

# **Low Impact Bridge Replacement**

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# **Low Impact Bridge Replacement**

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**North Carolina Department of Transportation**

# Division Managed Low-Impact Bridge Replacement Process

## Introduction

The State of North Carolina has enjoyed a rich past of good highways and mobility. It has prided itself on being the “Good Roads State” from the 1930’s when the visionary leaders of the time recognized the need to place all the county owned roads and bridges under the State’s control. The intent of this effort was, in part, to provide a consistent and reliable highway network across the state from the mountains to the sea and to provide basic transportation services by getting kids to school, farm products to market, and workers to factories.

In the 1950’s during Governor Kerr Scott’s administration, the state embarked on a massive highway building and modernization program to get people out of the mud and to help get farmers’ products to their markets. These “farm to market” roads became the backbone of the highway network and provide the life blood to a burgeoning and vital sector of North Carolina’s economy, the local farmer. To make this possible, thousand of local roads were widened to two lanes, and bridges were built to get across creeks and small rivers. The goal was to address as many primitive roads and bridges as possible with many highway crews devoted to building mile after mile of highway and many bridge crews building bridge after bridge. Little thought was given to the longevity of these roads and bridges. The legacy of this era of rapid building, while accomplishing the mission of the day, has unwittingly resulted in a large number of bridges that are reaching the end of their useful life.

The State’s bridges are aging out at a faster pace than the funds available to replace them. Under existing funding programs, for every bridge replaced, two additional ones become deficient. Currently, out of the approximately 2,770 bridges that are identified as deficient, only about 30% are funded in the 2009 - 2015 State Transportation Improvement Program (STIP) for replacement. On average, about 150 bridges are replaced annually, however, it is estimated that this number should be doubled to 300 bridges per year if we are to adequately address our growing population of deficient bridges. With this substantial increase in projects, it is imperative that all bridge replacements are planned, designed, constructed and maintained in accordance with state and federal environmental regulations while maintaining cost effective program delivery to ensure that state and federal funds are providing the maximum benefit to the traveling public.

## **Purpose**

Recognizing the looming problem in the growth of deficient bridges, NCDOT established an internal work group to study the issues and to make recommendations on how to improve the condition of the state's bridges; not only for today, but also for the future. This internal work group developed many valuable recommendations which the department is in the process of implementing. Two key recommendations that can impact the condition of the state's bridges are as follows:

- **Modify the design standards so that bridge replacements are economical and safe.**  
Over time the department expanded the scope of bridge replacement projects to address other highway needs such as bridge approach highway alignment and roadway width. This expansion of scope resulted in bigger and longer projects with bigger footprints, larger price tags, and more environmental impacts.
- **Plan, design and construct bridges as quickly as possible.**  
It had become standard practice for a simple bridge replacement project to take three to five years to deliver, which resulted in higher projects costs due to inflation and planning cost.

It has been estimated that if these two issues can be improved that a small bridge project will cost 25% less, which will free up valuable dollars to replace other bridges.

The department has addressed the first issue by developing the "Subregional Tier Design Guidelines for Bridge Projects"<sup>1</sup>. The department has tackled the second issue by developing an abbreviated project schedule for small bridges that established the standard of completing bridges, start to let, within one year. However, in order to meet our goal, the department needed help from others.

NCDOT solicited the help of federal and state partners through the Interagency Leadership Team (ILT)<sup>2</sup> to address the rapid replacement issue. The ILT has identified the investigation of program efficiencies and streamlining processes as a major goal and objective, so it became clear that this group could provide the appropriate resources to tackle this problem. In January 2009, the ILT agreed to support this effort and provided commitments to devote their staff resources to help develop a streamlining process for "Low-Impact Bridge Replacement

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<sup>1</sup> "Subregional Tier Design Guidelines for Bridge Projects" available on the web at: <http://www.ncdot.org/doh/preconstruct/highway/structur/subregional/STGFeb2008.pdf>

<sup>2</sup> ILT consists of members from the following agencies: NCDOT, NCDENR, NCDCCR, NC Commerce, NC WRC, NOAA Fisheries, NC Agriculture and Consumer Services, USACE, EPA, FHWA, USFWS

Projects”. A multi-agency work team<sup>3</sup> was assembled and charged with streamlining the environmental review process to help deliver low impact bridge replacement projects within one year from start to letting. This team’s efforts would compliment the other bridge initiatives that NCDOT had on-going. This manual is a product of both the multi-agency work team efforts along with those of the department’s internal workgroup and is defined as the **Division Managed Low-Impact Bridge Replacement Process**.

