



DISCIPLINE LEGEND

Communication Group (CG)	Environmental Analysis (EN)	Feasibility Studies (FS)	Hydraulics (HY)	Location & Surveys (LS)	Photogrammetry (PH)	Roadway (RD)	Railroad (RR)	Signing & Delineation (SD)	State Transportation Improvement Program (SI)	Signal System Timing Operations (SS)	Traffic Management (TM)	Transportation Planning (TP)	Utility Coordination & Design (UT)
Contract Standards & Development (CS)	Environmental Policy (EP)	Geotechnical (GT)	Integrated Mobility (IM)	Pavement Design (PD)	Public Involvement (PI)	Roadside Environmental (RE)	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)

Stage 5*
*See respective Stage 5 activities throughout the PDN.

1CS1 Prepare Conceptual Construction ~~Estimate~~ Cost Estimates

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](#)
- [Preliminary Estimate Request Form](#)
- [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 <u>Cost</u> 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	✗	<u>X</u>

^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 \$15 million and under).
- Submits the conceptual design stage quantities for each alternative/alignment on the [Preliminary 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 [Preliminary Construction Cost Estimate Request](#) 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 due to 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 [Preliminary Construction Cost Estimate Request](#) 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 1FS3 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 Construction Cost Estimates (Optional)

Overview

Develop the construction cost estimates for the Alignment Defined Stage, occurring just prior to the Field Inspection Review Meeting.

References

- [Contract Standards and Development Procedures Manual](#)
- [Conceptual Construction Cost Estimation Guidelines](#)
- [Preliminary Estimate Request Form](#)
- [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	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 \$15 million and under) on the [Preliminary 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 Inspection Construction Cost Estimates

Overview

Develop the construction cost estimates for the Alignment Defined Stage, 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

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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 Plan-in-Hand (13 Month Let List) Construction Cost Estimates

Overview

Develop Construction Cost Estimates for the Plan-in-Hand Stage, occurring just prior to the Plan-in-Hand Review Meeting.

References

- [Contract Standards and Development Procedures Manual](#)
- [Conceptual Construction Cost Estimation Guidelines](#)
- [Preliminary Estimate Request Form](#)
- [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)
Plan-In-Hand (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

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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 \$15 million and under) on the ~~Preliminary~~Plan-in-Hand (13 Month Let List) Construction Cost Estimate Request Form. The ~~estimator~~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.

Request 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*.

Attend 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 Purpose & Need as well as the initial Study Area.

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.

~~1FS1 Conduct Candidate Project Analysis~~

~~Overview~~

~~Assess the Proposed Regional Transportation System Improvements design concepts, scopes, and estimated costs conducting additional studies (if needed) and develop the preliminary prioritization candidate project list.~~

~~**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 “1FS1 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~~

- ~~☐ [Candidate Project: Systems Planning to Programming Flow Chart \(In-development\)](#)~~
- ~~☐ [Candidate Project Screening Tools \(In-development\)](#)~~
- ~~☐ [Candidate Project Guidance \(In-development\)](#)~~
- ~~☐ [NCDOT Quality Management Program: Quality Control and Quality Assurance](#)~~

~~Deliverables~~

Deliverable	Task	Activity Leader	Responsible Party
			Additional Support
Project Key Contact Sheet	* Evaluate Candidate Project Scope and Costs	Project Sponsors (MPO, RPO, Highway Divisions)	<ul style="list-style-type: none"> ▪ Transportation Planning Division ▪ Division Corridor Development Engineer ▪ Division Planning Engineer ▪ Corridor Development Unit/Feasibility Studies Unit
Corridor/Feasibility/Planning and Environmental Linkage (PEL) Study²	* Compile Corridor/Feasibility/Planning and Environmental Linkage (PEL) Studies	Feasibility Studies Unit/Corridor Development Unit	<ul style="list-style-type: none"> ▪ Transportation Planning Division ▪ Division Corridor Development Engineer ▪ Division Planning Engineer ▪ Project Sponsors (MPO, RPO, Highway Divisions) ▪ Transportation Planning Division ▪ Division Corridor Development Engineer ▪ Division Planning Engineer
Preliminary Prioritization Candidate Project List	* Develop and Submit Preliminary Prioritization Candidate Project List	Project Sponsors (MPO, RPO, Highway Divisions)	<ul style="list-style-type: none"> ▪ Corridor Development Unit/Feasibility Studies Unit ▪ State Transportation Improvement Program Unit ▪ Strategic Prioritization Office of Transportation

²~~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 Proposed Regional Transportation System Improvements~~

~~It is anticipated that Proposed Regional Transportation System Improvements (from Comprehensive Transportation Plans, Metropolitan Transportation Plans, etc.) are provided to the Project Sponsors for consideration of candidate projects. These proposed system improvements, along with other identified potential projects, are evaluated to determine if there is a need to refine the design, concept, scope, and cost of the potential improvement as shown below.~~

~~Evaluate Candidate Project Scope and Costs~~

~~An assessment of proposed regional transportation system improvement's design, concept, scope, and estimated cost is completed to determine if additional work is needed to update/refine these elements. If additional work is needed, then the Project Sponsor can work with their partners to better define the proposed improvement and its associated costs. This additional work could include simple refinements or full corridor/feasibility/PEL studies. The benefit of this early assessment and potential additional work is to avoid advancement of projects through the Candidate Project process that have serious challenges in terms of buildability, permitting, or excessive, anticipated costs.~~

~~As part of this evaluation, a Project Key Contact Sheet for each project is developed identifying key agencies and individuals who have been or should be engaged in advancing the project through the project's various phases.~~

~~Compile Corridor/Feasibility/Planning and Environmental Linkage (PEL) Studies~~

~~For any candidate project where it is identified that a full corridor/feasibility/PEL study is warranted, the Feasibility Studies/Corridor Development Units (FSU/CDU) can assist in the development of these studies. This effort occurs outside the normal Project Delivery Network process. The Feasibility Studies/Corridor Development Unit can provide any information on completed Systems Planning, Feasibility, or Corridor Studies to the Corridor Development Engineer, MPO/RPOs, or Highway Division staff for their use in developing candidate projects. Responses to these requests are anticipated to take five business days from receipt.~~

~~The Feasibility Studies/Corridor Development Unit is available to assist as the project is being evaluated prior to development of Express Designs as needed (see 1FS2 for related information).~~

~~Develop and Submit Preliminary Prioritization Candidate Project List~~

~~Understanding that long-range transportation planning identifies more system improvements than can be implemented during the time span of NCDOT's current work programs, a Preliminary Prioritization Candidate Project List of those system improvement projects seen by the Project Sponsors as being the highest priority to address key long-range transportation plan objectives are encouraged to be developed and submitted to the Feasibility Studies/Corridor Development Units.~~

~~Working with the NCDOT business units and other stakeholders, Project Sponsors develop their own criteria for defining their highest priority projects. The benefit of this step is to provide a list of potential SPOT submittals to the FSU/CDU so they can begin preparing their workload to address potential Express Design assignments (as shown in 1FS2).~~

~~Complete QC/QA Procedures~~

~~The Feasibility Studies Unit/Corridor Development Unit 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.~~

~~1FS2~~ ~~1FS1~~ Complete Express Design

Overview

As the first in-take of projects from Project Sponsors (Metropolitan Planning Organizations (MPOs), Rural Planning Organizations (RPOs), and Highway Division offices), produce a consistent and reliable description of projects that includes a cost estimate, purpose and need statement, and high-level environmental screening.

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References

- [Express Design Project Scoping Report Process](#)
- [Candidate Project: Systems Planning to Programming Flow Chart \(In development\)](#)
- [Candidate Project Screening Tools \(In development\)](#)
- [Candidate Project Guidance \(In development\)](#)
- [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	<ul style="list-style-type: none"> ▪ Complete Pre-Prioritization Design Concept & Scope Sufficiency Form 	Project Sponsors (MPOs, RPOs, Highway Divisions)	<ul style="list-style-type: none"> ▪ Project Lead ▪ Division Planning Engineer ▪ Transportation Planning Division
Express Design Evaluation Package (Cost Estimate only or Full Express Design) ^{A, Q}	<ul style="list-style-type: none"> ▪ Conduct Express Design Evaluation (Cost Estimate only or Full Express Design) ▪ Finalize Express Design Deliverables ▪ Submit the Express Design Evaluation 	Feasibility Studies/ Corridor Development Unit	<ul style="list-style-type: none"> ▪ Project Lead ▪ Division Corridor Development Engineer ▪ Division Planning Engineer ▪ Project Sponsor (MPO, RPO, Highway Divisions) ▪ Transportation Planning Division ▪ Assigned Private Engineering Firm

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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

1FS31FS2 Complete Project Scoping Report

Overview

Begin when a project is programmed in the State Transportation Improvement Program (STIP) to validate and enhance project information developed in the earlier Express Design Evaluation. To do this the Feasibility Studies/Corridor Development Unit develops a Project Scoping Report that has more alternatives/alignments, details, and may engage key stakeholders in discussions of those options.

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 Project Scoping Report Process](#)
- [Construction Contract Decision Matrix](#)
- [Candidate Project: Systems Planning to Programming Flow Chart \(In development\)](#)
- [Candidate Project Screening Tools \(In development\)](#)
- [Candidate Project Guidance \(In development\)](#)
- [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	<ul style="list-style-type: none"> ▪ Review/Update Information from the Express Design Evaluation ▪ Complete Project Scoping Level-of-Detail Evaluation 	Feasibility Studies/Corridor Development Unit	<ul style="list-style-type: none"> ▪ 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}	<ul style="list-style-type: none"> ▪ Develop and Complete Project Scoping Report 	Feasibility Studies/Corridor Development Unit	Assigned Private Engineering Firm
Final Project Initiation Packet ^{A,Q}	<ul style="list-style-type: none"> ▪ Compile Final Project Initiation Packet 	Division Corridor Development Engineer	<ul style="list-style-type: none"> ▪ Division Planning Engineer ▪ Feasibility Studies/Corridor Development Unit ▪ Project Lead ▪ Project Sponsor (MPO, RPO, Highway Divisions) ▪ Transportation Planning Division

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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

2GT3 Complete Pavement and Subgrade Investigation Report and Recommendations

Overview

Conduct ~~subsurface~~ investigation of existing pavement and subgrade and provide recommendations for proposed pavement designs. Refer to the NCDOT *Geotechnical Investigation and Recommendation Manual* linked below.

Note: *This activity involves field work with equipment, which could be affected by weather, difficulty of access, property owners, moratoriums, traffic control and conflicts with existing traffic control, etc.*

References

- [Geotechnical Investigation and Recommendations Manual](#)
- [NCDOT Quality Management Program: Quality Control and Quality Assurance](#)

Deliverables

Deliverables	Task	Responsible Party	
		Activity Leader	Additional Support
		Geopavement Engineer	Geopavement Supervisor
Supporting Investigation Documents (e.g., boring layout, investigation plan, etc.) ^Q	<ul style="list-style-type: none"> ▪ Complete Pavement and Subgrade Investigation ▪ Prepare Roadway Subsurface Inventory and Roadway Recommendation Report ▪ Pavement and Subgrade Recommendations Report 	X	X
Roadway Subsurface Inventory ^Q			
Roadway Recommendation Report ^Q			
Pavement and Subgrade Inventory Report			

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Complete Pavement and Subgrade Investigation

This task involves conducting ~~subsurface~~ investigation of existing pavement and subgrade to provide recommendations for proposed pavement designs (see 2PD1 for related information) and to inform the contractors on areas with critical geotechnical ~~issue~~issues that could be encountered during construction. In accordance with the *Geotechnical Investigation and Recommendation Manual*, the Geotechnical Engineering Unit receives a request from Pavement Design Engineer or Project Manager to begin work. The investigation requires the following roadway information: plan view, profile, and cross-section.

Upon receipt, the geotechnical team:

- Reviews existing data and the proposed design.
- Completes field reconnaissance and boring layout.
- Develops an investigation plan and conducts a scoping meeting with the Private Engineering Firm.
- Coordinates traffic control.
- Notifies 811 to locate utilities, where needed, and completes a field investigation.

- Assigns samples for lab testing, perform lab test, and compiles results.
- ~~Enters field log data into gINT and post bore logs.~~
- Develop graphics with pavement core photos.

Prepare ~~Roadway Subsurface~~Pavement and Subgrade Inventory and ~~Roadway~~ Recommendation ~~Report~~Reports

The geotechnical team (NCDOT Geotechnical staff and the Private Engineering Firm) prepares two separate reports using information obtained during the ~~subsurface~~pavement and subgrade investigation: the ~~Roadway Subsurface~~Pavement and Subgrade Inventory and the ~~Roadway~~ Recommendation ~~Report~~Reports. The reports are prepared in accordance with the *Geotechnical Investigation and Recommendation Manual*.

The ~~Roadway Subsurface~~Pavement and Subgrade Inventory lists the areas investigated, presents and interprets all of the data collected, and is available in the Let package for contractor reference. The ~~Roadway Subsurface~~Pavement and Subgrade Inventory is also used to generate the Pavement and Subgrade Recommendations Report.

The ~~Roadway~~ Recommendations Report lists specific design and construction recommendations required to build the project and to develop the contract documents.

Complete QC/QA Procedures

The ~~GeoEnvironmental Project~~Geopavement Engineer is to coordinate the applicable QC review for reports following the *NCDOT Quality Management Program: Quality Control and Quality Assurance* procedures and the respective QC Checklist before upload to the project SharePoint site and/or distribution of any deliverables. Provide deliverables to the Pavement Design Engineer (for action) and Project Manager (for information).

