

Virginia Intersection and Interchange Control Assessment Program

Technical Session 4

VASITE Annual Meeting 2022 | June 16, 2022

Virginia iCAP

- **Intersections**
 - Critical aspect of roadway network
 - Convergence of modes
 - Successful configuration/control choice is vital to safety and mobility
- **Session agenda**
 - An Introduction to Virginia Intersection & Interchange Control Assessment Program (Virginia iCAP)
 - Why Virginia iCAP? - Stories from across the Commonwealth
 - Let's do it! - Interactive Session with Audience and Virginia iCAP Tool

AN INTRODUCTION TO Virginia Intersection and Interchange Control Assessment Program

Policy, Tool, Guidebook, and Outreach

VASITE Annual Meeting 2022 | June 16, 2022

Sanhita Lahiri, P.E., PTOE
VDOT

FHWA – Intersection Control Evaluation (ICE)

“Intersection Control Evaluation (ICE) is a data-driven, performance-based framework and approach used to objectively screen alternatives and identify an optimal geometric and control solution for an intersection.”

– FHWA

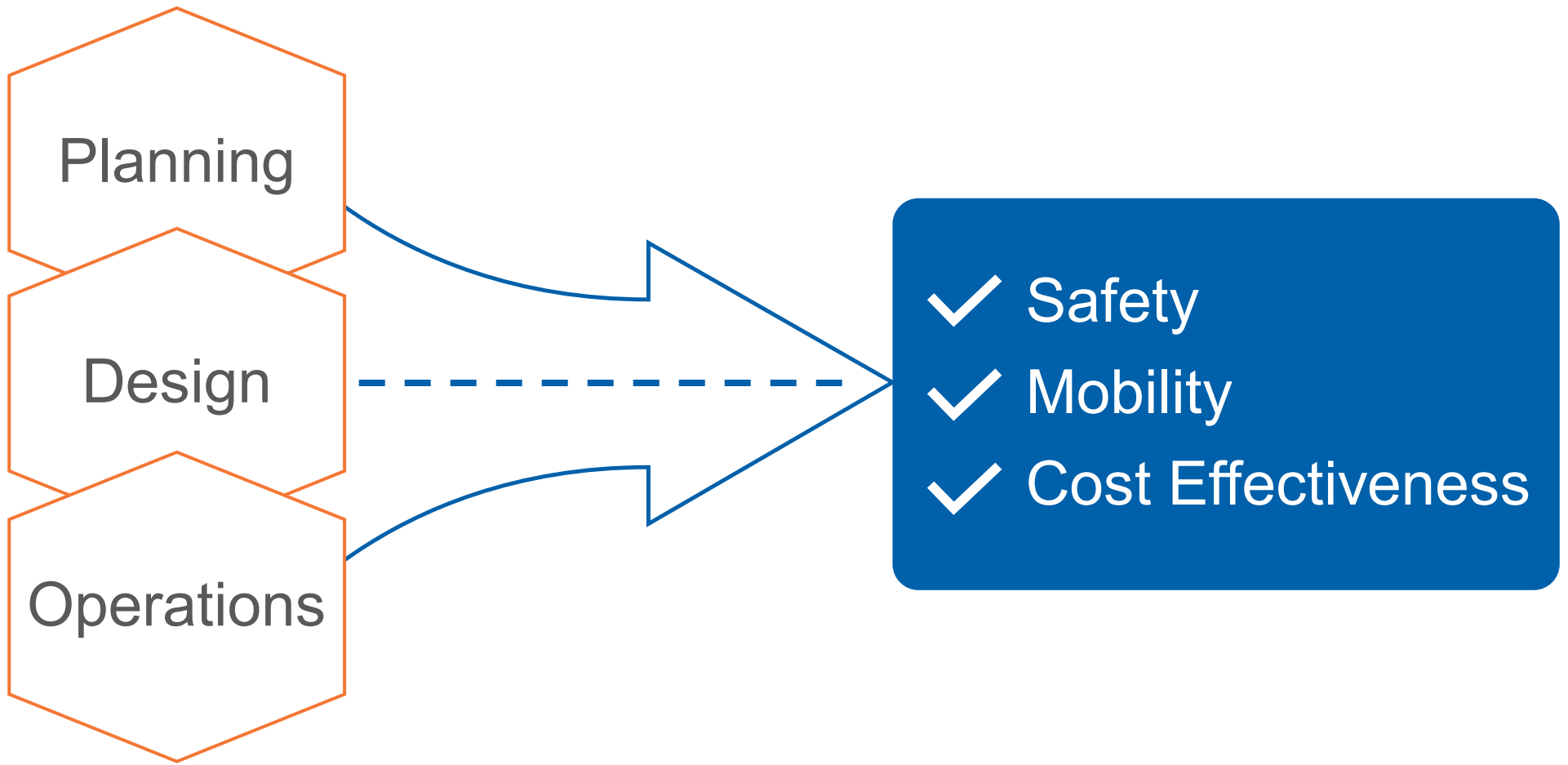
<https://safety.fhwa.dot.gov/intersection/ice/fhwasa18076.pdf>

