Project Delivery Network (PDN)

October 2024

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Read First: How to Use the PDN

The NCDOT Project Delivery Network (PDN) is a ***scalable and flexible*** support document for those involved with delivery and management of projects. This preface answers some of the typical questions regarding purpose and use of the PDN, alongside defining the common terms used throughout.

PDN Common Terms

Stage: A major step of the project development process that concludes with a milestone.

Activity: The overall action(s) completed by a technical Unit/discipline to move to the next stage of the PDN. An activity is represented by an identifier (e.g., 1FS1, 2HY2) as shown on the PDN Activity Diagram (discussed further below).

Task: The step(s) and process(es) necessary to complete an activity.

Detail: The task description to explain what and why of a task.

PDN Activity Diagram: A "map" of all PDN's activities that could be used to deliver a project.

What is the purpose of the PDN?

The PDN was developed to provide consistency and transparency throughout the project delivery process, enabling project teams to improve reliability and efficiency. The PDN outlines the stages, activities, tasks, deliverables, and references to accomplish these ends (see definition of the PDN's "common terms" in the callout to the right).

Specifically, the PDN is to assist technical team members, led by a Project Manager (whether a project is led by NCDOT or a private engineering firm [PEF]/consultant), to realize the following:

- Maintain consistency via a logical progression of activities throughout the project initiation, environmental, and design phases.
- Streamline processes and procedures throughout the project development process.
- Identify team integration points to promote multidisciplinary collaboration at each stage of the process.
- Provide a systematic quality control/quality assurance (QC/QA) process.
- Define key project deliverables and activities to build an MS Project schedule that a Project Manager and project team use to advance project delivery.

How is a project delivered within the PDN?

The PDN takes a project through the following five stages (*with each stage defined in terms of high-level goals that can be accomplished at any point in the stage and a milestone diamond(s) to assess the status of the project, review the project schedule, and memorialize when the stage is completed*):

Stage 1: Project Initiation

- **Goal:** Develop an initial vision and conceptual layout and report (e.g., Express Design and the Project Scoping Report) sufficient to commence the subsequent environmental and design process.
- **Milestone:** Notice to Proceed (NTP) – M0965
  - Completed once the PEF/consultant has been given official notice to proceed for the work.
  - Enter the date of the notification.

- If there is not a PEF on the project, enter the date that the internal team begins work. See the *PM Guide* for related information on NTP.

Stage 2: Environmental and ROW Plans

- **Goal:** Complete the needed survey, analyses, and design work to establish a horizontal and vertical roadway alignment, advance the environmental document, and progress design to develop the Field Inspection Plan Set that will include cross-discipline coordination and review for constructability considerations. This stage concludes with the project team incorporating field inspection comments to finalize the Right-of-Way Plan Set.
- **Milestone:** Right of Way Plans Complete (RPC)
  - Completed once the field inspection has been conducted and Right-of-Way Plan Set is submitted.
  - Enter the date of the review meeting.

Stage 3: Final Plans

- **Goal:** Complete all design, finalize the environmental document, and continue right-of-way and utility acquisition and relocation activities initiated in Stage 2.
- **Milestone:** Design Complete (DC) – M1007
  - Completed when all disciplines' design work is submitted for the Design Complete Review Meeting.
  - Enter the date of the review meeting.

Stage 4: Plans, Specifications, & Estimate (PS&E) and Letting

- **Goal:** Finalize all plans, specifications, and estimates to be packaged for letting and prepare the project for advertisement.
- **Milestone:** Let – Select milestone number based on project type.
  - Completed when the bids are opened.
  - Enter the date of bid opening.

Stage 5: Post-Letting/Construction

- **Goal:** Complete the necessary post-letting/construction activities to support the project's construction phase. Refer to post design construction services and Stage 5 throughout the PDN for additional information.

Does a project need to use every single PDN activity or task?

Not every project will require all activities and tasks detailed in the PDN. The steps necessary to deliver a large-scale interstate widening project will not be the same as those needed for a simple pavement preservation project.

As such, the PDN is designed to flex with a project's scope and objectives. It presents the whole process that includes the "universe of potential delivery options", while remaining scalable for how a project is:

- **Scoped:** The updated *PDN Scope of Service Generator* allows the user to select relevant PDN activities and tasks for the project in question.
- **Scheduled:** The *PDN MS Project Schedule Template* (*in development*) guides the user through activity logic, order, and major milestones typical for most projects. However, the template also allows a user to customize durations, relationships (i.e., predecessors), and which stage an activity or tasks would fall under, all driven on the project needs or commitments.
- **Budgeted:** The updated *Manday Estimate* is the tool used to build an estimate based on PDN activities and tasks and aligned with the standard scopes of services.

What role does coordination play in the PDN?

Coordination is essential for project success. Led by the Project Manager, team integration and communication among disciplines on the project team and with outside stakeholders and consultants are necessary to deliver a successful project that meets project goals on schedule and within budget. One of the foundational elements of the PDN is that it can be used by multiple audiences (Divisions, Technical Units, PEFs/consultants, or contractors) to understand the roles and responsibilities of each team member.

Throughout the PDN narrative and MS Project Schedule Template, references are embedded (e.g., "see 2RD1 for related information") to denote relationships between activities and, in certain instances, where specific deliverables or tasks require cross-discipline coordination before advancing. Searching for the term "related information" in an activity quickly reveals all of the cross-discipline coordination points.

Where will the project documentation be stored?

All documents related to the project will be stored electronically on the applicable project SharePoint site, following SharePoint Guidance and naming conventions. All final key documents for the project will be saved using the ATLAS Workbench to ensure they are tagged and named appropriately and can be found easily moving forward. The current version of the PDN now includes an ATLAS indicator associated with certain deliverable tables that notes every final document(s) or data set(s) that must be uploaded to the ATLAS Workbench. All NCDOT and/or PEF/consultant team members will have access to the project SharePoint site. Team members can choose to be notified when documents pertaining to their tasks are uploaded.

How is this PDN updated?

The PDN is intended to be dynamic and continually improved upon, and over time, the processes described herein are updated to ensure process refinement and best practices. As such, NCDOT encourages suggestions and comments from users to improve the process or identify opportunities for further acceleration or streamlining. NCDOT has set up a formal process for submitting comments and suggestions as questions, markups, or live edits in a form linked near the location this PDN is available for download.

Submitted comments will be reviewed on a regular basis for incorporation into the document. While an update to the PDN can take place at any time depending on the critical nature of the change, updates are planned annually. This will be an opportunity for all users to review and update their processes.

How are project stages and activities presented in the PDN?

Each stage consists of multiple activities, consisting of five parts:

1) Activity identifier and brief heading (defined further below)
2) Brief overview of the activity
3) Reference list and links to commonly used documents that guide a user on completing the activity
4) Responsibility table that lists all deliverables that may need to be developed/completed (defined further below)
5) Details for each task that provide a further description on how to apply the steps, processes, and reference materials to complete the activity

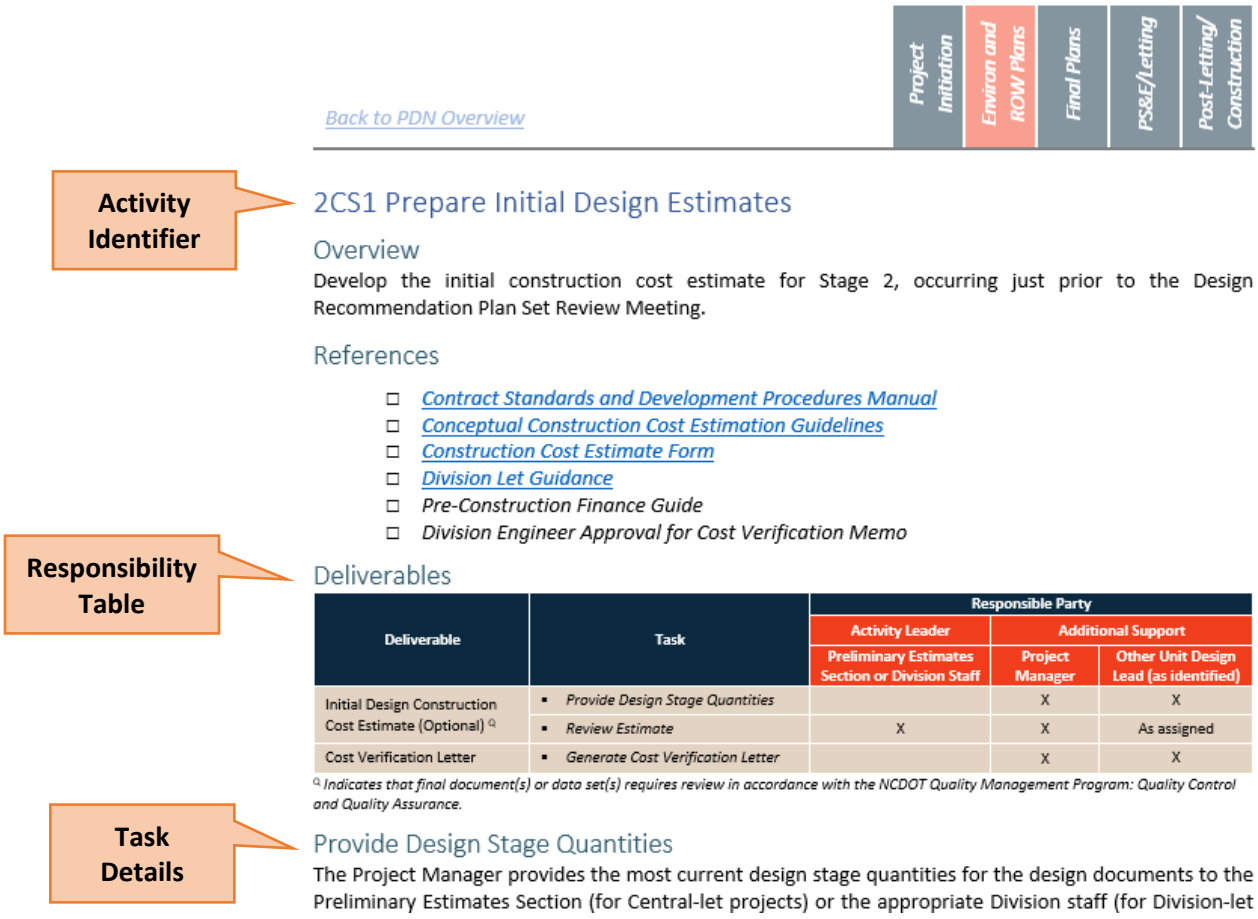

Figure 1: Example PDN Activity Breakdown

Activity Identifier

As identified on **Figure 1**, each activity has a unique "Activity Identifier" for tracking purposes in MS Project and for scoping purposes as the project evolves. The activity identifiers consist of the following:

- (Stage Number) (Unit/Discipline Designation) (Identifying Number)

Using **Figure 1** as an example, the identifier is "2CS1".

- The "2" indicates that the activity is completed in the Alignment Defined Stage (Stage 2).
- The "CS" identifies the Contract Standards & Development Unit as the lead for this activity.
- The "1" represents this as the first activity for that Unit in Stage 2.

Responsibility Table

The Responsibility Table for each activity identifies the deliverables, associated task(s), and the responsible party(ies) for each task(s). The listed order of tasks is ***not necessarily the chronological order for completion***.

The Activity Leader is the member of the project team responsible for ensuring that the task is completed successfully, and the Additional Support is anyone other than the Activity Leader who has a responsibility for the task. The table is not intended to list all team members involved, and the Activity Leader may delegate the completion of specific tasks or deliverables to other team members.

What is the PDN Activity Diagram?

From the first project initiation activities through letting, the following figure (see next page) illustrates a "map" of all the PDN's activities that could apply (***but are not necessarily required***) when delivering a project. The figure includes many unique features to guide the user.

- The Discipline Legend:
  - Denotes an individual color for each discipline that has an activity to complete.
  - Includes (as a separate downloadable file on the Project Management Connect Site) an interactive workflow that allows users via buttons (show all/hide all and by clicking on each discipline's box) the ability to highlight specific paths for a discipline(s). This allows the user to isolate a discipline path(s) to better view relationships to related activities and milestones.
- Milestones initiate and conclude each stage, denoted by diamonds.
- Each stage represents a series of activities that may need to be completed before moving onto the next stage.
  - The activities are not laid out chronologically or as a flowchart but are grouped by discipline. As such, the network requires collaboration, led by the Project Manager, to determine what activities apply and to define the logical relationships and order of activities for a specific project.
  - **Of note:** it ***may be advantageous to advance*** certain activities within a stage earlier or even advance activities in later stages to the current stage, if it is more efficient to deliver the project.
- Each activity box is interactively linked to its associated section in the PDN.

- By clicking on an activity box, a user is directed to that section for further details.
- The header of each section includes a “Back to PDN Overview” link that takes the user back to the diagram.

STAGE 1
PROJECT INITIATION

STAGE 0
Complete CTP/MTP (including Project Sheets) (0TP1)

Complete Express Design Traffic Volume (1TP1)
Complete Express Design Traffic Analysis (1TM1)
Structures Screening (1ST1)
Provide Best Available Geospatial Data (1PH1)
Initiate Roadway Coordination (1RD1)
Initiate Complete Streets Review (1IM1)
Identify Railroad Impacts (1RR1)
Assess Safety Planning (1TS1)
Develop Initial Utility Relocation & Construction Estimates (1UT1)
Prepare Conceptual ROW Cost Estimate (1RW1)
Prepare Conceptual Construction Cost Estimate (1CS1)
Develop STIP (1SI1)
Complete Project Prioritization (1SP1)
Complete Express Design (1FS1)
Investigate Existing ITS & Signal Communications (1SG1)
Establish Environmental Needs (1EN1)
Determine Affected Coordinated Corridors *(if not a Sig. Project)*)* (1SS1)
Review Project Scoping (1CG1)
Provide Photogrammetric Control & Initiate Surveys (1LS1)
Compile Aerial Photography & Mapping (1PH2)
Review Complete Street Elements (1IM2)
Initiate NEPA/SEPA Coordination (1EP1)
Geotechnical, Geopavement & GeoEnvironmental Planning (1GT1)
Initiate Public Engagement Tasks (1PI1)
Scope Traffic System Operations (1TO1)
Initiate Value Management Activities (1VM1)
Investigate Existing Utilities (1UT2)
Complete Project Scoping Report (1FS2)
Complete Traffic Forecast (1TP2)
Lead Team Through Project Initiation Handoff (1PM1)

STAGE 2
ENVIRONMENTAL AND ROW PLANS

Lead Team Through Environmental & ROW Plans (2PM1)
Complete Final Surveys (2LS1)
Initiate Natural Resources Analysis (2EN1)
Initiate Human Environment Analysis (2EN2)
Initiate Utility Coordination and/or Design (2UT1)
Complete Safety Analysis & Operational Review (2TS1)
Complete Traffic Analysis (2TM1)
Alternative Development (Opt.) (2RD1)
Initiate Signing & Delineation Design (2SD1)
Coordinate Railroad Review (2RR1)
Develop Preliminary Hydraulic Recommendations (2HY1)
Verify Complete Streets (2IM1)
Complete Value Management Activities (2VM1)
Scope Structures Design (2ST1)
Public Engagement (2PI1)
Assist with Public Engagement (2CG1)
GeoEnvironmental Phase I (2GT1)
Roadway Geotechnical & Geopavement Investigations (2GT2)
Prepare Utility Relocation & Construction Estimates (2UT2)
Prepare ROW Cost Estimate (2RW2)
Prepare Initial Design Estimates (2CS1)
Complete the Design Recommendation Plan Set (2RD2)
Advance NEPA/SEPA Documentation (2EP1)
Coordinate Railroad Review (2RR2)
Complete Drainage Design (2HY2)
Complete SUE Level A (2LS2)
Begin Advance Acquisition ROW Tasks (2RW1)
Develop Preliminary General Drawings (2ST2)
Initiate Erosion and Sediment Control Plans (2RE1)
Advance Signing and Delineation Design (2SD2)
Initiate Transportation Management Plan (2TM2)
Develop Design Noise Report or Addendum (2EN3)
Establish Signal & ITS Locations (2SG1)
Complete Pavement Design (2PD1)
Initiate Transportation Operations Plan *(if Sig. Project*)* (2TO1)
Geotechnical Structure Investigations (2GT3)
Advanced Utility Coordination and/or Design (2UT3)
Initiate Signal System Timing *(if not a Sig. Project)* (2SS1)
ROW, Utility and Permitting Strategy (2PM2)
Prepare for Field Inspection (2RD3)
Prepare Utility Relocation & Construction Estimates (2UT4)
Prepare ROW Cost Estimate (2RW3)
Prepare Field Construction Estimate (2CS2)
Coordinate Field Inspection (2PM3)
ROW Plans Completed (2RD4)

STAGE 3
FINAL PLANS

Lead Team Through Final Plans (3PM1)
Complete Additional Surveys & Initiate ROW Acquisition Surveys (3LS1)
Update Existing Mapping or Extend Mapping (3PH1)
Finalize ROW Authorization Package (3RW1)
Complete ROW Acquisitions & Relocations (3RW2)
Finalize Railroad Design & Agreements (3RR1)
Complete Railroad Coordination (3RR2)
Complete Utility Coordination and/or Design (3UT1)
Initiate Utility Relocations by Others (3UT2)
Verify and Revise Pavement Design (3PD1)
GeoEnvironmental Phase II (3GT1)
Verify Geotechnical Deliverables (3GT2)
Complete Erosion & Sediment Control Plans (3RE1)
Revisit NEPA/SEPA Documentation (3EP1)
Complete Hydraulic Permitting Tasks and Finalize Plans (3HY1)
Review and Verify Pavement Marking Designs (3IM1)
Document Noise Abatement Decision (3EN1)
Apply for Permits (3EN2)
Complete Transportation Management Plan (3TM1)
Complete Signal & ITS Design (3SG1)
Complete Signing & Delineation Design (3SD1)
Complete Safety Analysis & Operational Review (3TS1)
Complete Structures Design (3ST1)
Advance Transportation Operations Plan *(if Sig.Project)* (3TO1)
Initiate Signal System Timing *(if not a Sig.Project)* (3SS1)
Incorporate Value Management Activities (3VM1)
Complete Roadway Design (3RD1)
Prepare Design Complete Review Plan Set Utility Construction Estimate (3UT3)
Prepare Construction Estimate (3CS1)
Review Design Estimates (3CS2)
15 Month Let Review (3PM2)
Design Complete Review Meeting (3PM3)

STAGE 4
PLANS, SPECS, & ESTIMATES (PS&E)

Lead Team Through PS&E (4PM1)
Complete NEPA/SEPA Documentation (4EP1)
Secure Permits (4EN1)
Finalize Utility Coordination and/or Utility Design PS&E (4UT1)
Complete Utility Relocations by Others (4UT2)
Finalize Structures Design PS&E (4ST1)
Manage GeoEnvironmental Impacts (4GT1)
Complete ROW Acquisition Surveys (4LS1)
Hydraulic Let Preparation (4HY1)
Finalize Erosion & Sediment Control Contract Package (4RE1)
Complete Street Reporting (4IM1)
Complete Value Management Activities (4VM1)
Prepare Construction Communications Activities (4CG1)
Complete Transportation Operations Plan-Related Tasks (4TO1)
Signal Timing Implementation *(if not SP*)* (4SS1)
PS&E Review Meeting (4PM2)
Finalize the PS&E Package (4RD1)
Complete PS&E Package and Advertise the Project (4CS1)
Let, Award, and Execute (4CS2)
Stage 5*
*See respective Stage 5 activities throughout the PDN.

UNIT LEGEND

Communication Group (CG)
Environmental Analysis (EN)
Feasibility Studies (FS)
Hydraulics (HY)
Location & Surveys (LS)
Public Involvement (PI)
Project Manager (PM)
Railroad (RR)
Right-of-Way (RW)
Transportation Signals & ITS Design (SG)
Strategic Prioritization Office (SP)
Structures Design (ST)
Traffic Systems Operations (TO)
Traffic Safety (TS)
Value Management (VM)
Contract Standards & Development (CS)
Environmental Policy (EP)
Geotechnical (GT)
Integrated Mobility (IM)
Pavement Design (PD)
Photogrammetry (PH)
Roadway (RD)
Roadside Environmental (RE)
Signing & Delineation (SD)
State Transportation Improvement Program (SI)
Signal System Timing Operations (SS)
Traffic Management (TM)
Transportation Planning (TP)
Utility Coordination & Design (UT)
Key Milestone

1CS1 Prepare Conceptual Construction Cost Estimate

Overview

Develop conceptual construction cost estimates for all alternatives/alignments under consideration for a project.

Note: *Actions during the Project Initiation Stage may be led and completed by staff from several different NCDOT groups. Any person who has overall responsibility for a project during this Stage is referred to as the "Project Lead." This lead could be the Feasibility Studies Engineer, the Corridor Development Engineer, the Division Planning Engineer, or someone in a similar role as tasked by a state or local agency.*

References

- ☐ *Contract Standards and Development Procedures Manual*
- ☐ *Conceptual Construction Cost Estimation Guidelines*
- ☐ *Construction Cost Estimate Form*
- ☐ *Division Let Guidance*
- ☐ *Pre-Construction Finance Guide*
- ☐ *Division Engineer Approval for Cost Verification Memo*

Deliverables

Deliverable	Task	Responsible Party	
		Activity Leader	Additional Support
		Preliminary Estimates Section or Division Staff	Project Lead
Conceptual Construction Cost Estimate [Q]	▪ *Provide Conceptual Design Stage Quantities*		X
	▪ *Review Conceptual Estimates*	X	X
Verified Conceptual Construction Cost Estimate	▪ *Provide Conceptual Design Stage Quantities – Selected Alternative*		X
	▪ *Review Conceptual Estimates – Selected Alternative*	X	X
Cost Verification Letter [Q]	▪ *Request Cost Verification Letter*		X

[Q] *Indicates that final document(s) or data set(s) require review in accordance with the NCDOT Quality Management Program: Quality Control and Quality Assurance.*

Provide Conceptual Design Stage Quantities

For conceptual design stage quantities, the Project Lead:

- Requests a cost estimate from the Preliminary Estimates Section (for Central-let projects) or the appropriate Division staff (for Division-let projects $5 million and under).
- Submits the conceptual design stage quantities for each alternative/alignment on the Construction Cost Estimate Request Form to the estimator.

Review Conceptual Estimates

The Preliminary Estimates Section (for Central-let projects) or the appropriate Division staff (for Division-let projects) prices the estimate, and the Project Lead reviews the conceptual estimates for each alternative/alignment, considering the following:

- Costs for each pay item are determined using historical bid data and backup projects of similar work in the market area.
- Estimates are available as the project moves forward and can be part of the considerations for selecting the Least Environmentally Damaging Practical Alternative (LEDPA), if applicable.

Provide Conceptual Design Stage Quantities – Selected Alternative (if applicable)

The Project Lead provides the most current conceptual stage quantities for the selected alternative/alignment to the Preliminary Estimates Section (for Central-let projects) or the appropriate Division staff (for Division-let projects) on the Construction Cost Estimate Form. This is to ensure one is working with the most up-to-date estimate, considering that:

- Quantities/cost may change depending on 1) the amount of time that has passed allowing for increased costs because of inflation and supply chain issues and 2) the number of design changes that may have been implemented since the last estimate request.
- Updates to the estimates are to be made by submitting the Construction Cost Estimate Form any time new quantities are available or every two years, whichever occurs first.

Review Conceptual Estimate – Selected Alternative

For the selected alternative/alignment, the Preliminary Estimates Section (for Central-let projects) or the appropriate Division staff (for Division-let projects) prices the estimate, and the Project Lead:

- Reviews the conceptual estimates to ensure there are no obvious errors in quantities or items.
- Includes a copy of the most recent estimate within the appendix of the Project Scoping Report (see 1FS2 for more information).

Request Cost Verification Letter

After satisfactory review, the Project Lead generates and distributes a Cost Verification Letter per the process detailed in the *Division Engineer Approval for Cost Verification Memo*.

2CS1 Prepare Initial Design Estimates

Overview

Develop the initial cost estimate for Stage 2, occurring just prior to the Design Recommendation Plan Set Review Meeting.

References

- ☐ *Contract Standards and Development Procedures Manual*
- ☐ *Conceptual Construction Cost Estimation Guidelines*
- ☐ *Construction Cost Estimate Form*
- ☐ *Division Let Guidance*
- ☐ *Pre-Construction Finance Guide*
- ☐ *Division Engineer Approval for Cost Verification Memo*

Deliverables

Deliverable	Task	Responsible Party		
		Activity Leader	Additional Support	
		Preliminary Estimates Section or Division Staff	Project Manager	Other Unit Design Lead (as identified)
Initial Design Construction Cost Estimate (Optional) [Q]	▪ *Provide Design Stage Quantities*		X	X
	▪ *Review Estimate*	X	X	As assigned
Cost Verification Letter	▪ *Generate Cost Verification Letter*		X	X

[Q] *Indicates that final document(s) or data set(s) requires review in accordance with the NCDOT Quality Management Program: Quality Control and Quality Assurance.*

Provide Design Stage Quantities

The Project Manager provides the most current design stage quantities for the design documents to the Preliminary Estimates Section (for Central-let projects) or the appropriate Division staff (for Division-let projects $5 million and under) on the Construction Estimate Request Form. The Project Manager or appropriate Division staff is to verify that the Utility staff submit utility construction (PH 300) estimate quantities (see 3UT2 for more information).

Review Estimate

The Preliminary Estimates Section or the appropriate Division staff prices the estimate and provides the documentation to the entire team, notifying the Project Manager when complete. The project team (led by the Project Manager and including the estimator) reviews the estimate to ensure there are no obvious errors in quantities or items.

As applicable, the Environmental Document Lead includes a copy of the most recent estimate within the appendix of the NEPA document.

Generate Cost Verification Letter

After satisfactory review, the Project Manager generates and distributes a Cost Verification Letter per the process detailed in the *Division Engineer Approval for Cost Verification Memo*.

2CS2 Prepare Field Construction Estimate

Overview

Develop the next construction cost estimate for Stage 2, occurring just prior to the Field Inspection Review Meeting.

References

- ☐ *Contract Standards and Development Procedures Manual*
- ☐ *Conceptual Construction Cost Estimation Guidelines*
- ☐ *Construction Cost Estimate Form*
- ☐ *Division Let Guidance*
- ☐ *Pre-Construction Finance Guide*
- ☐ *Division Engineer Approval for Cost Verification Memo*

Deliverables

Deliverable	Task	Responsible Party		
		Activity Leader	Additional Support	
		Preliminary Estimates Section or Division Staff	Project Manager	Other Unit Design Lead (as identified)
Field Inspection Construction Cost Estimate [Q]	▪ *Provide Design Stage Quantities*		X	X
	▪ *Review Estimate*	X	X	As assigned
Cost Verification Letter	▪ *Generate Cost Verification Letter*		X	X

[Q] *Indicates that final document(s) or data set(s) requires review in accordance with the NCDOT Quality Management Program: Quality Control and Quality Assurance.*

Provide Design Stage Quantities

The Project Manager provides the most current design stage quantities for the design documents to the Preliminary Estimates Section (for Central-let projects) or the appropriate Division staff (for Division-let projects $5 million and under) on the Construction Estimate Request Form. The Project Manager or appropriate Division staff is to verify that the Utility staff submit utility construction (PH 300) estimate quantities (see 3UT2 for more information).

Review Estimate

The Preliminary Estimates Section or the appropriate Division staff prices the estimate and provides the documentation to the entire team, notifying the Project Manager when complete. The project team (led by the Project Manager and including the estimator) reviews the estimate to ensure there are no obvious errors in quantities or items.

As applicable, the Environmental Document Lead includes a copy of the most recent estimate within the appendix of the NEPA document.

Generate Cost Verification Letter

After satisfactory review, the Project Manager generates and distributes a Cost Verification Letter per the process detailed in the *Division Engineer Approval for Cost Verification Memo*.

3CS1 Prepare Construction Estimate/3CS2 Review Design Estimates

Overview

Develop Construction Cost Estimates for Stage 3, occurring just prior to the Design Complete Review Meeting.

References

- ☐ *Contract Standards and Development Procedures Manual*
- ☐ *Conceptual Construction Cost Estimation Guidelines*
- ☐ *Construction Cost Estimate Form*
- ☐ *Division Let Guidance*
- ☐ *Pre-Construction Finance Guide*
- ☐ *Division Engineer Approval for Cost Verification Memo*

Deliverables

Deliverable	Task	Responsible Party		
		Activity Leader	Additional Support	
		Preliminary Estimates Section or Division Staff	Project Manager	Other Unit Design Lead (as identified)
13 Month Let List Construction Cost Estimate [Q]	▪ *Provide Design Stage Quantities*		X	X
	▪ *Review Estimate*	X	X	As assigned
Cost Verification Letter	▪ *Generate Cost Verification Letter*		X	X

[Q] *Indicates that final document(s) or data set(s) requires review in accordance with the NCDOT Quality Management Program: Quality Control and Quality Assurance.*

Provide Design Stage Quantities

The Project Manager provides the most current design-stage quantities for the design documents to the Preliminary Estimates Section (for Central-let projects) or the appropriate Division staff (for Division-let projects $5 million and under) on the 13 Month Let List Construction Cost Estimate Form. The Project Manager or appropriate Division Staff is to verify that the Utility staff submit utility construction (PH 300) estimate quantities (see 3UT2 for more information).

Review Estimate

The Preliminary Estimates Section or the appropriate Division staff prices the estimate and provides the documentation to the entire team, notifying the Project Manager when complete. The project team (led by the Project Manager and including the estimator) reviews the estimate to ensure there are no obvious errors in quantities or items.

Generate Cost Verification Letter

After satisfactory review, the Project Manager generates and distributes a Cost Verification Letter per the process detailed in the *Division Engineer Approval for Cost Verification Memo*.

4CS1 Complete PS&E Package and Advertise the Project

Overview

Finalize and review the final PS&E package for authorization of construction funds and project advertisement. Although the Divisions may develop the PS&E package and assemble the proposal, the NC General Statute currently decides if the project is let at the division level or centrally in Raleigh.

References

- ☐ *Contract Standards and Development Procedures Manual*
- ☐ *Roadway Standard Drawings*
- ☐ *Standard Specifications*
- ☐ *2024 Review List for Final Construction Plans*
- ☐ *PS&E Checklist for Centrally Let Projects* OR *Division PS&E Checklist*
- ☐ *Automated Proposal Application (APA)*
- ☐ *Tentative Letting Lists (12-month and 13-month let lists)*
- ☐ *Division Let Guidance*
- ☐ NCDOT Bidding and Letting Section
- ☐ Central Let Resources
- ☐ *Pre-Construction Finance Guide*

Deliverables

Deliverable	Task	Responsible Party				
		Plan Review Engineer	Proposal Engineer	Contract Time Engineer	Provisions Engineer	Estimating Engineer
Final Plans [Q]	▪ *Complete Pre-Bid Process*	X				
Proposal [Q]	▪ *Complete Pre-Bid Process* ▪ *Advertise the Project*		X X	X	X	X
Confidential Engineer's Estimate	▪ *Complete Pre-Bid Process*					X

[Q] *Indicates that final document(s) or data set(s) requires review in accordance with the NCDOT Quality Management Program: Quality Control and Quality Assurance.*

Complete Pre-Bid Process

The pre-bid process covers two steps led by Contract Standards & Development staff or the equivalent Division staff.

- Prepare and approve the PS&E package (using the PS&E Checklist for Centrally Let Projects OR the Division PS&E Checklist, as applicable) for advertisement
- Obtain authorization for construction funds.

Review Plans

To complete the plan review, the Plan Review Engineer or the Division's Proposal Engineer:

- Reviews the plans and quantities for fatal flaws.
- Sends plan checking comments to the Project Manager, who post, sign, and date Final Plan files to the Let Preparation area of the project SharePoint site.

- Passes the PS&E package to the Proposal Engineer for completion.

Establish Contract Times

The Contract Time Engineer (or equivalent Division Lead) reviews the Transportation Management Plan (TMP), Utilities by Others Plans (UBO), other applicable plans, environmental documents, Intermediate Contract Times (provided by Work Zone Traffic Control), and pay items and quantities to establish overall contract times. (This includes the Completion Dates.) These tasks must be completed prior to the Contract Time Committee Meeting.

Generate Roadway Special Provisions and Engineer's Final Estimate tasks noted below run concurrently with Establish Contract Times.

Facilitate Goal Setting Meeting

The State Proposals Engineer or the Division Construction Engineer facilitates a meeting to establish the MBE, WBE, DBE participation goals based on federal and state regulations.

Generate Special Provisions

The Proposal Engineer reviews the plans and compiled estimate to provide special provisions for pay items not covered by the Standard Specifications (APA program initiated).

Generate Final Pay Items and Quantities

The Proposals Engineer reviews final pay items and quantities. The Estimating Engineer then generates the Confidential Engineer's Estimate and the percentage breakdown cost for work activities. The Proposals Engineer uses this information to identify the major contract items.

Assemble Proposal

The Proposal Engineer assembles the standard special provisions, the project special provisions, and item sheets into the final proposal as described in the *Central Let Resources* and the *Division Let Guidance*.

Advertise the Project

When the PS&E package has been finalized and construction funding is authorized, the project is ready to be advertised. *Central Let Resources* and the *Division Let Guidance* provide more information on the authorization (including necessary federal approval, certification, coordination, and timing requirements), advertisement, document posting, and point-of-contact designation for both Central and Division-let projects.

Advertisement

For Central-let projects, the electronically signed and sealed plan files and the electronically signed and sealed proposal are posted to the NCDOT Bidding and Letting section of the Connect Site (4 weeks prior to the letting date and 8 weeks prior to the letting date for special projects). For advertising a Division-let project, the *Division Let Guidance* provides more information on the advertisement process.

The NCDOT Bidding and Letting section of the Connect Site is the central repository for project letting information, including updated information for letting, newly advertised projects, addendums, and bid results.

Prepare Addendums

The State Plans and Standards Engineer or the State Proposals and Specifications Engineer (or designated point of contact for Division-let projects) responds to questions about currently advertised projects from contractors. Addendums to the plans and proposal are developed, posted, and processed in accordance with *Central Let Resources* and the *Division Let Guidance*.

4CS2 Let, Award, and Execute

Overview

Let, award, and execute the project in accordance with Sections 102 and 103 of the *Standard Specifications* and the letting guidance for both Central and Division-let projects.

References

- ☐ *Contract Standards and Development Procedures Manual*
- ☐ *Standard Specifications*
- ☐ *Tentative Letting Lists (12-month and 13-month let lists)*
- ☐ *Division Let Guidance*
- ☐ NCDOT Bidding and Letting
- ☐ Central Let Resources
- ☐ *Letting Administration User Guide*

Deliverables

Deliverable	Task	Responsible Party
		Activity Leader
Award Letter	▪ *Awarding and Executing a Contract*	State Contract Officer or Division Contract Engineer (or designee)
Goal Confirmation Letter	▪ *Letting the Project* ▪ *Awarding and Executing a Contract*	State Prequalification Engineer or Division Contract Engineer (or designee)
Execution Letter	▪ *Awarding and Executing a Contract*	Contract Office / Contract Engineer (or designee)

Letting the Project

On Let day, bids are received, verified as being responsive, and read aloud along with the Engineer's Estimate. Central Highway Letting Date is the 3rd Tuesday of each month. Each Division is assigned designated letting dates as detailed on the Division Letting Map in the *Division Let Guidance*. While different days may be set for special lettings, this is to be the exception and not the typical practice.

The letting process also includes several checks to verify the bids are responsive and the winning bidders are responsible to get a contract ready for award and execution, all of which follows the *Central Let Resources* and *Division Let Guidance:*

- Guidelines for bid openings
- Confirmation of documentation required to be included with the bids
- Process to review and verify the bids as responsive

Good Faith Effort Review Committee Meeting

The State Prequalification Engineer or Division Construction Engineer facilitates and records a meeting to review a submittal of Good Faith Effort should the project's MBE/WBE/DBE goal not be met. The committee determines whether a Good Faith Effort was met or was not. If the bidder was found in Good Faith, a Goal Confirmation Letter is written to outline the revised goals of the contract.

Bid Review Committee Meeting

The State Contract Officer or Division Engineer (or designated individuals):

- Facilitates and records a meeting to review the bid documents submitted with the bid, in addition to documents submitted after (e.g., letters of Interest, payment and performance bonds, certificate of insurance)
- Compares the bids with the Engineer's Estimate to determine whether a contract is to be awarded.

Awarding and Executing a Contract

Following a proposal of award of the contract by the Bid Review Committee, the State Contract Officer or Division Contract Engineer (or designee) develops and issues the Award Letter along with the Goal Confirmation Letter, if needed, to the contractor via email or US mail.

Additionally, the State Contract Officer or Division Contract Engineer (or designee):

- Executes in AASHTOWARE Preconstruction (see Division Letting Administration User Guide for more information)
- Distributes executed contract as necessary and uploads a copy of the executed contract (including Letters of Intent, Payment and Performance Bonds, Certificate of Insurance, and Non-Collusion, Debarment and Gift Ban Certification) and plans to the Construction Projects Team Site.
- Uploads the Award Letter, Goal Confirmation Letter, and Execution Letter and forms from the Bid Review and Good Faith Effort Committees.

5CS1 Construction Revisions

Overview

Incorporate construction revisions into the latest version of the Let Plans to address identified field issues and to efficiently update the plans, so construction work can continue to move forward using the latest design information.

References

- ☐ *Roadway Design Manual*
- ☐ *Construction Revision Memorandum*

Deliverables

Deliverable	Task	Responsible Party			
		Activity Leader	Additional Support		
		Project Manager	Division Representative	Roadway Design Lead	Other Unit Design Lead (as identified)
Construction Revision Request	▪ *Request a Construction Revision*	X	X		
Updated Plans [Q]	▪ *Update the Plans*	X	X	X	X
Updated Quantities [Q]	▪ *Update the Quantities and Special Provisions*	X		X	X
Updated Special Provisions (if applicable) [Q]					
Construction Revision Memorandum	▪ *Document Construction Revisions*	X			
Right of Way Revision Memorandum		X			

[Q] *Indicates that final document(s) or data set(s) requires review in accordance with the NCDOT Quality Management Program: Quality Control and Quality Assurance.*

Request a Construction Revision

When a potential construction revision is identified, the Division representative (typically the Resident Engineer) sends a revision request to the Project Manager. Throughout the construction revision process, the Project Manager coordinates with the Division representative/Resident Engineer regarding completion timelines and to ensure the revisions meet expectations in the field.

Update the Plans

Upon receiving the request, the Project Manager coordinates with the requestor (typically the Division Resident Engineer) to understand the reason for the change and to determine next steps in completing the revision. This typically includes identifying the:

- Background details that led to the request
- Limitations involved
- Expectations and next steps (e.g., timing for processing the request, process to revise the plans)

The Project Manager considers both the complexity of the revision and timing for completing the work to direct the affected Design Leads on how to revise the current version of the Let Plans. The Project Manager leads the coordination efforts and establishes the deadlines to revise, review, and comment on the construction revision.

- For a simple revision, the Roadway Design Lead modifies the current Roadway Design Plans, allowing time for all affected Design Leads to review and comment on the proposed changes.
  - **Note:** The Roadway Design Lead incorporates any comments/recommendations into the plans. There may be a need for additional coordination to resolve any issues or conflicting information.
- If major revisions are necessary, the Project Manager directs the affected Design Leads to revise their respective plans in parallel. Each Design Lead reviews the revisions, incorporating the changes into the Let Plans.
  - **Note:** Additional coordination may be needed to resolve any issues or conflicting information across the disciplines.

Typically, a Construction Revision Memorandum is issued with updated information from all affected disciplines. When preparing the memo, the Project Manager coordinates with each Design Lead to determine when to provide their portion for inclusion. However, depending on Division needs and time required to issue the construction revision, the Project Manager may elect to distribute submittals from the Design Leads separately.

Update Quantities and Special Provisions

In addition to updating the Let Plans, all affected Design Leads are to:

- Update their quantities, providing the net quantity adjustment (+ or -) to the Project Manager.
- Revise any special provisions, as needed, that are impacted by the construction revision.

Document Construction Revisions

To complete the construction revision process, the Project Manager:

- Conducts a completeness check of the plans, quantities, and special provisions (if applicable). If the revision impacts a municipal or developer agreement, the Project Manager includes any engineering cost in the documentation.
- Coordinates with the Design Leads to address further comments and changes
- Confirms that all revised files and documents have been uploaded to the project's SharePoint site.
  - **Note:** The affected Design Lead creates the PDFs and seals their respective construction revision before uploading.

The Project Manager completes the process by issuing a Construction Revision Memorandum that:

- Identifies the plan sheets and special provisions (if applicable) that have been modified
- Summarizes the design revisions on each plan sheet
- Issues a construction revision estimate for affected pay item quantities
- Provides a link to corresponding PDFs and MicroStation design files

Contract Standards and Development or the Division Contracting Office distributes the revised plans in accordance with the process detailed in the *Construction Revision Memorandum*.

A construction revision may trigger a change to the right-of-way, or additional property negotiations may require updates to the Final ROW Series Plan Set (e.g., a change to a "fee simple" acquisition, modifications to property access, or a change in easement boundaries).

To address these changes, the Project Manager issues a Right of Way Revision Memorandum that notifies the Central ROW office, the project team, Location and Surveys, and others, of changes made to the plans. This memo:

- Summarizes the right-of-way revisions on each plan sheet.
- Provides a link to the revised right-of-way files.

Location and Survey modifies the ROW Reference CADD following the process in 5LS1 and 5LS2. The work may involve performing additional surveys to update the design plans resulting from a construction revision, in addition to providing necessary construction survey support detailed in 5LS2.

The Project Manager and Division ROW Office establish the deadline to acquire the new property based on when construction work is to occur in the impacted area.

1EN1 Establish Environmental Needs

Overview

Ensure that all projects, federal or state funded, comply with relevant environmental laws, including the Clean Water Act, National Environmental Policy Act (NEPA), State Environmental Policy Act (SEPA), Section 4(f), Section 106, the Endangered Species Act, Section 6(f), Title VI of the Civil Rights Act, and Farmland Protection Policy Act.

At this stage it is very important to know the scope and schedule for the project as directed by the Project Lead. If the project is small and less complex (bridges) it may include a shorter duration for planning and design. In this case, environmental analysis may be accelerated and fully commence at 1EN1. If the project has many issues that involve more time for planning and design, then it is important to raise environmental "red flags" via an initial screening and the deeper dive for environmental analysis occurs at 2EN1. It is important to note that requests for Environmental Analysis Unit (EAU) actions start with a submittal via the Environmental Tracking & Coordination System (ETRACS). Division environmental staff may lead other environmental analysis efforts and use other informal request/coordination processes. NCDOT Natural Environment Lead review ground disturbing projects within the Division and/or EAU staff. Division environmental staff can lead many of the EAU-related tasks contained herein as long as they fulfill NCDOT policies and regulatory requirements.

Note: *Actions during the Project Initiation Stage may be led and completed by staff from several different NCDOT groups. Any person who has overall responsibility for a project during this Stage is referred to as the "Project Lead." This lead could be the Feasibility Studies Engineer, the Corridor Development Engineer, the Division Planning Engineer, the Central Project Manager (from PMU), or someone in a similar role as tasked by a state or local agency.*

References

- ☐ *2020 Section 106 Programmatic Agreement*
- ☐ *Programmatic Agreement Manual for Minor Transportation Projects in North Carolina*
- ☐ Historic Architecture Group Procedures and Work Products
- ☐ *Tribal Coordination Protocol*
- ☐ *ETRACS System and Tutorial*
- ☐ *NRTR Scope Template and Guidance*
- ☐ *NRTR Procedures Manual*
- ☐ Division ETRACS Request for Section 7 Surveys
- ☐ *NCDOT Traffic Noise Policy*
- ☐ *NCDOT Traffic Noise Manual*
- ☐ *NCDOT Air Quality Handbook*
- ☐ *NCDOT Quality Management Program: Quality Control and Quality Assurance*

Deliverables

Deliverable	Task	Responsible Party	
		Activity Leader	Additional Support
Comments on Draft Scoping Report	▪ *Review Draft Project Scoping Report*	Environmental Staff	Project Lead
Complete Request	▪ *Receive Initial Request (ETRACS or Other Informal Means) for Human and Natural Environment Studies*	Project Lead	Environmental Staff
Landowner Letters	▪ *Prepare and Send Survey Notification Letter*	Environmental Staff	Project Lead
Cultural Resources Programmatic Agreement Cultural Resources Screening Checklist for Section 106	▪ *Complete Cultural Resource Screening*	Project Lead	Environmental Staff
Traffic Noise and Air Quality (TNAQ) Notification Scoping Report Recommendations	▪ *Determine Noise/Air Analyses Needs*	Environmental Staff	Project Lead
Community Screening	▪ *Determine Community Analyses Needs*	Environmental Staff	Project Lead

Use of the references, development of deliverables, and applicability of the tasks listed below depend on the scope and schedule of the project, which is decided by the Project Lead prior to determination of requests going forward in this stage. This activity involves developing a Project Study Area as the boundary to be studied by multiple NCDOT disciplines.

- The Project Study Area is to be inclusive of all potential alternatives; yet not oversized to cause unnecessary review from NCDOT or unintentional concerns from unimpacted landowners.
- Depending on project size and complexity, setting the boundaries of the Project Study Area may require input from the technical leads/Units to ensure the size is appropriate for all factors.

If the Project Lead determines that this stage involves only a screening for possible environmental "red flags" then the following should occur:

- Prepare Project Initiation Letter or scope of project and distribute to groups in EAU
- Receive Feedback from groups in EAU
- If Feedback provides "red flags" from any group, then request a screening from that group

The screening helps to determine further the scope and schedule for the project.

Review Draft Project Scoping Report

Upon request of the Project Lead, groups in the EAU review the draft Project Scoping Report and provide comments to the Project Lead (see 1FS2 for related information).

Receive Initial Request (ETRACS or Other Informal Means) for Human and Natural Environment Studies

The Environmental Analysis Unit (EAU) receives requests from the Project Lead to begin human and natural environment studies as part of the Project Scoping Report (see 1FS2 for related information).

- Projects that are scheduled to receive Notice to Proceed within the next 12 months, have the their requests prioritized.

- Projects scheduled for Notice to Proceed beyond the next 12 months, have their requests scheduled to begin 12 months before Notice to Proceed is anticipated.

The Project Lead ensures that, as appropriate, requests are sent to the following EAU human and natural environmental groups:

- Environmental Coordination and Permitting (ECAP) (for Water Resources File, Section 7 Surveys)
- Biological Surveys Group (BSG) (Section 7 Surveys (only for Division Managed Projects))
- Cultural Resources (Historic Architecture and Archaeology)
- Traffic Noise and Air Quality
- Public Involvement, Community Studies, and Visualization (PICSViz)

If a resource has potential to be impacted or requires more analysis to determine impacts, 2EN1 and 2EN2 provide details to complete the necessary tasks and deliverables.

The following tasks provide additional steps that each resource lead completes when a request is made.

Determine Natural Resources Technical Report (NRTR) Needs

Once a request has been received, the Natural Environment Lead determines whether the NRTR is to be developed in-house or if development is assigned to an on-call consultant. If determined that the NRTR is to be developed by an on-call consultant, then the Natural Environment Lead coordinates the scope of work and fee necessary for the NRTR in accordance with *NRTR Scope Template and Guidance*.

Determine Section 7 Survey Needs

Once a request is received, the Natural Environment Lead adds a Section 7 Survey Request to the project which populates the threatened and endangered (T&E) species for the county(ies) and notifies BSG. BSG/ECAP assigns the review of T&E species listed to a biologist. If BSG determines Section 7 surveys are needed, surveys may be done in-house or a separate scope of work and fee is prepared. Division requests Section 7 surveys when it is required for BSG to review and survey for terrestrial and aquatic animal species.

Prepare and Send Survey Notification Letter

The survey notification letter is sent to landowners within the study area prior to any field work.

- The survey notification letter is sent out by Environmental Staff.
- The letter notifies landowners that NCDOT is beginning a project, and personnel may be on their property.
- If the project study area changes, a new landowner letter may be required.

Complete Cultural Resource Screening

For projects with a federal nexus, the Project Lead completes the Cultural Resources Screening Checklist for Section 106 provided in the *2020 Section 106 Programmatic Agreement for the Transportation Projects Program in North Carolina*.

- Using the results of the checklist, or other requirements under state and federal environmental laws and regulations, the Project Lead determines if the project is subject to further historic preservation review. If additional review is required, the requester completes an request for a Historic Architecture and Archaeology review.
- The request is assigned to an appropriate Culture Resource Specialist and investigations begin.

Identification of Cultural Resources may be finalized during the Project Initiation stage or during Stage 2.

Please note that the *2020 Section 106 Programmatic Agreement* for the Transportation Program in North Carolina does not pertain to the Federal Railroad Administration, Federal Transit Administration, Federal Aviation Administration, or Locally Administered Program undertakings or state funded transportation projects without a Federal Nexus.

For state funded and locally administered project, separate guidance is under development.

Determine Noise/Air Analyses Needs

The Project Lead consults with the Traffic Noise and Air Quality (TNAQ) Group to determine if a project needs a traffic noise or air quality analysis, the results of which are incorporated into the Project Scoping Report. The determination to include a traffic noise analysis and/or air quality analysis is based on both the proposed improvements and the type of environmental document being prepared for the project. It is not based on funding type.

If a traffic noise analysis is necessary, then the Traffic Noise and Air Quality Group advises whether a Traffic Noise Report or a Design Noise Report should be scoped/prepared. A Traffic Noise Report is recommended when there is a high degree of confidence that noise abatement is unlikely, or when only preliminary design is being developed concurrently. A Design Noise Report is recommended when it is expected that noise abatement may be likely, and final designs are developed concurrently with the NEPA/SEPA document development.

- An Air Quality Report is not required if a Minimum Criteria Determination Checklist (MCDC) or Categorical Exclusion (CE) is prepared for the project.
- If an Environmental Assessment (EA) or Environmental Impact Statement (EIS) is prepared for the project, then an Air Quality Report will be needed.
- Usually this will be a qualitative report, but sometimes a quantitative Air Quality Report may be needed for EAs and EISs. Additional coordination with the Traffic Noise and Air Quality Group is needed in these instances.

If the Traffic Noise and Air Quality Group determines that a Traffic Noise Report (TNR), Design Noise Report (DNR), or Air Quality Report (AQR) is required and that a consultant is needed (through a Division contact, PMU contract, or EAU on-call contract), then the firm develops a scope of work using the Scope of Services Generator for the Traffic Noise and Air Quality Group's review. Once the scope is finalized, Traffic Noise and Air Quality Group prepares an in-house estimate and negotiates the fee as appropriate with the consultant.

Determine Community Analyses Needs

The Project Lead submits a request for any required Community Analyses. The Community Studies Group reviews the project and determines the level of Community Analyses appropriate for the project (Community Characteristics Report, Community Impact Assessment, Land Use Scenario Assessment, etc.) and develops a Community Screening for completing analyses.

Complete QC/QA Procedures

Environmental Staff is to coordinate the applicable QC review following the NCDOT *Quality Management Program: Quality Control and Quality Assurance* procedures and the respective QC Checklist.

2EN1 Initiate Natural Resources Analysis

The environmental analysis required for this activity is separated into the following sub-activities.

Task details and deliverables for these sub-activities are found in the corresponding sections below.

Overview: Natural Resources Technical Report (NRTR)

Coordinate the preparation and QA/QC of the following tasks/deliverables:

- Survey Notification Letter
- NRTR Report
- Section 7 Surveys/Coordination
- Water Resources File*
- Jurisdictional Resources Package*

*If needed.

References

- ☐ *NRTR Scope Template and Guidance*
- ☐ *NRTR Procedures Manual*
- ☐ *ETRACS System and Tutorial*
- ☐ *Division ETRACS Request for Section 7 Surveys*

Deliverables

Deliverable	Task	Responsible Party	
		Activity Leader Natural Environment Lead	Additional Support
NRTR [A, Q]	▪ *Survey Notification Letter* ▪ *NRTR Report*** ▪ *Section 7 Surveys/ Coordination* ▪ *Water Resources File** ▪ *Jurisdictional Resources Package**	X (for all tasks)	▪ None ▪ None ▪ Biological Surveys Lead ▪ CADD Tech, Locations and Surveys ▪ CADD Tech

[A] *Indicates that final document(s) or data set(s) must be uploaded to the ATLAS Workbench.*
[Q] *Indicates that final document(s) or data set(s) requires review in accordance with the NCDOT Quality Management Program: Quality Control and Quality Assurance.*

Complete NRTR

The NRTR and any associated GIS deliverables are developed by the Natural Environment Lead using the *NRTR Template and Guidance* in conjunction with the *NRTR Procedures Manual and Consultant GPS CADD Guidance*.

The final NRTR and WEX file are placed on the ATLAS Workbench, with the Project Manager, Hydraulics Unit, Locations/Surveys Unit, Structures Management Unit, Utilities Unit, and Roadway Unit (and others as appropriate) being notified.

The Natural Environment Lead sends the Water Resources File to the Locations and Surveys Unit for the incorporation of the water resources into the project's Final Survey file.

Complete Jurisdictional Determination and Buffer Package

The Preliminary Jurisdictional Determination and Buffer (if applicable) Package are part of the deliverables for an NRTR.

Conduct Agency Field Review (if needed)

The Natural Environment Lead:

- Coordinates the scheduling of a field review with the USACE, North Carolina Division of Water Resources (NCDWR), and consultant (if applicable). The Project Manager is notified of this meeting but is not required to attend.
- At the end of the field review, if any changes are made, updates the Water Resources File and notifies Locations and Surveys for incorporation into the FS file.

Complete QC/QA Procedures

Environmental Staff is to coordinate the applicable QC review following the *NCDOT Quality Management Program: Quality Control and Quality Assurance* procedures and the respective QC Checklist.

(Back to activity overview)

Overview: Biological Surveys

When necessary, complete surveys for federally listed threatened and endangered (T&E) species in areas of suitable habitat in the project study area and obtain a biological conclusion to ensure compliance with the Endangered Species Act of 1973 and Marine Mammal Protection Act.

References

- ☐ *USFWS Section 7 Consultation*

Deliverables

Deliverable	Task	Responsible Party	
		Activity Leader	Additional Support
		Biological Survey Lead	Natural Environment Lead
Biological Surveys [A]	▪ *Initiate and Complete Biological Surveys*	X	X
BSG Concurrence on Biological Conclusions [A]	▪ *Review and Determine Biological Conclusions*	X	
Request USFWS or NMFS Concurrence on Species Determination			X
Biological Assessment [A]	▪ *Initiate Formal Section 7 Consultation*	X	X
USFWS or NMFS Biological Opinion [A]	▪ *Complete Section 7 Consultation*	X	X
Comment on NEPA/SEPA Document (as needed)	▪ *Review NEPA/SEPA Document*	X	X

[A] *Indicates that final document(s) or data set(s) must be uploaded to the ATLAS Workbench.*

Initiate and Complete Biological Surveys

The Natural Environment Lead (e.g., Division Environmental Officer) assigns one or more of the following groups to conduct T&E surveys:

- On-call biological consultants
- In-house BSG biologists

Review and Determine Biological Conclusions

To complete this task, the Biological Survey Lead is to:

- Review the T&E survey results
- Review and/or determine biological conclusions

If a determination other than "Unresolved" or "No Effect" is recommended for a federally listed T&E species, the Natural Environment Lead sends a request for concurrence letter to the US Fish and Wildlife (USFWS) or the National Oceanic and Atmospheric Administration (NOAA) National Marine Fisheries Service (NMFS) to determine if consultation under Section 7 of the Endangered Species Act (ESA) or the Marine Mammal Protection Act is required. The USFWS has primary responsibility for terrestrial and freshwater organisms, while the responsibilities of the NMFS are mainly marine wildlife such as whales and anadromous fish such as salmon. However, the agencies share responsibility for some species that

occur in both marine environments and freshwater or terrestrial habitats, such as sea turtles and Atlantic sturgeon.

Initiate Formal Section 7 Consultation

Biological Survey Lead coordinates with USFWS or NMFS to determine if formal or informal Section 7 Consultation is required.

- If it is determined that a project has a Biological Conclusion (BC) of "May Affect, Not Likely to Adversely Affect" (MANLAA) a listed species, Informal Consultation is required.
- If it is determined that a project has a "May Affect, Likely to Adversely Affect" (MALAA) BC or would "Adversely Affect" a listed species, Formal Consultation is required, which includes the development of a Biological Assessment by NCDOT and a Biological Opinion by USFWS or NMFS. The Biological Survey Lead develops the Biological Assessment with review and acceptance from Natural Environment Lead.

Complete Section 7 Consultation

Based on the Biological Assessment, USFWS or NMFS determines if any additional information is needed. Upon receipt of all required information, the agency develops the Biological Opinion. The USFWS or NMFS has 45 days to render the Biological Opinion once formal consultation is complete (90 days after initiation).

- The Biological Opinion may contain conditions that are required prior to construction, during construction, and post construction.
- The Biological Survey Lead or Natural Environment Lead ensures these commitments are included in the Project Commitments when they review the environmental document.

Complete QC/QA Procedures

Environmental Staff is to coordinate the applicable QC review following the NCDOT *Quality Management Program: Quality Control and Quality Assurance* procedures and the respective QC Checklist.

Review NEPA/SEPA Document (as needed)

The NEPA/SEPA Lead or Project Manager coordinates with the Natural Environment Lead or Biological Survey Lead to review the natural resources section(s) of NEPA/SEPA documents. This review is to:

- Focus on the accuracy of the information in the document.
- Ensure that avoidance and minimization measures have been captured.
- Ensure the Project Special Commitments (Green Sheets) agreements made with the agencies have been captured.

This coordination is tracked via an ETRACS request if involving EAU staff.

2EN2 Initiate Human Environment Analysis

The environmental analysis required for this activity is separated into the following sub-activities.

Task details and deliverables for these sub-activities are found in the corresponding sections below.

Overview: Community Studies

Complete the Community Characteristics Report and the Indirect and Cumulative Effects report (if determined necessary in Stage 1) for the study area or study corridors to inform project decision making, design, and permitting. A Community Characteristic Report is only needed if community impacts influence alternative selection. Complete an Indirect and Cumulation Effect only if screening indicates a need for assessment. Complete the Community Impact Assessment or Direct and Indirect Screening Tool based on the preliminary design for the preferred alternative, as well as the Land Use Scenario Assessment (if indicated), and document project decisions, commitments, recommendations, outstanding direct impacts, and potential future development areas.

References

- ☐ *Community Characteristics Report / Community Impact Assessment Resources*
- ☐ *Indirect and Cumulative Effects / Land Use Scenario Assessment Resources*

Deliverables

Deliverable	Task	Responsible Party	
		Activity Leader	Additional Support
		Community Studies Lead	PICSViz Team Member/ On-call Staff
Community Characteristics Report [A, Q]	▪ *Develop Community Characteristics Report*	X	X
Indirect and Cumulative Effects Report [A, Q]	▪ *Develop Indirect and Cumulative Effects Report*	X	X
Community Impacts Assessment [A, Q]	▪ *Develop Community Impact Assessment*	X	X
Land Use Scenario Assessment [A, Q]	▪ *Develop Land Use Scenario Assessment*	X	X
Comments on NEPA/SEPA Document	▪ *Review NEPA/SEPA Document*	X	X

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[Q] *Indicates that final document(s) or data set(s) requires review in accordance with NCDOT Quality Management Program: Quality Control and Quality Assurance.*

Develop Community Characteristics Report

When understanding community resources and potential impacts can help in the development of project alternatives/alignments, particularly for projects in developed areas, a Community Characteristic Report is developed. The Community Studies Lead develops a Community Characteristics Report based on

current templates, guidance, and tools maintained by Community Studies. The Community Studies Lead identifies direct impact and develops demographic study areas based on the current project study area. For more complex or potentially controversial projects, the Project Manager may request that Community Studies direct on-call staff to develop the Community Characteristics Report (CCR) and coordinate with Public Involvement.

Generated materials are reviewed and approved by Community Studies with activities that include:

- Download the latest templates, guidance, and tools
- Develop Demographic Study Area (DSA) and Direct Community Impact Area (DCIA) in accordance with guidance
- Coordinate with Community Studies to approve DSA and DCIA
- Prepare and email input forms to area planners, schools, and emergency management personnel, and conduct telephone or in-person interviews as appropriate
- Assess project area demographics, ATLAS maps, satellite images and other data sources prior to conducting interviews and field visit
- Conduct field visit according to guidance
- Prepare draft CCR and submit via request to Community Studies for review and comment
- Revise CCR based on Community Studies comments and submit via email to Community Studies for final review
- Finalize CCR and submit via email to Community Studies for distribution, ATLAS upload and posting to ATLAS Workbench

Develop Indirect and Cumulative Effects Report (if scoped)

An Indirect and Cumulative Effects Screening Report (ICE) is often developed based on the findings of Transportation Impact Causing Activities (TICAs) in the Community Screening. The Community Studies Lead develops an Indirect and Cumulative Effects report based on current templates, guidance, and tools maintained by Community Studies. The Community Studies Lead also refines the Future Land Use Study Area (FLUSA) based on the current project study area. For projects in high growth areas or for Merger projects, the Project Manager may request that Community Studies direct contract staff to develop the ICE and coordinate with Mitigation and ICI.

Generated materials are reviewed and approved by Community Studies, with activities that include:

- Download the latest templates, guidance, and tools
- Develop the Future Land Use Study Area (FLUSA) in accordance with guidance
- Coordinate with Community Studies to approve the FLUSA
- Prepare and email input forms to area planners, utilities staff and other personnel, and conduct telephone or in-person interviews as appropriate
- Assess project area demographics and growth trends, ATLAS maps, satellite images and other data sources prior to conducting interviews and field visit
- Conduct field visit according to guidance
- Prepare draft ICE and submit via request to Community Studies for review and comments

- Revise ICE based on Community Studies comments and submit via email to Community Studies for final review
- Finalize ICE and submit via email to Community Studies for distribution, ATLAS upload and posting to ATLAS Workbench.
- Community Studies coordinates the ICE Matrix finding with Mitigation and ICI, and scopes a Land Use Scenario Assessment if warranted by permitting needs

Develop Community Impacts Assessment

To document the avoidance, minimization, and mitigation of the impacts of a project alternative on community resources, as well as unresolved impacts remaining at preliminary design, a Community Impacts Assessment is prepared. The Community Studies Lead develops a Community Impact Assessment based on current templates, guidance, and tools maintained by Community Studies, and using the DCIA and DSA from the Community Characteristics Report (CCR), if one was prepared, or developing these areas if not. Projects following a standard schedule incorporate data from the CCR by reference. Projects that have experienced delays coordinate with Community Studies to determine if CCR data is to be updated. For more complex or potentially controversial projects, the Project Manager may request that Community Studies direct contract staff to develop the Community Impact Assessment and coordinate with Public Involvement and Office of Civil Rights.

Generated materials are reviewed and approved by Community Studies, with activities that include:

- Download the latest templates, guidance, and tools
- If no CCR was done, develop Demographic Study Area (DSA) and Direct Community Impact Area (DCIA) in accordance with guidance
- If newly developed, coordinate with Community Studies to approve the DSA and DCIA
- Prepare and email input forms to area planners, schools and emergency management personnel, and conduct telephone or in-person interviews as appropriate
- Assess project area demographics, ATLAS maps, satellite images and other data sources prior to conducting interviews and field visit in accordance with guidance
- Conduct field visit according to guidance
- Prepare draft CIA and submit via request to Community Studies for review and comments.
- Revise CIA based on Community Studies comments and submit via email to Community Studies for final review
- Finalize CIA and submit via email to Community Studies for distribution, ATLAS upload and posting to ATLAS Workbench.

Section 4(f) (recreational, not historic) and Section 6(f) resource presence are identified during Community Screening or by the CCR. If potential resource impacts to public parks, recreation areas, waterfowl and/or wildlife refuges are identified as part of the Community Impact Assessment, the NEPA/SEPA Lead and/or Project Manager coordinates with Federal Highway Administration about resources protected under Section 4(f) of the Department of Transportation Act (applies to federal projects only) or with NC Department of Environmental Quality about resources protected under Section 6(f) of the Land and Water Conservation Fund Act (applies to all projects), and cooperates with other stakeholders, as appropriate (see 2EP1 for related information).

Develop Land Use Scenario Assessment

If indicated by findings of the Indirect and Cumulative Effects matrix, or at the request of a permitting or resource agency (e.g., USACE, NCDWR, USFWS, etc.) the Community Studies Lead develops a Land Use Scenario Assessment (LUSA) report based on current templates, guidance, and tools maintained by Community Studies. The Community Studies Lead develops one or more Potential Development Areas (PDAs) within the Future Land Use Study Area (FLUSA). The purpose of a LUSA is to map and compare existing conditions within PDAs with future projections based on Build and No Build scenarios. For projects in high growth areas, or for Merger projects, the Project Manager may request that Community Studies direct contract staff to develop the LUSA and coordinate with Mitigation and ICI.

Generated materials are reviewed and approved by Community Studies, with activities that include:

- Download the latest templates, guidance, and tools
- Develop Probable Development Areas (PDAs) in accordance with guidance
- Coordinate with Community Studies to approve the PDAs
- Prepare and email input forms to area planners, development review staff and other personnel, and conduct telephone or in-person interviews as appropriate
- Assess project area development trends, development approvals and permits, ATLAS maps, satellite images and other data sources prior to conducting interviews and field visit
- Conduct field visit according to guidance
- Prepare draft LUSA and submit via request to Community Studies for review and comments
- Revise LUSA based on Community Studies comments and submit via email to Community Studies for final review
- Finalize LUSA and submit via email to Community Studies for distribution, ATLAS upload and posting to ATLAS Workbench
- Community Studies coordinates the LUSA findings with NCDOT Mitigation and ICI Group as needed for permitting

Complete QC/QA Procedures

Environmental Staff is to coordinate the applicable QC review following the NCDOT *Quality Management Program: Quality Control and Quality Assurance* procedures and the respective QC Checklist.

Review NEPA/SEPA Document

The NEPA/SEPA Lead or Project Manager coordinates with Community Studies to review the relevant sections of NEPA or SEPA documents, as needed.

This review is to:

- Focus on the accuracy of the information in the document.
- Ensure that avoidance and minimization measures have been captured, and that any outstanding issues are documented and adequality explained.
- Ensure the Project Special Commitments (Green Sheets) agreements made with stakeholders have been captured.

This coordination is tracked via an ETRACS request involving EAU staff.

(Back to activity overview)

Overview: Cultural Resources

Determine the potential effects of projects to cultural resources, historic architecture, and archaeology, as required by Section 106 of the National Historic Preservation Act (applies to state and federal projects) and Section 4(f) (applies to federal projects only). Section 4(f) resources may also include publicly owned public parks and recreation lands and waterfowl and wildlife refuges, in addition to historic resources. These additional resource types are identified and discussed in the Community Impact Assessment.

References

- ☐ *Programmatic Agreement Manual for Minor Transportation Projects in North Carolina*
  - ☐ Historic Architecture Group Procedures and Work Products
  - ☐ Archaeology Work Products
- ☐ *Tribal Coordination Protocol*

Deliverables

Deliverable	Task	Responsible Party Activity Leader Cultural Resource Specialist
Historic Architecture and Landscapes No Survey Required Form [A]	▪ *Complete Cultural Resource Screening*	X
No Archaeological Survey Required Form [A]		
Historic Architecture and Landscapes Survey Required Form (if needed) [A]		
Archaeological Survey Required Form (if needed) [A]		
Archaeology Report [Q]	▪ *Complete Archaeology Report*	X
No National Register of Historic Places Eligible or Listed Archaeological Sites Present Form [A]		
Archaeology Assessment of Effects Required Form		
Historic Architecture Building Inventory [Q]	▪ *Complete Historic Architecture Building Inventory*	X
No Historic Architecture and Landscapes Effects Required Form (if needed) [A]		
Historic Architecture Eligibility Evaluation Report [Q]	▪ *Complete Historic Architecture Eligibility Evaluation Report*	X
Historic Architecture and Landscapes Effects Required Form [A]		
No National Register of Historic Places Eligible or Listed Historic Properties Present or Affect Form [A]		
No National Register of Historic Places Eligible or Listed Archaeological Sites Affected Form [A]	▪ *Conduct Cultural Resource Effects Determination (Archaeological)*	X
No National Register of Historic Places Eligible or Listed Archaeological Sites Adversely Affected Form [A]		
Archaeological Adverse Effect Determination Form [A]		
National Register of Historic Places Eligible or Listed Historic Properties Effects Determination Form [A]	▪ *Conduct Cultural Resource Effects Determination (Historic Architecture and Landscapes)*	X
No National Register of Historic Places Eligible or Listed Historic Properties Present or Affected Form [A]		

Deliverable	Task	Responsible Party Activity Leader Cultural Resource Specialist
Draft Finding of Adverse Effect [Q]	▪ *Develop Section 106 MOA*	X
MOA		
Comments on NEPA/SEPA Document	▪ Review NEPA/SEPA Document	X

[A] *Indicates that final document(s) or data set(s) must be uploaded to the ATLAS Workbench.*
[Q] *Indicates that final document(s) or data set(s) requires review in accordance with NCDOT Quality Management Program: Quality Control and Quality Assurance.*

Identify Section 4(f) and 6(f) Resources (if needed)

The Cultural Resource Specialist reviews the study area to determine if Historic Section 4(f) or Section 6(f) (see 2EP1 for related information) resources are present. The Project Manager determines if Section 6(f) resources are present and coordinates with PICSViz if present. Cultural Resources is involved if Section 6(f) qualified to be included in the National Register of Historic Places (NRHP).

If present, the Project Manager and the Cultural Resources Specialist coordinate to determine if the project has the potential to impact these properties.

Complete Cultural Resource Screenings (if needed)

The Cultural Resources Specialists for Historic Architecture and Archaeology determine and document the discipline-specific Area of Potential Effects for the project based on the study area. Using the best available information, the Cultural Resources Specialists determine if there are any known or potential historic properties or archaeological sites that exist in the Area of Potential Effects and determines the need for further field surveys.

- The Cultural Resources Specialist may issue a No Survey Required Form or a Survey Required Form for historic architecture and archaeology and posts the forms to the project SharePoint site. The Historic Architecture Culture Resource Specialist may issue a Survey Required Form, and the Archaeological Culture Resource Specialist may issue a No Survey Required form or vice versa. The two Specialists may also issue the same form.
- If there is a known historic property(ies) or archaeological site(s) and the Cultural Resources Specialist can reasonably predict that the scope of the undertaking does not have the potential to effect the resource(s), the Cultural Resources Specialist may issue a No National Register of Historic Places Eligible or Listed Historic Properties Present or Affected Form or a No National Register of Historic Places Eligible or Listed Archaeological Sites Present or Affected Form.
- If the known historic property or archaeological site may be affected, the Cultural Resources Specialists issue an Historic Architecture and Landscapes Assessment of Effects Form or an Archaeology Assessment of Effects Required Form.

The Cultural Resources Specialists uploads the applicable form(s) to the ATLAS Workbench.

Complete Archaeology Report (if needed)

If the Cultural Resources Screening for archaeology determines that a survey is required, the Cultural Resources Specialist initiates a survey to identify currently unknown archaeological sites in accordance with applicable guidelines, standards, and regulations. If archaeological sites are identified, the Cultural Resources Specialist evaluates the eligibility for listing on the National Register of Historic Places. In accordance with the *Tribal Coordination Protocol*, the Cultural Resources Specialist consults with the applicable Native American Tribes and incorporates their responses when evaluating the site's eligibility.

- If the Cultural Resources Specialist determines that no sites are listed or eligible for listing in the National Register of Historic Places, a No National Register of Historic Places Eligible or Listed Archaeological Sites Present Form is issued.
- If the Cultural Resources Specialist determines that sites are listed or eligible for listing in the National Register of Historic Places, an Archaeology Assessment of Effects Required Form is issued.

The Cultural Resources Specialist uploads the applicable Cultural Resource Form to the ATLAS Workbench, notifying the Project Manager.

Complete Historic Architecture Building Inventory (if needed)

If the Cultural Resources Screening for historic architecture determines that a survey is required, the Cultural Resources Specialist for historic architecture initiates a survey to identify historic properties in accordance with the Historic Architecture Group Procedures and Work Products Manual and applicable guidelines, standards and regulations.

- If potential historic properties are identified, the Cultural Resources Specialist evaluates the eligibility for listing on the National Register of Historic Places. The Cultural Resources Specialist incorporates information provided by consulting parties and Native American Tribes when evaluating the properties eligibility.
- If properties are identified as being potentially eligible for listing on the National Register of Historic Places, the Cultural Resources Specialists has a full Evaluation Report completed.
- If no properties are identified as being potentially eligible for listing on the National Register of Historic Places, the Cultural Resources Specialists issues the No National Register of Historic Places Eligible or Listed Historic Properties Present or Affected Form.

The Cultural Resources Specialist uploads the applicable historic architecture form to the ATLAS Workbench, notifying the Project Manager.

Complete Historic Architecture Eligibility Evaluation Report (if needed)

If historic properties that are potentially eligible for listing on the National Register of Historic Places are identified during the Building Inventory, an Evaluation Report is completed. This report is submitted to the Historic Preservation Office and consulting parties for comments.

- If the Historic Preservation Office concurs that there are historic properties eligible for listing on the National Register of Historic Places, the Cultural Resources Specialist issues a Historic Architecture and Landscapes Assessment of Effects Form.

- If the Historic Preservation Office concurs that there are no historic properties eligible for listing on the National Register of Historic Places, the Cultural Resources Specialist issues a No National Register of Historic Places Eligible or Listed Historic Properties Present Form.

The Cultural Resources Specialist uploads the applicable historic architecture form to the ATLAS Workbench, notifying the Project Manager.

Conduct Cultural Resource Effects Determination (if needed)

Archaeological Effects

The Cultural Resources Specialist determines if the National Register of Historic Places is listed, or eligible sites are affected by the project.

- If National Register of Historic Places listed or eligible archaeological sites are present but not affected, the Cultural Resources Specialist issues a No National Register of Historic Places Eligible or Listed Archaeological Sites Present or Affected Form.
- If National Register of Historic Places eligible or listed archaeological sites are affected, Cultural Resources Specialist issues the Archaeological Adverse Effect Determination Form and follows the stipulations outlined in the Programmatic Agreement, including data recovery if needed.

The Cultural Resources Specialist uploads the applicable archaeological form to the ATLAS Workbench, notifying the Project Manager.

Historic Architecture and Landscapes Effects (if needed)

The Cultural Resources Specialist determines if National Register of Historic Places is listed, or eligible historic architecture sites are affected by the project. After an Historic Architecture and Landscapes Assessment of Effects Form is issued, the Project Manager ensures that the historic boundary is included on the design plans and requests an Effects meeting (led by the Cultural Resource Specialist) with the lead Federal Agency and Historic Preservation Office to request concurrence on affects to historic properties.

Following the meeting, the Cultural Resources Specialist issues a Historic Architecture and Landscapes Assessment of Effects Form and follows the stipulations outlined in the Programmatic Agreement.

The Cultural Resources Specialist uploads the applicable Cultural Resource Form to the ATLAS Workbench, notifying the Project Manager.

Develop Section 106 MOA (if needed)

After consultation has concluded with appropriate parties and it is determined that an Adverse Effect cannot be avoided, the Cultural Resources Specialist(s), for the affected resource(s), prepares a draft Finding of Adverse Effect for the lead federal agency so that the Advisory Council on Historic Preservation can be notified of the adverse effect finding. The lead federal agency reviews and distributes the Finding of Adverse Effect document to applicable parties.

The Cultural Resources Specialist(s) then works with the Historic Preservation Office, the lead federal agency, and other applicable parties negotiate the terms of a Memorandum of Agreement (MOA) and uploads it to the ATLAS Workbench site.

Complete QC/QA Procedures

Environmental Staff coordinate the applicable QC review following the NCDOT *Quality Management Program: Quality Control and Quality Assurance* procedures and the respective QC Checklist.

Review of NEPA/SEPA Document

The NEPA/SEPA Lead or Project Manager coordinates with the Cultural Resources Specialist(s) to review the relevant cultural resources discussions of NEPA/SEPA documents as needed. This review is to:

- Focus on the accuracy of the information in the document.
- Ensure that avoidance and minimization measures have been captured.
- Ensure the Project Special Commitments (Green Sheets) agreements made with the agencies have been captured.

This coordination is tracked via an ETRACS request if involving EAU Staff.

(*Back to activity overview*)

Overview: Traffic Noise and Air Quality

Consult with the Traffic Noise and Air Quality Group to determine if a traffic noise analysis and/or an air quality analysis is required. Complete the Traffic Noise Report, Design Noise Report, Air Quality Report, and prerequisite deliverables and tasks, once alternatives/alignments are developed. An Air Quality Report is required for all projects for which either an Environmental Assessment (EA) or Environmental Impact Statement (EIS) is being prepared.

References

- ☐ *Traffic Noise & Air Quality Resources Page*
  - NCDOT Traffic Noise Policy
  - NCDOT Traffic Noise Manual
  - NCDOT Air Quality Handbook

Deliverables

Deliverable	Task	Responsible Party	
		Activity Leader	Additional Support
Noise Analysis Work Plan[Q]	▪ *Develop Noise Analysis Work Plan*	Lead Traffic Noise Analyst	▪ Project Manager ▪ Local Government Agency ▪ QA Reviewer
Right-of-Entry Letter			
Noise Model Validation Memorandum[Q]	▪ *Perform Field Work and Noise Model Validation*		▪ QA Reviewer
Traffic Noise Report or Traffic Noise Report Addendum [A, Q]	▪ *Develop Traffic Noise Report (or Design Noise Report)*		▪ Project Manager ▪ Local Business Owners (for ER calculations) ▪ QA Reviewer
Streamlined Text			
Air Quality Report [A, Q]	▪ *Prepare Air Quality Report*	Lead Air Quality Analyst	▪ Project Manager ▪ FHWA ▪ QA Reviewer
Streamlined Text			

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[Q] *Indicates that final document(s) or data set(s) requires review in accordance with NCDOT Quality Management Program: Quality Control and Quality Assurance.*

Develop Noise Analysis Work Plan

The Lead Traffic Noise Analyst develops a Noise Analysis Work Plan based on the current template and guidance included in the *Traffic Noise Manual*. The Noise Analysis Work Plan identifies items such as noise study areas, noise-sensitive receptors, and potential noise measurement locations.

- Upon approval of the Noise Analysis Work Plan, the Traffic Noise and Air Quality Group provides a signed right-of-entry letter. The Lead Traffic Noise Analyst prepares a draft right-of-entry letter using the using the standard template.
- The Traffic Noise and Air Quality Group must sign and issue right-of-entry letters prior to any noise measurements.
- The Lead Traffic Noise Analyst marks the approved Noise Analysis Work Plan as final on the project SharePoint site.

Perform Field Work and Noise Model Validation

The Lead Traffic Noise Analyst conducts validation of project models using the noise measurement results, documented using the current template, in accordance with the *Traffic Noise Manual*. The results of the validation are documented in a Noise Model Validation Memorandum using the current template and guidance included in the *Traffic Noise Manual*.

- The Traffic Noise and Air Quality Group must approve the Noise Model Validation Memorandum prior to submitting the draft Traffic Noise Report.
- The Lead Traffic Noise Analyst marks the approved Noise Model Validation Memorandum as final on the project SharePoint site.

Develop Traffic Noise Report (or Design Noise Report)

The Lead Traffic Noise Analyst develops a Traffic Noise Report, Traffic Noise Report Addendum, or Design Noise Report based on current template and guidance included in the *Traffic Noise Manual*. The Traffic Noise Report or Design Noise Report evaluates the existing and no-build conditions and the build conditions for each detailed study alternative documented in the environmental document. Abatement is considered for all impacted receptors.

- If noise walls are identified as unlikely, no additional traffic noise analysis is required.
- If noise walls are identified as likely, a Design Noise Report is required (see 3EN1 for related information).
- A Design Noise Report may also be required in situations where the Traffic Noise Report identified noise walls as unlikely, but where the Design Noise Report could have different findings.

Upon acceptance of the Traffic Noise Report, the Lead Traffic Noise Analyst submits the draft streamlined text using the appropriate template.

The consultant uploads only the accepted Traffic Noise Report to the ATLAS Workbench and notifies the NEPA/SEPA Lead and the Project Manager. This automatically marks the accepted Traffic Noise Report as final and as KeyHE “TNR” on the project SharePoint site. Only the accepted Traffic Noise Report should be marked with the KeyHE “TNR”. The Lead Traffic Noise Analyst uploads the approved TNM files in a zipped folder to the project SharePoint site and marks it as final.

Prepare Air Quality Report

The Lead Air Quality Analyst develops an Air Quality Report based on the current template and guidance included in the *Air Quality Handbook*.

- If a federal EA or EIS is being prepared **and** a preferred alternative was not selected prior to January 1, 2022, then greenhouse gas emissions must be calculated in MOVES.

Upon acceptance of the Air Quality Report, the Lead Air Quality Analyst submits draft streamlined text using the appropriate template.

The consultant uploads only the accepted Air Quality Report to the ATLAS Workbench and notifies the NEPA/SEPA Lead and the Project Manager. This automatically marks the accepted Air Quality Report as

Final and as KeyHE "Air Quality Report" on the project SharePoint site. Only the accepted Air Quality Report should be marked with the KeyHE "Air Quality Report".

Complete QC/QA Procedures

Environmental Staff is to coordinate the applicable QC and QA reviews following the *NCDOT Quality Management Program: Quality Control and Quality Assurance* procedures and the respective QC and QA Checklists. A comment response matrix must be provided to document all comments for each deliverable.

2EN3 Develop Design Noise Report or Addendum

Overview

Prepare the Design Noise Report (if one is required and one has not yet been completed) or a Design Noise Report Addendum (if a Design Noise Report has been completed but updated design information or design changes require additional or new final design traffic noise analysis, or if new noise-sensitive development that was not included in the Design Noise Report has been permitted along the project prior to the Date of Public Knowledge).

References

- ☐ *Traffic Noise & Air Quality Resources Page*
  - NCDOT Traffic Noise Policy
  - NCDOT Traffic Noise Manual

Deliverables

Deliverable	Task	Responsible Party	
		Activity Leader Lead Traffic Noise Analyst	Additional Support
Noise Analysis Work Plan (as applicable) [Q]	▪ *Develop Design Noise Report or Design Noise Report Addendum*	X	▪ Project Manager ▪ Local Government Agency ▪ QA Reviewer
Right of Entry Letter (as applicable)			
Noise Model Validation Memorandum (as applicable) [Q]			▪ QA Reviewer
Design Noise Report or Design Noise Report Addendum [A, Q]			▪ Project Manager ▪ Local Business Owners (for ER calculations) ▪ Design Discipline Leaders (for feasibility review) ▪ QA Reviewer

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[Q] *Indicates that final document(s) or data set(s) requires review in accordance with NCDOT Quality Management Program: Quality Control and Quality Assurance.*

Develop Design Noise Report or Design Noise Report Addendum

If a Traffic Noise Report was previously completed and abatement was found to be likely or if the Traffic Noise and Air Quality Group determines that a Design Noise Report would be required even though the Traffic Noise Report found that abatement was unlikely, then the Lead Traffic Noise Analyst develops a Design Noise Report based on the guidance included in the *Traffic Noise Manual*.

The Design Noise Report evaluates the entire preferred/selected alternative, considers abatement for all impacted receptors, and creates noise wall envelopes in MicroStation/ORD for all noise walls recommended in the Design Noise Report. The final reasonableness criteria are determined through the noise abatement balloting process (see 3EN2 for related information) conducted after the acceptance of the Design Noise Report. Although a Design Noise Report recommends noise abatement, it is only after

the subsequent balloting process that abatement (walls or berms) is determined to be feasible and reasonable.

- A Noise Analysis Work Plan may not be required for a Design Noise Report. The Traffic Noise and Air Quality Group advises if one is necessary while developing the scope of services.
- A Noise Model Validation Memorandum may not be required for a Design Noise Report. The Traffic Noise and Air Quality Group advises if one is necessary while developing the scope of services.
- If a Noise Model Validation Memorandum is required, the Traffic Noise and Air Quality Group provides a signed right-of-entry letter. The Lead Traffic Noise Analyst drafts a right-of entry letter using the standard template. Ambient Noise Measurements cannot be conducted without a signed right-of-entry letter.
- Before the Design Noise Report can be accepted, a comprehensive inter-disciplinary engineering feasibility review must be conducted (as described in the following subsection).

The consultant uploads only the accepted Design Noise Report to the ATLAS Workbench and notifies the NEPA/SEPA Lead and the Project Manager. This automatically marks the accepted Design Noise Report as Final and as KeyHE “DNR” on the project SharePoint site. Only the accepted Design Noise Report should be marked with the KeyHE “DNR”. The consultant also uploads the approved TNM files and design files in CADD format in a zipped folder to the project SharePoint site and marks it as final.

Interdisciplinary Engineering Feasibility Review

When a draft Design Noise Report is submitted, the Traffic Noise and Air Quality group is responsible for circulating the recommended noise walls or berms to all appropriate parties for inter-disciplinary review to identify feasibility and constructability concerns. This includes Division, Utilities, Signing and Delineation, Geotech, Structures, Roadway, Hydraulics, and other appropriate parties.

If feasibility concerns are identified, the Traffic Noise and Air Quality Group works with the Lead Traffic Noise Analyst and the reviewing party to resolve.

- The Division Engineer has final authority to determine if noise walls are not feasible due to engineering or constructability conflicts.
- If the Division Engineer determines a noise wall is not feasible to construct, then the reasons for this are documented in the Design Noise Report.

