PD&E Traffic and Safety Analysis Scoping Tools

Guidance Documentation - User Guide

June 2022

www.fdot.gov/environment

PD&E Traffic and Safety Analysis Scoping Tool

Guidance Documentation – User Guide

prepared for

Florida Department of Transportation

date

June 2022

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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)

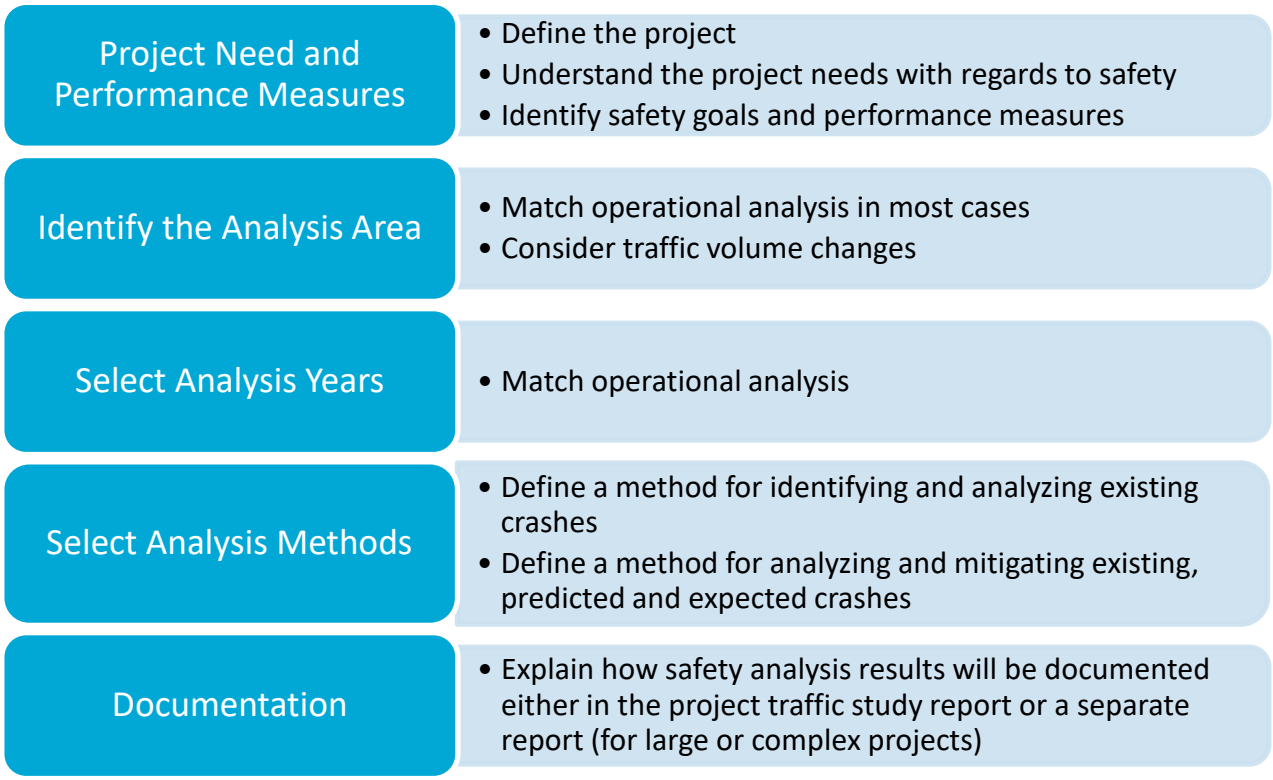
2.2 Input Parameters for Safety Analysis

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

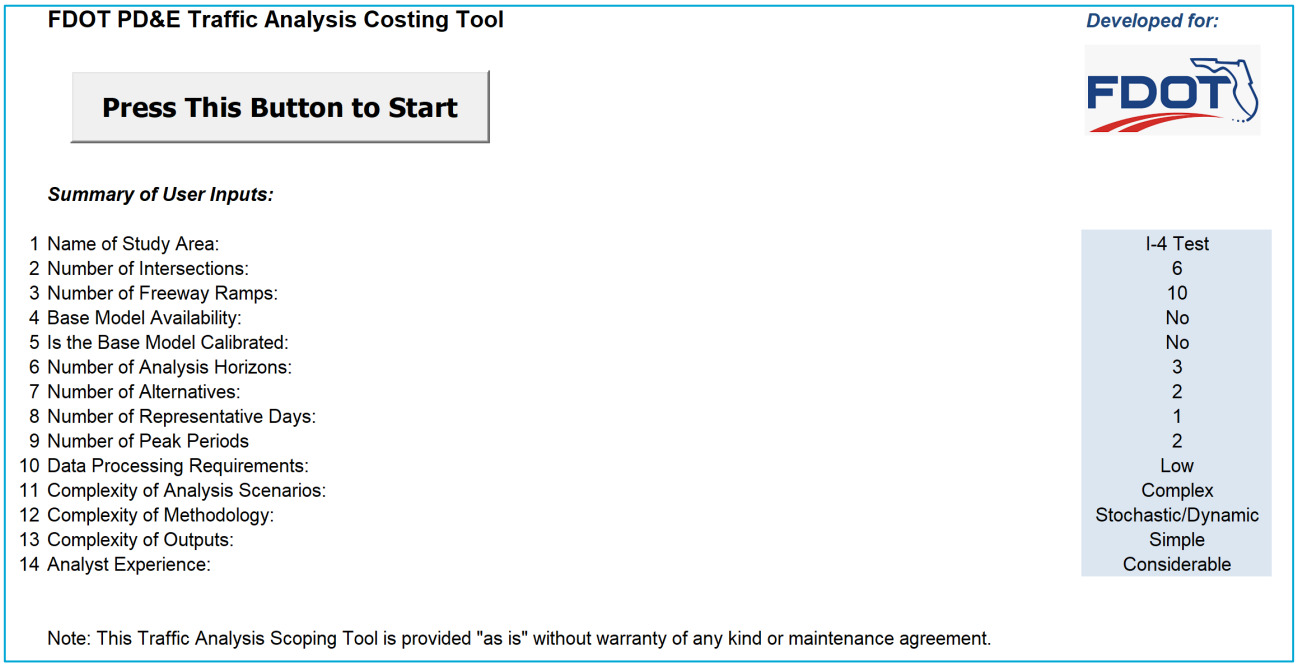
The spreadsheet-based tool for both the traffic and safety analyses contains three worksheets:

