FDOT Intersection Control Evaluation (ICE) Training

ICE Process for PD&E Overview and Updates

July 2025

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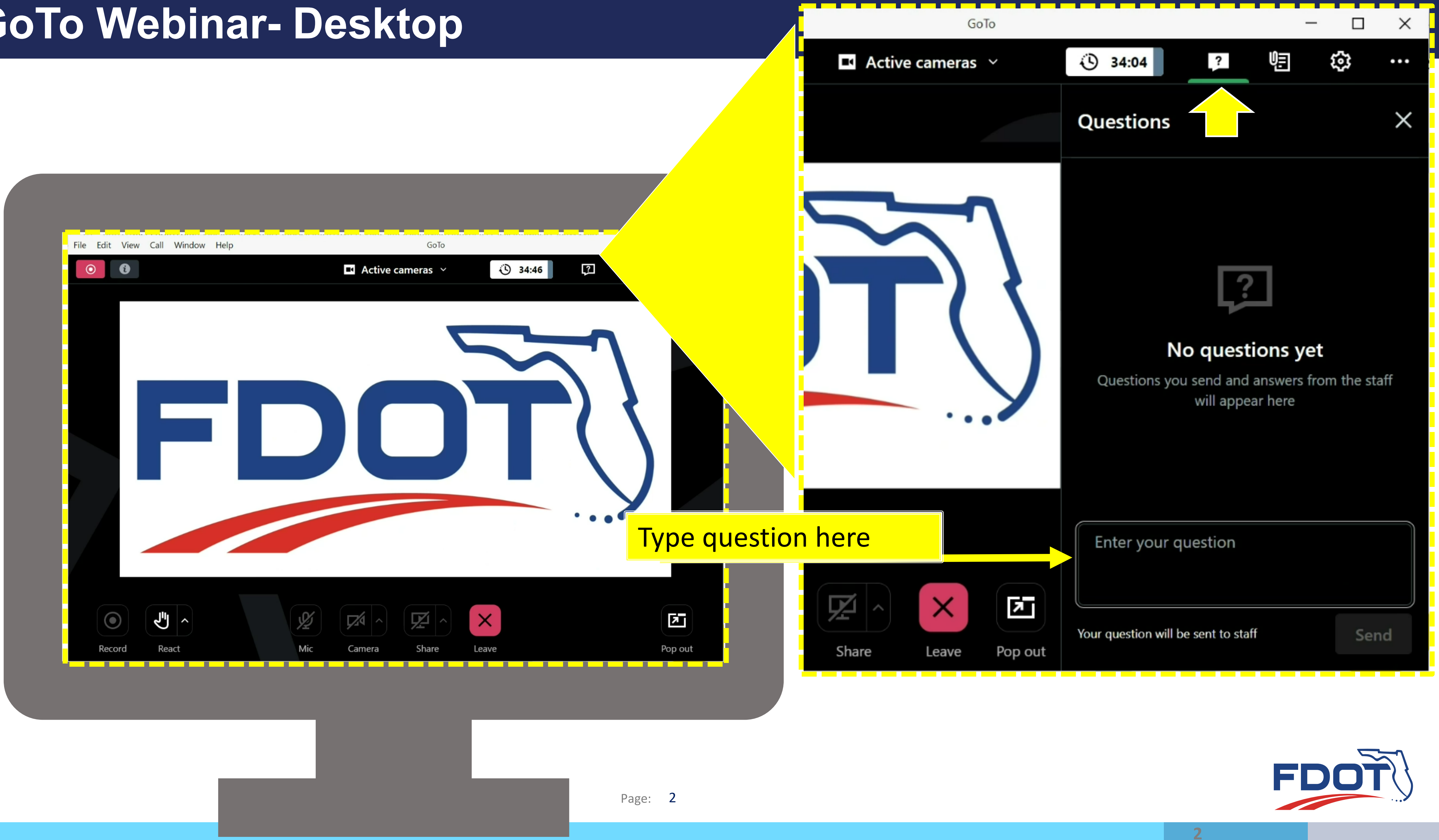

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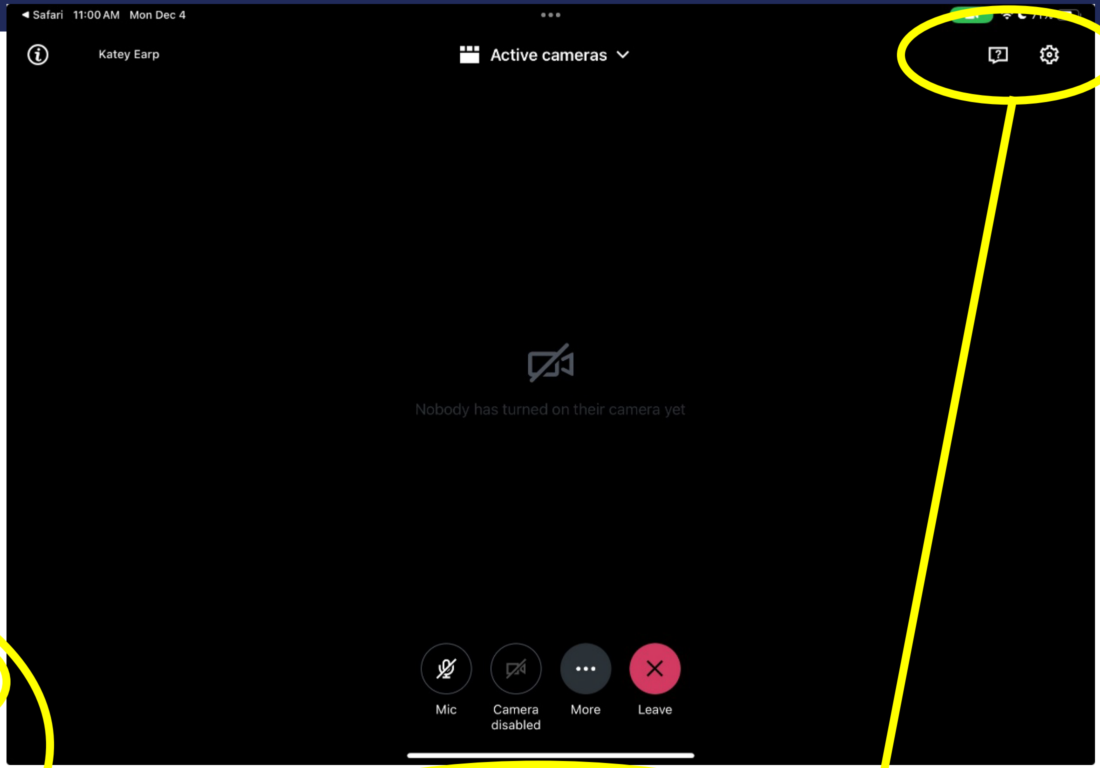

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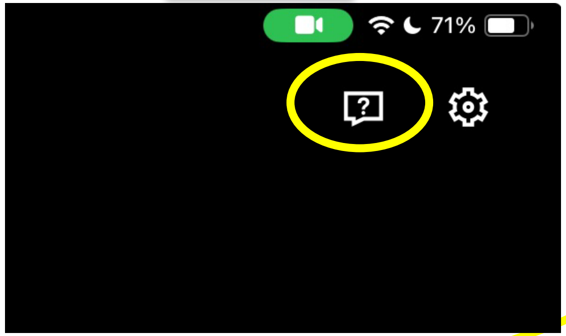

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AGENDA

Module 1

ICE Overview

Module 2

ICE in PD&E

Module 3

Example Exercises

Module 1

ICE Overview

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July 2025

MODULE 1 AGENDA

- Why & When
- Intersection Forms
- ICE Stages

POLL QUESTION

Have you conducted, supported, or reviewed an ICE study in Florida?

- Yes
- No

ICE PROCESS

- ICE Applicability
- Stage 1
  - CAP-X
  - SPICE
  - Stage 1 Form
- Stage 2
  - Operations
  - Concept
  - Cost
  - Safety
  - Economic Analysis Tool
  - Stage 2 Form
- Stage 3
  - Supplemental Analysis
  - Stage 3 Form

ICE RESOURCES

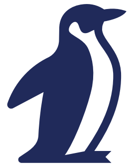
Home / Traffic / Traffic Services

Intersection Control Evaluation

- ICE Manual
- ICE Forms
- FDOT CAP-X Tool
- FDOT SPICE Tool
- FDOT Economic Analysis Tool for ICE (formerly ICE Tool)
- Synchro Templates
- Scope of Services and Staff Hour Estimation
- ICE Training Materials
- Pedestrian and Bicycle Treatments at Alternative Intersections
- Additional Resources

https://www.fdot.gov/traffic/trafficservices/intersection-control-evaluation

Please keep checking the website for updates!



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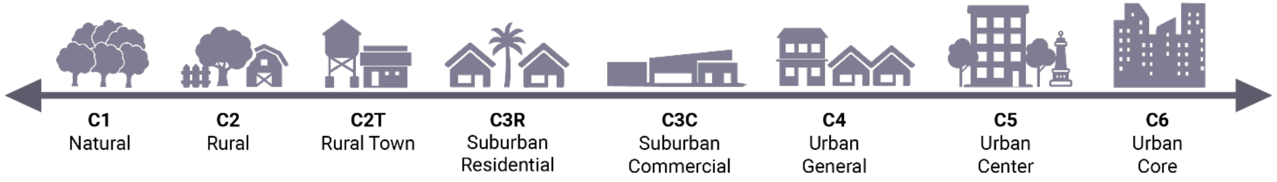
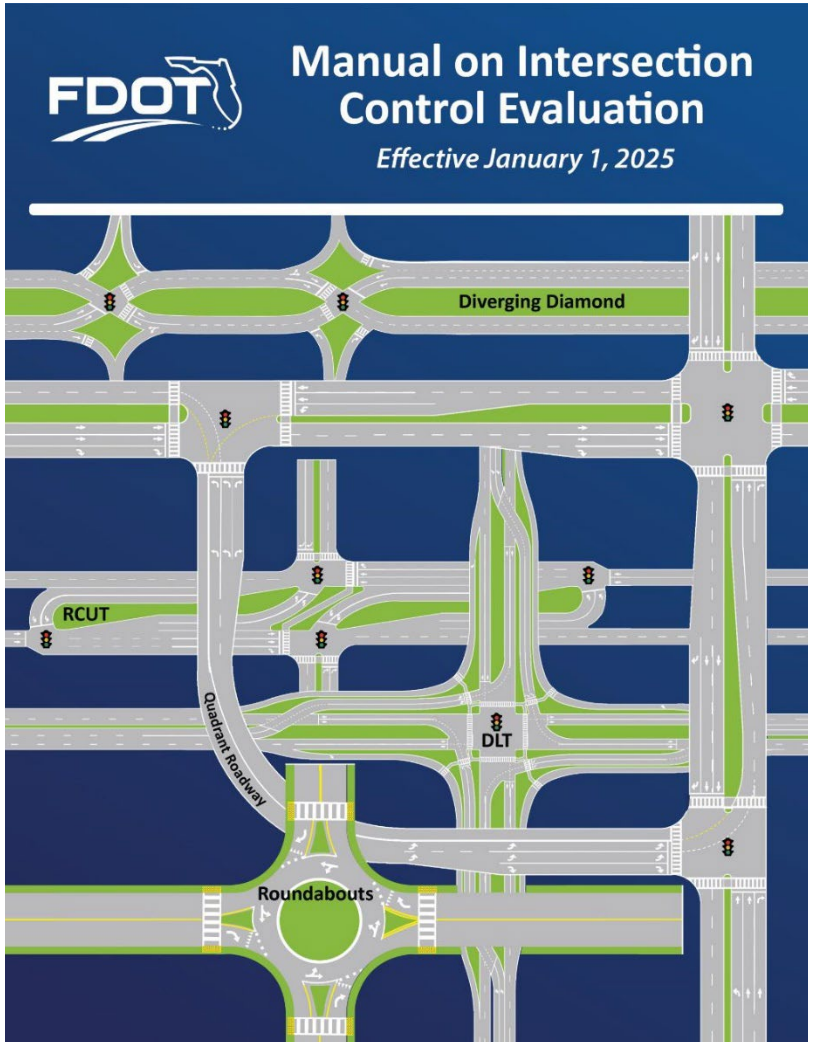
WHY ICE?

Purpose and need

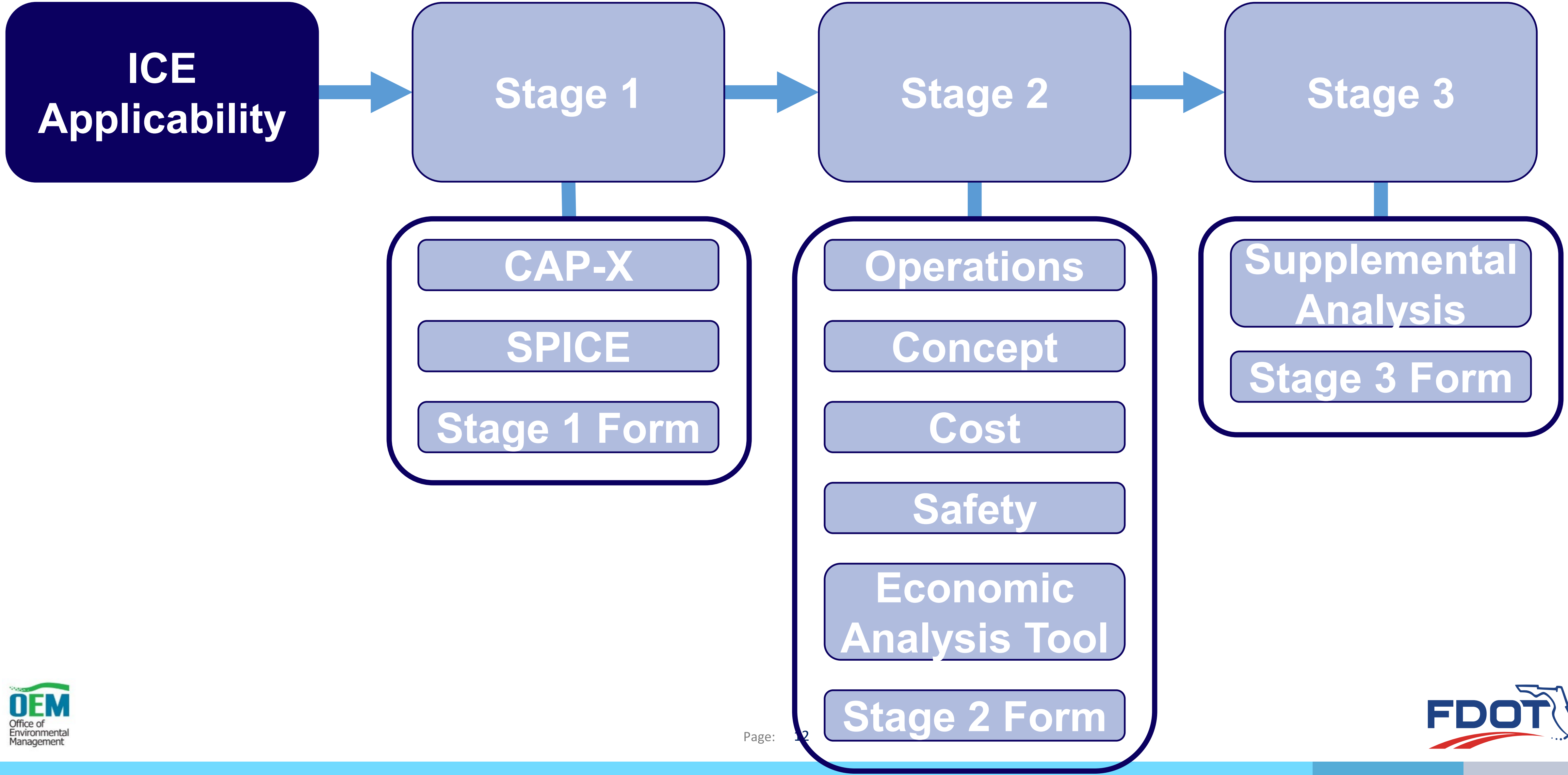


Efficient and safe

Best value



ICE PROCESS


ICE Applicability
Stage 1
Stage 2
Stage 3
CAP-X
SPICE
Stage 1 Form
Operations
Concept
Cost
Safety
Economic Analysis Tool
Stage 2 Form
Supplemental Analysis
Stage 3 Form

WHEN IS ICE APPLIED?

ICE is required for all projects on the state highway system prior to design when any of the following applies:

- New intersection signalization
- Major reconstruction, such as:
  - Adding a left-turn lane
  - Adding an intersection
  - Converting to a roundabout

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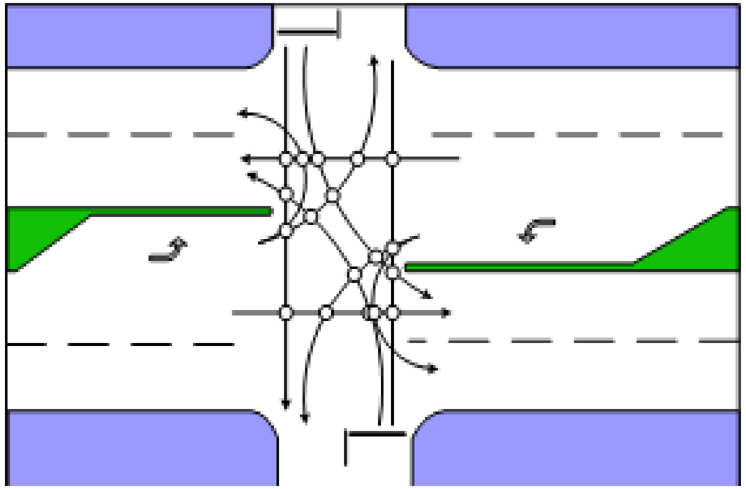
WHEN IS ICE APPLIED?

ICE required:

- New intersection signalization
- Major reconstruction
- Convert to a full median opening
- DDE or DTOE requires it



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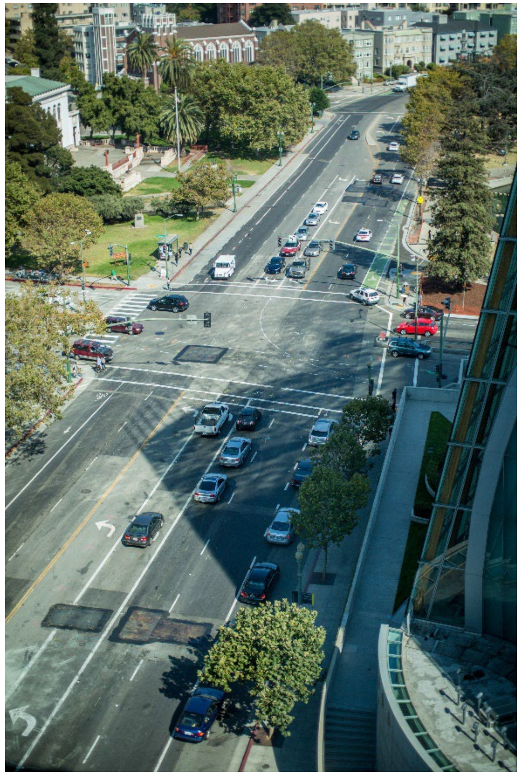
WHEN IS ICE APPLIED?

ICE required:

- New intersection signalization
- Major reconstruction
- Convert to a full median opening
- DDE or DTOE require it
- Connection to SHS generating 4,001 ADT or more (E, F, and G connection categories)
- Connection permit to remove, install or modify a traffic signal.



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WHEN IS ICE APPLIED?

ICE not required:

- Signalization of midblock crosswalk
- No substantive proposed changes, such as:
  - Mill and resurface with no change to geometry or control
  - Converting TWSC to AWSC
- Minor operational improvements, such as:
  - Adding right-turn lane
  - Changing phasing/timing

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AT-GRADE INTERSECTION FORMS

- Signalized Control
- Median U-Turn (MUT)
- Signalized Restricted Crossing U-turn (RCUT)
- Jughandle
- Displaced Left-Turn (DLT)
- Continuous Green T (CGT)
- Quadrant Roadway (QR)
- Signalized Thru-Cut
- Bowtie

$\underbrace{\hspace{10em}}_{\text{Signalized}}$

Signalized RCUT – Orlando, FL

Partial DLT – Lee County, FL

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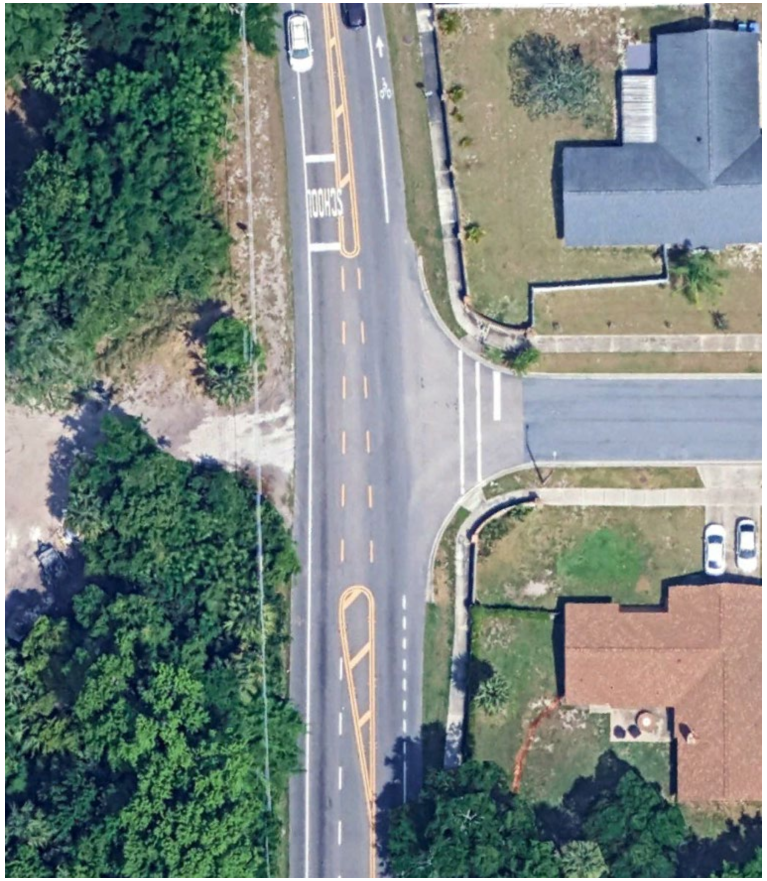
AT-GRADE INTERSECTION FORMS

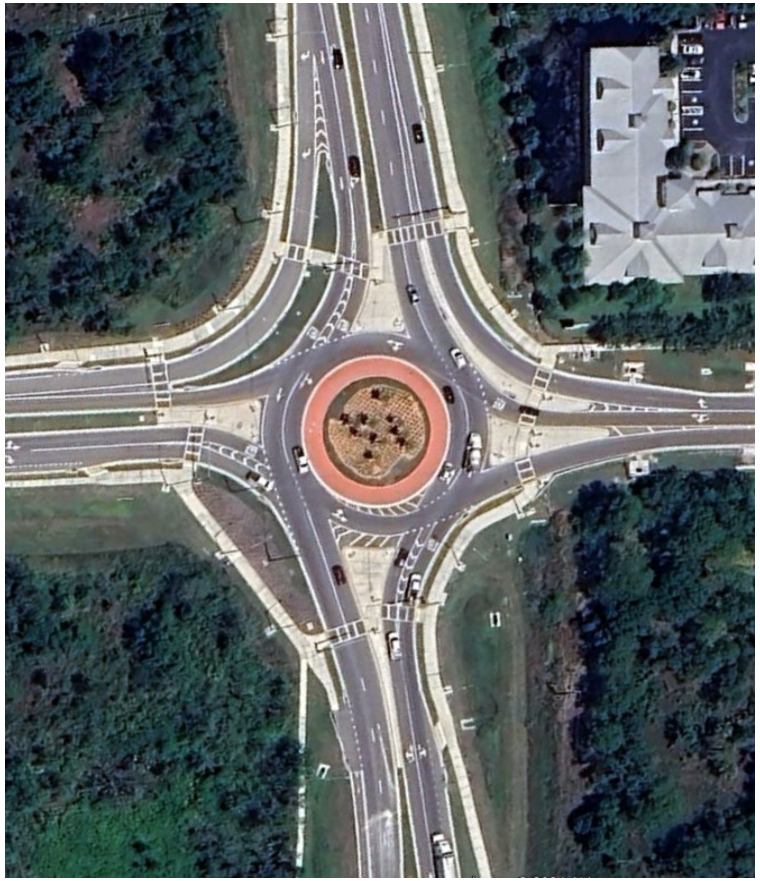
- Minor Road Stop Control
- All-Way Stop Control
- Roundabout
- Unsignalized RCUT
- Unsignalized Thru-Cut

Unsignalized

Minor Road Stop Control – Oviedo, FL



Multi-Lane Roundabout – Manatee County, FL



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Intersection Forms in ICE (Ramp-terminal)

- Signalized Diamond
- Signalized Half Diamond
- Tight Diamond
- Diverging Diamond
- Single-Point Diamond
- Signalized Two-Quadrant Partial Cloverleaf A
- Signalized Four-Quadrant Partial Cloverleaf A
- Signalized Two-Quadrant Partial Cloverleaf B
- Signalized Four-Quadrant Partial Cloverleaf B

Signalized

Diverging Diamond – Viera, FL

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Intersection Forms in ICE (Ramp-terminal)

- Unsignalized Diamond
- Unsignalized Half Diamond
- Unsignalized Two-Quadrant Partial Cloverleaf A
- Unsignalized Four-Quadrant Partial Cloverleaf A
- Unsignalized Two-Quadrant Partial Cloverleaf B
- Unsignalized Four-Quadrant Partial Cloverleaf B
- Roundabout

Unsignalized

One-Lane Roundabout – Apopka, FL

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POLL QUESTION

Is ICE required when a right turn lane is added to an existing signalized intersection?

