



PD&E Traffic and Safety Analysis Scoping Tools

Guidance Documentation - User Guide

PD&E Traffic and Safety Analysis Scoping Tool

Guidance Documentation – User Guide

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1.0 Introduction

1.1 Background

The Florida Department of Transportation (FDOT) has developed a Standard Scope of Services, PD&E Staff Hour Estimation (SHE) Guidelines, and PD&E Staff Hour Estimation Forms to assist the project managers (PM) in preparing staff hour estimates for Project Development and Environment (PD&E) studies. The SHE Guidelines lack specific guidance on estimating the level of effort to conduct traffic and safety analyses for PD&E studies. Therefore, there is a need for providing additional guidance on how to estimate the level of efforts required to conduct traffic and safety analysis.

A tool was developed for the Federal Highway Administration (FHWA) for estimating the level of effort for Traffic Analyses but is not tailored to FDOT PD&E project conditions. This task was initiated to develop a customized Traffic Analysis Scoping Tool for FDOT PD&E projects, as well as to develop a similar tool to estimate FDOT PD&E Safety Analyses. The development and use of the FDOT PD&E Traffic and Safety Analysis Scoping Tools (Scoping Tools) is detailed further in the following sections.

1.2 Purpose

The purpose of this document is to provide a detailed instructional guide on how to use the FDOT PD&E Traffic and Safety Analysis Scoping Tools for estimating level of staff hours using FDOT PD&E Standard Scope of Services.

2.0 Input Parameters

Identifying the input parameters for the traffic and safety analysis was the initial step for developing/updating the Scoping Tools.

The FHWA's Traffic Analysis Scoping Tool estimates staff hours for conducting traffic analysis projects. Based on the FDOT PD&E requirements for conducting traffic analysis, this document identifies the input parameters for the traffic analysis. This will ensure that the staff hour estimate output matches the tasks and activities for traffic analysis study.

The FHWA's Traffic Analysis Scoping Tool was not designed to estimate staff hours for a safety analysis. FDOT's Safety Analysis Guidebook for PD&E Studies provides guidance consistent with the requirements of safety analyses documented in Part 2, Chapter 2 of the PD&E Manual. This document identifies the input parameters for safety analysis based on these guidelines.

2.1 Input Parameters for Traffic Analysis / Customization of FHWA Traffic Analysis Scoping Tool

The FHWA's Traffic Analysis Scoping Tool (FHWA Scoping Tool) was developed to produce ballpark estimates of staff-hours to complete the tasks needed to support a traffic analysis consistent with an agency's guidelines. The objectives of the scoping tool are (1) to inform a procurement decision made by a transportation agency before procuring transportation analysis services; (2) to provide a rough order labor

hour estimate for conducting the transportation analysis; and (3) to incorporate an estimate of relative risk associated with various analysis tasks.

The focus of the FHWA Scoping Tool is on traditional, future project analysis—not on analysis conducted in real-time to actively manage aspects of the transportation system. This tool provides guidance for tasks associated with time based performance evaluations, such as those related to simulation tools and Highway Capacity Manual (HCM) analysis, and does not include guidance for design traffic growth using travel demand modeling.

The FDOT's Traffic Analysis Scoping Tool is a simple spreadsheet tool that produces ballpark estimates of labor hours required for analysis based on fourteen (14) user inputs. The tool first asks users to choose among small number of options related to the expected analytical complexity and risk. Based on user inputs, the tool assesses different complexity and risk levels and uses factors to produce task estimated outputs, including ranges of labor hours by task for three labor categories plus total labor hours by task. Assumptions and methodology were vetted in several review cycles, including both internal and external teams of analysis experts.

