

# The Design Process

The design of all local program administration (LPA) projects with a construction phase will follow three major steps: Engineering Study, Preliminary Design, and Final Design. Each step is represented by documentation, which must be submitted to NHDOT for review, approval, and notice-to-proceed with the next step of design. These steps are outlined in this section.

## **Engineering Study**

The first step in the design process is for the Project Sponsor (or the Sponsor's consultant) to prepare an Engineering Study that typically includes the following sections and information:

**Local Concerns Meeting:** The first public meeting for your LPA project is intended to allow members of the public:

- To hear the general overview of the program funding requirements;
- To find out the proposed schedule of the project (as identified from the project scoping meeting detailed in Section 6);
- To obtain an overview of the Sponsor/consultant's understandings of the project area and potential issues to be addressed/overcome;
- To provide comments on the proposed project.

The public information collected during this meeting will be used in the development of the project's Purpose and Need Statement.

**Purpose and Need Statement:** After the Local Concerns Meeting, the design consultant will prepare a Purpose and Need Statement. The Purpose and Need Statement is the backbone of project development, because the identified alternatives will be measured by their ability to address the project's identified purpose and need and potential impacts to the natural and cultural environment.

A Purpose and Need Statement should be written so that the needs and goals of the project are clearly defined. It shall not describe a solution. Without a well-defined Purpose and Need Statement, it will be difficult to determine a reasonable, prudent, and practicable alternative or range of alternatives and may be impossible to dismiss the alternatives not selected. A Purpose and Need Statement **must** illustrate that corrective effort is *justifiable* and *worth* the expenditure of public funds and *worth the impacts* to the natural and cultural environment.

**Existing Conditions:** This section shall contain a description of the existing site and project concept to include width and length; type of facility and amenities (i.e. structures, etc.); and general layout, including any significant geometric or topographical conditions. Special attention should be paid to existing drainage systems throughout the project area and how the proposed work may impact it. The Sponsor/consultant is required to take "before" photos for future reference.

**Design Criteria:** This section shall contain a listing of the relevant design criteria and manuals to be used. Refer to Section 16 for Design Standards.

**Preliminary Environmental Reviews and Documentation:** All federally-funded LPA projects that are to be advanced to Final Design, ROW and/or Construction must complete environmental reviews to document the probable effects of the project on natural and historic resources, and identify measures to avoid, minimize, or mitigate the effects. This review and documentation shall be conducted in accordance with all pertinent state and federal environmental laws and regulations. Early identification of significant natural and cultural resources is required to identify project constraints and possible avoidance alternatives of impacts. NHDOT recommends early coordination and review with the natural and cultural resource agencies as part of this step. Section 17 of this manual provides more detail regarding this portion of the project's design.

**Alternatives Analysis/Proposed Layout:** This section shall include a description of the methodology and reasoning used to determine the proposed layout. The narrative shall include facility alignment, widths, lengths, and materials and impacts of the proposed facility to evaluate the potential impacts of the proposed alternatives to environmental and historical resources, utilities, other existing structures, and private property. The narrative should also include identification of construction impacts to traffic and any necessary traffic control plans. This portion of the engineering design will identify a **proposed action** from all other alternatives considered and provide reasons why the other alternatives were not feasible. If costs are a consideration in the evaluation of alternatives, the costs of each alternative shall also be included in the Engineering Study. The proposed action will be the one alternative that best addresses the issues identified in the Purpose and Need Statement and represents the Least Environmentally Damaging Practicable Alternative (LEDPA).

**Structure Studies and Recommendations:** Structure types studied (for retaining walls, bridges, buildings, etc.) shall be indicated in narrative form and the recommended structure type shown in plan, elevation, and typical section along with the requisite reasoning. The typical section shall portray the components of the structure and materials of construction. The Sponsor's representative or consultant shall require borings for new or replacement structures. The number and content of the boring logs shall be sufficient to present a reasonably accurate picture of subsurface conditions. The study shall also address issues of hydraulics and constructability.

**Cost Estimate and Engineer's Estimate:** An itemized cost estimate shall be prepared using item number, nomenclature, description, materials, and construction requirements, which are contained in the *Standard Specifications for Road and Bridge Construction*, NHDOT's latest edition (Standard Specifications). The Standard Specifications must be used for item numbers and corresponding specifications (i.e. Division 200 through Division 700) unless the Sponsor wants to use specifications more restrictive. The itemized cost estimate may include a contingency in this Engineering Study. The cost estimate should also include a separate line item for the anticipated fee for construction services for the scope of work prepared in the consultant's contract (see Section 14).

**Public Presentation of Proposed Action:** This second public meeting will focus on presenting the identified alternatives, the pros and cons of each, and a detailed narrative of why the proposed action best meets the project's purpose and need and makes the most sense for the location context. This meeting may be held as a stand-alone meeting or as part of a regularly scheduled meeting (a board of selectmen meeting for example). Minutes of the meeting must be kept and included in the Engineering Study. Public comments regarding the proposed action should be considered during the development of the Engineering Study recommendations in evaluating what issues or alternatives might be considered further as the project advances to Preliminary Design phase.

