PART 2, CHAPTER 6

ENGINEERING ANALYSIS

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PART 2, CHAPTER 6

ENGINEERING ANALYSIS

6.1 OVERVIEW

6.1.1 Purpose

Engineering analysis builds upon the information developed and documented by the Florida Department of Transportation (FDOT) during the Planning phase of a project. This chapter contains FDOT's procedure for engineering analyses to support development of general project location and design concepts during Project Development and Environment (PD&E) Studies. The engineering analysis defines project features essential to the assessment of project impacts on the social, cultural, natural and physical environment and seeks to balance the extent to which project needs are addressed to ensure project costs and environmental impacts are minimized. Further, the analysis establishes necessary design considerations to support progression of the project from concept to preliminary design and eventually to final design.

This chapter provides guidance on engineering analysis and considerations concerning evaluation of existing conditions, selection of design parameters, development of project alternatives, analysis of alternatives, selection of the recommended alternative(s), and documentation of engineering analyses.

During the identification and evaluation of the project alternatives, the Project Manager should continuously coordinate with the various offices within the District to promote collaboration between engineers and environmental specialists throughout the project development process. Continual coordination is critical to the success of the project because it helps resolve and address project issues that may affect development of project alternatives. The Project Manager also has the responsibility of engaging project stakeholders and the public throughout the project development process.

A ***Preliminary Engineering Report (PER)*** is prepared to document the results of engineering analysis for a Type 2 Categorical Exclusion (CE), Environmental Assessment (EA), or Environmental Impact Statement (EIS). An engineering analysis technical memorandum is prepared to document the results of engineering analysis for State Environmental Impact Reports (SEIRs). If the Design phase occurs concurrently with the PD&E phase, a ***PER*** will not be prepared, rather the results supporting alternatives evaluation are documented in the Design Report or Design Documentation for the project.

The engineering analysis results are also summarized in the Environmental Document (Type 2 CE, EA, and EIS)

6.1.2 Definitions

The following definitions apply to terminology used in this chapter:

Air Operations Area - Any area of an airport used or intended to be used for landing, takeoff, or surface maneuvering of aircraft and includes such paved areas or unpaved areas that are used, or intended to be used, for the unobstructed movement of aircraft in addition to its associated runway, taxiways, or apron.

Alignment - Refers to both horizontal and vertical placement of a transportation facility. Horizontal alignment refers to the location of the transportation facility as described by curves and tangents. Vertical alignment refers to the vertical orientation of the facility (i.e., below grade, at grade, or above grade).

Alternative - A potential transportation corridor, alignment, design feature, mode, or improvement under consideration that addresses the project's purpose and need.

Alternative Corridor Evaluation – A continuously coordinated and documented process to identify reasonable alternative(s) for PD&E or ***National Environmental Policy Act*** (***NEPA)*** analysis which includes public involvement.

Bicycle Lane - A portion of a roadway (either with curb and gutter or a flush shoulder) which has been designated by striping and special pavement markings for preferential use by bicyclists.

Corridor - Any land area designated by the state, a county, or a municipality which is between two geographic points and which is used or suitable for the movement of people and goods by one or more modes of transportation, including areas necessary for management of access and securing applicable approvals and permits.

Design Exception - The process that is followed when a proposed design element is below both the FDOT's governing criteria and the American Association of the State Highway and Transportation Officials' (AASHTO's) new construction criteria for Controlling Design Elements.

Design Report – A folder prepared during the Design phase to document design notes, data, and calculations supporting the design conclusions reached during the development of the contract plans. It is also called Design Documentation.

Design Variation - The process that is followed when a proposed design element is below the FDOT's governing criteria and where a Design Exception is not required.

Final Design - Any design activities following preliminary design, expressly including the preparation of final construction plans and detailed specifications for the performance of construction work, final plans, final quantities, and final engineer's estimate for construction, also referred to as Plans Specifications & Estimates (PS&E).

Logical Termini - Rational beginning and ending point of sufficient length to address environmental matters and the purpose and need on a broad scope.

No-Action (No-Build) Alternative - The option in which the proposed project activity would not take place. The No-Action (No-Build) alternative provides the baseline for establishing environmental impacts of the build alternatives.

Preferred Alternative - The preferred alternative for a federal aid project is the alternative that has been approved by the Lead Federal Agency. If a preferred alternative is selected prior to the public hearing, it must be presented as such at the public hearing and in the Environmental Document available to the public during the period of public availability.

Preliminary Design - Defines the general project location and design concept. It includes, but is not limited to: preliminary engineering and other activities and analysis, such as environmental assessments, topographic surveys, metes and bounds surveys, geotechnical investigations, hydrologic analysis, utility engineering, traffic studies, financial plans, revenue estimates, hazardous materials assessments, general estimates of the types and quantities of materials, and other work needed to establish parameters for the final design.

Preliminary Engineering Report (PER) - The engineering report that documents engineering analyses and decisions made during the PD&E Study. The ***PER*** contains preliminary design plans and design parameters that support advancing the project into the final design phase.

Reasonable Alternatives - (Term used in EIS only) – Alternatives meeting the purpose and need which are practical or feasible from a technical and economic standpoint.

Recommended Alternative - The alternative submitted to the Lead Federal Agency for approval as the preferred alternative. In a Draft Environmental Impact Statement (DEIS), this alternative would become the FHWA preferred alternative if no substantial controversy or issues arise through the public and agency comment period.

Transportation Management Area (TMA) - All urbanized areas (UZAs) with population greater than 200,000 as determined by the most recent census.

Viable Alternatives - (Term used in Type 2 CE, EA, and SEIR only) – Alternatives that address the purpose and need that can be designed and constructed from an engineering standpoint, if there is more than one alternative proposed.

6.2 PROCEDURE

This section describes the procedure for conducting an engineering analysis during the PD&E phase. FDOT conducts engineering analysis consistent with the design standards, criteria and controls published in its manuals and procedures. See ***Figure 6-1***. Engineering considerations for a project begin during the Planning phase where the project purpose and need is defined, and continue throughout the PD&E process when conceptual and preliminary designs are prepared. Engineering analysis and

considerations include coordination with other offices within the Districts, Central Office and/or the Lead Federal Agency as appropriate.

6.2.1 Level of Detail of Analysis

The level of detail for engineering analyses for a PD&E Study depends on the overall size and complexity of the project. It also depends on the Class of Action (COA) for the project. Type 1 CE and Non-Major State Action (NMSA) projects require a lesser level of analysis and do not require a PD&E Study. Type 2 CE, EA, EIS, and SEIR projects require a more detailed level of analysis and documentation. Regardless of COA, the engineering analyses must be performed to a level of detail that is sufficient to assess the effects of the alternative(s) on the social, economic, natural, cultural, and physical environment. In order to analyze multiple alternatives the Project Manager must ensure that the alternatives are developed to the same level of detail.

For Type 2 CE, EA and EIS projects, a ***PER*** must be prepared. See ***Section 6.2.10.2*** for an outline of the ***PER***.

A SEIR does not require preparation of a ***PER***. Instead, the results of engineering analysis are summarized in the SEIR document (***Chapter 10, State, Local and Privately Funded Project Delivery***) and engineering analyses are attached in a technical memorandum to the SEIR.

PD&E Projects with a concurrent Design phase do not require preparation of a ***PER***. Instead, engineering analyses supporting alternatives development and evaluations are included in the Design Report See ***Part 1, Chapter 4, Project Development Process*** for guidance on overlapping PD&E and Design phases.

6.2.2 Project Coordination

The PD&E Project Manager is responsible for timely coordination with other offices within the District to ensure proper development and evaluation of project alternatives. A successful PD&E Study requires orderly and continuous coordination between planning, engineering, environmental, public involvement and other staff from various offices.

If the project has federal involvement, the Project Manager must coordinate the project development efforts with the Lead Federal Agency. Coordination with FHWA's bridge section is required for special bridge structures such as moveable bridges, historic bridges, and signature bridges. Coordination with the US Coast Guard and US Army Corps of Engineers (USACE) is also required for permitting purposes.

Prior to making commitments, the Project Manager must coordinate with appropriate staff to ensure commitments are viable and are approved by the appropriate offices. See ***Part 2, Chapter 32, Commitments***.

The following is a list of the various coordination efforts that the Project Manager undertake early in the PD&E Study.

Planning

It is the responsibility of the Project Manager to request the existing and future traffic projections, turning movements and traffic factors from the District Traffic Coordinator. See ***Part 1, Chapter 4, Project Development Process*** for guidance on re-using data from planning studies.

Projects involving Express Lanes require coordination with the Planning Office, the Systems Planning Office in Central Office and the Florida Turnpike Enterprise.

Traffic Operations

Projects involving Intelligent Transpiration System (ITS) require coordination with the Traffic Operations Office. The Project Manager is responsible for requesting crash data from the Safety Engineer within the Traffic Operations Office.

Roadway Design

Project alternatives must be reviewed for proper application of geometric design elements including design speed, typical section details, superelevation, horizontal and vertical alignment, constructability and maintainability. Unconventional design alternatives and innovative design concepts should be coordinated with the District Design Engineer, District Structures Design Engineer and the FHWA Transportation Engineer (for projects that require FHWA approval).

During the development and evaluation of alternatives, the viable or reasonable alternatives must be reviewed for situations that would require a Design Variation or Design Exception. If a variation or exception is needed, the Project Manager must coordinate with the District Design Engineer to receive District or Central Office approval, as required.

During the development of alternatives, the Project Manager must coordinate the typical sections with the District Design Engineer. After the public hearing is completed and the project alternative approved, a ***Typical Section Package*** will be finalized in accordance with ***PPM, Volume 1, Chapter 16, Topic No. 625-000-007***.