The user inputs and options used for traffic analysis in the FDOT's Traffic Analysis Scoping Tool will be applicable for traffic analysis of FDOT PD&E studies. These are identified below:

1. Name of Study
2. Number of intersections in the study area
3. Number of on- and off- freeway ramps
4. Baseline model availability (No, Partial, Full)
5. Calibration of Baseline Model Required? (No, Yes)
6. Data collection requirements (Low, Medium or High Effort (effort is determined based on time spent in collecting data))
7. Number of time periods to be analyzed (e.g., AM, mid-day and PM peak periods)
8. Number of alternatives to be included in the analysis
9. Number of operational conditions (high demand/no incident, medium demand/minor incident, etc.) to be analyzed
10. Number of analysis horizons (Baseline year plus X number of future years)
11. Complexity of analysis scenarios (multiple modes, pricing, etc.- Simple or Complex)
12. Complexity of analysis methodology (Deterministic or Dynamic/Stochastic)
13. Complexity of output performance measures (Simple or Comprehensive)
14. Analyst Experience (Some or Considerable)

2.2 Input Parameters for Safety Analysis

As indicated earlier, FDOT’s Safety Analysis Guidebook for PD&E Studies provides safety analysis guidance consistent with the requirements of safety analyses documented in Part 2, Chapter 2 of the PD&E Manual. While there is safety analysis guidance, the safety analysis methodology for a PD&E study is typically not prescriptive as the scale and scope of analysis effort depends on:

- Selected performance measures to address the purpose and need,
- Project type (such as widening, new alignment, etc.),
- Project location, context, and existing issues, and
- Complexity or scope of alternatives being evaluated.

Figure 1 illustrates the process that should be considered when determining the appropriate scope of safety analysis for a PD&E study. These items are scalable based on the type, context, and complexity of the project. The safety analysis scope should be developed concurrently with the traffic operational analysis scope since the same analysis years and data (traffic volume, traffic control, and roadway characteristics) are used for both analyses.

Figure 1 Safety Analysis Scoping Process



Based on the guidelines included in FDOT's Safety Analysis Guidebook for PD&E Studies, user inputs and options for the safety analysis are identified below:

1. Name of study
2. Number of intersections in the study area
3. Number of highway segments in the study area
4. Number of ramp segments in the study area
5. Number of analysis horizons (Baseline year plus X number of future years)
6. Availability of baseline/no-build data related to crash and roadway (good, sufficient, limited)
7. Availability of build alternatives data related to crash and roadway (good, sufficient, limited)
8. Complexity of geometry (simple, complex)
9. Type of future alternatives analysis (CMFs, Predictive Method)
10. Analyst experience (some, considerable)

3.0 FDOT PD&E Traffic and Safety Analysis Scoping Tool – Users Guide

This section provides the user with detailed information on how to use the FDOT PD&E Traffic and Safety Analysis Scoping Tool.

3.1 Acquiring the tool

The traffic and safety analysis scoping tools are provided by FDOT Office of Environmental Management as stand-alone spreadsheet-based tools for use by FDOT Districts and their consultants. No additional software is required to operate and utilize the tool. These spreadsheets are found on the FDOT Scope of Services and Staff Hour Estimation website at <https://www.fdot.gov/designsupport/Scope/default.shtm>.

3.2 Using the tool

The spreadsheet-based tool for both the traffic and safety analyses contains three worksheets:

- Input – for entering the project study details.
- Calculations – for a detailed understanding of the calculations and assumptions.
- Output – for the results of the scoping analysis tool.

Users should click on the “Press This Button to Start” to start entering the project input parameters (as covered in the section 2.0). The cells in the traffic and safety analysis tools are highlighted in light blue or white which denote the following:

- The information in “light blue” colored cells can be updated by the users to update the assumptions.
- The information in “white/uncolored” cells contain formulae and should not be updated by the user.
- The information in “grey” colored cells contain a summary of calculations from earlier steps and should not be updated by the user.

