

Arlington County Evaluation & Engineering Tools

WORKING DRAFT

PRESENTATION TO THE ACTC ON MAY 1, 2019



AGENDA

- Purpose
- The 5E Collaboration System
- Typical School Zone
- Identify Safety Issues
- Establish Countermeasures
- Communicate the Approach
- Summary

PURPOSE

1. Identify and assess safety issues in Arlington County.
2. Establish an understanding of available and applicable countermeasures to address these factors using an approach that considers engineering, enforcement, education, encouragement, and evaluation.
3. Communicate this documented, systematic, and context-sensitive approach to deploying countermeasures to improve Arlington County's streets.

THE 5E COLLABORATION SYSTEM

5 Es:

 **Engineering**

 Education

 Enforcement

 Encouragement

 **Evaluation**

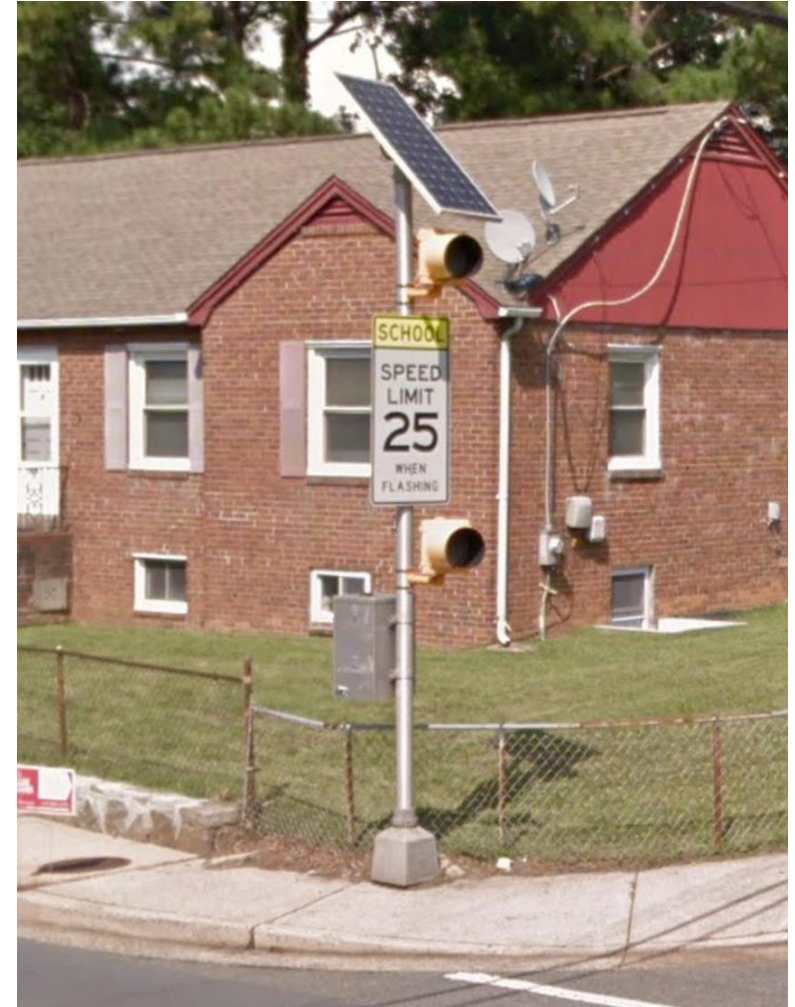
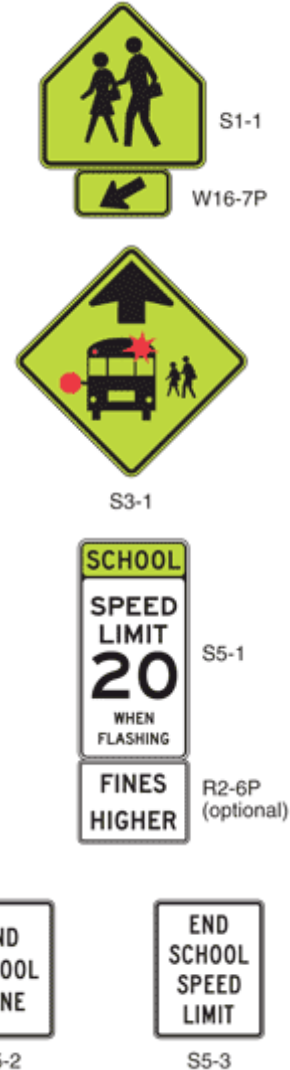
DES focuses on the "Engineering" and "Evaluation" components of the 5E collaboration system.

It is critical to acknowledge that safe streets cannot be engendered solely by these two principles alone. "Education" "Enforcement" and "Encouragement" are also needed from Arlington County staff, partners, and members of the community to realize a safe, efficient, and reliable transportation system.