- 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

Developed for:

FDOT

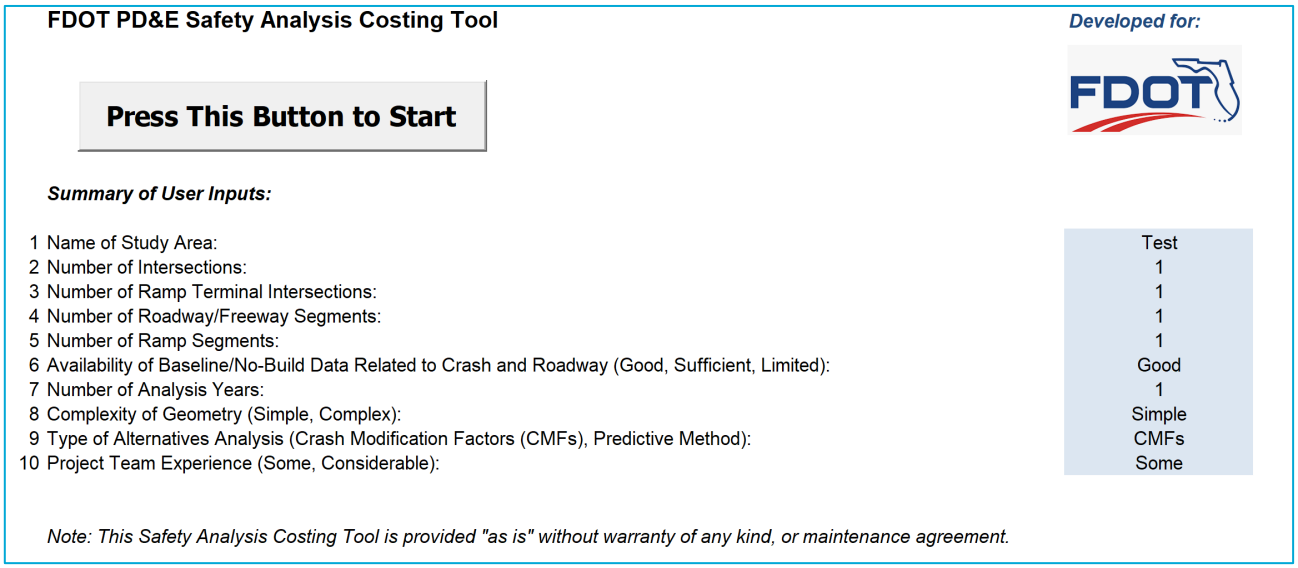
Press This Button to Start

Summary of User Inputs:

1	Name of Study Area:	I-4 Test
2	Number of Intersections:	6
3	Number of Freeway Ramps:	10
4	Base Model Availability:	No
5	Is the Base Model Calibrated:	No
6	Number of Analysis Horizons:	3
7	Number of Alternatives:	2
8	Number of Representative Days:	1
9	Number of Peak Periods	2
10	Data Processing Requirements:	Low
11	Complexity of Analysis Scenarios:	Complex
12	Complexity of Methodology:	Stochastic/Dynamic
13	Complexity of Outputs:	Simple
14	Analyst Experience:	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