2HY1 Develop Preliminary Hydraulic Recommendations

Overview

~~Provide preliminary hydraulic information to refine line and grade and establish the hydrologic performance standards for the project, regarding water quality and quantity management, including preliminary structure sizing where appropriate. A preliminary Stormwater Management Plan (pSMP) is developed to comply with the Department’s statewide National Pollutant Discharge Elimination System (NPDES) stormwater permit, and a scalable Hydraulic Planning Report is prepared to identify permitting requirements; identify risk; define avoidance and minimization opportunities; and estimate major drainage structure sizes where appropriate. discipline recommendations. If necessary, preliminary hydraulic modelling is conducted to inform project impacts and revise final alternative. If project is in Merger, applicable for the project, hydraulic support is provided for any Merger meetings up to and including LEDPA (CP3).~~

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](#)
- [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 \(ncdot.gov\) Merger Process](#)
- [Risk Management Guide v2](#)

Deliverables

Deliverable	Task	Responsible Party	
		Activity Leader	Additional Support
		Hydraulic Design Engineer	Project Manager
Hydraulic Planning Report (HPR) ^{A, Q}	<ul style="list-style-type: none"> ▪ Complete Hydraulic Planning Report (HPR) 	X	X
Preliminary Stormwater Management Plan (pSMP) ^Q	<ul style="list-style-type: none"> ▪ Complete Preliminary Stormwater Management Plan (pSMP) 	X	

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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*. Completion of the HPR template referenced in Chapter ~~13-3~~ is recommended.

The HPR allows the design team to identify and establish hydraulic design parameters; prepare Initial Design Estimates (2CS1); refine assumptions; identify and mitigate risk; and provides input for the Environmental Documentation (2EP1). ~~any hydraulic considerations for the planning document and subsequent design phases~~. Completing the Hydraulic Planning Report with these objectives realized reduces the amount of potential re-work and schedule delays for the project.

The HPR is scalable and should only include information necessary to inform decisions that could not otherwise be made later during final design; or may otherwise adversely affect the project scope, schedule, or budget; or are addressed through programmatic agreements and are not project specific concerns. Examples include alignment and bridging decisions that are needed for CP2 and CP2A in Merger; replacement of major drainage structures that may affect project cost; recommended major revisions to line, grade, or typical section. Close coordination with the project team is necessary to refine the scope and content of the HPR to ensure it is of utmost value to the project.

The Hydraulic Design Engineer also:

- Coordinates the QC review following the NCDOT Quality Management Program: Quality Control and Quality Assurance -procedures and the respective QC Checklist before distribution.
- Prepares the Hydraulic Planning Report and 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.

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 Hydraulic Design Engineer also provides the report 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 recommendations from the Preliminary Hydraulic Recommendations table included in the 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 as well as decisions by 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, has developed an application called the NC SELDM Catalog which is specifically designed to assist the engineer in establishing the stormwater treatment goals for the project. If the appropriate PCSP workflow NC-SELDM Catalog 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.

Provide Hydraulic Support

The Hydraulic Design Engineer provides support to the project team and other technical disciplines/Units. This allows any hydraulic concerns to be communicated during the early phases of the project. This support may include:

- Attending meetings and offering hydraulic expertise and recommendations related to the project.
- Responding to drainage-related questions and concerns.
- 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 and CP2A meetings to respond to hydraulic, floodplain, or general stormwater management questions or concerns (see 2EP1 for related information).

2HY2 Complete Drainage Design for Field Inspection

Overview

Review and provide comments on the Design Recommendation Plan Set and complete drainage design to be shown on the Field Inspection Plan Set.

References

- [Guidelines for Drainage Studies and Hydraulic Design](#)
- [Hydraulics Unit Web Page Content and Guidance Documents](#)
- [NCDOT Hydroplaning Assessment Tool](#)
- [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](#)
- [NCDOT Quality Management Program: Quality Control and Quality Assurance](#)

Deliverables

Deliverable	Task	Responsible Party	
		Activity Leader	Additional Support
		Hydraulic Design Engineer	Roadway Design Lead
Comments on Design Recommendations Plan Set(s) ^Q & Final Hydroplaning Assessment (as needed) ^Q	<ul style="list-style-type: none"> ▪ Review Roadway Design Plans for Drainage Issues ▪ Complete Final Hydroplaning Assessment (as needed) ▪ Attend Design Recommendations Plan Set Review Meeting ▪ Complete Hydroplaning Assessment (as needed) 	X	
Hydraulics Pre-Design Meeting Documentation ^Q	<ul style="list-style-type: none"> ▪ Prepare for and Conduct Hydraulics Pre-Design Meeting 	X	
Hydraulic Survey Reports for Major Structures ^Q	<ul style="list-style-type: none"> ▪ Complete Field Visit and Hydraulic Surveys 	X	
	<ul style="list-style-type: none"> ▪ Request Additional Information 	X	X
	<ul style="list-style-type: none"> ▪ Prepare Major Structure Reports 	X	
Drainage Plans for Merger CP4B Meeting and Minutes	<ul style="list-style-type: none"> ▪ Conduct Merger CP4B Meeting (if for the Hydraulic Design Review (as applicable for the project)) 	X	X
Drainage Plans for Field Inspection ^{A, Q}	<ul style="list-style-type: none"> ▪ Complete Drainage Designs for the Field Inspection Plan Set 	X	
	<ul style="list-style-type: none"> ▪ Review Field Inspection Plan Set and Attend Field Inspection 	X	
Railroad Drainage Submittals	<ul style="list-style-type: none"> ▪ Coordinate Railroad Drainage Design (if applicable for the project) 	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.

Review Roadway Design Plans for Drainage ~~Issues~~Concerns

The Roadway Design Lead sends the Design Recommendation Plan Set to the Hydraulic Design Engineer for review. This allows the Roadway Design Lead to make any needed changes before conducting the rest of the tasks in this phase and helps to prevent schedule delays. The reviewers are to:

- Provide comments on the plans, identify potential drainage issues, and make recommendations that improve drainage conditions on the project. Minimally, the review is to include the items listed in Section 4.2 of the *Guidelines for Drainage Studies and Hydraulic Design*.
- If a Final Hydroplaning Assessment is performed, then provide mitigation strategies for areas that show risk for hydroplaning.
- Review subsequent roadway plan submittals to make sure comments have been addressed and no new concerns have been created.
- Attend Design Recommendations Plan Set Review Meeting.

After receiving the Design Recommendation Plan Set, the Hydraulic Design Engineer is to attend (if requested) the Design Recommendation Plan Set review meeting, which is further detailed in 2RD1.

Prepare for and Conduct Hydraulics Pre-Design Meeting

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* 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 NCDOT Hydraulics Staff, Division Scope staff, or their designee in accordance with~~ 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 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. This task is 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 surveys and data gathered into the drainage redlines, major structure reports, or separate documentation posted on the project SharePoint site.

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 request. The method for any requests will be determined through regular communication with the PM and the affected disciplines. Such request may ~~coordinates the requests, which 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). Major hydraulic structure reports are used to facilitate efficient communication between the Hydraulic Design Engineer and other Discipline Leads. This reduces re-work and schedule delays by having agreement on Major Hydraulic Structure design elements and assumptions before the design begins. 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.

The major hydraulic structure reports are used to document the hydraulic design and to provide information to others. For this task, the Hydraulic Design Engineer is to:

- Complete field reconnaissance and surveys at each major hydraulic structure prior to completing the report.
- Prepare and submit draft BSRs to the Project Manager (for information) and the Hydraulics Reviewer (for action).
 - The draft BSR is reviewed by the Hydraulics Reviewer, as coordinated with the Structures Lead, to determine if the proposed structure type, length, span arrangement, and other design information is acceptable.
 - The Structures Lead coordinates with the Regional Bridge Construction Engineer and the Area Construction Engineer on constructability issues and concerns.
- Prepare QC (in accordance with the NCDOT Quality Management Program: Quality Control and Quality Assurance -procedures and the respective QC Checklist) and submit major structure reports to the Project Manager (for information) and Hydraulics Reviewer and Structures Lead (for review).
 - Note: CSR submittals are to include a construction phasing plan.
- Revise and resubmit 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 front of the report upon acceptance.

Upon acceptance from NCDOT Hydraulics Staff or NCDOT Project Manager the Hydraulic Design Engineer is to distribute 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 ~~(if applicable for the project)~~ 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 while the drainage designs are being completed for the Field Inspection Plan Set. 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 on the project and allows for easier permit reviews and subsequent /approvals.

During the meeting, The Hydraulic Design Engineer presents the preliminary drainage designs layouts to the agencies and obtains input, comments, and concerns from the team members. This keeps the appropriate agencies informed on the project and allows for easier permit reviews/approvals.

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) meeting a minimum of two months prior to the preferred date for central managed projects. (further described herein as the meeting)
 - 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 Merger CP4B meeting plans for review 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.
 - It is recommended the CP4B-meeting plans be submitted for review at least five weeks prior to the scheduled Merger-CP4B-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 Merger-CP4B 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 Merger-CP4B 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 Designs for the Field Inspection Plan Set

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 field visit and hydraulic surveys are completed prior to completing the drainage designs. The design is documented on the Redline Drainage Plans.

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.

Review Field Inspection Plan Set and Attend Field Inspection

The Hydraulic Design Engineer reviews the Field Inspection Plan Set prior to the meeting for any drafting errors or potential conflicts with the drainage design. The Hydraulic Design Engineer attends the Field Inspection Review Meeting. This allows design team members to voice concerns and potential issues to be addressed before the project is let, which leads to fewer change orders during construction. This task includes:

- Coordinating the QC review following the NCDOT Quality Management Program: Quality Control and Quality Assurance -procedures and the respective QC Checklist before upload and distribution.
- Responding to questions or concerns relating to the drainage design.
- Initiating discussion on drainage items that may need coordination.
- Participating in traffic control and phasing discussions as it relates to the 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).

Coordinate Railroad Drainage Design (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.

3HY1 Complete Hydraulic Design

Overview

Complete the final drainage designs to be shown on the Right-of-Way Plan Set and complete all required environmental permit drawings and Federal Emergency Management Agency (FEMA) compliance packages.

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](#)
- [Guidance for Concurrence Point 4C Meetings and Plans](#)
- [Completing 3D Series Hydraulic Summary Plan Sheets](#)
- [NCDOT Quality Management Program: Quality Control and Quality Assurance](#)
- [Merger Process \(ncdot.gov\) Merger Process](#)
- [Risk Management Guide V2.pdf \(ncdot.gov\) Risk Management Guide V2](#)

Deliverables

Deliverable	Task	Responsible Party	
		Activity Leader	Additional Support
		Hydraulic Design Engineer	
Final Drainage Design ^{A, Q}	<ul style="list-style-type: none"> Complete Final Drainage Design 	X	
FEMA/NFIP Compliance Packages (SFC/CLOMR) ^{A, Q}	<ul style="list-style-type: none"> Prepare and Submit FEMA NFIP Compliance Packages 	X	Hydraulics Unit (Floodplain Management)
Hydraulic Summary Sheet(s) ^Q	<ul style="list-style-type: none"> Complete Drainage Summary Sheet(s) Complete Stormwater Control Measures Summary Sheet 	X	
Stormwater Management Plan ^{A, Q}	<ul style="list-style-type: none"> Finalize Stormwater Management Plan 	X	
Environmental Permit Drawings ^{A, Q}	<ul style="list-style-type: none"> Complete/Submit Environmental Permit Drawing Package 	X	
Merger CP4C Meeting Package and Minutes	<ul style="list-style-type: none"> 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 Final Drainage Design

The final Redline Drainage Plans are completed after the Field Inspection Review Meeting and may require ongoing incorporation of drainage revisions due to field inspection comments, revisions to the roadway

design plans during the Plan-in-Hand Stage, constructability concerns (notably those coming out of the Constructability Review), and/or utility conflicts. To complete this task, the Hydraulic Design Engineer is to:

- 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 Redline Drainage Plans to the Roadway Design Lead and other affected disciplines/Units as directed by the Hydraulics Reviewer to complete a review and QA audit.
- Submit all revisions to the Project Manager (for information) and Hydraulics Reviewer (for action).
 - Revised submittals are to include an updated set of Redline Drainage Plans along with all supporting documentation and calculations necessary to review and approve the drainage 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 under this stage.
 - Upon final approval, the Hydraulic Design Engineer submits a final record set of updated Redline Drainage Plans, computations, and supplemental data (including photos) for archiving.

Prepare and Submit FEMA/NFIP 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 of plan changes and commitments resulting from FEMA and/or FMP review.

Complete Drainage Summary Sheet(s)

The Drainage Summary Sheets are completed after the Field Inspection Review Meeting is complete and may require ongoing incorporation of drainage revisions due to field inspection comments, revisions to the roadway design plans during the Plan-in-Hand Stage, constructability concerns (notably those coming out of the Constructability Review), and/or utility conflicts. These summary sheets provide approximate drainage structure elevations, types, and pipe sizes, which facilitate quantity take offs and allow other design units to coordinate and resolve possible conflicts.

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.

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.
 - The Structures Lead coordination may be required to determine impacts due to temporary work pads, work bridges, causeways, etc.
 - Others are ~~coordinated with~~ **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.
- 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 determine if additional impacts need to be included to account 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~~CP-4C meeting is held after the Merger CP4B meeting to present the approved Redline Drainage Plans 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 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.

4HY1 Complete Any Open Hydraulic Tasks

The Hydraulic Designer is to complete any outstanding tasks from the previous stages, including revisions to drainage plans, major structure reports, permit drawings, FEMA packages, Hydraulic Summary Sheets, and the Stormwater Management Plan. This includes submitting all outstanding deliverables with their appropriate QC checklist(s), ensuring all deliverables are current, continuing to work toward securing FEMA compliance and continuing to provide support to other disciplines/Units as needed to incorporate plan revisions and secure the permits.

The QA reviewer is to review all outstanding tasks to ensure that the design ~~is in compliance~~ complies with the *Guidelines for Drainage Studies and Hydraulic Design* and applicable standards, and deliverables are current and stored in the appropriate location.