TYPICAL SCHOOL ZONE

- School zone speed limit
- School zone flashers
- School zone signage
- All crosswalks marked
- Consideration of nearby crossings (crossing guards)

What happens when we need more?



#1: IDENTIFY SAFETY ISSUES

How does Arlington County identify potential safety or operational issues?

- **Routine Crash Analysis**
 - Annual report (10-year crash trends, 3-year crash patterns)
 - Systemic analysis
- **Repaving**
 - Repaving program presents an opportunity for new markings, changes to the street configuration, and other improvements
- **Projects**
 - Capital projects and smaller-scale projects involve crash review and application of mitigation strategies
- **Stakeholder Feedback**
 - Inquiries/observations from ACPD, APS, partner organizations, and members of the community

COMMON ISSUES



Speeding



Pedestrian Crossing Safety



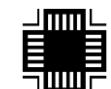
Inadequate or Missing Curbs & Sidewalks



Sight Limitations



Congestion



Safety and Conflicts at Intersections



Bicycle Safety



Driveway Conflicts



Access to Transit






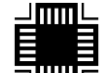






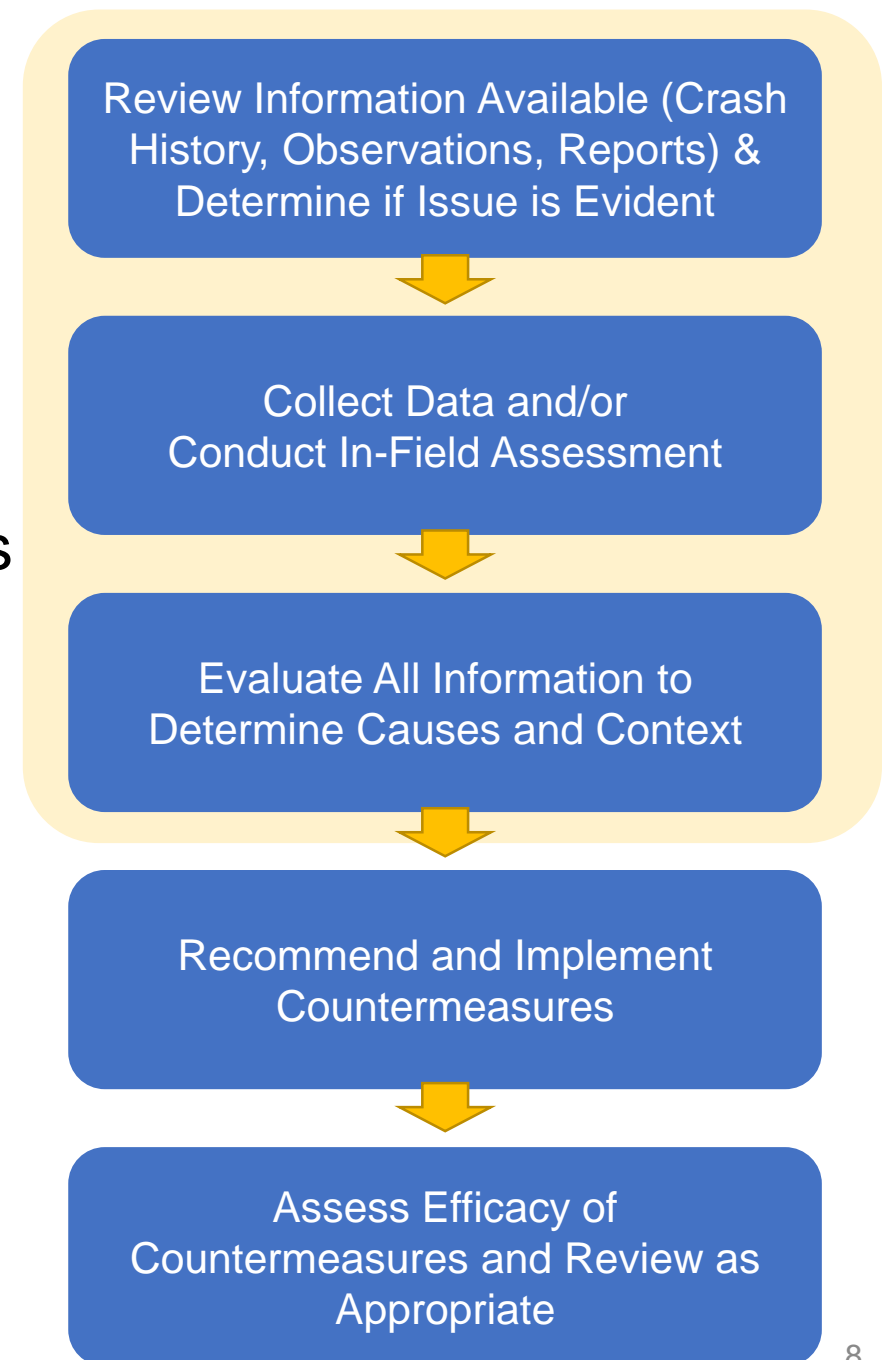
Bus Stop Safety

These are the same issues we see in school zones.