- Yes
- No

ICE STAGES

Stage 1: Screening/ Preliminary Analysis

Stage 2: Detailed Analysis

Stage 3: Supplemental Analysis

ICE STAGES

Stage 1: Screening/ Preliminary Analysis

Stage 2: Detailed Analysis

Stage 3: Supplemental Analysis

If a preferred intersection form is identified, analysis can be complete

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ICE PROCESS

- ICE Applicability
- Stage 1
  - CAP-X
  - SPICE
  - Stage 1 Form
- Stage 2
  - Operations
  - Concept
  - Cost
  - Safety
  - Economic Analysis Tool
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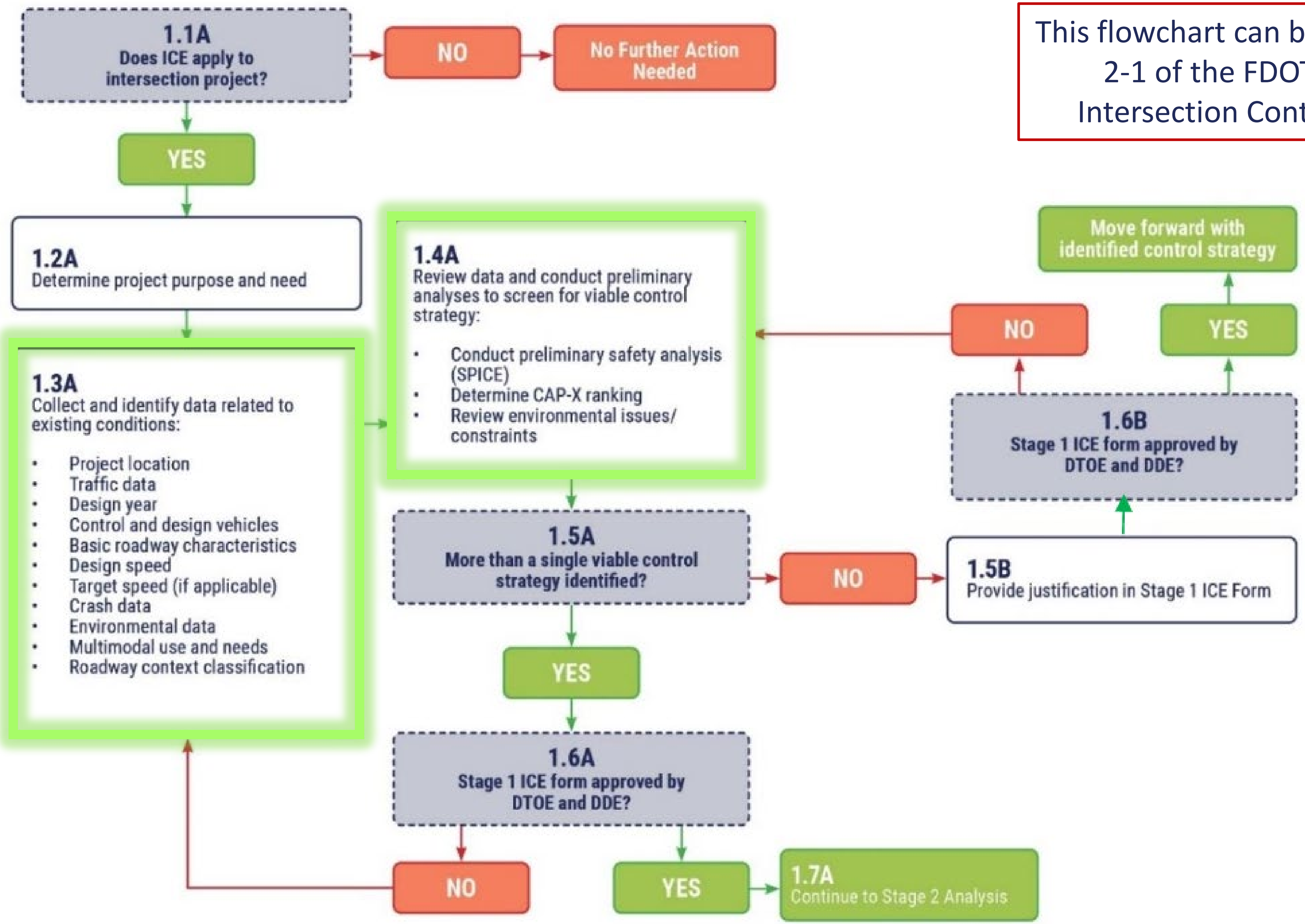
STAGE 1 OVERVIEW

This flowchart can be found as Figure 2-1 of the FDOT Manual on Intersection Control Evaluation



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STAGE 1 REQUIRED TOOLS

Capacity Analysis for Planning of Junctions

CAP-X

Cap-X Tool Customization for Florida DOT

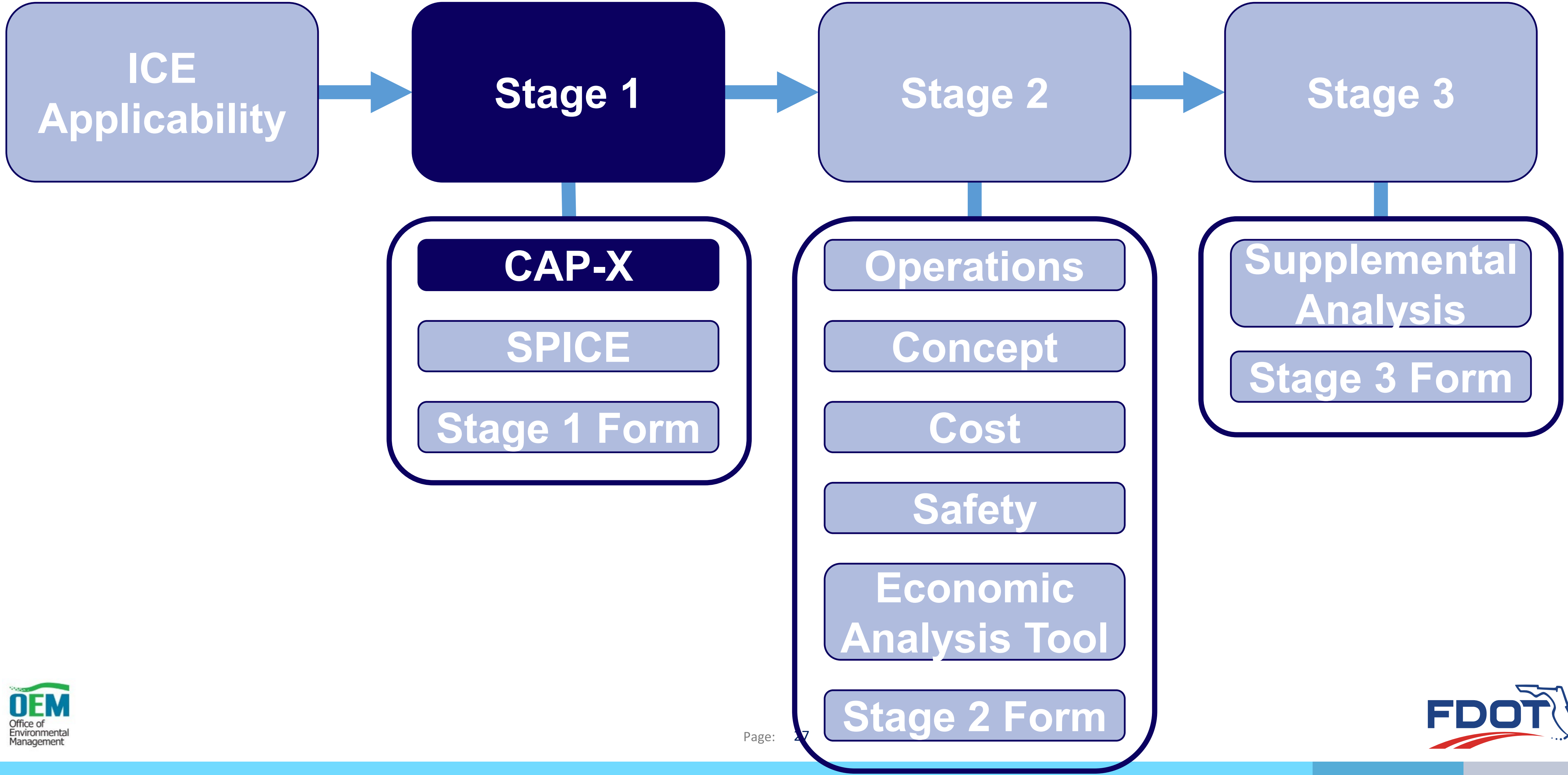
Safety Performance Intersection Control Evaluation

SPICE

FDOT Stage 1 ICE Form

Control Strategy Evaluation								
Provide a brief justification as to why each of the following control strategies should be advanced or not. Justification should consider potential environmental impacts.								
	CAP-X Outputs				SPICE Outputs			
	V/C Ratio							
Control Strategy			Ped Accom. Score	Bike Accom. Score	Crash Prediction Rank	SSI Rank	Strategy to be Advanced?	Justification

ICE PROCESS



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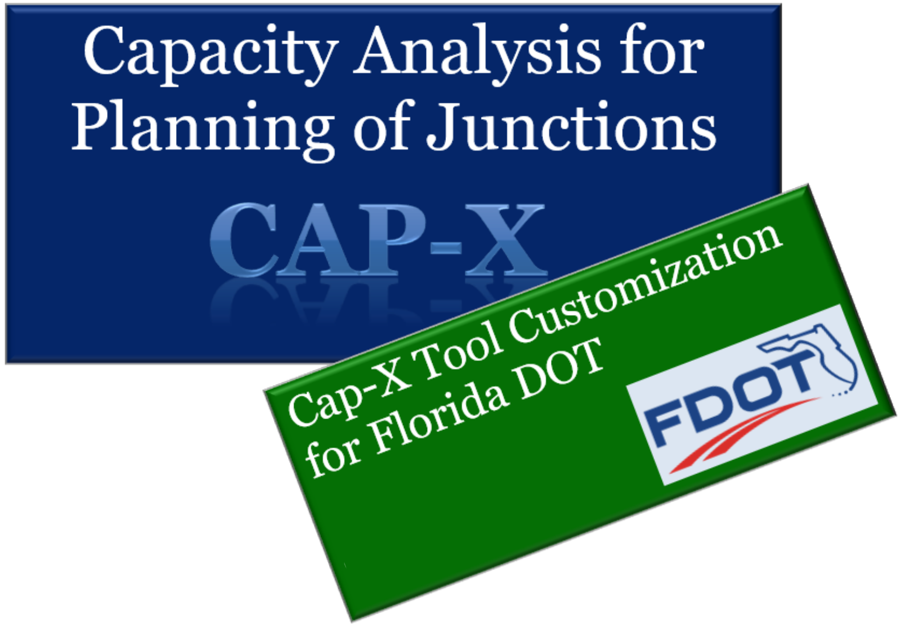
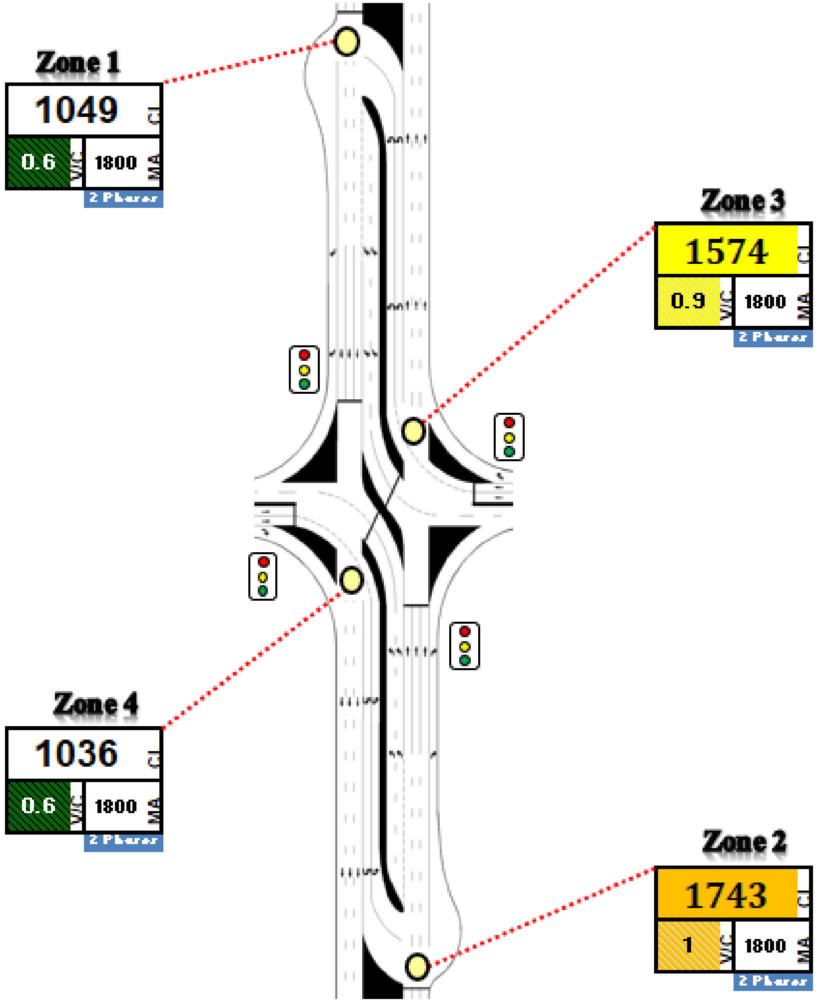
CAP-X


Capacity Analysis for
Planning of Junctions
CAP-X
Cap-X Tool Customization
for Florida DOT
FDOT


Zone 1
1049
0.6
1800
Zone 3
1574
0.9
1800
Zone 4
1036
0.6
1800
Zone 2
1743
1
1800

CAP-X TOOL: THE DATA NEEDED

Traffic Volume Demand						
	Volume (Veh/hr)				Percent (%)	
	U-Turn	Left	Thru	Right	Heavy Vehicles	Volume Growth
Eastbound		50	150	30	2.00%	0.00%
Westbound		70	200	70	2.00%	0.00%
Southbound		150	900	120	2.00%	0.00%
Northbound		150	800	120	2.00%	0.00%
Adjustment Factor	0.80	0.95		0.85		
Suggested	**0.80**	**0.95**		**0.85**		

Truck to PCE Factor		**Suggested = 2.00**	2.00
FDOT Context Zone	**C3C-Suburban Commercial**		
Critical Lane Volume Threshold	2-phase signal	**Suggested = 1800**	**1800**
	3-phase signal	**Suggested = 1750**	**1750**
	4-phase signal	**Suggested = 1700**	**1700**

All inputs in yellow are customizable for your own analysis

CAP-X: MULTIMODAL PEDS DATA

Roadway Speed Limits	
Major Street Speed Limit	40
Minor Street Speed Limit	30
Mini Roundabout Entry & Exit Speed Limit	20
1-Lane Roundabout Entry & Exit Speed Limit	25
2-Lane Roundabout Entry & Exit Speed Limit	30

The speeds are the main inputs in the pedestrian data

Higher score = better accommodation for that travel mode

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CAP-X: MULTIMODAL PEDS DATA

Pedestrian Crossing Configurations for Non-roundabout Intersections

TYPE OF INTERSECTION	Sheet	Intersection Score	Out of Direction Travel	Multistage Crossing	Crossing #1					Crossing #2				
					# Lanes	Speed Limit	Volume	Conflicting Veh Type	Markings	# Lanes	Speed Limit	Volume	Conflicting Veh Type	Markings
Traffic Signal	FULL	5.17	No	Yes Crossing(s) with 2 stages	4	40	1193	Stop/Signal Controlled	Marked	2	40	938	Stop/Signal Controlled	Marked
Signalized Restricted Crossing U-Turn	N-S	3.12	Yes	Yes Crossing(s) with 3+ stages	2	30	388	Stop/Signal Controlled	Marked	1	40	326	Yield Controlled	Marked
Median U-Turn	N-S	3.11	Yes	Yes Crossing(s) with 3+ stages	4	30	357	Stop/Signal Controlled	Marked	1	40	275	Yield Controlled	Marked
Signalized Thrucut	N-S	5.17	No	Yes Crossing(s) with 2 stages	2	30	530	Stop/Signal Controlled	Marked	4	40	1397	Stop/Signal Controlled	Marked

TYPE OF ROUNDABOUT	Sheet	Intersection Score	Out of Direction Travel	Multistage Crossing	Crossing #1					Crossing #2				
					# Lanes	Speed Limit	Volume	Conflicting Veh Types	Markings	# Lanes	Speed Limit	Volume	Conflicting Veh Types	Markings
Mixed Lane Roundabout (2NSx1EW)	2 X 1	4.90	No	Yes Crossing(s) with 2 stages	1	25	346	Yield Controlled	Marked	1	25	428	Free Flowing	Marked

Higher score = better accommodation for pedestrians

CAP-X: MULTIMODAL BIKE DATA

Roadway Speed Limits	
Major Street Speed Limit	40
Minor Street Speed Limit	30
Mini Roundabout Entry & Exit Speed Limit	20
1-Lane Roundabout Entry & Exit Speed Limit	25
2-Lane Roundabout Entry & Exit Speed Limit	30

Facility Type	
Major Street Facility Type	On-Street Lane
Minor Street Facility Type	Shared with Vehicles

The speeds are the main inputs in the bicycle data

Higher score = better accommodation for that travel mode

CAP-X: MULTIMODAL BIKE DATA

Bicycle Segment Configurations for Non-roundabout Intersections

TYPE OF INTERSECTION	Sheet	Intersection Score	Northbound					
			# Adjacent Thru Lanes	Leg AADT	Conflicting Control Type	Out of Direction	Riding Between Opposing Direction	Riding Across Free-Flow Ramp
Traffic Signal	FULL	4.25	2	23273	Stop/Signal Controlled	No	No	No
Signalized Restricted Crossing U-Turn	N-S	3.83	2	27771	Stop/Signal Controlled	No	No	No
Median U-Turn	N-S	4.17	2	23273	Stop/Signal Controlled	No	No	No
Signalized Thrucut	N-S	4.41	2	23273	Stop/Signal Controlled	No	No	No

TYPE OF ROUNDABOUT	Sheet	Intersection Score	Northbound					
			# Adjacent Thru Lanes	Leg AADT	Conflicting Control Type	Out of Direction	Riding Between Opposing Direction	Riding Across Free-Flow Ramp
Mixed Lane Roundabout (2NSx1EW)	2 X 1	4.17	2	23273	Yield Controlled	No	No	No

Higher score = better accommodation for bicyclists

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CAP-X

Capacity Analysis for Planning of Junctions

Summary Report - Page 2 of 2

TYPE OF INTERSECTION	Overall V/C Ratio	V/C Ranking	Pedestrian Accommodation Score	Bicycle Accommodation Score
Signalized ThruCut N-S	0.46	1	5.17	4.41
Median U-Turn N-S	0.49	2	3.11	4.17
Traffic Signal	0.52	3	5.17	4.25
Signalized Restricted Crossing U-Turn N-S	0.52	3	3.12	3.83
2NS X 1EW	0.67	5	4.90	4.17

Overall V/C is not the only predictor of a successful intersection

A lower V/C ratio and higher Ped/Bike scores are better. The tool is color coded, so green indicates better and red indicates worse.

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ICE PROCESS

- ICE Applicability
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SPICE

Control Strategy Selection and Inputs	
Specify the Facility Level Inputs and the Control Strategies to be included in the SPICE Analysis.	
Intersection Type	At-Grade Intersection
Analysis Year	Opening and Design Year
Opening Year	2030
Design Year	2040
Facility Type	On Urban and Suburban Arterial
Number of Legs	4-leg
1-Way/2-Way	2-way Intersecting 2-way
# of Major Street Lanes (both directions)	5 or fewer
Major Street Approach Speed	Less than 50 mph
Opening Year - Major Road AADT	26,000
Opening Year - Minor Road AADT	12,000
Design Year - Major Road AADT	30,000
Design Year - Minor Road AADT	14,000

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SPICE

Input		Control Strategy					
		Traffic Signal	Minor Road Stop	1-lane Roundabout	2-lane Roundabout	Signalized RCUT	Signalized Thru-Cut
Opening Year Major Road AADT	Optional AADT Overrides	26000	26000	26000	26000	26000	26000
Opening Year Minor Road AADT		12000	12000	12000	12000	12000	12000
Design Year Major Road AADT		30000	30000	30000	30000	30000	30000
Design Year Minor Road AADT		14000	14000	14000	14000	14000	14000
Number of Approaches with Left-Turn Lanes	Additional Required Control Strategy Inputs	2					
Number of Approaches with Right-Turn Lanes		0					
Number of Uncontrolled Approaches with Left-Turn Lanes			2				
Number of Uncontrolled Approaches with Right-Turn Lanes			0				

Safe System for Intersection (SSI) Inputs

Specify the geomtric, exposure, severity, and conflicting traffic complexity inputs required for an SSI analysis.