1LS1 Provide Photogrammetric Control and 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 DTM Manual/Connect Site](#)
- [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 PropCon](#)
- [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	<ul style="list-style-type: none"> Complete Photogrammetric Control for Preliminary/Planning Mapping (NC Grid Datum) 	Location & Surveys Division Team Lead/ Locating Engineer	<ul style="list-style-type: none"> Location & Surveys Assistant Division Team Lead/ Photogrammetry Unit Assigned Engineering Firm
SUE Level D Mapping ^Q	<ul style="list-style-type: none"> Complete SUE Level D 	Locating Engineer	<ul style="list-style-type: none"> Feasibility Studies Unit Assigned Engineering Firm
Final Mapping Limits Polygon ^A	<ul style="list-style-type: none"> Perform Independent Review of Mapping Limits Polygon 	Locating Engineer	<ul style="list-style-type: none"> Feasibility Studies Unit Roadway Design Engineer Photogrammetry Unit
Photogrammetric Control for Final Survey Mapping (Local Datum) ^Q	<ul style="list-style-type: none"> Complete Photogrammetric Control for Final Survey Mapping (Local Datum) 	Locating Engineer	<ul style="list-style-type: none"> Photogrammetry Unit Assigned Engineering Firm
Primary Survey Control Sheet ^Q	<ul style="list-style-type: none"> Complete Primary Survey Control (C-Series) 	Locating Engineer	Assigned Engineering Firm

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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 & Survey Division Team Lead, ~~with support from the Assistant Division Team Lead,~~ is to:

- ~~Contact~~ Confirm that 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 ~~using the Location and Surveys PropCon Database found at the Location & Surveys PropCon.~~
- Conform to Field Procedures, ~~6B.3.3~~ in the *Location & Surveys GPS Guidelines*, perform 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, ~~6B.3.4~~ 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)* ~~found at the reference listed above~~ and the applicable QA/QC Checklist located in review following the NCDOT Quality Management Program: Quality Control and Quality Assurance ~~procedures.~~

Complete SUE Level D

Being that SUE Level D mapping may be useful for long-range planning and early design development, the Location & Survey Division Team Lead, ~~with support from the Assistant Division Team Lead,~~ 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 Level D CADD file (NC Grid Datum) that maps existing utility records using the latest approved NCDOT MicroStation version.
- Provide the SUE Level D CADD file to Feasibility Studies Unit (See 1FS3 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)* ~~found at the reference listed above~~ and the applicable QA/QC Checklist located in 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 & Survey Division Team Lead, ~~with support from the Assistant Division Team Lead,~~ ~~is to:~~ 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 1FS3, 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 [QA/QC-Location & Surveys Project Review Checklist located in \(PRC\)](#) 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 & Survey Division Team Lead, ~~with support from the Assistant Division Team Lead,~~ is to:

- Develop a local project control network by ~~establishing horizontal and vertical survey control~~ using the current ~~Nation~~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~~Confirm that 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 ~~using the Location and Surveys PropCon Database found at the Location & Surveys PropCon.~~
- 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 (C-Series)

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 Division Team Lead 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) (C-Series) 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)* ~~found at the reference listed above~~ and the applicable QA/QC Checklist located in 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 and buffers for the ~~project~~ 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 PropCon](#)~~
- ~~[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](#)~~
- [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
		Location & Surveys Division Team Lead	Location & Surveys Assistant Division Team Lead
Final Surveys ^Q	<ul style="list-style-type: none"> ▪ Complete Field Surveys and Project Mapping 	Locating Engineer	<ul style="list-style-type: none"> ▪ Assigned Engineering Firm ▪ Other Technical Disciplines or Unit Leads
Surveyed Wetlands ^{A, Q}	<ul style="list-style-type: none"> ▪ Complete Wetland/Jurisdictional Stream/Buffer Field Surveys and Mapping 	Locating Engineer	<ul style="list-style-type: none"> ▪ Environmental Engineer ▪ Assigned Engineering Firm
Secondary Survey Control Sheets ^Q	<ul style="list-style-type: none"> ▪ Complete Secondary Survey Control (C-Series) 	Locating Engineer	<ul style="list-style-type: none"> ▪ Assigned Engineering Firm
Parcel Polygon File ^Q	<ul style="list-style-type: none"> ▪ Complete Parcel Polygon Mapping 	Locating Engineer	<ul style="list-style-type: none"> ▪ 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 & Survey Division Team Lead, ~~with support from the Assistant Division Team Lead,~~ is to:

- ~~Contact~~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 letter, phone, or in person and is to be documented ~~using the Location and Surveys PropCon Database found at the Location & Surveys PropCon~~.
- 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 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 DTM~~ 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* ~~that to~~ obtain ~~field~~ hydrographic features and are ~~included~~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 includingreferencing 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. ~~Incorporate~~

~~into~~[Reference in](#) the Final Survey CADD file using the latest approved NCDOT MicroStation version and *NCDOT CADD Mapping Standards*.

- ~~Develop right-of-way sheets (C-Series Only) by computing existing alignments (ELN) and compiling 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)* ~~found at the reference listed above~~ and the [applicable](#) QA/QC ~~Checklist located in 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/Buffer Field Surveys and Mapping

Required Wetland/Jurisdictional Stream/Buffer Field Surveys and Mapping are critical for obtaining necessary agency permitting. For this task, the Location & Survey Division Team Lead, ~~with support from the Assistant Division Team Lead~~, is to:

- ~~Perform~~[Complete](#) the wetland/jurisdictional stream/buffer ~~field~~ surveys in accordance with the *NCDOT Wetland Mapping Guidelines* ~~to obtain wetland boundaries, jurisdictional streams and buffers~~.
- ~~Develop wetland/jurisdictional stream/buffer mapping that conforms to the *NCDOT (Wetland Mapping Guidelines and Procedures In Development)*. This work~~ includes:
 - ~~Compiled field~~[Field](#) locations to create a surveyed WEX or WET CADD file using the latest approved NCDOT MicroStation version and *NCDOT CADD Mapping Standards*.
 - ~~Identified jurisdictional~~[Jurisdictional](#) streams and buffers [referenced](#) 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)* ~~found at the reference listed above~~ and the [applicable](#) QA/QC ~~Checklist located in 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/buffer mapping files and deliverables have been completed (See 2EN1 for related information).

Complete Secondary Survey Control (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 Division Team Lead 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 Division Team Lead is to:

- 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 & Survey Division Team Lead is to:

- Map the final Survey Limits Polygon (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 and ROW Advanced Acquisition Surveys

Overview

Complete SUE Level A investigations for utility conflict resolutions. Provide field delineation and acquisition exhibits and/or descriptions in support of right-of-way (ROW) advanced acquisitions.

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 PropCon](#)
- ~~☐~~ [Location & Surveys Connect Site](#)
- ~~☐~~ [Location & Surveys Project Review Checklist](#)
- ~~☐~~ [NCDOT Wetland Mapping Guidelines](#)
- ~~☐~~ [Location & Surveys File Naming Convention](#)
- ☐ [Location & Surveys Connect Site](#)
- ☐ [Location & Surveys Project Review Checklist](#)
- ☐ [Location & Surveys File Naming Convention](#)
- ~~☐~~ [Location and Surveys Unit Property Survey Manual](#)
- ~~☐~~ [NCDOT Quality Management Program: Quality Control and Quality Assurance](#)
- ☐ [Location & Surveys Unit Property Survey Manual](#)
- ☐ [NCDOT Quality Management Program: Quality Control and Quality Assurance](#)

Deliverables

Deliverable	Task	Responsible Party	
		Activity Leader	Additional Support
		Location & Surveys Division Team Lead	Location & Surveys Assistant Division Team Lead
SUE Level A ^q	<ul style="list-style-type: none"> ▪ Complete SUE Level A and Revise Mapping 	<ul style="list-style-type: none"> ✕ Locating Engineer 	<ul style="list-style-type: none"> ▪ ✕ Utility Engineer ▪ Assigned Engineering Firm
ROW Advanced Acquisition Surveys ^q	<ul style="list-style-type: none"> ▪ Complete ROW Advanced Acquisition Field Surveys and Mapping 	<ul style="list-style-type: none"> ✕ Locating Engineer 	<ul style="list-style-type: none"> ▪ ✕ Division ROW Agent ▪ Assigned Engineering Firm
	<ul style="list-style-type: none"> ✕ Complete ROW Advanced Acquisition Mapping 	✕	✕

^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 Level A and Revise Mapping

Accurate SUE Level A data is needed to minimize utility conflicts and avoid unnecessary costs and delays when relocating utilities. For this task, the Location & Survey Division Team Lead, ~~with support from the Assistant Division Team Lead,~~ is to:

- Perform/obtain surface utility Level A data and ~~includes this data~~ [reference](#) in the ~~updated~~ 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 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~~. [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)* ~~found at the reference listed above~~ and the [applicable QA/QC Checklist](#) ~~located in review following~~ the NCDOT *Quality Management Program: Quality Control and Quality Assurance* [procedures](#).

Complete ROW Advanced Acquisition ~~Field~~ Surveys

~~Accurate field delineation of proposed right of way and easements allows the Right of Way Agents and property owners to visualize impacts to affected parcels. To complete this task, the Location & Survey Division Team Lead, with support from the Assistant Division Team Lead, is to:~~ [Mapping](#)

~~Accurate advance acquisition exhibits and/or descriptions allow NCDOT to acquire property necessary for timely project construction. To accomplish this, the Location & Survey Division Team Lead is to:~~

- Collaborate with the Project Manager (for information) and Division Right-of-Way Agent (for action) to identify and prioritize all Advance Acquisition Parcels (See 2RW1 for related information).
- Verify with the Division Right-of-Way Agent that all affected property owners have been contacted and Right-of-Entry has been granted.
- Complete field delineation of proposed right-of-way and easements across all affected project parcels in accordance with the *Location & Surveys Baseline Guidelines*.
- ~~Complete the *Location & Surveys Project Review Checklist (PRC)* found at the reference listed above and the *QA/QC Checklist* located in the *NCDOT Quality Management Program: Quality Control and Quality Assurance*.~~

~~Complete ROW Advanced Acquisition Mapping~~

~~Accurate advance acquisition exhibits and/or descriptions allow NCDOT to acquire property necessary for timely project construction. To accomplish this, the Location & Survey Division Team Lead, with support from the Assistant Division Team Lead, is to:~~

- ~~Collaborate with the Project Manager (for information) and Division Right-of-Way Agent (for action) to identify and prioritize all advance acquisition parcels requiring an exhibit and/or description (See 2RW1 for related information).~~

- Compile and prepare an advance acquisition exhibit (PDF) and/or description (txt) using the latest approved NCDOT MicroStation version and NCDOT CADD Mapping Standards. ~~This exhibit and/or description is to conform to the Location & Surveys Procedure Memo PROC 2018-6 and Location and Surveys Unit Property Survey Manual.~~ This exhibit and/or description is to conform to the [Location & Surveys Procedure Memo PROC 2018-6](#) and [Location & Surveys Unit Property Survey Manual](#).
- Complete the [Location & Surveys Project Review Checklist \(PRC\)](#) ~~found at the reference listed above~~ and the [applicable QA/QC Checklist](#) ~~located in 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 ~~and (ROW) reference file~~ 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 and Surveys Unit Property Survey Manual](#)~~
- [Location & Surveys File Naming Convention](#)
- [Mobile and Terrestrial LiDAR Guidelines](#)
- [NCDOT Quality Management Program: Quality Control and Quality Assurance](#)
- ~~□ [Location & Surveys Deed Description Memo](#)~~
- ~~□ [Location & Surveys Row Procedure Memo](#)~~
- ~~□ [Location & Surveys Procedure Memo PROC 2018-3](#)~~
- ~~□ [Location & Surveys Procedure Memo PROC 2018-6](#)~~
- ~~□ [Location & Surveys Procedure Memo PROC 2018-5](#)~~

Deliverables

Deliverable	Task	Responsible Party	
		Activity Leader	Additional Support
Additional Surveys ^Q	<ul style="list-style-type: none"> ▪ Complete Additional Field Surveys and Revise Project Mapping 	Locating Engineer	<ul style="list-style-type: none"> ▪ Assigned Engineering Firm ▪ Other Technical Disciplines or Unit Leads
Parcel Polygon File ^Q	<ul style="list-style-type: none"> ▪ Complete Parcel Polygon Mapping 	Locating Engineer	<ul style="list-style-type: none"> ▪ Assigned Engineering Firm
Final Survey Mapping Limits Polygon ^{A, Q}	<ul style="list-style-type: none"> ▪ Complete Survey Limits Polygon 	Locating Engineer	<ul style="list-style-type: none"> ▪ Assigned Engineering Firm

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

Deliverable	Task	Responsible Party	
		Activity Leader	Additional Support

	Location & Surveys Team Lead	Location & Surveys Assistant Team Lead
Additional Surveys ^q	*	*
Complete Additional Field Surveys and Revise Project Mapping	*	*

^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 Additional Field Surveys and Revised Project Mapping

Building on the work done in 2LS1, 2LS2 and as needed for the project, the Location & Survey Division Team Lead, ~~with support from the Assistant Division Team Lead,~~ is to:

- Collaborate with the Photogrammetry Unit for readily available mapping and/or additional flight control to fly and compile ~~shell plan sheets~~ planimetric mapping and ground elevation data (See Proposed 3PH1 for related information).
- Coordinate with the appropriate disciplines/Units to ~~obtain~~ confirm the ~~Final~~ Latest Survey CADD File-(s).
- ~~Contact~~ Confirm that all property owners impacted by the ~~updated~~ 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 ~~using the Location and Surveys PropCon Database found at the Location & Surveys PropCon.~~
- Establish additional ~~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.*
- ~~In accordance with the NCDOT CADD Mapping Standards, update the~~ 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 ~~updated~~ Final Survey CADD ~~file~~ File and map per the latest approved NCDOT MicroStation version.
- Perform and/or obtain ~~additional~~ pavement and ground DTMs in accordance with the ~~Location & Surveys DTM Manual~~ Location & Surveys DTM Manual and ~~Mobile and Terrestrial LiDAR Guidelines~~ Mobile and Terrestrial LiDAR Guidelines. This includes developing ~~an updated final DTM~~ the Final Terrain Model CADD file using the latest approved NCDOT MicroStation version and *NCDOT CADD Mapping Standards*.
- Perform ~~additional~~ hydrographic surveys in accordance with the *Location & Surveys DTM Manual and Location & Surveys Hydro Manual* ~~that to~~ obtain ~~field~~ hydrographic features and are ~~included~~ 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 ~~additional~~ subsurface utility surveys (per scope) by:
 - Obtaining subsurface utility data and including referencing in the Final Survey CADD file using the latest approved NCDOT MicroStation version and *NCDOT CADD Mapping Standards*.