Vision

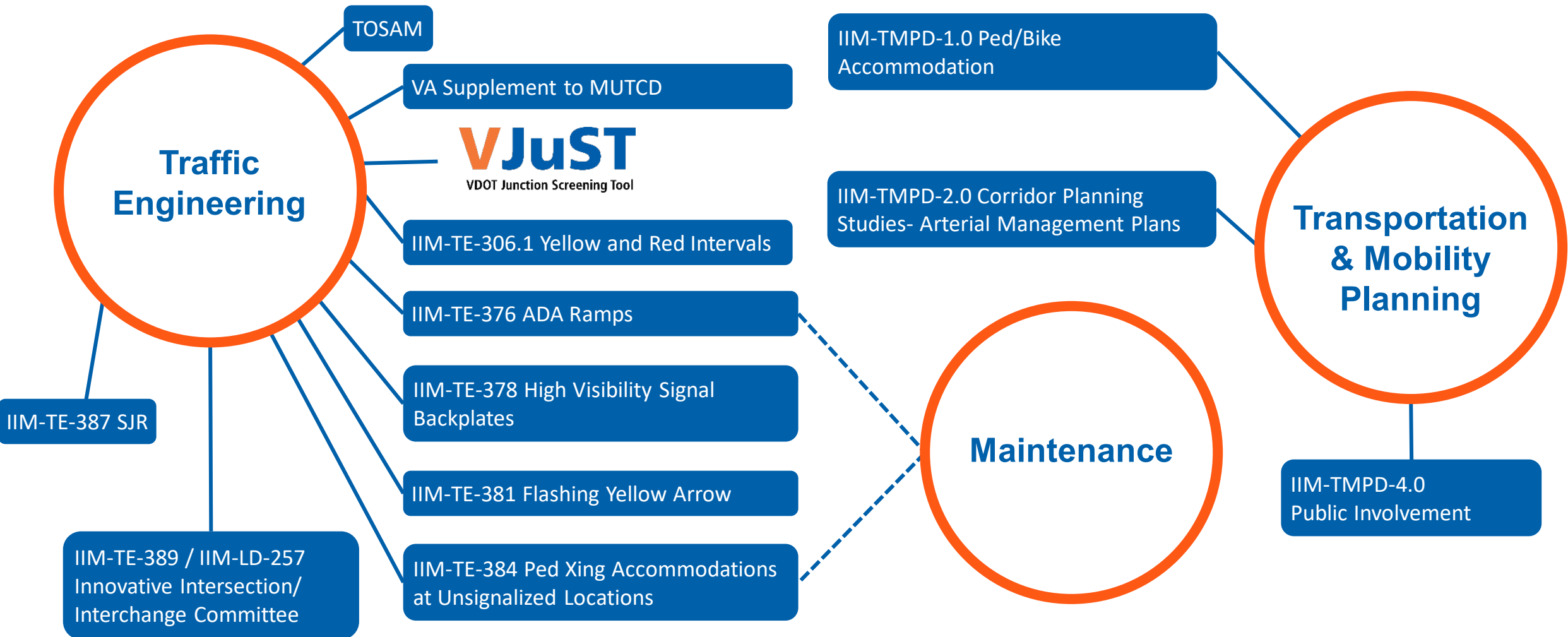
Consider intersection control holistically

**safety • accessibility • congestion
mode choice • cost effectiveness
asset condition • sustainability
quality of life for all users**

