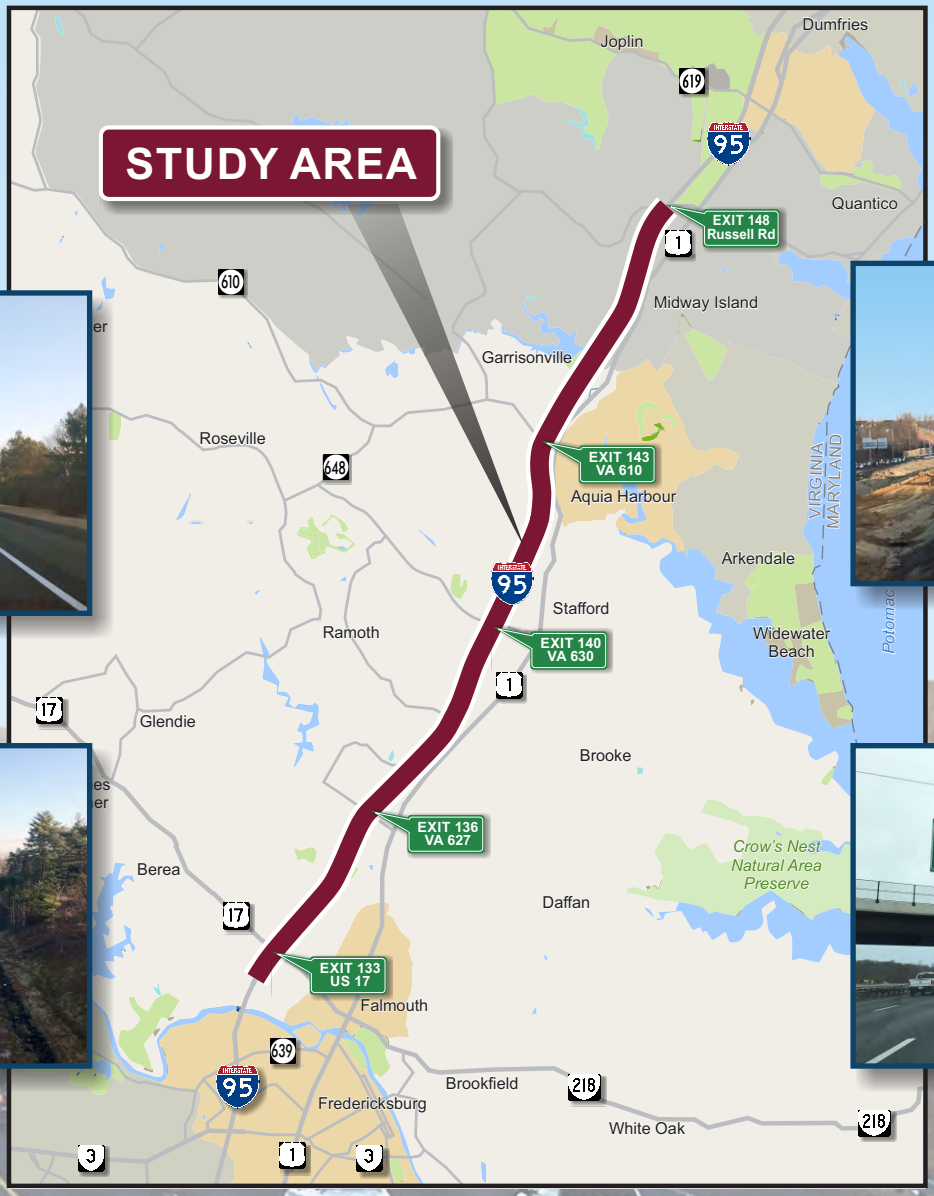
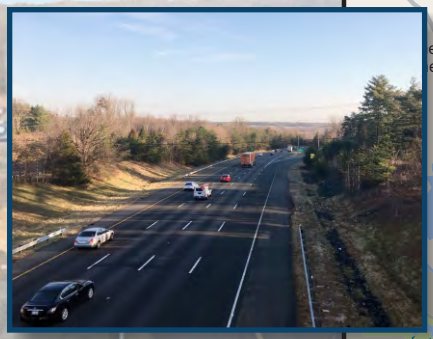
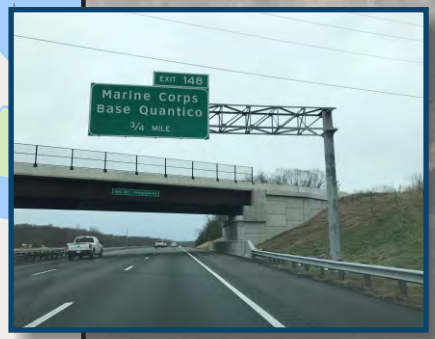
Interstate 95 Express Lanes
Fredericksburg Extension Study

ALTERNATIVES ANALYSIS TECHNICAL REPORT







VDOT Virginia Department of Transportation

U.S. Department of Transportation
Federal Highway Administration

AUGUST 2017

ALTERNATIVES TECHNICAL REPORT

INTERSTATE 95 EXPRESS LANES FREDERICKSBURG EXTENSION STUDY

Prepared in support of the Revised Environmental Assessment

VDOT Project #: 0095-969-739

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August 2017

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LIST OF ACRONYMS

AASHTO	American Association of State Highway and Transportation Officials
CFR	Code of Federal Regulations
DDI	Diverging Diamond Interchange
DMS	Dynamic Message Sign
EA	Environmental Assessment
FHWA	Federal Highway Administration
FONSI	Finding of No Significant Impact
GP	General Purpose
HCS	Highway Capacity Software
HOT	High-Occupancy Toll
HOV	High-Occupancy Vehicle
I-95	Interstate 95
LOS	Level of Service
MM	Mile Marker
NB	Northbound
NHS	National Highway System
SB	Southbound
VDOT	Virginia Department of Transportation
VPD	Vehicles per Day

1. INTRODUCTION

1.1 PROJECT DESCRIPTION

The Virginia Department of Transportation (VDOT), in coordination with the Federal Highway Administration (FHWA) as the lead federal agency, is preparing a Revised Environmental Assessment (Revised EA) for the Interstate 95 (I-95) HOT Lanes Project, for which a Finding of No Significant Impact (FONSI) was issued by FHWA in 2011. The Revised EA, which is being completed for the I-95 Express Lanes Fredericksburg Extension Study (or the "Fredericksburg Extension Study"), presents improvements identified in a portion of the 2011 FONSI-selected Alternative, from the I-95 / US 17 North interchange at Warrenton Road (Exit 133) to south of the I-95 / Russell Road interchange (Exit 148). The Revised EA also includes new access points along this portion of the 2011 FONSI-selected Alternative. As part of the current study, environmental resources along the corridor were updated according to the latest available data and information.

The purpose of this technical report is to describe the portion of the 2011 FONSI-selected Alternative being reviewed, review new access points, and describe options that were not retained. Information in this report is provided to support the Revised EA.

1.2 PURPOSE AND NEED

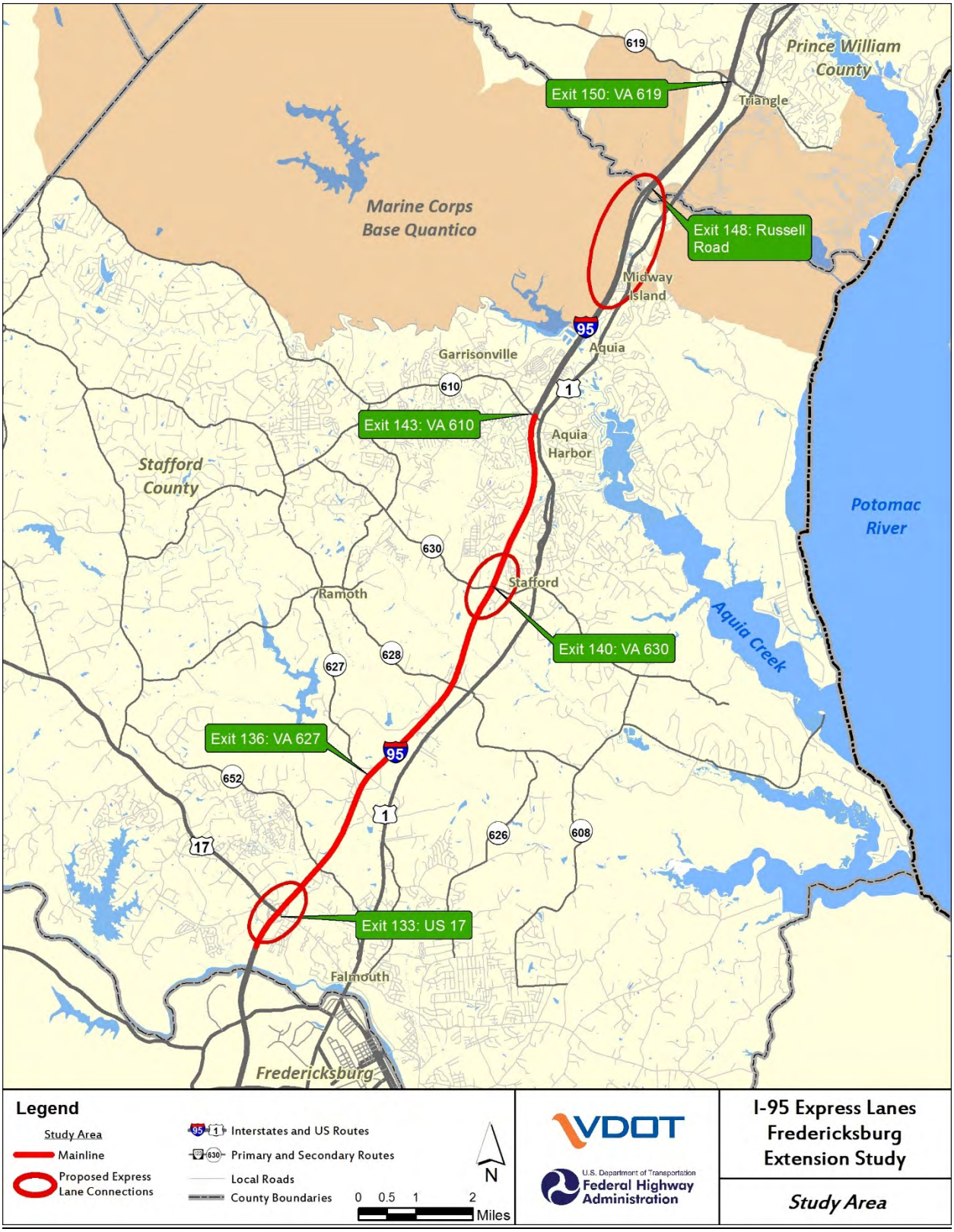
The purpose of the Fredericksburg Extension Study is to:

- Reduce daily congestion and accommodate travel demands more efficiently. Existing traffic volumes exceed available highway capacity, and the forecasts prepared using the regional travel demand models show continuing traffic growth in the corridor, with much of the Fredericksburg region's workforce continuing to commute north.
- Provide higher reliability of travel times. People place a high value on reaching their destinations in a timely manner, and in recent years, I-95 has become so congested that the existing I-95 facilities cannot provide reliable travel times during the peak periods.
- Expand travel choices by increasing the attractiveness and utility of ridesharing and transit usage while also providing an option for single-occupant vehicles to bypass congested conditions.

1.3 EXISTING CONDITIONS

The study area for the Fredericksburg Extension Study Revised EA is located along I-95 in Stafford and Prince William Counties, Virginia, from south of the I-95 / US 17 North interchange (Exit 133) to north of the I-95 / Russell Road interchange (Exit 148), a distance of approximately 15 miles (see **Figure 1-1**). I-95 within the study area generally includes three northbound (NB) and three southbound (SB) general purpose (GP) lanes. Two reversible Express Lanes currently operate as high-occupancy toll (HOT) lanes in the median between the I-95 NB and SB lanes from north of the I-95 / VA 610 interchange at Garrisonville (Exit 143) and extend north beyond the study area to Alexandria. The Express Lanes operate in the NB or SB direction based on peak traffic flow along I-95. The existing southern terminus of the Express Lanes is currently being extended for approximately two miles from north of Garrisonville Road to south of Garrisonville Road.

