



Route 28 and Dulles Toll Road/Dulles Greenway Traffic Operations and Safety Study

Alternatives Development Summary

November 2019 |

Prepared for



Prepared by

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DEVELOPMENT OF THREE ALTERNATIVES FOR EVALUATION

At the October 17, 2019 Stakeholders Meeting #4, stakeholders were presented the results of the 2045 No-Build traffic analysis and preliminary concepts to review, discuss, and brainstorm. During this meeting stakeholders provided feedback on initial improvement concepts presented and generated additional improvements concept ideas. This document provides a high-level summary of the following:

- Additional improvement concept ideas generated at and after the October 17, 2019 meeting
- Concept ideas that were eliminated for further evaluation
- Proposed packaging of the various improvement concepts into a set of three distinct improvement alternatives for the further evaluation

The three alternatives will be discussed at the next stakeholder meeting to reach concurrence on the proposed packaging of improvement concepts within each alternative before performing further analysis/evaluation.

Additional Improvement Concepts Generated

The following summarizes the additional improvement concepts generated during and after the October 17, 2019 Stakeholders Meeting (beyond the initial draft concepts that were presented).

Stakeholder Suggestions During Meeting

1. Dulles Toll Road – consider time of day fixed pricing; MWAA indicated that this may be feasible.
2. Southbound Route 28 to eastbound Route 267 movement – move /reconfigure ramp to merge on left side of eastbound Route 267.
3. Route 606 from Route 28 to the Dulles Greenway - widen to six lanes (consistent with Loudoun County’s Countywide Transportation Plan map). Route 606 is part of the “Dulles Loop” (including Route 28, Route 50, and Route 606).
4. Route 28/Route 606 Interchange - consider partial cloverleaf to remove weaves and minimize infrastructure cost.
5. Eastbound Dulles Toll Road - extend 5th lane that Dulles Greenway is building to continue beyond Centreville Road to the off-ramp at Fairfax County Parkway (similar to Concept L but adds a through lane through Centreville Road interchange). MWAA noted that they have studied this, and it appears to be feasible.
6. Add access from westbound Innovation Avenue to:
 - Southbound Route 28 to eastbound Route 267 flyover (Concept A)
 - Dulles Airport

This proposed change in access may require the need to keep the existing loop ramp to southbound Route 28 (ramp was eliminated in initial concepts and replaced with a southbound flyover).

Stakeholder Suggestions After the Meeting

1. Reverse the direction of existing flyover ramp for northbound Route 28 to westbound Dulles Greenway and Airport exits, where eastbound and westbound Route 267 traffic merges to left-hand median side of southbound Route 28
2. Increase capacity of Ariane Way between Route 606 and the north Rental Car Return Lot.
3. Provide direct access to the airport from Innovation Avenue to Pacific Boulevard

Other Ideas Developed after the October 17, 2019 Meeting

1. Frying Pan Road interchange – Barrier separate and lengthen the existing on-ramp acceleration lane from westbound Frying Pan Road to southbound Route 28.
2. Frying Pan Road interchange – Expand trumpet interchange by increasing the radius of the existing westbound to southbound loop ramp.
3. Policy - Add ITS/DMS for traffic monitoring and management in the study area.
4. Westbound Route 267 Mainline – Extend HOV lane past the DIAAH slip lane near the Route 28 interchange.
5. Westbound Dulles Greenway/Dulles Toll Road to southbound Route 28 ramp - Construct new flyover ramp and tie into southbound Route 28 mainline lanes on right-side south of the Innovation Avenue interchange.
6. Widen the ramp from southbound Route 28 to eastbound Dulles Toll Road to two lanes and add ramp braiding between the eastbound DIAAH and southbound Route 28 loop ramp.

Concept Ideas Not Carried Forward for Further Analysis

The Project Team further reviewed and screened each of the concept ideas to consider which were more viable to advance forward for as part of improvement alternatives package. Based on review of operations and/or review of feedback from stakeholders, the following concept ideas were not advanced forward for further analysis for the following reasons (**Attachment A** shows each graphically):

- **Frying Pan Road Roundabout** – Based on a preliminary SIDRA analysis, both a single and two-lane roundabout are anticipated to operate at LOS F either for the overall intersection or for approaches under future 2045 traffic volumes.
- **Centreville Road Interchange Diverging Diamond Interchange (DDI)**– This improvement was eliminated using an analysis in the VDOT Junction Screening Tool (VJuST), which showed comparable volume to capacity ratios between SPUI and DDI. Therefore, the DDI was eliminated because a SPUI would improve traffic signal spacing and could include a new ramp to accommodate a direct movement to westbound DIAAH from Centreville Road. This would eliminate the mainline westbound weave from Centreville Road traffic heading to Dulles Airport. Additionally, a DDI would preclude the ability to provide the proposed connection to Innovation Avenue/Dulles Green Boulevard (Concept F as presented at the October 17, 2019 meeting).
- **Southbound Route 28 to eastbound Route 267 movement – move ramp to merge on left side of eastbound Route 267** – Left-turn exits and entrances create additional safety concerns.
- **Widen Route 606 from Route 28 to the Dulles Greenway to six lanes** – While the 2045 No-Build traffic analysis showed some congestion along Route 606, this did not appear to impact operations along Route 28. This widening is in the Loudoun County Countywide Transportation Plan so this improvement may occur separately from the interchange improvements.
- **Additional capacity on Ariane Way or New access route to the airport** – This improvement was eliminated after discussions with MWAA. The Ariane Way access is intended for “back of the house” purposes (cargo, rental car fleet management, employee access, etc.) and is not intended to be a passenger entrance. A few concerns about increasing capacity along Ariane

Way is that it may encourage more passenger traffic and also “backtrackers” who are going through the airport to avoid the toll.

- **Add a new Dulles Airport access from Innovation Avenue and/or Pacific Boulevard to Ariane Way** - This improvement was eliminated after discussions with MWAA, see previous bullet for more details regarding Ariane Way.
- **Reverse Dulles Greenway and Airport ramp exits w/merge to left-hand median side of southbound Route 28** – While this concept partially addresses the southbound Route 28 weaving issue it still requires a left-hand merge that creates a new safety concern. Additionally, the northbound Route 28 to westbound Dulles Greenway movement is eliminated and a new ramp would be required that will likely contain multiple bridge structures.

All other concepts were advanced and incorporated into one of the three proposed alternatives.

Proposed Improvement Alternatives

Concepts that were not eliminated were considered for grouping into three proposed improvement alternative packages (3 packages were identified in the framework document). Once reviewed and a consensus is reached by the stakeholders, each alternative will be further evaluated through traffic analyses, cost estimates, and estimated right-of-way impacts to understand what elements of each package performs well and those that do not. Each improvement package applies a different approach for addressing challenges in the study area.

Since the framework identified three alternatives for further study, the overall approach to create three distinct different alternatives targeted to achieve different objectives. By creating these differences, it allows the team and stakeholders to see how certain elements perform and then combine elements into a preferred alternative.

Table 1 provides a summary of alternatives packaging and a listing of each improvement element by study area location. **Attachment B** includes illustrations of each improvement alternative.

The following sections describe the objective of each alternative and how the alternative mitigates existing and future challenges. Once the three alternatives are selected, the next phase of the project will analyze each and address the benefits and the challenges (bridge replacement, right-of-way impacts, etc.).