Virginia iCAP Policy Framework



Current Policy Landscape with Virginia iCAP Elements



Current Policy Landscape with Virginia iCAP Elements



Virginia iCAP Development and Guidance Team

Program Manager – Sanhita Lahiri, VDOT

Technical Working Group

District	Anne Booker (<i>District Maintenance Engineer</i>) Sean Nelson (<i>District Engineer</i>)
Transportation & Mobility Planning Division	Ben Mannell (<i>Assistant Division Administrator</i>)
Location & Design Division	Federico Gontaruk (<i>Design</i>) George Rogerson (<i>Policy</i>)
Office of Land Use	Rob Hofrichter (<i>Director</i>)
Traffic Engineering Division	Mena Lockwood (<i>Assistant State Traffic Engineer</i>) Stephen Read (<i>Safety</i>) Matt Bonacci (<i>Signal</i>) Allan Yue (<i>Analysis</i>)
Communications Division	Emily Wade (<i>Assistant Director</i>)
Virginia Division	Karen King (<i>Safety</i>) Mour Diop (<i>Environmental</i>)



Kimley»Horn



Tim White (*Project Manager*), Andy Nagle (*Deputy Project Manager*)

Kirsten Tynch (*Project Manager*)



Bryan Katz

Stakeholder Reviewers



- District Traffic Engineers
- Transportation Land Use Directors
- Residency Engineers/ Administrators
- Innovative Intersection Committee
- Virginia iCAP Champion



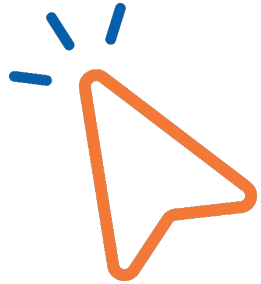
Virginia Intersection & Interchange Control Assessment Program (Virginia iCAP)
Policy, Tool, Guidebook, and Outreach

6/16/2022

Virginia iCAP Elements



Policy
IIM-TE-397



Assessment
Tool



Guidebook



Outreach

- Training
- Brochure
- Website

Virginia iCAP Policy (IIM-TE-397) Outline

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1.0 Purpose and Need

2.0 Definitions

3.0 Background

4.0 Standards

4.1 Virginia iCAP Process

4.2 Virginia iCAP Tool and Guidebook

4.3 Virginia iCAP Approval

5.0 Effective Dates and Applicability

5.1 Effective Dates

5.2 Project Applicability

5.3 Assessment Stage – Planning vs. Implementation

5.4 Virginia iCAP and Interchange Access Report (IARs)

6.0 References

VIRGINIA DEPARTMENT OF TRANSPORTATION	
TRAFFIC ENGINEERING DIVISION	
INSTRUCTIONAL & INFORMATIONAL MEMORANDUM	
GENERAL SUBJECT: Virginia Intersection and Interchange Control Assessment Program (iCAP) Policy and Guidance	NUMBER: IIM-TE-397
	SUPERSEDES: None
SPECIFIC SUBJECT: Requirements for intersection control assessment techniques to determine appropriate traffic control elements for new or modified intersections.	DATE: XXX XX, 2022
APPROVAL:	
/NOT YET SIGNED/ Raymond J. Khoury, P.E. State Traffic Engineer Richmond, VA Month XX, 2022	
1.0 PURPOSE AND NEED <p>According to the Federal Highway Administration (FHWA), Intersection Control Evaluation (ICE) is a data-driven, performance-based framework and approach used to objectively screen alternatives and identify an optimal geometric and control solution for an intersection or interchange¹. FHWA recommends that state agencies adopt an ICE policy. The Virginia Department of Transportation (VDOT) has adopted principles from the FHWA ICE framework to establish the Virginia Intersection and Interchange Control Assessment Program (Virginia iCAP), and this IIM serves as VDOT's policy.</p> <p>This Memorandum serves to:</p> <ul style="list-style-type: none"> • Convey goal of establishing Virginia iCAP as the ICE policy for VDOT. • Establish VDOT's process and requirements for evaluating intersection and interchange ramp termini control and configuration. • Provide guidance on how VDOT, localities, and private developers should consider and evaluate traffic control and intersection configuration throughout the project development process. 	
<small>¹ Source: <i>Intersection Control Evaluation Primer (FHWA-SA-18-076)</i>, FHWA Office of Safety, 2020.</small>	
<small>Page 1 of 10</small>	
<small>DRAFT – NOT FOR RELEASE: May 13, 2022</small>	

IIM-TE-397 – Snapshot

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4.0 Standards

4.1 Virginia iCAP Process

Virginia iCAP Process

APPLICABILITY

IS THE PROCESS REQUIRED?