- Providing the subsurface ~~Utility~~utility CADD file using the latest approved NCDOT MicroStation version and *NCDOT CADD Mapping Standards* to obtain linear footage.
- ~~Update~~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~~Develop property mapping by performing ~~additional~~ 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. ~~Incorporate~~Reference in the Final Survey CADD file ~~using the latest approved NCDOT MicroStation version and NCDOT CADD Mapping Standards~~.
- ~~Update the right of way sheets (C Series Only) by computing existing alignments (ELN) and compiling 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)* ~~found at the reference listed above~~ and the applicable QA/QC ~~Checklist located in 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 ~~(See 2RD1 to include the requested additional surveys (See 2RD2 and 3RD1 for related information))~~.

Initiate ROW Acquisition Surveys

In support of

Complete Parcel Polygon Mapping

The Parcel Polygon Mapping CADD file defines the ~~ROW~~parcel's property lines to be used during the ~~right-of-way~~ acquisition ~~process in Stage 3, the stage (4LS1)~~ and allows NCDOT to develop accurate metes and bounds descriptions. ~~The Location & Survey~~Surveys Division Team Lead, ~~is to:~~

- ~~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 support from the Assistant~~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 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 & Survey Division Team Lead, initiates:~~ is to:

- ~~ROW field delineation~~
- ~~ROW metes and bound descriptions~~
- ~~Eminent domain exhibit maps~~
- ~~ROW reference file~~
 - Map the final Survey Limits Polygon (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, [polygons](#) and [tables](#); eminent domain exhibit maps, [special acquisition maps](#) and the [ROW Series Plan Set](#) in support of right-of-way acquisitions. ~~Prepare final right-of-way (ROW) CADD file for the final ROW Series Plan Set.~~

References

- [Location & Surveys Baseline Guidelines](#)
- ~~[Location & Surveys Deed Description Memo](#)~~
- ~~[Location & Surveys Row Procedure Memo](#)~~
- [Location & Surveys CADD Mapping Standards](#)
- [Location ~~and~~ Surveys Unit Property Survey Manual](#)
- [Location & Surveys Procedure Memo-PROC-2018-3s](#)
- [Location & Surveys Project Review Checklist](#)
- ~~[Location & Surveys Procedure Memo-PROC-2018-6](#)~~
- ~~[Location & Surveys Procedure Memo-PROC-2018-5](#)~~
- [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	<ul style="list-style-type: none"> ▪ Complete ROW Field Delineation 	Locating Engineer	<ul style="list-style-type: none"> ▪ Division ROW Agent ▪ Assigned Engineering Firm
ROW Metes and Bounds Descriptions, Polygons and Tables ^Q	<ul style="list-style-type: none"> ▪ Complete ROW Metes and Bounds Descriptions, Polygons and Tables 	Project Data Condemnation Engineer	<ul style="list-style-type: none"> ▪ Division ROW Agent ▪ Locating Engineer ▪ Assigned Engineering Firm
Eminent Domain Exhibits ^Q	<ul style="list-style-type: none"> ▪ Complete Eminent Domain Exhibits 	Project Data Condemnation Engineer	<ul style="list-style-type: none"> ▪ Attorney General's Office ▪ Locating Engineer ▪ Assigned Engineering Firm
Special Acquisition Maps ^Q	<ul style="list-style-type: none"> ▪ Complete Special Acquisition Maps 	Locating Engineer	<ul style="list-style-type: none"> ▪ Division ROW Agent ▪ Project Data Condemnation Engineer ▪ Government/Private Agency ▪ Assigned Engineering Firm
ROW Series Plan Set ^{A,Q}	<ul style="list-style-type: none"> ▪ Complete ROW Series Plan Set 	Locating Engineer	<ul style="list-style-type: none"> ▪ Assigned Engineering Firm

Deliverable

Task

Responsible Party

		Activity Leader Location & Surveys Team Lead	Additional Support Location & Surveys Assistant Team Lead
ROW Field Delineation ^Q	* Complete ROW Field Delineation	X	X
ROW Metes and Bounds Descriptions ^Q	* Complete ROW Metes and Bounds Descriptions	X	X
Eminent Domain Exhibit Maps ^Q	* Complete Eminent Domain Exhibit Maps	X	X
ROW Reference File ^Q	* Complete ROW Reference File	X	X
Final ROW Series Plan Set ^{A, Q}	* Complete Final ROW Series Plan Set	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 NCDOT Quality Management Program: Quality Control and Quality Assurance.

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 & Survey Division Team Lead, ~~with support from the Assistant Division Team Lead,~~ is to:

- Verify that ROW authorization has been granted by the Board of Transportation and collaborate with the Project Manager (for information) and Division Right-of-Way Agent (for action) to prioritize staking of parcels (See 3RW2 for related information).
- Contact all property owners identified ~~in the ROW file~~ for property acquisition and those properties that may need to be accessed to perform ROW surveys. Contacts are to be made by letter, phone, or in person and is to be documented ~~using the Location and Surveys PropCon Database found at the Location & Surveys PropCon.~~
- Perform field right-of-way delineation in accordance with the *Location & Surveys ~~Baseline Guidelines 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)* ~~found at the reference listed above~~ and the applicable QA/QC Checklist located in review following the NCDOT Quality Management Program: Quality Control and Quality Assurance procedures.

Complete ROW Metes and Bounds Descriptions, Polygons and Tables

Accurate right-of-way metes and bounds descriptions, polygons and tables allow NCDOT to acquire necessary property to construct the project. To do this, the Location & Survey Division Team Lead, ~~with support from the Assistant Division Team Lead,~~ is to:

- Collaborate with the Project Manager (for information) and Division Right-of-Way Agent (for action) to prepare ~~and provide~~ ROW metes and bounds descriptions, polygons and tables for the entire project.
- Compile and prepare Polygons and Tables Mapping CADD file utilizing the Parcel Polygon Mapping and ROW Plan Set CADD file (See 3RD1 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 Polygons 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 GIS Layers in conformance with the [Location & Surveys Procedure Memo \(Deed Description Procedure In Development\)](#), and [Location & Surveys Connect Site](#).
- Complete the [Location & Surveys Project Review Checklist \(PRC\)](#) found at the reference listed above and the applicable QA/QC [Checklist](#) located in review following the NCDOT Quality Management Program: [Quality Control and Quality Assurance procedures](#).
- Provide ROW metes and bounds descriptions, [polygons](#) and [sketch map/stables](#) in PDF format to Project Manager (for information) and Division Right-of-Way (for action) in accordance with [Location & Surveys Procedure Memo \(Deed Description Procedure In Development\)](#) (See 4RW1 for related information).

Complete Eminent Domain ~~Exhibit Maps~~ Exhibits

NCDOT uses eminent domain 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 & Survey Division Team Lead, ~~with support from the Assistant Division Team Lead~~, is to:

- Compile and prepare an Eminent Domain [Map](#) [Plan Sheet](#) [Parcel Exhibit](#) using the latest approved NCDOT MicroStation version and [NCDOT CADD Mapping Standards](#). ~~Location and Surveys Unit (Project Data & Condemnation Group) modifies the Eminent Domain Map to produce an Eminent Domain Exhibit used to be utilized in the litigation process by the Attorney General's Office attorney to present NCDOT's case.~~
- Compile and prepare an Eminent Domain Exhibit (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 with North Carolina Attorney General's Office and ~~Location and Surveys Unit (Project Data & Condemnation Group)~~ [Locating Engineer](#) to ~~revise~~ complete the [Final](#) Eminent Domain Map and/or Exhibit as required.
- ~~Note: Ensure these deliverables conform to the [Location & Surveys Procedure Memo PROC-2018-6](#) and [Location and Surveys Unit Property Survey Manual](#).~~
- ~~Complete the [Location & Surveys Project Review Checklist \(PRC\)](#) found at the reference listed above and the applicable QA/QC [Checklist](#) located in the [NCDOT Quality Management Program: Quality Control and Quality Assurance](#).~~

Complete ROW Reference File

~~The final ROW Reference CADD file is an accurate depiction of as-staked field monumentation. This CADD file is referenced as part of the Final Roadway Design Plans and is the basis of the Final ROW~~

~~Series Plan Set. In accordance with the [Location & Surveys ROW Procedure Memo](#), the Location & Survey Division Team Lead, with support from the Assistant Division Team Lead, is to:~~

- ~~▪ Retrieve the ROW Reference CADD file from the appropriate discipline/Unit.~~
- ~~▪ Modify the ROW Reference CADD file when the ROW revision letter is received.~~
 - ~~▪ Revision(s) may be requested by the Division Right-of-Way Agent as part of right-of-way negotiations, by the Project Designer resulting from a design revision, by the review following Resident Engineer resulting from a constructability issue, or by the surveyor in responsible charge during right-of-way delineation.~~
 - ~~▪ All right-of-way revisions are to be documented with a ROW Revision Memorandum by the Division Right-of-Way Agent with the Project Manager being informed upon completion (See 3RW2 and 3RD1 for related information).~~
- ~~▪ Collaborate with the Project Manager (for information), the Division Right-of-Way Agent and Project Designer (for action) on all right-of-way revisions and the ROW Reference CADD File modifications.~~
- ~~▪ Complete the [Location & Surveys Project Review Checklist \(PRC\)](#) found at the reference listed above and the [QA/QC Checklist](#) located in the [NCDOT Quality Management Program: Quality Control and Quality Assurance](#) procedures.~~
- ~~▪ Provide Eminent Domain 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 ~~Final~~ 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 & Survey Division Team Lead 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 ~~Final~~ ROW Series Plan Set provides information necessary for ~~reestablishment~~ re-establishment of all permanent right-of-way, control of access, and easement monumentation by NCDOT or private surveyors. The plan set is prepared in accordance with ~~North Carolina General Statutes §136-19.4A to~~

~~address concerns of the North Carolina Board of Examiners for Engineers and Surveyors and the private surveying community. To complete the Final. To complete the~~ ROW Series Plan Set, the Location & Survey Division Team Lead, ~~with support from the Assistant Division Team Lead,~~ is to:

- ~~Prepare~~Complete the ~~Final~~ ROW Series D, E, and RW Sheets using the ~~latest approved NCDOT MicroStation version and NCDOT CADD Mapping Standards.~~
- ~~Modify the C-Series Right-of-Way Sheets if required. The C-Series Right-of-Way Sheets are located under the projects “Let Preparation” topic on the NCDOT Connect Preconstruction Site.~~
- ~~Complete the Final ROW Series D, E, and RW Sheets using the Final Roadway Design Plans and ROW Reference CADD file.~~
- ~~Include the PLS seal of the surveyor in responsible charge of Right-of-Way Field Delineation on the Final ROW Series ROW Plan Set sheets.~~
- ~~Create a PDF version of all final ROW Series Plan Set sheets with the electronic signature of the surveyor in responsible charge.~~
 - ~~Upload the PDF (See 3RD1 and 4RW1 for related information) with the latest approved NCDOT MicroStation version of the signed and sealed Final ROW Series Plan Set under the projects “Let Preparation – 150 Folder” on the project’s SharePoint site and NCDOT CADD Mapping Standards.~~
- ~~Ensure this deliverable conforms to the Location & Surveys ROW Procedure Memo, Location & Surveys Creating NCDOT Right-of-Way Plans, Location & Surveys Right-of-Way Connect Site, Location & Surveys Procedure Memo PROC 2018-3, and Location & Surveys File Naming Convention.~~
- ~~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) found at the reference listed above and the applicable QA/QC Checklist located in review following the NCDOT Quality Management Program: Quality Control and Quality Assurance procedures.~~

5LS1 Provide Construction ~~Support~~ Surveys and Mapping

Overview

The Location & Surveys Team Lead provides the following support during the Construction Phase:

- ~~▪ Provides Photogrammetric~~ Provide photogrammetric control for the compilation of earthwork quantities at various stages during the construction process.
- ~~▪ Provides UAV imagery for the compilation of earthwork quantities and monitoring construction progress.~~
- ~~▪ Provides as needed high accuracy monitoring of construction sites, including, not limited to:~~
 - ~~▪ MSE Walls~~
 - ~~▪ Structures~~
 - ~~▪ Earthwork~~
 - ~~▪ Pavement LiDAR Scans~~
- ~~▪ Provides as needed, unmanned aircraft vehicle surveys, additional surveys for design modifications.~~
- ~~▪ Provides technical expertise and aids and mapping, and construction surveys in the verifications~~ support of the project's survey control and/or current survey data/information. This includes, but is not limited to:
 - ~~▪ Attending the pre-construction meeting~~
 - ~~▪ Assisting with the verification of all project control~~

Coordinates all ROW revisions on let projects following the Construction Revision process as defined in 5CS1 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 and Surveys Unit Property Survey Manual](#)~~
- [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
		Location & Surveys Team Lead	Location & Surveys Assistant Team Lead
Photogrammetric Control for Construction Panels (Localized Datum) ^Q	<ul style="list-style-type: none"> Complete Photogrammetric Control for Construction Panels (Localized Datum) 	<ul style="list-style-type: none"> Locating Engineer 	<ul style="list-style-type: none"> Resident Engineer Photogrammetry Unit Assigned Engineering Firm
UAV Imagery Unmanned Aircraft Vehicle Construction Support^Q	<ul style="list-style-type: none"> Complete UAV Imagery Unmanned Aircraft Vehicle Construction Support 	<ul style="list-style-type: none"> Locating Engineer 	<ul style="list-style-type: none"> Resident Engineer Division of Aviation Photogrammetry Unit Assigned Engineering Firm
Additional Surveys ^Q	<ul style="list-style-type: none"> Complete Additional Field Surveys and Revise Project Mapping 	<ul style="list-style-type: none"> Locating Engineer 	<ul style="list-style-type: none"> Resident Engineer Other Technical Disciplines or Unit Leads Assigned Engineering Firm
ROW Field Delineation Construction Survey Support^Q	<ul style="list-style-type: none"> Complete ROW Field Delineation Construction Survey Support 	<ul style="list-style-type: none"> Locating Engineer 	<ul style="list-style-type: none"> Resident Engineer Other Technical Disciplines or Unit Leads Assigned Engineering Firm
ROW Metes and Bounds Descriptions	<ul style="list-style-type: none"> Complete ROW Metes and Bounds Descriptions 	<ul style="list-style-type: none"> X 	<ul style="list-style-type: none"> X
ROW Reference File	<ul style="list-style-type: none"> Modify ROW Reference File 	<ul style="list-style-type: none"> X 	<ul style="list-style-type: none"> X
Final ROW Series Plan Set	<ul style="list-style-type: none"> Modify ROW Series Plan Set 	<ul style="list-style-type: none"> X 	<ul style="list-style-type: none"> 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.