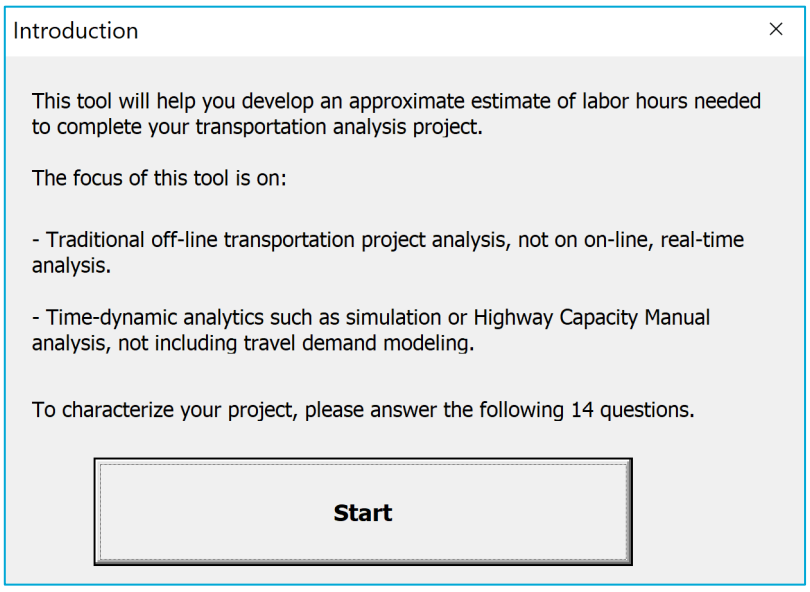


3.3 FDOT PD&E Traffic Analysis Scoping Tool

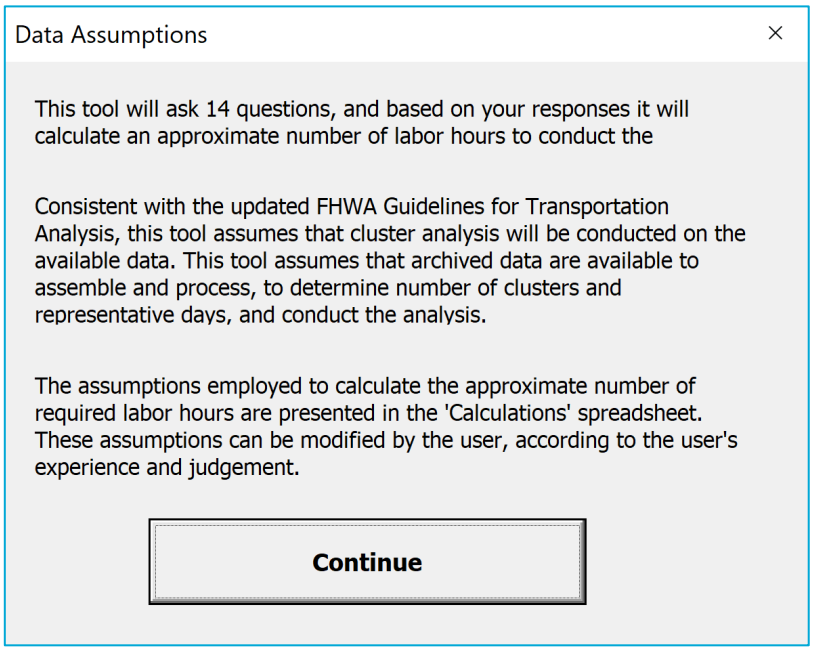
3.3.1 Data Input

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

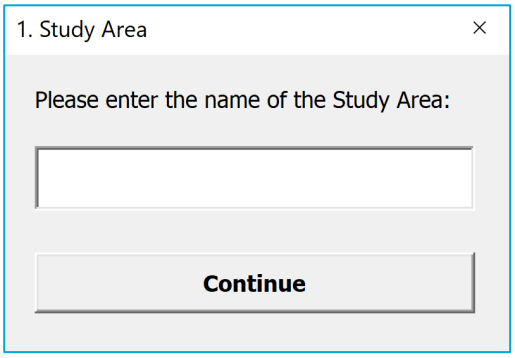
- Press the “Start” button.



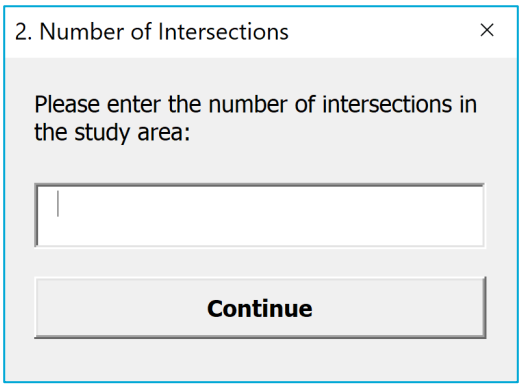
- Read/acknowledge the assumptions.



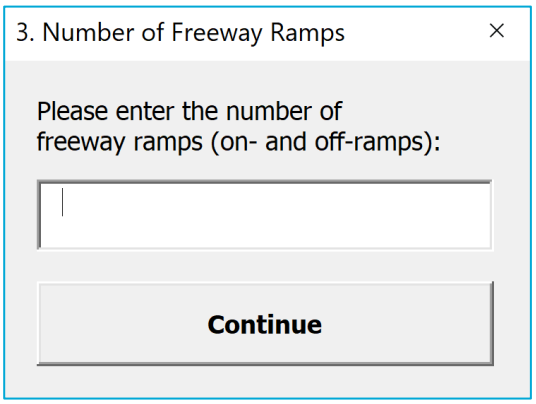
1. Enter the Project Title.



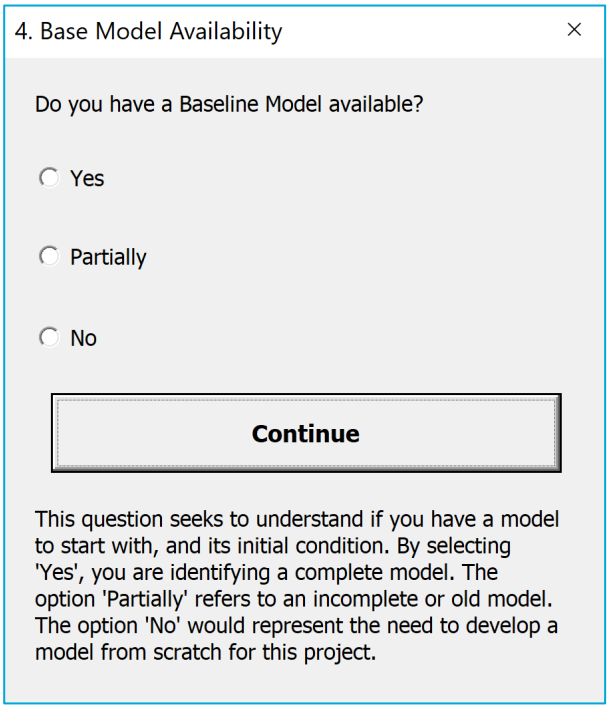
2. Enter the number of intersections.



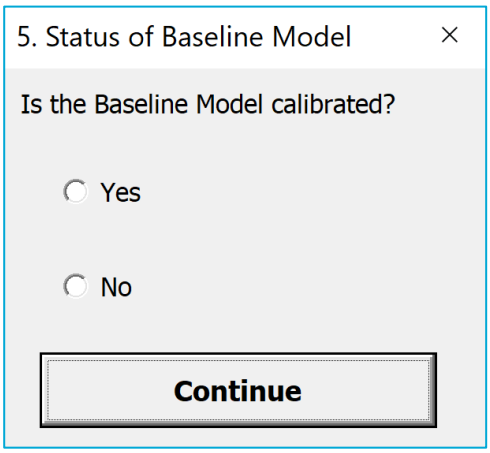
3. Enter the number of freeway ramps.