Safe System for Intersection (SSI) Inputs

Specify the geomtric, exposure, severity, and conflicting traffic complexity inputs required for an SSI analysis.

1. Roadway Geometry	**Lanes**
Major number thru lanes (one direction)	2
Minor number thru lanes (one direction)	1

Major Street Designation	
Select major street direction	N-S
Median Presence on Major Road	Yes
Median Presence on Minor Road	No

	Required Inputs
	Default Available, Override Optional
	Planning-Level Default Input
	Computed Value, Override Optional
	Computed Value - No Override
	Disabled Cell (Often based on input selections)

Reset Overridable SSI Inputs to Default

2. Complete the **"Exposure"** inputs. These inputs will apply to all interesections selected for analysis.
3. Complete the **"Severity"** inputs
4. Complete the **"Conflicting Traffic Complexity"** inputs

2. Exposure - All Intersections

Average Daily Traffic (veh/day)	Open	Design
Major	26,000	30,000
Minor	12,000	14,000

ADT Directional Split	
Major	0.50
Minor	0.50

Are turning movement ADT values are available?	No	If "Yes", input values in **Table 2-A**
Are peak hour turning movement counts available?	Yes	If "Yes", input values in **Table 2-B**

If no turning movment volumes or counts are available, a user can optionally override the planning-level default turning movment proportions in **Table 2-C**

Nonmotorized Total ADBP (ped-bike/day)	**Activity Level**	**ADBP Value (ped-bike/day**
Open Year Total Intersection NM	Low (20)	50
Design Year Total Intersection NM	Low (20)	50

(or overwrite ped movement ADBPs below)

Nonmotorized Movement ADBP (ped-bike/day)	**Open**	**Design**
Major NM 1 (NM mvmt crossing Maj1)	13	13
Major NM 2	13	13
Minor NM 1	13	13
Minor NM 2	13	13

SPICE

Safe System for Intersection (SSI) Inputs

Specify the geomtric, exposure, severity, and conflicting traffic complexity inputs required for an SSI analysis.

Safe System for Intersection (SSI) Inputs

Specify the geomtric, exposure, severity, and conflicting traffic complexity inputs required for an SSI analysis.

1. Roadway Geometry	Lanes
Major number thru lanes (one direction)	2
Minor number thru lanes (one direction)	1

Major Street Designation	
Select major street direction	N-S
Median Presence on Major Road	Yes
Median Presence on Minor Road	No

(orange)	Required Inputs
(blue)	Default Available, Override Optional
(yellow)	Planning-Level Default Input
(green)	Computed Value, Override Optional
(white)	Computed Value - No Override
(grey)	Disabled Cell (Often based on input selections)

Reset Overridable SSI Inputs to Default

2. Complete the **"Exposure"** inputs. These inputs will apply to all interesections selected for analysis.
3. Complete the **"Severity"** inputs
4. Complete the **"Conflicting Traffic Complexity"** inputs

2. Exposure - All Intersections

Average Daily Traffic (veh/day)	Open	Design
Major	26,000	30,000
Minor	12,000	14,000

ADT Directional Split	
Major	0.50
Minor	0.50

Nonmotorized Total ADBP (ped-bike/day)	Activity Level	ADBP Value (ped-bike/day
Open Year Total Intersection NM	Low (20)	50
Design Year Total Intersection NM	Low (20)	50

(or overwrite ped movement ADBPs below)

Nonmotorized Movement ADBP (ped-bike/day)	Open	Design
Major NM 1 (NM mvmt crossing Maj1)	13	13
Major NM 2	13	13
Minor NM 1	13	13
Minor NM 2	13	13

Are turning movement ADT values are available?	No	If "Yes", input values in **Table 2-A**
Are peak hour turning movement counts available?	Yes	If "Yes", input values in **Table 2-B**

If no turning movment volumes or counts are available, a user can optionally override the planning-level default turning movment proportions in **Table 2-C**

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Safe System for Intersection (SSI) Inputs

Specify the geomtric, exposure, severity, and conflicting traffic complexity inputs required for an SSI analysis.

Safe System for Intersection (SSI) Inputs

Specify the geomtric, exposure, severity, and conflicting traffic complexity inputs required for an SSI analysis.

1. Roadway Geometry	Lanes
Major number thru lanes (one direction)	2
Minor number thru lanes (one direction)	1

Major Street Designation	
Select major street direction	N-S
Median Presence on Major Road	Yes
Median Presence on Minor Road	No

Legend
Required Inputs
Default Available, Override Optional
Planning-Level Default Input
Computed Value, Override Optional
Computed Value - No Override
Disabled Cell (Often based on input selections)

Reset Overridable SSI Inputs to Default

2. Complete the **"Exposure"** inputs. These inputs will apply to all interesections selected for analysis.
3. Complete the **"Severity"** inputs
4. Complete the **"Conflicting Traffic Complexity"** inputs

2. Exposure - All Intersections

Average Daily Traffic (veh/day)	Open	Design
Major	26,000	30,000
Minor	12,000	14,000

ADT Directional Split	
Major	0.50
Minor	0.50

Are turning movement ADT values are available?	No	If "Yes", input values in **Table 2-A**
Are peak hour turning movement counts available?	Yes	If "Yes", input values in **Table 2-B**

If no turning movment volumes or counts are available, a user can optionally override the planning-level default turning movment proportions in **Table 2-C**

Nonmotorized Total ADBP (ped-bike/day)	Activity Level	ADBP Value (ped-bike/day
Open Year Total Intersection NM	Low (20)	50
Design Year Total Intersection NM	Low (20)	50

(or overwrite ped movement ADBPs below)

Nonmotorized Movement ADBP (ped-bike/day)	Open	Design
Major NM 1 (NM mvmt crossing Maj1)	13	13
Major NM 2	13	13
Minor NM 1	13	13
Minor NM 2	13	13

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SPICE

Safe System for Intersection (SSI) Inputs

Specify the geomtric, exposure, severity, and conflicting traffic complexity inputs required for an SSI analysis.

Table 2-B: Turning Movement Counts (Optional)

	Mvmt	AM Peak	AM %	PM Peak	PM %	Avg %
Major Thru 1	NBT	700	0.76	800	0.75	0.76
Major Left Turn 1	NBL	120	0.13	150	0.14	0.14
Major Right Turn 1	NBR	100	0.11	120	0.11215	0.11
Major Thru 2	SBT	800	0.8	900	0.769231	0.78
Major Left Turn 2	SBL	100	0.1	150	0.128205	0.11
Major Right Turn 2	SBR	100	0.1	120	0.102564	0.1
Minor Thru 1	EBT	120	0.67	150	0.652174	0.66
Minor Left Turn 1	EBL	40	0.22	50	0.217391	0.22
Minor Right Turn 1	EBR	20	0.11	30	0.130435	0.12
Minor Thru 2	WBT	180	0.64	200	0.588235	0.61
Minor Left Turn 2	WBL	50	0.18	70	0.205882	0.19
Minor Right Turn 2	WBR	50	0.18	70	0.205882	0.19

SPICE

Safe System for Intersection (SSI) Inputs

Specify the geomtric, exposure, severity, and conflicting traffic complexity inputs required for an SSI analysis.

All numbers in yellow are customizable for your analysis

3. Severity

Vehicle Speeds	mph
Major Posted Speed Limit	45
Minor Posted Speed Limit	30
Major thru	45
Major left	20
Major right	15
Minor thru	25.5
Minor left	20
Minor right	15
Stop near	15
Stop far	25
Signal near	15
Signal far	25
RAB entering	20
RAB circulating	25
RAB exiting	30
Nonmotorized	0

4. Conflicting Traffic Complexity

Traffic Control	Decimal
Base Traffic Control Adjustment Value (BTCAV) for permitted	1
Base Traffic Control Adjustment Value (BTCAV) for protected/permitted	0.85
Base Traffic Control Adjustment Value (BTCAV) for protected	0.01
Base Traffic Control Adjustment Value (BTCAV) for stop-controlled	0.45
Weight, f, for permitted	0.5
Weight, f, for protected/permitted	0.5
Weight, f, for protected	0.5
Weight, f, for stop-controlled	0.5
Major LT signal phasing (drop-down)	Protected
Minor LT signal phasing (drop-down)	Protected
Exclusive Pedestrian phasing (drop-down)	No

SPICE RESULTS

		Crash Prediction Summary							SSI Score		
Control Strategy	Crash Type	Opening Year	Design Year	Total Project Life Cycle	Crash Prediction Rank	AADT Within SPF Prediction Range?		Source of Prediction	Opening Year	Design Year	SSI Rank
						Opening Year	Design Year				
Traffic Signal	Total	14.03	16.89	169.97	4	Yes	Yes	Calibrated SPF	77	70	5
	Fatal & Injury	4.83	5.87	58.80							
2-lane Roundabout	Total	16.20	19.19	194.59	2	Yes	No	Uncalibrated SPF	95	94	1
	Fatal & Injury	3.02	3.65	36.66							
Full Median U-Turn (MUT)	Total	8.84	10.64	107.08	3	N/A	N/A	CMF	83	77	4
	Fatal & Injury	3.67	4.46	44.69							
Signalized RCUT	Total	9.37	11.73	115.94	1	Yes	Yes	Uncalibrated SPF	87	83	2
	Fatal & Injury	2.25	2.87	28.15							
Signalized Thru-Cut	Total	No SPF	No SPF	No SPF	--	N/A	N/A	N/A	84	79	3
	Fatal & Injury	No SPF	No SPF	No SPF							

Legend	
	AADT >= 75%
	AADT >= 50%
	AADT >= 25%
	AADT >= 10%
	AADT > 0%

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SPICE RESULTS

Crash Prediction Summary									SSI Score		
Control Strategy	Crash Type	Opening Year	Design Year	Total Project Life Cycle	Crash Prediction Rank	AADT Within SPF Prediction Range? Opening Year	AADT Within SPF Prediction Range? Design Year	Source of Prediction	Opening Year	Design Year	SSI Rank
Traffic Signal	Total	14.03	16.89	169.97	4	Yes	Yes	Calibrated SPF	77	70	5
	Fatal & Injury	4.83	5.87	58.80							
2-lane Roundabout	Total	16.20	19.19	194.59	2	Yes	No	Uncalibrated SPF	95	94	1
	Fatal & Injury	3.02	3.65	36.66							
Full Median U-Turn (MUT)	Total	8.84	10.64	107.08	3	N/A	N/A	CMF	83	77	4
	Fatal & Injury	3.67	4.46	44.69							
Signalized RCUT	Total	9.37	11.73	115.94	1	Yes	Yes	Uncalibrated SPF	87	83	2
	Fatal & Injury	2.25	2.87	28.15							
Signalized Thru-Cut	Total	No SPF	No SPF	No SPF	--	N/A	N/A	N/A	84	79	3
	Fatal & Injury	No SPF	No SPF	No SPF							

Legend

	AADT >= 75%
	AADT >= 50%
	AADT >= 25%
	AADT >= 10%
	AADT > 0%

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SPICE RESULTS

Urban and Suburban Arterials				
Intersection Type	Major Road AADT		Minor Road AADT	
2x2 5 or Fewer Lanes	Min	Max	Min	Max
3ST	0	45,700	0	9,300
4ST	0	46,800	0	5,900
3SG	0	58,100	0	16,400
4SG	0	67,700	0	33,400
3AWSC	0	20,131	0	11,000
4AWSC	0	12,955	0	11,982

SPICE RESULTS

FDOT Design Manual Table 122.6.3 – Florida Calibration Factors

Crash Prediction Summary									SSI Score		
Control Strategy	Crash Type	Opening Year	Design Year	Total Project Life Cycle	Crash Prediction Rank	AADT Within SPF Prediction Range? Opening Year	AADT Within SPF Prediction Range? Design Year	Source of Prediction	Opening Year	Design Year	SSI Rank
Traffic Signal	Total	14.03	16.89	169.97	4	Yes	Yes	Calibrated SPF	77	70	5
	Fatal & Injury	4.83	5.87	58.80							
2-lane Roundabout	Total	16.20	19.19	194.59	2	Yes	No	Uncalibrated SPF	95	94	1
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Full Median U-Turn (MUT)	Total	8.84	10.64	107.08	3	N/A	N/A	CMF	83	77	4
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Signalized RCUT	Total	9.37	11.73	115.94	1	Yes	Yes	Uncalibrated SPF	87	83	2
	Fatal & Injury	2.25	2.87	28.15							
Signalized Thru-Cut	Total	No SPF	No SPF	No SPF	--	N/A	N/A	N/A	84	79	3
	Fatal & Injury	No SPF	No SPF	No SPF							

Legend	
	AADT >= 75%
	AADT >= 50%
	AADT >= 25%
	AADT >= 10%
	AADT > 0%

SPICE RESULTS

FDOT Design Manual Table 122.6.3 – Florida Calibration Factors

Crash Prediction Summary									SSI Score		
Control Strategy	Crash Type	Opening Year	Design Year	Total Project Life Cycle	Crash Prediction Rank	AADT Within SPF Prediction Range?		Source of Prediction	Opening Year	Design Year	SSI Rank
						Opening Year	Design Year				
Traffic Signal	Total Fatal & Injury	14.03 4.83	16.89 5.87	169.97 58.80	4	Yes	Yes	Calibrated SPF	77	70	5
2-lane Roundabout	Total Fatal & Injury	16.20 3.02	19.19 3.65	194.59 36.66	2	Yes	No	Uncalibrated SPF	95	94	1
Full Median U-Turn (MUT)	Total Fatal & Injury	8.84 3.67	10.64 4.46	107.08 44.69	3	N/A	N/A	CMF	83	77	4
Signalized RCUT	Total Fatal & Injury	9.37 2.25	11.73 2.87	115.94 28.15	1	Yes	Yes	Uncalibrated SPF	87	83	2
Signalized Thru-Cut	Total Fatal & Injury	No SPF No SPF	No SPF No SPF	No SPF No SPF	--	N/A	N/A	N/A	84	79	3

Legend	
	AADT >= 75%
	AADT >= 50%
	AADT >= 25%
	AADT >= 10%
	AADT > 0%

SPICE RESULTS

FDOT Design Manual Table 122.6.3 – Florida Calibration Factors

Crash Prediction Summary									SSI Score		
Control Strategy	Crash Type	Opening Year	Design Year	Total Project Life Cycle	Crash Prediction Rank	AADT Within SPF Prediction Range? Opening Year	AADT Within SPF Prediction Range? Design Year	Source of Prediction	Opening Year	Design Year	SSI Rank
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	Fatal & Injury	3.02	3.65	36.66							
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Signalized RCUT	Total	9.37	11.73	115.94	1	Yes	Yes	Uncalibrated SPF	87	83	2
	Fatal & Injury	2.25	2.87	28.15							
Signalized Thru-Cut	Total	No SPF	No SPF	No SPF	--	N/A	N/A	N/A	84	79	3
	Fatal & Injury	No SPF	No SPF	No SPF							

Legend	
(dark red)	AADT >= 75%
(red)	AADT >= 50%
(light red)	AADT >= 25%
(pink)	AADT >= 10%
(light pink)	AADT > 0%

ICE PROCESS

ICE Applicability → Stage 1 → Stage 2 → Stage 3

Stage 1
- CAP-X
- SPICE
- Stage 1 Form

Stage 2
- Operations
- Concept
- Cost
- Safety
- Economic Analysis Tool
- Stage 2 Form

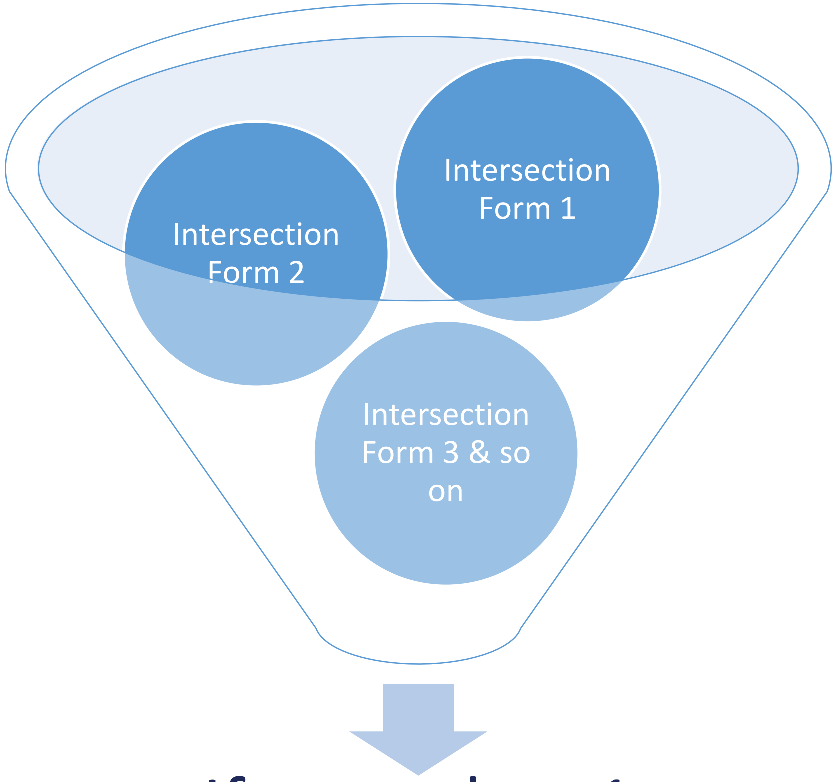
Stage 3
- Supplemental Analysis
- Stage 3 Form

STAGE 1 FORM

Control Strategy Evaluation

Provide a brief justification as to why each of the following control strategies should be advanced or not. Justification should consider potential environmental impacts.

Control Strategy	CAP-X Outputs: V/C Ratio		CAP-X Outputs: Ped Accom. Score	CAP-X Outputs: Bike Accom. Score	SPICE Outputs: Crash Prediction Rank	SPICE Outputs: SSI Rank	Strategy to be Advanced?	Justification
Signalized Control	0.49	0.52	5.17	4.25	2	5	Yes	No build condition.
Roundabout (2-lane)	0.60	0.67	4.90	4.17	4	1	Yes	Good operations and safety is good.
Median U-Turn	0.48	0.49	3.11	4.17	1	4	Yes	Good operations and safety is good.
Restricted Crossing U-turn (Signalized)	0.50	0.52	3.12	3.83	3	2	Yes	Good operations and safety is good.
Thru-Cut (Signalized)	0.45	0.46	5.17	4.41	N/A	3	Yes	Good operations and safety is good.
Recommendation	Multiple viable control strategies are identified: Continue to Stage 2							



If more than 1 viable, go to stage 2

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POLL QUESTION

Should a Safety Performance Function be used in SPICE if the intersection's AADT is outside the SPF's AADT prediction range?

- Yes
- No
- Maybe

ICE PROCESS

ICE Applicability → Stage 1 → Stage 2 → Stage 3

- **ICE Applicability**
- **Stage 1**
  - CAP-X
  - SPICE
  - Stage 1 Form
- **Stage 2**
  - Operations
  - Concept
  - Cost
  - Safety
  - Economic Analysis Tool
  - Stage 2 Form
- **Stage 3**
  - Supplemental Analysis
  - Stage 3 Form

STAGE 2 TOOLS

Stage 2

Goal: Detailed analysis to determine the preferred intersection form

- Operations Analysis
- SPICE
- FDOT Economic Analysis Tool for ICE

FDOT Intersection Control Evaluation (ICE) Tool rebranded to the FDOT Economic Analysis Tool for ICE

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STAGE 2 TOOLS

Stage 2

Goal: Detailed analysis to determine the preferred intersection form

- Operations Analysis
- SPICE
- FDOT Economic Analysis Tool for ICE

FDOT Intersection Control Evaluation (ICE) Tool rebranded to the FDOT Economic Analysis Tool for ICE