If a Design Noise Report was previously completed and abatement was determined to be likely/recommended, then the Traffic Noise and Air Quality Group reviews the Design Noise Report and its noise wall recommendations in light of any additional final design information to verify that there are still no feasibility concerns with the recommended noise walls in light of the final design information to be reflected in the Right-of-Way Plan Set. If feasibility concerns are identified, then the Traffic Noise and Air Quality Group staff coordinates with appropriate parties (Division, Utilities, Signing and Delineation, Geotech, Structures, etc.) to resolve.

If resolution of these issues changes the noise wall recommendations from the Design Noise Report, then a Design Noise Report Addendum is prepared to document the new noise wall recommendations and the supporting reasons and analysis.

If resolution of these issues does not change the noise wall recommendations from the Design Noise Report, then a memo documenting this is prepared, stating that the Design Noise Report noise wall recommendations remain valid, and no further final design noise analysis is needed.

Complete QC/QA Procedures

Environmental Staff is to coordinate the applicable QC and QA reviews following the *NCDOT Quality Management Program: Quality Control and Quality Assurance* procedures and the respective QC and QA Checklists. A comment response matrix must be provided to document all comments for each deliverable.

3EN1 Document Noise Abatement Decision

Overview

Complete this step when noise abatement is recommended for a project based on the analysis done as part of the Design Noise Report or Design Noise Report Addendum (see 3EN1 for related information). After approval of the Design Noise Report or Design Noise Report Addendum, and after all feasibility concerns have been thoroughly resolved and final design information that could affect recommended noise wall locations has been verified, conduct the balloting process (detailed in the *Traffic Noise Manual*) to determine whether the majority of property owners and tenants who would benefit from a noise wall or berm support its construction. Prepare a memorandum that summarizes the balloting process, results, and final determination of noise wall installation.

References

- ☐ *Traffic Noise & Air Quality Resources Page*
  - NCDOT Traffic Noise Policy
  - NCDOT Traffic Noise Manual

Deliverables

Deliverable	Task	Responsible Party	
		Activity Leader TNAQ Group	Additional Support
Balloting Figure	▪ *Conduct Noise-Related Ballot Process*	X	▪ Assigned Engineering Firm
Benefited Receptor Mailing List		X	▪ On-Call Consultant
Notice of Upcoming Ballot and/or Public Noise Meeting (optional)		X	▪ On-Call Consultant (Assigned Engineering Firm) ▪ Project Manager ▪ Roadway Design Lead ▪ Public Involvement Officer
Noise Wall Ballots		X	▪ On-Call Consultant
Noise Wall Balloting Results [Q]	▪ *Prepare Memorandum on Noise Wall Balloting Results*	X	

[Q] *Indicates that final document(s) or data set(s) requires review in accordance with NCDOT Quality Management Program: Quality Control and Quality Assurance.*

Conduct Noise-Related Ballot Process

The Traffic Noise and Air Quality Group conducts the noise-abatement ballot process detailed in the *Traffic Noise Manual*. The process determines the preference regarding noise barrier construction (for or against) of property owners and tenants of all benefited receptors (including properties represented by equivalent receptors).

Prepare Memorandum on Noise Wall Balloting Results

Upon completion of the balloting process, the Traffic Noise and Air Quality Group:

- Prepares the Memorandum on Noise Wall Balloting Results to document which noise abatement measures are feasible and reasonable and are therefore to be implemented for a project and then

notifies the Project Manager, FHWA, and other appropriate parties via a courtesy copy or other appropriate method.

- Uploads Memorandum on Noise Wall Balloting Results to ATLAS Workbench as a KeyHE document and provides it to the appropriate parties (e.g., the Roadway Design Lead, Structures Lead, and Geotechnical Design Geotechnical Engineer), notifying the Project Manager when complete.

Complete QC/QA Procedures

Environmental Staff is to coordinate the applicable QC and QA reviews following the *NCDOT Quality Management Program: Quality Control and Quality Assurance* procedures and the respective QC and QA Checklists.

3EN2 Apply for Permits

Overview

Apply for the required project permits once permit impact drawings have been completed and impacts are calculated.

References

- ☐ *Permit Application Timeline*
- ☐ *Permit Types and Due Dates*
- ☐ *Individual Permit Application Template*
- ☐ *e-PCN Worksheet*

Deliverables

Deliverable	Task	Responsible Party	
		Activity Leader	Additional Support
Permit Applications [A, Q]	▪ *Prepare Permit Applications*	Natural Environment Lead (or Division Environmental Officer)	Various Multi-Discipline Staff

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[Q] *Indicates that final document(s) or data set(s) requires review in accordance with NCDOT Quality Management Program: Quality Control and Quality Assurance.*

Prepare Permit Applications

The Natural Environment Lead (or Division Environmental Officer) receives draft permit drawings for review of completeness, avoidance and minimization measures, and accurate capturing of impact type and location. Based on this information, the Natural Environment Lead submits applications for the following permits and others, as appropriate:

- Section 404: Nationwide, Regional General, or Individual Permit (USACE)
- Section 401: Water Quality Certification, General or Individual (NCDWR)
- Buffer Authorization (NCDWR)
- Coastal Area Management Act (CAMA) Permit (NC Division of Coastal Management)
- Section 10 Permit (USACE and US Coast Guard)
- Federal Energy Regulatory Commission (FERC) Coordination and Approval
- Bridge Permit or Exemption Approval (US Coast Guard)

Once the permit applications have been submitted to the appropriate agency(ies), the Natural Environment Lead notifies the Project Manager and the applicable units/disciplines. Approved permits are required to be in place before any construction authorized under the permit conditions can occur.

Complete QC/QA Procedures

Environmental Staff is to coordinate the applicable QC review following the NCDOT *Quality Management Program: Quality Control and Quality Assurance* procedures and the respective QC Checklist.

4EN1 Secure Permits

Overview

Coordinate with the agency representative for any additional information that is needed to issue the permit(s). Once the agency(ies) issues the permit(s), update the Project Special Commitments (Green Sheets) to include special permit conditions and prepare the permit package for distribution.

References

- ☐ *Project Special Commitments (Green Sheets) Guidance*

Deliverables

Deliverable	Task	Responsible Party	
		Activity Leader	Additional Support
		Natural Environment Lead	ECAP Team Leader
Permit Package [A, Q]	▪ *Finalize Permit Package and Address Agency Comments*	X	X
Project Special Commitments (Green Sheets)	▪ *Update Project Commitments*	X	

[A] *Indicates that final document(s) or data set(s) must be uploaded to the ATLAS Workbench.*
[Q] *Indicates that final document(s) or data set(s) requires review in accordance with NCDOT Quality Management Program: Quality Control and Quality Assurance.*

Finalize Permit Package and Address Agency Comments

The Natural Environment Lead coordinates with the agency representative as necessary to finalize the needed permits for the project. These permits may include:

- Section 404: Nationwide, Regional General, or Individual Permit (USACE)
- Section 401: Water Quality Certification, General or Individual (NCDWR)
- Buffer Authorization (NCDWR)
- Coastal Area Management Act (CAMA) Permit (NC Division of Coastal Management)
- Section 10 Permit (USACE and US Coast Guard)
- Federal Energy Regulatory Commission (FERC) Coordination and Approval
- Bridge Permit or Exemption Approval (US Coast Guard)

Update Project Commitments

When the permits are received, the Natural Environment Lead reviews them for any additional permit conditions required by agencies. If there are additional permit conditions, the Natural Environment Lead ensures they are included in the Project Special Commitments (Green Sheets). The Natural Environment Lead also develops and uploads a permit package that includes project permits and notifies the Project Manager, Contract, Preconstruction Unit Heads, and Division. Approved permits are required to be in place before any construction authorized under the permit conditions can occur.

5EN1 Environmental Compliance During Construction

Continue project coordination to help construction oversight staff ensure compliance with permits and other environmental commitments.

1EP1 Initiate NEPA/SEPA Coordination

Overview

Begin NEPA/SEPA efforts early and clearly document any decisions being made that could affect the NEPA/SEPA process. Assist with the development and/or review of Merger Pre-Screening, Merger Screening (if needed), Merger Concurrence Point 1 (CP 1) (if needed), Project Scoping Report, and Project Initiation processes in accordance with NCDOT *Express Design/Scoping Report Guidance* and NCDOT *Merger Guidance*.

Note: *A "NEPA/SEPA Lead" (a subject matter expert in National Environmental Policy Act [NEPA] and North Carolina Environmental Policy Act [SEPA] documentation, which generally means Division Environmental Staff, Environmental Policy Unit staff, and/or consultants) is generally responsible for oversight of these tasks, in collaboration with a Project Lead and other relevant team members.*

Actions during the Project Initiation Stage may be led and completed by staff from several different NCDOT groups. Any person who has overall responsibility for a project during this Stage is referred to as the "Project Lead." This lead could be the Feasibility Studies Engineer, the Corridor Development Engineer, the Division Planning Engineer, or someone in a similar role as tasked by a state or local agency.

References

- ☐ *NCDOT Merger Pre-Screening Guidance*
- ☐ *NCDOT Project Scoping Report Guidance*
- ☐ *NCDOT Project Initiation Guidance*
- ☐ *NCDOT Project Initiation Form*
- ☐ *NCDOT Merger Guidance*
- ☐ Merger Calendar
- ☐ *NCDOT Quality Management Program: Quality Control and Quality Assurance*

Deliverables

Deliverable	Task	Responsible Party	
		Activity Leader	Additional Support
Merger Screening [A]	▪ *Complete Merger Pre-Screening*	NEPA/SEPA Lead	Environmental Policy Unit
	▪ *Schedule Merger Screening Meeting (if needed)*	Environmental Policy Unit	NEPA/SEPA Lead
Merger Plan (if needed) [A]	▪ *Coordinate and Review Merger Plan (if needed)*	NEPA/SEPA Lead	Project Lead and Environmental Policy Unit
Merger CP1 Meeting Packet [A, Q]	▪ *Review Merger CP1 Meeting Packet (if needed)*	Project Lead and NEPA/SEPA Lead	Environmental Policy Unit
CP Documentation [A]	▪ *Conduct Concurrence Point 1 (if needed)*	Project Lead, NEPA/SEPA Lead, and Environmental Policy Unit	Applicable Regulatory Agencies

[A] *Indicates that final document(s) or data set(s) must be uploaded to the ATLAS Workbench.*
[Q] *Indicates that final document(s) or data set(s) requires review in accordance with NCDOT Quality Management Program: Quality Control and Quality Assurance.*

Complete Merger Pre-Screening

Once there is enough data to support a valid Merger Screening effort, the NEPA/SEPA Lead completes the Merger Pre-Screening Form per current NCDOT guidance; the Environmental Policy Unit reviews the Form to ensure accuracy and validate the decision.

Upon completion, the NEPA/SEPA Lead and/or Environmental Policy Unit leads the following activities:

- If a project pre-screens out of the Merger Process with Environmental Policy Unit concurrence, document the decision using the form in the ATLAS Workbench.
- If a project pre-screens into the Merger Process, coordinate with Environmental Policy Unit to schedule a Merger Screening meeting and update/file the form.

The NEPA/SEPA Lead is responsible for ensuring the Merger Pre-Screening documentation is on the ATLAS Workbench.

Schedule Merger Screening Meeting (if needed)

If needed, the Environmental Policy Unit schedules and helps the Project Lead host a Merger Screening meeting, per NCDOT guidance. The NEPA/SEPA Lead works with the Environmental Policy Unit to support the Project Lead in consideration of:

- Relevant environmental regulations and permitting requirements
- Merger process requirements
- Meeting facilitation strategies where needed
- Production and review of a draft Merger Plan, if proceeding into Merger

Coordinate and Review Merger Plan (if needed)

If a project screens into the Merger Process, the Project Lead works with the NEPA/SEPA Lead to develop a Merger Plan, in coordination with the Environmental Policy Unit and per NCDOT guidance. Plan development is to be discussed during the Merger Screening Meeting to streamline and customize the Merger Process to benefit the project.

The Environmental Policy Unit reviews the Merger Plan prior to finalization and distribution to the Merger Team; the Plan can be posted to the project's External Collaboration SharePoint site for consumption by the Merger Team. The Merger Plan is a living document, to be updated at each concurrence point, with the final versions of the Merger Plan posted to the ATLAS Workbench.

Initiate Environmental Documentation

The Project Lead coordinates with the NEPA/SEPA Lead as the Project Scoping Report is developed (see 1FS2 for related information). The NEPA/SEPA Lead provides both technical content and recommendations to be included in the Project Scoping Report. Since the Project Scoping Report outlines recommendations for project initiation activities, the NEPA/SEPA Lead and the Environmental Policy Unit are to review each Project Scoping Report for accuracy; these materials are relied upon for future environmental reviews and NEPA/SEPA documentation throughout the life of the project.

Lead Project Initiation Meeting

The NEPA/SEPA Lead attends the Project Initiation Meeting and is available to assist as the Project Manager takes over the project from the Project Lead prior to Notice to Proceed and beginning at the Alignment Defined Stage. The Environmental Policy Unit confirms the National Environmental Policy Act (NEPA) or State Environmental Policy Act (SEPA) class of action for the project (Categorical Exclusion, Minimum Criteria Determination Checklist, Environmental Assessment/Finding of No Significant Impact, or Environmental Impact Statement/Record of Decision). The NEPA/SEPA Lead coordinates with appropriate staff to begin documenting the Purpose & Need and the initial Project Study Area, in addition to completing other coordination efforts (e.g., Start of Study notification, sending Project Initiation materials to identified agencies, and conducting tribal protocols).

Set Up Merger CP1 Meeting (if needed)

In general, the formal Merger Screening Meeting and CP 1 pre-meeting can be a combined meeting. The Project Lead coordinates closely with the Environmental Policy Unit and the NEPA/SEPA Lead to determine the appropriate format and content of any Screening and Concurrence meetings. The Project Manager is to consider the following when requesting a meeting:

- The request takes place 6 to 8 weeks in advance of the requested date.
- A calendar is posted with reserved dates each month for western and eastern Merger projects.

While it is expected that all Merger meetings be held in Raleigh on the selected dates so Merger Team members can plan accordingly, it is possible to have meetings on other dates or in other locations. For instance, some meetings may require a field visit and are held at a location near the project (e.g., Division office) and/or on-site. Also, some concurrence points may be achieved via informal coordination, without a meeting at all.

Review Merger CP1 Meeting Packet (if needed)

The Project Lead and NEPA/SEPA Lead coordinate to provide a draft CP1 packet to the Environmental Policy Unit for review. An important element of the CP1 packet is the project's Purpose and Need statement. For a Purpose and Need statement that involves safety, the project team collaborates safety data with the Traffic Safety Unit/State Traffic Engineer (see 1TS1 for related information). As a foundational element of a project's future decision-making, the Purpose and Need is to be thoroughly reviewed prior to regulatory agency review.

Host Merger CP1 Pre-Meeting (if needed)

Per NCDOT guidance, the Project Lead coordinates with the NEPA/SEPA Lead and the Environmental Policy Unit to host a pre-meeting with the Merger MOU signatory agencies:

- Pre-meetings include, at a minimum, NCDOT, Federal Highway Administration (FHWA) (for federal projects), US Army Corps of Engineers (USACE), and the North Carolina Division of Water Resources (NCDWR).
- All pre-meetings are scheduled a minimum of three weeks in advance of the respective concurrence point to allow adequate time to modify the Merger packet, if necessary.
- The project team is to solicit comments and encourage input at the pre-meeting, with the intent of producing a reliable Purpose and Need and a Study Area that can garner agency concurrence.

Conduct CP1 (if needed)

Per NCDOT Merger guidance, the Project Lead works with the NEPA/SEPA Lead and the Environmental Policy Unit to request concurrence from the relevant agencies on the project's Study Area and its Purpose and Need. Once concurrence is received, the Project Lead uploads a completed meeting summary and signature form to the ATLAS Workbench, along with appropriate GIS files for the Study Area. These files are relied upon for future environmental reviews and NEPA/SEPA documentation throughout the life of the project.

Complete QC/QA Procedures

The NEPA/SEPA Lead is to coordinate the applicable QC review following the *NCDOT Quality Management Program: Quality Control and Quality Assurance* procedures and the respective QC Checklist before upload and distribution of all related deliverables.

2EP1 Advance NEPA/SEPA Documentation

Overview

Prepare, assist, coordinate, and/or review all relevant environmental disciplines as projects navigate the NEPA/SEPA documentation and 404/NEPA Merger processes (as applicable for the project), including the quality control and quality assurance reviews of all relevant environmental documentation.

Note: *For projects using the Merger Process, the following tasks are required for Merger Concurrence Points (CP) 1 through 4A, unless specifically noted below. The 404/NEPA Merger process supports NCDOT's NEPA/SEPA documentation and decision-making efforts and are to be viewed as a more robust/structured version of the everyday non-Merger agency coordination efforts.*

References

- ☐ NCDOT Environmental Policy Unit Policies, Procedures, and Guidance Documents
- ☐ *NCDOT Merger Guidance*
- ☐ *NCDOT-FHWA CE Programmatic Agreement*
- ☐ *NCDOT Section 4(f) Guidance (In development)*

Deliverables

Deliverable	Task	Responsible Party	
		Activity Leader	Additional Support
Merger Preparation Materials [Q]	▪ *Set Up Merger Concurrence Points* ▪ *Review Merger Concurrence Point (CP) Materials*	NEPA/SEPA Lead and Environmental Policy Unit	Project Manager and Environmental Policy Unit
Merger CP Outcomes [A]	▪ *Distribute Merger CP Meeting Materials and Conduct Meeting*	NEPA/SEPA Lead and Project Manager	Environmental Policy Unit
Comments on Merger Public Engagement Materials	▪ *Review Merger Public Engagement Materials*	Environmental Policy Unit	Public Involvement Staff
Approved NEPA/SEPA Documentation [A, Q]	▪ *Prepare NEPA/SEPA Documentation*	NEPA/SEPA Lead	Division Environmental Officer Staff or Environmental Policy Unit
Comments on Environmental Documents	▪ *Review Environmental Documents*	NEPA/SEPA Lead	Environmental Policy Unit
Approved Section 4(f) Documentation [Q]	▪ *Review Section 4(f) Documentation*	NEPA/SEPA Lead	Environmental Policy Unit and EAU Community Studies Staff/Division Environmental staff
Annual CE Review and Report	▪ *Provide Categorical Exclusions (CE) Compliance Review*	Environmental Policy Unit	Federal Highway Administration

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Set Up Merger Concurrence Points

All Merger concurrence points can be achieved via in-person or virtual meetings or coordinated via email. The project's NEPA/SEPA Lead coordinates with the Environmental Policy Unit to maintain the Merger Plan and align it with the overall project schedule. As each Concurrence Point approaches, the Environmental Policy Unit's activities begin when the Unit receives an email at EPU@ncdot.gov. This request takes place at least two months in advance of the requested date. Dates have been reserved each

month for Merger meetings. A calendar is posted each year with selected dates for western and eastern projects.

While it is expected that all Merger meetings are held in Raleigh on the selected dates so Merger Team members can plan accordingly, it is possible to have meetings on other dates or in other locations. For instance, some meetings may require a field visit and are held at a location near the project (e.g., Division office) and/or on-site.

- For the Merger CP2A meeting, the project team may elect to schedule a field meeting to review the proposed major crossing structure locations and get a better idea of the quality of the impacted resources. If needed, the Project Manager coordinates the meeting date, time, and location with the Merger Team, notifying the Environmental Policy Unit as a courtesy.

Review Merger Concurrence Point Materials

In collaboration with the Project Manager and in accordance with the NCDOT Merger guidance, the NEPA/SEPA Lead provides the draft Merger Concurrence Point (CP) materials and submits it to the Environmental Policy Unit Lead for review, which minimally includes the following for each Merger CP:

- Meeting purpose
- Project description, vicinity map, and study area figure
- Summary of Merger Process decisions to date
- Nearby STIP projects
- Project schedule
- Summary of public engagement (as applicable)
- Avoidance and minimization measures to date

For Merger CP2, the packet also includes:

- Summary of alternatives considered
- Summary of proposed detailed study alternatives

For Merger CP2A, the packet also includes:

- Water resources summary
- Major Hydraulic Crossings and Alignment Review

For Merger CP3 and CP4A, the packet also includes:

- Cost Estimates
- Impact summary
- Recommended least environmentally damaging practicable alternative (LEDPA)
- Avoidance and minimization measures summary for each concurrence point and for activities that have taken place since Merger CP3

Host Merger CP Pre-Meeting

Prior to a scheduled Merger meeting, the project team may host a call with the Merger MOU Signatory agencies to solicit questions and address agency concerns.

- Pre-meetings include, at a minimum, NCDOT, Federal Highway Administration (FHWA) (for federal projects), US Army Corps of Engineers (USACE), and the North Carolina Division of Water Resources (NCDWR).
- All pre-meetings are scheduled a minimum of three weeks in advance of the respective Merger meeting to allow adequate time to modify the Merger packet, if necessary.

Pre-meetings are required at Merger CP3 and are encouraged at Merger CP2, CP2A, and CP4A for complex projects. The project team is prepared to address concerns expressed at the pre-meeting prior to or at the Merger meeting (i.e., in the Merger packet or in the meeting presentation).

Distribute Merger CP Meeting Materials and Conduct Meeting

The Merger Process requires that the completed packet and relevant logistical information (e.g., meeting invitation, videoconference link, and/or teleconference number) is circulated to Merger Team members at least two weeks prior to the scheduled meeting date. The Environmental Policy Unit oversees the material distribution requirements, in addition to supporting the NEPA/SEPA Lead with securing audio and visual equipment, a conference call number, and video meeting link, initiating each at the beginning of the meeting.

The NEPA/SEPA Lead and/or Project Manager conducts the concurrence point coordination, with the Environmental Policy Unit and Division Environmental staff supporting the Project Team throughout the Merger process.

Review Merger Public Engagement Materials

Public engagement (e.g. public meeting, newsletter) requirements for a project in the Merger process are detailed in *NCDOT's Merger Guidance*. The Environmental Policy Unit and NCDOT Public Involvement staff review the draft public engagement materials in order to ensure compliance with the guidance and adhere to USACE permitting requirements.

Prepare the NEPA/SEPA Documentation

Due to the complexity and variability of NEPA/SEPA documentation, the guidance provided herein is simply an overview. In most cases NEPA/SEPA documentation is prepared by a consulting firm on behalf of NCDOT; in other cases, NCDOT staff prepares the environmental documentation in-house. While the documentation itself (Categorical Exclusion, Minimum Criteria Determination Checklist, Environmental Assessment/Finding of No Significant Impact, or Environmental Impact Statement/Record of Decision) is the culmination of the process, the analyses and documentation efforts are taking place throughout the project's development, beginning in the Project Initiation Stage of the PDN.

The final NEPA/SEPA documentation is often referred to as NCDOT's "decision document" because it presents the case for why a project is proceeding forward with action based on the identified needs, purpose, and in light of the relevant environmental and design constraints analyzed. The entirety of the PDN's stages 1 and 2 build up to completion of the project's NEPA/SEPA documentation.

The NEPA/SEPA Lead (typically Division Environmental or Environmental Policy Unit staff within NCDOT) oversees preparation of NEPA/SEPA documentation, including:

- Coordination with project team members to gain a full understanding of the project's location and proposed actions.
- Evaluating the project's potential impacts with up to date environmental resource information in accordance with state and federal environmental rules, regulations, and policies.
- Ensuring transparency of NCDOT's decision-making and environmental impact analysis processes, including public involvement and stakeholder input.
- Preparing and coordinating approval of the environmental documentation in accordance with current NCDOT procedures; for example, many STIP projects are documented as Categorical Exclusions, so the current *FHWA-NCDOT CE Programmatic Agreement* governs the preparation of that documentation.

Upon approval of the NEPA/SEPA documentation, the NEPA/SEPA Lead coordinates with the Division Environmental staff or Environmental Policy Unit to:

- Inform the project team and upload the final document and supporting memos, determinations, correspondence, and technical studies to the ATLAS Workbench.
- Ensure the environmental documentation's project commitments are included in the Green Sheet, communicated to the project team, and incorporated into the project's plan set. (*Note: Environmental commitments that impact the project's overall scope, schedule, or budget are to be coordinated with the Project Manager and the appropriate discipline leads prior to their inclusion.)*

Review Environmental Document(ation)

The NEPA/SEPA Lead is responsible for coordinating with the Environmental Policy Unit to provide quality control reviews for NEPA (Environmental Assessments [EAs]/Findings of No Significant Impact [FONSIs], Environmental Impact Statements [EISs], and Records of Decision [RODs]) and SEPA documents. The Environmental Policy Unit and/or Division Environmental staff provide quality control reviews of NEPA Categorical Exclusion (CE) and SEPA Minimum Criteria Determination Checklist (MCDC) documentation. Once requested, the Environmental Policy Unit and/or Division Environmental staff:

- Reviews the environmental documents (draft and final versions) and provides comments back to the preparer,
- Obtains federal agency review (as needed), and
- Ensures the final document(ation) is uploaded to the ATLAS Workbench.

NCDOT staff review and approval is directly tied to state/federal requirements and quality assurance processes. For example, the *FHWA NCDOT CE Agreement* states that NCDOT must rely on "qualified NCDOT staff to make CE approvals or certifications submitted to FHWA under this agreement. The NCDOT may not delegate its responsibility for CE approvals or certifications to third parties (i.e., consultants, local government staff, and other State agency staff)."

Review Section 4(f) Documentation (if needed)

The NEPA/SEPA Lead is to work with the Environmental Policy Unit, EAU Community Studies staff, and/or Division Environmental staff to review, coordinate, and complete Section 4(f) documentation, as needed.

- Section 4(f) documentation is often completed with the draft environmental document and is necessary for USDOT agency administered (such as FHWA) projects that may impact a Section 4(f)

recreational resource (the Environmental Analysis Unit's Cultural Resources staff generally coordinates Section 4(f) documentation for historic resource impacts – see 2EN2 for related information).

- The impact may involve *de minimis* or "programmatic use" coordination with FHWA and the local official with jurisdiction over the resource, or it may involve more complex Section 4(f) use evaluations.

This documentation is very project specific. A Section 4(f) use evaluation could become a driver for project decision-making and significantly affect project schedule. Potential 4(f) resources are to be identified during the Project Initiation Stage and be tracked throughout a project's development. More information on this task is detailed on the Environmental Policy Unit website and in 2EN2.

Provide Categorical Exclusion (CE) Compliance Review

Under the terms of the *FHWA-NCDOT CE Programmatic Agreement*, the Environmental Policy Unit works collaboratively with FHWA to conduct an annual Compliance Review and Report of CEs completed by the various Units and Divisions. The review typically includes at least one CE from each Unit or Division that developed a CE within the calendar year and a total of at least 10 percent of completed CEs.

As part of the Report, the Environmental Policy Unit develops a list of CEs completed by Type, which is provided to FHWA. The Environmental Policy Unit develops and finalizes the Compliance Review Report, making it available to NCDOT staff and FHWA. NCDOT and FHWA jointly review areas of improvement and best practices noted in the CE review and report, determining if trainings or other steps are needed to ensure continued improvement in CE development.

3EP1 Complete NEPA/SEPA Documentation

Overview

Conduct Consultation (a written summary to evaluate whether the prior NEPA/SEPA documentation remains valid) prior to executing right-of-way authorization if more than one year has passed since approval of the environmental document(ation) or if substantial project changes have occurred.

References

- ☐ *NCDOT Consultation and Re-Evaluation Guidance*
- ☐ *NCDOT NEPA/SEPA Consultation Form*

Deliverables

Deliverable	Task	Responsible Party	
		Activity Leader	Additional Support
		NEPA/SEPA Lead	Project Manager and Roadway Design Lead
NCDOT NEPA/SEPA Consultation Form [A, Q]	▪ *Complete Right-of-Way Consultation (as applicable)*	X	X

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[Q] *Indicates that final document(s) or data set(s) requires review in accordance with NCDOT Quality Management Program: Quality Control and Quality Assurance.*

Complete Right-of-Way Consultation (as applicable)

At least three months prior to requesting right-of-way authorization (see 3RW2 for related information), the Project Manager and Roadway Design Lead coordinate with the NEPA/SEPA Lead (typically Division Environmental or Environmental Policy Unit staff within NCDOT) to determine if a Consultation is required. The Consultation is completed in accordance with the current version of the NCDOT *Consultation and Re-Evaluation Guidance* and documented on the *NCDOT NEPA/SEPA Consultation Form*. As an example, the Consultation process could require updated Threatened and Endangered species surveys, additional Section 4(f), LWCF, or 106 coordination, or revisions to other environmental resource reports. The completed Consultation is distributed by the NEPA/SEPA Lead to the Project Manager and applicable project team members and uploaded to the ATLAS Workbench.

4EP1 Complete NEPA/SEPA Documentation

Overview

Conduct Consultation (a written summary to evaluate whether the prior NEPA/SEPA documentation remains valid) prior to executing construction authorization if more than one year has passed since approval of the environmental document(ation) or if substantial project changes have occurred.

References

- ☐ *NCDOT Consultation and Re-Evaluation Guidance*
- ☐ *NCDOT NEPA/SEPA Consultation Form*

Deliverables

Deliverable	Task	Responsible Party	
		Activity Leader	Additional Support
		NEPA/SEPA Lead	Project Manager and Roadway Design Lead
NCDOT NEPA/SEPA Consultation Form [A, Q]	▪ *Complete Construction Consultation (as applicable)*	X	X

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[Q] *Indicates that final document(s) or data set(s) requires review in accordance with NCDOT Quality Management Program: Quality Control and Quality Assurance.*

Complete Construction Consultation (as applicable)

At least three months prior to requesting construction authorization, the Project Manager and Roadway Design Lead coordinate with the NEPA/SEPA Lead (typically Division Environmental or Environmental Policy Unit staff within NCDOT) to determine if a Consultation is required. The Consultation is completed in accordance with the current version of the NCDOT *Consultation and Re-Evaluation Guidance* and documented on the *NCDOT NEPA/SEPA Consultation Form*. As an example, the Consultation process could require updated Threatened and Endangered species surveys, additional Section 4(f), 6(f), or 106 coordination, or revisions to other environmental resource reports. The completed Consultation is distributed by the NEPA/SEPA lead to the Project Manager and applicable project team members and uploaded to the ATLAS Workbench.

1FS1 Complete Express Design

Overview

As the initial step in the planning and design of a candidate project, produce a consistent and reliable description of project alternatives that could be used to 1) better define project scope and costs as part of prioritization and 2) more effectively relay information to a project manager to jump-start the environmental planning process. Components of an express design typically include:

- Project-specific goals (determined in coordination with locals)
- A summary of viable alternatives/alignments for a proposed project
- Cost estimates
- NEPA/SEPA-appropriate information that can inform a project's purpose and need and high-level environmental screening

Note: *Actions during the Project Initiation Stage may be led and completed by staff from several different NCDOT groups. Any person who has overall responsibility for a project during this Stage is referred to as the "Project Lead." This lead could be the Feasibility Studies Engineer, the Division-based Corridor Development Engineer, the Division Planning Engineer, or someone in a similar role as tasked by a state or local agency.*

References

- ☐ *Express Design Project Scoping Report Process*
- ☐ *Express Design Traffic Evaluation Procedures*
- ☐ *Candidate Project: Systems Planning to Programming Flow Chart*
- ☐ *Candidate Project Screening Tools*
- ☐ *Candidate Project Guidance*
- ☐ *NCDOT Quality Management Program: Quality Control and Quality Assurance*

Deliverables

Deliverable	Task	Responsible Party	
		Activity Leader	Additional Support
Pre-Prioritization Design, Concept, & Scope Sufficiency Form	▪ *Complete Pre-Prioritization Design Concept & Scope Sufficiency Form*	Project Sponsors (MPOs, RPOs, Highway Divisions)	▪ Project Lead ▪ Division Planning Engineer ▪ Transportation Planning Division
Express Design Evaluation Package (Cost Estimate only or Full Express Design) [A, Q]	▪ *Conduct Express Design Evaluation (Cost Estimate only or Full Express Design)* ▪ *Finalize Express Design Deliverables* ▪ *Submit the Express Design Evaluation*	Feasibility Studies Unit	▪ Project Lead ▪ Division Corridor Development Engineer ▪ Division Planning Engineer ▪ Project Sponsor (MPO, RPO, Highway Divisions) ▪ Transportation Planning Division ▪ Assigned Private Engineering Firm

[A] *Indicates that final document(s) or data set(s) must be uploaded to the ATLAS Workbench (refer to Appendix A in the Express Design Project Scoping Report Process Guidance) and the Conceptual Express Design Site.*

[Q] *Indicates that final document(s) or data set(s) requires review in accordance with the NCDOT Quality Management Program: Quality Control and Quality Assurance.*

Complete Pre-Prioritization Design Concept & Scope Sufficiency Form

Once projects have been identified as being of high priority for implementation through the Preliminary Prioritization Candidate Project List, they can be screened for adequacy of concept scope development and cost estimates through the submission of a Pre-Prioritization Design Concept & Scope Sufficiency Form. Projects not shown on the Preliminary Prioritization Candidate Project List can still be submitted on the sufficiency form. Once completed for a potential project improvement, the form is submitted to the Feasibility Studies Unit (FSU) for review.

Receive Pre-Prioritization Design Concept & Scope Sufficiency Form and Conduct Adequacy Evaluation

Once a Pre-Prioritization Design Concept & Scope Sufficiency Form is received by FSU, the form and potential project is reviewed, and next steps are recommended. There are three potential recommendations:

- No further analysis,
- Recommend a cost estimate update, or
- Recommend conducting an Express Design.

FSU develops the parameters for adequacy of the evaluation.

Receive Project Express Design Evaluation Request

If the Project Sponsor decides that an Express Design is needed to fully evaluate a potential project, they send a Project Evaluation Request to FSU to request an Express Design Evaluation.

Note: All project concepts to be prioritized and/or programmed should have an Express Design Evaluation completed. However, it is up to the discretion of FSU and the Divisions to determine what project concepts are viable and should be evaluated. Additionally, FSU focuses on ensuring that all candidate projects needing an Express Design Evaluation are developed and supplied to the Division-based Corridor Development Engineer to allow for the project to be reviewed using SPOT On!ine and reviewed to determine if the project is ready for prioritization submittal (see 1SP1 for related information).

If a project is submitted to the Strategic Prioritization Office (SPOT) and an Express Design Evaluation or similar study has not been initiated, then SPOT submits a Project Evaluation Request to FSU for inclusion into the Express Design Evaluation program.

Conduct Express Design Evaluation (Cost Estimate only or Full Express Design)

FSU performs Express Design Evaluations or Cost Estimate Evaluations on candidate projects as capacity permits.

Most full express designs are assigned to one of FSU's on-call consulting firms, with direction and oversight from FSU, and the design is to be prepared in accordance with the *Express Design Project Scoping Report Process* guidance. FSU manages the following tasks:

- Coordinate assignment of the express design with Division staff to understand the context of the project and the firms to be considered.
  - Determine what firm to assign for the express design.

- Consult with the NCDOT Congestion Management Section to determine if an Express Design Traffic Evaluation (EDTE) is needed.
- If an EDTE is needed, then the NCDOT Congestion Management Project Engineer determines the EDTE level of analysis. The NCDOT Project Lead and Congestion Management Project Engineer agree on a firm to complete the work based on the prequalification status of the available firms. FSU coordinates the development of the EDTE as outlined in 1TP1 and 1TM1.
- **Note:** Projects with substantial new location facilities require a project-level traffic forecast or traffic estimate. In those situations, consult with both the Congestion Management Section and the Transportation Planning Division (see 1TP1 and 1TP2 for related information).

- Provide general information of the project, including a project description, preliminary stakeholder plan, and priority of assignment.
- Identify stakeholders (refer to the *Express Design Project Scoping Report Process*) and ensure that the firm has fully coordinated with all appropriate parties (e.g., Metropolitan and/or Rural Planning Organizations (MPOs/RPOs), NCDOT staff, etc.).
- Set up and facilitate a kickoff meeting to determine the scope of the express design.
- Provide readily available data to the project team, including crash data, adjacent project CADD files, and structures reports.
- Review and provide oversight on all express design deliverables as outlined in the *Express Design Project Scoping Report Process*.
- Coordinate the conceptual cost estimates with the Contract Standards and Development Unit, Utilities Coordinator, and the appropriate Right-of-Way (ROW) contact (refer to 1CS1, 1UT1, and 1RW1, respectively, for related information)
- Coordinate with the Traffic Safety Planning Engineer, as needed (see 1TS1 for related information)

Finalize Express Design Deliverables

Following the *Express Design Project Scoping Report Process*, FSU compiles a package of information developed during the Express Design Evaluation, including conceptual design, cost estimates, and the project initiation form.

FSU coordinates with the local MPOs/RPOs to ensure that the Final Express Design Evaluation Package is compatible with the local vision for the project. FSU revises the Express Design, if needed.

The Final Express Design Evaluation Package is uploaded to the ATLAS Workbench, which copies the document package to the Conceptual Express Design Site (refer to Appendix A in the *Express Design Project Scoping Report Process Guidance*).

Submit the Express Design Evaluation

FSU submits the Final Express Design Evaluation Package to SPOT, including the anticipated costs of the improvements. In addition, FSU notifies key NCDOT and MPO/RPO partners of the package being complete.

Complete QC/QA Procedures

The FSU Lead is to coordinate the applicable QC review following the NCDOT *Quality Management Program: Quality Control and Quality Assurance* procedures and the respective QA Checklist before upload and distribution of all related deliverables.

1FS2 Complete Project Scoping Report

Overview

Produce a Project Scoping Report (PSR) that includes a consistent and reliable description of project alternatives that can be used to:

- Better define project scope and costs
- Effectively jump-starts the environmental planning process through coordination with the Project Manager

When or if the project is programmed in the STIP, it will be at the discretion of the Project Lead to determine the best time to initiate the PSR. The PSR is an update to the express design and provides a more in-depth evaluation to inform how the project should proceed.

Note: *Actions during the Project Initiation Stage may be led and completed by staff from several different NCDOT groups. Any person who has overall responsibility for a project during this Stage is referred to as the "Project Lead." This lead could be the Feasibility Studies Engineer, the Division-based Corridor Development Engineer, the Division Planning Engineer, or someone in a similar role as tasked by a state or local agency.*

References

- ☐ *Express Design Project Scoping Report Process*
- ☐ *Express Design Traffic Evaluation Procedures*
- ☐ *Construction Contract Decision Matrix (and training module)*
- ☐ *Candidate Project Screening Tools*
- ☐ *Candidate Project Guidance (and Flow Chart)*
- ☐ *NCDOT Quality Management Program: Quality Control and Quality Assurance*

Deliverables

Deliverable	Task	Responsible Party	
		Activity Leader	Additional Support
Project Scoping Report Level-of-Detail Screening Form [A]	▪ *Review/Update Information from the Express Design Evaluation* ▪ *Complete Project Scoping Level-of-Detail Evaluation*	Feasibility Studies Unit	▪ Transportation Planning Division ▪ Division Corridor Development Engineer ▪ Division Planning Engineer ▪ Project Sponsor (MPO, RPO, Highway Divisions) ▪ Project Lead ▪ Environmental Policy Unit ▪ Assigned Private Engineering Firm
Project Scoping Report Package [A, Q]	▪ *Develop and Complete Project Scoping Report*	Feasibility Studies Unit	Assigned Private Engineering Firm

Deliverable	Task	Responsible Party	
		Activity Leader	Additional Support
Final Project Initiation Packet [A, Q]	▪ *Compile Final Project Initiation Packet*	Division Corridor Development Engineer	▪ Division Planning Engineer ▪ Feasibility Studies Unit ▪ Project Lead ▪ Project Sponsor (MPO, RPO, Highway Divisions) ▪ Transportation Planning Division

[A] *Indicates that final document(s) or data set(s) must be uploaded to the ATLAS Workbench (refer to Appendix A in the Express Design Project Scoping Report Process Guidance) and the Conceptual Express Design Site.*
[Q] *Indicates that final document(s) or data set(s) requires review in accordance with the NCDOT Quality Management Program: Quality Control and Quality Assurance.*

Review/Update Information from the Express Design Evaluation

If, during prioritization (see 1SP1 for related information), a project is selected for programming in the STIP (see 1SI1 for related information), a review and update (if necessary) of the project data developed during the Express Design Evaluation is required. The *Express Design Project Scoping Report Process* is used to update the Express Design Evaluation information, as appropriate, and provides more in-depth information in the PSR to inform the Project Manager how the project is to proceed in Stage 1.

Components of a PSR include:

- Project-specific goals (determined in coordination with locals)
- A summary of viable alternatives/alignments for a proposed project
- Cost estimates
- NEPA/SEPA-appropriate information that can inform a project's purpose and need and high-level environmental screening

Output from a PSR is a deliverable package that can include a combination of the:

- Preliminary Environmental Considerations (PEC) Checklist
- Project Initiation Form
- A Project Scoping Technical Report (depends on the complexity of the project)
- Public involvement/Resource Agency Documentation

Complete Project Scoping Level-of-Detail Evaluation

Before development of the PSR can begin, a decision must be made to determine which tier of PSR is completed. The three tiers of PSRs are:

- **Streamlined PSR:** For small, straightforward projects, to include only a Screening Checklist and Project Initiation Form
- **Regular PSR:** Includes a Screening Checklist and Project Initiation Form, plus a more detailed Technical Report
- **Enhanced PSR:** Includes a Screening Checklist, Project Initiation Form, and Technical Report of the Regular PSR, plus Public Involvement Documentation and Resource Agency Documentation needed to define Merger Screening and document achieving Merger Concurrence Point 1

For each project that has received a sufficiently high Project Prioritization score to be considered for inclusion in the STIP, the Feasibility Studies Unit (FSU) completes the PSR Level-of-Detail Screening Form. The form recommends the PSR level-of-effort commensurate with previous analysis for the project. The form, together with the supporting documentation, is reviewed by the Environmental Policy Unit and Project Lead. Should there be disagreement with the recommendation, they meet with FSU to resolve the discrepancy.

Develop and Complete Project Scoping Report

Following review and update (if necessary) of the Express Design Evaluation and Project Scoping Level-of-Detail Evaluation, FSU manages the development of the PSR Package as detailed in the *Express Design Project Scoping Report Process*, which includes:

- Coordinate assignment of the PSR with Division staff to understand the context of the project and the firms to be considered.
  - Determine what firm to assign for the PSR
  - Consult with the NCDOT Congestion Management Section to determine if the existing Express Design Traffic Evaluation (EDTE) is current and relevant.
  - If a new EDTE is needed, then the NCDOT Congestion Management Project Engineer determines the EDTE level of analysis. The NCDOT Project Lead and Congestion Management Project Engineer agree on a firm to complete the work based on the prequalification status of the available firms. FSU coordinates the development of the EDTE as outlined in 1TP1 and 1TM1.
  - **Note:** Projects with substantial new location facilities require a project-level traffic forecast or traffic estimate. In those situations, consult with both the Congestion Management Section and the Transportation Planning Division (see to 1TP1 and 1TP2 for related information).
- Review and approve the consultant's Project Scoping Screening Checklist
- Review and provide oversight on all PSR deliverables as outlined in the *Express Design Project Scoping Report Process* (dependent upon PSR level of detail).
- Coordinate with NCDOT Environmental Policy Unit (EPU) on Merger if the Merger Pre-Screening determines the project should have a formal Merger Screening and potentially enter the Merger Process (see 1EP1 for related information).
- Coordinate development of SUE level D with the Location & Survey Division Team Lead (see 1LS1 for related information)
- Coordinate the best available geospatial data from the Photogrammetry Unit (see 1PH1 and 1PH2 for related information).
- Coordinate with the Roadway Design Unit as appropriate (see 1RD1 for related information).
- Coordinate with NCDOT Public Involvement, Community Studies, and Visualizations (PICSViz) to receive recommendations on potential impacts to community resources or demographics and determine if a Public Involvement Plan (PIP) is needed for the project.
- Develop the Project Scoping Technical Report
- Complete the Construction Contract Decision Matrix
- Coordinate with the Geotechnical Unit (GeoEnvironmental) to complete the GeoEnvironmental screening process and the Geotechnical Report for Planning (see 1GT1 for related information)
- Initiate railroad coordination, if required for the project (see 1RR1 for related information)

- Coordinate with the Communications Group when the PSR is complete to request comments (see 1CG1 for related information)

FSU uploads the PSR Package to ATLAS Workbench, which copies the package to the Conceptual Express Design Site (refer to Appendix A in the *Express Design Project Scoping Report Process Guidance*).

Compile Final Project Initiation Packet

Throughout the Candidate Project process, a record of documents that have defined the project are compiled and maintained for ultimate delivery to the project development team. This includes an opportunity for public review and comment on all project planning materials included in the Final Project Initiation Packet. The Division Corridor Development Engineer compiles the packet and provides it to the Project Lead to move forward in the PDN process.

Complete QC/QA Procedures

The FSU Lead is to coordinate the applicable QC review following the NCDOT *Quality Management Program: Quality Control and Quality Assurance* procedures and the respective QA Checklist before upload and distribution of all related deliverables.

1GT1 Geotechnical, Geopavement & GeoEnvironmental Planning

The following geo-planning activities are requested from and performed by internal NCDOT staff of the Geotechnical Engineering Unit. Geotechnical Engineering Unit input during the Project Initiation Stage is separated into subtasks related to the three focus areas of the Unit:

Task details and deliverables are found in the corresponding sections below. These tasks are initiated by the Project Manager submitting a Work Request Form.

Overview: Geotechnical

Identify potential geotechnical risks to the project. Detailed exploration of the project site and in-depth analysis are not performed during this task. General risks posed by soil, rock, and groundwater in the project geologic setting and negative construction impacts to the surrounding area are primary considerations.

References

- ☐ *Geotechnical Investigation and Recommendations Manual*
- ☐ *NCDOT Quality Management Program: Quality Control and Quality Assurance*

Deliverables

Deliverable	Task	Responsible Party	
		Activity Leader	Additional Support
Geotechnical Planning Report	▪ *Develop Geotechnical Planning Report*	NCDOT Project Geological Engineer	NCDOT Geotechnical Design Engineer

Develop Geotechnical Planning Report

Utilizing the *Geotechnical Investigation and Recommendations Manual*, the Project Geological Engineer with the support of the Geotechnical Design Engineer reviews the conceptual design, available project information, geologic maps, soil surveys, and any available nearby geotechnical explorations to inform the Project Manager and design team of the anticipated subsurface conditions and implications for the project as proposed. Preliminary geotechnical project design recommendations such as preferred slope configurations will be included.

Complete QC/QA Procedures

The Project Geological Engineer is to coordinate the applicable QC review following the *NCDOT Quality Management Program: Quality Control and Quality Assurance* procedures and the respective QC Checklist before distribution of the Geotechnical Planning Report through the project Connect site.

(*Back to activity overview*)

Overview: Geopavement

This task is primarily recommended for arterial and larger facilities or more complex projects to determine the investigation approach and potential benefit of subgrade stabilization or pavement reclamation. Geopavement tasks provide the:

- Roadway Design Engineers with recommendations for subgrade preparation to include in models and plan set
- Pavement Design Engineers with the project pavement support and existing pavement data to evaluate pavement alternatives.

References

- ☐ *Geotechnical Investigation and Recommendations Manual*
- ☐ *NCDOT Quality Management Program: Quality Control and Quality Assurance*

Deliverables

Deliverable	Task	Responsible Party	
		Activity Leader	Additional Support
Geopavement Planning Report	▪ *Develop Geopavement Planning Report*	NCDOT Geopavement Engineer	NCDOT Pavement Design Engineer

Develop Geopavement Planning Report

The Geopavement Engineer evaluates the proposed project relative to the existing pavements and geologic setting. The Geopavement Engineer then confers with the Pavement Design Engineer to gather any available records for the existing pavements and determines the investigation needs for the project as well as the benefit of subgrade stabilization or pavement reclamation. The Geopavement Engineer prepares a summary report of their findings and recommendations for subsequent Geopavement tasks to the project team.

Complete QC/QA Procedures

The Geopavement Engineer is to coordinate the applicable QC review following the *NCDOT Quality Management Program: Quality Control and Quality Assurance* procedures and the respective QC Checklist before distributing the Geopavement Planning Report through the project Connect site.

(*Back to activity overview*)

Overview: GeoEnvironmental

Identify and complete an accurate depiction of historical and existing potential hazardous waste sites within the project limits.

References

- ☐ *Geotechnical Investigation and Recommendations Manual*
- ☐ *GeoEnvironmental Product Matrix*
- ☐ *NCDOT Quality Management Program: Quality Control and Quality Assurance*

Deliverables

Deliverable	Task	Responsible Party Activity Leader
GeoEnvironmental Scoping Comments Report [A]	▪ *Develop GeoEnvironmental Scoping Comments Report*	NCDOT GeoEnvironmental Project Engineer

[A] *Indicates that final document(s) or data set(s) must be uploaded to the ATLAS Workbench.*

Develop GeoEnvironmental Scoping Comments Report

The GeoEnvironmental Project Engineer conducts a desktop review of GIS database files of the project study area for GeoEnvironmental Sites of Concern. The GeoEnvironmental Project Engineer summarizes the review in a report that includes a map and shapefile of the noted GeoEnvironmental Sites of Concern, if discovered.

Complete QC/QA Procedures

The GeoEnvironmental Project Engineer is to coordinate the applicable QC review following the *NCDOT Quality Management Program: Quality Control and Quality Assurance* procedures and the respective QC Checklist before distribution of the GeoEnvironmental Scoping Comments Report through the project Connect site.

2GT1 GeoEnvironmental Phase I

Overview

Confirm GeoEnvironmental Sites of Concern within the project corridor, compile data for the DGN, and evaluate risk. This stage should be performed with Geotechnical Engineering Unit personnel for historical perspective and to identify the need of additional investigation and reports.

References

- ☐ *Geotechnical Investigation and Recommendations Manual*
- ☐ *NCDOT GeoEnvironmental Phase I Scope of Work*
- ☐ *NCDOT GeoEnvironmental Phase I Template*
- ☐ *NCDOT GeoEnvironmental Product Matrix*
- ☐ *NCDOT Quality Management Program: Quality Control and Quality Assurance*

Deliverables

Deliverable	Task	Responsible Party Activity Leader
GeoEnvironmental Phase I Report GeoEnvironmental DGN	▪ *Develop GeoEnvironmental Phase I Report and Related Materials*	NCDOT GeoEnvironmental Project Engineer

Develop GeoEnvironmental Phase I Report and Related Materials

This task is to develop Phase I products in accordance with the guidelines and references linked above.

The Project Manager submits a Work Request Form to the GeoEnvironmental Project Engineer (internal NCDOT Staff) to identify sites of concern within the preferred alternative/alignment study limits via field reconnaissance and review available aerial imagery, maps, regulatory databases/files. This information is included in the HazMat section of the environmental document or checklist. The GeoEnvironmental Project Engineer develops the GeoEnvironmental DGN file that indicates GeoEnvironmental Sites of Concern to be referenced and shown in the roadway plan set by the Roadway Design Lead.

Complete QC/QA Procedures

The GeoEnvironmental Project Engineer is to coordinate the applicable QC review following the *NCDOT Quality Management Program: Quality Control and Quality Assurance* procedures and the respective QC Checklist before distribution of any deliverables through the project Connect site.

2GT2 Roadway Geotechnical & Geopavement Investigations

The Roadway Geotechnical and Geopavement investigations are generally corridor-wide and typically require the same or similar equipment, investigation methods, and soil laboratory testing. The investigations assist in developing recommendations for different recipients and purposes.

These investigations require field work with equipment that could be affected by weather, difficulty of access, property owners, moratoriums, and traffic control or conflicts with construction activities. The effort and duration required for these investigations vary based on project size, complexity, and location. For bridge replacement projects, these tasks may be performed concurrently with the Geotechnical Structure Investigations (2GT3) tasks. For larger and more complex projects these investigations may be initiated as the Design Recommendation Plan Set is nearing approval.

Task details and deliverables are found in the corresponding sections below. These tasks are initiated by the Project Manager submitting a Work Request Form.

Overview: Roadway Geotechnical Investigation

Conduct a subsurface investigation and provide design and construction recommendations to support the overall roadway design. The roadway geotechnical investigation provides a recommendations report addressing cut slope and embankment stability, subgrade stability, depth to groundwater, subsurface drainage, special ditches, borrow, and wells and bodies of water in or near the corridor.

References

- ☐ *Geotechnical Investigation and Recommendations Manual*
- ☐ *NCDOT Quality Management Program: Quality Control and Quality Assurance*

Deliverables

Deliverable	Task	Responsible Party	
		Activity Leader	Additional Support
Preliminary Roadway Recommendations Memo	▪ *Complete Roadway Geotechnical Investigation, Reporting, and Recommendations*	Project Geological Engineer or Geologist	Geotechnical Design Engineer
Roadway Subsurface Investigation Inventory			
Roadway Recommendations Report			
Geotechnical Summary Tables (3G Sheet)			
Roadway Special Details (2G Sheets)		Geotechnical Design Engineer	Project Geological Engineer or Geologist
Special Provisions			

Complete Roadway Geotechnical Investigation, Reporting, and Recommendations

Although coordination of the subsurface investigation may proceed, the approved Design Recommendation Plan Set (see 2RD2 for related information) and model are required to develop the Roadway Recommendations Report. The Project Geological Engineer uses the available design model to

coordinate the subsurface investigation in accordance with the *Geotechnical Investigation and Recommendation Manual*.

The Project Geological Engineer summarizes results of the subsurface investigation in the Roadway Subsurface Investigation Inventory listing soils, rock type, and groundwater levels present in the project area and geotechnical areas of special interest. The Roadway Subsurface Investigation Inventory is included in the Let package for Contractor information.

The Project Geological Engineer, with the support of the Geotechnical Design Engineer, may provide a Preliminary Roadway Recommendations Memo to the Project Manager, the Roadway Design Lead, and the Hydraulic Design Engineer. This memo addresses any preliminary geotechnical recommendations that may affect right-of-way requirements and would be prepared prior to the full recommendations package to document geotechnical recommendations necessary to advance the project design. Items to be addressed are slope configuration, retaining wall type if known (anchors or soil nails may require additional right-of-way), and special ditches or subsurface drains in Coastal Plain to lower groundwater. These preliminary recommendations will be based on the limited information available from site reconnaissance and subsurface investigations completed to date. Therefore, the recommendations are subject to change based on additional information obtained after the date of issuance and are superseded by the Roadway Recommendations Report

The Project Geological Engineer, with the support of the Geotechnical Design Engineer, uses the Roadway Subsurface Investigation Inventory to develop final recommendations for grading and construction of the roadway corridor. The Roadway Recommendations Report includes a summary of estimated contract pay item quantities, adjustments for earthwork calculations, and other miscellaneous items. Geotechnical Summary Tables, Roadway Plan Sheet 3G-1, are prepared by the Project Geological Engineer and distributed with the recommendations.

The Geotechnical Design Engineer, with the support of the Project Geological Engineer, prepares any special roadway details (roadway plan set 2G sheets). Special details may be required to show miscellaneous geotechnical items and quantities, such as staged construction, ground improvement, surcharges, embankment or slope reinforcement, and specialized geotechnical instrumentation. Any Project Special Provisions needed for construction of the details are prepared and distributed with the Roadway Recommendations Report. Some typical geotechnical Special Provisions include:

- Special handling of material
- Ground Improvement
- Geotextile for Subgrade Stabilization
- Reinforced Soil Slopes (RSS)
- Cellular Confinement Systems
- Rock Embankments
- Blasting or vibration requirements

Complete QC/QA Procedures

The Project Geological Engineer and Geotechnical Design Engineer are to coordinate the applicable QC review following the *NCDOT Quality Management Program: Quality Control and Quality Assurance* procedures and the respective QC Checklist before distributing any deliverables they prepare through the project Connect site.

(*Back to activity overview*)

Overview: Geopavement Investigations

Conduct investigation of existing pavements and subgrades to provide the Pavement Design Engineer field data and subgrade characteristics necessary to generate and evaluate pavement design alternatives.

References

- ☐ *Geotechnical Investigation and Recommendations Manual*
- ☐ *NCDOT Quality Management Program: Quality Control and Quality Assurance*

Deliverables

Deliverables	Task	Responsible Party	
		Activity Leader	Additional Support
Pavement and Subgrade Investigation Report Recommendations for Pavement and Subgrade Geotechnical Summary Tables (3G-1) Sheet	▪ *Complete pavement and subgrade investigation and recommendations*	Geopavement Engineer	Pavement Design Engineer

Complete Pavement and Subgrade Investigation and Recommendations

The Geopavement Engineer coordinates an investigation of existing pavement, existing subgrade, and soils within the corridor in accordance with the *NCDOT Geotechnical Investigation and Recommendations Manual*. The purpose of the investigation is to gather information about the condition of existing pavements and characterize the soils on the project for pavement support. The findings of the investigation are presented in the Pavement and Subgrade Investigation Report. The Pavement and Subgrade Investigation Report is included in the Let package for Contractor information.

The Geopavement Engineer provides Recommendations for Pavement and Subgrade for use by the Pavement Design Engineer and the Roadway Design Lead. The Pavement Design Engineer uses these recommendations to evaluate pavement sections in the Complete Pavement Design activity (see 2PD1 for related information).

The Roadway Design Lead references these recommendations to determine if subgrade stabilization by mechanical (Aggregate Subgrade) or chemical (Lime, Cement) means is recommended and for which alignments. The Roadway Design Lead should include the appropriate details and any specific locations for these recommendations in the typicals and details of the roadway plan set (see 2RD3 for related information). Additionally, the Roadway Design Lead should review the recommendations for other pay item quantity estimates to be included in the project contract. If the Geopavement Engineer recommends Aggregate Subgrade, he/she creates a Geotechnical Summary Tables (3G-1) sheet to accompany the recommendation, which is to be included in the roadway plan set.

Complete QC/QA Procedures

The Geopavement Engineer is to coordinate the applicable QC review following the *NCDOT Quality Management Program: Quality Control and Quality Assurance* procedures and the respective QC Checklist before distribution of any deliverables through the project Connect site.

2GT3 Geotechnical Structure Investigations

Overview

Conduct subsurface investigation of bridges, box culverts, retaining walls, sound barrier walls, and temporary shoring. A final report with applicable subsurface inventory, engineering recommendations, necessary details, and provisions will be provided for each proposed structure.

References

- ☐ *Geotechnical Investigation and Recommendations Manual*
- ☐ *Temporary Shoring Standard Provision*
- ☐ *Standard Temporary Shoring Detail 1801.01*
- ☐ *Standard Sound Barrier/ Noise Wall Foundations*
- ☐ *NCDOT Quality Management Program: Quality Control and Quality Assurance*

Deliverables

Deliverables	Task	Responsible Party	
		Activity Leader	Additional Support
Structure Subsurface Investigation Inventory	▪ *Complete Structure Subsurface Investigation and Structure Geotechnical Design Deliverables*	Geotechnical Design Engineer	Project Geological Engineer
Design Scour Elevation Report			
Structure Foundation Recommendations Report			
Foundation Tables Structure Plan Sheet			
Retaining Wall Plan and Details (W Sheets)			
Temporary Shoring Recommendations			
Special Provisions			

Complete Structure Subsurface Investigation and Structure Geotechnical Design Deliverables

The Project Manager should initiate this task by submitting a Work Request Form. The following project deliverables are required to coordinate the structure subsurface investigations:

- Hydraulic Survey Reports developed in 2HY2 for culverts or bridges over water
- Structure Preliminary General Drawing developed in 2ST2 for bridges
- Retaining wall envelopes
- Sound barrier wall locations developed in 2EN3
- Temporary shoring locations
- Transportation Management Plan concepts

The Geotechnical Design Engineer coordinates an investigation of each structure with the support of the Project Geological Engineer, in accordance with the *Geotechnical Investigation and Recommendation Manual.* The Geotechnical Design Engineer and Project Geological Engineer summarizes the subsurface investigations in a Structure Subsurface Investigation Inventory. The Structure Subsurface Investigation Inventories are included in the Let package for Contractor information.

For bridges over water, the Project Geological Engineer and/or the Geotechnical Design Engineer evaluates the theoretical scour predicted by the Hydraulic Design Engineer for each bridge foundation location and determines if adjustment based on the materials encountered during the subsurface investigation is warranted. Adjustments to or acceptance of the theoretical scour elevation are documented in the Design Scour Elevation Report. The Methodology of computations is to be in accordance with the *Geotechnical Investigations and Recommendations Manual*.

The Geotechnical Design Engineer will prepare foundation recommendations based on the applicable Structure Subsurface Investigation Inventory. The recommendations include a short summary report with the following as applicable to the type of structure:

- Plan notes
- Foundation Tables Sheet
- Retaining Wall Typicals and Details (W plan sheets)
- Project Special Provisions
- Standard Temporary Shoring / Wall Details

Deliverables should be distributed through project SharePoint and designated as recommendations and details accordingly.

Complete QC/QA Procedures

The Geotechnical Design Engineer and Project Geological Engineer are to coordinate the applicable QC review following the *NCDOT Quality Management Program: Quality Control and Quality Assurance* procedures and the respective QC Checklist before distributing any deliverables they prepare through the project Connect site.

3GT1 GeoEnvironmental Phase II

Overview

For projects where GeoEnvironmental Sites of Concern are identified, develop the GeoEnvironmental Phase II deliverables to determine potential risk and document impacts to project.

References

- ☐ *GeoEnvironmental Report Standards*
- ☐ *Geophysical UST Rating*
- ☐ *Geotechnical Investigation and Recommendations Manual*
- ☐ *NCDOT Quality Management Program: Quality Control and Quality Assurance*

Deliverables

Deliverable	Task	Responsible Party Activity Leader
GeoEnvironmental Phase II Report	▪ *Develop GeoEnvironmental Phase II reporting*	NCDOT GeoEnvironmental Project Engineer
GeoEnvironmental Right-of-Way Recommendations		
GeoEnvironmental Design and Environmental Conflict Memo		

Develop GeoEnvironmental Phase II Reporting

When sites of GeoEnvironmental concern are identified for a project during the GeoEnvironmental Planning (1GT1) or GeoEnvironmental Phase I (2GT1) tasks, this task is to be the first intrusive GeoEnvironmental investigation. The Project Manager submits a Work Request Form to the GeoEnvironmental Project Engineer to initiate this task once Right-of-Way Plan Set are completed (see 2RD4 for related information). The GeoEnvironmental Project Engineer coordinates the geophysical surveys to identify underground storage tanks (USTs) and collection of soil and groundwater samples from sites of concern. The collected samples are analyzed to determine risk and potential impacts to the project.

Based on the findings, the GeoEnvironmental Project Engineer prepares the right-of-way acquisition recommendations for GeoEnvironmental Sites of Concern to inform the Roadway Designer of right-of-way and easement needs and Right-of-Way Agent of the recommended acquisition method and any transaction details, such as withholds for contaminated soil expenses. If conflicts can be avoided, the GeoEnvironmental Project Engineer prepares a GeoEnvironmental Design and Environmental Conflict Memo addressed to the Project Design Engineer outlining the conflict.

Complete QC/QA Procedures

The GeoEnvironmental Project Engineer is to coordinate the applicable QC review following the *NCDOT Quality Management Program: Quality Control and Quality Assurance* procedures and the respective QC Checklist before distribution of any deliverables through the project Connect site.

3GT2 Verify Geotechnical Deliverables

Overview

Review plan sets and provisions to verify geotechnical recommendations are included correctly and update plans and/or recommendations as needed.

References

- ☐ *Geotechnical Investigation and Recommendations Manual*
- ☐ *NCDOT Quality Management Program: Quality Control and Quality Assurance*

Deliverables

Deliverable	Task	Responsible Party	
		Activity Leader	Additional Support
Roadway Special Details (2G Sheets) Geotechnical Summary Tables (3G Sheet) Foundation Tables Structure Plan Sheet Retaining Wall Plan and Details (W Sheets) Special Provisions	▪ Review Plan Sets and Coordinate Let Package Preparation	NCDOT Geotechnical Design Engineer	NCDOT Project Geological Engineer NCDOT Geopavement Engineer

Review Plan Sets and Coordinate Let Package Preparation

The Project Manager or a Design Lead may initiate this task by submitting a Work Request Form. The Geotechnical Design Engineer with support from the Project Geological Engineer and Geopavement Engineer, if applicable, will review project plans to verify the geotechnical recommendations, plan sheets, details, and notes have been included correctly. The Project Geological Engineer will confirm all project Subsurface Investigation Inventories are denoted in the Project SharePoint Geotechnical directory and placed in Let Preparation. The Geotechnical Design Engineer will confirm that all Geotechnical Project Special Provisions are sequentially numbered, sealed, and ready for let.

Complete QC/QA Procedures

The Geotechnical Design Engineer is to coordinate the applicable QC review following the *NCDOT Quality Management Program: Quality Control and Quality Assurance* procedures and the respective QC Checklist before distribution of any deliverables.

4GT1 Manage GeoEnvironmental Impacts

Overview

Prepare GeoEnvironmental Sites of Concern for Let by removing underground storage tanks (USTs), contaminated materials, and environmental monitoring wells in conflict with the project. Document the activities in the appropriate report and distribute to NCDOT project team, North Carolina Department of Environmental Quality, and the Environmental Protection Agency, as required.

References

- ☐ *GeoEnvironmental Report Standards*
- ☐ *NCDOT GeoEnvironmental Product Matrix*
- ☐ *Geotechnical Investigation and Recommendations Manual*
- ☐ *NCDOT Quality Management Program: Quality Control and Quality Assurance*

Deliverables

Deliverable	Task	Responsible Party Activity Leader
Underground Storage Tank Closure Report	▪ *Prepare GeoEnvironmental Sites of Concern for Let*	NCDOT GeoEnvironmental Project Engineer
Environmental Groundwater Monitoring Well Closure Report		
Contaminated Soil Removal Report		
Contaminated Materials Management Plan		
GeoEnvironmental Special Provisions		

Prepare GeoEnvironmental Sites of Concern for Let

Once an access agreement is in place or NCDOT has acquired a GeoEnvironmental Site of Concern, the Project Manager or Right-of-Way Office should initiate these tasks with a Work Request Form to the GeoEnvironmental Project Engineer. The GeoEnvironmental Project Engineer will coordinate removal of USTs, contaminated materials, and environmental monitoring wells in conflict with the project. Items that are not practicable to remove before project letting are to be addressed in a project special provision prepared by the GeoEnvironmental Project Engineer. The GeoEnvironmental Engineer coordinates and completes the following as necessary for GeoEnvironmental Sites of Concern:

- Underground Storage Tank Removal
  - Remove USTs in conjunction with right-of-way.
  - Document the process, results, and future actions (if necessary) in the Underground Storage Tank Closure Report.
  - Upload the report to project SharePoint site and inform the Project Manager, Right-of-Way, and NCDEQ, as required by regulation.
- Environmental Groundwater Monitoring Well Abandonment
  - Abandon monitoring wells in conflict with the project.
  - Document the process, results, and future actions (if necessary) in the report.

- Upload the report to project SharePoint Site and inform the Project Manager, Right-of-Way, and NCDEQ, as required by regulation.
- Contaminated Soil Removal
- When practicable, remove contaminated soil prior to project letting.
- Document the process, results, and future actions (if necessary) in the report.
- Upload the report to project SharePoint site and inform the Project Manager, Right-of-Way, and NCDEQ, as required by regulation.

- Contaminated Materials Management Plan
  - Remove contaminated media prior to project letting if practical.
  - When it is not practical, develop a Materials Management Plan to describe materials handling during construction.
  - Develop project special provision(s) to be included in the contract that describe material handling, personal protective equipment (if needed), and any other processes necessary to construct the project.

Applicable reports are also distributed to The Environmental Protection Agency (EPA) if a GeoEnvironmental Site of Concern is also a NPL Superfund site.

Complete QC/QA Procedures

The GeoEnvironmental Project Engineer is to coordinate the applicable QC review following the *NCDOT Quality Management Program: Quality Control and Quality Assurance* procedures and the respective QC Checklist before distribution of any deliverables through the project Connect site.

5GT1 Geotechnical and GeoEnvironmental Construction Support

The Geotechnical Engineering Unit provides the following support during the Construction Phase:

- Provides technical expertise and answers questions related to geotechnical conditions during the pre-construction meeting and throughout construction and during claims.
- Completes Construction Revision (as needed): Perform construction revisions of the latest version of the Let Plans (see 5CS1 for related information) to address identified field issues
- Reviews working drawings and associated calculations for:
  - Drilled Pier Construction Plans
  - Crosshole Sonic Logging (CSL) Reports
  - Pile Driving Equipment Data Forms
  - Pile Driving Analyzer (PDA) Reports
  - Retaining Wall designs
  - Temporary Shoring designs
- Works with Resident Engineer's office and contractor to review and accept foundation repairs.
- Reviews blasting plans and monitors associated vibrations.
- Reviews settlement monitoring and approves completion and field investigations for soft soils, undercuts, and underdrains.
- Analyzes unstable cut and fill slopes and recommend repair.
- Samples and determines rates of chemical stabilization of subgrades or recommend aggregate subgrade, as needed.

The GeoEnvironmental Section provides Construction Phase support for:

- Removing previously unknown USTs encountered during construction.
- Contaminated soil disposal from previous unknown locations not addressed with special provisions.
- Providing containers and disposal for dewatering in contaminated areas.
- Waste disposal characterization.

2HY1 Develop Preliminary Hydraulic Recommendations

Overview

Provide preliminary hydraulic information to refine line and grade and establish the hydrologic performance standards for the project. A Hydraulic Planning Report is prepared to provide preliminary hydraulic recommendations, identify permitting requirements and risks, define avoidance and minimization opportunities, and estimate any major drainage structure sizes. A preliminary Stormwater Management Plan (pSMP) is developed to comply with NCDOT's statewide National Pollutant Discharge Elimination System (NPDES) stormwater permit. If the project is in Merger, hydraulic support is provided for any Merger meetings up to and including Avoidance and Minimization (CP4A). Additional action items, such as preliminary hydraulic modeling, may be added on a project-specific basis when items are required to select/refine an alternative or reduce project risks and costs.

References

- ☐ *Guidelines for Drainage Studies and Hydraulic Design*
- ☐ Hydraulics Unit Web Page Content and Guidance Documents
- ☐ *Stormwater Management Plan Template*
- ☐ *Hydraulics Planning Report Template*
- ☐ *NC-SELDM Catalog Application*
- ☐ *NCDOT Hydroplaning Assessment Tool*
- ☐ *Training Videos for Using the NC-SELDM Catalog (NC Learning Center – requires NCID)*
- ☐ *Post-Construction Stormwater Program Post-Construction Stormwater Controls for Roadway and Non-Roadway Projects*
- ☐ *Stormwater Best Management Practices Toolbox*
- ☐ *BMP Decision Support Matrix*
- ☐ *Highway Floodplain Program*
- ☐ *U.S. Geological Survey Resources*
- ☐ *NCDOT Quality Management Program: Quality Control and Quality Assurance*
- ☐ *Merger Process*
- ☐ *Risk Management Guide v2*
- ☐ *Guidance For Merger Concurrence Point 2A Meeting*

Deliverables

Deliverable	Task	Responsible Party	
		Activity Leader	Additional Support
		Hydraulic Design Engineer	Project Manager
Hydraulic Planning Report (HPR) [A, Q]	▪ *Complete Hydraulic Planning Report (HPR)*	X	X
Preliminary Stormwater Management Plan (pSMP) [A, Q]	▪ *Complete Preliminary Stormwater Management Plan (pSMP)*	X	
Hydraulic Control Letter	▪ *Complete Hydraulic Control Letter*	X	
Comments on Design Recommendations Plan Set(s) [Q] & Final Hydroplaning Assessment (as needed) [Q]	▪ *Review Preliminary Roadway Plans*	X	

[A] *Indicates that final document(s) or data set(s) must be uploaded to the ATLAS Workbench.*
[Q] *Indicates that final document(s) or data set(s) requires review in accordance with NCDOT Quality Management Program: Quality Control and Quality Assurance.*

Complete Hydraulic Planning Report (HPR)

The Hydraulic Design Engineer completes the Hydraulic Planning Report in accordance with Chapter 3 of the *Guidelines for Drainage Studies and Hydraulic Design*. The HPR allows the project team to:

- Become familiar with the project
- Establish preliminary hydraulic design parameters and assumptions
- Identify and mitigate risk
- Identify permitting requirements and provide input for the Environmental Documentation (see 2EP1 for related information)
- Provide preliminary recommendations for use in preparing the Design Recommendations Plan Set (see 2RD2 for related information)

Completing the Hydraulic Planning Report with these objectives realized reduces the amount of potential re-work and schedule delays for the project and helps identify and mitigate other project risks.

Coordination with others should also occur to ensure Hydraulic Recommendations are practical and feasible. Example of this coordination include:

- Contacting Division to identify existing drainage issues and any design preferences or constructability concerns
- Coordinating with Utilities to identify utilities that should be avoided
- Coordinating with EAU and EPU regarding project-specific compliance items such as FERC permits
- Coordinating with Structures and Division to verify preliminary bridge and culvert recommendations are practical and don't present undue constructability or maintenance concerns.

The Hydraulic Design Engineer uses his/her expertise and judgment to determine project-specific coordination needs.

The Hydraulic Design Engineer also:

- Prepares the Hydraulic Planning Report and coordinates the QC review following the NCDOT Quality Management Program: Quality Control and Quality Assurance procedures and the respective QC Checklist.
- Delivers an electronic copy of the report to the Project Manager (for information) and the Hydraulics Reviewer (for action) to complete a review and QA audit.
- Revises and resubmits as needed to address the Hydraulics Reviewer's comments.
- Upon approval by the Hydraulics Reviewer, posts the HPR on the Preconstruction Site via ATLAS and notifies the Project Manager of the report's location and that it is ready for distribution.

The Project Manager reviews the report for recommendations that may impact the project's scope, schedule, or budget or that may conflict with other disciplines'/Units' recommendations. The Project Manager initiates further coordination when appropriate.

The Project Manager also provides the report as follows to other technical disciplines/Units.

- The Roadway Design Lead is to use the report in the development of the Design Recommendation Plan Set (see 2RD1 for related information). This includes evaluating and incorporating typical

sections and mitigation strategies (ex. pavement mix design) recommended by the Preliminary Hydroplaning Assessment (if needed).

- The Structures Lead is to review and notify the Hydraulic Design Engineer and Project Manager of any concerns. If the report recommends retaining a hydraulic structure, the Structures Management Unit is to notify the Project Manager and Hydraulic Design Engineer if it recommends replacement of the structure due to structural deficiencies or other reasons.
- The NEPA/SEPA Lead, Environmental Analysis Lead, and Project Lead use the report in the development of the Environmental Document and recommendations from the Preliminary Hydraulic Recommendations table included in the Hydraulic Planning Report are to be presented during the Merger CP2A meeting (see 2EP1 for related information).
- The report provides general hydraulics information to both internal and external stakeholders and may aid in the development of scopes of work or labor estimates for later project phases.

Complete Preliminary Stormwater Management Plan (pSMP)

NCDOT's statewide NPDES stormwater permit (NCS000250) requires projects that increase built-upon area to comply with the workflows presented in the Post Construction Stormwater Program (PCSP). The PCSP defines implementation of the BMP Toolbox and preparation of Stormwater Management Plans (SMP). Most of the Department's projects require the preparation of an SMP. An SMP helps to ensure NCDOT is in compliance with the statewide permit and to communicate with those preparing any applicable permits. SMPs are prepared in two phases as follows:

1. A preliminary SMP is prepared following the 'General guidelines for filling out the pSMP' which is located in the Overview tab of the Stormwater Management Plan Template Excel workbook. The primary objective of the pSMP is to establish the stormwater treatment goals for the project, which helps inform subsequent drainage design decisions and may impact the work of other disciplines such as Right-of-Way (RW), Utility Coordination and Design (UT), Geotechnical (GT), etc. In such cases where a stormwater control measure may impact Right-of-Way or other disciplines, the Hydraulics Design Engineer is responsible for coordinating with discipline leads and the project manager. The PCSP workflows require implementation of Stormwater Toolbox BMPs to the maximum extent practicable for certain receiving waters based on waterbody classification or other characteristics. For project areas that drain to other waters the workflows require use of the NC-SELDM Catalog. The NC-SELDM Catalog is an application, developed by NCDOT in partnership with the USGS, which is specifically designed to assist the engineer in establishing the stormwater treatment goals for the project. If the appropriate PCSP workflow indicates a goal of implementing a stormwater control measure from the BMP Toolbox, then the BMP Decision Support Matrix may be used to refine the choice of control measures selected for the goal in conjunction with sound engineering judgement. Detailed instructions for running the NC-SELDM Catalog application are included in the application along with a project example. Training videos for how to use the NC-SELDM Catalog application are available through the NC Learning Center website (requires an NCID).

2. The final SMP is prepared in activity 3HY1. The final SMP serves to document the stormwater management decisions made for the project to comply with the NPDES stormwater permit, and when required, is included in applications for other permits such as the 404/401.

Review Preliminary Roadway Plans

Coordination with the Roadway Design Lead should occur throughout development of the Design Recommendations Plan Set (see 2RD2 for related information). During development of the plan set, the Roadway Design Lead sends the plans to the Hydraulic Design Engineer for review and comment. This allows the Roadway Design Lead to make any needed changes before final roadway review and distribution of the plan set. This coordination helps to prevent schedule delays and rework that are more likely if revisions occur after the plan set has been distributed.

As part of this review, the Hydraulic Design Engineer:

- Provides comments on the plans, identifies potential drainage issues, and makes recommendations that improve drainage conditions on the project.
  - Minimally, the review includes the items listed in Section 4.2 of the *Guidelines for Drainage Studies and Hydraulic Design*.
- If a Final Hydroplaning Assessment is performed, provides mitigation strategies for areas that show risk for hydroplaning.
- Reviews subsequent roadway plan submittals to make sure comments have been addressed and no new concerns have been created.

After receiving the Design Recommendation Plan Set, the Hydraulic Design Engineer attends (if requested) the Design Recommendation Plan Set Review Meeting (see 2RD2 for related information).

Complete Hydraulic Control Letter

At the request of the Roadway Design Lead, the Hydraulic Design Engineer provides a written statement of any specific hydraulic grade requirements to the Roadway Design Lead. If there are no specific grade requirements, the Hydraulic Design Engineer provides a written statement to the Roadway Design Lead that the grade is not hydraulically controlled. The Hydraulic Design Engineer determines grade requirements using information gathered and calculations completed during completion of the HPR and reviews of preliminary roadway plans. This correspondence is used by the Roadway Design Lead during development of the Design Recommendations Plan Set and becomes part of the project documentation.

Provide Hydraulic Support

The Hydraulic Design Engineer provides continuous support to the project team and other technical disciplines/Units during this activity. This allows any hydraulic concerns and risks to be communicated early in the project's development so appropriate steps can be taken to mitigate those risks, deliver high quality projects, reduce project costs and avoid later revisions and rework that could impact the scope and schedule. The Hydraulic Design Engineer should be proactive in identifying drainage-related project concerns or opportunities for improvement and in communicating these to the project team for consideration. Providing hydraulic support may include:

- Attending meetings and offering hydraulic expertise and recommendations related to the project.
- Responding to drainage-related questions and concerns as each occurs.
- Coordinating with others to resolve conflicting recommendations among disciplines/Units.

For Merger projects (if applicable), the Hydraulic Design Engineer is to:

- Attend the Merger CP2, CP2A, and CP4A meetings to respond to hydraulic, floodplain, or general stormwater management questions or concerns (see 2EP1 for related information).
- Attend other Merger meetings as needed to provide hydraulic information and recommendations and to identify potential issues related to the drainage design.

2HY2 Complete Drainage Design

Overview

Complete the drainage design to be included in the Field Inspection Plan Set, attend the Field Inspection Meeting, and complete any drainage revisions necessary for incorporation into the Right-of-Way Plan Set.

References

- ☐ *Guidelines for Drainage Studies and Hydraulic Design*
- ☐ *Hydraulics Unit Web Page Content and Guidance Documents*
- ☐ *Post-Construction Stormwater Program Post-Construction Stormwater Controls for Roadway and Non-Roadway Projects*
- ☐ *Stormwater Best Management Practices Toolbox*
- ☐ *BMP Decision Support Matrix*
- ☐ *Highway Floodplain Program*
- ☐ *U.S. Geological Survey Resources*
- ☐ *Guidance for Concurrence Point 4B Meetings and Plans*

Deliverables

Deliverable	Task	Responsible Party	
		Activity Leader	Additional Support
		Hydraulic Design Engineer	Project Manager
Hydraulics Pre-Design Meeting Documentation [Q]	▪ *Prepare for and Conduct Hydraulics Pre-Design Meeting*	X	
Hydraulic Survey Reports for Major Structures [A, Q]	▪ *Complete Field Visit and Hydraulic Surveys* ▪ *Request Additional Information* ▪ *Prepare Major Hydraulic Structure Reports*	X X X	 X
Merger CP4B Plans and Meeting Minutes [A]	▪ *Conduct Merger CP4B Meeting or the Hydraulic Design Review (as applicable for the project)*	X	X
Drainage Plans [A, Q]	▪ *Complete Drainage Design* ▪ *Complete Hydraulic Summary*	X X	
Revised Drainage Plans (as needed) [A, Q]	▪ *Review Field Inspection Plan Set and Attend Field Inspection* ▪ *Attend Preliminary TMP Review Meeting* ▪ *Complete Drainage Revisions*	X	

[A] *Indicates that final document(s) or data set(s) must be uploaded to the ATLAS Workbench.*
[Q] *Indicates that final document(s) or data set(s) requires review in accordance with NCDOT Quality Management Program: Quality Control and Quality Assurance.*

Prepare for and Conduct Hydraulics Pre-Design Meeting

After receiving the approved Design Recommendations Plan Set (see 2RD1 for related information) and prior to starting the drainage design, a Pre-Design Meeting should be conducted in accordance with the pre-design guidance provided in the *Guidelines for Drainage Studies and Hydraulic Design*. The Hydraulics Pre-design Meeting provides an opportunity for the hydraulic designer and hydraulic reviewer to discuss quality assurance elements such as procedures, criteria, and methods, and to reach concurrence before

final hydraulic design begins. This meeting should occur before commencing detailed drainage design. The meeting is important to prevent schedule delays and limit re-work. For the Pre-Design Meeting, the Hydraulic Design Engineer is to:

- Complete Page 1 of *Pre-Design Checklist for Drainage Study and Hydraulic Design* which can be found in the *Guidelines for Drainage Studies and Hydraulic Design* manual. In preparation for the Hydraulics Pre-Design Meeting the engineer should prepare a list of questions addressing drainage design, assumptions and criteria.
- Review the project's Risk Assessment Worksheet.
- Schedule and conduct the Hydraulics Pre-Design Meeting with the designated Quality Assurance Expert in accordance with the hydraulics pre-design meeting guidance, which can be found in Section 4.4. of the *Guidelines for Drainage Studies and Hydraulic Design* manual.
- Prepare and submit for review/approval the Hydraulics Pre-Design Meeting Minutes to document decisions made during the meeting and follow-up tasks that need to be completed.

Complete Field Visit and Hydraulic Surveys

The hydraulic field visit and surveys are conducted after the Design Recommendations Plan Set is completed and are used to familiarize the Hydraulic Design Engineer(s) with the project area, identify and document existing drainage patterns and problems, and identify and obtain additional survey information needed to complete the drainage design and hydraulic structure reports. This task is also used to try to prevent issues from arising during construction based on field conditions that vary from the final survey.

For this task, the Hydraulic Design Engineer:

- Conducts field surveys in accordance with Field Reconnaissance and Survey, Section 5.2 of the *Guidelines for Drainage Studies and Hydraulic Design*.
- Incorporates field notes, photos, and documentation of survey and other data gathered into the drainage redlines, major structure reports, or separate documentation posted on the project SharePoint site.

The Hydraulic Design Engineer should notify the Project Manager, Locations and Surveys, and other appropriate disciplines of any major inaccuracies or oversights in the final survey file that would impact design by Hydraulics or others. Examples could include:

- New development within, or very close to, the project's proposed R/W
- Significant channels or other drainage features that are missing from Locations and Surveys final survey files
- Inaccuracies in existing storm sewer data shown in the final survey files when such data is required to complete the drainage design

Request Additional Information

The Hydraulic Design Engineer identifies and requests any additional information or revisions needed from other technical disciplines/Units and informs the Project Manager of these requests. To minimize the risk of project delays, the Hydraulic Design Engineer should notify the Project Manager and the Hydraulics Reviewer as soon as they identify the need for additional information from others. The method for any requests is to be determined through regular communication and coordination with the Project

Manager and the affected disciplines. The Project Manager considers the needs of all disciplines and the project schedule when coordinating requests for additional information. For additional surveys, the Project Manager may combine requests from multiple disciplines into a single request before submitting to Locations and Surveys if the project schedule allows. Additional information request may include:

- Additional survey requests
- Subsurface investigation requests
- Existing pipe inspections
- Corrections to survey or WET/WEX files
- Special detail requests

Prepare Major Hydraulic Structure Reports

Major structure reports include the Bridge Survey and Hydraulic Design Reports (BSRs), Detour Survey and Hydraulic Design Reports (DSRs), and Culvert Survey and Hydraulic Design Reports (CSRs). The Hydraulic Design Engineer prepares the major structure reports after the Design Recommendations Plan Set is completed and after the Hydraulic Pre-Design Meeting occurs. These reports are used to document the hydraulic structure design and to facilitate efficient communication between the Hydraulic Design Engineer and other Discipline Leads. Information in these reports is used by other disciplines such as Structures, Geotechnical, Work Zone Traffic Control, and Roadside Environmental to complete their designs.

