

INDIANA DEPARTMENT OF TRANSPORTATION

Engineering Assessment Manual

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TABLE OF CONTENTS

| | |
|--|----|
| TABLE OF CONTENTS..... | 2 |
| POLICY / MANUAL APPROVAL | 4 |
| 1-1.0 INTRODUCTION..... | 5 |
| 1-1.01 Asset Management Project Prioritization Process..... | 5 |
| 1-1.02 District Activities, AMP3 | 5 |
| 1-1.03 Purpose of the Engineering Assessment Document..... | 5 |
| 1-1.04 Definitions | 6 |
| 2-1.0 DISTRICT PROJECT DEVELOPMENT..... | 6 |
| 3-1.0 NEED IDENTIFICATION..... | 7 |
| 3-2.0 DETERMINE ENGINEERING ASSESSMENT LEVEL..... | 8 |
| 3-3.0 CONDUCT ENGINEERING ASSESSMENT | 9 |
| 3-3.01 Task 1 - Determine the Essential Project Need (Deficiency) and Purpose (Objective) (Define the Problem)..... | 10 |
| 3-3.02 Task 2 – Gather Information (Define the Existing Project Environment) | 11 |
| 3-3.02(01) Field Inspection..... | 11 |
| 3-3.02(02) Design Criteria | 11 |
| 3-3.02(03) Existing Roadway Geometry | 11 |
| 3-3.02(04) Existing Structure Condition Data..... | 11 |
| 3-3.02(05) Traffic Analysis | 11 |
| 3-3.02(06) Crash Analysis | 12 |
| 3-3.03 Task 3 – Develop Project Alternatives | 12 |
| 3-3.03(01) Outline of Alternative | 13 |
| 3-3.04 Task 4 – Evaluate Alternatives..... | 13 |
| 3-3.05 Task 5 – Develop Preferred/Recommended Alternatives | 13 |
| 3-3.05(01) Recommended/Preferred Alternative..... | 13 |
| 3-3.05(02) Maintenance of Traffic Plan | 14 |
| 3-3.05(03) Environmental Impacts | 15 |
| 3-3.05(04) Community/External Stakeholder Context..... | 15 |
| 3-3.05(05) Cost Estimate | 15 |
| 3-3.06 Task 6 – Write the Engineer’s Report (Present Recommendation)..... | 16 |
| 3-4.0 ENGINEERING REPORT TYPES..... | 16 |
| 3-4.01 Abbreviated Engineer’s Report (AbbEngRpt) | 16 |
| 3-4.01(01) Report Contents | 16 |

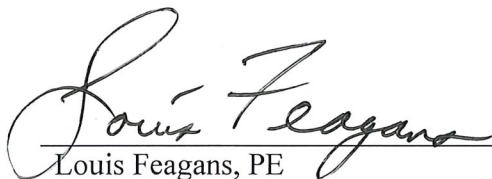
| | |
|--|----|
| 3-4.01(02) Existing Facility Information - Road / Safety / Mobility..... | 17 |
| 3-4.01(03) Existing Facility Information – Bridge / Culvert..... | 18 |
| 3-4.01(04) Abbreviated Engineer’s Report Additional Documents: | 19 |
| 3-4.02 Engineer’s Report (EngRpt) | 19 |
| 3-4.02(01) Engineer’s Report Contents | 19 |
| 3-4.03 Report Concurrence Matrix..... | 19 |
| 3-4.03(01) Typical Concurrence Block | 20 |
| 3-4.04 Scope Addendum Process | 20 |
| FIGURES..... | 21 |
| 1-1A District Activities, Asset Management Project Prioritization Process..... | 21 |
| 3-3A Field Inspection Checklist..... | 22 |
| 3-3B Alternative Evaluation Matrix Example | 24 |
| 3-4A Engineer’s Report Format | 26 |
| 3-4B Report Concurrence Block | 32 |

POLICY / MANUAL APPROVAL

Transmitted herewith is the Engineering Assessment Manual for the Indiana Department of Transportation (INDOT). This manual replaces all previous versions of the INDOT Design Manual's Chapter 5, and will be used in lieu of that chapter.

Minor changes to this manual may be made via executive memorandum with approval from the Deputy Commissioner for Engineering and Asset Management or the Director of Statewide Technical Services. These changes will be incorporated into the copy of the Engineering Assessment Manual which is posted on the INDOT website.


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ENGINEERING ASSESSMENT

This manual provides processes and guidelines regarding development and evaluation of transportation improvement alternatives for a Department project. This manual outlines the processes and methods adopted by the Department to facilitate the engineering assessment process (i.e. project scope development) portion of asset management and project development.

The engineering assessment process is a transportation decision-making process that facilitates project development from concept through design hand-off. Each scoping activity is developed to facilitate informed decision making based on an appropriate level of project development and risk management. The process encourages communication among disciplines, requires documentation of the reasoning behind project related decisions, eliminates duplicated effort among disciplines, and provides for early identification of potential issues. Involvement of all disciplines during the early stages of scope development ensures that issues affecting project type, schedule, and costs can be correctly evaluated and anticipated.

Engineering assessment is a critical portion of the Department's Asset Management Project Prioritization Process. For each district, the engineering assessment process is led by the respective Technical Services Division and sets the conditions for successful project development through project selection, funding, design and construction.

1-1.0 INTRODUCTION

1-1.01 Asset Management Project Prioritization Process

This is INDOT's process for project development, selection and funding. The intent of this document is to define the engineering assessment portion of this process.

1-1.02 District Activities, AMP3

The published AMP3 process does not detail the engineering assessment phase of the project prioritization process. All projects moving into the project prioritization process should have some type of engineering assessment document completed prior to being scored and prioritized at the district level.

1-1.03 Purpose of the Engineering Assessment Document

The project scope development process produces an engineering assessment document that:

- Facilitates each district's initial portion of the Department's Asset Management Project Prioritization Process (AMP3)
- Documents the engineering assessment phase / early preliminary engineering phase of a project completed prior to the Asset Team Prioritization portion of AMP3 (commonly called Project Deliberation)
- Documents coordination and sets conditions for successful integration with internal and external project stakeholders
- Serves as a guide for subsequent project development activities (e.g. survey, design, right-of-way acquisition)

- Establishes overall costs of reasonable improvement alternatives for analysis and comparison, sets baseline overall cost for preferred alternative(s)
- Establishes project Purpose and Need statement
- Selects and evaluates feasible project alternatives that will address the project’s purpose and need.
- Serve as the public record of project decisions and is defensible

1-1.04 Definitions

Engineer. Individual responsible for conducting engineering assessment and developing documents for same. May be either an Asset Engineer or a Scoping Engineer.

Asset Owner/Engineer. District staff within the Technical Services Division that are the asset leads for the following asset groups: Bridge / Roadway / Safety / Mobility.

IDM. The Indiana Design Manual. Available here:
https://www.in.gov/indot/design_manual/design_manual_2013.htm

TMP. Transportation Management Plan. A transportation management plan (TMP) is an overall strategy for accommodating traffic during construction. The TMP not only must address the alternatives confined to the project site, but it must also evaluate the impact traffic will have on the entire corridor. The TMP will address the proposed traffic-control plan, alternative traffic control applications, the effect traffic will have on other facilities, local concerns, cost effectiveness of various alternatives, etc. See IDM Ch 503 for greater detail regarding TMP documentation and process.