- Project Location
 - On APN
 - Off APN
- Project Purpose and

ASSESSMENT STAGE 1

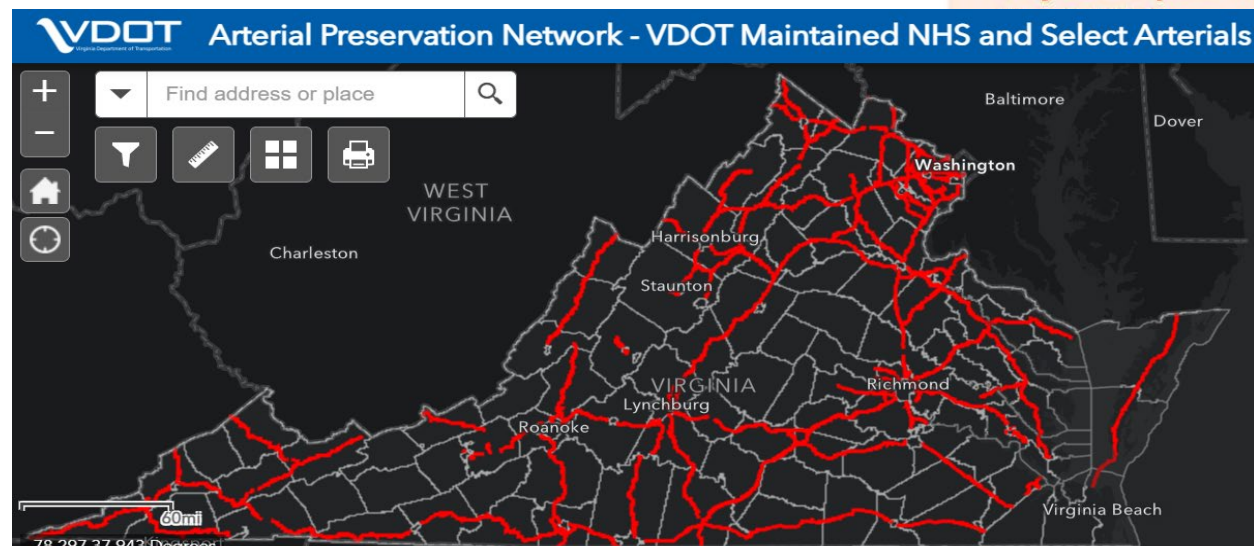
SCREENING TO ESTABLISH A LIST OF VIABLE INTERSECTION TYPES

- Congestion (V/C)
- Safety (Conflict Points)
- Ped/Bike (Accommodation)
- Cost (Planning Level)

ASSESSMENT STAGE 2

EVALUATE ALTERNATIVES TO NARROW SELECTION

- Traffic Operations (MOEs based on PPN)
- Safety (Crash and Crash Reduction)
- Cost (Right of Way, Construction)
- Optimal Benefit



APN = VDOT Arterial Preservation Network

IIM-TE-397 – Snapshot

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4.0 Standards

4.1 Virginia iCAP Process

Facility Type	Intersection Location		
	On APN	Off the APN and Signal Recommended	Off the APN and Signal <i>NOT</i> Recommended
On VDOT-maintained road	Full iCAP assessment required	Conduct Stage 1 iCAP assessment and warrant study per the latest version of IIM-TE-387	iCAP not required
On locality-maintained road (to be constructed using state or federal funds)	Full iCAP assessment required	Conduct Stage 1 iCAP assessment and warrant study per the latest version of IIM-TE-387	iCAP not required
On locality-maintained road (constructed using funds other than state or federal funds)	This IIM does not apply. However, localities must still prepare signed and sealed signal warrant studies as required by the MUTCD.	This IIM does not apply. However, localities must still prepare signed and sealed signal warrant studies as required by the MUTCD.	iCAP not required



What will happen to Signal Justification Report (SJR) requirements?