The reports are also distributed to Division for their information and review so any constructability concerns can be identified, discussed, and resolved. For this task, the Hydraulic Design Engineer is to refer to the *Guidelines for Drainage Studies and Hydraulic Design* when determining if a Bridge, Culvert, or Detour Survey Report is required. A Construction Phasing Plan is required in conjunction with any Culvert Survey Report to demonstrate a temporary drainage plan that may be used to maintain flows adequately during culvert construction. The Construction Phasing Plan is used by the Roadside Environmental Engineer and may be used to inform other decisions regarding permitting and construction needs.

For this task, the Hydraulic Design Engineer:

- Completes field reconnaissance and surveys at each major hydraulic structure prior to completing the report.
- For bridges, submits a draft BSR to the Structures Management, Geotechnical, and Hydraulics Reviewers.
    - The draft BSR is reviewed by these disciplines for concurrence with superstructure and substructure type, bridge length, span arrangement, bent locations, and skew. Reviewers will also review in regards to potential constructability concerns.
    - The Structures Reviewer coordinates with the Regional Bridge Construction Engineer and the Area Construction Engineer on constructability issues and concerns.

Upon receipt of comments, the Hydraulic Design Engineer initiates further coordination, as needed, to resolve the comments and revises and resubmits the draft BSR. Upon approval of the draft BSR by the reviewers above, the Hydraulic Design Engineer proceeds with preparation of the final BSR, including:

- Preparing QC (in accordance with the *NCDOT Quality Management Program: Quality Control and Quality Assurance* procedures and the respective QC Checklist) and submits major structure reports to the Project Manager (for information), Hydraulics Reviewer and Structures Lead (for review).
  - **Note:** CSR submittals are to include a construction phasing plan.
- Revising and resubmitting the major hydraulic structure reports upon receiving comments from the Hydraulics Reviewer.

Upon notification that the report is approved and signed by the Hydraulics Reviewer, the report is sent to the NCDOT Hydraulics Staff or NCDOT Project Manager to initial the front of the report upon acceptance.

Upon acceptance from NCDOT Hydraulics Staff or Project Manager, the Hydraulic Design Engineer distributes the approved major hydraulic structure reports (bridge and culverts) together with any construction phasing plan(s) to the Project Manager, Division Engineer, Area Bridge Engineer, Roadway Design Lead, Structures Lead, and Design Geotechnical Engineer. In addition to the above, CSRs are to be distributed with the construction phasing plan to the Roadside Environmental Engineer.

Conduct Merger CP4B Meeting or the Hydraulic Design Review (as applicable for the project)

If the project is following the Merger Process (see 2EP1 for related information), the Merger CP4B meeting is held after the CP4A meeting and during development of the drainage design. In some cases, a project may not follow the Merger process formally, but will have a quasi- CP4B meeting, normally described as a Hydraulic Design Review Meeting. This keeps the appropriate agencies informed of impacts to environmental resources, while discussing avoidance and minimization efforts used for the project. This process allows for easier permit reviews and subsequent approvals.

During the meeting, the Hydraulic Design Engineer presents preliminary drainage designs and obtains input, comments, and concerns from the team members.

The Hydraulic Design Engineer is to:

- Notify the Hydraulics Reviewer of the preferred date and amount of time needed for the Merger CP4B meeting (or Hydraulic Review Meeting) a minimum of two months prior to the preferred date for central managed projects.
  - The Hydraulics Reviewer coordinates with the Environmental Policy Unit to schedule the meeting and notify attendees.
  - For non-central managed projects, follow the direction of the Project Manager for scheduling the meeting and inviting attendees.
- Prepare and submit the meeting plans for review to the Hydraulics Reviewer, Project Manager, Environmental Analysis Unit, and NEPA/SEPA Lead for central managed projects or as directed by the Project Manager/Division Environmental Officer for non-central managed projects.
  - It is recommended the meeting plans be submitted for review at least five weeks prior to the scheduled meeting to allow adequate time for review and revisions, if necessary.
  - The plans are to be developed in accordance with the *Guidance for Concurrence Point 4B Meetings and Plans*.
  - Review comments are returned to the Hydraulic Design Engineer.
- Revise and resubmit the meeting plans as needed for approval.

- Upon approval, the Hydraulic Reviewer provides the final meeting plans to the Environmental Policy Unit to post for team members to access.
- Plans are to be posted at least two weeks prior to the meeting date.

- Conduct the meeting in accordance with the Guidance for Concurrence Point 4B Meetings and Plans.
- Prepare meeting minutes/summary in accordance with the Guidance for Concurrence Point 4B Meetings and Plans to document discussion and decisions made during the meeting.

Complete Drainage Design

The Hydraulic Design Engineer completes the Redline Drainage Plans in accordance with the project's scope of work and *Guidelines for Drainage Studies and Hydraulic Design*. The pre-design meeting and field visit and hydraulic surveys are completed prior to completing the drainage designs. The drainage design may be completed concurrently with completion of Major Hydraulic Structure Reports. The drainage design is documented on the Redline Drainage Plans and will be incorporated into the Field Inspection Plan Set

Once complete, the Hydraulic Design Engineer:

- Coordinates the QC review following the NCDOT Quality Management Program: Quality Control and Quality Assurance procedures and the respective QC Checklist before upload and distribution.
- Submits the Redline Drainage Plans along with all supporting documentation and calculations to the Project Manager (for information) and the Hydraulics Reviewer (for action) to complete a review and QA audit. The Redline Drainage Plans are to include the items specified in the redline guidance provided in Chapter 5 of the *Guidelines for Drainage Studies and Hydraulic Design*.
- Revises and resubmits the Redline Drainage Plans to address comments received from the Hydraulics Reviewer.

Upon approval of the Redline Drainage Plans, the Hydraulics Reviewer notifies the Project Manager (for information) and the Roadway Design Lead (for action) that the drainage design is ready for incorporation into the Field Inspection Plan Set. The Hydraulics Reviewer also distributes the drainage design to the Utilities Design Lead and Roadside Environmental Design Lead (for information).

Draft Hydraulic Summary

The Hydraulic Design Engineer provides the Roadway Design Lead with drafts of the Hydraulic Summary Sheets. Tools available in Microstation or OpenRoads Designer are used to produce the Draft Drainage Summary Sheet. The Hydraulic Design Engineer should ensure the tools produce a reasonably complete product but are not expected to otherwise revise or refine the draft from what is produced using the automated methods. These drafts are included in the Field Inspection Plan Set to allow preliminary review by construction and other disciplines during the Field Inspection Review Meeting and are used to generate preliminary cost estimates prior to the Field Inspection Review Meeting.

Review Field Inspection Plan Set and Attend Field Inspection

The Hydraulic Design Engineer reviews the Field Inspection Plan Set prior to the Field Inspection Review Meeting. The Hydraulic Design Engineer is to verify the drainage design shown matches the approved drainage design and reviews for any drafting errors or potential conflicts with the drainage design. The

Hydraulic Design Engineer attends the Field Inspection Review Meeting. This allows the project team to voice concerns and potential issues to be addressed before the project proceeds, leading to fewer Right-of-Way revisions and change orders during construction. This task includes:

- Responding to questions or concerns relating to the drainage design.
- Initiating discussion on drainage items that may need coordination or that other disciplines need to be aware of.
- Verifying that drainage easements shown on the plans are adequate for construction and maintenance purposes.
- Participating in traffic control and phasing discussions as it relates to drainage design.
- Obtaining information needed to complete environmental permit drawings, such as amount and type of clearing required and construction methods and impacts required for construction of major drainage structures (e.g., temporary work bridges, causeways, and work pads).

Attend Preliminary TMP Review Meeting

The Drainage Design Engineer attends the Preliminary TMP Review Meeting (see 2TM2 for related information), when applicable, which may be held in conjunction with the Field Inspection or separately. The Drainage Design Engineer:

- Provides input on hydraulics concerns.
- Answers drainage-related questions as they relate to temporary drainage concerns.
- Participates in identifying solutions to any problems that are identified.

The Hydraulic Design Engineer coordinates with the Traffic Engineer upon request and as needed before and after the TMP Review Meeting.

Complete Drainage Design Revisions

The Hydraulic Design Engineer coordinates with others prior to and during completion of the drainage design so the need for subsequent revisions is minimized. However, despite best efforts, revisions may be necessary after the initial approval of deliverables. Common reasons for revisions after initial approval include:

- Comments or concerns brought up during the Field Inspection Review Meeting
- Revisions by other disciplines
- Private development within the project area
- Constructability concerns
- Utility conflicts
- The addition of noise walls

The Hydraulic Design Engineer coordinates with the Project Manager and other disciplines, as needed, to identify and incorporate any necessary revisions. When revisions are necessary, the Hydraulic Design Engineer:

- Follows the guidance given elsewhere for the specific deliverable to complete the revision.
- Coordinate the QC review following the *NCDOT Quality Management Program: Quality Control and Quality Assurance* procedures and the respective QC Checklist before upload and distribution.

- Submits the revised deliverable to the appropriate reviewers for QA audit, as provided elsewhere for the deliverable being revised.
- Revises and resubmits the deliverable to address comments received from the QA Reviewer(s).
  - Revised submittals are to include a list of all revisions made, an updated copy of the deliverable along with all supporting documentation and calculations necessary to review and approve the revisions.
  - The Hydraulics Reviewer notifies the Project Manager (for information) and the Roadway Design Lead (for action) when the revisions have been approved and may be incorporated into the current roadway plans.

Upon final approval, the Hydraulic Design Engineer submits a final record set of the updated deliverable, computations, and supplemental data (including photos) for archiving. Where applicable, the final deliverables are uploaded to the Preconstruction Site using ATLAS Workbench.

Provide Hydraulic Support

Throughout this activity, the Hydraulic Design Engineer provides support to the project team and other technical disciplines/Units. This communication and coordination help the project team to deliver a high-quality project while minimizing scope changes and schedule delays. The Hydraulic Design Engineer should be proactive in identifying drainage-related project concerns or opportunities for improvement as early as possible and in communicating these to the project team for consideration. Providing hydraulic support may include:

- Attending meetings and offering hydraulic expertise and recommendations related to the project
- Responding to drainage-related questions and concerns from others as they occur
- Coordinating with others to resolve issues that occur

3HY1 Complete Hydraulic Permitting Tasks and Finalize Plans

Overview

Complete all hydraulic action items required to secure project permits and authorizations. This includes completing environmental permit drawings, Federal Emergency Management Agency (FEMA) compliance packages, and railroad drainage packages when required. The Hydraulic Design Engineer responds to and coordinates with others, as needed, to assist the responsible parties in obtaining any required permits and authorizations.

The Hydraulic Design Engineer generally begins these tasks after the Right-of-Way Plan Set is complete (see 2RD4 for related information) and significant design revisions that would affect these products are not expected. When design revisions are anticipated, the Hydraulic Design Engineer should closely coordinate with the Project Manager and other disciplines to determine when permitting tasks should be completed to minimize the need for re-work after initial completion and minimize schedule delays. The Hydraulic Design Engineer generally aims to complete these tasks prior to the 15-month Let Review Meeting or earlier, if requested by another technical Unit/discipline and the Project Manager. Coordinate with others, as needed, to complete design revisions and prepare Final Plans.

References

- ☐ *Guidelines for Drainage Studies and Hydraulic Design*
- ☐ *Hydraulics Unit Web Page Content and Guidance Documents*
- ☐ Post-Construction Stormwater Program
- ☐ Post-Construction Stormwater Controls for Roadway and Non-Roadway Projects
- ☐ *Stormwater Best Management Practices Toolbox*
- ☐ *BMP Decision Support Matrix*
- ☐ *Highway Floodplain Program*
- ☐ *Guidance for Concurrence Point 4C Meetings and Plans*
- ☐ *NCDOT Quality Management Program: Quality Control and Quality Assurance*
- ☐ *Merger Process*
- ☐ *Risk Management Guide V2*

Deliverables

Deliverable	Task	Responsible Party	
		Activity Leader: Hydraulic Design Engineer	Additional Support
Railroad Drainage Submittals	▪ *Complete Railroad Drainage Design Packages (if applicable for the project)*	X	
FEMA/NFIP Compliance Packages (SFC/CLOMR) [A, Q]	▪ *Prepare and Submit FEMA Compliance Packages*	X	Hydraulics Unit (Floodplain Management)
Hydraulic Summary Sheet(s) [Q]	▪ *Complete Final Drainage Summary Sheet(s)* ▪ *Complete Stormwater Control Measures Summary Sheet*	X	
Stormwater Management Plan [A, Q]	▪ *Finalize Stormwater Management Plan*	X	

Deliverable	Task	Responsible Party	
		Activity Leader: Hydraulic Design Engineer	Additional Support
Environmental Permit Drawings [A, Q]	▪ *Complete/Submit Environmental Permit Drawing Package*	X	
Merger CP4C Meeting Package and Minutes [A]	▪ *Conduct Merger CP4C Meeting (if applicable for the project)*	X	Project Manager (as applicable)

[A] *Indicates that final document(s) or data set(s) must be uploaded to the ATLAS Workbench.*
[Q] *Indicates that final document(s) or data set(s) requires review in accordance with NCDOT Quality Management Program: Quality Control and Quality Assurance.*

Complete Drainage Design Revisions (as needed)

Design revisions after the right-of-way date should be minimized as much as possible. Design revisions may be required for many reasons such as new development within the project area, property owner concerns that come up during right-of-way acquisition, conflicts with other disciplines' designs, and constructability issues. Design revisions after the right-of-way date have greater potential to adversely impact the scope, schedule, and budget and should be closely coordinated with the Project Manager and other disciplines involved to ensure they are necessary and to make sure all applicable products are updated accordingly. The Hydraulic Design Engineer must make sure to review and revise permitting, compliance, and authorization packages when they are impacted by any design revisions.

When drainage revisions are necessary, the Hydraulic Design Engineer:

- Follows the guidance given elsewhere for the specific deliverable being revised to complete the revision.
- Coordinates the QC review following the *NCDOT Quality Management Program: Quality Control and Quality Assurance* procedures and the respective QC Checklist before upload and distribution.
- Submits the revised deliverable to the appropriate reviewers for QA audit, as provided elsewhere for the deliverable being revised.
- Revises and resubmits the deliverable to address comments received from the QA Reviewer(s).
  - Revised submittals are to include a list of all revisions made, an updated copy of the deliverable along with all supporting documentation and calculations necessary to review and approve the revisions.
  - The Hydraulics Reviewer notifies the Project Manager (for information) and the Roadway Design Lead (for action) when the revisions have been approved and may be incorporated into the current roadway plans.

Upon final approval, the Hydraulic Design Engineer submits a final record set of the updated deliverable, computations, and supplemental data (including photos) for archiving. Where applicable, the final deliverables are uploaded to the Preconstruction Site using ATLAS Workbench.

- Revise permit drawings, FEMA compliance packages, and/or Railroad Drainage Submittal Packages if needed due to the drainage revision.

Complete Railroad Drainage Design Packages (if applicable for the project)

If railroad drainage submittals are required for the project, the Hydraulic Design Engineer provides drainage plans, drainage calculations, and other drainage information requested by the Structures Lead or Project Manager, as needed for coordination with the applicable railroads for approval.

- This information is supplied when no further revisions are expected that would affect the railroad. Limited exceptions to this may occur but require close coordination with the Project Manager, Structures Management Unit, and others as needed, to avoid or minimize impacts to the project schedule.
- The Hydraulic Design Engineer:
  - Submits the Railroad Drainage Design Package along with all supporting documentation and calculations to the Project Manager (for information) and the Hydraulics Reviewer (for action) to complete a review.
  - Revises and resubmits the Redline Drainage Plans to address comments received from the Hydraulics Reviewer.

Upon approval of the Railroad Drainage Design Package, the Hydraulics Reviewer notifies the Project Manager (for information) and the Structures Design Lead (for action).

Prepare and Submit FEMA Compliance Packages

To complete this task, the Hydraulic Design Engineer:

- Prepares any FEMA/NFIP compliance packages needed for the project following the procedures for the type of State Floodplain compliance required.
  - Additional information on this process is included on the Hydraulics Unit's Highway Floodplain Program website and in Chapter 15 of the *Guidelines for Drainage Studies and Hydraulic Design*.
- Revises and resubmits documents to address comments from FEMA and/or FMP.
  - The Hydraulics Unit (Floodplain Management) uploads approval letters to the project SharePoint site and notifies the Roadway Design Lead, Hydraulics Reviewer, and Project Manager when approval is received.
- Informs the Project Manager and other disciplines, as needed, of plan changes and commitments resulting from FEMA and/or FMP review.

Complete Final Drainage Summary Sheet(s)

The Drainage Summary Sheets are completed after the Field Inspection Review Meeting and after any revisions that come out of that meeting are complete. Once completed, the Drainage Summary Sheet requires ongoing incorporation of any drainage revisions. These summary sheets are used for cost estimates prior to Let and provide approximate drainage structure elevations, types, and pipe sizes, which facilitate quantity take-offs and may help identify conflicts with other disciplines such as utilities if those conflicts were not identified during earlier stages.

To complete this task, the Hydraulic Design Engineer is to:

- Complete the Drainage Summary Sheets according to the guidance entitled *Completing 3D Series Hydraulic Summary Plan Sheets*, (*Section 5.5 of the Guidelines for Drainage Studies and Hydraulic*

Design) and provide them to the Roadway Design Lead for incorporating into the current roadway design plans/Right-of-Way Plan Set.
- Coordinate the QC review following the NCDOT Quality Management Program: Quality Control and Quality Assurance procedures and the respective QC Checklist before upload and distribution.
- Revise and resubmit the Drainage Summary Sheets to the Roadway Design Lead and other affected disciplines/Units as directed by the Hydraulics Reviewer to complete a review and QA audit.

Complete Stormwater Control Measure Summary Sheet

The stormwater control measure (SCM) Summary Sheet is auto populated based on content entered in the Stormwater Management Plan. The purpose of the SCM Summary Sheet is to provide Roadside Environmental Field Operations Engineers a means to verify that the SCM was constructed and then enter the SCM into NCDOT's Stormwater Control Management System for subsequent inspection and maintenance as required in the Department's statewide NPDES stormwater permit (NCS000250).

The Hydraulic Design Engineer submits the SCM Summary Sheet concurrent with the Drainage Summary Sheet(s). The guidance document entitled *Completing 3D Series Hydraulic Summary Plan Sheets* provides additional information for preparing and submitting the SCM Summary Sheet.

Provide Any Required Hydraulics Special Details or Project Provisions

When Hydraulic Special Provisions or Drainage Special Details are required, the Hydraulic Design Engineer provides those to the Roadway Design Lead for incorporation into the PS&E Plans and Submittal. The Hydraulic Design Engineer:

- Coordinates with the Project Manager and Hydraulic QA Reviewer to determine if NCDOT has the required provision or detail needed.
- When the required provision or detail is not available from NCDOT, prepares the provision or detail. When a required drainage provision or drainage detail involves multiple disciplines, the Hydraulic Design Engineer coordinates with the appropriate discipline design engineer to produce the final product.
- Submits a copy of the sealed detail or special provision to the Hydraulics QA Reviewer
- Upon approval from the Hydraulics QA Reviewer, provides a sealed copy of the special detail or special provision to the Roadway Design Lead.

Finalize Stormwater Management Plan

In activity 2HY1, the Hydraulic Design Engineer prepared a preliminary Stormwater Management Plan (pSMP) that established the stormwater treatment goals for the project using the NC-SELDM Catalog application and if necessary, the BMP Decision Support Matrix. In this activity (3HY1), the Hydraulic Design Engineer finalizes the SMP to document stormwater management decisions and whether the treatment goals were able to be achieved. For those situations where pSMP treatment goals could not be attained due to various constraints, the finalized SMP describes such constraints and the alternative management decisions that were made. This description defines the maximum extent practical stormwater management applied to the project in compliance with the NPDES permit Post-Construction Stormwater Program (PCSP). The SMP also serves to document compliance with Rule 15A NCAC 04B .0109 and is intended to ensure that stormwater discharges do not erode receiving channels.

The Hydraulic Design Engineer submits the finalized Stormwater Management Plan as compliance documentation with the NPDES stormwater permit (NCS000250) and, when required, for review as part of the Environmental Permit Drawing Package.

Complete/Submit Environmental Permit Drawing Package

The Hydraulic Design Engineer prepares the environmental permit drawing permit package used for the environmental permit application(s) in accordance with *Guidelines for Drainage Studies and Hydraulic Design* and the *Guidance for Concurrence Point 4C Meetings and Plans* document as follows:

- Obtain information needed from others.
  - The Structures Lead provides impact quantities for temporary and permanent bridge bents.
  - Coordination with the Structures Lead and Division Construction Engineer may be required to determine impacts due to temporary work pads, work bridges, causeways, etc. if this information was not available earlier, such as during the Field Inspection Meeting.
  - The Hydraulic Design Engineer should ensure impacts shown on the Environmental Permit Drawings are sufficient for the proposed erosion control as shown on the Erosion Control and Sedimentation Plans.
    - Others are consulted depending on project specifics.
- Complete environmental permit drawings, including (as applicable to the project):
  - Wetland and surface water permit drawings
  - Buffer permit (NCDWR) drawings
  - Coastal Area Management Act (CAMA) (NC Division of Coastal Management) permit drawings
  - Federal Energy Regulatory Commission (FERC) permit drawings
- Coordinate the QC review following the NCDOT Quality Management Program: Quality Control and Quality Assurance procedures and the respective QC Checklist before upload and distribution.
- Submit the drawings with the Stormwater Management Plan to the Project Manager (for information), the Hydraulics Reviewer to complete a review and QA audit, the Roadway Design Lead, and Environmental Analysis Unit or NEPA/SEPA Lead (for action).
- Revise and resubmit (as needed) to address comments received.
- Conduct the Merger CP4C meeting (if required for the project; see Conduct Merger CP4C Meeting section below), incorporate any changes agreed to during the Merger CP4C meeting, and then resubmit the package to the Hydraulics Reviewer.
- Revise and resubmit (as needed) to address comments received.
- Provide CADD files of the impacts.
  - The Utilities Coordinator uses these CADD files to complete their own permit drawings showing additional utility impacts.
  - The Roadside Environmental Engineer uses these files to verify impacts shown have accounted for erosion control measures, notifying the Hydraulic Design Engineer and Hydraulics Reviewer if additional impacts are needed.
  - The Roadway Design Lead uses these files for a consistency review with the current roadway design plans.
- Assist the Environmental Analysis Unit (Environmental Coordination and Permitting), as needed, for them to complete the environmental permit applications or respond to permitting agencies' questions or concerns until necessary permits are secured.

- Ensure all avoidance and minimization measures have been documented appropriately.

Chapter 14 in the *Guidelines for Drainage Studies and Hydraulic Design* provides additional information on how to prepare these drawings.

Conduct Merger CP4C Meeting (if applicable for the project)

If the project is following the Merger Process (see 2EP1 for related information), the Merger CP4C meeting is held after the Merger CP4B meeting to present the final drainage design and Environmental Permit Drawing Package to the agencies and allow for discussion of the environmental impacts. Other items that may be discussed are avoidance and minimization measures and changes from what was presented during the Merger CP4B meeting. The Merger CP4C meeting is held after approval of the Redline Drainage Plans, the combined field inspection, and submittal of the Environmental Permit Drawing Package.

The Hydraulic Design Engineer is to:

- Notify the Hydraulics Reviewer of the preferred date and amount of time needed for the Merger CP4C meeting a minimum of two months prior to the preferred date for centrally managed projects.
  - The Hydraulics Reviewer coordinates with the Environmental Policy Unit to schedule the meeting and notify attendees.
  - For non-central managed projects, follow the direction of the Project Manager for scheduling the meeting and inviting attendees.
- Prepare and submit Merger CP4C Environmental Permit Drawing Package to the Hydraulics Reviewer, Project Manager, and Environmental Analysis Unit or NEPA/SEPA Lead for central managed projects or as directed by the Project Manager/Division Environmental Officer for non-central managed projects.
  - The CP4C package should be submitted for review at least seven weeks prior to the scheduled Merger CP4C meeting to allow adequate time for review and revisions, if necessary.
  - The plans are to be developed in accordance with the *Guidance for Concurrence Point 4C Meetings and Plans*.
  - Review comments are returned to the Hydraulic Design Engineer.
- Revise and resubmit the Merger CP4C Environmental Permit Drawing Package as needed for approval.
  - Upon approval, the Hydraulic Reviewer provides the final Merger CP4C Environmental Permit Drawing Package to the Environmental Policy Unit to distribute to merger team members.
  - Plans are to be posted at least two weeks prior to the meeting date.
- Conduct the Merger CP4C meeting in accordance with the Merger CP4C Meeting Guidance.
- Prepare meeting minutes in accordance with the *Guidance for Concurrence Point 4C Meetings and Plans* to document discussion and decisions made during the meeting.

Provide Hydraulic Support

Throughout this activity, the Hydraulic Design Engineer provides support to the project team and other technical disciplines/Units. This communication and coordination help the project team to deliver a high -quality project while minimizing delays to the schedule, scope changes, and schedule delays. The Hydraulic Design Engineer should be proactive in identifying drainage-related project concerns or

opportunities for improvement as early as possible and in communicating these to the project team for consideration. Providing hydraulic support may include:

- Attending meetings and offering hydraulic expertise and recommendations related to the project.
- Responding to drainage-related questions and concerns from others as they occur.
- Coordinating with others to resolve issues as they arise.

4HY1 Hydraulic Let Preparation

Attend the Design Complete Review Meeting and provide support and assistance, as needed, in the preparation of the PS&E package and the final Let Plans.

In Stage 3, the Hydraulic Design Engineer prepared various permitting and compliance packages. If final permits and authorizations for the project were not received during Stage 3, complete any outstanding tasks and coordinate with other disciplines as necessary to secure the required permits and authorizations. Address any drainage related comments from plan checking and reviews and seal the applicable sheets of the final plans.

References

- ☐ *Guidelines for Drainage Studies and Hydraulic Design*
- ☐ *Hydraulics Unit Web Page Content and Guidance Documents*
- ☐ Post-Construction Stormwater Program
  - ☐ Post-Construction Stormwater Controls for Roadway and Non-Roadway Projects
- ☐ *Stormwater Best Management Practices Toolbox*
- ☐ *BMP Decision Support Matrix*
- ☐ *NCDOT's Compliance Documentation Workflow for Rule 15A NCSAC 04B .0109*
- ☐ *Highway Floodplain Program*
- ☐ *NCDOT Quality Management Program: Quality Control and Quality Assurance*
- ☐ *Risk Management Guide V2*

Review Plan in Hand Plan Set and Attend Design Complete Review Meeting

The Hydraulic Design Engineer reviews the Design Complete Review Plan Set prior to the Design Complete Review Meeting. The Hydraulic Design Engineer verifies the drainage design shown matches the final approved drainage design and reviews for any drafting errors or potential conflicts with the drainage design.

The Hydraulic Design Engineer attends and participates in the Design Complete Review Meeting. This allows project team to voice concerns and potential issues to be addressed before the project proceeds, leading to fewer change orders during construction. This task includes:

- Responding to questions or concerns relating to the drainage design.
- Initiating discussion regarding drainage items that may need attention or coordination.
- Participating in traffic control and phasing discussions as each relates to the drainage design.

Provide Hydraulic Support

While the Hydraulic Design Engineer's goal is that all hydraulic design and permitting deliverables are complete prior to Stage 4, some action items from Stage 3 may continue into Stage 4. For example, FEMA compliance packages may have been submitted during Stage 3, but final SFC approval may not have been received before the end of Stage 3. While environmental permit drawings were completed by the Hydraulic Design Engineer during Stage 3, additional coordination with the Environmental Analysis Group may be required during Stage 4 to secure final permit approval.

Questions and comments may arise during the preparation of the PS&E package or during plan checking. The Hydraulic Design Engineer is to address any drainage questions and comments in a timely and appropriate manner to avoid schedule delays.

Revisions during this stage should be minimized as revisions may create delays to the project schedule. Closely coordinate any revisions with the Project Manager to minimize schedule delays. If revisions are necessary, the Drainage Design Engineer reviews all previously completed permitting and compliance deliverables from Stage 3 and revises those items as needed, in addition to revising the drainage plans (see 3HY1 for related information regarding revisions).

5HY1 Hydraulic Construction Support

Overview

Provide timely reviews and technical expertise throughout the project's construction phase as needed. The importance of this phase is to provide technical support to the resident engineer's office.

References

- ☐ *Guidelines for Drainage Studies and Hydraulic Design*
- ☐ *Hydraulics Unit Web Page content and guidance documents*
- ☐ *Field Guide For Post-Construction Stormwater BMPs*
- ☐ *Post-Construction Stormwater Program*
- ☐ *Post-Construction Stormwater Controls for Roadway and Non-Roadway Projects*
- ☐ *Stormwater Best Management Practices Toolbox*
- ☐ *Highway Floodplain Program*
- ☐ *CLEAR Program*

Deliverables

Deliverable	Task	Responsible Party
		Activity Leader
		Hydraulic Design Engineer
Drainage Investigation Documentation [A]	▪ *Complete Drainage Investigation*	X
Construction Support Documentation [A]	▪ *Hydraulic Construction Support*	X

[A] *Indicates that final document(s) or data set(s) must be uploaded to the ATLAS Workbench.*

Complete Drainage Investigation

Upon request from Division staff, the Hydraulics Unit investigates and reviews drainage-related issues. The Hydraulic Design Engineer is to complete a drainage review, report findings, determine the Department's responsibility in resolving the issue, and provide recommendations.

- Review may include a site investigation, compiling data including mapping, topography, and historical plans, the analysis of pre and post conditions, development of calculations, and analysis.
- For central-managed projects, submit findings and recommendations to the Hydraulics Unit for review and delivery to Division staff. For Division-managed projects, submit findings and recommendations as directed by Division staff.

Hydraulic Construction Support

Upon request from Division staff or the Hydraulics Unit, the Hydraulic Design Engineer provides the following support during the Construction Phase:

- Provides technical expertise and answers questions on the project's hydraulic design including post-construction stormwater BMPs.
- Responds to requests for information (RFI) from the Contractor on behalf of the Division office.
- Completes the drainage design component of any construction revisions in accordance with 5CS1 and hydraulic references noted above.

- If construction revisions change the permitted environmental impacts, the Hydraulic Design Engineer coordinates the changes with the Division Environmental Officer.
- If construction revisions change floodplain impacts as approved in any State Floodplain Compliance authorizations, the Hydraulic Design Engineer coordinates with the Hydraulics QA Reviewer and the NCDOT Highway Floodplain Engineer to ensure the Department remains in compliance with NFIP floodplain requirements.

- Reviews shop drawings for stormwater control measure devices as needed.

Throughout the hydraulic construction support process, the Hydraulic Design Engineer may provide best practices or lessons learned to the CLEAR Program as needed (see related VM activities for related information).

5HY2 Review As-Builts

Overview

Provide timely reviews and technical certification of As-Built plans for structures located in FEMA regulated areas (including appropriate coordination with Locations and Survey and the construction revision process per 5LS2 and 5CS1).

References

- ☐ Hydraulics Unit Web Page Content and Guidance Documents
- ☐ *Highway Floodplain Program*
- ☐ *Construction Manual – Records & Reports: FEMA Certification*

Deliverables

Deliverable	Task	Responsible Party Activity Leader Highway Floodplain Program
As-Built Certification Package to NCFMP [A]	▪ *Submit Final Certified As-Built Package to NCFMP*	X
LOMR Approval [A]	▪ *Process LOMR Application to FEMA and Obtain Final LOMR Approval*	X

[A] *Indicates that final document(s) or data set(s) must be uploaded to the ATLAS Workbench.*

Receive FEMA As-built Structure Drawings

To complete this task, the Highway Floodplain Program Engineer ensures FEMA As-built Structure Drawings have been provided by Division or Construction Unit staff in accordance with procedures outlined in the *NCDOT Construction Manual*.

Review FEMA As-Built Structure Drawings

To complete this task, the Highway Floodplain Program Engineer is to follow the process outlined on the Highway Floodplain Program site.

Submit Final Certified As-Built Package to NCFMP

To complete this task, the Highway Floodplain Program Engineer:

- Reviews the applicable as-built documents in accordance with *As-Built Certification Review Form* per Highway Floodplain Program.
- Addresses any follow-up issues, as applicable.

Process LOMR Application to FEMA and Obtain Final Approval

To complete this task, the Highway Floodplain Program Engineer is to follow the LOMR application and approval process as set forth in FEMA NFIP regulations, as applicable.

1IM1 Initiate Complete Streets Review

Overview

Assess the *Complete Streets Project Sheet* for multimodal facilities and initiate project review with the *Complete Streets Project Evaluation Methodology* to identify requested exemptions, planned and existing facilities, estimated multimodal activity, locally requested facilities, and the initial preferred and alternative bicycle, pedestrian, or transit facility selection.

Note: *Actions during the Project Initiation Stage may be led and completed by staff from several different NCDOT groups. Any person who has overall responsibility for a project during this Stage is referred to as the "Project Lead." This lead could be the Feasibility Studies Engineer, the Corridor Development Engineer, the Division Planning Engineer, or someone in a similar role as tasked by a state or local agency. Integrated Mobility Division (IMD) staff is currently the Activity Leader for 1IM1; this will transfer to the Project Manage Unit (PMU) or Division Planning Engineer late 2022 or early 2023.*

References

- ☐ *Complete Streets Policy*
- ☐ *Complete Streets Implementation Guide*
- ☐ *Complete Streets Project Evaluation Methodology*
- ☐ *Complete Streets Project Sheet*
- ☐ *Complete Streets Review Assessment*
- ☐ Integrated Mobility Division (IMD) Project Scoping and Design Concurrence Portal
- ☐ *Complete Streets Activity Estimation Tool*
- ☐ Bicycle and Pedestrian Crash Data
- ☐ Pedestrian and Bicycle Infrastructure Network GIS Data (ATLAS)

Deliverables

Deliverable	Task	Responsible Party		
		Activity Leader	Additional Support	
		Integrated Mobility Division Staff	Complete Streets Coordinator	Project Lead
Complete Streets Project Sheet [A]	▪ *Conduct Project Review*		X	X
Complete Streets Review Assessment (CSRA) [A]		X	X	

[A] *Indicates that final document(s) or data set(s) must be uploaded to the ATLAS Workbench.*

Conduct Project Review

Integrated Mobility Division staff complete an initial project review for implementation of pedestrian, bicycle, and public transportation elements using the *Complete Streets Project Sheet* when notified through the Smartsheet Portal. The request for project review is to include the items listed for the Project Initiation (Stage 1) selection on the Integrated Mobility Division (IMD) Project Scoping and Design Concurrence Portal.

Integrated Mobility Division staff conduct a review of the project through the first three steps of the *Complete Streets Project Evaluation Methodology:*

- Initial Screening and Data Input
- Transportation Need Determination
- Facility Type Selection

Integrated Mobility Division staff document the findings of each step in the *Complete Streets Review Assessment* and review the activity estimates, initial facility selection, and potential maintenance responsibilities with the relevant local municipality and MPO/RPO. Specific recommendations identified in Step 3 (Facility Type Selection) include the preferred and alternative facility types and reference to applicable design standards and the source (e.g., RDM, AASHTO, FHWA, and NACTO).

Integrated Mobility Division staff complete the *Complete Streets Review Assessment* through Step 3, unless exceptions identified in Step 1 (Data Input and Screening) require review by the Complete Streets Review Team. Integrated Mobility Division staff is responsible for uploading the *Complete Streets Review Assessment* and signed *Complete Streets Project Sheet* to the project SharePoint site via the ATLAS Workbench. Further coordination and consultation between the Project Lead and Integrated Mobility Division staff continue over the course of the project as it relates to facility design as requested by the Project Lead.

The Project Lead is responsible for reviewing the *Complete Streets Review Assessment* to ensure enough detail has been provided to continue project evaluation. Integrated Mobility Division staff remain engaged to ensure provisions from the *Complete Streets Policy* are implemented consistently for projects with significant physical and environmental constraints, and ensure the Complete Streets Review Team is engaged, if required.

For P6.0 projects (and forward), the *Complete Streets Project Sheet* have already been completed for the project. This sheet is attached when the project was submitted for scoring. However, if a *Complete Streets Project Sheet* has not yet been completed for a current project, one is to be completed and submitted at this stage in addition to a *Complete Streets Review Assessment*. The *Complete Streets Project Sheet* must be filled out prior to requesting the initial project review and before moving onto Stage 2.

1IM2 Review Complete Street Elements

Overview

Assess *Express Design Evaluation Package* to determine if recommendations from *Complete Streets Review Assessment* are satisfied by express design and cost estimates.

Note: *Actions during the Project Initiation Stage may be led and completed by staff from several different NCDOT groups. Any person who has overall responsibility for a project during this Stage is referred to as the "Project Lead." This lead could be the Feasibility Studies Engineer, the Corridor Development Engineer, the Division Planning Engineer, or someone in a similar role as tasked by a state or local agency.*

References

- ☐ *Express Design Evaluation Package*
- ☐ *Complete Streets Project Evaluation Methodology*
- ☐ *Complete Streets Review Assessment*
- ☐ TPD Comprehensive Transportation Plan (CTP) Database
- ☐ Pedestrian and Bicycle Infrastructure Network GIS Data (ATLAS)

Deliverables

Deliverable	Task	Responsible Party		
		Activity Leader	Additional Support	
		Project Lead	Complete Streets Coordinator	Integrated Mobility Division Staff
Complete Streets Review Assessment (CSRA) [A]	▪ *Conduct Project Review*	X	X	X

[A] *Indicates that final document(s) or data set(s) must be uploaded to the ATLAS Workbench.*

Conduct Project Review

The Project Lead continues project review based upon the results of the *Express Design Evaluation Package* to determine project cost and schedule impacts and potential facility modifications to the initial recommendations in the *Complete Streets Review Assessment*. The project is reviewed through the final two steps of the *Complete Streets Project Evaluation Methodology:*

- Impact Assessment
- Final Analysis

The Project Lead is responsible for coordinating and documenting the results of the Express Design cost, schedule, and environmental impact findings and final facility selection in the *Complete Streets Review Assessment*. The pedestrian, bicycle, or public transportation element(s) are evaluated for opportunities to reduce impacts, including through facility and roadway design modifications. The Project Lead coordinates with the local municipality and MPO/RPO to review potential maintenance responsibilities, proposed facility modifications, increased cost-share (as applicable). The final facility recommendation is documented, including a request to exclude Complete Streets elements based on Step 5 (Final Analysis). The Complete Streets Review Team provides a recommendation for inclusion of the facility, continued analysis, project modifications to reduce impacts, or exclusion of the Complete Streets elements.

2IM1 Verify Complete Streets

Overview

Review the roadway design plans (e.g., the Design Recommendation Plan Set) to assess if the pedestrian, bicycle, and public transportation elements are appropriate for the project's design, generally aligns with the facilities from the *Complete Streets Project Sheet*, follows the facility selection guidance in the *Complete Streets Project Evaluation Methodology*, and adheres to the authoritative design standards of the *NCDOT Roadway Design Manual*.

References

- ☐ *AASHTO Bicycle Design Guide*
- ☐ *AASHTO Pedestrian Design Guide*
- ☐ *AASHTO Guide for Geometric Design of Transit Facilities on Highways and Streets*
- ☐ *Complete Streets Policy*
- ☐ *Complete Streets Implementation Guide*
- ☐ *Complete Streets Project Evaluation Methodology*
- ☐ *Complete Streets Review Assessment*
- ☐ *Roadway Design Manual*
- ☐ Integrated Mobility Division (IMD) Project Scoping and Design Concurrence Portal
- ☐ *FHWA Guidance Bikeway Selection Guide*
- ☐ *NACTO Urban Design Guide*
- ☐ *NACTO Transit Street Design Guide*

Deliverables

Deliverable	Task	Responsible Party		
		Activity Leader	Additional Support	
		Project Lead	Complete Streets Coordinator	Integrated Mobility Division Staff
Complete Streets Review Assessment (CSRA) [A]	▪ *Complete Documentation Confirming Review of Roadway Plans for Compliance with Complete Streets Policy*	X	X	X

[A] *Indicates that final document(s) or data set(s) must be uploaded to the ATLAS Workbench.*

Complete Documentation Confirming Review of Roadway Plans for Compliance with Complete Streets Policy

The Project Lead reviews the *Complete Streets Review Assessment* for updates that may change pedestrian, bicycle, or public transportation facility design based upon new roadway design information. These may include new data and corresponding decisions from Steps 2-5 of the *Complete Streets Project Evaluation Methodology*, such as revisions to anticipated Complete Streets activity, local agency preferences, roadway design modifications that affect facility selection, maintenance responsibilities, and project schedule and cost impacts. This may also include a revised request to exclude the Complete Streets elements; the Complete Streets Review Team provides a recommendation for inclusion of the facility, continued analysis, project modifications to reduce impacts, or exclusion of the Complete Streets elements.

The Project Lead requests an Integrated Mobility Division design concurrence review by uploading the revised and completed *Complete Streets Review Assessment* to the project SharePoint site and submitting a Stage 2 request to the designated Integrated Mobility Division staff via the Smartsheet Portal. The request for project review is to include the *Complete Streets Review Assessment* and items listed for Stage 2 selection on the Integrated Mobility Division (IMD) Project Scoping and Design Concurrence Portal.

Integrated Mobility Division staff review the *Complete Streets Review Assessment* and roadway design plans and return the document with comments to the Project Lead for action and more information (as applicable). The design concurrence review considers updated project information, local agency and MPO/RPO consultation, current facility design guidance, and design modification recommendation to meet the identified transportation need (as applicable).

The revised *Complete Streets Review Assessment* is saved to the project SharePoint site by the Roadway Design Lead/Project Manager.

3IM1 Review and Verify Pavement Marking Designs

In development.

4IM1 Complete Street Reporting

In development.

1LS1 Provide Photogrammetric Control & Initiate Surveys

Overview

Provide photogrammetric control in support of the Photogrammetry Unit, preliminary utility mapping in support of long-range transportation planning, and initiate base mapping surveys once project mapping limits have been completed and reviewed.

Note: *Actions during the Project Initiation Stage may be led and completed by staff from several different NCDOT groups. Any person who has overall responsibility for a project during this Stage is referred to as the "Project Lead." This lead could be the Feasibility Studies Engineer, the Corridor Development Engineer, the Division Planning Engineer, or someone in a similar role as tasked by a state or local agency.*

References

- ☐ *Location & Surveys Connect Site*
- ☐ *Location & Surveys GPS Guidelines*
- ☐ *Location & Surveys Coordinate Systems*
- ☐ *Location & Surveys CADD Mapping Standards*
- ☐ *Location & Surveys Baseline Guidelines*
- ☐ *Location & Surveys Traffic Signing Diagrams*
- ☐ *Location & Surveys SUE Guidelines*
- ☐ *Location & Surveys Procedure Memos*
- ☐ *Location & Surveys File Naming Convention*
- ☐ *Location & Surveys Project Review Checklist*
- ☐ *NCDOT Quality Management Program: Quality Control and Quality Assurance*

Deliverables

Deliverable	Task	Responsible Party	
		Activity Leader	Additional Support
Photogrammetric Control for Preliminary/Planning Mapping (NC Grid Datum) [Q]	▪ *Complete Photogrammetric Control for Preliminary/Planning Mapping (NC Grid Datum)*	Locating Engineer	▪ Photogrammetry Unit ▪ Assigned Engineering Firm
SUE Quality Level D Mapping [Q]	▪ *Complete SUE Quality Level D*	Locating Engineer	▪ Feasibility Studies Unit ▪ Assigned Engineering Firm
Final Mapping Limits Polygon [A, Q]	▪ *Perform Independent Review of Mapping Limits Polygon*	Locating Engineer	▪ L&S Regional Engineer ▪ Feasibility Studies Unit ▪ Roadway Design Engineer ▪ Photogrammetry Unit
Photogrammetric Control for Final Survey Mapping (Local Datum) [Q]	▪ *Complete Photogrammetric Control for Final Survey Mapping (Local Datum)*	Locating Engineer	▪ L&S Regional Engineer ▪ Photogrammetry Unit ▪ Assigned Engineering Firm
Primary Survey Control Sheet [Q]	▪ *Complete Primary Survey Control*	Locating Engineer	▪ Assigned Engineering Firm

[A] *Indicates that final document(s) or data set(s) must be uploaded to the ATLAS Workbench.*
[Q] *Indicates that final document(s) or data set(s) requires review in accordance with the NCDOT Quality Management Program: Quality Control and Quality Assurance.*

Complete Photogrammetric Control for Preliminary/Planning Mapping (NC Grid Datum)

Photogrammetric control is critical to orient aerial photography onto the North Carolina State Plane Coordinate System. To complete this task, the Location & Surveys Locating Engineer is to:

- Contact all property owners where aerial targets are placed, or those properties crossed to place an aerial target. Contacts are to be made by the appropriate approved letter.
- Conform to Field Procedures in the *Location & Surveys GPS Guidelines,* complete panel control target surveys where panel targets are placed according to a panel plan provided by the Photogrammetry Unit (see 1PH2 for related information).
- Process and develop panel control in accordance with Office Procedures from the *Location & Surveys GPS Guidelines*.
- Provide panel control to the Photogrammetry Unit, considering:
  - Panel control text file (Grid Datum) for the Photogrammetry Unit to orient aerial photography.
  - Include northing, easting, and elevation projected onto the North Carolina State Plane Coordinate System.
- Complete the *Location & Surveys Project Review Checklist (PRC)* and the applicable QA/QC review following the NCDOT *Quality Management Program: Quality Control and Quality Assurance* procedures.

Complete SUE Quality Level D

Being that SUE Quality Level D mapping may be useful for long-range planning and early design development, the Location & Surveys Locating Engineer is to:

- Research and/or obtain existing utility records by contacting and coordinating with project utility owners in accordance with the *Location & Surveys SUE Guidelines*.
- Develop and provide a SUE Quality Level D CADD file (NC Grid Datum) that maps existing utility records using the latest approved NCDOT MicroStation version.
- Provide the SUE Quality Level D CADD file to Feasibility Studies Unit (see 1FS2 for related information).
  - Note: Ensure this deliverable conforms to the NCDOT CADD Mapping Standards, Procedure Memo PROC 2018-6, and Location & Surveys File Naming Convention.
- Complete the *Location & Surveys Project Review Checklist (PRC)* and the applicable QA/QC review following the NCDOT *Quality Management Program: Quality Control and Quality Assurance* procedures.

Perform Independent Review of Mapping Limits Polygon

The mapping limits polygon defines the boundary for mapping and surveys that are needed for project development. To complete this task, the Location & Surveys Locating Engineer is to:

- Review and evaluate mapping limits to confirm they are adequate for the proposed design and analysis, but not excessive to overburden resources. Further coordination with the

Photogrammetry Unit and the Project Lead may be needed for this task (see 1FS2, 1RD1 and 1PH2 for related information).

- Revise and provide a mapping limits polygon that involves:
  - Map final mapping limits using the latest approved NCDOT MicroStation version.
  - Provide final mapping limits CADD file to the Photogrammetry Unit and/or Project Lead.
- Complete the *Location & Surveys Project Review Checklist (PRC)* and the applicable QA/QC review following the NCDOT *Quality Management Program: Quality Control and Quality Assurance* procedures.

Complete Photogrammetric Control for Preliminary/Planning Mapping (Local Datum)

With photogrammetric control being critical to orient aerial photography onto a localized North Carolina State Plane Coordinate System, the Location & Surveys Locating Engineer is to:

- Develop a local project control network by using the current National Spatial Reference System (NSRS) projected onto the North Carolina State Plane Coordinate System. This process is to conform to the *Location & Surveys GPS Guidelines* and *Location & Surveys Coordinate Systems*.
- Contact all property owners where aerial targets are placed, or those properties crossed to place an aerial target were contacted. Contacts are to be made by letter, phone, or in person and is to be documented.
- Conform to Field Procedures, 6B.3-3 in the *Location & Surveys GPS Guidelines,* perform panel control target surveys where panel targets are placed according to a panel plan provided by the Photogrammetry Unit (See 1PH2 for related information).
- Process and develop panel control in accordance with Office Procedures, 6B.3-4 from the *Location & Surveys GPS Guidelines*.
- Complete the *Location & Surveys Project Review Checklist (PRC)* and the applicable QA/QC review following the NCDOT *Quality Management Program: Quality Control and Quality Assurance* procedures.
- Provide panel control to the Photogrammetry Unit, considering:
  - Panel control text file (Local Datum) to the Photogrammetry Unit to orient aerial photography.
  - Include both Grid/Local northing, easting, and elevation projected onto the North Carolina State Plane Coordinate System.

Complete Primary Survey Control

The project's primary control is the critical foundation for establishing the localized horizontal and vertical datum to be utilized for all subsequent surveys. The Location & Surveys Locating Engineer is to:

- Establish a local project control network by creating horizontal and vertical survey control monuments using the current National Spatial Reference System (NSRS) projected onto the North Carolina State Plane Coordinate System. This process is to conform to the *Location & Surveys GPS Guidelines* and *Location & Surveys Coordinate Systems*.

- Develop Primary Survey Control Sheet(s) using the latest approved NCDOT MicroStation version and *NCDOT CADD Mapping Standards*. Complete in conformance with the *Location & Surveys Baseline Guidelines*, *Location & Surveys Procedure Memos*, and *Location & Surveys Connect Site*.
- Complete the *Location & Surveys Project Review Checklist (PRC)* and the applicable QA/QC review following the NCDOT *Quality Management Program: Quality Control and Quality Assurance* procedures.

While these tasks and the related deliverables may be completed during Stage 1, task completion may also extend into Stage 2. Complete Final Surveys (2LS1) provides additional details on each task and how to complete the related deliverables.

2LS1 Complete Final Surveys

Overview

Provide complete surveys and mapping, including wetlands, jurisdictional streams, for the project's survey mapping limits in support of the design, right-of-way acquisition, and construction phases.

References

- ☐ *Location & Surveys DTM Manual*
- ☐ *Mobile and Terrestrial LiDAR Guidelines*
- ☐ *Location & Surveys GPS Guidelines*
- ☐ *Location & Surveys Coordinate Systems*
- ☐ *Location & Surveys CADD Mapping Standards*
- ☐ *Location & Surveys Hydro Manual*
- ☐ *Location & Surveys Baseline Guidelines*
- ☐ *Location & Surveys Traffic Signing Diagrams*
- ☐ *Location & Surveys SUE Guidelines*
- ☐ *Location & Surveys Procedure Memos*
- ☐ *Location & Surveys Connect Site*
- ☐ *Location & Surveys Project Review Checklist*
- ☐ *NCDOT Wetland Mapping Guidelines*
- ☐ *Location & Surveys File Naming Convention*
- ☐ *NCDOT Quality Management Program: Quality Control and Quality Assurance*

Deliverables

Deliverable	Task	Responsible Party	
		Activity Leader	Additional Support
Final Surveys [Q]	▪ *Complete Field Surveys and Project Mapping*	Locating Engineer	▪ L&S Regional Engineer ▪ Assigned Engineering Firm ▪ Other Technical Disciplines or Unit Leads
Surveyed Wetlands [A, Q]	▪ *Complete Wetland/Jurisdictional Stream Field Surveys and Mapping*	Locating Engineer	▪ Environmental Engineer ▪ Assigned Engineering Firm
Secondary Survey Control Sheets [Q]	▪ *Complete Secondary Survey Control Sheets (C-Series)*	Locating Engineer	▪ Assigned Engineering Firm
Parcel Polygon File [Q]	▪ *Complete Parcel Polygon Mapping*	Locating Engineer	▪ Assigned Engineering Firm
Final Survey Mapping Limits Polygon [A, Q]	▪ *Complete Survey Limits Polygon*	Locating Engineer	▪ Assigned Engineering Firm

[A] *Indicates that final document(s) or data set(s) must be uploaded to the ATLAS Workbench.*
[Q] *Indicates that final document(s) or data set(s) requires review in accordance with NCDOT Quality Management Program: Quality Control and Quality Assurance.*

Complete Field Surveys and Project Mapping

With accurate field surveys and mapping being the critical foundation for all subsequent design, right-of-way acquisition, and construction phases for a project, the Location & Surveys Locating Engineer is to:

- Confirm that all property owners impacted by the mapping limits and those properties accessed to perform required surveys were contacted. Contacts are to be made by the appropriate approved letter.
- Establish the project's primary control (Azimuth Pairs), secondary control (Baseline), and benchmarks (Vertical) in accordance with the *Location & Surveys GPS Guidelines*, *Location & Surveys Baseline Guidelines*, and *Location & Surveys Coordinate Systems.*
- Obtain planimetric mapping and ground elevation data included in the project's survey mapping limits (See 1PH2 for related information).
- Conform to the *NCDOT CADD Mapping Standards,* complete planimetric classification that includes field classifying and labeling existing planimetric features referenced in the Final Survey CADD File and map per the latest approved NCDOT MicroStation version.
- Perform pavement and ground DTMs and/or coordinate with the Terrestrial Scan LiDAR Group (TSLG) in accordance with the *Location & Surveys DTM Manual* and *Mobile and Terrestrial LiDAR Guidelines*. This includes developing the Final Terrain Model CADD file using the latest approved NCDOT MicroStation version and *NCDOT CADD Mapping Standards*.
- Develop ELN alignments in accordance with Location & Surveys Baseline Guidelines.
- Perform hydrographic surveys and/or coordinate with the Hydrographic Sonar Group (HSG) in accordance with the *Location & Surveys DTM Manual* and *Location & Surveys Hydro Manual* to obtain hydrographic features and are referenced in the Final Survey CADD file using the latest approved NCDOT MicroStation version and *NCDOT CADD Mapping Standards*.
- Perform Sanitary Sewer and Storm Utility surveys in accordance with the *Location & Surveys DTM Manual* and *Location & Surveys Hydro Manual* to obtain sanitary sewer and storm sewer features and are referenced in the Final Survey CADD file using the latest approved NCDOT MicroStation version and *NCDOT CADD Mapping Standards*.
- In accordance with the *Location & Surveys SUE Guidelines*, perform subsurface utility surveys (per scope) by:
  - Obtaining subsurface utility data and referencing in the Final Survey CADD file using the latest approved NCDOT MicroStation version and *NCDOT CADD Mapping Standards*.
  - Providing the subsurface utility CADD file using the latest approved NCDOT MicroStation version and *NCDOT CADD Mapping Standards* to obtain linear footage.
- Perform Septic System surveys in accordance with the *Location & Surveys Procedure Memo (Septic System Mapping In Development)* to obtain septic system features (See 2RD1 and 2RW1 for related information) and are referenced in the Final Survey CADD file using the latest approved NCDOT MicroStation version and *NCDOT CADD Mapping Standards*.
- Develop property mapping by performing courthouse research, reconning and locating monumentation, requesting the Right-of-Way Abstract (See 2RW1 for related information), and investigating as-builts and maps according to records and monumentation. Reference in the Final Survey CADD file using the latest approved NCDOT MicroStation version and *NCDOT CADD Mapping Standards*.
- Complete the *Location & Surveys Project Review Checklist (PRC)* and the applicable QA/QC review following the NCDOT *Quality Management Program: Quality Control and Quality Assurance* procedures.
- Notify the project team, including the Project Manager, that all MicroStation base mapping files and deliverables have been completed (See 2RD1 for related information).

Complete Wetland/Jurisdictional Stream Field Surveys and Mapping

Required Wetland/Jurisdictional Stream Field Surveys and Mapping are critical for obtaining necessary agency permitting. For this task, the Location & Surveys Locating Engineer is to:

- Complete the wetland/jurisdictional stream surveys in accordance with the *NCDOT Wetland Mapping Guidelines (Wetland Procedures In Development).* This work includes:
  - Field locations to create a surveyed WLL (pdf) and a WEX or WET CADD file using the latest approved NCDOT MicroStation version and *NCDOT CADD Mapping Standards*.
    - Field locations to create a surveyed jurisdictional streams CADD file using the latest approved NCDOT MicroStation version and *NCDOT CADD Mapping Standards*.
- Complete the *Location & Surveys Project Review Checklist (PRC)* and the applicable QA/QC review following the NCDOT *Quality Management Program: Quality Control and Quality Assurance* procedures.
- Notify the project team, including the Project Manager, that all wetland/jurisdictional stream mapping files and deliverables have been completed (see 2EN1 for related information).

Complete Secondary Survey Control Sheets (C-Series)

The project's Secondary Survey Control Sheets are a critical part in documenting the localized horizontal and vertical datum to be utilized for all subsequent surveys. The Location & Surveys Locating Engineer is to:

- Develop Primary and/or Secondary Survey Control Sheets (C-Series) by computing existing alignments (ELN) and compiling both C-Series right-of-way sheets using the latest approved NCDOT MicroStation version and *NCDOT CADD Mapping Standards*. Complete in conformance with the *Location & Surveys Baseline Guidelines*, *Location & Surveys Procedure Memos*, and *Location & Surveys Connect Site*.
- Complete the *Location & Surveys Project Review Checklist (PRC)* and the applicable QA/QC review following the NCDOT *Quality Management Program: Quality Control and Quality Assurance* procedures.

Complete Parcel Polygon Mapping

The Parcel Polygon Mapping CADD file defines the parcel's property lines to be used during the right-of-way acquisition stage (4LS1) and allows NCDOT to develop accurate metes and bounds descriptions. The Location & Surveys Locating Engineer is to:

- Compile and prepare a GIS Centroid Property Data Layer utilizing the Statewide ArcGIS Centroid Property Database in conformance with the *Location & Surveys Procedure Memo (Parcel Polygon Procedure In Development)*, and *Location & Surveys Connect Site*.
- Compile and prepare a Parcel Polygon Mapping CADD file utilizing the property mapping in the Final Survey CADD file using the latest approved NCDOT MicroStation version and *NCDOT CADD Mapping Standards*. Complete in conformance with the *Location & Surveys Procedure Memo (Parcel Polygon Procedure In Development)*, and *Location & Surveys Connect Site*.
- Complete the *Location & Surveys Project Review Checklist (PRC)* and the applicable QA/QC review following the NCDOT *Quality Management Program: Quality Control and Quality Assurance* procedures.

Complete Survey Limits Polygon

The Survey Limits Polygon CADD file defines the boundary of final surveys to be used as a GIS database layer historically documenting the project's survey limits. To complete this task, the Location & Surveys Locating Engineer is to:

- Map the final Survey Limits Polygon (ECTM Boundary or TIN Hull) mapping limits using the latest approved NCDOT MicroStation version and *NCDOT CADD Mapping Standards*. Complete in conformance with the *Location & Surveys Procedure Memo (Survey Limits Polygon In Development)*, and *Location & Surveys Connect Site*.
- Complete the *Location & Surveys Project Review Checklist (PRC)* and the applicable QA/QC review following the NCDOT *Quality Management Program: Quality Control and Quality Assurance* procedures.

2LS2 Complete SUE Level A

Overview

Complete SUE Quality Level A investigations for utility conflict resolutions.

References

- ☐ *Location & Surveys GPS Guidelines*
- ☐ *Location & Surveys Coordinate Systems*
- ☐ *Location & Surveys CADD Mapping Standards*
- ☐ *Location & Surveys Traffic Signing Diagrams*
- ☐ *Location & Surveys SUE Guidelines*
- ☐ *Location & Surveys Procedure Memos*
- ☐ *Location & Surveys Connect Site*
- ☐ *Location & Surveys Project Review Checklist*
- ☐ *Location & Surveys File Naming Convention*
- ☐ *NCDOT Quality Management Program: Quality Control and Quality Assurance*

Deliverables

Deliverable	Task	Responsible Party	
		Activity Leader	Additional Support
SUE Quality Level A [Q]	▪ *Complete SUE Quality Level A and Revise Mapping*	Locating Engineer	▪ Utility Engineer ▪ Assigned Engineering Firm

[Q] *Indicates that final document(s) or data set(s) requires review in accordance with NCDOT Quality Management Program: Quality Control and Quality Assurance.*

Complete SUE Quality Level A and Revise Mapping

Accurate SUE Quality Level A data is needed to minimize utility conflicts and avoid unnecessary costs and delays when relocating utilities. For this task, the Location & Surveys Locating Engineer is to:

- Perform/obtain surface utility Quality Level A data and reference in the Final Survey CADD file using the latest approved NCDOT MicroStation version and *NCDOT CADD Mapping Standards* (See 2UT1 for related information).
- Compile and deliver the SUE Quality Level A Certification Sheets in accordance with *NCDOT Location & Surveys Standard Procedures*, *Location & Surveys SUE Guidelines, Location & Surveys File Naming Convention, Location & Surveys Procedure Memo PROC 2018-6,* and *Location & Surveys Baseline Guidelines*.
- Complete the *Location & Surveys Project Review Checklist (PRC)* and the applicable QA/QC review following the NCDOT *Quality Management Program: Quality Control and Quality Assurance* procedures.

3LS1 Complete Additional Surveys and Initiate ROW Acquisition Surveys

Overview

Provide additional surveys and base mapping for the project's revised mapping limits in support of the design, right-of-way acquisition and construction phases. Initiate right-of-way field delineation, metes and bounds descriptions, and eminent domain exhibit maps in support of right-of-way acquisitions.

References

- ☐ *Location & Surveys DTM Manual*
- ☐ *Location & Surveys GPS Guidelines*
- ☐ *Location & Surveys Hydro Manual*
- ☐ *Location & Surveys Coordinate Systems*
- ☐ *Location & Surveys CADD Mapping Standards*
- ☐ *Location & Surveys Baseline Guidelines*
- ☐ *Location & Surveys Traffic Signing Diagrams*
- ☐ *Location & Surveys SUE Guidelines*
- ☐ *Location & Surveys Procedure Memos*
- ☐ *Location & Surveys Project Review Checklist*
- ☐ *Location & Surveys File Naming Convention*
- ☐ *Mobile and Terrestrial LiDAR Guidelines*
- ☐ *NCDOT Quality Management Program: Quality Control and Quality Assurance*

Deliverables

Deliverable	Task	Responsible Party	
		Activity Leader	Additional Support
Additional Surveys [Q]	▪ *Complete Additional Field Surveys and Revise Project Mapping*	Locating Engineer	▪ L&S Regional Engineer ▪ Assigned Engineering Firm ▪ Other Technical Disciplines or Unit Leads
Parcel Polygon File [Q]	▪ *Complete Updated Parcel Polygon Mapping*	Locating Engineer	▪ Assigned Engineering Firm
Final Survey Mapping Limits Polygon [A, Q]	▪ *Complete Updated Survey Limits Polygon*	Locating Engineer	▪ Assigned Engineering Firm

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Complete Additional Field Surveys and Revised Project Mapping

Building on the work done in 2LS1, 2LS2 and as needed for the project, the Location & Surveys Locating Engineer is to:

- Collaborate with the Photogrammetry Unit for readily available mapping and/or additional flight control to fly and compile planimetric mapping and ground elevation data (See Proposed 3PH1 for related information).
- Coordinate with the appropriate disciplines/Units to confirm the Latest Survey CADD File(s).

- Confirm that all property owners impacted by the mapping limits and those properties accessed to perform required additional surveys were contacted. Contacts are to be made by the appropriate approved letter.
- Establish additional secondary control (Baseline) and benchmarks (Vertical) in accordance with the *Location & Surveys GPS Guidelines*, *Location & Surveys Baseline Guidelines*, and *Location & Surveys Coordinate Systems.*
- Update Primary and/or Secondary Survey Control Sheets (C-Series) by computing existing alignments (ELN) and compiling both C-Series right-of-way sheets using the latest approved NCDOT MicroStation version and *NCDOT CADD Mapping Standards*. Complete in conformance with the *Location & Surveys Baseline Guidelines*, *Location & Surveys Procedure Memos*, and *Location & Surveys Connect Site*.
- Conform to the *NCDOT CADD Mapping Standards,* complete planimetric classification that includes field classifying and labeling existing planimetric features referenced in the Final Survey CADD File and map per the latest approved NCDOT MicroStation version.
- Perform pavement and ground DTMs and/or coordinate with the Terrestrial Scan LiDAR Group (TSLG) in accordance with the *Location & Surveys DTM Manual* and *Mobile and Terrestrial LiDAR Guidelines*. This includes developing the Final Terrain Model CADD file using the latest approved NCDOT MicroStation version and *NCDOT CADD Mapping Standards*.
- Develop ELN alignments in accordance with *Location & Surveys Baseline Guidelines*.
- Perform hydrographic surveys and/or coordinate with the Hydrographic Sonar Group (HSG) in accordance with the *Location & Surveys DTM Manual* and *Location & Surveys Hydro Manual* to obtain hydrographic features and are referenced in the Final Survey CADD file using the latest approved NCDOT MicroStation version and *NCDOT CADD Mapping Standards*.
- Perform Sanitary Sewer and Storm Utility surveys in accordance with the *Location & Surveys DTM Manual* and *Location & Surveys Hydro Manual* to obtain sanitary sewer and storm sewer features and are referenced in the Final Survey CADD file using the latest approved NCDOT MicroStation version and *NCDOT CADD Mapping Standards*.
- In accordance with the *Location & Surveys SUE Guidelines*, perform subsurface utility surveys (per scope) by:
  - Obtaining subsurface utility data and referencing in the Final Survey CADD file using the latest approved NCDOT MicroStation version and *NCDOT CADD Mapping Standards*.
  - Providing the subsurface utility CADD file using the latest approved NCDOT MicroStation version and *NCDOT CADD Mapping Standards* to obtain linear footage.
- Perform Septic System surveys in accordance with the *Location & Surveys Procedure Memo (Septic System Mapping In Development)* to obtain septic system features (See 2RD1 and 2RW1 for related information) and are referenced in the Final Survey CADD file using the latest approved NCDOT MicroStation version and *NCDOT CADD Mapping Standards*.
- Develop property mapping by performing courthouse research, reconning and locating monumentation, requesting the Right-of-Way Abstract (See 2RW1 for related information), and investigating as-builts and maps according to records and monumentation. Reference in the Final Survey CADD file using the latest approved NCDOT MicroStation version and *NCDOT CADD Mapping Standards*.

- Complete the *Location & Surveys Project Review Checklist (PRC)* and the applicable QA/QC review following the NCDOT *Quality Management Program: Quality Control and Quality Assurance* procedures.
- Notify the project team, including the Project Manager, that all MicroStation base mapping files and deliverables have been updated to include the requested additional surveys (see 2RD2 and 2RD4 for related information).

Complete Updated Parcel Polygon Mapping

The Parcel Polygon Mapping CADD file defines the parcel's property lines to be used during the right-of-way acquisition stage (4LS1) and allows NCDOT to develop accurate metes and bounds descriptions. The Location & Surveys Locating Engineer is to:

- Compile and prepare an Updated GIS Centroid Property Data Layer utilizing the Statewide ArcGIS Centroid Property Database in conformance with the *Location & Surveys Procedure Memo (Parcel Polygon Procedure In Development)*, and *Location & Surveys Connect Site*.
- Compile and prepare an Updated Parcel Polygon Mapping CADD file utilizing the property mapping in the Final Survey CADD file using the latest approved NCDOT MicroStation version and *NCDOT CADD Mapping Standards*. Complete in conformance with the *Location & Surveys Procedure Memo (Parcel Polygon Mapping In Development)*, and *Location & Surveys Connect Site*.
- Complete the *Location & Surveys Project Review Checklist (PRC)* and the applicable QA/QC review following the NCDOT *Quality Management Program: Quality Control and Quality Assurance* procedures.

Complete Updated Survey Limits Polygon

The Updated Survey Limits Polygon CADD file defines the current boundary of final surveys to be used as a GIS database layer historically documenting the project's survey limits. To complete this task, the Location & Surveys Locating Engineer is to:

- Map the final Survey Limits Polygon (ECTM Boundary or TIN Hull) mapping limits using the latest approved NCDOT MicroStation version and *NCDOT CADD Mapping Standards*. Complete in conformance with the *Location & Surveys Procedure Memo (Survey Limits Polygon Mapping In Development)*, and *Location & Surveys Connect Site*.
- Complete the *Location & Surveys Project Review Checklist (PRC)* and the applicable QA/QC review following the NCDOT *Quality Management Program: Quality Control and Quality Assurance* procedures.

While these tasks and the related deliverables may be completed during Stage 3, task completion may also extend into Stage 4. Complete ROW Acquisition Surveys (4LS1) provides additional details on each task and how to complete the related deliverables.

4LS1 Complete ROW Acquisition Surveys

Overview

Provide right-of-way field delineation, metes, and bounds descriptions, CADD Take Maps and tables, Plan Sheet Exhibits, eminent domain exhibit maps, special acquisition maps and the ROW Series Plan Set in support of right-of-way acquisitions.

References

- ☐ *Location & Surveys Baseline Guidelines*
- ☐ *Location & Surveys CADD Mapping Standards*
- ☐ *Location & Surveys Unit Property Survey Manual*
- ☐ *Location & Surveys Procedure Memos*
- ☐ *Location & Surveys Project Review Checklist*
- ☐ *Location & Surveys File Naming Convention*
- ☐ *North Carolina General Statutes §136-19.4A*
- ☐ *NCDOT Quality Management Program: Quality Control and Quality Assurance*

Deliverables

Deliverable	Task	Responsible Party	
		Activity Leader	Additional Support
ROW Field Delineation [Q]	▪ *Complete ROW Field Delineation*	Locating Engineer	▪ L&S Regional Engineer ▪ Assigned ROW Agent ▪ Assigned Engineering Firm
ROW Metes and Bounds Descriptions, CADD Take Maps and Tables, and Plan Sheet Exhibits [Q]	▪ *Complete ROW Metes and Bounds Descriptions, CADD Take Maps and Tables, and Plan Sheet Exhibits*	Project Data Condemnation Engineer	▪ Assigned ROW Agent ▪ Locating Engineer ▪ Assigned Engineering Firm
Eminent Domain Preliminary Exhibits [Q]	▪ *Complete Eminent Domain Preliminary Exhibits*	Locating Engineer	▪ Project Data Condemnation Engineer ▪ L&S Regional Engineer ▪ Assigned Engineering Firm
Eminent Domain Final Exhibits [Q]	▪ *Complete Eminent Domain Final Exhibits*	Project Data Condemnation Engineer	▪ Attorney General's Office ▪ Locating Engineer ▪ L&S Regional Engineer ▪ Assigned Engineering Firm
Special Acquisition Maps [Q]	▪ *Complete Special Acquisition Maps*	Locating Engineer	▪ L&S Regional Engineer ▪ Assigned ROW Agent ▪ Project Data Condemnation Engineer ▪ Government/Private Agency ▪ Assigned Engineering Firm
ROW Series Plan Set [A, Q]	▪ *Complete ROW Series Plan Set*	Locating Engineer	▪ L&S Regional Engineer ▪ Assigned Engineering Firm

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Complete ROW Field Delineation

Accurate field delineation of proposed right-of-way and easements allows the ROW Agents and property owners to visualize impacts to affected parcels. For this task, the Location & Surveys Locating Engineer is to:

- Verify that ROW authorization has been granted by the Board of Transportation and collaborate with the Project Manager (for information) and Assigned Right-of-Way Agent (for action) to prioritize staking of parcels (See 3RW2 for related information).
- Contact all property owners identified for property acquisition and those properties that may need to be accessed to perform ROW surveys. Contacts are to be made by the appropriate approved letter.
- Perform field right-of-way delineation in accordance with the *Location & Surveys Procedure Memo (ROW Procedures In Development)*. This work includes:
  - Computing and verifying plan locations of proposed right-of-way and easement monuments.
  - Completing field delineation of proposed right-of-way and easement monumentation across all affected parcels in accordance with the set of plans used for acquisition.
- Complete the *Location & Surveys Project Review Checklist (PRC)* and the applicable QA/QC review following the NCDOT *Quality Management Program: Quality Control and Quality Assurance* procedures.

Complete ROW Metes and Bounds Descriptions, CADD Take Maps and Tables, and Plan Sheet Exhibits

Accurate right-of-way metes and bounds descriptions, CADD Take (CT) Maps and Tables, and Plan Sheet Exhibits allow NCDOT to acquire necessary property to construct the project. To do this, the Location & Surveys Project Data Condemnation Engineer is to:

- Collaborate with the Project Manager (for information) and Assigned Right-of-Way Agent (for action) to prepare ROW metes and bounds descriptions, CADD Take (CT) Maps and Tables for the entire project.
- Compile and prepare CADD Take (CT) Maps and Tables Mapping CADD file utilizing the Parcel Polygon Mapping and Right-of-Way Plan Set CADD file (see 2RD4 for related information) using the latest approved NCDOT MicroStation version and *NCDOT CADD Mapping Standards*. Complete in conformance with the *Location & Surveys Procedure Memo (Deed Description Procedure In Development)*, and *Location & Surveys Connect Site*.
- Compile and prepare ROW metes and bounds descriptions utilizing the CADD Take (CT) Maps and Tables Mapping CADD file using the latest approved NCDOT MicroStation version. Complete in conformance with the *Location & Surveys Procedure Memo (Deed Description Procedure In Development)*, and *Location & Surveys Connect Site*.
- Compile and prepare a Plan Sheet Exhibit (Formerly PCM) using the latest approved NCDOT MicroStation version and *NCDOT CADD Mapping Standards* to be utilized in the litigation process by the Attorney General's Office.

- Complete the Location & Surveys Project Review Checklist (PRC) and the applicable QA/QC review following the NCDOT Quality Management Program: Quality Control and Quality Assurance procedures.
- Provide ROW metes and bounds descriptions, CADD Take (CT) Maps and Tables, and Plan Sheet Exhibits in PDF format to Project Manager (for information) and Assigned Right-of-Way (for action) in accordance with *Location & Surveys Procedure Memo* (Deed Description Procedure In Development) (See 4RW1 for related information).
- Provide Plan Sheet Exhibits in PDF format to the Attorney General's Office. (See 4RW1 for related information).

Complete Eminent Domain Preliminary Exhibits

NCDOT uses eminent domain preliminary exhibits in the condemnation process for preparation of the eminent domain final exhibit. Exhibits are to be prepared in accordance with North Carolina General Statutes §136-106 and are on a strict schedule mandated by this statute. To support the preparation of these exhibits, the Location & Surveys Locating Engineer is to:

- Collaborate with the Project Data and Condemnation Engineer to compile and prepare Preliminary Eminent Domain Exhibits (See 4RW1 for related information) using the latest approved NCDOT MicroStation version and *NCDOT CADD Mapping Standards* to produce an Eminent Domain Preliminary Exhibit utilized by the Project Data and Condemnation Engineer in conformance with the *Location and Surveys Unit Property Survey Manual*.
- Complete the *Location & Surveys Project Review Checklist (PRC)* and the applicable QA/QC review following the NCDOT *Quality Management Program: Quality Control and Quality Assurance* procedures.
- Provide Eminent Domain Preliminary Exhibits in CADD and PDF formats to the Location & Surveys Project Data and Condemnation Engineer in conformance with the *Location and Surveys Unit Property Survey Manual*.

Complete Eminent Domain Final Exhibits

NCDOT uses eminent domain final exhibits in the condemnation process for both mediation and as a courtroom exhibit. Exhibits are to be prepared in accordance with North Carolina General Statutes §136-106 and are on a strict schedule mandated by this statute. To support the preparation of these exhibits, the Location & Surveys Project Data and Condemnation Engineer is to:

- Collaborate with the Locating Engineer to compile and prepare Preliminary Eminent Domain Exhibits (See 4RW1 for related information) using the latest approved NCDOT MicroStation version and *NCDOT CADD Mapping Standards* to produce an Eminent Domain Exhibit utilized by the Attorney General's Office in conformance with the *Location and Surveys Unit Property Survey Manual*.
- Collaborate, if needed with North Carolina Attorney General's Office to complete the Final Eminent Domain Exhibits.
- Complete the *Location & Surveys Project Review Checklist (PRC)* and the applicable QA/QC review following the NCDOT *Quality Management Program: Quality Control and Quality Assurance* procedures.

- Provide Eminent Domain Final Exhibits in PDF format to Right-of-Way Unit (for information) and Attorney General's Office (for action) in conformance with the *Location and Surveys Unit Property Survey Manual*.

Complete Special Acquisition Maps

NCDOT uses special acquisition maps to acquire necessary property to construct the project. Maps are to be prepared in accordance with individual government or private agency requirements. To support the preparation of these maps, the Location & Surveys Locating Engineer is to:

- Compile and prepare special acquisition maps using the latest approved NCDOT MicroStation version and *NCDOT CADD Mapping Standards*. Complete in conformance with the individual governmental or private agency requirements. This work may include:
  - Railroad Easement Maps (See 3ST1 and 3RR1 for related information)
  - Federal Energy Regulatory Commission (FERC Map)
  - American Land Title Association (ALTA Map).
  - Department of the Interior (Federal Refuge and Park Land Maps)
  - Department of Defense (Military Installations)
- Complete the *Location & Surveys Project Review Checklist (PRC)* and the applicable QA/QC review following the NCDOT *Quality Management Program: Quality Control and Quality Assurance* procedures.

Complete ROW Series Plan Set

The ROW Series Plan Set provides information necessary for re-establishment of all permanent right-of-way, control of access, and permanent easement monumentation by NCDOT or private surveyors. This Plan Set is used as documentation for ROW acquisition in combination with the Roadway Plans. When Roadway Plans have not been developed, a stand-alone ROW Series Plan Set may be used in lieu of a Recorded 47-30 Plat. The ROW Series Plan Set is prepared in accordance with *North Carolina General Statutes §136-19.4A*. To complete the ROW Series Plan Set, the Location & Surveys Locating Engineer is to:

- Complete the ROW Series D, E, and RW Sheets using the Right-of-Way Plan Set (See 2RD4 and 4RW1 for related information) or the scoped ROW acquisition surveys in lieu of ROW Plan Set with the latest approved NCDOT MicroStation version and *NCDOT CADD Mapping Standards*.
- Ensure this deliverable conforms to the *Location & Surveys Procedure Memo PROC 2018-3, Location & Surveys Procedure Memo PROC 2018-5*, *Location & Surveys Connect Site* and *Location & Surveys File Naming Convention*.
- Complete the *Location & Surveys Project Review Checklist (PRC)* and the applicable QA/QC review following the NCDOT *Quality Management Program: Quality Control and Quality Assurance* procedures.

5LS1 Provide Construction Surveys and Mapping

Overview

Provide photogrammetric control, unmanned aircraft vehicle surveys, additional surveys and mapping, and construction surveys in support of the construction phase.

References

- ☐ Location & Surveys DTM Manual
- ☐ Location & Surveys GPS Guidelines
- ☐ Location & Surveys Coordinate Systems
- ☐ Location & Surveys CADD Mapping Standards
- ☐ Location & Surveys Baseline Guidelines
- ☐ Location & Surveys Procedure Memos
- ☐ Location & Surveys Project Review Checklist
- ☐ Location & Surveys File Naming Convention
- ☐ Mobile and Terrestrial LiDAR Guidelines
- ☐ Manual for Construction Layout
- ☐ NCDOT Quality Management Program: Quality Control and Quality Assurance

Deliverables

Deliverable	Task	Responsible Party	
		Activity Leader	Additional Support
Photogrammetric Control for Construction Panels (Localized Datum) [Q]	▪ *Complete Photogrammetric Control for Construction Panels (Localized Datum)*	Locating Engineer	• Resident Engineer • Photogrammetry Unit • Assigned Engineering Firm
Unmanned Aircraft Vehicle Construction Support [Q]	▪ *Complete Unmanned Aircraft Vehicle Construction Support*	Locating Engineer	• Resident Engineer • Division of Aviation • Photogrammetry Unit • Assigned Engineering Firm
Additional Surveys [Q]	▪ *Complete Additional Field Surveys and Revise Project Mapping*	Locating Engineer	• Resident Engineer • Other Technical Disciplines or Unit Leads • Assigned Engineering Firm
Construction Survey Support [Q]	▪ *Complete Construction Survey Support*	Locating Engineer	• Resident Engineer • Other Technical Disciplines or Unit Leads • Assigned Engineering Firm

[Q] *Indicates that final document(s) or data set(s) requires review in accordance with NCDOT Quality Management Program: Quality Control and Quality Assurance.*

Complete Photogrammetric Control for Construction Panels (Local Datum)

With photogrammetric control being critical to orient aerial photography onto a localized North Carolina State Plane Coordinate System, the Location & Surveys Locating Engineer is to:

- Conform to Field Procedures, 6B.3-3 in the *Location & Surveys GPS Guidelines,* perform panel control target surveys where panel targets are placed according to a panel plan provided by the Photogrammetry Unit (See 5PH1 for related information).
- Process and develop panel control in accordance with Office Procedures, 6B.3-4 from the *Location & Surveys GPS Guidelines*.
- Complete the *Location & Surveys Project Review Checklist (PRC)* and the applicable QA/QC review following the NCDOT *Quality Management Program: Quality Control and Quality Assurance* procedures.
- Provide panel control to the Photogrammetry Unit, considering:
  - Panel control text file (Local Datum) to the Photogrammetry Unit to orient aerial photography.
  - Include both Grid/Local northing, easting, and elevation projected onto the North Carolina State Plane Coordinate System.

Complete Unmanned Aircraft Vehicle Construction Support

The use of Unmanned Aircraft Vehicles in support of construction and/or additional surveys and mapping, the Location & Surveys Locating Engineer is to:

- Collaborate with the Resident Engineer in support of earthwork quantities that include but are not limited to borrow pits, project corridors, and project site developments.
- Collaborate with the Resident Engineer to provide aerial photography and/or aerial videography for documenting project progress, erosion control monitoring and incident violations.
- Collaborate with the Resident Engineer to obtain additional survey mapping for the completion of design and construction revisions.

Complete Additional Field Surveys and Revise Project Mapping

Building on the work done in 2LS1, 2LS2, 3LS1 and as needed for the project, the Location & Surveys Locating Engineer is to:

- Collaborate with the Photogrammetry Unit for readily available mapping and/or additional flight control to fly and compile planimetric mapping and ground elevation data (See 5PH1 for related information).
- Coordinate with the appropriate disciplines/Units to confirm the Latest Survey CADD File(s).
- Confirm that all property owners impacted by the mapping limits and those properties accessed to perform required additional surveys were contacted. Contacts are to be made by letter, phone, or in person and is to be documented.
- Establish additional secondary control (Baseline) and benchmarks (Vertical) in accordance with the *Location & Surveys GPS Guidelines*, *Location & Surveys Baseline Guidelines*, and *Location & Surveys Coordinate Systems.*
- Develop Primary and/or Secondary Survey Control Sheets (C-Series) by computing existing alignments (ELN) and compiling both C-Series right-of-way sheets using the latest approved

NCDOT MicroStation version and *NCDOT CADD Mapping Standards*. Complete in conformance with the *Location & Surveys Baseline Guidelines*, *Location & Surveys Procedure Memos*, and *Location & Surveys Connect Site*.

- Conform to the *NCDOT CADD Mapping Standards,* complete planimetric classification that includes field classifying and labeling existing planimetric features referenced in the Final Survey CADD File and map per the latest approved NCDOT MicroStation version.
- Perform and/or obtain pavement and ground DTMs in accordance with the *Location & Surveys DTM Manual* and *Mobile and Terrestrial LiDAR Guidelines*. This includes developing the Final Terrain Model CADD file using the latest approved NCDOT MicroStation version and *NCDOT CADD Mapping Standards*.
- Perform hydrographic surveys in accordance with the *Location & Surveys DTM Manual* and *Location & Surveys Hydro Manual* to obtain hydrographic features and are referenced in the Final Survey CADD file using the latest approved NCDOT MicroStation version and *NCDOT CADD Mapping Standards*.
- In accordance with the *Location & Surveys SUE Guidelines*, perform subsurface utility surveys (per scope) by:
  - Obtaining subsurface utility data and referencing in the Final Survey CADD file using the latest approved NCDOT MicroStation version and *NCDOT CADD Mapping Standards*.
  - Providing the subsurface utility CADD file using the latest approved NCDOT MicroStation version and *NCDOT CADD Mapping Standards* to obtain linear footage.
- Develop property mapping by performing courthouse research, reconning and locating monumentation, requesting the Right-of-Way Abstract, and investigating as-builts and maps according to records and monumentation. Reference in the Final Survey CADD file using the latest approved NCDOT MicroStation version and *NCDOT CADD Mapping Standards*.
- Complete the *Location & Surveys Project Review Checklist (PRC)* and the applicable QA/QC review following the NCDOT *Quality Management Program: Quality Control and Quality Assurance* procedures.
- Notify the project team, including the Project Manager, that all MicroStation base mapping files and deliverables have been updated to include the requested additional surveys (See 5CS1 for related information).

Complete Construction Survey Support

Accurate construction stakeout is necessary for the timely completion of transportation facility projects, the Location & Surveys Locating Engineer, is to:

- Coordinate with the appropriate disciplines/Units to confirm the Latest CADD File(s).
- Perform construction surveys as directed and in accordance with the *Manual for Construction Layout.*
- Complete the *Location & Surveys Project Review Checklist (PRC)* and the applicable QA/QC review following the NCDOT *Quality Management Program: Quality Control and Quality Assurance* procedures.

5LS2 Perform Verification of Right-of-Way and As-Built Surveys

Overview

Perform verification of all permanent right-of-way, control of access and permanent easement monumentation and provide final ROW Series Plan Set. Complete as-built surveys at the time of project completion.