Table 1. Route 28 Dulles Toll Road/Dulles Greenway Study DRAFT Improvement Alternatives*

Study Area Location	Alternative 1 - Maximizing Existing Infrastructure/Minimizing Impacts/Implementing Policy Changes	Alternative 2 - Addressing Critical Issues	Alternative 3 - Considering Unconstrained Infrastructure
Policy	<p><u>(1a)</u>: Maintain HOV-2 on DTR</p> <p><u>(1b)</u>: Restructure tolls on Dulles Greenway</p> <p><u>(1c)</u>: Change to time of day fixed pricing along the DTR</p> <p><u>(1d)</u>: Add ITS/DMS for traffic monitoring/management</p>	<p><u>(2a)</u>: Add ITS/DMS for traffic monitoring/management</p>	<p><u>(3a)</u>: Add ITS/DMS for traffic monitoring/management</p>
Route 28/ DTR/Dulles Greenway/ DIAAH Interchange Area	<p><u>(1e)</u>: Widen southbound Route 28 to eastbound DTR loop ramp to two-lanes</p> <p><u>(1f)</u>: Add ramp braiding between eastbound DIAAH ramp with southbound Route 28 ramp</p> <p><u>(1g)</u>: Construct new flyover ramp from westbound Dulles Greenway ramp; Tie into southbound Route 28 mainline lanes on right-side</p> <p><u>(1h)</u>: Widen westbound DTR to northbound Route 28 ramp to two lanes and add ramp braiding between westbound DTR ramp and northbound Route 28 ramp</p>	<p><u>(2b)</u>: Implement flyover ramp from southbound Route 28 to eastbound DTR and westbound DIAAH; Remove (1) existing southbound Route 28 to eastbound DTR loop ramp and (2) existing access from southbound Route 28 to westbound DIAAH</p> <p><u>(2c)</u>: Widen westbound DTR to northbound Route 28 ramp to two lanes and add ramp braiding between westbound DTR ramp and northbound Route 28 ramp</p> <p><u>(2d)</u>: Remove eastbound DIAAH toll plaza and implement new electronic tolling on Route 28 ramps</p>	<p><u>(3b)</u>: Implement flyover ramp from southbound Route 28 to eastbound DTR and westbound DIAAH; Remove (1) existing southbound Route 28 to eastbound DTR loop ramp and (2) existing access from southbound Route 28 to westbound DIAAH</p> <p><u>(3c)</u>: Widen westbound DTR to northbound Route 28 ramp to three lanes and add ramp braiding between westbound DTR ramp and northbound Route 28 ramp</p> <p><u>(3d)</u>: Remove eastbound DIAAH toll plaza and implement new electronic tolling on Route 28 ramps</p>
Route 28 Mainline	<p><u>(1j)</u>: Implement southbound C-D Road from Innovation Avenue to DTR</p>	<p><u>(2e)</u>: Add ramp braiding along southbound Route 28 between Route 606 and Innovation Avenue ramps</p>	<p><u>(3e)</u>: Implement northbound Route 28 C-D road with two ramp braids from south of loop ramp from DIAAH to Route 606</p> <p><u>(3f)</u>: Implement southbound Route 28 C-D road with two ramp braids from Route 606 interchange to Innovation Avenue interchange</p>
Sterling Boulevard Interchange Area	None	None	None
Route 606 Interchange Area	<p><u>(1k)</u>: Convert to partial cloverleaf; Remove (1) westbound to southbound loop and (2) eastbound to northbound loop</p>	<p><u>(2f)</u>: Convert to Diverging Diamond Interchange (DDI)</p>	<p><u>(3g)</u>: Convert to Single Point Urban Interchange (SPUI)</p>
Innovation Avenue Interchange Area	<p><u>(1l)</u>: Provide westbound Innovation Avenue connection to Dulles Greenway via signalized intersection</p> <p><u>(1m)</u>: Modify southbound Route 28 off ramp; Tie into signalized intersection with connection to Dulles Greenway and Innovation Avenue</p> <p><u>(1n)</u>: Modify westbound Innovation Avenue to southbound Route 28 loop ramp; Tie into southbound C-D Road</p>	<p><u>(2g)</u>: Provide westbound Innovation Avenue connection to Dulles Greenway via signalized intersection</p> <p><u>(2h)</u>: Modify southbound Route 28 off ramp from Route 606 interchange area; Tie into signalized intersection with connection to Dulles Greenway and Innovation Avenue</p> <p><u>(2i)</u>: Replace existing Innovation Avenue to southbound Route 28 loop ramp with new access to new flyover ramp (to southbound Route 28 to DIAAH/eastbound DTR)</p>	<p><u>(3h)</u>: Replace existing westbound Innovation Avenue to southbound Route 28 loop ramp with new ramp providing access to southbound Route 28</p> <p><u>(3i)</u>: Implement westbound Innovation Avenue connection to Dulles Greenway</p> <p><u>(3j)</u>: Construct Pacific Boulevard between Route 606 and Innovation Avenue</p> <p><u>(3k)</u>: Implement access from Innovation Avenue/Dulles Green Boulevard to Centreville Road/Dulles Toll Road</p>
Frying Pan Road Interchange Area	<p><u>(1o)</u>: Implement barrier separated on-ramp from Frying Pan Road to southbound Route 28</p> <p><u>(1p)</u>: Extend acceleration lane to southbound Route 28 across bridge</p>	<p><u>(2j)</u>: Expand trumpet interchange by increasing design speed</p>	<p><u>(3l)</u>: Implement partial Diverging Diamond Interchange (DDI)</p>
Route 267 Mainline	<p><u>(1q)</u>: Extend eastbound DTR 5th through lane to Fairfax County Parkway</p> <p><u>(1r)</u>: Extend westbound HOV Lane pass left exit to DIAAH</p> <p><u>(1s)</u>: Close eastbound DIAAH slip ramps east of and west of Centreville Road</p>	<p><u>(2k)</u>: Extend eastbound DTR 5th through lane to Fairfax County Parkway</p> <p><u>(2l)</u>: Extend westbound HOV Lane pass left exit to DIAAH</p> <p><u>(2m)</u>: Close eastbound DIAAH slip ramps east of and west of Centreville Road</p> <p><u>(2n)</u>: Close slip ramp from westbound DTR to DIAAH</p>	<p><u>(3m)</u>: Extend eastbound DTR 5th through lane to Fairfax County Parkway</p> <p><u>(3n)</u>: Extend westbound HOV Lane pass left exit to DIAAH</p> <p><u>(3o)</u>: Close eastbound DIAAH slip ramps east of and west of Centreville Road</p> <p><u>(3p)</u>: Close slip ramp from westbound DTR to DIAAH</p>
Centreville Road Interchange Area	None	<p><u>(2o)</u>: Implement Single Point Urban Interchange (SPUI) and widen Centreville Road to 6 lanes</p> <p><u>(2p)</u>: Provide ramp from Centreville Road to westbound DIAAH within the SPUI</p>	<p><u>(3q)</u>: Widen Centreville Road to 6 lanes</p> <p><u>(3r)</u>: Provide ramp from Centreville Road to westbound DIAAH via a displaced left-turn signal</p>

*Refer to corresponding graphics for illustrations of alternatives

Alternative 1: Maximizing Existing Infrastructure, Minimize Impacts, and

Implementing Policy Changes - This alternative seeks to maximize the existing infrastructure (pavement, bridges, etc.) and minimize right-of-way impacts by influencing travel patterns/capacity through policy changes. Below is a summary of how Alternative 1 mitigates existing and future challenges by location/strategy.

- **Policy**
 - Maintaining HOV 2 along the DTR provides better lane utilization and additional capacity on DTR during peak periods
 - Lowering tolls attract more traffic from Route 28 and local roads to Dulles Greenway
 - Provides motorists travel information and introduce traffic monitoring/management with technology
- **Route 28/Dulles Toll Road/Dulles Greenway/DIAAH Interchange Area**
 - Adds capacity for large peak volume demand from southbound Route 28 to eastbound DTR movement
 - Eliminates weave on eastbound DIAAH with Route 28 ramps
 - Eliminates weave on southbound Route 28 between the Dulles Greenway and DTR
 - Adds capacity for large peak volume demand from westbound DTR to northbound Route 28
 - Eliminates weave on northbound Route 28 between DTR and Innovation Avenue
 - Improves safety concerns along eastbound DTR where left-turn slip lanes currently exist
- **Route 28 Mainline**
 - None beyond specific interchange improvements at Route 28/Dulles Toll Road/Dulles Greenway/DIAAH Interchange and Route 606/ Route 28 Interchange
- **Sterling Boulevard/Route 28 Interchange Area**
 - No improvements identified – no challenges identified at this location
- **Route 606/Route 28 Interchange Area**
 - Eliminates weave areas on northbound and southbound Route 28
 - Utilizes existing bridge/interchange infrastructure
- **Innovation Avenue/Route 28 Interchange Area**
 - Provides direct route from Innovation Avenue to westbound Dulles Greenway from Innovation Avenue
 - Eliminates merging conflicts on southbound Route 28 mainline from Innovation Avenue
- **Frying Pan Road/Route 28 Interchange Area**
 - Addresses speed differentials between merging and southbound Route 28 mainline traffic while maintaining existing ramp infrastructure
- **Route 267 Mainline**
 - Adds capacity on eastbound DTR to Fairfax County Parkway to address operational challenges during peak hour conditions
 - Improves safety and operations for westbound DTR near the DIAAH at slip ramp
- **Centreville Road/Route 267 Interchange Area**
 - No improvements identified – improvements would require interchange rebuild