Structures

The Project Manager must request approval from the District Structures Design Engineer for conceptual location and design recommendations for each bridge alternative including cost and any benefit-cost analyses used for selecting or recommending structure alternatives. In addition, the Project Manager must consult the District Structures Design Engineer if non-standard signs, lighting, signals or other miscellaneous structures are under consideration.

For coastal bridge replacement projects, consideration may be given to using clean demolition materials as an artificial reef under ***Title 33 U.S.C. Chapter 35***. This consideration must be part of the coordination and consultation process with the

regulatory and resource agencies as well as with other stakeholders. Considerations will include, but not be limited to, management, testing, storage and transport of the material as well as permitting and agreements that may be required.

Drainage

The District Drainage Engineer should review tidal projects to determine if coastal hydraulics will affect project design. If so, a coastal engineer should review the project in accordance with the ***Drainage Manual, Topic No. 625-040-002***.

The Project Manager should also meet with the District Drainage Engineer to explore watershed stormwater needs, stormwater pond sites, and alternative permitting approaches during the development of alternatives.

Freight/Port

The Project Manager must coordinate with the District Seaport Coordinator and/or District Freight Coordinator whenever the project is part of landside port transportation or access improvements, such as highways connecting Florida's ports to their markets.

Aviation

The Project Manager must coordinate with the District Aviation Coordinator when a project or a portion of a project meets at least one of the following:

1. Located within five (5) miles of the air operations area of a public-use or military airport

2. If utilization of the Notice Criteria Tool of the Federal Aviation Administration (FAA) indicates that an aeronautical study will be requested by the FAA. See ***Section 6.3*** for a link to the Notice Criteria Tool website.

FDOT's Airspace and Land Use Manager in the Aviation and Spaceport Office will assist the Project Manager and the District if an aeronautical study is required.

FAA discourages placing stormwater treatment facilities within the airport's air operation area because of their potential for being hazardous wildlife attractants. The Project Manager must coordinate with the District Aviation Coordinator when stormwater treatment facilities are proposed within the vicinity of an airport. Such coordination is essential to ensure the stormwater treatment facilities incorporate the FAA design criteria of no above-ground standing water.

Scenic Highways

The Project Manager must coordinate with the District Scenic Highway Coordinator for projects affecting designated scenic highways. If the project impacts a scenic highway

and qualifies for screening, it will be identified in the Environmental Screening Tool (EST) as part of the Efficient Transportation Decision Making (ETDM) process.

Right of Way

The Project Manager should discuss right of way (ROW) requirements associated with the project alternatives and coordinate ROW cost estimates with the District ROW office.

Landscape

The Project Manager should discuss landscaping needs for the preferred alternative with the District Landscape Architect.

Permits

The scoping of permits for the project starts during the ETDM Programming Screen. Representatives from each of the environmental permit agencies comment on the general project (including potential permits from their agency). Early coordination with the regulatory agencies is necessary to determine the level of detail required to acquire permits concurrent with PD&E. For more information regarding the environmental permit process, see ***Part 1, Chapter 12, Environmental Permits***.

Local Governments Corridor Vision

The Project Manager should begin early coordination with the local governments and/or Metropolitan Planning Organizations (MPOs) to discuss the vision for the corridor. The project should be designed in a context sensitive manner, considering the existing and proposed land uses adjacent to the corridor.

6.2.3 Preliminary Engineering Analysis

The key elements in performing engineering analysis during PD&E are:

1. Project needs
2. Data collection
3. Design controls and criteria
4. Existing conditions analysis
5. Alternatives analysis
6. Documentation

6.2.3.1 Project Purpose and Need

Purpose and need identification occurs during the Planning phase of the project. It is important for the Project Manager to review and understand the project's purpose and

need, which drives the development of alternatives considered and evaluated during the PD&E process and documented in the Environmental Document.

The Project Manager must review the ***Programming Screen Summary Report*** for projects that were screened through the ETDM Process and understand the COA for projects, if a determination has been made. The Project Manager should also review planning documents such as the Long Range Transportation Plan (LRTP).

6.2.3.2 Data Collection

The data collection process should consider the purpose and need for the project and the goals and objectives of the PD&E Study. Specifically, data collection should start by obtaining the data to assess and support the purpose and need for the project. When existing data is available, efforts should be made to determine any gaps in the data and approaches to fill the gaps. Data can be grouped into four categories: roadway characteristics, traffic characteristics, operations and safety characteristics, and environmental characteristics.

6.2.3.3 Design Controls and Criteria

Design controls are established parameters or physical characteristics that affect the selection of criteria and standards for geometric design of project alternatives. Design controls are also established for roadway elements such as lighting, noise abatement, drainage consideration, access management and multi-modal facilities.

Design controls include:

1. Functional classification and system classification
2. Access management class and standards
3. Design speed
4. Capacity and level of service (LOS)
5. Project traffic
6. Design vehicle
7. Pedestrian and bicycle requirements
8. Physical constraints (e.g., existing ROW, approach roads, intersecting roads, railroads, major utilities)
9. Environmental constraints (e.g., public parks, historic and cultural features, wetlands, flood plains,)
10. Type of stormwater management facilities (e.g., closed or open drainage systems)

11. Navigational requirements

12. Design high water

13. Design wave heights for coastal bridges

PPM, Volume 1, Topic No. 625-000-007 is the principal source of values for design criteria for projects on the State Highway System (SHS). The values for design criteria contained in the ***PPM*** have been accepted by FHWA. The ***Florida Greenbook, Topic No. 625-000-015*** must be used only on projects not on the SHS or federal aid systems. Design criteria for transit facilities can be found in the ***Accessing Transit Design Handbook***.

When the design elements of the recommended alternative do not meet the designated design criteria, Design Exceptions or Design Variations must be prepared and approved per ***PPM, Volume 1, Chapter 23, Topic No. 625-000-007***.

6.2.3.4 Existing Conditions

The purpose of the existing conditions analysis is to document available information regarding the existing facility or corridor. Existing conditions analysis documents the inventory of roadway elements, structure elements, and environmental features of the project. It also includes review of planning issues contained in previous planning documents such as corridor feasibility studies or interchange access requests. The existing conditions analysis helps to identify or confirm design and operational deficiencies associated with the project study area, as well as to verify, refine, and support the purpose and need for the project.

Comparison of the existing conditions against the current design controls or criteria identifies roadway and structure elements that do not meet current standards. Such project deficiencies must be discussed, analyzed, and documented in the ***PER*** or SEIR. Analysis of project deficiencies is used to support the project purpose and need (see ***Part 2, Chapter 4, Project Description and Purpose and Need***).

The sections below are examples of elements of existing conditions analysis. For new corridors, analysis of existing conditions requires a description of the adjacent facilities to explain how the existing transportation system is currently handling the travel demand.

6.2.3.4.1 Existing Roadway Conditions

Existing roadway conditions should be documented to reflect the following:

1. Functional classification and other classifications

2. Access classification and access management standards

3. Typical sections – description and dimensions of each cross-sectional element

4. ROW including extent and type of limited access and easements
5. Property lines and land use types adjacent to the roadway
6. Pavement type, structural and operational conditions
7. Design speed and posted speed
8. Horizontal and vertical alignments
9. Multi-modal facilities:
    a. Pedestrian accommodations - Walkways, crosswalks, ADA accessibility, and school routes
    b. Bicycle facilities - Location, type, width, and designation
    c. Mass transit facilities including bus and rail services – Type, locations and number of stops, transfer centers, park-and-ride facilities, bus bays
    d. Freight and intermodal logistics centers
10. Intersections - Lane configuration, type, control type, technology, and operational conditions
11. Physical or operational restrictions such as special use lanes, parking, evacuation routes, fixed objects, barriers, clear zone
12. Traffic data - Annual Average Daily Traffic (AADT), peak hour volume, truck percentage, pedestrian and bicycle counts, transit data
13. Roadway operational conditions - Level of service (LOS) or relevant performance measures such as delay, travel time, density
14. Crash data - Crash rates, severity, number (frequency), types, locations, contributing causes and patterns
15. Railroad crossings - Number of tracks, number of train crossings, speed, type of train (passenger or freight), type of warning devices, operating characteristics, railroad ROW, Rail Master Plan
16. Drainage system - Drainage areas and flow patterns, floodplains and stormwater management systems including regional facilities
17. Lighting - Location, type, condition, spacing, and maintaining agency
18. Utilities - Location, maintaining agency, contact persons
19. Soils classifications

20. Aesthetic features (e.g., lighting, landscaping, vegetation, pavers)

21. Traffic signs

6.2.3.4.2 Existing Bridge Conditions

The FDOT Bridge Maintenance Office maintains ***Bridge Inspection Reports*** for every public bridge in the State of Florida. The Project Manager must obtain the ***Bridge Inspection Report*** for each bridge on the existing corridor. Additionally, geotechnical and scour reports, permits and previous studies for existing bridges can be requested from the structures and permits offices. If hydraulic analysis is anticipated, bridge information for each bridge upstream and downstream of the existing crossing can also be obtained.

Evaluation of existing bridge conditions should include identification of wildlife crossing features. These features include bridges, bridges with shelves, specially identified culverts, enlarged culverts or drainage culverts and/or exclusionary devices such as fencing, walls or other barriers, or some combination of these features. The Project Manager should confirm the location of a wildlife crossing feature based on coordination with the District Environmental Administrator, District Permit Coordinator and District Structures Design Engineer.