2-1.0 DISTRICT PROJECT DEVELOPMENT

Developing an accurate and complete engineering assessment requires participation from a variety of stakeholders. The following table lists which individuals provide input for projects in development, generally after the identification of the project need and before the project deliberation process.

| Position | Role | Responsibility |
|-----------------------------------|---|---|
| Technical Services Director (TSD) | Support/Approval | Provides informational support, confirms need for project, and advocates for support from other Departments. |
| System Asset Manager (SAM) | Support/Approval | Provides informational support and project approval. Approves District project priorities as needed. Facilitates coordination between projects and asset engineers. |
| District Scoping Manager (DSM) | Review / Facilitation / Approval Recommendation | Summarizes project and ensures all stakeholder input is provided and noted. Provides quality control review over engineering assessment |

| Position | Role | Responsibility |
|---|---|---|
| | | documents. Facilitates engineering assessment process. |
| Capital Program Management Director (CPMD) | Support | Provides/ensures Department participation from In-house Design, Environmental Services, R/W, Utilities, and Railroads. |
| Consultant Services Manager | Support | Provides/ensures support from Consultant Services including expected development time and other informational support. |
| District Asset Engineers <ul style="list-style-type: none"> • Pavement • Bridge • Safety • Mobility | Asset Lead/Approval Recommendation | Provides information regarding the primary treatment and ancillary treatment items as well as recommending scope approval. Develops project prioritization for approval by SAM if needed. |
| District Maintenance Director / Sub District Manager | Support | Provides/ensures support from Maintenance including participation from Maintenance Units, existing or historic issues relevant to the project, and other informational support. |
| District Traffic Engineer | Support/ Asset Lead / Approval Recommendation | Provides traffic support to project development. May have asset engineer responsibilities relative to safety and/or mobility project development. Provide guidance and direction for MOT recommendations. |
| District Construction Director (DCD) | Support | Provides/ensures support from construction including participation from the Area Engineer, input for MOT recommendations, and other informational support. |

3-1.0 NEED IDENTIFICATION

| Step | By Whom | Output |
|---------------------|---|---|
| Need Identification | District Asset Engineers (i.e. roadway, bridge, safety, mobility) | <ul style="list-style-type: none"> • Initial Project On-line Application • Preliminary Analysis |

District Asset Engineers begin the engineering assessment process by identifying asset shortfalls/deficiencies/transportation improvements and answering the following questions:

- What is the asset shortfall/deficiency/needed system improvement?
- What is the cause of the asset deficiency?
- What is the desired condition of the asset?
- What is the proposed solution (short term / long term) to correct the asset deficiency?
- Where is the asset and issue located?
- When should this issue be addressed?
- Why does this issue need to be addressed?

Once the District Asset Engineer(s) have identified the asset deficiency and desired asset performance, the following information is captured through INDOT’s online GIS application “INDOT Project Miniscope”:

- (Where) Corridor / Route
- (Where) Location of asset issue/concern
- (What/Why) Asset issue/concern/shortfall
- (What) Tentative project work type to address issue/shortfall/improvement of asset
- (When) Desired construction timeframe

3-2.0 DETERMINE ENGINEERING ASSESSMENT LEVEL

| Step | By Whom | Output |
|--------------------------------------|---------------------------|---|
| Engineering Assessment Determination | District Scoping Managers | <ul style="list-style-type: none"> • Determine the level of engineering assessment required for each project • Determination of responsible personnel to conduct engineering assessment and develop the required scoping document (i.e. INDOT or consultant, etc) |

| Engineering Assessment Level | Non-Complex | Complex |
|---|---|---|
| Criteria | <ul style="list-style-type: none"> • Directed alternative; no alternative analysis required | <ul style="list-style-type: none"> • No clear alternative; alternative analysis required • Historic bridges • Interchange access • Safety analysis with no directed treatment • Mobility analysis with no directed treatment |
| Engineering Assessment Product | Abbreviated engineering assessment = Abbreviated Engineer’s Report (AbbEngRpt) | Full engineering assessment = Full Engineer’s Report (EngRpt) |
| Work Types Common to the Assessment Level NOTE: This is not a definitive list of how | Bridge: <ul style="list-style-type: none"> • Bridge rehabilitation or repair (2) • Bridge deck (all type of modification) • Bridge thin deck overlay • Replace superstructure • Bridge widening • Bridge painting | Bridge <ul style="list-style-type: none"> • Bridge replacement (all types) (1) Mobility <ul style="list-style-type: none"> • New bridge • New interchange • Interchange modification |

| Engineering Assessment Level | Non-Complex | Complex |
|---|--|--|
| <p>these work types should be assessed. Project context and engineering judgement needs to be the ultimate determination of assessment efforts.</p> | <ul style="list-style-type: none"> • Substructure repair/rehabilitation • Bridge maintenance and repair • Repair/replace joints • Arch reconstruction/repair • Small Structure replacement (3) • New small structure (3) • Small structure pipe lining (3) <p>Mobility</p> <ul style="list-style-type: none"> • Auxiliary lane all types <p>Roadway</p> <ul style="list-style-type: none"> • HMA, PM Overlay • HMA Overlay, Structural • HMA Functional on PCCP • Crack sealing • PCCP Patching • Profiling, PCCP • PCCP, clean and seal joints • Partial 3-R • Surface treatments, all types • Concrete pavement restoration (CPR) • Shoulder rehab and repair <p>Safety</p> <ul style="list-style-type: none"> • Curve correction • Sight correction, all types • Sight distance improvement | <ul style="list-style-type: none"> • Added capacity <p>Roadway</p> <ul style="list-style-type: none"> • Road rehab (3R/4R) • Road reconstruct (3R/4R) • Crack and seat, all types • Rubblize • PCCP on PCCP pavement • Storm sewer repair/replace (3) • Pump/lift station • Pavement replacement, all types • Slide correction |

Notes:

- (1) Bridge replacement requires a structure, size and type report during design.
- (2) Rehabilitation work is non-complex minus rehabilitation on a historic structure.
- (3) Requires hydraulic analysis which should be done as part of the engineering assessment process

Engineering judgement should be used to ensure that the project context is reviewed with the project work type. Work type alone cannot dictate the level of engineering assessment required for an individual project.

Each project must have a type of engineer’s assessment document completed prior to moving through the Department’s Asset Management Project Prioritization Process.

3-3.0 CONDUCT ENGINEERING ASSESSMENT

The tasks in the following sections are listed in order of prevailing use in practice. However, an individual project may vary in level of effort and processing order. The user must use flexibility when applying these guidelines. Projects that do not require a full Engineer’s Report may not utilize all of these steps. Frequently, the Engineer is developing an assessment based on a

directed alternative from the District's Asset Engineer. The engineering assessment and alternative analysis is then limited to the directed alternative and the "No Build" alternative.

3-3.01 Task 1 - Determine the Essential Project Need (Deficiency) and Purpose (Objective) (Define the Problem)

Primary Task Assignment: Asset Engineer

Supporting: Scoping Engineer

Engineering Assessment Level: Both (Non-complex and Complex)

Engineering assessment seeks to establish an action plan that satisfies the project objectives while minimizing agency and user costs. The purpose and need statement within the engineering assessment document serves as the basis for system-wide improvements and individual project development.