Alternative 1: Summary of New Access Provided

- Innovation Avenue to westbound Dulles Greenway

Alternative 1: Summary of Movements Redirected/Modified

- Westbound Route 606 to southbound Route 28 – free flow changed to signalized
- Eastbound Route 606 to northbound Route 28 – free flow changed to signalized
- Southbound Route 28 to Innovation Avenue – free flow changed to signalized
- Southbound Route 28 to eastbound DTR – rerouted to Collector-Distributor Road
- Southbound Route 28 to Dulles Airport – rerouted to Collector-Distributor Road
- Innovation Avenue to southbound Route 28 – rerouted to Collector-Distributor Road
- Eastbound DIAAH to northbound Route 28 – rerouted to Collector-Distributor Road
- Westbound DTR to Innovation Avenue – rerouted through ramp braid
- Northbound Route 28 to Innovation Avenue – rerouted through ramp braid
- Eastbound DIAAH to eastbound DTR – rerouted to Collector-Distributor Road

Alternative 1: Summary of Movements Removed

- None

Alternative 2: Addressing Critical Issues - This alternative seeks to address the critical safety and operational issues identified for 2045 No-Build analysis. The following were the primary focus:

1. Southbound Route 28 to eastbound DTR and the westbound DTR to northbound DTR movements.
2. Route 28 weaving movements between DTR and Innovation Avenue and within the Route 606 interchange
3. Eastbound DTR congestion
4. Frying Pan Road/Route 28 interchange safety challenges
5. Route 267 mainline safety challenges due to the slip lanes and weaves between Centreville Road and Dulles Airport

Addressing these critical areas may yield significant safety and operational benefits to the study area. Below is a summary of how proposed improvements mitigate existing and future challenges.

- **Policy**
 - Provides motorists travel information and introduce traffic monitoring with technology
- **Route 28/Dulles Toll Road/Dulles Greenway/DIAAH Interchange Area**
 - Adds capacity for large peak volume demand from southbound Route 28 to eastbound DTR movement
 - Eliminates weave on eastbound DIAAH with Route 28 ramps
 - Eliminates weave on southbound Route 28 between the Dulles Greenway and DTR
 - Adds capacity for large peak volume demand from westbound DTR to northbound Route 28
 - Eliminates weave on northbound Route 28 between DTR and Innovation Avenue
 - Improves safety concerns along eastbound DTR where left-turn slip lanes currently exist
 - Eliminates weave conditions on eastbound and westbound DTR between Centreville Road and Dulles Airport

- **Route 28 Mainline**
 - None beyond specific interchange improvements at Route 28/Dulles Toll Road/Dulles Greenway/DIAAH Interchange and Route 606/ Route 28 Interchange
- **Sterling Blvd/Route 28 Interchange Area**
 - No improvements identified – no challenges identified at this location
- **Route 606/Route 28 Interchange Area**
 - Eliminates weave areas on northbound and southbound Route 28
 - Improves traffic signal spacing along Route 606
 - Eliminates weave on southbound Route 28 between Route 606 and Innovation Avenue
- **Innovation Avenue/Route 28 Interchange Area**
 - Provides direct route from Innovation Avenue to access westbound Dulles Greenway from Innovation Avenue
 - Eliminates merging conflicts on southbound Route 28 mainline from Innovation Avenue
- **Frying Pan Road/Route 28 Interchange Area**
 - Addresses speed differentials between merging and southbound Route 28 mainline traffic
 - Addresses small radius of existing loop ramp
- **Route 267 Mainline**
 - Adds capacity on eastbound DTR to Fairfax County Parkway to address operational challenges during peak hour conditions
 - Improves safety and operations for westbound DTR near the DIAAH at slip ramp
- **Centreville Road/Route 267 Interchange Area**
 - Provides alternative access from Centreville Road to westbound DIAAH, eliminating the westbound DTR mainline weave
 - Improves traffic signal spacing and capacity along Centreville Road

Alternative 2: Summary of New Access Provided

- Innovation Avenue to westbound Dulles Greenway
- Centreville Road to westbound DIAAH

Alternative 2: Summary of Movements Redirected/Modified

- Westbound Route 606 to southbound Route 28 - free flow changed to signalized
- Eastbound Route 606 to northbound Route 28 - free flow changed to signalized
- Southbound Route 28 to eastbound Route 606 - free flow changed to signalized
- Northbound Route 28 to westbound Route 606 - free flow changed to signalized
- Southbound Route 28 to Innovation Avenue - free flow changed to signalized
- Southbound Route 28 to eastbound DTR – rerouted to flyover ramp
- Southbound Route 28 to Dulles Airport – rerouted to flyover ramp
- Innovation Avenue to eastbound DTR – rerouted to flyover ramp
- Innovation Avenue to Dulles Airport – rerouted to flyover ramp
- Westbound DTR to Innovation Avenue – rerouted through ramp braid
- Northbound Route 28 to Innovation Avenue – rerouted through ramp braid
- Eastbound DIAAH to eastbound DTR – rerouted to Collector-Distributor Road

- Northbound Centreville Road to Dulles Airport – rerouted through new ramp to westbound DIAAH
- Southbound Centreville Road to Dulles Airport – rerouted through new ramp to westbound DIAAH

Alternative 2: Summary of Movements Removed

- None

Alternative 3: Considering Unconstrained Infrastructure - This alternative focuses on expanding or adding new infrastructure with a relatively “unconstrained” approach to address the challenges noted for existing and future 2045 challenges. Below is a summary of how proposed improvements mitigate existing and future challenges.

- **Policy**
 - Provides motorists travel information and introduce traffic monitoring with technology
- **Route 28/Dulles Toll Road/Dulles Greenway/DIAAH Interchange Area**
 - Adds capacity for large peak volume demand from southbound Route 28 to eastbound DTR
 - Eliminates weave on eastbound DIAAH with Route 28 ramps
 - Eliminates weave on southbound Route 28 between Dulles Greenway and DTR
 - Adds capacity for large peak volume demand from westbound DTR to northbound Route 28
 - Eliminates weave on northbound Route 28 between DTR and Innovation Avenue
 - Eliminates weave conditions on eastbound and westbound DTR between Centreville Road and Dulles Airport
- **Route 28 Mainline**
 - Eliminates weave on southbound Route 28 from Dulles Greenway to eastbound DTR
 - Eliminates weaves on northbound Route 28 and addresses closely spaced exit ramps between DTR to Route 606
 - Northbound and southbound Collector-Distributor Roads minimize exit and entrance locations
- **Sterling Blvd/Route 28 Interchange Area**
 - No improvements identified – no challenges identified at this location
- **Route 606/Route 28 Interchange Area**
 - Eliminates weave areas on northbound and southbound Route 28.
- **Innovation Avenue/Route 28 Interchange Area**
 - Provides direct route from Innovation Avenue to access westbound Dulles Greenway from Innovation Avenue
 - Eliminates weave on southbound Route 28 between Route 606 and Innovation Avenue
 - Provides alternative north-south connection between Route 606 and Innovation Avenue via Pacific Boulevard extension
 - Eliminates merging conflicts on southbound Route 28 mainline from Innovation Avenue
 - Provides access from Innovation Avenue/Dulles Green Boulevard to DTR/Centreville Road interchange