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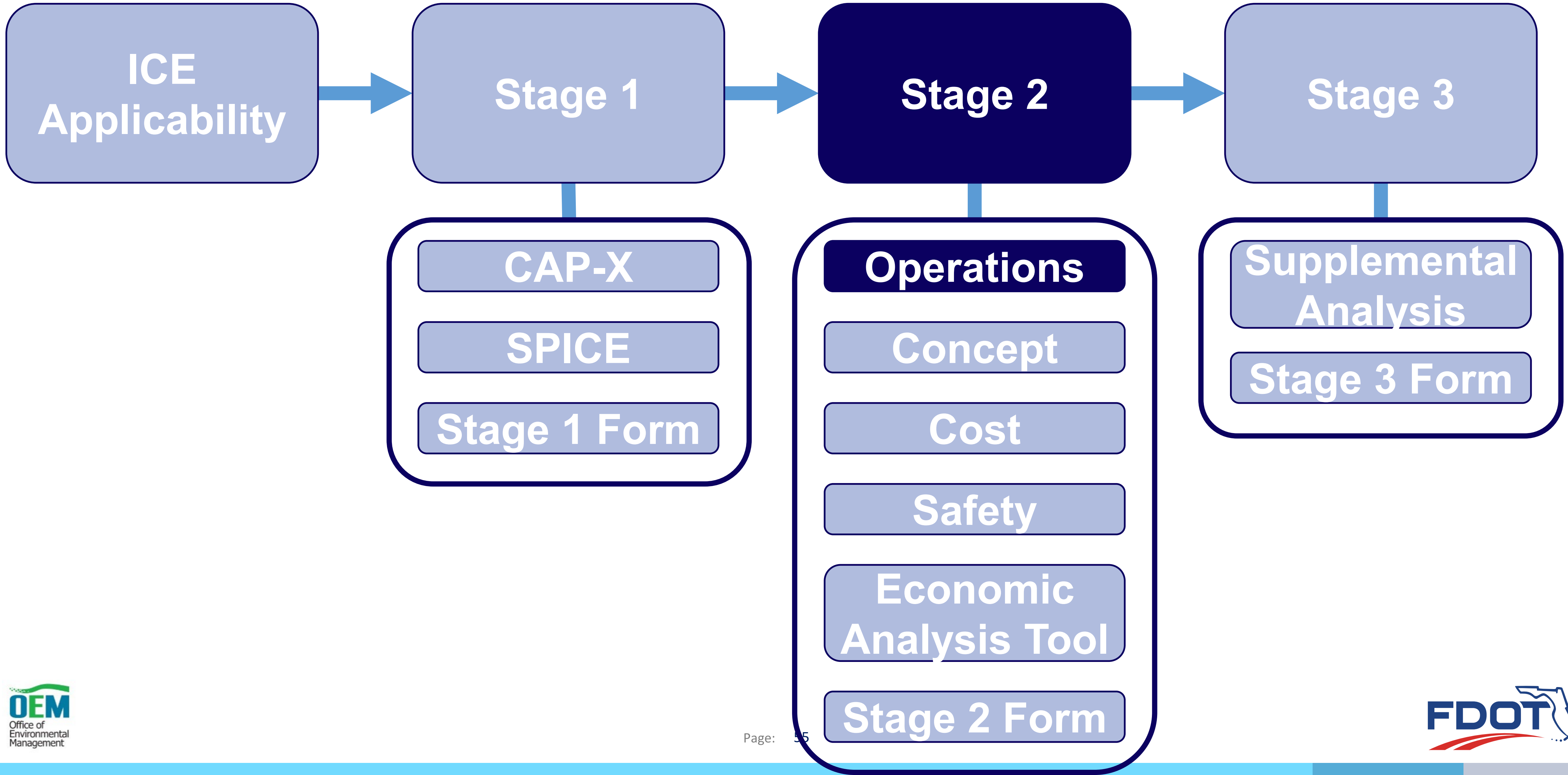
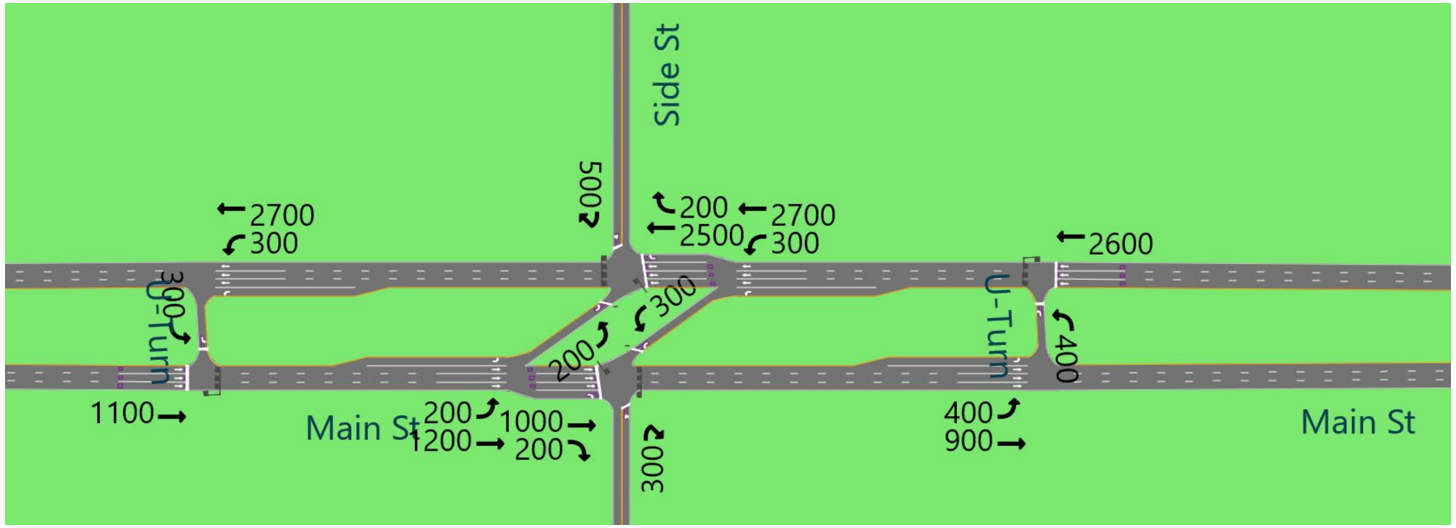
ICE PROCESS


ICE Applicability
Stage 1
Stage 2
Stage 3
CAP-X
SPICE
Stage 1 Form
Operations
Concept
Cost
Safety
Economic Analysis Tool
Stage 2 Form
Supplemental Analysis
Stage 3 Form

SYNCHRO TEMPLATES



Modify for context

SIDRA INTERSECTION

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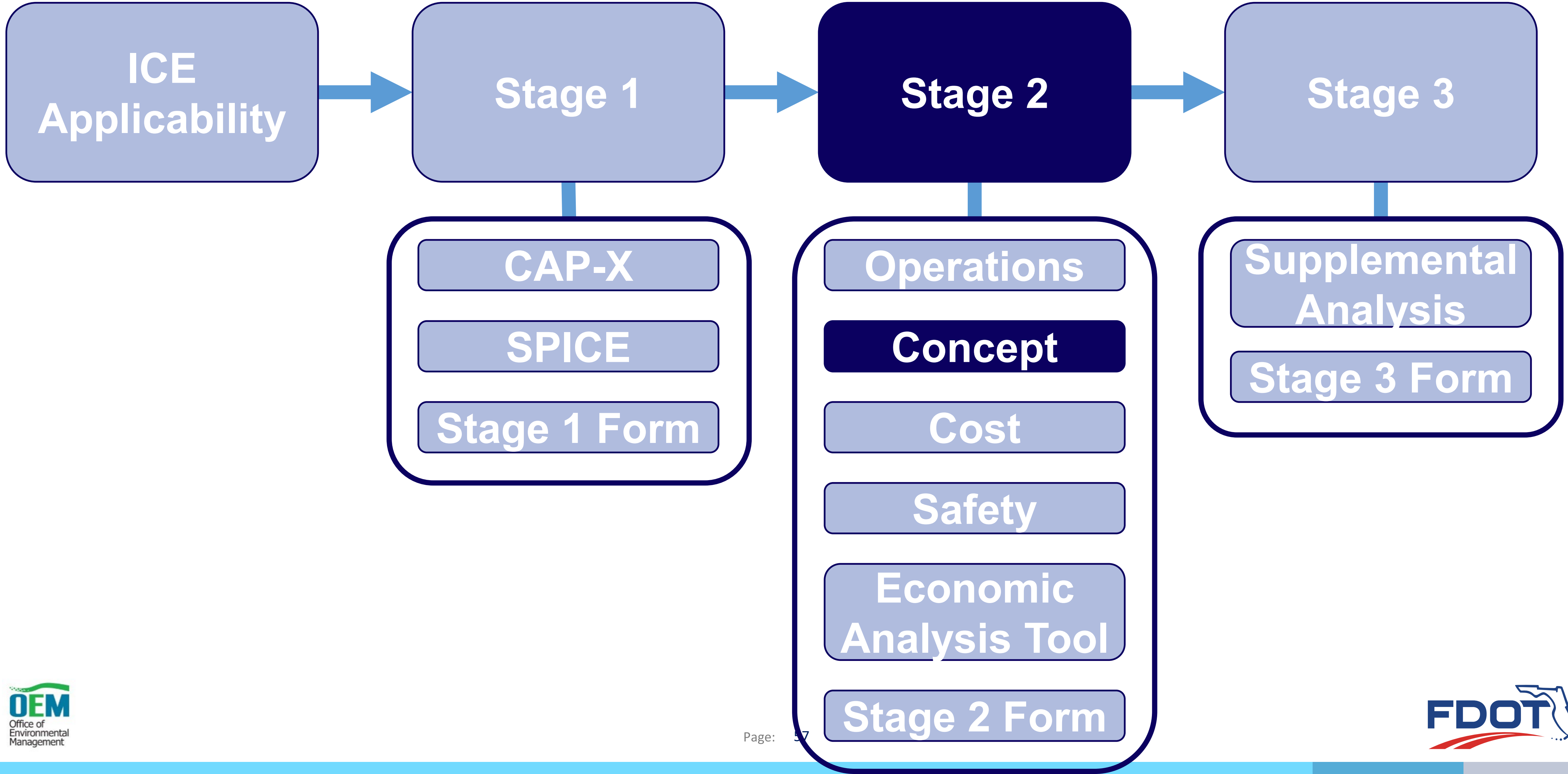
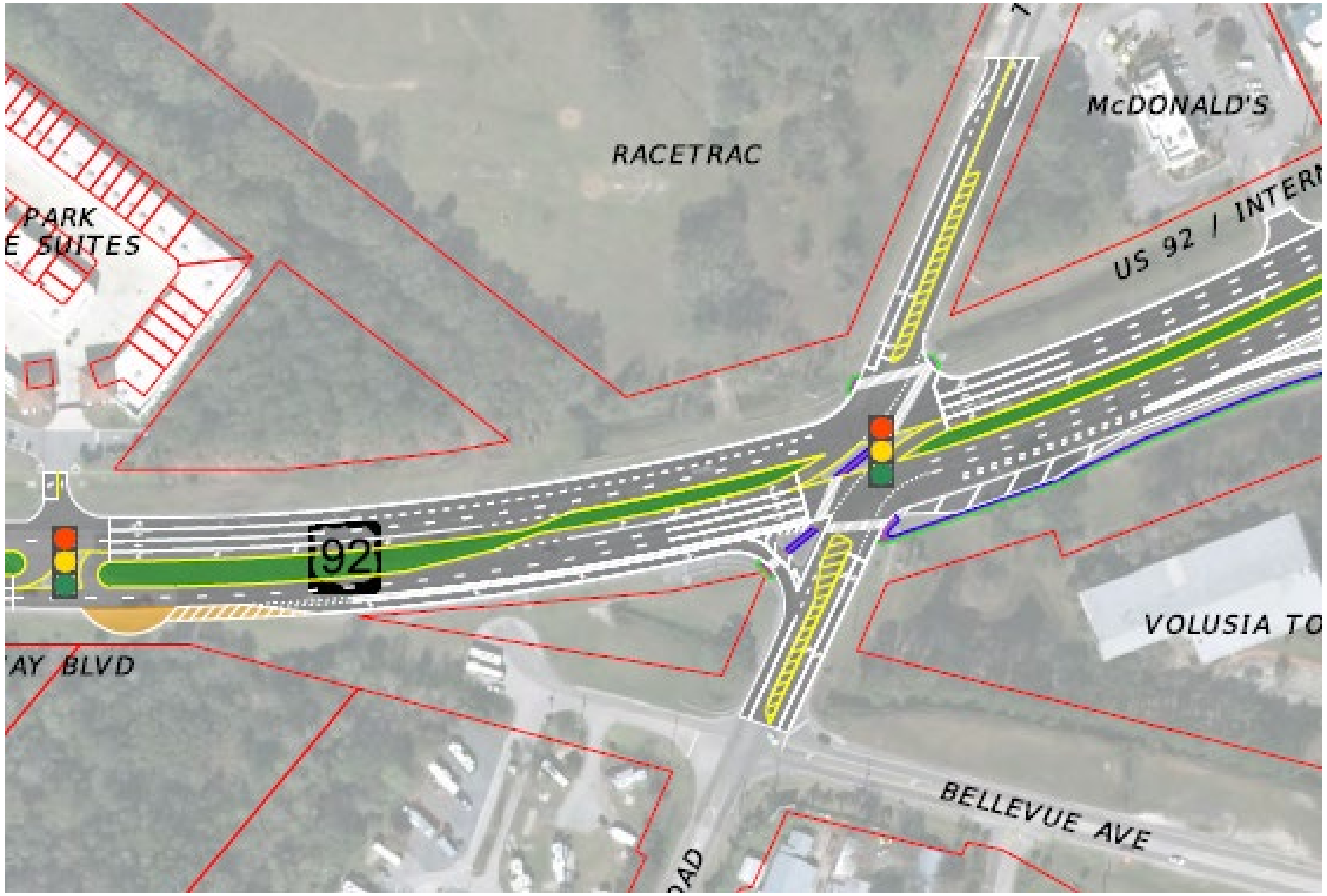
ICE PROCESS


ICE Applicability
Stage 1
Stage 2
Stage 3
CAP-X
SPICE
Stage 1 Form
Operations
Concept
Cost
Safety
Economic Analysis Tool
Stage 2 Form
Supplemental Analysis
Stage 3 Form

Example of a RCUT Concept Development



ICE PROCESS

ICE Applicability → Stage 1 → **Stage 2** → Stage 3

- Stage 1
  - CAP-X
  - SPICE
  - Stage 1 Form
- Stage 2
  - Operations
  - Concept
  - **Cost**
  - Safety
  - Economic Analysis Tool
  - Stage 2 Form
- Stage 3
  - Supplemental Analysis
  - Stage 3 Form

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COST DEVELOPMENT

Description	Total Quantity	Unit	Weighted Avg. Unit Price	Total Amount
PLAIN CEMENT CONC, 6"	433.33	SY	$50.00	$21,666.67
TRAF SEP CONC-TYPE I, 4' WIDE	0.00	LF	$28.04	$0.00
THERMOPLASTIC, STD, WHITE, SOLID, 12"	600.00	LF	$3.16	$1,896.00
THERMOPLASTIC, STD, WHITE, SOLID, 24"	935.00	LF	$5.08	$4,749.80
THERMOPLASTIC, STD, WHITE, ARROW	26.00	EA	$66.81	$1,737.06
Roadway Component Total				$30,049.53

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POLL QUESTION

What tools are typically used in a Stage 2 analysis?

- CAP-X, SPICE, Economic Analysis Tool, Synchro
- SPICE, Economic Analysis Tool, Synchro
- CAP-X, Economic Analysis Tool, Synchro
- CAP-X, SPICE, Synchro

ICE PROCESS

- ICE Applicability
- Stage 1
  - CAP-X
  - SPICE
  - Stage 1 Form
- Stage 2
  - Operations
  - Concept
  - Cost
  - Safety
  - Economic Analysis Tool
  - Stage 2 Form
- Stage 3
  - Supplemental Analysis
  - Stage 3 Form

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STAGE 2 SPICE

SPICE Stage 1 Steps

- Facility level inputs
- Control strategy selection
- Control strategy turn lane geometry
- SSI inputs

SPICE Stage 2 Steps

- Refine Stage 1 inputs if changed
- Part C CMF inputs
- Historical crash data

Input		Control Strategy Traffic Signal	Control Strategy 2-lane Roundabout	Control Strategy Full Median U-Turn
Keep default values below here for planning-level analysis, override with actual values for full HSM Analysis				
Reset Planning Inputs to Defaults	Part C CMFs Optional For Stage 1 ICE, Required for Stage 2 ICE		Scroll Down for Roundabout CMF Inputs	CMF - No Inputs Required
Skew Angle	All yellow cells will be automatically populated by a macro. If users want to do a planning-level analysis, they can leave the automatic inputs as-is.	N/A		
Lighting Present		Yes		
# of Approaches Permissive LT Signal Phasing		4		
# of Approaches Perm/Prot LT Signal Phasing		0		
# of Approaches Protected LT Signal Phasing		0		
Number of Approaches with Right-Turn-on-Red Prohibited		0		
Red Light Cameras Present		No		
Number of Major Street Through Lanes		0		
Number of Minor Street Lanes		0		
# of Major St Approaches w/ Right-Turn Channelization		0		
Number of Approaches with U-Turn Prohibited		0		
Pedestrian Volume by Activity Level		Low (20)		
User Specified Sum of all daily pedestrian crossing volumes		50		
Max # of Lanes Crossed by Pedestrians		5		
Number of Bus Stops within 1000' of Intersection		0		
Schools within 1000' of intersection		No		
Number of Alcohol Sales Establishments within 1000' of Intersection		0		

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STAGE 2 SPICE

Historical Crash Data Input

Note: In order to use Empirical Bayes (EB), the historical intersection type must be a traffic signal or a minor road stop. Additionally, this alternative must be selected to be included in the analysis, and the historical intersection specified below. Up to 10 years of historical data can be used to perform the EB adjustment.

Is historical crash data available?	Yes		
Number of years available:	5	(Up to 10)	First Year Data is available: 2019
Historical Intx Type:	4SG		

Historical Crash Counts		Year										Total
		2019	2020	2021	2022	2023	--	--	--	--	--	Total
Combined	Total											
	Fatal & Injury											
	PDO											
Single-Vehicle	Total						--	--	--	--	--	0
	Fatal & Injury	2	3	1	3	1						10
	PDO	5	4	2	2	1						14
Multiple-Vehicle	Total						--	--	--	--	--	0
	Fatal & Injury	8	8	9	5	6						36
	PDO	12	15	20	15	12						74
Veh-Ped	Fatal & Injury	2	1	3	2	2						10
Veh-Bike	Fatal & Injury	2	3	5	2	3						15
Total	All	31	34	40	29	25	--	--	--	--	--	159

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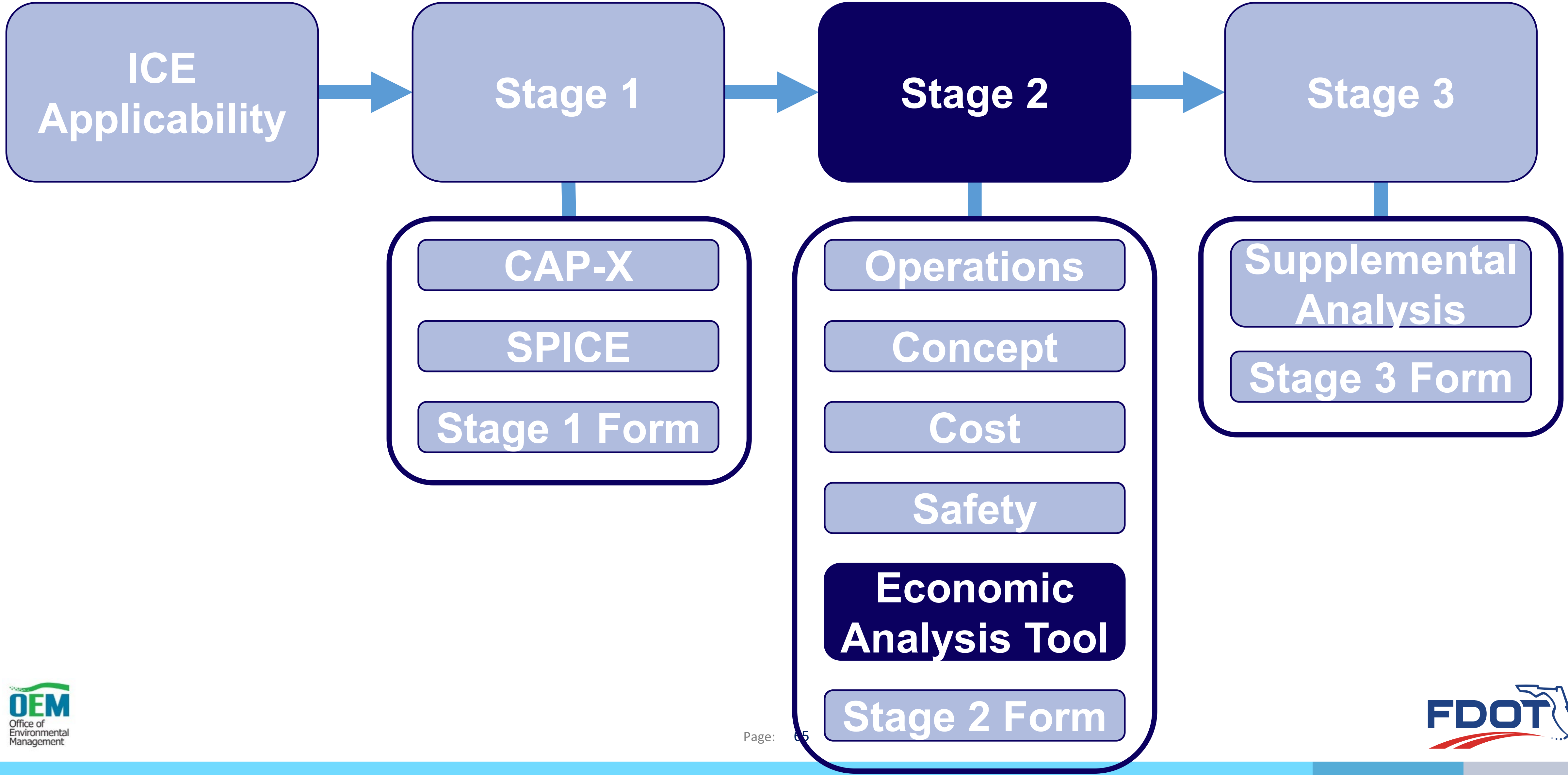
ICE PROCESS



ICE Applicability
Stage 1
Stage 2
Stage 3
CAP-X
SPICE
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Supplemental Analysis
Stage 3 Form

ECONOMIC ANALYSIS TOOL FOR ICE

Legend	
	Required data entry field
	Optional data entry field
	Data entry field not used

At-Grade Intersections	Total Design & Construction	Total Right of Way Costs	Operating & Maintenance	Signal Retiming	Lighting	Signal Maintenance	Roundabout Landscaping
Traffic Signal	$ 800,000	$ -	Cost Period	$ 5,000 Every 3 years	$ 1,000 1 (yearly)	$ 4,000 1 (yearly)	$ - 1 (yearly)
Roundabout (2-Lane)	$ 1,500,000	$ 120,000	Cost Period	$ - 1 (yearly)	$ 3,000 1 (yearly)	$ - 1 (yearly)	$ 2,000 1 (yearly)
Median U-Turn (MUT)	$ 800,000	$ 150,000	Cost Period	$ 12,500 Every 3 years	$ 2,000 1 (yearly)	$ 10,000 1 (yearly)	$ - 1 (yearly)
Signalized Restricted Crossing U-Turn (RCUT)	$ 800,000	$ 150,000	Cost Period	$ 12,500 Every 3 years	$ 2,000 1 (yearly)	$ 10,000 1 (yearly)	$ - 1 (yearly)

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ECONOMIC ANALYSIS TOOL FOR ICE

Crash Prediction Results

At-Grade Intersection	Crash Type	Opening Year	Design Year
Traffic Signal	Total	3.05	3.64
	Fatal & Injury	6.56	7.99
Roundabout (2-Lane)	Total	16.20	19.19
	Fatal & Injury	3.02	3.65
Median U-Turn (MUT)	Total	1.92	2.29
	Fatal & Injury	4.99	6.07
Signalized Restricted Crossing U-Turn (RCUT)	Total	9.37	11.73
	Fatal & Injury	2.25	2.87
Signalized Thrucut	Total		
	Fatal & Injury		

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Delay Results

				Opening Year			Design Year		
At-Grade Intersections				Average vehicle delay			Average vehicle delay		
Control Strategy		Delay Type	Units	AM Peak	PM Peak	Weekend Peak	AM Peak	PM Peak	Weekend Peak
Traffic Signal	Single Input	Single Input	sec/veh	30.00	35.00		40.00	45.00	
Roundabout (2-Lane)	Single Input	Single Input	sec/veh	20.00	25.00		25.00	30.00	
Median U-Turn (MUT)	Select Input Type	Worksheet (Full N-S)	sec/veh	28.83	33.83		40.27	45.40	
Signalized Restricted Crossing U-Turn (RCUT)	Select Input Type	Single Input	sec/veh	30.00	32.00		35.00	37.00	
Signalized Thrucut	Select Input Type	Single Input	sec/veh	35.00	40.00		38.00	45.00	

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ECONOMIC ANALYSIS TOOL FOR ICE DATA NEEDS

User must enter value on this sheet

	Southern Crossover	Northern Crossover
Distance from main intersection to:	700	700
Free-flow speed on major street	40	

Show Computed Delay

Opening Year AM Peak

Intersection 1	SB Thru	NB U-Turn
Volume	760	120
Delay	8	9

Intersection 2	NB Thru	NB Right	EB Thru	EB Right	SB Thru	SB Right	WB Thru	WB Right
Volume	620	130	100	40	710	170	150	70
Delay	10	12	14	20	25	18	17	10