Bridge Inspection Reports typically contain the following information:

1. Bridge number
2. Bridge Type
3. Typical Section
4. Facility crossed (waterway, roadway or railroad)
5. Year structure was built and/or modified
6. Type of structure - Timber, concrete, or steel
7. Condition - Structural rating and suitability for widening or retrofitting
8. Load posting information
9. Horizontal and vertical clearances
10. Ship impact data
11. Span arrangement - Number and length of spans
12. Historical significance - i.e., ***National Register of Historic Places (NRHP)*** eligible or may be a potentially significant historic bridge (of 50 years of age or older). If a

bridge is on the ***NHRP***, determine if the bridge is a critical landmark or a signature structure

13. Geotechnical information from existing bridge borings, pile driving records, scour reports and maintenance history where available

14. Channel data - Alignment, width, depth, and clearance requirements

15. On bridges with moveable spans - The average number of times the bridge opens per day, results of boat traffic and mast height surveys, include any special navigation (shipping/boating) requirements that will require accommodation during construction

16. Normal High Water and Mean High Water (for coastal bridges) in accordance with ***PPM, Volume 1, Section 2.10, Topic No. 625-000-007*** and ***Section 4.6, Drainage Manual, Topic No. 625-040-002***.

17. Bridge security issues

For bridges maintained by other agencies, all relevant information regarding the existing bridge should be requested from the owner of the bridge.

6.2.3.4.3 Existing Environmental Features

Existing conditions analysis must include a review of potential environmental issues in the project area that would affect development of project alternatives. This analysis requires input from environmental specialists. As such, field observations of existing environmental features must be conducted concurrently with the review of existing roadway and bridge features. Close coordination between environmental and engineering staff is essential to developing alternatives that reduce environmental impacts.

6.2.3.4.4 Existing Intelligent Transportation Systems

Projects that involves Intelligent Transportation Systems (ITS) must include review of existing ITS documents and plans to determine operational needs and infrastructure requirements.

6.2.4 Alternatives Analysis

Alternatives analysis is the process of developing, evaluating, and eliminating potential project alternatives based on the purpose and need for the project. Alternatives analysis involves evaluation of both engineering and environmental aspects of a project. Therefore, the Project Manager must engage both District engineering and environmental staff from the scope development stage through the alternative analysis process.

The process to develop and evaluate potential alternatives must also seek public and stakeholder input. See ***Part 1, Chapter 11, Public Involvement*** for guidance regarding public involvement for a project.

The alternatives analysis of a PD&E Study must consider the following alternatives:

1. No-Action Alternative, or No-Build Alternative
2. Transportation Systems Management and Operations (TSM&O) Alternative
3. Multimodal alternative
4. Build Alternative(s)

Some of the project alternatives developed, analyzed and eliminated during the Planning phase of a project can be eliminated as alternatives consistent with the conditions in ***Title 23 U.S.C. §168.*** It is the responsibility of the Project Manager to review planning studies completed for the project and document the alternatives considered, screened and eliminated through a planning process, in the PD&E Study. The Project Manager must coordinate with the Lead Federal Agency in advance, to verify any planning decision that can be adopted or incorporated by reference into the Environmental Document according to ***23 USC §168 and 23 CFR Part 450, Appendix A***. This coordination must occur during the scope development stage of the PD&E project. See ***Part 1, Chapter 4, Project Development Process*** for more guidance.

6.2.4.1 No-Action Alternative

The No-Action Alternative (or No-Build Alternative) serves as the baseline, or benchmark against which the Build Alternatives are evaluated. The No-Action Alternative is defined as the alternative in which the proposed project activity would not take place

The engineering analysis must analyze the effects of the No-Action Alternative on the surrounding human, natural and physical environment to the same level of detail as the build alternatives. The No-Action Alternative remains under consideration throughout the PD&E Study including the public hearing. Both the ***PER*** and Environmental Document must include and discuss the No-Action Alternative. Discussion about impacts of the No-Action Alternative must include the impacts to surrounding areas, such as increased travel demand on the existing facility and parallel routes, impacts to multi-modal facilities, and impacts to emergency response times, amongst others.

Documentation of the alternatives analysis must include advantages and disadvantages of the No-Action Alternative.

6.2.4.2 Transportation System Management and Operations Alternative

The Transportation System Management and Operations (TSM&O) Alternative generally provides short-term improvements that extend the service life of the facility. The TSM&O Alternative includes activities and strategies designed to optimize the performance and utilization of the existing infrastructure through implementation of systems, services, and projects to preserve the capacity and improve the security, safety and reliability of the transportation system. The TSM&O Alternative may include upgrades or additions to the

existing facility, such as ramp signals, arterial traffic management systems, traffic incident management, work zone traffic management, road weather management, traveler information services, congestion pricing, parking management, traffic control, commercial vehicle operations, transit priority signals systems, and freight management.

The TSM&O Alternative may also include conversion of facilities with existing non-tolled managed lanes such as High Occupancy Vehicle (HOV) lanes to Express Lanes (as long as the total number of existing non-tolled general purpose lanes remains the same and other considerations are met). Although a tolling agreement is not necessary [***23 U.S.C. § 166(b)(4)***], coordination with FHWA is required for projects requiring FHWA approval.

Prior to evaluating build alternatives, engineering analysis must demonstrate that maximization of the existing system through various TSM&O strategies will not meet the purpose and need for the project. Documentation of the TSM&O alternative evaluation must include a description of the strategies considered.

While TSM&O primarily relates to projects in urbanized areas, the concept of achieving maximum utilization is also important in rural areas. The TSM&O Alternative shall be discussed in the alternatives section of the ***PER*** and Environmental Document. If the TSM&O Alternative does not meet the purpose and need for the project, the ***PER*** and Environmental Document must briefly explain why.

6.2.4.3 Multimodal Alternatives

When consistent with the purpose and need, the alternatives analysis should consider multimodal alternatives. The Project Manager should review the MPO LRTP for any multimodal projects that are planned along the corridor for possible inclusion into the project. Multimodal alternatives can include non-motorized facilities (for pedestrians and bicyclists) to meet the purpose and need for the project. These alternatives must include the types of facilities that are planned in the Local Government Comprehensive Plans (LGCP). Discussion of multimodal alternatives should include cost factors (monetary and environmental) required to meet the local needs as stated in LRTP and/or LGCP.

6.2.4.4 Build Alternatives

The Build Alternatives are proposed to address the project's purpose and need. Build alternatives should seek to avoid or minimize impacts to the environment by considering issues, concerns and opportunities identified during the Planning phase of the project. The development of build alternatives should use a Context Sensitive Solutions (CSS) approach which considers the physical setting within which the project is located.

In order to ensure meaningful evaluation of alternatives, **each** build alternative **must** have:

1. Logical termini and should be of sufficient length to address environmental matters and the purpose and need on a broad scope.

2. Independent utility, i.e., be able to function as designed and be a reasonable expenditure even if no additional transportation improvements in the area are made.

The Project Manager and project team may consider opportunities for developing hybrid alternatives that could incorporate TSM&O strategies and/or multimodal options with the build alternative to meet the purpose and need for the project.

Design detail of the Build Alternatives should be commensurate with the information needed to define and evaluate environmental impacts or define ROW. Each alternative must be explored at a sufficient level of detail to support a reasoned choice. All alternatives under consideration must be developed to a comparable level of detail so that their comparative merits may be evaluated.

6.2.4.4.1 Development of Build Alternatives

The number of Build Alternatives to be analyzed during the PD&E Study affects the project schedule and budget. The initial number of Build Alternatives to be analyzed in detail during the PD&E Study must be relative to the size and complexity of the project. As such, only viable or reasonable build alternatives should be evaluated in detail.

For complex projects, an evaluation of alternatives may start by high-level screening of a broad number of improvements or concepts to eliminate unreasonable or nonviable alternatives from further detailed analysis. The ***PER*** and Environmental Document must discuss the development of a broad number of alternatives. The ***PER*** and Environmental Document must also document the high-level screening process that was followed, why alternatives were selected for further evaluation and why others were eliminated.

A Type 2 CE or SEIR must evaluate at least one Build Alternative and a No-Action Alternative. The actual number of alternatives evaluated depends on factors such as complexity of the project, environmental issues/resources, results of planning/corridor studies, and input from stakeholders and the public.

An EA must evaluate at least one Build Alternative and a No-Action Alternative. ***FHWA Technical Advisory T 6640.8A*** noted that the purpose of the EA is to determine whether or not an EIS is required. The EA does not need to evaluate in detail all reasonable alternatives for the project, and may be prepared for one or more viable build alternatives. Additionally, any alternative considered but eliminated prior to preparation of the EA should be discussed and the reasons for its elimination documented in the EA.

An EIS must evaluate reasonable alternatives or a “reasonable range” of alternatives in addition to a No-Action Alternative, In accordance with ***40 CFR § 1505.1(e)***. The ***Council on Environmental Quality Memorandum on Most Asked Questions Concerning CEQ’s National Environmental Policy Act Regulations*** has defined “reasonable” to mean those technically and economically feasible alternatives that would satisfy the primary objectives of the project defined in the purpose and need.

Because some projects have a large number of alternatives, FDOT developed the Alternative Corridor Evaluation (ACE) process to help refine the scope and number of alternatives in the Planning phase of the project development process. The ACE process is discussed in detail in ***Part 1, Chapter 4, Project Development Process***.

6.2.4.4.2 Alternatives Considered but Eliminated

The primary reason for eliminating an alternative from consideration is that it does not meet the project's purpose and need. For FHWA led projects, eliminated alternatives must be approved by FHWA. Although the No-Action Alternative does not typically meet the purpose and need, it must be considered as a viable alternative throughout the study.