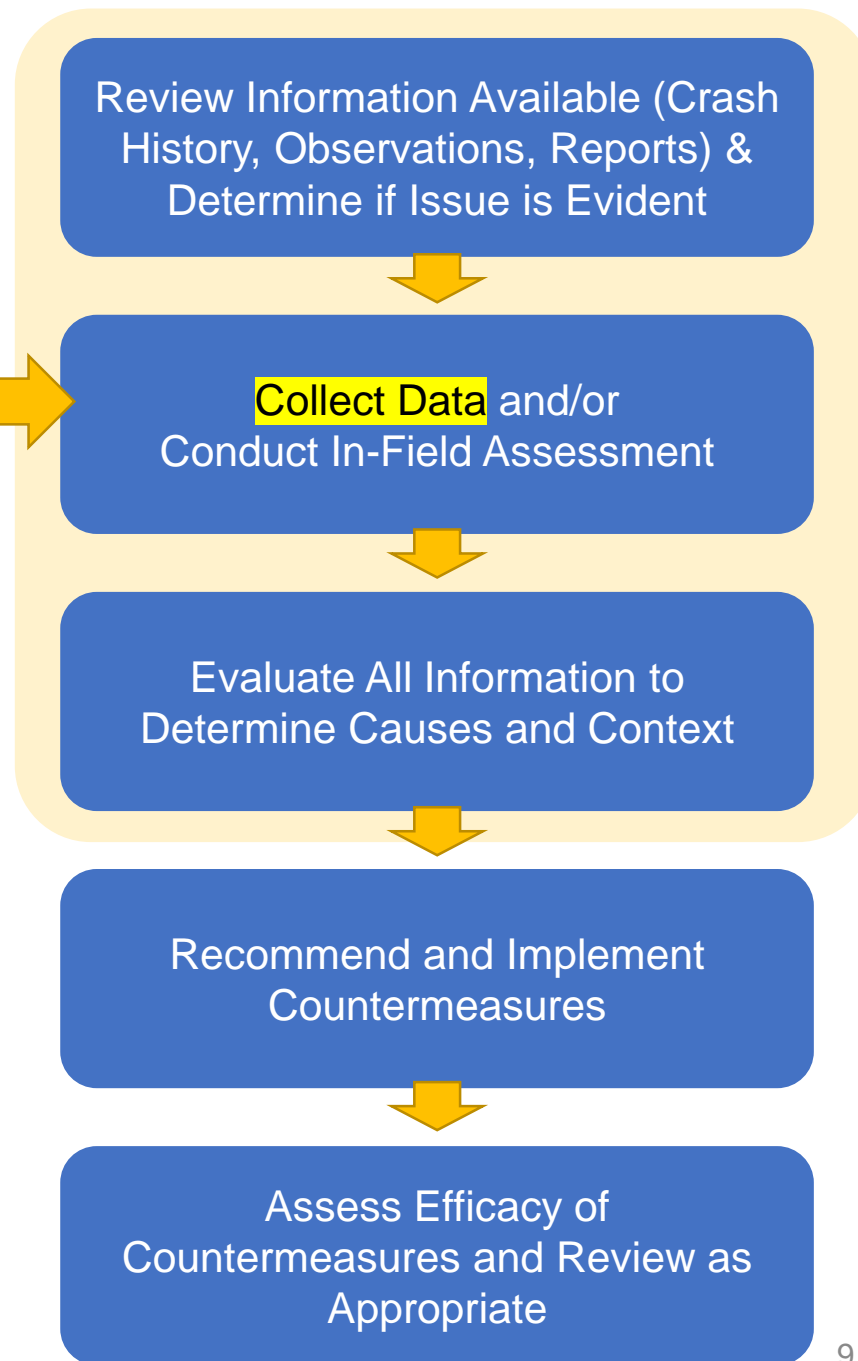
IDENTIFYING ISSUES

-  Speeding
-  Pedestrian Crossing Safety
-  Inadequate or Missing Curbs & Sidewalks
-  Sight Limitations
-  Congestion
-  Safety and Conflicts at Intersections
-  Bicycle Safety
-  Driveway Conflicts
-  Access to Transit
-  Bus Stop Safety



DATA COLLECTION

- The County has various methods for collecting vehicle, pedestrian, and bicycle data:
 - Collected by county staff
 - Contracted out to private data collection agencies
 - Pre-existing sources (VDOT, Count Stations, etc.)
- Three major factors affect the County's ability to collect and analyze data:
 - Seasonal conditions
 - Weather conditions
 - Volume of Inquires
- Therefore, transportation analysis may take several months before sufficient data is available and staff are able to review conditions.