This ground breaking effort by the multi-agency work team demonstrates the positive benefits and cooperative spirit that can be accomplished by working together for a common purpose. NCDOT wishes to express its appreciation to the ILT for their support and the individual work team members that spent many hours working on this new process which could be a model for other states to follow. In addition, the department wishes to thank Donna Dancausse, FHWA for the countless hours devoted to this effort.

The intent of this document is to provide guidance on a process to deliver low impact bridge replacement projects within a 12 month time frame that meet the low – impact bridge characteristics and the construction cost does not exceed the current Purchase Order Contract limit of \$1.2 million, however, it should not preclude the department from using this process for environmental review on other bridges that cost more than \$1.2 million or in cases where only minor environmental impacts are encountered that cause the time frame to exceed the 12 month target.

## **Bridge Selection Process**

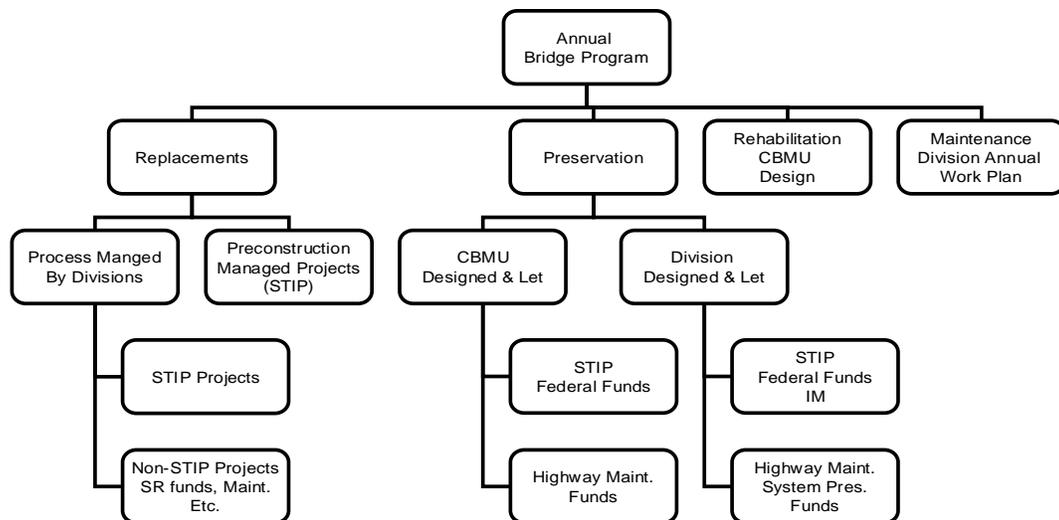
The management of the Bridge Program cuts across several units within NCDOT. The lead unit is the Central Bridge Management Unit (CBMU) since they have reporting requirements in accordance with US Congressional mandates as administered by FHWA. CBMU is the lead unit that coordinates the programming of bridges that are added to the STIP using the department’s Bridge Management System. An effective Bridge Management Program requires the use of asset management principles of setting strategic plans, objectives and goals and an optimum funding strategy in the selection of projects for maintenance, preservation, rehabilitation and replacement with specific performance expectations and a feedback loop for validation. While this manual is devoted to delivery of low-impact bridge replacement projects through the Division Managed Process, the following text attempts to put the process of selection of all bridges for improvement in context with the total Bridge Program to provide an overall picture of how the various efforts compliment and intertwine with each other.

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<sup>3</sup> See [Attachment N](#) for a list of work team members

On or before January 1 each year, Central Bridge Management Unit (CBMU) sends each Division Engineer a list of potential bridge replacement projects that qualify for FHWA funding, ranked by deficiency point numbers along with performance metric goals, the current Division metric status and statewide metric status (annually). At the same time CBMU will also send a list of potential candidates for rehabilitation and preservation that qualify for FHWA funding. This process will be done annually such that new projects are identified each year and added to the NCDOT 5 year work plan (Figure 1).