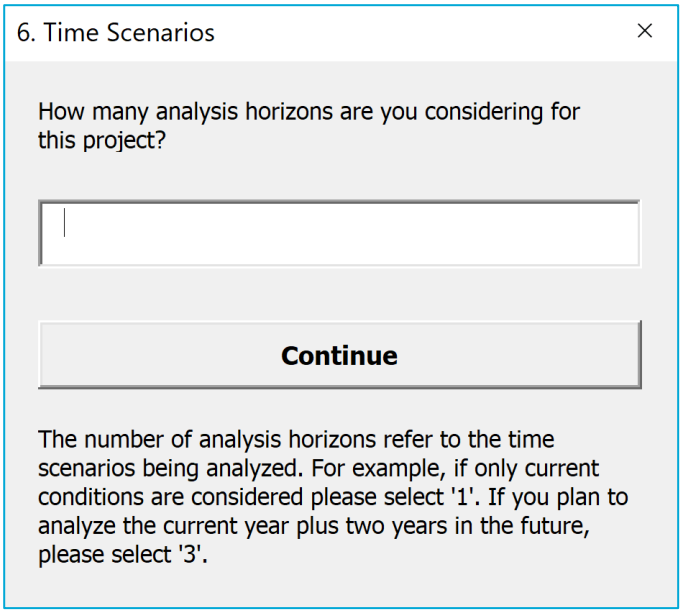
4. Indicate the availability of baseline model.



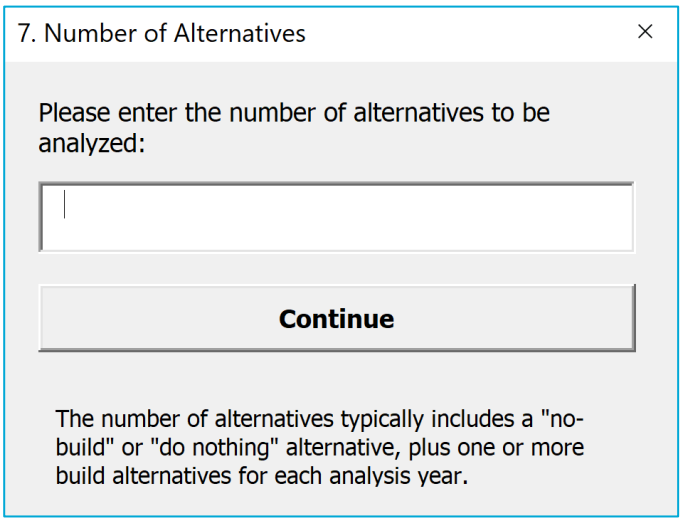
5. Indicate whether the baseline model is calibrated.



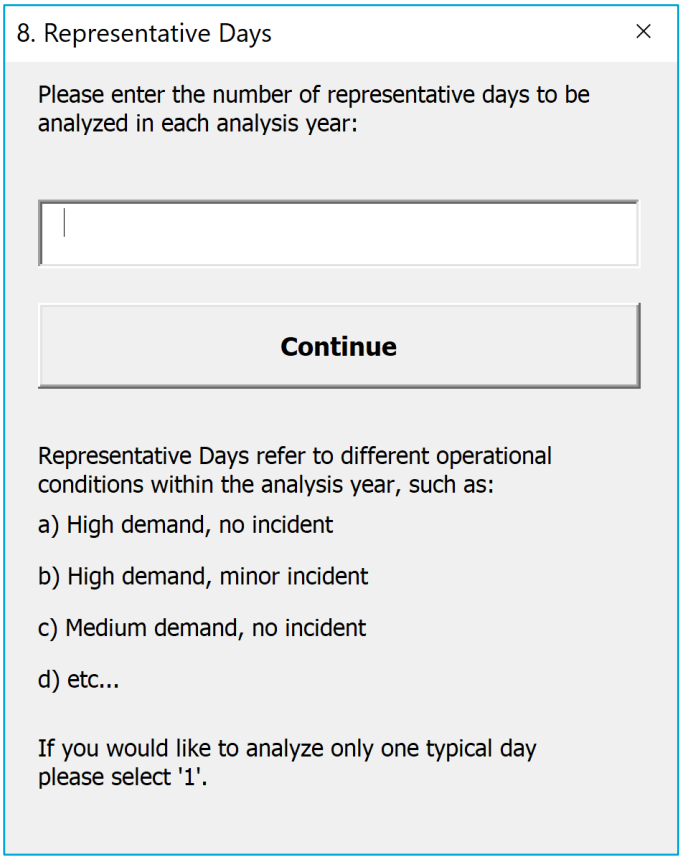
6. Provide the number of analysis years for the project.



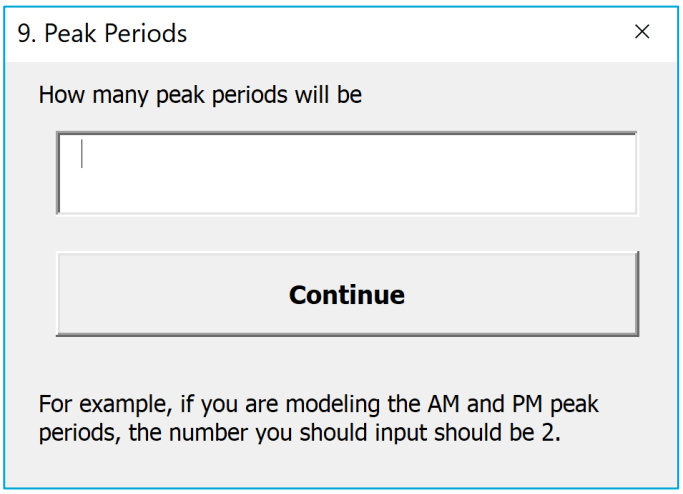
7. Provide the number of alternatives to be analyzed.