Figure 1-1: Study Area



1.4 PREVIOUS STUDIES AND PROJECT HISTORY

The 2011 EA reviewed a study area that extended along I-95 from 1.1 miles south of the I-95 / US 17 South Interchange in Spotsylvania County (Exit 126) to just north of the I-95 / I-495 / I-395 Interchange in Springfield (Exit 169) (**Figure 1-2**). The EA included a No-Build Alternative and a Build Alternative. Under the 2011 No-Build Alternative, the lane configurations of I-95 within the study area that existed in 2011 would remain. This included three to four GP travel lanes in each direction and two reversible high-occupancy vehicle (HOV) lanes within the median from Dumfries Road (Exit 152) to the Capital Beltway (Exit 169), with a variable width vegetated median ranging from 40 to 600 feet wide (FHWA, 2011a).

The 2011 FONSI-selected Alternative consisted of constructing new HOT lanes from one mile south of the I-95 / US 17 South interchange (Exit 126) to VA 234 / Dumfries Road, and converting existing HOV lanes to HOT (Express) lanes between VA 234 / Dumfries Road (Exit 152) to just north of Turkeycock Run. Per the 2011 EA, the HOT Lanes would generally consist of two, 11- to 12-foot-wide travel lanes and variable shoulder widths, in accordance with the American Association of State Highway and Transportation Officials (AASHTO) standards. The Express Lanes would be operated using all-electronic tolling and would be reversible based on peak travel times (FHWA, 2011a).

The 2011 FONSI-selected Alternative identified access points for entry to and exit from the Express Lanes via slip ramps or flyover ramps. Access points were proposed at locations where they would provide optimal access to the Express Lanes with minimal impacts to right-of-way and the I-95 GP lanes. Of the proposed access points connecting the GP lanes to the Express Lanes, 30 were proposed as at-grade slip ramps, and five were recommended as grade-separated flyover ramps:

- Between VA 630 / Courthouse Road (Exit 140) and VA 610 / Garrisonville Road (Exit 143);
- Between VA 610 / Garrisonville Road (Exit 143) and Russell Road (Exit 148);
- Between VA 619 / Joplin Road (Exit 150) and VA 234 / Dumfries Road (Exit 152);
- Between Alban Road and the Express Lanes; and
- At the northern terminus of the project (north of Edsall Road).

Since 2011, some sections of the proposed Express Lanes have been constructed or are under construction. Improvements proposed in the northern section, from the I-95 / Route 610 Interchange at Garrisonville (Exit 143) to the Turkeycock Run interchange on I-395 at the Capital Beltway, opened in December 2014. All access points described in this northern section were implemented. Following a National Environmental Policy Act reevaluation of the 2011 EA, completed in March 2016 (FHWA, 2016b), construction is underway to extend the Express Lanes approximately two miles south from the current southern terminus near VA 610 / Garrisonville Road (Exit 143). This project, called the I-95 Express Lanes Southern Extension, is anticipated to open in 2018 (**Figure 1-2**), and will include the addition of a reversible, single lane in the median of I-95, which will split into NB and SB merge ramps (VDOT, 2017b).

In 2015, VDOT completed the I-395 Express Lanes Northern Extension EA, followed by a Revised EA in 2016, which documented a preferred alternative that would extend the I-395 Express Lanes eight miles from the Turkeycock Run Interchange to the vicinity of Eads Street in Arlington (I-395, Exit 8). Two existing HOV lanes would be converted to three Express Lanes using a portion of the existing shoulder. Construction of the I-395 Northern Extension began in summer 2017, and is expected to be completed by summer 2020 (VDOT, 2016) (**Figure 1-2**).

Figure 1-2: I-95 Express Lanes Status

2. ALTERNATIVES

2.1 ALTERNATIVES DEVELOPMENT

This technical report is focused on refinements to a portion of the 2011 FONSI-selected Alternative that was not constructed: mainline improvements and Express Lane access points from the I-95 / US 17 North interchange at Warrenton Road (Exit 133) to the I-95 / Russell Road interchange (Exit 148). As a result, the alternatives development process began with a review of the Build Alternative from the 2011 *I-95 HOT Lanes Project EA*, as described in **Section 1.4** of this report.

2.2 ALTERNATIVES RETAINED FOR EVALUATION

This section presents the revisited southern portion of the 2011 FONSI-selected Alternative as well as the No-Build Alternative. During the course of the Fredericksburg Extension Study, several locations were considered for access to the Express Lanes at the I-95 / US 17 North Interchange at Warrenton Road (Exit 133), the I-95 / VA 630 Interchange at Courthouse Road (Exit 140), and the vicinity of the Marine Corps Base Quantico. The access points at US 17 / Warrenton Road and VA 630 / Courthouse Road were included in the 2011 FONSI-selected Alternative. The access point at Marine Corps Base Quantico was not included in the 2011 FONSI-selected Alternative; however, it is included in this Revised EA because extending the Express Lanes south without providing additional access would leave a gap of roughly 24 miles between NB entry and exit points that would reduce user choice and accessibility. Potential access in the vicinity of the Base was evaluated at Joplin Road, Telegraph Road, and Russell Road; Russell Road was identified as the most appropriate location. Access options are described in detail in **Section 2.2.2** and **Section 2.3**, below.

2.2.1 No-Build Alternative

Under the No-Build Alternative, the Express Lanes would not be extended south beyond the southern terminus of the I-95 Express Lanes Southern Extension project (south of VA 610 / Garrisonville Road at Exit 143). There would be no change to existing access points and I-95 would remain in its present configuration. VDOT would continue maintenance and repairs of the existing roadway, as needed, with no substantial changes to current capacity or management activities. The No-Build Alternative was not identified as the preferred alternative in the 2011 EA and subsequent FONSI but is retained as a baseline for comparison in this technical report.

2.2.2 Build Alternative

Design Criteria

Design criteria for the Build Alternative described in this Revised EA have been updated from the 2011 EA based on AASHTO's *A Policy on Geometric Design of Highways and Streets*, 2011 and *Roadside Design Guide*, 2011; and the VDOT *Road and Bridge Standards*, 2016 and *Road Design Manual*, 2011. These criteria determine the design speed for the roadway and associated design elements, such as minimum radii, lane width, roadway shoulder width, bridge shoulder width, median width, sight distance, and vertical clearance. Refer to **Appendix A** for specific design criteria for the Express Lanes, GP lanes, Interchange Ramps, and adjacent roadways.

Description

The Build Alternative would extend two reversible Express Lanes in the median of I-95 from the vicinity of the I-95 / US 17 North Interchange at Warrenton Road (Exit 133) to south of I-95 / VA 610 Interchange at Garrisonville Road (Exit 143) to tie into the I-95 Southern Extension Project. It would also provide Express

Lane access at several locations (further described below). The Express Lanes would be located in the median of I-95 and consist of two, 12-foot reversible lanes with 10-foot shoulders on each side.

One typical section was planned for the full Build Alternative: an open drainage section, which would convey stormwater from the roadway to an adequate outfall via open channels. The open section is shown in **Figure 2-1**. However, after reviewing the southern half of the study area, it was determined that a narrower section should be used in that half in order to avoid and minimize impacts to the Waters of the US. As a result, a narrower, closed drainage section was created. A closed drainage section is one that uses underground conduits to convey stormwater collected by inlets to an adequate outfall. The narrower, closed section would be applied from the I-95 / US 17 Interchange at Warrenton Road (Exit 133) to the vicinity of VA 628 / American Legion Road, and the open section would be applied from the vicinity of VA 628 / American Legion Road to south of VA 610 / Garrisonville Road at Exit 143. Further efforts to minimize impacts would be explored in later stages of design and permitting that would follow a FONSI from FHWA.

In the open typical section, the grass median on the southbound side of the Express Lanes would range from 20 feet to 500 feet, and the grass median on the northbound side would range from 20 feet to 70 feet. In the closed typical section, the width of the median on the southbound side of the Express Lanes would range from 18 to 300 feet, and the width of the median on the northbound side would range from 12 to 70 feet. The width of the grass median in both sections is dependent upon the size of the existing median at a given location.

In order to accommodate the Express Lane improvements and associated entrance and exit access points, the existing GP lanes of I-95 would be widened or realigned in several locations. The NB GP lanes would be widened to include an auxiliary lane between a half-mile north of US 17 North and a half-mile north of VA 652 / Truslow Road. The SB GP lanes would be realigned between 0.3 miles north of Route 628 and 0.4 miles south of Route 628, and between 0.6 miles north of VA 652 / Truslow Road and the I-95 / US 17 North Interchange.

Express Lane Access

The Build Alternative would provide Express Lane access at several locations, including the I-95 / US 17 North Interchange at Warrenton Road (Exit 133), the I-95 / VA 630 Interchange at Courthouse Road (Exit 140), and near the I-95 / Russell Road Interchange at Marine Corps Base Quantico (Exit 148). The Build Alternative, including mainline and access improvements, is shown in **Appendix A**. The Express Lanes would operate as reversible HOT lanes based on peak traffic flow, and would be consistent with the portion of the 2011 FONSI-selected Alternative that has already been constructed.

Figure 2-2 shows the status of Express Lane access points from the 2011 FONSI-selected Alternative. Four access points, proposed in the 2011 EA as slip ramps, are included in this Revised EA:

- Two flyovers: an entrance south of Route 8900 / Centreport Parkway (Exit 136) and an entrance south of Russell Road (Exit 148) on I-95 SB; and
- Two direct connections at VA 630 / Courthouse Road (Exit 140): a SB exit and a NB entrance.

Four additional access points have been added to the 2011 FONSI-selected Alternative based on updated traffic and environmental information:

- A slip ramp north of US 17 / Warrenton Road (Exit 133) on I-95 SB;
- A flyover exit north of US 17 / Warrenton Road (Exit 133) on I-95 SB;
- A slip ramp entrance north of US 17 / Warrenton Road (Exit 133) on I-95 NB; and
- A flyover exit south of Russell Road (Exit 148) on I-95 NB.