Figure 2 FDOT PD&E Traffic Analysis Costing Tool

FDOT PD&E Traffic Analysis Costing Tool

Press This Button to Start

Summary of User Inputs:

- 1 Name of Study Area:
- 2 Number of Intersections:
- 3 Number of Freeway Ramps:
- 4 Base Model Availability:
- 5 Is the Base Model Calibrated:
- 6 Number of Analysis Horizons:
- 7 Number of Alternatives:
- 8 Number of Representative Days:
- 9 Number of Peak Periods
- 10 Data Processing Requirements:
- 11 Complexity of Analysis Scenarios:
- 12 Complexity of Methodology:
- 13 Complexity of Outputs:
- 14 Analyst Experience:

Developed for:



I-4 Test

6

10

No

No

3

2

1

2

Low

Complex

Stochastic/Dynamic

Simple

Considerable

Note: This Traffic Analysis Scoping Tool is provided "as is" without warranty of any kind or maintenance agreement.

Figure 3 FDOT PD&E Safety Analysis Costing Tool

FDOT PD&E Safety Analysis Costing Tool

Press This Button to Start

Summary of User Inputs:

- 1 Name of Study Area:
- 2 Number of Intersections:
- 3 Number of Ramp Terminal Intersections:
- 4 Number of Roadway/Freeway Segments:
- 5 Number of Ramp Segments:
- 6 Availability of Baseline/No-Build Data Related to Crash and Roadway (Good, Sufficient, Limited):
- 7 Number of Analysis Years:
- 8 Complexity of Geometry (Simple, Complex):
- 9 Type of Alternatives Analysis (Crash Modification Factors (CMFs), Predictive Method):
- 10 Project Team Experience (Some, Considerable):

Note: This Safety Analysis Costing Tool is provided "as is" without warranty of any kind, or maintenance agreement.

Developed for:



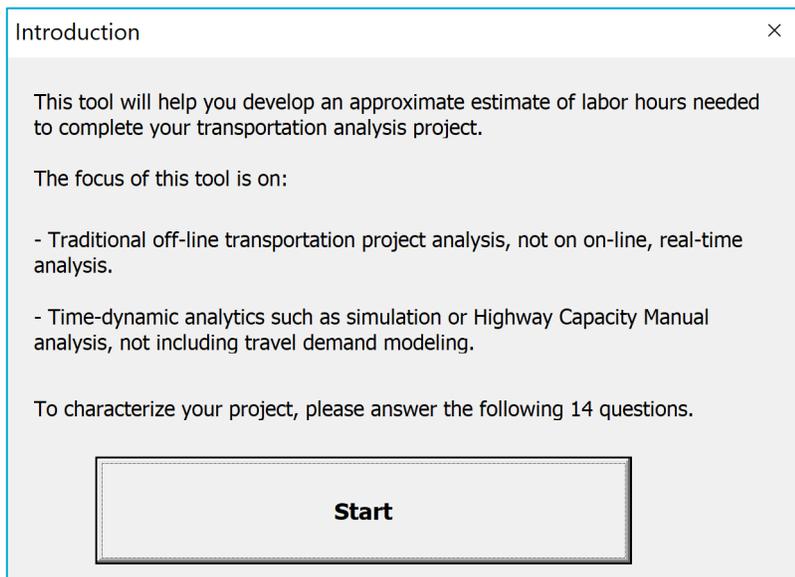
Test
1
1
1
1
Good
1
Simple
CMFs
Some

3.3 FDOT PD&E Traffic Analysis Scoping Tool

3.3.1 Data Input

The steps for data input and corresponding screenshots of the analysis tool dialog boxes are as follows:

- Press the “Start” button.



- Read/acknowledge the assumptions.

Data Assumptions ×

This tool will ask 14 questions, and based on your responses it will calculate an approximate number of labor hours to conduct the

Consistent with the updated FHWA Guidelines for Transportation Analysis, this tool assumes that cluster analysis will be conducted on the available data. This tool assumes that archived data are available to assemble and process, to determine number of clusters and representative days, and conduct the analysis.

The assumptions employed to calculate the approximate number of required labor hours are presented in the 'Calculations' spreadsheet. These assumptions can be modified by the user, according to the user's experience and judgement.