#2: ESTABLISH COUNTERMEASURES

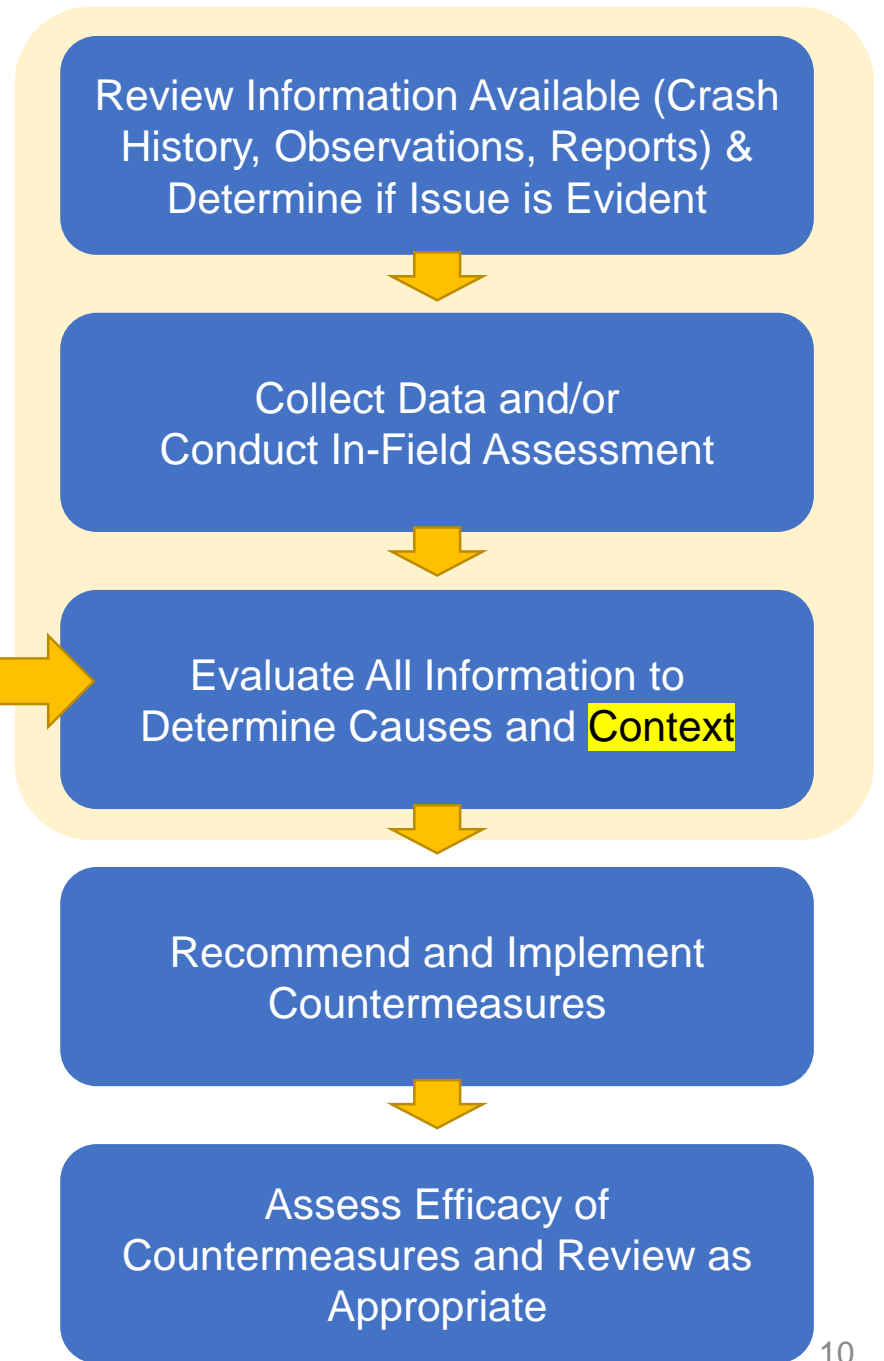


CONTEXT IS KEY!

Not every countermeasure is feasible for every street type.

Staff resources, cost, and timeframe also impact when and where a tool will make a positive impact on roadway conditions.

Nearby facilities—*like schools*—have a large impact on which countermeasures are applied.