Every project should have a well-defined and documented purpose-and-need statement that specifies the problem to be solved and future goals of the corridor/system to be achieved by the proposed project. Any features that do not directly support the purpose-and-need statement should be re-evaluated, redesigned, or eliminated.

Initial statements of project purpose and need are determined in the beginning stages of engineering assessment and should precede development of any other activity within the assessment phase of a project.

The project Purpose and Need Statement establishes why the project is required. It develops a shared understanding of the transportation problems and desired performance of an asset as a result of the project. The Purpose and Need Statement helps to:

- Define a project's scope;
- Develop and evaluate alternatives;
- Achieve environmental streamlining;
- Identify potential context sensitive solutions;
- Allow transportation decisions to be legally defensible;
- Justify impacts and spending of funds; and
- Comply with other federal environmental laws.

The Purpose and Need Statement development process is as follows:

1. Review system performance
2. Identify gaps in system performance
3. Identify problems to be fixed → *Project Need*
4. Establish desired facility/asset performance → *Project Purpose*

A "need" is an underperforming aspect of your transportation system; a problem to correct. A "purpose" identifies how the transportation facility/asset should perform after implementing the project. Note that a "purpose" allows for a reasonable range of alternatives, and does not define evaluation criteria for alternatives within the statement (i.e. "seek the most cost effective solution"). **Do not write the purpose as a specific solution.**

3-3.02 Task 2 – Gather Information (Define the Existing Project Environment)

Primary Task Assignment: Scoping Engineer

Supporting: Asset Engineer

Engineering Assessment Level: Both (Non-complex and Complex)

Once the Purpose and Need statement is developed, the Engineer continues to gather information relevant to the project. Gathering information begins with defining the purpose and need, and continues throughout the engineering assessment process.

3-3.02(01) Field Inspection

Engineering Assessment Level: As Required by the Engineer

Field check during the engineering assessment phase may be done based on engineering judgement by the Scoping Engineer or Asset Engineer. Consideration should be given to the amount of time available to develop the engineering assessment for individual projects. Input from all stakeholders is necessary, though it may be very difficult to schedule field checks which includes all stakeholders for every project in the assessment process at the district level. Engineering judgement and creativity are critical to reviewing the existing conditions of a project firsthand, and gaining input from the stakeholder group. The Field Inspection Checklist (Figure 3-3A) may be used as a guide for conducting the field inspection.

3-3.02(02) Design Criteria

Engineering Assessment Level: Both (Non-complex and Complex)

Select the applicable design criteria based on the project's work type and functional classification. See Chapters 40 and 53 through 56 for more information. Engineer should develop an initial assessment of the design criteria based on the level of capital improvement intended by the project work type.

3-3.02(03) Existing Roadway Geometry

Engineering Assessment Level: Both (Non-complex and Complex)

Based on the project work type, compare existing conditions to the selected geometric criteria. Identify deficiencies in Level 1 and Level 2 design criteria. Note whether any deficiencies should be addressed by the project or if any design exceptions are anticipated.

3-3.02(04) Existing Structure Condition Data

Engineering Assessment Level: Both (Non-complex and Complex)

Compare existing conditions to the desired condition data. Bridge and culvert condition data may be found in INDOT's Bridge Inspection Application System (BIAS).

3-3.02(05) Traffic Analysis

Engineering Assessment Level: Both (Non-complex and Complex)

Some form of traffic analysis is required for all projects. Traffic analysis is defined as one of two types:

1. Capacity Analysis: This analysis should only be performed when Level of Service (LOS) is insufficient, and the need of the project requires an increase in the capacity of the asset. Use the Transportation Research Board's *Highway Capacity Manual* and companion software (or compatible software/methods) for LOS analysis. See Chapter 41 for more information.
2. Traffic Forecast: At a minimum, traffic analyses should determine current- (base-) year and design-year (typically twenty years after construction) AADT. The most recent traffic data is available from the Traffic Count Database System (TCDS) which is accessible from the Department's Traffic Data webpage <http://www.in.gov/indot/2469.htm>, or directly from indot.ms2soft.com. Official traffic counts with projections are provided by the Technical Planning Support & Programming Division Office of Traffic Statistics. A request for a project traffic forecast should be made through the INDOT Technical Applications Pathway (ITAP). An ITAP user account and access to the Traffic Forecasting Requests application will be required.

3-3.02(06) Crash Analysis

Engineering Assessment Level: Both (Non-complex and Complex)

Crash analysis may be required by the Engineer to facilitate assessment of a project. In cases where analysis is not specifically required, engineering judgement is required to determine need for crash analysis and possible counter measures. Crash analysis may also be done to facilitate evaluation of possible design exceptions.

See Section 55-8.0 for further guidance on conducting a crash analysis.

3-3.03 Task 3 – Develop Project Alternatives

Engineering Assessment Level: Complex only

This section should only be utilized for a full engineering assessment where alternative analysis is required. For engineering assessment where District Asset Management staff have directed an alternative, move to Task 5 “Develop Recommended Alternative”

There may be directed alternative analysis requirements for engineering assessment based on a specific project or work type. The following are engineering assessment processes that have directed alternative analysis:

- Intersection analysis / improvement:
http://www.in.gov/indot/files/ROP_IntersectionDecisionGuide.pdf
- Historic bridge alternative analysis:
<https://www.in.gov/indot/2531.htm>
- Interchange access request:
https://www.in.gov/indot/files/State%20of%20Indiana%20Interstate%20Access%20Request%20Procedures_5-2018.pdf

3-3.03(01) Outline of Alternative

Engineering judgment and coordination with project stakeholders are used in the development of conceptual solutions. Although there may be an infinite number of alternatives that solve a particular asset need, the engineer should address only those alternatives which are reasonable, prudent, practicable, and constructible. The alternatives that are developed in this step must satisfy the purpose and need, have logical termini, demonstrate independent utility, and must not restrict the consideration of future alternatives.

Sufficiently outline the plan to allow informed comparison with competing alternatives, and convey the full scope-of-work to end-users (i.e., design engineers, environmental scientists, etc) of the Engineer's Report. The explanation may be presented in the form of drawings and/or written text. Essential elements include the typical cross section, horizontal (and, if required, vertical) alignment, major structures, and project limits. Additional detail regarding right-of-way impacts, construction costs, and maintenance of traffic during construction are only provided in this section if they have a direct bearing on the alternative comparison later in the report.

3-3.04 Task 4 – Evaluate Alternatives

Engineering Assessment Level: Complex only

This process is similar in concept to the process outlines in INDOT's "Procedures Manual for Preparing Environmental Documents". Evaluation criteria used for this step may be quantitative or qualitative, although quantitative criteria are preferred. Examples of criteria include cost, level of service, safety, impacts to the human and natural environment, engineering design issues, land use, and right of way acquisition. Evaluation criteria shall include the project specific major factors that directly impact the evaluation and selection of the preferred alternative.