Complete Photogrammetric Control for Construction Quantities Panels (Local Datum)

With photogrammetric control being critical to orient aerial photography onto a localized North Carolina State Plane Coordinate System, the Location & Survey Division Team Lead, ~~with support from the Assistant Division Team Lead~~, is to:

- ~~Develop a local project control network by establishing horizontal and vertical survey control using the current Nation 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 White Paper.~~
- 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 ~~Project Review Checklist (PRC) found at~~ Division Team Lead is to:

- ~~Collaborate with the reference listed above and the QA/QC Checklist located in 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 NCDOT Quality Management Program: Quality Control and Quality Assurance-Resident Engineer to obtain additional survey mapping for the completion of design and construction revisions.~~

~~Complete UAV Imagery~~

~~In-development~~

Complete Additional Field Surveys and ~~Revised~~ Revise Project Mapping

~~In providing information for design modifications~~ Building on the work done in 2LS1, 2LS2, 3LS1 and as needed for the project, the Location & Survey Division Team Lead, ~~with support from the Assistant Division Team Lead~~, 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 ~~obtain~~ confirm the ~~Final~~ Latest Survey CADD File-(s).
- ~~Contact~~ Confirm that all property owners impacted by the ~~updated~~ 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 ~~using the Location and Surveys PropCon Database found at the Location & Surveys PropCon.~~
- Establish additional ~~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*.
- ~~In accordance with the NCDOT CADD Mapping Standards, update the~~ 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 updated Final Survey CADD ~~file~~File and map per the latest approved NCDOT MicroStation version.
- Perform and/or obtain additional pavement and ground DTMs in accordance with the Location & Surveys DTM Manual~~Location & Surveys DTM Manual~~ and Mobile and Terrestrial LiDAR Guidelines~~Mobile and Terrestrial LiDAR Guidelines~~. This includes developing an updated final DTM~~the Final Terrain Model~~ CADD file using the latest approved NCDOT MicroStation version and NCDOT CADD Mapping Standards.
- Perform additional hydrographic surveys in accordance with the Location & Surveys DTM Manual and Location & Surveys Hydro Manual ~~that to~~ obtain field hydrographic features and are included~~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 additional subsurface utility surveys (per scope) by:
 - Obtaining subsurface utility data and including~~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.
- Update~~Develop~~ property mapping by performing additional courthouse research, reconning and locating monumentation, requesting the Right-of-Way Abstract, and investigating as-builts and maps according to records and monumentation. Incorporate into~~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) ~~found at the reference listed above~~ and the applicable QA/QC Checklist ~~located in review following~~ the NCDOT Quality Management Program: Quality Control and Quality Assurance- procedures.
- Notify the project team, including the Project Manager, that all final~~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 & Survey Division Team Lead, is to:

- Coordinate with the appropriate disciplines/Units to confirm the Latest CADD File(s).
- Perform construction surveys as directed and in accordance with Location & Surveys Standard Procedures, Location & Surveys File Naming Convention, and Location & Surveys Procedure Memo PROC-2018-6: the Manual for Construction Layout.

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 & Survey Division Team Lead, with support from the Assistant Division Team Lead, is to:

- Verify that ROW authorization has been granted by the Board of Transportation and collaborate with the Project Manager and Division Right of Way Agent to prioritize staking of parcels.
- Contact all property owners identified in the ROW file for property acquisition and those properties that may need to be accessed to perform ROW surveys. Contacts are to be made by letter, phone, or in person and is to be documented using the Location and Surveys PropCon Database found at the *Location & Surveys PropCon*.
- Perform field right of way delineation in accordance with the *Location & Surveys Baseline Guidelines*. 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)* found at the reference listed above and the [applicable QA/QC Checklist](#) located in [review following the NCDOT Quality Management Program: Quality Control and Quality Assurance- procedures](#).

Complete ROW Metes and Bounds Descriptions

Accurate right of way metes and bounds descriptions allow NCDOT to acquire necessary property to construct the project. To do this, the Location & Survey Division Team Lead, with support from the Assistant Division Team Lead, is to:

- Collaborate with the Project Manager (for information) and Division Right of Way Agent (for action) to prepare and provide as needed ROW metes and bounds descriptions.
- Complete the *Location & Surveys Project Review Checklist (PRC)* found at the reference listed above and the *QA/QC Checklist* located in the *NCDOT Quality Management Program: Quality Control and Quality Assurance*.
- Provide ROW metes and bounds descriptions and sketch maps in PDF format to Project Manager (for information) and Division Right of Way (for action) in accordance with *Location & Surveys Deed Description Memo*.

Modify ROW Reference File

The final ROW Reference CADD file is an accurate depiction of as-staked field monumentation. This CADD file is referenced as part of the Final Roadway Design Plans and is the basis of the Final ROW Series Plan Set. In accordance with the *Location & Surveys ROW Procedure Memo*, the Location & Survey Division Team Lead, with support from the Assistant Division Team Lead, is to:

- Retrieve the ROW Reference CADD file from the appropriate discipline/Unit.
- Modify the ROW Reference CADD file when the ROW revision letter is received.
 - Revision(s) may be requested by the Division Right of Way Agent as part of right of way negotiations, by the Project Designer resulting from design modifications or by the Resident Engineer resulting from a constructability issue.
 - All right of way revisions are to be documented with a ROW Revision Memorandum by the Division Right of Way Agent with the Project Manager being informed upon completion.
- Collaborate with the Project Manager (for information) and Division Right of Way Agent (for action) on all right of way revisions and the ROW Reference CADD File modifications.

- ~~Complete the *Location & Surveys Project Review Checklist (PRC)* found at the reference listed above and the *QA/QC Checklist* located in the *NCDOT Quality Management Program: Quality Control and Quality Assurance*.~~

Modify ROW Series Plan Set

The Final ROW Series Plan Set provides information necessary for reestablishment of all permanent right-of-way control of access, and easement monumentation by NCDOT or private surveyors. The plan set is prepared in accordance with North Carolina General Statutes §136-19.4A to address concerns of the North Carolina Board of Examiners for Engineers and Surveyors and the private surveying community. To complete the ROW Series Plan Set, the Location & Survey Division Team Lead, with support from the Assistant Division Team Lead, is to:

- ~~Modify the ROW Series D, E, and RW Series Sheets using the latest approved NCDOT MicroStation version and *NCDOT CADD Mapping Standards*.~~
- ~~Modify the C-Series Right-of-Way Sheets if required. The C-Series Right-of-Way Sheets are located under the projects “Let Preparation” topic on the NCDOT Connect Preconstruction Site.~~
- ~~Modify the ROW Series D, E, and RW Series Sheets using the Roadway Design Plans and ROW Reference CADD file.~~
- ~~Include the PLS seal of the surveyor in responsible charge of Right of Way Field Delineation on the ROW Series Plan Set sheets.~~
- ~~Create a PDF version of all modified ROW Series Plan Set sheets with the electronic signature of the surveyor in responsible charge.~~
- ~~Upload the modified PDF version of the signed and sealed ROW Series Plan Set under the projects “Let Preparation—150 Folder” on the project’s SharePoint site.~~
- ~~Ensure this deliverable conforms to the *Location & Surveys ROW Procedure Memo*, *Location & Surveys Creating NCDOT Right-of-Way Plans*, *Location & Surveys Right-of-Way Connect Site*, *Location & Surveys Procedure Memo PROC 2018-3*, and *Location & Surveys File Naming Convention*.~~

~~Complete the *Location & Surveys Project Review Checklist (PRC)* found at the reference listed above and the *QA/QC Checklist* located in the *NCDOT Quality Management Program: Quality Control and Quality Assurance*.~~

- Perform ~~verification of final~~ field ~~monumentation~~ right-of-way delineation in accordance with the Location & Surveys ~~Baseline Guidelines~~ Procedure Memo: (ROW Procedures In Development). This work includes:
 - Computing and ~~field verification~~ verifying plan locations of final permanent right-of-way, ~~control and easement monumentation.~~
 - Completing field delineation of ~~access~~ final permanent right-of-way and easement monumentation across all affected parcels in accordance with the ~~final and recorded ROW Series Plan Set~~ set of plans used for acquisition.
 - Complete the Location & Surveys Project Review Checklist (PRC) ~~found~~ 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 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 & Survey Division Team Lead 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 Division 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 the reference listed above and the QA/QC Checklist located in the NCDOT Quality Management Program: Quality Control and Quality Assurance.~~

Complete Hydraulic Structure Inventory

record or accurate representation of the projects' infrastructure at the time of completion. To complete this task, the Location & Surveys Team Lead is to:

- ~~Perform field locations of as-built drainage structures to be added to NCDOT inventory.~~
- ~~Submit inventory of all drainage structures in the required format.~~

- ~~Complete the *Location & Surveys Project Review Checklist (PRC)* found at the reference listed above and the *QA/QC Checklist* located in the *NCDOT Quality Management Program: Quality Control and Quality Assurance*.~~
- ~~Additional in details *in development*.~~

~~Complete Other Inventory~~

- ~~Procedures *In development*~~Development

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-~~or train customers who wish to obtain the data on their own.~~

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 ^α	<ul style="list-style-type: none"> Obtain Orthoimagery 	Project Lead	Photogrammetry Assistant Unit Head
Elevation Data (NCDOT login) ^α	<ul style="list-style-type: none"> Obtain Elevation Data (NCDOT or Custom) 	Photogrammetry Assistant Unit Head *	Project Lead *
County GIS Property Data ^α	<ul style="list-style-type: none"> Obtain County GIS Property Data 		
Small-Scale Topographic Mapping ^α	<ul style="list-style-type: none"> Provide More Current Mapping Product 		

^αIndicates 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 ~~NCOneMap~~[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
- 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 and 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	Additional Support
		Photogrammetry Assistant Unit Head	
Controlled Aerial Photography	<ul style="list-style-type: none"> ▪ <i>Schedule and Fly Project</i> 	X	Location and Survey Unit and Aviation Unit
Large Scale Mapping Q (Planimetric Mapping^Q with Surface model)	<ul style="list-style-type: none"> ▪ <i>Providing Mapping Product</i> 	X	
Elevation Data^Q		*	
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.
 - 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.

- 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.
- Communicating 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 on 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, ~~Photosimulations~~[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.

2PI1 Continue 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	<ul style="list-style-type: none"> ▪ <i>Finalize Public Involvement Plan (PIP)</i> 	X	X
Mailing List and GIS Boundary ^A	<ul style="list-style-type: none"> ▪ <i>Compile Mailing List</i> 		X
NCDOT Project and PublicInput.com webpages	<ul style="list-style-type: none"> ▪ <i>Create Project Webpage</i> 	<u>X</u>	<u>X</u>
Public Outreach Materials ^A	<ul style="list-style-type: none"> ▪ <i>Coordinate Public Outreach Event Notifications</i> 	X	
Newsletter/Postcard Approval ^A	<ul style="list-style-type: none"> ▪ <i>Develop/Update Newsletter/Postcards</i> 		X
Environmental Document Comments	<ul style="list-style-type: none"> ▪ <i>Review Environmental Document</i> 	X	X
Public Meeting/Public Hearings ^A	<ul style="list-style-type: none"> ▪ <i>Conduct Public Meetings and/or Public Hearing</i> 		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 ~~update~~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

Upon receipt of an ETRACS request for support, the Public Involvement Lead completes the following in accordance with the *Public Involvement Guidelines*.

- ~~Review the project study area map and project mailing area~~

~~Provide the draft A mailing list to the assigned Private Engineering Firm or other of potentially affected stakeholders (e.g., property owners) will be provided by PICSviz and must be updated by the consultant, who updates 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 through study area is likely to be larger than the project duration 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.~~
- ~~Ensure approved mailing list is uploaded to the project SharePoint site~~

~~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 ~~and websites~~ 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 operate 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*.

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	<ul style="list-style-type: none"> ▪ 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 issues or needs regarding communication for any project with an offsite detour, strong potential for controversy or likelihood for complexity (see 1FS3 and 1PI1 for related information).~~

~~Via a request sent to the Public Involvement Lead from the Project Lead, for any project with an offsite detour or strong potential for controversy (or likelihood for complexity), the Public Involvement Team Lead reviews the current project scoping report and notifies the Feasibility Studies Unit and Communications Officer of any issues or needs regarding communication for a project (see 1FS3 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 admin for 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	<ul style="list-style-type: none"> ▪ <i>Create or Administer Outreach Materials</i> 	X	X
Project Special Commitments (Green Sheets) (when applicable)	<ul style="list-style-type: none"> ▪ <i>Environmental Document Review</i> 	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 can help facilitate several activities related to public outreach on the project, including:

- Coordinating with the Public Involvement Lead to review of newsletters, public meeting attendance, and interview requests.
- Review and coordination of efforts for creating and administering web pages
- Social media outreach
- Review of project-specific visualizations and video production in coordination with [the Environmental Analysis unit's AU \(Public Involvement, Community Studies, and Visualization team\(PICSViz\)\)](#).

Environmental Document Review

As coordinated with the Public Involvement Lead and the Project Manager, the Communications Officer reviews the draft environmental document to be better able to respond to media and public inquiries about a project's potential environmental impacts and ensure public outreach-related Project Special Commitments (~~Green Sheets~~) during the project's construction phase are noted.

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	<ul style="list-style-type: none">Provide Roadway Input on Express Design	NCDOT Roadway Design Engineer	Project Lead
Comments on Mapping Limits	<ul style="list-style-type: none">Perform Independent Review of Mapping Limit Polygon	NCDOT Roadway Design Engineer or Appropriate Division Personnel	<ul style="list-style-type: none">Project LeadDivision 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 assist in the comments being understood.

In all, the NCDOT Roadway Design Engineer provides roadway design technical expertise during this activity that involves:

1RR1 Identify Railroad Impacts

Overview

Determine impacts when the Rail Division Unit is contacted concerning 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	Railroad Coordination Engineer	Project Lead
	▪ Determine a Finding of One or More Rail Impacts		
	▪ Submit Scoping Letter		

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 determine 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.