- **Frying Pan Road/Route 28 Interchange Area**
 - Addresses speed differentials between merging and southbound Route 28 mainline traffic
 - Retains existing bridge infrastructure
 - Eliminating small radius of existing loop ramp
- **Route 267 Mainline**
 - Adds capacity on eastbound DTR to Fairfax County Parkway to address operational challenges during peak hour conditions
 - Improves safety and operations for westbound DTR near the DIAAH at slip ramp
- **Centreville Road/Route 267 Interchange Area**
 - Adds connection from Innovation Avenue/Dulles Green Boulevard and provides access to DTR/Centreville Road interchange
 - Provides alternative access from Centreville Road to westbound DIAAH
 - Provides direct access from Centreville Road area to Innovation Avenue via ramp to eastbound DTR

Alternative 3: Summary of New Access Provided

- Pacific Boulevard to Innovation Avenue
- Pacific Boulevard to westbound Dulles Greenway
- Pacific Boulevard to southbound Route 28
- Innovation Avenue to westbound Dulles Greenway
- Innovation Avenue/Dulles Green Boulevard to northbound and southbound Centreville Road
- Innovation Avenue/Dulles Green Boulevard to DTR
- Centreville Road to westbound DIAAH

Alternative 3: Summary of Movements Redirected/Modified

- Westbound Route 606 to southbound Route 28 - free flow changed to signalized
- Eastbound Route 606 to northbound Route 28 - free flow changed to signalized
- Southbound Route 28 to eastbound Route 606 - free flow changed to signalized
- Northbound Route 28 to westbound Route 606 - free flow changed to signalized
- Southbound Route 28 to Innovation Avenue - free flow changed to signalized
- Southbound Route 28 to eastbound DTR – rerouted to flyover ramp
- Southbound Route 28 to Dulles Airport – rerouted to flyover ramp
- Innovation Avenue to southbound Route 28 - free flow changed to signalized
- Innovation Avenue to eastbound DTR – rerouted to flyover ramp
- Innovation Avenue to Dulles Airport – rerouted to flyover ramp
- Westbound DTR to Innovation Avenue – rerouted through ramp braid
- Northbound Route 28 to Innovation Avenue – rerouted through ramp braid
- Eastbound DIAAH to eastbound DTR – rerouted to Collector-Distributor Road
- Northbound Centreville Road to Dulles Airport – rerouted through new ramp to westbound DIAAH
- Southbound Centreville Road to Dulles Airport – rerouted through new ramp to westbound DIAAH

Alternative 3: Summary of Movements Removed

- None

Table 2 summarizes how each alternative addresses the operational, safety, and geometric challenges previously identified in existing and future analysis.

Next Steps

These three improvement alternatives will be presented at the December 4, 2019 Stakeholders Meeting. The project team requests that Stakeholders review improvement alternatives prior to the meeting and be prepared to discuss the packaging of improvements for further analysis.

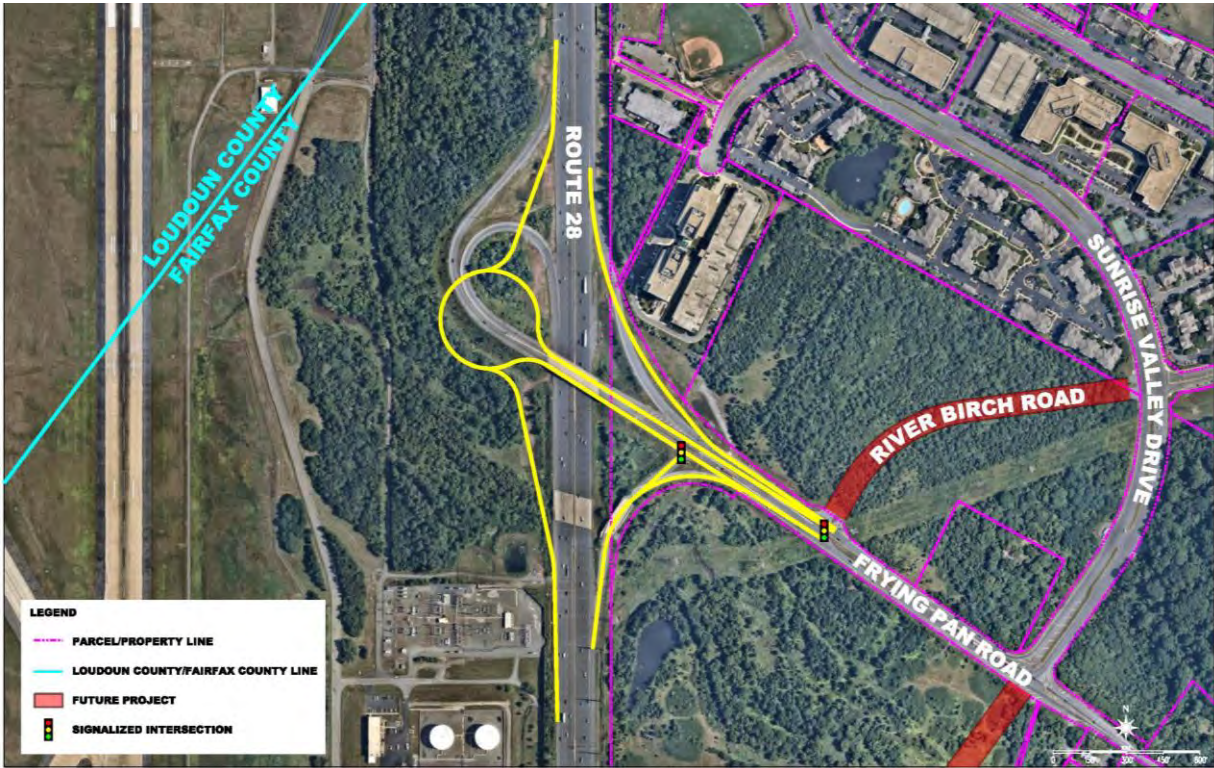
Table 2. DRAFT Improvement Alternatives and Challenges Matrix

Improvement Alternatives	Policy	Safety Hot Spots										Traffic Operations Challenges					Geometric Challenges																	
		1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15			
		SB Route 28 between ramps at Frying Pan Rd Interchange	NB Route 28 on-ramp from EB DIAAH to n/o accel. lane	SB Route 28 weave area at Old Ox Rd Interchange	NB Route 28 weave area at Old Ox Rd Interchange	WB DTR off-ramp to NB Route 28 gore area	WB DTR off-ramp to NB Route 28 taper area	EB DTR slip-ramp from DIAAH to DTR tie-in	EB DTR on-ramp from Centreville Rd	EB DIAAH weave area at Route 28 Interchange	WB DIAAH slip-ramp from EB DTR e/o Route 28	AM PEAK: SB Route 28 to EB DTR	AM PEAK: EB DTR between Route 28 and Centreville Road	PM PEAK: NB Route 28 north of DTR	PM PEAK: WB DTR e/o Route 28 to NB Route 28, spillback to Centreville Rd	PM PEAK: EB DIAAH at Route 28 weave area, spillback to SB Route 28 and WB Route 267	Accel. Lane EB Old Ox to NB Route 28	Accel. Lane WB Old Ox to SB Route 28	Accel. Lane Centreville Road to EB Route 267	Decel. Lane NB Route 28 to WB Old Ox	Decel. Lane SB Route 28 to EB Old Ox	Intersection Spacing	Bridge Clearance EB DTR over Centreville Road	Bridge Clearance EB DIAAH over Centreville Road	Bridge Clearance WB DIAAH over Centreville Road	Bridge Clearance WB DTR over Centreville Road	Bridge Clearance WB Dulles Greenway over Route 28	Bridge Clearance Ramp from DIAAH over parking lot access	Interchange Spacing Design Exception	Minimum Radius Design Exception	Shoulder Width Design Exception			
<i>Alternative 1 - Maximizing Existing Infrastructure/Minimizing Impacts/Implementing Policy Changes</i>																																		
	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓															
<i>Alternative 2 - Addressing Critical Issues</i>																																		
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<i>Alternative 3 - Considering Unconstrained Infrastructure</i>																																		
	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓	✓			