References

- ☐ *Location & Surveys Baseline Guidelines*
- ☐ *Location & Surveys Procedure Memos*
- ☐ *Location & Surveys CADD Mapping Standards*
- ☐ *Location & Surveys Procedure Memo PROC 2018-3*
- ☐ *Location & Surveys Project Review Checklist*
- ☐ *Location & Surveys Procedure Memo PROC 2018-6*
- ☐ *Location & Surveys Procedure Memo PROC 2018-5*
- ☐ *NCDOT Quality Management Program: Quality Control and Quality Assurance*

Deliverables

Deliverable	Task	Responsible Party	
		Activity Leader	Additional Support
Final ROW Field Delineation [Q]	▪ *Complete Final ROW Field Delineation*	Locating Engineer	▪ Resident Engineer ▪ Assigned ROW Agent • Assigned Engineering Firm
Final ROW Series Plan Set [A, Q]	▪ *Complete Final ROW Series Plan Set*	Locating Engineer	• Resident Engineer • Assigned Engineering Firm
As-Built Surveys [Q]	▪ *Complete As-Built Surveys*	Locating Engineer	• Resident Engineer • Other Technical Disciplines or Unit Leads • Assigned Engineering Firm

[A] *Indicates that final document(s) or data set(s) must be uploaded to the ATLAS Workbench.*
[Q] *Indicates that final document(s) or data set(s) require review in accordance with NCDOT Quality Management Program: Quality Control and Quality Assurance.*

Complete Final ROW Field Delineation

Accurate field delineation of recorded right-of-way and permanent easements provides information necessary for re-establishment of all permanent right-of-way, control of access, and permanent easements owned by NCDOT. For this task, the Location & Surveys Locating Engineer is to:

- Perform final field right-of-way delineation in accordance with the *Location & Surveys Procedure Memo (ROW Procedures In Development)*. This work includes:
  - Computing and verifying plan locations of final permanent right-of-way and permanent easement monumentation.
  - Completing field delineation of final permanent right-of-way and permanent easement monumentation across all affected parcels in accordance with the set of plans used for acquisition.

- Complete the *Location & Surveys Project Review Checklist (PRC)* and the applicable QA/QC review following the NCDOT *Quality Management Program: Quality Control and Quality Assurance* procedures.

Complete Final ROW Series Plan Set

The Final ROW Series Plan Set provides information necessary for re-establishment of all permanent right-of-way, control of access, and permanent easement monumentation by NCDOT or private surveyors. The plan set is prepared in accordance with *North Carolina General Statutes §136-19.4A*. To complete the Final ROW Series Plan Set, the Location & Surveys Locating Engineer is to:

- Complete the Final ROW Series D, E, and RW Sheets using the current ROW Plan Set (See 5RD1 for related information) with the latest approved NCDOT MicroStation version and *NCDOT CADD Mapping Standards*.
- Ensure this deliverable conforms to the *Location & Surveys Procedure Memo PROC 2018-3, Location & Surveys Procedure Memo PROC 2018-5*, *Location & Surveys Connect Site* and *Location & Surveys File Naming Convention*.
- Complete the *Location & Surveys Project Review Checklist (PRC)* and the applicable QA/QC review following the NCDOT *Quality Management Program: Quality Control and Quality Assurance* procedures.
- Notify the Assigned Right of Way Agent or Central Right of Way office (Procedure In Development), including the Project Manager that the ROW Series Plan Set have been updated in accordance with *Location & Surveys Procedure Memo PROC 2018-3, Location & Surveys Procedure Memo PROC 2018-5*, *Location & Surveys Connect Site* and *Location & Surveys File Naming Convention*. (See 5RW1 and 5CS1 for related information).

Complete As-Built Surveys

As-Built Surveys provide a record or accurate representation of the projects' infrastructure at the time of completion. To complete this task, the Location & Surveys Locating Engineer is to:

- *Procedures In Development*

2PD1 Complete Pavement Design

Overview

Coordinate Geotechnical Pavement Design Investigation (PDI) with the Geotechnical Engineering Unit; evaluate condition of existing pavement; and produce the Final Pavement Design Memo that includes pavement designs for all roads, ramps, and loops (including minimum overlay requirements).

References

- ☐ *NCDOT Pavement Design Procedure*
- ☐ *NCDOT Quality Management Program: Quality Control and Quality Assurance*

Deliverables

Deliverable	Task	Responsible Party	
		Activity Leader: Pavement Design Engineer	Additional Support
Final Pavement Design Memo	▪ *Coordinate Geotechnical Pavement Design Investigation (PDI)*	X	Geopavement Engineer
	▪ *Evaluate Condition of Existing Pavement*	X	
	▪ *Review Traffic Forecast*	X	Traffic Forecast Engineer
	▪ *Determine Alternative Pavement Designs for New Locations and Widenings*	X	Roadway Design Lead
	▪ *Determine Treatment of Existing Pavement and Minimum Overlay Requirements*	X	Roadway Design Lead
	▪ *Perform Life-Cycle Cost Analysis on Pavement Alternatives*	X	
	▪ *Prepare Pavement Review Package Presenting Alternatives*	X	
	▪ *Select Pavement Design Alternatives at Pavement Review Committee Meeting*	X	Pavement Review Committee
	▪ *Determine if Shoulder Drains are Required*	X	
	▪ *Prepare Final Pavement Design Memo*	X	Project Manager

Coordinate Geotechnical Pavement Design Investigation (PDI)

The Pavement Design Engineer coordinates with the Geotechnical Engineering Unit to determine if a PDI is required for the project.

- If so, confirm that the project has a PDI scheduled.
  - If no PDI is scheduled, request that the Geotechnical Engineering Unit adds this to the list of PDIs to be performed.
  - Determine the estimated completion date of the PDI.
  - Determine if supplementary or preliminary PDI activities should be performed by the Materials & Tests Unit and/or a consultant to help accelerate the pavement design prior to receiving the full PDI from the Geotechnical Engineering Unit or to augment the data acquired during the PDI.

- If no PDI is required, determine if a pavement investigation (a simplified PDI performed by the Materials & Tests Unit) is required.
  - If yes, schedule the Materials & Tests pavement investigation.
  - If no, use historical data (obtained from the pavement management system database, as-built construction drawings, old pavement design files, or conversations with Division personnel) for the pavement design.

Evaluate Condition of Existing Pavement

The Pavement Design Engineer reviews the pavement condition information contained in the pavement management system. This review includes:

- Reviewing historical imagery of the roadway.
- Reviewing as built and letting plans of previous projects (if available).
- Performing a site visit to verify the pavement condition and review pavement drainage and other considerations.
- If required, performing Materials & Tests pavement investigation, including additional coring and/or dynamic cone penetration (DCP) testing and/or falling weight deflectometer (FWD) testing.

Review Traffic Forecast

To review the traffic forecast for reasonableness and completeness, the Pavement Design Engineer:

- Obtains the most updated traffic forecast diagrams. These documents are produced by Transportation Planning Division/Technical Services Unit and are typically available on the respective project SharePoint site.
- Determines if supplementary traffic information is required.
  - If required, work with the Project Manager and/or the Division to obtain additional information not contained within the traffic forecasts or the Traffic Survey Group's website.

Determine Alternative Pavement Designs for New Locations and Widenings

The Pavement Design Engineer follows the *Pavement Design Procedure* to produce alternate pavement designs (as required) depending on project type, project length, traffic level, and complexity.

Determine Treatment of Existing Pavement and Minimum Overlay Requirements

Based on the information from the roadway design plans (in support of developing the Design Recommendation Plan Set; see 2RD1), traffic forecast, PDI, and pavement condition evaluations, the Pavement Design Engineer determines the minimum treatments required to confirm structural adequacy of the existing pavements.

- The minimum treatments are included in the Pavement Review Package and in the Final Pavement Design Memo, as discussed below.
- In cases of significant overlays, the Pavement Design Engineer coordinates with the Project Manager and Roadway Design Lead to verify if this is acceptable, or if other options need to be considered in order to meet roadway profile elevation/overhead clearance requirements.

Perform Life-Cycle Cost Analysis on Pavement Alternatives

Using the alternative pavement designs and existing treatment options proposed, the Pavement Design Engineer then:

- Calculates quantities,
- Obtains unit cost information from the Contract Standards and Development Unit or applicable Division estimating staff, and
- Calculates life-cycle costs per NCDOT's *Life-Cycle Cost policy*.

Prepare Pavement Review Package Presenting Alternatives

The Pavement Design Engineer combines the current roadway design plans, traffic forecast, pavement condition, pavement design, geotechnical, and life-cycle cost information into a simplified package for review by the Pavement Review Committee. To provide timely review, the Pavement Design Engineer is to consider the following:

- The Pavement Review Committee meets monthly.
- Email the Pavement Review Package to the committee one week before the meeting.
- Committee membership is defined in the *NCDOT Pavement Design Procedure*.

Select Pavement Design Alternatives at Pavement Review Committee Meeting

The Pavement Review Committee follows the *NCDOT Pavement Selection policy* to select the chosen alternative(s), considering information in the pavement review package, as well as additional information brought up by Pavement Review Committee members.

Determine if Shoulder Drains are Required

The Pavement Design Engineer is to determine if shoulder drains are required for the project based on current roadway design plans (e.g., profile and cross section), project size, traffic level, and geotechnical information. For unique situations, the Pavement Design Engineer is to reach out to the Geotechnical Engineering Unit for input.

Prepare Final Pavement Design Memo

To complete the Pavement Design Memo, the Pavement Design Engineer summarizes final pavement design determinations to include:

- The selected pavement designs for the requested alignments on the project.
- The selected treatment for existing pavement for the requested alignments on the project.
- Shoulder drains requirements, if needed for the project.

The Pavement Design Engineer also provides the Roadway Design Lead with additional information, such as additional geotechnical information and quantities if available in the PDI. This information assists the Roadway Design Lead when developing the typical sections and quantity calculations.

- If the design is provided by a Division, a Division representative is required to seal the plan sheets.

Complete QC/QA Procedures

The Pavement Design Engineer is to coordinate the applicable QC review following the *NCDOT Quality Management Program: Quality Control and Quality Assurance* procedures and the respective QC Checklist before upload and distribution of all related deliverables.

3PD1 Verify and Revise Pavement Design

Overview

Verify that the Final Pavement Design Memo is still valid, review typical sections, and establish shoulder drain details, drain locations, and outlet locations.

References

- ☐ *NCDOT Pavement Design Procedure*
- ☐ *NCDOT Quality Management Program: Quality Control and Quality Assurance*

Deliverables

Deliverable	Task	Responsible Party	
		Activity Leader	Additional Support
		Pavement Design Engineer	Roadway Design Lead
Final Pavement Design Verification Memo	▪ *Review Pavement Design and Current Pavement Conditions*	X	X
	▪ *Prepare Verification Memo*	X	X
Typical Section Review Email	▪ *Prepare Email on Typical Section Issues*	X	
Shoulder Drain Memo	▪ *Prepare Complete Shoulder Drain Memo*	X	X

Review Pavement Design and Current Pavement Conditions

In the initial step of verifying the Final Pavement Design Memo, the Pavement Design Engineer is to:

- Review the pavement design to verify adequacy based on current NCDOT specifications, current NCDOT pavement design procedures, updated traffic information (if any), current roadway design plans (including changes to the alignment configuration, profile, or cross section; the addition or removal of Y lines) and additional geotechnical information (if any).
- Review the updated pavement condition information contained in the pavement management system, which involves a:
  - Review of any historical imagery of the roadway taken after the final pavement design was completed in 2PD1.
  - Review as built and letting plans of projects that have taken place on the roadway since the completion of the final pavement design (if any).
  - Perform a site visit to verify pavement condition, if required.
- Work with the Roadway Design Lead, Project Manager, and other relevant parties, to adjust the design as necessary.
  - In these cases, options that do not change the roadway elevation or cross slope as currently set in the Design Recommend Plan Set are to be used.

Prepare Verification Memo

The Pavement Design Engineer provides a memo that verifies the final pavement design as previously provided and/or includes necessary modifications and updates. This includes:

- Providing pavement designs for newly added Y lines or temporary pavements.

- Adjusting pavement thicknesses to match curb and gutter elevations if paved shoulders were changed to curb and gutter.
- Changing mix type due to an increase in traffic from an updated traffic forecast, etc.
- Changing treatment of existing pavement.

Prepare Email on Typical Section Issues

For the Pavement Design Engineer to seal the typical sections and confirm that the pavement can be constructed to provide reliable and cost-effective performance, the Pavement Design Engineer:

- Reviews the typical sections to verify accuracy/compliance to the Final Pavement Design Memo and the verification memo.
- Prepares email documentation on issues, coordinating with relevant parties to correct issues with the typical sections, if any.

Complete Shoulder Drain Memo

For shoulder drains required on the project as determined under 2PD1, the Pavement Design Engineer is to:

- Select or develop the appropriate shoulder drain details by obtaining the most recent pavement profile, cross section, and plan information from the Roadway Design Unit.
- Determine shoulder drain locations and outlet locations based on the roadway's geometry.
- Determine outlet locations based on the project topography and the locations of existing and/or proposed drainage structures.
- Prepare the Shoulder Drain Memo for the Roadway Design Lead to present as recommendations for the shoulder drain details, summarizing the locations of shoulder drains and outlet locations.

The Pavement Design Engineer coordinates this information with the Roadway Design Lead for use when developing the roadway design plans.

Complete QC/QA Procedures

The Pavement Design Engineer is to coordinate the applicable QC review following the NCDOT *Quality Management Program: Quality Control and Quality Assurance* procedures and the respective QC Checklist before upload and distribution of all related deliverables.

5PD1 Pavement Construction Support

The Pavement Design Engineer provides the following support during the Construction Phase:

- Provides technical expertise and answers questions on the project's pavement design
- Completes Construction Revision (as needed): Perform construction revisions of the latest version of the Let Plans (see 5CS1 for related information) to address identified field issues
- Performs pavement test (as needed) when field questions arise regarding specifications

1PH1 Provide Best Available Geospatial Data

Overview

Upon request, obtain, analyze, and provide best available orthoimagery, elevation data, and county GIS property data for the project area or train customers who wish to obtain the data on their own. If needed, provide more current data by flying the project area and delivering either an orthophoto with elevation data or small-scale topographic mapping with elevation data and an orthophoto.

Note: *Actions during the Project Initiation Stage may be led and completed by staff from several different NCDOT groups. Any person who has overall responsibility for a project during this Stage is referred to as the "Project Lead." This lead could be the Feasibility Studies Engineer, the Corridor Development Engineer, the Division Planning Engineer, or someone in a similar role as tasked by a state or local agency.*

References

- ☐ Photogrammetry Resource Page
- ☐ *NCDOT Quality Management Program: Quality Control and Quality Assurance*

Deliverables

Deliverable	Task	Responsible Party	
		Activity Leader	Additional Support
Orthoimagery [Q]	▪ *Obtain Orthoimagery*	Photogrammetry Assistant Unit Head	Project Lead
Elevation Data (NCDOT login) [Q]	▪ *Obtain Elevation Data (NCDOT or Custom)*		
County GIS Property Data [Q]	▪ *Obtain County GIS Property Data*		
Small-Scale Topographic Mapping [Q]	▪ *Provide More Current Mapping Product*		

[Q] *Indicates that final document(s) or data set(s) requires review in accordance with the NCDOT Quality Management Program: Quality Control and Quality Assurance.*

Obtain Orthoimagery

The Project Lead can access orthoimagery (3-band RGB Color imagery at 0.5-foot GSD) on his/her own through the instructions provided on the Photogrammetry Resource Page or submit a request to the Photogrammetry Unit.

Obtain Elevation Data (NCDOT or Custom)

The Project Lead can obtain Quality Level 2 (QL2) Aerial LiDAR elevation data (Bare Earth or DEM) on his/her own or submit a request to the Photogrammetry Unit for LiDAR elevation data on the Photogrammetry Resource Page. Output from the tool is an ASCII formatted file with an *.DAT extension for use with Bentley MicroStation and Bentley Connect/ORD.

Obtain County GIS Property Data

The Project Lead submits a request to the Photogrammetry Unit for County GIS Property Data in a MicroStation or ArcGIS format. Alternatively, the Project Lead can download County GIS Property Data in an ArcGIS format from NC OneMap. The Photogrammetry Resource Page details the process used by Photogrammetry Unit staff to convert ArcGIS County Property Data to a MicroStation format.

Provide More Current Mapping Product

If the Project Lead determines that the best available geospatial data is obsolete, the Project Lead submits a request to the Photogrammetry Unit to obtain current mapping. The Photogrammetry Resource Page includes instructions on how to request photogrammetric mapping and the process used by Photogrammetry Unit to produce mapping. This work includes:

- Obtaining controlled aerial photography (see 1LS1 for related information)
- Compiling elevation data
- Creating the orthoimagery
- Compiling topographic mapping

Complete QC/QA Procedures

The Photogrammetry Assistant Unit Head is to coordinate the applicable QC review following the *NCDOT Quality Management Program: Quality Control and Quality Assurance* procedures and the respective QC Checklist before upload and distribution.

1PH2 Compile Aerial Photography & Mapping

Overview

Upon request, obtain controlled aerial photography that covers the project mapping limits to ensure horizontal and vertical mapping accuracies are achieved. Use in-house staff or a Private Engineering Firm to perform aerotriangulation using ground survey control provided by the Location and Surveys Unit and airborne GNSS-IMU control, compiling planimetric and digital terrain mapping data, and creating a digital mosaic.

References

- ☐ Photogrammetry Resource Page
- ☐ *NCDOT Quality Management Program: Quality Control and Quality Assurance*

Deliverables

Deliverable	Task	Responsible Party	
		Activity Leader Photogrammetry Assistant Unit Head	Additional Support
Controlled Aerial Photography (and all related plans)	▪ *Schedule and Fly Project*	X	Location and Survey Unit and Aviation Unit
Large Scale Mapping [Q] (Planimetric with Surface model)	▪ *Providing Mapping Product*	X	
Digital Mosaic [Q]		X	
Airborne Survey reports [Q]		X	

[Q] *Indicates that final document(s) or data set(s) requires review in accordance with the NCDOT Quality Management Program: Quality Control and Quality Assurance.*

Schedule and Fly Project

Controlled aerial photography requires coordination with both the Location and Surveys Unit and the Aviation Unit. This involves the following steps:

- Create a Flight and Ground Control Survey Plan that shows the proposed flight lines for the project with specific flying heights, forward overlap, and side overlap that optimally facilitates aerotriangulation to ensure horizontal and vertical mapping accuracies are achieved.
- Obtain ground control survey (see 1LS1 for related information).
  - The Photogrammetry Unit creates a ground control plan that shows the approximate location of proposed ground control targets (panels).
  - The panel plan is submitted to the Location and Surveys Unit to layout out the panels and to survey coordinates for each panel point.
  - The Location and Surveys Unit localizes the control coordinates to the project control network.
- Upon notification of completion of the panels, the Photogrammetry Unit coordinates with the Aviation Unit to fly the project to obtain the aerial photography.
- After the project has been flown, the Photogrammetry Unit completes post-processing for both the aerial photography and the GNSS-IMU data that was collected during the flight.

Provide Mapping Product

Once the aerial photography is obtained and all data posted processed, the Photogrammetry Unit either uses in-house staff or a Private Engineering Firm to complete the mapping product. The Photogrammetry Unit is to localize all ancillary support data to the project control network. Aerotriangulation using the ground surveyed panel coordinates is performed next to establish accurate exterior orientation parameters for each photograph.

An Aerotriangulation Report is completed, sealed and certified by an NC PLS, if the work is contracted with a Private Engineering Firm. The planimetric mapping and ground elevation data is also compiled, and a digital mosaic completed, while the mapping is compiled.

Complete QC/QA Procedures

The Photogrammetry Assistant Unit Head is to coordinate the applicable QC review following the *NCDOT Quality Management Program: Quality Control and Quality Assurance* procedures and the respective QC Checklist before upload and distribution.

3PH1 Update Existing Mapping or Extend Mapping

As needed, the Photogrammetry Unit may reengage in later stages if additional survey is required (see the Location and Surveys section for related information). The additional work during Stage 2 or 3 could involve generating additional mapping from previous flights and/or conducting new flights (to inform new mapping) using the process described in this 1PH2.

5PH1 Photogrammetry Construction Support

The Photogrammetry Unit provides the following support during the Construction Phase:

- Provide technical expertise and answers questions on the project's imagery or data needs
- Complete construction earthwork quantity determinations (as requested)
- Support the Location and Surveys Unit regarding Photogrammetric Control for Construction Panels, including conducting manned or UAV flights (see 5LS1 for related information)
- Coordinate with the Location and Surveys Unit regarding any revised project mapping (see 5LS1 for related information)

1PI1 Initiate Public Engagement Tasks

Overview

Required as part of the environmental process, ensure stakeholder input is received and the public is informed on the project, providing transparency in the public engagement process.

Note: *Actions during the Project Initiation Stage may be led and completed by staff from several different NCDOT groups. Any person who has overall responsibility for a project during this Stage is referred to as the "Project Lead." This lead could be the Feasibility Studies Engineer, the Corridor Development Engineer, the Division Planning Engineer, or someone in a similar role as tasked by a state or local agency.*

References

- ☐ *Public Involvement Guidelines*
- ☐ *Public Involvement Practitioner's Guide*
- ☐ Public Engagement Toolkit
- ☐ *Visualization Products*
- ☐ *Visualization Request Form*
- ☐ *Statewide Public Involvement Plan*

Deliverables

Deliverable	Task	Responsible Party	
		Activity Leader	Additional Support
		Public Involvement Lead/PICSVIz	Public Involvement Team Member/ Communications Officer
RPO/MPO CTP/LRTP Outreach Documentation	▪ *Outreach Before/During State Transportation Improvement Program (STIP) Development*	X	
Public Involvement Plan (PIP) [A]	▪ *Develop the Draft Public Involvement Plan (PIP)*	X	X

[A] *Indicates that final document(s) or data set(s) must be uploaded to the ATLAS Workbench.*

Outreach Before/During State Transportation Improvement Program (STIP) Development

The Project Lead develops an Environmental Tracking and Coordination System (ETRACS) request to solicit Public Involvement support. If ETRACS access is unavailable, the Project Lead sends an email to the Public Involvement, Community Studies & Visualization (PICSViz) Group Leader requesting Public Involvement support. The Public Involvement Lead then documents the following related to this task:

- Document and upload, to project files, both process-and project-specific Metropolitan and/or Rural Planning Organization (MPO/RPO) or local government public outreach efforts for NCDOT use and Title VI documentation.
- Document and upload, to project files, both process and project-specific Strategic Prioritization Office (SPOT) outreach efforts

- Upload, to project files, preliminary screenings prior to the Project Scoping Report that includes Community Studies' Community Screenings for areas of potential concern and Public Involvement's initial recommendations as part of the Public Involvement Plan (PIP). The PIP is to be scaled to the project and is reviewed prior to Notice to Proceed to determine if updates are needed.

Conduct STIP Outreach

The Public Involvement Lead assists in development of the State Transportation Improvement Program (STIP), including:

- Coordination on projects included at each level of the STIP.
- Communication on project schedules and specific public outreach needs.

Participate in the Project Initiation Meeting

In collaboration with the Project Manager (when the project is transitioned to the Project Manager from the Project Lead), the Public Involvement Lead, along with the Communications Officer, participates in the Project Initiation Meeting to address any future public engagement and communication strategies, so that input on the stakeholder process is identified early. The level of public engagement and outreach needed for a project depends on several factors, including:

- Type, size, and duration of the project
- Complexity of the project and project area
- Significance of direct, indirect, cumulative, recurring, and disproportionate impacts
- Resource notability and sensitivity
- Number of partners and sources of potential funding
- Anticipated controversy
- Type of visualizations needed (e.g., illustrations, renderings, photo simulations, animation, drone photography, etc.)

The availability of the Community Screening (see 1EN1 for related information) is foundational for the Public Involvement Lead to reference when identifying the level of public outreach and to further develop the PIP.

Develop the Draft Public Involvement Plan (PIP)

The Project Manager sends an ETRACS request to Public Involvement to review a draft Public Involvement Plan (PIP) developed by the consultant. The purpose of a PIP is for NCDOT staff, local and regional partners, and consultants/contractors to work in concert throughout a project when developing:

- An understanding of community resources and demographics,
- What information is to be exchanged between the stakeholders and NCDOT, and
- The best ways to engage and inform the public and stakeholders for decision making.

The Public Involvement Lead works with the project team to develop the draft PIP, which becomes a part of the Project Scoping Report (see 1FS2 for related information). At this stage, the draft PIP is to initially address the following project details, all of which are finalized as part of 2PI1.

- Project overview
- Goals and objectives for outreach on the project, in part based on findings in the Community Understanding Report and Project Sheet
- Key messages to communicate to the public
- Project-specific or potentially controversial issues from local knowledge, the Community Understanding Report, project sheets, or Community Screening
- Potential for Environmental Justice, Limited English Proficiency, or other Title VI considerations
- Stakeholders and interested groups, including special populations such as the elderly, college students, or business owners
- Public engagement roles and responsibilities
- Commitments made to stakeholders in previous project phases
- Potential communication methods/outreach tools
- Preliminary schedule for public engagement activities
- Measures for evaluating the success of the public outreach program

As a dynamic document, the Public Involvement Lead and Communications Officer, in collaboration with the Project Lead/Manager, updates the PIP throughout the design development process to reflect changes in the project's scope, schedule or from stakeholder comments.

Determine Visualization Needs

Projects can benefit from visualizations in many steps during the planning of a project. It is essential to assess that need early in the planning stages. Visualization should be coordinated with the Public Involvement Lead to assess the appropriate products to incorporate into the PIP. The Visualization Team Lead may be consulted at this time.

A 1-to-6-month turnaround should be expected depending on the scale and complexity of the project and the type of work requested. It is possible to expedite that timeframe, but it is project dependent. As with requesting work from other departments, the team is to plan for a minimum of 1 month for a finished product. Design files are required to create most visualization projects.

2PI1 Public Engagement

Overview

During this phase, assist with project-specific public engagement activities to ensure a transparent process is followed as required under the National Environmental Policy Act (NEPA) and the State Environmental Policy Act (SEPA).

References

- ☐ *Public Involvement Guidelines*
- ☐ *Public Involvement Practitioner's Guide*
- ☐ Public Engagement Toolkit
- ☐ *Visualization Products*
- ☐ *Visualization Request Form*
- ☐ *Setting Up a Public Meeting*
- ☐ *Setting up a Public Hearing*
- ☐ *Statewide Public Involvement Plan*
- ☐ Public Involvement, Community Studies & Visualization (PICSViz) Connect Site

Deliverables

Deliverable	Task	Responsible Party	
		Activity Leader	Additional Support
		Public Involvement Lead	Public Involvement Team Member/ Communications Officer
Public Involvement Plan (PIP) [A]	▪ *Finalize Public Involvement Plan (PIP)*	X	X
Mailing List and GIS Boundary [A]	▪ *Compile Mailing List*		X
NCDOT Project and PublicInput.com webpages	▪ *Create Project Webpage*	X	X
Public Outreach Materials [A]	▪ *Coordinate Public Outreach Event Notifications*	X	
Newsletter/Postcard Approval [A]	▪ *Develop/Update Newsletter/Postcards*		X
Environmental Document Comments	▪ *Review Environmental Document*	X	X
Public Meeting/Public Hearings [A]	▪ *Conduct Public Meetings and/or Public Hearing*		X

[A] *Indicates that final document(s) or data set(s) must be uploaded to the ATLAS Workbench.*

Finalize Public Involvement Plan (PIP)

The Project Manager sends an Environmental Tracking and Coordination System (ETRACS) request to Public Involvement to complete the final Public Involvement Plan (PIP). Based on the Project Scoping Report and Community Screening, as well as discussions with the Project Manager, Communications Lead and/or project team, Public Involvement updates the PIP to include:

- Potential outreach methods best suited to the project
- Public meetings
- Local and elected public officials' informational meetings
- Additional Public Involvement needs for Merger Projects

- Small group meetings to inform the public about the project

The updated PIP is reviewed and approved by the Project Manager, Public Involvement and Communications.

These activities build upon the work to incorporate the PIP in the Project Initiation Stage.

Compile Mailing List

A mailing list of potentially affected stakeholders (e.g., property owners) will be provided by PICSViz and must be updated by the consultant throughout the duration of the project.

- When developing a mailing list, it is important to consider the study area.
- Close attention should be paid to developments (i.e., residential, commercial and/or industrial parks) adjacent to a proposed project to make sure that the entire development is captured.
- As such, the mailing list study area is likely to be larger than the project study area.
- This is especially important when there is only one access to or from the proposed project.
- While all the properties and businesses may not be directly impacted, they will be indirectly due to construction activities.

The mailing list should also include neighborhood associations, civic and business groups, interested citizens, and local public officials for the purpose of providing the public with information concerning progress on the project and for notifying the public of future meetings and public hearings.

- For in-house or consultant managed projects, PICSViz will clean data and make labels (if needed).
- For consultant managed projects, the cleaned list will be sent for mailing processing by consultants.

Mailing list process

- The consultant should place a shapefile along with a pdf of the study area and proposed mailing area on Connect NCDOT.
- The PICSViz Group will review the study area and make suggested area edits as needed.
- Following approval of the study area, the consultant should place a shapefile along with a pdf of the approved mailing area on Connect NCDOT for updating throughout the planning process.
- The Project Manager visits ETRACS to request the mailing list from the approved study area. A link to the shapefile of the approved study area is included in the ETRACS request.

Create Project Webpage

There are two ways to post project information online, either an NCDOT project webpage or a Publicinput.com webpage. These sites can be developed for any type of project. Some projects may use both platforms, while others may only use one. If a project has an NCDOT webpage, the PublicInput.com page should serve as the survey page for gathering input (comment form in handouts or other materials should mirror questions asked on these pages). The NCDOT and PublicInput.com project webpages will be cross-linked for optimal public exposure.

To create an NCDOT webpage or Publicinput.com page, the Project Manager completes the NCDOT Project Webpage questionnaire and submits it to PICSViz via ETRACS. PICSViz will coordinate with the Division Communications Public Involvement Officer (PIO) on review and production of the webpage.

Project webpages may include maps, surveys, and sign-ups to project updates and make it easier for visitors to learn about projects and get engaged. Refresh project webpages at major milestones or as new information becomes available, or at least every six months. Links to other sites should be clearly labeled and checked periodically. It is the responsibility of the Project Manager to alert PICSViz and Communications when updates are needed.

For webpage updates, the Project Manager sends an email to both the PICSViz staff and the Division PIO.

NCDOT Project Webpage

NCDOT hosted project webpages (NCDOT.gov) provide information and direct questions and/or comments to specific locations. These are typically for high profile or larger scope projects. They should offer the opportunity to "sign up" for project updates by providing an email which will work with the PublicInput.com platform below to create a project email and/or text list. These webpages will use a public input site as a survey page to collect comments and feedback. The survey page will be linked to and from the NCDOT project webpage.

PublicInput.com

PublicInput.com project webpages provide information and allow submission of survey responses, questions and comments, and a project-specific email address and a toll-free phone number to record questions or comments directly into the project's digital database. PublicInput.com webpages are typically used as the sole webpage for smaller projects.

Coordinate Public Outreach Event Notifications

Upon receipt of an ETRACS request for support, the Public Involvement Lead:

- Arranges meeting locations and facilities.
- Ensures the public is notified as to where and when the public meeting(s) is to occur.
- Collaborates with the Communications Office to release a press notice regarding each meeting. Note: The Communications Office also notify citizens of the public meetings using social media outlets (e.g., Facebook, Twitter and Nextdoor) (see 2CG1 for related information).
- Uploads the project map and available documents to the NCDOT Public Meeting webpage as appropriate.
- Develop/Update Newsletter/Postcards

Develop/Update Newsletter/Postcards

The Project Manager sends an ETRACS request to Public Involvement. During the project the Private Engineering Firm, or other consultant, may prepare a newsletter/postcard using the NCDOT approved templates for distribution to persons on the project mailing list and to State officials. Public Involvement and Communications approves the newsletter/postcard prior to distribution; the Private Engineering Firm, or other consultant, is responsible for printing and distributing the newsletter. Templates are available on PICSViz Connect Site.

Review Environmental Document

Prior to finalization of the environmental document, the Public Involvement Lead is to:

- Confirm the completed public involvement tasks have been accurately summarized in the environmental document.
- Identify and inform the Project Manager and Communication Group Lead of any public involvement Project Special Commitments (Green Sheets) required for the design and construction phases.

Conduct Public Meeting and/or Public Hearing

The Project Manager and Public Involvement Lead collaborate to set up and facilitate public meetings, and/or public hearings, in accordance with the Public Involvement, Community Studies, and Visualization [PICSViz]) procedures identified in *Setting Up a Public Meeting and Setting Up a Public Hearing*.

Complete Any Open Public Engagement Tasks

While there are no specific public engagement activities or tasks in the Plan-in-Hand and PS&E/Letting stages, Public Involvement remains an available resource if any meetings are required during final design or the construction stage, all in coordination with the Communications Group and the Project Manager.

Public meetings during this stage are generally referred to as Project Update Meetings. These meetings can be held just prior to the Right of Way (Stage 3) or Construction (Stage 5) phases. These are especially beneficial if several years have passed since previous outreach efforts and/or the project is in a rapidly growing area. Depending on the project, these meetings can be used to introduce the public to the contractor.

Other tasks that could happen during these stages include:

- Local government informational meetings
- Managing and addressing public comments
- Preparing a public engagement summary document
- Preparing project visualizations

1CG1 Review Project Scoping

Overview

As part of Project Initiation Stage, coordinate with the Highway Division Communications Officer (Communications Officer) to evaluate the project's communication needs.

Note: *Actions during the Project Initiation Stage may be led and completed by staff from several different NCDOT groups. Any person who has overall responsibility for a project during this Stage is referred to as the "Project Lead." This lead could be the Feasibility Studies Engineer, the Corridor Development Engineer, the Division Planning Engineer, or someone in a similar role as tasked by a state or local agency.*

References

- ☐ *Communications Office Overview*
- ☐ *Statewide Public Involvement Plan*

Deliverables

Deliverable	Task	Responsible Party
		Activity Leader
		Communications Officer
Project Scoping Report Review Comments	▪ *Review Project Scoping Report*	X

Review Project Scoping Report

The Public Involvement team lead reviews the current project scoping report and notifies the Feasibility Studies Unit and Communications Officer of any communication issues or needs for any project with an offsite detour, strong potential for controversy or likelihood for complexity (see 1FS2 and 1PI1 for related information).

If necessary, the Communications Officer works with the Project Lead to start developing a Communications Plan with a timeline of specific deliverables for public outreach. The plan is a working document that is adjusted to meet different communication needs throughout the project.

2CG1 Assist with Public Engagement

Overview

Help to facilitate public meetings, assist with media interview requests, develop videos, review drafts of public facing materials, create and coordinate development and administration of webpages, and review project notification needs or requirements.

References

- ☐ *Communications Office Overview*
- ☐ *Statewide Public Involvement Plan*
- ☐ *Project Special Commitments (Green Sheet) Guidance*

Deliverables

Deliverable	Task	Responsible Party	
		Activity Leader	Additional Support
		Communications Officer	Public Involvement Lead
Various Outreach Materials	▪ *Create or Administer Outreach Materials*	X	X
Project Special Commitments (Green Sheets) (when applicable)	▪ *Environmental Document Review*	X	X

Create or Administer Outreach Materials

As coordinated with the Public Involvement Lead and the Project Manager, the Communications Officer is available to provide media outreach or other public information dissemination work as needed. The Communications Officer helps facilitate several activities related to public outreach on the project, including:

- Coordination with the Public Involvement Lead to review of newsletters, public meeting attendance, and interview requests
- Review and coordination of efforts for creating and administering webpages
- Social media outreach
- Review of project-specific visualizations and video production in coordination with the Environmental Analysis unit's Public Involvement, Community Studies, and Visualization team

Environmental Document Review

As coordinated with the Public Involvement Lead and the Project Manager, the Communications Officer reviews the draft environmental document to be able to respond to media and public inquiries about a project's potential environmental impacts and ensure public outreach-related Project Special Commitments during the project's construction phase are noted.

4CG1 Prepare Construction Communications Activities

Overview

Outreach during construction is critical for safety updates and informing the public of road or lane closures if a traffic pattern changes or if detours are needed. Prepare for construction outreach by incorporating construction milestones into the Communications Plan. The Project Manager/Resident Engineer notifies the Communications Officer prior to the start of construction.

References

- ☐ *Communications Office Overview*
- ☐ *Statewide Public Involvement Plan*
- ☐ *NCDOT Social Media Policy*
- ☐ *Postcard Guidelines Procedures*

Deliverables

Deliverables	Task	Responsible Party	
		Activity Leader	Additional Support
		Communications Officer	Public Involvement Lead
Construction Outreach Material (varies by need)	▪ *Identify Construction Outreach Needs*	X	X
	▪ *Media Relations*		
Construction Public Information Plan	▪ *Develop the Construction Public Information Plan*	X	X

Identify Construction Outreach Needs

The Communications Officer works with the Project Manager and the Work Zone Traffic Control (WZTC) Project Engineer to ensure the necessary public informational campaign occurs during the construction phase. This involves a pro-active identification of public outreach needs when the Communications Officer receives notice from the Project Manager/Resident Engineer that the project has been placed on the letting list.

Some items to consider include:

- Send advanced notice on letting when road closures and/or lane shifts occur for projects with road closures and/or work zone issues.
- Outline when to use social media, public service announcements, local media, and other means to push communications out to interested parties.
- Develop/update/review the project website for accuracy.
- Provide legislative liaison support that communicates with state and federal legislative bodies.

Media Relations

In coordination with the Project Manager, the Communications Officer may:

- Provide on-camera interviews or coordinate and prepare staff for media interviews.
- Hold news media briefings.

Develop the Construction Public Information Plan

In coordination with the Project Manager/Resident Engineer, the Communications Officer formalizes the stakeholder informational campaign for use during construction. This is a formal or informal deliverable, depending on the scale of the project.

5CG1 Public Information During Construction

Overview

Implement strategies to keep the public and stakeholders informed of construction impacts, related time frames, and other pertinent information.

References

- ☐ *Communications Office Overview*
- ☐ *Statewide Public Involvement Plan*
- ☐ *NCDOT Social Media Policy*
- ☐ *Postcard Guidelines Procedures*

Deliverables

Deliverables	Task	Responsible Party	
		Activity Leader	Additional Support
		Communications Officer	Public Involvement Lead
Public Outreach Material	▪ *Revise Public Outreach Material*	X	X
	▪ *Disseminate Public Outreach Material*		
	▪ *Lead Interview*		

Revise Public Information Material

The Communications Officer works with the Project Manager/Resident Engineer and the Work Zone Traffic Control (WZTC) Project Engineer to ensure the required public information materials (e.g., construction schedules that relate to the duration and/or intensity of community disruptions) are being updated during the construction phase.

Disseminate Public Information Material

The Communications Officer distributes updated information and materials through a variety of means including:

- News releases
- NCDOT website updates from the project team
- Social media
- Community groups and stakeholders
- Project one pagers and other collateral

Depending on the project, a range of resources may be needed to target local and/or regional travelers, affected property and business owners, and emergency services.

Lead Interviews (if needed)

In coordination with the Project Manager/Resident Engineer, the Communications Officer may:

- Provide media interviews or coordinate/prepare staff interviews
- Hold media briefings.

Other Items

In coordination with the Project Manager/Resident Engineer, the Communications Officer may:

- Receive notice if a problem occurs in the field
- Circulate notice once construction is complete

1PM1 Lead Team through Project Initiation Handoff

Overview

Organize the project and project team and create a scope of work, delivery schedule, and budget. Determine the need for a Professional Engineering Firm (PEF) and/or General Engineering Services Consultant (GESC) to support the project.

The Project Manager initiates this activity by reviewing the Project Initiation Packet developed by the Feasibility Studies Unit. This packet includes the Project Scoping Report (PSR) and other available information. The Project Manager then identifies the team and leads them in developing a scope of services, schedule, budget, project communication plan, and risk assessment worksheet. The Project Manager also establishes clear expectations regarding quality.

If required, the Project Manager organizes, leads, and facilitates a Project Initiation Meeting with the Division Planning/Corridor Development Engineer, NCDOT staff, and appropriate GESC resources. **This optional meeting is generally held prior to securing professional engineering firm (PEF) consultants.** It provides an opportunity to bring discipline managers and leads together to initiate the preparation of the scope of services required for each discipline, including identification of required PDN activities and discipline-specific expertise and resources necessary to deliver the project.

Consultants may be obtained separately, at different stages, and for varying lengths of time depending on the project needs. The Project Manager determines the approach to contracting based on the availability of NCDOT staff to perform the work and the complexity of the project. The NCDOT Project Manager proactively manages the consulting resources, ensures adherence to the terms of the contract(s), and provides formal and informal feedback on performance.

Reference the Project Management Guide for detailed guidance.

References

- ☐ *Project Management Guide*
- ☐ *Project Management and Delivery (Connect NCDOT)*
- ☐ *Preconstruction Finance Guide*

2PM1 Lead Team through Environmental & ROW Plans

Overview

Lead the project team through the completion of the environmental document, Design Recommendation Plan Set, and Right-of-Way (ROW) plan set. Facilitate regular coordination with the project team to resolve issues, manage risks, and verify quality procedures are followed.

A project kick-off meeting will typically be held to bring all team members together to ensure understanding of project roles and responsibilities, project schedule, and facilitation of the project communication plan. The Project Manager directs the project to ensure it remains on schedule, within allocated resources (budget and staff), and within the scope of work. The NCDOT Project Manager oversees all related Professional Engineering Services Contracts, as applicable. Firms must receive the NCDOT Project Manager's approval prior to any changes to scope, schedule, or budget.

Reference the Project Management Guide for detailed guidance.

References

- ☐ *Project Management Guide*
- ☐ *Project Management and Delivery (Connect NCDOT)*
- ☐ *Preconstruction Finance Guide*

2PM2 ROW, Utility and Permitting Strategy

Overview

Organize, lead, and facilitate the Right-of-Way (ROW), Utility, & Permitting Strategy with the project team. The purpose of this activity is to develop a plan to optimize delivery of the right-of-way acquisition, utility agreements and utility relocations, as well as to confirm the timeline for permit applications. Each of these areas relate to external stakeholder interests and needs. Therefore, a strategy to manage each should be developed (typically following the Design Recommendation Plan Set), with updates likely recurring throughout project delivery. Coordination involves cross-discipline dialogue to address challenges and risks identified during design progression.

Reference the Project Management Guide for detailed guidance.

References

- ☐ *Project Management Guide*
- ☐ *Project Management and Delivery (Connect NCDOT)*

2PM3 Coordinate Field Inspection

Overview

Organize and coordinate this meeting with the project team and Division Construction Engineer, who leads and facilitates the Field Inspection Review Meeting. The purpose of this review meeting is to provide multidisciplinary feedback on any issues, opportunities, challenges, conflicts, or omissions in the scope of work. The team also considers the needs and commitments for right-of-way, utilities, permitting, constructability, and local jurisdiction. A thorough review during this stage helps to reduce rework during subsequent stages, eliminating potential obstacles to construction that may lead to errors, delays, and/or overruns.

Reference the Project Management Guide for detailed guidance.

References

- ☐ *Project Management Guide*
- ☐ *Project Management and Delivery (Connect NCDOT)*

3PM1 Lead Team through Final Plans

Overview

Lead the project team through Stage 3 by facilitating regular coordination between project team members to resolve issues, manage risks, and verify quality procedures are followed as the project team makes the necessary refinements to finalize their designs. The Project Manager will direct the project to ensure it remains on schedule, within allocated resources (budget and staff), and within the scope of work. The NCDOT Project Manager oversees their Professional Engineering Services Contracts. Firms must receive the NCDOT Project Manager's approval prior to any changes to scope, schedule, or budget.

Reference the Project Management Guide for detailed guidance.

References

- ☐ *Project Management Guide*
- ☐ *Project Management and Delivery (Connect NCDOT)*
- ☐ *Preconstruction Finance Guide*

3PM2 15 Month Let Review

Overview

Use the 15 Month Let Review to confirm that a project is ready to be added to the 12 Month Let List. The Department's goal is to publish a dependable 12 Month Let List consisting of projects that have a high probability of being let according to schedule. A Project Manager who has projects identified each month receives an invitation to attend the 15 Month Let Meeting to discuss and provide an update on the project. The goal of this meeting is to determine if a project is ready to advance to the 12 Month Let List. This increases program stability by ensuring projects on the 12 Month Let List are on track to let on schedule as well as assists in ensuring programmed project funds align with the estimated project cost.

Reference the Project Management Guide for detailed guidance.

References

- ☐ *Project Management Guide*
- ☐ *Project Management and Delivery (Connect NCDOT)*

3PM3 Design Complete Review Meeting

Overview

Organize the Design Complete Review Meeting with the Division Construction Engineer, who leads and facilitates the review. The purpose of this review meeting is to provide a point of assessment to understand and resolve any issues with scope, schedule, and budget commitments. The team considers the needs and commitments for right-of-way, utilities, permit applications, and local jurisdiction agreements. The meeting allows the project team to collaboratively discuss plan set quality and constructability review comments to deliver a biddable and constructable project.

Reference the Project Management Guide for detailed guidance.

References

- ☐ *Project Management Guide*
- ☐ *Project Management and Delivery (Connect NCDOT)*

4PM1 Lead Team through PS&E

Overview

Lead the project team through Stage 4 by facilitating regular coordination between project team members to resolve issues, manage risks, and verify quality as the project team finalizes all plans, specifications, and estimates (PS&E) to be packaged for letting when preparing the project for advertisement.

Reference the Project Management Guide for detailed guidance.

References

- ☐ *Project Management Guide*
- ☐ *Project Management and Delivery (Connect NCDOT)*
- ☐ *Preconstruction Finance Guide*
- ☐ *PS&E Checklist*

4PM2 PS&E Review Meeting

Overview

Use the PS&E Turn-In Review Meeting to confirm that a project is ready for submittal to the Contract Standards and Development Unit for advertisement. The expectation is that a project submitted at PS&E turn-in is complete in its design, calculations, and has all the required permits, certifications, agreements, etc.

A Project Manager who has a project identified receives an invitation to attend the PS&E Review meeting to discuss and provide an update on the project. The goal of this meeting is to focus on projects that are within two (2) weeks and six (6) weeks of PS&E turn-in to ensure that all the required documents have been, or will be obtained by turn-in, and the plan set is 100% complete. The PS&E turn-in date is the final date for all submittals and includes completing all QC/QA efforts. There should be no additional work submitted after this date. Communication between the Project Manager, the project team, and Contract Standards and Development is key for timely delivery of plans that are approaching advertisement.

Reference the Project Management Guide for detailed guidance.

References

- ☐ *Project Management Guide*
- ☐ *Project Management and Delivery (Connect NCDOT)*
- ☐ *Preconstruction Finance Guide*
- ☐ *PS&E Checklist*

1RD1 Initiate Roadway Coordination

Overview

Ensure that the Express Design is both consistent with the vision established for the corridor by internal and external stakeholders and represents sound roadway design principles and practices.

References

- ☐ *American Association of State Highway Transportation Officials (AASHTO) A Policy on Geometric Design of Highways and Streets and Errata*
- ☐ *Roadway Design Manual*
- ☐ *Mapping & Surveys for Planning and Design Activities Guide*
- ☐ *NCDOT Quality Management Program: Quality Control and Quality Assurance*

Deliverables

Deliverable	Task	Responsible Party	
		Activity Leader	Additional Support
Comments on Express Designs	▪ *Provide Roadway Input on Express Design*	NCDOT Roadway Design Engineer	Project Lead
Comments on Mapping Limits	▪ *Perform Independent Review of Mapping Limit Polygon*	NCDOT Roadway Design Engineer or Appropriate Division Personnel	▪ Project Lead ▪ Division Location and Surveys Engineer and/or Photogrammetric Engineer

Provide Roadway Input on Express Design

Considering the need for early coordination as an Express Design is developed (see 1FS2 for related information), the NCDOT Roadway Design Engineer is to engage as follows:

- Review the roadway design elements of the Express Design as provided by the Feasibility Studies Engineer by:
  - Evaluating the design to confirm design elements are in alignment with the AASHTO *A Policy on Geometric Design of Highways and Streets* and NCDOT's *Roadway Design Manual and Complete Streets Memo/Policy*.
  - Evaluating the design to confirm it reflects any multimodal accommodations coordinated with municipalities, metropolitan or rural planning organizations, and/or that which is recommended by the NCDOT.
- Generate comments on the Express Design, considering that:
  - Comments are to focus on any issues that could adversely affect decision-making as they are being evaluated in the prioritization process.
  - Comments are submitted to Feasibility Studies Engineer in written format with all necessary accompanying documentation that assists in the comments being understood.

In all, the NCDOT Roadway Design Engineer provides roadway design technical expertise during this activity that involves:

- Responding verbally or in writing, as appropriate, to questions or concerns that may arise about roadway design policies, practices, and/or procedures as the Express Design is being developed.
- Participating in meetings in which the Roadway Design Unit or NCDOT Roadway Design Engineer is requested to attend.

Perform Independent Review of Mapping Limits Polygon

To perform this review task, the NCDOT Roadway Design Engineer or Division designee reviews mapping limits polygon for final surveys as provided by the Feasibility Studies Engineer to:

- Evaluate limits to check that they are sufficient for design, but not so excessive that it overburdens resources.
  - There are times where further coordination with Location and Surveys and/or Photogrammetry may be needed.
- Provide comments to the Feasibility Studies Engineer in written format with all accompanying documentation that assist in the comments being understood.

2RD1 Alternative Development (Optional)

Overview

Develop conceptual level alternative designs to evaluate what alternative could be pursued for the final design phase. This task is only necessary if additional alternative investigation is needed beyond what was previously explored during Stage 1.

References

- ☐ American Association of State Highway Transportation Officials (AASHTO) *A Policy on Geometric Design of Highways and Streets and Errata*
- ☐ American Association of State Highway Transportation Officials (AASHTO) *Roadside Design Guide 4th Edition and Errata*
- ☐ *Roadway Design Manual*
- ☐ *Roadway Standard Drawings*
- ☐ *Roadway Design Consultant Coordination Guidelines* (*In Development: The guidelines are being updated.)*
- ☐ *NCDOT Quality Management Program: Quality Control and Quality Assurance*

Deliverables

Deliverable	Task	Responsible Party	
		Activity Leader	Additional Support
Preliminary Design Criteria and Associated Typical Sections [Q]	▪ *Complete Design Criteria and Typical Sections for Alternatives*	Roadway Design Plan Review Group Leader or Division Personnel	Roadway Design Lead
Prepare Alternative Design [Q]	▪ *Complete Alternative Design(s)*	Roadway Design Lead	
Design Public Meeting Maps [Q]		Roadway Design Lead	

[Q] *Indicates that final document(s) or data set(s) requires review in accordance with the NCDOT Quality Management Program: Quality Control and Quality Assurance.*

Develop Design Criteria and Typical Sections for Alternatives

Coordination with municipalities, RPOs, and MPOs on Complete Streets elements to be incorporated into the project begins in Stage 1. This information is captured in design criteria for the mainline, major y-lines, ramps, and loops and is provided in the Project Scoping Report (see 1FS2 for related information). The Roadway Design Lead ensures this information has been incorporated into the design criteria for the entire project (see 2IM1 for related information).

While the Roadway Design Lead may not perform all tasks associated with the development of the roadway design, the Roadway Design Lead ultimately seals the final plans and, as such, has a responsible charge for both the roadway design and documentation of design decisions. To determine design criteria and typical sections, the Roadway Design Lead completes the design criteria package and submits it for review.

- The design criteria and typical sections are generated in accordance with the *AASHTO A Policy on Geometric Design of Highways and Streets*, *AASHTO Roadside Design Guide*, *Roadway Design Manual*, and *NCDOT Standards*. Decisions regarding elements that are considered non-standard are documented in written format.
- The design criteria and typical sections are submitted to the Roadway Design Unit or Division designee for review and comment.

The Roadway Design Review Engineer or Division designee:

- Reviews the design criteria package to verify the appropriate references are used and values for each element are correct based on those references.
- Confirms consistency between the design criteria and typical sections.
- Provides comments and any associated documents to the Roadway Design Lead (for action) and Project Manager (for information).

Once complete, a meeting can be requested to discuss concerns or gain clarity on statements.

Complete Alternative Design(s)

Alternative designs should be developed using the best available survey or mapping data. To develop the plan set, the Roadway Design Lead develops the horizontal and vertical alignments for all affected roadways, which involves:

- Developing the roadway designs in compliance with the approved design criteria, the AASHTO *A Policy on Geometric Design of Highways and Streets*, and NCDOT's Roadway Design policies, procedures, and practices as defined in the *Roadway Design Manual*.
- Evaluating the horizontal and vertical alignments to ensure each fit the context of the subject roadways. **Note:** Design decisions deviating from the guidance are to be documented in written format.

Additionally, as part of this task, the Roadway Design Lead is to:

- Layout roadway and structural design elements, basing both on the:
  - Roadway design elements identified in the Traffic Operations Analysis Technical Memorandum from the Congestion Management Project Engineer if available (see 2TM1 for related information).
  - Structural design elements on the design criteria, recommendations from the Hydraulic Design Engineer (if bridging a body of water), the Rail Division and Structure Management Units (if bridging a railroad), and coordination with the Structures Lead on the bridge type.
- Layout superelevation transitions that involve verifying that the superelevation transitions conform to the current *AASHTO Policy on Geometric Design of Highways and Streets* and *NCDOT Standard Drawings*.
- Calculate vertical clearance, if applicable, and document the vertical clearance calculations in a format that is easy to understand and verify.
  - **Note:** The minimum clearances for each structure over a roadway, railroad, or navigable waterway are provided in the approved design criteria.
  - Vertical clearance calculations are generated to confirm each has been met.

- Develop conceptual gore calculations, if applicable, and document the calculations in a format that is easy to understand and verify. **Note:** The gore calculations are generated to ensure the rollover limitations are not violated as detailed in the *Roadway Design Manual*.
- Perform sight distance calculations as prescribed in the *Roadway Design Manual*, documenting the calculations in a format that is easy to understand and verify.

3D Model Development

The Roadway Design Lead also generates a 3D Model of the proposed design for the construction proposed by the project and lays out limits of construction (slope stakes), considering:

- The limits of construction are to be reflective of the 3D model.
- Design elements shown in the plan view are to be the same as the 3D model.

The Roadway Design Lead details the appropriate version of software in the scope of work.

Right-of-Way and Easement Layout

The Roadway Design Lead also lays out the initially proposed right-of-way and easements generated based on guidance in the *Roadway Design Manual* and in coordination with the appropriate technical discipline/Unit. Station and offset labels are not required for alternative development.

Public Involvement Engagement

For public engagement at this point in the process, the Roadway Design Lead develops design public meeting maps to conform with the public involvement and mapping guidelines (found in the *Roadway Design Manual*) and coordinates the QC review following the NCDOT *Quality Management Program: Quality Control and Quality Assurance* procedures and the QC Checklist. The Roadway Design Lead coordinates with the Project Manager and Public Involvement Lead to set up a review meeting to confirm what is represented on the map conveys the intent of the project.

Attendees at the meeting include the Roadway Design Lead and representation from:

- The Division
- Public Involvement Lead/Unit
- Environmental Analysis Unit (Community Studies and Visualization)
- Experts representing the technical disciplines/Units (including Hydraulics, Utilities, Work Zone Traffic Control, and Structures Management)
- Any other relevant stakeholders (including the municipality, MPO/RPO).

Technical experts are to be either representatives from central technical units or appropriate Division staff. Once all comments from the review meeting are addressed and the maps updated, the Public Involvement Officer and/or Communications Group is notified so that the website can be updated (see 2PI1 for related information). The Project Manager is included in the correspondence.

After the Design Public Meeting has been held and the comment period closed, the Roadway Design Lead coordinates with the Project Manager to schedule a Post-Public Meeting Resolution Meeting to determine the best path forward to address the comments.

- Meeting attendees include those invited to the map review and anyone else who can provide feedback on the concerns from the public.

- The resolutions requiring revisions to the designs (as presented to the public) are incorporated into the plans.

Alternative Design Plan Set(s) Preparation

The Roadway Design Lead lays out the alternative designs on roll plots that encompass all the work proposed by the project, providing the design data used to establish the design criteria for the mainline. The horizontal and vertical alignment data are transferred into the plan and profile plots. The Roadway Design Lead also develops earthwork quantities for cost estimate requests per the guidance in the *Roadway Design Manual*.

Additionally, as part of this task, the Roadway Design Lead lays out roadway and structural design elements, basing both on the:

- Roadway design elements identified in the Traffic Operations Analysis Technical Memorandum from the Congestion Management Project Engineer (see 2TM1 for related information).
- Coordination with the Signing and Delineation Designer to ensure lane continuity is met and the proposed design can be signed in accordance with the Manual on Uniform Traffic Control Devices (MUTCD) (see 2SD1 for related information).
- Structural design elements on the approved design criteria, recommendations from the Hydraulic Design Engineer (if bridging a body of water), the Rail Division and Structure Management Units (if bridging a railroad), and coordination with the Structures Lead on the bridge type.

Lastly, the Roadway Design Lead completes the QC Checklist following the NCDOT *Quality Management Program: Quality Control and Quality Assurance* procedures before upload and/or distribution of Alternative Design Plans.

Design Alternative Plan Review

Since the character and complexity of each project is different, a determination of how to generate feedback on the Alternative Designs should be made when the work is scoped. The Roadway Design Lead coordinates with the Project Manager to distribute plans to the technical disciplines/Units for review.

For roadway designs developed by a Private Engineering Firm/consultant firm, the NCDOT Roadway Design reviewer or Division designee uses appropriate resources, including the applicable QA checklist in the *Quality Management Manual* to complete a quality assurance review. This review confirms the plan set is complete and in compliance with current NCDOT and Roadway Design Unit guidance, policies, and procedures.

From there, the Roadway Design Lead updates the plans based on comments, considering the following.

- Comments and recommendations from the review are analyzed to determine if each is feasible.
- If results of the analyses do not provide a clear resolution, results are circulated to all relevant technical design Leads and Division personnel for a final determination.
- The designs and plans are updated to include all final recommendations.

The Roadway Design Lead distributes the updated plan set to the technical disciplines/units and/or appropriate Division personnel through the project SharePoint site in preparation for the Alternative Selection Meeting.

Alternative Selection Meeting

The Roadway Design Lead coordinates with the Project Manager to distribute revised plans to the technical disciplines/Units and appropriate Division personnel for a review period and to schedule an Alternative Selection Meeting.

During this meeting, the project team is tasked with selecting one or more of the designs to move forward into the development of a Design Recommendation Plan Set.

2RD2 Complete the Design Recommendation Plan Set

Overview

Complete the project's Design Recommendation Plan Set and associated roadway tasks to establish the essential roadway design elements that facilitate multiple activities across multiple disciplines early in this stage. This activity provides needed data that is incorporated into the environmental document, serves as a visual aid during public engagement activities, and sets a foundation for coordination activities with other technical disciplines/Units, so that the technical leads can develop and advance their design recommendations and plans early.

References

- ☐ American Association of State Highway Transportation Officials (AASHTO) *A Policy on Geometric Design of Highways and Streets and Errata*
- ☐ American Association of State Highway Transportation Officials (AASHTO) *Roadside Design Guide 4th Edition and Errata*
- ☐ *Roadway Design Manual*
- ☐ *Roadway Standard Drawings*
- ☐ *Roadway Design Consultant Coordination Guidelines* (*In Development: The guidelines are being updated.)*
- ☐ American Association of State Highway Transportation Officials (AASHTO) *Roadway Lighting Design Guide*
- ☐ National Cooperative Highway Research Program (NCHRP) *Report 152 "Warrants of Highway Lighting"*
- ☐ *Location and Design Approval Procedures*
- ☐ *NCDOT Quality Management Program: Quality Control and Quality Assurance*

Deliverables

Deliverable	Task	Responsible Party	
		Activity Leader	Additional Support
Approved Design Criteria and Associated Typical Sections [Q]	▪ *Complete Design Criteria and Typical Sections*	Roadway Design Plan Review Group Leader or Division Personnel	Roadway Design Lead
Design Public Meeting Maps [Q]	▪ *Complete Design Recommendation Plan Set*	Roadway Design Lead	
Design Recommendation Plan Set [Q]		Roadway Design Lead	Other Technical Discipline/Unit Leads (Roles noted in the descriptions below)
Approved Design Exception [A, Q]	▪ *Formalize Design Exceptions*	Technical Services Director or Division Engineer	Roadway Design Lead/State Roadway Design Engineer or Division Project Development Engineer
Initial Lighting Assessment	▪ *Determine Lighting Needs and Owner*	Roadway Lighting Design Engineer	
Lighting Evaluation Report [Q]		Roadway Lighting Design Engineer	
Agreement with Municipality for Lighting Ownership and Maintenance			Division Engineer
Location and Design Approval Support Document	▪ *Issue Location and Design Approval (LADA)*	Technical Services Director or Division Engineer	State Roadway Design Engineer or Division Project Development Engineer
Location and Design Approval Letter (LADA)		Technical Services Director or Division Engineer	State Roadway Design Engineer or Division Project Development Engineer

[A] *Indicates that final document(s) or data set(s) must be uploaded to the ATLAS Workbench.*
[Q] *Indicates that final document(s) or data set(s) requires review in accordance with the NCDOT Quality Management Program: Quality Control and Quality Assurance.*

Complete Design Criteria and Typical Sections

Coordination with municipalities, RPOs, and MPOs on Complete Streets elements to be incorporated into the project begins in Stage 1. This information is captured in design criteria for the mainline and is provided in the Project Scoping Report. The Roadway Design Lead ensures this information is incorporated into the design criteria for the entire project (see 2IM1 for related information).

While the Roadway Design Lead may not perform all tasks associated with the development of the roadway designs, the Roadway Design Lead ultimately seals the final plans and, as such, has responsible charge for the roadway designs and documentation of design decisions. To determine design criteria and typical sections, the Roadway Design Lead completes the design criteria package and submits for approval.

- The design criteria and typical sections are generated in accordance with the *AASHTO A Policy on Geometric Design of Highways and Streets*, *AASHTO Roadside Design Guide*, *Roadway Design Manual*, and *NCDOT Standards*. Decisions made about elements that are considered non-standard are documented in written format.
- The design criteria and typical sections are submitted to the Roadway Design Unit or Division designee for review and comment.

The Roadway Design Review Engineer or Division designee then:

- Reviews the design criteria package to verify the appropriate references are used and values for each element are correct based on those references.
- Confirms consistency between the design criteria and typical sections.
- Provides comments and any associated documents to the Roadway Design Lead (for action) and Project Manager (for information). Once complete, a meeting can be requested to discuss concerns or gain clarity on statements.

The Roadway Design Plan Review Group Leader or appropriate Division personnel then issues design criteria approval, and once comments have been adequately resolved, the Roadway Design Plan Review Group Lead or appropriate Division personnel provides documentation of approval to the Roadway Design Lead and Project Manager.

Complete the Design Recommendation Plan Set

The development of final surveys is a coordinated effort between the Locations and Surveys and Photogrammetry leads or Units, which begins in Stage 1. The final survey product is then delivered to the Roadway Design Lead prior to initiating the Design Recommendation Plan Set. The designs developed for this plan set are also used to facilitate the completion of the environmental document.

To develop this plan set, the Roadway Design Lead develops the horizontal and vertical alignments for all affected roadways that involves:

- Developing the roadway designs to be in compliance with the approved design criteria, the AASHTO *A Policy on Geometric Design of Highways and Streets* and NCDOT's Roadway Design policies, procedures, and practices as defined in the *Roadway Design Manual*.
- Coordinating with the other technical disciplines/Units (e.g., Hydraulics, Utilities, Geotechnical, Structures Management, etc.) and Division staff to verify that no new issues presented themselves based on the delivery of the final surveys.
- Evaluating the horizontal and vertical alignments to ensure each fits the context of the subject roadways.
- Design decisions deviating from the guidance in the previous bullet are to be thoroughly documented in written format.

Additionally, as part of this task, the Roadway Design Lead is to:

- Layout roadway and structural design elements, basing both on the following:
  - Roadway design elements identified in the Traffic Operations Analysis Technical Memorandum from the Congestion Management Project Engineer (see 2TM1 for related information).
  - Coordination with the Signing and Delineation Designer to ensure lane continuity is met and the proposed design can be signed in accordance with the *Manual on Uniform Traffic Control Devices* (MUTCD) (see 2SD1 for related information).
  - Structural design elements on the approved design criteria, recommendations from the Hydraulic Design Engineer (if bridging a body of water), the Rail Division and Structure Management Units (if bridging a railroad), and coordination with the Structures Lead on the bridge type.

- Layout superelevation transitions that involve:
  - Verifying that the superelevation transitions conform to the current *AASHTO Policy on Geometric Design of Highways and Streets* and NCDOT Standard Drawings.
  - Coordinating with the Hydraulic Design Engineer to identify areas and address concerns where hydroplaning concerns exist.
- Calculate vertical clearance, if applicable, and document the vertical clearance calculations in a format that is easy to understand and verify.
  - **Note:** The minimum clearances for each structure over a roadway, railroad, or navigable waterway are provided in the approved design criteria.
  - Vertical clearance calculations are generated to confirm they have been met.
- Develop gore calculations, if applicable, and document the calculations in a format that is easy to understand and verify.
  - **Note:** The gore calculations are generated to ensure the rollover limitations are not violated as detailed in the *Roadway Design Manual*.
- Perform sight distance calculations as prescribed in the *Roadway Design Manual* documenting the calculations in a format that is easy to understand and verify.

3D Model Development

The Roadway Design Lead also generates a 3D Model, of the proposed design for the construction proposed by the project, and layout cross sections and limits of construction (slope stakes), considering:

- The cross sections and limits of construction are to be reflective of the 3D model.
- Design elements shown in the plan view are to be the same as the 3D model.

The appropriate version of software to be used is to be detailed in the scope of work.

Right-of-Way and Easement Layout

The Roadway Design Lead is to also layout initially proposed right-of-way and easements generated based on guidance in the *Roadway Design Manual* and in coordination with the appropriate technical discipline/Unit (see 2LS1 and 2RW2 for related information). Station and offset labels are not required for the Design Recommendation Plan Set.

Maintenance of Traffic Narrative

The Roadway Design Lead coordinates the development of the maintenance of traffic narrative, which is meant to be:

- A viable plan for maintenance of traffic conveyed in written format to demonstrate the project can be constructed as designed.
- The Work Zone Traffic Engineer is engaged early in the design process to discuss potential traffic management challenges and solutions (see 2TM2 for related information).

Public Involvement Engagement

For public engagement at this point in the process, the Roadway Design Lead develops design public meeting maps to conform with the public involvement and mapping guidelines (found in the *Roadway Design Manual*) and coordinates the QC review following the NCDOT *Quality Management Program: Quality Control and Quality Assurance* procedures and the QC Checklist. The Roadway Design Lead

coordinates with the Project Manager and Public Involvement Lead to set up a review meeting to confirm what is represented on the map conveys the intent of the project.

- Attendees at the meeting are the Roadway Design Lead and representation from each of the following: the Division, Public Involvement Lead/Unit, Environmental Analysis Unit (Community Studies and Visualization), experts representing the technical disciplines/Units (including, but not limited to, Hydraulics, Utilities, Work Zone Traffic Control, and Structures Management) and any other relevant stakeholders (including, but not limited to, municipality, MPO/RPO).

Technical experts are to be either representatives from central technical units or appropriate Division designees. Once all comments from the review meeting are addressed and the maps updated, the Public Involvement Officer and/or Communications Group are notified so that the website can be updated (see 2PI1 for related information). The Project Manager is included in the correspondence.

After the Design Public Meeting has been held and the comment period closed, the Roadway Design Lead coordinates with the Project Manager to schedule a Post-Public Meeting Resolution Meeting to determine the best path forward to address the comments.

- Attendees to the meeting include those invited to the map review and anyone else who can provide feedback on the concerns from the public.
- The resolutions requiring revisions to the designs as presented to the public are incorporated into the plans.

Potential Retaining Wall Location Evaluation

To complete this subtask, the Roadway Design Lead evaluates roadway design information for potential locations where retaining walls are a cost-effective solution to reduce impacts. The evaluation includes coordination efforts with the Hydraulics Design Engineer, Design Geotechnical Engineer, Structures Lead, Utility Coordinator, and appropriate Division personnel. Of note:

- Where determined to be viable, the retaining wall locations are incorporated in the typical sections, plan sheets, and cross section sheets.
- Retaining wall envelopes are developed for each retaining wall location.

The Roadway Design Lead requests the retaining wall investigations and design recommendations from the Geotechnical Engineering Unit (see 3GT2 for related information). The Project Manager is included in the correspondence.

Design Recommendation Plan Set Preparation

The Roadway Design Lead is to lay out the title sheet, plan and profile sheets, and cross section sheets to include a title sheet that:

- Encompasses all the work proposed by the project,
- Contains an accurate description of the project limits and type of work, and
- Provides the design data used to establish the design criteria for the mainline.

The horizontal and vertical alignment data, along with the 3D model information, are transferred into plan, profile, and cross section sheets as prescribed in the *Roadway Design Manual*.

The Roadway Design Lead also incorporates the final pavement design into the typical sections upon receipt of the final pavement design recommendations in the final Pavement Design Memo (see 2PD1 for related information). Of note:

- The pavement designs are evaluated to determine if any are incompatible with the proposed designs.
- If concerns arise or the recommendations are incomplete, the Pavement Design Engineer is contacted for further discussion.
- The final pavement designs are to be accurately reflected in the pavement schedule, typical sections, and paving details per the guidance in the *Roadway Design Manual*.

The Roadway Design Lead also develops an earthwork summary, which is all to be provided in the plans per the guidance in the *Roadway Design Manual*.

Lastly, the Roadway Design Lead completes the QC Checklist following the NCDOT *Quality Management Program: Quality Control and Quality Assurance* procedures before upload and/or distribution of Design Recommendation Plan Set.

Design Recommendation Plan Set Review and Finalization

Since the character and complexity of each project is different, a determination of how to generate feedback on the Design Recommendation Plan Set should be made when the work is scoped. The Roadway Design Lead coordinates with the Project Manager to either distribute plans to the technical disciplines/Units and appropriate Division personnel for a comment period or schedule a Design Recommendation Plan Set Review Meeting. If a Design Recommendation Plan Set Review Meeting is to be held, the Roadway Design Lead (or assigned designee) distributes the plans to the technical disciplines/Units and appropriate Division personnel ahead of the meeting.

For roadway designs developed by a Private Engineering Firm/consultant firm, the NCDOT Roadway Design reviewer or Division designee is to use appropriate resources, including the applicable QA checklist in the *Quality Management Manual* to complete a quality assurance review. This review confirms the plan set is complete and in compliance with current NCDOT and Roadway Design Unit guidance, policies, and procedures.

From there, the Roadway Design Lead updates the plans based on comments from the Design Recommendation Plan Set Review Meeting, considering the following.

- Comments and recommendations from the review meeting are analyzed to determine if they are feasible.
- If results of the analyses do not provide a clear resolution, results are circulated to all relevant technical design Leads and Division personnel for a final determination.
- The designs and plans are updated to include all final recommendations.

The Roadway Design Lead distributes the updated plan set to the technical disciplines/units and/or appropriate Division personnel through the project SharePoint site. The Roadway Design Lead coordinates with the Value Management Office to determine the need for a Value Engineering Study. As directed, the Roadway Design Engineer prepares the necessary documentation in accordance with the

Value Management Guidelines (see 2VM1 for related information). The Project Manager is included on all the correspondence.

Formalize Design Exceptions

During the development of the Design Recommendation Plan Set, it may not be feasible to meet all the required design criteria. If it is determined that design element identified in the design exception checklist cannot be met, a formal design exception is required.

To complete this task, the Roadway Design Lead completes the design exception package and submits the package as follows:

- The design exception checklist is completed per the design exception guidance in the *Roadway Design Manual*
- All pertinent data in the current design exception request letter includes the responses to all questions on the "Basis of the Exception."
- Sketches of the design exception locations are developed considering AASHTO and proposed dimensions associated with the exception
- A report of the most recent 5-year crash history is requested from Transportation Safety and Mobility.
- The letter, checklist, sketches, crash history and location of the design plans is submitted to the designated NCDOT or GESC reviewer for review.

The NCDOT or GESC Reviewer reviews the design exception package for accuracy and completeness, considering that written comments and associated documents are provided to the Roadway Design Lead (for action) and the Project Manager (for information).

If deemed necessary, a meeting is held to ensure clarity of comments and responses. For centrally managed projects, a review by the State Roadway Design Engineer is required prior to moving forward with signatures.

Once comments have been adequately addressed, the process for obtaining signatures is as follows:

- For Centrally Managed Projects: Engineer of Record, a NCDOT or GESC Reviewer, a State Roadway Design Engineer, a Technical Services Director
- For Division Managed Projects: Engineer of Record, a NCDOT or GESC Reviewer, a Division Engineer

The Technical Services Director or Division Engineer has an opportunity to provide additional comments at this time, if needed. If there are no comments, the Technical Services Director or Division Engineer approves the design exception by signing the document.

Determine Lighting Needs and Owner

NCDOT-owned and maintained lighting systems are typically installed inside full control of access facilities. The exceptions are complex intersections, such as a roundabout or continuous flow intersection (CFI).

Prior to preparing a lighting evaluation, the Roadway Lighting Design Engineer is to refer to the *Roadway Lighting Policy* and NCHRP Report 152 as part of determining the warrant for an evaluation that assess:

- The access control of the interchange or corridor,

- If complex intersections (continuous flow, roundabout, etc.) are in the design, and/or
- If the night-to-day accident ratio for existing conditions at the interchange or along the corridor is met.

When a lighting evaluation is warranted, the Roadway Lighting Design Engineer is to:

- Prepare a lighting evaluation for the interchange or corridor in accordance with NCHRP Report 152.
- Prepare a Lighting Evaluation Map showing the result of all evaluated interchanges and/or continuous roadway sections within the project.
- Complete the QC review following the NCDOT *Quality Management Program: Quality Control and Quality Assurance* and the QC Checklist before upload and/or distribution.

The Roadway Lighting Design Engineer provides the lighting evaluation and map to the NCDOT Roadway Lighting Team Lead for review. The results of the lighting evaluation are discussed at the next quarterly Lighting Committee meeting, with the approval to include lighting in the project being determined by the NCDOT Lighting Committee.

Where the lighting evaluation shows that lighting is not justified, the Division Engineer works with the affected municipality to determine if the municipality is interested in partnering with the NCDOT on including lighting in the project.

Issue Location and Design Approval (LADA)

To review and issue a Location and Design Approval, the State Roadway Design Engineer, Division Engineer, or designee performs, a consistency review between the environmental document and the roadway design plans in accordance with the Location and Design Approval procedures. Upon review, a letter is drafted for the signature of the Technical Services Director, with supporting documentation attached. See the *Roadway Design Manual* for more background on the LADA process.

2RD3 Prepare for Field Inspection

Develop a coordinated set of design plans (the Field Inspection Plan Set) that can be used for the Field Inspection Review Meeting and a constructability review, so that all vested parties are able to review and discuss concerns that could impact how a project is built.

References

- ☐ American Association of State Highway Transportation Officials (AASHTO) *Roadside Design Guide 4th Edition and Errata*
- ☐ *Roadway Design Manual*
- ☐ *Roadway Standard Drawings*
- ☐ *Roadway Design Consultant Coordination Guidelines* (*In Development: The guidelines are being updated.)*
- ☐ *NCDOT Quality Management Program: Quality Control and Quality Assurance*

Deliverables

Deliverable	Task	Responsible Party	
		Activity Leader	Additional Support
		Roadway Design Lead	Other Technical Discipline/Unit Leads
Field Inspection Plan Set [Q]	▪ *Complete Field Inspection Plan Set*	X	X
Quantities for Construction Estimate [Q]		X	X

[Q] *Indicates that final document(s) or data set(s) requires review in accordance with the NCDOT Quality Management Program: Quality Control and Quality Assurance.*

Complete Field Inspection Plan Set

To complete the Field Inspection Plan Set, the Roadway Design Lead incorporates input from several sources as follows.

Hydraulic Design Input

The relevant information in the completed major structure reports (e.g., the Bridge Survey and Hydraulic Design Reports (BSRs), Detour Survey and Hydraulic Design Reports (DSRs), and Culvert Survey and Hydraulic Design Reports (CSRs)) and the completed drainage plans for field inspection are evaluated to confirm consistency between the hydraulic design and the roadway design plans (see 2HY2 for related information). The Roadway Design Lead incorporates the hydraulic design, details, and quantities into the 3D model and the roadway design plan, profile, and cross section sheets per the guidance in the *Roadway Design Manual*.

The Roadway Design Lead discusses concerns about the intent and/or accuracy of the hydraulic design with the Hydraulics Design Engineer to determine possible solutions. If the recommended solution has the potential to jeopardize the scope, schedule, or budget, the Roadway Design Lead notifies the Project Manager, so that the Project Manager can determine what further coordination is needed.

Preliminary General Drawing Input

The preliminary general drawing is reviewed to ensure consistency with how the structure information relevant to the roadway design plans is shown per guidance in the *Roadway Design Manual* (see 2ST2 for related information).

The Roadway Design Lead discusses concerns about the intent and/or accuracy of the preliminary general drawing with Structures Lead and Hydraulics Design Engineer, if needed, to determine possible solutions. If the recommended solution has the potential to jeopardize the scope, schedule, or budget, the Roadway Design Lead notifies the Project Manager, so that the Project Manager can determine what further coordination is needed.

Geotechnical Slope and Roadway Input

The geotechnical slope and roadway recommendations are reviewed and incorporated into the roadway design, plan, profile, and cross section sheets, and the earthwork summary per the guidance in the *Roadway Design Manual* (see 2GT2 for related information).

The Roadway Design Lead discusses concerns about the intent and/or accuracy of the geotechnical slope and/or roadway recommendations with the Design Geotechnical Engineer to determine possible solutions. If the recommended solution has the potential to jeopardize the scope, schedule, or budget, the Roadway Design Lead notifies the Project Manager, so that the Project Manager can determine what further coordination is needed.

Work Zone Traffic Control Input

The maintenance of traffic narrative provided in the Design Recommendation Plan Set is further developed into concept plans for the traffic control plans. The roadway design plans are updated to reflect the concepts plans.

The Roadway Design Lead discusses concerns about the intent and/or accuracy of the traffic control concepts with the Work Zone Traffic Control (WZTC) Project Engineer to determine possible solutions (see 2TM2 for related information). If the recommended solution has the potential to jeopardize the scope, schedule, or budget, the Roadway Design Lead notifies the Project Manager, so that the Project Manager can determine what further coordination is needed.

Right-of-Way and Easement Layout Update

The Roadway Design Lead revises the initial right-of-way and easements provided in the Design Recommendation Plan Set by incorporating the completed drainage design for the field inspection plans (see 2HY2), geotechnical recommendations (see 2GT2), utility coordination (see 2UT1), temporary or permanent erosion and sediment control measures (see 2RE1), and signal poles (see 2SG1) per the guidance in the *Roadway Design Manual*.

- Station and offset information is included in the plan set at this stage.
- The appropriate discipline/Unit supplying the information listed in the bullet above and/or the Division are contacted if there are concerns with how to contain the impacts.

Construction Estimate Quantities

The Roadway Design Lead and other associated disciplines/Units develop quantities for pay items associated with the construction of the proposed designs per guidance in the *Roadway Design Manual*.

The quantities are provided to the Project Manager, so that the Project Manager can request an updated construction cost estimate be generated by the Contract Standards and Development Unit (see 2CS1 for related information).

Field Inspection Plan Set QC Review, Review Meeting, and Finalization

The Roadway Design Lead completes the respective QC Checklist following the NCDOT *Quality Management Program: Quality Control and Quality Assurance* procedures before upload and/or distribution of Field Inspection Plan Set.

Once the plans are complete, the Roadway Design Lead coordinates with the Project Manager and Division Construction Engineer to schedule the Field Inspection Review Meeting. The Roadway Design Lead distributes the plans to the technical disciplines/Units and/or appropriate Division personnel in advance of the meeting. The team confirms there is enough time to allow a thorough review from the Value Management Office prior to the Field Inspection Review Meeting.

For roadway designs developed by a Private Engineering Firm, the Roadway Design reviewer or Division designee uses appropriate means, including the applicable QA checklist in the *Quality Management Manual* to complete a quality assurance review. This review is to verify the plan set is complete and in compliance with current NCDOT and Roadway Design Unit guidance, policies, and procedures.

From there, the Roadway Design Lead updates the plans based on comments from the Field Inspection Review Meeting, considering the following.

- Comments and recommendations from the review meeting are analyzed to determine if they are feasible.
- If results of the analyses do not provide a clear resolution, results are circulated to all relevant designers and Division personnel for a final determination.
- The designs and plans are updated to include all final recommendations.

The Roadway Design Lead distributes the updated plan set to the technical disciplines/units and/or appropriate Division personnel through the project SharePoint site. The Project Manager is included on the correspondence.

2RD4 ROW Plans Completed

Overview

Evaluate and/or incorporate decisions from the field inspection, constructability review, and all remaining design recommendations from the technical disciplines/Units into the plans, which results in a set of plans with no major right-of-way issues.

References

- ☐ American Association of State Highway Transportation Officials (AASHTO) *Roadside Design Guide 4th Edition and Errata*
- ☐ *Roadway Design Manual*
- ☐ *Roadway Standard Drawings*
- ☐ *Roadway Design Consultant Coordination Guidelines* (*In Development: The guidelines are being updated.)*
- ☐ *Standard Specifications for Roads and Structures*
- ☐ *NCDOT Quality Management Program: Quality Control and Quality Assurance*

Deliverables

Deliverable	Task	Responsible Party	
		Activity Leader	Additional Support
Right-of-Way Plan Set w/ Noise Wall Locations [Q]	▪ *Complete the Right-of-Way Plan Set*	Roadway Design Lead	Other Technical Discipline/Unit Leads (Roles noted in the descriptions below)
Quantities for Construction Estimate [Q]		Roadway Design Lead	Other Technical Discipline/Unit Leads (Roles noted in the descriptions below)

[Q] *Indicates that final document(s) or data set(s) requires review in accordance with the NCDOT Quality Management Program: Quality Control and Quality Assurance.*

Complete the Right-of-Way Plan Set

As the other technical disciplines/Units continue to make minor adjustments to finalize their plans, and the approved design noise report is issued towards the end of this Stage, the Right-of-Way Plan Set is used by:

- Location and Surveys Unit for staking of proposed right-of-way and easements (see 4LS1 for related information)
- Right-of-Way Unit for appraisal and acquisitions.

Plan Set Compilation

The Roadway Design Lead receives final designs, plans, and/or results of coordination efforts from Hydraulics, Utilities, Work Zone Traffic Control, Structures Management, Signing and Delineation, Roadside Environmental, Geotechnical Engineering, and Rail Division. Their information is reviewed for consistency with the roadway design plans per the *Roadway Design Manual*.

- If there are concerns that need to be addressed, the appropriate lead is engaged to determine practicable solutions.

- If the recommended solution has the potential to jeopardize the scope, schedule, or budget, the Roadway Design Lead informs the Project Manager, so that the Project Manager can determine what further coordination is needed.

Construction Estimate Quantities

The Roadway Design Lead and other associated disciplines/Units update the quantities for pay items associated with the construction of the proposed designs per guidance in the *Roadway Design Manual* to reflect any design revisions and/or updated recommendations from other technical Units or the Division. The quantities are provided to the Project Manager, so that the Project Manager can coordinate an updated construction cost estimate generated by the Contract Standards and Development Unit (see 3CS1 for related information).

Plan Set QC Review, Review Meeting, and Finalization

The Roadway Design Lead completes the respective QC Checklist following the NCDOT *Quality Management Program: Quality Control and Quality Assurance* procedures before upload and/or distribution of Right-of-Way Plan Set.

Once the Roadway Design Lead determines the Right-of-Way Plan Set is complete, the Roadway Design Lead distributes the plans to the technical disciplines/Units and/or appropriate Division personnel. These plans utilize the most current design and recommendations from the other technical disciplines/Units. Right-of-way acquisition can begin once the Project Manager obtains authorization for funding.

3RD1 Complete Roadway Design

Overview

Evaluate and/or incorporate decisions from the field inspection, constructability review, and all remaining design recommendations from technical disciplines/Units into the plans, resulting in a set of plans with no major constructability or right-of-way issues.

References

- ☐ American Association of State Highway Transportation Officials (AASHTO) *Roadside Design Guide 4th Edition and Errata*
- ☐ *Roadway Design Manual*
- ☐ *Roadway Standard Drawings*
- ☐ *Roadway Design Consultant Coordination Guidelines* (*In Development: The guidelines are being updated.)*
- ☐ *Standard Specifications for Roads and Structures*
- ☐ American Association of State Highway Transportation Officials (AASHTO) *Roadway Lighting Design Guide*
- ☐ National Electrical Code (NEC)
- ☐ *NCDOT Quality Management Program: Quality Control and Quality Assurance*

Deliverables

Deliverable	Task	Responsible Party	
		Activity Leader	Additional Support
Design Complete Review Plan Set [Q]	▪ *Complete the Final Plans*	Roadway Design Lead	Other Technical Discipline/Unit Leads (Roles noted in the descriptions below)
Quantities for Construction Estimate [Q]		Roadway Design Lead	Other Technical Discipline/Unit Leads (Roles noted in the descriptions below)
Roadway Design Plans Set for Permit Application	▪ *Conduct Permit Drawing Consistency Review*	Roadway Design Lead	Hydraulics Design Engineer
Photometric Layout [Q]	▪ *Complete Lighting Layout*	Roadway Lighting Design Engineer	
Lighting Plans Prepared in MicroStation [Q]		Roadway Lighting Design Engineer	
Voltage Drop Calculations [Q]		Roadway Lighting Design Engineer	
Typical Sections for Pavement Design Review	▪ *Submit/Review Typical Sections (Pavement Management)*	Roadway Design Lead	Pavement Design Lead

[Q] *Indicates that final document(s) or data set(s) requires review in accordance with the NCDOT Quality Management Program: Quality Control and Quality Assurance.*

Complete the Final Plans

Noise Wall Location Incorporation

The Roadway Design Lead obtains and incorporates approved noise wall locations from the Design Noise Report into the plan set per guidance in the *Roadway Design Manual*. The Design Noise Report is

generated by the Environmental Analysis Unit (Traffic Noise and Air Quality) or their designee (see 3EN1 and 3EN2 for related information).