Intersection 3	NB Thru	SB U-Turn
Volume	640	110
Delay	5	8

Opening Year PM Peak

Intersection 1	SB Thru	NB U-Turn
Volume	940	170
Delay	10	11

Intersection 2	NB Thru	NB Right	EB Thru	EB Right	SB Thru	SB Right	WB Thru	WB Right
Volume	750	220	110	50	870	240	150	100
Delay	12	14	16	22	27	20	19	12

	NB Thru	SB U-Turn
Volume	820	150
Delay	7	10

Design Year AM Peak

Intersection 1	SB Thru	NB U-Turn
Volume	1000	170
Delay	15	13

Intersection 2	NB Thru	NB Right	EB Thru	EB Right	SB Thru	SB Right	WB Thru	WB Right
Volume	860	200	120	60	950	220	180	100
Delay	15	18	20	25	30	22	24	23

Intersection 3	NB Thru	SB U-Turn
Volume	920	140
Delay	10	12

Design Year PM Peak

Intersection 1	SB Thru	NB U-Turn
Volume	1200	220
Delay	17	15

Intersection 2	NB Thru	NB Right	EB Thru	EB Right	SB Thru	SB Right	WB Thru	WB Right
Volume	1000	270	150	80	1120	300	200	140
Delay	17	20	22	27	32	24	26	25

	NB Thru	SB U-Turn
Volume	1070	200
Delay	12	14

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ECONOMIC ANALYSIS TOOL FOR ICE

Analysis Summary

Cost Categories	Net Present Value of Costs					
	Base Case - Traffic Signal	Traffic Signal	Roundabout (2-Lane)	Median U-Turn (MUT)	Signalized Restricted Crossing U-Turn (RCUT)	Signalized Thrucut
Planning, Construction & Right of Way Costs	$ 800,000	$ 800,000	$ 1,524,000	$ 830,000	$ 830,000	$ -
Post-Opening Costs	$ 98,229	$ 98,229	$ 72,952	$ 238,276	$ 238,276	$ 238,276
Auto Passenger Delay	$ 24,773,939	$ 24,773,939	$ 16,712,020	$ 24,408,156	$ 22,172,985	$ 26,444,555
Truck Delay	$ 1,384,672	$ 1,384,672	$ 934,073	$ 1,364,227	$ 1,239,298	$ 1,478,046
Safety	$ 32,250,001	$ 32,250,001	$ 16,585,542	$ 24,469,187	$ 12,325,060	--
Total cost	**$59,306,840**	**$59,306,840**	**$35,828,586**	**$51,309,847**	**$36,805,620**	**$28,160,877**

ECONOMIC ANALYSIS TOOL FOR ICE

Select Base Case for Benefit-Cost Comparison:	Traffic Signal					
	Net Present Value of Benefits Relative to Base Case					
Benefit Categories		Traffic Signal	Roundabout (2-Lane)	Median U-Turn (MUT)	Signalized Restricted Crossing U-Turn (RCUT)	Signalized Thrucut
Auto Passenger Delay			$ 8,061,919	$ 365,783	$ 2,600,954	$ (1,670,616)
Truck Delay			$ 450,599	$ 20,444	$ 145,373	$ (93,374)
Safety			$ 15,664,459	$ 7,780,814	$ 19,924,940	
Net Present Value of Benefits			**$ 24,176,977**	**$ 8,167,041**	**$ 22,671,268**	**$ (1,763,990)**
Net Present Value of Costs			**$ 698,723**	**$ 170,048**	**$ 170,048**	**$ (659,952)**
Net Present Value of Improvement			**$ 23,478,254**	**$ 7,996,993**	**$ 22,501,220**	**$ (1,104,038)**
Benefit-Cost (B/C) Ratio			**34.60**	**48.03**	**133.32**	**Benefits are less than base case and cost is less than base case.**
Delay B/C			**12.18**	**2.27**	**16.15**	**Benefits are less than base case and cost is less than base case.**
Safety B/C			**22.42**	**45.76**	**117.17**	

ECONOMIC ANALYSIS TOOL FOR ICE

Select Base Case for Benefit-Cost Comparison:	Traffic Signal					
Benefit Categories	Net Present Value of Benefits Relative to Base Case					
		Traffic Signal	Roundabout (2-Lane)	Median U-Turn (MUT)	Signalized Restricted Crossing U-Turn (RCUT)	Signalized Thrucut
Auto Passenger Delay			$ 8,061,919	$ 365,783	$ 2,600,954	$ (1,670,616)
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Net Present Value of Improvement			**$ 23,478,254**	**$ 7,996,993**	**$ 22,501,220**	**$ (1,104,038)**
Benefit-Cost (B/C) Ratio			**34.60**	**48.03**	**133.32**	**Benefits are less than base case and cost is less than base case.**
Delay B/C			**12.18**	**2.27**	**16.15**	**Benefits are less than base case and cost is less than base case.**
Safety B/C			**22.42**	**45.76**	**117.17**	

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ECONOMIC ANALYSIS TOOL FOR ICE

Select Base Case for Benefit-Cost Comparison:	Traffic Signal					
	Net Present Value of Benefits Relative to Base Case					
Benefit Categories		**Traffic Signal**	**Roundabout (2-Lane)**	**Median U-Turn (MUT)**	**Signalized Restricted Crossing U-Turn (RCUT)**	**Signalized Thrucut**
Auto Passenger Delay			$ 8,061,919	$ 365,783	$ 2,600,954	$ (1,670,616)
Truck Delay			$ 450,599	$ 20,444	$ 145,373	$ (93,374)
Safety			$ 15,664,459	$ 7,780,814	$ 19,924,940	
Net Present Value of Benefits			**$ 24,176,977**	**$ 8,167,041**	**$ 22,671,268**	**$ (1,763,990)**
Net Present Value of Costs			**$ 698,723**	**$ 170,048**	**$ 170,048**	**$ (659,952)**
Net Present Value of Improvement			**$ 23,478,254**	**$ 7,996,993**	**$ 22,501,220**	**$ (1,104,038)**
Benefit-Cost (B/C) Ratio			**34.60**	**48.03**	**133.32**	**Benefits are less than base case and cost is less than base case.**
Delay B/C			**12.18**	**2.27**	**16.15**	**Benefits are less than base case and cost is less than base case.**
Safety B/C			**22.42**	**45.76**	**117.17**	

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ICE PROCESS

ICE Applicability → Stage 1 → Stage 2 → Stage 3

Stage 1
- CAP-X
- SPICE
- Stage 1 Form

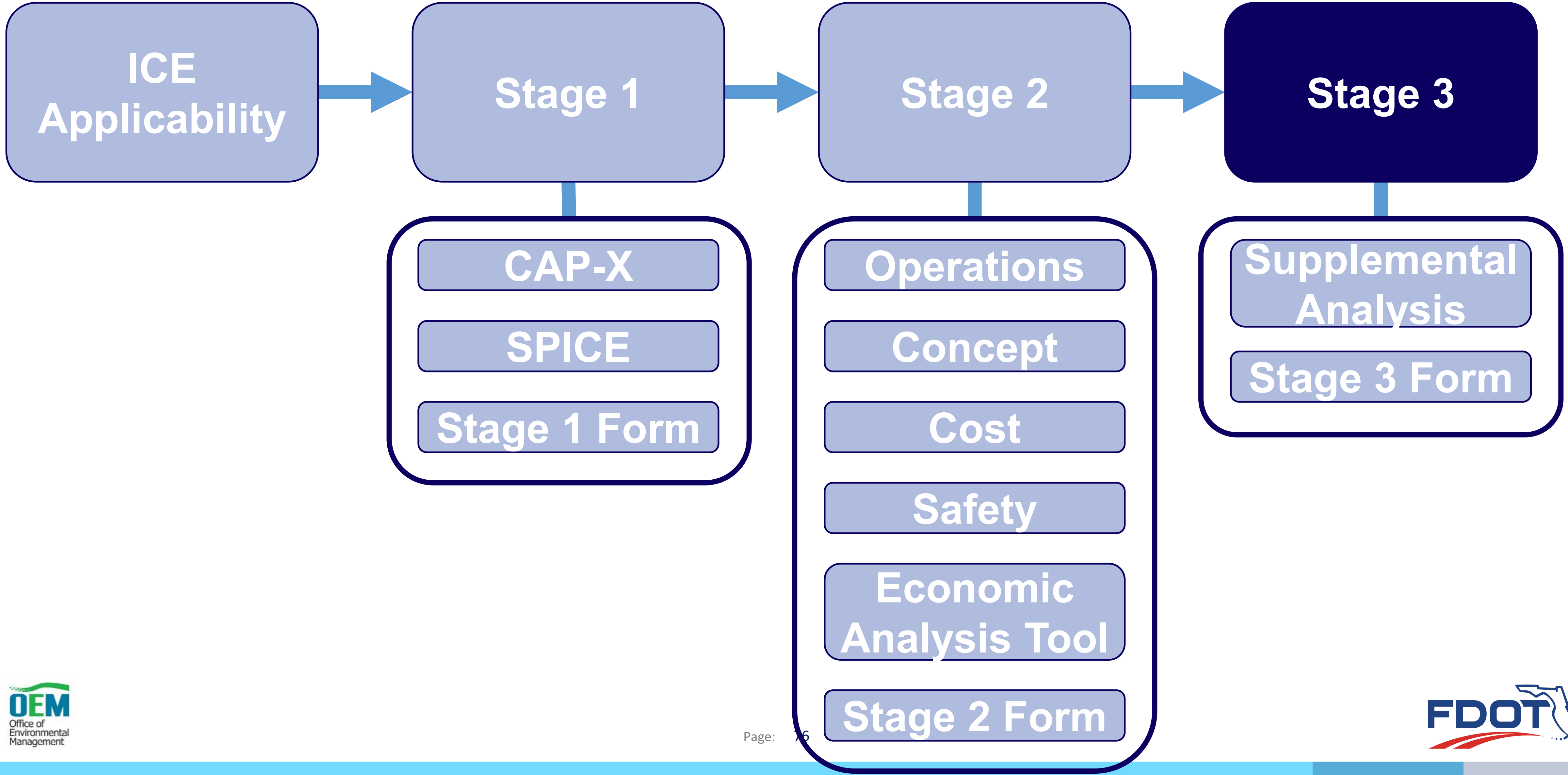
Stage 2
- Operations
- Concept
- Cost
- Safety
- Economic Analysis Tool
- Stage 2 Form

Stage 3
- Supplemental Analysis
- Stage 3 Form

STAGE 2 FORM

Control Strategy Evaluation		
Provide a brief justification as to why each of the following is either viable or not viable. If a single control strategy is recommended, select it as the only strategy to be advanced.		
Control Strategy	Strategy to be Advanced?	Justification
Signalized Control	No	Middle regarding delay, poorest regarding safety, existing condition.
Roundabout (2-lane)	No	Best regarding delay; middle regarding safety, middle Benefit-Cost ratio and best Net Present Value.
Median U-Turn	No	Middle regarding delay, middle regarding safety, middle Benefit-Cost ratio and Net Present Value.
Restricted Crossing U-turn (Signalized)	Yes	Middle regarding delay, best regarding safety, best Benefit-Cost ratio and almost best Net Present Value.
Thru-Cut (Signalized)	No	Worst regarding delay; unknown crash prediction, worst Benefit-Cost ratio and Net Present Value.

ICE PROCESS


ICE Applicability
Stage 1
Stage 2
Stage 3
CAP-X
SPICE
Stage 1 Form
Operations
Concept
Cost
Safety
Economic Analysis Tool
Stage 2 Form
Supplemental Analysis
Stage 3 Form

STAGE 3 OVERVIEW

In-depth Analysis

+

PD&E Process

Environmental Impacts Assessment

+

Public Vetting

AGENDA

Module 1

ICE Overview

Module 2

ICE in PD&E

Module 3

Example Exercises

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Module 1 Q&A

ICE Overview

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FDOT Intersection Control Evaluation (ICE) Training

ICE Process for PD&E Overview and Updates

Module 2

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Agenda

Module 1

ICE Overview

Module 2

ICE in PD&E

Module 3

Example Exercises

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Module 2

ICE in PD&E

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Poll Question

Please let us know if you have used the ICE process during a PD&E Study.

- Yes
- No

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Module 2 Agenda

Conducting Stage 1 ICE

Identify Viable Intersection Forms

Conducting Stage 2 ICE

During PD&E Study

During Final Design
With PD&E Re-evaluation

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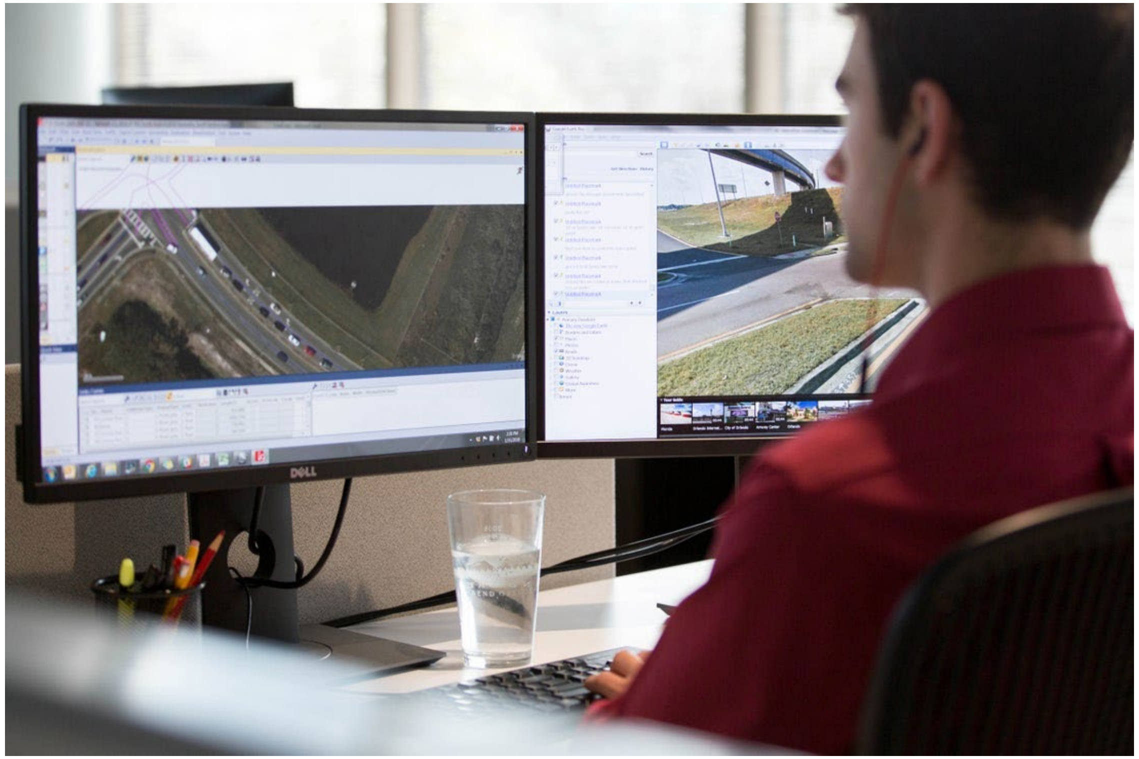
ICE in PD&E

Forms and Tools are the same, but the process is different



ICE in PD&E - Applicability Guidance

Intersection Control Evaluation

ICE

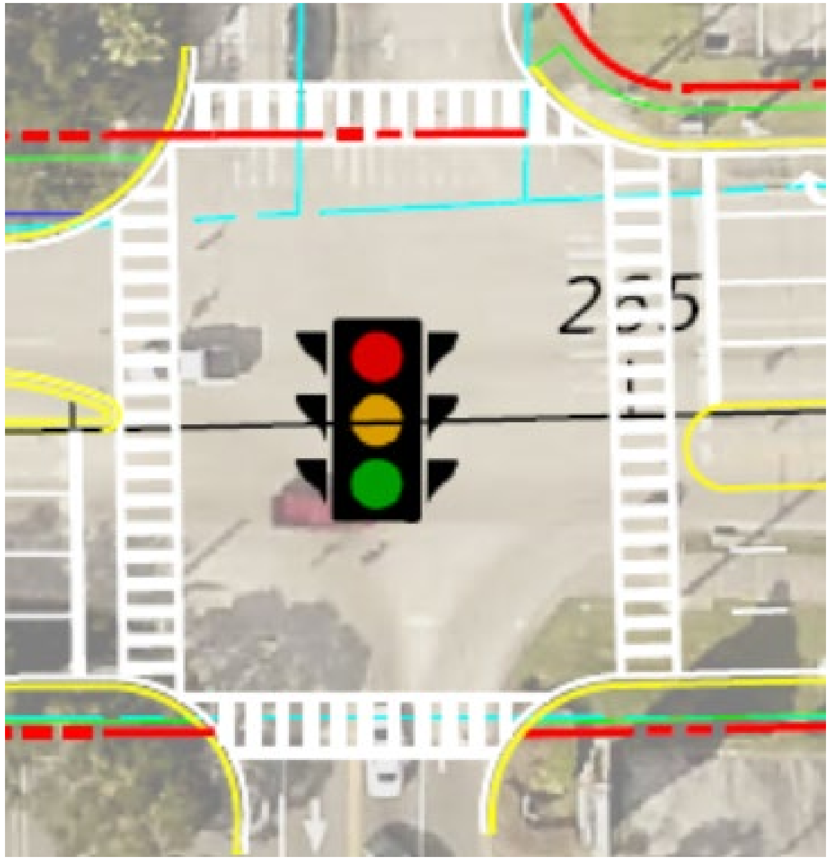
ICE is for a single intersection

Multiple intersections = ICE for each

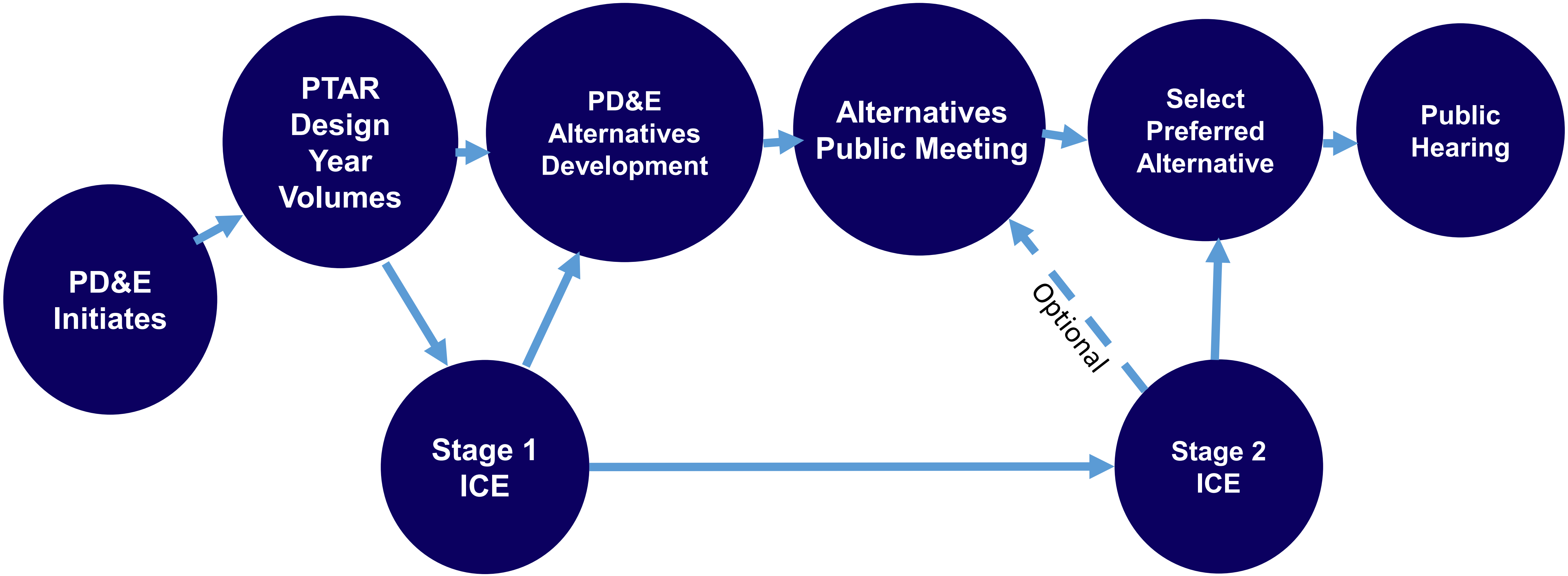
When is ICE Required in PD&E?