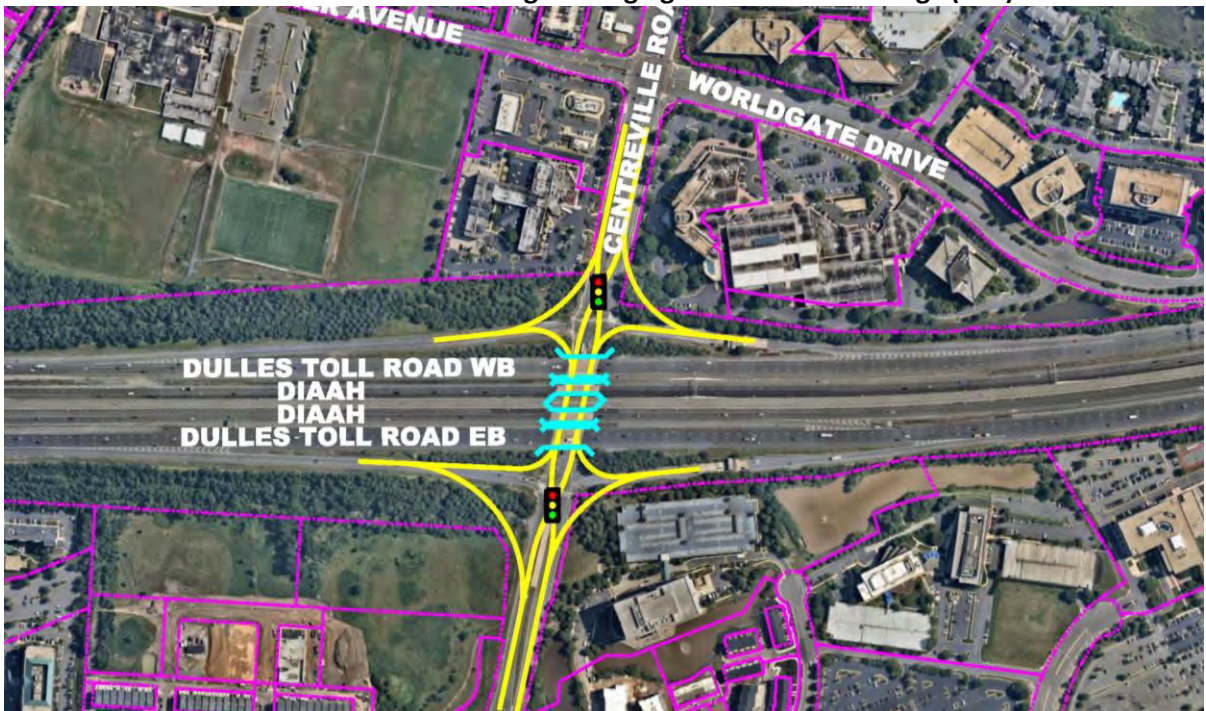


Attachment A – Sketches of Concept Ideas Not Carried Forward For Analysis

Frying Pan Road Roundabout



Centreville Road Interchange Diverging Diamond Interchange (DDI)



Southbound Route 28 to eastbound Route 267 movement – move ramp to merge on left side of eastbound Route 267



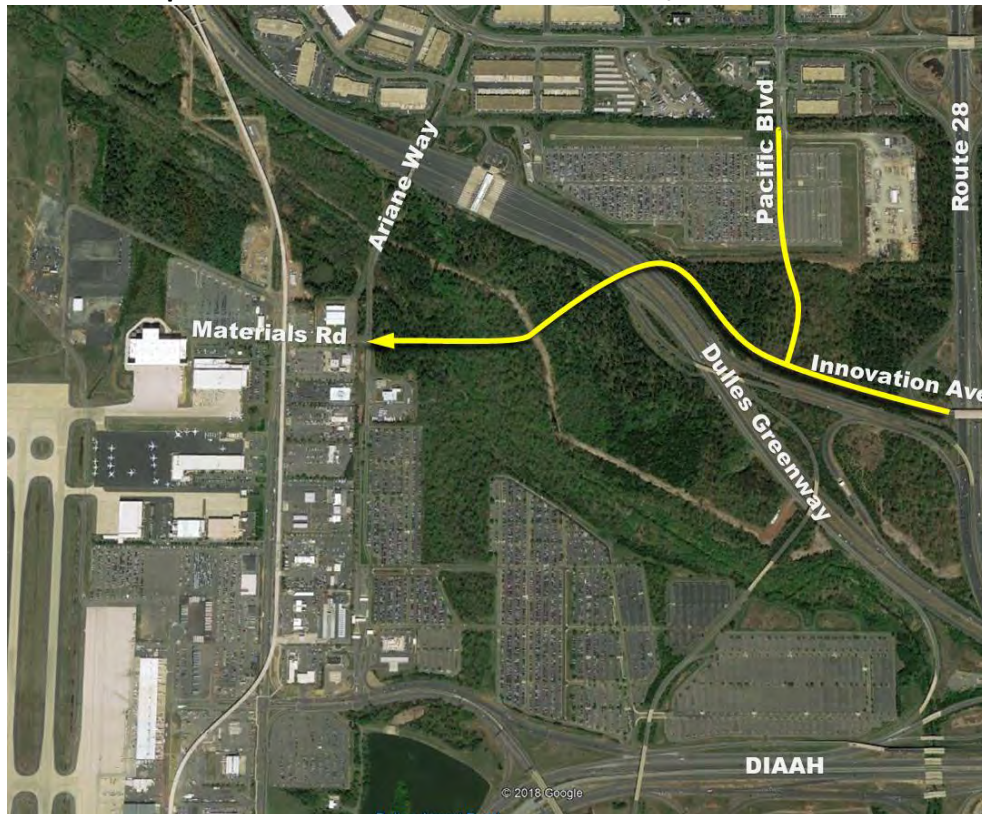
Widen Route 606 from Route 28 to the Dulles Greenway to six lanes



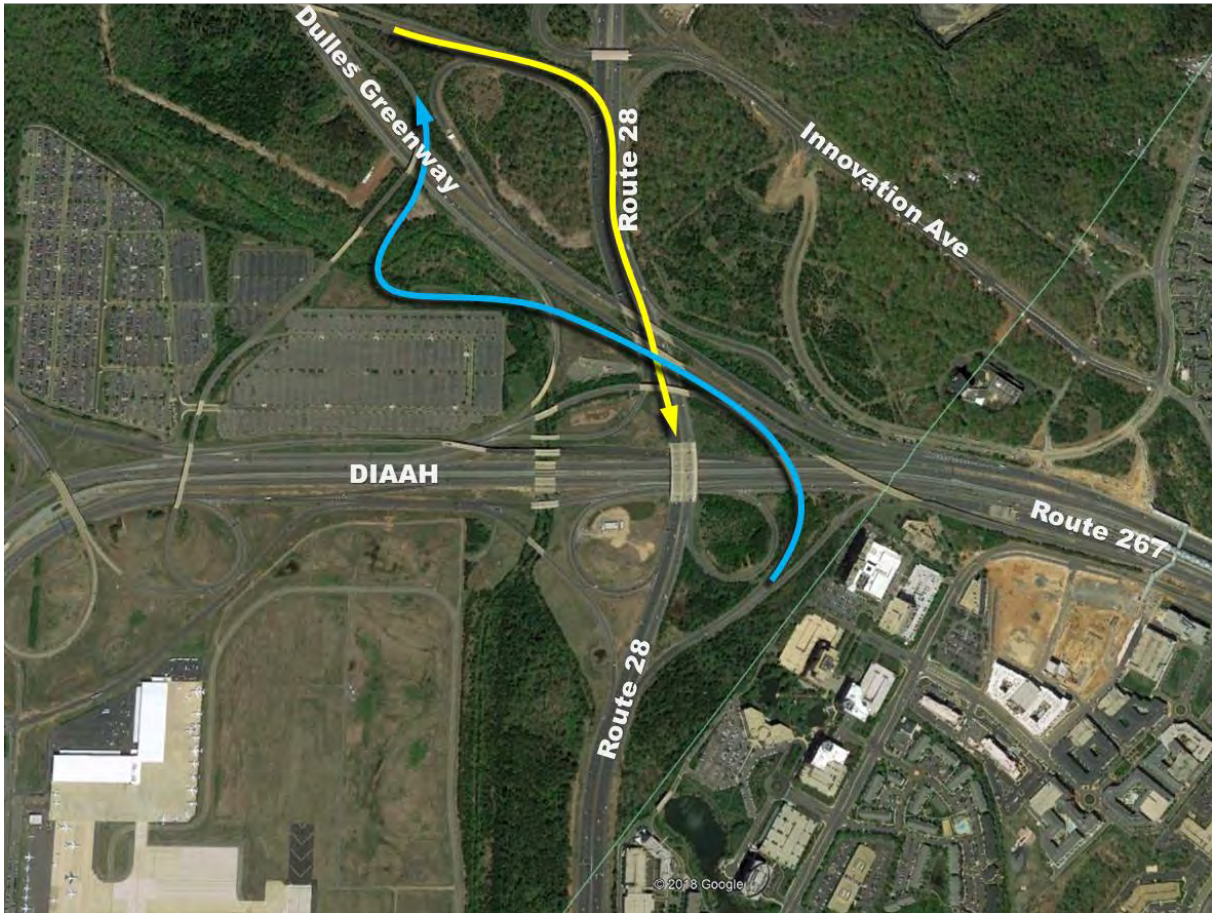
Additional capacity on Ariane Way or New access route to the airport