- Note: Anticipated revisions to the plans include potential modifications to the typical sections, plan sheets, 3D model, cross sections, slope stakes, and proposed right-of-way and/or easements.

If required, the Roadway Design Lead participates in coordination to resolve any conflicts the noise wall locations may present within the designs. Others engaged in this coordination include the Hydraulics Design Engineer, Design Geotechnical Engineer, Utility Coordinator, Structures Lead, Work Zone Traffic Control (WZTC) Project Design Engineer, and the appropriate Division personnel. If the recommended solution has the potential to jeopardize the scope, schedule, or budget, the Project Manager determines what further coordination is needed to obtain a final resolution.

Plan Set Compilation

The Roadway Design Lead continues to receive final designs, plans, and/or results of coordination efforts from all or a portion of the disciplines/Units. This includes but is not limited to Hydraulics, Utilities, Work Zone Traffic Control, Structures Management, Signing and Delineation, Roadside Environmental, Geotechnical Engineering, and Rail Division. Their information is reviewed for consistency with the roadway design plans per the *Roadway Design Manual*.

- If there are concerns that need to be addressed, the appropriate lead is engaged to determine practicable solutions.
- If the recommended solution has the potential to jeopardize the scope, schedule, or budget, the Roadway Design Lead informs the Project Manager, so that the Project Manager can determine what further coordination is needed.

Construction Estimate Quantities

The Roadway Design Lead and other associated disciplines/Units update the quantities for pay items associated with the construction of the proposed designs per guidance in the *Roadway Design Manual* to reflect any design revisions and/or updated recommendations from other technical Units or the Division. The quantities are provided to the Project Manager, so that the Project Manager can coordinate an updated construction cost estimate generated by the Contract Standards and Development Unit (see 3CS1 for related information).

Plan Set QC Review, Design Complete Review Meeting, and Finalization

The Roadway Design Lead completes the respective QC Checklist following the NCDOT *Quality Management Program: Quality Control and Quality Assurance* procedures before upload and/or distribution of Design Complete Review Plan Set.

After the other technical disciples/Units have uploaded their completed plans and notified the Roadway Design Lead and Project Manager, the Project Manager coordinates the scheduling of the previously scoped Design Complete Review Meeting. If needed (depending on the complexity of the project or if significant changes have occurred from Stage 2), the Roadway Design Lead and Project Manager determine the need for an additional Constructability Review (see 3VM1 for related information).

For roadway designs developed by a Private Engineering Firm, the Roadway Design reviewer or Division designee uses appropriate means, including the applicable QA checklist in the *Quality Management*

Manual to complete a quality assurance review. This review is to ensure the plan set is complete and in compliance with current NCDOT and Roadway Design Unit guidance, policies, and procedures.

Conduct Permit Drawing Consistency Review

The development of environmental permit drawings is a critical component for obtaining approval from the appropriate environmental agencies prior to let. To complete this task, the Roadway Design Lead compares the draft environmental permit drawings with the current roadway design plans.

- Upon receipt of the draft environmental permit drawings from the Hydraulics Design Engineer, the Roadway Design Lead compares the plans to verify the impacts are the same.
- The elements under review include slope stakes, proposed right-of-way and easement impacts, clearing methodology, and the data associated with major hydraulic crossings.

The Roadway Design Lead provides written comments on any inconsistencies and provides all associated documents to the Hydraulics Design Engineer. If needed, the Roadway Design Lead coordinates with the Hydraulics Design Engineer and any other technical experts to resolve the concern.

Any resolution of inconsistencies requiring revisions to the roadway design are incorporated into the roadway design plans, and once inconsistencies are resolved, the Roadway Design Lead notifies the Environmental Analysis Unit (Environmental Coordination and Permitting) of the location of the roadway design plans. The Project Manager is included on the correspondence.

Complete Lighting Layout

If lighting is warranted or existing lighting conflicts with construction, the Roadway Lighting Design Engineer prepares and provides a photometric layout, including:

- Luminaire variables and preliminary light pole locations determinations.
- Light Levels calculations.

The Roadway Lighting Design Engineer also prepares a lighting design package, including:

- Voltage drop calculations based on the system operating voltage and circuit loads.
- A Photometric layout replicated in MicroStation
- Determination of underpass lighting requirements.

All of this is done in coordination with the Roadway Design Lead, with the total number of lighting plan sheets provided to the Roadway Design Lead for inclusion in the roadway design plans' index of sheets.

The Roadway Lighting Design Engineer prepares special provisions for any lighting items not included in the *Standard Specifications for Roads and Structures*.

Submit/Review Typical Sections (Pavement Management)

Once design has been completed to the point where no more revisions are anticipated to the typical sections, the Roadway Design Lead provides typical section sheets to the Pavement Design Engineer for review (see 3PD1 for related information).

In updating the typical sections, the Roadway Design Lead evaluates the comments and/or corrections from the Pavement Design Engineer when updating to the typical section sheets.

- If there is uncertainty about a comment, the Pavement Design Engineer is engaged to resolve them.
- The agreed upon changes to the typical sections are made so that the plans are ready for seals and signatures as part of 4RD1.

4RD1 Finalize the PS&E Package

Overview

With right-of-way acquisition and utility relocations well underway, compile the Final Roadway Design Plans, Specifications, and Estimate (PS&E) with all other required documentation to assist the Contract Standards and Development Unit to develop the contract for the Advertisement and Letting Process.

References

- ☐ *Roadway Design Manual*
- ☐ *Roadway Design Consultant Coordination Guidelines (In Development: The guidelines are being updated.)*
- ☐ *NCDOT Quality Management Program: Quality Control and Quality Assurance*

Deliverables

Deliverable	Task	Responsible Party	
		Activity Leader	Additional Support
		Roadway Design Lead	Other Technical Discipline/Unit Leads
Review Set of Final Plans [Q]	▪ *Complete PS&E Package*	X	
Final Construction Quantities for Roadway Design Plans [Q]		X	
Sealed Contract Roadway Design Plans [Q]	▪ *Submit Contract/Final Plans*	X	X (Roles noted in the descriptions below)

[Q] *Indicates that final document(s) or data set(s) requires review in accordance with the NCDOT Quality Management Program: Quality Control and Quality Assurance.*

Complete PS&E Package

The Roadway Design Lead updates the plans based on comments from the Design Review Complete Meeting, considering:

- Comments and recommendations from the review meeting are analyzed to determine if each is feasible to address.
- If results of the analyses do not provide a clear resolution, results are circulated to all relevant engineers and Division personnel for a final determination.
- The designs and plans are updated to include all final recommendations.

For compiling a complete PS&E package, the Roadway Design Lead updates the plans, as needed, for any design changes that occurred after the end of Stage 3. The process includes completing:

- The appropriate documentation required by the Contract Standards and Development Unit or Division Contract Engineer in proper format to either be included in the plans or provided as standalone documents.
- Items include the index of sheets, list of standard drawings, general notes, special provisions, relevant summary plan sheets summaries, quantities, and key documents.

The Roadway Design Lead completes the respective QC Checklist following the NCDOT *Quality Management Program: Quality Control and Quality Assurance* procedures before upload and/or distribution of Final PS&E package.

For roadway designs developed by a Private Engineering Firm, the Roadway Design reviewer or Division designee is to use appropriate means, including the applicable QA checklist in the *Quality Management Manual* to complete a quality assurance review.

This review is to ensure the plan set is complete and in compliance with current NCDOT and Roadway Design Unit guidance, policies, and procedures.

The Roadway Design Lead notifies the Plan Review Engineer or the Division Contract Engineer, with a cc to the Project Manager, when the Roadway Design Review Plan Set and the contract documentation have been placed on the project SharePoint site in the Let Preparation area. The Project Manager is included on the correspondence.

The Plan Review Engineer or the Division Contract Engineer provides comments to the Project Manager (for information) and Roadway Design Lead (for action). The Roadway Design Lead updates the plans and provides a response to all comments so that the group is aware of what has changed.

Submit Contract/Final Plans

Plan sheets are uploaded into DocuSign or equivalent software and sent to the Roadway Design Lead, Hydraulic Design Lead, and Pavement Design Engineer for dated seals and signatures.

Special detail sheets are uploaded to DocuSign and sent to the State Plans and Standards Engineer for dated seal and signature.

The Roadway Design Lead notifies the Plan Review Engineer or the Division Contract Engineer when the final sealed roadway design plan set/PS&E has been uploaded onto the project SharePoint site in the Let Preparation area. The Project Manager is included in the correspondence.

5RD1 Roadway Construction Support

The Roadway Design Lead provides the following support during the Construction Phase:

- Provides technical expertise and answers questions on the project's roadway design
- Completes Construction Revision (as needed):
  - Performs construction revisions of the latest version of the Let Plans (see 5CS1 for related information) to address identified field issues
  - Coordinates the applicable QC review following the NCDOT *Quality Management Program: Quality Control and Quality Assurance procedures* and the respective QC Checklist before upload and/or distribution
- Reviews contractor shop drawings, in coordination with identified technical disciplines/Units
- For Division-led projects, the Roadway Design Lead records the final as-builts.

2RE1 Initiate Erosion and Sediment Control Plans

Overview

Produce Erosion and Sediment Control (E&SC) plans for review at the Field Inspection Review Meeting to identify sufficient right-of-way/easement needs for erosion and sediment control installation, maintenance, and removal. Determine additional permit needs to ensure schedule commitments are met. Begin the design of the Erosion and Sediment Control Field Inspection Plans after approval, or concurrent with advancement, of the drainage design.

References

- ☐ Roadside Environmental - Soil and Water Webpage
- ☐ *Erosion and Sediment Control Design and Construction Manual*
- ☐ *NCDEQ Erosion and Sediment Control Planning and Design Manual*
- ☐ *BMP for Construction and Maintenance Activities*
- ☐ *NCDOT Quality Management Program: Quality Control and Quality Assurance*

Deliverables

Deliverable	Task	Responsible Party	
		Activity Leader	Additional Support
		E&SC Design Engineer	Roadside Environmental Unit Reviewer
Water Quality Worksheet (Form ESC-1)	▪ *Document Review and Surface Water Delineation for Design Requirements* ▪ *Conduct E&SC Project Site Visit*	X	X
Environmental Document Review (Form ESC-2)		X	X
Pre-Design Meeting Minutes	▪ *Conduct E&SC Pre-Design Meeting*	X	X
E&SC Field Inspection Plans	▪ *Design E&SC Field Inspection Plans for Clearing & Grubbing and Final Construction Phases*	X	X
	▪ *Design Pipe/Culvert Construction Sequences*	X	X
	▪ *Review E&SC Field Inspection Plan Set and Attend Field Inspection Review Meeting*	X	
ROW/Easement Request File	▪ *Develop ROW/Easement Request File*	X	X

Document Review and Surface Water Delineation for Design Requirements

To complete this task, the E&SC Design Engineer is to:

- Provide a project investigation and watershed analysis by reviewing the project's environmental documents for commitments related to E&SC design, mitigation, landscaping, and vegetation re-establishment.
- Complete and submit the *Water Quality Worksheet* (Form ESC-1) and *Environmental Document Review* (Form ESC-2) (both located on the Soil and Water webpage) to verify E&SC design requirements and to document environmental commitments to be addressed by the E&SC plans and other Roadside Environmental Unit operations.

The *Water Quality Worksheet* and *Environmental Document Review* are reviewed by Roadside Environmental Unit Reviewer and uploaded onto the project SharePoint site when complete.

Conduct E&SC Project Site Visit

The E&SC Design Engineer performs a site visit for familiarization with the area and to evaluate existing groundcover, soils, and jurisdictional features for E&SC design. This work includes:

- Comparing design file topography with existing field topography for discrepancies.
- Evaluating and noting any potential construction and maintenance issues for E&SC measures.
- Documenting and photographing current condition of noted jurisdictional streams and wetlands or other sensitive drainage features.
- Distributing the notes and photos to Roadside Environmental Unit Reviewer, uploading all onto the project SharePoint site.

Conduct E&SC Pre-Design Meeting

In conducting the meeting with the Roadside Environmental Unit staff after the site visit, the E&SC Design Engineer is to:

- Discuss E&SC design concept for the project, including potential design exceptions, any issues noted during the site visit, environmental commitments, and any current Division preferences or potential constructability conflicts.
- Submit draft meeting minutes for review and comment to attendees and other Units, as necessary.
- Submit final meeting minutes to attendees and upload onto the project SharePoint site.

Design E&SC Field Inspection Plans for Clearing & Grubbing and Final Construction Phases

For this portion of the plans, the E&SC Design Engineer is to design the clearing and grubbing and final construction phase E&SC plans in accordance with the *Erosion and Sediment Control Design and Construction Manual* and NCDEQ's *Erosion and Sediment Control Planning and Design Manual*.

- For the Clearing and Grubbing E&SC plans, this work includes:
  - Delineating the watersheds that drain through the project and their discharge points based on existing topography and drainage features.
  - Designing any basins at existing outfalls and routing runoff with existing or temporary ditches with velocity controls, as needed.
  - Identifying and protecting jurisdictional features.
  - Delineating the Environmentally Sensitive Areas (ESA), as required.
  - Designing perimeter protection to contain runoff not conveyed to an E&SC basin.
  - Designing inlet protection for existing inlets and drainage inflow points.
- For the Final Construction Phase E&SC plans, this work includes:
  - Delineating watersheds that drain through the project and their discharge points based on proposed topography and drainage plans.
  - Designing basins at outfalls using proposed pipes and drainage channels.
  - Designing temporary ditches, as needed, to convey runoff to E&SC basins.
  - Designing velocity controls for proposed drainage channels and temporary ditches.

- Incorporating clearing and grubbing E&SC plans, as practical.
- Designing perimeter protection to contain runoff not conveyed to an E&SC basin.
- Designing inlet protection for proposed inlets and other drainage inflow points.

The E&SC Field Inspection Plans is to show locations of E&SC measures and evaluate necessary temporary construction easement for the installation, maintenance, and removal of the measures.

The E&SC Design Engineer submits E&SC Field Inspection Plans to the Roadside Environmental Unit Reviewer (for action) and Project Manager (for information) along with all supporting documentation and calculations.

The E&SC Design Engineer also completes the respective QC Checklist following the *NCDOT Quality Management Program: Quality Control and Quality Assurance* procedures before upload and/or distribution of E&SC plans.

Design Pipe/Culvert Construction Sequences

When designing the pipe/culvert construction sequencing, the E&SC Design Engineer is to:

- Design construction sequence drawings and narratives, for pipes/culverts carrying jurisdictional streams sufficient to convey the stream through the project construction site, while maintaining separation from the work site.
- Design temporary drainage (e.g., pipes, channels, etc.) as needed to maintain stream passage during construction. Include designs for temporary pipes carrying jurisdictional streams that are needed for work zone traffic control and other construction activities.
- Incorporate pipe/culvert construction sequences into the clearing & grubbing phase E&SC plans.

The E&SC Design Engineer determines applicability of other permits or variances (e.g., NC Division of Water Resources Central Coastal Plain Capacity Use Area (CCPCUA) Permits, NC Department of Environmental Quality Trout Buffer Variance and High-Quality Waters (HQW) Variance, etc.) and begins application coordination as required.

Review Field Inspection E&SC Plan Set and Attend Field Inspection

The ES&C Design Engineer is to:

- Distribute the approved E&SC Field Inspection Plans to the appropriate Units/discipline leads (e.g., the Project Manager, Structures Management, Roadway Design, Division Construction, Utilities, Right-of-Way, Division Environmental Officer, REU Field Operations, Central Construction, etc.) for review and comment at the Field Inspection Review Meeting.
- Review the E&SC Field Inspection Plans prior to the Field Inspection Review Meeting noting any errors or conflicts with utilities or other construction activities.
- Attend the Field Inspection Review Meeting, respond to questions or concerns relating to the E&SC design, and note additional coordination or revisions needed due to traffic control, utilities, or temporary construction impacts (e.g., temporary work bridges, causeways, work pads, access or haul roads etc.).

Develop ROW/Easement Request File

When developing the ROW/Easement Request file, the E&SC Design Engineer:

- Delineates temporary construction easements that are necessary for the construction, maintenance, and removal of E&SC measures and adds additional easements on the E&SC Field Inspection Plans.
  - After review and acceptance from the Roadside Environmental Unit Reviewer, the preliminary easement request CADD file is to be submitted to the Roadway Design Lead for incorporation with the Field Inspection Plans.
- Coordinates with Roadway, Hydraulics, Right-of-Way, Utilities, and other disciplines/Units to identify and resolve conflicts or issues raised in the Field Inspection Review Meeting with the planned E&SC measures.

Once the necessary E&SC design changes are made and approved to address the conflicts, the E&SC Design Engineer produces a completed easement request CADD file and distributes to the Right-of-Way team (for action), Roadway Design Lead, and the Project Manager (for information).

3RE1 Complete Erosion & Sediment Control Plans

Overview

Complete the erosion and sediment control (E&SC) plans to supplement the overall design and complete the necessary applications for additional permits related to E&SC so as to not delay project letting.

References

- ☐ Roadside Environmental - Soil and Water Webpage
- ☐ *Erosion and Sediment Control Design and Construction Manual*
- ☐ *NCDEQ Erosion and Sediment Control Planning and Design Manual*
- ☐ *BMP for Construction and Maintenance Activities*
- ☐ *NCDOT Quality Management Program: Quality Control and Quality Assurance*

Deliverables

Deliverable	Task	Responsible Party	
		Activity Leader	Additional Support
		E&SC Design Engineer	Roadside Environmental Unit Reviewer
E&SC Plan Set [Q]	▪ *Complete E&SC plans for Clearing and Grubbing Construction Phase*	X	X
	▪ *Complete E&SC plans for Intermediate and Final Construction Phases*	X	X
	▪ *Calculate Matting Requirements for Ditches and Slopes*	X	X
	▪ *Add Details, Notes, and Vegetation Management Plans*	X	X
E&SC Special Provisions & Quantities [Q]	▪ *Calculate Final E&SC Quantities and Develop Project Specific E&SC Special Provisions*	X	X
Approved Applicable Permits/Variances	▪ *Apply for other Applicable Permits Related to the E&SC Plans*	X	X

[Q] *Indicates that final document(s) or data set(s) requires review in accordance with the NCDOT Quality Management Program: Quality Control and Quality Assurance.*

Complete E&SC Plans for Clearing and Grubbing Construction Phase

For this portion of the plans, the E&SC Design Engineer is to complete the design for the clearing and grubbing E&SC plans. This work includes revising E&SC Field Inspection Plans as necessary due to comments from the Field Inspection Review Meeting, design changes from other Units/disciplines, and utility conflicts.

Complete E&SC Plans for Intermediate and Final Construction Phases

For this portion of the plans, the E&SC Design Engineer completes the E&SC Final Construction Phase plans and any necessary intermediate phase E&SC plans in accordance with the *Erosion and Sediment Control Design and Construction Manual* and the NCDEQ *Erosion and Sediment Control Planning and Design Manual*. This work includes:

- Revising E&SC Field Inspection Plans as necessary due to comments from the Field Inspection Review Meeting, design changes from other Units/disciplines, and utility conflicts.

- Designing for temporary drainage associated with temporary traffic detours or construction activities that may not be captured in the clearing and grubbing or final phase E&SC plans.
- Additional ES&C designs determined to be necessary to capture construction stormwater runoff due to changes in drainage during mass grading.

Calculate Matting Requirements for Ditches and Slopes

To calculate matting requirements, the E&SC Design Engineer:

- Analyzes flow rates and determines stabilization requirements for channels with erosive velocities and slopes with potential for erosive failure throughout the project.
- Denotes stabilization using matting or other groundcover in a summary table or annotation on the E&SC plans.

Add Details, Notes, and Vegetation Management Plans

For this task, the E&SC Design Engineer:

- Completes the E&SC plans by incorporating appropriate title sheet information, required details, and notes on the E&SC plan sheets for project-specific environmental information into the plan.
- Adds project-specific vegetation management plans (e.g., reforestation, streambank reforestation, wetland grass or reforestation, etc.) or landscaping as required through permitting or project commitments to the E&SC plans.

Calculate Final E&SC Quantities and Develop Project Specific E&SC Special Provisions

The E&SC Design Engineer submits quantity calculations and develops project Special Provisions for all items in the E&SC plans not covered under the NCDOT Standard Specifications. This task involves calculating quantities for all E&SC items and applying maintenance factors for final quantities.

Complete QC/QA Procedures

The E&SC Design Engineer submits E&SC Plans to the Roadside Environmental Unit Reviewer (for action) and Project Manager (for information) along with all supporting documentation and calculations.

Lastly, the E&SC Design Engineer completes the respective QC Checklist following the *NCDOT Quality Management Program: Quality Control and Quality Assurance* procedures before upload and/or distribution of E&SC plans. All related information is uploaded to the project SharePoint site.

Apply for other Applicable Permits Related to the E&SC Plans

Applications for other project-specific required permits/variances (e.g., NC Department of Environmental Quality Trout Buffer, NC Division of Water Resources Central Coastal Plain Capacity Use Area (CCPCUA) Permits, NC Department of Environmental High Quality Waters (HQW), etc.) are to be submitted for approval by the regulatory agency (see 3HY1 and 3EN1 for related information).

The E&SC Design Engineer conducts any meetings with regulatory agencies and other appropriate design staff as necessary to secure approval for other permits related to E&SC. The E&SC Design Engineer makes modifications to the E&SC plans as needed and advises other Units/disciplines, the project manager, and construction staff of any construction management requirements or restrictions developed during this process.

4RE1 Finalize Erosion & Sediment Control Contract Package

Overview

Address any necessary design revisions and compile and submit the Erosion and Sediment Control Plans, Specifications, and Estimates along with any other required permits, vegetation management, landscaping, or aesthetic enhancement documentation.

References

- ☐ Roadside Environmental - Soil and Water Webpage
- ☐ *Erosion and Sediment Control Design and Construction Manual*
- ☐ NCDEQ *Erosion and Sediment Control Planning and Design Manual*
- ☐ *BMP for Construction and Maintenance Activities*
- ☐ *NCDOT Quality Management Program: Quality Control and Quality Assurance*

Deliverables

Deliverable	Task	Responsible Party	
		Activity Leader	Additional Support
Approved E&SC Contract Package [Q]	▪ *Complete E&SC Contract Package*	E&SC Design Engineer	Roadside Environmental Unit E&SC Reviewer
Approved Applicable Permits/Variances	▪ *Receive Approval for other Applicable Permits Related to the E&SC Plans*	E&SC Design Engineer	

[Q] *Indicates that final document(s) or data set(s) requires review in accordance with the NCDOT Quality Management Program: Quality Control and Quality Assurance.*

Complete E&SC Contract Package

For compiling a complete contract package, the E&SC Designer updates the plans, as needed, for any design changes that occurred after the end of Stage 3. The process includes:

- Completing any necessary E&SC design changes required due to plan revisions from other Units and modification of details, provisions, and quantities that are affected, as well as any modifications due to conditions required by permits related to E&SC plans.
- Submittal of revisions for approval by the Roadside Environmental Unit Reviewer and final plan acceptance notification.
- Completion of the respective QA Checklist following the *NCDOT Quality Management Program: Quality Control and Quality Assurance* procedures before upload and/or distribution of E&SC plans.
- Completion of any outstanding E&SC related tasks.

The E&SC Design Engineer notifies the Roadway Design Lead and Project Manager (for information) when the accepted E&SC plans and the contract documentation have been placed on the project SharePoint site in the Let Preparation area and the quantities have been entered into the quantities management system.

Receive Approval for other Applicable Permits Related to the E&SC Plans

The E&SC Design Engineer receives final approval for the applicable E&SC related permits and distributes the document to necessary parties for information and incorporates the approval into the Complete E&SC Contract Package.

5RE1 NPDES Stormwater Construction Compliance Support

To complete this task, the E&SC Design Engineer is to:

- Notify the Roadside Environmental Operations Management Engineer of all impacts to NPDES regulated permanent stormwater controls, both temporary and permanent, associated with the project for status updates in the NCDOT SCMS database.
- Coordinates with the NCDOT Hydraulics Stormwater NPDES Permit Program to identify new or revised permanent stormwater control measures and ensure latest designs are supplied to the Roadside Environmental Operations Management Engineer for upload into the NCDOT SCMS database.

References

- ☐ Roadside Environmental - Soil and Water Webpage
- ☐ *Erosion and Sediment Control Design and Construction Manual*

1RR1 Identify Railroad Impacts

Overview

Determine impacts when the Rail Division Unit is contacted about a potential project rail corridor impact or invite the Rail Division Unit to a scoping or planning meeting.

References

- ☐ *American Railway Engineering and Maintenance-of-Way Association (AREMA) Manual for Railway Engineering*
- ☐ *Federal Highway Administration (FHWA) Manual on Uniform Traffic Control Devices (MUTCD)*
- ☐ *FHWA Highway-Rail Crossing Handbook*
- ☐ *CSX Public Projects Manual*
- ☐ *Norfolk Southern (NS) Public Projects Manual*
- ☐ *Roadway Design Manual*
- ☐ *Rail Grade Separation Guidelines*
- ☐ *Complete Streets Memo/Policy*
- ☐ *Guidelines for Median Separations at Highway-Railway At-Grade Crossings*
- ☐ *State Maintained Road/Railroad Crossing Closure Procedures*
- ☐ *Summary of State Highway-Railroad Grade Separation Policies*
- ☐ *NCDOT Quality Management Program: Quality Control and Quality Assurance*

Deliverables

Deliverable	Task	Responsible Party	
		Activity Leader	Additional Support
Scoping Response Letter	▪ *Determine a Finding of No Rail Impacts* ▪ *Determine a Finding of One or More Rail Impacts* ▪ *Submit Scoping Letter*	Railroad Coordination Engineer	Project Lead

Determine a Finding of No Rail Impacts

To determine a "Finding of No Rail Impacts," the Railroad Coordination Engineer is to:

- Examine rail corridor mapping to determine proximity of the project to nearest rail corridor(s) and whether the proposed project is not proximate to a rail corridor.
- In the event there is a no rail impact finding, review the project to determine if there is an abandoned corridor maintained by NCDOT or if there are other rail impacts that are not obvious (e.g., newly built tracks that only the Rail Division are familiar with).

If examinations result in a negative (or no) finding, the Railroad Coordination Engineer sends a "Finding of No Rail Impacts" to the Feasibility Studies/Corridor Development Unit Lead.

Determine a Finding of One or More Rail Impacts

To determine a "Finding of One or More Rail Impacts," the Railroad Coordination Engineer, with support from Rail Division Staff, is to:

- Examine rail corridor mapping to determine proximity of the project in relationship to nearest rail corridor(s).
- Describe impacts if the proposed project crosses, shares right-of-way, or operationally impacts one or more rail corridors.
  - Impacts may include widening a roadway into railroad right-of-way; a Y-line that has an at-grade crossing or other improvement that impacts railroad right-of-way; or new location projects that are proposed to be grade-separated (preferably over the railroad).

If examinations result in a positive finding, the Railroad Coordination Engineer sends a "Finding of One or More Rail Impacts" to the Feasibility Studies/Corridor Development Unit Lead.

Submit Scoping Response Letter

The Railroad Coordination Engineer provides a scoping response letter to the Feasibility Studies/Corridor Development Unit Lead (see 1FS2 for related information) that is also distributed internally within the Rail Division Unit. Details of the letter identify the railroad impacts and the appropriate Rail Discipline Lead(s) for coordination throughout the remainder of the project. Rail Discipline Leads have specialties in the areas of encroachment, crossing signals, roadway coordination, bridges (roadway over rail led by Structures Management Unit), and railroad design, including railroad bridges over roadway led by Rail Division.

Attend Meetings

The appropriate Rail Discipline Lead(s) attends or, in some cases, initiates planning-level meeting with other Units/disciplines or stakeholders.

- The Rail Discipline Lead(s) , as requested, reviews the preliminary plans/Express Design, planning documents, or meeting summaries, providing written feedback to the Feasibility Studies/Corridor Development Unit Lead and Project Lead on any rail impacts.
- The Rail Discipline Lead(s) may also be invited to attend follow-up meetings as the project progresses.

Initiate Rail Outreach

Apart from meeting and plan reviews, the appropriate Rail Discipline Lead(s) also contacts any Class I Railroads and other partnering agencies to provide general project scope information and solicit future participation, feedback, or other requests for information to support a project.

Complete QC/QA Procedures

The Railroad Coordination Engineer coordinates the applicable QC review following the *NCDOT Quality Management Program: Quality Control and Quality Assurance* procedures and the respective QC Checklist before upload and distribution of all related deliverables.

2RR1 Coordinate Railroad Review

Overview

Initiate railroad review and design (if necessary) when there are identified rail corridor impacts on a project.

References

- ☐ *American Railway Engineering and Maintenance-of-Way Association (AREMA) Manual for Railway Engineering*
- ☐ *Federal Highway Administration (FHWA) Manual on Uniform Traffic Control Devices (MUTCD)*
- ☐ *FHWA Highway-Rail Crossing Handbook*
- ☐ *CSX Public Projects Manual*
- ☐ *Norfolk Southern (NS) Public Projects Manual*
- ☐ *Roadway Design Manual*
- ☐ *Rail Grade Separation Guidelines*
- ☐ *Complete Streets Memo/Policy*
- ☐ *Guidelines for Median Separations at Highway-Railway At-Grade Crossings*
- ☐ *State Maintained Road/Railroad Crossing Closure Procedures*
- ☐ *Summary of State Highway-Railroad Grade Separation Policies*
- ☐ *NCDOT Quality Management Program: Quality Control and Quality Assurance*

Deliverables

Deliverable	Task	Responsible Party	
		Activity Leader	Additional Support
		Railroad Discipline Lead(s)	Railroad Coordination Engineer
Railroad Design Line and Grade [Q]	▪ *Approve Railroad Design Line and Grade*	X	X
Railroad PE Agreement	▪ *Establish Railroad Preliminary Engineering (PE) Agreement*	X	X
Roadway Plans for Rail Review	▪ *Submit Roadway Plans for Rail Review*	X	X
Crossing Scope for Off-Site Detour	▪ *Define Crossing Scope for Off-Site Detour*	X	X

[Q] *Indicates that final document(s) or data set(s) requires review in accordance with the NCDOT Quality Management Program: Quality Control and Quality Assurance.*

Approve Railroad Design Line and Grade

The Roadway Design Lead (or assigned design lead) and appropriate Rail Discipline Lead coordinate on the roadway design and rail design to establish the project footprint. The Railroad Design Reviewer receives the current railroad design plans from the consultant/Private Engineering Firm (PEF) for review and initial comments. Once revised, the appropriate Rail Discipline Lead submits the revised design to the appropriate railroad. The appropriate Rail Discipline Lead works with the railroad to obtain comments and coordinates with the Roadway Design Lead (for action), the Railroad Coordination Engineering (for information), and the Project Manager (for information) on required plan revisions necessary for railroad approval.

Establish Railroad Preliminary Engineering (PE) Agreement

The Rail Encroachment Lead develops, coordinates, and executes a preliminary engineering agreement for any railroad encroachments. The exceptions are:

- Structures over/under the railroad, which are handled by the Structures Management Unit.
- City projects, which are generally handled by the municipality if it is a city project.

Submit Roadway Plans for Rail Review

The appropriate Rail Discipline Lead reviews the Design Recommendation Plan Set, providing initial comments at the associated review meeting. The appropriate Rail Discipline Lead submits the revised Design Recommendation Plan Set to the appropriate railroad. The appropriate Rail Discipline Lead works with the railroad to obtain comments and coordinates with the Roadway Design Lead (for action), the Railroad Coordination Engineer (for information), and the Project Manager (for information) on required plan revisions necessary for railroad approval.

Define Crossing Scope for Off-Site Detour

For all projects that impact a railroad crossing or contemplate a detour that diverts traffic to another railroad crossing, the Rail Signals Lead reviews the temporary traffic control (TTC) plans (see 2TM1 for related information). The Rail Signals Lead receives the TTC plans from the Work Zone Traffic Control (WZTC) Project Engineer, with a notification to the Project Manager, for review and provides initial comments back.

The Work Zone Traffic Control (WZTC) Project Engineer revises the plans based on Rail Division review, resubmitting the plans to the Rail Signals Lead for submission to the appropriate railroad.

The Rail Signals Lead works with railroad to obtain comments and coordinates with the Work Zone Traffic Control (WZTC) Project Engineer (for action), the Railroad Coordination Engineer (for information), and Project Manager (for information) on necessary plan revisions.

Complete QC/QA Procedures

The appropriate Rail Discipline Lead(s) coordinates the applicable QC review following the *NCDOT Quality Management Program: Quality Control and Quality Assurance* procedures and the respective QC Checklist before upload and/or distribution of any related deliverables.

2RR2 Coordinate Railroad Review

In development.

3RR1 Finalize Railroad Design & Agreements

Overview

Complete the railroad design and execute all necessary railroad agreements.

References

- ☐ *American Railway Engineering and Maintenance-of-Way Association (AREMA) Manual for Railway Engineering*
- ☐ *Federal Highway Administration (FHWA) Manual on Uniform Traffic Control Devices (MUTCD)*
- ☐ *FHWA Highway-Rail Crossing Handbook*
- ☐ *CSX Public Projects Manual*
- ☐ *Norfolk Southern (NS) Public Projects Manual*
- ☐ *Roadway Design Manual*
- ☐ *Rail Grade Separation Guidelines*
- ☐ *Complete Streets Memo/Policy*
- ☐ *Guidelines for Median Separations at Highway-Railway At-Grade Crossings*
- ☐ *State Maintained Road/Railroad Crossing Closure Procedures*
- ☐ *Summary of State Highway-Railroad Grade Separation Policies*
- ☐ *NCDOT Quality Management Program: Quality Control and Quality Assurance*

Deliverables

Deliverable	Task	Responsible Party	
		Activity Leader	Additional Support
		Railroad Discipline Lead(s)	Railroad Coordination Engineer
Railroad Signal Planimetric [Q]	▪ *Prepare Railroad Signal Planimetric and Complete Railroad Crossing Signal Design*	X	X
Railroad Crossing Signal Design [Q]		X	X
Railroad Design Plans [Q]	▪ *Provide Final Railroad Design Plans to the Railroad*	X	X
Relevant Railroad Agreements	▪ *Complete Railroad Agreements*	X	X

[Q] *Indicates that final document(s) or data set(s) requires review in accordance with the NCDOT Quality Management Program: Quality Control and Quality Assurance.*

Prepare Railroad Signal Planimetric and Complete Railroad Crossing Signal Design

The Rail Signals Lead receives the Field Inspection Plan Set, which includes advanced drainage design from the Hydraulics Design Engineer, that is used to prepare a planimetric for railroad signal locations.

The Rail Signals Lead sends the railroad planimetric and Authorization for Preliminary Engineering (A4PE) to the railroad to complete their final design for the railroad crossing signal plans. The Railroad sends the signal design back to the Rail Signals Lead, who completes an Approved for Construction (A4C) upon completion of the final signal design and informs the Railroad Coordination Engineer and Project Manager for information.

Provide Final Railroad Design Plans to the Railroad

The Rail Design Lead receives the current railroad design plans from the assigned design lead for review, providing initial comments on the plans. Once revised, the plans are resubmitted to the Rail Design Lead to be submitted to the appropriate railroad. The appropriate Rail Division Lead works with the railroad to obtain comments and coordinates with the Roadway Design Lead (or assigned design lead) on required plan revisions to either the Rail Division plans and/or the roadway design plans (if necessary) for railroad approval.

Complete Railroad Agreements

The Rail Encroachments Lead completes and coordinates a railroad agreement for any railroad encroachments, except for structures over/under the railroad, which are handled by the Structures Management Unit with support from the Location and Surveys Unit for any recordable map needs (see 3ST1 and 4LS1 for related information).

Complete QC/QA Procedures

The appropriate Rail Discipline Lead(s) coordinates the applicable QC review following the *NCDOT Quality Management Program: Quality Control and Quality Assurance* procedures and the respective QC Checklist before upload and/or distribution of any related deliverables.

3RR2 Complete Railroad Coordination

Overview

Complete all railroad coordination. The other mechanism for continuing this task is getting involved in stakeholder meetings and coordination meetings.

References

- ☐ *American Railway Engineering and Maintenance-of-Way Association (AREMA) Manual for Railway Engineering*
- ☐ *Federal Highway Administration (FHWA) Manual on Uniform Traffic Control Devices (MUTCD)*
- ☐ *Federal Highway Administration (FHWA) Highway-Rail Crossing Handbook*
- ☐ *CSX Public Projects Manual*
- ☐ *Norfolk Southern (NS) Public Projects Manual*
- ☐ *Roadway Design Manual*
- ☐ *Rail Grade Separation Guidelines*
- ☐ *Complete Streets Memo/Policy*
- ☐ *Guidelines for Median Separations at Highway-Railway At-Grade Crossings*
- ☐ *State Maintained Road/Railroad Crossing Closure Procedures*
- ☐ *Summary of State Highway-Railroad Grade Separation Policies*
- ☐ *Division Let Guidance*
- ☐ *NCDOT Quality Management Program: Quality Control and Quality Assurance*

Deliverables

Deliverable	Task	Responsible Party	
		Activity Leader	Additional Support
		Railroad Discipline Lead(s)	Railroad Coordination Engineer
Railroad Agreements	▪ *Receive/Execute Relevant Railroad Agreements*	X	X
Project Special Provisions [Q]	▪ *Provide Project Special Provisions to Contract Standards*	X	X

[Q] *Indicates that final document(s) or data set(s) requires review in accordance with the NCDOT Quality Management Program: Quality Control and Quality Assurance.*

Receive/Execute Relevant Railroad Agreements

The Rail Encroachment Lead coordinates the execution of the final railroad agreement for the railroad encroachment (if needed), except for structures over/under the railroad, which are handled by the Structure Management Unit. The Rail Encroachment Lead then distributes the agreement to the Railroad Coordination Engineer and Project Manager when finalized.

Provide Project Special Provisions to Contract Standards

The appropriate Rail Division Lead provides any project-specific Special Provisions to the Contract Standards and Development Unit (for action) and the Railroad Coordination Engineer and Project Manager for information.

Issue Railroad Certification

Once all railroad work has been completed or arrangements for proper coordination during construction are included in the bid proposal, the Surfaces & Encroachments Manager in the Rail Division completes a railroad certification. Additional information on this certification is detailed in the *Division Let Guidance* for Division-let projects. The certification is retained for the project files and as a key document in the rail library.

Complete QC/QA Procedures

The appropriate Rail Discipline Lead(s) coordinates the applicable QC review following the *NCDOT Quality Management Program: Quality Control and Quality Assurance* procedures and the respective QC Checklist before upload and/or distribution of any related deliverables.

5RR1 Railroad Construction Support

The Rail Division provides the following support during the Construction Phase:

- Provides technical expertise and answers questions related to railroad coordination and identified design during the pre-construction meeting and throughout construction
- Completes Construction Revision (as needed):
  - Perform construction revisions of the latest version of the Let Plans (see 5CS1 for related information) to address identified field issues
  - Review associated working drawings and associated calculations
  - Manage any Internal Construction Inquiry (ICI) initiated by NCDOT RCU or railroad partner
    - Should a Construction Change Request (CCR) initiated by NCDOT RCU be warranted after an ICI is processed, a Construction Revision (or CREVs) or a sketch bulletin would result

1RW1 Prepare Conceptual ROW Cost Estimate

Overview

Prepare conceptual right-of-way (ROW) cost estimates early in the planning process for inclusion with the conceptual construction estimate.

Note: *Actions during the Project Initiation Stage may be led and completed by staff from several different NCDOT groups. Any person who has overall responsibility for a project during this Stage is referred to as the "Project Lead." This lead could be the Feasibility Studies Engineer, the Corridor Development Engineer, the Division Planning Engineer, or someone in a similar role as tasked by a state or local agency.*

References

- ☐ Right-of-Way SharePoint Site
- ☐ *Right-of-Way Manual*

Deliverables

Deliverable	Task	Responsible Party	
		Activity Leader	Additional Support
Conceptual ROW Cost Estimate	▪ *Develop Conceptual Right-of-Way Cost Estimate* ▪ *Review Estimate*	Central ROW Office	▪ Project Lead ▪ Division, Roadway, or Outside Consultant Firm

Develop Conceptual Right-of-Way Cost Estimate

The ROW estimate is a critical component of the larger project estimate being generated and compiled Preliminary Estimates Section (for Central-let projects) or the appropriate Division staff (for Division-let projects $1 million and under).

For Division-let projects/DPOC projects, the Division may generate ROW estimates with the support of consulting firms and/or Division ROW staff. The request includes the Express Design showing general limits of ROW to be acquired, along with a letter requesting the cost estimate, and the due date for the estimate.

For Central-let projects, a Project Manager may elect to follow the request information in the Interim 5W Guide and sends a ROW cost estimate request to the Central ROW Office. The request includes the Express Design showing general limits of ROW to be acquired, along with a letter requesting the cost estimate, and the due date for the estimate.

Upon receiving the request, the Appraisal Estimate Coordinator assigns the conceptual ROW cost estimate request to an in-house staff member or contracts with a qualified fee appraiser to perform the estimate.

- If a contracted appraiser is used, the Appraisal Estimate Coordinator sends the plans and the request to the appraiser and requests a signed contract to allow the contracted appraiser to perform the work.

As part of the estimate, the Appraiser includes:

- A completed appraiser worksheet (using the NCDOT Cost Estimate Detail Sheet)
- Completed Request for R/W Cost Estimate Form with relocation counts and labeled pictures of the parcels identified for relocation.
- Any Relocation EIS studies submitted to Central ROW for final approval per federal requirements.

Review Estimate

The Appraiser sends the conceptual ROW cost estimate to Appraisal Estimate Coordinator, who reviews the estimate and adds additional costs and multipliers to the estimate to account for the possibility of relocation, administrative adjustments, and condemnation/court costs.

Generate Cost Verification Letter

After satisfactory review, the Appraisal Estimate Coordinator sends the estimate to the Project Manager, who generates and distributes a Cost Verification Letter per the process detailed in the *Division Engineer Approval for Cost Verification Memo* (see 1CS1 for related information).

2RW1 Begin Advance Acquisition ROW Tasks

Overview

Begin advanced acquisitions of project right-of-way (ROW) based on hardships, protective purchases, or complex relocation or utility issues associated with certain parcels.

References

- ☐ Right-of-Way SharePoint Site
- ☐ *Right-of-Way Manual*

Deliverables

Deliverable	Task	Responsible Party		
		Activity Leader	Additional Support	
		Division Engineer's Office	Division ROW Office or PEF/Consultant	Central ROW Office AARC Committee
Advance Acquisition Property Owner Contacts	▪ *Review/Approve Advanced Acquisition Requests*	X	X	X
	▪ *Set Up Funding*			X
	▪ *Contact Property Owners*		X	X
Advanced Acquisition ROW Authorization	▪ *Request Advanced Acquisition ROW Authorization*	X	X	X
	▪ *Request Additional PE Funding*	X	X	X

Verify Existing ROW

The Locations and Surveys Unit, along with the Division ROW Office, verify the existing ROW and assist in determining the acquisition areas on an early/advanced acquisition parcel, so as not to acquire land that is already in existing ROW limits.

As requested by the Utilities Coordinator, ROW staff provides existing ROW documentation and/or supporting information to inform the Cost Responsibility Analysis associated with potential utility conflicts (see 2UT1 for related information).

Review/Approve Advanced Acquisition Requests

The Division ROW Office, the Division Engineer, or the Division Construction Engineer sends an Advanced Acquisition and Advanced Acquisition Hardship Requests to the Advanced Acquisition Review Committee for review and approval. In accordance with the *ROW Manual*, the request includes:

- A letter from the property owner requesting the hardship acquisition (if available), along with any documentation provided by the property owner to support the hardship case.
- Plans (if available) for review.
- An explanation of the issues, if the request is based on a complex relocation or utility issue.

Set Up Funding

Once approved, the Advanced Acquisition Review Committee requests funding either through Preliminary Engineering funding (for costs up to and including requesting an appraisal) or Right-of-Way/Utility (ROW)

funding for one or more parcels. ROW funding must be available in order to settle or condemn an advanced acquisition parcel.

Contact Property Owners

The Acquisition Agent assigned to the parcel(s) begins the ROW acquisition process and contacts the appropriate property owners.

- If the parcel(s) in question is assigned to a Private Engineering Firm/ROW consultant, then a contract is executed by the Division finance section, with the assistance of the Division ROW Office.
- However, if this is performed out of the Central ROW Office, then the assigned Private Engineering Firm/ROW consultant signs a contract through the Consultant Coordinator in order to proceed.
- Assignment of parcels to Acquisition Agents is based on the current workload of the agents available to perform the work.

Request Advanced Acquisition ROW Authorization

If Preliminary Engineering funding was used to make initial contact and request the appraisal, the Acquisition Agent is to:

- Request ROW funding in the amount of the settlement, relocation, and recording fees in order to close/condemn on the parcel.
- This is typically done at settlement of a hardship acquisition and at settlement or condemnation of other advanced acquisition parcels.

Request Additional PE Funding

The Acquisition Agent requests additional Preliminary Engineering funds or authorized ROW funds for early/advanced acquisitions from the fiscal unit.

Verify Field Inspection Plans/Revise as Needed

Reviewing the Field Inspection Plan Set provides the project team insight into obvious oversights, such as missing driveways, missing improvements, etc. The Acquisition Agent, Project Manager, or Division ROW Office level handles this type of review prior to the Field Inspection Review Meeting.

2RW2/2RW3 Prepare ROW Cost Estimate

Overview

Prepare right-of-way (ROW) cost estimate (PH 200) and verify the estimate for inclusion with the project estimates under 2CS1 and 3CS1.

References

- ☐ Right-of-Way SharePoint Site
- ☐ Right-of-Way Forms and NCPMA Plan Requests
- ☐ *List of Qualified Appraisers*
- ☐ *Right-of-Way Manual*

Deliverables

Deliverable	Task	Responsible Party	
		Activity Leader	Additional Support
		Central ROW Office	Division, Roadway, or Outside Consultant Firm
ROW Cost Estimate (PH 200)	▪ *Develop Right-of-Way Cost Estimate* ▪ *Review Estimate*	X	X

Develop Right-of-Way Cost Estimate

The ROW estimate is a critical component of the larger project estimate being generated and compiled Preliminary Estimates Section (for Central-let projects) or the appropriate Division staff (for Division-let projects $1 million and under).

For Division-let projects/DPOC projects, the Division may generate ROW estimates with the support of consulting firms and/or Division ROW staff. The request includes the Design Recommendation Plan Set (for 2RW2) or the Field Inspection Plan Set (for 2RW3) showing the ROW to be acquired, along with a letter requesting the cost estimate, and the due date for the estimate.

For Central-let projects, a Project Manager may elect to follow the request information in the Interim 5W Guide and sends a ROW cost estimate request to the Central ROW Office. The request includes the Design Recommendation Plan Set (for 2RW2) or the Field Inspection Plan Set (for 3RW1) showing the ROW to be acquired, along with a letter requesting the cost estimate, and the due date for the estimate.

Upon receiving the request, the Appraisal Estimate Coordinator assigns the conceptual ROW cost estimate request to an in-house staff member or contracts with a qualified fee appraiser to perform the estimate. If a contracted appraiser is used, the Appraisal Estimate Coordinator sends the plans and the request to the appraiser and requests a signed contract to allow the contracted appraiser to perform the work.

As part of the estimate, the Appraiser includes:

- A completed appraiser worksheet (using the NCDOT Cost Estimate Detail Sheet)
- Completed Request for R/W Cost Estimate Form with relocation counts and labeled pictures of the parcels identified for relocation.
- Any Relocation EIS studies submitted to Central ROW for final approval per federal requirements.

Review Estimate

The Appraiser sends the completed the ROW cost estimate to Appraisal Estimate Coordinator, who reviews the estimate and adds additional costs and multipliers to the estimate to account for the possibility of relocation, administrative adjustments, and condemnation/court costs.

Generate Cost Verification Letter

After satisfactory review, the Appraisal Estimate Coordinator sends the estimate to the Project Manager, who generates and distributes a Cost Verification Letter per the process detailed in the *Division Engineer Approval for Cost Verification Memo*. This is to be included with the appropriate project estimate (see 2CS1 and 3CS1 for related information).

3RW1 Finalize ROW Authorization Package

Overview

Although not solely performed by the ROW Unit, authorize right-of-way (ROW) as informed by letter from the Project Manager and after the NCDOT Board of Transportation approves the authorization.

References

- ☐ Right-of-Way SharePoint Site
- ☐ *Right-of-Way Manual*

Deliverables

Deliverable	Task	Responsible Party		
		Activity Leader	Additional Support	
		Division or Resident Engineer's Office	Fiscal Section	Central ROW Office
ROW Authorization Letter	▪ Verify ROW Plans/Revise as Needed	X		
	▪ Receive Board Authorization	X		X
	▪ Request ROW Delineation	X		
	▪ Submit ROW Authorization Letter	X	X	X

Verify ROW Plans/Revise as Needed

Upon final review of the Right-of-Way Plan Set (see 2RD4 for related information):

- Any request for revisions is sent through the Locations and Surveys Unit and the Division office for approval.
- The Project Manager submits the verified plans to the NCDOT Board of Transportation for approval.

Receive Board Authorization

The NCDOT Board of Transportation approves a project to move forward to ROW acquisition, and the Project Manager issues a formal letter authorizing ROW acquisition to the Locations and Surveys Unit and Central ROW Office.

Request ROW Delineation

As requested by the Project Manager, the Locations and Surveys Unit typically assists with determining the location of the ROW (see 4LS1 for related information). The Acquisition Agent can measure from back of ditch to back of ditch on the other side of the road for an estimate of State-maintained ROW.

Submit ROW Authorization Letter

After the project has been approved by the NCDOT Board of Transportation and the project funding for ROW is set up, the Project Manager issues a formal letter to the Locations and Surveys Unit and Central ROW Office authorizing ROW acquisition. The Central ROW office sends the ROW Authorization Letter to the appropriate Division ROW Office.

Identify Early Acquisitions for Utilities and Displacements

Similar to 2RW1, the Division ROW Office or Central ROW Office reviews the Right-of-Way Plan Set for complex relocations due to utility relocations or complex displacements (such as a large business with lots of equipment and people to move) ahead of the ROW authorization to identify possible advanced acquisition.

- Preliminary Engineering funds may be requested, if not already available, and used for everything up through requesting an appraisal.
- The ROW project is to be authorized in order to use ROW funds when settling the claim or moving displaces or utilities.

Initiate Additional Advanced Acquisition Property Owner Contacts

The Acquisition Agent begins the advanced acquisition process of complex relocation or utility parcels and contacts the appropriate property owners. 2RW1 and 4RW1 provide additional information on this process.

Request Additional Advanced Acquisition ROW Authorization

If necessary, the Division ROW Office or the Central ROW Office requests funding to advanced acquisitions on complex relocation or utility parcels, or in an effort to acquire a property as a protective purchase in order to keep it from being developed prior to full ROW authorization on a project.

3RW2 Complete ROW Acquisitions & Relocations

Overview

Acquire right-of-way (ROW), complete the condemnation process for parcels not settled, and assist occupants through the relocation process.

References

- ☐ Right-of-Way SharePoint Site

Deliverables

Deliverable	Task	Responsible Party			
		Activity Leader		Additional Support	
		Central ROW Office	Division ROW Office	Acquisition Agent	Relocation Agent
Negotiations	▪ *Commence Parcel Negotiations*		X	X	
Condemnation	▪ *Initiate Condemnation Activities*	X	X	X	
Relocations	▪ *Relocate Occupants*				X

Commence Parcel Negotiation

In accordance with the ROW Manual, the following describes the parcel negotiation process led by either Central or Division ROW Office.

The first step is to create project parcel files in Division ROW Office or by the Private Engineer Firm/ROW consultant firm handling the acquisitions, ensuring all parcels are entered into SAP through the ROW Central Office.

To begin negotiations, an Acquisition Agent calls, mails a letter, or knocks on doors to initiate contact with property owners. The formal initial contact where the project is located and its effects on the property are required to be made in person if the owner lives in the State.

To order appraisals and title requests, the Acquisition Agent sends an appraisal request to the Area Appraisal office where it is assigned to an Area Appraiser.

- The Area Appraiser handles the contract with a fee appraiser to perform the work or delegate the work to an in-house appraiser.
- The Acquisition Agent orders the title opinion through a local attorney's office.
- The attorney researches the title and returns the title opinion back to the acquisition agent.
- The Acquisition Agent reviews the title opinion in order to ensure they are dealing with the proper owners of the property.

When submitting/reviewing/approving appraisals, the appraiser assigned to appraise a parcel follows the appraisal guidelines, and the completed appraisal is transmitted back to the Area Appraisal Office for review by either an in-house review appraiser or a fee review appraiser. The appraisal is approved by the Area Appraisal Office or the NCDOT State Appraiser.

An Acquisition Agent handles the step of meeting with property owners and making offers.

- If it is a small claim, the Acquisition Agent may be able to make an offer to the property owner upon initial contact with a claim report without an appraisal.
- Otherwise the Acquisition Agent receives the approved appraisal back from the Area Appraisal Office and can meet with the property owner again to make the acquisition offer.

The Acquisition Agent must negotiate at least 30 days prior to requesting condemnation, unless an amicable settlement is reached, or the property owner asks the agent to go ahead and file the condemnation prior to the 30-day period ending. An agent can negotiate for longer than the required 30 days as the project time limits allow. If at all possible, a right of entry is obtained in order to allow work to begin on a parcel prior to the settlement funds or condemnation funds being disbursed to the property owner.

For settling ROW claims, the Acquisition Agent draws up the Deed and/or Easement agreements, presenting them to the property owner, or their representation, for the property owner's signature. Once the Acquisition Agent has received the signed documents, they can put together a final report to send to their Project Manager or Division ROW Agent for approval. The Division ROW Agent sends the approved final report to the ROW Central Office Document Auditing section to begin the process of requesting a check.

Upon requesting a check (payment), the ROW Document Auditing section reviews the final report package for any errors and works with the Division ROW office to resolve any errors. After the review is complete, the proper managerial signatures are obtained, prior to uploading the file into SAP, and requesting the check from the Fiscal Unit.

Once Fiscal has approved the check in SAP, and have cut the check, the check can be delivered either by the Acquisition Agent directly to the property owner, or by a closing attorney, depending on the amount of the check.

In closing a ROW Claim, the ROW deeds and easements are recorded in the Register of Deeds office in that particular County, either by the Acquisition Agent, or the closing attorney.

To complete relocation, a relocation agent follows 49 CFR 24 to ensure all residential and non-residential displacees are given every opportunity to claim all eligible relocation benefits under Federal and State law. Per State law, 49 CFR 24 is followed on all projects, whether they are Federally funded or not.

Recording of ROW typically happens at the closing of the ROW claim. The Acquisition Agent or the closing attorney can record the deed and easements.

To secure a ROW certification, the Division ROW Agent informs the Project Manager of the need to acquire additional ROW, if the design and construction improvements are not within existing ROW.

- If all construction activities are within the existing ROW, then the Division ROW Agent prepares the ROW Certification, signs for approval, and submits the ROW Certification to the ROW Central Office, Division Program Manager, Project Manager, and the Resident Engineer's Office.

- If a project requires additional ROW, the ROW Acquisition Agent collaborates with the Project Manager and Division ROW Agent to complete the ROW Certification Request (with or without delays of entry).
  - In this process, the Division ROW Agent verifies that all parcels have been acquired or that a Right of Entry has been obtained. Parcels that have *NOT* been acquired are classified as a delay of entry parcel.
  - The Division ROW Agent also verifies that all displacees have been relocated or are scheduled to be relocate before the construction begins. If occupants have *NOT* been relocated, this is a delay of entry parcel.

The next step is the approval of the ROW Certification, certifying that the project has all parcels cleared for construction activities.

- If all parcels are not cleared for the project to commence construction activities:
  - The lead Acquisition Agent provides a "Committed" timeline identifying the date each parcel is to be cleared and provides the Project Manager the delay of entry date for inclusion in the project specifications.
- The Project Manager and Resident Engineer reviews and agrees to the delays of entry and forwards the ROW Certification request to the Division ROW Agent.
- The Division ROW Agent signs the ROW Certification pending the delays of entry.
- The Division ROW Agent sends the Certification to the Central ROW Office for approval. The Certification is then sent to Roadway and Construction.

For projects with ROW delays of entry:

- This task is used to track the status and progress of parcels needed for construction that have delays of entry on them after a project is advertised.
- The ROW Lead Agent continues the acquisition process to obtain either a signed ROW deed or easement, or an agreement for entry. All deadlines provided in the ROW Certification must be adhered to in order to prevent any and all ROW delay claims.

Once every parcel that was advertised with delays of entry has been cleared for construction, the Division ROW Agent prepares and submits a revised ROW Certification clearing the project of all delays of entry.

Lastly, the Central ROW Office staff sends the Final ROW Series Plan Set from the Location and Surveys Unit for recording (see 4LS1 for related information).

Initiate Condemnation Activities

If standard parcel negotiations are unsuccessful, the following condemnation activities are initiated per Chapter 13 of the NCDOT ROW Manual.

- Obtain signed Frm10-F from Area Agent.
- Review title report, legal description, and ROW maps.
- Submit Final Report for Condemnation.
- Request check from the Fiscal Unit.
- Submit file and check to Attorney General (AG) Office.
- Complete meditation and/or trial, if necessary.

- Obtain consent judgment/property deed.

Relocate Occupants

Occupants are relocated per Chapter 15 of the *ROW Manual* and 49 CFR 24.

5RW1 Right-of-Way Construction Support

Assigned ROW staff provides the following support during the Construction Phase:

- Provides technical expertise and answers questions related to ROW acquisitions and ROW conditions during the pre-construction meeting and throughout construction
- Completes Right-of-Way Revision (as needed) (see 5CS1 for related information):
  - A construction revision may trigger a change to the right-of-way or additional property negotiations may require updates to the Final ROW Series Plan Set (e.g., a change to a "fee simple" acquisition, modifications to property access, or a change in easement boundaries.

To address these changes, the Project Manager issues a Right of Way Revision Memorandum that notifies the Central ROW office, the project team, Location and Surveys, and others, of changes made to the plans. This memo:

- Summarizes the right-of-way revisions on each plan sheet
- Provides a link to the revised right-of-way files

Location and Survey modifies the ROW Reference CADD following the process in 5LS1. The Project Manager and Division ROW Office establish the deadline to acquire the new property based on when construction work is to occur in the impacted area.

2SD1 Initiate Signing and Delineation Design

Overview

Using the roadway model as a guide, develop a signing and delineation design for the project. Locate overhead and ground mounted type A and B-signs and establish pavement delineation in accordance with *Manual of Uniform Traffic Control Devices* (MUTCD), NCDOT *Roadway Standard Drawings*, and NCDOT *Signing and Delineation Manual*.

References

- ☐ *Federal Highway Administration (FHWA) Manual on Uniform Traffic Control Devices (MUTCD)*
- ☐ FHWA *Standard Highway Signs and Markings*
- ☐ Signing and Delineation Unit Website
- ☐ *Signing and Delineation Procedure Manual*
- ☐ *Standard Specifications for Roads and Structures*
- ☐ *Traffic Engineering Practices, Policies, and Legal Authority (TEPPL)*
- ☐ *Roadway Standard Drawings*
- ☐ *Roadway Design Manual*
- ☐ *Construction Manual*
- ☐ *NC Supplement to the Manual on Uniform Traffic Control Devices*
- ☐ *Logo Manual*
- ☐ *American Association of State Highway Transportation Officials (AASHTO) Roadside Design Guide*
- ☐ AASHTO *A Policy on Geometric Design of Highways and Streets*
- ☐ *NCDOT Quality Management Program: Quality Control and Quality Assurance*

Deliverables

Deliverable	Task	Responsible Party		
		Activity Leader	Additional Support	
		Signing and Delineation Designer	Regional Signing and Delineation Engineer	Other Technical Discipline/Unit Leads (Roles noted in the descriptions below)
Preliminary Signing and Delineation Strip Map [Q]	▪ *Complete Preliminary Signing and Delineation Layout*	X	X	X
	▪ *Identify Conflicts with Utilities, Right-of-Way, Wall, and ITS Device Conflicts*	X	X	X
	▪ *Determine Signing and Delineation Construction Limits*	X	X	X
	▪ *Ensure Lane Continuity and Adequate Merging*	X	X	
	▪ *Submit Preliminary Signing and Delineation Strip Map*	X		

[Q] *Indicates that final document(s) or data set(s) requires review in accordance with the NCDOT Quality Management Program: Quality Control and Quality Assurance.*

Complete Preliminary Signing and Delineation Layout

The Signing and Delineation Designer is to develop the Preliminary Signing and Delineation Strip Map using NCDOT *Roadway Standard Drawings,* the MUTCD, TEPPL, and NCDOT *Signing and Delineation Procedure Manual*. Review the Traffic Operations Analysis Technical Memorandum and proposed lane configuration with the Roadway Design Lead to ensure lane continuity is met and the proposed design can be signed and marked in accordance with the MUTCD on complex projects (see 2TM1 and 2RD1 for related information). QC review is required before distribution for all labels, callouts, notes, and information.

In reference to Chapter 4 of the NCDOT *Signing and Delineation Procedure Manual*, the Signing and Delineation Designer is to complete the following for signing design:

- Develop Signing and Delineation Strip Map that includes both existing and proposed signing.
  - If it makes the Strip Map easier to read, the existing signs may be shown on a separate strip map.
  - Strip Map shall include all guide signs (MUTCD Chapters 2D through 2L) and all Type A, B and D signs.
- Show the preliminary delineation layout on the Signing and Delineation Strip Map.
- Determine sign messaging.
- Identify ground mounted sign locations (stations) for all Type A, B and D signs.
- Identify overhead sign locations (stations).
- Determine overhead sign structure type.
- Determine simple (guardrail) or break away supports for ground mounted signs.
- Develop preliminary barrier and guardrail request for foundation and support protection.
- Review recommendations from the Complete Street Review Assessment and incorporate if appropriate.
- Coordinate with appropriate Division and TSMO that their proposed DMS locations do not conflict with permanent signs locations.
- Identify if a Work Zone Signing Staging plan is needed, as coordinate with the Traffic Management Unit (Work Zone Traffic Control).

The Signing and Delineation Designer coordinates with the Signing and Delineation Unit, Division Office for approval of routing and sign messaging in accordance with MUTCD, TEPPL, FHWA, and AASHTO.

- Review for safety, operational, or other elements that may require roadway modifications (i.e. lane drops and option lanes.)
- Review for compliance with MUTCD, TEPPL and *Roadway Standard Drawings*.
- Review lane configuration and complex interchanges, exit only, lane drops, and option lanes.
- Replace, modify, or upgrade existing signs where necessary in accordance with MUTCD and TEPPL.
- Send plans and communicate with appropriate Division Traffic Engineer and Regional Traffic Engineer to acquire and review for combined comments with Signing and Delineation Unit staff (see 2TS1 for related information).

In reference to Chapter 5 of the NCDOT *Signing and Delineation Procedure Manual*, the Signing and Delineation Designer is to complete the following for delineation design:

- Acquire a pavement marking recommendation letter from Signing and Delineation Standards Section.
  - This letter can be found under the SharePoint site Preconstruction Projects file structure or by contacting the Signing and Delineation Standards Engineer.
- Base the striping plan on the roadway model.
- Ensure lane continuity (also see Chapter 2 of the NCDOT *Signing and Delineation Manual*).
- Note lane configurations, such as lane drops, lane reductions, and option lanes (additional signs may be required). Coordinate with the Roadway Design Lead, Congestion Management Project Engineer, and Division Traffic Engineer as required.

The Signing and Delineation Designer is to send plans and fully communicate with appropriate Division Traffic Engineer and Regional Traffic Engineer to acquire and review for combined comments with Signing and Delineation Unit staff.

For all submittals, the Signing and Delineation Designer uploads the submittal onto the project SharePoint site.

Identify Conflicts with Utilities, Right-of-Way, Wall, and ITS Devices

The Signing and Delineation Designer is to consider placement of signing, considering that regulatory, warning and guide signs have a higher priority. Of note, the:

- Remaining signs shall only be installed where adequate spacing is available between other higher priority signs.
- Other signs shall not be installed in a position where they obscure the road users' view of other traffic control devices.

Additionally, the Signing and Delineation Designer is to:

- Ensure there are no utility (e.g., gas, fiber), wall (e.g., retaining, noise), ITS device, or drainage (e.g., drop inlets) conflicts.
- Ensure the sign is visible and not obstructed by other roadway features (e.g., bridge, vertical/ horizontal curvature).
- Determine if additional right-of-way is required.
- Document if signs are required to be adjusted due to conflicts.

Determine Signing and Delineation Construction Limits

Signing and Delineation construction limits can extend past construction limits. When completing this task, the Signing and Delineation Designer is to:

- Account for construction phasing for opening of portions of roadway.
- Ensure necessary routing is established throughout the project.
- Ensure all signs, including advance and route continuity, are considered when reviewing overall signing plan.

- Ensure all pavement markings, including offsite approaches and departures, are considered when developing the overall delineation plan.
- Coordinate with the Traffic Management Unit (Work Zone Traffic Control) if signs are located outside of the construction limits.
- Coordinate with the Roadway Designer and Traffic Management Unit (Wok Zone Traffic Control) if required pavement markings are located outside of the construction limits.

Ensure Lane Continuity and Adequate Merging

The Signing and Delineation Designer is to ensure lane continuity in reference to Section 2.7 of the NCDOT *Signing and Delineation Procedure Manual*. This includes review of the geometric layout to ensure that elements such as signing requirements, intersection operation, merging, exit only, lane/route continuity, end of freeway plans, and temporary connection plans are sufficient for the safety and operations of roadway users. Any necessary modifications to geometric layout to ensure lane continuity, adequate merging, and required signing are to be discussed and coordinated with all affected technical Units/disciplines (such as Roadway and Congestion Management) and all stakeholders (such as the Regional Traffic Engineer and the applicable Division).

Submit Preliminary Signing and Delineation Strip Map

The Signing and Delineation Designer coordinates the QC review following the *NCDOT Quality Management Program: Quality Control and Quality Assurance* procedures and the respective QC Checklist before upload and distribution of any deliverables. Once the Preliminary Signing and Delineation Strip Map is QC'd, the Signing and Delineation Designer submits the Strip Map and supporting documentation via the project SharePoint site for review and comment. The Signing and Delineation Designer sends email notification with a link to the submittal to the appropriate staff as applicable: Project Manager, Division, Regional Traffic Engineer and Regional SDU Engineer.

2SD2 Advance Signing and Delineation Design

Overview

Advance the signing and delineation plans in reference to NCDOT *Roadway Standard Drawings,* the MUTCD, TEPPL, and NCDOT *Signing and Delineation Procedure Manual*.

References

- ☐ Federal Highway Administration (FHWA) *Manual on Uniform Traffic Control Devices (MUTCD)*
- ☐ FHWA *Standard Highway Signs and Markings*
- ☐ Signing and Delineation Unit Website
- ☐ *Signing and Delineation Procedure Manual*
- ☐ *Standard Specifications for Roads and Structures*
- ☐ *Traffic Engineering Practices, Policies, and Legal Authority (TEPPL)*
- ☐ *Roadway Standard Drawings*
- ☐ *Roadway Design Manual*
- ☐ *Construction Manual*
- ☐ *NC Supplement to the Manual on Uniform Traffic Control Devices*
- ☐ *Logo Manual*
- ☐ American Association of State Highway Transportation Officials (AASHTO) *Roadside Design Guide*
- ☐ AASHTO *A Policy on Geometric Design of Highways and Streets*
- ☐ *NCDOT Quality Management Program: Quality Control and Quality Assurance*

Deliverables

Deliverable	Task	Responsible Party	
		Activity Leader	Additional Support
		Signing and Delineation Designer	Regional Signing and Delineation Engineer
Update Strip Map [Q]	▪ *Advance Signing and Delineation Design for Field Inspection* ▪ *Advance Signing and Delineation Design for Right-of-Way Plans*	X	X
Develop Signing Plans [Q]		X	X
Develop Ground Mounted Sign Support Design Worksheets [Q]		X	X
Develop Ground Mounted Sign Support Design Cross Sections [Q]		X	X
Document Guardrail/Barrier Locations [Q]		X	X
Develop Overhead Sign Locations [Q]		X	X
Develop Pavement Marking Plans [Q]		X	X

[Q] *Indicates that final document(s) or data set(s) requires review in accordance with the NCDOT Quality Management Program: Quality Control and Quality Assurance.*

Advance Signing and Delineation Design for Field Inspection

The Signing and Delineation Designer is to advance the signing and delineation plans for use at the Field Inspection. The Signing and Delineation Designer is to submit the Field Inspection plans including an

updated strip map to the appropriate Division Office, Regional Traffic Engineer, Regional Signing and Delineation Engineer and Project Manager. This includes steps that involve:

- Addressing comments by the Signing and Delineation Unit and the applicable Division from the previous design phase review.
- Providing an updated Signing and Delineation Strip Map from 2SD1 with the addition of all regulatory and warning signs.
- Addressing all right-of-way, utility, drainage, retaining/noise wall, ITS device conflicts, or provide a plan of action for addressing these conflicts.
- Updating preliminary signing and marking concept per revisions to the roadway design including any changes to lane widths and intersection layouts.
- Coordinating with appropriate Division and TSMO that their proposed DMS locations do not conflict with the permanent sign locations.
- Coordinating stop bar and crosswalk locations with the Signal Design lead.
- Developing proposed signing plans with notes in accordance with MUTCD, the NCDOT *Signing and Delineation Procedure Manual (Chapter 4)*, and NCDOT *Roadway Standard Drawings* (Section 9) with supporting signing documentation including:
  - Ground mounted sign support design worksheets
  - Ground mounted sign support design cross sections
  - List of all Barrier and Guardrail Locations needed for sign foundation and support protection.
  - List of all Overhead Sign Locations - list of all overhead sign locations with coordinates
- Developing proposed pavement marking plans in accordance with MUTCD, the NCDOT *Signing and Delineation Procedure Manual (Chapter 5)*, and NCDOT *Roadway Standard Drawings* (Section 12), including notes, schedule, pavement marking stations, labels, and proposed curb ramp locations and types

Submit Signing and Delineation Design for Field Inspection

The Signing and Delineation Designer coordinates the QC review following the *NCDOT Quality Management Program: Quality Control and Quality Assurance* procedures and the respective QC Checklist before upload and distribution of any deliverables. Once the Signing and Delineation Plans for Field Inspection are QC'd, the Signing and Delineation Designer submits the Plans and supporting documentation via the project SharePoint site for review and comment. The Signing and Delineation Designer sends email notification with a link to the submittal to the appropriate staff as applicable: Project Manager, Division, Regional Traffic Engineer and Regional SDU Engineer.

Advance Signing and Delineation Design for Right-of-Way Plans

The Signing and Delineation Designer is to advance the signing and delineation plans and to complete the Right-of-Way Plan Set. The Signing and Delineation Designer is to submit the plans including and updated strip map to appropriate Division office, Regional Traffic Engineer, Regional Signing and Delineation Engineer, and Project Manager. This includes steps that involve:

- Addressing comments by the Signing and Delineation Unit and the applicable Division from the previous Field Inspection Plans.
- Providing an updated Signing and Delineation Strip Map.

- Addressing all right-of-way, utility, drainage, retaining/noise wall, ITS device conflicts, or provide a plan of action for addressing these conflicts.
- Updating preliminary signing and marking per revisions to the roadway design including any changes to lane widths and intersection layouts.
- Coordinating stop bar and crosswalk location changes with Signal Design Lead.
- Updating proposed signing plans in accordance with MUTCD, the NCDOT *Signing and Delineation Procedure Manual (Chapter 4)*, and NCDOT *Roadway Standard Drawings* (Section 9) with supporting signing documentation including:
  - Ground mounted support design worksheets
  - Ground mounted support design cross sections
  - List of all Barrier and Guardrail Locations needed for sign foundation and support protection
  - List of all Overhead Sign Locations - list of all overhead sign locations with coordinates
- Updating proposed pavement marking plans in accordance with MUTCD, the NCDOT *Signing and Delineation Procedure Manual (Chapter 5)*, and NCDOT *Roadway Standard Drawings* (Section 12), including notes, schedule, pavement marking stations, labels and proposed curb ramp locations and types.

Submit Signing and Delineation Design for Right-of-Way Plans

The Signing and Delineation Designer coordinates the QC review following the *NCDOT Quality Management Program: Quality Control and Quality Assurance* procedures and the respective QC Checklist before upload and distribution of any deliverables. Once the Signing and Delineation Plans for the Right-of-Way Plan Set are QC'd, the Signing and Delineation Designer submits the Plans and supporting documentation via the project SharePoint site for review and comment. The Signing and Delineation Designer sends email notification with a link to the submittal to the appropriate staff as applicable: Project Manager, Division, Regional Traffic Engineer and Regional SDU Engineer.

3SD1 Complete Signing & Delineation Design

Overview

Complete the signing and delineation plans in reference to NCDOT *Roadway Standard Drawings,* the MUTCD, TEPPL, and NCDOT *Signing and Delineation Procedure Manual*.

References

- ☐ Federal Highway Administration (FHWA) *Manual on Uniform Traffic Control Devices (MUTCD)*
- ☐ FHWA *Standard Highway Signs and Markings*
- ☐ Signing and Delineation Unit Website
- ☐ *Signing and Delineation Procedure Manual*
- ☐ *Standard Specifications for Roads and Structures*
- ☐ *Traffic Engineering Practices, Policies, and Legal Authority (TEPPL)*
- ☐ *Roadway Standard Drawings*
- ☐ *Roadway Design Manual*
- ☐ *Construction Manual*
- ☐ *NC Supplement to the Manual on Uniform Traffic Control Devices*
- ☐ *Logo Manual*
- ☐ AASHTO *Roadside Design Guide*
- ☐ AASHTO *A Policy on Geometric Design of Highways and Streets*
- ☐ *NCDOT Quality Management Program: Quality Control and Quality Assurance*

Deliverables

Deliverable Task	Task	Responsible Party	
		Activity Leader	Additional Support
		Signing and Delineation Designer	Regional Signing and Delineation Engineer
Complete Strip Map [Q]	▪ *Complete Signing and Delineation Plans*	X	X
Complete Signing Plans [Q]		X	X
Complete Ground Mounted Sign Support Design Worksheets [Q]		X	X
Complete Ground Mounted Sign Support Design Cross Sections [Q]		X	X
Complete Guardrail/Barrier Locations [Q]		X	X
Complete Overhead Sign Locations [Q]		X	X
Complete Sign Designs		X	X
Complete Quantities [Q]		X	X
Develop Project Special Provisions [Q]		X	X
Complete Pavement Marking Plans		X	X
Complete Three Way Check-QC/QA		X	X
Finalize Quantities [Q]	▪ *Final Signing and Delineation Plans*	X	X
Finalize Project Special Provisions [Q]		X	X
Finalize Plans and Supporting Documentation		X	X

[Q] *Indicates that final document(s) or data set(s) requires review in accordance with the NCDOT Quality Management Program: Quality Control and Quality Assurance.*

Complete Signing and Delineation Plans

The Signing and Delineation Designer is to complete and submit the Complete Signing and Delineation Plans to the appropriate Division office, Regional Traffic Engineer, Regional Signing and Delineation Engineer, and Project Manager. This includes steps that involve:

- Addressing comments by the Signing and Delineation Unit and the applicable Division from the previous design phase review.
- Providing approved strip map of the signing concept
- Addressing all right-of-way, utility, drainage, retaining/noise wall, ITS device conflicts. No conflicts are to be left unresolved at this stage.
- Updating proposed signing plans in accordance with MUTCD, the NCDOT *Signing and Delineation Procedure Manual (Chapter 4)*, and NCDOT *Roadway Standard Drawings* (Section 9) with supporting signing documentation including:
  - Ground mounted support design worksheets (PDF)
  - Ground mounted support design cross sections (PDF)
  - List of all Barrier and Guardrail Locations needed for sign foundation and support protection (PDF)
  - List of all Overhead Sign Locations - list of all overhead sign locations with coordinates (PDF)
  - Electronic copy of support design worksheets (Excel)
  - Sign Designs with one design per page (DGN)
  - Sign Designs with one design per page (PDF)
  - Final Quantity Estimate Calculations (PDF)
  - Final Quantity Estimate (PIQ Tool)
  - Special Provisions that are project specific and not included within the current NCDOT Standard Specifications
- Updating proposed pavement marking plans in accordance with MUTCD, the NCDOT *Signing and Delineation Procedure Manual (Chapter 5)*, and NCDOT *Roadway Standard Drawings* (Section 12), including notes, schedule, pavement marking stations, labels and proposed curb ramp locations and types with supporting pavement marking documentation including:
  - Final Quantity Estimate Calculations (PDF)
  - Final Quantity Estimate (PIQ Tool)
  - Special Provisions that are project specific and not included within the current NCDOT Standard Specifications
- Perform a three-way check and appropriate QC/QA in accordance with Chapter 4 of the NCDOT *Signing and Delineation Procedure Manual*, the *NCDOT Quality Management Program: Quality Control and Quality Assurance* procedures, and the respective QC Checklist. Ensure that the Signing and Delineation Unit and the applicable Division comments are addressed.

The Signing and Delineation Designer is to upload the submittal onto the project SharePoint site.

Final Signing and Delineation Plans

Once the Complete Signing and Delineation Plan package is reviewed and approved by the Signing and Delineation Unit, the Signing and Delineation Designer is to electronically submit signed and sealed PDFs, using DocuSign (or other esignatures tool acceptable). Signing and Delineation Designer submits the Plans and supporting documentation via the project SharePoint site. The Signing and Delineation Designer sends email notification with a link to the submittal to the appropriate staff as applicable: Project Manager, Division, Regional Traffic Engineer and Regional SDU Engineer.

As appropriate, NCDOT staff also complete and submit a Private Engineering Firm evaluation at this time.

5SD1 Signing and Delineation Construction Support

The Signing and Delineation Designer provides the following support during the Construction Phase:

- Provides technical expertise and answers questions on the project's signing and delineation plans and approach
- Coordinates requisition of all project signs in accordance with the *Construction Manual*
- Reviews contractor shop drawings, in coordination with the Structures Lead, for type A and B-signs
- Verifies all vertical elevations from the plans
- Completes Construction Revision (as needed):
  - Performs construction revisions of the latest version of the Let Plans (see 5CS1 for related information) to address identified field issues
  - Revises the plans as needed following the field verification of all vertical elevations

1SG1 Investigate Existing ITS & Signal Communications

Overview

Inventory existing signal communications and ITS infrastructure facilities in the project area. Identify signal communications equipment or fiber or ITS infrastructure that are costly to relocate or otherwise create risks for the project construction schedule if they are not relocated. Determine if signal communications fiber relocations prior to let are necessary, resulting in pre-let and post-let signal communications plans.

References

- ☐ *Signal Communications checklist [In Development]*

Signal Communications Deliverables

Deliverable	Task	Responsible Party	
		Activity Leader	Additional Support
		Signal Communications Lead	Signal System Owners/ Utilities Coordinator
Signal Communications Checklist [A, Q]	▪ *Initiate Signal System Fiber Owners and Contacts* ▪ *Conduct Preliminary Signal System Investigation*	X	X

[A] *Indicates that final document(s) or data set(s) must be uploaded to the ATLAS Workbench.*
[Q] *Indicates that final document(s) or data set(s) requires review in accordance with the NCDOT Quality Management Program: Quality Control and Quality Assurance.*

Initiate Signal System Fiber Owners and Contacts

The Signal Communications Lead meets with the Signal System owners and the Utilities Coordinator to discuss signal facilities in the project study area and vicinity. These meetings are to be with employees of the signal systems familiar with the existing facilities and with plans for future facilities in the study area. These meetings are likely held individually with each signal system owner at a location convenient for the signal system owner employees. Other projects may be discussed in these meetings, if possible and appropriate.

In this meeting, the Signal Communication Lead:

- Explains the scope of the project and the location of all alternatives/alignments.
- Explains the projected schedule and expected project duration.
- Requests that the signal system owners:
  - Provide a description of the type, size, and function of all facilities in the project area.
  - Identify critical facilities that have restrictions on service interruption for relocation or may be difficult to relocate. **Note:** A facility may be difficult to relocate because of difficulty in acquiring

property for the relocation of the facility, difficulty in coordination of outages with customers being served, or difficulty in construction.
    - Identify facilities with a high cost of relocation.
- Identify off-site work required to perform relocation on the project.
- Provide a description of factors that may affect the project schedule, such as lengthy design times, need to establish a construction budget, long-lead times when ordering materials, or long times between construction of the new facilities and abandonment of the old facilities.
- Provide a preliminary estimation of durations for the relocation of critical facilities with the understanding that it is to be further refined as the overall project design develops and actual impacts identified and evaluated.
- Discusses the expected impact of each of the utility facilities on the project and the impact of the project on the utility facilities.

This meeting may also involve a site visit to verify and correlate information provided by the signal system owners and to search for previously unknown signal communications or ITS infrastructure.

Conduct Preliminary Signal System Investigation

If there are existing traffic signals on a project, an investigation needs to be conducted to determine the impact level to either a municipal signal system or a closed loop system. If it is an isolated signal, then no additional investigation needs to be conducted.

The Signals Communications Lead conducts an initial field investigation to determine if a project includes existing signal communications cable that may be impacted. The field investigation determines if the signal communications (fiber, radio, or modem) may require pre-let plans to relocate the equipment out of the way from utility construction.

- Where possible, consider temporary radio or cellular communications for approval by the municipality or Division. Pre-Let plans, if required, are developed at a later stage.
- The Signal Communications checklist also documents adjacent signals and the distance off the project limits to determine if the project study area needs to be increased.
- Once the initial field investigation is completed, the checklist documents the findings.

The Signal Communications Lead coordinates with the Environmental Analysis Unit if signal communications work is required outside of the project limits. Typically, connecting traffic signals to the rest of the system are outside the normal project limits and need to be evaluated as part of the environment document (see 1EP1 for related information).

Complete QC/QA Procedures

The Signals Communications Lead is to coordinate the applicable QC review following the *NCDOT Quality Management Program: Quality Control and Quality Assurance* procedures and the respective QC Checklist before upload and/or distribution of any deliverables.

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ITS Deliverables

Deliverable	Task	Responsible Party	
		Activity Leader	Additional Support
		ITS Lead	TSMO Unit/ Utilities Coordinator
ITS Risk Analysis and Report	▪ *Conduct Preliminary ITS Investigations* ▪ *Submit report*	X	X

ITS Risk Analysis and Report

The ITS Lead conducts an initial field investigation to determine if a project includes existing ITS infrastructure that may be impacted or if there is planned/proposed ITS infrastructure. The field investigation determines if the existing ITS may need to be relocated and when that relocation needs to occur during construction. Once the Preliminary ITS Investigation is complete, the ITS lead submits an ITS Risk and Analysis Report to the TSMO unit for review.

The ITS Lead coordinates with the Environmental Analysis Unit if ITS work is required outside of the project limits. Typically, ITS devices and connections fall outside the project limits/Project Study Area and need to be evaluated as part of the environment document (see 1EP1 for related information).

Complete QC/QA Procedures

The ITS Lead is to coordinate the applicable QC review following the *NCDOT Quality Management Program: Quality Control and Quality Assurance* procedures and the respective QC Checklist before upload and/or distribution of any deliverables.

2SG1 Establish Signal & ITS Locations

Overview

Begin the activity as soon as the Signal Recommendations are received from the Regional Traffic Engineer. Ensure early coordination of ITS and Signal structures and equipment locations with Utilities to mitigate issues related to power and overhead/underground conflicts prior to signal/ITS construction. Pre-Let Signal Communications plans may be prepared at the discretion of the Division to relocate the fiber if it is impacted by utility pole relocations prior to letting. The specific efforts of this activity are separated into the following sub-activities.

Task details and deliverables for these sub-activities are found in the corresponding sections below.

References

- ☐ *Federal Highway Administration (FHWA) Manual on Uniform Traffic Control Devices (MUTCD)*
- ☐ *TSMO Unit Design Manual Part 1 - Signal Design*
- ☐ *TSMO Unit Design Manual Part 3 - ITS*
- ☐ *Roadway Standard Drawings*
- ☐ *Standard Specifications for Roads and Structures*
- ☐ *NCDOT Quality Management Program: Quality Control and Quality Assurance*
- ☐ *Example Letters of Intent for New and UMR Poles*

Signal Deliverables

Deliverable	Task	Responsible Party	
		Activity Leader	Additional Support
		Signal Lead	Utility Lead/Utility Owners
Signal Pole/Cabinet Location Diagrams [Q]	▪ *Complete Preliminary Signal Pole/Cabinet Locations*	X	X
Generate device list to allocate an IP range		X	

[Q] *Indicates that final document(s) or data set(s) requires review in accordance with the NCDOT Quality Management Program: Quality Control and Quality Assurance.*

Complete Preliminary Signal Pole/Cabinet Locations

To establish the preliminary signal pole/cabinet locations, the Signal Lead is to develop signal pole/cabinet location diagrams following the references noted herein. This includes:

- Where possible, locating poles outside the clear zone.
  - Where clear zone requirements cannot be met due to utility considerations or limited right-of-way, locate poles as far as is practical from the edge of pavement.
- Where mastarms are desired, designing for a maximum of 75-foot arm length.