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	Central ROW Office	▪ Project Lead
	▪ Review Estimate		▪ 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:

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.

1ST1 Investigate Structures

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	<ul style="list-style-type: none"> ▪ Gather Existing Structure Inspection Reports and Plans 	Structures Management Unit Field Operations Support, Division Bridge Maintenance	Project Lead
	<ul style="list-style-type: none"> ▪ Obtain Structures Input on Express Design 		

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:

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 Transportation Management Plan (TMP) Submittal ^Q Final Unsealed TMP, including Draft Quantity Estimate, Intermediate Contract Times (ICTs), and Project Special Provisions (PSPs)	Complete Final TTC Plans ^Q Unsealed TMP	X	X
	Attend Plan-In-Hand review meeting	X	X
^Q Sealed TMP and Project Special Provisions, Quantity Estimate, and Intermediate Contract Times (ICTs)	Complete Sealed 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 ~~TTC Plans~~ 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 Plan-in-Hand Review Meeting. ~~Upon request, the WZTC Project Engineer also provides WZTC pay items, estimated quantities, and estimated cost for use by the Contract Standards and Development Unit to prepare the project for letting.~~

Concurrent with the on-going coordination, the WZTC Project Engineer is to progress the TMP for the ~~PS&E phase~~ Plan-in-Hand review 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).

~~The WZTC Project Engineer coordinates~~ Upload final unsealed TMP and supporting documents to the project SharePoint site prior to the Plan- in-Hand review 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 before upload and distribution.
- 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.

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://nconnect.sharepoint.com/:f:/r/sites/trafficsystemsoperationsprojects/Shared%20Documents/References?csf=1&web=1&e=tqPQy2>
 - <https://connect.ncdot.gov/resources/safety/Teppl/Pages/tepl.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 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	<ul style="list-style-type: none"> ▪ Complete Operational Risk Assessment 	X	Project Lead
Incident Management Alternate / Detour Map ^Q	<ul style="list-style-type: none"> ▪ Develop Initial Incident Management Alternate and Detour Options 	X	

Deliverable	Task	Responsible Party	
		Activity Leader	Additional Support
		Traffic Operations Engineer	
Traffic Operations Strategies Checklist	<ul style="list-style-type: none"> Develop Initial Traffic Operation Strategies 	X	
Travelers Information Strategy	<ul style="list-style-type: none"> Develop Travelers Information Strategy 	X	
Planning Level ITS Device / Signal Map ^Q	<ul style="list-style-type: none"> Identify New ITS Devices and Incident Management Signal Equipment Upgrades 	X	
List of Affected ITS Devices, Signal Systems and Signals ^Q		X	<ul style="list-style-type: none"> Signal System Engineer Project Lead
Signal System Number(s) for New System(s)		X	<ul style="list-style-type: none"> Signal System Engineer Project Lead
Planning Level Estimate of Traffic Operations Scope ^Q		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~~Operational Risk Assessment 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~~Operational Risk Assessment suggests potential strategies to identified risks, including the order that construction projects are carried out. A key objective of the ~~ORA~~Operational Risk Assessment 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~~Operational Risk Assessment to the Feasibility Studies Unit and Strategic Prioritization Office for preferred phasing of the projects. The ~~ORA~~Operational Risk Assessment is also used to internally develop traffic operation strategies.

2TO1 Initiate Transportation Operations Plan (if a Significant Project)

Overview

Work with Traffic Management Unit (Work Zone Traffic Control) and ITS and Signals 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://nccconnect.sharepoint.com/:f:/r/sites/trafficsystemsoperationsprojects/Shared%20Documents/References?csf=1&web=1&e=tqPQy2>
 - <https://connect.ncdot.gov/resources/safety/Tepp/Pages/tepp.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	<ul style="list-style-type: none"> ▪ Validate Operational Risk Assessment 	X	
Traffic Operations Recommendations ^A	<ul style="list-style-type: none"> ▪ Validate Traffic Operations Strategies 	X	
Initial Incident Management (Quick Clearance) Strategies Recommendations ^A	<ul style="list-style-type: none"> ▪ Initiate Incident Clearance Strategies and Incident Management Plan 	X	
Draft Signal Timing Plans ^Q	<ul style="list-style-type: none"> ▪ Prepare Signal System Coordination <u>Plans and Upgrades List</u> 		X
Integrated Corridor Management Decision Matrix (Ruleset) ^Q	<ul style="list-style-type: none"> ▪ Develop Incident Management Alternate/Detour Route Response Plan 	X	
List of Smart Work Zone Equipment	<ul style="list-style-type: none"> ▪ Determine Level of Smart Work Zone Needs for Incident Management 	X	
Detailed Travelers Information Plan	<ul style="list-style-type: none"> ▪ Prepare Detailed Travelers Information Plan 	X	
Updated Cost Estimate ^Q	<ul style="list-style-type: none"> ▪ Prepare Detailed Traffic Operations and ITS Cost Estimate 	X	
Initial Stakeholder Meeting Minutes	<ul style="list-style-type: none"> ▪ Hold initial <u>Stakeholder Meetings</u> 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.

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, CTB 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.
- [Resolve 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 changeable 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 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 will prepare a Travelers Information Strategy if applicable to project. Details regarding the Travelers Information tasks are still *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~~[contractor](#). The Traffic Operations Engineer may

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://nconnect.sharepoint.com/:f:/r/sites/trafficsystemsoperationsprojects/Shared%20Documents/References?csf=1&web=1&e=tqPQy2>
 - <https://connect.ncdot.gov/resources/safety/Tepl/Pages/tepl.aspx>
- [NCDOT Quality Management Program: Quality Control and Quality Assurance](#)

Deliverables

Deliverable	Task	Responsible Party	
		Activity Leader	Additional Support
		Traffic Systems Operation	
Final Cost Estimate ^Q	<ul style="list-style-type: none"> ▪ <i>Update Construction-Phase Operations Cost Estimate</i> 	X	ITS and Signals Management Section
Requirements of Incident Management Plan ^A	<ul style="list-style-type: none"> ▪ <i>Submit Requirements for Incident Management Plan</i> 	X	
CCTV Plans , DMS/CMS Plans, CTB Plans , Cable Routing Plans, Signal Plans, CTB Plans ^Q	<ul style="list-style-type: none"> ▪ <i>Coordinate Incident Management Alternate / Detour Route Response Plan</i> 		ITS and Signals Management Section
Static Trailblazer Sign Plans ^Q			Signing & Delineation Designer
Signal System Timing Plans ^Q			Signal System Engineer
Static Trailblazer Sign Plans ^Q			Signing & Delineation Designer
Message Sets, ICM Response Database ^Q		X	
Final Demand Management Plan ^{A, Q}	<ul style="list-style-type: none"> ▪ <i>Submit Demand Management Plan</i> 	X	

Deliverable	Task	Responsible Party	
		Activity Leader	Additional Support
		Traffic Systems Operation	
Draft Tow Contract Documents ^Q	<ul style="list-style-type: none"> Submit Tow Contract Documents 	X	
Draft Law Enforcement Memorandum of Understanding ^Q	<ul style="list-style-type: none"> Initiate Memorandum of Understanding (MOU)/Agreements with Law Enforcement/Municipalities 	X	
Draft Agreement with Municipalities ^Q		X	
Coordination Meeting with NCDOT Communications Minutes	<ul style="list-style-type: none"> Coordinate with NCDOT Communication on Public Information Plan 	X	
Final Transportation Operations Plan ^{A, Q}	<ul style="list-style-type: none"> Complete Final Traffic Operations Plan 	X	
Final Equipment List ^A	<ul style="list-style-type: none"> Develop Equipment Purchase Need for Construction 	X	ITS and Signals Management Section

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^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., ITS and Signals Management Section), 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, CTB 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 CTB plans. The Traffic Operations Engineer will conduct 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 databases](#) for each route scenario, each route, CTB'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.

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://nconnect.sharepoint.com/:f:/r/sites/trafficsystemsoperationsprojects/Shared%20Documents/References?csf=1&web=1&e=tqPQy2>
 - <https://connect.ncdot.gov/resources/safety/Tepl/Pages/tepl.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 [□]	<ul style="list-style-type: none"> ▪ <i>Complete Tow Contract Documents</i> 	X	X
Final Law Enforcement Memorandum of Understanding (MOUs) [□]	<ul style="list-style-type: none"> ▪ <i>Complete Law Enforcement Memorandums of Understanding</i> 	X	
STOC Operators Training	<ul style="list-style-type: none"> ▪ <i>Confirm available staffing for STOC/TMC</i> 	X	
IMAP Procurement Schedule	<ul style="list-style-type: none"> ▪ <i>Plan IMAP Coverage Expansion Truck Purchases</i> 	X	
<u>Verified ICM Response Database</u>	<ul style="list-style-type: none"> ▪ <u><i>Verify Incident Management Alternate / Detour Route Response Plan</i></u> 	X	

[□] 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~~Finalize Tow Contract Documents

The Traffic Operations Engineer finalizes the details of tow contracts for inclusion in the special provisions. The Traffic Operations Engineer will coordinate with the Division’s Contract/Proposal Engineer.

~~Complete~~Finalize 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 is available for additional coverage needed during construction. If additional staff is needed, the Division coordinates with the Traffic Operations Engineer.

Details regarding ~~any~~the training ~~tasks for~~ the State Traffic Operations Center (STOC) ~~operators~~ ~~operator tasks~~ are still *in development*.

~~Plan~~Expand 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~~Verify 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~~populated into tool~~ for State Traffic Operations Center (STOC)/Traffic Management Center (TMC) operators to use during construction.
- ~~Verifies~~Verify 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 (IRR) Process Document (Formerly After-Action Review (AAR))*—
- Future Location of all Documents
 - o <https://nconnect.sharepoint.com/:f:/r/sites/trafficsystemsoperationsprojects/Shared%20Documents/References?csf=1&web=1&e=tqPQy2>
 - o <https://connect.ncdot.gov/resources/safety/Tepl/Pages/tepl.aspx>
- [NCDOT Quality Management Program: Quality Control and Quality Assurance](#)

Deliverables

Deliverable	Task	Responsible Party	
		Activity Leader	
		Traffic Operations Engineer	
Let Tow Contract	<ul style="list-style-type: none"> ▪ Complete Let Tow Contract Documents 	X	
STOC/TMC Training	<ul style="list-style-type: none"> ▪ Train STOC/TMC Staff 	X	
ATMS Integration into STOC	<ul style="list-style-type: none"> ▪ Integrate Advanced Traffic Management System (ATMS) 	X	
Expanded IMAP Coverage	<ul style="list-style-type: none"> ▪ Finalize IMAP Expansion 	X	
Go Live Meeting Test Plans and Summaries	<ul style="list-style-type: none"> ▪ Conduct ICM Implementation and Testing 	X	
Implement ICM Devices		X	
Contractor submittals	<ul style="list-style-type: none"> ▪ Collaborate with Resident Engineer and Contractor 	X	
ICM Response Review (IRR) Meetings	<ul style="list-style-type: none"> ▪ Conduct ICM Response Reviews (IRR) 	X	
Updated Database ^Q	<ul style="list-style-type: none"> ▪ 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 will complete 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](#)The Traffic Operations Engineer:

- [Schedules](#)~~Schedule~~ meeting with all stakeholders before testing to update them on ICM responses
- [Gathers](#)~~Gather~~ construction methodologies from previous projects and coordinate with applicable Division on implementation methods
- [Provides](#)~~Provide~~ implementation and integration support for the ICM devices (including traffic signals, changeable trailblazer signs, DMS/CMS, ~~and~~ 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](#)~~Review~~ 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](#)~~Document~~ how the system will be tested and validated for approval
 - [Observing](#)~~Observe~~ the testing to ensure effective system operations
 - [Testing](#)~~Test~~ 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](#)~~contractor~~
- Reviewing and coordinating details of the Incident Management Plan
- Reviewing Contractor ITS Device location/placement
- Testing ITS devices after installation
- Attending [Contractor Maintenance](#)~~contractor maintenance~~ of [Traffic](#)~~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 will coordinate with the Division on adjacent project schedules during construction as described in the ORA. The Resident will prepare 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 will perform a post construction assessment for on-going use of ICM along the project after construction. This assessment will include:

- 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.

OTP1 Complete CTP/MTP (including Project Sheet)

Overview

Insert overview text for this activity.

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

- (In development)
- (In development)

Deliverables

<u>Deliverable</u>	<u>Task</u>	<u>Responsible Party</u>	
		<u>Activity Leader</u>	<u>Additional Support</u>
<u>CTP/MTP Problem Statement</u>	<u>Develop Community Vision</u>	<u>Transportation Planning Division and MPOs/RPOs</u>	<ul style="list-style-type: none"> <u>Division Corridor Development Engineer</u> <u>Division Planning Engineer</u> <u>Planning Organizations (MPOs/RPOs)</u>
	<u>Select Facility to Study</u>		<ul style="list-style-type: none"> <u>Division Corridor Development Engineer</u> <u>Division Planning Engineer</u> <u>Planning Organizations (MPOs/RPOs)</u> <u>Integrated Mobility Division</u> <u>Railroad Division</u> <u>Roadway Design Unit</u>
	<u>Evaluate Facility Constraints</u>		
	<u>Perform Facility Analysis</u>		
	<u>Conduct Multimodal Assessment</u>		
	<u>Coordinate on Roadway Design</u>		
	<u>Initiate Railroad Coordination</u>		
	<u>Evaluate Future Year Solution</u>		
<u>Validate Solution against Vision</u>	<ul style="list-style-type: none"> <u>Division Corridor Development Engineer</u> <u>Division Planning Engineer</u> <u>Planning Organizations (MPOs/RPOs)</u> 		
<u>Complete CTP/MTP Project Sheet</u>	<ul style="list-style-type: none"> <u>Division Corridor Development Engineer</u> <u>Division Planning Engineer</u> <u>Planning Organizations (MPOs/RPOs)</u> <u>Integrated Mobility Division</u> <u>Railroad Division</u> <u>Roadway Design Unit</u> 		

Develop Community Vision

In development.

Select Facility to Study

In development.

Evaluate Facility Constraints

In development.

Perform Facility Analysis

In development.