Continue

1. Enter the Project Title.

1. Study Area ×

Please enter the name of the Study Area:

Continue

2. Enter the number of intersections.

2. Number of Intersections ×

Please enter the number of intersections in the study area:

Continue

3. Enter the number of freeway ramps.

3. Number of Freeway Ramps ×

Please enter the number of freeway ramps (on- and off-ramps):

Continue

4. Indicate the availability of baseline model.

4. Base Model Availability ×

Do you have a Baseline Model available?

Yes

Partially

No

Continue

This question seeks to understand if you have a model to start with, and its initial condition. By selecting 'Yes', you are identifying a complete model. The option 'Partially' refers to an incomplete or old model. The option 'No' would represent the need to develop a model from scratch for this project.

- Indicate whether the baseline model is calibrated.

5. Status of Baseline Model ×

Is the Baseline Model calibrated?

Yes

No

Continue

- Provide the number of analysis years for the project.

6. Time Scenarios ×

How many analysis horizons are you considering for this project?

Continue

The number of analysis horizons refer to the time scenarios being analyzed. For example, if only current conditions are considered please select '1'. If you plan to analyze the current year plus two years in the future, please select '3'.

7. Provide the number of alternatives to be analyzed.

7. Number of Alternatives ×

Please enter the number of alternatives to be analyzed:

Continue

The number of alternatives typically includes a "no-build" or "do nothing" alternative, plus one or more build alternatives for each analysis year.

8. Provide the number of representative days for analysis.

8. Representative Days ×

Please enter the number of representative days to be analyzed in each analysis year:

Continue

Representative Days refer to different operational conditions within the analysis year, such as:

- a) High demand, no incident
- b) High demand, minor incident
- c) Medium demand, no incident
- d) etc...

If you would like to analyze only one typical day please select '1'.

9. Identify the number of peak periods.

9. Peak Periods ×

How many peak periods will be

Continue

For example, if you are modeling the AM and PM peak periods, the number you should input should be 2.

10. Identify data processing requirements.

10. Data Processing Requirements ×

For data processing activities, what level of effort do you anticipate would be required?

Low effort

Medium effort

High effort

Continue

Data processing includes identifying available sources, assembling data, cleaning data, processing data, and producing a database and a report on the data.

11. Identify complexity of analysis scenarios.

11. Complexity of Analysis Scenarios
×

How complex are the analysis scenarios or

Simple

Complex

Continue

The level of complexity of analysis scenarios depends on a number of factors, such as:

- a) The number of transportation modes included. If only one transportation mode is considered, the analysis scenario would be simple.
- b) The complexity of analysis alternatives. For example, if the the analysis considers congestion pricing, the analysis is usually complex. If the analysis considers traditional capacity improvements (such as new highway lanes), the analysis is fairly simple.

12. Identify the analysis methodology.

12. Complexity of Analysis Methodology
×

What type of methodology will be used?

Deterministic

Stochastic/Dynamic

Continue

Typically, deterministic analysis methods (such as Highway Capacity Manual) are used for sketch planning or pre-engineering analysis efforts. Stochastic or dynamic analysis methods are typically used for the analysis of design or operational improvements.

13. Identify the complexity of outputs to be generated.

13. Complexity of outputs ×

Determine the complexity of required output performance measures

Simple

Comprehensive

Continue

Traffic volumes, travel speeds, and level of service are typically considered as simple output performance measures. Travel time reliability, emissions, and benefit-cost analysis require more comprehensive

14. Indicate the project team experience.

14. Analyst Experience ×

Determine the level of experience of the analyst:

Some experience

Considerable experience

Finish

3.3.2 Calculations

The “Calculations” tab on the spreadsheet tool uses the information provided by the user in the “Input” tab and develops estimates of staff hours for traffic analysis.

Assumptions for number of labor hours per average intersection, and freeway ramp are provided and can be updated by the user, as needed. Factors for availability of baseline model, availability of a calibrated model, data processing requirements, scenarios/alternatives, methodology, types of output and project team experience are also included in the tool and can be updated by the user, as needed.