Figure 2-1: Typical Section

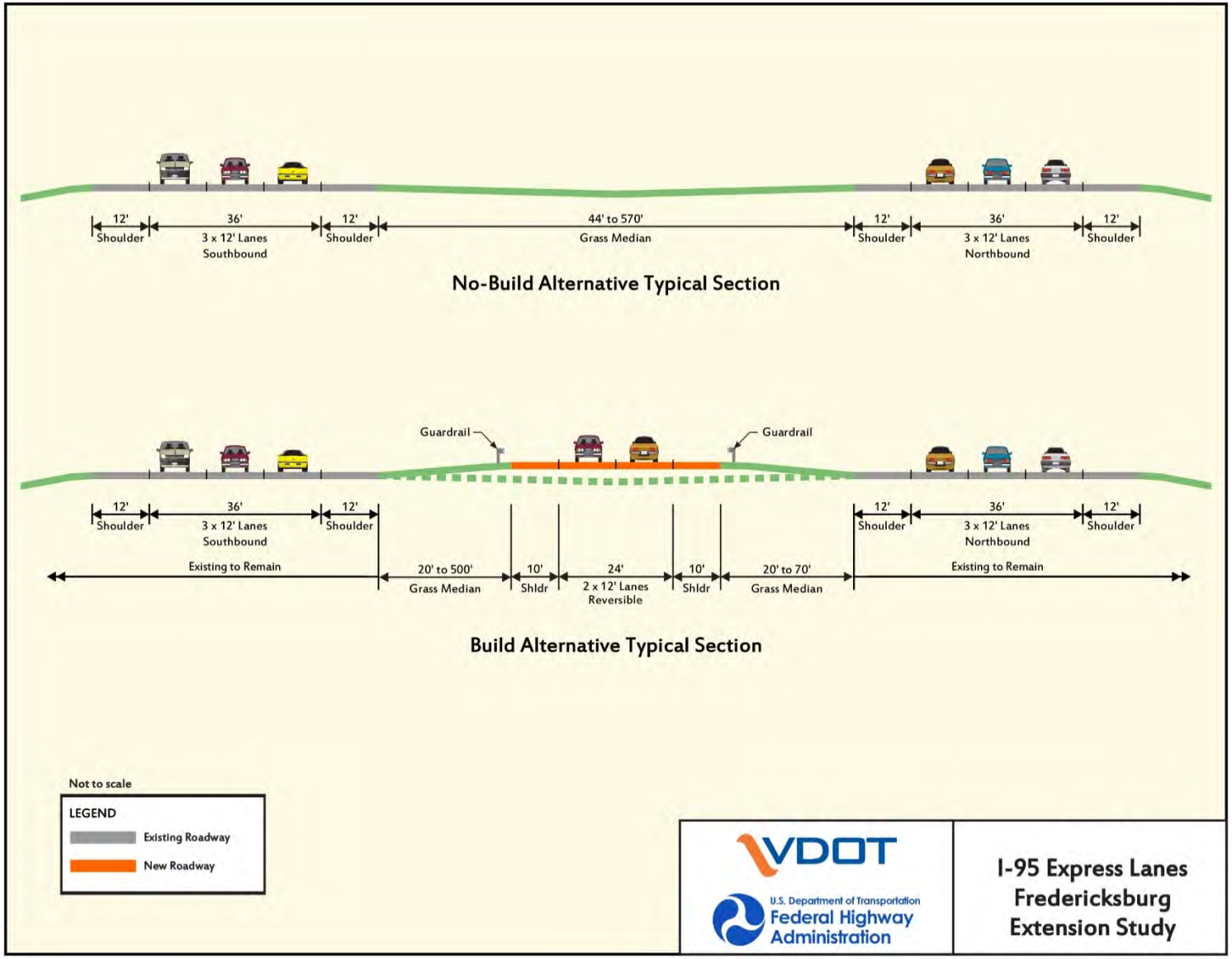
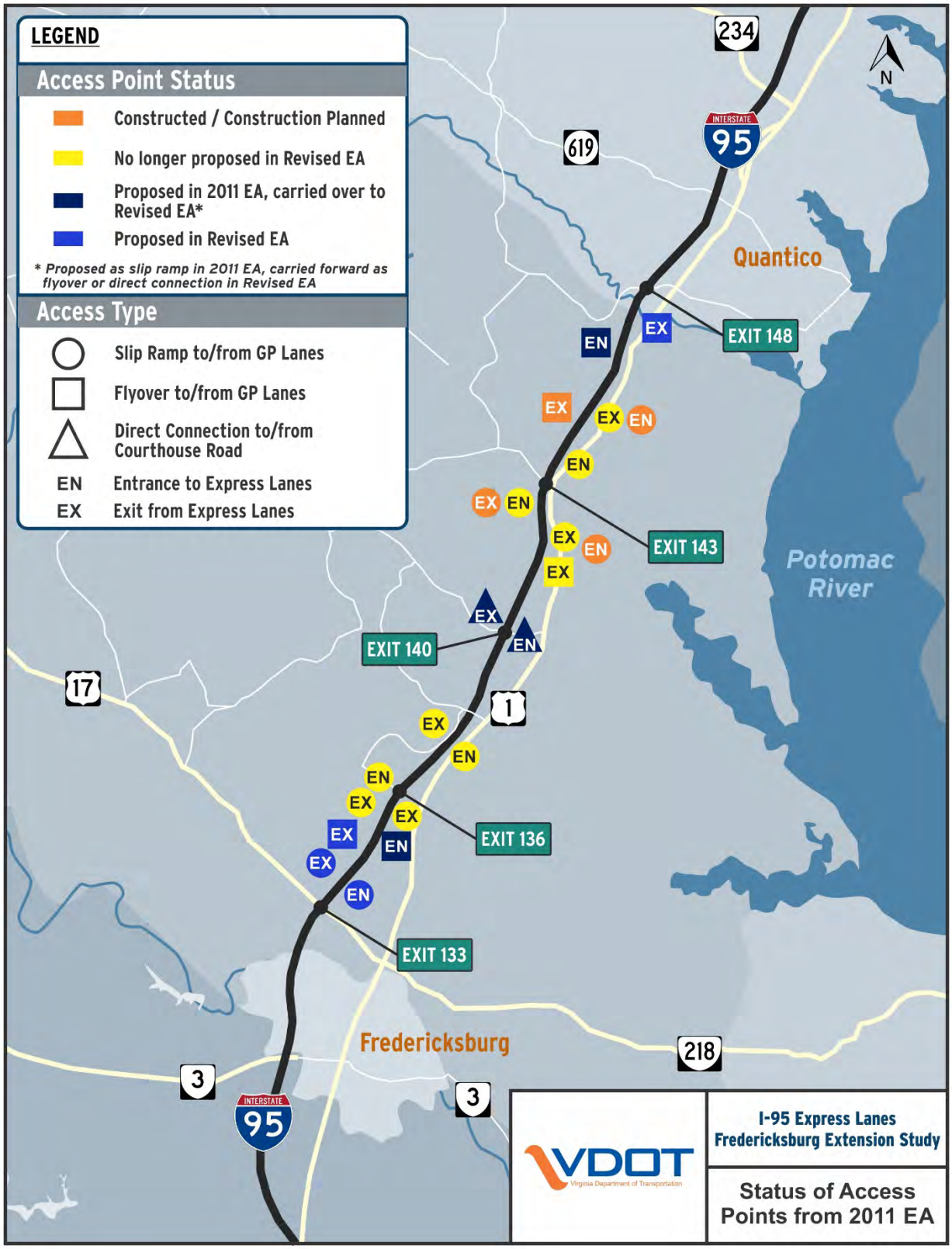


Figure 2-2: Status of Access Points from the 2011 EA



The access points to and from the Express Lanes would vary for NB and SB travel; accordingly, the Build Alternative is described below for each direction.

Northbound Travel

The first access to the proposed northbound Express Lanes would be at their southern terminus south of the I-95 / US 17 North Interchange at Warrenton Road (Exit 133). Access to and from the NB Express Lanes would also occur as follows:

- North of the I-95 / US 17 North Interchange at Warrenton Road (Exit 133), vehicles could enter the Express Lanes from the left lane (west side) of I-95 via a new slip ramp and from a new flyover entrance from the right lane (east side) of NB I-95.
- At VA 630 / Courthouse Road (Exit 140), an entrance to the Express Lanes would come directly from Courthouse Road; this ramp would be reversible and would serve both NB and SB travel.
- South of Russell Road (Exit 148), a flyover ramp emerging from the left lane (west side) of the Express Lanes would provide an exit from the Express Lanes and allow cars to merge into the right lane (east side) of the NB GP lanes.

Southbound Travel

The proposed southbound Express Lanes extension would begin approximately one mile south of VA 610 / Garrisonville Road (Exit 143) where the current Express Lanes end, and would continue to the proposed terminus of the Express Lanes, just north of US 17 (Exit 133). Access to and from the SB Express Lanes would occur as follows:

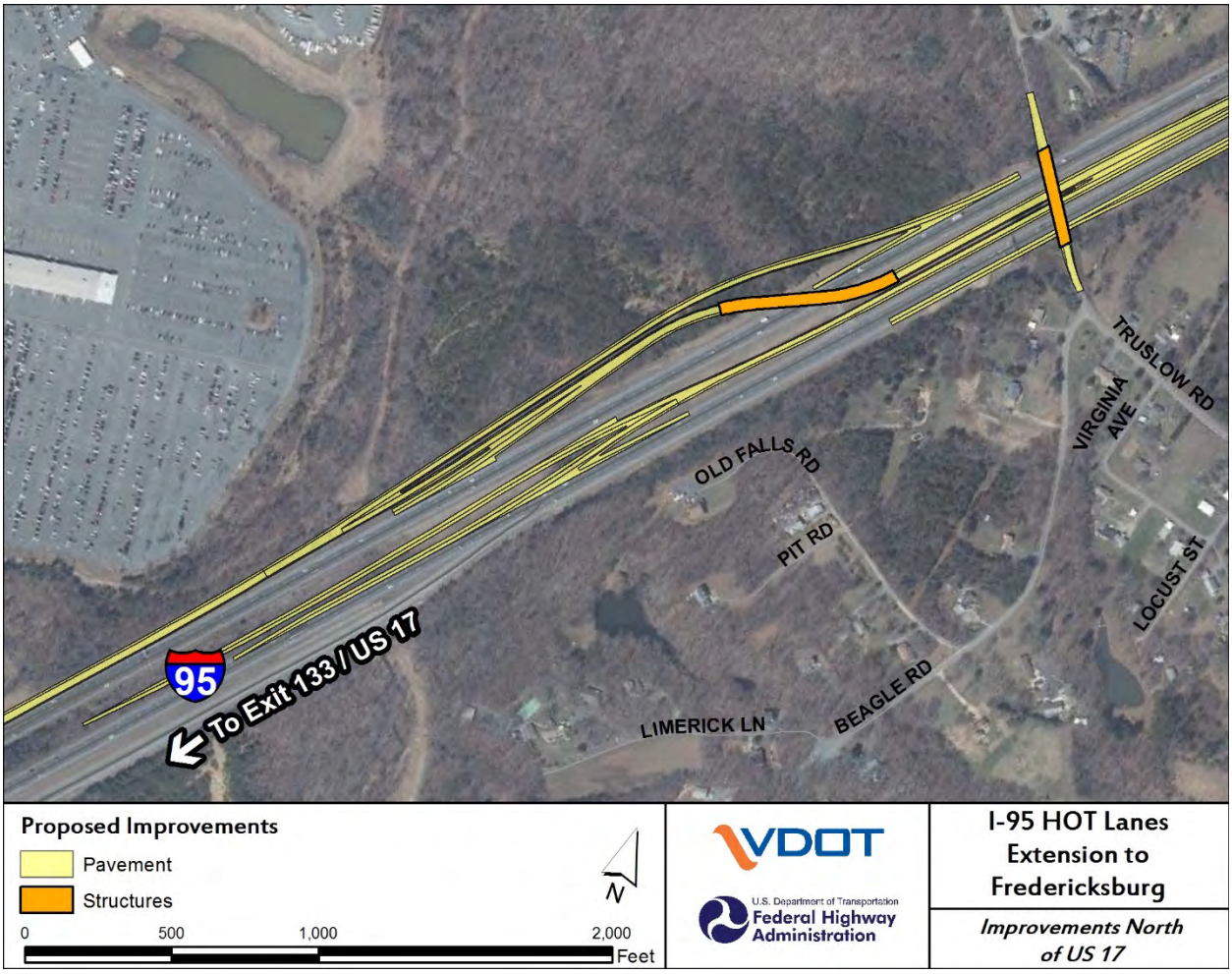
- South of Russell Road (Exit 148), users in the GP lanes could enter the Express Lanes just south of VA 637 via a new flyover from the right lane (west side) of SB I-95.
- At VA 630 / Courthouse Road (Exit 140), a new exit from the Express Lanes would connect directly to Courthouse Road; this ramp would be reversible and would serve both NB and SB travel.
- North of US 17 North / Warrenton Road (Exit 133), a new flyover ramp would provide an exit from the Express Lanes to access the GP lanes and US 17. SB travelers could also access GP lanes via a new slip ramp which merges into the left (east) GP lane.

As described above, the Build Alternative would include access points to and from the Express Lanes at various locations for NB and SB travel between Exit 133 and Exit 148. Detailed descriptions for access points at US 17 (Exit 133), VA 630 / Courthouse Road (Exit 140), and Russell Road (Exit 148) are provided below.

US 17 / Warrenton Road (Exit 133)

The proposed access point at US 17 would consist of a dual-lane flyover from the I-95 Express Lanes, with one lane providing access to the I-95 GP lanes and one lane allowing access directly to Route 17. Accompanying the Express Lane access point would be four GP lanes split into two through lanes: one choice lane (to stay on the mainline or exit), and one local lane. The dual-lane flyover and collector/distributor lanes would separate Express Lane users choosing to exit to Route 17 from GP lane users choosing to exit to Route 17, eliminating what would otherwise be a weaving segment between the Express Lanes flyover and US 17 on the collector/distributor roads (see **Figure 2-3**).