Conduct Multimodal Assessment

In development.

Coordinate on Roadway Design

In development.

Initiate Railroad Coordination

In development.

Evaluate Future Year Solution

In development.

Validate Solution against Vision

In development.

Complete CTP/MTP Project Sheet

In development.

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 Tool
- 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	<ul style="list-style-type: none"> ▪ Scope EDTE 	<ul style="list-style-type: none"> ▪ <u>Transportation Planning Division</u> ▪ <u>Feasibility Studies/ Corridor Development Unit</u> ▪ <u>Congestion Management Unit</u> 	<ul style="list-style-type: none"> ▪ <u>Project Lead</u> Congestion Management Unit or ▪ <u>Feasibility Studies/Corridor Development Unit</u>
	<ul style="list-style-type: none"> ▪ ApprovedInitiate EDTV ^ADevelopment Process 	<ul style="list-style-type: none"> ▪ Scope EDTETransportation Planning Division 	
	<ul style="list-style-type: none"> ▪ Initiate EDTV Development Process ▪ Produce EDTVs 	<ul style="list-style-type: none"> ▪ <u>Feasibility Studies/ Corridor Development Unit</u> 	<ul style="list-style-type: none"> ▪ XProject Lead ▪ <u>Traffic Safety Unit</u>
	<ul style="list-style-type: none"> ▪ ProduceReview/Finalize EDTVs 	<ul style="list-style-type: none"> XTransportation Planning Division 	<ul style="list-style-type: none"> XProject Lead

Deliverable	Task	Responsible Party	
		Activity Leader	Additional Support
Revised Project Scoping Report (if needed)	<ul style="list-style-type: none"> Review/Finalize EDTVs/Update in Project Scoping Report (if needed) 		

[^] 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. Refer to 1TM1 (Complete Express Design Traffic Analysis) 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 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.](#)

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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	<ul style="list-style-type: none"> ▪ <i>Conduct Traffic Safety Review for Selected Feasibility Study, Corridor Study, or Express Design</i> 	Safety Planning Engineer	Project Lead
Traffic Safety Review for Selected Project Scoping Reports	<ul style="list-style-type: none"> ▪ <i>Conduct Traffic Safety Review for Selected Project Scoping Reports</i> 		
Review of Purpose and Need Statements Containing Safety	<ul style="list-style-type: none"> ▪ <i>Review Purpose and Need Statements Containing Safety</i> 		

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 1FS3 for related information), the Safety Planning Engineer:

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	<ul style="list-style-type: none"> ▪ <i>Develop Conceptual Utilities Cost Estimate</i> ▪ <i>Review Estimate</i> 	Utilities Coordinator	Project Lead
Preliminary Utility Construction Estimate			

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 utilities 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).

Review Estimate

The Utilities Coordinator sends the two utilities cost estimate to the Utility Lead, who reviews the estimate, 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).

1VM1 Initiate ~~CR-RAVE, CLEAR Activities, and Value Assessment~~Cost Containment Value Management Activities

Overview

Ensure that initial Constructability Review, Risk Assessment Management, and Value Engineering (~~CR-RAVE~~) tasks begin in this Stage 1 to inform the Express Design and Project Scoping Report. Also initiate the Communicate Lessons, Exchange Advice, Record (CLEAR) and Value Assessments~~Cost Containment~~ (VACC) tasks.

The major tasks of this Stage are defined as follows:

- a) Constructability Review (CR) – support review of constructability considerations as part of project scope development.
- b) Risk Assessment Management (RMA) – support identification of potential issues (e.g., risks) that could jeopardize project delivery, including impacts to project scope, schedule, and budget goals.
- c) Value Engineering (VE) – ~~supports~~supports the determination if a VE Study is required (or recommended) for state or federal projects that meet or exceed defined ~~federal~~ thresholds.
- d) Communicate Lessons, Exchange Advice, Record (CLEAR) – ~~support~~ support identification of relevant lessons learned (LLs) and best practices (BPs), to leverage past successes and errors to deliver project more efficiently. Value Management Office (VMO) maintains the CLEAR database, which contains Department wide LLs and BPs.
- e) Value Assessment~~Cost Containment~~ (VACC) – support cost-saving ideas such as time savings, reduction in impacts, and improved constructability to aid in alternative design selection and scope development.

While ~~CR-RAVE, CLEAR, and Value Assessment~~Cost Containment~~s~~all Value Management tasks include separate items, starting the items together allows the outcomes to inform each other since they typically overlap.

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

- [Value Management Office](#)
 - *Value Management Guidelines*
- [Constructability Review Program](#)
 - *Constructability Review Checklist*
- [Risk Management Program](#)
 - *Risk Management Guide*
 - *Risk Assessment Worksheet (RAW)*
 - *How to use the Online RAW*
 - *Risk Examples and Mitigation Strategies*
- [Value Engineering Program](#)

1VM1 Initiate ~~CR-RAVE, CLEAR Activities, and Value Assessment~~Cost ContainmentValue Management Activities

- ~~○ Value Engineering Checklist~~
- Value Engineering Schedule
- [ArcGIS STIP and NHS Maps](#)
- [CLEAR Program](#)
 - CLEAR SharePoint Site
- ~~Value Containment Assessment~~
- ~~○ Value Assessment Worksheet~~
- ~~○ Value Assessment Worksheet SOP Video~~
- ~~○ Value Assessment Sample Scope of Work~~
- [Project Management Guide](#)
- [NCDOT Quality Management Program: Quality Control and Quality Assurance](#)

Deliverables

Deliverable	Task	Responsible Party	
		Activity Leader	Additional Support
		Project Lead	
Constructability Review Checklist	<i>Review Constructability Review Checklist</i>	X	Division Construction Engineer Area Construction Engineer Value Management Office
Risk Assessment Worksheet	<i>Conduct Risk Management Activities</i>	X	Value Management Office Program Manager
Risk Assessment Study ^A			Value Management Office Program Manager
Value Engineering (VE) Checklist	<i>Determine if a Value Engineering Study is Needed (Available in ATLAS)</i>	X	Value Management Office Program Manager
Value Engineering (VE) Schedule	<i>Develop the Value Engineering Schedule</i>		Value Management Office Program Manager
CLEAR Database Search	<i>Search and Share Relevant LL and BP (CLEAR Database Search) with Project Team</i>	X	Value Management Office Program Manager
Value Assessment Cost Containment Activities	Conduct Value Assessment Cost Containment Activities	X	Value Assessment Cost Containment Consultant
Value Assessment Cost Containment Worksheet			Value Management Office Program Manager

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

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 gives 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 CR where 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. If Project Lead determines a Formal CR (to include Contractors) is needed, VMO will need to be contacted. VMO provides support as needed.

1VM1 Initiate ~~CR-RAVE, CLEAR Activities, and Value Assessment Cost Containment~~ Value Management Activities

Conduct Risk ~~Management~~ 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 1FS3 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 of~~ 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 the Alignment Defined Stage.

Determine if a Value Engineering Study is Needed

~~As outlined in the Value Engineering (VE) Checklist, the~~ The Project Lead or Project Manager (depending on the timing of when the determination is made) ~~establishes notifies if VMO a VE study is required or recommended~~ for state or federal projects that meet or exceed the following thresholds:

Any project ~~on the National Highway System (NHS) that~~ has a construction estimate of is \$250 million or more, ~~or~~

- ~~Any project on the NHS that is \$40 million or more for projects with structures, or~~
- ~~Any project that is over \$500 million regardless of NHS designation.~~

~~Develop the Value Engineering Schedule~~

~~Based on the information in the State Transportation Improvement Program (STIP), the VMO Program Manager develops a preliminary VE Studies Schedule and is responsible for maintaining and managing the VE Studies Schedule. The VMO Program Manager prepares a preliminary list of projects that require a VE~~

1VM1 Initiate ~~CR-RAVE, CLEAR Activities, and Value Assessment~~ Cost Containment Value Management Activities

~~Study based on project information in the STIP. However, as a project develops, 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. It is the responsibility of the Project Lead or Project Manager (depending on the timing of review) to review the monthly 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.~~

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.

Conduct ~~Value Assessment~~Cost Containment Activities

The Project Lead may ~~utilize~~look to exercise cost containment measures related to scoping and alternative design selection. This may include reviewing roadway alignment, local agreements, and intersection treatment options, etc for efficiencies or improvements. These cost containment measures including cost savings amounts should can be added to a Value AssessmentCost Containment Worksheet for the project.

The Project Lead will can choose an outside-VA Consultant to conduct a Value AssessmentCost Containment Assessment (VACCA) towards the end of this stage, to be conducted in Stage 2, but a third-party consultant is no longer required for cost containment activities. The Project Lead should follow the Sample Scope of Work for Value AssessmentsAdditional information on the Cost Containment program can be found on the VMO Connect Site.

~~The assessment should be completed by a Consultant not directly involved in the project. For an Urban project, the consultant must be prequalified for Urban Design. The VA Consultant Lead that conducts these workshop discussions are a multi-disciplined group of experts based on the primary design and construction elements of the project and assist in facilitating cost containment recommendations. The teams should be tailored to expertise most critical for cost containment design recommendations based on the specific project.~~

~~Once the VA Consultant is selected, the Project Lead should provide read access to project SharePoint site and project information with contributor access to Value Management Library to the VA Consultant. The VA Consultant Lead and Project Lead should review the project scope items and other project objectives in a pre-workshop meeting.~~

1VM1 Initiate ~~CR-RAVE, CLEAR Activities, and Value Assessment~~Cost ContainmentValue Management Activities

2VM1 Complete ~~CR-RAVE Studies/Reviews, CLEAR Activities, and Conduct Value Assessment~~Cost Containment Value Management Activities

Overview

Building off the work started in Stage 1, ensure Constructability Review, Risk ~~Assessment~~Management, and Value Engineering (~~CR-RAVE~~) studies and reviews are continuing forward, along with continuing the ~~Value Assessment (VA)~~Cost Containment and Communicate Lessons, Exchange Advice, Record (CLEAR) tasks.

The major tasks of this Stage are defined as follows:

- a) Constructability Review (CR) – support review of constructability considerations as part of project scope development.
- b) Risk ~~Assessment~~Management (RAM) – 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.
- c) Value Engineering (VE) – when applicable for the project, complete the VE Study for state or federal projects that meet or exceed established federal thresholds.
- d) 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 project more efficiently. Value Management Office (VMO) maintains the CLEAR database, which contains Department wide LLs and BPs.
- e) ~~Value Assessment~~Cost Containment (AVACC) – advance cost-saving ideas such as time savings, reduction in impacts, and improved constructability to aid in alternative design selection and scope development.

While ~~CR-RAVE, CLEAR, and Value Assessment~~Cost Containments all Value Management tasks include separate items, advancing the items together allows the outcomes to inform each other since they typically overlap and may be combined (specifically for a Risk Assessment Study and VE Study).

References

- [Value Management Office](#)
 - o [Value Management Guidelines](#)
- [Constructability Review Program](#)
 - o [Constructability Review Checklist](#)
- [Risk Management Program](#)
 - o [Risk Management Guide](#)
 - o [Risk Assessment Worksheet \(RAW\)](#)
 - o [How to use the Online RAW](#)
 - o [Risk Examples and Mitigation Strategies](#)
- ~~[Risk Assessment Program](#)~~
 - o ~~[Risk Management Guide](#)~~

2VM1 Complete ~~CR-RAVE Studies/Reviews, CLEAR Activities, and Conduct Value Assessment~~Cost Containment Value Management Activities

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- ~~— Risk Assessment Worksheet (RAW)~~
- ~~— How to Use the Online RAW~~
- ~~○ Risk Examples and Mitigation Strategies~~
- [Value Engineering Program](#)
- ~~○ Value Engineering Checklist~~
- Value Engineering Schedule
- [ArcGIS STIP and NHS Maps](#)
- CLEAR Program
- CLEAR SharePoint Site
- [Cost Containment](#)
- ~~○ Value Assessment~~
- ~~○ Value Assessment Worksheet~~
- ~~○ Value Assessment Worksheet SOP Video~~
- ~~○ Value Assessment Sample Scope of Work~~
- [Project Management Guide](#)
- [NCDOT Quality Management Program: Quality Control and Quality Assurance](#)
- [Project Knowledge Sharing](#)

Deliverables

Deliverable	Task	Responsible Party	
		Activity Leader	Additional Support
Constructability Review Checklist	<ul style="list-style-type: none"> ▪ Complete Constructability Review Checklist 	Project Manager	<ul style="list-style-type: none"> ▪ Division Construction Engineer ▪ Area Construction Engineer ▪ Value Management Office
Constructability Review Minutes/CR Log ^A	<ul style="list-style-type: none"> ▪ Complete Constructability Review 	Value Management Office Program Manager	
Risk Assessment Worksheet	<ul style="list-style-type: none"> ▪ Update Risk Assessment Worksheet and Hold Risk Assessment Study 	Project Manager	<ul style="list-style-type: none"> ▪ Value Management Office Program Manager ▪ Project Team
Risk Assessment Study ^A		Value Management Office Program Manager	Project Manager
Cost Containment Activities Value Assessment	<ul style="list-style-type: none"> ▪ Complete Cost Containment Activities Hold Value Assessment and complete VA Cost Containment worksheet 	Project Manager	<ul style="list-style-type: none"> ▪ Value Management Office Program Manager ▪ Division Engineer
Value Assessment Cost Containment Worksheet		VA Cost Containment Consultant Project Manager	
Value Engineering (VE) Study Report ^A	<ul style="list-style-type: none"> ▪ Hold Value Engineering Study and Review Report 	Value Management Office Program Manager	
Value Engineering (VE) Study Recommendations		Value Management Office Program Manager	
Final Dispositions (Responses to recommendations)		Project Manager or Other Technical Disciplines/Units	Value Management Office Program Manager
CLEAR Database Search	<ul style="list-style-type: none"> ▪ Conduct CLEAR Activities 	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.

2VM1 Complete ~~CR-RAVE Studies/Reviews, CLEAR Activities, and Conduct Value Assessment~~
~~Cost Containment~~ Value Management Activities

July ~~2022~~ 2023

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 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.

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.