**Submission Requirements:** Submit the Engineering Study requesting NHDOT review and approval by letter on the Sponsor's letterhead. All materials described previously in this section shall be included in the submission. Verify the number of copies required with the NHDOT project manager.

Please see Section 30 for the discussion regarding what happens in those situations where projects are identified as not feasible at the conclusion of the Engineering Study.

### **Preliminary Design**

The Sponsor may proceed with the preliminary design step of the project after receipt of the NHDOT letter for Engineering Study Approval and the Notice-to-Proceed with Preliminary Design. All comments on the Engineering Study shall be incorporated into the Preliminary Design submission. Preliminary design includes developing in more detail the proposed action for the purpose of completing the NEPA process. The submission may include but is not limited to the following information:

#### **Drawings/Plans:**

- Location plan
- General plan and profile
- Typical and critical cross-sections
- Cross-section of intersecting facilities
- Cross-section of the bridges and/or structures
- Base plans with existing topographic features, utilities, wetlands, and right-of-way
- Grading, drainage, utilities, and erosion control
- Landscaping
- Signing and striping design and layout
- Detail Sheets

**Environmental Documentation:** Submit a copy of Environmental classification memorandum for project close to the submission of preliminary plans (see Section 17 for more information regarding the environmental checklists).

**NOTE:** Any environmental commitments identified as a result of the NEPA process must be included into final design and construction estimates, bidding documents and contracts, as appropriate as FHWA classification of the project is contingent upon their successful implementation.

**ADA Compliance:** Federal-aid projects must comply with the *Americans with Disabilities Act* (ADA). ADA is a Federal law administered by the US Department of Justice, and all public works projects must comply with the provisions of the law. Refer to Section 16 for Standards and Guidelines for Accessible Design.

**Miscellaneous:**

- Traffic Studies
- Boring location and logs, if project requires borings
- Hydrologic and hydraulic data
- Documentation of proposed design exception from accepted design standards, if applicable (refer to Section 16 for more information)
- Appropriate environmental/historical documentation (see **Section 17** for more detail)

**Cost Estimate and Engineer's Estimate:** The itemized cost estimate submitted with the Engineering Study must be updated using the information presented on the Preliminary Plans. The itemized Preliminary Design cost estimate may include a contingency percentage. The amount of the percentage depends on the level of detail provided in the preliminary design phase. The cost estimate should also include an updated anticipated fee for construction services for the scope of work prepared in the consultant's contract.

**Submission Requirements:** Submit the documentation requesting NHDOT review and approval of preliminary design by letter on the Sponsor's letterhead. All materials described previously in this section shall be included in the submission. The plans shall be submitted on 11" x 17" size sheets. Verify the number of copies required with the NHDOT project manager.

**Final Design/Plans, Specifications and Engineer's Estimate (PS&E)**

The Sponsor may proceed with the Final Design/PS&E step of the project after receipt of the NHDOT letter for Preliminary Plan Approval and Notice to Proceed with Final Design/PS&E. All comments on the Preliminary Plans shall be incorporated into the Final Design/PS&E submission. In addition, the Sponsor may proceed with Final Design providing that all environmental documentation has been submitted and NHDOT has confirmed that the NEPA process has been completed.

Right-of-Way (ROW) negotiations and acquisitions shall not begin until the Final Design Phase. The submission shall typically include the following:

**Drawings/Plans:** The plans carried forward in the Preliminary Design step will be finalized and any new plans added as required. The Final/PS&E plans will need to have sufficient information, along with the bid documents, for construction. The submission may include but is not limited to the following information:

- Design speed
- Lane width
- Shoulder width
- Pavement Section
- Horizontal Alignment

- Vertical Alignment
- Grades
- Stopping sight distance
- Cross slope
- Details for drainage catch basins, manholes, headwalls, and culverts
- Notation that traffic control devices are in accordance with MUTCD
- Traffic Management Plan
- Finalization of erosion control plan and details
- Sponsor/Consultant has checked that construction plans agree with pay items in Contract documents and Final Engineer's Estimate
- Sponsor/Consultant has submitted bridge plans to NHDOT for review and all comments were resolved
- Sponsor/Consultant has coordinated utility relocation with appropriate utility companies and finalized utility agreements as required

A municipal engineer's or consultant engineer's licensed professional engineer stamp for the State of New Hampshire shall appear on the plans and contract documents to be advertised. The stamp shall be that of the professional engineer who prepared the plans and contract documents or under whose direct supervisory control they were prepared.

**Contract Documents:** The Contract Documents typically include the following information:

Bidding and Contract Documents

- Invitation to Bid
- Instruction to Bidders
- Contract Agreement
- Change Order Form
- Application for Payment Form
- Bid Bond
- Bid Form
- Schedule of Prices
- Bid Addendum (if any)
- Performance and Maintenance Bond
- Labor and Materials Bond
- Non-collusive Affidavit
- Notice of Award
- Prosecution of Work
- Wage Rates Federal Aid Projects
- Required Contract Documents Package (from NHDOT website)
- Environmental Commitments
- NHDOT Project Close-Out Forms
- NHDOT Quality Assurance Program for Municipally Managed Federal-aid Projects, which includes the Sample Materials Certification to be signed by Municipal Official and Resident Engineer