Figure 2-3: US 17 / Warrenton Road (Exit 133) Access



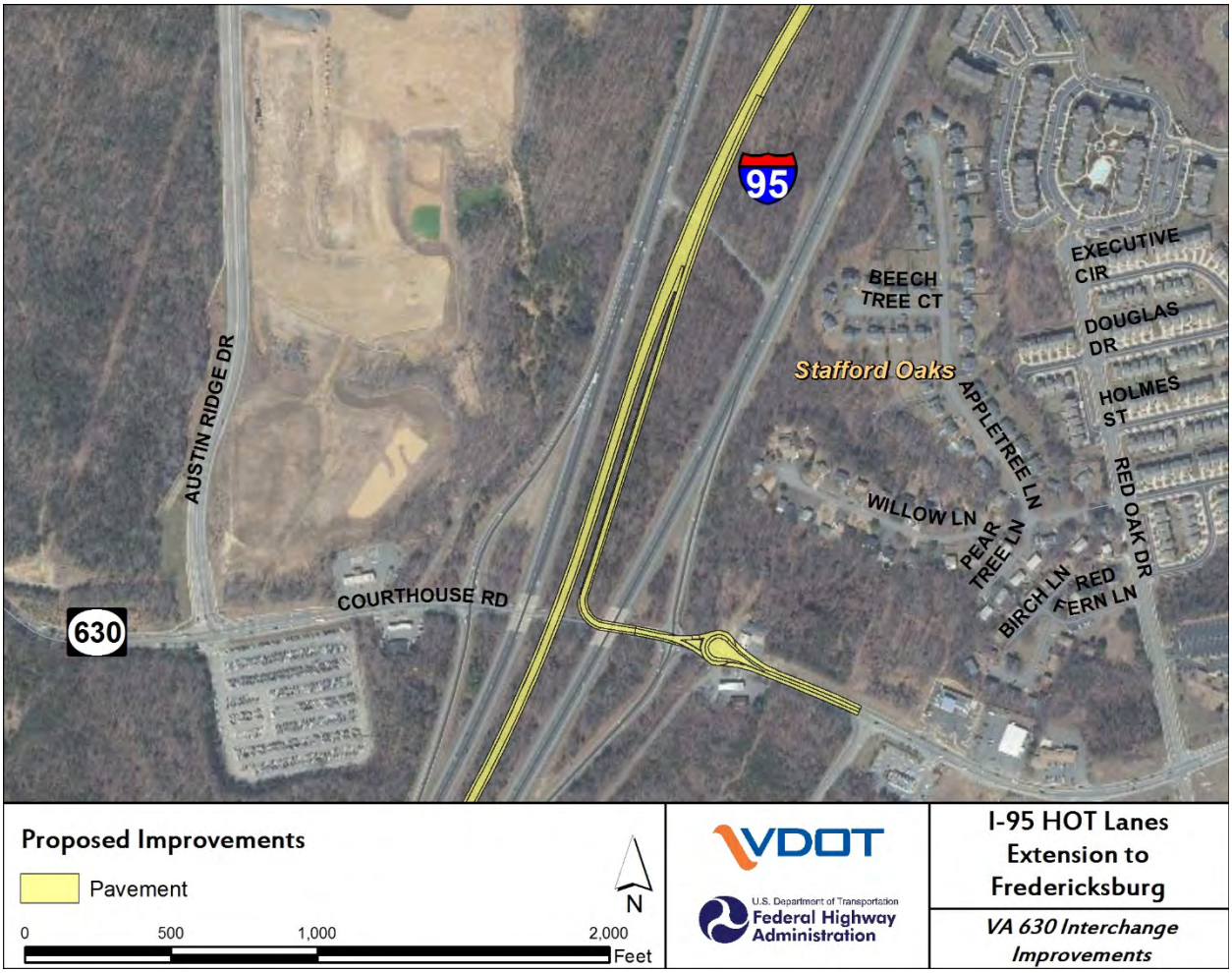
VA 630 / Courthouse Road (Exit 140)

The proposed access point at Courthouse Road would be designed to complement VDOT's Route 630 Interchange Relocation and Route 630 Widening Project. Construction began in summer 2017, with estimated completion by summer 2020. VDOT will be rebuilding the Route 630 interchange as a diverging diamond interchange (DDI), widening Courthouse Road, and relocating the current Courthouse Road Park & Ride lot from its current location, west of I-95. The new Park & Ride lot will be located east of I-95 and the number of parking spaces will be expanded from 545 to 1,000 (VDOT, 2017c).

The proposed access to the Express Lanes that runs under the existing I-95 bridge would consist of a ramp utilizing a portion of the existing Courthouse Road that will no longer be part of the realigned DDI Courthouse Road. The ramp merges with the Express Lanes on the west side and would provide either an entrance to the NB Express Lanes or an exit from the SB Express Lanes, depending on the time of day.

The construction of this proposed access point would also involve the construction of a partial roundabout between the Express Lanes access ramp and the Park & Ride lot entrance. The partial roundabout would allow users to turn around if attempting to enter the Express Lane ramp when the direction of traffic has been reversed. The ramp would have gates and "Do Not Enter" signs that would be engaged when the direction of traffic has been reversed. Signage indicating ramp closure would include a Dynamic Message Sign (DMS) in each direction on Route 1, as well as a DMS within or just before the roundabout. The DMS would have a message stating "Gates Closed, Do Not Enter" (see **Figure 2-4**).

Figure 2-4: VA 630 / Courthouse Road (Exit 140) Access



Marine Corps Base Quantico

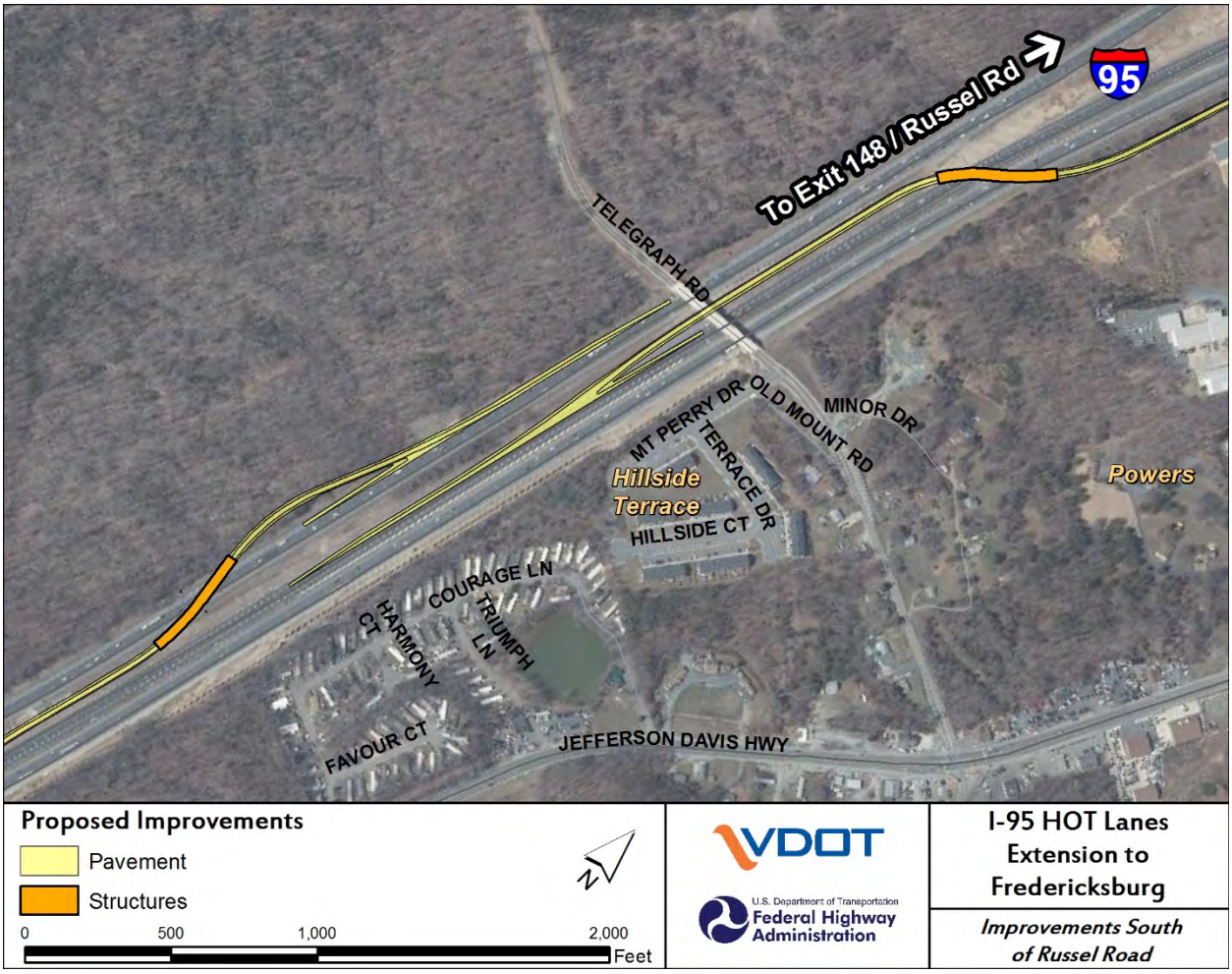
Northbound Flyover Exit

The proposed NB Express Lanes flyover ramp access point at Russell Road would consist of a ramp emerging from the west side of the existing Express Lanes at approximately mile marker (MM) 147.0, crossing back over the Express Lanes and NB GP lanes at MM 147.6, and continuing approximately 0.2 miles before merging back onto the east side of I-95 NB GP lanes at MM 147.9, just south of Exit 148. The ramp provides an exit from NB Express Lanes to I-95 NB GP lanes and Russell Road (see **Figure 2-5**).

Southbound Flyover Entrance

This option would introduce a flyover ramp on the right side of the I-95 GP lanes to provide access to the Express Lanes. Under this option, traffic desiring to access the Express Lanes from Russell Road would merge into the right lane along the I-95 GP lanes and then would not need to make any additional lane changes to position themselves to exit onto the flyover ramp. The flyover ramp would also provide access to the Express Lanes for other traffic in the I-95 GP lanes (from points north of Russell Road) (see **Figure 2-5**).

Figure 2-5: Marine Corps Base Quantico Access



2.2.3 Ability to Meet Needs

The Build Alternative described in this technical report is a portion of the 2011 FONSI-selected Alternative and therefore continues to meet the study needs.

The Build Alternative would increase the total daily volumes along I-95 within the study corridor as compared with 2042 No-Build conditions. Total projected daily traffic volumes (including both the GP and the new Express Lanes) would increase by approximately six percent (8,000 to 11,000 vehicles per day (vpd)) north of VA 610 / Garrisonville Road (Exit 143) and approximately eight to ten percent (15,000 to 17,000 vpd) between US 17 / Warrenton Road (Exit 133) and VA 610 / Garrisonville Road (Exit 143). North of VA 610 / Garrisonville Road (Exit 143), the daily volumes in the GP lanes would decrease by approximately 4,000 vpd, while the Express Lane volumes would increase by approximately 14,000 vpd. Between US 17 / Warrenton Road (Exit 133) and VA 610 / Garrisonville Road (Exit143), the daily I-95 GP volumes would decrease by approximately 14,000 vpd and the proposed I-95 Express Lanes would carry approximately 26,000 vpd. **Table 2-1** shows the summary of daily traffic volumes for each major segment of I-95 (defined as segments between interchanges) within the study area.

Table 2-1: Daily Volume Comparison

Location on I-95	Direction	2016 Daily Volumes			2042 No-Build Daily Volumes			2042 Build Daily Volumes		
		GP	Express	Total	GP	Express	Total	GP	Express	Total
North of Jefferson Davis Highway (US 1, Exit 126)	NB	52,000	-	**105,100**	75,500	-	**151,400**	77,400	-	**156,000**
	SB	53,100	-		75,900	-		78,600	-	
North of Plank Road (Route 3, Exit 130)	NB	69,000	-	**136,000**	88,300	-	**173,800**	91,100	-	**180,100**
	SB	67,000	-		85,500	-		89,000	-	
North of Warrenton Road (US 17, Exit 133)	NB	62,200	-	**124,400**	80,700	-	**157,800**	76,200	13,300	**171,100**
	SB	62,200	-		77,100	-		68,400	13,200	
North of Centreport Parkway (Route 8900, Exit 136)	NB	61,900	-	**124,200**	78,200	-	**154,400**	76,000	13,300	**170,000**
	SB	62,300	-		76,200	-		67,500	13,200	
North of Courthouse Road (Route 630, Exit 140)	NB	60,900	-	**121,900**	81,400	-	**158,000**	76,400	15,300	**175,500**
	SB	61,000	-		76,600	-		67,900	15,900	
North of Garrisonville Road (Route 610, Exit 143)	NB	69,600	6,200	**153,700**	85,300	12,500	**188,800**	81,500	20,500	**199,800**
	SB	68,600	9,300		75,000	16,000		75,500	22,300	
North of Russell Road (Exit 148)	NB	64,900	6,200	**143,000**	77,600	12,500	**175,400**	76,100	20,500	**183,100**
	SB	62,600	9,300		69,300	16,000		70,200	16,300	

A summary of projected Level of Service (LOS) and travel times for the I-95 corridor for 2042 No-Build and 2042 Build conditions are provided in **Table 2-2**. It should be noted that the travel time estimates were developed from planning-level capacity analysis output and are intended to indicate relative changes in travel time between alternatives. Although LOS is used as a measure of I-95's traffic performance in the 2011 EA and the Revised EA, the Revised EA does not establish a minimum LOS for I-95 in the Fredericksburg Extension Study Area. LOS values may not be reasonably attainable in some situations, including the heavily congested conditions occurring in the Fredericksburg Extension Study Area. FHWA's revised policy (FHWA, 2016a) also clarifies that the agency does not have regulations or policies that require specific minimum LOS values for improvement projects on the National Highway System (NHS). The NHS is a network of strategic highways that includes the Interstate Highway System as well as other roads important to the nation's economy, defense, and mobility. I-95 in the Fredericksburg Extension Study Area is part of the NHS.