The documentation should identify all alternatives that were considered, describe the criteria and methodology that were used, define the no-build solution, identify solutions that were eliminated (and why each was eliminated), present the estimated costs for each solution, and recommend an alternative for further consideration. A matrix is strongly suggested as a clear way to present the results of the analysis. The alternative that survives this screening process is developed as the preferred alternative. Documentation and description of this process is required. A summary matrix is helpful, but is not a stand-alone documentation of the evaluation process.

See Figure 3-3B Alternative Evaluation Matrix for examples of how to present a summary of analysis results.

3-3.05 Task 5 – Develop Preferred/Recommended Alternatives

3-3.05(01) Recommended/Preferred Alternative

Engineering Assessment Level: Both (Non-complex and Complex)

Develop the proposal (i.e., recommendation or selected preferred alternative) in sufficient detail to the extent that the alignment and design features of the roadway are established, drainage needs are accommodated, environmental impacts may be outlined, and right-of-way requirements are determined at a preliminary level.

Example (from an abbreviated engineer's report):

The existing pavement structure on SR2 will undergo a mill of 1.5 inches and overlay with 1.5 inches of HMA. This alternative was selected as the most economically feasible alternative that meets the project's purpose and need. Other alternatives were reviewed and found to be either economically unfeasible or they did not meet the project's need nor achieve the project's purpose.

Pavement patching is anticipated on this project. Remove and replace any damaged curb within project limits. Adjust existing castings within project limits to finish grade and replace any curb inlets that are damaged and unsafe. Existing guardrail replacement is not required. Field review sheet signs within project limits to determine if replacement is warranted. Field review existing curb ramps to determine if ramps are within current PROWAG standards or require replacement.

3-3.05(02) Maintenance of Traffic Plan

Engineering Assessment Level: Both (Non-complex and Complex)

Analyze the options for maintenance of traffic during construction as outlined in Chapters 81 and 82. The engineer preparing the engineering assessment may choose to utilize the Traffic Control Plan Checklist (<https://www.in.gov/dot/div/contracts/design/dmforms/EChk82-7A.doc>) to facilitate initial definition of the environment for the maintenance of traffic plan. Do not defer selection of a conceptual maintenance of traffic plan until the design phase of the project. The maintenance of traffic plan may add significant cost to a project. There are projects where the maintenance of traffic plan warrants an alternative analysis due to the impact of the maintenance of traffic plan on the overall scope of the project. In some cases the feasibility of the maintenance of traffic plan is the required alternative analysis for a project.

If circumstances warrant, the Scoping Engineer is charged with forming and, at least initially, steering the transportation management action group according to the criteria described in Chapter 503. The scope should determine mobility significance per Chapter 503 and provide a statement to that effect in the engineering assessment document.

Mobility Significant Project Statement:

"This project is considered a mobility significant project per IDM Section 503-2.02. The draft Transportation Management Plan (attached) is provided to guide efforts to ensure that the work zone activity and maintaining traffic plan is integrated with project stakeholders."

Not Mobility Significant Project Statement:

"This project is not considered a mobility significant project per IDM Section 503-2.02. The following is the temporary traffic control plan concept that may be used for the project:"

The maintenance of traffic plan initially developed by the Engineer should be developed to the degree needed to facilitate cost estimation for the project. The Designer should evaluate the

maintenance of traffic concept provided in the engineering assessment document to ensure relevance and completeness prior to developing the final maintenance of traffic plan.

3-3.05(03) Environmental Impacts

Engineering Assessment Level: Both (Non-complex and Complex)

The engineering assessment is an integral part of a larger group of pre-design activities that form the basis for compliance with the National Environmental Policy Act (NEPA) for study and disclosure of socio-economic and environmental impacts precipitated by a project. The engineering assessment document is developed considering the variety of possible environmental factors impacting project development. The Engineer should consult with the environmental manager to evaluate the environmental impacts of the directed/preferred alternatives under consideration as needed. This cooperative effort will be documented in the engineering assessment document and may be used by the environmental manager in documenting environmental assessment. Projects vary in the level of environmental oversight necessary to satisfy NEPA.

3-3.05(04) Community/External Stakeholder Context

Engineering Assessment Level: Both (Non-complex and Complex)

Stakeholder engagement is a key aspect of a successful project. Seeking stakeholder input during the engineering assessment portion of a project:

- Minimizes design changes, particularly late in the project development process
- Develops partnerships
- Improves customer service
- Facilitates timely conflict resolution
- Facilitates timely consideration of multi-modal facilities
- Facilitates community-focused context sensitive solutions that also balance environmental considerations with transportation needs.

One cornerstone of stakeholder engagement is to start early and plan for continuous input. The goal is to have a plan, engage in meaningful dialogue, keep things moving and be flexible. Opportunities to make changes diminish as a project nears design completion.

The Engineer should be mindful during stakeholder engagement to seek input from partners and not make binding commitments on behalf of INDOT.

3-3.05(05) Cost Estimate

Engineering Assessment Level: Both (Non-complex and Complex)

The estimating process, during engineering assessment, includes determining the costs associated with all phases of a candidate project. The development of a complete and reasonable estimate is critical to a successful project scoping package, and facilitates the project selection process. The estimate developed, as part of the engineering assessment process, is used to program the funding of the design, Right of Way (ROW) and construction for the project.

For non-complex engineering assessments, cost estimates should be developed for the directed alternative. For complex engineering assessments, cost estimates are required for all alternatives under consideration. The cost estimate should be for the current year only. Document all assumptions and generally round cost items to \$10,000 to avoid the false impression of precision.

A reasonable amount of contingency should be included to account for the unknowns that may arise during the detailed design of the project. Contingency values account for change in conditions, standards, specifications and policy implementations that occur between the time the project is scoped and time of construction, as well as other minor work items not easily estimated at the time of scoping.

3-3.06 Task 6 – Write the Engineer’s Report (Present Recommendation)

3-4.0 ENGINEERING REPORT TYPES

3-4.01 Abbreviated Engineer’s Report (AbbEngRpt)

Primary Task Assignment: Scoping Engineer

Supporting: Asset Engineer

The abbreviated engineer's report is a succinct assessment document that summarizes the project scope. This type of assessment is the most common and anticipated for the majority of all projects within INDOT’s capital program. This document is also referred to as a “mini-scope”.

3-4.01(01) Report Contents

The report may take one of two formats. The most common format is through INDOT online GIS application “INDOT Project Miniscope”. This online tool is not a complete conveyance of the full project scope, and additional documents are required to be uploaded into the application (see list below). If the online application is the only format being used for the report, that document, once complete, should be printed to a PDF and saved into ProjectWise and SPMS with all required supporting documents.