## Comprehensive Bridge Program



**Figure 1**

The Division Engineer reviews Central Bridge Management Unit information along with information such as mobility (truck weight restrictions), safety, individual bridge maintenance costs, future projects, impacts to traffic along corridors or connecting routes, time required to deliver the project, and then determines bridge priorities for replacement, rehabilitation, and preservation. For bridge replacement candidates, the Division Engineer will develop a recommendation of which bridges should follow the tradition “Preconstruction Managed Process” (PMP) and which bridges should follow the “Division Managed Low-Impact Bridge Replacement Process” (LIBRP) and the requested funding fiscal year. (Note: the Department has set aside \$ 2 million per Division and set up a STIP number for each Division to support and expedite the programming and delivery of bridges that meet the LIBRP criteria and these bridges may be identified, funding and completed within a two year time frame).

The Division Engineer will forward their list back to CBMU for review and concurrence. If necessary, the Division Engineer and the State Bridge Management Engineer will meet to discuss and resolve any priority differences before finalizing the priority list. Central Bridge Management Unit will collect and forward the recommended replacement list with estimated costs of each project to Program Development Branch.

Program Development Branch and Central Bridge Management will meet to review the bridge priority list and determine, based upon priorities and fiscal constraints, if the year the Divisions have recommended each bridge candidate be let to contract can be met. Once this has been determined, based upon the fiscal constraints and priorities, the list will be returned to each Division Engineer.

The Division Engineer reviews the data, considers other potential funding sources (secondary road funds, small construction, etc.), meets with the State Bridge Management Engineer as needed to discuss any necessary adjustments for bridge replacements, bridge rehabilitation and bridge preservation to be accomplished, and together completes the final list of projects per year along with a backup list of bridges that could be substituted should one on the final list fall out. This list will also contain the bridge projects identified as Low-Impact Bridge Replacement Projects the Division will accomplish. The bridge replacement projects to be accomplished by the Division Managed process will be screened by the Division to ensure the projects selected meet the criteria for low-impact bridge project criteria.

Once the final list of bridge projects has been completed, the State Bridge Management Engineer will forward the list of bridge projects to the Director of Preconstruction, Program Development Branch, and Division Engineers. The list will identify the method by which the project will follow; either the LIBRP process or the Preconstruction Managed Process. Program Development Branch will initiate the process to add the list of bridge replacement projects to the STIP for the PMP. The Director of Preconstruction will forward the list of bridge projects identified to follow the Preconstruction Managed Process to all units involved in the project delivery process for their information and workload scheduling necessary to meet the identified let dates for the projects. The list of projects identified as following the Division Managed process will be forwarded to the respective Division Engineer for their information and workload scheduling necessary to meet the identified let dates for the project. These projects will not require the establishment of a separate STIP number, but will be programmed under the Division wide STIP number for Low-Impact Bridge Projects. The Divisions will work with Program Development Branch to setup the funding for these projects, the appropriate workflow for compliance purposes and will also use the STARS scheduling tool to develop a delivery schedule for these projects.

## **Division Managed Low-Impact Bridge Replacement Process**

This document outlines the steps for the 12-month planning and development process for Low Impact STIP Bridge Replacement Projects. Candidates for this process will have a construction cost of \$1.2 million or less, require minimal permits, PCE planning documents, minor Right of Way and Utility impacts, no FEMA study, no on site detour, and meets other low-impact characteristics as identified in Attachment B. This process will require the Division to manage the project and accomplish the majority of the project development work with professional engineering firms. It is the intent of this program for the Divisions to complete these least complicated types of bridges to provide quick project delivery for these projects. The manager of this process is the Division Maintenance Engineer.

It is understood that as the project is developed, concerns could be identified that would prohibit the project from moving forward in the low impact process.

To ensure timely project delivery, proper project selection is critical. Projects that have more time consuming requirements such as significant Right of Way acquisition or FEMA regulated streams should not be selected for this program. This careful consideration is necessary to ensure accurate and timely delivery of the projects.

The delivery of these projects in 12 months will require significant project management skills, forward thinking and planning to identify issues and resolutions to achieve timely delivery.