The ICE Manual says ICE is required when:

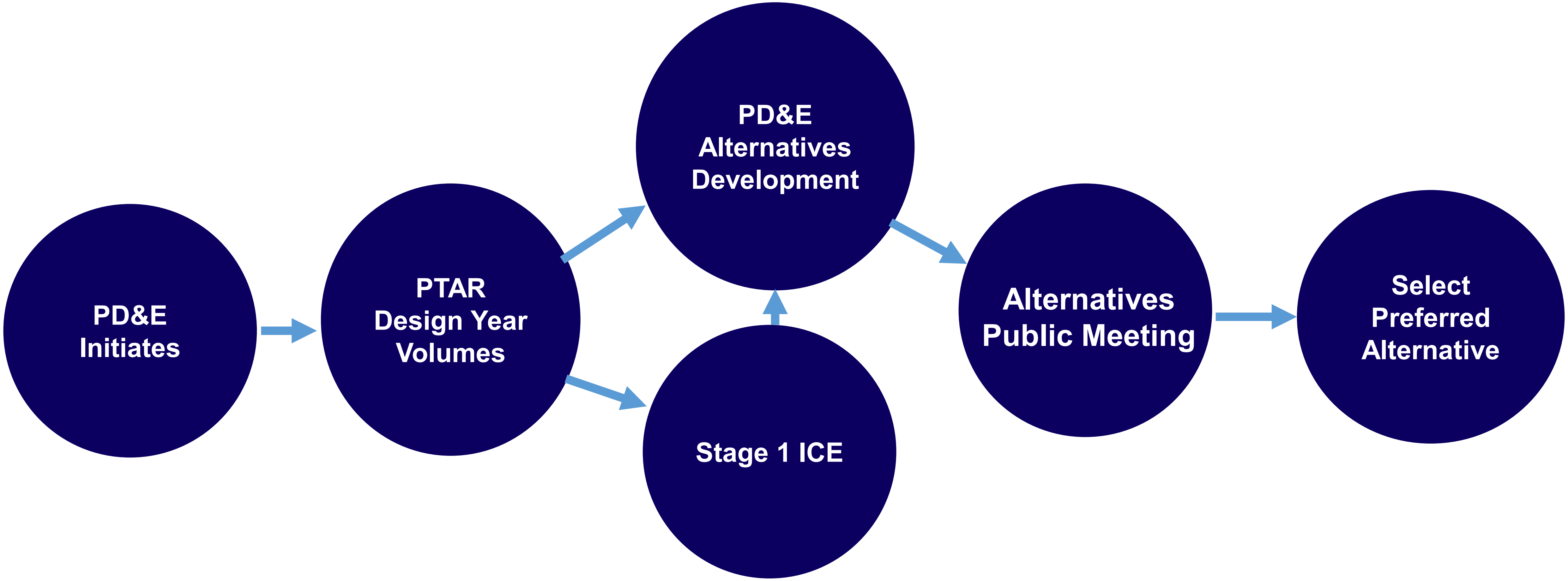
- New intersection signalization
- Major reconstruction
- Convert to a full median opening
- DDE or DTOE require it
- Connection to SHS generating more than 4,000 ADT (E, F, and G connection categories)
- Connection permit



PD&E and ICE Timeline – Stage 2 During PD&E



PD&E and ICE Timeline – Stage 2 deferred to Final Design



Stage 1 ICE

ICE in PD&E

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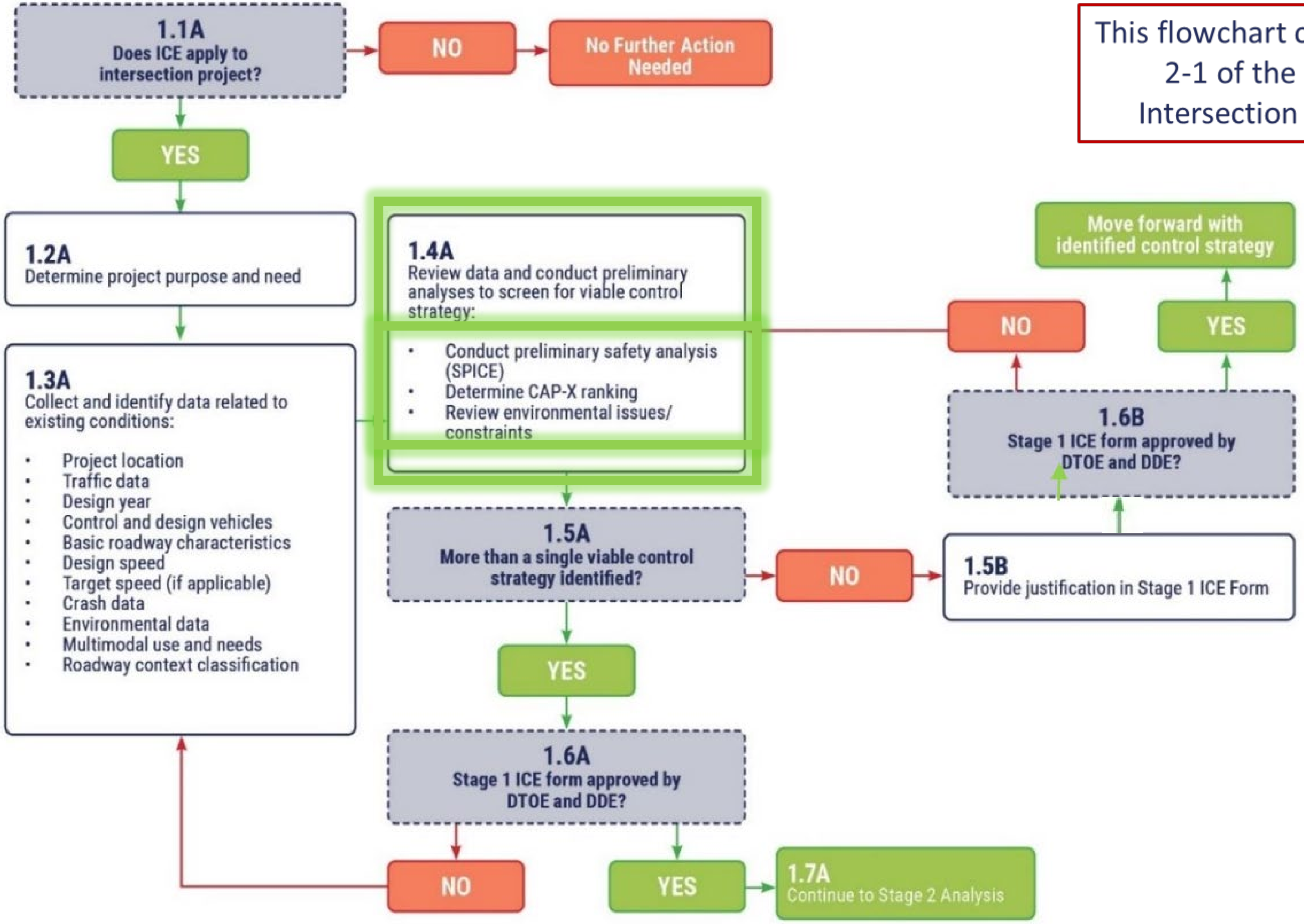
Stage 1 Analysis

This flowchart can be found as Figure 2-1 of the FDOT Manual on Intersection Control Evaluation



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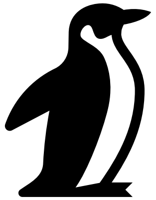
Stage 1 Analysis

1.3A
Collect and identify data related to existing conditions:

- Project location
- Traffic data
- Design year
- Control and design vehicles
- Basic roadway characteristics
- Design speed
- Target speed (if applicable)
- Crash data
- Environmental data
- Multimodal use and needs
- Roadway context classification

ICE in PD&E should be based on the design year traffic volumes



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CAP-X Analysis

TYPE OF INTERSECTION	Overall v/c Ratio	V/C Ranking	Pedestrian Accommodation Score	Bicycle Accommodation Score
Median U-Turn N-S	0.63	1	3.11	4.33
Signalized Restricted Crossing U-Turn N-S	0.69	2	3.06	4.00
Traffic Signal	0.71	3	5.02	4.33
2 X 2	1.05	4	4.49	4.33
2NS X 1EW	1.09	5	4.71	4.42
1 X 1	2.06	6	5.09	4.50
--	--	--	--	--
--	--	--	--	--
--	--	--	--	--
--	--	--	--	--

Green reflects a good score, red is poor.
Lower V/C is better.
A higher ped/bike score is better.

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Poll Question

When conducting a PD&E’s Stage 1 CAP-X, the traffic volumes used in the analysis should be based on the ________ year.

- Existing
- Opening
- Design

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SPICE Analysis

Crash Prediction Summary									SSI Score		
Control Strategy	Crash Type	Opening Year	Design Year	Total Project Life Cycle	Crash Prediction Rank	AADT Within SPF Prediction Range? (Open Year)	AADT Within SPF Prediction Range? (Design Year)	Source of Prediction	Opening Year	Design Year	Rank
Traffic Signal	Total	9.10	10.95	210.32	5	Yes	Yes	Calibrated SPF w/ EB	85	81	6
	Fatal & Injury	3.13	3.81	72.77							
1-lane Roundabout	Total	3.75	4.19	83.45	1	No	No	Uncalibrated SPF	98	98	1
	Fatal & Injury	0.81	0.93	18.33							
2-lane Roundabout	Total	16.20	19.19	371.48	4	Yes	No	Uncalibrated SPF	97	96	2
	Fatal & Injury	3.02	3.65	69.99							
Full Median U-Turn (MUT)	Total	5.73	6.90	132.50	3	N/A	N/A	CMF	90	87	4
	Fatal & Injury	2.38	2.89	55.31							
Signalized RCUT	Total	9.37	11.73	221.33	2	Yes	Yes	Uncalibrated SPF	90	87	3
	Fatal & Injury	2.25	2.87	53.74							
Signalized Thru-Cut	Total	No SPF	No SPF	No SPF	--	N/A	N/A	N/A	87	84	5
	Fatal & Injury	No SPF	No SPF	No SPF							

SPICE Analysis - Safe System Intersection

Signalized Thru-Cut*	Yes	--	*SSI Only, No Crash Prediction Available*
Unsignalized Thru-Cut*	Yes	--	*SSI Only, No Crash Prediction Available*
Bowtie*	Yes	--	*SSI Only, No Crash Prediction Available*

SPICE Analysis - Safe System Intersection

SSI Score		
Opening Year	Design Year	Rank
89	85	6
99	98	1
98	97	2
93	91	3
92	89	4
90	87	5

Factors that go into SSI score

- Volume
- Travel Speed
- Angle of Crash
- Intersection Complexity

Higher the score = safer the intersection

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SPICE Analysis - Safe System Intersection

Signalized Thru-Cut*	Yes	--	*SSI Only, No Crash Prediction Available
Unsignalized Thru-Cut*	Yes	--	*SSI Only, No Crash Prediction Available
Bowtie*	Yes	--	*SSI Only, No Crash Prediction Available

Control Strategy	Opening Year	Design Year	Rank
Traffic Signal	85	81	6
1-lane Roundabout	98	98	1
2-lane Roundabout	97	96	2
Full Median U-Turn (MUT)	90	87	4
Signalized RCUT	90	87	3
Signalized Thru-Cut	87	84	5

Utilize SSI score if no crash prediction is available

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Input CAP-X and SPICE Results into ICE Form

Control Strategy Evaluation								
Provide a brief justification as to why each of the following control strategies should be advanced or not. Justification should consider potential environmental impacts.								
	CAP-X Outputs				SPICE Outputs			
	V/C Ratio		Ped Accom. Score	Bike Accom. Score	Crash Prediction Rank	SSI Rank	Strategy to be Advanced?	Justification
Control Strategy								
Signalized Control	0.71	0.76	5.02	4.33	5	6	Yes	Existing condition
Roundabout (1-lane)	2.06	2.12	5.09	4.50	1	1	No	Too high over capacity.
Roundabout (2-lane)	1.05	1.09	4.49	4.49	4	2	Yes	Good safety; maybe operations results will be better using Sidra.
Median U-Turn	0.63	0.68	3.11	4.33	3	3	Yes	Good operations and safety is good.
Restricted Crossing U-turn (Signalized)	0.69	0.76	3.06	4.00	2	4	Yes	Good operations and safety is good.
Thru-Cut (Signalized)	0.62	0.71	5.02	4.49	N/A	5	No	Good operations but safety is not good.

Goal: Identify viable intersection forms

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Poll Question

What is the fundamental purpose of conducting Stage 1 ICE?

- Select a preferred intersection alternative
- Select viable alternatives to be evaluated in Stage 2
- Conduct analysis the best operating intersection form.

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Viable Intersection Alternatives

Stage 1 ICE → Viable Intersection Alternatives →

PD&E

- Concept Development
- R/W Cost Analysis
- Construction Cost Analysis
- Operational Analysis
- Safety Analysis
- Benefit-Cost & Net Pursuit Value Analysis

→ Select Preferred Intersection Form

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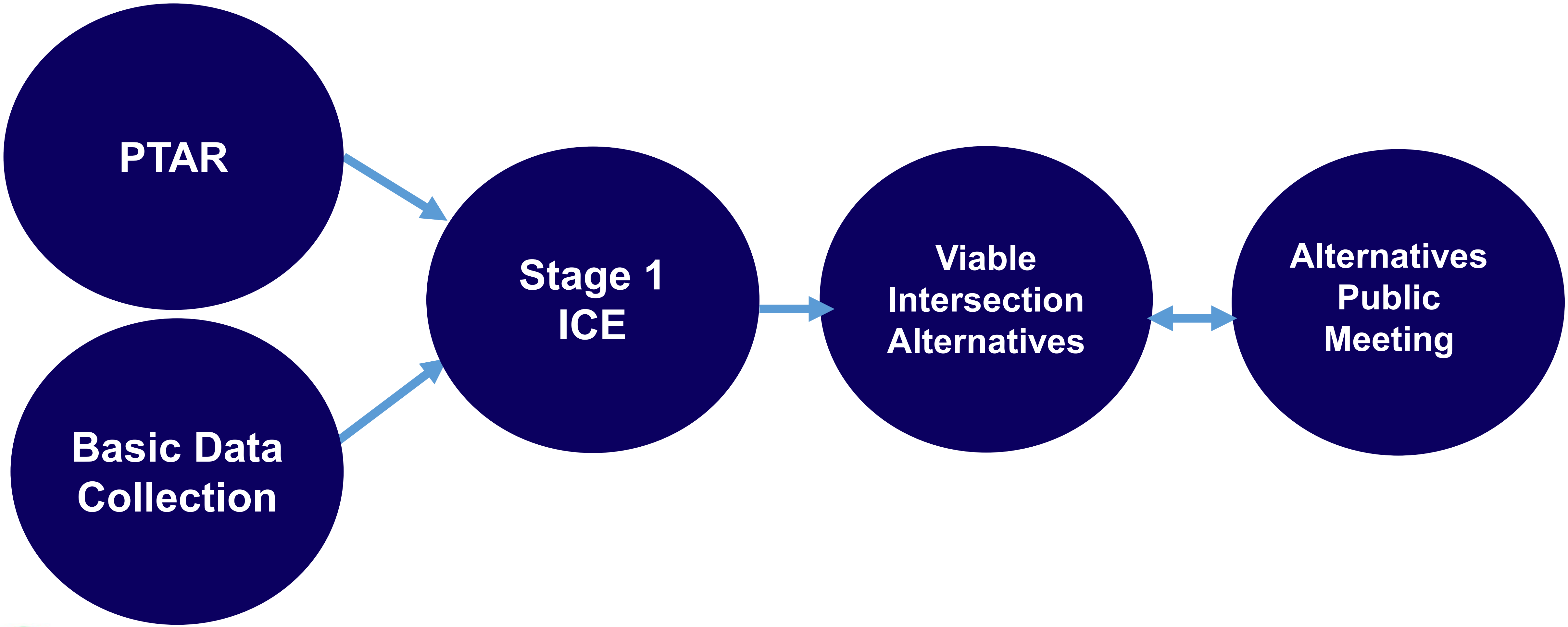
When is the Stage 1 Analysis Conducted?



Stage 1 ICE Form

Resolution					
To be filled out by FDOT District Traffic Operations Engineer and District Design Engineer					
Project Determination					
Comments					
DTOE Name		Signature		Date	
DDE Name		Signature		Date	

Poll Question

When should Stage 1 ICE be performed?

- After the Alternatives Public Meeting
- As part of the PD&E's Alternative Analysis process
- To develop potential intersection alternatives

Stage 2 ICE

ICE in PD&E

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When is Stage 2 ICE Conducted?

During PD&E Study?

No

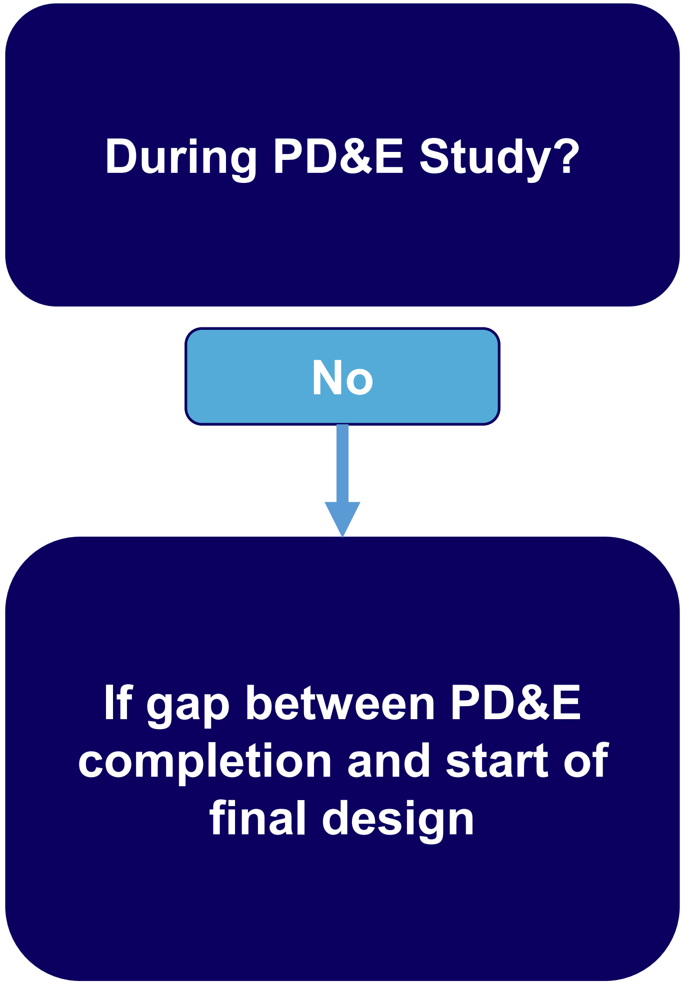
If gap between PD&E completion and when final design starts

During PD&E Study?

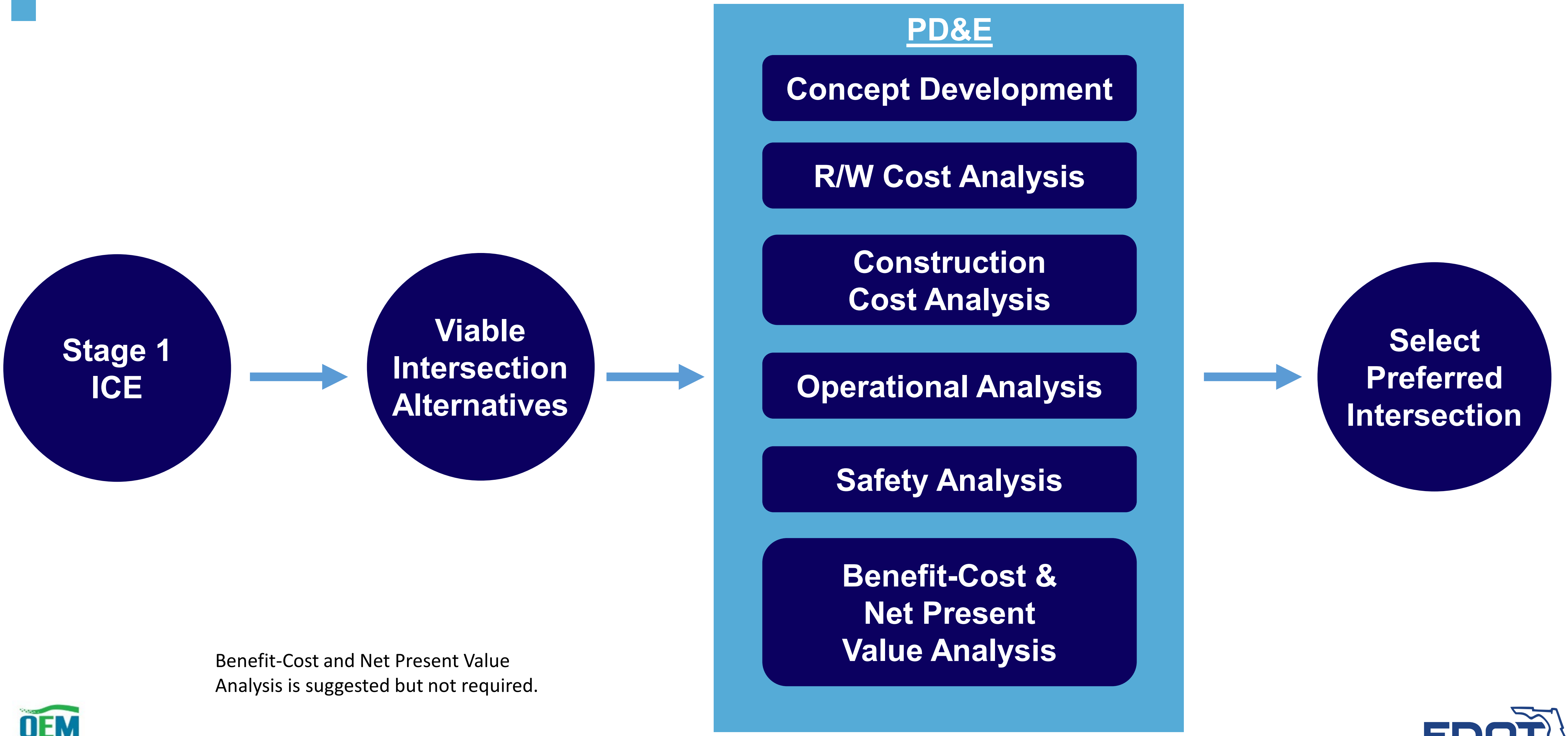
Yes

1. **PD&E includes the final design component**
2. **Combined PD&E and design project**
3. **Programmed as a design-build**

Stage 2 ICE deferred to Final Design



PD&E's preferred intersection when Stage 2 deferred



Benefit-Cost and Net Present Value Analysis is suggested but not required.

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ICE Manual Guidance – Stage 2 During PD&E Study

During PD&E Study?

Yes

1. **PD&E includes the final design component**
2. **Combined PD&E and design project**
3. **Programmed as a design-build**

Located in ICE Manual Section 2.5.2

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Poll Question

When can conducting Stage 2 ICE be deferred?