Project managers are encouraged to use fatal flaw analysis early in the alternative development stage to eliminate unreasonable alternatives. Fatal flaw analysis determines if an individual alternative or a concept has one or more deficiencies that prevent it from being successfully implemented. Fatal flaw analysis is a high-level screening of alternatives based on project purpose and need, established goals and objectives, or environmental controversy based on impacts on natural, social, physical or cultural environment.

The ***PER*** and Environmental Document must include a section that discusses alternatives including TSM&O, which were considered for the project but eliminated from detailed study (during the Planning or PD&E phase). The section should summarize the rationale for eliminating alternatives, what criteria were used to eliminate them, who was involved in establishing the criteria, and at what point in the process the alternatives were removed.

6.2.5 Engineering Considerations for Build Alternatives

The following section discusses important engineering considerations during the development of build alternatives.

6.2.5.1 Complete Streets

Development of Build Alternatives must consider the ***FDOT Complete Streets Policy, Topic No. 000-625-017*** and ***Context Sensitive Solutions, Topic No. 000-650-002*** early in the alternatives development process. The ***Complete Streets Policy*** requires a context-sensitive approach to project development by accommodating all transportation users and their relationship to safety, economy, mobility and the environment. Consideration and integration of complete streets during the PD&E Study promotes the efficient development of a multimodal transportation system.

Complete streets must serve the transportation needs of users of all ages and abilities, including cyclists, pedestrians, motorists, transit riders, emergency responders, and freight handlers. Incorporation of complete streets into the project development process requires coordination with local governments, MPOs, transportation agencies and the public.

Understanding of community context (transportation network, land use and local priority), potential users and needs are key inputs for developing build alternatives that are complete streets oriented. The Project Manager must evaluate these key inputs during data collection, existing conditions analysis, and the alternatives development steps of the engineering analysis.

There is no single design solution for complete streets because each street and its context and travel demand are unique. For example, a complete street in an urban setting is quite different from a complete street in a rural setting; however, both streets must be designed to meet the users' needs and the transportation objectives of safety, mobility and the environment. Incorporation of complete streets may necessitate modification of design standards to allow typical sections to accommodate non-motorized traffic or allow raised medians, adequate shoulders, narrow lanes and traffic calming features. Such modifications must follow the FDOT Design Exceptions and Design Variations process.

6.2.5.2 Pedestrians and Bicycle Accommodation

In 2010, the U.S. Department of Transportation (USDOT) issued a policy on ***Bicycle and Pedestrian Accommodation Regulation and Recommendations*** to support the development of fully integrated active transportation networks. It states:

> The DOT policy is to incorporate safe and convenient walking and bicycling facilities into transportation projects. Every transportation agency, including DOT, has the responsibility to improve conditions and opportunities for walking and bicycling and to integrate walking and bicycling into their transportation systems. Because of the numerous individual and community benefits that walking and bicycling provide — including health, safety, environmental, transportation, and quality of life — transportation agencies are encouraged to go beyond minimum standards to provide safe and convenient facilities for these modes.

The USDOT policy encouraged the State, local government, and public transportation agencies to:

1. Consider walking and cycling as equals with other transportation modes
2. Ensure that there are transportation choices for people of all ages and abilities
3. Go beyond minimum design standards

The FDOT ***Complete Streets Policy*** is consistent with the 2010 USDOT ***Policy Statement on Bicycle and Pedestrian Accommodation Regulations and Recommendations*** and further specifies that facilities be context-appropriate, based on existing or planned land use. Additionally, ***Section 335.065, F.S.***, requires full consideration of bicycle and pedestrian ways along state roads and transportation facilities during planning and project development. Therefore, all Build Alternatives must consider pedestrian and bicycle use as an integral feature of the project. Guidance on the design of pedestrian and bicycle facilities can be found in:

1. Chapter 2 - Design Geometrics and Criteria and Chapter 8 - Pedestrian, Bicycle, and Public Transit Facilities of ***PPM, Volume 1, Topic No. 625-000-007***

2. ***AASHTO Guide for the Development of Bicycle Facilities***

3. ***AASHTO Guide for the Development of Pedestrian Facilities***

4. ***Florida Greenbook*** (for off-system projects)

PPM, Volume 1, Chapter 8, Topic No. 625-000-007 requires design of buffered bicycle lanes within one mile of an urban area and on curb and gutter facilities beyond one mile of an urban area for all new construction or reconstruction projects. Other bicycle facilities or accommodations include paved shoulders, wide outside lanes, and shared lane markings.

Pedestrian sidewalks in highly-developed urban areas and in the vicinity of schools may require additional width based on anticipated pedestrian volumes and context. When designing pedestrian facilities, the safe crossing needs of the pedestrian must be considered, such as providing median refuge, placing crosswalks perpendicular to the roadway, or to match the intersection lines at skewed intersections, and minimizing pedestrian crossing length.

For interchange design, pedestrians and bicyclists accommodation on the arterial must be considered at the beginning of the planning and design process. Ramp configurations, speeds, and overall complexity can create impractical and unsafe conditions for bicyclists and pedestrians if not carefully considered throughout the design process.

6.2.5.3 Traffic Operations and Safety

Build alternatives should be evaluated to carry projected travel demand from a traffic operations perspective. Traffic analysis for build alternatives include both travel demand forecasting and capacity analysis to determine the number of through lanes, intersection control type, intersection configurations, need for auxiliary lanes, access management, etc. One of the primary objectives of traffic analysis is to determine if the Build Alternative will operate acceptably through the design year. Projects in urban areas require extensive traffic operational evaluations as compared to projects in rural areas because of recurring congestion and ROW constraints.

Safety analysis for build conditions should occur after evaluation of crash data to determine any existing safety deficiencies and appropriate corrective measures. Evaluation of existing safety can also include a Road Safety Audit (RSA), which is an examination of safety conditions of a road by an independent audit team. Safety analysis for build conditions should analyze potential hazardous elements on the proposed project conditions and draw inferences based on interactions of these elements and users. Development of Build Alternatives must correct existing safety deficiencies.

6.2.5.4 Express Lanes

Express Lanes can be implemented by converting existing non-tolled managed lanes, such as High Occupancy Vehicle (HOV) lanes to tolled Express Lanes or by constructing new Express Lanes separated from general use lanes. Constructing new Express Lanes adds roadway capacity and therefore, should be analyzed as a Build Alternative.

Express Lanes are generally considered in congested urban areas with limited ROW and where the previous widening projects have not met travel demand. For this reason, the Express Lanes alternative must be evaluated for its ability to provide long-term mobility, managed capacity, travel time reliability and travel options.

Statewide Express Lanes directive, ***Tolling for New and Existing Facilities on the State Highway System, Topic No. 525-030-020***, outlines FDOT's policy for capacity projects located on limited access facilities on the State Highway System (SHS). It requires Express Lanes as a TSM&O strategy for capacity improvements on existing limited access facilities on the SHS and does not apply to Florida's Turnpike facilities.

Implementation of the Express Lanes directive for PD&E projects on SHS facilities is as follows:

Interstate highway - All PD&E Studies evaluating additional capacity on the Interstate System must include a dynamically tolled alternative in the form of Express Lanes. Coordination with FHWA should take place if tolling will be considered on a federal project to ensure federal requirements are met. PD&E Studies can evaluate the Express Lanes alternatives against the No-Action (No-Build) Alternative if the project is included in the MPO LRTP as an Express Lanes project, a managed lanes project, special use lanes or if previously completed planning or corridor studies had recommended Express Lanes.

Non-interstate limited access facilities - When adding capacity to an existing limited access facility on the SHS, a dynamically tolled alternative in the form of Express Lanes must be evaluated where deemed appropriate through a transportation planning process. Dynamic tolls are to be applied to the additional lanes only. The number of non-tolled lanes must remain the same as before the construction. PD&E Studies can evaluate the Express Lanes alternative as a Build Alternative, against the No-Action (No-Build) Alternative if the project is included in the MPO LRTP as an Express Lanes project or if previous planning/corridor studies had recommended Express Lanes.

Controlled access facilities - New capacity projects on non-limited access SHS facilities must at least consider managed lanes. These lanes may be priced or non-priced and combined with other TSM&O strategies such as Advanced Traffic Management Systems (ATMS), Emergency/Incident Management, Arterial Management, Work Zone Traffic Management, etc. The PD&E Build Alternative can include TSM&O alternatives in the development of Build Alternatives.

Major bridges and tunnels - Projects on the SHS with new or replacement major bridges over waterways must consider tolling to pay fully or partially for the cost of the project. The PD&E alternatives analysis should document consideration of a tolling option for new

or major bridge replacement projects over waterways. Typically, development of initial tolling concepts and the decision to consider tolling is made during the Planning phase. The initial tolling concepts may be refined during the PD&E phase as more data related to engineering, finance, and public factors are collected. Therefore, the Project Manager should coordinate with the Planning Office about the tolling decision and the scope of tolling analysis, if required during the PD&E phase.

Each Express Lanes project must develop a Concept of Operations (ConOps). ConOps describes the operation of the system being developed from the various stakeholder viewpoints. Development of ConOps requires input from the traffic operations engineer and the various stakeholders (e.g., users, maintenance, and management) on how the facility will operate. See ***Express Lanes Handbook, Chapter 4*** for more details about ConOps.