Virginia iCAP will lead the process.

IIM-TE-387 (SJR) is being revised to reflect Warrant Study

IIM-TE-397 – Snapshot

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5.0 Effective Dates and Applicability

5.2 Project Applicability



**Virginia iCAP
Best Practice for All Intersections**

Applicability

- **All projects on APN**
 - VDOT-administered
 - Locality-administered
 - Land use permit requests
 - In-house study
 - Design projects
- **Projects not on the APN which propose a new or modified traffic signal**

APN = Arterial Preservation Network

IIM-TE-397 – Snapshot

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Examples of projects that may not require iCAP assessment

- New turn lanes or other auxiliary lanes without modifications to existing traffic control
- Modifications to existing signal phasing or timing
- New or modified pedestrian or bicycle accommodations
- Emergency repairs
- Maintenance work
- Locations with a previously VDOT-approved SJR if approved within 2 years and/or if conditions haven't changed
- Reconstruction of existing signal equipment
- Replacement of signal controllers and/or upgrades to controller software that does not alter the operation or display of pedestrian signals
- Installation of other sign, signal, communication, or ITS equipment
- Pavement marking installation or maintenance, including revisions to crosswalk marking patterns
- In-pavement detector installation or replacement
- Installation of a crosswalk

Projects excluded from performing a Virginia iCAP assessment should be verified and documented with **District Traffic Engineer** or their designee.

Virginia iCAP Assessment Process

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iCAP

Virginia iCAP Tool

Virginia Intersection and Interchange
Control Assessment Program

*Beta Version 11.0
May 2022*



VDOT

Refer to the Virginia iCAP Guidebook for guidance on the Virginia iCAP policy and detailed instructions on the Virginia iCAP Tool

Virginia iCAP Process

APPLICABILITY

IS THE PROCESS REQUIRED?

- Project Location
 - On APN
 - Off APN
- Project Purpose and Need (PPN)
- Performance Based Practical Design

ASSESSMENT STAGE 1

SCREENING TO ESTABLISH A LIST OF VIABLE INTERSECTION TYPES

- Congestion (V/C)
- Safety (Conflict Points)
- Ped/Bike (Accommodation)
- Cost (Planning Level)

ASSESSMENT STAGE 2


EVALUATE ALTERNATIVES TO NARROW SELECTION

- Traffic Operations (MOEs based on PPN)
- Safety (Crash and Crash Reduction)
- Cost (Right of Way, Construction)
- Optimal Benefit

APN = VDOT Arterial Preservation Network

Virginia iCAP Tool – Applicability Form

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VIRGINIA iCAP APPLICABILITY FORM 

Evaluator: Date:

PROJECT LOCATION

Locality/County:

Location:

Is the project located on the Arterial Preservation Network (Yes)
 → If Yes, complete section A. If No, complete section B.

A) APPLICABILITY FOR LOCATIONS ON THE APN

PROJECT PURPOSE AND NEED:

Does the project purpose and need indicate intersection or interchange control should be No
 → If Yes, proceed to Performance Based Practical Design
 → If No, an iCAP assessment is not required

PERFORMANCE BASED PRACTICAL DESIGN:

If the existing intersection is signalized, can operational and safety issues be resolved with Not Applicable
 → If Yes, an iCAP assessment is not required
 → If No, an iCAP assessment is required

B) APPLICABILITY FOR LOCATIONS OFF THE APN

PROJECT PURPOSE AND NEED:

Is a signal recommended as the intersection traffic control Not Applicable
 → If Yes, conduct Stage 1 iCAP assessment and warrant study per the latest version of MM-TE-387
 → If No, an iCAP assessment is not required

ASSESSMENT REQUIREMENT AND APPROVAL

Document the analysis required and submit to the VDOT District Traffic Engineer or designee for approval.


Required Assessment: Full iCAP Assessment Required

Reason for Exclusion:

Justification:

VDOT District Traffic Engineer or designee approval:

Name / Signature: Title: Date:

¹ https://www.virginia.gov/programs/vdot_arterial_preservation_program.asp 

APPLICABILITY

IS THE PROCESS REQUIRED?