Abbreviated Engineer’s Report Content

| Report Section | Requirement | Information Source / Notes |
|--------------------------|-------------|--|
| Report Information | Req’d | Date of report Date of report revision (if modifying a document already published) Project Designation # |
| Project Location | Req’d | Must have RP location (at or To/From) as well as latitude-longitude location |
| Existing Facility | Req’d | See below for information requirements |
| Purpose & Need Statement | Req’d | |
| Directed alternative | Req’d | See Section 3-3.05(01). Include construction timeframe if project is expected to take more than one season. |

| Report Section | Requirement | Information Source / Notes |
|--------------------------------|-------------|--|
| | | Include information regarding related projects as needed. |
| No Action Consequences | Req'd | The "No Build" Alternative |
| Maintenance of Traffic Concept | Req'd | Based on the detailed alternative <ul style="list-style-type: none"> • Is the project mobility significant? • Does the project require a TMP • Can the road be closed to traffic (detour)? • Does the project require an IHCP exception? |
| Community Context | As Needed | Based on the detailed alternative; include potential construction impacts |
| Environmental Impacts | Req'd | Significant impacts based on the detailed alternative (may be other impacts not listed here) <ul style="list-style-type: none"> • Is tree clearing required? • Are there impacts to the Indiana bat? • Are there known historic impacts? • Are there known or anticipated wetland impacts? • What level of CE is anticipated? |
| Permits Required | Req'd | Requirements based on the detailed alternative <ul style="list-style-type: none"> • USACE 404? • IDEM Rule 5? • IDEM 401? • IDNR CIF? • IDNR Navigable Waterway? • What Storm Water Quality Manager Level is anticipated? |
| ROW Impacts | Req'd | Impacts based on the detailed alternative |
| RR Impacts | Req'd | Impacts based on the detailed alternative |
| Utility Impacts | Req'd | Impacts based on the detailed alternative |
| Preliminary Cost Est | Req'd | Based on the detailed alternative |
| Phase costs for CN/PE/RR/RW/UT | Req'd | Phase costs based on the detailed alternative |

3-4.01(02) Existing Facility Information - Road / Safety / Mobility

Please note that the following information is integrated into INDOT's online GIS application "INDOT Project Miniscope" and will automatically populate in that application.

1. Roadway Information
 - a. Pavement section ID
 - b. RP from/to
 - c. Project length (in miles)
 - d. Number of through lanes
 - e. Number of lane miles
 - f. Pavement area (in square yards)

- g. AADT
 - h. AADT Truck
 - i. AADT Year
 - j. Pavement type
 - k. County(s)
 - l. Subdistrict(s)
 - m. Functional classification
 - n. On NHS (yes/no)
 - o. Estimated number of large culverts within project limits
 - p. Estimated number of small culverts within project limits (document type, size, location and treatment if required within the project scope)
2. Pavement History:
 - a. Project History: Last functional project / last structural project
 - b. Maintenance History: Last major treatment / last minor treatment
 3. Condition Data:
 - a. Data year
 - b. Percent functional cracking
 - c. Percent structural cracking
 - d. Average rut (in inches)
 - e. Average IRI (in/mile)

3-4.01(03) Existing Facility Information – Bridge / Culvert

Please note that the following information is integrated into INDOT's online GIS application "INDOT Project Miniscope" and will automatically populate in that application.

1. Bridge Attributes (locational)
 - a. AADT
 - b. AADT Truck
 - c. On NHS
 - d. Functional classification
 - e. District
 - f. County
 - g. Route
 - h. Reference Post location
 - i. Latitude / longitude
2. Bridge Attributes (specific)
 - a. Existing structure number
 - b. Structure type
 - c. Route over
 - d. Route under (or facility under if not a road)
 - e. Year built
 - f. Inspection date
 - g. Year reconstructed
 - h. INV Tons
 - i. Structure length
 - j. Deck width
 - k. Deck Area

- l. Lanes over
- m. Lanes under
- n. Maximum length span
- o. Number of main spans
- p. Deck wear surface rating
- q. Deck condition rating
- r. Super structure condition rating
- s. Sub structure condition rating
- t. Scour critical evaluation rating

3-4.01(04) Abbreviated Engineer’s Report Additional Documents:

| Document | Requirement | Notes |
|--|----------------|--|
| Location Map | Req’d | |
| Str Inspection Report | Req’d - Bridge | |
| Typical Section | Optional | |
| Maintenance of Traffic Typical Section | Optional | |
| Conceptual Project Layout | Optional | |
| Draft TMP | Req’d | Based on mobility significance per Ch 81 |

3-4.02 Engineer’s Report (EngRpt)

The engineer's report is a full assessment document that details the project scope. This type of assessment is uncommon and anticipated for a minor number of projects within INDOT’s capital program.

3-4.02(01) Engineer’s Report Contents

Utilize the Engineer’s Report Format (Figure 3-4A) as a guide for generating the Engineer’s Report.

3-4.03 Report Concurrence Matrix

Individuals in the following positions provide concurrence for each document type as outlined in the chart below:

| | AbbEngRpt | EngRpt |
|---|-----------|----------|
| Asset Engineer | (1) | (1) |
| Scoping Manager | (2) | (2) |
| System Asset Manager | Yes | Yes |
| Tech Services Director | Optional | Optional |
| Capital Program Management Director | | Optional |
| Central Office Corridor Development Group | - | Yes (3) |

Notes:

- (1) Reviews document for concurrence with original need identification and recommended alternative. Recommends Approval or Disapproval
- (2) Reviews document for quality control of engineering assessment and documentation of same. Recommends Approval or Disapproval

(3) For large scale interstate mobility project scope development.

Any engineering assessment document prepared for a project shall have concurrence as shown herein.

3-4.03(01) Typical Concurrence Block

See Figure 3-4B for a typical concurrence block used on engineering assessment documents.

3-4.04 Scope Addendum Process

The engineering assessment process presented does not end with the creation of a document, rather engineering assessment is conducted and refined through the life of the project. Once the engineering assessment document is complete the project must be deliberated for funding approval. Once it is an approved project it is still necessary to follow the project through design development by participating in kickoff meetings and field checks to ensure the project's scope is maintained or to help determine when it needs to be adjusted. It is also necessary to support Project Managers by answering questions and assisting in any necessary change management applications.