6.2.5.5 Access Management

Access management is a comprehensive approach to the management and regulation of driveways, medians, median openings, intersections, and freeway interchanges. The purpose of access management is to provide access from the SHS to abutting lands while limiting and separating traffic conflict points in order to increase safety and efficiency of the transportation system. It also ensures balance between accessibility and mobility while increasing the capacity of a roadway system. Access management analysis in the PD&E Study should evaluate and recommend appropriate locations for median openings and driveways, as applicable. The concept plans developed in the PD&E Study should show appropriate access management features. The Project Manager should coordinate with the District Access Management Review Committee for any proposed deviations from the access management and median opening standards.

6.2.5.6 Roundabouts

Roundabout alternative(s) must be evaluated on new construction and reconstruction projects if a roundabout meets the criteria for an intersection design. Roundabout evaluation is also required for all projects that propose new signalization or require a change in an un-signalized intersection control. An evaluation is not required for minor operational improvements such as changes to signal phasing or for signal replacement projects where the primary purpose is to upgrade deficient equipment and installations. Roundabout designs must be consistent with the ***Florida Intersection Design Guide*** and approved by the State Roadway Design Engineer.

While roundabouts may provide a community enhancement, they are not to be constructed on state roads solely for this purpose. To construct a roundabout on the SHS, one of the following criteria must be met:

1. ***Manual on Uniform Traffic Control Devices (MUTCD)*** traffic signal warrants 1 or 2

2. Documented high frequency of severe crashes

3. Context Sensitive Solutions for the implementation of Complete Streets on a low speed facility.

The 20-year design traffic shall be used for roundabout evaluation and design. Roundabouts are not warranted at intersections where the design year total traffic entering volume exceeds 25,000 AADT for a single-lane roundabout, or 45,000 AADT for a two-lane roundabout. Roundabouts are also not required for corridors with at least six travel lanes. See ***PPM, Volume 1, Chapter 2, Topic No. 625-000-027*** and the ***Florida Intersection Design Guide*** for roundabout evaluation and design requirements.

6.2.5.7 Interchanges on Interstate Highways

The approval of an Interchange Access Request (IAR) on Interstate highways may precede or occur concurrently with the PD&E Study. When the IAR precedes the PD&E Study, it is approved through a two-step process. The first step is a determination of engineering and operational acceptability of the request by complying with the FHWA's eight policy points and FDOT's procedure for new or modified interchanges. The second step is the final approval by FHWA that occurs upon completion of the PD&E Study and verification that the design of the preferred ***NEPA*** alternative matches the design of the accepted IAR proposal. When the IAR is concurrent with the PD&E Study, the final approval occurs after verification that the request meets FHWA's eight policy points and satisfies the FDOT's procedure for new or modified interchanges.

If the project includes a new interchange or a modification to an existing interchange, the Project Manager must coordinate closely with the District's Interchange Review Coordinator (DIRC) to ensure that the alternative approved in the ***Interchange Justification Report (IJR)***, ***Interchange Modification Report (IMR)*** or ***Interchange Operational Analysis Report (IOAR)*** is included as one of the PD&E Study alternatives.

If the PD&E Study does not consider new interchange concepts other than those analyzed in the ***IJR***, ***IMR*** or ***IOAR***, the Project Manager must verify the following before incorporating by reference IAR traffic analysis results into the PD&E Study:

1. The approved interchange document is less than 8 years old. The IAR must be reevaluated if the project does not move to the construction phase within 8 years

2. Conditions (e.g., traffic, land use type, and environment) have not changed significantly since the approval of the interchange document

The Project Manager must consider re-using IAR traffic analysis (methodology, assumptions, data and/or results) early on during developing the scope of the PD&E Study. Refer to ***Part 2, Chapter 5, Traffic Analysis*** for further guidance on re-using data from planning studies.

If the recommended PD&E Study alternative is different from the approved interchange concept, the ***IJR***, ***IMR***, or ***IOAR*** must be reevaluated to demonstrate that the recommended alternative meets the requirements of the IAR analysis procedure. The need and scope for the reevaluation must be determined through consultation with the

DIRC, Statewide Interchange Review Coordinator (SIRC), and FHWA. See the ***Interchange Access Request User's Guide*** for IAR reevaluation guidance.

6.2.5.8 Intelligent Transportation Systems

If a project uses federal funds and involves ITS technologies or a system of technologies, the requirements specified in ***FDOT Guidelines for the Implementation of Part 940 in Florida, Topic No. 750-040-003*** must be followed. The guidelines ensure an ITS project's compliance with ***23 CFR § 940.11*** and FDOT's requirements. Authorization of federal funds for construction or implementation of the project cannot proceed until compliance with ***23 CFR § 940.11*** is demonstrated.

Title 23 CFR § 940.11 requires that all ITS projects funded with highway trust funds be based on systems engineering analysis and have a project level ITS architecture that is coordinated with the development of the regional ITS architecture before advancing to final design. The Project Manager must prepare a ***System Engineering Management Plan (SEMP)*** to document the results of the system engineering analysis. The ***SEMP*** is a technical document that defines the project's system engineering process for ITS deployments from concept to system operations in Florida consistent with ***23 CFR Part 940***. SEMP specifies systems engineering activities and what must be built to satisfy stakeholder needs. Coordinate with the District ITS engineer or program manager when developing the SEMP. Example of project alternatives that may require a SEMP are Express Lanes alternatives, transit alternatives, and the majority of TSM&O alternatives, because they involve ITS technologies and may be funded by federal funds.

6.2.5.9 Stormwater Management

A PD&E Study must consider how management of stormwater from the project area will meet quality, rate, and quantity requirements of the FDOT, Water Management Districts (WMD) and the Florida Department of Environmental Protection (DEP).

The ***Drainage Manual, Topic No. 625-040-002*** contains the drainage design standards for FDOT projects. Additionally, the ***Drainage Handbook - Stormwater Management Facility*** contains design guidance on stormwater management.

After the project's stormwater management requirements are determined and before stormwater management design decisions are planned, the Project Manager should as appropriate convene an Environmental Look Around (ELA) meeting with regional stakeholders to explore watershed-wide stormwater needs and alternative permitting approaches. The ELA should explore the following types of opportunities:

1. WMD / Florida DEP issues: wetland rehydration, water supply needs, minimum flows and levels, flooding, Total Maximum Daily Load (TMDL), acquisition of fill from DEP/WMD lands

2. City / County issues: stormwater re-use, flooding, discharge to golf courses or parks, National Pollutant Discharge Elimination System (NPDES) needs, and water supply needs

3. FDOT project permitting: regional treatment, stormwater re-use, and joint use facilities

Potential participants from FDOT include the Design Engineer, Project Manager, Drainage Engineer, Permit Coordinator, and NPDES Coordinator. Potential representatives from the City/County include the Public Works Director, City/County Engineer, and Stormwater Engineer. Other participants would include WMD/DEP staff.

Areas of potential cooperation shall be documented as appropriate in the ***PER*** and ***Pond Siting Report*** or ***Conceptual Design Report*** for future follow up as the project development process moves forward. Any stormwater management commitments made during ELA meeting must be documented in the Environmental Document and follow the process outlined in ***Part 2, Chapter 32, Commitments***.

6.2.5.9.1 Drainage and Landscaping

The Project Manager should meet with the District Drainage Engineer and Landscape Architect to explore opportunities for integrating pond features with existing and proposed landscaping.

6.2.5.9.2 Water Quality Impact Evaluation

A ***Water Quality Impact Evaluation (WQIE) Checklist*** must be prepared for each Type 2 CE, EA, EIS or SEIR project. The WQIE focuses on surface water and ground water. The surface water evaluation should identify and document water quality issues to produce designs that are in compliance with the goals of the ***Clean Water Act (CWA)***, as amended. The objective of the ***CWA*** is to provide guidance for developing comprehensive solutions to prevent, reduce, and eliminate pollution of waters of the United States. The ground water evaluation, in coordination with the EPA and other regulatory agencies, should be consistent with the ***Safe Drinking Water Act (SDWA)***, as amended. The ***SDWA*** requires ground water quality to be maintained to protect human health, the environment, and ground water resources. WQIE requirements are discussed in detail in ***Part 2, Chapter 20, Water Quality Impact Evaluation.***

6.2.5.9.3 Hydrology and Hydraulic Evaluation

Analysis of project alternatives includes hydrology and hydraulic evaluation to determine preliminary location, type and size of major drainage crossings that may impact floodplains and floodways. Protection of floodplains and floodways is required by ***Executive Order 11988, Floodplain Management. USDOT Order 5650.2, Floodplain Management and Protection*** and ***23 CFR Part 650A***. The intent of these directives is to avoid or minimize highway encroachments within the 100-year (base) floodplains, where practicable, and to avoid supporting land use development which is incompatible with floodplain values.

Hydraulics evaluation involves field observations to determine or confirm needed improvements, analysis of existing and proposed drainage basins, design of cross drains

and culverts, design of outfall structures, determination of special erosion control and flood control features, among other things. Hydraulics evaluation also determines and corrects roadway design profile issues that may cause roadway flooding or overtopping.

The results of hydrology and hydraulic evaluation are summarized in the ***PER*** and detailed in the ***Location Hydraulics Report***. See ***Part 2, Chapter 24, Drainage and Floodplains*** for guidance on how to prepare a ***Location Hydraulics Report***.

6.2.5.10 Utilities and Railroads

The Project Manager should coordinate with the District Utility Engineer and District Railroad Coordinator whenever a project involves utilities and/or rail systems on the project. The goal is to identify potential existing or future conflicts with the project. Coordination requirements for potential utilities and railroad conflicts are outlined in ***Part 2, Chapter 10, Utilities and Railroads***.