- Project Location
 - On APN
 - Off APN
- Project Purpose and Need (PPN)
- Performance Based Practical Design

Virginia iCAP Tool Assessment Summary

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iCAP ASSESSMENT OUTPUT

Evaluator Name: Evaluation ID:

Applicability and Project Purpose

Locality/County	
Location	
Is the Project Located on the AF	
Project Description	
Current Year	
Design Year or Future Year	

Project Purpose and Need

VTrans Identified Needs

VTrans Need	Priority	Options
Capacity Preservation		
Congestion Mitigation		
Pedestrian Access		
Pedestrian Safety Improvement		
Bicycle Access		
Safety Improvement		
Reliability		
IEDA (UDA) Access		
Rail On-time Performance		
Transit Access		
Transit Access for Equity Emphasis Administration Demand Management		

Metric Priority Based on Need

Metric	Priority	Justification
Traffic Operations	Moderate (2)	good
Pedestrian	Low (1)	nice
Safety	Moderate (2)	ok
Cost	High (3)	sorry

Volume Data, Crash History, and Multimodal Information

Assessment Scenario Volume Data						
Direction	Volume (veh/hr)			Truck %	Daily Pedestrian	Daily Bicycle
	U-Turn /	Through	Right			
Eastbound						
Westbound						
Northbound						
Southbound						

5-Year Crash Data Summary (2015-2019)				
Crash Analysis Years	From:	2015	To:	2019
Fatal + Injury Crashes		35		
Pedestrian Crashes		1		
Bicycle Crashes		2		

Existing Multimodal Accommodations

Pedestrian	
Bicycle	
Transit	None

Multimodal Accommodations

Crash History

Page 1 of 2

iCAP ASSESSMENT OUTPUT

Stage 1: Alternatives Screening Performance Matrix

Stage 1 Assessment

Alternative	Traffic Operations		Pedestrian Metric		Safety Metric		Stage 1 Cost		Total Stage 1 Score	Selected for Stage 2 Analysis?
	VJuST Maximum	Score	Accommodation	Score	Conflict Points	Score	Cost Category	Score		
Base Condition	--	--	--	--	--	--	--	--		Yes this one is good
										No bad

**Traffic Operations
Pedestrian Accommodation
Safety
Cost**

Stage 2: Alternatives Screening Performance Matrix

MOE 1: 35

Alternative	Traffic Operations			Pedestrian Metric Score	Safety Metric		Stage 2 Cost		Total Stage 2 Score	Preferred Alternative?
	MOE 1	MOE 2	Total Score		Annual F+I Crash	Score	VJuST-Cost	Score		
					0.00					No: bad
					0.00					Yes
					0.00					
					0.00					
					0.00					

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Stage 2 Assessment

Virginia iCAP Guidebook Chapter Outline

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Chapter 1. Virginia iCAP Policy and Background

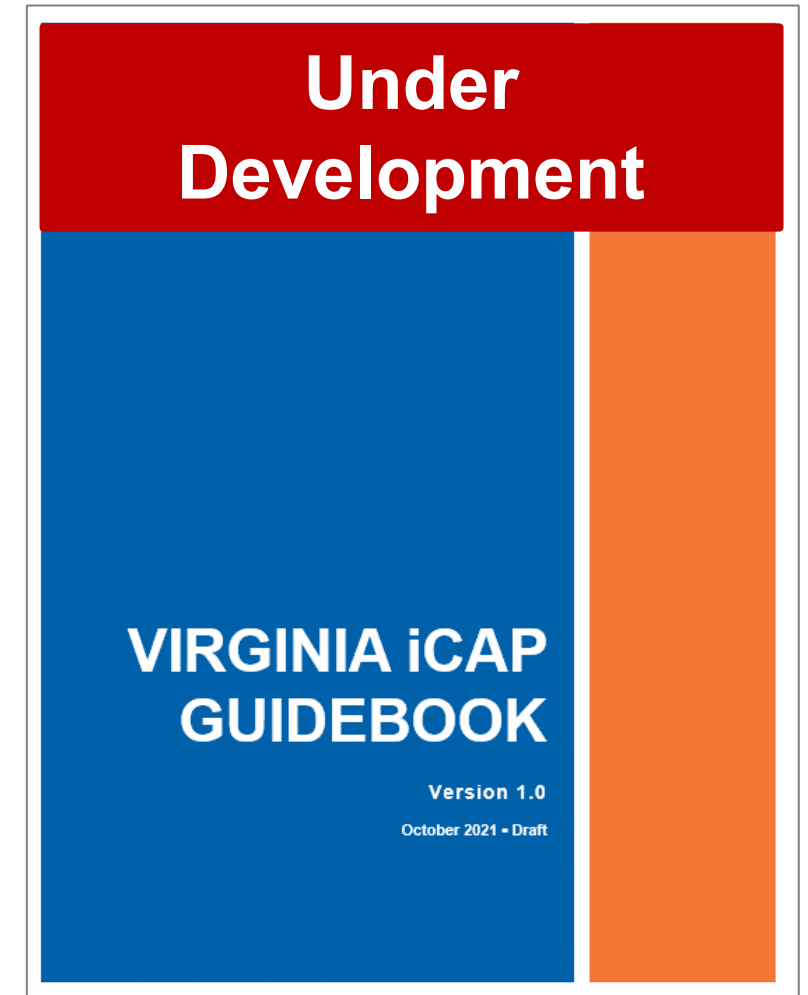
- 1.1 Overview of the Virginia iCAP Policy
- 1.2 Relationship to other VDOT Initiatives
- 1.3 Guidebook Organization