EVALUATING COUNTERMEASURES



Speeding



Pedestrian Crossing Safety



Inadequate or Missing Curbs & Sidewalks



Sight Limitations



Congestion



Safety and Conflicts at Intersections



Bicycle Safety



Driveway Conflicts



Access to Transit



Bus Stop Safety

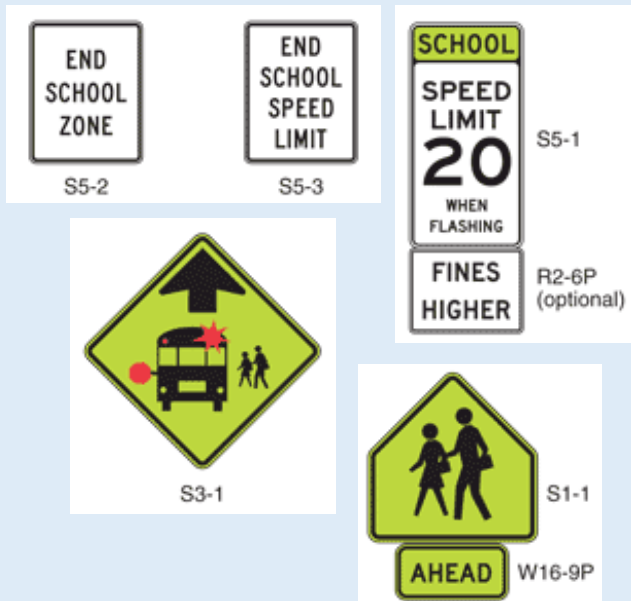
SPEED

Data & Analysis Needs: **HIGH**
Requires data collection, field visit,
engineering analysis



FREQUENTLY APPLIED COUNTERMEASURES

Speed-related Signage



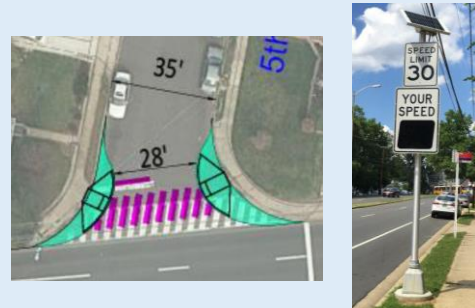
OCCASSIONALLY APPLIED COUNTERMEASURES

Modifications to Curb
(Markings/Bollards or Build Out)

Street Narrowing

Speed Feedback Signs

Traffic Circles
(Markings/Bollards or Build Out)



RARELY APPLIED COUNTERMEASURES

Speed Markings

Speed Humps

Speed Limit Changes



PED CROSSING SAFETY

Data & Analysis Needs: **HIGH**
Requires data collection, field visit, engineering analysis



FREQUENTLY APPLIED COUNTERMEASURES

Crosswalk Markings

Pedestrian-Related Signage



OCCASSIONALLY APPLIED COUNTERMEASURES

Modifications to Curb (Markings/Bollards or Build Out)

Lighting Improvements

Crossing Guard

Rectangular Rapid Flashing Beacon (RRFB)



RARELY APPLIED COUNTERMEASURES

Pedestrian Hybrid Crossing (HAWK)

Two-Stage RRFB Crossing w/ Median



PED CROSSING SAFETY



Uncontrolled Crosswalk Treatments

Roadway Configuration	Roadway ADT & Posted Speed Limit											
	1,500 to 9,000 vpd			9,000 to 12,000 vpd			12,000 to 15,000 vpd			> 15,000 vpd		
	≤ 30 mph	35 mph	40 mph	≤ 30 mph	35 mph	40 mph	≤ 30 mph	35 mph	40 mph	≤ 30 mph	35 mph	40 mph
2 Lanes (two-way street)	A	B	C	A	B	C	A	B	C	B	C	E
2 Lanes (one-way street)	A	B	C	B	B	C	B	B	C	B	C	E
3 Lanes w/ raised median ¹	A	A	C	A	C	D	B	C	D	C	D	E
3 Lanes, no median	A	A	D	C	C	D	C	D	D	C	D	E
4 Lanes w/ raised median ¹	A	A	D	A	C	D	C	C	D	D	D	E
4 lanes, no median	A	D	E	C	D	E	D	E	E	E	E	E
5 Lanes w/ raised median ¹	A	A	D	A	C	E	D	D	E	D	E	E
5 lanes, no median	A	D	E	C	D	E	E	E	E	E	E	E
6 Lanes w/ raised median ¹	A	A	D	A	C	E	D	D	E	E	E	E
6 lanes, no median	A	D	E	C	D	E	E	E	E	E	E	E

¹ The raised median or refuge island must be at least 6 feet wide to adequately serve as refuge area for pedestrians.

Treatment Descriptions:

Volumes below 1,500 vpd

Install “standard” parallel style crosswalk markings. These should only be used to re-mark existing crosswalks of this style, to mark minor-street approach crossings along busy arterials at unsignalized intersections, or when it is necessary to direct pedestrians along the proper crossing path. Use Treatment A for school crossings.

Treatment A

Install high-visibility style (continental) crosswalk markings with road-side W11-2 (S1-1 for school crossings) and W16-7P pedestrian crossing warning signage placed at the crosswalk location.

Treatment B

Same as A, but in addition install advance road-side W11-2 and W16-9P warning signage and in-roadway R1-6 bollards (except on one-way streets).

Treatment C

Same as B, but in addition install yield lines and sign R1-5 both placed 20’ to 50’ in advance of the crosswalk marking. If applicable and feasible, install curb extensions (bulb-outs) and median refuge islands.