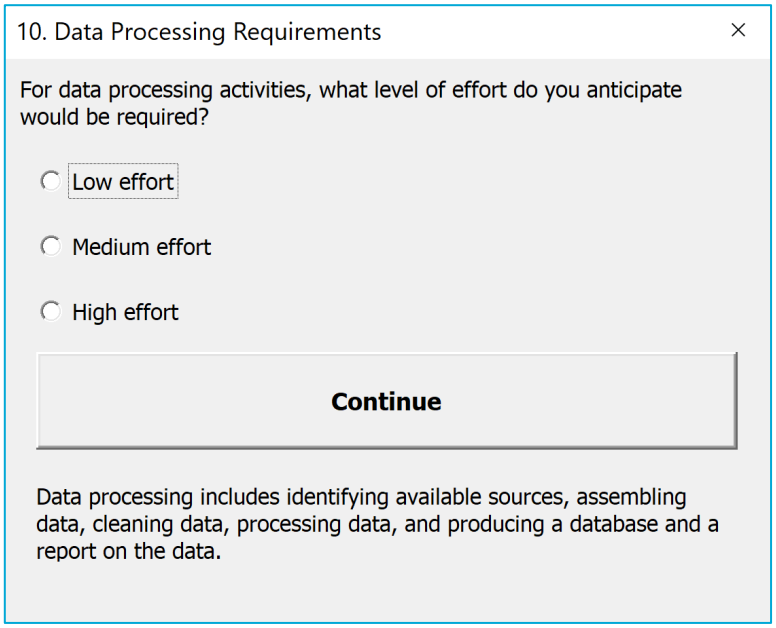
8. Provide the number of representative days for analysis.



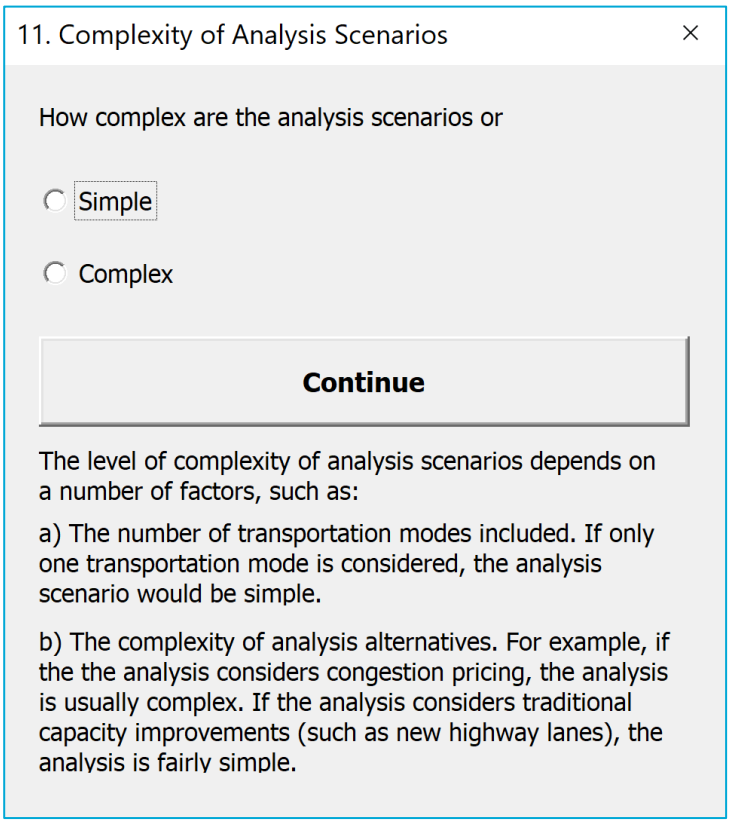
9. Identify the number of peak periods.



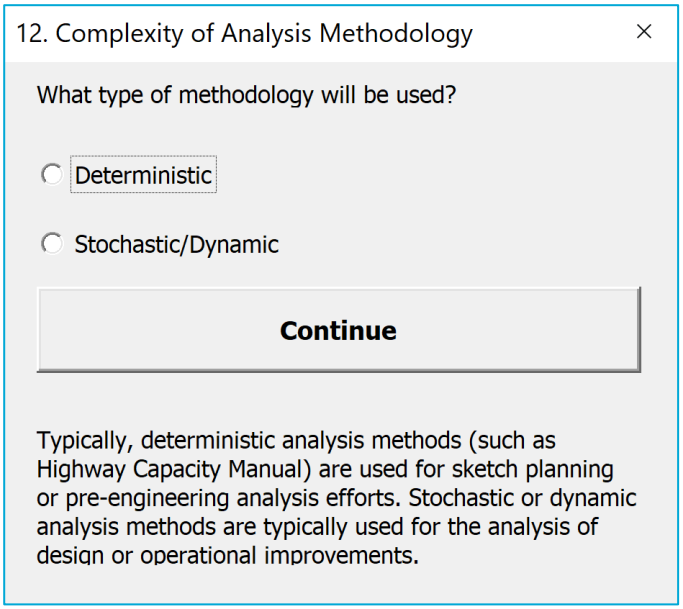
10. Identify data processing requirements.



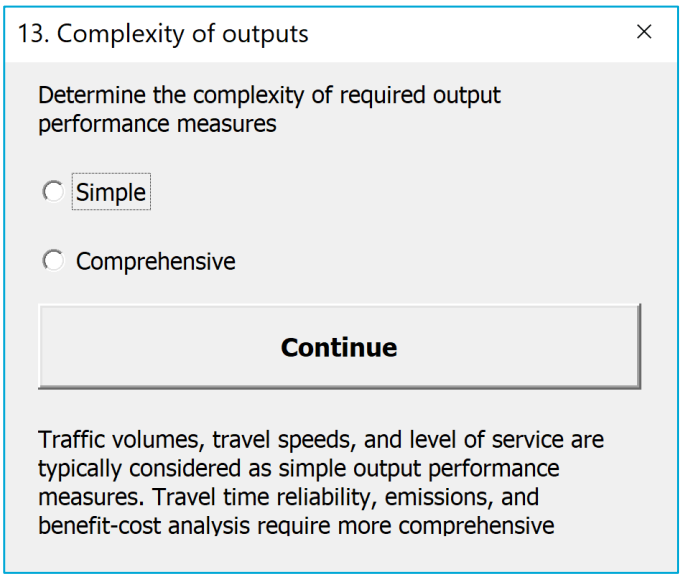
11. Identify complexity of analysis scenarios.