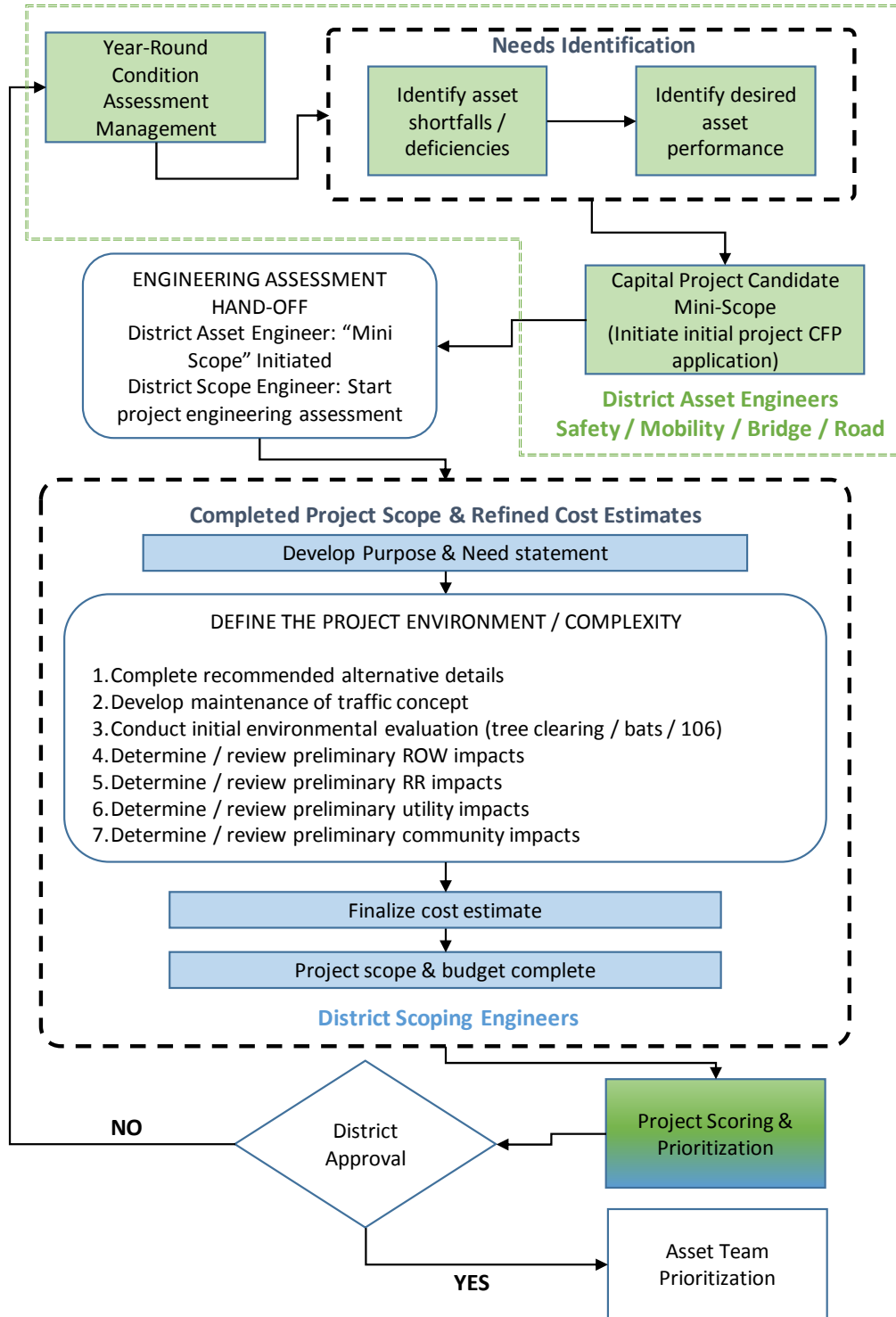
The designer is responsible for designing the project to comply with the intent of the published engineering assessment document. In the event the designer determines a need to deviate from the scope, the Project Manager, Asset Engineer and Scoping Engineer must be notified to review and determine if the scope warrants revision. Examples of changes that may warrant scope revision are:

- Change in work type (i.e. bridge rehabilitation moving to a bridge replacement);
- Change in preferred alternative;
- Inclusion of work outside of the project purpose;
- Revision of project termini sufficient to necessitate change management activities;
- Change in the design criteria or level of capital improvement intended by the project work type (i.e. pavement project changes from partial 3R to 3R due to pavement design);
- Change in the proposed maintenance of traffic scheme such that the additional cost for proposed scheme necessitates change management activities.

When the situation warrants, a scope addendum is required for the proposed change. Revisions to a project's scope are then reviewed and approved per the Report Concurrence Matrix.

FIGURES

1-1A District Activities, Asset Management Project Prioritization Process



3-3A Field Inspection Checklist

Conduct the following prior to the field investigation:

1. Review existing plans, previous studies or reports
2. Review traffic data
3. Review crash data (if required)
4. Identify apparent deficiencies/needs
5. Review other projects in the area for consistency, possible project bundling and MOT conflicts
6. Determine functional classification
7. Determine NHS status, and National Truck Network status
8. Determine if the project is located in a flood plain, karst area or other designated sensitive region.

During the field review, the Engineer should address the following:

1. Record the names of all persons attending;
2. Verify project need and purpose;
3. Evaluate and note condition (state of repair) of existing infrastructure, including road, bridges, small structures, or traffic control devices;
4. Validate significant features, including historical structures, archaeological sites, cemeteries, churches, hospitals, fire stations, police stations, schools, parks, playgrounds, wetlands, Section 4(f) and 6(f) properties, etc;
5. Evaluate existing drainage patterns and features;
6. Check reasonableness of project termini;
7. Assess accommodation of pedestrian and bicycle traffic and any ADA concerns;
8. Identify street lighting and its ownership;
9. Discuss potential constructability issues and their solutions;
10. Note posted speed limits and advisory speeds as well as other signs;
11. Note land use (e.g., residential, commercial, industrial, agricultural, woodland, wetland) and existing drive locations;
12. Identify traffic generators (e.g., schools, residential, industrial, commercial developments);
13. Identify traffic control (e.g., signals, flashing beacons, two-way and four-way stop, railroad crossing protection);

14. Identify environmentally sensitive sites (Note this may be done prior to field inspection and verified in the field). Evaluate the need for any potential environmental mitigation.
15. Note any clearing requirements such as tree removal to facilitate construction activities.
16. Photograph critical features;
17. Identify access control type (Note this may be done prior to field inspection and verified in the field).
18. Identify soil and rock types, unsuitable soils (e.g., peat, sink holes, etc);
19. Note adjoining septic systems and water wells;
20. Identify substandard roadsides, particularly with respect to clear zone or obstruction-free zone;
21. Assess potential need of additional right of way and its location;
22. Identify speed monitoring, telemetry, and weigh-in-motion sites;
23. Identify active, or abandoned railroads. Note location for possible de minimus actions within project.
24. Note locations of backslopes that have been steepened due to lengthening acceleration and deceleration lanes that have therefore developed slope stability or erosion problems.
25. Traffic control plan concept and potential routes for detour during construction.
26. Impact of the project on local traffic and on LPA projects and their assets in the area.
27. Potential issues that may require environmental commitments (such as don't disturb a tree or a fence)
28. Gather any other information as needed.

3-3B Alternative Evaluation Matrix Example

Alternative Matrix – Example 1

This Alternative Matrix was developed to provide a method to compare the project alternatives. Various quantitative and qualitative elements were included and assigned weights according to the project scope and engineering judgement.

Quantitative items for each Alternative are listed below:

| | Alternative 1 – Do Nothing | Alternative 2 – Partially Enclosed System | Alternative 3a – Enclosed System, 24 in. Outfall | Alternative 3b – Enclosed System, 30 in. Outfall | Alternative 3c – Enclosed System, 36 in. Outfall | Alternative 4 – Split System |
|---------------------------|-------------------------------|---|--|--|--|---------------------------------|
| Conveyance Capacity (cfs) | n/a | 9.5 | 9.5 | 14.8 | 24.0 | 14.9 |
| Construction Cost (\$) | 0 | 910,000 | 1,000,000 | 1,040,000 | 1,070,000 | 1,020,000 |
| Land Acquisition (\$) | 0 | 105,000 | 95,000 | 95,000 | 95,000 | 155,000 |

PER and Temporary R/W required for each Alternative. Permanent R/W Required for Alts. 2 and 6.

Numerical scores were assigned to each item and alternate. Right-of-Way scores were based upon permanent right-of-way requirements. Appeal scores were based upon how improvements would impact the appearance and function of each parcel.