Add a new Dulles Airport access from Innovation Avenue and/or Pacific Boulevard to Ariane Way



Reverse Dulles Greenway and Airport ramp exits w/merge to left-hand median side of southbound Route 28

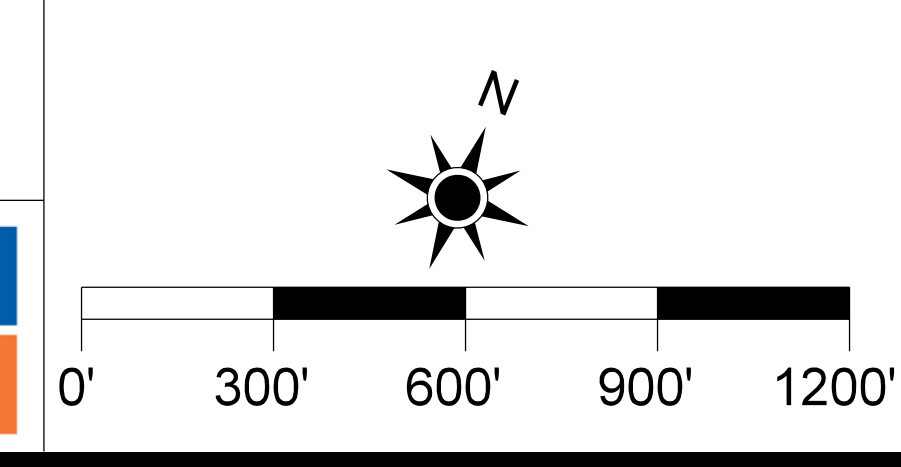


Attachment B – Maps Showing Improvement Alternatives



ALTERNATIVE 1 MAXIMIZING EXISTING INFRASTRUCTURE, MINIMIZING IMPACTS, AND IMPLEMENTING POLICY CHANGES

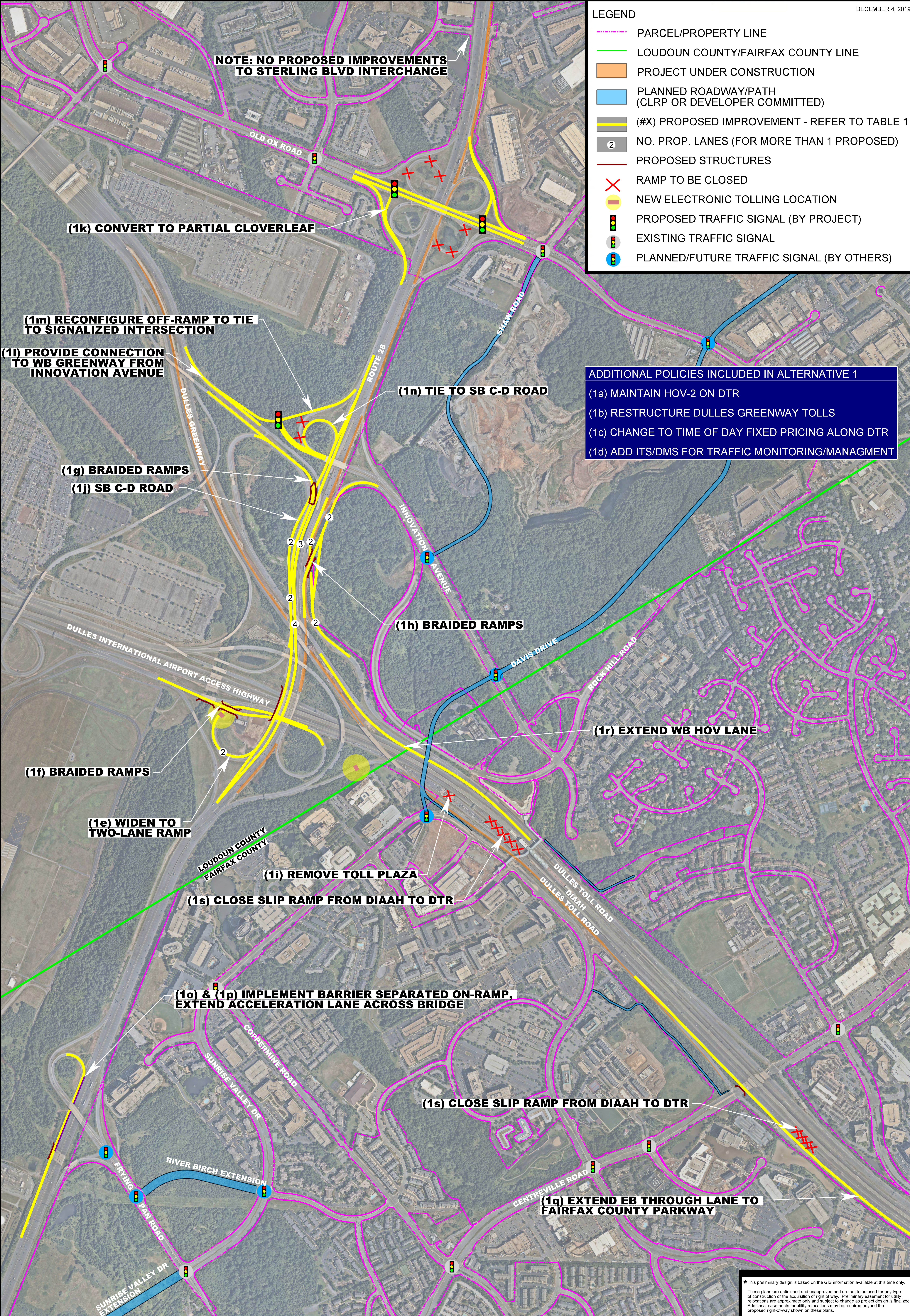
ROUTE 28 & DULLES TOLL ROAD/
DULLES GREENWAY STUDY



DECEMBER 4, 2019

LEGEND

- PARCEL/PROPERTY LINE
- LOUDOUN COUNTY/FAIRFAX COUNTY LINE
- PROJECT UNDER CONSTRUCTION
- PLANNED ROADWAY/PATH (CLRP OR DEVELOPER COMMITTED)
- (#X) PROPOSED IMPROVEMENT - REFER TO TABLE 1
- NO. PROP. LANES (FOR MORE THAN 1 PROPOSED)
- PROPOSED STRUCTURES
- RAMP TO BE CLOSED
- NEW ELECTRONIC TOLLING LOCATION
- PROPOSED TRAFFIC SIGNAL (BY PROJECT)
- EXISTING TRAFFIC SIGNAL
- PLANNED/FUTURE TRAFFIC SIGNAL (BY OTHERS)