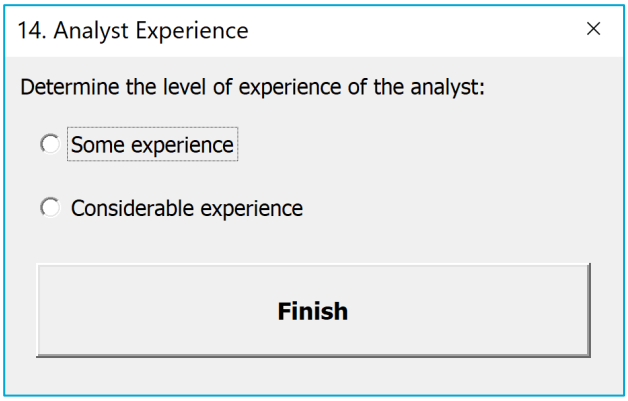
12. Identify the analysis methodology.



13. Identify the complexity of outputs to be generated.



14. Indicate the project team experience.



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.

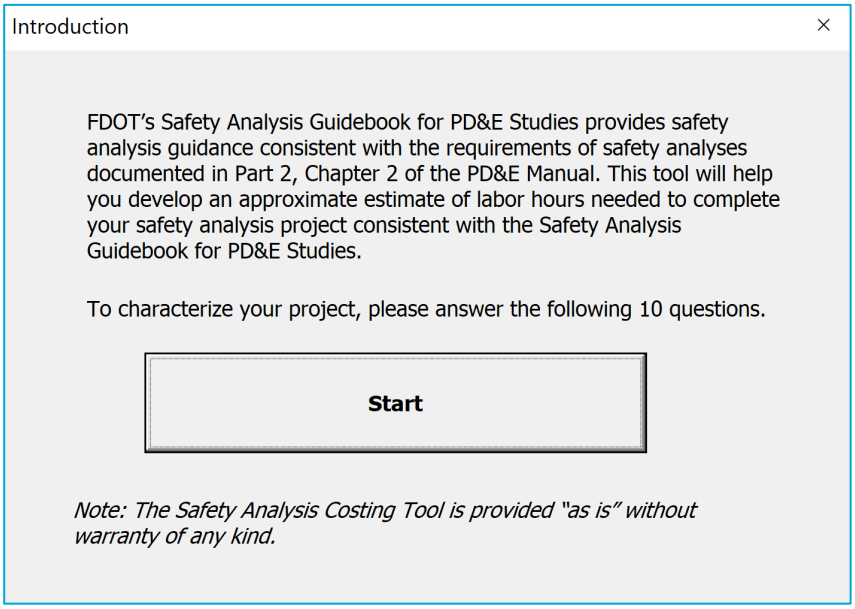
- 4.5.6 (Existing Traffic Operational Analysis) – This includes the total hours from project tasks 2, 3 and 4 in the PD&E traffic analysis tool.
- 4.5.7 (Model Calibration and Validation) – This includes the total hours from project task 5 in the PD&E traffic analysis tool.
- 4.5.8 (Future Demand Forecasting) – 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

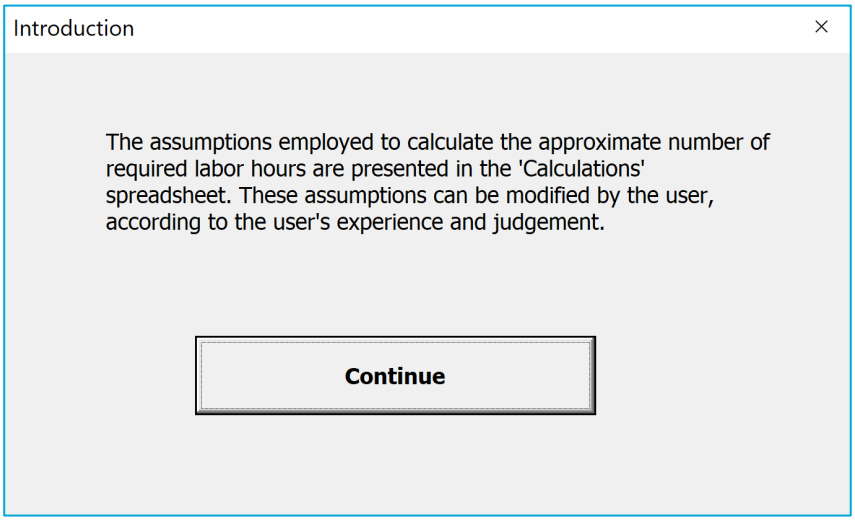
3.4.1 Data Input

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

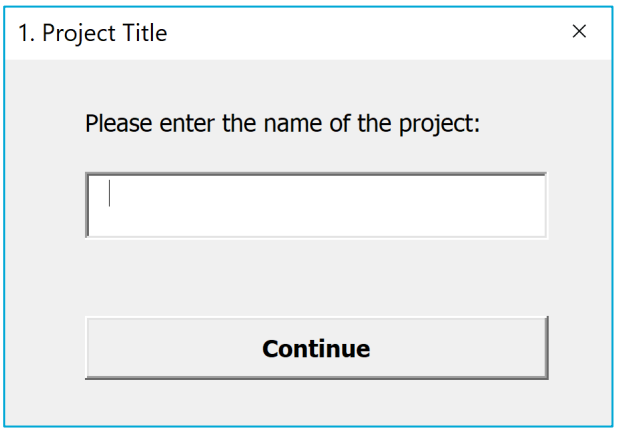
- Press the “Start” button.