Chapter 2. Virginia iCAP Assessment Process

- 2.1 Applicability
- 2.2 Assessment Stage 1: Alternatives Screening
- 2.3 Assessment Stage 2: Alternatives Assessment
- 2.4 Reporting and Approvals

Chapter 3. Virginia iCAP Tool

- 3.1 Instructions
- 3.2 Applicability and General Input Worksheet
- 3.3 Metric Weighting
- 3.4 Stage 1: Alternatives Screening
- 3.5 Stage 2: Alternatives Assessment
- 3.6 Reporting
- 3.6 Troubleshooting Tool Issues



Virginia iCAP Guidebook Chapter Outline

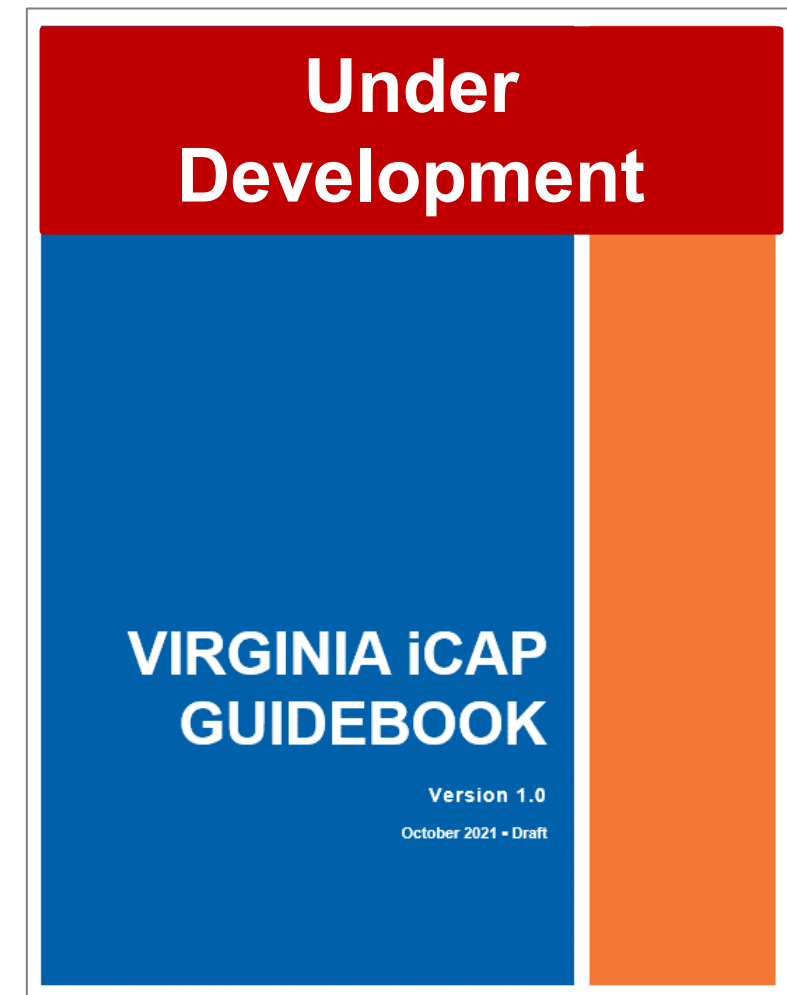
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Chapter 4. Assessment Techniques and Strategies