6.2.5.11 Survey and Mapping

Development of the horizontal and vertical alignment of the build alternative requires topographic survey data. The Project Manager should obtain existing information on survey control points, benchmarks and control data (e.g., vertical and horizontal datum, coordinate system). The scale of surveying and mapping required for a PD&E Study depends on the project context, project complexity and adjacent land use intensity. The scale of surveying and mapping also depends on the scope of the preliminary engineering. Engineering analysis for build alternatives may require the following:

1. Existing aerial photographs and imagery
2. Previous topographic surveys and reports
3. Previous roadway corridor mapping
4. U.S. Geological Survey (USGS) topographic maps
5. ROW maps, including supporting survey and title work
6. County maps showing adjacent parcels, plats, and side streets
7. Utility locates
8. Additional topographic surveys, digital terrain models (DTM) and reports

Refer to the ***Surveying and Mapping Procedure, Topic No. 550-030-101***, ***Surveying and Mapping Handbook***, and ***Right-of-Way Mapping Handbook*** for standards and guidance for conducting surveying and mapping.

6.2.5.12 Geotechnical Investigation

Soil exploration during the PD&E phase is part of the analysis that supports location and design of project alternatives. A subsurface investigation is required at the site of new structures, roadway construction, widening, trails and rehabilitation locations as directed by the District Geotechnical Engineer or project scope. The scale of geotechnical investigation depends on the level of design analysis for the PD&E project and the type of soils involved. Geotechnical and subsurface investigation during PD&E involves:

1. Reviewing project requirements such as project location, alignment, structure location, structure loads, pier locations and cut/fill area locations

2. Performing field reconnaissance of the site and existing structures to determine conditions that may affect development and construction of the project

3. Reviewing or obtaining ground survey data, aerial photography, geological information, U.S. Department of Agriculture (USDA) soil data, USGS topo maps, U.S Coast and Geodetic Survey (USCGS) maps

4. Planning and conducting field investigation and laboratory testing

5. Preparing a preliminary geotechnical report summarizing available data and providing recommendation

6. Identifying potential needs for the design investigation to address construction requirements and anticipate problems

Geotechnical and subsurface investigations must be conducted by a geotechnical engineer in accordance with geotechnical standards, policies, and procedures (refer to the ***Soil and Foundation Handbook***).

Geotechnical and subsurface investigations may reveal evidence of contamination or solid waste/land-filling activities. This information is useful to the environmental analyst tasked to perform contamination assessment work on the same project. When these investigations reveal contamination issues, the project geotechnical engineer should inform the Project Manager and the District Contamination Impacts Coordinator (DCIC).

6.2.5.13 Structures and Bridges

The Project Manager should include structures engineers when developing project alternatives that may require bridges, retaining walls, tunnels, culverts, or other structural elements.

6.2.5.13.1 Development of Bridge Alternatives

When the project involves a bridge or box culvert, several important factors guide the development of bridge alternatives. For existing bridges, the age, sufficiency rating, typical section, repair costs, vertical and horizontal clearance, historic significance,

maintenance of traffic plan and availability of a detour route determine if the bridge needs to be repaired or replaced.

For new bridges, the proposed typical section, navigation requirements, vertical and horizontal clearance requirements, location hydraulic evaluation and scour analysis, geotechnical data, ship/barge traffic, security requirements, aesthetics requirements and bridge deck drainage considerations will guide the selection of the superstructure, substructure and foundations.

For projects involving replacement of a bridge that is considered historic, or has substantial community value, the study must include a rehabilitation or repair alternative. If the bridge has an existing wildlife crossing feature, coordination with the District Environmental Administrator and the resource agencies is required to ensure appropriate bridge design alternatives are considered.

The purpose of the bridge analysis is to determine the general attributes for the bridge alternative(s). The bridge analysis must provide conceptual guidance for the bridge designer who will develop specific attributes of the bridge (such as bridge design and structure type) in the ***Bridge Development Report (BDR)***. The scope of services for the PD&E Study must specify the level of structural analysis and development for each anticipated bridge structure in the study. The District Structures Design Engineer must concur with the findings of the bridge analysis. See ***PPM, Volume 1 Chapter 26, Bridge Project Development, Topic No. 625-000-007*** for the contents of the bridge analysis.

6.2.5.13.2 Braided Underpass Structures

Design of interchange concepts and ramp configurations must consider the three-dimensional relationship of roadway and bridge components. Such components can include the mainline, auxiliary lanes, ramps, collector-distributor (C-D) roads, braided (grade-separated) ramps, ramp terminal intersections and ramp junctions. When an interchange concept involves braided underpass structures, the Project Manager must coordinate with the District Structures Design Engineer to ensure vertical and horizontal geometry of the bridges can be structurally designed. Braided underpass structures usually carry primary roadway traffic (e.g. mainline or C-D road traffic) over secondary roadway traffic (e.g. ramp traffic). They typically consist of single-span bridges where the beams or flat slab superstructure component is not oriented parallel to traffic of the overlying roadway and a portion of the superstructure and substructure extends beyond the limits of the traffic barriers (Refer to the ***Structures Manual, Topic No. 625-020-018*** for details).

6.2.5.13.3 Bridge Hydraulic Analysis

The drainage engineer must prepare a ***Location Hydraulic Report*** for bridges over water in accordance with the procedures outlined in the ***Drainage Manual, Topic No. 625-040-***

002. Depending on the level of engineering analysis during the PD&E phase, a ***Bridge Hydraulic Report*** may be prepared to determine the hydraulic length of the bridge.

The District Drainage Engineer should review tidal projects to determine if coastal hydraulics is a meaningful consideration in a roadway or bridge project's design. When coastal hydraulics is essential to the project, a coastal engineer must assist in determining the level of bridge analysis effort during scoping of the PD&E phase. Conditions that typically require attention by a coastal engineer during the final design phase are as follows:

1. Hydraulic analysis of interconnected inlet systems
2. Analysis of inlet or channel instability, either vertically or horizontally
3. Determination of design wave parameters
4. Prediction of over wash and channel cutting
5. Design of countermeasures for inlet instability, wave attack or channel cutting
6. Prediction of sediment transport or design of countermeasures to control sediment transport
7. Assessment of wave loading on bridges and other structures

6.2.5.14 Transportation Management Plan

Conceptual Transportation Management Plan (TMP) should be prepared during PD&E and will evolve as the project progresses toward final design and construction. Conceptual TMP must include traffic control strategies, and may also include additional work zone management strategies based upon the expected work zone impacts of a project. For additional guidance related to the TMP development process, see the ***PPM, Volume 1, Chapter 10***.

6.2.5.15 Constructability

The evaluation of build alternatives requires review of their constructability and ability to maintain traffic during construction to uncover issues that may prevent their implementation. The Project Manager should include Roadway Design Office, Structures Office and Construction Office in the reviews of concept plans prepared for the Build Alternatives.

6.2.5.16 Construction Impacts

Impacts resulting from the actual construction of the proposed project should be discussed. A listing of general areas that may be discussed is provided below. This list is not intended to be all inclusive, as some impacts may be unknown and other activities are governed by specifications and law.

1. Air quality impacts related to open burning and dust control, see ***Part 2 Chapter 16, Air Quality Analysis***

2. Noise and vibration impacts related to construction activities, see ***Part 2 Chapter 17, Highway Traffic Noise***

3. Water quality impacts related to erosion control, sedimentation, and turbidity reduction

4. Maintenance of traffic and detour routing

5. Maintenance of access to businesses and residences

6. Safety considerations

7. Public involvement and community interaction to ease disruptive effects

8. Disposal of construction materials

9. Stockpiling of construction materials and fill

10. Use of borrow areas and any mitigation measures proposed to reduce dredge and fill-related impacts

The ***PER*** and Environmental Document must contain a section that discusses construction impacts of the project. The discussion must include impacts which may occur, whether they are disruptive or beneficial, and measures, where feasible, to reduce the amount disruption which could result. Generally, FDOT has standard construction practices which take into consideration many of the direct impacts of construction, and provides for measures to reduce or eliminate their effects. Many of these measures are found in the ***Standard Specifications for Road and Bridge Construction***. There are occasions where the FDOT may commit to implement specific

There are occasions where the FDOT may commit to implement specific measures, features or activities. Such measures will become commitments by FDOT and, as such, must be incorporated in the Commitments section of the ***PER*** and Environmental Document consistent with ***Part 2, Chapter 32, Commitments***.

6.2.6 Environmental Considerations for Build Alternatives

Development of Build Alternatives must consider the environment within which the project will be built and reflect the environmental constraints identified in the project area. Therefore, the development of the Build Alternatives should begin with overlaying environmental data collected during field review on the base map. Additional information is contained in the ***Programming Screen Summary Report*** that is completed for

projects qualified for EDTM screening. For environmental considerations refer to ***Part 2*** of this ***PD&E Manual***.

6.2.7 Comparative Alternatives Evaluation

Each project presents a unique set of challenges and the Project Manager must carefully provide a balance between the environmental impacts, the engineering analysis and the project costs, along with public input when selecting a recommended alternative. Analysis requires a comparative evaluation to objectively assess project alternatives at the same level of detail in a matrix format. The objective of an alternatives evaluation matrix is to compare and contrast the performance of each alternative in meeting the evaluation criteria, and to quantify its impacts to the natural, social, cultural and physical environment. The comparative alternative evaluation must include the No-Action Alternative (No-Build Alternative).

A number of metrics should be used that help the general public, elected officials and agencies understand the advantages and disadvantages associated with each alternative.

The following is a list of suggested items to be compared in a matrix format. The list is not meant to be comprehensive, and it should be tailored to each project.