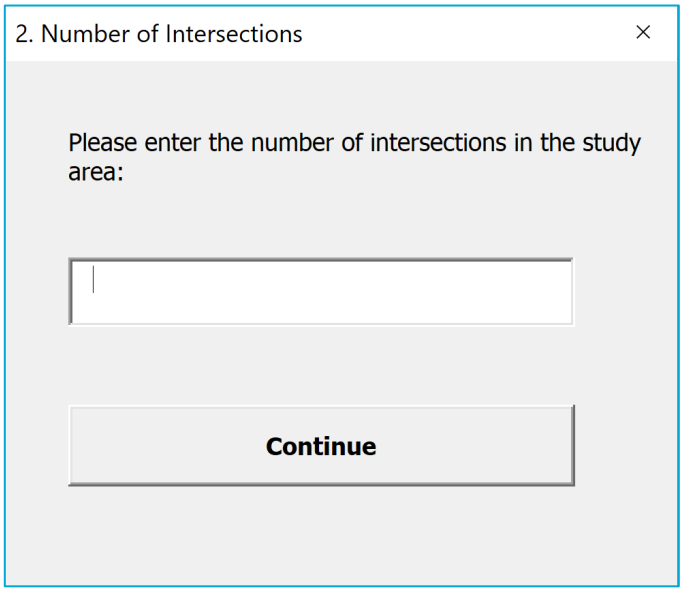
- Read/acknowledge the assumptions.



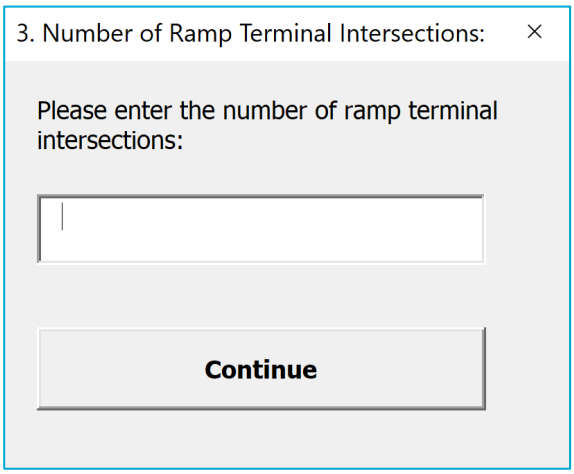
1. Enter the Project Title.



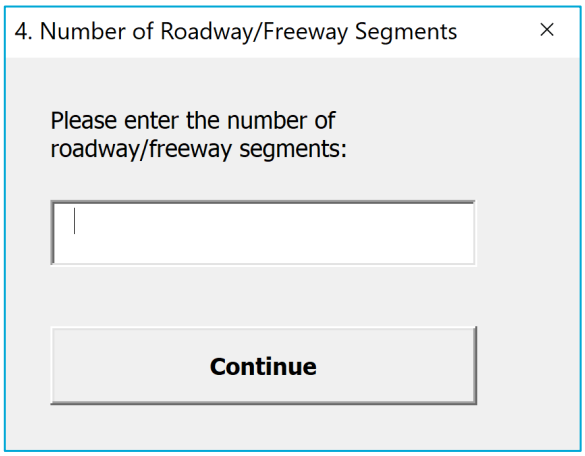
2. Enter the number of intersections.



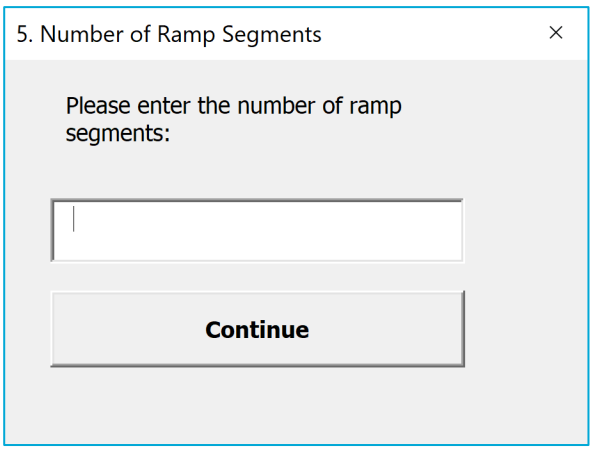
3. Enter the number of ramp terminal intersections.



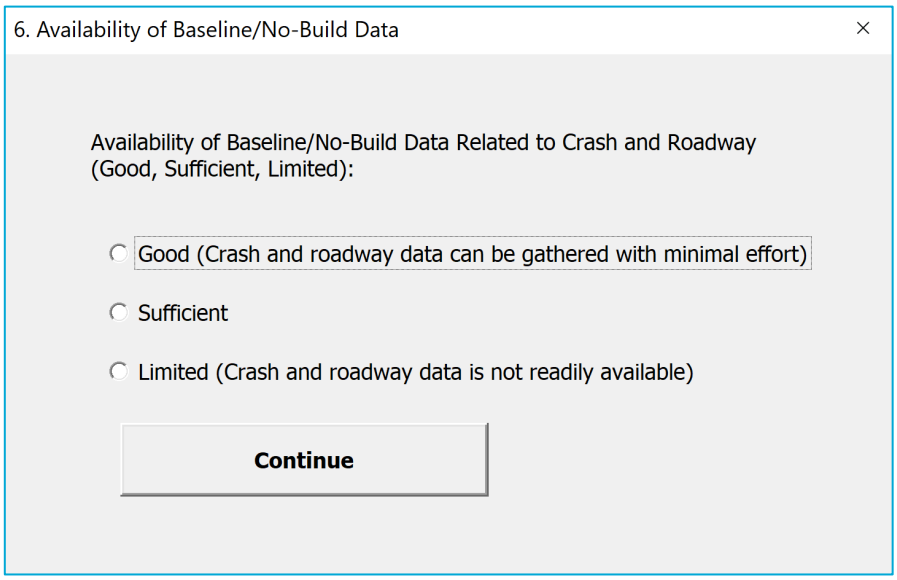
4. Enter the number of roadway/freeway segments.