Treatment D

Same as C, but in addition install road-side pedestrian activated Rectangular Rapid Flashing Beacons (RRFB).

Treatment E

Do not install marked crosswalk. Consider HAWK beacon, pedestrian traffic signal, road-diet, or grade-separated crossing.



INADEQUATE OR MISSING CURBS & SIDEWALKS

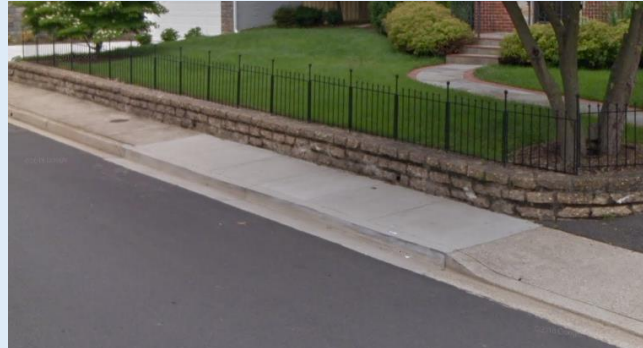
FREQUENTLY APPLIED COUNTERMEASURES

Spot Repair (Temporary)



OCCASSIONALLY APPLIED COUNTERMEASURES

Sidewalk Replacement



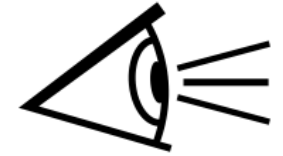
RARELY APPLIED COUNTERMEASURES

New Sidewalk



SIGHT LIMITATIONS

Data & Analysis Needs: **MED-HIGH**
Requires field visit, possibly data,
engineering analysis



FREQUENTLY APPLIED COUNTERMEASURES

Obstruction Removal



OCCASSIONALLY APPLIED COUNTERMEASURES

Stop Bar Relocation

All-Way Stop



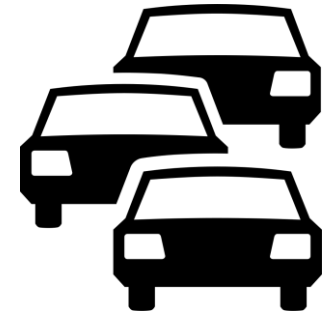
RARELY APPLIED COUNTERMEASURES

Speed Limit Changes



CONGESTION

Data & Analysis Needs: **HIGH**
Requires data collection, field visit,
traffic analysis