2VM1 Complete ~~CR-RAVE Studies/Reviews, CLEAR Activities, and Conduct Value Assessment~~
~~Cost Containment~~ Value Management Activities

July~~2022~~ 2023

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.

Hold Value Engineering Study and Review Report

As outlined in the *Value Engineering (VE) Checklist*, or as listed on the *VE Schedule*, the Project Manager establishes if a VE study is required or recommended for state or federal projects that meet or exceed the following thresholds:

- Any project (or combination of projects) on the National Highway System (NHS) that could have a total estimate of at least \$50 million, or
- Any project on the NHS that is \$40 million or more for projects with structures, or
- Any project that is over \$500 million regardless of NHS designation.

If required (or recommended), the VE Study is scheduled as early as possible after notice to proceed (NTP) to maximize the opportunity to include recommendations into the Design Recommendation Plan Set. The VE Study is conducted pursuant to FHWA guidance and thresholds, 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 Study Report, including VE recommendations, following the guidance defined in the *Value Management Guidelines*. Once prepared, the VE Report is submitted to the Project Manager and Roadway Design Lead to review with support from all applicable technical disciplines/Units 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.

2VM1 Complete ~~CR-RAVE Studies/Reviews, CLEAR Activities, and Conduct Value Assessment~~
~~Cost Containment~~ Value Management Activities

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The VMO records the dispositions in the VE Program Action Register, and the Project Manager works with all applicable technical disciplines/Units leads to implement the accepted recommendations into the project's design documents and permitting documents, if necessary.

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 reviews the monthly 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.

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: [Project Knowledge Sharing](#).

Conduct ~~Value Assessment~~ Cost Containment Activities

~~If determined to be advantageous by the Project Lead, During this stage, the VA Consultant identified in Stage 1, will conduct the VAa Cost Containment Assessment and complete the VACost Containment Worksheet. There may already be a VA-Worksheet of cost saving -ideas initially identified in Stage 1. This should be provided to the firm conducting the VAassessment. The VA-assessment should be done early enough to allow sufficient time for the Project Team to incorporate changes into the project without impacting the project schedule. Based on the Cost -Ceontainment Guidance, the purpose of the Workshop is to evaluate the programmed purpose and need and scope and brainstorm cost saving ideas that would reduce the Construction, Utility, Right of Way, and future Maintenance Costs without affecting~~

2VM1 Complete ~~CR-RAVE Studies/Reviews, CLEAR Activities, and Conduct Value Assessment~~ Cost Containment Value Management Activities

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~~functionality of the project based on its purpose and need.~~ The output from the ~~VA~~Assessment is the ~~VA~~Cost Containment Worksheet. ~~Directions on how to fill out the VA W~~Worksheet, for consultant firms, Project Managers, and Division Engineers, can be found ~~in the VA Worksheet SOP Video~~on the VMO Connect Site. Once the consultant firm completes the ~~VA W~~Worksheet, it should be posted to the project SharePoint site in the Value Management Library under the Value Assessment topic.

The Project Manager will evaluate and review the ideas with the Project Team for feasibility, cost savings, and if the ~~p~~Project will still meet the original purpose and need. The Project Manager will then provide a final disposition of Accepted, Accepted as Modified, or Rejected. All rejected recommendations need to include a detailed explanation as to why the recommendation is rejected. The Division Engineer has an opportunity to provide comments ~~in~~on the ~~VA W~~Worksheet ~~as well~~. Any cost savings identified may need to be included in the Cost Verification Memo (see *Project Management Guide* for related information).

****Note:*** ~~A Value-Cost Containment Assessment will not take the place of a required Value Engineering Study.~~

Complete QC/QA Procedures

The Value Management Office Program 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~~deliverables.

3VM1 Incorporate ~~CR-RAVE Outcomes, Submit CLEAR Activities, and Implement Value Assessment~~Cost ContainmentValue Management Activities

Overview

As applicable, ensure outcomes from the Constructability Review, Risk ~~Assessment Study~~Management, ~~Value-Cost Containment~~ Assessment, and Value Engineering Study (~~CR-RAVE~~) activities are incorporated into the design. Additionally, ensure Communicate Lessons, Exchange Advice, Record (CLEAR) activities continue.

While ~~CR-RAVE and CLEAR activities~~Value Management activities include separate items, considering the items together allows the outcomes to inform each other since they typically overlap and may be joined (especially a Risk Assessment and VE Study).

References

- [Value Management Office](#)
 - [Value Management Guidelines](#)
- [Constructability Review Program](#)
 - [Constructability Review Checklist](#)
- [Risk ~~Assessment~~ Management Program](#)
 - [Risk Management Guide](#)
 - [Risk Assessment Worksheet \(RAW\)](#)
 - [How to use the Online RAW](#)
 - [Risk Examples and Mitigation Strategies](#)
- [Value Engineering Program](#)
 - ~~[Value Engineering Checklist](#)~~
 - [Value Engineering Schedule](#)
- [ArcGIS STIP and NHS Maps](#)
- [CLEAR Program](#)
 - [CLEAR SharePoint Site](#)
 - [Cost Containment](#)
 - ~~[Value Assessment](#)~~
 - ~~[Value Assessment Worksheet](#)~~
 - ~~[Value Assessment Worksheet SOP Video](#)~~
 - ~~[Value Assessment Sample Scope of Work](#)~~
- [Project Management Guide](#)
- [NCDOT Quality Management Program: Quality Control and Quality Assurance](#)
- [Project Knowledge Sharing](#)

3VM1 Incorporate ~~CR-RAVE Outcomes, Submit CLEAR Activities, & Implement Value Assessment~~Cost ContainmentValue Management Activities

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Deliverables

Deliverable	Task	Responsible Party	
		Activity Leader	Additional Support
Constructability Review Checklist	<ul style="list-style-type: none"> Incorporate Constructability Review Outcome 	Project Manager	<ul style="list-style-type: none"> Division Construction Engineer Area Construction Engineer Value Management Office
Constructability Review Minutes/CR Log ^A	<ul style="list-style-type: none"> Complete Constructability Review 	Value Management Office Program Manager	
Risk Assessment Worksheet	<ul style="list-style-type: none"> 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
Value Assessment Cost Containment Recommendations	<ul style="list-style-type: none"> Implement recommendations from VA Worksheet 	Project Manager	<ul style="list-style-type: none"> Project Team Value Management Office Program Manager
Value Engineering Study Report (including VE recommendation Forms) ^A	<ul style="list-style-type: none"> Implement Value Engineering Recommendations 	Value Management Office Program Manager	
CLEAR Database Submission	<ul style="list-style-type: none"> 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.

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 Constructability Review (CR) ~~regardless whether or not if~~ one had been held during an earlier stage since multiple CRs can occur as the design develops.

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*.

Implement Value Engineering Recommendations

If a VE Study was held, the Project Manager makes sure the VE Study 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 VMO Program Manager makes sure the dispositions were recorded in the VE Program Action Register, and 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.

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 and 2VM1 as outlined in the *Value Engineering (VE) Checklist*. Changes may also impact the timing of when a VE Study is held. The Project Manager reviews the monthly 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.

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: [Project Knowledge Sharing](#).

3VM1 Incorporate ~~CR-RAVE Outcomes, Submit CLEAR Activities, & Implement Value Assessment Cost Containment Value Management~~ Activities

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Implement ~~Value Assessment~~ Cost Containment Recommendations

The accepted recommendations from the ~~VA~~ Cost Containment Assessment should be implemented into the design of the project. Prior to the conclusion of this stage, the Project Team should do an additional review to identify any additional cost containment changes that can be made based on new information discovered since the ~~VA~~ Assessment. Additional changes/recommendations should be added to the ~~VA~~ W worksheet and may need to be included in the Cost Verification Memo (see *Project Management Guide* for related information).

Complete QC/QA Procedures

The Value Management Office Program 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~~ deliverables.

4VM1 Complete ~~CR-RAVE, CLEAR and Complete Cost Value~~ ~~Assessment~~ContainmentValue Management Activities

Overview

As applicable, ensure outcomes from the Constructability Review, Risk ~~Assessment~~Management Study, Cost ~~Containment-Value Assessment~~, and Value Engineering Study (~~CR-RAVE~~) activities are incorporated into the design. Additionally, ensure Communicate Lessons, Exchange Advice, Record (CLEAR) activities continue.

While ~~CR-RAVE and CLEAR~~all Value Management activities include separate items, considering the items together allows the outcomes to inform each other since they typically overlap and may be joined (specifically a Risk Assessment and VE Study).

References

- [Value Management Office](#)
 - [Value Management Guidelines](#)
- [Constructability Review Program](#)
 - [Constructability Review Checklist](#)
- [Risk ~~Assessment~~Management Program](#)
 - [Risk Management Guide](#)
 - [Risk Assessment Worksheet \(RAW\)](#)
 - [How to use the Online RAW](#)
 - [Risk Examples and Mitigation Strategies](#)
- [Value Engineering Program](#)
 - [Value Engineering Checklist](#)
 - [Value Engineering Schedule](#)
- [ArcGIS STIP and NHS Maps](#)
- [CLEAR Program](#)
 - CLEAR SharePoint Site
- [Cost Containment](#)
- ~~Value Assessment~~
 - ~~Value Assessment Worksheet~~
 - ~~Value Assessment Worksheet SOP Video~~
 - ~~Value Assessment Sample Scope of Work~~
- [Project Management Guide](#)
- [NCDOT Quality Management Program: Quality Control and Quality Assurance](#)
- [Project Knowledge Sharing](#)

Deliverables

Deliverable	Task	Responsible Party	
		Activity Leader	Additional Support
Constructability Review Minutes/CR Log ^A	<ul style="list-style-type: none"> ▪ <i>Complete Constructability Review Implementation Check</i> 	Value Management Office Program Manager	

4VM1 Complete ~~CR-RAVE, CLEAR and Complete Value Assessment~~Cost Containment-Value Management Activities

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Deliverable	Task	Responsible Party	
		Activity Leader	Additional Support
Risk Assessment Worksheet	<ul style="list-style-type: none"> Update and Monitor Risk Assessment Worksheet 	Project Manager	Value Management Office Program Manager
Value Assessment Cost Containment Activities	<ul style="list-style-type: none"> Complete Value Assessment Implementation Check 	Project Manager	<ul style="list-style-type: none"> Value Management Office Program Manager Division Engineer
Value Engineering (VE) Study Report ^A	<ul style="list-style-type: none"> Complete Value Engineering Recommendation Implementation Check 	Value Management Office Program Manager	
CLEAR Database Submissions	<ul style="list-style-type: none"> Submit LL and BP from throughout 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.

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 Constructability Review (CR) regardless if one had been held during an earlier stage since multiple CRs can occur as the design develops.

Update and Monitor Risk Assessment Worksheet

The Project Manager, with support as needed from the VMO Program Manager, continually revises the ~~risk register~~ 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*.

Complete ~~Value Assessment~~ Cost Containment Assessment Implementation Check

The Project Manager confirms implementation of accepted recommendations and completes the ~~Value Assessment~~ Implementation Check on the ~~VA~~ Cost Containment Worksheet. Any cost savings identified

4VM1 Complete ~~CR-RAVE, CLEAR and Complete Value Assessment~~ Cost Containment Value Management Activities

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may need to be included in the Cost Verification Memo (see *Project Management Guide* for related information).

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. ~~The VMO Program Manager records the implementation check in the VE Program Action Register.~~

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 and 2VM1 as outlined in the *Value Engineering (VE) Checklist*. Changes may also impact the timing of when a VE Study is held. The Project Manager reviews the monthly 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.

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: [Project Knowledge Sharing](#).

Complete QC/QA Procedures

The Value Management Office Program 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.

5VM1 Value Management Construction Support

Overview

As applicable, ensure outcomes from the Constructability Review, Risk ~~Assessment Study~~Management, and Value Engineering Study (~~CR-RAVE~~) and ~~Value Assessment~~Cost Containment activities are incorporated during construction. Additionally, ensure Communicate Lessons, Exchange Advice, Record (CLEAR) activities continue.

Complete Value Engineering Proposal activities if necessary.

References

- [Value Management Office](#)
 - Value Management Guidelines*
- [Constructability Review Program](#)
 - Constructability Review Checklist*
- [Risk ~~Assessment~~Management Program](#)
 - Risk Management Guide*
 - Risk Assessment Worksheet*
 - Risk Examples and Mitigation Strategies*
- [CLEAR Program](#)
 - CLEAR SharePoint Site
- [Project Knowledge Sharing](#)
- [Value Engineering Proposal Program](#)
- [Standard Specifications for Roads and Structures](#)
- [Construction Manual](#)

Deliverables

Deliverable	Task	Responsible Party	
		Activity Leader	Additional Support
Risk Assessment Worksheet	<ul style="list-style-type: none"> ▪ <i>Update and Monitor Risk Assessment Worksheet</i> 	Project Manager/ Resident Engineer	Value Management Office Program Manager
CLEAR Database Submissions	<ul style="list-style-type: none"> ▪ <i>Submit LL and BP from throughout Project Design and Development (CLEAR Submissions)</i> 	Division Personnel	Value Management Office Program Manager
<i>Value Engineering Proposal Memo</i>	<ul style="list-style-type: none"> ▪ <i>Compile Value Engineering Proposal Memo</i> 	Value Management Office Program Manager	<ul style="list-style-type: none"> ▪ CCU ▪ Technical Disciplines/Units, ▪ Resident Engineer

Update and Monitor Risk Assessment Worksheet

The Project Manager and Resident Engineer, with support as needed from the VMO Program Manager, continually revise the ~~risk register~~RAW (as needed), ~~and~~ and reference the Risk Assessment Study Report (if a study occurred) to continue to monitor and control project risks. ~~Be sure to follow~~ing 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.

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: [Project Knowledge Sharing](#).

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 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~~ 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](#)
- [Value Management Guidelines](#)
- [Risk Assessment Management Program](#)
- [Risk Assessment Worksheet](#)
- [CLEAR Program](#)
- [Project Knowledge Sharing](#)

Deliverables

Deliverable	Task	Responsible Party	
		Activity Leader	Additional Support
Post Construction Assessment Summary	<ul style="list-style-type: none">▪ Summary of discussion generated by VMO and shared.	Value Management Office Program Manager	Project Team

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.

Pre-Post Construction Assessment 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.