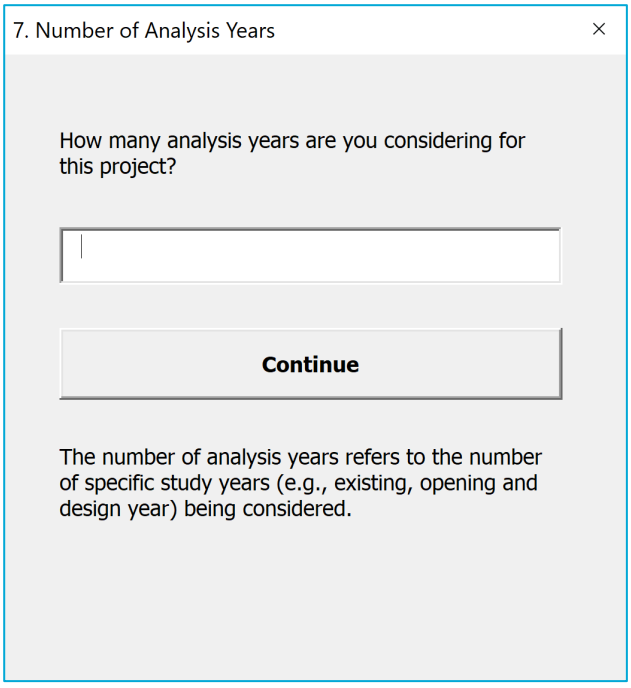
5. Enter the number of ramp segments.



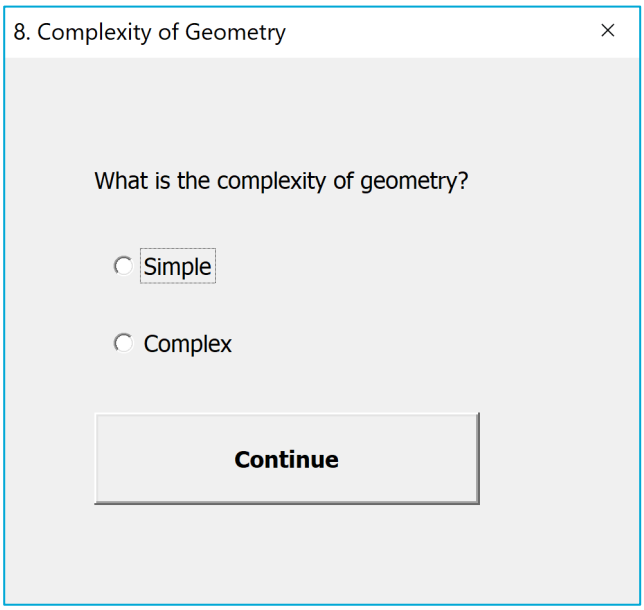
6. Indicate the availability of baseline/no-build data.



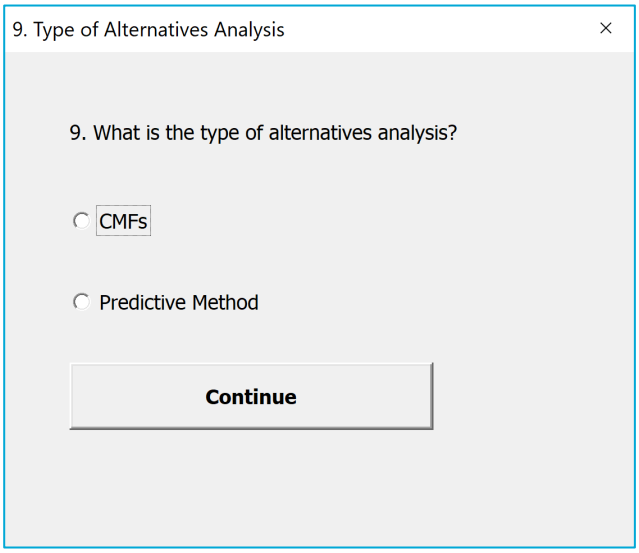
7. Provide the number of analysis years.



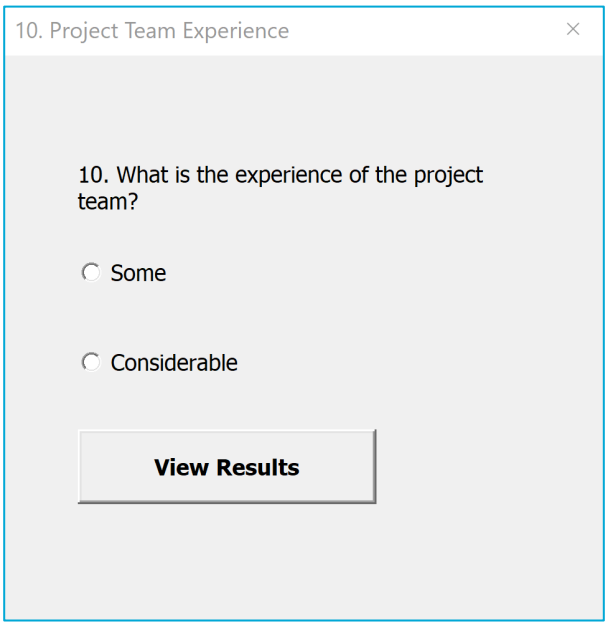
8. Identify the complexity of geometry.



9. Identify the type of alternatives analysis



10. Indicate the project team experience



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).