Overall, the I-95 GP lanes are projected to continue to operate at LOS F in the NB direction during the AM peak period and at LOS F in the SB direction during the PM peak period. Compared to 2042 No-Build conditions, travel times within the GP lanes within the study segment are projected to decrease by five minutes in the NB direction during the AM peak period and seven minutes in the SB direction during the PM peak period. It should be noted that in the SB direction, the congested segment extends beyond the Study Limits in 2042, so the overall change in SB travel times may be larger if a larger study limit were reviewed.

Table 2-2: HCS Freeway Facilities Results

Period	Existing				2042 No-Build				2042 Build			
	NB		SB		NB		SB		NB		SB	
	LOS	Travel Time (min)	LOS	Travel Time (min)	LOS	Travel Time (min)	LOS	Travel Time (min)	LOS	Travel Time (min)	LOS	Travel Time (min)
6 – 7 AM	F	26	A	17	F	37	B	17	F	32	B	17
7 – 8 AM	F		B		F		B		F		B	
8 – 9 AM	F		B		F		B		F		B	
3 – 4 PM	C	17	F	30	C	17	F	32	C	17	F	25
4 – 5 PM	C		F		C		F		C		F	
5 – 6 PM	C		F		C		F		C		F	
6 – 7 PM	C		F		C		F		C		F	

Travel times within the I-95 Express Lanes within the study limits are projected to be 16 minutes with free-flow conditions throughout the Express Lanes based on the forecasted demand, offering a travel time savings of nine to 16 minutes compared to the I-95 GP lanes in the peak periods (**Table 2-3**).

Table 2-3: I-95 Travel Time Comparison

Direction & Time Period	Existing		2042 No-Build		2042 Build		
	GP	Express	GP	Express	GP	Express	Express Savings
NB AM	26	-	37	-	32	16	16 min
SB PM	30	-	32	-	25	16	9 min

Source and notes: Corridor travel times from Rappahannock River to North of Exit 148 (approximately 18 miles). Results estimated from HCS Freeway Facilities analysis.

2.3 ALTERNATIVES NOT RETAINED FOR EVALUATION

During the course of the study, several options were considered for access to the Express Lanes at the I-95 / US 17 interchange at Warrenton Road (Exit 133), the I-95 / VA 360 interchange at Courthouse Road (Exit 140), and in the vicinity of the Marine Corps Base Quantico, but were dismissed for reasons described below.

2.3.1 US 17 Options

Option 1

The first option proposed at US 17 was a dual-lane flyover from the I-95 Express Lanes leading to I-95 GP lanes, with four GP lanes split into two through lanes: one choice lane and one local lane. This option was later modified as a result of modeling that showed severe congestion approaching the split. The modified option was changed to accommodate five GP lanes split into two through lanes: one choice lane and two

local lanes. This option was ultimately dismissed when modeling showed that traffic weaving from the Express Lanes to the GP lanes operated with some friction, and that another option could eliminate weaving and provide higher speeds.

Option 2

The second option proposed at US 17 was a single-lane flyover from the I-95 Express Lanes leading to local I-95 Lanes, with four GP lanes split into two through lanes: one choice lane and one local lane. This option was later modified as a result of modeling that showed severe congestion approaching the split. The modified option was changed to accommodate five GP lanes split into two through lanes: one choice lane and two local lanes. This option was ultimately dismissed when modeling showed that a two-lane flyover provided additional capacity for the Express Lane system, that traffic weaving from the Express Lanes to the GP lanes operated with some friction, and that another option could eliminate weaving and provide higher speeds.

2.3.2 Courthouse Road Options

Direct Access Ramp merging on the west side of Express Lanes

A direct access ramp from Courthouse Road to the Express Lanes was proposed to run under the existing I-95 NB bridge and under a new Express Lanes bridge, and merge with the Express Lanes on the west side. The ramp would provide either an entrance to the NB Express Lanes or an exit from the SB Express Lanes, depending on the direction of operation.

The construction of this access point would have needed a new Express Lanes bridge over this ramp, a retaining wall between the ramp and I-95 SB GP lanes, and rehabilitation of the existing I-95 bridge over Courthouse Road. This ramp would also have a roundabout interface to prohibit entrance access during SB peak traffic flow. This option was dismissed due to the need for excessive construction and the maintenance cost of the structures.

Direct Ramp at Courthouse Road without a Roundabout

This option consisted of a ramp providing access to and from the Express Lanes at Courthouse Road. There would be no roundabout with this option, and users would need to utilize the Park & Ride to turn around if the ramp gates were closed. The gates would be located beyond the commuter lot entrance to push traffic to the left if the gates were closed.

This option was dismissed amid concerns for driver confusion when the gates are closed. The option was thought to increase the chance that vehicles would continue forward on the ramp, despite the gates being closed, if the driver did not have a clear option to turn around.

Symmetrical Roundabout

This option consisted of a ramp with access to and from the Express Lanes at Courthouse Road, as well as a roundabout for drivers to turn around when the ramp gates are closed. The Symmetrical Roundabout option centered the roundabout on Courthouse Road. This option was dismissed because of the direct impacts that it would cause to the Park & Ride lot.

2.3.3 Marine Corps Base Quantico Options

Northbound Joplin Road Access

This option consisted of NB direct access to Joplin Road to and from the Express Lanes. Currently, there is not enough space in the median between GP lanes to develop a new single-ramp lane at the necessary point in the I-95 corridor. In order to make this option viable, the NB GP lanes would need to be realigned

for roughly one mile, which would include realigning the NB GP Lane overpass. A retaining wall would need to be used to accommodate the vertical elevation change between the new ramp and the existing Express Lanes facility.

This option was dismissed because the effort described above would be a complex structure with a large footprint and would require realignment of GP lanes, increasing impacts to right-of-way.

Northbound Telegraph Road Access

This option consisted of direct access to Telegraph Road to and from the Express Lanes and would require a widened bridge on the south side. This option was dismissed for three reasons. First, it does not provide direct access to Marine Corps Base Quantico. Vehicles would first have to merge with Route 1, enter a high volume of traffic, and maneuver to the right lane to get to Russell Road. Second, maintenance of traffic during construction of this option could be difficult. Third, there could be issues with acquiring the temporary or permanent right-of-way from Marine Corps Base Quantico that would be necessary to implement this option.

Northbound Russell Road Direct Access

This option consisted of direct access from Russell Road to the I-95 Express Lanes via a new T-intersection at Russell Road and the ramp crossing over Chopawamsick Creek to join the Express Lanes. The T-intersection would have reduced the number of westbound lanes along Russell Road from two through lanes to one through lane and one left-turn lane. In the eastbound direction, a taper exit to SB Express Lanes was proposed. This option was dismissed because of environmental impacts to resources located within the footprint of the ramp between the Express Lanes and SB I-95, and because of safety and operational impacts due to the reduction of through lanes at the T-Intersection in the westbound direction.

Southbound Slip Ramp

This option would introduce a slip ramp on the left side of the I-95 GP lanes to provide access to the Express Lanes. Under this option, traffic desiring to access the Express Lanes from Russell Road would merge into the right lane along the I-95 GP lanes, and then be required to make two additional lane changes to the left to position themselves to exit onto the slip ramp. The slip ramp would also provide access to the Express Lanes for other traffic in the I-95 GP lanes (from points north of Russell Road). This option was dismissed as a result of the number of additional lane changes users would need to make in order to utilize the slip ramp. Additionally, although the left-side exit to the Express Lanes would be consistent with other access points along the I-95 Express Lanes system, it is less common with other facilities and not as aligned with driver expectancy as other options.

3. REFERENCES

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APPENDIX A
DESIGN CRITERIA

Roadway Inventory and Major Design Criteria

Project	95 EXPRESS LANES FREDERICKSBURG EXTENSION
Subject	ROADWAY DESIGN
Task	DESIGN CRITERIA

Design Criteria
95 Express Lanes

Location: 95 Express Lanes - Beginning to Approximate Start of 95 Express Lanes STE Project

DESIGN ELEMENT	DESIGN VALUE	SOURCE
Facility Type	Limited Access Interstate Freeway *Rolling Terrain*	VDOT
Design Speed (DS)	75 MPH	RDM, Appendix A, GS-1
Minimum Lane Widths ***Rdwy Shldr Widths*** ***Bridge Shldr Widths***	12' travel lanes Fill: 16' w/10' paved Cut: 12' w/10' paved 12' Left / 12' Right	RDM, Appendix A, GS-1 RDM, Appendix A, GS-1, Footnote (1 & 2) RDM, Appendix A, GS-1, Footnote (1 & 2) RDM, Appendix A, GS-1, Footnote (5)
Median Width	N/A	
Maximum Grade	4%	AASHTO, Table 8-1
Pavement Cross Slopes (Tangent)	2%	AASHTO, Pages 4-5 and 4-6
Minimum Grade (Barrier Wall & Gutter Sections)	0.3% Minimum 0.5% Desirable	AASHTO, Page 3-119
Min. Stopping Sight Distance	820' (Grades <3%) 866' (Downgrades 3% - 4%)	RDM, Appendix A, GS-1 AASHTO, Table 3-2
Horizontal Curves ***Minimum Radius @ 8%*** ***Minimum Radius w/o Super (NC)***	Min. L = 15 x V (MPH) = 1125' Des. Min. L = 30 x V (MPH) = 2250' 2215' 16100'	AASHTO, Page 3-111 AASHTO, Page 3-111 RDM, Appendix A, GS-1 RBS, TC-5.11, Pg. 803.43
Crest Vertical Curve	Min. K = 312 Min. L = 3 x DS = 225' L=KA (where A=Algebraic Dif in Grades in %)	AASHTO, Table 3-34 AASHTO, Page 3-153
Sag Vertical Curve	Min. K = 206 Min. L = 3 x DS = 225' L=KA (where A=Algebraic Dif in Grades in %)	AASHTO, Table 3-36 AASHTO, Page 3-161
Superelevation	e max = 0.08 Transition Relative Gradient = 0.38 Runoff (2/3 Outside and 1/3 Inside Curve)	RBS, TC-5.11, Pg. 803.43 RBS, TC-5.11, Pg. 803.20 RBS, TC-5.11, Pg. 803.06
Minimum Vertical Clearance	16'-6" Roadway Over Roadway	RDM, Appendix A, GS-1, Footnote (5) Bridge Man. Vol. V Part 2, File 06.02-2
Clear Zone (Recoverable Terrain)	30' with 6:1 Front Slopes	RDM, Table A-2-1/RDG, Table 3.1

EXCEPTION / WAIVER	DESCRIPTION	REMARKS
DESIGN EXCEPTION	N/A	
DESIGN WAIVER	Design Waiver – Use of alternative shoulder pavement design and revised MC-4 requirements along 95 Express Lanes	Revised shoulder pavement design along Express Lanes was introduced in Segment 1 as a cost reduction measure