### **Pre Scoping Meeting**

**(Division Maintenance Engineer Schedules the Pre Scoping meeting to occur 12 months prior to the let date):**

The purpose of the Pre-Scoping Meeting is to determine if the bridge being considered for replacement is a feasible candidate for the Division Managed Low Impact Bridge Replacement Process. Several bridges should be scoped simultaneously, with consideration for geographical locations. The Pre-Scoping Meeting will be attended by the Division Maintenance Engineer, the Division Environmental Officer, the Division Design-Construction Engineer, a representative of the Hydraulics Unit, and the Division Bridge Maintenance Engineer. These five individuals will make up the core group which will make the decision as to which process the project will follow. At the outcome of the meeting, the group will have identified all of the questions that will need to be addressed at the scoping meeting (i.e. permits, detours, FEMA, etc.).

Following the Pre-Scoping Meeting, this same core group will begin preparations necessary for the Scoping Meeting. These activities are to be completed prior to the scoping meeting and will be discussed in detail at the scoping meeting.

**NOTE: The scoping meeting will occur 11 months prior to the let date.** The following activities are necessary:

- The Division Environmental Officer will begin assembling all of the preliminary environmental data pertinent to the project. These items may include but not be limited to, stream classifications, threatened and endangered species presence and habitat, jurisdictional boundaries, anadromous fish moratoria, mussels and potential mussel habitat, etc. In accordance with FHWA's document for Division-Managed Low-Impact Bridge Replacement Program, the Division Environmental Officer will be responsible for complying with NEPA ([Attachment O](#)).
- The Division Maintenance Engineer or delegate will have all utilities within the project area identified and located. All utility owners will be contacted and made aware of the upcoming project. The Division Bridge Maintenance Engineer will contact the utility owners by phone and a meeting on site will be scheduled. All parties will meet on site to discuss the utility relocations, and any potential problems will be addressed at this time. The Division Bridge Maintenance Engineer will be responsible for following up on the progress of the relocations to ensure that they are clear prior to the scheduled let date.
- The Hydraulics Unit Representative will complete the Preliminary Hydraulics Recommendation for the project. The State Stormwater Permit (SSP) determination will be made at this time also.
- The Division Maintenance Engineer or delegate will be responsible for sending out request for comment letters to all government agencies, resources agencies, and municipalities in order to gather input on the project. ([Attachment D](#), [Attachment E](#), [Attachment F](#)). Property owners most directly affected by the project will also be contacted and informed of the project intent, details and schedule. If a public hearing is requested the Division Maintenance Engineer will coordinate the meeting. Contact will also be made with the Wildlife Resource Commission (WRC) with a request for comment letter with regards to public water access. The contact person with WRC will be:

Erik Christofferson  
Engineering Services Division Chief  
Wildlife Resources Commission  
1720 Mail Service Center  
Raleigh, NC 27699-1720  
(919) 707-0153

- The Division Maintenance Engineer or delegate will draft a Location and Design Authorization Letter for the respective Division Engineer's signature. The issuance of this letter will allow preliminary engineering funds to be released for the project. ([Attachment I](#))

## **Scoping Meeting**

**(Division Maintenance Engineer schedules the Scoping meeting to occur 11 months prior to the let date)**

The core group will meet on site along with the designated representatives from the appropriate professional engineering firm to finalize the scope of the project. The resource agencies will be invited to this meeting. If a representative from a resource agency is unable to attend, it is the responsibility of that representative to visit the site as necessary at another time to gather information for scoping comments. The Division Maintenance Engineer will begin the meeting and explain that the intent of the meeting is to establish the details and limits of the project. All questions will be addressed and a clear scope of the bridge replacement will be determined. A scoping worksheet will be compiled by the Division Maintenance Engineer and will serve as the minutes of the meeting. (See [Attachment C](#))

The use of the subregional design guidelines will be used along with standardized cored slab bridge plans where possible for bridges incorporated in the Division Managed Process. The use of the standard bridge plans will reduce the design effort and costs.