It should be noted that the assumptions for number of labor hours and factors for data items were developed using a small sample set of data from Districts 3, 4, and 5. As such, there will be a need for reviewing and updating the assumptions and factors to the specific project being analyzed.

3.3.3 Output

An example of the output table is provided below.

Project Task	Manager Hours	Engineer/Planner Hours	Technician Hours	Total Hours	Lower Bound	Upper Bound
1 Develop workplan, analysis plan, and project management						
2 Select analysis tool						
3 Develop data plan and process data						
4 Define clusters and representative days						
5 Develop and calibrate baseline model(s)						
6 Develop future baseline model(s)						
7 Analyze Alternatives						
8 Reports and Presentations						
Total Labor Hours						

The PD&E SHE guidelines includes line items for traffic analysis 4.5.6 – 4.5.12. The following list describes how these line items correlate to the results from the PD&E traffic analysis tool. While the PD&E traffic analysis tool is not intended to provide a direct correlation to line items in the PD&E SHE guidelines, the outputs from the tool can be used as a refined starting point for staff hour estimates and discussions with the District Planning and/or Traffic Operations.

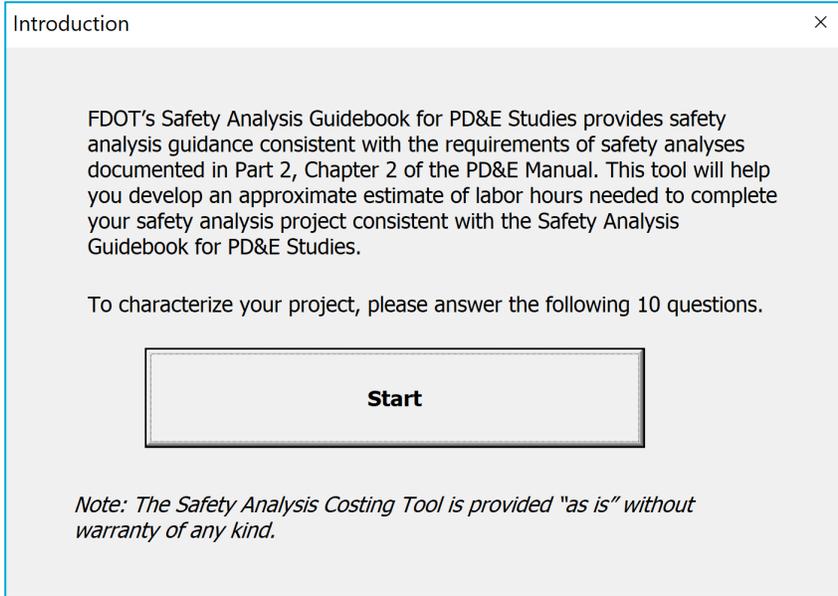
- 4.5.6 (Existing Traffic Operational Analysis) – This includes the total hours from project tasks 2, 3 and 4 in the PD&E traffic analysis tool.
- 4.5.7 (Model Calibration and Validation) – This includes the total hours from project task 5 in the PD&E traffic analysis tool.
- 4.5.8 (Future Demand Forecasting) – This includes the total hours from project task 6 in the PD&E traffic analysis tool.
- 4.5.9 (No-Build Analysis), 4.5.10 (Development and Screening of Alternatives), 4.5.11 (Operational evaluation of build alternatives) This includes the total hours from project task 7 in the PD&E traffic analysis tool. A detailed breakdown by the PD&E SHE guideline line item is not readily available from the PD&E traffic analysis tool.
- 4.5.12 (Project Traffic Analysis Report) – PD&E traffic analysis tool project task 8 in the PD&E traffic analysis tool.