Project Cost - The project cost should include costs associated with:

1. Design Phase
2. ROW Acquisition (cost of acquiring ROW, relocation cost and business damages, if any)
3. Construction (roadway and bridge) - including TMP
4. Construction Engineering Inspection
5. Wetland Mitigation
6. Utility Relocation Cost
7. Operations and Maintenance Cost (for transit projects)

Social Environment

1. Number of parcels (business and residential)
2. Number of relocations (business and residential)
3. Parks, recreation areas
4. Churches, Synagogues, Mosques, Worship centers

5. Cemeteries
6. Schools
7. Hospitals, Medical Centers

Cultural Environment

1. Historic Cemeteries
2. Archaeological Sites
3. Native American Lands
4. Historic Bridges
5. Historic Properties

Natural Environment

1. Wetlands
2. Endangered Species Habitat
3. Farmlands
4. Wellfield Protection Areas

Physical Environment

1. Contamination/Hazardous Waste Sites
2. Number of Impacted Noise Receptors
3. Water Quality and Quantity
4. Air Quality
5. Utilities

Traffic Operations and Safety

1. Level of Service
2. Throughput
3. Delay
4. Travel Time

5. Safety

6. Vehicles Hours Traveled/Vehicle Miles Traveled

7. Travel Time Reliability

An evaluation matrix for multimodal projects should include multimodal measures such as increased ridership, connectivity and accessibility, reduction of modal conflicts, and change in vehicle miles traveled.

For freight-focused projects, the comparative evaluation matrix should include freight-related performance measures. Such measures can include diversion estimates from through town, estimated travel-time savings between port and warehouse locations, travel time improvements for port access, travel-time differentials, and reduction in the number of truck trips.

6.2.8 Value Engineering

In accordance with the ***Value Engineering Program, Topic No. 625-030-002***, all projects with an estimated cost of $25,000,000 or more (including all phases of the project), shall have a minimum of one ***Value Engineering (VE) Study***, performed during the development of the project prior to the completion of final design. Projects that have a potential for value improvements and do not meet the $25,000,000 criteria may also be studied.

The Director of Transportation Development may waive the requirement for VE studies, See ***Value Engineering Program, Topic No. 625-030-002***. Projects delivered with the Design/Build method of construction are not required by federal regulation to have a VE study; therefore, the requirement may be waived regardless of the dollar amount.

A VE Study can be conducted either during PD&E or during Preliminary Engineering Design. If the VE Study is conducted during the PD&E phase, it must occur after alternatives analysis is complete and before the public hearing. In addition, all VE issues/recommendations should be resolved before scheduling a public hearing. The Project Manager should coordinate scheduling of the VE study with the District Value Engineer and make sure that draft Environmental Document, ***PER***, Summary of Public Involvement, and other technical documents are available for review by the VE team. Recommendations from the VE study must be incorporated in the comparative alternatives evaluation and documented in the ***PER*** and the Environmental Document

6.2.9 Recommended Alternative

The selection of the recommended alternative is based on the results of the comparative alternatives evaluation. The FDOT recommended alternative becomes the Lead Federal Agency preferred alternative subsequent to a public availability and public hearing being, if applicable, and if no substantial controversy or issues arise through the public and agency comment period. Once approved by the Lead Federal Agency, the District must identify the preferred alternative in the Environmental Document and ***PER***, and discuss

the basis for its selection. This should be documented in the Preferred Alternative section of the Environmental Document.

The Lead Federal Agency will not accept the identification of a preferred alternative until completion of sufficient scoping and analysis to support the identification. The preferred alternative must be identified in the final Environmental Document and must be approved by the Lead Federal Agency.

The coordination to determine the preferred alternative may occur through various mechanisms, including verbal communication, a letter, or identification in the Environmental Document. The coordination must be documented in the ***PER*** and Environmental Document and maintained in the project file.

Once an alternative is recommended for approval, the ***PER*** must be updated to describe design details associated with the recommended alternative. The description of the recommended alternative should be of sufficient detail to enable the project to be designed and constructed. The design details for the recommended alternative must include horizontal and vertical alignments, typical sections, conceptual ROW limits, and intersection/interchange concepts. Final design of these features occurs during the Design phase, in accordance with the ***PPM***.

The following are elements of the recommended alternative that require detailed discussion, if applicable.

Typical Section(s)

Discuss the proposed typical sections and include a ***Typical Section Package*** finalized in accordance with ***PPM, Volume 1, Chapter 16, Topic No. 625-000-007*** (pavement design will not be included at this stage). A copy of the approved ***Typical Section Package*** should be included in the ***PER*** for Type 2 CEs, EAs with FONSIs, EISs, and SEIRs.

Project Traffic Volumes

Reference the ***Project Traffic Analysis Report***, if a separate report was produced. Otherwise, summarize the traffic projections for analysis years, traffic factors and any level of service or other relevant traffic performance measures developed from the analysis.

Horizontal and Vertical Geometry

Include preliminary concept plans showing the horizontal and vertical geometry of the project.

Intersection/Interchange Concepts and Signal Analysis

Include concepts plans showing proposed intersections and/or interchange configurations. Refer to either the ***Project Traffic Analysis Report*** for signal timing analysis or include signal analysis in the Appendix.

Bridge Analysis

Include a proposed typical section for all bridges on the project. Include the proposed superstructure and substructure for each bridge and the breakdown of cost.

Access Management

Discuss the existing access management classification(s) and any change(s) to that classification proposed by the recommended alternative. Discuss other access point changes such as medians and driveways and show the proposed changes on the concept plans. Prepare a conceptual access management plan to document access management issues and preliminary design decisions and actions reached during the PD&E phase.

Variations and Exceptions

Discuss any design controls and criteria that will need a design variation or design exception. Include any approved variations or exceptions, if received.

Right of Way

Discuss the number of parcels, the number of relocations and the total cost estimate for the acquisition of those parcels. If a ***Conceptual Stage Relocation Plan*** has been developed for the project, include a reference to the plan and its conclusions. Details regarding costs for individual parcels must not be included in this discussion or elsewhere in the report.

Utilities

Include a list of all the utilities together with the contact information for each utility within the recommended alternative. Include a cost estimate for utility relocations.

Transportation Management Plan

Discuss or detail preliminary a TMP that will handle all phases of construction for the recommended alternative.

Bicycle and Pedestrian Accommodations

Discuss multimodal accommodation (bicycles, pedestrians, transit), Complete Streets and Context Sensitive design solutions applied to the alternative. Note compliance with current policies.

Preliminary Drainage Analysis

Discuss the type of drainage system(s) to be used for the recommended alternative. A discussion of the number and type of stormwater management systems should also be included.

Floodplain Analysis

Discuss impacts that occur to floodplains. This discussion should include whether the impacts will be parallel or perpendicular to the floodplain.

Special Features

Discuss any features that are not commonly associated with a transportation project. Examples could include any features included to protect or minimize impacts to the environment.

Cost Estimates

Include a table summarizing project costs consistent with the Long Range Estimate (LRE). Use the FDOT LRE System for construction costs, and ROW estimates for ROW costs. Design and Construction Engineering Inspection (CEI) costs may be developed based on a fixed percentage of construction cost. For a project with wetland impacts, include the cost of wetland mitigation. For a project with utility impacts, include the costs of utility relocation both directly and indirectly to FDOT.

Construction Impacts

Discuss all direct impacts resulting from the actual construction of the proposed project.

6.2.10 Documentation

This section provides guidance on documenting alternatives analysis in the Environmental Document and ***PER***. A Florida registered professional engineer must sign and seal the engineering analysis performed to support PD&E Studies in accordance with ***Chapter 471, Florida Statutes***.

6.2.10.1 Environmental Document

The Environmental Document must discuss impacts on the environment from the recommended/preferred alternative and other alternatives in a comparative form. The comparative alternative evaluation must provide a clear basis for the decision to select the preferred alternative. The alternatives section of the Environmental Document must address the following in accordance with ***40 CFR § 1502.14***:

1. Rigorously explore and objectively evaluate all reasonable alternatives (for EISs), and, for alternatives which are being eliminated from detailed study, briefly discuss the reasons for their elimination.

2. Devote an equal level of detail to each alternative considered, including the proposed action, so that their comparative merits can be evaluated.

3. For EISs only, include reasonable alternatives not within the jurisdiction of the Lead Agency.

4. Include the No-Action Alternative.

5. Identify the agency's preferred alternative, if one or more exists, in the draft document and identify such alternative in the final document, unless another law prohibits the expression of such a preference.

6. Include appropriate mitigation opportunities and measures not already incorporated as a part of the proposed action or the alternatives proposed.

The location of alternatives documentation in the Environmental Document differs depending on the COA:

1. **Type 2 CE** - If more than one alternative is analyzed, alternatives information is included in Block 2.b. (Proposed Improvements) of the ***Type 2 Categorical Exclusion Determination Form, Form No. 650-050-11***.

2. **EA** - Alternatives information is included in the section titled Alternatives Considered.

3. **EIS** - Alternatives information is included in the section titled Alternatives Including Proposed Action.

4. **SEIR** - Alternatives information is included in the Engineering Analysis section of the SEIR.

The alternatives section for EAs and EISs should be divided into the following sub-sections, as applicable:

1. Alternatives Development

2. Alternatives Considered but Eliminated

3. Alternatives Considered for Additional Study

4. Comparative Alternatives Evaluation

5. FDOT Recommended/Preferred Alternative

Alternatives Development - Summarize any Planning phase alternative corridor reports, screening reports, and results of the ACE process as applicable. Provide a brief description of the original alternatives that were considered and the methodology used for evaluation, while referencing technical documents such as the ***PER*** and ***Project***

Traffic Analysis Report, ***Alternative Corridor Evaluation Report (ACER)***, for detailed information. Discuss public involvement activity as related to alternatives development.