- If the arm length exceeds 75 feet, consult with the Transportation Systems Management & Operations (TSMO) Unit (Signal Design Section).

- Avoiding conflicts by coordinating with utility owners and other Units/disciplines, including utilities, roadway design, and hydraulics.
- Providing signal cabinet locations to ensure the availability of power at proposed locations.

For acceptance and transmittal, the Signal Lead is to:

- Submit coordinated pole/cabinet locations to the Transportation Systems Management & Operations (TSMO) Unit (Signal Design Section) and Utilities Coordinator for review.
- Transmit final accepted pole/cabinet locations to the ITS and Management Section), Utilities Coordinator, and the Project Manager.

Complete QC/QA Procedures

The Signals Lead is to coordinate the applicable QC review following the *NCDOT Quality Management Program: Quality Control and Quality Assurance* procedures and the respective QC Checklist before upload and distribution.

(Back to activity overview)

Signal Communications Deliverables

Deliverable	Task	Responsible Party	
		Activity Leader	Additional Support
		Signal Communications Lead	Utility Lead/Utility Owners
Letter of Intent to Joint Use Pole Owners	▪ *Complete Letter of Intent*	X	X
Complete Pre-Let Signal Communications and Fiber Splice Sheets	▪ *Complete Pre-Let Signal Communications and Fiber Splice Sheets*	X	X

[Q] *Indicates that final document(s) or data set(s) requires review in accordance with the NCDOT Quality Management Program: Quality Control and Quality Assurance.*

Complete Letter of Intent

The Signal Communications Lead issues a Letter of Intent to all joint use pole owners within the project limits of the Department's request to attach to their poles. This letter informs the utility companies that the Department is installing a fiber on the pole line and reserves the spot even if there is already NCDOT fiber attached to the poles.

Complete Pre-Let Signal Communications and Fiber Splice Sheets

Begin the activity as soon as the Utility Coordination Working Plans are received from the Utility Owner or their delegated representative, if applicable (see 2UT1 for related information).

When developing the plan package, the Signals Communications Lead is to submit preliminary pre-let signal communications and fiber splice plans to the ITS and Signals Management Section for review. These plans will be available for the Division to let a project so that the Division can relocate any existing NCDOT fiber attached to poles that are being moved prior to the project letting. The Signals Communications Lead coordinates with the project Utility Coordinator to determine which poles are impacted using the Preliminary Utility Relocation Plans from Utility Owners.

The Signal Communications Lead references the Signal Recommendations, NCDOT Transportation Systems Management and Operations (TSMO) *Unit Design Manual*, and the NCDOT *ITS & Signal Plan Guidelines* when preparing these plans.

When finalizing the pre-let plan package, the Signal Communications Lead:

- Provides written responses to each signal communications-related and fiber splice comment from the previous submittal.
- Revises the design in accordance with the responses.
- Ensures revisions conform to the Signal Recommendations (provided by the Regional Traffic Engineer), NCDOT Transportation Systems Management & Operations (TSMO) Unit Design Manual, NCDOT ITS & Signal Plan Guidelines, and the Utilities Accommodation Manual.
- Coordinate the QC review following the *NCDOT Quality Management Program: Quality Control and Quality Assurance* procedures and the respective QC Checklist before upload and distribution.

Once all previous comments are addressed and plans QC'ed, the Signal Communications Lead uploads the plan sheets to the project SharePoint/ProjectWise site and notifies the ITS and Signals Management Section for review.

Complete QC/QA Procedures

The Signals Communications Lead is to coordinate the applicable QC review following the *NCDOT Quality Management Program: Quality Control and Quality Assurance* procedures and the respective QC Checklist before upload and distribution.

(Back to activity overview)

ITS (Development and Design) Deliverables

Deliverable	Task	Responsible Party	
		Activity Leader	Additional Support
Preliminary ITS Device Map [Q]	▪ *Complete Preliminary ITS Device Locations Map*	ITS Lead	▪ TSMO ▪ STOC ▪ Division

[Q] *Indicates that final document(s) or data set(s) requires review in accordance with the NCDOT Quality Management Program: Quality Control and Quality Assurance.*

Complete Preliminary ITS Device Map

To establish the Preliminary ITS device locations, the ITS Lead finalizes the boundaries of the project and develops a base map. The ITS Lead also develops the ITS Device Location Map (if applicable) following the references noted herein. This includes:

- Providing device cabinet locations to ensure the availability of power at proposed locations. (ITS Device)
- Collaborate with the applicable utility company to identify closest power source. (ITS Device)
- Collaborate with appropriate TSMO, Division and/or Municipal staff on proposed device quantities and locations.

For acceptance and transmittal, the ITS Lead is to submit coordinated preliminary device locations to the ITS and Signals Management Section for review. (ITS Device)

Complete QC/QA Procedures

The ITS Lead is to coordinate the applicable QC review following the *NCDOT Quality Management Program: Quality Control and Quality Assurance* procedures and the respective QC Checklist before upload and distribution.

3SG1 Complete Signal & ITS Design

Overview

Following the Signal Recommendations, NCDOT *ITS & Signal Plan Guidelines*, and other references, complete signal, signal communications, and ITS designs. The specific design efforts of this activity are separated into the following sub-activities.

Task details and deliverables for these sub-activities are found in the corresponding sections below.

References

- ☐ *Federal Highway Administration (FHWA) Manual on Uniform Traffic Control Devices (MUTCD)*
- ☐ *TSMO Unit Design Manual Part 1 - Signal Design*
- ☐ *TSMO Unit Design Manual Part 2 - Signals Management*
- ☐ *TSMO Unit Design Manual Part 3 - ITS*
- ☐ *National Electrical Safety Code*
- ☐ *National Electric Code*
- ☐ *Roadway Standard Drawings*
- ☐ *Standard Specifications for Roads and Structures*
- ☐ *ITSS Project Special Provisions – PSP – Current Version*
- ☐ *NCDOT Quality Management Program: Quality Control and Quality Assurance*
- ☐ *Roadway Design Manual (Part II, Section 15.3.5 – Proprietary Products)*
- ☐ *CCTV Arterial Deployment Checklist (In Development)*

Signal Deliverables

Deliverable	Task	Responsible Party	
		Activity Leader	Additional Support
		Signal Lead	ITS Lead
Signal Plan and Electrical Detail Sheets [Q]	▪ *Complete Signal Plan and Electrical Detail Sheets*	X	
Quantity and Cost Estimates [Q]	▪ *Complete Quantity and Cost Estimates*	X	X
Project Special Provisions [Q]	▪ *Develop Project Special Provisions*	X	X
Project Documentation [Q]	▪ *Complete Project Documentation*	X	

[Q] *Indicates that final document(s) or data set(s) requires review in accordance with the NCDOT Quality Management Program: Quality Control and Quality Assurance.*

Complete Signal Plan and Electrical Detail Sheets

To complete this task, the Signal Lead is to submit the signal designs to the Project Manager and ITS and Signals Management Section. This includes:

- Using Signal Recommendations (provided by the Regional Traffic Engineer), NCDOT *Transportation Systems Management & Operations (TSMO) Unit Design Manual*, and NCDOT *ITS & Signal Plan Guidelines*, develop and submit the initial signal design package after completing QC.
- Electrical details are not required at this submittal.

To finalize the signal design and in submitting the electrical details, the Signal Lead is to:

- Provide a written response to each signal-related comment from the previous submittal.
- Revise the design in accordance with the responses.
- Ensure revisions conform to the Signal Recommendations (provided by the Regional Traffic Engineer), NCDOT *Transportation Systems Management & Operations (TSMO) Unit Design Manual*, and NCDOT *ITS & Signal Plan Guidelines*.
- Coordinate the QC review following the *NCDOT Quality Management Program: Quality Control and Quality Assurance* procedures and the respective QC Checklist before upload and distribution.

Once all previous comments are addressed and the plans QC'ed, the Signal Lead is to submit plan sheets to the Transportation Systems Management and Operation (TSMO) Unit (Signal Design Section), uploading plans on the project SharePoint site.

Complete Quantity and Cost Estimates

To complete the quantity and cost estimate, the Signal Lead is to:

- Perform quantity takeoffs following the NCDOT Transportation Systems Management and Operations (TSMO) Unit Design Manual, NCDOT Standard Specifications for Roads and Structures, and the most recent ITS and Signals Unit pay item list.
- Use standard pay items when possible and coordinate with the appropriate Lead in the ITS and Signals Management Section when generic pay items are necessary.
- Develop cost estimates using recent bid data available on the NCDOT's website and ITS and Signals Management Section resources.
- Submit the draft and final approved quantity and cost estimate to the appropriate Lead in the ITS and Signals Management Section.

Develop Project Special Provisions

The Signal or ITS Lead is to use the *ITSS Project Special Provisions-PSP-Current Version* and quantity list when preparing the project-related special provisions, submitting the special provisions to the ITS and Signals Management Section for review.

Once completed and accepted, the Signal or ITS Lead is to upload completed documents on the project SharePoint site.

Complete Project Documentation

The Signal Lead is to do the following concurrently with developing the signal plans and submittals:

- Submit Autoturn simulations for left-turning vehicles for all signal designs on the project.
- Provide signed clearance time calculations and clearance distances for all signal designs on the project

- Provide metal pole elevations and calculations for metal pole heights.
  - Design for 17 feet of roadway clearance except when otherwise specified.
  - Provide standard strain pole selections and justifications.
- Provide documentation of latest counts per intersection and justification of phase selection.
- Provide copies of signal related email correspondence with the NCDOT or Municipal personnel, notes from any signal-related phone conversations, and any field notes.
- Provide a database or configuration file for each location.
  - Ensure the file includes all the necessary programming entries to achieve the desired operation of the signal design for the location.
  - Ensure the file is compatible with the local controller software that is being used and is able to be downloaded directly to the controller unit without conversion.
- Place all simulations, calculations, and other documentation in the project's "Intelligent Traffic Systems and Signals" folder on the project SharePoint site and submit draft Project Documentation.

The Signal Lead is to revise and resubmit draft Project Documentation in response to any comments.

Signal Communications Deliverables

(Back to activity overview)

Deliverable	Task	Responsible Party	
		Activity Leader	Additional Support
		Signal Communications Lead	Signal Lead
Complete UMR Plans	▪ *Complete UMR Plans*		X
Signal Communications and Fiber Splice Sheets [Q]	▪ *Complete Signal Communications and Fiber Splice Sheets*	X	
Electrical Service and Feeder Conductors [Q]	▪ *Complete Electrical Service to Devices*	X	
Quantity and Cost Estimates [Q]	▪ *Complete Quantity and Cost Estimates*	X	X
Project Special Provisions [Q]	▪ *Develop Project Special Provisions*	X	X
Railroad Encroachment Agreement(s) [Q]	▪ *Complete Railroad Encroachment Agreement(s) –*	X	

[Q] *Indicates that final document(s) or data set(s) requires review in accordance with the NCDOT Quality Management Program: Quality Control and Quality Assurance.*

Complete UMR Plans

Begin the activity as soon as the Preliminary Utility Coordination Working Plans are received from the Utility Owner or their delegated representative, if applicable (see 3UT1 for related information). UMR Plans are only needed for fiber that is attached to joint use poles that are not being replaced in the Preliminary Utility Relocation Plans. To establish the UMR Plans, the Signal Communications Lead finalize the boundaries of the project and develops a base map for the UMR plans. This includes:

- Identifying, recording, and mapping all roadways and driveways, cabinet and signal inventory numbers and all poles in which cable will be attached aerially (UMR plan sheets).
- Developing a tree map, identifying proposed and all existing utility cable heights (UMR plan sheets).
- Avoiding conflicts by coordinating with utility owners and other Units/disciplines, including utilities, roadway design, and hydraulics.

For acceptance and transmittal, the Signals Communications Lead:

- Provides written responses to each related comment from the previous submittal of UMR plan sheets.
- Submits draft final UMR plans to utility companies for review and comment.
- Submits final UMR plans and requests estimates from utility companies for utility work.

Complete Signal Communications and Fiber Splice Sheets

When developing the plan package, the Signal Communications Lead is to submit preliminary signal communications and fiber splice plans to the ITS and Signals Management Section for review. The Signal Communications Lead is to reference the Signal Recommendations, NCDOT *Transportation Systems Management and Operations (TSMO) Unit Design Manual*, and NCDOT *ITS & Signal Plan Guidelines* when preparing these plans.

To finalize the plan package, the Signal Communications Lead is to:

- Provide written responses to each signal communications-related and fiber splice comment from the previous submittal.
- Revise the design in accordance with the responses.
- Ensure revisions conform to the Signal Recommendations (provided by the Regional Traffic Engineer), NCDOT Transportation Systems Management and Operations (TSMO) Unit Design Manual, and NCDOT ITS & Signal Plan Guidelines.
- Coordinate the QC review following the NCDOT Quality Management Program: Quality Control and Quality Assurance procedures and the respective QC Checklist before upload and distribution.

Once all previous comments are addressed and plans QC'ed, the Signals Communications Lead uploads the plan sheets to the project SharePoint/ProjectWise site and notifies the Signal Design Section for review with the signal designs.

CCTV installations on Signal Communications Projects that at more than 300 feet from the signal cabinet and that require a separate electrical service are to follow the same electrical service requirements as other stand-alone ITS devices. Electrical Service plans for these devices are to be shown on the Signal Communications plan sheets.

Complete Quantity and Cost Estimates

3SG1 under the signal's section details how to complete Quantity and Cost Estimates.

Develop Project Special Provisions

3SG1 under the signal's section details how to develop the Project Special Provisions, in addition to using the *ITSS Project Special Provisions-PSP-Current Version.*

Complete Railroad Encroachment Agreement(s)

Complete Railroad Encroachment Agreement(s) If the fiber will cross a railroad corridor either aerially or underground, the Signals Communications Lead is responsible for completing all applications and drawings required for processing railroad encroachment agreements for the project. The Signal Communications Lead is also responsible for any changes requested by the Project Manager or the Railroad Company.

After the applications and drawings are completed, the Signal Communications Lead submits the package to the Project Manager for further processing and payments.

(Back to activity overview)

ITS Deliverables

Deliverable	Task	Responsible Party	
		Activity Leader	Additional Support
		ITS Lead	TSMO UNIT
ITS Cable Routing Plans and Fiber Splice Plans ᵠ	▪ *Complete ITS Cable Routing Plans and Fiber Splicing Diagrams*	X	X
Final ITS Device List for IP Address Allocation	▪ *Complete Final ITS Device List for IP Address Allocation*	X	X
Quantity and Cost Estimates ᵠ	▪ *Complete Quantity and Cost Estimates*	X	X
Project Special Provisions ᵠ	▪ *Develop Project Special Provisions*	X	X
Railroad Encroachment Agreement(s) ᵠ	▪ *Complete Railroad Encroachment Agreement(s) – ITS Cable Routing*	X	X

ᵠ *Indicates that final document(s) or data set(s) require review in accordance with the NCDOT Quality Management Program: Quality Control and Quality Assurance.*

Complete ITS Cable Routing Plans and Fiber Splicing Diagrams

When developing the plan package, the ITS Lead is to submit preliminary ITS Cable Routing Plans and Fiber Splice Plans to the ITS and Signals Management Section for review. The ITS Lead is to reference the Signal Recommendations, NCDOT *ITS and Signals Unit Design Manual*, NCDOT *ITS & Signal Plan Guidelines* and any other references required for the project by the NCDOT ITS Unit when preparing these plans.
To finalize the plan package, the ITS Lead is to:

- Provide written responses to each ITS-related and fiber splice comment from the previous submittal.
- Revise the design in accordance with the responses.
- Ensure revisions conform to the NCDOT ITS and Signals Unit Design Manual and NCDOT ITS & Signal Plan Guidelines.
- Coordinate the QC review following the *NCDOT Quality Management Program: Quality Control and Quality Assurance* procedures and the respective QC Checklist before upload and distribution.

Once all previous comments are addressed and plans QC'ed, the ITS Lead uploads the plan sheets to the project SharePoint/ProjectWise site and notifies the ITS and Signals Management Section for review.

CCTV installations on Signal Communications Projects that at more than 300 feet from the signal cabinet and that require a separate electrical service are to follow the same electrical service requirements as other stand-alone ITS devices. Electrical Service plans for these devices are to be shown on the Signal Communications plan sheets.

Reference the UMR Plans task under the Signal Communications Deliverables for any ITS projects that require UMR work.

Complete Final ITS Device List for IP Address Allocation

The ITS Team Lead is to submit a final list of ITS device quantities, types and locations to DIT and the TSMO Unit for IP address allocation. This list shall include any device or cabinet with an ethernet device including HUB and Splice cabinets

Complete Quantity and Cost Estimates

3SG1 under the signal's section details how to complete Quantity and Cost Estimates.

Develop Project Special Provisions

3SG1 under the signal's section details how to develop the Project Special Provisions, in addition to using the *ITSS Project Special Provisions-PSP-Current Version*.

Complete Railroad Encroachment Agreement(s)

The ITS Lead is responsible for completing all applications and drawings required for processing railroad encroachment agreements for the project. The ITS Lead is also responsible for any changes requested by the Project Manager or the Railroad Company.

After the applications and drawings are completed, the ITS Lead submits the package to the Project Manager for further processing and payments.

5SG1 Signal and ITS Construction Support

The Signal Lead and/or ITS Lead provides the following support during the Construction Phase:

- Provides technical expertise and answers questions related to signals and ITS design during the pre-construction meeting and throughout construction
- Completes Construction Revision (as needed): Perform applicable steps for a construction revision based on the latest version of the Let Plans (see 5CS1 for related information) to address identified field issues
- Reviews working/shop drawings
- Reviews associated materials submittals. This process includes:
  - The submittal package is sent by the contractor to the Signal or ITS Lead and other appropriate persons.
  - The submittal package is reviewed by the appropriate Group in the ITS and Signals Management Section.
  - The appropriate Group approves or rejects each item in the submittal package.
  - The completed submittal package is sent to the contractor and other appropriate persons.
- Ensures the electrical service is in compliance with NCDOT *Roadway Standard Drawings*, *Standard Specifications for Roads and Structures*, National electrical Safety Code and the National Electrical Code.
- Completes ITS Testing: Conducts and completes successfully the following tests before acceptance of the signal system project:
  - Conducts site tests as described in the project's Special Provisions
  - Conducts system testing as described in the project's Special Provisions
  - Signs testing documents for approval (City and/or ITS Lead)
  - Starts the 60-day Observation Period upon the successful completion of all tests and punch-list items as described in the project's Special Provisions (if applicable).

References

- ☐ *Federal Highway Administration (FHWA) Manual on Uniform Traffic Control Devices (MUTCD)*
- ☐ *TSMO Unit Design Manual Part 1 - Signal Design*
- ☐ *TSMO Unit Design Manual Part 2 - Signals Management*
- ☐ *TSMO Unit Design Manual Part 3 - ITS*
- ☐ *National Electrical Safety Code*
- ☐ *National Electric Code*
- ☐ *Roadway Standard Drawings*
- ☐ *Standard Specifications for Roads and Structures*
- ☐ *ITSS Project Special Provisions – PSP – Current Version*
- ☐ *TSMO Unit Qualified Products List*
- ☐ *NCDOT Quality Management Program: Quality Control and Quality Assurance*

1SI1 Develop STIP

Overview

Prepare the State Transportation Improvement Program (STIP) to both communicate projects that NCDOT intends to work on during the next 10 years and to satisfy federal and state funding requirements.

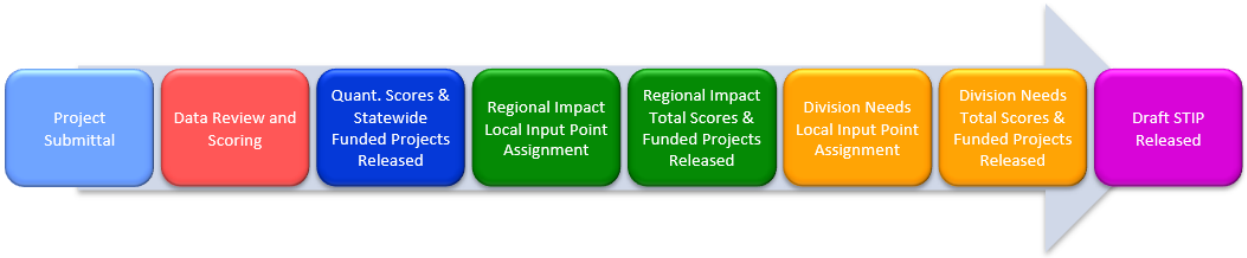
References

- ☐ *Federal Highway Regulation on State Transportation Improvement Program (STIP) Development*
- ☐ *Federal Highway Regulation on Project Selection from the (STIP)*
- ☐ *State Transportation Improvement Program (STIP) Guidance*
- ☐ *Federal Transit State Transportation Improvement Program (STIP) Regulations in 49 CFR 613*
- ☐ *Federal Transit State Transportation Improvement Program (STIP) Guidance*
- ☐ *State Transportation Improvement Program (STIP) Requirements (§ 136-189.11)*
- ☐ *State Transportation Improvement Program (STIP) Development of Transportation System (§ 136-66.2) Around Municipalities*
- ☐ *NCDOT Strategic Mobility Formula*
- ☐ *NCDOT Quality Management Program: Quality Control and Quality Assurance*

Deliverables

Deliverable	Task	Responsible Party	
		Activity Leader: Assistant Director, Division of Planning, and Programming	Additional Support
Draft State Transportation Improvement Program	▪ *Develop Draft STIP Details*	X	STIP Regional Managers
Draft State Transportation Improvement Program website update, including interactive map	▪ *Publish Draft STIP*	X	STIP Unit GIS Lead
Final State Transportation Improvement Program	▪ *Develop Final STIP*	X	STIP Regional Managers
Final State Transportation Improvement Program website update, including interactive map		X	Program Manager – STIP Unit
Final State Transportation Improvement Program – Division Supplements		X	STIP Regional Managers
Final State Transportation Improvement Program – MPO and RPO Supplements		X	STIP Regional Managers

The development of the State Transportation Improvement Program (STIP) is closely connected with the Strategic Project Prioritization Process (see 1SP1).



Collect Public Input

As a steward of taxpayer dollars, NCDOT seeks input from the public on projects that the NCDOT intends to fund over the next 10 years. Prior to the submission of projects for evaluation in the Project Prioritization Process, NCDOT Divisions hold public input sessions to receive input on projects that are submitted. The Division Engineers consider this input when submitting projects through the Project Prioritization Process.

Following the release of the Draft STIP, NCDOT holds additional public comment opportunities to receive feedback on the Draft STIP. However, since the Strategic Transportation Investments (STI) law directs NCDOT to select projects for funding based on score, it is important to make sure the correct projects are submitted for evaluation.

This input process satisfies federal requirements that the public has an opportunity to comment on the STIP prior to approval by the Board of Transportation (see 1SP1 for related information).

- NCDOT Divisions, Metropolitan Planning Organizations (MPOs), and Rural Planning Organizations (RPOs) submit projects for evaluation in the Project Prioritization Process (managed by the SPOT office).
- Projects are reviewed and scored using the process, criteria, and weights approved the Board of Transportation (managed by the Strategic Prioritization Office or SPOT office).
- Project scores are then provided to the STIP Unit for programming in the STIP.

Develop Draft STIP Details

The STIP Unit develops the draft STIP details, including setting up the Draft STIP database that:

- Starts with most recent Board of Transportation-adopted STIP. This is used as the basis for the next Draft STIP.
- Adds 2 or 3 years to the end of the STIP in the STIP database. This accounts for the next 2 or 3 years, so the STIP remains 10 years in duration.
- Attributes all committed projects. Based on the most recent Board of Transportation-adopted `STIP, all projects classified as committed (i.e., those that do not have to be reprioritized in the next prioritization cycle) are designated in the STIP database. Similarly, all projects that are subject to reprioritization in the next prioritization cycle are designated in the STIP database as well.

Next, the STIP Unit determines the STIP budget.

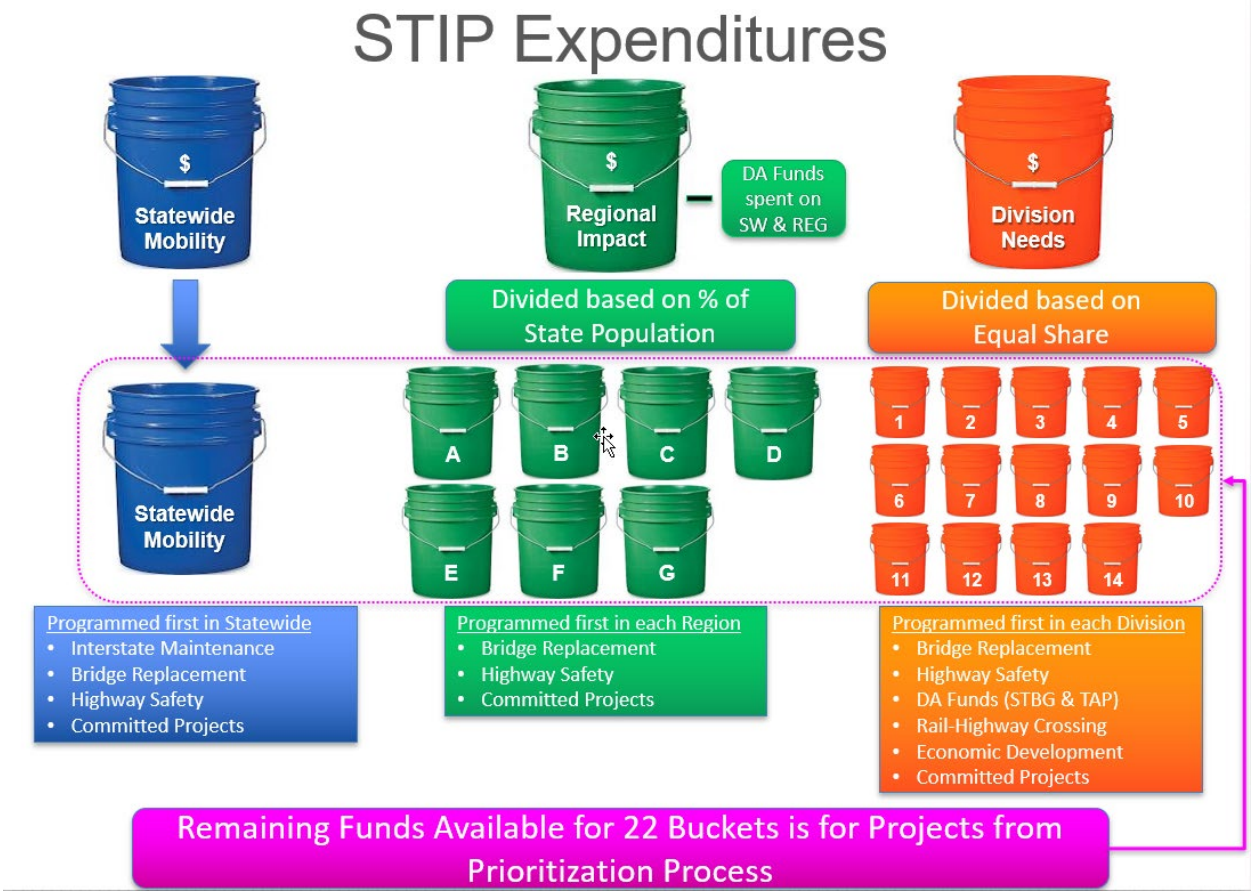
- The STIP Unit works with Funds Administration Section within the Financial Management Division on a 10-year STIP Budget. The Funds Administration Section provides a forecasted 10-year STIP budget in a MS-Excel™ spreadsheet.
- Discussions occur on estimated expenses for Preliminary Engineering, Congestion Mitigation Air Quality (CMAQ) projects, bonus allocation projects, Appalachian Development Highway System (ADHS) projects, and other programs, as these funds are allocated prior to the 40/30/30 split (40 percent Statewide Mobility, 30 percent Division Needs, 30 Percent Regional Impact) STI funding as documented in the Strategic Mobility Formula.
  - Funds Administration Section also provides variance calculation, which compares previous authorizations in each of the 22 STI funding buckets (1 Statewide Mobility, 7 Regional Impacts, 14 Division Needs) to previous allocations.
- The STIP Unit receives certified county population from the State Demographer. This data is used in determining Regional Impact budget amounts for the seven funding regions

Add Projects to Draft STIP

Projects placed in the STIP prior to adding high-scoring projects from the prioritization process include:

- Interstate Maintenance projects (Statewide Mobility)
- Bridge replacement projects (All 22 STI funding buckets)
- Highway safety projects (All 22 STI funding buckets)
- Committed projects selected/funded from prior prioritization cycles (All 22 STI funding buckets)
- STBG-DA and TAP-DA projects selected by MPOs over 200,000 in population (Primarily Division Needs funding buckets)
- Rail-highway crossing projects (Division Needs funding buckets)
- Economic development projects (Division Needs funding buckets)

These projects are programmed in the STIP with information on phase (typically right-of-way, utilities, construction, and sometimes preliminary engineering), funding source and amount, and schedule. The process for which projects are programmed in the STIP is as follows.



Add Alternative Criteria Projects

The STIP Unit works with the:

- Chief Engineers Office on Interstate Maintenance Projects over the next 10 years. Projects are programmed in the Draft STIP. The funding source is initially set to National Highway Performance Program (NHPP) funds
- Structures Management Unit on bridge projects over the next 10 years in the STIP. The projects are programmed in the Draft STIP. Funding source is determined by project location, using the most restrictive funds first, such as Surface Transportation Block Grant (STBG) Off-System Bridges and/or STBG less than 5,000 in population. Most on-system bridges will likely be funded with federal Bridge Formula Program (BFP) funds.
- Mobility and Safety Division, generally on a quarterly basis, for safety projects. These projects are added to the Draft STIP as received.
- Rail Division to add new rail-highway crossing projects to the Draft STIP.
- MPOs over 200,000 in population for STBG Direct Assistance (STBG-DA) and Transportation Alternatives Program-Direct Attributable (TAP-DA) projects that are to be added to the Draft STIP on a continual basis, as approved by the MPOs.

Perform 5/10-Year Analysis

Once all of the alternate criteria and committed projects are entered into the STIP database, the STIP Unit performs the "5/10-year analysis," which is a comparison of the STIP budget to the programmed funds.

- Over the first 5 years of the STIP, NCDOT can program funds +/- 15 percent of the budget, as defined in the STI law. Funding for projects in the first 5 years of the STIP is considered committed. Projects in the last 5 years of the STIP are to be reprioritized in the next round to the STIP, competing with new projects for funding.
- Over the entire 10 years of the STIP, NCDOT can program funds +/- 10 percent of the budget.

The results of this initial analysis are used for determining available funding within the 22 buckets for projects selected during the latest prioritization cycle.

Select Statewide Mobility Projects

Using the statewide mobility scores provided by the SPOT office for eligible projects (see 1SP1 for related information), the STIP Unit selects and programs projects based on the scores in descending order, until the remaining statewide mobility funds in the Draft STIP are assigned.

Project schedules are determined based on:

- Available funding,
- Prioritization score,
- Project delivery estimate (preference is given to projects previously programmed in the STIP),
- Local knowledge, and
- Input from the Divisions.

Funding sources may initially be set to federal funding, using the most restrictive funding, but switched to state trust funds, as appropriate. This is meant to be an iterative process. As projects are added to the STIP, the STIP Unit engineers continually perform the 5/10-year analysis to make sure programmed projects in the statewide mobility category meet the 15 percent and 10 percent budgetary tests, and check annual fiscal constraint to make sure programmed funds do not exceed the estimated yearly budget, and adjust schedules, as needed.

In addition, the following constraints are considered as projects are programmed in the statewide mobility category:

- Statewide mobility corridor cap: No more than 10 percent of the funds projected to be allocated to the statewide strategic mobility category over any 5-year period may be assigned to any project or group of projects in the same corridor within a Division or within adjoining Divisions.
- Aviation projects: No more than $500,000 can be allocated to a single airport project per year.

Select Regional Impact Projects

After Statewide Mobility Projects are programmed, SPOT works with the Metropolitan or Rural Planning Organizations (MPOs/RPOs) and Divisions to assign points to Regional Impact Projects. SPOT then finalizes the Regional Impact Scores and the TIP Unit Programs Regional Impact Projects. Using the Regional Impact total scores provided by the Strategic Prioritization Office for eligible projects (incorporating local input points) (see 1SP1 for related information), the STIP Unit selects and programs projects based on the scores

in descending order for each of the seven funding regions, until the remaining Regional Impact funds in the Draft STIP are assigned.

The STIP Unit applies "normalization" as projects are selected, which allocates funding between highway and non-highway projects, based on minimum guarantees of funding (based on percentage).

The normalization process for each Region is as follows:

Step 1: Non-Highway Only (Statewide Competition)

- Determine 4 percent of total Regional Impact budget (10-year, adjusted).
- Determine how much in the 4 percent Non-Highway bucket is already allocated; the amount remaining is available for prioritization.
- Sort eligible Non-Highway projects by score in descending order.
- Select projects until all funding is allocated.

Step 2: Highway Only (Regional Competition)

- Within each region, subtract the amount of Non-Highway projects programmed (over 10 years).
- Set aside 6 percent of each Region's allocation (10-year, adjusted).
- Determine how much of the remaining funding is already allocated; the amount remaining is available for prioritization.
- Within each Region, sort eligible Highway projects by score in descending order.
- Select projects until all funding is allocated.

Step 3: All-Modes (Flex) (Regional Competition)

- Determine the amount of funding set aside under Step 2 (10-year, adjusted from step 2).
- Within each Region, sort eligible Highway and Non-Highway projects by score in descending order.
- Select projects until all funding is allocated.

This is an iterative process. As projects are added to the STIP, the STIP Unit engineers continually perform the 5/10-year analysis to make sure programmed projects in each Region meet the 15 percent and 10 percent budgetary tests. STIP Unit engineers also continually check that annual fiscally constraint projects are added to the STIP.

In addition, the following constraints are considered as projects are programmed in the Regional Impact category:

- Public Transportation projects: No more than 10 percent of a region's funds can be allocated to public transportation projects (over the entire 10-year STIP).
- Light Rail and Commuter Rail projects: Total state funding for a commuter rail or light rail project shall not exceed the lesser of 10 percent of the distribution region allocation or 10 percent of the estimated total project costs used during the prioritization scoring process.
- Aviation project: No more than $300,000 can be spent on any single airport project per year

Select Division Needs Projects

After Statewide and Regional Projects are programmed into the STIP, the Divisions provide Local Input points for Division Needs Projects. Using the Division Needs total scores provided by the SPOT office for

eligible projects (incorporating local input points), the STIP Unit selects and programs projects based on the scores in descending order for each of the 14 Divisions, until the remaining Division Needs funds in the Draft STIP are assigned.

The normalization process for each Division is as follows:

Step 1: Non-Highway (Division Competition)

- Determine 4 percent of total Division Needs budget (10-year, adjusted), then divide by 14.
- Determine for the amount of funding that is already allocated; the amount of funding remaining is available for prioritization.
- Within each Division, sort Non-Highway projects by score in descending order.
- Select projects until funding is allocated.

Step 2: Highway Only (Division Competition)

- Within each Division, subtract the amount of funding (4 percent) from Step 1 (over 10 years).
- Set aside 6 percent of each Division's allocation (10-year, adjusted).
- Determine how much of the remaining funding is already committed to determine the amount remaining available for prioritization.
- Within each Division, sort highway projects by score in descending order.
- Select projects until funding is allocated.

Step 3: All-Modes (Flex) (Division Competition)

- Determine the amount of funding set aside under Step 2 (10-year, adjusted from step 2).
- Within each Division, sort Highway and Non-Highway projects by score in descending order.
- Select projects until funding is allocated.

Project schedules are determined based on:

- Available funding,
- Prioritization score,
- Project delivery estimate (preference is given to projects previously programmed in the STIP),
- Local knowledge, and
- Input from the Divisions.

Funding sources may initially be set to federal funding, using the most restrictive funding, but switched to state trust funds, as appropriate. This is meant to be an iterative process. As projects are added to the STIP, the STIP Unit engineers continually perform the 5/10-year analysis to make sure programmed projects in each Division meet the 15 percent and 10 percent budgetary tests and adjust schedules, as needed. STIP Unit engineers also continually check that annual fiscally constraint projects are added to the STIP.

In addition, the following constraints are considered as projects are programmed in the Division Needs category:

- Aviation projects: No more than $18.5M can be allocated to aviation projects per year.

- Bicycle and pedestrians projects: No state funds shall be allocated to independent bicycle and pedestrian projects.

Publish Draft STIP

Once all levels of STIP projects have been finalized, the Draft STIP is presented to the Board of Transportation for approval. The STIP Unit works with the Communications Group to publish the Draft STIP. The Draft STIP is for 11 years (current year plus 10 years). To publish the Draft STIP:

- A document from the STIP database is produced. This document may be a PDF and/or Excel spreadsheet.
- The Draft STIP is typically released at a Board of Transportation meeting.
- The STIP website is updated with the Draft STIP and interactive map in coordination with the Communications Group (see 1CG1 for related information).

Develop Final STIP

To develop the Final STIP:

- Start with Draft STIP.
- Update schedules and funding, as needed.
- Perform 5/10-year analysis and fiscal constraint checks to ensure the Final STIP is within budgetary constraints defined in state law.
- Add the Prologue to document.
- Add the public engagement documentation (see 1PI1 for related information).

The Final STIP is a 10-year document. The document from the STIP database is produced, with minimal hard copies, and the Final STIP is presented to the Board of Transportation for approval. The document may be a PDF and/or Excel spreadsheet.

Following the Board of Transportation approval:

- The STIP website is updated with Final STIP and interactive map.
- The STIP Unit sends Division, MPO, and RPO Supplements to respective organizations.
- Affected MPOs begin Air Quality Conformity Determination analysis (currently Metrolina region only).
- MPOs approve TIPs, notify STIP Unit as approved.

Upon all MPOs approving TIPs, the STIP Unit packages the Board of Transportation-approved STIP and MPO TIPs, sending to FHWA and FTA for approval. Once FHWA and FTA approve the new STIP, the new STIP becomes the official STIP.

Complete QC/QA Procedures

The Division of Planning is to coordinate the applicable QC review following the *NCDOT Quality Management Program: Quality Control and Quality Assurance* procedures and the respective QC Checklist before upload and distribution of all related deliverables.

1SP1 Complete Project Prioritization

Overview

Develop a project prioritization score for each project and provide the final scores to the State Transportation Improvement Program (STIP) Unit for use and guidance in developing the STIP.

References

- ☐ *State Transportation Improvement Program*
- ☐ *SPOT TransModeler Analysis and Volume Development Procedures Manual*
- ☐ *Prioritization Resources SharePoint Page*
- ☐ *Prioritization n.0 Submittal Guidance and Resources*
- ☐ *Prioritization Data SharePoint Page*
- ☐ *NCDOT Quality Management Program: Quality Control and Quality Assurance*

Deliverables

Deliverable	Task	Responsible Party	
		Activity Leader	Additional Support
Board of Transportation Approved Pn.0 Scoring Methodology	▪ *Develop Pn.0 Scoring Methodology by Prioritization Workgroup with Board of Transportation*	SPOT Lead	▪ Prioritization Workgroup Members Prioritization Workgroup Consultant
Spreadsheet of Final Quantitative Scores for all Submitted Projects in 6 Modes	▪ *Develop Project Prioritization Scores*	SPOT Lead	▪ Congestion Management Unit ▪ DIT GIS Unit ▪ NEPA/SEPA Lead ▪ Environmental Analysis Unit ▪ TPD: NCSTM Consultant ▪ Feasibility Studies Unit ▪ Traffic Safety Unit ▪ ITS/Signals Unit ▪ NC Turnpike Authority ▪ TREDIS (Consultant) ▪ Aviation Division ▪ Ferry Division ▪ Integrated Mobility Division ▪ ITRE ▪ Rail Division ▪ Chief Engineer's Office ▪ Communications Group ▪ Public Involvement Unit
	▪ *Release Pn.0 Data Scores and Statewide Mobility Project List* [Q]		
	▪ *Complete Regional Impact Project Public Comment Period*		
	▪ *Release Regional Impact Project List* [Q]		
	▪ *Complete Division Needs Project Public Comment Period*		
Map of Evaluated Projects with Scoring Data (and funded status when applicable)	▪ *Develop GIS Map of Evaluated Projects* [Q]	SPOT Lead	SPOT GIS Support

Develop Pn.0 Scoring Methodology by Prioritization Workgroup with Board of Transportation

The Strategic Prioritization Office (SPOT) Unit convenes the Prioritization Workgroup at the start of each cycle to identify scoring methodologies for each new iteration of the project prioritization process. To do this, the SPOT Unit obtains a consultant to coordinate the Prioritization Workgroup tasks (e.g., logistic facilitation, materials development, decision point documentation, etc.) to maintain a neutral atmosphere while working closely with a diverse array of transportation partners.

The SPOT Lead coordinates approval of the current cycle's Pn.0 Scoring Methodologies with the North Carolina Board of Transportation.

Develop Project Prioritization Scores

Project prioritization is developed on a regular cyclical basis (approximately every 2-3 years) in accordance with the Strategic Transportation Investments (STI) law (GS 126-189.10 and .11). For each prioritization cycle (Pn.0, where n equals the cycle number), the SPOT develops the project prioritization scores. The SPOT Lead and staff follows the process detailed in the current version of the *Prioritization n.0 Submittal Guidance and Resources* found on the Prioritization Data SharePoint site.

After approval of the scoring methodology (as recommended by the Prioritization Workgroup and approved by the Board of Transportation) ***and*** after development of Pn.0 cycle's release of SPOT On!ine in coordination with the NCDIT/GIS Unit; the Metropolitan Planning Organizations (MPOs), Rural Planning Organizations (RPOs), and Division Engineers submit candidate projects during a submittal window into SPOT On!ine. SPOT On!ine captures project data and processes key scoring components. SPOT staff perform project data verification and calculate scores for each candidate project. As part of their review of the candidate projects, SPOT staff coordinate with the following Units, as appropriate:

- For Highway Travel Time Savings: Congestion Management, Transportation Planning Division
  - **Note:** The Congestion Management Unit contracts with a consultant to complete the SPOT Transmodeler Analysis and Volume Development activity. In coordination with the Congestion Management Unit, the consultant develops, processes, and analyzes the travel time savings model(s) in accordance with the *SPOT TransModeler Analysis and Volume Development Procedures Manual*. Results are provided to the Congestion Management Unit and SPOT Staff (See 1TP1 for related information).
- Modal Divisions: Aviation, Ferry, Integrated Mobility Division (IMD)/ITRE, Rail
- Cost Estimates: Feasibility Studies, Central Corridor Development, Signal System Timing Operations, N.C. Turnpike Authority
- Traffic Safety

Once SPOT staff have verified the scoring data and calculated scores, the final spreadsheet is provided to the STIP Unit for Statewide Mobility programming (see 1SI1 for related information). The STIP Unit provides the draft Statewide Mobility projects back to SPOT staff for formatting and sharing with partners.

While the STIP Unit is programming candidate projects, SPOT organizes a committee to review 51 Local Input Point Methodologies from every MPO, RPO, and Division to review how each organization applies and assigns their local input points to the Regional Impact and Division Needs categories.

Release Pn.0 Data Scores and Draft STIP

SPOT staff work with the Communications Group to update the www.ncdot.gov website about the release of the Pn.0 quantitative scores (see 1CG1 for related information). SPOT staff develop a spreadsheet and map of the draft Statewide Mobility-funded projects. A mass email is generated and sent to all MPOs/RPOs/Divisions to inform them of the release.

Complete Regional Impact Project Public Comment Period

To complete this task, the SPOT staff:

- Work with the Chief Engineer's Office and Public Involvement Unit to establish each Division's public comment period for Regional Impact projects (see 1PI1 for related information).
- Assist each Division with spreadsheets and visuals and provide other support during each public comment period.
- Re-initialize the SPOT On!ine portal for the acceptance of Regional Local Input Points.
- Export the Regional Local Input Points results, then compile the new Regional Impact scores and pass the updated spreadsheet to the STIP Unit for draft Regional Impact programming.

Release Regional Impact Project List

SPOT staff work with the Communications Group to update the www.ncdot.gov website about the release of the Pn.0 regional scores. SPOT staff draft programmed Regional Impact projects into a spreadsheet and map. SPOT and the Communications Group generate a mass email and send to all the MPO/RPO/Divisions who submitted projects to let them know of the release.

Complete Division Needs Project Public Comment Period

Similar to the Regional Impact process, SPOT staff:

- Work with the Chief Engineer's Office and Public Involvement Unit to establish public comment periods for each Division for Division Needs projects.
- Assist each Division with spreadsheets and visuals and provide other support during each public comment period.
- Re-initialize the SPOT On!ine portal for the acceptance of Division Needs Local Input Points.
- Export the Division Needs Local Input Points results, then compile the new Division Needs scores and pass the updated spreadsheet to the STIP Unit for draft Division Needs programming.

Develop GIS Map of Evaluated Projects

SPOT develops a public-facing GIS map of all Pn.0 evaluated projects covering all six modes that is color coded by its draft funding status:

- Blue for Statewide Mobility
- Green for Regional Impact
- Orange for Division Needs
- Pink for evaluated but not funded.

The projects are attributed with key information including SPOTID, TIP number (if applicable), STI eligible category, location details, project description, specific improvement type, primary purpose, final project scores, and funding information (if applicable).

Complete QC/QA Procedures

The SPOT Lead is to coordinate the applicable QC review following the *NCDOT Quality Management Program: Quality Control and Quality Assurance* procedures and the respective QC Checklist before upload and distribution of all related deliverables.

1SS1 Determine Affected Coordinated Corridors (if not a Significant Project)

Overview

Beginning the activity as soon as the project limits are set, determine all affected coordinated corridors crucial to the scoping, design, and implementation of signal timing plans for the duration and completion of the project.

Note: *For Significant Level 1 or Level 2 projects, follow 1TO1 for Traffic Systems Operations, which includes signal system timing and operations and traffic operations activities. 1TO1 includes steps to determine a project's significance level.*

References

- ☐ *NCDOT Signals Map*
- ☐ *NCDOT Quality Management Program: Quality Control and Quality Assurance*

Deliverables

Deliverable	Task	Responsible Party	
		Activity Leader	Additional Support
List of Affected Signal Systems and Signals [A]	▪ *Complete List of Affected Signal Systems*	Signal System Engineer	Project Lead
Signal System Number(s) for New System(s)	▪ *Complete List of Affected Signal Systems*		

[A] *Indicates that final document(s) or data set(s) must be uploaded to the ATLAS Workbench.*

List of Affected Signal Systems

The Signal System Engineer prepares a list of the affected signal systems, which involves:

- Determining which signal systems, if any, are affected along the project corridor using the NCDOT Signals Map.
- Compiling a list of all affected signal system and the signals within those systems. This list includes:
  - Any new systems being constructed by the project or signals being added to existing systems by the project.
  - Identification of the party responsible for traffic operations along the corridor (i.e., NCDOT or Municipality).

The Signal Systems Engineer assigns a signal system number to any new system(s) being constructed by the project. The list is used for scoping to determine the number of signals impacted by the project that need to be retimed.

2SS1/3SS1 Initiate Signal System Timing (if not a Significant Project)

Overview

Determine whether the staging and phasing of the construction necessitates and/or benefits from corresponding signal coordination changes. Construction phasing signal timing is only needed for high volume critical corridors. Confirm with the Signal Timing Engineer if construction phasing signal timing plans are needed.

Note: *For Significant Level 1 or Level 2 projects, follow 3TO1 for Traffic Systems Operations, which includes signal system timing and operations and traffic operations activities.*

References

- ☐ Signal System Timing and Operations Timeline and Process Documents
- ☐ List of Signals and Signal Systems (developed during Project Initiation)
- ☐ Work Zone Traffic Control (WZTC) Traffic Management Plan
- ☐ Traffic Data Request
- ☐ *NCDOT Quality Management Program: Quality Control and Quality Assurance*

Deliverables

Deliverable	Task	Responsible Party Activity Leader Signal System Engineer
Construction Signal Timing Phases	▪ *Construction Phasing Analysis*	X
Summary of Existing Signal System Operations	▪ *Develop Summary of Existing Signal System Operations*	X
Existing Synchro and Tru-Traffic files	▪ *Develop Summary of Existing Signal System Operations*	X

Construction Phasing Analysis

Based on the timing and phasing of construction, the WZTC Project Engineer coordinates with the Signal System Engineer to determine how many sets of construction-specific signal coordination phases are needed, along with the justification for each phase (see 2TM1 for related information). Potential justification may include:

- Long-term road closures and corresponding detours
- Long-term capacity reductions
- Elimination of high-volume traffic movements

The Division requests the Signal System Engineer to prepare construction phasing signal timing plans for a project. The Signal System Engineer works with the Signal Lead (see 3SG1 for related information) and Work Zone Traffic Control (WZTC) Project Engineer (see 3TM1 for related information) regarding temporary traffic patterns at signalized intersections.

Develop Summary of Existing Signal System Operations

The Signal System Engineer then gathers all available controller data and provides a summary of the overall existing signal system operations.

- Collect all signal plans including current, construction-specific, and final.
- Upload all signal timing databases to verify existing operations.
- Gather all available signal controller data, including vehicle detector logs, split monitor logs, and any high-resolution data and automated traffic signal performance metrics (ATSPM).
- Notify relevant engineer of any discrepancies between signal plans and current operation.
- Verify existing communications, schedule synchronicity, and overall intended operations are in place.

The Signal System Engineer prepares a Synchro file and a Tru-traffic file for each existing timing plan. The traffic volumes from the corridor-wide volume map are coded into the networks.

Complete QC/QA Procedures

The Signal System Engineer is to coordinate the applicable QC review following the *NCDOT Quality Management Program: Quality Control and Quality Assurance* procedures and the respective QC Checklist before upload and/or distribution of any deliverables.

4SS1 Signal Timing Implementation (if not a Significant Project)

In development.

5SS1 Signal System Modeling, Analysis, Implementation and Fine Tuning (if not a Significant Project)

Overview

For projects that require construction phasing, model the corridor using the latest approved version of *Synchro*. Fine-tune the model based on field observation. Implement and evaluate the signal timings during construction phases and after the roadway is open in the final traffic pattern.

Note: *For Significant Level 1 or Level 2 projects, follow 5TO1 for Traffic Systems Operations, which includes signal system timing and operations and traffic operations activities.*

References

- ☐ Signal System Timing and Operations Timeline and Process Documents
  - *Signal System Timing Philosophy Manual*
  - *Project Review Checklist for Preliminary Submittal*
  - *Project Review Checklist for Final Submittal*
  - *Standard Practice for Tru-Traffic Travel Time Runs*
  - *Local Signal Software Programming Manuals*
  - *Central Signal Software User Manual*
- ☐ Work Zone Traffic Control (WZTC) Traffic Management Plan
- ☐ *NCDOT Quality Management Program: Quality Control and Quality Assurance*

Deliverables

Deliverable	Task	Responsible Party Activity Leader Signal System Engineer
Synchro Microsimulation Model(s)	▪ *Develop Synchro Microsimulation Model*	X
Network Volume Overview Map	▪ *Develop Network Volume Overview Map*	X
Signal Timing Databases	▪ *Develop Signal Timing Databases*	X
Summary of Design Cycle Length and Schedules	▪ *Prepare Preliminary Signal Timing Report*	X
"Before" Travel Time Runs	▪ *Perform "Before" Travel Time Runs*	X
Implemented Signal Timing Plans	▪ *Implement & Fine Tune Signal Timing Plans*	X
"After" Travel Time Runs	▪ *Perform "After" Travel Time Runs*	X
"Before" and "After" Travel Time Summary	▪ *Compare "Before" and "After" Travel Time Results*	X
Final Signal Timing Report	▪ *Prepare Final Signal Timing Report*	X

Develop Synchro Microsimulation Model

For the purposes of coordination optimization, the Signal System Engineer models the corridor using the latest approved version of the Synchro microsimulation software.

- Model the corridor following the Synchro guidelines in the PEF Project Review Checklist.
- Fine-tune the model based on field observations and Tru-Traffic travel time runs.

If there is to be construction phase signal coordination plans, each phase is modeled. Synchro models are to be reviewed by someone other than the design engineer.

Develop Network Volume Overview Map

The Signal System Engineer requests turning movements counts for critical intersections along the corridor from the Traffic Safety Unit. The Traffic Safety Unit sends the completed turning movement counts to the Signal System Engineer when completed (see 2TS1 for related information).

Using the traffic counts, the Signal System Engineer interpolates and volume-balances critical intersection turning movement counts to develop a corridor-wide volume map.

Develop Signal Timing Databases

To complete this task, the Signal System Engineer is to develop timing databases following the guidelines in the "PEF Project Review Checklist."

If there are construction phase signal coordination plans, each phase is programmed. Timing databases shall be reviewed by someone other than the design engineer.

Prepare Preliminary Signal Timing Report

The Signal System Engineer summarizes the proposed timing plans and schedule for each timing plan according to the latest guidance from the PEF Project Review Checklist.

Perform "Before" Travel Time Runs

The Signal System Engineer collects "before" travel time runs in accordance with *Standard Practice for Travel Time Runs Guidelines*. "Before" travel time runs should be completed after traffic is in the pattern to be evaluated.

Implement & Fine Tune Signal Timing Plans

The Signal System Engineer implements the approved timing plans and installs the signal timing database. The Signal System Engineer then fine tunes the timing plans according to actual traffic patterns. The Signal System Engineer prioritizes the Division concerns identified during scoping.

If there is to be construction phase signal coordination plans, each phase is implemented and fine-tuned.

Perform "After" Travel Time Runs

The Signal System Engineer collects "after" travel time runs in accordance with *Standard Practice for Travel Time Runs Guidelines* after the implemented signal timing plans are installed.

If there is to be construction phase signal coordination plans, each phase requires "after" travel time runs to be collected.

Compare "Before" and "After" Travel Time Run Results

The Signal System Engineer runs a report summarizing the "before" and "after" travel time run results. The results are to be in accordance with the scope of work.

If there is to be construction phase signal coordination plans, each phase is compared to "pre-construction" travel time runs.

Prepare Final Signal Timing Summary Report

The Signal System Engineer summarizes the construction timing plans and schedule for each timing plan according to the latest guidance from the *PEF Project Review Checklist*.

Complete QC/QA Procedures

The Signal System Engineer is to coordinate the applicable QC review following the *NCDOT Quality Management Program: Quality Control and Quality Assurance* procedures and the respective QC Checklist before upload and/or distribution of any deliverables.

1ST1 Structures Screening

Overview

Provide technical input on Express Design, determine preliminary structure cost for new structures, and evaluate the condition of each existing structure to determine if replacement, rehabilitation, or widening is an option.

Note: *Actions during the Project Initiation Stage may be led and completed by staff from several different NCDOT groups. Any person who has overall responsibility for a project during this Stage is referred to as the "Project Lead." This lead could be the Feasibility Studies Engineer, the Corridor Development Engineer, the Division Planning Engineer, or someone in a similar role as tasked by a state or local agency.*

References

- ☐ *NCDOT Spatial Data Viewer*
- ☐ *WIGINS Bridge Inspection & Inventory Software*
- ☐ *Candidate Project/Express Design*

Deliverables

Deliverable	Task	Responsible Party	
		Activity Lead	Additional Support
Structures Cost Estimate for Express Design	▪ *Gather Existing Structure Inspection Reports and Plans* ▪ *Obtain Structures Input on Express Design*	Structures Management Unit Field Operations Support, Division Bridge Maintenance	Project Lead

Gather Existing Structure Inspection Reports and Plans

When existing structures are in the project study area, the Project Lead identifies all bridge and culvert structures within the area. For existing structures, the Project Lead collects all related Bridge/Culvert Inspection Reports and any existing structure plans to determine if replacement or rehabilitation is necessary. This is all done in coordination with the Division Bridge Maintenance staff and Structures Management Unit's Field Operations Engineer, considering the following.

- Obtain existing inspection reports by contacting Structures Management Unit (Inventory & Appraisal)
  - Use NCDOT Spatial Data Viewer with the structure layer to obtain the Bridge Number.
  - Provide Existing Bridge Numbers to Structures Management Unit (Inventory & Appraisal).
- Request Bridge Inspection Report from Structures Management Unit (Inventory & Appraisal).
- Request structure plans or as-built plans for existing bridge Structures Management Unit (Inventory & Appraisal).

Obtain Structures Input on Express Design

The Project Lead is to obtain input on structures for the Express Design. The Structures Management Unit's Field Operations Engineer provides the following for all identified structures:

- Coordinate with the Division Bridge Maintenance staff
- Determine preliminary feasibility for the structure design and preliminary structure depth/ clearance, considering:
  - Bridge widening may require smaller girder depths.
  - For Grade Separations – coordinate with the Roadway Design Unit for vertical and horizontal clearance requirements.
  - For Stream Crossings – coordinate with the Hydraulic Unit for span length and girder height.
- Determine the existing Bridge Numbers using the NCDOT Spatial Data Viewer and the structure layer
- If necessary, collect data from a field inspection of all structures within the project area, which includes all bridges, culverts, pipes, and walls.
- Investigate and document current condition of all non- NBIS structures.
- Consult with the Structures Management Unit's Field Operations Engineer and the Division to determine if replacement is necessary or if rehabilitation is required.

In coordination with the Structures Management Unit, the Project Lead provides a summary of the preliminary structure recommendations to the Feasibility Studies Unit for the Express Design (see 1FS2 for related information).

2ST1 Scope Structures Design

Overview

Following the development of Design Recommendation Plan Set and the Bridge Survey Report, initiate and finalize structure-related scope and estimating in coordination with the Project Manager.

References

- ☐ *SMU Bridge Data Sheet – Scoping Template.xlsx*
- ☐ *NCDOT Workday Estimate Form*
- ☐ American Association of State Highway Transportation Officials (AASHTO)
- ☐ *Load and Resistance Factor Design (LRFD) Bridge Design Manual*
- ☐ *Structures Management Unit Design Manual*
- ☐ *Structures Management Unit Design Manual – Standard Letters/Policy Memos*
- ☐ *Structures Management Unit SharePoint Guidelines*

Deliverables

Deliverable	Task	Responsible Party		
		Activity Leader		Additional Support
		Project Manager	Design Firm Structures Lead	Structures Management Unit PEF Coordination Group
Preliminary / Final Scoping Sheet	▪ *Develop and Finalize Structure Scoping Sheet*		X	X
Preliminary / Final Manday Estimate	▪ *Develop Preliminary Manday Estimate*		X	X
	▪ *Finalize Manday Estimate*	X	X	X
	▪ *Initiate NTP*	X		

Develop and Finalize Structure Scoping Sheet

After development of the Design Recommendation Plan Set (after Preliminary Plans and Bridge Survey and Hydraulic Design Reports (BSR) are finalized), the Design Firm Structures Lead is to complete the SMU Bridge Data Sheet – Scoping Template. The Design Firm Structures Lead can coordinate with Structures Management Unit Private Engineering Firm (PEF) Coordination Group to develop the SMU Bridge Data Sheet. The Bridge Data Sheet includes:

- Project Information
- Structure Data for each site:
  - Superstructure Type
  - Number of spans
  - Span lengths
  - Skew
  - Alignment Type
  - Proposed Rail Type
  - Proposed Foundation Type
  - Utilities

- Joint Type
- Additional Comments – indicating additional items needed for scoping (Sidewalk/ MUP, Staged Construction, etc.)

- Delivery Schedule for structure deliverables

Develop Preliminary Manday Estimate

To develop the Preliminary Manday Estimate, the Design Firm Structures Lead develops and submits an initial "blank" manday estimate to the Project Manager. The Project Manager sends the "blank" manday estimate and the Scoping Sheet to the Structures Management Unit PEF Coordination Group for preparation of the in-house estimate.

Finalize Manday Estimate

The final estimate for manday and cost are to be within an allowable tolerance (5% hours, 10% cost). If negotiation is necessary, the Project Manager asks the Structures Management Unit PEF Coordination Group to negotiate with the Design Firm Structures Lead.

After negotiation, and revisions to the estimates are made, the Structures Management Unit PEF Coordination Group returns the final estimate to the Project Manager, and the consultant Design Firm Structures Lead submits a final manday estimate to the Project Manager. Upon completion, the Project Manager issues Notice to Proceed (NTP) and a purchase order (PO) number to the Design Firm.

2ST2 Develop Preliminary General Drawings

Overview

Complete and distribute the Preliminary General Drawings (PGDs) for all structures on the project.

References

- ☐ *SMU Bridge Data Sheet – Scoping Template.xlsx*
- ☐ *NCDOT Workday Estimate Form*
- ☐ American Association of State Highway Transportation Officials (AASHTO) *Load and Resistance Factor Design (LRFD) Bridge Design Manual*
- ☐ *Structures Management Unit Design Manual*
- ☐ *Structures Management Unit Design Manual – Standard Letters/Policy Memos*
- ☐ *Structures Management Unit SharePoint Guidelines*
- ☐ *NCDOT Quality Management Program: Quality Control and Quality Assurance*
- ☐ *Structures QA Checklists*
- ☐ *Structures QC Checklists*

Deliverables

Deliverable	Task	Responsible Party		
		Activity Leader	Additional Support	
		Design Firm Structures Lead	Structures Management Unit PEF Coordination Group	Geotechnical
Draft Preliminary General Drawings (PGDs) for Review [Q]	▪ *Develop Draft Preliminary General Drawings (PGDs)*	X	X	
	▪ *Submit Draft PGD for Review to Structures Management Unit PEF Coordination Group*	X	X	
Preliminary Header Elevations (if required)	▪ *Submit Draft PGD for Review to Structures Management Unit PEF Coordination Group*	X	X	
Vertical Abutment Wall Envelopes	▪ *Provide Vertical Abutment Wall Envelopes to Structures Management Unit PEF Coordination Group*	X	X	X
Final Preliminary General Drawings (PGDs) for Distribution [Q]	▪ *Finalize and Distribute Final PGDs*	X	X	

[Q] *Indicates that final document(s) or data set(s) requires review in accordance with the NCDOT Quality Management Program: Quality Control and Quality Assurance.*

Develop Draft Preliminary General Drawings (PGDs)

When developing the draft Preliminary General Drawings (PGDs), the Design Firm Structures Lead is to reference the current Roadway Design plans (i.e., the Design Recommendation Plan Set) and the Bridge Survey and Hydraulic Design Reports (BSR) and coordinate as needed with the project Design Geotechnical Engineer.

- For grade separations, determine bridge length, clearances, and girder type
  - Develop preliminary span lengths

- Develop preliminary girder designs
- Evaluate potential utility conflicts
- Evaluate constructability, temporary access

- For stream crossings, verify span lengths provided in the BSR
  - Developing preliminary span lengths
  - Developing preliminary girder designs
  - Evaluate potential jurisdictional impacts
  - Evaluate constructability, temporary access
- For railroad crossings, verify location of future tracks provided by Rail Owner
  - Verify minimum vertical and horizontal clearance required
  - Develop preliminary span lengths
  - Develop preliminary girder designs
  - Evaluate potential changes in grade and impacts

The Design Firm Structures Lead drafts the Profile and Plan sheet, Typical Section, and Location Sketch sheet as per Chapter 4 of the *Structure Management Unit Design Manual.*

Submit Draft PGD for Review to Structures Management Unit PEF Coordination Group

Following initial draft, the Design Firm Structures Lead uploads the draft PGDs to the project SharePoint site for review, which includes:

- Structures Management Unit Private Engineering Firm (PEF) Coordination Group
- Division (if applicable)
- Project Manager

The Design Firm Structures Lead is to allow up to 10 days for review comments.

If needed, the Design Firm Structures Lead develops the preliminary header elevations in accordance with Section 6.2.2.9 of the *Structures Management Unit Design Manual*.

Provide Vertical Abutment Wall Envelopes to Structures Management Unit PEF Coordination Group

For structures with vertical abutment walls, the Design Firm Structures Lead develops the wall envelope, submitting the envelope to the Project Manager (for information) and to Structures Management Unit PEF Coordination Group for delivery to the Design Geotechnical Engineer for wall design.

Finalize and Distribute Final PGDs

After review and comments are returned to the Design Firm Structures Lead, and comments are addressed, the Design Firm Structures Lead submits the Final PGD to the Structures Management Unit PEF Coordination Group and the project team.

In coordination with the Project Manager, the Structures Management Unit PEF Coordination Group emails the Final PGD using the distribution list that includes the following:

- Area Bridge Construction Engineer

- Geotechnical Unit
- Hydraulic Unit
- Structures Management Unit
- Roadway Design Unit
- Transportation Mobility Unit
- Utilities Unit
- Construction Unit

The Final PGD package includes links for the following:

- Construction Unit Questionnaire
- Google Map of bridge
- Structure Inspection Report and existing bridge plans (if available)
- Bridge Survey Report
- Project Commitments
- Design Recommendation Plat Set

In coordination with the Project Manager, the Structures Management Unit PEF Coordination Group requests both the schedule for geotechnical foundation recommendations and feedback from Area Bridge Construction. The Design Firm Structures Lead provides the preliminary header elevations to the Area Bridge Construction Engineer for review, if needed.

Complete QC/QA Procedures

The Design Firm Structures Lead is to coordinate the applicable QC review following the *NCDOT Quality Management Program: Quality Control and Quality Assurance* procedures and the respective QC Checklist before upload and distribution of all related deliverables.

3ST1 Complete Structures Design

Overview

Complete the structure design and draft plans for all structures. Coordination is involved with the Hydraulic Design Engineer, Environmental Analysis Unit (EAU) for environmental impacts and environmental permit drawings, and with the Design Geotechnical Engineer for foundation recommendations.

References

- ☐ *Structures Management Unit Design Manual*
- ☐ American Association of State Highway Transportation Officials (AASHTO) *Load and Resistance Factor Design (LRFD) Bridge Design Manual*
- ☐ *Request for Foundation Recommendations*
- ☐ *Geotechnical Load Request*
- ☐ *Structures Management Unit SharePoint Guidelines*
- ☐ *NCDOT Quality Management Program: Quality Control and Quality Assurance*
- ☐ *Structures QA Checklists*

Deliverables

Deliverable	Task	Responsible Party					
		Activity Leader	Additional Support				
		Design Firm Structures Lead	Structures Management Unit PEF Coordination Group	Geotechnical	Construction	Environ.	Hydraulics
Geotechnical Foundation Loads	▪ *Provide Geotechnical Foundation Loads*	X	X	X			
Access Drawings	▪ *Provide Access Drawings – Stream Crossings*	X	X		X	X	X
Coast Guard Permit Sketches (if required)	▪ *Complete Coast Guard Permit Sketches and Coordination*	X	X			X	
Railroad Easement Sketches (if required)	▪ *Complete Railroad Coordination Support and Easement Sketches*						
Permit Impacts	▪ *Provide Structure Permit Impacts*	X	X		X	X	X
Final Structure Plans Review [Q]	▪ *Complete Final Structure Plans*	X	X				

[Q] *Indicates that final document(s) or data set(s) requires review in accordance with the NCDOT Quality Management Program: Quality Control and Quality Assurance.*

Provide Geotechnical Foundation Loads

After the distribution of Preliminary General Drawings (PGDs), the Design Firm Structures Lead coordinates with the Project Manager, Structures Management Unit PEF Coordination Group, and Geotechnical Engineering Unit as follows:

- Geotechnical Engineering Unit submits its Request for Loads to Structures Management Unit PEF Coordination Group.
- Structures Management Unit PEF Coordination Group passes the request along to Design Firm Structures Lead.
- Design Firm Structures Lead submits foundation loads to Structures Management Unit PEF Coordination Group.
- Structures Management Unit PEF Coordination Group sends loads to Geotechnical Engineering Unit
- Geotechnical Engineering Unit post the Foundation Recommendations to the project SharePoint site.

Provide Access Drawings – Stream Crossings

For stream crossings and in coordination with the Hydraulic Design Engineer and Environmental Analysis Unit, the Design Firm Structures Lead provides the General Drawing of Site denoting access type (e.g., rock causeway, temporary work bridge) to the Hydraulic Design Engineer.

- For a rock causeway:
  - Provide area for the causeway.
  - Show staging for removal or construction.
  - Provide the Hydraulic Design Engineer with specific information required for Environmental Permit Drawings.
- For a temporary work bridge:
  - In most cases, assume 30-foot spans, 30-foot width for mainline, 20-foot width for fingers, and 16-inch pipe piles.
  - Provide area of piles for temporary impacts.
  - Show temporary bridge on the General Drawing.

Complete Coast Guard Permit Sketches and Coordination

The Design Firm Structures Lead coordinates with the Structures Management Unit PEF Coordination Group and Environmental Analysis Unit to develop U.S. Coast Guard permit sketches for proposed structures over navigable waters. Prepare sketches in accordance with the Structures Management Unit Manual.

Complete Railroad Coordination Support and Easement Sketches

The Design Firm Structures Lead coordinates with the Structures Management Unit PEF Coordination Group, Location & Surveys Unit, and Rail Division to develop temporary and permanent easement sketches. Once approved by Rail Owner, permanent easements are surveyed, recorded and plat maps are developed for recordation.

Provide Structure Permit Impacts (Wetlands, Surface Water, etc.)

To establish structure permit impacts, the Design Firm Structures Lead is to coordinate with the Hydraulic Design Engineer and Environmental Analysis Unit (EAU) in calculating temporary and permanent structure impacts:

- For temporary structure impact for temporary work bridge: calculate area of pipe piles.
- For permanent structure impacts for bridge: calculate area of piles, shafts, and footings.
  - Surface water
  - Wetlands
  - Environmentally sensitive areas

The Design Firm Structures Lead provides the General Drawing of Site and Impacts to the Hydraulic Design Engineer.

Complete Final Structure Plans

In accordance with the *Structures Management Unit Design Manual*, the Design Firm Structures Lead develops the final structure design and associated plans that includes the following.

Structure Design

- Superstructure: Deck design (chart) – link slabs, integrals
  - Finalize bridge length and layout
  - A typical section
  - Girder design
    - Steel: studs, BFS, charpy v-notch, deflection, plate sizes, diaphragms
    - Concrete: stirrups, strand pattern, conc strength, diaphragms
  - Girder rating
  - Bearings
  - Joints
  - Rails
- Substructure
  - End Bent, caps, footings, piles
  - Bent: caps, columns, footings, piles, shafts
  - Geotech loads/ coordination
  - Abutment walls
- Slopes
- Approach slabs

Structure Drawings

- General Drawing (Staging Sequence)
- BOM
- Rating (LRFR)
- Erection Sequence
- Typical section & details
- Plan of spans
- Closed drainage
- Framing plans
- Girder sheets
- Diaphragm details
- Bearings
- Deflections/camber
- Rail
- Sidewalk/median
- Guardrail attachment
- Joints
- Total Super BOM
- End bents
- Bents
- End Bent 2

- PS Conc Pile Std
- Sign attachments
- Electrical conduit system
- Fender system
- Navigational lighting conduit
- Slope protection
- App slabs
- Standard notes

Culvert Design

- Culvert length
- Culvert design
- LRFR rating
- Wing design

Culvert Drawings

- Location sketch
- Total quantities
- Rating sheet (LRFR)
- Profile along CL culvert
- Plans
- Guardrail attachment
- Section views (including sills if required)
- Wing details

Retaining Walls

- Envelopes (structure critical walls only)

Sound Barrier Walls

- Plans (ref standards)

Complete QC/QA Procedures

The Design Firm Structures Lead is to coordinate the applicable QC review following the *NCDOT Quality Management Program: Quality Control and Quality Assurance* procedures and the respective QC Checklist before upload and distribution of all related deliverables.

4ST1 Finalize Structures Design PS&E

Overview

Submit Plans, Specifications, and Estimates (PS&E) to the Structures Management Unit PEF Coordination Group, who submits to Contract Standards and Development (CS&D) for letting.

References

- ☐ *Structures Management Unit Design Manual*
- ☐ *Structures Management Unit SharePoint Guidelines*
- ☐ *Roadway Design/Structures Checklist*
- ☐ *Structures Working Days Guidelines*
- ☐ *Structures PSP Lineup Sheet*
- ☐ *NCDOT Quality Management Program: Quality Control and Quality Assurance*
- ☐ *Structures QA Checklists*
- ☐ *Structures QC Checklists*

Deliverables

Deliverable	Task	Responsible Party	
		Activity Leader	Additional Support
		Design Firm Structures Lead	Structures
Final Structure Plans—PE-Sealed [Q]	▪ *Complete PS&E Package*	X	X
Structures Working Days Estimate [Q]		X	X
Structures Project Special Provisions—PE-Sealed [Q]		X	X
Structures Quantity Estimate [Q]		X	X
Structure Design Files		X	X
Bridge Construction Elevations		X	X
Final Plans [Q]	▪ *Submit Contract/Final Plans to CS&D*	X	X

[Q] *Indicates that final document(s) or data set(s) requires review in accordance with the NCDOT Quality Management Program: Quality Control and Quality Assurance*

Complete PS&E Package

For compiling a complete contract/PS&E package, the Design Firm Structures Lead updates the plans, as needed, for any design changes that occurred after the end of Stage 3. The appropriate documentation required by the Contract Standards and Development Unit or Division Contract Engineer in proper format is either to be included in the plans or provided as standalone documents. Items include:

- Index of structures
- Final Plans - single PDF of signed sealed sheets, full set combined PDF
- Special Provisions
- Design Files – Super and Substructure calculations – PDF set
- Construction Elevations – PDF set
- Structures Quantity Estimate
- Structure Working Days

The Design Firm Structures Lead completes the respective QC Checklist following the *NCDOT Quality Management Program: Quality Control and Quality Assurance* procedures before upload and/or distribution of Final PS&E contract package.

For structures designs developed by a Private Engineering Firm (PEF)/consultant, the Structures Management Unit reviewer is to use appropriate means, including the applicable QA checklist in the *Quality Management Manual* to complete a quality assurance review. This review is to ensure the plan set is complete and in compliance with current NCDOT and Structures Management Unit guidance, policies, and procedures. Items to be reviewed include material quantities, notes, and references to project special provisions.

Submit Contract/Final Plans to CS&D

Plan sheets and other key documents are uploaded into SharePoint by the Design Firm Structures Lead and sent to the Structures Management Unit Project Management Group for final processing. The Structures Management Unit Project Management Group notifies the Plan Review Engineer or the Division Contract Engineer, with a cc to the Project Manager, when the PS&E package and the contract documentation have been placed on the project SharePoint site in the Let Preparation area.

5ST1 Structures Construction Support

The Design Firm Structures Lead and/or Structures Management Unit provides the following support during the Construction Phase:

- Provides technical expertise and answers questions related to the structures design during the pre-construction meeting and throughout the construction phase.
- Completes Construction Plan Revision (as needed):
  - Perform construction revisions of the latest version of the Let Plans (see 5CS1 for related information) to address identified plan errors or field changes either initiated by NCDOT or Contractor.
- Review working drawings and associated calculations for:
  - Retaining Walls
  - Prestressed Girder fabrication issues
  - Steel girder fabrication issues
  - Metal bar railing fabrication
  - Stay In Place forms
  - Prestress girder strand release patterns
  - Temporary shoring design review
  - Temporary detour bridge design
  - Temporary work bridges
  - Crane capacities
  - Top-down construction sequence and equipment review
  - Railroad review and coordination for bridge construction
  - Overhead Sign assembly review

As construction progresses, items may also result in reviews to be completed by the Design Firm Structures Lead and/or Structures Management Unit. This may include, but is not limited to, the following:

- Pile issues (including bearing capacity, changes in subsurface conditions or refusal)
- Pile location changes and structure re-analysis for changed conditions
- Drilled shaft location changes
- Rebar material changes/issues
- Concrete mix design issues (strength reductions, admixtures)
- Bearing location issues/changes
- Girder erection issues/changes
- Girder camber/sweep issues
- Steel girder fit up issues (diaphragms, curved girders)
- Stay in place formwork
- Stirrup height/stud height
- Construction Elevations - buildup height issues
- Deck pour sequence changes/issues
- Deck steel forming issues
- Sidewalk issues/changes
- Barrier rail issues/changes

- Deck steel concrete cover issues
- Deck drain/ closed drain system installation
- Electrical conduit system, utilities added
- Lighting conduit in rails
- Protective fencing added
- Deck joint installation
- Aesthetics details
- Culvert headwall extensions
- Culvert formwork issues
- Retaining wall construction issues
- Sound barrier wall issues

1TM1 Complete Express Design Traffic Analysis (EDTA)

Overview

Obtain a preliminary assessment of the traffic operations for a proposed project, both with and without the proposed project. The purpose of the assessment is to utilize a simplified analysis method to determine the feasibility of proposed designs that complement the Express Design process in determining viable alternatives/alignments for proposed projects. This process is referred to as the Express Design Traffic Analysis (EDTA). Collectively, the EDTV and EDTA are referred to as the Express Design Traffic Evaluation (EDTE). See below:

Express Design Traffic Components:

Traffic Evaluation (EDTE) = Traffic Volume (EDTV) + Traffic Analysis (EDTA)

The EDTA also includes the determination of the Work Zone Level of Significance. The results of the determination are included in the Project Scoping Report. The summary documents the determination in the planning process and begins the coordination with the Traffic Operations Engineer (see 1TO1 and 2TM2 for related information).

Note: *Actions during the Project Initiation Stage may be led and completed by staff from several different NCDOT groups. Any person who has overall responsibility for a project during this Stage is referred to as the "Project Lead." This lead could be the Feasibility Studies Engineer, the Corridor Development Engineer, the Division Planning Engineer, or someone in a similar role as tasked by a state or local agency.*

References

- ☐ *Selecting Optimum Intersection or Interchange Alternatives*
- ☐ *NCDOT Express Design Traffic Evaluation Guidance*
- ☐ *Guidelines for Determining Work Zone Level of Significance*

Deliverables

Deliverable	Task	Responsible Party	
		Activity Leader	Additional Support
		Congestion Management Section -or- Feasibility Studies Unit	Congestion Management Section -or- Feasibility Studies Unit
Express Design Traffic Analysis Report [Q]	▪ *Initiate/Scope Express Design Traffic Analysis*	X	X
	▪ *Determine Alternatives for Analysis/Scope Analysis*	X[a]	X
	▪ *Initiate/Produce Express Design Traffic Volumes (EDTV)*	N/A – Refer to 1TP1 (Complete EDTV)	
	▪ *Develop Traffic Analysis*	X	X
	▪ *Develop Express Design Traffic Analysis Summary*	X	X

Deliverable	Task	Responsible Party	
		Activity Leader	Additional Support
		Congestion Management Section -or- Feasibility Studies Unit	Congestion Management Section -or- Feasibility Studies Unit
Work Zone Level of Significance Documentation	▪ *Determine Level of Significance*	Traffic Management Unit (Work Zone Traffic Control)	

[Q] *Indicates that final document(s) or data set(s) requires review in accordance with the NCDOT Quality Management Program: Quality Control and Quality Assurance.*

[a] *If developed by FSU/CDU, concurrence by Congestion Management Section required.*

Initiate/Scope Express Design Traffic Operations Analysis

The Express Design Traffic Analysis (EDTA) is scoped jointly with the Express Design Traffic Volumes (EDTV) in one cohesive scoping document. Therefore, the EDTE Project Manager (as designated by the FSU/CDU, Transportation Planning Division, and Congestion Management Section) will develop the scope for the overall EDTE.

The traffic operations analysis includes the development of a simplified analysis and supports the development of the Express Design alternatives/alignments. The traffic operations analysis includes the analysis of recommended lane geometries, general storage lengths and the design configurations for selected Build alternatives/alignments that are included in the Express Design study.

To initiate the traffic operations analysis, the first step is to determine the level of analysis required. The Congestion Management Section determines the level of projects. The level of analysis is based on a combination of the complexity of the project and how the project is scored in the Prioritization Process (see 1SP1 for related information). The following are the levels of traffic operations:

- Level 0 – Low traffic volume locations where traffic operations are not critical to the design of the project. No detailed traffic analysis is required.
- Level 1 - Level 1 analysis involves basic traffic operations that can be reviewed by use of macroscopic analysis tools. This type of analysis is typically done for projects that are identified in the Prioritization Process as corridor type projects. Traffic analysis software typically used for this type of analysis include Synchro, HCS or Sidra. Additionally, simplified spreadsheet analysis that utilizes critical lane volume analysis procedures may be utilized.
- Level 2 - Level 2 analysis involves more complex traffic operations that can be best evaluated by use of microscopic analysis tools. This type of analysis is typically done for projects that are developed by the Congestion Management Team in the Prioritization Process or involve more complex multi-nodal or closely-spaced junctions. Traffic analysis software typically used for this analysis is TransModeler.
- Level 3 – Level 3 analysis involves the highest complexity for traffic operations. These projects require evaluation by use of advanced methodology involving microscopic analysis tools. Typical projects may include (but are not limited to) complex freeway system interchanges, new alignment projects (both freeway and arterial) that involve potential multiple travel routing options, and multi-modal projects. Traffic analysis software typically used for this analysis is TransModeler. Level 3 projects are not typically undertaken during the EDTE and simplified methods covered in Level 1 or

2 are normally adequate at the Express Design stage. The implementation of Level 3 analysis will occur in 2TM1.

The following table provides general guidance on the appropriate levels of analysis for each Specific Improvement Type (SIT) from the Prioritization Process:

Prioritization Specific Improvement Type	Level 0	Level 1	Level 2	Level 3
1 - Widen Existing Roadway		X		
2 - Upgrade Arterial to Freeway/Expressway		X		
3 - Upgrade Expressway to Freeway	X	X		
4 - Upgrade Arterial to Reduced Conflict Intersection (RCI) Corridor			X	
5 - Construct Roadway on New Location		X		X
6 - Widen Existing Roadway and Construct Part on New Location		X		X
7 - Upgrade At-grade Intersection to Interchange or Grade Separation			X	
8 - Improve Interchange			X	X
9 - Convert Grade Separation to Interchange		X	X	
10 - Improve Intersection			X	
11 - Access Management	X	X	X	
12 - Ramp Metering	X	X	X	
13 - Citywide Signal System	X			
14 - Closed Loop Signal System	X			
15 - Install Cameras and DMS	X			
16 - Modernize Roadway	X	X		
17 - Upgrade Freeway to Interstate Standards	X	X		
18 - Widen Existing Local (Non-State) Roadway		X		
19 - Improve Intersection on Local (Non-State) Roadway			X	
20 - Convert Grade Separation to Interchange to Relieve Existing Congested Interchange			X	
21 - Realign Multiple Intersections			X	
22 - Construct Auxiliary Lanes or Other Operational Improvements			X	
23 - Construct Grade Separation at Highway / Railroad Crossing		X	X	
24 - Implement Road Diet to Improve Safety	X	X		
25 - Improve Multiple Intersections along Corridor		X	X	
26 - Upgrade Roadway	X	X		

Based on an understanding of the project goals, the Congestion Management Section determines the Level of Analysis on a project-by-project basis and selects the software to be utilized for the analysis.

Determine Alternatives for Analysis/Scope Analysis

The first step in scoping the analysis is to discuss the proposed project and review the study area with the Congestion Management Engineer overseeing the study, the Traffic Analysis Engineer completing the study and the Feasibility Study Lead. The discussion includes:

- Determine locations for development of Express Design traffic volumes based on a review of the study area and the guidelines included in the *Express Design Traffic Evaluation Guidance*,
- Determine Design Year for analysis,
- Determine sources for developing growth rates, and
- Determine if separate No-Build and Build volumes are needed.

The next step is to determine which alternatives/alignments are evaluated in the traffic analysis. The traffic analysis and roadway design alternatives/alignments should be coordinated to determine which discipline is the most critical. On some projects, the constraints of the design largely dictate the alternatives/alignments being considered and result in roadway design being the primary driver of the alternatives/alignments, while other projects have a specific operational goal where the traffic analysis is the primary driver. On select projects both disciplines are critical, and a more integrated and iterative level of analysis is required.

Based on the determination of which disciplines are critical, the range of alternatives/alignments to be developed are selected. For projects that include improvements to intersections, an informal intersection control evaluation (ICE) is conducted for each intersection that is to be improved as part of the project to ensure that the best alternatives are included. Project teams should consider consulting "Selecting Optimum Intersection or Interchange Alternatives". The number of alternatives/alignments for traffic analysis and roadway design may differ depending on which discipline is determined to be critical. For traffic critical projects, more alternatives/alignments may be evaluated for traffic operations with only the best options continuing to roadway design. Conversely, for roadway design critical projects the feasibility of certain alternatives/alignments is completed, and only a selection of feasible options are advanced for traffic operations.

Once the analysis level and alternatives/alignments are developed the project is assigned to a prequalified individual (Traffic Analysis Engineer) to develop the traffic analysis scope for the project. The limits of the analysis and intersections to be included in the analysis is provided based on the steps described above. The traffic analysis typically includes the following analysis scenarios:

- Base Year No-Build (based on existing conditions),
- Future Year No-Build (based on existing conditions, without the proposed project but with any other fiscally constrained project(s) in place), and
- Future Year Build for each alternative/alignment.

Initiate/Produce Express Design Traffic Volumes Process

See 1TP1, Complete Express Design Traffic Volume for related information.

Develop Traffic Analysis

The traffic operations analysis is to be completed in the prescribed software package in accordance with the *Express Design Traffic Evaluation Guidance*. The first step in the analysis process is to develop the Base Year and Future Year No-Build scenarios, with the following considerations.

- These may be developed and submitted separately from the Build analysis, if determined to be appropriate by the project team.
- Preliminary review and approval of the No-Build analysis may be helpful for projects where the build scenarios expand on the no-build analysis and help reduce re-analysis by identifying issues earlier in the process.

The next step is to develop the analysis of the Build alternatives/ alignments. The Build analysis is typically accomplished in one of two ways: either the traffic analysis precedes the design, or the design precedes the traffic analysis.