- 4.1 Partial and Hybrid Innovative Intersection Designs
- 4.2 Analyzing Multiple Intersections
- 4.3 Impacts to Adjacent Intersections
- 4.4 Analyzing Five-Legged Intersections
- 4.5 Analyzing Multiple Peak Periods

Appendices

- Appendix A: VJuST Configurations
- Appendix B: Virginia iCAP Assessment Applicability Form
- Appendix C: iCAP Tool Metric Scoring Methodology
- Appendix D: Example Intersection Assessments



Benefits of Virginia iCAP Process

Project –

- Consistent, Stepwise approach for Optimal Control Solution
- Objective Performance Metrics for Consistent comparisons
- Consistent Documentation to track Decision Making
- Efficiency in the Long Term

Overall –

- Consistency
- Transparency
- Accountability



Virginia iCAP Stakeholders

VDOT

District

Residencies

Divisions

OIPI

Agencies

FHWA

MPOs

PDCs

Localities

Other

Industry

Consultant

Developer

Other

Virginia iCAP Socialization Plan

High Level

- Executives,
- VDOT District Administrators,
- FHWA,
- OIPI,
- MPOs,
- Developers

Implementers

- Program/ Project Managers,
- VDOT District:
 - Traffic Engineers,
 - Planners,
 - Design Engineers,
 - Land Use Engineers
- Localities

Analysts

- Project Managers
- Consultants,
- Locality staff,
- VDOT analysts

Virginia iCAP Institutionalization

Smooth transition incorporating Virginia iCAP into:

- Upcoming planning projects/studies
- Locally or developer led projects
- SMART SCALE
- Project Pipeline
- Other VDOT policies and manuals

Knowledgeable and engaged industry who:

- Accepts Virginia iCAP as best practice

MYTH**or****FACT**

FACT *Majority of Ingredients of iCAP are in place in Virginia*

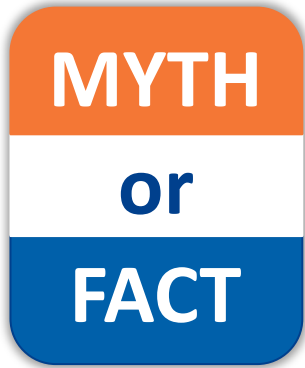
Virginia iCAP policy will bring the **consistent** consideration of these under one umbrella and include other elements that are currently not being considered **consistently**

MYTH *All intersections need to be analyzed using iCAP*

iCAP is applicable for intersections/ramp termini on **Arterial Preservation Network**. It is best practice for all intersection assessments

FACT *Some projects may NOT require iCAP Assessment*

iCAP may not be required for some projects like emergency repairs, reconstruction of existing signal equipment, etc. Projects excluded from performing a Virginia iCAP assessment should be verified and **documented with District Traffic Engineer** or their designee.



MYTH *This is another way for Central Office to control District*

- Virginia iCAP policy will be administered by the District.
- Role of **District Traffic Engineer** in Virginia iCAP process
 - Approve Virginia iCAP assessment need
 - Review and approve iCAP assessments prepared external to VDOT
 - In case a Signal is recommended on an intersection on **APN** forward iCAP assessment to the Innovative Intersection Committee for review and further recommendation to State Traffic Engineer

Virginia iCAP Timeline

Draft MUTCD Review
for Virginia iCAP
Implications



Virginia iCAP Policy IIM
Development



Virginia iCAP Tool &
Guidebook Development



Modifications to
Relevant IIMs &
Manuals



Webinar Development
& Delivery



External Rollout



VDOT, FEDERAL, & LOCALITY ENGAGEMENT



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Link to Arterial Preservation Network (APN)

<https://vdot.maps.arcgis.com/apps/webappviewer/index.html?id=6a024b2739e44b5b8599d86aa3b2c6d7>