NOTE: NO PROPOSED IMPROVEMENTS TO STERLING BLVD INTERCHANGE

(1k) CONVERT TO PARTIAL CLOVERLEAF

(1m) RECONFIGURE OFF-RAMP TO TIE TO SIGNALIZED INTERSECTION

(1l) PROVIDE CONNECTION TO WB GREENWAY FROM INNOVATION AVENUE

(1n) TIE TO SB C-D ROAD

(1g) BRAIDED RAMPS

(1j) SB C-D ROAD

(1h) BRAIDED RAMPS

(1f) BRAIDED RAMPS

(1e) WIDEN TO TWO-LANE RAMP

(1r) EXTEND WB HOV LANE

(1i) REMOVE TOLL PLAZA

(1s) CLOSE SLIP RAMP FROM DIAAH TO DTR

(1o) & (1p) IMPLEMENT BARRIER SEPARATED ON-RAMP, EXTEND ACCELERATION LANE ACROSS BRIDGE

(1s) CLOSE SLIP RAMP FROM DIAAH TO DTR

(1q) EXTEND EB THROUGH LANE TO FAIRFAX COUNTY PARKWAY

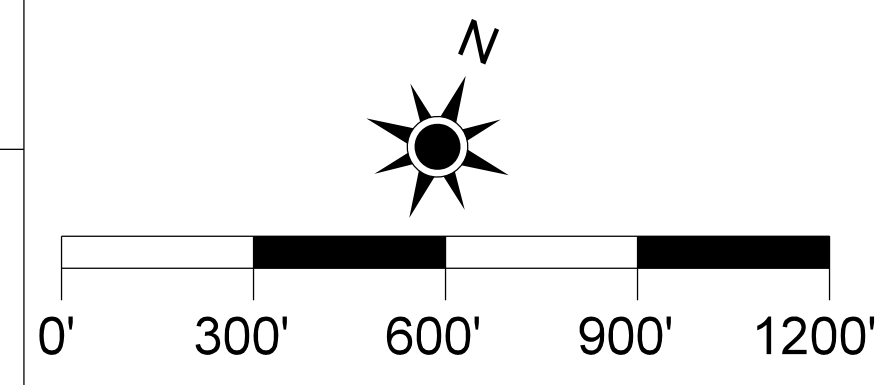
ADDITIONAL POLICIES INCLUDED IN ALTERNATIVE 1

- (1a) MAINTAIN HOV-2 ON DTR
- (1b) RESTRUCTURE DULLES GREENWAY TOLLS
- (1c) CHANGE TO TIME OF DAY FIXED PRICING ALONG DTR
- (1d) ADD ITS/DMS FOR TRAFFIC MONITORING/MANAGEMENT

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ALTERNATIVE 2 ADDRESSING CRITICAL ISSUES

ROUTE 28 & DULLES TOLL ROAD/
DULLES GREENWAY STUDY

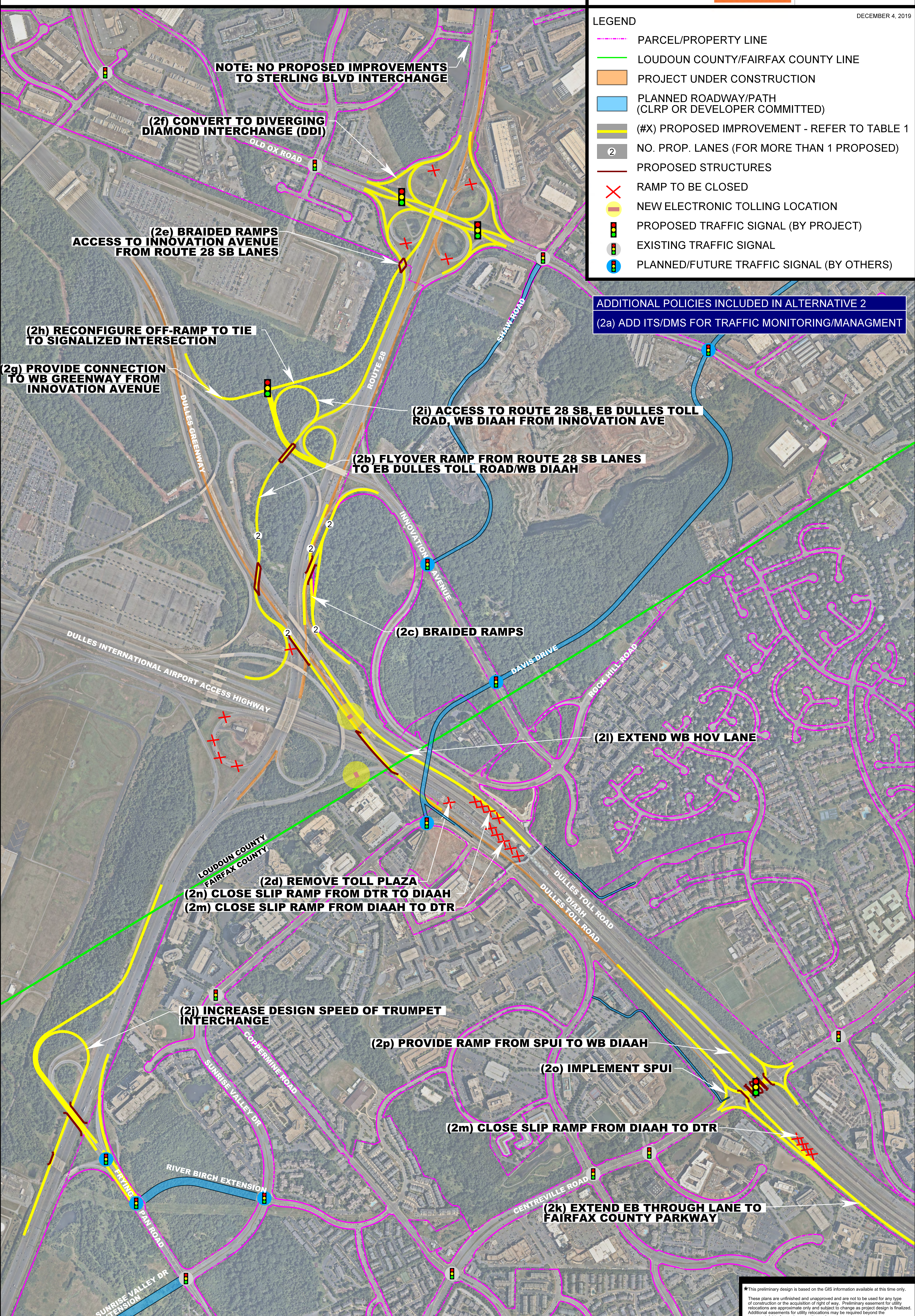


DECEMBER 4, 2019

LEGEND

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- LOUDOUN COUNTY/FAIRFAX COUNTY LINE
- PROJECT UNDER CONSTRUCTION
- PLANNED ROADWAY/PATH (CLRP OR DEVELOPER COMMITTED)
- (#X) PROPOSED IMPROVEMENT - REFER TO TABLE 1
- NO. PROP. LANES (FOR MORE THAN 1 PROPOSED)
- PROPOSED STRUCTURES
- RAMP TO BE CLOSED
- NEW ELECTRONIC TOLLING LOCATION
- PROPOSED TRAFFIC SIGNAL (BY PROJECT)
- EXISTING TRAFFIC SIGNAL
- PLANNED/FUTURE TRAFFIC SIGNAL (BY OTHERS)

ADDITIONAL POLICIES INCLUDED IN ALTERNATIVE 2
(2a) ADD ITS/DMS FOR TRAFFIC MONITORING/MANAGEMENT



NOTE: NO PROPOSED IMPROVEMENTS TO STERLING BLVD INTERCHANGE

(2f) CONVERT TO DIVERGING DIAMOND INTERCHANGE (DDI)