The Division Maintenance Engineer will ensure all members of the core group and the consultants leave the meeting with a clear direction as to what is expected of them with regards to their responsibilities to meet each step of the process and the overall schedule. Areas of responsibility will fall into three distinct categories; Division Operations, Professional Engineering Firm, and NCDOT Preconstruction, ***with overall project progress lying with the Division Maintenance Engineer.***

Once the Scoping Meeting has been completed, the actual work of designing, estimating, assembling contract documents, acquiring environmental permits, etc. for the project will begin; therefore, resource agencies should notify Division Staff as soon as possible if there are any concerns that might remove the project from the low impact process.

## **Responsibilities by Team Member**

### **Resource Agencies**

Review list of proposed Division Managed projects and scoping comment letters. This initial screening of proposed projects will allow for desktop reviews of proposed projects and early identification of projects that are not appropriate for the Division Managed process.

Attend on-site scoping meeting (11 months) or visit the site as necessary at another time to gather field data for response to scoping comment requests.

Provide comments on proposed projects indicating any field conditions that may disqualify a project for the Division Managed process. NCWRC will provide the appropriate authorization letter(s) for projects in trout counties.

Review any written notifications required for any permit authorizations. Permit documentation should be reviewed and appropriate permits should be issued in a timely manner to reduce the risk of delays.

### **Division Operations**

The Division Maintenance Engineer, or his delegate, will be responsible for the overall delivery of the process. They will coordinate with all participants in the process to ensure that the project stays on course as established during the scoping meeting, and on schedule. He will also be responsible for requesting Right of Way, Utilities and Construction funding authorizations.

The Division Environmental Officer (DEO) will be responsible for reviewing and signing [Attachment G](#), the Low Impact Project Data Sheet. This Data Sheet serves as the PCE for the project and will be assembled by the consultant. The DEO will review and submit all permit documents to the appropriate agencies. All permit documents will be assembled by the consultant. The DEO will receive all permit authorizations from the respective agencies and will assist in the Division's review of the final construction plans to ensure that all permit requirements have been addressed in the final plans.

### **Professional Engineering Firm (PEF)**

The PEF will be responsible for completing the following tasks:

**Utility Relocations** – The PEF will coordinate directly with utility owners to clear any utilities deemed to be in conflict with the project. This will include any planning and verifications that may be necessary. The PEF will be tasked with the relocation of the subject utilities once authorization to do so is received. Utilities that must be relocated are to be identified

and scheduled for relocation **8 months prior to the let date**. All utilities are to be cleared no later than **1 month prior to the let date**.

**Wetland Delineation and completion of the Low Impact Bridge**

**Project Data Sheet** – The PEF will be responsible for all wetland delineation and required environmental surveys (**11 months prior to the let date**), and will complete the project data sheet for the DEO’s review and signature (**10 months prior to the let date**). The DEO reviews and signs the project data sheet and coordinates the FHWA review and approval (**6 months prior to the let date**). *(This entire task can be retained by the respective division and performed by DEO, if desired.)*

**Topographic Survey** – Boundaries for the required survey will be established by the PEF at the scoping meeting. (**11 months prior to the let date**). *(This task can be retained by the respective division and performed with DOT personnel, if desired.)*

**Bridge Survey Report** – The Bridge Survey Report will be completed by the PEF and shall provide information and supporting computations as prescribed in the NCDOT Hydraulics Unit “Guidelines for Drainage Studies and Hydraulic Design”. This information shall be submitted to the NCDOT Hydraulics Unit for review and comment **9 months prior to the let date**. The NCDOT review will take no longer than 10 working days.

**Preliminary General Drawing** – The Preliminary General Drawing will be completed by the PEF and will provide information and detail per the NCDOT Structure Design Manual. For structure standards and details refer to <http://www.ncdot.org/doh/preconstruct/highway/structur/>. The Preliminary General Drawing will be completed and submitted to the NCDOT Structure Design Unit for review and comment after the Bridge Survey Report has been reviewed **9 months prior to the let date**. The review will take no longer than 10 working days.

**Geotechnical Borings** – Borings will be performed by the PEF **8 months prior to the let date**. Borings are recommended to be taken only after the review of the Preliminary General Drawing has been completed to ensure borings are taken at substructure locations. The borings and foundation recommendations shall be performed in accordance with the Geotechnical Unit’s “Guidelines for Borings and Foundation Recommendations for Division Managed Bridge Projects”.