3.4 FDOT PD&E Safety Analysis Scoping Tool

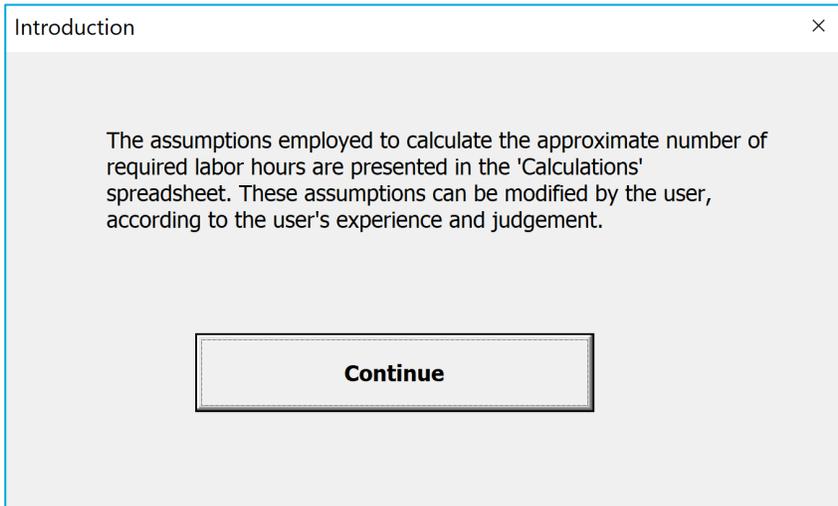
3.4.1 Data Input

The steps for data input and corresponding screenshots of the analysis tool dialog boxes are as follows:

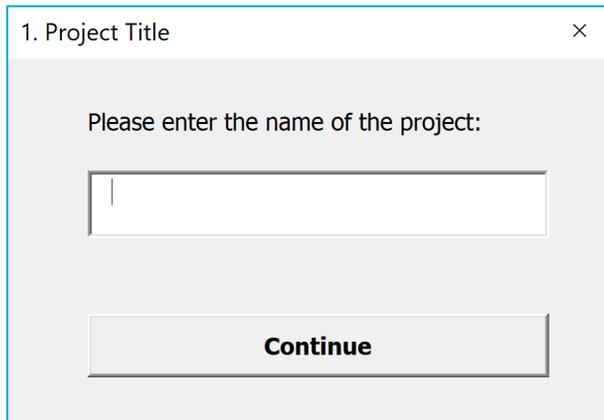
- Press the “Start” button.



- Read/acknowledge the assumptions.



1. Enter the Project Title.

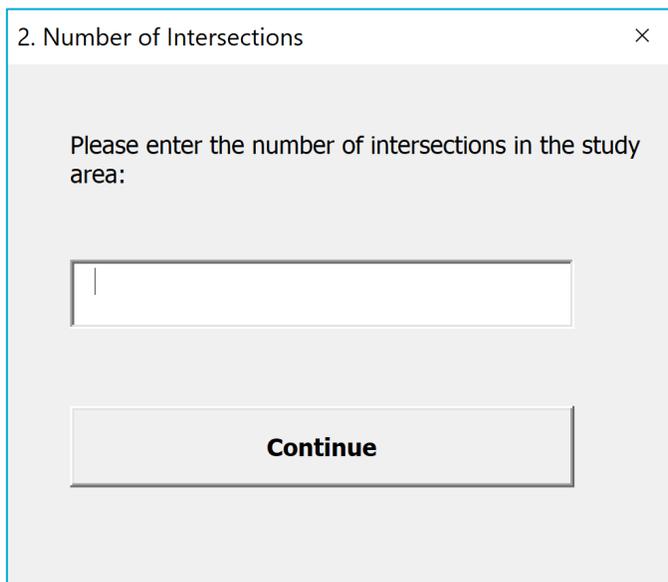


1. Project Title ×

Please enter the name of the project:

Continue

2. Enter the number of intersections.



2. Number of Intersections ×

Please enter the number of intersections in the study area:

Continue

3. Enter the number of ramp terminal intersections.

3. Number of Ramp Terminal Intersections: ×

Please enter the number of ramp terminal intersections:

4. Enter the number of roadway/freeway segments.

4. Number of Roadway/Freeway Segments ×

Please enter the number of roadway/freeway segments:

5. Enter the number of ramp segments.

5. Number of Ramp Segments ×

Please enter the number of ramp segments:

6. Indicate the availability of baseline/no-build data.

6. Availability of Baseline/No-Build Data ×

Availability of Baseline/No-Build Data Related to Crash and Roadway (Good, Sufficient, Limited):

Good (Crash and roadway data can be gathered with minimal effort)

Sufficient

Limited (Crash and roadway data is not readily available)

Continue

7. Provide the number of analysis years.

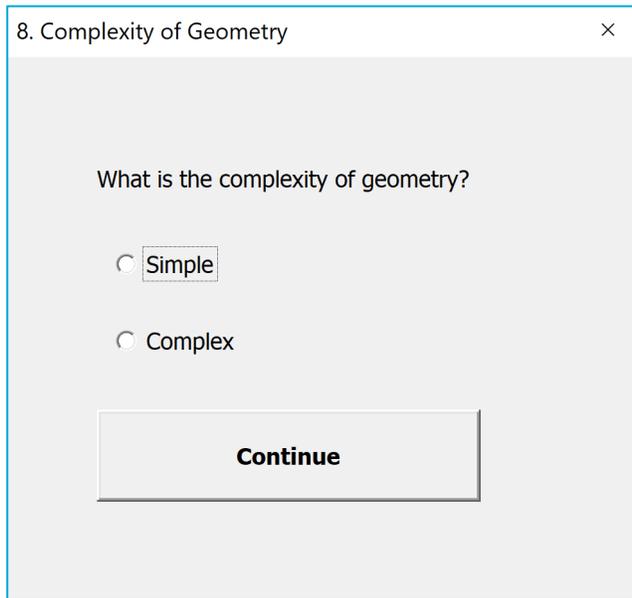
7. Number of Analysis Years ×

How many analysis years are you considering for this project?

Continue

The number of analysis years refers to the number of specific study years (e.g., existing, opening and design year) being considered.

8. Identify the complexity of geometry.



8. Complexity of Geometry

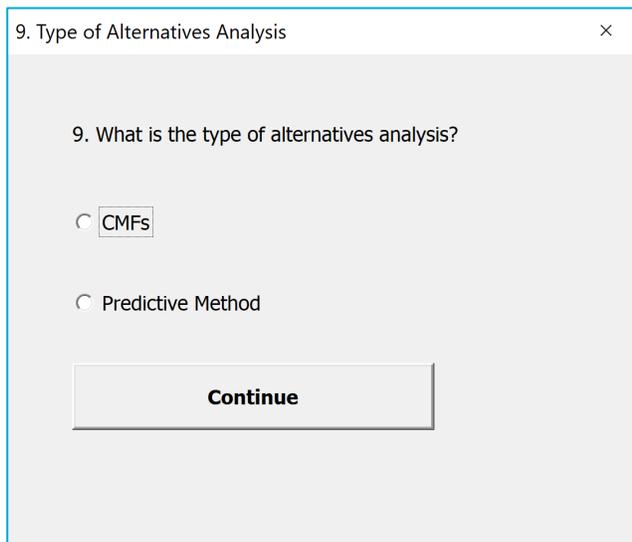
What is the complexity of geometry?