Alternative Matrix

| Criteria | Weight | Alternative 1 – Do Nothing | Alternative 2 – Partially Enclosed System | Alternative 3a – Enclosed System, 24 in. Outfall | Alternative 3b – Enclosed System, 30 in. Outfall | Alternative 3c – Enclosed System, 36 in. Outfall | Alternative 6 – Split System, 24 in. Outfall |
|--------------|-------------|-------------------------------|--|---|---|---|--|
| Drainage | 50% | 0 | 7 | 7 | 9 | 10 | 9 |
| Cost | 20% | 10 | 9 | 7 | 5 | 3 | 6 |
| R/W | 20% | 10 | 5 | 10 | 10 | 10 | 2 |
| Appeal | 10% | 10 | 7 | 10 | 10 | 10 | 7 |
| Total | 100% | 5.0 | 7.0 | 7.9 | 8.5 | 8.6 | 6.8 |

Preferred

Alternative Matrix – Example 2

Alternative Comparison SR 23 Small Structure Replacement Des. No. 19abcde

| Alternative | Replace Culvert | Add Guardrail (L) | Design Exceptions Req'd | Add'l ROW Req'd (acre) | Construction Cost | Advantages | Disadvantages | Reason Alternative was Eliminated/Selected |
|--|-----------------|-------------------|-------------------------|------------------------|-------------------|---|--|---|
| 1 Maintain ex cross section | Yes 14x4 RCB | No | L1 = 3 L2 = 1 | 0.45 ac | \$180,000 | Low Construction Cost, Small amount of R/W required | Design Exceptions required for Lane Width, Horizontal Radius, Superelevation, and Roadside Safety. | Does not provide mitigation measures for substandard horizontal curve and superelevation; therefore alternative is not recommended. |
| 2 Impr shoulders, add guardrail | Yes 14x4 RCB | Yes | L1 = 3 | 0.5 ac | \$235,000 | 4' paved shoulders are a mitigation measure for the substandard horizontal radius and superelevation | Design Exceptions required for Lane Width, Horizontal Radius and Superelevation | Roadside Safety Design Criteria are met with new guardrail installation. Due to the similar construction cost, and that the guardrail itself could be a potential hazard, Alternative 2B is recommended over Alternative 2. |
| 2A Impr shoulders, no add'l guardrail | Yes 14x4 RCB | No | L1 = 3 L2 = 1 | 0.5 ac | \$220,000 | 4' paved shoulders are a mitigation measure for the substandard horizontal radius and superelevation | Design Exceptions required for Lane Width, Horizontal Radius, Superelevation, and Roadside Safety. | Roadside Safety Design Criteria are not met due to ends of culvert being inside clear zone and unprotected. Alternative 2B is recommended over this alternative due to improved roadside safety despite additional cost increase for Alternative 2B. |
| 2B (Recommended) Impr shoulders, extend culvert ends beyond CZ | Yes 14x4 RCB | No | L1 = 3 | 0.5 ac | \$235,000 | 4' paved shoulders are a mitigation measure for the substandard horizontal radius and superelevation. Eliminates design exception for Roadside Safety | Design Exceptions required for Lane Width, Horizontal Radius and Superelevation | Roadside Safety Design Criteria are met by extending culvert ends outside clear zone and providing traversable slopes near the structure. Due to the minimal ROW required, construction cost, low number of crashes occurring in this area, and eliminating the need for guardrail, this is the recommended alternative. |
| 3 Impr shoulders, horiz alignment, & pvt cross slope; add guardrail | Yes 14x4 RCB | Yes | L1 = 1 | 0.80 ac | \$340,000 | Design exception only required for Lane Width | High Construction Cost, Large Amount of R/W Required | Alternative corrects substandard horizontal radius and superelevation; however, it has the highest construction and R/W requirement. Based on crash analysis, there is no evidence that requires the improvement of the alignment or superelevation to current standards. Due to these reasons this alternative is not recommended. |
| 4- No Build | No | No | No | No | \$0 | No Construction Cost | Does not provide a long term solution for this crossing. | Alternative is not recommended as the existing temporary culvert does not provide a long term solution for this crossing. Multiple structure opening crossings similar to the three CMPA culverts are prone to collecting debris which will increase overtopping occurrences and will likely lead to future failures. |

NOTES:

- (1) Adding guardrail presents additional roadside hazard due to cross section geometry. No guardrail is better at this location than guardrail.
- (2) Raising the profile grade above existing will result in greater ROW acquisition. Desire is to minimize the change to the profile grade.

Note the original document shown herein will be available on the Engineering Assessment website.

3-4A Engineer's Report Format

1. Purpose of Report. State the purpose of the Engineer's Report, which generally is to document the engineering assessment phase and, most important, to outline the proposal (recommendation). Explain the Report's intended use.

Recommended Report Purpose: "The purpose of this report is to document the engineering assessment phase of project development, including all coordination that has been completed in preparation for this [road/bridge] project. This document outlines the proposal and is intended to serve as a guide for subsequent survey, design, environmental, right of way and other project activities leading to construction. The preferred alternative identified in this document is considered predecisional, pending the outcome of environmental studies."

2. Project Location. Specify subject mainline road, crossing roads, stream or other feature; site's offset from nearest State, U.S., or Interstate highway, reference post(s), county, city or town, and district. Refer to project location maps and photographs, routinely appended.

This project is located on SR 18, 2.45 miles west of US 41 at reference post 5+27 in Benton County. The GPS coordinates are 40°37'19.0" North and 87°25'38.9" West. The project is in the Indiana Department of Transportation's Crawfordsville District, West Lafayette Sub-District. This location is in a rural planning organization region, the Kankakee-Iroquois Regional Planning Commission.

3. Project Purpose and Need.
4. Project History: Discuss any relevant, previous study of the project or site. ***This section may be omitted if not relevant.***
5. Existing Facility. Describe the history and status of the present facility, its roads, bridges, small structures, traffic control devices, land use, etc.

The existing roadway facility is classified as a [classification] and is/is not part of the US National Highway System (NHS). The roadway is/is not on the National Truck Network. The posted speed limit at the project location is [speed limit] mph.

Roadway

The existing roadway is [width] through the project limits with [existing bridge railing and approach rail/guardrail]. The existing roadway consists of [width] foot travel lanes and [width] paved shoulders and [width] useable shoulders

| Roadway Information | | | |
|--------------------------------|-------------------------------------|-------------------------------|--|
| Geometric Criteria | | | |
| <i>Design Speed</i> | <i>Xx mph</i> | <i>Functional Class</i> | <i>Major Collector</i> |
| <i>Design Criteria</i> | <i>3R (Non Freeway)</i> | <i>Rural/Urban</i> | <i>Rural</i> |
| <i>Terrain</i> | <i>Level</i> | <i>Access Control</i> | <i>None</i> |
| Approach Cross Section | | | |
| <i>IDM Figure Reference</i> | <i>IDM 55-xx</i> | | |
| <i>Travel Lane Count</i> | <i>2</i> | <i>Travel Lane Width</i> | <i>Xx (existing) Yy (proposed)</i> |
| <i>Shoulder Width (Usable)</i> | <i>Xx (exist) Yy (proposed)</i> | <i>Shoulder Width (Paved)</i> | <i>Xx (exist) Yy (proposed)</i> |
| <i>Mainline Pavement</i> | <i>HMA on Conc</i> | <i>Shoulder Pavement</i> | <i>Agg, earth (exist) HMA (proposed)</i> |
| Alignment | | | |
| <i>Horizontal</i> | <i>Tangent</i> | <i>Vertical</i> | <i>Straight grade (exist) Crest curve (prop)</i> |

Road History

| <i>[Road name] Pavement History Within Project Limits</i> | | |
|---|--------------|---------------------|
| <i>Year</i> | <i>Width</i> | <i>Type of Work</i> |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |

Structure [STR NO]

The existing bridge data is as follows:

- Structure Number:*
- Feature Intersected:*
- Superstructure Type:*
- Substructure Type:*
- Span Length:*
- Structure Length:*
- Deck Geometry:*
- Deck Railing:*
- Skew Angle:*

Structure Inspection Observations

The bridge railings...