**Foundation Recommendations** – Foundation Recommendations completed by the PEF will be forwarded to the NCDOT Geotechnical Unit Head **8 months prior to the let date** for review and comment. This review will take no longer than 10 working days.

**Final Structure Plans** - The Structure Plans completed by the PEF will be forwarded to the NCDOT Structure Design Unit Head for review and comment **5 months prior to the let date**. This review will take no longer than 10 working days.

**Final Roadway Plans** - The Roadway Plans will be reviewed by the DDC Engineer **5 months prior to the let date**. This process will take no longer than 10 working days.

**Permit Documentation and Permit Drawings** – The completed Permit Documentation and associated permit drawings will be forwarded to the DEO for review and approval **7 months prior to the let date**. This review and approval will take no longer than 10 working days. Once approved, the DEO will submit the permit documentation to the appropriate regulatory agencies **6 months prior to the let date**. (*This task can be retained by the respective division and performed with DOT personnel, if desired.*)

**Final Construction Plans and Contract Documents** – final plans and contract documents are assembled by the PEF and submitted to the Division for review **3 months prior to the let date**.

**Construction Cost Estimate** - The engineer's estimate is developed by the Division Contract officer **3 months prior** to the let date with assistance from the PEF, Central Bridge Management, Structure Design and Central Contract Office as necessary.

**Project Advertisement** - Projects will be advertised and let in the Divisions. Project advertisements will be mailed to the AGC for informational purposes. Advertisements should be sent to:

**Carolinas Association of General Contractors**

Post Office Box 30277  
Charlotte, North Carolina 28230-0277

**NCDOT Preconstruction**

As referenced above, the various disciplines within the NCDOT Preconstruction Unit will review and comment on the following items within 10 working days:

Bridge Survey Report  
Preliminary General Drawings.  
Foundation Recommendations.  
Final Structure Plans

**Review of Final Plans and Contract Documents**

The Division will be responsible for the final review of the plans, contract documents, and the construction cost estimate **3 months prior to the let date**. This will be a collaborative effort by the Division staff. This will be similar, in many ways, to our current method of final field plans inspections. The Division Construction Engineer, Division Maintenance Engineer, Division Operations Engineer, Division Bridge Maintenance Engineer, and Division Environmental Officer, will be involved. This will be the final opportunity to revise any part of the plans and contract documents prior to the project let. The Division Maintenance Engineer will schedule the meeting and will be responsible for ensuring any necessary revisions are achieved.

**NOTE:** All contracts with federal funding are required to have a traffic control line item.

Upon completion of this review, the Division will request authorization of construction funds for the project **3 months prior to the let date**.

Permit authorization is received **3 months prior to the let date**.

All contract plans and documents will be finalized, and the project will be advertised 2 months prior to the let date.

Bids are received and contracts awarded, in accordance with the guidelines set forth by the Department's Contract Standards and Development Unit.

<http://www.ncdot.org/doh/preconstruct/ps/>. The use of the format provided by this unit ensures uniformity and continuity in contracts across the Department.

# Attachments for Low Impact Bridge Replacement Process

[Attachment A: Workflow for Low Impact Bridge Replacement Project Development](#)

[Attachment B: Characteristics of Bridge Replacements with Low/Minimal Impacts](#)

[Attachment C: Field Scoping Meeting Worksheet](#)

[Attachment D: Sample EMS Scoping Letter](#)

[Attachment E: Sample Schools Scoping Letter](#)

[Attachment F: Sample Agency Scoping Letter](#)

[Attachment G: Low/Minimal Impact Bridge Project Data Sheet](#)

[Attachment H: Low Impact Bridge Data Spreadsheet Compilation Guide](#)

[Attachment I: Sample Location & Design Approval](#)

[Attachment J: Standard Recommendations of Small Bridge Replacements in Trout Waters](#)

[Attachment K: Screening List for Low Impact Bridge Replacement Projects Located in Trout Counties](#)

[Attachment L: NWP3 – Buffer Application](#)

[Attachment M: Example of Buffer Application Drawings](#)

[Attachment N: List of Bridge Streamlining Multi-Agency Team Members](#)

[Attachment O: FHWA's NEPA Requirements for the NCDOT Low Impact Bridge Replacement Program](#)

[Attachment P: List of Bridge Streamlining Multi-Agency Team Members](#)