- Gap between PD&E completion and final design start
- PD&E includes the final design component
- Combined PD&E and design project
- Project programmed as a design build

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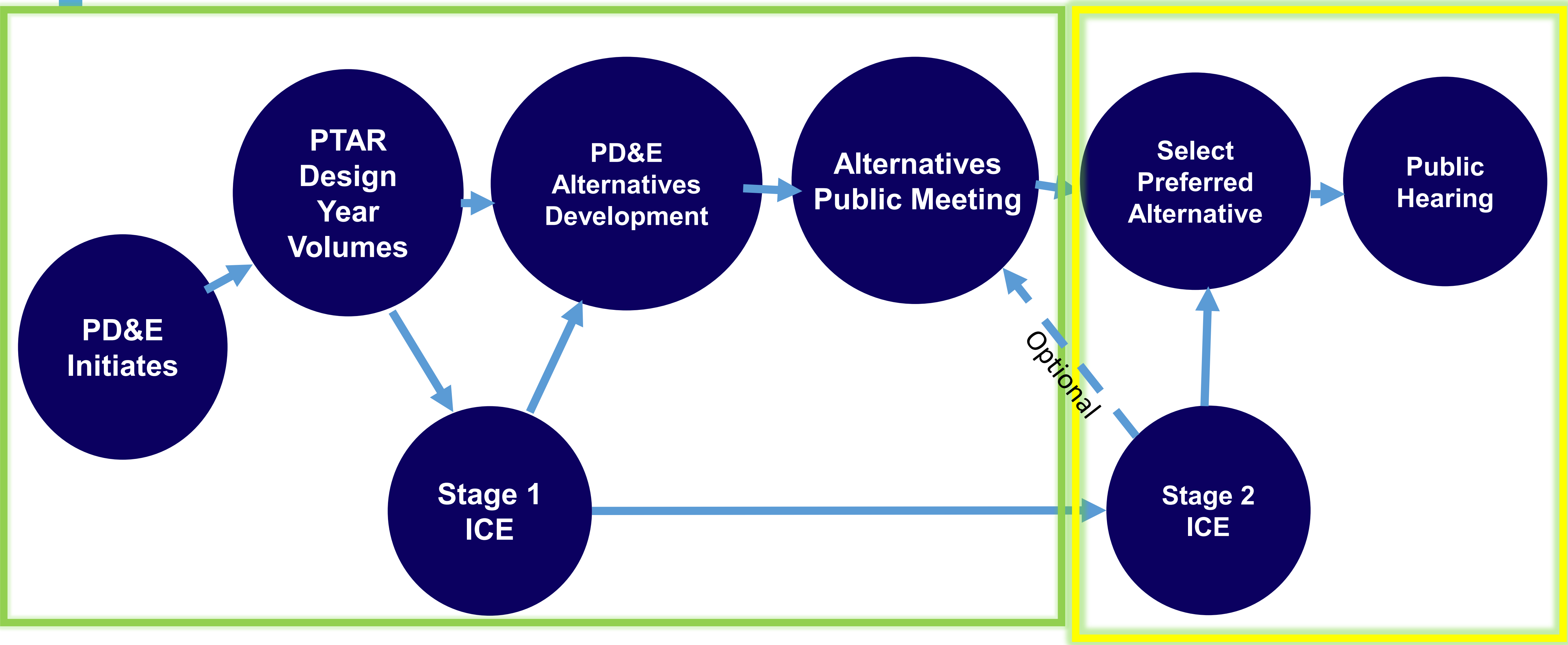
PD&E and ICE Timeline – Stage 2 During PD&E



Stage 2 Analysis Uses PD&E Elements

Stage 1 ICE

Viable Intersection Alternatives

Initiate Stage 2 ICE

Concept Development

R/W & Construction Costs

With PD&E Alternative Concept & Cost Analysis

Operation & Safety Analysis

Done in PD&E with PTAR

Conduct Benefit-Cost & Net Present Value Analysis

Input into PD&E Comparative Evaluation Matrix for Alternative's Public Meeting

Show Alternatives @ PD&E's Alternative's Public Meeting

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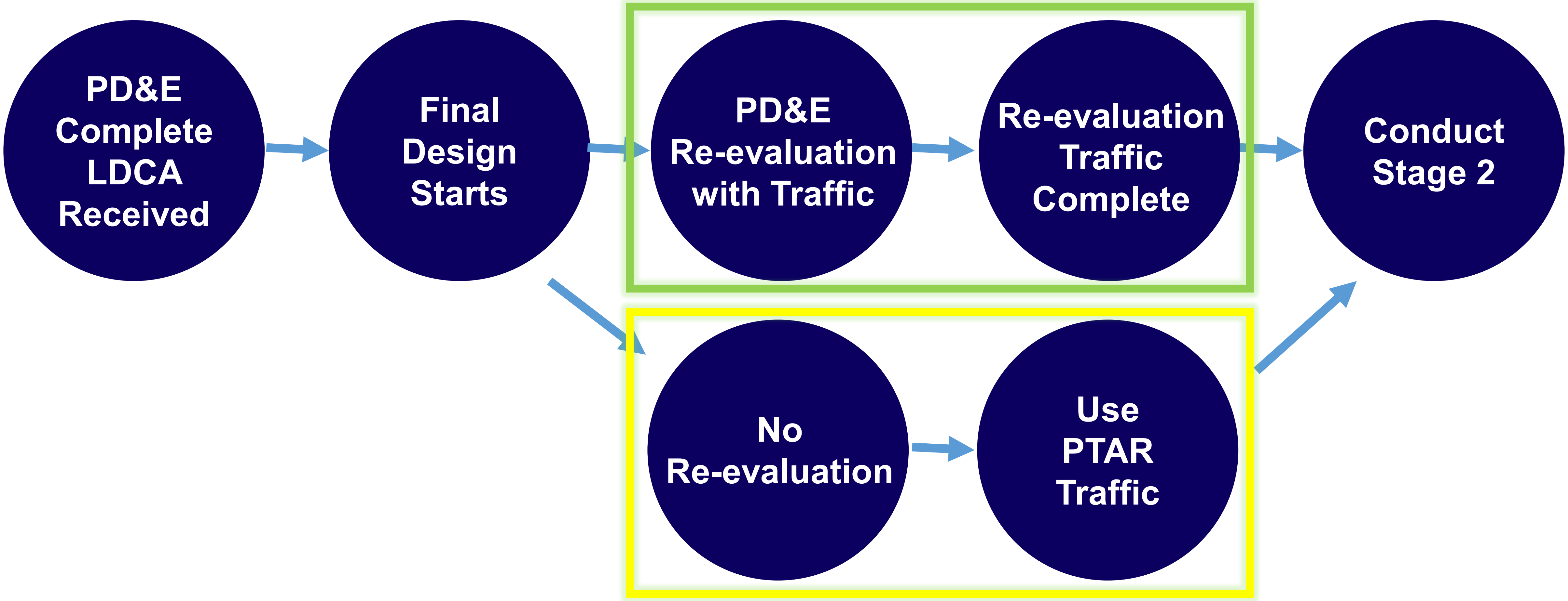
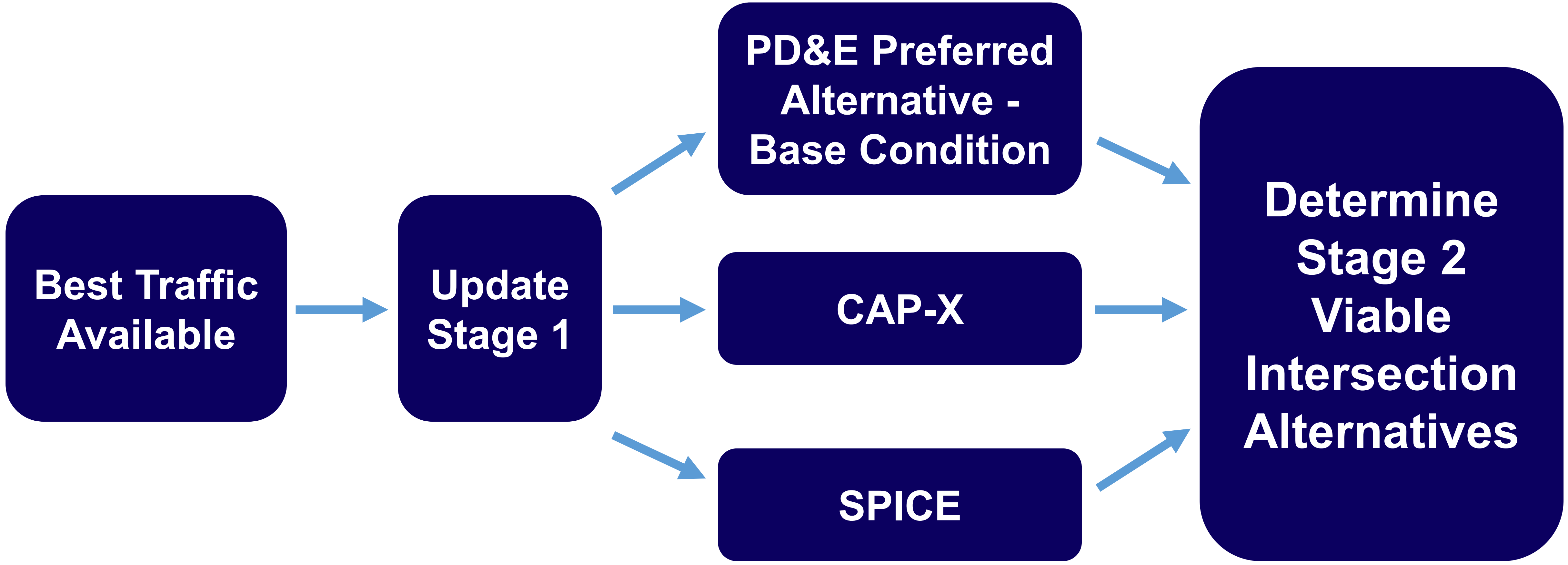
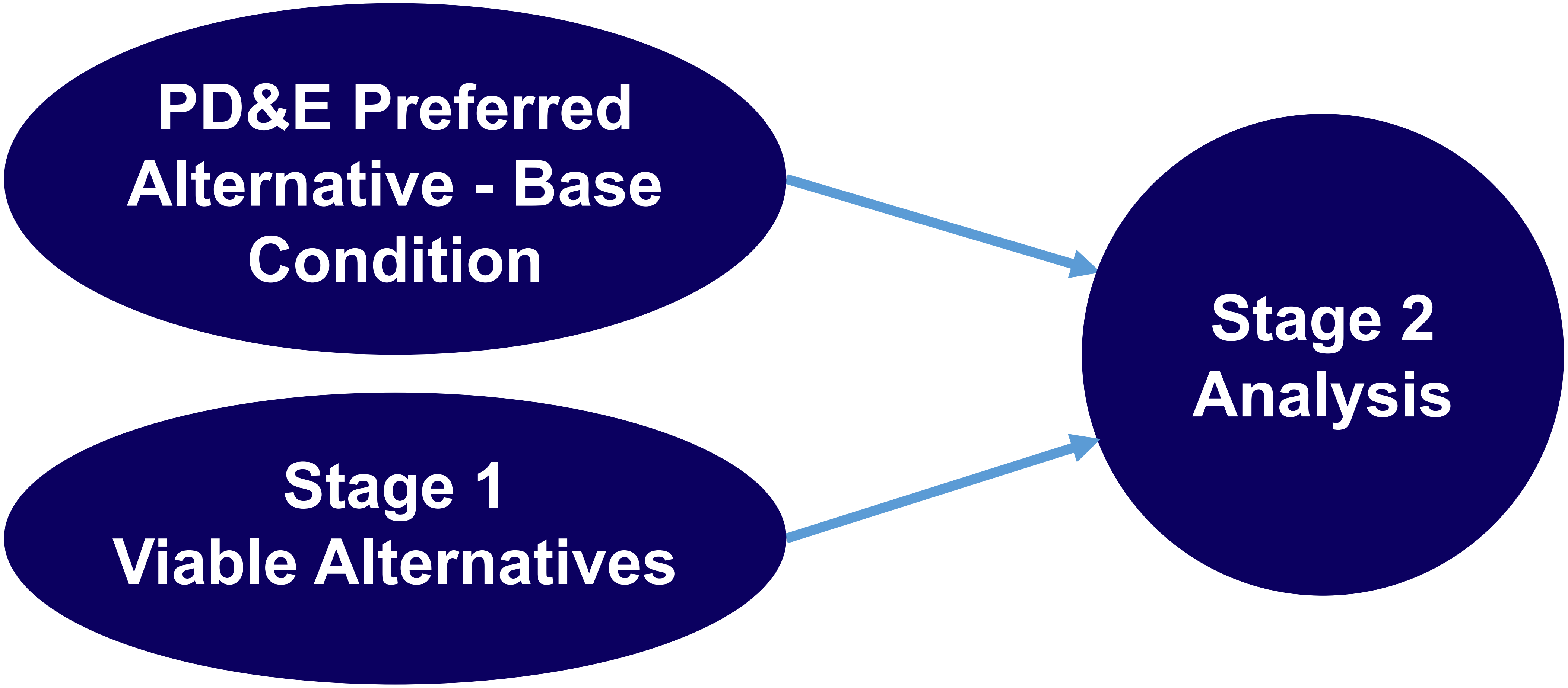
What Happens When Stage 2 is Deferred to Final Design?



Redo Stage 1 Analysis



Determine Viable Intersection Alternatives



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Stage 2 Operations Analysis

Stage 2 Analysis

Concept Development

R/W Cost Analysis

Construction Cost Analysis

Operational Analysis

Safety Analysis

Benefit-Cost & Net Present Value Analysis

Recommend Intersection Form

Stage 2 Safety Analysis

Stage 2 Analysis →

- Concept Development
- R/W Cost Analysis
- Construction Cost Analysis
- Operational Analysis
- **Safety Analysis**
- Benefit-Cost & Net Present Value Analysis

→ **Recommend Intersection Form**

Economic Analysis Tool

Stage 2 Analysis

- Concept Development
- R/W Cost Analysis
- Construction Cost Analysis
- Operational Analysis
- Safety Analysis
- Benefit-Cost & Net Present Value Analysis

Recommend Intersection Form

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Stage 2 ICE Form

Control Strategy Evaluation		
Provide a brief justification as to why each of the following is either viable or not viable. If a single control strategy is recommended, select it as the only strategy to be advanced.		
Control Strategy	Strategy to be Advanced?	Justification
Signalized Control	No	Middle regarding delay; poorest regarding safety. Lowest Benefit-Cost ratio and Lowest Net present value
Roundabout (2-lane)	Yes	While highest regarding delay, not significantly higher; best regarding safety; best Benefit-Cost ratio and net present value.
Median U-Turn	No	Best regarding delay; middle regarding safety; middle Benefit-Cost ratio and middle Net present value
Restricted Crossing U-turn (Signalized)	No	Second regarding delay; middle regarding safety; middle Benefit-Cost ratio and middle Net present value

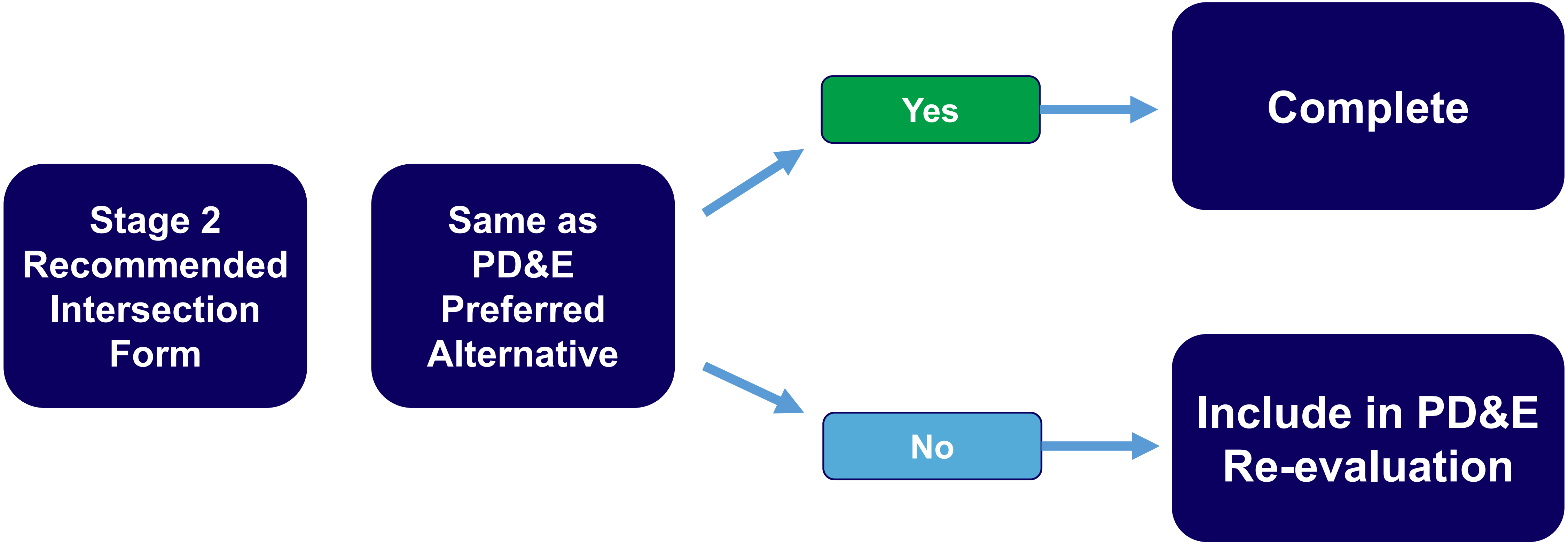
Resolution					
To be filled out by FDOT District Traffic Operations Engineer and District Design Engineer					
Project Determination					
Comments					
DTOE Name		Signature		Date	
DDE Name		Signature		Date	

Poll Question

When Stage 2 ICE is conducted in Final Design, at what design phase should the ICE analysis be conducted?

- Phase 1/30%
- Phase 2/60%
- Phase 3/90%

Outcome if the Previous Preferred Intersection Changes?



CONCLUSION

Module 1 → Module 2 → Module 3

Module 2 Q&A

ICE in PD&E

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FDOT Intersection Control Evaluation (ICE) Training

ICE Process in PD&E Overview and Updates

Module 3

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Agenda

Module 1

ICE Overview

Module 2

ICE in PD&E

Module 3

Example Exercises

Module 3

Example Exercises

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Module 3 Agenda

US 98 Project Example

Conducting Stage 1 ICE

Identify Viable Intersection Forms

Conducting Stage 2 ICE

During Final Design With PD&E Re-evaluation

During PD&E Study

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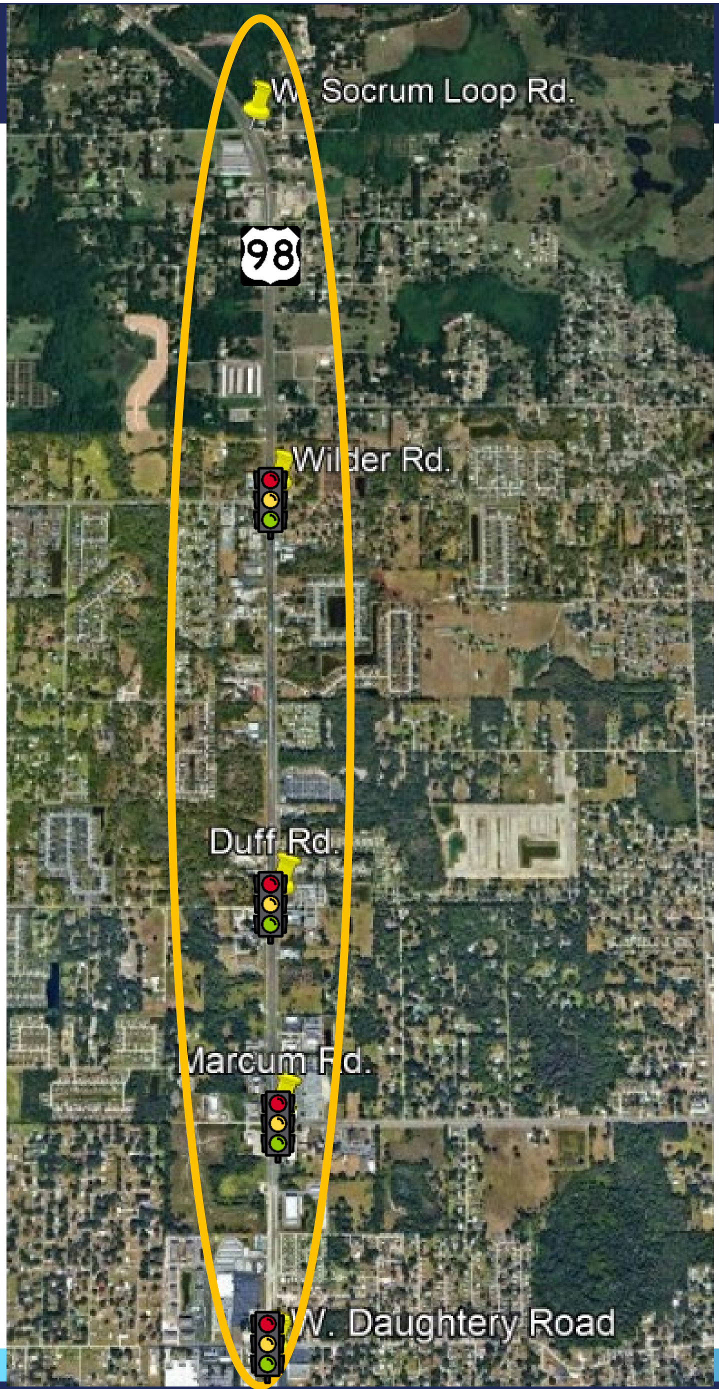
US 98 Example

- 4-lane divided, planned to become 6-lane divided
- C-3C Context Classification
- 50-mph speed limit
- Final design funded in Work Program's 5th year
- Stage 2 ICE deferred



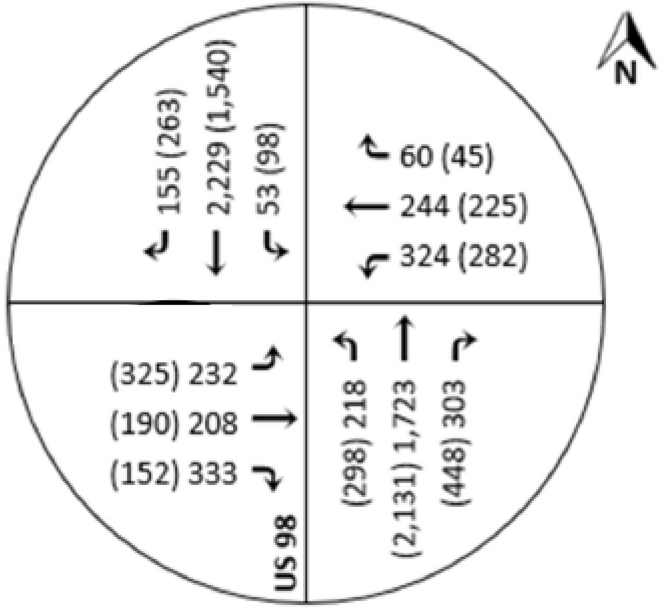
US 98 Example – Stage 1 ICE

PTAR advanced and design year traffic volumes are available

CAP-X and SPICE analyses conducted

Traffic Volumes for ICE Stage 1

Design Year 2045



AM (PM) Turning Movement Volumes

US 98 Example – CAP-X Results

TYPE OF INTERSECTION	Overall V/C Ratio	V/C Ranking	Pedestrian Accommodation Score	Bicycle Accommodation Score
Displaced Left Turn	0.59	1	2.92	2.74
Partial Displaced Left Turn N-S	0.78	2	2.68	2.74
Partial Median U-Turn N-S	0.83	3	2.70	4.08
Median U-Turn N-S	0.84	4	2.84	4.08
Signalized Restricted Crossing U-Turn N-S	0.90	5	2.76	3.49
Traffic Signal	0.98	6	4.67	4.08

Displaced Left Turn best operations and Traffic Signal poorest operations.
Traffic Signal best for Ped/Bike.

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US 98 Example – Stage 1 SPICE

Crash Prediction Summary								
Control Strategy	Crash Type	Opening Year	Design Year	Total Project Life Cycle	Crash Prediction Rank	AADT Within SPF Prediction Range?		Source of Prediction
						Opening Year	Design Year	
Traffic Signal	Total	19.74	25.93	479.09	4	Yes	Yes	Uncalibrated SPF w/ EB
	Fatal & Injury	6.73	8.74	162.31				
Partial Displaced Left Turn (PDLT)	Total	17.37	22.82	421.60	3	N/A	N/A	CMF
	Fatal & Injury	5.92	7.69	142.83				
Full Median U-Turn (MUT)	Total	12.44	16.34	301.83	2	N/A	N/A	CMF
	Fatal & Injury	5.11	6.64	123.35				
Signalized RCUT	Total	15.20	22.12	390.50	1	Yes	Yes	Uncalibrated SPF
	Fatal & Injury	3.52	5.33	92.48				

Restricted Crossing U-Turn has best crash prediction with MUT and DLT close behind.

Traffic Signal has poorest crash prediction

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US 98 Example – Stage 1 SPICE

Crash Prediction Summary	SSI Score		
Control Strategy	Opening Year	Design Year	SSI Rank
Traffic Signal	60	44	3
Partial Displaced Left Turn (PDLT)	46	29	4
Full Median U-Turn (MUT)	81	71	1
Signalized RCUT	76	65	2

Median U-turn has best SSI score with RCUT close behind. Traffic Signal ranked 3rd with DLT being poorest.

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US 98 Example – Stage 1 ICE Approval

Control Strategy	CAP-X Outputs				SPICE Outputs		Strategy to be Advanced?	Justification
	V/C Ratio		Ped Accom. Score	Bike Accom. Score	Crash Prediction Rank	SSI Rank		
	Weekday AM Peak	Weekday PM Peak						
Signalized Control	1.18	0.98	4.67	4.08	4	3	Yes	Existing condition - advanced for comparison purposes.
Median U-Turn	0.73	0.84	2.84	4.08	2	1	Yes	Good alternative for future study.
Median U-Turn (Partial)	0.78	.83.	2.70	4.08			Yes	Good alternative for future study.
Restricted Crossing U-turn (Signalized)	0.83	..90	2.76	3.71	1	2	Yes	Good alternative for future study.
Displaced Left-Turn (Partial)	0.88	0.85	2.92	2.74	3	4	No	Crossover LT volumes are too low. R/W impacts may be high.