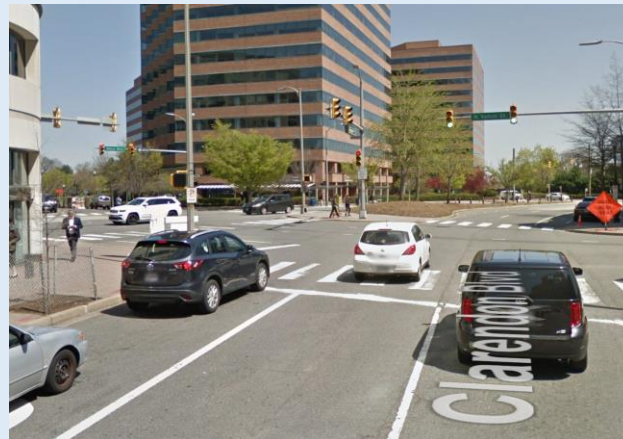
FREQUENTLY APPLIED COUNTERMEASURES

Improving Alternative Modes
of Transportation



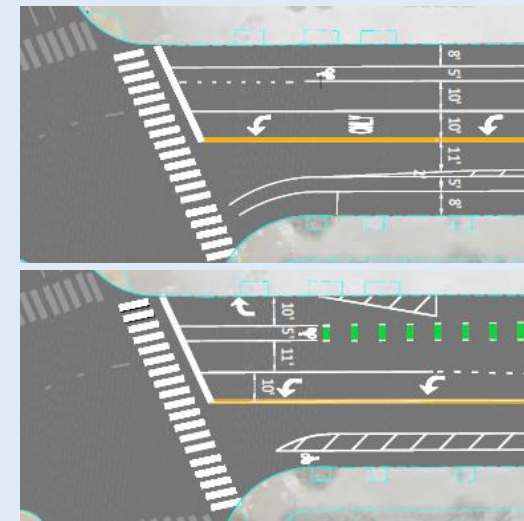
OCCASSIONALLY APPLIED COUNTERMEASURES

Signal Timing and Phasing
Intersection Adjustments



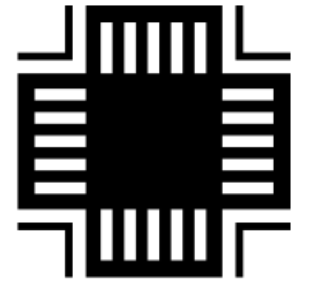
RARELY APPLIED COUNTERMEASURES

Adding or Modifying a
Traffic Lane



SAFETY & CONFLICTS AT INTERSECTIONS

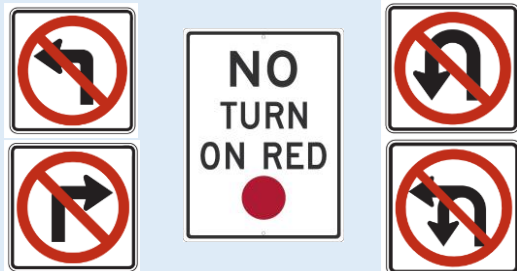
Data & Analysis Needs: **HIGH**
Requires data collection, field visit,
traffic analysis



FREQUENTLY APPLIED COUNTERMEASURES

Advanced Intersection Signage

Turning Movement Restrictions



OCCASSIONALLY APPLIED COUNTERMEASURES

Intersection Skip Lines

Lighting Improvements

Intersection Sight Distance

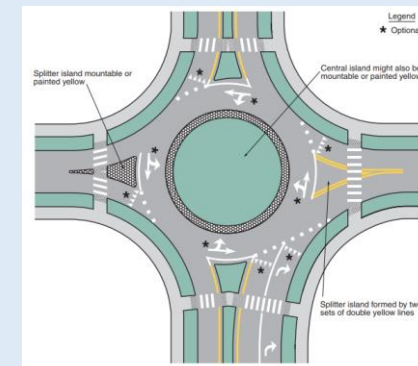
Modifications to Curb
(Markings/Bollards Build Out)

All-Way Stop

Signal Timing and Phasing

RARELY APPLIED COUNTERMEASURES

Roundabout



BICYCLE SAFETY

Data & Analysis Needs: **HIGH**
Requires data collection, field visit,
curbspace coordination



FREQUENTLY APPLIED COUNTERMEASURES

Standard Bike/Buffer Lanes

Bicycle-related Signage

Bike Friendly Crosswalk
Markings



OCCASSIONALLY APPLIED COUNTERMEASURES

Shared Bike Lanes (Sharrows)

Protected Bike Lanes

Green Colored Pavement
Markings

Bike Accommodation at Turn
Lanes



RARELY APPLIED COUNTERMEASURES

Contraflow Bike Lanes



BICYCLE SAFETY



Contextual Guidance for Determining Bike Treatments

Contextual Guidance for Selecting All Ages & Abilities Bikeways				
Roadway Context				All Ages & Abilities Bicycle Facility
Target Motor Vehicle Speed*	Target Max. Motor Vehicle Volume (ADT)	Motor Vehicle Lanes	Key Operational Considerations	
Any		Any	Any of the following: high curbside activity, frequent buses, motor vehicle congestion, or turning conflicts†	Protected Bicycle Lane
< 10 mph	Less relevant	No centerline, or single lane one-way	Pedestrians share the roadway	Shared Street
≤ 20 mph	≤ 1,000 – 2,000		< 50 motor vehicles per hour in the peak direction at peak hour	Bicycle Boulevard
≤ 25 mph	≤ 500 – 1,500	Single lane each direction, or single lane one-way	Low curbside activity, or low congestion pressure	Conventional or Buffered Bicycle Lane, or Protected Bicycle Lane
	≤ 1,500 – 3,000			Buffered or Protected Bicycle Lane
	≤ 3,000 – 6,000			Protected Bicycle Lane
	Greater than 6,000			Protected Bicycle Lane
Greater than 26 mph†	≤ 6,000	Single lane each direction	Low curbside activity, or low congestion pressure	Protected Bicycle Lane, or Reduce Speed
		Multiple lanes per direction		Protected Bicycle Lane, or Reduce to Single Lane & Reduce Speed
	Greater than 6,000	Any	Any	Protected Bicycle Lane, or Bicycle Path
High-speed limited access roadways, natural corridors, or geographic edge conditions with limited conflicts		Any	High pedestrian volume	Bike Path with Separate Walkway or Protected Bicycle Lane
			Low pedestrian volume	Shared-Use Path or Protected Bicycle Lane