- For projects where the traffic analysis precedes the design, a general design concept is identified for the traffic analysis and the purpose of the analysis is to develop the details of the design to meet the goals of the project.
  - The analysis determines the recommended design layout and provides the required lane configurations and storage lengths.
  - The recommended layout is then provided to the design team for incorporation into the project's design plans.
  - If elements of the recommended layout cannot be accommodated in the design due to constraints, coordination should occur between the design team and the traffic analysis team to determine how the design can be revised and still meet the project goals.
  - The process should end with a traffic analysis of a design that fits and meets project goals.
- For projects where the design precedes the traffic analysis, a detailed design is developed and provided to the traffic analysis team for analysis.
  - The traffic analysis is developed based on the design provided and any locations where the design does not meet the project goals are identified and recommendations on design revisions are provided.
  - Additionally, any locations where the design provided exceeds what is needed to meet the goals of the project are noted and provided to the project's design team (namely the Roadway Design Lead) to determine, through value engineering, if design revisions are warranted (see 1RD1, 2RD1, 1VM1, and 2VM1 for related information).
  - At the end of the process, a comparison of the traffic analysis and design is completed to determine that they match.
  - The process should end with a traffic analysis of a design that fits and meets project goals.

Once the Draft Express Design Traffic Analysis is developed, it is submitted to the Traffic Management Unit (Congestion Management Section) or the EDTE Project Manager (if delegated by Congestion Management Section) for review.

Develop Express Design Traffic Analysis Summary

After a review of the analysis and receiving approval from the Traffic Management Unit (Congestion Management Section) or EDTE Project Manager, the analysis is finalized through the development of an Express Design Traffic Analysis Report. The Report includes a brief description of the alternatives/alignments evaluated, a simplified reporting of the Measures of Effectiveness (MOE), and conclusions of the evaluation.

- The final version is sealed by the Professional Engineer that was responsible of the analysis.
- The final Summary and analysis files are delivered to the Project Lead and uploaded to the project SharePoint site by the Congestion Management Project Engineer or Project Design Engineer.

All the requirements to develop and complete the summary are described in the *Express Design Traffic Evaluation Guidance*.

Determine Level of Significance

Referencing the *Guidelines for Determining Work Zone Level of Significance*, the Traffic Management Unit (Work Zone Traffic Control) or Transportation Planning Unit evaluates the following project characteristics to determine project/work zone level of significance:

- Category and project type
- Existing volumes and traffic lanes
- Total truck traffic (dual & TTST combined)
- US or NC route
- Project length

The level of significance can be determined based on the EDTV data; however, the determination should be revisited once the project level traffic forecast is completed (see 1TP1 for related information). The Transportation Planning Unit or Traffic Management Unit (Work Zone Traffic Control Section) documents the determination in the planning process and coordinates with the Traffic Operations Engineer (see 1TO1 for related information).

2TM1 Complete Traffic Analysis

Overview

Complete a traffic operations analysis that evaluates the study area, both with and without the proposed project, to identify projected traffic data and inform project design criteria.

References

- ☐ Traffic Engineering Suite
- ☐ *Capacity Analysis Guidelines*
- ☐ *Simulation Guidelines*

Deliverables

Deliverable	Task	Responsible Party	
		Activity Leader	Additional Support
		Congestion Management Project Engineer/Project Design Engineer	Congestion Management Regional Engineer
Traffic Operations Analysis Technical Memorandum [A, Q]	▪ *Initiate/Scope Traffic Operations Analysis*	X	X
	▪ *Develop Analysis*	X	X
	▪ *Complete the Traffic Operations Analysis Technical Memorandum*	X	X

[A] *Indicates that final document(s) or data set(s) must be uploaded to the ATLAS Workbench.*
[Q] *Indicates that final document(s) or data set(s) requires review in accordance with the NCDOT Quality Management Program: Quality Control and Quality Assurance.*

Initiate/Scope Traffic Operations Analysis

The traffic operations analysis is to develop the measures of effectiveness (MOEs), typically in the form of level of service (LOS), and is to support the environmental document's purpose and need statement for projects that have congestion or mobility related needs. The traffic operations analysis also includes the development of recommended lane geometries, storage lengths, and the design configurations for the Design Recommendation Plan Set (see 2RD1 for related information) or any alternatives/alignments included in the study.

To initiate this analysis, the Traffic Management Unit (Congestion Management Section) determines the level of project complexity based on the levels of traffic operations:

- Level 0 – Low traffic volume locations where traffic operations are not critical to the design of the project. No detailed traffic analysis is required.
- Level 1 - Level 1 analysis involves basic traffic operations that can be reviewed by use of macroscopic analysis tools. This type of analysis is typically done for projects that are identified in the Prioritization Process as corridor type projects. Traffic analysis software typically used for this type of analysis include Synchro, HCS or Sidra. Additionally, simplified spreadsheet analysis that utilizes critical lane volume analysis procedures may be utilized.

- Level 2 - Level 2 analysis involves more complex traffic operations that can be best evaluated by use of microscopic analysis tools. This type of analysis is typically done for projects that are developed by the Congestion Management Team in the Prioritization Process or involve more complex multi-nodal or closely-spaced junctions. Traffic analysis software typically used for this analysis is TransModeler.
- Level 3 – Level 3 analysis involves the highest complexity for traffic operations. These projects require evaluation by use of advanced methodology involving microscopic analysis tools. Typical projects may include (but are not limited to) complex freeway system interchanges, new alignment projects (both freeway and arterial) that involve potential multiple travel routing options, and multi-modal projects. Traffic analysis software typically used for this analysis is TransModeler.

Once a level of analysis is determined, the Traffic Management Unit (Congestion Management Section) verifies that the analysis is to be completed by an individual prequalified to perform the analysis. (Note that prequalification for Congestion Management work codes is by individual, not by firm.)

Once the project is assigned, the Traffic Management Unit (Congestion Management Section) reviews and approves the scope of the work. The limits of the analysis and intersections to be included in the analysis typically match those included in the traffic forecast and should be coordinated with the Congestion Management Section during the scoping of the traffic forecast (See 1TP2 for related information). The traffic analysis also typically includes the following scenarios:

- Base Year No-Build (based on existing conditions);
- Future Year No-Build (based on existing conditions, without the proposed project but with any other fiscally constrained project(s) in place);
- Future Year Build for each alternative/alignment; and
- Base Year Build may be analyzed for some projects considering:
  - If determined to be warranted by the Congestion Management Project Engineer or Regional Engineer, and
  - Typically completed only for the recommended alternative/alignment.

The scoping of the analysis is completed in accordance with the *Congestion Management Scope Templates*, which are included in the *Traffic Engineering Suite* under the Scope and Estimate Resources section.

- Level 1 projects are to use the HCS/Synchro/Sidra scope template, and Level 2 and Level 3 projects are to use the TransModeler scope template.
- The scope template is attached to the overall scope for multi-discipline task orders and is not to be modified or renumbered as the tasks are tied to the inputs in the Scope and Manday Estimate spreadsheet.

Develop Analysis

The traffic operations analysis is to be completed in the prescribed software package in accordance with the *Congestion Management Guidelines*. Level 1 projects are to adhere to the *Capacity Analysis Guidelines*, while Level 2 and 3 projects are to adhere to the *Simulation Guidelines.*

The first step in the analysis process is to develop the Base Year and Future Year No-Build scenarios, with the following considerations.

- These may be developed and submitted separately from the Build analysis, if determined to be appropriate by the project team.
- Preliminary review and approval of the No-Build analysis may be helpful in validating the Purpose and Need for the environmental document. Preliminary review and approval can also be beneficial for complex projects where the build scenarios expand on the no-build analysis and help reduce re-analysis by identifying issues earlier in the process.
- It is recommended that the Base Year and Future Year No-Build models for all Level 3 projects (and some Level 2 projects) be reviewed and approved prior to the development of Build scenarios.

The next step is to develop the analysis of the Build alternatives/alignments. The Build analysis is typically accomplished in one of two ways, either the traffic analysis precedes the design, or the design precedes the traffic analysis.

The next step is to develop the analysis of the Build alternatives/ alignments. The Build analysis is typically accomplished in one of two ways: either the traffic analysis precedes the design, or the design precedes the traffic analysis.

- For projects where the traffic analysis precedes the design, a general design concept is identified for the traffic analysis and the purpose of the analysis is to develop the details of the design to meet the goals of the project.
  - The analysis determines the recommended design layout and provides the required lane configurations and storage lengths.
  - The recommended layout is then provided to the design team for incorporation into the project's design plans.
  - If elements of the recommended layout cannot be accommodated in the design due to constraints, coordination should occur between the design team and the traffic analysis team to determine how the design can be revised and still meet the project goals.
  - The process should end with a traffic analysis of a design that fits and meets project goals.
- For projects where the design precedes the traffic analysis, a detailed design is developed and provided to the traffic analysis team for analysis.
  - The traffic analysis is developed based on the design provided and any locations where the design does not meet the project goals are identified and recommendations on design revisions are provided.
  - Additionally, any locations where the design provided exceeds what is needed to meet the goals of the project are noted and provided to the project's design team (namely the Roadway Design Lead) to determine, through value engineering, if design revisions are warranted (see 1RD1, 2RD1, 1VM1, and 2VM1 for related information).
  - At the end of the process, a comparison of the traffic analysis and design is completed to determine that they match.
  - The process should end with a traffic analysis of a design that fits and meets project goals.

Complete the Traffic Operations Analysis Technical Memorandum

After receiving approval from the Traffic Management Unit (Congestion Management Section), the analysis is to be finalized through a Traffic Operations Analysis Technical Memorandum.

- The final version of the Memorandum is sealed by the North Carolina Professional Engineer that was in responsible charge of the analysis.
- The final Memorandum is uploaded to the project SharePoint site by the Congestion Management Project Engineer, with a notification to the Roadway Design Lead and the Signing and Delineation Designer (see 2RD1 and 2SD1 for related information).

All of the requirements to develop and complete the technical memorandum are described in the *Capacity Analysis Guidelines* and *Simulation Guidelines*.

2TM2 Initiate Transportation Management Plan

Overview

Begin this activity based on the Design Recommendation Plan Set to verify the overall transportation management strategy with the Division, identify any impacts to right-of-way, and identify all items that require coordination with other disciplines/Units for inclusion in the final Transportation Management Plan (TMP).

References

- ☐ American Association of State Highway and Transportation Officials (AASHTO) *Roadside Design Guide 4th Edition and Errata*
- ☐ American Association of State Highway and Transportation Officials (AASHTO) *A Policy on Geometric Design of Highways and Streets and all Errata*
- ☐ Federal Highway Administration (FHWA) *Manual on Uniform Traffic Control Devices (MUTCD)*
- ☐ Federal Highway Administration (FHWA) *Standard Highway Signs*
- ☐ Federal Highway Administration (FHWA) *Rule on Work Zone Safety and Mobility (23 CFR 630 Subpart J and K)*
- ☐ Transportation Research Board (TRB) *Highway Capacity Manual*
- ☐ *Roadway Design Manual*
- ☐ *Standard Specifications for Roads and Structures*
- ☐ *Roadway Standard Drawings*
- ☐ *Supplement to the Manual on Uniform Traffic Control* Devices (NCSMUTCD)
- ☐ *Guidelines for Transportation Management Plan Development*
- ☐ *Work Zone Traffic Control (WZTC) Design Manual*
- ☐ *Guidelines for the Use of Positive Protection in Work Zones*
- ☐ *Temporary Shoring Policies and Procedures*
- ☐ *Policy for Providing Temporary Pedestrian Accommodations in Work Zones*
- ☐ *Americans with Disabilities Act of 1990* (ADA)
- ☐ *NCDOT Quality Management Program: Quality Control and Quality Assurance*

Deliverables

Deliverable	Task	Responsible Party	
		Activity Leader	Additional Support
		WZTC Project Engineer	WZTC Project Design Engineer
Temporary Traffic Control (TTC) Concept Plans [Q]	▪ *Complete Concept TTC Plans* ▪ *Lead TTC Concept Review Meeting*	X	X

[Q] *Indicates that final document(s) or data set(s) requires review in accordance with the NCDOT Quality Management Program: Quality Control and Quality Assurance.*

Complete Concept Temporary Traffic Control (TTC) Plans

The WZTC Project Engineer, with support from the Work Zone Traffic Control (WZTC) Project Design Engineer, develops the conceptual temporary traffic control (TTC) plans to demonstrate how traffic

(motorists, pedestrians, and cyclists) is to be safely maintained during construction activities in a manner that does not overly degrade mobility, compromise worker safety, or prevent timely and efficient completion of the project. The plans are to include overview drawings, details, preliminary general notes, and written construction staging.

For this task, the WZTC Project Engineer is to:

- Facilitate resolution of constructability concerns and identify all areas where additional coordination with other disciplines/Units is needed.
- Review with and receive concurrence from Division construction staff and provide action items to other disciplines/Units responsible for temporary components of the Final TTC Plans (see 3TM1 for related information).

To prepare the concept plans, the WZTC Project Engineer, with support from the WZTC Project Design Engineering, is to:

- Analyze the Design Recommendation Plan Set (see 2RD1 for related information), Preliminary General Drawings (see 2ST2 for related information), and current hydraulics design (see 2HY1 and 2HY2 for related information), coordinating directly with each discipline/Unit to ensure the WZTC Project Engineer is reviewing the most up-to-date information.
- Initiate coordination with the Utilities Lead, Utilities Coordinator, and Utility Design Engineer to discuss any known issues regarding the construction of utilities constructed by the contractor or during the term of the highway construction.
- Initiate coordination with the Signing and Delineation Designer to discuss potential signing (notably for overhead signs, consequential guide signs, temporary regulatory signs that direct temporary traffic patterns).
- Perform a field review/site investigation.
- Determine work zone capacity, obtain hourly traffic counts or Annual Average Daily Traffic (AADT), and determine lane and road closure restrictions.
- Develop a transportation management strategy for vehicles and pedestrians.

The plans also include identifying several items for the plans that include:

- Proposed road closures and detours, including need and expected duration.
- Proposed temporary alignments and grades.
- Location and type of work zone positive protection.
- Locations of proposed temporary drainage.
- Location of proposed temporary shoring for the maintenance of traffic.
- Location and number of temporary signals and signal timing (see 2SG1 and 2SS1 for related information).

The WZTC Project Engineer is to also develop:

- Preliminary general notes, limited to proposed lane and road closure restrictions, as well as hauling restrictions.

- Written construction staging that aligns with the overview drawings and describes in broad terms, the construction that is taking place in each construction phase and how traffic is maintained in each phase.
- Any Phase/Step intermediate contract times.

The WZTC Project Engineer coordinates the QC review following the *NCDOT Quality Management Program: Quality Control and Quality Assurance* procedures and the respective QC Checklist before upload and distribution.

Lead TTC Concept Review Meeting

After developing the TTC Concept Plans, the Regional WZTC Engineer, with support from the WZTC Project Design Engineering, is to schedule and lead a TTC concept review meeting with the following considerations:

- Set up the TTC review meeting with Division construction, Roadway Design Lead, Hydraulics Design Engineer, Structures Lead, and Regional Traffic Engineer.
  - For complex, significant projects, this meeting may also include the Construction Unit and Statewide Transportation Operation Center (STOC).
  - Depending upon the complexity of the project, it may be beneficial to conduct this meeting as part of the Field Inspection Review Meeting. Otherwise, conduct a separate meeting prior to the Field Inspection Review Meeting.
- Prior to meeting, provide the TTC Concept Plans and an agenda specifying points of discussion and items of further coordination.
- Submit meeting minutes, including action items and the further coordination required to complete Final TTC plans.

3TM1 Complete Transportation Management Plan

Overview

Begin this activity after Division concurrence with temporary traffic control (TTC) concept, where early and effective coordination with other disciplines/Units is needed to deliver a final Transportation Management Plan (TMP).

References

- ☐ American Association of State Highway and Transportation Officials (AASHTO) *Roadside Design Guide 4th Edition and Errata*
- ☐ American Association of State Highway and Transportation Officials (AASHTO) *A Policy on Geometric Design of Highways and Streets and all Errata*
- ☐ Federal Highway Administration (FHWA) *Manual on Uniform Traffic Control Devices (MUTCD)*
- ☐ Federal Highway Administration (FHWA) *Standard Highway Signs*
- ☐ Federal Highway Administration (FHWA) *Rule on Work Zone Safety and Mobility (23 CFR 630 Subpart J and K)*
- ☐ Transportation Research Board (TRB) *Highway Capacity Manual*
- ☐ *Roadway Design Manual*
- ☐ *Standard Specifications for Roads and Structures*
- ☐ *Roadway Standard Drawings*
- ☐ *Supplement to the Manual on Uniform Traffic Control* Devices (NCSMUTCD)
- ☐ *Guidelines for Transportation Management Plan Development*
- ☐ *Work Zone Traffic Control (WZTC) Design Manual*
- ☐ *Guidelines for the Use of Positive Protection in Work Zones*
- ☐ *Temporary Shoring Policies and Procedures*
- ☐ *Policy for Providing Temporary Pedestrian Accommodations in Work Zones*
- ☐ *Americans with Disabilities Act of 1990* (ADA)
- ☐ *NCDOT Quality Management Program: Quality Control and Quality Assurance*

Deliverables

Deliverable	Task	Responsible Party	
		Activity Leader	Additional Support
		WZTC Project Engineer	WZTC Project Design Engineer
Final Unsealed TMP, including Draft Quantity Estimate, Intermediate Contract Times (ICTs), and Project Special Provisions (PSPs)	▪ *Complete Final Unsealed Transportation Management Plan (TMP)*	X	X
		X	X
Sealed TMP and Project Special Provisions, Quantity Estimate, and Intermediate Contract Times (ICTs) [Q]	▪ *Complete Final Sealed Transportation Management Plan (TMP)*	X	X

[Q] *Indicates that final document(s) or data set(s) requires review in accordance with the NCDOT Quality Management Program: Quality Control and Quality Assurance.*

Complete Final Unsealed Transportation Management Plan (TMP)

To complete this task, the WZTC Project Engineer, with the support of the WZTC Project Design Engineer, advance the TMP by incorporating all previously agreed upon transportation management strategies and recommendations, completing the required coordination with other disciplines/Units and progressing to final plan format.

Upon receiving Division concurrence with the TTC concept, the WZTC Project Engineer is to directly coordinate with the previously identified disciplines/Units around several specific elements of design.

- Roadway Design Unit/Roadway Design Lead
  - Temporary shoring for staged embankment construction
  - Temporary alignments
  - Temporary pavement
  - Temporary guardrail, end units, guardrail to portable concrete barrier transitions, re-lapping of guardrail
- Structures Management Unit/Structures Lead
  - Temporary shoring for substructure construction
  - Staged bridge construction (construction joint locations)
  - Girder erection over open roads including need and location of shoring towers
  - Anchored portable concrete barriers on bridge decks
- Hydraulics Unit/Hydraulics Design Engineer and Roadside Environmental Unit/Roadside Environmental Engineer
  - Temporary drainage
  - Staged culvert construction
- Geotechnical Engineering Unit/Design Geotechnical Engineer
  - Temporary shoring
  - Temporary slopes
- ITS and Signals Unit/Signal Lead and Signal System Engineer
  - Temporary traffic patterns at signalized intersections
- Utilities Lead/Utilities Coordinator/Utilities Design Engineer
  - Relocation of utilities by the contractor
- Signing and Delineation Unit/Signing and Delineation Designer
  - Coordinate on development of intermediate signing plans (notably for overhead signs, consequential guide signs, temporary regulatory signs that direct temporary traffic patterns) for each phase of construction
- Regional Traffic Engineer
- Statewide Transportation Operations Center (STOC)
- Transportation Operations and Incident Management

The WZTC Project Engineer documents all coordination efforts, completing coordination with the identified disciplines/Units prior to Design Review Complete Meeting.

Concurrent with the on-going coordination, the WZTC Project Engineer is to progress the TMP for the Design Review Complete Meeting, including:

- Title Sheet/Legend
- Final General Notes
- Final Phasing in phase/step format
- Detailed long-term temporary traffic patterns that align with final phasing including:
  - Cut Sections at strategic locations that detail spatial relationship among traffic, traffic control devices, and construction
  - Temporary Pavement Marking
  - Channelization
  - Delineation
  - Positive Protection
  - Work Zone Signing, including the location and messaging of Portable Changeable Message Signs
  - Modifications to existing signing due to temporary traffic patterns
  - Pedestrian accommodations
- Offsite detour details that include both Advance Warning and Trail Blazing Signs
- Special Details
  - Work Zone Speed Reduction Signing
  - Portable concrete barriers at Temporary Shoring
  - Special Sign Designs

The WZTC Project Engineer is to also submit the following items with the Final unsealed TMP:

- Draft version of TMP estimate of WZTC pay items and estimated quantities.
- Draft version of Intermediate Contract Times using standard ICT templates.
- Draft version of the WZTC Special Provisions generated from the Work Zone Application for Special Provisions (WASP).

Upload final unsealed TMP and supporting documents to the project SharePoint site prior to the Design Review Complete Meeting.

Complete Final Sealed Transportation Management Plan (TMP)

Progress the TMP to the PS&E and Letting phase as follows:

- Address comments by the Work Zone Traffic Control Section and the applicable Division from the previous design phase review. Coordinate the QC review following the NCDOT Quality Management Program: Quality Control and Quality Assurance procedures and the respective QC Checklist.
- Upload Final Unsealed TMP, Intermediate Contract Times, Project Special Provisions, and Estimate to the project SharePoint Let Preparation Folder for review by CS&D Unit.
- Address final comments by CS&D Unit and upload Final Sealed TMP and Project Special Provisions to the project SharePoint Let Preparation Folder for final processing by CS&D Unit.

5TM1 Traffic Management Construction Support

The WZTC Project Engineer provides the following support during the Construction Phase:

- Provides technical expertise and answers questions on the project's Transportation Management Plan (TMP) and associated Temporary Traffic Control (TTC) Plans
- Completes Construction Revision (as needed):
  - Performs construction revisions of the latest version of the Let Plans (see 5CS1 for related information) to address identified field issues
  - Coordinates the applicable QC review following the *NCDOT Quality Management Program: Quality Control and Quality Assurance* procedures and the respective QC Checklist before upload and/or distribution
- Completes Work Zone Safety Audits for significant project and/or when crash severity is a concern or when the project receives public comments
- Reviews construction access point modifications
- Reviews changes in traffic control plan to accommodate contractor means and methods, utility constrains, or ROW issues that arise in construction
- Reviews value Engineering proposals from contractor

1TO1 Scope Traffic Systems Operations

Overview

Determine project/work zone category of significance and complete the necessary tasks based on the identified category.

References

- ☐ *Work Zone Levels of Significance*
- ☐ *NCDOT Signals Map*
- ☐ *Guidelines for Determining Work Zone Level of Significance*
- ☐ *Integrated Corridor Management (ICM) Project Process Outline (PPO)*
- ☐ *CCTV Camera and DMS Preliminary Siting Guidance*
- ☐ *Operational Risk Assessment Handbook*
- ☐ Future Location of all Documents
  - https://ncconnect.sharepoint.com/:f:/r/sites/trafficsystemsoperationsprojects/Shared%20Documents/References?csf=1&web=1&e=tqPQy2
  - https://connect.ncdot.gov/resources/safety/Teppl/Pages/teppl.aspx
- ☐ *NCDOT Quality Management Program: Quality Control and Quality Assurance*

Determine Level of Significance

Referencing the *Guidelines for Determining Work Zone Level of Significance*, Traffic Management (Work Zone Traffic Control) or Transportation Planning documents the level of significance determination, coordinating the findings with the Traffic Operations Engineer (see 1TM1 for related information).

If a project is a determined to be a significant project (either Category Level 1 or Level 2 or there is a level of significance after construction), the Traffic Operations Engineer initiates scoping of traffic systems operations strategies needed during and after construction. Determining all affected intelligent transportation system (ITS) devices and coordinating corridors are crucial to the scoping, design, and implementation of comprehensive incident management plans.

If a project is determined to be not significant (either Category Level 3 or Level 4), then Traffic Operations Engineer, as coordinated with others on the team, may determine that ITS device scoping be included in the project. Determining all affected coordinated corridors is crucial to the scoping, design, and implementation of signal timing plans for the duration and completion of the project. Also see 1SS1 for related information on non-significant projects.

Deliverables (if a Significant Project)

Deliverable	Task	Responsible Party	
		Activity Leader	Additional Support
		Traffic Operations Engineer	
Operational Risk Assessment [Q]	▪ *Complete Operational Risk Assessment*	X	Project Lead
Incident Management Alternate / Detour Map [Q]	▪ *Develop Initial Incident Management Alternate and Detour Options*	X	
Traffic Operations Strategies Checklist	▪ *Develop Initial Traffic Operation Strategies*	X	

Deliverable	Task	Responsible Party	
		Activity Leader: Traffic Operations Engineer	Additional Support
Travelers Information Strategy	▪ *Develop Travelers Information Strategy*	X	
Planning Level ITS Device / Signal Map [Q]	▪ *Identify New ITS Devices and Incident Management Signal Equipment Upgrades*	X	
List of Affected ITS Devices, Signal Systems and Signals [Q]		X	▪ Signal System Engineer ▪ Project Lead
Signal System Number(s) for New System(s)		X	▪ Signal System Engineer ▪ Project Lead
Planning Level Estimate of Traffic Operations Scope [Q]	▪ *Develop Operational Strategy and ITS Scope Costs*	X	Project Lead

[Q] *Indicates that final document(s) or data set(s) requires review in accordance with the NCDOT Quality Management Program: Quality Control and Quality Assurance.*

Complete Operational Risk Assessment

Operational Risk Assessments (ORA) are completed along with Planning Documents early in the project process. This allows for proper planning, analysis, coordination, and design of suggested mitigations within the report. It is expected that the Operational Risk Assessment is used to inform cost estimates for the preliminary engineering and construction phases, project schedules, and the design of the project.

Operations Risk Assessments are requested as part of the process for the following STIP projects:

- Interstate (I-####) projects >$14M
- Rural (R-####, A-####, and X-####) projects >$100M
- Urban (U-####) projects >$100M
- Highway Safety (W-####, SI-####, and SF-####) projects >$70M

The estimate project costs are based on estimated construction costs before being assigned sub-TIP numbers.

Just because an ORA is requested and meets the thresholds above, does not mean that one is completed. Projects that do not present impacts or risks to the road network do not require an ORA. For example, the Traffic Systems Operations Unit may determine the construction of a new ring freeway with relatively small impacts to existing traffic does not need an ORA.

For significant projects, the ORA of an individual construction project considers safety, congestion, mobility, commerce (e.g., freight), and influence of other projects on the traffic operations of the surrounding road network. The ORA suggests potential strategies to identify risks, including the order that construction projects are carried out. A key objective of the ORA is to inform the project prioritization process and identify preferred project schedule from a traffic operations perspective.

The Traffic Operations Engineer sends a completed ORA to the Feasibility Studies Unit and Strategic Prioritization Office for preferred phasing of the projects. The ORA is also used to internally develop traffic operation strategies.

Develop Initial Incident Management Alternate and Detour Options

To ensure that incident management alternate and detour routes are included in the environmental document, the Traffic Operations Engineer develops an initial map detailing potential routes to help refine the project limits (refer to the Integrated Corridor Management Project Process Outline for the alternative routes and/or detour routes for a project). The Traffic Operations Engineer:

- Includes any routes that need updated signal timing.
- Coordinates with the Feasibility Studies Unit to include in the project limits.
- Ensures the applicable Division(s) review the potential routes.

The Traffic Operations Engineer coordinates with the Environmental Analysis Unit if incident management alternate / detour routes are required. Typically permanent ITS devices on incident management detour routes are outside the normal project limits and need to be evaluated as part of the environment document.

The Signal Systems Engineer prepares the map in accordance with the Integrated Corridor Management Project Process Outline. After the map is complete, the Traffic Operations Engineer sends the map to the following units for their reference:

- Environmental Analysis Unit
- Feasibility Studies Unit
- The applicable Division(s)
- Traffic Management Unit (Work Zone Traffic Control)

Develop Initial Traffic Operation Strategies

The Traffic Operations Engineer could develop the following traffic operation strategies to address mobility and safety throughout the project limits to support the construction effort.

- Tow contracts
- Incident management alternate / detour route strategies
- Smart work zone technology
- Other means to improve the mobility and safety of the work zone or address concerns identified in the Operational Risk Assessment

The Traffic Operations Engineer coordinates with the applicable Division(s) on potential strategies to be used during construction, providing a checklist of items that may be feasible for the project.

Develop Travelers Information Strategy

The Traffic Operations Engineer develops a Travelers Information Strategy if applicable to the project. Details regarding the Travelers Information tasks are still *in development*.

Identify New ITS Devices and Incident Management Signal Equipment Upgrades

To determine signal equipment upgrades needed for incident management, the Traffic Operations Engineer, in coordination with the Signal System Engineer:

- Determines which signal systems, if any, are affected along the project corridor or identifies/refines incident management alternate and/or detour routes using the NCDOT Signals Map.

- Compiles a list of all affected signal system and the signals within those systems. The list includes:
  - Any new systems being constructed by the project or signals being added to existing systems by the project.
  - The party responsible for traffic operations along the corridor (NCDOT or municipality).

The Signal System Engineer assigns a signal system number to any new system(s) being constructed by the project.

The Traffic Operations Engineer, in coordination with the Transportation Systems Management & Operations (TSMO) Unit (Signal Design Section and Regional ITS Section), is to:

- Determine additional permanent ITS devices and locations.
- Provide a planning level map showing new and existing device locations for a corridor.

At this point, the Traffic Operations Engineer also:

- Finalizes the map, sending it to the appropriate Units or Sections included in the planning process.
- Sends the Planning Level ITS device/Signal map to the Environmental Analysis Unit to include in the project limits.

The Traffic Operations Engineer continues coordination with the Environmental Analysis Unit as the ITS device strategies are further refined on the incident management alternate / detour routes.

Develop Operational Strategy and ITS Scope Costs

For this task, the Traffic Operations Engineer develops a planning-level cost estimate for any traffic system operational strategies to be included in the conceptual construction estimate (see 1CS1 for related information). This could include:

- Tow contracts
- Integrated Corridor Management (ICM)
- Incident Management Assistance Patrol (IMAP)
- Traffic Management Center (TMC) resources

The cost could also include:

- Incident management signal system upgrades
- Signal timing
- New permanent ITS devices
- NCDOT operational cost post-construction
- Any other additional equipment needed

The Traffic Operations Engineer submits the cost estimate to the Feasibility Studies/Corridor Development Unit Lead.

Complete QC/QA Procedures

The Traffic Operations Engineer is to coordinate the applicable QC review following the *NCDOT Quality Management Program: Quality Control and Quality Assurance* procedures and the respective QC Checklist before upload and/or distribution of any deliverables.

Deliverables (if *not a* Significant Project)

Deliverable	Task	Responsible Party
		Activity Leader
		Traffic Operations Engineer
Planning Level ITS Device Map [Q]	▪ *Identify New ITS Devices*	X
Planning Level Estimate of Traffic Systems Operational Strategies [Q]	▪ *Develop ITS Scope Costs*	X

[Q] *Indicates that final document(s) or data set(s) requires review in accordance with the NCDOT Quality Management Program: Quality Control and Quality Assurance.*

Identify New ITS Devices

In coordination with the Transportation Systems Management & Operations (TSMO) Unit (ITS Design Section), the Traffic Operations Engineer determines any additional ITS devices and locations. The Traffic Operations Engineer also provides a planning level map showing new and existing device locations for a corridor.

Develop ITS Scope Costs

For this task, the Traffic Operations Engineer develops a planning-level cost estimate for any traffic systems operational strategies to be included in the conceptual construction estimate (see 1CS1 for related information). This is to include new permanent ITS devices. The Traffic Operations Engineer submits the cost estimate to the Feasibility Studies/Corridor Development Unit Lead.

Complete QC/QA Procedures

The Traffic Operations Engineer is to coordinate the applicable QC review following the *NCDOT Quality Management Program: Quality Control and Quality Assurance* procedures and the respective QC Checklist before upload and/or distribution of any deliverables.

2TO1 Initiate Transportation Operations Plan (if a Significant Project)

Overview

Work with Traffic Management Unit (Work Zone Traffic Control) and Transportation Systems Management & Operations (TSMO) Unit to develop the traffic operations portion of the Transportation Management Plan (TMP). Work Zone Traffic Control develops the temporary traffic control (TTC) plans / Maintenance of Traffic Plan and Traffic Systems Operations develops the plans for Travel Demand Management, signal retiming, integration of ITS devices supporting incident management alternate / detour routes, and Incident Management Plan.

References

- ☐ *Guidelines for Transportation Management Plan Development*
- ☐ *Work Zone Traffic Control Design Manual*
- ☐ *Guidelines for the Use of Positive Protection in Work Zones*
- ☐ *Integrated Corridor Management (ICM) Project Process Outline (PPO)*
- ☐ *Incident Management Plan Guidelines*
- ☐ *Operational Risk Assessment Handbook*
- ☐ Incident Management Assistance Patrol (IMAP) Resources for Significant Project (*In Development*)
- ☐ Future Location of all Documents
  - https://ncconnect.sharepoint.com/:f:/r/sites/trafficsystemsoperationsprojects/Shared%20Documents/References?csf=1&web=1&e=tqPQy2
  - https://connect.ncdot.gov/resources/safety/Teppl/Pages/teppl.aspx
- ☐ *NCDOT Quality Management Program: Quality Control and Quality Assurance*

Deliverables

Deliverable	Task	Responsible Party	
		Activity Leader	
		Traffic Operation Engineer	Signal System Engineer
Updated Operational Risk Assessment [A]	▪ *Validate Operational Risk Assessment*	X	
Traffic Operations Recommendations [A]	▪ *Validate Traffic Operations Strategies*	X	
Initial Incident Management (Quick Clearance) Strategies Recommendations [A]	▪ *Initiate Incident Clearance Strategies*	X	
Draft Signal Timing Plans [Q]	▪ *Prepare Signal System Coordination Plans and Upgrades List*		X
Integrated Corridor Management Decision Matrix (Ruleset) [Q]	▪ *Develop Incident Management Alternate/Detour Route Response Plan*	X	
List of Smart Work Zone Equipment	▪ *Determine Level of Smart Work Zone Needs for Incident Management*	X	
Detailed Travelers Information Plan	▪ *Prepare Detailed Travelers Information Plan*	X	
Updated Cost Estimate [Q]	▪ *Prepare Detailed Traffic Operations and ITS Cost Estimate*	X	
Initial Stakeholder Meeting Minutes	▪ *Hold initial Stakeholder Meetings about Traffic Operation Strategies*	X	

[A] *Indicates that final document(s) or data set(s) must be uploaded to the ATLAS Workbench.*
[Q] *Indicates that final document(s) or data set(s) requires review in accordance with the NCDOT Quality Management Program: Quality Control and Quality Assurance.*

Validate Operational Risk Assessment

After projects are selected and prioritized, the Traffic Operations Engineer determines if there are any effects that require changes to the traffic operation strategies. The Traffic Operations Engineer also updates the Operational Risk Assessment, as needed, to include any updates to the project. The validation also is to update for changes to the project limits or the phasing of adjacent projects.

Validate Traffic Operations Strategies

Once the strategies are selected to mitigate the work zone impacts and the project risks are updated, the Traffic Operations Engineer develops a concept planning document that:

- Assigns leads for each strategy.
- Establishes the need and purpose of each strategy.
- Aligns milestones to ensure synchronization of the strategy development.

Initiate Incident Clearance Strategies

The Traffic Operations Engineer coordinates with the applicable Division to provide a list of the incident clearance requirements for the project, which are to be administered by NCDOT and the Contractor. The Traffic Operations Engineer:

- Determines requirement for type and management of tow contracts (e.g., DOT managed, Contractor managed, etc.).
- Determines the expansion of Incident Management Assistance Patrol (IMAP) routes.
- Determines if any other strategies would assist in the following:
  - Incident detection
  - Incident response
  - Incident clearance
  - Incident site management
  - Incident information dissemination

Prepare Signal System Coordination Plans and Upgrades List

The Signal System Engineer coordinate with the applicable Division or Unit to:

- Coordinate with the Division and Signal/ITS lead about project schedule.
- Coordinate with the Traffic Operations Engineer to update the list of affected ITS Devices, Signal Systems and Signals from 1TO1.
- Verify with the Signal Lead (see 2SG1 for related information) if the traffic signals along a potential incident management detour route may require equipment upgrades for NCDOT to communicate with the traffic signals.
- Develop/review draft signal timing plans along the incident management detour routes.
- Coordinate with the Signal Lead (see 2SG1 for related information) if updated signal plans are required to replace equipment or install a new signal.
- Coordinate with ITS Lead (see 2SG1 for related information) if traffic communication plans are required to include traffic signals in a centralized signal system software.

Develop Incident Management Alternate/Detour Route Response Plan

Using the Alternate/Detour Route Map, the Traffic Operations Engineer conducts a field inspection to validate the selected incident management routes with Division and other required stakeholders. Update the maps if needed after the field inspection.

The Traffic Operations Engineer prepares an Integrated Corridor Management Decision Matrix (Ruleset) in accordance with the Integrated Corridor Management Project Process Outline. The Traffic Operations Engineer:

- Holds stakeholder meetings to discuss the input criteria/thresholds and general response parameters for any incident at any location within the mainline project. Input discussion to include at a minimum: general route information, time of day, day of week, type of incident (Minor, Intermediate, and Major), queue threshold, and number of lanes affected. Response parameters discussion to include at a minimum: alternate/detour route usage, CMS/DMS message strategies, signal timing activation, DTB activation, and Division specific restrictions.
- Develops and populates an Integrated Corridor Management Decision Matrix (Ruleset) summarizing the inputs and response parameters for each scenario from stakeholder input.
- Resolves conflicts of concurrent ICM responses with ranking during activations.

From the field inspection and with the Integrated Corridor Management Decision Matrix (Ruleset), the Traffic Operations Engineer:

- Identifies the required ITS devices, traveler information, and coordinated signal system timing.
- Updates ITS Device/Signal Map from 1TO1.
- Updates List of affected ITS Devices, Signal Systems and Signals from 1TO1.
- Coordinates the development of the ITS plans, Signal plans, and dynamic trailblazers with the other Units.
- Continues coordination with the Environmental Analysis Unit about updated ITS device and Signal locations along incident management alternate / detour routes.

Determine Level of Smart Work Zone Needs for Incident Management

If a Smart Work Zone is required, the Traffic Operations Engineer:

- Meets with the Traffic Management Unit (Work Zone Traffic Control) to discuss options that can be incorporated into the Incident Management Plan.
- Adds the appropriate level of involvement of the State Traffic Operations Center in the operations and maintenance of smart work zone devices.
- Assists with developing a list of Smart Work Zone Equipment.

Prepare Detailed Travelers Information Plan

The Traffic Operations Engineer prepares a Travelers Information Strategy if applicable to the project. Details regarding the Travelers Information tasks are *in development*.

Prepare Detailed Traffic Operations and ITS Cost Estimate

Once the strategies are developed, the Traffic Operations Engineer prepares a refined estimate to include the cost to the NCDOT and the cost to the Contractor. The Traffic Operations Engineer may include an

operational cost estimate for the project after construction if items were identified. The Traffic Operations Engineer coordinates with Transportation Systems Management & Operations (TSMO) Unit as needed. The estimate may include:

- Portable and temporary ITS devices
- IMAP expansion
- Tow contract management
- Traffic Management Center (TMC) operation
- ITS device installation

Some of these pay items are at NCDOT's cost during and after construction, and others are included in the Contractor's construction cost estimate. The estimate is sent to the Project Manager, who reviews the estimate, and Contract Standards and Development Unit (see 2CS1 for related information).

Hold Initial Stakeholder Meetings about Traffic Operations Strategies

The Traffic Operations Engineer meets with project stakeholders to coordinate associated incident management efforts that need to occur during construction within their areas. These stakeholders could include:

- Municipal and/or county Law Enforcement
- Towing industry
- Municipal traffic engineers and/or signal engineers

The Traffic Operations Engineer prepares the meeting minutes and submits these minutes to the Project Manager and all meeting attendees.

Complete QC/QA Procedures

The Traffic Operations Engineer is to coordinate the applicable QC review following the *NCDOT Quality Management Program: Quality Control and Quality Assurance* procedures and the respective QC Checklist before upload and/or distribution of any deliverables.

3TO1 Advance Transportation Operations Plan (if a Significant Project)

Overview

Finalize traffic operation plans and start traffic operation discussions for desired support with outside agencies.

References

- ☐ *Integrated Corridor Management (ICM) Project Process Outline (PPO)*
- ☐ *Incident Management Plan Guidelines*
- ☐ *Incident Management Assistance Patrol (IMAP) Resources for Significant Projects* (*In Development*)
- ☐ Memorandum of Understanding (MOUs) with Municipalities and Emergency Responders (*In Development*)
- ☐ State Traffic Operations Center (STOC)/Traffic Management Center (TMC) Operator Training (*In Development*)
- ☐ *Helping All Work Zones Keep Safe (HAWKS) Process Document* (*In Development*)
- ☐ *Tow Contract Document (In Development)*
- ☐ Future Location of all Documents
  - https://ncconnect.sharepoint.com/:f:/r/sites/trafficsystemsoperationsprojects/Shared%20Documents/References?csf=1&web=1&e=tqPQy2
  - https://connect.ncdot.gov/resources/safety/Teppl/Pages/teppl.aspx
- ☐ *NCDOT Quality Management Program: Quality Control and Quality Assurance*

Deliverables

Deliverable	Task	Responsible Party	
		Activity Leader Traffic Systems Operation	Additional Support
Final Cost Estimate [Q]	▪ *Update Construction-Phase Operations Cost Estimate*	X	TSMO Unit
Requirements of Incident Management Plan [A]	▪ *Submit Requirements for Incident Management Plan*	X	
CCTV Plans, DMS/CMS Plans, DTB Plans, Cable Routing Plans, Signal Plans [Q]	▪ *Coordinate Incident Management Alternate / Detour Route Response Plan*		TSMO Unit
Signal System Timing Plans [Q]			Signal System Engineer
Static Trailblazer Sign Plans [Q]			Signing & Delineation Designer
Message Sets, ICM Response Database [Q]		X	
Demand Management Plan [A, Q]	▪ *Submit Demand Management Plan*	X	
Draft Tow Contract Documents [Q]	▪ *Submit Tow Contract Documents*	X	

Deliverable	Task	Responsible Party	
		Activity Leader: Traffic Systems Operation	Additional Support
Draft Law Enforcement Memorandum of Understanding [Q]	▪ *Initiate Memorandum of Understanding (MOU)/Agreements with Law Enforcement/Municipalities*	X	
Draft Agreement with Municipalities [Q]		X	
Coordination Meeting with NCDOT Communications Minutes	▪ *Coordinate with NCDOT Communication on Public Information Plan*	X	
Final Transportation Operations Plan [A, Q]	▪ *Complete Final Traffic Operations Plan*	X	
Final Equipment List [A]	▪ *Develop Equipment Purchase Need for Construction*	X	TSMO Unit Engineer

[A] *Indicates that final document(s) or data set(s) must be uploaded to the ATLAS Workbench.*
[Q] *Indicates that final document(s) or data set(s) requires review in accordance with the NCDOT Quality Management Program: Quality Control and Quality Assurance.*

Update Construction-Phase Operations Cost Estimate

Using the final Transportation Management Plan (TMP), the Operational Plan, and the final equipment list, the Traffic Operations Engineer develops a final cost estimate for the project in coordination with other Units/Sections (i.e., Transportation Systems Management & Operations [TSMO] Unit), as needed.

Submit Requirements for Incident Management Plan

The Traffic Operations Engineer:

- Prepares and submits the requirements of an incident management plan for the project.
- Coordinates with Traffic Management Unit (Work Zone Traffic Control) to include the relevant information on the temporary traffic control (TTC) plans or the Traffic Operations Plan (see the *Incident Management Plan Guidelines* and 3TM1 for related information).

If the project is to be let by the Division, the Traffic Operations Engineer coordinates with the Division to let equipment, tow contract, and hiring the Incident Management Assistance Patrol (IMAP) drivers. The Traffic Operations Engineer purchases the trucks and provides training for the IMAP drivers.

Coordinate Incident Management Alternate / Detour Route Response Plan

The Traffic Operations Engineer coordinates with the following leads regarding equipment and data required to be included on the respective plans:

- ITS Lead on CCTV Plans, DMS/CMS Plans, DTB Plans, or Cable Routing Plans
- Signal Lead on Signal Plans
- Signal System Engineer on Signal System Timing Plans
- Signing and Delineation Designer on Static Trailblazer Plans

The Traffic Operations Engineer also coordinates with applicable Division and regional personnel.

The Traffic Operations Engineer coordinates with the ITS Lead to develop DTB plans. The Traffic Operations Engineer conducts a field review and site assessment for determination of specific placement based on:

- Advance notifications of Alternate/Detour Routes
- Roadway geometry and sight distance
- Roadway design speed
- Potential driver obstructions
- Vertical and lateral clearance guidelines from AASHTO, MUTCD, and NCDOT publications
- Spacing to existing signs
- Power source
- Existing property lines and right-of-way markers if present
- Roadway cross sections

The Signal System Engineer develops the signal timing plans for incident management detour routes and the thresholds for each plan. The Traffic Operations Engineer:

- Develops message sets for dynamic signs for each detour for each scenario using ITS device locations previously approved.
- Use decision matrix (ruleset) to populate a response plan and plan sheets for device locations. The information is populated into a ICM response database for State Traffic Operations Center (STOC)/Traffic Management Center (TMC) operators to use during construction.
- Provides a list or chart of equipment needed for each scenario impacted by the detour route.
- Develops the ICM response database for each route scenario, each route, DTB's, DMS/CMS message sets, and all other ICM response database features in accordance with the database scheme specified by NCDOT.

Submit Demand Management Plan

The Traffic Operations Engineer develops a demand management plan for the project regarding strategies for other alternative modes of transportation during construction (e.g., additional transit routes, ridesharing).

Submit Tow Contract Documents

The Traffic Operations Engineer prepares the draft tow contract documents based on the level of towing required for the project. The Traffic Operations Engineer coordinates with the applicable Division as needed.

Initiate Memorandum of Understanding (MOU)/Agreements with Law Enforcement/Municipalities

The Traffic Operations Engineer continues discussions with law enforcement regarding the project. The Traffic Operations Engineer prepares a draft Law Enforcement memorandum of understanding in response to comments summarizing the project commitments if needed.

The Traffic Operations Engineer continues discussions with the municipalities regarding the project. The Traffic Operations Engineer prepares a Draft Agreement with Municipalities in response to comments summarizing the project commitments.

Submit Detailed Travelers Information Plan

The Traffic Operations Engineer submits a Travelers Information Strategy if applicable to project. Details regarding the Travelers Information tasks are *in development*.

Coordinate with NCDOT Communications on Public Information Plan

If a project requires a Public Information Plan by Traffic Operations, the Traffic Operations Engineer coordinates with the applicable Division, Traffic Management Unit (Work Zone Traffic Control), and the Communications Group using the information from the TMP before, during, and/or after construction.

Complete Final Traffic Operations Plan

The Traffic Operations Engineer prepares and submits the final Traffic Operations Plan for bidding or internal execution, which includes:

- A traffic response plan
- A tow contract
- A list of additional items to be included
- Items the Contractor is responsible for
- Additional equipment needed for incident management

Develop Equipment Purchase Need for Construction

Using the TMP, the Traffic Operations Engineer determines if any additional equipment is needed to be purchased and included in the overall contract by outside agencies or the Division prior to construction. This list is provided to the Project Manager and Contract Letting for bidding and/or to the Division or region for internal execution. The Traffic Operations Engineer coordinates with Transportation Systems Management & Operations (TSMO) Unit as needed. Potential equipment could include:

- Changeable message signs
- Portable closed circuit televisions (CCTVs)
- IMAP vehicles
- Dynamic Trailblazer signs
- Traffic signal equipment

The Traffic Operations Engineer provides a list to FHWA of any exceptions to procure equipment or devices that may be used on future projects.

Complete QC/QA Procedures

The Traffic Operations Engineer is to coordinate the applicable QC review following the *NCDOT Quality Management Program: Quality Control and Quality Assurance* procedures and the respective QC Checklist before upload and/or distribution of any deliverables.

4TO1 Complete Transportation Operations Plan-Related Tasks (if a Significant Project)

Overview

Finalize the remaining tasks on the Transportation Management Plan (TMP) with outside agencies to solidify traffic operation activities for construction.

References

- ☐ *Integrated Corridor Management (ICM) Project Process Outline (PPO)*
- ☐ *Incident Management Plan Guidelines*
- ☐ *Incident Management Assistance Patrol (IMAP) Resources for Significant Projects* (*In Development*)
- ☐ Memorandum of Understanding (MOUs) with Municipalities and Emergency Responders (*In Development*)
- ☐ *State Traffic Operations Center (STOC)/ Traffic Management Center (TMC) Operator Training* (*In Development*)
- ☐ *Helping All Work Zones Keep Safe (HAWKS) Process Document* (*In Development*)
- ☐ Future Location of all Documents
  - https://ncconnect.sharepoint.com/:f:/r/sites/trafficsystemsoperationsprojects/Shared%20Documents/References?csf=1&web=1&e=tqPQy2
  - https://connect.ncdot.gov/resources/safety/Teppl/Pages/teppl.aspx
- ☐ *NCDOT Quality Management Program: Quality Control and Quality Assurance*

Deliverables

Deliverable	Task	Responsible Party	
		Activity Leader	Additional Support
		Traffic Operations Engineer	Division Contract/Proposal Engineer
Final Tow Contract Documents [Q]	▪ *Complete Tow Contract Documents*	X	X
Final Law Enforcement Memorandum of Understanding (MOUs) [Q]	▪ *Complete Law Enforcement Memorandums of Understanding*	X	
STOC Operators Training	▪ *Confirm available staffing for STOC/TMC*	X	
IMAP Procurement Schedule	▪ *Plan IMAP Coverage Expansion*	X	
Verified ICM Response Database	▪ *Verify Incident Management Alternate / Detour Route Response Plan*	X	

[Q] *Indicates that final document(s) or data set(s) requires review in accordance with the NCDOT Quality Management Program: Quality Control and Quality Assurance.*

Complete Tow Contract Documents

The Traffic Operations Engineer finalizes the details of tow contracts for inclusion in the special provisions. The Traffic Operations Engineer coordinates with the Division's Contract/Proposal Engineer.

Complete Law Enforcement Memorandums of Understanding

The Traffic Operations Engineer finishes discussions with law enforcement regarding the terms of the memorandum of understanding (MOU). The Traffic Operations Engineer completes the MOU and has NCDOT and the law enforcement agency execute the MOU.

Confirm STOC/TMC Staffing

The Traffic Operations Engineer determines if available STOC/TMC staff are available for additional coverage needed during construction. If additional staff is needed, the Division coordinates with the Traffic Operations Engineer.

Details regarding any training tasks for the State Traffic Operations Center (STOC) operators are *in development*.

Plan IMAP Coverage Expansion

The Traffic Operations Engineer coordinates with the applicable Division to prepare a schedule to ensure IMAP Route expansion in the work zone for:

- Hiring Incident Management Assistance Patrol (IMAP) drivers
- Training IMAP drivers
- Purchasing IMAP vehicles for a project/transfer vehicle to construction work zone

Verify Incident Management Alternate / Detour Route Response Plan

The Signal System Engineer verifies the signal timing plans for incident management detour routes and the thresholds for each plan. The Traffic Operations Engineer:

- Verifies if TIP schedules for adjacent projects impact alternate/detour routes.
- Verifies previously populated decision matrix or rulesets for each response plan and plan sheets for device locations. The information is verified in the ICM response database for State Traffic Operations Center (STOC)/Traffic Management Center (TMC) operators to use during construction.
- Verifies list or chart of equipment needed for each scenario impacted by the detour route is still valid.
- Verifies that the final response scenario in accordance with the Integrated Corridor Management Project Process Outline.

Complete QC/QA Procedures

The Traffic Operations Engineer is to coordinate the applicable QC review following the *NCDOT Quality Management Program: Quality Control and Quality Assurance* procedures and the respective QC Checklist before upload and/or distribution of any deliverables.

5TO1 Complete Transportation Operations Construction-Related Tasks (if a Significant Project)

Overview

Finalize the remaining tasks on the Transportation Management Plan (TMP) with outside agencies to solidify traffic operation activities for construction. Provide timely reviews and technical expertise throughout the project's construction phase.

References

- ☐ *Integrated Corridor Management (ICM) Project Process Outline (PPO)*
- ☐ *Incident Management Plan Guidelines*
- ☐ *Incident Management Assistance Patrol (IMAP) Resources for Significant Projects* (*In Development*)
- ☐ *State Traffic Operations Center (STOC)/ Traffic Management Center (TMC) Operator Training* (*In Development*)
- ☐ *Helping All Work Zones Keep Safe (HAWKS) Process Document* (*In Development*)
- ☐ *ICM Response Review (IIR) Process Document (Formerly After-Action Review (AAR))*
- ☐ Future Location of all Documents
  - https://ncconnect.sharepoint.com/:f:/r/sites/trafficsystemsoperationsprojects/Shared%20Documents/References?csf=1&web=1&e=tqPQy2
  - https://connect.ncdot.gov/resources/safety/Teppl/Pages/teppl.aspx
- ☐ *NCDOT Quality Management Program: Quality Control and Quality Assurance*

Deliverables

Deliverable	Task	Responsible Party Activity Leader Traffic Operations Engineer
Let Tow Contract	▪ *Complete Let Tow Contract Documents*	X
STOC/TMC Training	▪ *Train STOC/TMC Staff*	X
ATMS Integration into STOC	▪ *Integrate Advanced Traffic Management System (ATMS)*	X
Expanded IMAP Coverage	▪ *Finalize IMAP Expansion*	X
Go Live Meeting	▪ *Conduct ICM Implementation and Testing*	X
Implement ICM Devices		X
Contractor submittals	▪ *Collaborate with Resident Engineer and Contractor*	X
ICM Response Review (IRR) Meetings	▪ *Conduct ICM Response Reviews (IRR)*	X
Updated Database [Q]	▪ *Post Construction Assessment*	X

[Q] *Indicates that final document(s) or data set(s) requires review in accordance with the NCDOT Quality Management Program: Quality Control and Quality Assurance.*

Complete Let Tow Contract Documents

The Division lets the Tow Contract prior to any construction activity traffic impacts. The Traffic Operations Engineer completes any necessary training for the Tow Contractor before the date of availability.

Train STOC/TMC Staff

The Traffic Operations Engineer coordinates any training needed for STOC/TMC staff for specific projects before the Go Live date.

Integrate Advanced Traffic Management System (ATMS)

Details regarding the Advanced Traffic Management System (ATMS) integration tasks are still *in development*.

Finalize IMAP Expansion

The Traffic Operations Engineer coordinates with the applicable Division to prepare a schedule for:

- Hiring Incident Management Assistance Patrol (IMAP) drivers
- Training IMAP drivers
- Purchasing IMAP vehicles for a project

Conduct ICM Implementation and Testing

Before the ICM Go Live, the Traffic Operations Engineer:

- Schedules meeting with all stakeholders before testing to update them on ICM responses
- Gathers construction methodologies from previous projects and coordinate with applicable Division on implementation methods
- Provides implementation and integration support for the ICM devices (including traffic signals, dynamic trailblazer signs, DMS/CMS, CCTV's, etc.) with the NCDOT statewide network and central software by:
  - Verifying Device Location
  - Programming DMS/CMS messages into statewide system
  - Programming PCCTV's into the statewide system
  - Reviewing existing test plans and prepares project specific test plans for integrating the ICM devices into the different statewide software programs and meets ICM response plan requirements
  - Documenting how the system is to be tested and validated for approval
  - Observing the testing to ensure effective system operations
  - Testing the devices with the response plans and provide summary of issues observed

Collaborate with Resident Engineer and Contractor

The Traffic Operations Engineer facilitates communication between the Resident Engineer and the Contractor during construction by:

- Reviewing documents provided by Contractor
- Reviewing and coordinating details of the Incident Management Plan
- Reviewing Contractor ITS Device location/placement
- Testing ITS devices after installation
- Attending Contractor Maintenance of Traffic meetings
- Attending Incident Management Plan meetings with Contractor
- Attending other design meetings with Contractor as needed

The Traffic Operations Engineer coordinates with the Division as they manage the project. The Traffic Operations Engineer coordinates with the Division on adjacent project schedules during construction as described in the ORA. The Resident Engineer prepares the Work Zone Contact Matrix for the STOC during construction.

Conduct ICM Response Reviews (IRR)

The Traffic Operations Engineer conducts ICM Response Reviews (IRR) meetings after an incident occurs to review the system performance of the technology, the effectiveness of the operations in place to manage the system, and the agreements in place to support interagency operations. Follow the policy and procedures on how to conduct an IRR. Any improvements identified in the IRRs are to be addressed by the Traffic Operations Engineer.

Post Construction Assessment

The Traffic Operations Engineer performs a post construction assessment for on-going use of ICM along the project after construction. This assessment includes:

- An adjusted set of decision matrices or rulesets that are applicable to the final roadway configuration
- Update of all necessary documents and database to reflect the necessary operational changes due to the final roadway configuration
- Coordinate with any local municipalities on appropriateness of the final routes

Complete QC/QA Procedures

The Traffic Operations Engineer is to coordinate the applicable QC review following the *NCDOT Quality Management Program: Quality Control and Quality Assurance* procedures and the respective QC Checklist before upload and/or distribution of any deliverables.

0TP1 Long Range Planning Stage: Complete CTP/MTP (including Project Sheets)

Overview

A Comprehensive and/or Metropolitan Transportation Plan (CTP or MTP) represents a community's and NCDOT's consensus on future transportation needs to support anticipated growth and development. The final plan is multimodal including current and future plans for highways, public transportation, rail, bicycle, and pedestrian facilities. A CTP/MTP includes documentation of the plan development and approval process, public engagement, and recommendations for transportation improvements in the form of project sheets and other supporting documentation. CTPs are developed for all areas in NC based on state law (GS 136-66.2) and show project proposals to meet the projected needs in the planning timeframe (25-30 years). MTPs are developed for Metropolitan Planning Organization (MPO) areas based on federal requirements (23 USC 134, 23 CFR 450) and are the fiscally constrained project proposals (essentially a subset of the CTP's full needs listing).

The Strategic Transportation Corridors (STCs) identify a network of critical multimodal transportation corridors considered the backbone of the state's transportation system. These corridors move most of our freight and people, link critical centers of economic activity to international air and seaports, and support interstate commerce. They must operate well to help North Carolina attract new businesses, grow jobs and catalyze economic development. Individual strategic corridor master plans are developed for selected corridors.

CTP/ MTP Roles

The Transportation Planning Division (TPD) is typically the activity leader for most major tasks for CTPs, particularly in RPO areas. However, roles and responsibilities are set at the start of each plan update. RPOs lead and/or play significant roles in specific sub-tasks such as the CUR and public involvement, for example. MPOs typically lead tasks for MTP development. Other planning partners may include the CTP Steering Committee and other relevant stakeholders and resource agencies. All must agree on the Vision, Goals and Objectives, System Assessment, Alternative Analysis and Final Plan.

References

- ☐ *Comprehensive Transportation Plans*
- ☐ *Comprehensive Transportation Planning Manual*
- ☐ *Strategic Transportation Corridors (STCs)*

Deliverables

Deliverables	Task	Responsible Party	
		Activity Leader	Additional Support
Vision, Goals, and Objectives	▪ *Develop Vision*	Transportation Planning Division (TPD)	Division Corridor Development Engineer (DCDE) Division Planning Engineer (DPE) Metropolitan Planning Organizations (MPOs) Rural Planning Organizations (RPOs)
Community Understanding Report (CUR)			
Transportation Network to be Studied			
Existing and Future Deficiencies	▪ *Conduct System Assessment*		
Environmental Features Maps			
Alternative Analysis Evaluation	▪ *Analyze Alternatives*		
Indirect and Cumulative Effects Products (ICE) (if applicable)			
CTP/ MTP report, including Project Sheets	▪ *Develop Final Plan*		
STC Master Plans	▪ *Develop STC Master Plans*		

Develop Vision

Developing a vision sets the foundation for partnerships that are needed to develop a transportation plan that fits into a community's vision. Consensus, active participation, and clearly defined goals and objectives demonstrate successful implementation of this part of the process.

Conduct System Assessment

During system assessment, the focus is on data collection, data projection (for socioeconomic data), and analysis of the current transportation system. This part of the process includes participation by all planning partners to reach agreement on data including base and future year deficiencies.

Analyze Alternatives

Alternative analysis focuses on developing and evaluating different strategies that address transportation deficiencies. In evaluating different strategies to handle these deficiencies, it is necessary to appropriately consider environmental issues (opportunities and constraints) – both human and natural. Alternatives and scenarios are evaluated using the established vision, goals and objectives, and performance measures.

Develop Final Plan

To develop the final plan, a set of proposed transportation recommendations is developed for all modes. The level of detail for each recommendation varies, as determined by a review process that includes evaluation of multiple factors/ criteria. Project Sheets are available for project proposals and prepared based on tiering criteria and they can include information on deficiencies, environmental considerations, public input, and other relevant documentation. The final plan contains additional information and is mutually adopted by NCDOT and appropriate partners.

Develop STC Master Plans

The intent of the STC master plans is to develop a consistent transportation vision for the identified corridor, based on stakeholder input and sound technical assessment, that recognizes statewide economic development objectives, advances subsequent regional planning and corridor project development activities, and can serve to streamline the project development process. These plans are developed in collaboration with all relevant stakeholders to integrate all modes and connect statewide and regional transportation-dependent activity centers, to enhance economic development, to promote highly reliable and efficient mobility and accessibility, and to support good decision-making.

STC plans include coordination with MPOs and RPOs, review of all CTPs and MTPs within the corridor, consideration of present and future deficiencies, alternative analysis and assessment of any modification from CTP/MTP recommendations, and considering resiliency, planning environmental linkage (PEL) elements and ICE analysis as appropriate.

1TP1 Complete Express Design Traffic Volume (EDTV)

Overview

The Express Design Traffic Volume (EDTV) process is a simplified method of obtaining traffic volumes for use during the development of the Express Design phase of project development. The completed EDTV is used to inform and develop the Express Design Traffic Analysis (EDTA). Collectively, the EDTV and EDTA are referred to as the Express Design Traffic Evaluation (EDTE). See below:

Express Design Traffic Components:

Traffic Evaluation (EDTE) = Traffic Volume (EDTV) + Traffic Analysis (EDTA)

The EDTV includes daily traffic volumes, peak hour volumes, intersection turning movements, and traffic volumes for different scenarios (base year, future year, and Build alternatives). The purpose of the EDTV is to utilize simplified volume development and forecasting methods to determine design year traffic volumes that seamlessly integrate into the Express Design Traffic Analysis process and inform decision-makers in determining viable alternatives/alignments for proposed projects.

Note: *Actions during the Project Initiation Stage may be led and completed by staff from several different NCDOT groups. Any person who has overall responsibility for a project during this Stage is referred to as the "Project Lead." This lead could be the Feasibility Studies Engineer, the Corridor Development Engineer, the Division Planning Engineer, or someone in a similar role as tasked by a state or local agency.*

References

- ☐ *Express Design Traffic Evaluation Guidance*
- ☐ *Traffic Data Collection Request System*
- ☐ *Existing Count Map – Traffic Safety Search Data*
- ☐ *Existing Count Database – Traffic Safety Data Files*

Deliverables

Deliverable	Task	Responsible Party	
		Activity Leader	Additional Support
Approved EDTV [A]	▪ *Scope EDTE*	▪ *Transportation Planning Division* ▪ *Feasibility Studies/ Corridor Development Unit* ▪ *Congestion Management Section*	▪ *Project Lead* ▪ *Congestion Management Section*
	▪ *Initiate EDTV Development Process*	▪ *Transportation Planning Division* ▪ *Feasibility Studies/ Corridor Development Unit*	
	▪ *Produce EDTVs*		▪ *Project Lead* ▪ *Traffic Safety Unit*
	▪ *Review/Finalize EDTVs*	Transportation Planning Division	Project Lead
Revised Project Scoping Report (if needed)	▪ *Review/Update in Project Scoping Report (if needed)*		

[A] *Indicates that final document(s) or data set(s) must be uploaded to the ATLAS Workbench.*

Scope Express Design Traffic Evaluation

The process begins once a proposed project is submitted to the Feasibility Studies Unit (FSU) / Corridor Development Unit (CDU) Project Lead or when an existing project that does not have a current traffic evaluation is identified. Once the project is submitted or identified the scoping of the Project Scoping Process begins and the scope of the traffic evaluation is determined.

The EDTV is scoped jointly with the EDTA in one cohesive scoping document. Therefore, the EDTE Project Manager (as designated by the FSU/CDU, Transportation Planning Division, and Congestion Management Section) will develop the scope for the overall EDTE. 1TM1 (Complete Express Design Traffic Analysis) provides for more information on the joint scoping of the EDTE.

Initiate Express Design Traffic Volumes Process

The Express Design Traffic Volumes (EDTV) are a simplified method of developing traffic volumes for use during the development of the Express Design phase of project development. The development of Express Design Traffic Volumes is suitable during Stage 1: Project Initiation. Beyond Stage 1 a project level traffic forecast should be utilized (see 1TP1 for related information).

Once the overall EDTE has been scoped, the next step in the development of the EDTVs is to collect counts for each identified location. The volume development process utilizes 13-hour turning movement counts. The EDTV Engineer reviews available count databases to determine if any existing turning counts are available. Turning counts should typically be less than five years old to be utilized in the volume development process. The engineer should also review available resources, such as aerial photography or listings of recently completed projects to determine if the travel patterns contained in the previously collected count are adequate for the desired purpose.

If there are no suitable existing counts available, a new 13-hour turning movement count needs to be ordered through the Mobility and Safety Information Section of the Transportation Mobility and Safety Division.

The EDTV Engineer also collects the required data to complete the EDTV, including historic growth rates, official travel demand model output, and any project specific data to complete the volume development process. The model base year and future year daily traffic volumes are used to calculate projected growth rates.

Produce Express Design Traffic Volumes

The EDTV Engineer then develops the express design volumes for each location in accordance with procedure included in the *Express Design Traffic Evaluation Guidance*. Traffic volumes are ideally developed objectively and independently based upon available and approved data, such as official travel demand models, historic AADT estimates, and traffic data collection.

Review/Finalize Express Design Traffic Volumes

Once the Draft Express Design Traffic Volumes are developed, they are submitted to the Transportation Planning Division (or their designated reviewer) for review. Following review, any comments are addressed, and the final traffic volumes are produced. The Final EDTVs are delivered via e-mail to the Project Lead and uploaded to the project SharePoint site.

Review/Update in Project Scoping Report (if needed)

In development.

1TP2 Complete Traffic Forecast

Overview

Obtain an approved traffic forecast that provides the traffic data necessary for analysis to inform project planning, design, and operations.

Note: *Actions during the Project Initiation Stage may be led and completed by staff from several different NCDOT groups. Any person who has overall responsibility for a project during this Stage is referred to as the "Project Lead." This lead could be the Feasibility Studies Engineer, the Corridor Development Engineer, the Division Planning Engineer, or someone in a similar role as tasked by a state or local agency.*

References

- ☐ Project Level Traffic Forecasting Resource Page
- ☐ *Traffic Forecasting Technical Policy Manual*
- ☐ *Traffic Forecasting Administrative Policy Manual*
- ☐ Travel Demand Model Coverage Map
- ☐ *NCDOT Quality Management Program: Quality Control and Quality Assurance*
- ☐ Traffic Forecasting Decision Points Tool and Guidance (In development)

Deliverables

Deliverable	Task	Responsible Party	
		Activity Leader	Additional Support
Approved Traffic Forecast [A]	▪ *Initiate Traffic Forecast* ▪ *Determine Level of Traffic Forecast Needed* ▪ *Scope Traffic Forecast* ▪ *Produce Traffic Forecast* ▪ *Complete and Deliver Traffic Forecast*	Traffic Forecasting Project Manager	Transportation Planning Division Planning Staff and Traffic Forecasting Group

[A] *Indicates that final document(s) or data set(s) must be uploaded to the ATLAS Workbench.*

Initiate a Traffic Forecast

The traffic forecast is typically prepared as the project transitions from the end of Stage 1 to the beginning of Stage 2. The project-level traffic forecast is scheduled so that it is initiated a reasonable amount of time prior to the Project Kickoff Meeting (2PM1) (typically no earlier than a few months before the Project Kickoff Meeting). The goal is to reduce the risk of a potential forecast update during Stage 2.

To initiate a traffic forecast, the Transportation Planning Division is typically contacted by the Project Lead from the:

- Feasibility Studies Unit for pre-environmental and pre-State Transportation Improvement Plan (STIP) planning and study (see 1FS2 for related information)
- Central Corridor Development Unit for pre-environmental and pre-STIP planning and study (see 1FS2 for related information)
- Divisions for the Transportation Improvement Program (TIP) project development
- Project Management for TIP project development

- Structures Management Unit for bridge replacement projects
- Rail Division, Engineering Coordination, and Safety Branch for railroad crossings/safety improvement projects
- A Traffic Forecasting Project Manager and the project team review the project to determine if a traffic forecast is needed. If a traffic forecast is needed, an inquiry can be made about the current status of the project and the availability of a forecast with the Traffic Forecasting Project Manager. If a forecast is not available, or in-progress, one may be requested.

To complete an inquiry:

- A standard Traffic Forecast Request Form (available on the Project Level Traffic Forecasting Resource Page) may be used to request a traffic forecast. However, all that is required is communicating a need for a traffic forecast with the Traffic Forecasting Group. The Traffic Request Form or the e-mail inquiry is sent to: TrafficForecast@ncdot.gov.
- The Traffic Forecasting Project Manager produces a map and traffic forecast scope and coordinates with the Transportation Planning Division and the larger project team regarding all aspects of the traffic forecast.

Determine Level of Traffic Forecast Needed

A traffic forecast may be in the form of three (3) different products:

- **Project-level Forecast:** Includes Annual Average Daily Traffic (AADT) volumes for through and turning movements, truck percentages, peak hour factors and directional distribution for the study area network. Traffic statistics for the base year (customarily the current year) and one or more future years are provided.
- **Traffic Estimate:** Is typically limited in scope to current and future-year AADT for roadway segments. Therefore, this product is only applicable to certain project situations (one example would be bridge replacement projects or other project types that do not need intersection turning movement data).
- **Express Design Traffic Volume (EDTV):** Simplified method of developing traffic volumes for use during the Express Design phase of project development. The development of EDTVs is suitable during Stage 1 (Project Initiation). An EDTV could be updated for a Project Scoping Report if it was determined to provide the appropriate amount of information.

Typical projects require a project-level forecast, which contains sufficient traffic statistics to support design decisions for a roadway improvement project. For unique situations where less detailed information is needed, coordinate with the Traffic Forecasting Group.

Scope a Traffic Forecast

As part of the scoping process, the Traffic Forecasting Project Manager, in coordination with the project team, determines the junctions and scenarios to be included in a traffic forecast. This coordination includes obtaining approval of the traffic forecast study area from the Congestion Management Section.

Produce a Traffic Forecast

To produce a traffic forecast, the Traffic Forecaster:

- Collects existing and new traffic data needed
- Acquires the official Travel Demand Model (if available) in coordination with the Project Lead.
  - Contact the Traffic Forecasting Group (TrafficForecast@ncdot.gov) for information on the availability of and how to acquire Official Travel Demand Models.
  - Also see the Travel Demand Model Coverage Map on the Connect NCDOT site to see what may be available.
- Develops the traffic forecast AADT estimates, truck percentages, and design factors.
  - Traffic forecasts are ideally developed objectively and independently based upon available and approved data, such as official travel demand models, historic AADT estimates, and new traffic data collection.

Complete and Deliver a Traffic Forecast

To finalize the traffic forecast, the Traffic Forecasting Project Manager obtains traffic forecast approval from the Transportation Planning Division.

- To assure that a traffic forecast provides objective data that reasonably supports the project though the environmental process without substantial objection, it is provided to the Transportation Planning Division for TPD review and approval. The Traffic Forecast is sent to: TrafficForecast@ncdot.gov.
- After receiving approval from the Transportation Planning Division, the traffic forecast is delivered via e-mail to the Project Lead and uploaded to ATLAS.

Complete QC/QA Procedures

The Traffic Forecasting Project Manager is to coordinate the applicable QC review following the *NCDOT Quality Management Program: Quality Control and Quality Assurance* procedures and the respective QC Checklist before upload and distribution of all related deliverables.

1TS1 Assess Safety Planning

Overview

Complete traffic safety screening early in the life of the project to inform scoping and design decisions.

Note: *Actions during the Project Initiation Stage may be led and completed by staff from several different NCDOT groups. Any person who has overall responsibility for a project during this Stage is referred to as the "Project Lead." This lead could be the Feasibility Studies Engineer, the Corridor Development Engineer, the Division Planning Engineer, or someone in a similar role as tasked by a state or local agency.*

References

- ☐ *Traffic Safety Screening Tool for Express Design*
- ☐ *Traffic Safety Screening Tool for Project Scoping Reports*
- ☐ *NCDOT Quality Management Program: Quality Control and Quality Assurance*

Deliverables

Deliverable	Task	Responsible Party	
		Activity Leader	Additional Support
Traffic Safety Review for Selected Feasibility Study, Corridor Study, or Express Design	▪ *Conduct Traffic Safety Review for Selected Feasibility Study, Corridor Study, or Express Design*	Safety Planning Engineer	Project Lead
Traffic Safety Review for Selected Project Scoping Reports	▪ *Conduct Traffic Safety Review for Selected Project Scoping Reports*		
Review of Purpose and Need Statements Containing Safety	▪ *Review Purpose and Need Statements Containing Safety*		

Conduct Traffic Safety Review for Selected Feasibility Study, Corridor Study, or Express Design

Once the Project Lead runs the Traffic Safety Screening Tool for a selected study/design (see 1FS2 for related information), the Safety Planning Engineer:

- Gathers available safety data (e.g., crash data, available volumes (including non-motorists), roadway characteristics data, etc.) in the vicinity of the project limits, as defined in the project description, but may be extended farther based on specific project considerations.
- Summarizes this detail in a report with project safety-related considerations documented to inform project scoping decisions.
- Sends the report to the Project Lead to be included with the study/design.

Conduct Traffic Safety Review for Selected Project Scoping Reports

Once the Project Lead runs the Traffic Safety Screening Tool for a selected Project Scoping Report (see 1FS2 for related information), the Safety Planning Engineer:

- Gathers available safety data (e.g., crash data, available volumes (including non-motorists), roadway characteristics data, etc.) in the vicinity of the project limits, as defined in the project description, but that may be extended farther based on specific project considerations.
- Summarizes this detail in a report with project safety-related considerations documented to inform project scoping decisions.
- Sends the report to the Project Lead to be included with the Project Scoping Report.

Review Purpose and Need Statements Containing Safety

For validating Purpose and Need Statements that contain safety, the State Traffic Safety Engineer, specifically, sends a memo to the NEPA/SEPA Lead and Project Manager, who formally approves the statements regarding safety before it is used as a basis of the environmental document's Purpose and Need.

- This step verifies NCDOT has safety data to defend safety as the Purpose and Need for a project.
- Purpose and Need Statements without a safety component do not need Traffic Safety Unit approval.

The Traffic Safety Unit is involved in design concepts and design parameters to confirm improvements address safety concerns identified in the project limits.

Complete QC/QA Procedures

The Safety Planning Engineer is to coordinate the applicable QC review following the *NCDOT Quality Management Program: Quality Control and Quality Assurance* procedures and the respective QC Checklist before upload and/or distribution of any deliverables.

2TS1 Complete Safety Analysis & Operational Review

Overview

Confirm that projects have addressed existing safety issues and have incorporated safety into design elements.

References

- ☐ Federal Highway Administration (FHWA) *Manual on Uniform Traffic Control Devices (MUTCD)*
- ☐ American Association of State Highway and Transportation Officials (AASHTO) *Highway Safety Manual (HSM)*
- ☐ *North Carolina Specific Safety Performance Function Calibration Factors for the Highway Safety Manual*
- ☐ *North Carolina Specific Crash Proportion Tables for the Highway Safety Manual*
- ☐ *Development of Safety Performance Functions for North Carolina (2010)*
- ☐ *Updated and Regional Calibration Factors for Highway Safety Manual Crash Prediction Models (2016)*
- ☐ *Updated and Regional Calibration Factors for Highway Safety Manual Crash Prediction Models (2020)*
- ☐ *North Carolina Project Development Crash Reduction Factor Information*
- ☐ TIP Project Signal Recommendation Guidelines
- ☐ TIP Project Signal Recommendation Standard Practices
- ☐ Traffic Signal Recommendation Memo Template

Deliverables

Deliverable	Task	Responsible Party	
		Activity Leader	
		Regional Traffic Engineer	Safety Planning Engineer
Traffic Signal Recommendations [A]	▪ *Provide Traffic Signal Recommendations*	X	
Traffic Safety Alternatives Analysis Report [A]	▪ *Develop Traffic Safety Alternatives Analysis Report (CP2/ CP3)*		X
Safety Data and Analysis for Environmental Document [A]	▪ *Provide Safety Data and Analysis for the Environmental Document*		X
Roadway Plan Comment Memo [A]	▪ *Review Roadway Plans*	X	
Signing and Delineation Plan Comment Memo [A]	▪ *Review Signing and Delineation Plans*	X	
Comments on the Transportation Management Plan [A] (TMP) and temporary traffic control (TTC) plans	▪ *Review Transportation Management Plan*	X	

[A] *Indicates that final document(s) or data set(s) must be uploaded to the ATLAS Workbench.*

Provide Traffic Signal Recommendations

In accordance with the *Signal Recommendations Guidelines for Regional Traffic Engineers*, the Regional Traffic Engineer reviews the available project information to determine if signalization is appropriate based on projected traffic volumes. To do this, the Regional Traffic Engineer:

- Consults with the assigned Division Traffic Engineer when making recommendations.
- Reviews the traffic forecast and proposed intersection design (i.e., the most current roadway design plans; likely the Design Recommendation Plan Set) as inputs for decision making.
- Reviews applicable pedestrian and bicyclist data to determine appropriate accommodations at the traffic signal.

The Regional Traffic Engineer prepares a memo with signal recommendations that is sent to the Division, the Roadway Design Lead, and the Signal Lead.

Develop Traffic Safety Alternatives Analysis Report (CP2 / CP3)

For merger projects (if applicable), the Safety Planning Engineer or Group prepares an analysis on projects where safety is in the environmental document's Purpose and Need, or on projects where value is added in communicating the anticipated safety impacts of a project.

- The inputs needed for this analysis are the traffic forecast, the design criteria file, and the current roadway design files (likely the Design Recommendation Plan Set).
- The analysis uses Highway Safety Manual predictive modeling methodologies to predict the number of crashes along each alternative/alignment being considered, including the no-build alternative.
- NCDOT-specific calibration factors for models found in the *Development of Safety Performance Functions for North Carolina* and *Updated and Regional Calibration Factors for Highway Safety Manual Crash Prediction Models* are to be used as part of the analysis.
- Design parameters (such as lane widths, shoulder widths and types, and curve radius) and projected traffic volumes are critical inputs. Traffic volumes are used to model the corridor from a safety perspective to provide a sense for how each alternative/alignment may perform.

The Safety Planning Engineer summarizes the analysis in a report that outlines how each alternative/alignment is expected to impact safety and to help select the Least Environmentally Damaging Practicable Alternative (LEDPA). The limitations of the analysis are to be clearly outlined in the report. The Safety Planning Engineer provides the report to the NEPA/SEPA Lead and Project Manager.

Provide Safety Data and Analysis for the Environmental Document

Documentation of the existing crash patterns along the project area is typically required for inclusion within the Purpose and Need section of the environmental document and organized by the Safety Planning Engineer. This documentation could include:

- A five-year crash history,
- An explanation of the patterns of crashes that exist in the project area,
- How the project is expected to impact safety, and/or
- A high-level summary of the crash history in the project area.

Review Roadway Plans

The Regional Traffic Engineer's Office reviews the current roadway design plans and traffic forecast, considering:

- General design concerns, such as pedestrian accommodations, lane continuity, typical section, and median breaks.

- Safety-related design recommendations submitted to the Roadway Design Lead and Project Manager in a memo.

Review Signing and Delineation Plans

The Regional Traffic Engineer's Office reviews the current Signing and Delineation Plans, considering:

- General concerns related to signing and pavement markings/delineation.
- Safety-related signing/pavement marking recommendations submitted to the Signing and Delineation Designer (for action) and Project Manager (for information) in a memo (see 2SD1 for related information).

Review Transportation Management Plan

The Regional Traffic Engineer's Office reviews the concept Transportation Management Plan (TMP) and participates in the temporary traffic control (TTC) concept review meeting. The Regional Traffic Engineer provides input on the following:

- Overall traffic operations and safety
- Appropriate temporary traffic control devices
- Proposed detours
- Proposed phased construction

Safety-related TTC comments are submitted to the Regional Work Zone Traffic Control (WZTC) Engineer and WZTC Project Design Engineer (see 2TM1 for related information).

When the document is ready in Stage 3, the Regional Traffic Engineer's Office Reviews the final TMP, considering:

- Overall traffic operations and safety
- Temporary traffic control devices
- Detours
- Phased construction

Safety-related TTC comments are submitted to the Regional WZTC Engineer and WZTC Project Design Engineer (see 3TM1 for related information).

3TS1 Complete Safety Analysis & Operational Review

In development.

1UT1 Develop Initial Utility Relocation & Construction Estimates

All tasks required for this activity are associated with Utilities Coordination.

Note: *Actions during the Project Initiation Stage may be led and completed by staff from several different NCDOT groups. Any person who has overall responsibility for a project during this Stage is referred to as the "Project Lead." This lead could be the Feasibility Studies Engineer, the Corridor Development Engineer, the Division Planning Engineer, or someone in a similar role as tasked by a state or local agency.*

Additionally, because job titles within NCDOT overlap with job titles in the consulting firms, and because different project management centers within the Department divide project management and technical duties differently, this section clarifies who is filling each role as identified in the deliverable table and task descriptions below.

Utilities Coordinator

The Utilities Coordinator role is typically filled by a Professional Engineering Firm (PEF)/Consultant providing Utilities Coordination services for the project. The Utilities Coordinator coordinates the relocation activities of all utilities on the project but does not provide any design service for any utility.

If a utility is providing complete Utilities Construction Plans for inclusion in the contract, the Utilities Coordinator is responsible for the coordination and delivery to NCDOT of the deliverables assigned to the Utilities Design Engineer that are instead being produced by the utility. The Utilities Coordinator is not responsible for the production of those deliverables.

Utilities Design Engineer

The Utilities Design Engineer role is typically filled by Professional Engineering Firm (PEF)/Consultant providing Utilities Design Services for the project. This firm may or may not be the same firm providing Utilities Coordination Services. There may be more than one PEF providing Utilities Design Services, depending on the number and types of utilities included for construction in the contract and the areas of expertise of each firm.

The role of the Utilities Design Engineer is to design the relocation of the assigned utility facilities. The Utilities Coordinator coordinates the location of those facilities with the other utilities.

If a utility chooses to provide a complete design plan for inclusion in the project, the agreement with the utility should require the utility to complete the tasks expected of the Utilities Design Engineer. The Utilities Coordinator provides the deliverables to NCDOT.

Utilities Lead

The Utilities Lead is an NCDOT representative responsible for the oversight of the utility's relocation effort and the technical review of the utility's deliverables. Depending on the design center where the project is managed, this role may be filled by more than one person managing different portions of the relocation. The Department representatives and roles are to be clear in the scopes.

Overview: Utilities Coordination

Develop a preliminary estimate for both utility construction and relocation costs to establish the baseline estimate to be used for subsequent utility estimates.

References

- ☐ *Utilities Accommodation Manual*
- ☐ *Estimates, Materials & Approved Products for Utilities Work*
- ☐ *Utility Cost Estimate Request Form*

Deliverables

Deliverable	Task	Responsible Party	
		Activity Leader	Additional Support
Preliminary Utility Relocation Estimate Preliminary Utility Construction Estimate Utility Relocation Estimate Report	▪ *Develop Conceptual Utilities Cost Estimate* ▪ *Review Estimate*	Utilities Coordinator	Project Lead

Develop Conceptual Utilities Cost Estimate

The Utilities Coordinator visits the project site and inventories utility facilities on the project in accordance with the identified manuals and procedures.

Using the inventory of facilities and the utility estimating tools on the Estimates, Materials & Approved Products for Utilities Work resource page, the Utilities Coordinator provides a preliminary estimate to the Project Lead of the preliminary utility construction costs and costs of possible utility relocations, including a short description of utilities observed. The Utilities Coordinator works with the Project Lead and Preliminary Estimates Section (for Central-let projects) or the appropriate Division staff (for Division-let projects) to adjust the utility construction estimate as part of the review and verification process (see 1CS1 and 1FS2 for related information).

The Utilities Coordinator produces a Utility Relocation Estimate Report to accompany the Utility Relocation Estimates. This report documents the production of the estimate. This report contains an inventory of utilities on the project, including:

- A description of the facilities
- The methodology used in producing the estimate (length of facilities, length of pipe or count of unit quantities, number of poles)
- Any assumptions made, such as what needs to be relocated, facility size, etc.
- The source and date of unit prices used in the estimate

Review Estimate

The Utilities Coordinator sends the two utility cost estimates and report to the Utilities Lead, who reviews the estimates and report, before sending to the Project Lead.