(2e) BRAIDED RAMPS ACCESS TO INNOVATION AVENUE FROM ROUTE 28 SB LANES

(2h) RECONFIGURE OFF-RAMP TO TIE TO SIGNALIZED INTERSECTION

(2g) PROVIDE CONNECTION TO WB GREENWAY FROM INNOVATION AVENUE

(2i) ACCESS TO ROUTE 28 SB, EB DULLES TOLL ROAD, WB DIAAH FROM INNOVATION AVE

(2b) FLYOVER RAMP FROM ROUTE 28 SB LANES TO EB DULLES TOLL ROAD/WB DIAAH

(2c) BRAIDED RAMPS

(2i) EXTEND WB HOV LANE

(2d) REMOVE TOLL PLAZA
(2n) CLOSE SLIP RAMP FROM DTR TO DIAAH
(2m) CLOSE SLIP RAMP FROM DIAAH TO DTR

(2j) INCREASE DESIGN SPEED OF TRUMPET INTERCHANGE

(2p) PROVIDE RAMP FROM SPUI TO WB DIAAH

(2o) IMPLEMENT SPUI

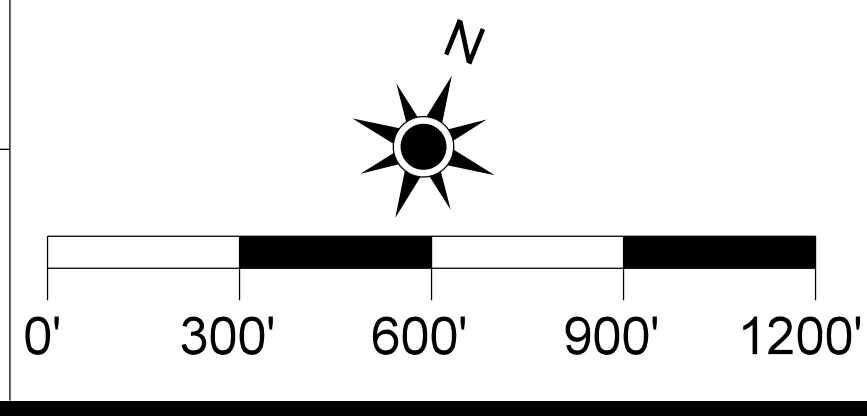
(2m) CLOSE SLIP RAMP FROM DIAAH TO DTR

(2k) EXTEND EB THROUGH LANE TO FAIRFAX COUNTY PARKWAY

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ALTERNATIVE 3 CONSIDERING UNCONSTRAINED INFRASTRUCTURE

ROUTE 28 & DULLES TOLL ROAD/
DULLES GREENWAY STUDY

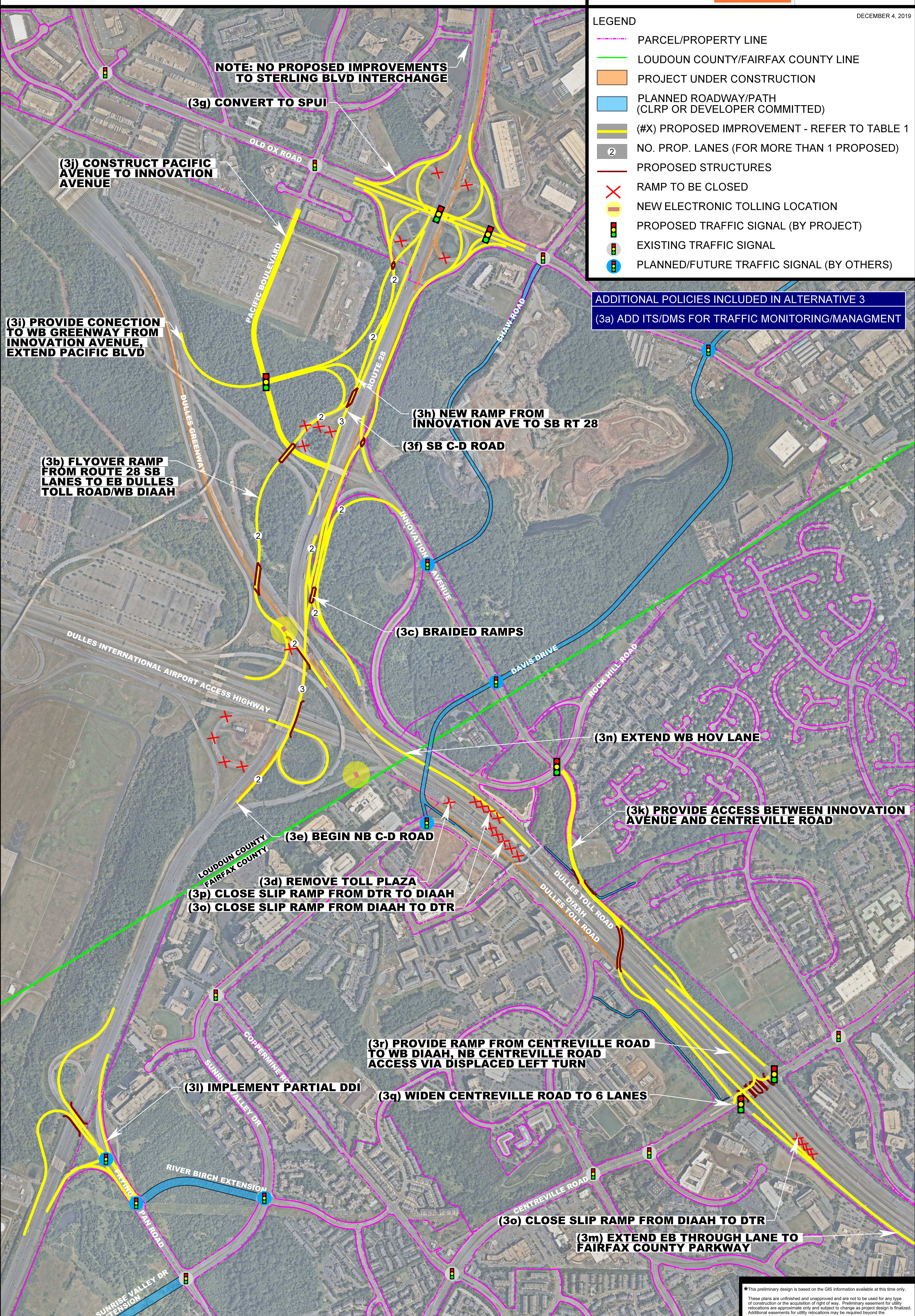


DECEMBER 4, 2019

LEGEND

- PARCEL/PROPERTY LINE
- LOUDOUN COUNTY/FAIRFAX COUNTY LINE
- PROJECT UNDER CONSTRUCTION
- PLANNED ROADWAY/PATH (CLRP OR DEVELOPER COMMITTED)
- (#X) PROPOSED IMPROVEMENT - REFER TO TABLE 1
- NO. PROP. LANES (FOR MORE THAN 1 PROPOSED)
- PROPOSED STRUCTURES
- RAMP TO BE CLOSED
- NEW ELECTRONIC TOLLING LOCATION
- PROPOSED TRAFFIC SIGNAL (BY PROJECT)
- EXISTING TRAFFIC SIGNAL
- PLANNED/FUTURE TRAFFIC SIGNAL (BY OTHERS)

ADDITIONAL POLICIES INCLUDED IN ALTERNATIVE 3
(3a) ADD ITS/DMS FOR TRAFFIC MONITORING/MANAGEMENT



NOTE: NO PROPOSED IMPROVEMENTS TO STERLING BLVD INTERCHANGE

(3g) CONVERT TO SPUI

(3j) CONSTRUCT PACIFIC AVENUE TO INNOVATION AVENUE

(3i) PROVIDE CONECTION TO WB GREENWAY FROM INNOVATION AVENUE, EXTEND PACIFIC BLVD

(3b) FLYOVER RAMP FROM ROUTE 28 SB LANES TO EB DULLES TOLL ROAD/WB DIAAH

(3h) NEW RAMP FROM INNOVATION AVE TO SB RT 28

(3f) SB C-D ROAD

(3c) BRAIDED RAMPS

(3n) EXTEND WB HOV LANE

(3k) PROVIDE ACCESS BETWEEN INNOVATION AVENUE AND CENTREVILLE ROAD

(3e) BEGIN NB C-D ROAD

(3d) REMOVE TOLL PLAZA
(3p) CLOSE SLIP RAMP FROM DTR TO DIAAH
(3o) CLOSE SLIP RAMP FROM DIAAH TO DTR

(3r) PROVIDE RAMP FROM CENTREVILLE ROAD TO WB DIAAH, NB CENTREVILLE ROAD ACCESS VIA DISPLACED LEFT TURN

(3i) IMPLEMENT PARTIAL DDI

(3q) WIDEN CENTREVILLE ROAD TO 6 LANES

(3o) CLOSE SLIP RAMP FROM DIAAH TO DTR

(3m) EXTEND EB THROUGH LANE TO FAIRFAX COUNTY PARKWAY

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