RBS = Road and Bridge Standards (2016), Virginia Department of Transportation (VDOT)
RDM = Roadway Design Manual (2011), Virginia Department of Transportation (VDOT)
RDG = Roadside Design Guide (2011), American Assoc. of State Highway & Transportation Officials (AASHTO)
AASHTO = American Assoc. of State Highway & Transportation Officials - A Policy on Geometric Design of Highways and Streets (2011)

Roadway Inventory and Major Design Criteria

Project	95 EXPRESS LANES FREDERICKSBURG EXTENSION
Subject	ROADWAY DESIGN
Task	DESIGN CRITERIA

Design Criteria
95 Express Lanes

Location: 95 Express Lanes - Approximate Start of 95 Express Lanes STE to Approx. End of 95 Express Lanes STE

DESIGN ELEMENT	DESIGN VALUE	SOURCE
Facility Type	Limited Access Interstate Freeway *Rolling Terrain*	VDOT
Design Speed (DS)	70 MPH	RDM, Appendix A, GS-1
Minimum Lane Widths ***Rdwy Shldr Widths*** ***Bridge Shldr Widths***	12' travel lanes Fill: 16' w/10' paved Cut: 12' w/10' paved 12' left and right	RDM, Appendix A, GS-1 RDM, Appendix A, GS-1, Footnote (1 & 2) RDM, Appendix A, GS-1, Footnote (1 & 2) RDM, Appendix A, GS-1, Footnote (5)
Median Width	N/A	
Maximum Grade	4%	AASHTO, Table 8-1
Pavement Cross Slopes (Tangent)	2%	AASHTO, Pages 4-5 and 4-6
Minimum Grade (Barrier Wall & Gutter Sections)	0.3% Minimum 0.5% Desirable	AASHTO, Page 3-119
Min. Stopping Sight Distance	730' (Grades <3%) 771' (Downgrades 3% - 4%)	RDM, Appendix A, GS-1 AASHTO, Table 3-2
Horizontal Curves ***Minimum Radius @ 8%*** ***Minimum Radius w/o Super (NC)***	Min. L = 15 x V (MPH) = 1050' Des. Min. L = 30 x V (MPH) = 2100' 1821' 14500'	AASHTO, Page 3-111 AASHTO, Page 3-111 RDM, Appendix A, GS-1 RBS, TC-5.11, Pg. 803.42
Crest Vertical Curve	Min. K = 247 Min. L = 3 x DS = 210' L=KA (where A=Algebraic Dif in Grades in %)	AASHTO, Table 3-34 AASHTO, Page 3-153
Sag Vertical Curve	Min. K = 181 Min. L = 3 x DS = 210' L=KA (where A=Algebraic Dif in Grades in %)	AASHTO, Table 3-36 AASHTO, Page 3-161
Superelevation	e max = 0.08 Transition Relative Gradient = 0.40 Runoff (2/3 Outside and 1/3 Inside Curve)	RBS, TC-5.11, Pg. 803.42 RBS, TC-5.11, Pg. 803.20 RBS, TC-5.11, Pg. 803.06
Minimum Vertical Clearance	16'-6" Roadway Over Roadway	RDM, Appendix A, GS-1, Footnote (5) Bridge Man. Vol. V Part 2, File 06.02-2
Clear Zone (Recoverable Terrain)	30' with 6:1 Front Slopes	RDM, Table A-2-1/RDG, Table 3.1

EXCEPTION / WAIVER	DESCRIPTION	REMARKS
DESIGN EXCEPTION	N/A	
DESIGN WAIVER	Design Waiver – Use of alternative shoulder pavement design and revised MC-4 requirements along 95 Express Lanes	Revised shoulder pavement design along Express Lanes was introduced in Segment 1 as a cost reduction measure

RBS = Road and Bridge Standards (2016), Virginia Department of Transportation (VDOT)
RDM = Roadway Design Manual (2011), Virginia Department of Transportation (VDOT)
RDG = Roadside Design Guide (2011), American Assoc. of State Highway & Transportation Officials (AASHTO)
AASHTO = American Assoc. of State Highway & Transportation Officials - A Policy on Geometric Design of Highways and Streets (2011)

Roadway Inventory and Major Design Criteria

Project	95 EXPRESS LANES FREDERICKSBURG EXTENSION
Subject	ROADWAY DESIGN
Task	DESIGN CRITERIA

Design Criteria
I-95 General Purpose Lanes

Location: Realignment of Southbound GP Lanes near MP 139 (American Legion Road)
Auxiliary Lanes for Express Lanes Access Ramps

DESIGN ELEMENT	DESIGN VALUE	SOURCE
Facility Type	Limited Access Interstate Freeway *Rolling Terrain*	VDOT
Design Speed (DS)	70 MPH	RDM, Appendix A, GS-1
Minimum Lane Widths ***Rdwy Shldr Widths*** ***Bridge Shldr Widths***	12' travel lane Fill: 18' w/12' Paved Cut: 14' w/12' Paved 12' left and right	RDM, Appendix A, GS-1 RDM, Appendix A, GS-1, Footnote (1 & 2) RDM, Appendix A, GS-1, Footnote (1 & 2) RDM, Appendix A, GS-1, Footnote (5)
Median Width	N/A	
Maximum Grade	4%	AASHTO, Table 8-1
Pavement Cross Slopes (Tangent)	2%	AASHTO, Pages 4-5 and 4-6
Minimum Grade (Barrier Wall & Gutter Sections)	0.3% Minimum 0.5% Desirable	AASHTO, Page 3-119
Min. Stopping Sight Distance	730' (Grades <3%) 771' (Downgrades 3% - 4%)	RDM, Appendix A, GS-1 AASHTO, Table 3-2
Horizontal Curves ***Minimum Radius @ 8%*** ***Minimum Radius w/o Super (NC)***	Min. L = 15 x V (MPH) = 1050' Des. Min. L = 30 x V (MPH) = 2100' 1821' 14500'	AASHTO, Page 3-111 AASHTO, Page 3-111 RDM, Appendix A, GS-1 RBS, TC-5.11, Pg. 803.42
Crest Vertical Curve	Min. K = 247 Min. L = 3 x DS = 210' L=KA (where A=Algebraic Dif in Grades in %)	AASHTO, Table 3-34 AASHTO, Page 3-153
Sag Vertical Curve	Min. K = 181 Min. L = 3 x DS = 210' L=KA (where A=Algebraic Dif in Grades in %)	AASHTO, Table 3-36 AASHTO, Page 3-161
Superelevation	e max = 0.08 Transition Relative Gradient = 0.40 Runoff (2/3 Outside and 1/3 Inside Curve)	RBS, TC-5.11, Pg. 803.42 RBS, TC-5.11, Pg. 803.20 RBS, TC-5.11, Pg. 803.06
Minimum Vertical Clearance	16'-6" Roadway Over Roadway	RDM, Appendix A, GS-1, Footnote (5) Bridge Man. Vol. V Part 2, File 06.02-2
Clear Zone (Recoverable Terrain)	30' with 6:1 Front Slopes	RDM, Table A-2-1/RDG, Table 3.1

EXCEPTION / WAIVER	DESCRIPTION	REMARKS
DESIGN EXCEPTION	N/A	
DESIGN WAIVER	N/A	

RBS = Road and Bridge Standards (2016), Virginia Department of Transportation (VDOT)
RDM = Roadway Design Manual (2011), Virginia Department of Transportation (VDOT)
RDG = Roadside Design Guide (2011), American Assoc. of State Highway & Transportation Officials (AASHTO)
AASHTO = American Assoc. of State Highway & Transportation Officials - A Policy on Geometric Design of Highways and Streets (2011)

Roadway Inventory and Major Design Criteria

Project	95 EXPRESS LANES FREDERICKSBURG EXTENSION
Subject	ROADWAY DESIGN
Task	DESIGN CRITERIA

Design Criteria
Interchange Ramp / Slip Ramp, 60 MPH

Location: TBD - As the preliminary design is finalized, the appropriate Design Speed will be determined and corresponding Design Criteria will be applied.

DESIGN ELEMENT	DESIGN VALUE	SOURCE
Facility Type	Interchange Ramp *Rolling Terrain*	VDOT
Design Speed (DS)	60 MPH	RDM, Appendix A, GS-R
Minimum Lane Widths ***Rdwy Shldr Widths**** ***(* Use Right Shoulder Widths on both sides for ramps with flyover bridges)*** ***Bridge Shldr Widths****	16' single travel lane or 12' dual travel lanes Right: 10' w/8' paved Right with GR: 14' w/8' paved Left: 6' w/4' paved* Left with GR: 10' w/4' paved* 6' Left* / 10' Right	RDM, Appendix A, GS-R RDM, Appendix A, GS-R RDM, Appendix A, GS-R RDM, Appendix A, GS-R RDM, Appendix A, GS-R RDM, Appendix A, GS-R, Footnote (4)
Median Width	N/A	
Maximum Grade	1-way Ascend. & Reversible: 5% 1-way Descend. (Special Circumstance): 7% 1-way Descend. & Reversible w/Sharp Curve: 4%	RDM, Appendix A, GS-R
Pavement Cross Slopes (Tangent)	2%	AASHTO, Pages 4-5 and 4-6
Minimum Grade (Barrier Wall & Gutter Sections)	0.3% Minimum 0.5% Desirable	AASHTO, Page 3-119
Min. Stopping Sight Distance	570' (Grades <3%) 638' (Downgrades 3% - 6%)	RDM, Appendix A, GS-R AASHTO, Table 3-2
Horizontal Curves ***Minimum Radius @ 8%*** ***Minimum Radius w/o Super. (NC)***	Des. Min. L = 15 x V (MPH) = 900' 1204' 11500'	AASHTO, Page 3-111 RDM, Appendix A, GS-R RBS, TC-5.11, Pg. 803.40
Crest Vertical Curve	Min. K = 151 Min. L = 3 x DS = 180' L=KA (where A=Algebraic Dif in Grades in %)	AASHTO, Table 3-34 AASHTO, Page 3-153
Sag Vertical Curve	Min. K = 136 Min. L = 3 x DS = 180' L=KA (where A=Algebraic Dif in Grades in %)	AASHTO, Table 3-36 AASHTO, Page 3-161
Superelevation	e max = 0.08 Transition Relative Gradient = 0.51 single/0.60 dual Runoff (2/3 Outside and 1/3 Inside Curve)	RBS, TC-5.11, Pg. 803.40 RBS, TC-5.11, Pg. 803.20 RBS, TC-5.11, Pg. 803.06
Minimum Vertical Clearance (Roadway Over Roadway)	16'-6"	RDM, Appendix A, GS-R, Footnote (4)
Clear Zone (Recoverable Terrain) (6:1 or Flatter)	ADT Under 750: 16' ADT 750-1500: 20' ADT 1500-6000: 26' ADT Over 6000:30'	RDM, Table A-2-1/RDG, Table 3.1

EXCEPTION / WAIVER	DESCRIPTION	REMARKS
DESIGN EXCEPTION	N/A	
DESIGN WAIVER	N/A	

RBS = Road and Bridge Standards (2016), Virginia Department of Transportation (VDOT)
RDM = Roadway Design Manual (2011), Virginia Department of Transportation (VDOT)
RDG = Roadside Design Guide (2011), American Assoc. of State Highway & Transportation Officials (AASHTO)
AASHTO = American Assoc. of State Highway & Transportation Officials - A Policy on Geometric Design of Highways and Streets (2011)

Roadway Inventory and Major Design Criteria

Project	95 EXPRESS LANES FREDERICKSBURG EXTENSION
Subject	ROADWAY DESIGN
Task	DESIGN CRITERIA

Design Criteria
Interchange Ramp / Slip Ramp, 50 MPH

Location: TBD - As the preliminary design is finalized, the appropriate Design Speed will be determined and corresponding Design Criteria will be applied.