Generate Cost Verification Letter

After satisfactory review, the Utilities Coordinator works with the Project Lead, who generates and distributes a Cost Verification Letter per the process detailed in the *Division Engineer Approval for Cost Verification Memo* (see 1CS1 for related information).

Complete QC/QA Procedures

The Utilities Coordinator is to coordinate the applicable QC review following the *NCDOT Quality Management Program: Quality Control and Quality Assurance* procedures and the respective QC Checklist before upload and distribution of all related deliverables.

1UT2 Investigate Existing Utilities

All tasks required for this activity are associated with Utilities Coordination.

Overview: Utilities Coordination

Inventory utility facilities in the project area. Identify utilities that are costly to relocate, have long design or construction times, or otherwise create risks for project construction or schedule if they are relocated. Initiate coordination with those identified utilities.

Using and analyzing available resources, the Utilities Lead and Project Manager may determine that it is not necessary to scope this utilities stage.

References

- ☐ *Utilities Accommodation Manual*
- ☐ *NCDOT Quality Management Program: Quality Control and Quality Assurance*

Deliverables

Deliverable	Task	Responsible Party	
		Activity Leader	Additional Support
Critical Utilities Strategy	▪ *Identify Critical Impact Utilities*	Utilities Coordinator	Utilities Lead

Identify Critical Impact Utilities

Using reports form 811, site visits, internet mapping services, available GIS data, the Preliminary Utility Relocation Estimate and Report, and other available data, the Utility Coordinator identifies utility facilities that are costly or that have a long relocation time and that pose a risk to the project budget or schedule. The Utility Coordinator discusses the preliminarily identified utilities with the Utilities Lead and Project Manager. These critical impact utilities may include energy transmission facilities (electric transmission line and gas and petroleum pipelines), telephone trunk lines, telephone SLIC/SLAC sites, raw water supply lines, large water supply lines, and sewer outfalls.

Involving NCDOT, the Utility Coordinator meets with the identified critical impact utilities to present to them the project, discuss potential impacts, and obtain utility feedback on avoidance or minimization measures.

The Utility Coordinator produces a Critical Utilities Strategy that:

- Documents the analysis of all utilities (critical or not).
- Identifies the critical impact utilities.
- Analyze the consequences relocating or otherwise impacting those utilities.

Complete QC/QA Procedures

The Utilities Coordinator is to coordinate the applicable QC review following the *NCDOT Quality Management Program: Quality Control and Quality Assurance* procedures and the respective QC Checklist before upload and distribution of all related deliverables.

2UT1 Initiate Utility Coordination and/or Design

Deliverables

Deliverable	Task	Responsible Party	
		Activity Leader	Additional Support
Utility Project Outline	▪ *Conduct Preliminary Utility Investigations* ▪ *Initiate Utility Owner Contacts* ▪ *Submit Utility Project Outline*	Utilities Coordinator	Utilities Lead
Utility Construction Request (UCR)	▪ *Submit Utility Construction Requests*		

Conduct Preliminary Utility Investigations

Using the Feasibility Estimate from 1UT1, the Critical Utilities Strategy from 1UT2, NC811, GIS resources, and other online resources combined with a site visit, the Utilities Coordinator creates an inventory of utilities existing on and near the project. This inventory:

- Provides a description of the type, size, and function of all facilities in the project area.
- Identifies off-site work required to perform relocation on the project, where possible to predict.
- Identifies utilities that should be avoided by the project.

In the site visit, it is good practice to take notes or sketches of the type and routing of overhead cables and the number and location of guy wires.

Begin Critical Utility Coordination

Begin or continue coordination with critical utilities identified in 1UT2 in this stage at an appropriate level to avoid or minimize impacts, or to begin design and planning for the relocation of utilities with long design or construction times.

Initiate Utility Owner Contacts

The Utilities Coordinator notifies utility owners of the project, including the expected schedule for start of utility design (the Utilities Kickoff Meeting) and the beginning of right-of-way (ROW) acquisition, and provides a copy of the Design Recommendation Plan Set. The Utilities Coordinator works with the utility owners as necessary to ensure utilities are ready to begin design for the project on time, including having a design firm selected and budgeted.

Submit Utility Project Outline

The Utilities Coordinator provides a Utility Project Outline that:

- Provides an inventory of utilities and facilities in the study area.
- Describes all utility facilities.
- Documents conflicts.
- Documents utility design decisions.

The Utilities Lead reviews the report and provides comments to the Utilities Coordinator, who updates the document.

The Utility Project Outline is provided to the Project Manager and used by the project team to evaluate design alternatives/alignments. The report is also a guide to minimize the overall impact of utilities on the project.

The Utility Project Outline is a living document that should be continuously updates during the life of the project to incorporate newly discovered utilities and encroachments, and to document design decisions or changes in strategy their motivation or justification. Previous versions should be preserved to maintain a project history.

Submit Utility Construction Requests (UCRs)

For this task, the Utilities Coordinator:

- Identifies utilities that may want construction of their facilities completed by the selected contractor and included as part of the project's contract.
- Obtains a Utility Construction Request (UCR) from each of these utilities describing the facilities likely to be in conflict or that may need early analysis.
- Identifies in the Utility Construction Request whether NCDOT is being requested to perform construction or both design and construction.
- Submits the UCR to the Utilities Lead.

The Utilities Lead discusses acceptance of the work into the contract with the Project Manager and the Division, notifying the utility of the result.

These requests are submitted early enough in the stage to ensure that design engineers for each of these utilities can be contracted prior to the Utilities Kickoff Meeting. This request should be obtained as early as possible if early analysis or design is required.

Complete QC/QA Procedures

The Utilities Coordinator is to coordinate the applicable QC review following the *NCDOT Quality Management Program: Quality Control and Quality Assurance* procedures and the respective QC Checklist before upload and distribution of all related deliverables.

2UT2 Prepare Utility Relocation and Construction Estimates

All tasks required for this activity are associated with Utilities Coordination.

Overview: Utilities Coordination

Prepare both utility relocation and construction cost estimates to support the project development process prior to the Environmental Document being approved.

References

- ☐ *Utilities Accommodation Manual*
- ☐ *Estimates, Materials & Approved Products for Utilities Work*
- ☐ *Utility Cost Estimate Request Form*

Deliverables

Deliverable	Task	Responsible Party Activity Leader
Utility Relocation (PH 250) Estimate	▪ *Prepare Utility Relocation Estimate*	Utilities Coordinator
Utility Construction (PH 300) Estimate	▪ *Prepare Utility Construction Estimate*	Utilities Coordinator

Prepare Utility Relocation Estimate

Per a request from the Project Manager (or Roadway Design Lead) using the Utility Cost Estimate Request Form for relocation costs, the Utilities Coordinator prepares the project's utility relocation estimate, referencing the resources and process detailed on the Estimates, Materials & Approved Products for Utilities Work resource page. The Utilities Coordinator prices the relocation work using the Utilities Cookbook Database or by coordinating cost directly with the impacted utility owners.

The Utilities Coordinator works with the Project Manager (or assigned) to assist in drafting any justification or additional information, if there is a difference in cost between the current and previous estimate.

Prepare Utility Construction Estimate

Per a request from the Project Manager (or assigned) using the Utility Cost Estimate Request Form for construction costs, the Utilities Coordinator prepares the project's utility construction estimate using historic bid data adjusted for project conditions and expected price increases.

The Utilities Coordinator works with the Utilities Lead and Project Manager (or assigned) to assist in drafting any justification or additional information, if there is a difference in cost between the current and previous estimate. The Utilities Coordinator confirms that utility construction pay items and quantities are included in the construction estimate request, as required.

If a Utilities Design Engineer has been scoped at this time, the Utilities Design Engineer can prepare this estimate.

Review Estimate

The Utilities Coordinator sends the two utilities cost estimate to the Utilities Lead, who reviews the estimate.

Generate Cost Verification Letter

After satisfactory review, the Utilities Coordinator sends the estimates to the Project Manager, who generates and distributes a Cost Verification Letter per the process detailed in the *Division Engineer Approval for Cost Verification Memo* (see 2CS1 and 3CS1 for related information).

2UT3 Advance Utility Coordination and/or Design

The tasks required for this activity are separated into the sub-activities of:

Task details and deliverables for these sub-activities are found in the corresponding sections below.

Overview: Utilities Coordination

Coordinate with utility owners to identify conflicts between their facilities and the project and develop a resolution for those conflicts. Coordinate preliminary utility designs to conform with the *Utilities Accommodation Manual*, preventing conflicts among utilities where possible and determining utility easement requirements.

Note: *Because job titles within NCDOT overlap with job titles in the consulting firms, and because different project management centers within the Department divide project management and technical duties differently, this section clarifies who is filling each role as identified in the deliverable table and task descriptions below.*

Utilities Coordinator

The Utilities Coordinator role is typically filled by a Professional Engineering Firm (PEF)/Consultant providing Utilities Coordination services for the project. The Utilities Coordinator coordinates the relocation activities of all utilities on the project but does not provide any design service for any utility.

If a utility is providing complete Utilities Construction Plans for inclusion in the contract, the Utilities Coordinator is responsible for the coordination and delivery to NCDOT of the deliverables assigned to the Utilities Design Engineer that are instead being produced by the utility. The Utilities Coordinator is not responsible for the production of those deliverables.

Utilities Design Engineer

The Utilities Design Engineer role is typically filled by Professional Engineering Firm (PEF)/Consultant providing Utilities Design Services for the project. This firm may or may not be the same firm providing Utilities Coordination Services. There may be more than one PEF providing Utilities Design Services, depending on the number and types of utilities included for construction in the contract and the areas of expertise of each firm.

The role of the Utilities Design Engineer is to design the relocation of the assigned utility facilities. The Utilities Coordinator coordinates the location of those facilities with the other utilities.

If a utility chooses to provide a complete design plan for inclusion in the project, the agreement with the utility should require the utility to complete the tasks expected of the Utilities Design Engineer. The Utilities Coordinator provides the deliverables to NCDOT.

Utilities Lead

The Utilities Lead is an NCDOT representative responsible for the oversight of the utility's relocation effort and the technical review of the utility's deliverables. Depending on the design center where the project is managed, this role may be filled by more than one person managing different portions of the relocation. The Department representatives and roles are to be clear in the scopes.

References

- ☐ Conflict Letter Template
- ☐ *Utilities Accommodation Manual*
- ☐ *Dig Once Policy*
- ☐ Utilities Connect Site
- ☐ *NCDOT Quality Management Program: Quality Control and Quality Assurance*
- ☐ *Proprietary Products Guidelines*

Deliverables

Deliverable	Task	Responsible Party	
		Activity Leader	Additional Support
Utility Coordination Kickoff Meeting Minutes	▪ *Provide Plans to Utility Owners* ▪ *Identify Major Utility Conflicts and Relocation Impacts* ▪ *Conduct Utility Coordination Kickoff Meeting (All Utilities)*	Utilities Coordinator	Utilities Lead
Conflict Letters	▪ *Provide Conflict Letters to all Utilities*	Utilities Coordinator	Utilities Lead
Utility Coordination Working plans (continuous)	▪ *Initiate Cost Responsibility Analysis* ▪ *Receive Preliminary Utility Relocation Plans from Utility Owners*	Utilities Coordinator	Utilities Lead
Relocation Schedule	▪ *Create Relocation Schedule*	Utilities Coordinator	Utilities Lead
Subsurface Utility Engineering (SUE) Level A Request	▪ *Request Subsurface Utility Engineering (SUE) Level A*	Utilities Coordinator	Utilities Lead
Utility Easement Request and Utility Parcel List	▪ *Submit Required Utility Easements and Parcel List*	Utilities Coordinator	Utilities Lead

Continuing Tasks

The Utilities Coordinator continues to maintain and update the Utility Project Outline begun in 2UT1.

Review New Encroachments

The Utilities Lead receives all new encroachments on the project from the District Office or Encroachments Section. The Utilities Lead determines the nature of the encroachment. The Utilities Lead coordinates the review and approval of all new utility encroachments. New non-utility encroachments are returned to the Encroachment Section or District Office, as appropriate, for review coordination with the project team. The utilities Lead then notifies the Project Manager of all new encroachments and their nature.

- On new utility encroachments, the Utilities Coordinator reviews the encroachment for conflict with project utilities and the project and provides recommendations (as appropriate) to avoid the conflicts. The Utilities Lead incorporates those comments (as appropriate) in responding to the encroachment.

- On new non-utility encroachments, the Utilities Coordinator reviews the encroachment for conflict with project utilities, identifies new utility conflicts created by the encroachment, provides recommendations (as appropriate) to avoid those conflicts, and notifies the Utilities Lead and Project Manager of the findings.

Provide Conflict Letters to all Utilities

The Conflict Letter is a letter sent to a utility located on the project alerting the utility of a potential conflict with the project within ten days following the Utility Kickoff Meeting. It requires the utility to take action and relocate within a reasonable amount of time. The Conflict Letter documents that the utility is aware of the need to coordinate and relocate in a reasonable period.

The Utilities Coordinator drafts a conflict letter for each utility. The drafts are provided to the Utilities Lead for revisions and signature. The Utilities Coordinator sends the signed letters to the utilities.

Provide Plans to Utility Owners

The Utilities Coordinator provides a PDF and DGN set of the current plans and the Utility Project Outline to the utility companies and their designated design representatives. The Utilities Coordinator requests that the utility companies:

- Review the plans for accuracy in the surveyed depiction of their facilities.
- Notify the Utilities Coordinator of facilities that are omitted or are inaccurately depicted.
- Analyze their facilities for conflicts with the project as designed.
- Consider options and schedule for relocation or mitigation of the conflicts.
- Suggest revisions that could eliminate conflicts or reduce relocations.
- Notify the Utilities Coordinator of assistance or input required from NCDOT during the project, such as any additional notification required from the Department to request establishment of a budget or schedule for the relocation.

Identify Major Utility Conflicts and Relocation Impacts

In this task, the Utilities Coordinator creates a set of Utilities Coordination Working Plans. The Utilities Coordination Working Plans and Utilities by Others (UbO) plans (see 4UT1 for related information) are not the same document, although work expended in creating these plans can be leveraged for creating UbO plans. The purpose of the Utilities Coordination Working Plans is to:

- Document points of conflict.
- Show the relocation plans (new alignments, facility retentions, and abandonments) of all utilities in a single view.
- Show the means of construction where necessary.
- Develop easement needs.
- Identify utility parcels.
- Track and coordinate unsurveyed new utility encroachments.

The Utilities Coordination Working Plans are continuously maintained after creation and are kept available for all members of the project team on the SharePoint project site. They are updated at least monthly, upon the receipt of initial or updated relocation plans from a utility, and prior to project meetings.

To complete this task, the Utilities Coordinator:

- Reviews the plans to identify likely locations of conflicts.
- Creates a set of Utilities Working Coordination Plans and documents those conflicts on the Utilities Coordination Working Plans.
- Determines the presumed responsibility for the cost of relocations based readily observable information on the plans, such as the location of facilities inside or outside of existing right of way and the existence of surveyed easements.

The Utilities Lead reviews the Utilities Coordination Working Plans and updates/provides comments to the Utilities Coordinator, including a review of the application of the *Utilities Accommodation Manual*, a constructability review, and a review of possible alternatives/alignments.

Conduct Utility Coordination Kickoff Meeting (All Utilities)

The Utility Coordination Kickoff Meeting is conducted by the Utilities Coordinator, design team members, members the NCDOT project team, and the utilities in order to present to the utilities the information on the project, and to gather from the utilities the information about their relocation plans and probable schedule. The meeting also provides an opportunity for utility representatives to network and discuss areas of collaboration in their relocation efforts, such as shared pole lines or duct banks.

The Utilities Coordinator schedules the Utility Coordination Kickoff Meeting. Invite all personnel required in the KO Meeting Prep QC Checklist, plus any additional personnel whose attendance may be required by the circumstances of the project.

Prior to conducting the Utilities Kickoff Meeting, the Utilities Coordinator consults with the Utilities Lead to agree on potential conflicts and guidance to be given to the utilities. The Utilities Coordinator also discusses possible resolutions and areas of concern with the design team.

The Utilities Coordinator conducts the Utility Kickoff meeting. At this meeting and with assistance from the Utilities Lead, the Utilities Coordinator:

- Provides information to the utility companies about the project, in particular discussing:
  - An overview of the project
  - Environmental features including environmentally sensitive areas and historic properties
  - The project schedule
  - Other features of the project that may affect utility design
- Reviews the presumptive cost responsibility and establish which utility companies believe they have a compensable interest.
- Requests a preliminary relocation schedule from the utility companies.
- Elicits information about the risks the utilities believe they pose to the project.
- Discusses preliminary alignments for relocations.
- Informs utilities of their responsibilities under the Dig Once Policy. The Utilities Coordinator is responsible for the administration of this policy on the project.
- Asks the utility companies to prepare preliminary plans and identify easement needs.
- Identifies action items for NCDOT and the utility companies.

If no Utility Design Engineer has been chosen as part of the design team by the time of the Utility Kickoff Meeting, the Utilities Coordinator gathers the needed information from any utility that has requested to be in the highway contract.

Following the kickoff meeting, the Utilities Coordinator prepares meeting minutes, stores them on the SharePoint project site, and sends links to the Project Manager, Utilities Lead, and other utilities personnel identified in the project scope. The Utilities Coordinator sends copies of the minutes to the utilities and sends conflict letters to each of the affected utility companies.

Initiate Cost Responsibility Analysis

The Utilities Coordinator uses the information from the survey and information provided by the utilities to initiate the Cost Responsibility Analysis. To do this, the Utilities Coordinator:

- Investigates documents provided by the utility companies.
- Compares documents provided by the utility companies with the plans.
- Prepares opinions on the relevance of those documents to any claims of compensable interest.

It is the responsibility of the utility companies to prove their claims of compensable interest. It is the responsibility of the Utilities Coordinator to review the claims and provide a recommendation to the Utilities Lead and the Project Manager on the merits of the claims.

The analysis of cost responsibility is an ongoing task that culminates with the production of a document stating the findings for each utility. This document becomes a part of the submittal for each relocation agreement (see 3UT1 for related information).

Receive Preliminary Utility Relocation Plans from Utility Owners

Utility Relocation Plans are the plans prepared by the utility to be attached to an agreement and are to be authorized and used by the utility for construction of their facilities.

To complete this task, the Utilities Coordinator:

- Receives preliminary utility relocation plans from the utility companies and the Utility Design Engineer.
- Reviews the plans to ensure compliance with the Utilities Accommodation Manual.
- Coordinates relocation design with relevant project team members.
- Incorporates the relocation plans into the Utilities Coordination Working Plans.
- Communicates the relocations to all utilities via the Utilities Coordination Working Plans.

Preliminary relocation plans from the utilities are not final designs. Instead, these plans are to show the scope and alignment of the relocation. The design is to be complete enough to determine easement requirements and environmental impacts from the proposed alignment and construction.

Place preliminary relocation plans on the SharePoint project site in a Document Set for each utility, updating the working plans as changes occur.

Create Relocation Schedule

The Utilities Relocation Schedule is an ongoing task that begins after the Utilities Kickoff Meeting. This schedule should include start dates and durations for all utilities, and well as document the dependencies each utility has. The completion of the acquisition of utility parcels should be included as a dependency, along with other major project milestones such as let date and project availability. Some larger projects may have schedules for multiple independent sections.

The Utilities Coordinator creates a Utilities Relocation Schedule to be delivered initially after the Kickoff Meeting for use in guiding project scheduling and tracking relocation progress. This schedule is developed in consideration of:

- Utility work by others only
- Important milestones in project completion, such as design time, relocation time, moratoria, acquisition of special materials, permitting, availability of right-of-way and easements, and construction staging
- Information obtained from the utilities, the Right-of-Way Agents, project documents, and other sources, as needed
- Time required to remove existing facilities

The Relocation Schedule should be maintained as a narrative and as a Gantt chart.

The Utilities Coordinator maintains this schedule as conditions change and milestones are completed, coordinating this with the Project Manager, the Utilities Lead, and the larger project schedule. The project schedule delivery should be updated as schedules provided by the utilities and other milestones change.

The Utilities Lead reviews this schedule and provides comments to the Utilities Coordinator. The review includes the practicality of accomplishing the schedule.

Request Subsurface Utility Engineering (SUE) Level A

The Utilities Coordinator requests and compiles subsurface utility engineering (SUE) Level A requests from the designers of each of the utilities. To do this:

- Collaborate with the Utilities Lead to evaluate the need for each location.
- Create a final SUE request to be coordinated with Location and Surveys (see 2LS2 for related information).

Submit Required Utility Easements and Parcel List

The Utilities Coordinator collects, validates, and aggregates easement needs for all of the utilities. The Utilities Coordinator then prepares the Utility Easement Request and Utility Parcel List, which includes:

- Obtaining concurrence from the Utilities Lead on the eligibility for each utility to request easements that are acquired by NCDOT.
- Vetting easements requested by the utility companies for compliance with NCDOT policy.
- Compiling all eligible easements requested.
  - Draw the compiled easements on the Utilities Working Plans and submit to the Utilities Lead for concurrence in the request.
- After receiving concurrence, submit the easement request for inclusion in the plans.

- For utilities relocating in advance of the project's contract, compiling a list of parcels containing any of those utilities in NCDOT-purchased easement or right-of-way.
  - List which utilities are occupying each parcel.
- Determine the date each parcel is needed according to the schedule of utility construction on each parcel.
  - Provide a list of parcels requiring relocation of water backflow preventers as provided by the water utility designers.

Design files are to include stations and offsets at each easement boundary corner and be incorporated into the Right-of-Way Plan Set (see 2RD4 for related information). Easements requested by utilities should not be altered to round off stations or offsets of easement boundaries.

The Utilities Lead reviews the requested easements for compliance with the *Utilities Accommodation Manual*, for impact on property owners and for possible economizations. The Utilities Coordinator confirms all approved easements are incorporated into the Field Inspection Plan Set (see 2RD2 for related information).

Coordinate Utility Design

If Utility Construction Plans are provided by the utility, the Utilities Coordinator coordinates with the utility and the utility's Design Engineer by providing plans, project CADD file updates, and project schedules. The Utilities Coordinator monitors progress by the Utility's designer and updates the Utilities Lead and Project Manager regularly. The Utilities Coordinator coordinates the deliverables required in Initiate Utility Design but is not responsible for their production.

Complete QC/QA Procedures

The Utilities Coordinator is to coordinate the applicable QC review following the *NCDOT Quality Management Program: Quality Control and Quality Assurance* procedures and the respective QC Checklist before upload and distribution of all related deliverables.

(Back to activity overview)

Overview: Utility Design

Initiate the design of scoped utilities, including all elements of design required to determine easement needs.

References

- ☐ *Utilities Accommodation Manual*
- ☐ *Dig Once Policy*
- ☐ Utilities Connect Site
- ☐ *NCDOT Quality Management Program: Quality Control and Quality Assurance*
- ☐ *Proprietary Products Guidelines*
- ☐ *Backflow Preventer Policy*
- ☐ *Standard Specifications for Roads and Structures*

Deliverables

Deliverable	Task	Responsible Party	
		Activity Leader	Additional Support
Preliminary Utility Construction Plans	▪ *Submit Preliminary Utility Construction Plans*	Utilities Design Engineer	Utilities Lead
Subsurface Utility Engineering (SUE) Level A Needs to Utility Coordinator	▪ *Submit Subsurface Utility Engineering (SUE) Level A Needs*	Utilities Design Engineer	Utilities Design Engineer & Utilities Lead
Backflow Preventer List	▪ *Submit Backflow Preventer List*	Utilities Design Engineer	Utilities Lead
Geotechnical Investigation (Trenchless) Request	▪ *Request Geotechnical Investigation for Trenchless Utilities*	Utilities Design Engineer	Utilities Lead & Design Geotechnical Engineer

Identify Conflicts

The Utilities Design Engineer:

- Reviews the project plans with the applicable utility companies for the facilities scoped for design.
- Reviews the plans for accuracy in the surveyed depiction of their facilities.
- Notifies the Utilities Coordinator of facilities that are omitted or are inaccurately depicted.
- Identifies conflicts, proposes preliminary relocation routing or a plan to mitigate the conflicts, and secures approval from the utility.
- Provides this information to the Utilities Coordinator prior to the Utility Coordination Kickoff Meeting.

Attend Utility Kickoff Meeting

The Utilities Design Engineer attends the Utilities Kickoff Meeting on behalf of the scoped utilities and provides information about those utilities as needed by the Utilities Coordinator.

Submit Preliminary Utility Construction Plans

The Utility Design Engineer creates plans for the construction of the scoped utility relocations. As a continuing part of this task, the Design Engineer provides the Utilities Coordinator with regular updates via pdf plans and CADD files for utilities coordination purposes.

The Utilities Design Engineer submits the Preliminary Utility Construction Plans for review by the Utilities Lead. These plans are to:

- Show routing and major design elements.
- Identify any needed easements outside of existing right-of-way.
- Provide draft Special Provisions, especially including any requested pay items for review.
- Comply with the Proprietary Products Guidelines or identify all items that need to be brought into compliance.

Subsurface Utility Engineering (SUE) Level A Needs to Utility Coordinator

The Utilities Design Engineer submits this request to the Utilities Coordinator for aggregation with requests by other utilities. This request is to be coordinated with Location and Surveys (see 2LS2 for related information).

Request Geotechnical Investigation for Trenchless Utilities

A Geotechnical Investigation is used to identify underground conditions along the trenchless installation for the purposes of bidding. The Utilities Design Engineer identifies locations for the geotechnical investigation along the planned location of all trenchless installations of utilities to be constructed. To do this, the Utilities Design Engineer is to:

- Identify the expected depth of the utility at each location.
- Collaborate with the Utilities Lead and the Design Geotechnical Engineer to create a final list of requested locations.

Submit Backflow Preventer List

The Utilities Design Engineer submits a list of parcels requiring relocation of water service backflow preventers.

Coordination of Utility Construction Plans

If, in addition to the utilities scoped to the Utilities Design Engineer, there are utilities to be constructed in the highway contract that to be designed by the utility's engineer, the Utilities Design Engineer coordinates inputting of quantity estimates, plan sheet numbering, and special pay item naming for all Utility Construction plans and Special Provisions to verify the plan set for all work. This is not to be confused with "Coordinate Utility Design" in the Utilities Coordination scope.

Complete QC/QA Procedures

The Utilities Design Engineer is to coordinate the applicable QC review following the *NCDOT Quality Management Program: Quality Control and Quality Assurance* procedures and the respective QC Checklist before upload and distribution of all related deliverables.

2UT4 Prepare Utility Relocation and Construction Estimates

The tasks required for this activity are separated into the sub-activities of:

Task details and deliverables for these sub-activities are found in the corresponding sections below.

Overview: Utilities Coordination

Prepare both utility relocation and construction cost estimates to support the project development process prior to the Right-of-Way Plan Set being finalized.

References

- ☐ *Utilities Accommodation Manual*
- ☐ *Estimates, Materials & Approved Products for Utilities Work*
- ☐ *Utility Cost Estimate Request Form*

Deliverables

Deliverable	Task	Responsible Party
		Activity Leader
Utility Relocation (PH 250) Estimate	▪ *Prepare Utility Relocation Estimate*	Utilities Coordinator
Utility Construction (PH 300) Estimate	▪ *Prepare Utility Construction Estimate*	Utilities Design Engineer

Prepare Utility Relocation Estimate

Per a request from the Project Manager (or Roadway Design Lead) using the Utility Cost Estimate Request Form for relocation costs, the Utilities Coordinator prepares the project's utility relocation estimate, referencing the resources and process detailed on the Estimates, Materials & Approved Products for Utilities Work resource page. The Utilities Coordinator prices the relocation work using the Utilities Cookbook Database or by coordinating cost directly with the impacted utility owners. An estimate from that prepared by the utilities is preferred at this stage.

The Utilities Coordinator works with the Project Manager (or assigned) to assist in drafting any justification or additional information, if there is a difference in cost between the current and previous estimate.

Prepare Utility Construction Estimate

The Utilities Coordinator receives the Utility Construction Estimate from the Utilities Design Engineer or the utility's engineer and coordinates the submittal of the estimate to the Utilities Lead and the Project Manager.

Review Estimate

The Utilities Coordinator sends the two utilities cost estimate to the Utilities Lead, who reviews the estimate.

Generate Cost Verification Letter

After satisfactory review, the Utilities Coordinator sends the estimates to the Project Manager, who generates and distributes a Cost Verification Letter per the process detailed in the *Division Engineer Approval for Cost Verification Memo* (see 2CS1 and 3CS1 for related information).

(*Back to activity overview*)

Overview: Utility Design

Prepare the construction cost estimate to support the project development process prior to the Right-of-Way Plan Set being finalized.

Deliverables

Deliverable	Task	Responsible Party
		Activity Leader
Utility Construction (PH 300) Estimate	▪ *Prepare Utility Construction Estimate*	Utilities Design Engineer

Prepare Utility Construction Estimate

Per a request from the Project Manager (or assigned) using the Utility Cost Estimate Request Form for construction costs, the Utilities Design Engineer prepares the project's utility construction estimate using historic bid data adjusted for project conditions and expected price increases.

The Utilities Design Engineer works with the Utilities Lead and Project Manager (or assigned) to assist in drafting any justification or additional information, if there is a difference in cost between the current and previous estimate. The Utilities Design Engineer is to ensure that utility construction pay items and quantities are included in the construction estimate request, as required.

3UT1 Complete Utility Coordination and/or Design

The tasks required for this activity are separated into the sub-activities of:

Task details and deliverables for these sub-activities are found in the corresponding sections below.

Overview: Utilities Coordination

Coordinate the final design of utilities and needs for environmental permitting. Authorize utility relocations.

References

- ☐ *Utilities Accommodation Manual*
- ☐ *Dig Once Policy*
- ☐ *Utilities Connect Site*
- ☐ *NCDOT Quality Management Program: Quality Control and Quality Assurance*
- ☐ *Proprietary Products Guidelines*

Deliverables

Deliverable	Task	Responsible Party	
		Activity Leader	Additional Support
Cost Responsibility Analysis Report	▪ *Submit Cost Responsibility Analysis*	Utilities Coordinator	Utilities Lead
Utility Agreements (and related Authorizations)	▪ *Execute Utility Agreements* ▪ *Issue Utility Construction Authorization*	Utilities Coordinator	Utilities Lead
Utility Environmental Permit Drawings (and Narrative)	▪ *Provide Permit Related Utility Environmental Impacts*	Utilities Coordinator	Utilities Lead

Continuing Tasks

The Utilities Coordinator continues to maintain and update the Utilities Coordination Working Plans, Utility Project Outline, and Utilities Relocation Schedule begun in Stage 2, reviewing new utility and non-utility encroachments as described in 2UT2.

Complete Dig Once Policy Agreements

If any utilities enter into agreement under the Dig Once Policy, the Utilities Coordinator completes the processing of these agreements according to the Dig Once Policy.

Review Utility Relocation Packages

The Utilities Coordinator receives and reviews the final Utility Relocation Plans and Estimates. The Utilities Coordinator:

- Reviews the plans for conformity with the *Utilities Accommodation Manual*.
- Reviews the estimates, if needed for the agreement.

The Utilities Lead reviews the agreements for compliance with policy.

The Utilities Coordinator forwards the plans and estimates to the Utilities Lead for review and approval and then assembles the utility agreement packages.

Submit Cost Responsibility Analysis

The Utilities Coordinator submits cost responsibility justification for each utility as part of the utility agreement package. In this report, the Utilities Coordinator examines the evidence provided by the utility and provides a conclusion on whether the evidence provided supports reimbursement by NCDOT.

The Utilities Lead reviews the analysis and requests additional information (if needed), comments as required, and accepts the report when complete. The Utilities Lead retains this report with the agreement documents.

Execute Utility Agreements

The Utilities Coordinator submits utility agreement packages (URAs or relocation encroachments) to the Utilities Lead. After review, the Utilities Lead submits the utility agreements to the authorized NCDOT official for signature.

Issue Utility Construction Authorization

After execution of each utility agreement for construction by the utility, the Utilities Coordinator prepares an authorization letter for signature by the Utilities Lead. The Utilities Coordinator sends the authorization to the utility, with copies as required.

Provide Permit-Related Utility Environmental Impacts

The Utilities Coordinator uses the information from the Utility Coordination Working Plans to create a set of Utilities Environmental Permit Drawings. These plans consist of an environmental narrative, plans showing impacts, utility profiles, and impact area charts. Not all components are required for all projects. As part of the plans, the Utilities Coordinator:

- Coordinates areas of utility impacts with areas of roadway impacts.
- Submits to the Utilities Lead to obtain concurrence.
- After obtaining concurrence, submits to the Utilities Lead and the 3EN2 Activity Leader (for action) and Project Manager (for information).

The Utilities Lead reviews the proposed construction methods, environmental impacts of the utility relocations, and consistency with the current roadway design plans. The Utilities Lead consults with the project's Environmental Lead about proposed environmental impacts.

Coordinate Utility Design

If Utility Construction Plans are provided by the utility, the Utilities Coordinator coordinates with the utility and the utility's Design Engineer by providing plans, project CADD file updates, and project schedules. The Utilities Coordinator monitors progress by the Utility's designer and updates the Utilities Lead and Project Manager regularly. The Utilities Coordinator coordinates the delivery of the deliverables required in Initiate Utility Design (2UT1) but will not be responsible for their production.

Complete QC/QA Procedures

The Utilities Coordinator and/or Utilities Design Engineer is to coordinate the applicable QC review following the *NCDOT Quality Management Program: Quality Control and Quality Assurance* procedures and the respective QC Checklist before upload and distribution of all related deliverables.

(Back to activity overview)

Overview: Utility Design

Coordinate the final design of utilities and needs for environmental permitting.

References

- ☐ *Utilities Accommodation Manual*
- ☐ *Dig Once Policy*
- ☐ *Utilities Connect Site*
- ☐ *NCDOT Quality Management Program: Quality Control and Quality Assurance*
- ☐ *Proprietary Products Guidelines*
- ☐ *Standard Specifications for Roads and Structures*

Deliverables

Deliverable	Task	Responsible Party	
		Activity Leader	Additional Support
Utility Agreement Plans	▪ *Submit Utility Agreement Plans*	Utilities Design Engineer	Utilities Lead
Permit Applications	▪ *Initiate Water and Sewer Permits*		
Utility Environmental Permit Plans and Narrative	▪ *Provide Permit Related Utility Environmental Impacts*	Utilities Coordinator	Utilities Lead

Submit Utility Agreement Plans

The Utilities Design Engineer submits the Utility Construction Plans, Special Provisions, and draft quantities estimate for review by the Utilities Design Lead. This includes:

- Showing routing and major design elements.
- Review of UC Special Provisions and UC Plans (including notes and details) by the Utilities Designer to ensure compliance with the Proprietary Products Guidelines.
- After receiving concurrence from the Utilities Lead, initiating the NC Department of Environmental Quality (DEQ) permitting process.

The Utilities Design Engineer addresses any comments and submits a set of Utility Agreement Plans.

- The purpose of these plans is to be an attachment to the Utility Construction Agreement or Use and Occupancy Agreement.
- Special Provisions and agreement estimate are also required.

The Utilities Lead generates the appropriate agreement and submits it to the utility company for execution.

Initiate Water and Sewer Permits

The Utilities Design Engineer determines the need for water and sewer permits (Authorization to Construct for water and Sewer Extension Permit for sewer). It is expected that utility permits are to be obtained for all water and sewer work to be performed by the project's contractor.

The Utilities Design Engineer prepares the applications and assists the utility in submitting the applications to NC Department of Environmental Quality (DEQ) Public Water Supply Section and Division of Water

Quality. The Utilities Lead may waive the utility permit requirement for a utility if it is clear a permit is not required under NCDEQ rules and the utility concurs, or may instead choose to require that the utility permit be obtained.

Coordination of Utility Construction Plans

If, in addition to the utilities scoped to the Utilities Design Engineer, there are utilities to be constructed in the highway contract that to be designed by the utility's engineer, the Utilities Design Engineer coordinates inputting of quantity estimates, plan sheet numbering, and special pay item naming for all Utility Construction plans and Special Provisions to verify the plan set for all work. This is not to be confused with "Coordinate Utility Design" in the Utilities Coordination scope.

Complete QC/QA Procedures

The Utilities Design Engineer is to coordinate the applicable QC review following the *NCDOT Quality Management Program: Quality Control and Quality Assurance* procedures and the respective QC Checklist before upload and distribution of all related deliverables.

3UT2 Initiate Utility Relocations by Others

All tasks required for this activity are associated with Utilities Coordination.

Overview: Utilities Coordination

Support the Project Manager and Resident Engineer by maintaining contact with the utilities, maintaining the Utilities Relocation Schedule, and continuing coordination to resolve relocation issues until the relocations by the utilities are complete. This task continues as 4UT2 and may continue into construction of the roadway or may alternatively be continued as part of 5UT1.

References

- ☐ *Utilities Accommodation Manual*

Deliverables

Deliverable	Task	Responsible Party	
		Activity Leader	Additional Support
Relocation Scheduling Conference	▪ *Hold Relocation Scheduling Conference*	Utilities Coordinator	Utilities Lead
Updated Utilities Relocation Schedule	▪ *Maintain Contact with Utilities*		
	▪ *Update the Utilities Relocation Schedule*		
Regular Utility Meetings	▪ *Continued Coordination*		

Hold Relocation Scheduling Conference

After receiving the Utility Authorization, the Utilities Coordinator schedules and holds the Relocation Scheduling Conference for each utility. The conference is to be attended by the utility company, the utility's contractor, the Project Manager, Resident Engineer, and others, as required. The Utilities Coordinator facilitates this meeting on behalf of the Resident Engineer. The Utilities Coordinator updates the Utilities Relocation Schedule.

Maintain Contact with Utilities

The Utilities Coordinator maintains weekly contact with the utilities during their relocation construction. The Utilities Coordinator monitors the progress of the relocations and determines if intervention is needed to keep the utility relocations on schedule. If intervention is needed, the Utilities Coordinator contacts and involves needed resources or makes recommendations/implements strategies to maintain the relocations to support the overall project schedule.

Update the Utilities Relocation Schedule

The Utilities Coordinator updates the Utilities Relocation Schedule weekly and distributes the schedule to the Resident Engineer, Utilities Lead, and Project Manager.

Continued Coordination

The Utilities Coordinator continues coordination with utilities to address issues that arise during the relocation phase of the project. The Utilities Lead provides input, as necessary, to resolve issues involving the scoped utilities. Continued coordination may involve holding regular meetings with representatives of the utilities, NCDOT, and other disciplines in the project in attendance to facilitate coordination with right-of-way, clearing, and demolition activities and cooperation among utilities.

Other Construction Support

The Utilities Coordinator provides other utility construction support as scoped.

3UT3 Prepare Design Complete Review Plan Set Utility Construction Estimate

The tasks required for this activity are separated into the sub-activities of:

Task details and deliverables for these sub-activities are found in the corresponding sections below.

Overview: Utilities Coordination

Facilitate receiving the Design Complete Review Plan Set Utility Construction Estimate, if necessary.

Coordinate Utility Design

If Utility Construction Plans are provided by the utility, the Utilities Coordinator coordinates with the utility and the utility's Design Engineer to provide the quantities estimate to the Utilities Lead.

(*Back to activity overview*)

Overview: Utility Design

Prepare the Design Complete Review Plan Set utility construction cost estimates at the time of finalizing the Design Complete Review Plan Set.

References

- ☐ *Utilities Accommodation Manual*
- ☐ *Estimates, Materials & Approved Products for Utilities Work*
- ☐ *Utility Cost Estimate Request Form*

Deliverables

Deliverable	Task	Responsible Party
		Activity Leader
Design Complete Review Plan Set Utility Construction (PH 300) Estimate	▪ *Prepare Design Complete Review Plan Set Utility Construction Estimate*	Utilities Design Engineer

Prepare Design Complete Review Plan Set Utility Construction Estimate

The Utilities Design Engineer prepares a quantity estimate for the Utility Construction Plans using NCDOT pay items.

The Utilities Lead works with the Project Manager (or assigned) and Preliminary Estimates Section (for Central-let projects) or the appropriate Division staff (for Division-let projects) to adjust the estimate, as needed, when reviewing final pay items/quantities.

Coordination of Utility Construction Plans

If, in addition to the utilities scoped to the Utilities Design Engineer, there are utilities to be constructed in the highway contract that to be designed by the utility's engineer, the Utilities Design Engineer coordinates the estimate quantities. This is not to be confused with "Coordinate Utility Design" in the Utilities Coordination scope.

4UT1 Finalize Utility Coordination and/or Utility Design PS&E

The tasks required for this activity are separated into the sub-activities of:

Task details and deliverables for these sub-activities are found in the corresponding sections below.

Overview: Utilities Coordination

Facilitate the relocation of utilities being relocated by the utility owners.

References

- ☐ *Utilities by Others Plans Development*
- ☐ *Utilities Accommodation Manual*
- ☐ *NCDOT Quality Management Program: Quality Control and Quality Assurance*
- ☐ *Style Guide for Provisions*
- ☐ *Proprietary Products Guidelines*

Deliverables

Deliverable	Task	Responsible Party	
		Activity Leader	Additional Support
Utilities by Others Plans and Special Provisions	▪ *Complete Utilities by Others Plans*	Utilities Coordinator	Utilities Lead
Utility Certification	▪ *Issue Utility Certification*	Utilities Lead	Utilities Coordinator

Continuing Tasks

The Utilities Coordinator continues to maintain and update the Utilities Coordination Working Plans, Utility Project Outline, and Utilities Relocation Schedule begun in Stage 2, and continues to review new utility and non-utility encroachments as described in 2UT2.

Complete Utilities by Others Plans

The purpose of the Utilities by Others Plans is to convey information to the bidding contractors about the extent and timing of utility relocations and abandonments, performed by others, for use in developing the bid. The Utilities Coordinator uses the Utilities Coordination Working Plans and Authorized Relocation Plans to create Utilities by Others Plans and Special Provisions. The Utilities Coordinator:

- Creates the plans and special provisions in conformance with templates and guidance provided on the Utilities Connect site.
- Submits these plans and special provisions to the Utilities Lead (for action) and Project Manager (for information).

The Utilities Lead reviews the Utilities by Others Plans and Special Provisions. The review evaluates the information provided on owner, location, and schedule.

Issue Utility Certification

The Utilities Lead completes the Utility Certification and submits it to the authorized NCDOT official for signature. The certification is retained for the project files and as a key document in the Utilities library.

Coordinate Utility Design

If Utility Construction Plans are provided by the utility, the Utilities Coordinator receives Utility Construction Plans, Special Provisions, and Estimates from the utility designer, places the plans and Special Provisions on the project site (including water and sewer permits), and enters the quantity estimate as required. The Utilities Coordinator monitors progress by the utility's designer and updates the Utilities Lead and Project Manager regularly. The Utilities Coordinator coordinates the deliverables required in Finalize Utility Design but is not responsible for their production.

Complete QC/QA Procedures

The Utilities Coordinator is to coordinate the applicable QC review following the *NCDOT Quality Management Program: Quality Control and Quality Assurance* procedures and the respective QC Checklist before upload and distribution of all related deliverables.

(*Back to activity overview*)

Overview: Utility Design

Facilitate the relocation of utilities being relocated by the utility owners.

References

- ☐ *Utilities Construction Plans Development*
- ☐ *Utilities Accommodation Manual*
- ☐ *NCDOT Quality Management Program: Quality Control and Quality Assurance*
- ☐ *Style Guide for Provisions*
- ☐ *Proprietary Products Guidelines*
- ☐ *Standard Specifications for Roads and Structures*

Deliverables

Deliverable	Task	Responsible Party	
		Activity Leader	Additional Support
Utility Construction Plans (PS&E)	▪ *Complete Utility Construction Plans*	Utilities Design Engineer	Utilities Lead
Water and Sewer Permits	▪ *Receive Water and Sewer Permits*	Utilities Design Engineer	Utilities Lead

Complete Utility Construction Plans

The Utilities Design Engineer ensures the compliance of the final Utility Construction Plans and Special Provisions with the Proprietary Products Guidelines.

The Utilities Design Engineer submits final Utility Construction Plans, Special Provisions, and quantity estimates with cost breakdown by responsible party and betterment to the Utilities Lead (for action) and Project Manager (for information). The Utilities Design Engineer also submits an advisory cost estimate.

The Utilities Lead reviews the plans, estimates, and special provisions and returns comments.

Receive Water and Sewer Permits

The Utilities Design Engineer receives the Authorizations to Construct from NC Department of Environmental Quality (DEQ) Public Water Supply Section and Division of Water Quality. After receiving the Authorizations, the Utilities Design Engineer:

- Places them on the project SharePoint site.
- Notifies the Utilities Lead (for action) and Project Manager (for information).

Coordination of Utility Construction Plans

If, in addition to the utilities scoped to the Utilities Design Engineer, there are utilities to be constructed in the highway contract that to be designed by the utility's engineer, the Utilities Design Engineer coordinates inputting of quantity estimates, plan sheet numbering, and special pay item naming for all Utility Construction plans and Special Provisions to verify the plan set for all work. This is not to be confused with "Coordinate Utility Design" in the Utilities Coordination scope.

Complete QC/QA Procedures

The Utilities Design Engineer is to coordinate the applicable QC review following the *NCDOT Quality Management Program: Quality Control and Quality Assurance* procedures and the respective QC Checklist before upload and distribution of all related deliverables.

4UT2 Complete Utility Relocations by Others

All activities required for this task are associated with Utilities Coordination.

Overview: Utilities Coordination

Support the Project Manager and Resident Engineer by maintaining contact with the utilities, maintaining the Utilities Relocation Schedule, and continuing coordination to resolve relocation issues until the relocations by the utilities are complete. This task is a continuation of the duties of 3UT2. This task may continue into construction of the roadway or may alternatively be continued as part of 5UT1.

References

- ☐ *Utilities Accommodation Manual*

Deliverables

Deliverable	Task	Responsible Party	
		Activity Leader	Additional Support
		Utilities Coordinator	Utilities Design Engineer
Relocation Scheduling Conference	▪ *Hold Relocation Scheduling Conference*	X	
Updated Utilities Relocation Schedule	▪ *Maintain Contact with Utilities*	X	X
	▪ *Update the Utilities Relocation Schedule*		
Regular Utility Meetings	▪ *Continued Coordination*	X	

5UT1 Utility Construction Support

The tasks required for this activity are separated into the sub-activities of:

Task details and deliverables for these sub-activities are found in the corresponding sections below.

Overview: Utilities Coordination

Support project construction by continuing coordination with utilities and by reviewing new encroachment requests as needed for conflict with the project and other utilities.

References

- *Utilities Accommodation Manual*
- *Standard Specifications for Roads and Structures*

Continue 4UT2 (as necessary)

The Utilities Coordinator continues the tasks of 4UT2 after let, until all utility-constructed relocations are complete.

Review New Utility Encroachments

The Utilities Coordinator reviews new utility encroachments to ensure that there are no conflicts with the project and other utilities. The Utilities Coordinator coordinates with the utility as needed to support construction.

(Back to activity overview)

Overview: Utility Design

Support project construction by reviewing utilities submittals to ensure relocations are completed on time and submittals are reviewed for compliance, and by creating revised Utility Construction Plans and Special Provisions as needed.

References

- ☐ *Utilities Accommodation Manual*
- ☐ *Standard Specifications for Roads and Structures*

Deliverables

Deliverable	Task	Responsible Party	
		Activity Leader	Additional Support
Submittal Review Letter	▪ *Review Utilities Materials Submittals*	Utilities Design Engineer	Utilities Lead
Revised Utility Construction Plan Sheets	▪ *Submit Design Revisions*		

Review Utilities Materials Submittals

The Utilities Design Engineer reviews all submitted utility shop drawings and catalog cuts for compliance with the project's Special Provisions and plans and the *Standard Specifications for Roads and Structures*. The Utilities Design Engineer submits a Submittal Review Letter to the Utilities Lead and Resident Engineer, approving or rejecting each utility submittal item.

If the utilities were designed by an engineer hired by the utility company, the Utilities Lead is responsible for the review of submittals.

Submit Design Revisions

The Utilities Design Engineer revises the Utility Construction Plans or Special Provisions as needed and in consultation with the Resident Engineer, Utilities Lead, and Project Manager. Revisions are submitted to the Utilities Lead for review. The final revised design is submitted to the Project Manager for processing.

1VM1 Initiate Value Management Activities

Ensure that the initial Value Management activities begin in Stage 1 to inform the Express Design and Project Scoping Report. The specific efforts of this activity are separated into the following sub-activities.

Task details and deliverables for these sub-activities are found in the corresponding sections below.

Overview: Constructability Review (CR)

Support review of constructability considerations as part of project scope development.

References

- ☐ Value Management Office
- ☐ Constructability Review Program
  - *Constructability Review Checklist*
- ☐ ArcGIS STIP and NHS Maps
- ☐ Project Management & Delivery
  - *Project Management Guide*

Deliverables

Deliverable	Task	Responsible Party	
		Activity Leader / Project Lead	Additional Support
Constructability Review Checklist	▪ *Review Constructability Review Checklist*	X	Division Construction Engineer Area Construction Engineer Value Management Office

Review Constructability Review Checklist

The Project Lead reviews the project scope using the list of constructability considerations provided in the *Constructability Review Checklist*. Many of the items may not be able to be assessed at this stage of the project, but this provides the Project Lead an opportunity to consider the questions that should be reviewed as the scope is developed. If the Project Lead is unsure how to accommodate the construction impacts of a particular question, they can schedule an informal/internal CR where VMO coordinates the internal CR with the technical groups and the Division Construction Engineer (DCE) or Area Construction Engineer (ACE) to optimize use of construction knowledge, methodology, and experience. If Project Lead determines a Formal CR (to include Contractors) is needed, VMO will need to be contacted. VMO provides support as needed.

(*Back to activity overview*)

Overview: Risk Management (RM)

Support identification of potential issues (e.g., risks) that could jeopardize project delivery, including impacts to project scope, schedule, and budget goals.

References

- ☐ Value Management Office
- ☐ Risk Management Program
  - *Risk Management Guide*
  - *Risk Assessment Worksheet (RAW)*
  - *How to use the Online RAW*
  - *Risk Examples and Mitigation Strategies*
- ☐ ArcGIS STIP and NHS Maps
- ☐ Project Management & Delivery
  - *Project Management Guide*

Deliverables

Deliverable	Task	Responsible Party	
		Activity Leader / Project Lead	Additional Support
Risk Assessment Worksheet	▪ *Conduct Risk Management Activities*	X	Value Management Office Program Manager
Risk Assessment Study [A]			Value Management Office Program Manager

[A] *Indicates that final document(s) or data set(s) must be uploaded to the ATLAS Workbench.*

Conduct Risk Management Activities

The Project Lead conducts an early risk management review to identify potential issues that could jeopardize project delivery, with identified risks documented in the Project Scoping Report (see 1FS2 for related information). If the risk review reveals potential fatal flaws, the project is reassessed with support from assigned technical leads/Units either during drafting of the Project Scoping Report or during development of Design Recommendation Plan Set in Stage 1 (see 2RD1 for related information). VMO provides support as needed.

Per the *Risk Management Guide*, risks are captured in the Project Scoping Report and transferred to the *Risk Assessment Worksheet (RAW)* around the time the project is transferred to the Project Manager. If a Connect Preconstruction Project Site has been created for the project, the Project Lead can enter risks into the Online RAW linked from the project's Preconstruction Dashboard. While a Risk Assessment Study or Workshop is not required for every project, based on the severity of the risks, a Risk Assessment Study may be necessary to provide greater assurance that a project can maintain its scope, schedule, and budget goals. Therefore, the Project Lead is to coordinate with the VMO to determine if a Risk Assessment Study is appropriate.

During this stage, the VMO supports the Project Lead by providing guidance for the *Risk Assessment Worksheet (RAW)* and/or facilitating a Risk Assessment Study or Workshop in accordance with the *Value Management Guidelines*. If a Risk Assessment Study is deemed necessary, the VMO Program Manager:

- Gathers a team of experts from the applicable technical disciplines/Units.
- Facilitates the Development of the Risk Response Strategy.
- Develops an Implementation Plan.
- Or Provides consultant to lead Risk Assessment Study/Workshop

From there, the Project Lead monitors and controls the identified project risks following the process and procedures detailed in the *Risk Management Guide*. The Project Lead transfers this responsibility to the Project Manager right before notice to proceed (NTP) or early in Stage 2.

(Back to activity overview)

Overview: Value Engineering (VE)

Support the determination if a VE Study is required (or recommended) for state or federal projects that meet or exceed defined thresholds.

References

- ☐ Value Management Office
- ☐ Value Engineering Program
  - *Value Engineering Schedule*
  - *VE Guidelines*
- ☐ ArcGIS STIP and NHS Maps
- ☐ Project Management & Delivery
  - *Project Management Guide*

Deliverables

Deliverable	Task	Responsible Party	
		Activity Leader / Project Lead	Additional Support
Value Engineering (VE) Checklist	▪ *Determine if a Value Engineering Study is Needed (Available in ATLAS)*	X	Value Management Office Program Manager
Value Engineering (VE) Schedule	▪ *Develop the Value Engineering Schedule*		Value Management Office Program Manager

[A] *Indicates that final document(s) or data set(s) must be uploaded to the ATLAS Workbench.*

Determine if a Value Engineering Study is Needed

The Project Lead or Project Manager (depending on the timing of when the determination is made) notifies VMO for state or federal projects that are on the National Highway System (NHS) and have a total estimate of $30 million or more. The total estimate includes the costs for preliminary engineering, utilities, right-of-way acquisition, and construction. If unsure if a project is on or intersects an NHS route, contact VMO for clarification.

Develop the Value Engineering Schedule

The VMO Program Manager produces an annual schedule of projected VE Studies each State Fiscal Year and publishes the schedule so Project Leads/Managers can prepare for the upcoming study. The VMO Program Manager produces and distributes updates to the schedule. VE Studies are to be held before the Design Recommendation Plan Set is published (2RD1), barring extraordinary circumstances, so that accepted VE recommendations can be included in the design.

(*Back to activity overview*)

Overview: Communicate Lessons, Exchange Advice, Record (CLEAR)

Support identification of relevant lessons learned (LLs) and best practices (BPs), to leverage past successes and errors to deliver projects more efficiently. Value Management Office (VMO) maintains the CLEAR database, which contains Department wide LLs and BPs.

References

- ☐ Value Management Office
- ☐ CLEAR Program

Deliverables

Deliverable	Task	Responsible Party	
		Activity Leader / Project Lead	Additional Support
CLEAR Database Search	▪ *Search and Share Relevant LL and BP (CLEAR Database Search) with Project Team*	X	Value Management Office Program Manager

[A] *Indicates that final document(s) or data set(s) must be uploaded to the ATLAS Workbench.*

Search and Share Relevant BP and LL (CLEAR Database Search) with Project Team

VMO maintains the Communicate Lessons, Exchange Advice, Record (CLEAR) database (internal Knowledge Management tool), which contains lessons learned (LL) and best practices (BP) from across the Department. VMO provides support for searching the database, as well as connecting users to experts that provide input to find solutions and vet ideas.

The Project Lead and technical leads/Units can identify key words from the initial project documents (Project Initiation Form, Feasibility Study, etc.) and search the CLEAR portal to identify relevant LL and BP in order to leverage past successes and errors to deliver the project more efficiently. The outcomes of the search are then reviewed and vetted for applicability. Additional searches based on project location, type, and areas of concern by discipline are performed as needed. The ultimate goal is to produce a better Project Scoping Report; not limited to a better and safer project, but a more design-friendly scope.

2VM1 Complete Value Management Activities

Building off the work started in Stage 1, ensure Value Management Activities are continuing forward. The specific efforts of this activity are separated into the following sub-activities.

Task details and deliverables for these sub-activities are found in the corresponding sections below.

Overview: Constructability Review (CR)

Support review of constructability considerations as part of project design development.

References

- ☐ Value Management Office
- ☐ Constructability Review Program
  - *Constructability Review Checklist*
- ☐ ArcGIS STIP and NHS Maps
- ☐ Project Management & Delivery
  - *Project Management Guide*

Deliverables

Deliverable	Task	Responsible Party	
		Activity Leader	Additional Support
Constructability Review Checklist	▪ *Complete Constructability Review Checklist*	Project Manager	▪ Division Construction Engineer ▪ Area Construction Engineer ▪ Value Management Office
Constructability Review Minutes/CR Log [A]	▪ *Complete Constructability Review*	Value Management Office Program Manager	

[A] *Indicates that final document(s) or data set(s) must be uploaded to the ATLAS Workbench.*

Complete Constructability Review Checklist

In accordance with the *Project Management Guide* and *Value Management Guidelines*, the Project Manager, in collaboration with the Roadway Design Lead or another assigned technical disciplines/Units, evaluates the project using the list of constructability considerations provided in the *Constructability Review Checklist*. The Checklist is completed (all items assessed) by the end of this stage to make sure the project team has considered constructability issues as the design progresses. As construction issues/risks are identified and documented, the Project Manager or Roadway Design Lead is to contact the respective Division Construction Engineer (DCE) or Area Construction Engineer (ACE) to consult on their construction knowledge, methodology, and experience. VMO provides support as needed. The CR Checklist is to be uploaded to the Value Management Library in the Project SharePoint site under the topic of Constructability Review.

Complete Constructability Review

Following a discussion with the DCE or ACE, the Project Manager in collaboration with the Roadway Design Lead or other technical disciplines/Units, may contact the Value Management Office (VMO) to set up a formal or informal Constructability Review (CR) in accordance with the *Value Management Guidelines* and the *Project Management Guide*. Any member of the project team can alert the Project Manager of the need for a Constructability Review based on aspects of their technical discipline.

A CR can help improve the design to include the impacts to construction. By assessing construction impacts early, consideration for the environmental permits can help mitigate the risk of a permit modification later in the process. Additionally, ROW, Utility, and easement impacts can be reviewed more completely. If a CR is deemed necessary, a log with suggested design implementations (CR Log) and general notes is documented during the review then distributed as meeting minutes to the attendees, including the Project Manager, and are referenced throughout project development. The CR Log is to be uploaded to the Project Site in the Value Management Library under the topic Constructability Review by the VMO Program Engineer. From there, the Project Manager works with all applicable technical disciplines/Unit leads to address constructability issues as review comments and recommendations are addressed within the project's design documents and permit documents, if necessary.

(*Back to activity overview*)

Overview: Risk Management (RM)

Support identification or further assessment of potential issues (e.g., risks) that could jeopardize project delivery, including impacts to project scope, schedule, and budget goals.

References

- ☐ Value Management Office
- ☐ Risk Management Program
  - *Risk Management Guide*
  - *Risk Assessment Worksheet (RAW)*
  - *How to use the Online RAW*
  - *Risk Examples and Mitigation Strategies*
- ☐ ArcGIS STIP and NHS Maps
- ☐ Project Management & Delivery
  - *Project Management Guide*

Deliverables

Deliverable	Task	Responsible Party	
		Activity Leader	Additional Support
Risk Assessment Worksheet	▪ *Update Risk Assessment Worksheet and Hold Risk Assessment Study*	Project Manager	▪ Value Management Office Program Manager ▪ Project Team
Risk Assessment Study [A]		Value Management Office Program Manager	Project Manager

[A] *Indicates that final document(s) or data set(s) must be uploaded to the ATLAS Workbench.*

Update Risk Assessment Worksheet and Hold Risk Assessment Study

The Project Manager, with support from the VMO Program Manager (if needed), continues risk management review to identify potential issues that could jeopardize project delivery. Per the *Risk Management Guide* and the *Project Management Guide*, the Project Manager begins this step by identifying additional risks not captured in the Project Scoping Report on the *Risk Assessment Worksheet (RAW)*. If a Connect Preconstruction Project Site has been created for the project, the Project Manager should enter risks into the Online RAW linked from the project's Preconstruction Dashboard. This RAW is intended to be a living list that follows that project throughout its lifecycle. If the project has a substantial change, it is beneficial to review the RAW and determine if the change elevates or diminishes project risks. The Project Manager initiates the review. If the risk review reveals potential fatal flaws, the project is reassessed with support from applicable technical disciplines/Units before a substantial part of the budget is spent. All project team members can contribute to the online RAW. VMO provides support as needed.

While a Risk Assessment Study is not required for every project, based on the severity of the risks, a Risk Assessment Study may be necessary to provide greater assurance that a project can maintain its scope, schedule, and budget goals. Therefore, the Project Manager is to coordinate with the VMO to determine if a Risk Assessment Study is appropriate.

During this stage, the VMO supports the Project Manager by providing guidance for the *Risk Assessment Worksheet (RAW)* and/or facilitating a Risk Assessment Study in accordance with the *Value Management*

Guidelines and the *Project Management Guide*. If a Risk Assessment Study is deemed necessary, the VMO Program Manager:

- Gathers a team of experts from the applicable technical disciplines/Units.
- Facilitates the development of the Risk Response Strategy.
- Develops an Implementation Plan.

From there, the Project Manager continually monitors and controls the identified project risks following the process and procedures detailed in the *Risk Management Guidelines* and the *Project Management Guide*. Of note, as the project moves forward, the Project Manager and team should be aware that different risks may be encountered from one stage to the next, which is why it is critical to engage the various technical disciplines/Units when identifying and documenting risks related to each stage of delivery. The RAW is to be uploaded into the Value Management Library of the Project SharePoint site under the Risk Assessment Topic.

(Back to activity overview)

Overview: Value Engineering (VE)

When applicable for the project, complete the VE Study for state or federal projects that meet or exceed established VE Study thresholds.

References

- ☐ Value Management Office
- ☐ Value Engineering Program
  - *Value Engineering Schedule*
- ☐ ArcGIS STIP and NHS Maps
- ☐ Project Management & Delivery
  - *Project Management Guide*

Deliverables

Deliverable	Task	Responsible Party	
		Activity Leader	Additional Support
Value Engineering (VE) Report [A]	▪ *Hold Value Engineering Study and Review Report*	Value Management Office Program Manager	
Value Engineering (VE) Recommendations		Value Management Office Program Manager	
Final Dispositions (Responses to recommendations)		Project Manager or Other Technical Disciplines/Units	Value Management Office Program Manager

[A] *Indicates that final document(s) or data set(s) must be uploaded to the ATLAS Workbench.*

Hold Value Engineering Study and Review Report

As outlined in the Initiate Value Management Activities step (1VM1), the Project Manager notifies VMO for state or federal projects that are on the National Highway System (NHS) and have a total estimate of $30 million or more. The total estimate includes the costs for preliminary engineering, utilities, right-of-way acquisition, and construction. If unsure if a project is on or intersects an NHS route, contact VMO for clarification. A schedule of upcoming VE studies will be developed and distributed by the VMO Program Manager.

The VE Study is scheduled as early as possible after notice to proceed (NTP) to maximize the opportunity to include recommendations in the Design Recommendation Plan Set. The VE Study is conducted pursuant to FHWA guidance, where a multi-discipline team not currently involved with the project provides ideas for cost and process improvements. The VE Study requires initial input from the project team but is completed by the VMO (or VMO-selected firm) in accordance with the *Value Management Guidelines*.

After the VE Study, the VMO (or VMO-selected firm) prepares the VE Report and VE recommendations, following the guidance defined in the *Value Management Guidelines*. Once prepared, the VE Report is submitted to the Project Manager to review with support from all applicable technical disciplines/Unit leads, and final dispositions (responses to recommendations) are returned to the VMO. These documents are to be uploaded to the Project SharePoint site in the Value Management Library under the Value Engineering Topic.

The VMO records the dispositions in the VE Program Action Register, and the Project Manager works with all applicable technical disciplines/Units to implement the accepted recommendations into the project's design documents and permitting documents.

Revisit VE Threshold Requirements (As Needed)

As a project progresses from one stage to the next, changes (to scope, total project cost, schedule, or the project delivery method) may impact if a VE Study is required and the timing of when a VE Study is held. The Project Manager shall review the VE Study schedule and notify VMO if a project requiring a VE Study is missing from the schedule as well as if there is a **major change that triggers a required VE Study**, such as changes to a project's scope, total project cost, schedule, or the project delivery method.

(Back to activity overview)

Overview: Communicate Lessons, Exchange Advice, Record (CLEAR)

Support identification of relevant lessons learned (LL) and best practices (BP) to leverage past successes and errors to deliver projects more efficiently. Value Management Office (VMO) maintains the CLEAR database, which contains Department wide LLs and BPs.

References

- ☐ Value Management Office
- ☐ CLEAR Program
  - ○ *Lessons Learned Submission Form (External)*

Deliverables

Deliverable	Task	Responsible Party	
		Activity Leader	Additional Support
CLEAR Database Search	▪ *Conduct CLEAR Activities*	Project Manager or Other Technical Disciplines/Units	Value Management Office Program Manager

Conduct CLEAR Activities

VMO maintains the Communicate Lessons, Exchange Advice, Record (CLEAR) database (internal Knowledge Management tool), which contains lessons learned (LL) and best practices (BP) from across the Department. VMO provides support for searching the database as well as connecting users to experts that provide input to find solutions and vet ideas.

The Project Manager and technical leads/Units identify key words from the Project Scoping Report and search the CLEAR portal to identify relevant LL and BP in order to leverage past successes and errors to deliver the project more efficiently. The outcomes of the search are then reviewed and vetted for applicability. Additional searches based on project location, type, and areas of concern by discipline are performed as needed. The ultimate goal is to produce better design documents; not limited to a better and safer design, but a more comprehensive biddable contract, (i.e., more contractor-friendly bid package).

Any LL or BP developed during any CR-RAVE activities (any ideas, recommendations, and solutions) should be submitted into the CLEAR portal so other Project Teams can leverage successes and errors to deliver other projects more efficiently. LL and BPs should include any ideas, recommendations and solutions generated during CR-RAVE activities. These submissions can include everything from communication to improved designed documents, guidelines and standards and are not limited to better and safer designs but also more Contractor-friendly bid packages.

External consultants (PEFs) can submit any ideas, recommendations, and solutions through the form found here: Lessons Learned Submission Form.

3VM1 Incorporate Value Management Activities

As applicable, ensure outcomes Value Management activities are incorporated into the design. Additionally, ensure Communicate Lessons, Exchange Advice, Record (CLEAR) activities continue. The specific efforts of this activity are separated into the following sub-activities.

Task details and deliverables for these sub-activities are found in the corresponding sections below.

Overview: Constructability Review (CR)

Continue to support review of constructability considerations as part of project design development.

References

- ☐ Value Management Office
- ☐ Constructability Review Program
  - *Constructability Review Checklist*
- ☐ ArcGIS STIP and NHS Maps
- ☐ Project Management & Delivery
  - *Project Management Guide*

Deliverables

Deliverable	Task	Responsible Party	
		Activity Leader	Additional Support
Constructability Review Checklist	▪ *Incorporate Constructability Review Outcome*	Project Manager	▪ Division Construction Engineer ▪ Area Construction Engineer ▪ Value Management Office
Constructability Review Minutes/CR Log [A]	▪ *Complete Constructability Review (if needed)*	Value Management Office Program Manager	

[A] *Indicates that final document(s) or data set(s) must be uploaded to the ATLAS Workbench.*

Incorporate Constructability Review Outcome

In accordance with the *Project Management Guide* and *Value Management Guidelines*, the Project Manager, in collaboration with the Roadway Design Lead or other technical disciplines/Units, continues to review/reference the list of constructability considerations assessed in the Constructability Review Checklist, as well as the CR Log and meeting minutes from the Constructability Review (if one was held). The Project Manager continues to work with all applicable technical disciplines/Unit leads to address constructability issues by updating the project's design documents and permit documents, if necessary. If any additional construction impacts arise, the Division Construction Engineer (DCE) or Area Construction Engineer (ACE) are contacted to optimize use of construction knowledge, methodology, and experience. VMO provides support as needed.

Complete Constructability Review (if needed)

As construction issues/risks are further identified or carried forward from previous assessments or reviews, the Project Manager or Roadway Design Lead is to contact the respective Division Construction Engineer (DCE) or Area Construction Engineer (ACE) to consult on their construction knowledge, methodology, and experience. Following a discussion with the DCE or ACE, the Project Manager, in collaboration with the Roadway Design Lead or other assigned technical disciplines/Units, may contact the Value Management Office (VMO) to set up a formal or informal/internal Constructability Review (CR) whether one had been held during an earlier stage since multiple CRs can occur as the design develops.

(*Back to activity overview*)

Overview: Risk Management (RM)

Continue to support identification of potential issues (e.g., risks) that could jeopardize project delivery, including impacts to project scope, schedule, and budget goals.

References

- ☐ Value Management Office
- ☐ Risk Management Program
  - *Risk Management Guide*
  - *Risk Assessment Worksheet (RAW)*
  - *How to use the Online RAW*
  - *Risk Examples and Mitigation Strategies*
- ☐ ArcGIS STIP and NHS Maps
- ☐ Project Management & Delivery
  - *Project Management Guide*

Deliverables

Deliverable	Task	Responsible Party	
		Activity Leader	Additional Support
Risk Assessment Worksheet	▪ *Update and Monitor Risk Assessment Worksheet and implement mitigation strategies*	Project Manager	Value Management Office Program Manager
Risk Assessment Study Report [A]		Project Team	Project Manager

[A] *Indicates that final document(s) or data set(s) must be uploaded to the ATLAS Workbench.*

Update and Monitor Risk Assessment Worksheet

The Project Manager, with support from the VMO Program Manager (if needed), continually revises the risk register and references the Risk Assessment Study Report (if a Study occurred) to continue to monitor and control project risks, all following the process and procedures detailed in the *Risk Management Guide* and the *Project Management Guide*. Whether using the Excel version or the Online RAW, it is intended that the RAW is a living document that tracks project risks throughout the project lifecycle. The Online RAW can be accessed from the project's Connect Preconstruction site and the related Preconstruction Dashboard. Of note, as the project moves forward, the Project Manager and team should be aware that different risks may be encountered from one stage to the next, which is why it is critical to engage the various technical disciplines/Units when identifying and documenting risks related to each stage of delivery.

Complete Risk Assessment Study (if needed)

Based on project scope and risk assessment data, the Project Manager may request an additional Risk Assessment Study from the VMO, which is completed following the process defined in the *Value Management Guidelines*.

(*Back to activity overview*)

Overview: Value Engineering (VE)

If a VE Study was held, incorporate accepted recommendations into the project's design if not already accomplished before the Design Recommendation Plan Set.

References

- ☐ Value Management Office
- ☐ Value Engineering Program
  - *Value Engineering Schedule*
- ☐ ArcGIS STIP and NHS Maps
- ☐ Project Management & Delivery
  - *Project Management Guide*

Deliverables

Deliverable	Task	Responsible Party	
		Activity Leader	Additional Support
Value Engineering Report (including VE recommendation Forms) [A]	▪ *Implement Value Engineering Recommendations*	Value Management Office Program Manager	

[A] *Indicates that final document(s) or data set(s) must be uploaded to the ATLAS Workbench.*

Implement Value Engineering Recommendations

If a VE Study was held, the Project Manager ensures the VE Report (prepared by VMO) was reviewed with support from all applicable technical disciplines/Units leads and final dispositions (responses to recommendations) were returned to the VMO Program Manager.

The Project Manager continues to work with all applicable technical disciplines/Unit leads as the accepted recommendations are incorporated into the project's design documents, updating permit documents if necessary. A final audit of the design (called an Implementation Check) is to be completed before the project is allowed to be advertised per federal guidelines. Project Managers are to coordinate with VMO for the Implementation Check if not completed before project moves to the 13 month Let List.

Revisit VE Threshold Requirements (if needed)

As a project progresses from one stage to the next, changes (to scope, total project cost, schedule, or the project delivery method) may impact if a VE Study is required per the thresholds listed in 1VM1. Changes may also impact the timing of when a VE Study is held. The Project Manager reviews the VE Study schedule and notifies VMO if a project requiring a VE Study is missing from the schedule as well as if there is a major change to a project's scope, total project cost, schedule, or the project delivery method that would warrant a study.

(Back to activity overview)

Overview: Communicate Lessons, Exchange Advice, Record (CLEAR)

Support identification of relevant lessons learned (LL) and best practices (BP) to leverage past successes and errors to deliver projects more efficiently. Value Management Office (VMO) maintains the CLEAR database, which contains Department wide LLs and BPs.

References

- ☐ Value Management Office
- ☐ CLEAR Program
  - ○ *Lessons Learned Submission Form (External)*

Deliverables

Deliverable	Task	Responsible Party	
		Activity Leader	Additional Support
CLEAR Database Submission	▪ *Submit LL and BP from Project Design and Development (CLEAR Submissions)*	Project Manager or Other technical disciplines/Units	Value Management Office Program Manager

[A] *Indicates that final document(s) or data set(s) must be uploaded to the ATLAS Workbench.*

Submit LL and BP from Project Design and Development (CLEAR Submissions)

The Project Manager (or assigned NCDOT employee) continues to identify any lessons learned (LL) and best practices (BP) to submit into the CLEAR portal (by a NCDOT employee) so other Project Managers and applicable technical disciplines/Units can leverage successes and errors to deliver other projects more efficiently.

External consultants (PEFs) can submit submission through the form found here: Lessons Learned Submission Form.

4VM1 Complete Value Management Activities

As applicable, ensure outcomes from Value Management activities are incorporated into the design. Additionally, ensure Communicate Lessons, Exchange Advice, Record (CLEAR) activities continue. The specific efforts of this activity are separated into the following sub-activities.

Task details and deliverables for these sub-activities are found in the corresponding sections below.

Overview: Constructability Review (CR)

Support review of constructability considerations as part of final plan development.

References

- ☐ Value Management Office
- ☐ Constructability Review Program
  - *Constructability Review Checklist*
- ☐ ArcGIS STIP and NHS Maps
- ☐ Project Management & Delivery
  - *Project Management Guide*

Deliverables

Deliverable	Task	Responsible Party	
		Activity Leader	Additional Support
Constructability Review Minutes/CR Log [A]	▪ *Complete Constructability Review Implementation Check* ▪ *Complete Constructability Review (if needed)*	Value Management Office Program Manager	

[A] *Indicates that final document(s) or data set(s) must be uploaded to the ATLAS Workbench.*

Complete Constructability Review Implementation Check

In accordance with the *Project Management Guide* and *Value Management Guidelines*, the Project Manager, in collaboration with the Roadway Design Lead or other technical disciplines/Units, reviews the list of constructability considerations assessed in the Constructability Review Checklist, as well as the CR Log and meeting minutes from the Constructability Review (if one was held) to make sure constructability issues have been addressed in the design package. If a Constructability Review was held, the action item log (located in the Value Management Library on the Project SharePoint site) should be updated to confirm which items have been implemented and noting reasons for any items that were not.

Complete Constructability Review (if needed)

As construction issues/risks are further identified or carried forward from previous assessments or reviews, the Project Manager or Roadway Design Lead is to contact the respective Division Construction Engineer (DCE) or Area Construction Engineer (ACE) to consult on their construction knowledge,

methodology, and experience. Following a discussion with the DCE or ACE, the Project Manager may contact the VMO to set up a formal or informal/internal Constructability Review (CR) regardless of if one had been held during an earlier stage since multiple CRs can occur as the design develops.

(*Back to activity overview*)

Overview: Risk Management (RM)

Continue to support identification of potential issues (e.g., risks) that could jeopardize project delivery, including impacts to project scope, schedule, and budget goals.

References

- ☐ Value Management Office
- ☐ Risk Management Program
  - *Risk Management Guide*
  - *Risk Assessment Worksheet (RAW)*
  - *How to use the Online RAW*
  - *Risk Examples and Mitigation Strategies*
- ☐ ArcGIS STIP and NHS Maps
- ☐ Project Management & Delivery
  - *Project Management Guide*

Deliverables

Deliverable	Task	Responsible Party	
		Activity Leader	Additional Support
Risk Assessment Worksheet	▪ *Update and Monitor Risk Assessment Worksheet*	Project Manager	Value Management Office Program Manager

Update and Monitor Risk Assessment Worksheet

The Project Manager, with support as needed from the VMO Program Manager, continually revises the RAW (as needed), and references the Risk Assessment Study Report to continue to monitor and control project risks, all following the process and procedures detailed in the *Risk Management Guide* and the *Project Management Guide*.

Complete Risk Assessment Study (if needed)

Based on project scope and risk assessment data, the Project Manager may request an additional Risk Assessment Study from the Value Management Office (VMO), which is completed following the process defined in the *Value Management Guidelines.*

(*Back to activity overview*)

Overview: Value Engineering (VE)

If a VE Study was held, confirm implementation of accepted recommendations.

References

- ☐ Value Management Office
- ☐ Value Engineering Program
  - *Value Engineering Schedule*
- ☐ ArcGIS STIP and NHS Maps
- ☐ Project Management & Delivery
  - *Project Management Guide*

Deliverables

Deliverable	Task	Responsible Party	
		Activity Leader	Additional Support
Value Engineering (VE) Study Report [A]	▪ *Complete Value Engineering Recommendation Implementation Check*	Value Management Office Program Manager	

[A] *Indicates that final document(s) or data set(s) must be uploaded to the ATLAS Workbench.*

Complete Value Engineering Recommendation Implementation Check

If a VE Study was held, the Project Manager confirms implementation of accepted recommendations, which is verified by VMO per FHWA requirements on the recommendation forms located in the Value Management Library on the Project SharePoint site. This step is the Implementation Check and completes the Value Engineering Study. Implementation Checks are held before the project is added to the 13 month Let List as federal guidelines do not permit projects to be advertised without a finalized Implementation Check for the VE Study.

Revisit VE Threshold Requirements (if needed)

After Stage 3, projects should not require a VE Study as designs are substantially complete. If the project scope and design is modified at this stage, however, a VE Study may be required. Project Managers should contact VMO if a project scope changes at this stage and the project estimate escalates past $30M in total cost. The VMO Program Manager determines if the project meets the thresholds requiring a VE Study.

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Overview: Communicate Lessons, Exchange Advice, Record (CLEAR)

Support identification of relevant lessons learned (LL) and best practices (BP) to leverage past successes and errors to deliver projects more efficiently. Value Management Office (VMO) maintains the CLEAR database, which contains Department wide LLs and BPs.

References

- ☐ Value Management Office
- ☐ CLEAR Program
  - ○ *Lessons Learned Submission Form (External)*

Deliverables

Deliverable	Task	Responsible Party	
		Activity Leader	Additional Support
CLEAR Database Submissions	▪ *Submit LL and BP from Project Design and Development (CLEAR Submissions)*	Project Manager or Other Technical Disciplines/Units	Value Management Office Program Manager

[A] *Indicates that final document(s) or data set(s) must be uploaded to the ATLAS Workbench.*

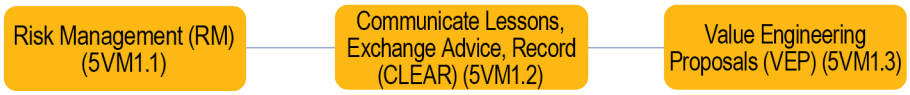
Submit LL and BP from Project Design and Development (CLEAR Submissions)

The Project Manager (or assigned NCDOT employee) continues to identify any lessons learned (LLs) and best practices (BPs) to submit into the CLEAR portal (by an NCDOT employee) so other Project Managers and applicable technical disciplines/Units can leverage successes and errors to deliver other projects more efficiently.

External NCDOT personnel can submit submission through the form found here: Lessons Learned Submission Form.

5VM1 Value Management Construction Support

As applicable, ensure outcomes from Value Management activities are incorporated during construction. Additionally, ensure Communicate Lessons, Exchange Advice, Record (CLEAR) activities continue. Complete Value Engineering Proposal activities if necessary. The specific efforts of this activity are separated into the following sub-activities.



Task details and deliverables for these sub-activities are found in the corresponding sections below.

Overview: Risk Management (RM)

Continue to support identification of potential issues (e.g., risks) that could jeopardize project delivery, including impacts to project scope, schedule, and budget goals.

References

- ☐ Value Management Office
- ☐ Risk Management Program
  - *Risk Management Guide*
  - *Risk Assessment Worksheet*
  - *Risk Examples and Mitigation Strategies*
- ☐ Project Management & Delivery
  - *Project Management Guide*

Deliverables

Deliverable	Task	Responsible Party	
		Activity Leader	Additional Support
Risk Assessment Worksheet	▪ *Update and Monitor Risk Assessment Worksheet*	Project Manager/ Resident Engineer	Value Management Office Program Manager

Update and Monitor Risk Assessment Worksheet

The Project Manager and Resident Engineer, with support as needed from the VMO Program Manager, continually revise the RAW (as needed) and reference the Risk Assessment Study Report (if a study occurred) to continue to monitor and control project risks. Be sure to follow the process and procedures detailed in the *Risk Management Guide* and the *Project Management Guide*. Resident Engineers should be able to view risks entered into the Online RAW on the project's Preconstruction project site from the related Preconstruction Dashboard.

(Back to activity overview)

Overview: Communicate Lessons, Exchange Advice, Record (CLEAR)

Support identification of relevant lessons learned (LL) and best practices (BP) to leverage past successes and errors to deliver projects more efficiently. Value Management Office (VMO) maintains the CLEAR database, which contains Department wide LLs and BPs.

References

- ☐ Value Management Office
- ☐ CLEAR Program
  - *Lessons Learned Submission Form (External)*

Deliverables

Deliverable	Task	Responsible Party	
		Activity Leader	Additional Support
CLEAR Database Submissions	▪ *Submit LL and BP from throughout Project Design and Development (CLEAR Submissions)*	Division Personnel	Value Management Office Program Manager

Submit LL and BP during Construction (CLEAR Submissions)

VMO maintains the Communicate Lessons, Exchange Advice, Record (CLEAR) database (internal Knowledge Management tool), which contains lessons learned (LL) and best practices (BP) from across the Department. VMO provides support for submitting to the database as well as coordinating review by experts that provide input and vet ideas.

All NCDOT Employees can identify any lessons learned (LL) and best practices (BP) to submit into the CLEAR portal (by an NCDOT employee) so others can leverage successes and errors to deliver other projects more efficiently. These submissions can include everything from communication to improved designed documents and are not limited to better and safer designs, but also more contractor-friendly bid packages.

External NCDOT personnel can submit submission through the form found here: Lessons Learned Submission Form.

(*Back to activity overview*)

Overview: Value Engineering Proposal (VEP)

Support construction contractors in the development of Value Engineering Change Proposals that could result in cost or time savings without impairing the essential project functions or characteristics.

References

- ☐ Value Management Office
- ☐ Value Engineering Proposal Program
- ☐ Standard Specifications for Roads and Structures
- ☐ Construction Manual

Deliverables

Deliverable	Task	Responsible Party	
		Activity Leader	Additional Support
Value Engineering Proposal Memo	▪ *Compile Value Engineering Proposal Memo*	Value Management Office Program Manager	▪ CCU ▪ Technical Disciplines/Units, ▪ Resident Engineer

Compile Value Engineering Proposal Memo

The purpose of the Value Engineering Proposal Program (VEPP) is to encourage contractors to develop Value Engineering ideas by utilizing their design and construction ingenuity, experience, and background. A Value Engineering Change Proposal (VEP) is a post-award proposal made by the construction contractor which includes any changes to work that may potentially result in cost or time savings, without impairing essential functions and characteristics of the project, such as: service life, safety, reliability, economy of operation, ease of maintenance, desired aesthetics, design, standardized features, and environmental.

A contractor can submit a Value Engineering Proposal to the VMO at any time during construction. These proposals are to follow the guidelines in the *Standard Specifications for Roads and Structures* and *Construction Manual*. The Contractor submits a conceptual proposal shown through sketches, mark-ups on existing plan sheets, a short description, and breakdown of costs associated with the proposal. The VMO sends the preliminary submittal for review to the Resident Engineer, Technical Disciplines, and Project Manager. The Department uses the Preliminary Submittal to review the merit of the conceptual proposal prior to the Contractor spending time and money developing a more detailed Final Proposal.

Upon the approval of the preliminary review, the contractor submits a final proposal. The initial Proposal must include design calculations, contract plan sheet modifications, contract document changes, and a cost savings estimate based on contract line items, all at the Contractor's expense. VMO sends the final proposal to the Resident Engineer, Technical Disciplines, and Project Manager for review. Once the review is completed and a final decision made, the VMO prepares the Value Engineering Proposal memo, which is sent to the Resident Engineer to share with the contractor. The Resident Engineer is responsible for execution of any necessary Supplemental Agreements.

5VM2 Post Construction Assessment

Overview

The Post Construction Assessment brings together the design team, NCDOT personnel, and contractors to review lessons learned and best practices related to the construction of these projects to improve delivery of future projects.

References

- ☐ Value Management Office
- ☐ CLEAR Program
  - *Post Construction Assessments (PCAs)*
  - *Lessons Learned Submission Form (External)*

Deliverables

Deliverable	Task	Responsible Party	
		Activity Leader	Additional Support
Post Construction Assessment Summary	▪ *Project Selection* ▪ *Post Construction Assessment Pre-Meeting*	Value Management Office Program Manager	Project Team
CLEAR Database Submissions	▪ *Submit Lessons Learned and Best Practices*	Division Personnel	Value Management Office Program Manager

Project Selection

Projects that should have a Post Construction Assessment can be identified by any member of the Project Team. The Project Team should inform the VMO as soon as they have determined that the project benefits from a Post Construction Assessment at the completion of the project.

Post Construction Assessment Pre-Meeting

The Value Management and internal Project Team define the topics that should be covered during the Post Construction Assessment. Topics should be focused on areas to capture lessons learned and best practices. Additionally, the group ensures all the right internal and external stakeholders are invited to make the assessment complete.

Submit Lessons Learned and Best Practices

Following the Post Construction Assessment, the lessons learned, and best practices generated from the discussion are submitted into the CLEAR database and routed to experts for vetting and implementation.