The bridge deck is...

The bearings are...

The joints are...

The substructure is/appears to be...

The approaches are ...(pavement, guardrail, erosion issues)

Drainage

Existing Drainage through the project is [primarily through sheet flow away from the road into Wells Ditch]. No drainage problems exist in the project area. The proposed drainage through the project will be [primarily sheet flow to roadside ditches and into Wells Ditch]. The existing Q_{100} high water elevation on the existing plans / as noted in the field indicates that the roadway is/is not overtopped

Railroads

There is one railroad crossing within the project limits. The Northern Indiana Commuter Train District (NICTD) crosses SR39 at 41°43'04" North, 86°43'59" West, and is crossing #870427C. This crossing is a bridge over SR39 and will not require significant railroad interaction. The shoulder widening will be restricted to ensure that the existing structure and guardrail is accommodated.

6. Field Check. Highlight events of the on-site inspection. Append field-check minutes. Summarize decisions made in the field.
7. Traffic Data and Capacity Analysis. Furnish traffic counts and results of capacity analysis. Discuss meaning of results as appropriate to the project context. ***Capacity analysis may be omitted if it is not relevant to the project.***
8. Crash Data and Analysis. Provide crash history, its analysis, and countermeasures.
9. Alternatives and Recommendations: Outline alternative improvement plans. Describe alternatives evaluation. State design guidelines. Discuss hydraulic, geotechnical, and pavement elements, as needed for the preferred alternative. Identify the proposal (recommendation, preference, selection).

Alternate A: Do Nothing

This alternate would allow the existing roadway and structures to remain in place with no improvements, which will result in the corridor not being able to accommodate

additional commercial traffic volumes. This alternative does not meet the need nor achieves the purpose of the project and will not be considered further.

Alternate B: Widen existing shoulders

This alternative meets the need and purpose of the project and is the preferred alternative.

Details of Preferred Alternate

Maximize shoulder widening within the project limits without compromising existing guardrail or public road approaches. Existing guardrail shall not be removed or replaced. Shoulder widening shall exempt existing public road approaches. Review driveways for slope and existing drive culverts removed and replaced to accommodate revised side road ditch lines.

Design standards used for this project shall be as follows:

| | |
|-------------------------------|---|
| <i>Design Standard:</i> | <i>3R, Rural Major Arterial, Figure 55-3A, 2 Lane</i> |
| <i>Design Speed:</i> | <i>Posted, 55 mph</i> |
| <i>Lane Width:</i> | <i>12' minimum 3R standard (match existing)</i> |
| <i>Paved Shoulder Width:</i> | <i>10' per 3R standard for expanded truck volumes</i> |
| <i>Usable Shoulder Width:</i> | <i>11' beyond per 3R standard for expanded truck volumes</i> |
| <i>Side Slopes:</i> | <i>2H:1V or flatter; 3H:1V slopes are desirable if feasible based on clear zone requirements and ditch bottom depth and shape</i> |
| <i>Obstruction Free Zone:</i> | <i>6'</i> |
| <i>Clear Zone:</i> | <i>24'</i> |

A Level 1 Design Exception is anticipated for the project based on... (list design exception issues)

10. Maintenance of Traffic During Construction. With respect to the selected alternative, explain traffic maintenance options and provide a recommendation. Clarify any decisions deferred to the design phase.

Mobility Significant Project Statement:

“This project is considered a mobility significant project per IDM Section 503-2.02. The draft Transportation Management Plan (attached) shall be used to guide efforts to ensure that the work zone activity and maintaining traffic plan is integrated with project stakeholders.”

Not Mobility Significant Project Statement:

“This project is not considered a mobility significant project per IDM Section 503-2.02. The following is the temporary traffic control plan concept that shall be used for the project.”

A partial closure of SR 39 with a detour is acceptable for this project due to the low ADT and the estimated time of construction. One direction (NB) of SR 39 will be closed and detoured, creating a one-way work zone through the length of the project. During the project construction a detour route will be provided for NB SR 39 that will utilize US 20, I94, and M239 (prior coordination with MDOT Coloma Business Office will be required for the detour route). The official detour length will be approximately 12 miles, but only requires an additional seven miles of travel. No local detour has been coordinated for this project.

11. Cost Estimate. Tabulate present-year costs for construction, right of way, and design engineering. List separate costs for road and individual traffic signal, lighting, and bridge elements to simplify scheduling. The cost estimate in the report is ONLY for the recommend/preferred alternative.

The cost of Alternative B is as follows:

| | |
|--------------------------------------|------------------------|
| Construction Cost (CN) | \$6,860,000.00 |
| <i>Right-of-Way (RW)</i> | <i>\$3,000,000.00</i> |
| <i>Preliminary Engineering (PE)</i> | <i>\$549,000.00</i> |
| <i>Railroad Coord (RR)</i> | <i>\$83,000.00</i> |
| <i>Utility (UT)</i> | <i>\$275,000.00</i> |
| <i>Construction Engineering (CE)</i> | <i>\$240,000.00</i> |
| Total Project Cost | \$11,007,000.00 |

12. Environmental Issues. List potential environmental constraints associated with the recommend/preferred alternative.
13. Survey Requirements. Indicate the limits of requisite field survey of the recommend/preferred alternative.
14. Right-of-Way Impact. Indicate the limits of additional permanent and temporary right of way needed to contain road improvements and consequent impacts. State land area and type, number of parcels, number and type of relocations, etc.
15. Railroad Impact
16. Utility Impact
17. Related Projects: Note related projects in the area and on any selected detour. Discuss any coordination necessary among projects, their timing in particular.

18. Coordination, Meetings: Summarize stakeholder contacts made in association with the engineering assessment phase. Include information regarding any public meeting held during the process. State agreements made in principle to the proposal. ***This section may be omitted.***
19. Concurrence: Provide concurrence blocks as required in Section 5-6.05.

3-4B Report Concurrence Block

The following is a typical report concurrence block that may be used on engineering assessment documents:

This document was prepared by:

_____ [Date]
[Name]
[Title]

Reviewed by:
Asset Engineer Review

_____ [Date]
[Name]
[Title]
Recommend: APPROVAL / DISAPPROVAL

Reviewed by:
Scope Manager Review

_____ [Date]
[Name]
[Title]
Recommend: APPROVAL / DISAPPROVAL

Reviewed by:
SAM Review

_____ [Date]
[Name]
Systems Asset Manager, [District]
APPROVE / DISAPPROVE

Additional approval blocks may be added below the System Asset Manager approval as needed.