Simple

Complex

Continue

9. Identify the type of alternatives analysis



9. Type of Alternatives Analysis

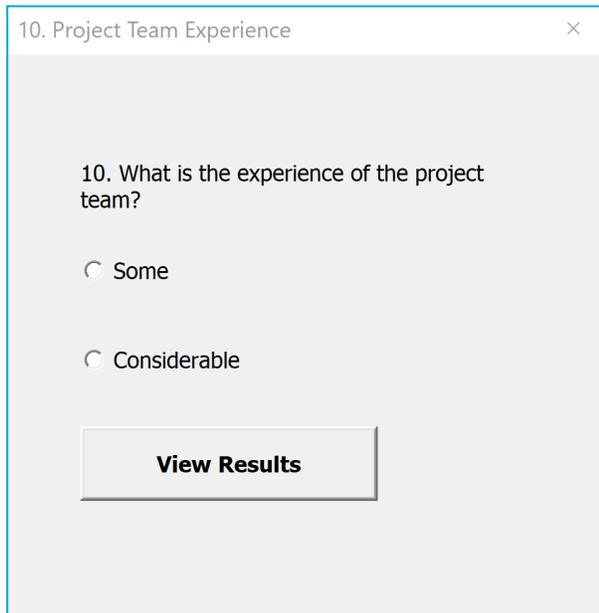
9. What is the type of alternatives analysis?

CMFs

Predictive Method

Continue

10. Indicate the project team experience



10. Project Team Experience

10. What is the experience of the project team?

Some

Considerable

View Results

3.4.2 Calculations

The “Calculations” tab on the spreadsheet tool uses the information provided by the user in the “Input” tab and develops estimates of staff hours for safety analysis.

Assumptions for number of labor hours per average intersection, ramp terminal intersection, roadway/freeway segment, and ramp segment are provided and can be updated by the user, as needed.

Factors for availability of baseline/no-build data related to crash and roadway, complexity of geometry and project team experience are also included in the tool and can be updated by the user, as needed.

It should be noted that the assumptions for number of labor hours and factors for data items were developed using an engineering judgement based on national traffic safety studies. As such, there will be a need for reviewing and updating the assumptions and factors to the specific project being analyzed.

3.4.3 Output

An example of the output table is provided below.

Project Task	Manager Hours	Engineer/Planner Hours	Technician Hours	Total Hours	Lower Bound	Upper Bound
1 Develop workplan, analysis plan, and project management						
2 Data collection and processing						
3 Analysis - Existing Conditions						
4 Analysis - Alternatives						
5 Documentation						
Total Labor Hours						

The PD&E SHE guidelines includes line items for safety analysis 4.8.1 – 4.8.3. The following list describes how these line items correlate to the results from the PD&E safety analysis tool. While the PD&E safety analysis tool is not intended to provide a direct correlation to line items in the PD&E SHE guidelines, the outputs from the tool can be used as a refined starting point for staff hour estimates.

- 4.8.1 (Crash data) – This includes the total hours from project task 2 in the PD&E safety analysis tool
- 4.8.2 (Historical Crash Analysis) – This includes the total hours from project task 3 in the PD&E safety analysis tool
- 4.8.2 (HSM Safety Analysis) – This includes the total hours from project task 4 in the PD&E safety analysis tool.
- 4.8.3 (Documentation of Safety Analysis) – This includes the total hours from project task 5 in the PD&E safety analysis tool.

4.0 Additional Notes

The user should take note of the following items which would be helpful for reviewing and updating the tools.

- The user should review the labor hours for an average intersection, ramp terminal intersection, roadway/freeway ramp, freeway ramps provided in the tool and update as needed based on the best engineering judgement.
- If prompted, the user should enable macros for the spreadsheet. The tool is made available to the user “as is” and if any changes are made to the tool, the user should reach out to FDOT Office of Environmental Management.

- The tool currently is limited to the input parameters described in Section 2. If the user desires to consider additional input parameters, they should reach out to FDOT Office of Environmental Management.
- The line items 4.5.6 – 4.5.12 and 4.8.1 – 4.8.3 in PD&E SHE guidelines can be updated to refer to the PD&E safety and traffic analysis tools as a resource for estimating the hours.

5.0 Current Version and Future Updates

The current version of the traffic and safety analysis scoping tools are listed as **v1.0**. Future updates will be release by FDOT Office of Environmental Management based on the updates from the underlying guidance documents. For additional information please refer to the FDOT Office of Environmental Management (<https://www.fdot.gov/environment/default.shtm>).