Source: The National Association of City Transportation Officials

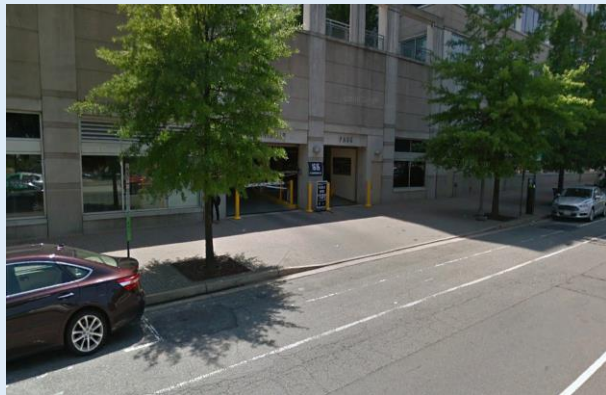
DRIVEWAY CONFLICTS

Data & Analysis Needs: **MED-HIGH**
Requires field visit, possibly data



FREQUENTLY APPLIED COUNTERMEASURES

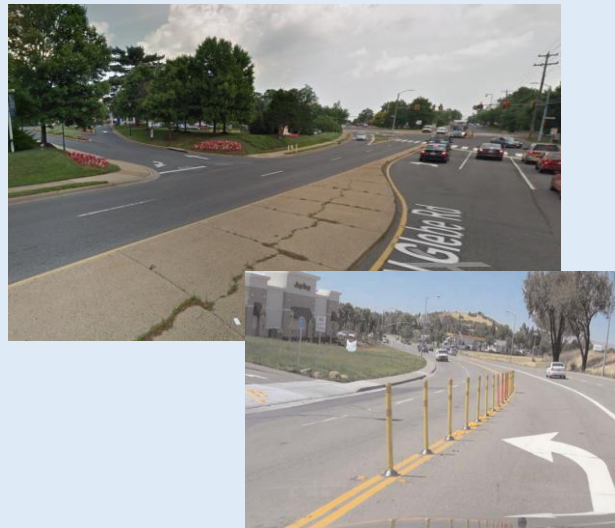
Parking Offset from
Driveway



OCCASSIONALLY APPLIED COUNTERMEASURES

Driveway Edgeline Markings

Driveway Access Controls



RARELY APPLIED COUNTERMEASURES

N/A

ACCESS TO TRANSIT/ BUS STOP SAFETY

Data & Analysis Needs: **HIGH**
Require field visit, ridership analysis



FREQUENTLY APPLIED COUNTERMEASURES

Accessibility Features
(Standard All Buses)



OCCASSIONALLY APPLIED COUNTERMEASURES

Bus Pad Improvements



RARELY APPLIED COUNTERMEASURES

Stop Location Change

All previously-
referenced tools help
to address access to
transit, too.

CONSIDERATION OF NEW COUNTERMEASURES

Traffic engineers and planners across the world are constantly seeking and implementing new methods of making their roadways safer for vehicles, bikes, and pedestrians. When and how does Arlington County think outside the box?

- Problem areas where traditional methods prove ineffective once implemented
- Problem areas with unique roadway or pathway configurations where traditional measures would not address the safety issue
- Problem areas where there is no precedent method to improve safety
- Problem areas where traditional methods are too costly to implement given available funding sources
- When we apply a new method for the first time, it is considered as a "pilot project." New methods require approval from Transportation Staff Leadership and entails at least a year long timeframe for monitoring conditions/user behavior once in place.

#3: COMMUNICATE THE APPROACH

- The County is working to make information about this analysis process available to the public.
- The County is also in the process of considering and evaluating a Vision Zero program to further integrate safety into daily activities for all departments.
- As mentioned earlier, this approach focuses on **Engineering** and **Evaluation**. *What about the other three Es?*

HUMAN FACTORS

How does Arlington County address *human factors and the other three Es*?

1. Identify safety problems related to human factors:

- Patterns in crash data (distracted driving, alcohol, speed, behaviors)
- Visibility factors (headlights, signaling, vehicle/bike conspicuity, pedestrian clothing)
- Other behavior reported by ACPD and/or residents

2. Address safety problems through:

- **Education:** Education programs, signage, communications campaigns, police warnings
- **Encouragement:** Events, contests, partnerships
- **Enforcement:** Ticketing and penalization of illegal activities, requiring new developments to incorporate safety into site plans

EDUCATION EXAMPLES



Arlington County communications posts signs when a roadway has a new configuration to educate the community on how to use the new infrastructure.



be a PAL

Predictable | Alert | Lawful

The PAL campaign communicates how to easily and safely share the streets. If more people know about being a PAL, we can all benefit from a safer and more enjoyable journey.

BikeArlington hosts events like the 'Kids Bike Rodeo' to help parents check their children's bicycles for safety.



The County, ACPD, and other partners use Twitter to message educational information.

ENCOURAGEMENT EXAMPLES



Over the years, Bike to Work Day has grown into a widespread event with countless bicyclists taking to the streets nationwide in an effort to get commuters to try bicycling to work as a healthy and safe alternative to driving alone.



Arlington *Champions* receive recognition and rewards for implementing sustainable transportation benefits and programs to their employees, tenants, students, or residents.



Arlington County's Safe Routes to School initiative is part of a national program that works to make it safer and easier for students to walk or bike to school.

SUMMARY

- Purpose
 - Identify Safety Issues *Consistently*
 - Establish Countermeasures *within Context*
 - *Communicate* the Approach
 - Explanation of Countermeasures
 - Emphasis on the 5E Collaboration System

QUESTIONS?