DESIGN ELEMENT	DESIGN VALUE	SOURCE
Facility Type	Interchange Ramp *Rolling Terrain*	VDOT
Design Speed (DS)	50 MPH	RDM, Appendix A, GS-R
Minimum Lane Widths ***Rdwy Shldr Widths**** ***(* Use Right Shoulder Widths on both sides for ramps with flyover bridges)*** ***Bridge Shldr Widths****	16' single travel lane or 12' dual travel lanes Right: 10' w/8' paved Right with GR: 14' w/8' paved Left: 6' w/4' paved* Left with GR: 10' w/4' paved* 6' Left* / 10' Right	RDM, Appendix A, GS-R RDM, Appendix A, GS-R RDM, Appendix A, GS-R RDM, Appendix A, GS-R RDM, Appendix A, GS-R RDM, Appendix A, GS-R, Footnote (4)
Median Width	N/A	
Maximum Grade	1-way Ascend. & Reversible: 5% 1-way Descend. (Special Circumstance): 7% 1-way Descend. & Reversible w/Sharp Curve: 4%	RDM, Appendix A, GS-R
Pavement Cross Slopes (Tangent)	2%	AASHTO, Pages 4-1 to 4-6
Minimum Grade (Barrier Wall & Gutter Sections)	0.3% Minimum 0.5% Desirable	AASHTO, Page 3-119
Min. Stopping Sight Distance	425' (Grades <3%) 474' (Downgrades 3% - 6%)	RDM, Appendix A, GS-R AASHTO, Table 3-2
Horizontal Curves ***Minimum Radius @ 8%*** ***Minimum Radius w/o Super. (NC)***	Des. Min. L = 15 x V (MPH) =750' 760' 8150'	AASHTO, Page 3-111 RDM, Appendix A, GS-R RBS, TC-5.11, Pg. 803.38
Crest Vertical Curve	Min. K = 84 Min. L = 3 x DS = 150' L=KA (where A=Algebraic Dif in Grades in %)	AASHTO, Table 3-34 AASHTO, Page 3-153
Sag Vertical Curve	Min. K = 96 Min. L= 3 x DS = 150' L=KA (where A=Algebraic Dif in Grades in %)	AASHTO, Table 3-36 AASHTO, Page 3-161
Superelevation	e max = 0.08 Transition Relative Gradient = 0.57 single/0.67 dual Runoff (2/3 Outside and 1/3 Inside Curve)	RBS, TC-5.11, Pg. 803.38 RBS, TC-5.11, Pg. 803.20 RBS, TC-5.11, Pg. 803.06
Minimum Vertical Clearance (Roadway Over Roadway)	16'-6"	RDM, Appendix A, GS-R, Footnote (4)
Clear Zone (Recoverable Terrain) (6:1 or Flatter)	ADT Under 750: 10' ADT 750-1500: 14' ADT 1500-6000: 16' ADT Over 6000: 20'	RDM, Table A-2-1/RDG, Table 3.1

EXCEPTION / WAIVER	DESCRIPTION	REMARKS
DESIGN EXCEPTION	N/A	
DESIGN WAIVER	N/A	

RBS = Road and Bridge Standards (2016), Virginia Department of Transportation (VDOT)
RDM = Roadway Design Manual (2011), Virginia Department of Transportation (VDOT)
RDG = Roadside Design Guide (2011), American Assoc. of State Highway & Transportation Officials (AASHTO)
AASHTO = American Assoc. of State Highway & Transportation Officials - A Policy on Geometric Design of Highways and Streets (2011)

Roadway Inventory and Major Design Criteria

Project	95 EXPRESS LANES FREDERICKSBURG EXTENSION
Subject	ROADWAY DESIGN
Task	DESIGN CRITERIA

Design Criteria
Interchange Ramp, 40 MPH

Location: TBD - As the preliminary design is finalized, the appropriate Design Speed will be determined and corresponding Design Criteria will be applied.

DESIGN ELEMENT	DESIGN VALUE	SOURCE
Facility Type	Interchange Ramp *Rolling Terrain*	VDOT
Design Speed (DS)	40 MPH	RDM, Appendix A, GS-R
Minimum Lane Widths ***Rdwy Shldr Widths**** ***(* Use Right Shoulder Widths on both sides for ramps with flyover bridges)*** ***Bridge Shldr Widths****	16' single travel lane or 12' dual travel lanes Right: 10' w/8' paved Right with GR: 14' w/8' paved Left: 6' w/4' paved* Left with GR: 10' w/4' paved* Sum of Left and Right Paved Shoulders: 10' Min. 6' Left* / 10' Right	RDM, Appendix A, GS-R RDM, Appendix A, GS-R RDM, Appendix A, GS-R RDM, Appendix A, GS-R RDM, Appendix A, GS-R RDM, Appendix A, GS-R, Footnote (2) RDM, Appendix A, GS-R, Footnote (4)
Median Width	N/A	
Maximum Grade	1-way Ascend. & Reversible: 6% 1-way Descend. (Special Circumstance): 8% 1-way Descend. & Reversible w/Sharp Curve: 4%	RDM, Appendix A, GS-R
Pavement Cross Slopes (Tangent)	2%	AASHTO, Pages 4-5 and 4-6
Minimum Grade (Barrier Wall & Gutter Sections)	0.3% Minimum 0.5% Desirable	AASHTO, Page 3-119
Min. Stopping Sight Distance	305' (Grades <3%) 333' (Downgrades 3% - 6%)	RDM, Appendix A, GS-R AASHTO, Table 3-2
Horizontal Curves ***Minimum Radius @ 8%*** ***Minimum Radius w/o Super. (NC)***	Des. Min. L = 15 x V (MPH) =600' 446' 5410'	AASHTO, Page 3-111 RDM, Appendix A, GS-R RBS, TC-5.11, Pg. 803.36
Crest Vertical Curve	Min. K = 44 Min. L = 3 x DS = 120' L=KA (where A=Algebraic Dif in Grades in %)	AASHTO, Table 3-34 AASHTO, Page 3-153
Sag Vertical Curve	Min. K = 64 Min. L = 3 x DS = 120' L=KA (where A=Algebraic Dif in Grades in %)	AASHTO, Table 3-36 AASHTO, Page 3-161
Superelevation	e max = 0.08 Transition Relative Gradient = 0.66 single/0.77 dual Runoff (2/3 Outside and 1/3 Inside Curve)	RBS, TC-5.11, Pg. 803.36 RBS, TC-5.11, Pg. 803.20 RBS, TC-5.11, Pg. 803.06
Minimum Vertical Clearance (Roadway Over Roadway)	16'-6"	RDM, Appendix A, GS-R, Footnote (4)
Clear Zone (Recoverable Terrain) (6:1 or Flatter)	ADT Under 750: 7' ADT 750-1500: 10' ADT 1500-6000: 12' ADT Over 6000: 14'	RDM, Table A-2-1/RDG, Table 3.1

EXCEPTION / WAIVER	DESCRIPTION	REMARKS
DESIGN EXCEPTION	N/A	
DESIGN WAIVER	N/A	

RBS = Road and Bridge Standards (2016), Virginia Department of Transportation (VDOT)
RDM = Roadway Design Manual (2011), Virginia Department of Transportation (VDOT)
RDG = Roadside Design Guide (2011), American Assoc. of State Highway & Transportation Officials (AASHTO)
AASHTO = American Assoc. of State Highway & Transportation Officials - A Policy on Geometric Design of Highways and Streets (2011)

Roadway Inventory and Major Design Criteria

Project	95 EXPRESS LANES FREDERICKSBURG EXTENSION
Subject	ROADWAY DESIGN
Task	DESIGN CRITERIA

Design Criteria
Interchange Ramp, 35 MPH

Location: TBD - As the preliminary design is finalized, the appropriate Design Speed will be determined and corresponding Design Criteria will be applied.

DESIGN ELEMENT	DESIGN VALUE	SOURCE
Facility Type	Interchange Ramp *Rolling Terrain*	VDOT
Design Speed (DS)	35 MPH	RDM, Appendix A, GS-R
Minimum Lane Widths	16' single travel lane	RDM, Appendix A, GS-R
Rdwy Shldr Widths*	Right: 10' w/8' paved	RDM, Appendix A, GS-R
	Right with GR: 14' w/8' paved	RDM, Appendix A, GS-R
(* Use Right Shoulder Widths on both	Left: 6' w/4' paved*	RDM, Appendix A, GS-R
sides for ramps with flyover bridges)	Left with GR: 10' w/4' paved*	RDM, Appendix A, GS-R
	Sum of Left and Right Paved Shoulders: 10' Min.	RDM, Appendix A, GS-R, Footnote (2)
Bridge Shldr Widths*	6' Left* / 10' Right	RDM, Appendix A, GS-R, Footnote (4)
Median Width	N/A	
Maximum Grade	1-way Ascend. & Reversible: 6% 1-way Descend. (Special Circumstance): 8% 1-way Descend. & Reversible w/Sharp Curve: 4%	RDM, Appendix A, GS-R
Pavement Cross Slopes (Tangent)	2%	AASHTO, Pages 4-5 and 4-6
Minimum Grade (Barrier Wall & Gutter Sections)	0.3% Minimum 0.5% Desirable	AASHTO, Page 3-119
Min. Stopping Sight Distance	250' (Grades <3%) 271' (Downgrades 3% - 6%)	RDM, Appendix A, GS-R AASHTO, Table 3-2
Horizontal Curves	Des. Min. L = 15 x V (MPH) =525'	AASHTO, Page 3-111
Minimum Radius @ 8%	316'	RDM, Appendix A, GS-R
Minimum Radius w/o Super. (NC)	4260'	RBS, TC-5.11, Pg. 803.35
Crest Vertical Curve	Min. K = 29 Min. L = 3 x DS = 105' L=KA (where A=Algebraic Dif in Grades in %)	AASHTO, Table 3-34 AASHTO, Page 3-153
Sag Vertical Curve	Min. K = 49 Min. L = 3 x DS = 105' L=KA (where A=Algebraic Dif in Grades in %)	AASHTO, Table 3-36 AASHTO, Page 3-161
Superelevation	e max = 0.08 Transition Relative Gradient = 0.71 Runoff (2/3 Outside and 1/3 Inside Curve)	RBS, TC-5.11, Pg. 803.35 RBS, TC-5.11, Pg. 803.20 RBS, TC-5.11, Pg. 803.06
Minimum Vertical Clearance (Roadway Over Roadway)	16'-6"	RDM, Appendix A, GS-R, Footnote (4)
Clear Zone (Recoverable Terrain) (6:1 or Flatter)	ADT Under 750: 7' ADT 750-1500: 10' ADT 1500-6000: 12' ADT Over 6000: 14'	RDM, Table A-2-1/RDG, Table 3.1

EXCEPTION / WAIVER	DESCRIPTION	REMARKS
DESIGN EXCEPTION	N/A	
DESIGN WAIVER	N/A	

RBS = Road and Bridge Standards (2016), Virginia Department of Transportation (VDOT)
RDM = Roadway Design Manual (2011), Virginia Department of Transportation (VDOT)
RDG = Roadside Design Guide (2011), American Assoc. of State Highway & Transportation Officials (AASHTO)
AASHTO = American Assoc. of State Highway & Transportation Officials - A Policy on Geometric Design of Highways and Streets (2011)

Roadway Inventory and Major Design Criteria

Project	95 EXPRESS LANES FREDERICKSBURG EXTENSION
Subject	ROADWAY DESIGN
Task	DESIGN CRITERIA

Design Criteria
Interchange Ramp, 25 MPH

Location: Express Lanes slip ramp to Old Courthouse Road (Ramp CHR)