Alternatives Considered but Eliminated - Discuss alternatives considered but eliminated from detailed analysis (include alternatives considered and eliminated during planning). Clarify why the alternatives were eliminated, what criteria were used to eliminate them, at what point in the process the alternatives were removed, and who was involved in establishing the criteria.

Alternatives Considered for Additional Study - Identify the alternatives studied in detail during the PD&E Study and include a concise discussion of how and why they were selected. Describe each alternative in sufficient detail to support decision-making. Provide a clear understanding of each alternative's termini, location, costs, and major design features (i.e., number of lanes, ROW requirements, median widths, access control). See ***Section 6.2.5*** for information to consider for each Build Alternative. Present a summary of the environmental impacts of each alternative based on the information and analysis presented in the Affected Environment and Environmental Consequences/Impact sections of the Environmental Document. The information should provide a clear basis for decision-making.

Comparative Alternative Evaluation - Describe the alternatives evaluation methodology used to objectively compare all alternatives. Present comparative evaluation results (qualitative and quantitative) in a matrix form. Information in the matrix must be consistent with the Environmental Document and applicable technical reports. Describe the rationale and the factors used in the ranking of the alternatives.

Recommended/Preferred Alternative - Describe the alternative which FDOT is recommending to the Lead Federal Agency for Location Design Concept Approval (LDCA). The preferred alternative should be described in sufficient detail so the reader can understand the FDOT's and Lead Federal Agency's decision.

Below is an example of the discussion generally found in this section.

> As a result of scoping, environmental analysis, the public hearing, and interagency coordination, the alternative identified for LDCA is (alternative name), which is (alternative description) (cite location of alternative specific details and typical sections).

For an EA or DEIS, this should be titled FDOT Recommended Alternative when the District has selected the recommended alternative. Once approved by the Lead Federal Agency, the District must retitle the FDOT Recommended Alternative section as Preferred Alternative in the final Environmental Document (FEIS or FONSI).

The FEIS must identify the preferred alternative and should discuss the basis for its selection [See ***23 CFR § 771.125(a)(1)***].

6.2.10.2 Preliminary Engineering Report

Documentation of engineering analysis of a PD&E Study should include at the following elements at a minimum:

1. Cover Page (See ***Figure 6-2***)

2. Project Summary

    a. Project Description - Include a brief description of the project including location, length of project, number of interchanges and bridges and/or major features.

    b. Purpose and Need - Include the purpose and need for the project. Must be consistent with purpose and need described in the Environmental Document.

    c. Commitments - Include a list of all engineering related commitments that will be included in the Environmental Document.

    d. Description of Recommended Alternative - Include a brief description of the recommended alternative(s).

3. Existing Conditions - Briefly discuss existing roadway conditions, structure conditions and the environmental characteristics. Include discussion of typical section, ROW, roadway classification, vertical and horizontal alignment, pedestrian and bicycle facilities, transit facilities, drainage, crash data, utilities, design, posted speed and traffic characteristics.

4. Design Controls and Criteria - List design controls and criteria used to develop alternatives.

5. Alternatives Analysis - Discuss development of alternatives. Discuss evaluation and elimination of alternatives. Include the No-Action (No-Build) Alternative, TSM&O Alternative and Build Alternative(s). Include a comparative alternatives evaluation with assumptions made during the development of the evaluation matrix. Incorporate by reference the results of the environmental technical analyses to reduce repetition.

6. Public Involvement/Project Coordination - Document all public meetings and hearing(s) held for the project. Include coordination with Elected/ Appointed officials, MPO/County/City and citizens as well as resource agencies.

7. Recommended Alternative(s) - Discuss major design features such as typical sections, horizontal and vertical geometry, access management, variation and exceptions, utilities, preliminary drainage, structures, intersection and interchange concepts, drainage and stormwater treatment and facilities.

6.3 REFERENCES

23 Code of Federal Regulations (CFR), Part 450. Planning Assistance and Standards

23 CFR Part 771. Environmental Impact and Related Procedures

40 CFR Part 230. Section 404(b)(1) Guidelines for Specification of Disposal Sites for Dredged or Fill Material

40 CFR §§1500-1508. Council on Environmental Quality, Executive Office of the President. Regulations For Implementing The Procedural Provisions Of The National Environmental Policy Act

American Association of the State Highway and Transportation Officials (AASHTO). August, 2007. Practitioner's Handbook. Defining the Purpose and Need and Determining the Range of Alternatives for Transportation Projects

Council on Environmental Quality (CEQ), 1981. Forty Most Asked Questions Concerning CEQ's National Environmental Policy Act Regulations. https://ceq.doe.gov/nepa/regs/40/40p3.htm

Federal Aviation Administration (FAA). Notice Criteria Tool. https://oeaaa.faa.gov/oeaaa/external/gisTools/gisAction.jsp?action=showNoNoticeRequiredToolForm

FAA, 2005. Wildlife Hazard Management at Airports

Federal Highway Administration (FHWA). 1987. FHWA Technical Advisory. T6640.8A, Guidance for Preparing and Processing Environmental and Section 4(f) Documents. https://www.environment.fhwa.dot.gov/projdev/impta6640.asp

FHWA, 2010. FHWA Order 6640.1A. FHWA Policy on Permissible Project Related Activities during the NEPA Process. https://www.fhwa.dot.gov/legsregs/directives/orders/66401a.cfm

FHWA, 2010. Integrating Freight into NEPA Analysis. http://www.ops.fhwa.dot.gov/publications/fhwahop10033/sec4.htm

FHWA. 2011. Guidance on Using Corridor and Subarea Planning to Inform NEPA. https://www.environment.fhwa.dot.gov/integ/corridor_nepa_guidance.pdf

FHWA. 2012. Guidance on Section 129 General Tolling Program, Federal Tolling Programs under the Moving Ahead for Progress in the 21st Century. https://www.fhwa.dot.gov/map21/guidance/guidetoll.cfm

FHWA. NEPA and Transportation Decision Making, Development and Evaluation of Alternatives. https://www.environment.fhwa.dot.gov/projdev/tdmalts.asp

Moving Ahead for Progress in the 21st Century (MAP-21), Section 1310

United States Code (U.S.C.) Title 23 Chapter 166 (23 U.S.C § 166 (b). HOV Facilities, Exemption. https://www.gpo.gov/fdsys/pkg/USCODE-2010-title23/pdf/USCODE-2010-title23-chap1-sec166.pdf

6.4 HISTORY

1/12/2000, 10/16/2013

Engineering analyses, design concepts, and accompanying reports must be prepared consistently with the latest edition of the following documents:

1. ***Plans Preparation Manual (PPM), Volume 1, Topic No. 625-000-007***
2. ***Plans Preparation Manual (PPM), Volume 2, Topic No. 625-000-008***
3. ***Manual of Uniform Minimum Standards for Design, Construction, and Maintenance for Streets and Highways (Florida Greenbook), Topic No. 625-000-015***
4. ***Structures Manual, Topic No. 625-020-018***
5. ***Median Opening and Access Management Decision Process, Topic No. 625-010-021***
6. ***Manual on Uniform Traffic Studies (MUTS), Topic No. 750-020-007***
7. ***Drainage Manual, Topic No. 625-040-002***
8. ***Structures Manual, Topic No. 625-020-018***
9. ***Utility Accommodation Manual, Topic No. 710-020-001***
10. ***CADD Manual, Topic No. 625-050-001***
11. ***Design Standards, Topic No. 625-010-003***
12. ***Context Sensitive Solutions, Topic No. 000-650-002***
13. ***Complete Streets, Topic No. 000-625-017***
14. ***Americans with Disabilities (ADA) Requirements for Access to Department Facilities, Topic No. 625-020-15***
15. ***Transit Corridor Program, Topic No. 725-030-003***
16. ***FDOT Right of Way Manual, Topic No. 575-000-000***
17. ***FDOT Standard Specifications for Road and Bridge Construction***
18. ***Project Traffic Forecasting, Procedure No. 525-030-120***
19. ***FDOT Quality/Level of Service Handbook***

Figure 6-1 Manuals, Design Standards, and Procedures to Establish Project Development Design Controls and Criteria

20. ***Highway Beautification Policy Topic 000-650-011***

21. ***FDOT Traffic Engineering Manual (TEM), Topic No. 750-000-005***

22. ***FDOT Florida Intersection Design Guide***

23. ***FDOT Express Lanes Handbook***

24. ***FDOT Accessing Transit Design Handbook***

The engineering analysis may also use national publications such as:

1. ***Highway Capacity Manual (HCM)***
2. ***American Association of the State Highway and Transportation Officials (AASHTO) A Policy on Highway Geometric Design (AASHTO Green book)***
3. ***AASHTO Highway Safety Manual (HSM)***
4. ***NCHRP Report 672, Roundabouts: an Informational Guide***
5. ***AASHTO Guide for the Development of Bicycle Facilities***
6. ***AASHTO Guide for the Development of Pedestrian Facilities***
7. ***Manual on Uniform Traffic Control Devices (MUTCD)***

Figure 6-1 Manuals, Design Standards, and Procedures to Establish Project Development Design Controls and Criteria

PRELIMINARY ENGINEERING REPORT

Florida Department of Transportation

ETDM Number
Financial Management Number
Federal-Aid Project Number (if applicable)

This preliminary engineering report contains detailed engineering information that fulfills the purpose and need for project _____.

___ / ___ / ___
Date

_____
Professional Engineer

Seal below

Figure 6-2 Preliminary Engineering Report Sample Cover Page