Send to DTOE and DDE for approval

Get approval before or after conducting an Alternatives Public Meeting

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US 98 Example – PD&E Preferred Alternative

Stage 1 ICE

Viable Intersection Alternatives

- No Build – Traffic Signal
- Build – MUT, Partial MUT & RCUT

PD&E

- Concept Development
- R/W Cost Analysis
- Construction Cost Analysis
- Operational Analysis
- Safety Analysis
- Benefit-Cost & Net Present Value Analysis

Suggested but not required

Select Preferred Intersection Form

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Poll Question

When Stage 2 ICE is deferred to final design, how is the intersection preferred alternative selected?

- Use Stage 2 ICE without DTOE & DDE approval.
- Using the normal PD&E alternatives analysis process.
- Alternative having the lowest crash prediction.

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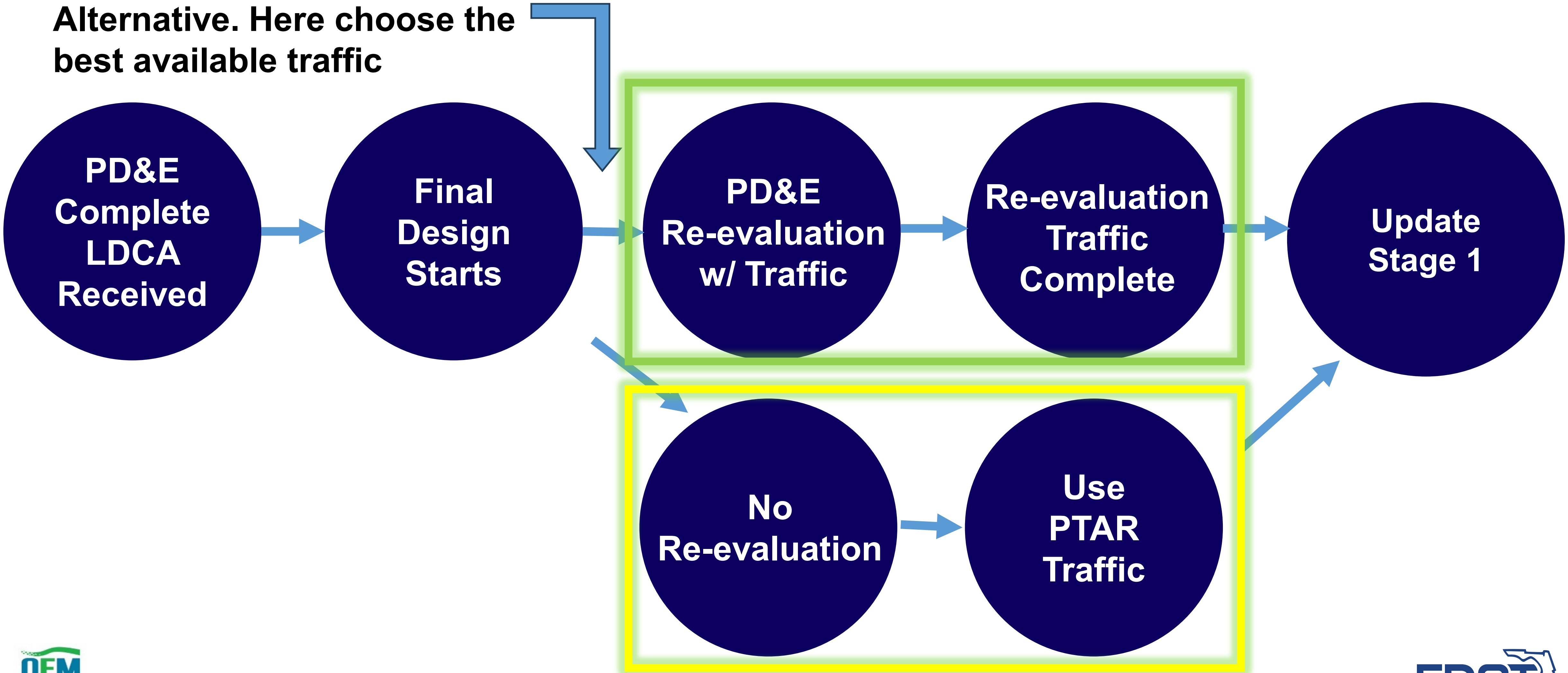
US 98 Example – PD&E Receives LDCA

Re-evaluate PD+E Preferred Alternative. Here choose the best available traffic



Poll Question

You are initiating Stage 2 ICE with the start of final design. What is your initial step?

- Retrieve the Stage 1 ICE conducted in PD&E
- Choose the best traffic data for the Stage 2 ICE analysis
- Determine the base condition for the Stage 2 ICE analysis

US 98 Example - Initiate Final Design

Use Re-evaluation Traffic

PD&E Complete LDCA Received → **Final Design Starts** → **PD&E Re-evaluation with Traffic** → **Re-evaluation Traffic Complete** → **Update Stage 1**

All analysis should be on the design year condition

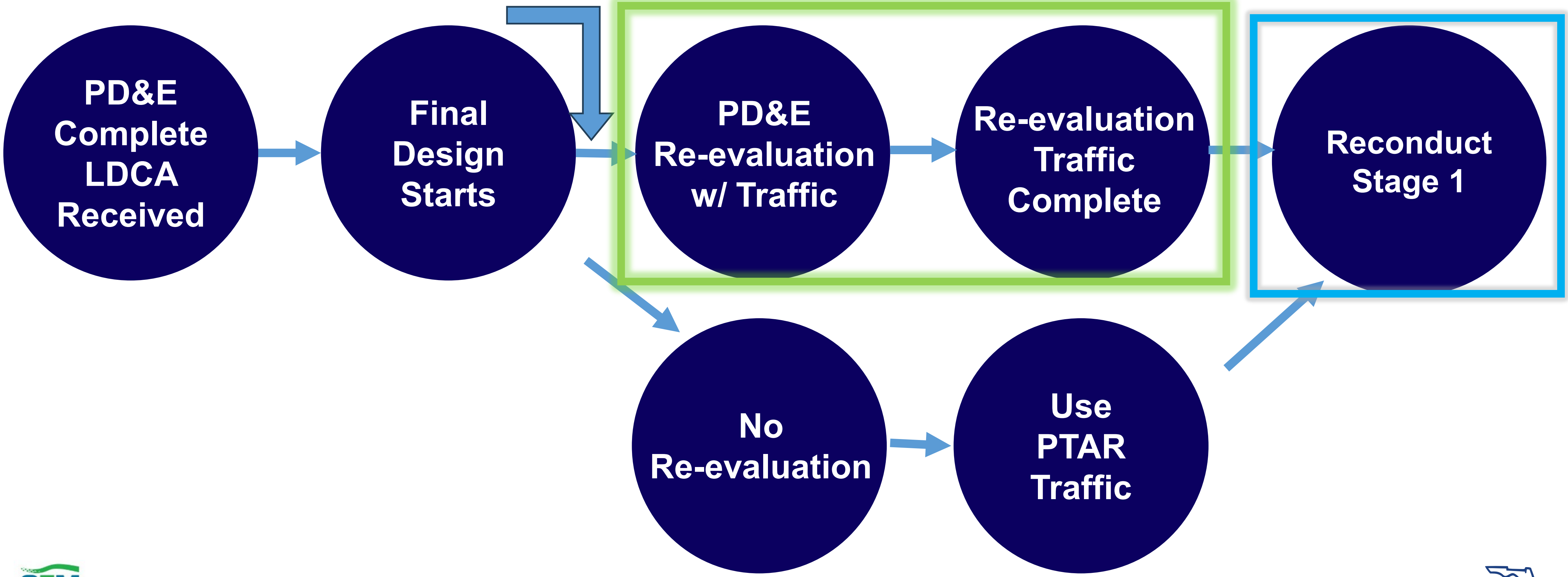
PD&E Preferred Alternative Still the Best Alternative?

The big question:

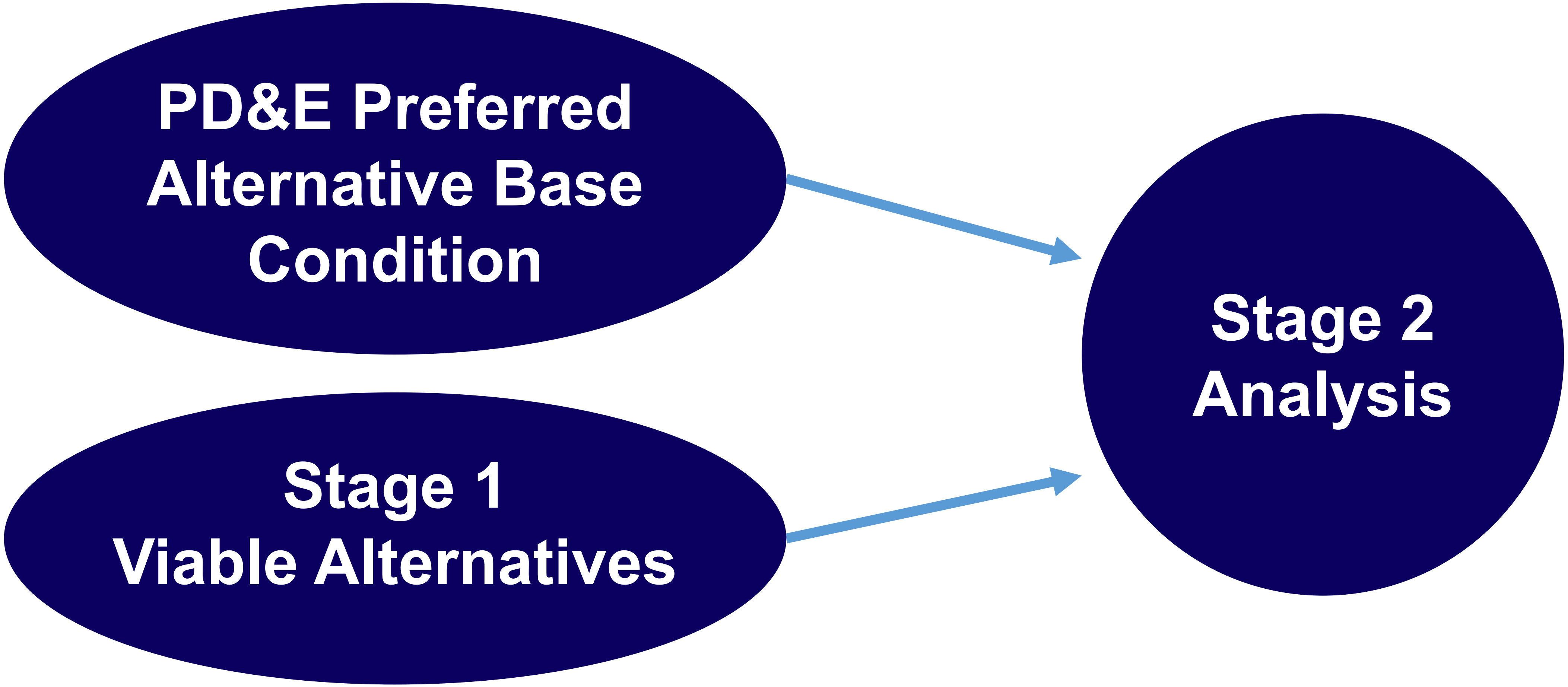
Is the PD&E Preferred Alternative still the best alternative?

Reconduct Stage 1 ICE

Re-evaluate PD+E Preferred Alternative. Here choose the best available traffic volumes

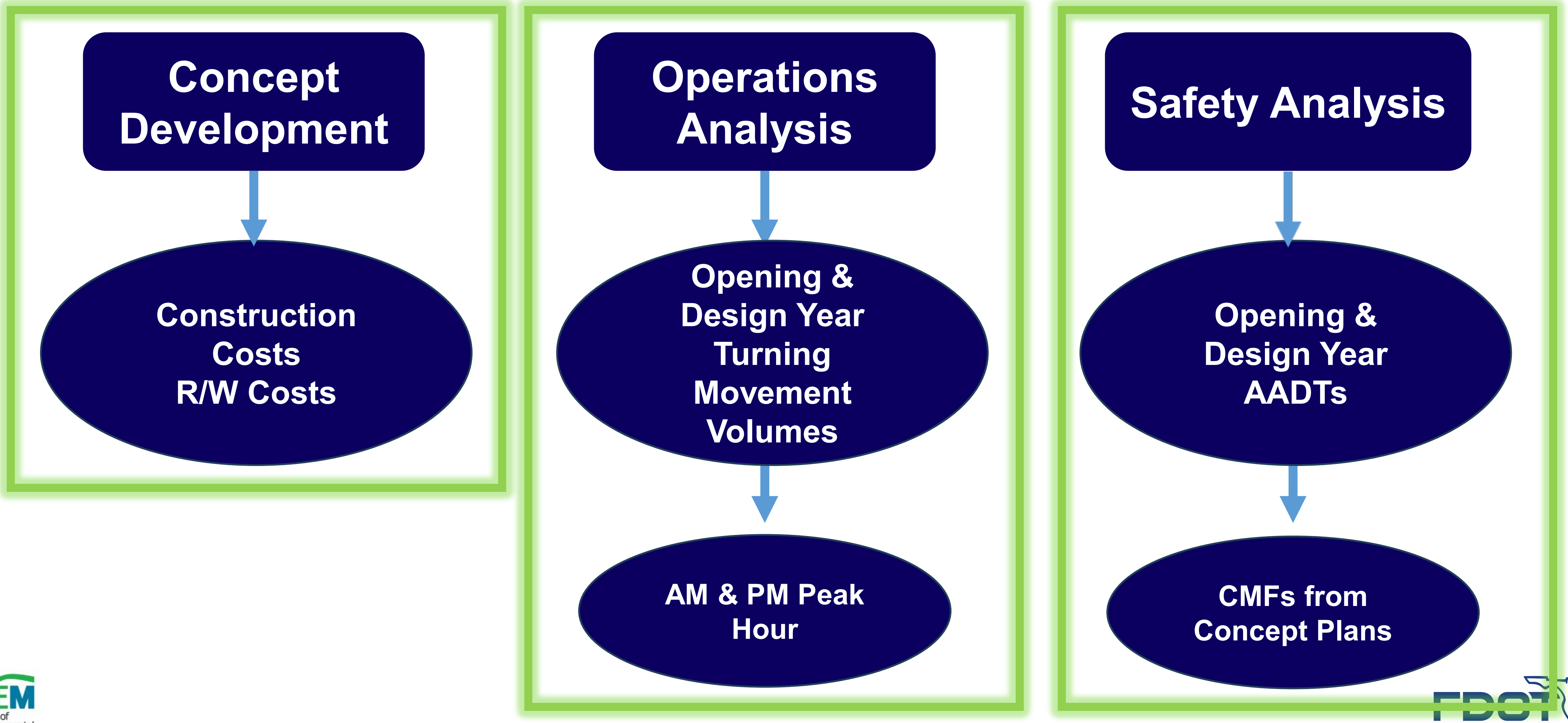


Determine Viable Intersection Alternatives



Initiate Stage 2 analysis

STAGE 2 DATA NEEDS



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Determine Stage 2 preferred alternative

Synchro/Sidra – Intersection Delay

SPICE Annualized Crash Prediction

Design, Construction & R/W Costs

FDOT Economic Analysis Tool for ICE

Benefit-Cost & Net Present Value

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Complete Stage 2 ICE Form

Control Strategy Evaluation		
Provide a brief justification as to why each of the following is either viable or not viable. If a single control strategy is recommended, select it as the only strategy to be advanced.		
Control Strategy	Strategy to be Advanced?	Justification
Signalized Control	No	Poorest operations and safety results.
Median U-Turn	No	High minor road LT volumes in both the EB and WB directions result in a two lane u-turn movement.
Median U-Turn (Partial)	Yes	Minor road high LT volumes get direct LT movement reducing major road u-turn volume. Improves intersection operations.
Restricted Crossing U-turn (Signalized)	No	High minor road LT volumes in both the EB and WB directions result in a two lane u-turn movement.

Sent to DTOE and DDE for approval

Poll Question

In completing Stage 2 ICE during final design, what is the fundamental question you are trying to answer?

- PD&E Preferred Alternative is still the best alternative.
- PD&E Preferred Alternative turn lane storage length is adequate
- PD&E Preferred Alternative is acceptable to the public.

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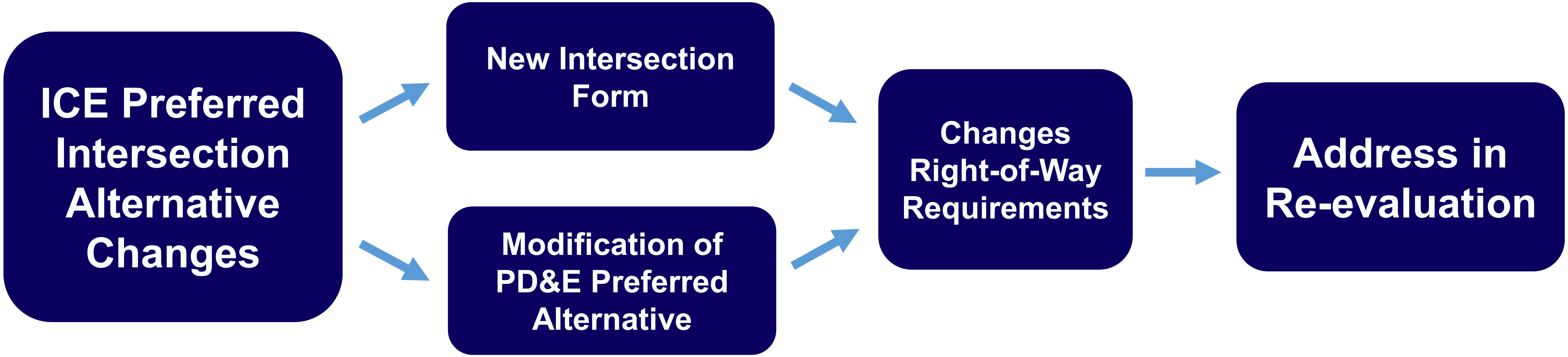
Intersection Concept Changes



ICE Manual Stage 2 Guidance

Stage 2 Performed During PD&E Study?

Yes

1. Final design immediately follows PD&E
2. Combined PD&E & design project
3. Programmed as a design-build

Located in ICE Manual Section 2.5.2

Incorporate into the PD&E's evaluation process

Stage 1 ICE → **Viable Intersection Alternatives**

Initiate Stage 2 ICE

Concept Development

R/W & Construction Costs

Operation & Safety Analysis

Conduct Benefit-Cost & Net Present Value Analysis

Show Alternative at PD&E Public Meeting

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Incorporate into the PD&E's evaluation process

EVALUATION FACTORS	Alternative	8-Lane US 41 with Traffic Signal	6-Lane US 41 with Partial Displaced Left Turn	No Build
TRAFFIC OPERATIONS				
US 41/Bonita Beach Road Intersection 2050 Average Vehicle Delay in Seconds (Midday/PM)		71/93	69/98	231/256
Net Present Value[1] (Compared to No-Build)		$263,360,000	$314,380,000	N/A

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Stage 2 ICE Approval During PD&E

The preferred alternative is selected based on the combination of the ICE and PD&E

Prepare Stage 2 ICE

↓

Select Preferred Alternative

↓

Conduct Environmental Analysis

→

Submit Stage 2 ICE Form to DTOE & DDE

↓

Include Stage 1 & Stage 2 Approved ICE Forms in PER

↓

Place on Public Hearing Public Display

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Poll Question

When conducting Stage 2 ICE during the PD&E project, when should the Stage 2 ICE Form receive DTOE and DDE approval?

- Prior to receiving Location Design Concept Approval (LDCA).
- Prior to conducting the Public Hearing
- Prior to PD&E's preferred alternative being selected

When is ICE Complete?

Within PD&E → ICE Stage 2 Preferred Alternative NOT Signed by DTOE & DDE → PD&E Selects Preferred Alternative → PD&E Receives LDCA → ICE Complete

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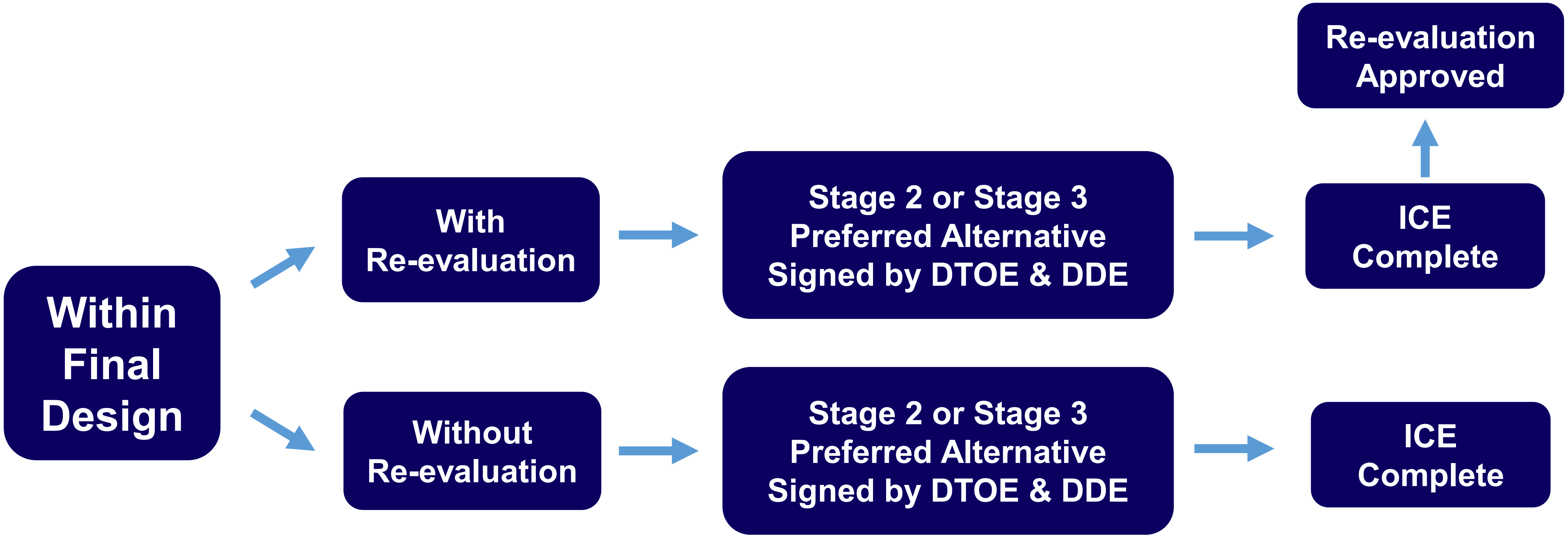
When is ICE Complete?



CONCLUSION

Module 1 → Module 2 → Module 3 ✓

Questions?

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Module 3 Q&A

Example Exercises

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July 2025