DESIGN ELEMENT	DESIGN VALUE	SOURCE
Facility Type	Interchange Ramp *Rolling Terrain*	VDOT
Design Speed (DS)	25 MPH	RDM, Appendix A, GS-R
Minimum Lane Widths ***Rdwy Shldr Widths**** ***(* Use Right Shoulder Widths on both sides for ramps with flyover bridges)*** ***Bridge Shldr Widths****	16' single travel lane Right: 10' w/8' paved Right with GR: 14' w/8' paved Left: 6' w/4' paved* Left with GR: 10' w/4' paved* Sum of Left and Right Paved Shoulders: 10' Min. 6' Left* / 10' Right	RDM, Appendix A, GS-R RDM, Appendix A, GS-R RDM, Appendix A, GS-R RDM, Appendix A, GS-R RDM, Appendix A, GS-R RDM, Appendix A, GS-R, Footnote (2) RDM, Appendix A, GS-R, Footnote (4)
Median Width	N/A	
Maximum Grade	1-way Ascend. & Reversible: 7% 1-way Descend. (Special Circumstance): 9% 1-way Descend. & Reversible w/Sharp Curve: 4%	RDM, Appendix A, GS-R
Pavement Cross Slopes (Tangent)	2%	AASHTO, Pages 4-5 and 4-6
Minimum Grade (Barrier Wall & Gutter Sections)	0.3% Minimum 0.5% Desirable	AASHTO, Page 3-119
Min. Stopping Sight Distance	155' (Grades <3%) 173' (Downgrades 3% - 9%)	RDM, Appendix A, GS-R AASHTO, Table 3-2
Horizontal Curves ***Minimum Radius @ 8%*** ***Minimum Radius w/o Super. (NC)***	Des. Min. L = 15 x V (MPH) =375' 135' 2370'	AASHTO, Page 3-111 RDM, Appendix A, GS-R RBS, TC-5.11, Pg. 803.33
Crest Vertical Curve	Min. K = 12 Min. L = 3 x DS = 75' L=KA (where A=Algebraic Dif in Grades in %)	AASHTO, Table 3-34 AASHTO, Page 3-153
Sag Vertical Curve	Min. K = 26 Min. L = 3 x DS = 75' L=KA (where A=Algebraic Dif in Grades in %)	AASHTO, Table 3-36 AASHTO, Page 3-161
Superelevation	e max = 0.08 Transition Relative Gradient = 0.80 Runoff (2/3 Outside and 1/3 Inside Curve)	RBS, TC-5.11, Pg. 803.33 RBS, TC-5.11, Pg. 803.20 RBS, TC-5.11, Pg. 803.06
Minimum Vertical Clearance (Roadway Over Roadway)	16'-6"	RDM, Appendix A, GS-R, Footnote (4)
Clear Zone (Recoverable Terrain) (6:1 or Flatter)	ADT Under 750: 7' ADT 750-1500: 10' ADT 1500-6000: 12' ADT Over 6000: 14'	RDM, Table A-2-1/RDG, Table 3.1

EXCEPTION / WAIVER	DESCRIPTION	REMARKS
DESIGN EXCEPTION	N/A	
DESIGN WAIVER	N/A	

RBS = Road and Bridge Standards (2016), Virginia Department of Transportation (VDOT)
RDM = Roadway Design Manual (2011), Virginia Department of Transportation (VDOT)
RDG = Roadside Design Guide (2011), American Assoc. of State Highway & Transportation Officials (AASHTO)
AASHTO = American Assoc. of State Highway & Transportation Officials - A Policy on Geometric Design of Highways and Streets (2011)

Roadway Inventory and Major Design Criteria

Project	95 EXPRESS LANES FREDERICKSBURG EXTENSION
Subject	ROADWAY DESIGN
Task	DESIGN CRITERIA

Design Criteria
Urban Collector w/Shoulder, 40 MPH

Location: Truslow Road

DESIGN ELEMENT	DESIGN VALUE	SOURCE
Facility Type	Urban Collector	VDOT
Design Speed (DS)	40 MPH	RDM, Appendix A, GS-7
Posted Speed	35 MPH	VDOT
Minimum Lane Widths	11' - travel lane	RDM, Appendix A, GS-7
Rdwy Shldr Widths	Cut & Fill: 8' w/1' Pavement Extension	RDM, Appendix A, GS-7
	Fill w/GR: 12' w/1' Pavement Extension	RDM, Appendix A, GS-7
Bridge Shldr Widths (<100' Length)	8' Left / 8' Right	RDM, Appendix A, GS-7, Footnote (8)
Bridge Shldr Widths (>100' Length)	3' Left / 3' Right (Design Waiver)	AASHTO, Table 6-6
Median Width	N/A	
Maximum Grade	10%	AASHTO, Table 6-8
Pavement Cross Slopes (Tangent)	2%	AASHTO, Pages 4-5 and 4-6
Minimum Grade (Barrier Wall & Gutter Sections)	0.3% Minimum 0.5% Desirable	AASHTO, Page 3-119
Min. Stopping Sight Distance	305' (Grades <3%) 354' (Downgrades 3% - 9%)	RDM, Appendix A, GS-7 AASHTO, Table 3-2
Horizontal Curves	Des. Min. L = 15 x V (MPH) = 600'	AASHTO, Page 3-111
Minimum Radius @ 4%	536'	RDM, Appendix A, GS-7
Minimum Radius w/o Super. (NC)	4770'	RBS, TC-5.11, Pg. 803.28
Crest Vertical Curve	Min. K = 44 Min. L = 3 x DS = 120' L=KA (where A=Algebraic Dif in Grades in %)	AASHTO, Table 3-34 AASHTO, Page 3-153
Sag Vertical Curve	Min. K = 64 Min. L = 3 x DS = 120' L=KA (where A=Algebraic Dif in Grades in %)	AASHTO, Table 3-36 AASHTO, Page 3-161
Superelevation	e max = 0.04 Transition Relative Gradient = 0.58 Runoff (2/3 Outside and 1/3 Inside Curve)	RBS, TC-5.11, Pg. 803.28 RBS, TC-5.11, Pg. 803.20 RBS, TC-5.11, Pg. 803.06
Minimum Vertical Clearance (Roadway Over Roadway)	14'-6" (Minimum) (Design Waiver) 16'-6" (Desirable)	RDM, Appendix A, GS-7, Footnote (8)
Clear Zone (Recoverable Terrain)	16' with 4:1 Front Slope	RDM, Table A-2-1/RDG, Table 3.1 (ADT 1500-6000)

EXCEPTION / WAIVER	DESCRIPTION	REMARKS
DESIGN EXCEPTION	N/A	
DESIGN WAIVER	N/A	

RBS = Road and Bridge Standards (2016), Virginia Department of Transportation (VDOT)
RDM = Roadway Design Manual (2011), Virginia Department of Transportation (VDOT)
RDG = Roadside Design Guide (2011), American Assoc. of State Highway & Transportation Officials (AASHTO)
AASHTO = American Assoc. of State Highway & Transportation Officials - A Policy on Geometric Design of Highways and Streets (2011)

Roadway Inventory and Major Design Criteria

Project	95 EXPRESS LANES FREDERICKSBURG EXTENSION
Subject	ROADWAY DESIGN
Task	DESIGN CRITERIA

Design Criteria
Urban Collector w/Curb & Gutter, 40 MPH

Location: Old Courthouse Road

DESIGN ELEMENT	DESIGN VALUE	SOURCE
Facility Type	Urban Collector	VDOT
Design Speed (DS)	40 MPH	RDM, Appendix A, GS-7
Posted Speed	40 MPH	VDOT
Minimum Lane Widths	11' - travel lane	RDM, Appendix A, GS-7
Rdwy Shldr Widths	Outside: Std. Curb & Gutter CG-6	RDM, Appendix A, GS-7
	Median: Std. Curb CG-2	RDM, Appendix A, GS-7
Bridge Shldr Widths	Curb to Curb Width	RDM, Appendix A, GS-7, Footnote (8)
Median Width	Min. 4'	RDM, Section 2E-3
Maximum Grade	10%	AASHTO, Table 6-8
Pavement Cross Slopes (Tangent)	2%	AASHTO, Pages 4-5 and 4-6
Minimum Grade (Barrier Wall & Gutter Sections)	0.3% Minimum 0.5% Desirable	AASHTO, Page 3-119
Min. Stopping Sight Distance	305' (Grades <3%) 354' (Downgrades 3% - 9%)	RDM, Appendix A, GS-7 AASHTO, Table 3-2
Horizontal Curves	Des. Min. L = 15 x V (MPH) = 600'	AASHTO, Page 3-111
Minimum Radius @ 4%	536'	RDM, Appendix A, GS-7
Minimum Radius w/o Super. (NC)	4770'	RBS, TC-5.11, Pg. 803.28
Crest Vertical Curve	Min. K = 44 Min. L = 3 x DS = 120' L=KA (where A=Algebraic Dif in Grades in %)	AASHTO, Table 3-34 AASHTO, Page 3-153
Sag Vertical Curve	Min. K = 64 Min. L = 3 x DS = 120' L=KA (where A=Algebraic Dif in Grades in %)	AASHTO, Table 3-36 AASHTO, Page 3-161
Superelevation	e max = 0.04 Transition Relative Gradient = 0.58 Runoff (2/3 Outside and 1/3 Inside Curve)	RBS, TC-5.11, Pg. 803.28 RBS, TC-5.11, Pg. 803.20 RBS, TC-5.11, Pg. 803.06
Minimum Vertical Clearance (Roadway Over Roadway)	14'-6" (Minimum) (Design Waiver) 16'-6" (Desirable)	RDM, Appendix A, GS-7, Footnote (8)
Buffer Strip Widths	Min. 5'	RDM, Appendix A, GS-7, Footnote (9)
Clear Zone (Recoverable Terrain)	Min. 1.5' Lateral Offset from Face of Curb	RDM, Appendix A, Section A-2

EXCEPTION / WAIVER	DESCRIPTION	REMARKS
DESIGN EXCEPTION	N/A	
DESIGN WAIVER	N/A	

RBS = Road and Bridge Standards (2016), Virginia Department of Transportation (VDOT)
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RDG = Roadside Design Guide (2011), American Assoc. of State Highway & Transportation Officials (AASHTO)
AASHTO = American Assoc. of State Highway & Transportation Officials - A Policy on Geometric Design of Highways and Streets (2011)

Roadway Inventory and Major Design Criteria

Project	95 EXPRESS LANES FREDERICKSBURG EXTENSION
Subject	ROADWAY DESIGN
Task	DESIGN CRITERIA

Design Criteria
Rural Collector, 40 MPH

Location: American Legion Road

DESIGN ELEMENT	DESIGN VALUE	SOURCE
Facility Type	Rural Collector *Rolling Terrain*	VDOT
Design Speed (DS) ***Posted Speed***	40 MPH 40 MPH	RDM, Appendix A, GS-3 VDOT
Minimum Lane Widths ***Rdwy Shldr Widths*** ***Bridge Shldr Widths (<100' Length)*** ***Bridge Shldr Widths (>100' Length)***	12' - travel lane Cut & Fill: 8' w/4' Paved (Pending truck data) Fill w/GR: 12' w/4' Paved (Pending truck data) 8' Left / 8' Right 3' Left / 3' Right (Design Waiver)	RDM, Appendix A, GS-3 RDM, Appendix A, GS-3, Footnote (3) RDM, Appendix A, GS-3, Footnote (3) RDM, Appendix A, GS-3, Footnote (7) AASHTO, Table 6-6
Median Width	N/A	
Maximum Grade	8%	AASHTO, Table 6-2
Pavement Cross Slopes (Tangent)	2%	AASHTO, Pages 4-5 and 4-6
Minimum Grade (Barrier Wall & Gutter Sections)	0.3% Minimum 0.5% Desirable	AASHTO, Page 3-119
Min. Stopping Sight Distance	305' (Grades <3%) 354' (Downgrades 3% - 8%)	RDM, Appendix A, GS-3 AASHTO, Table 3-2
Horizontal Curves ***Minimum Radius @ 8%*** ***Minimum Radius w/o Super. (NC)***	Des. Min. L = 15 x V (MPH) = 600' 446' 5410'	AASHTO, Page 3-111 RDM, Appendix A, GS-3 RBS, TC-5.11, Pg. 803.36
Crest Vertical Curve	Min. K = 44 Min. L = 3 x DS = 120' L=KA (where A=Algebraic Dif in Grades in %)	AASHTO, Table 3-34 AASHTO, Page 3-153
Sag Vertical Curve	Min. K = 64 Min. L = 3 x DS = 120' L=KA (where A=Algebraic Dif in Grades in %)	AASHTO, Table 3-36 AASHTO, Page 3-161
Superelevation	e max = 0.08 Transition Relative Gradient = 0.58 Runoff (2/3 Outside and 1/3 Inside Curve)	RBS, TC-5.11, Pg. 803.36 RBS, TC-5.11, Pg. 803.20 RBS, TC-5.11, Pg. 803.06
Minimum Vertical Clearance (Roadway Over Roadway)	14'-6" (Minimum) (Design Waiver) 16'-6" (Desirable)	RDM, Appendix A, GS-3, Footnote (7)
Clear Zone (Recoverable Terrain)	16' with 4:1 Front Slopes	RDM, Table A-2-1/RDG, Table 3.1 (ADT 1500-6000)

EXCEPTION / WAIVER	DESCRIPTION	REMARKS
DESIGN EXCEPTION	N/A	
DESIGN WAIVER	N/A	

RBS = Road and Bridge Standards (2016), Virginia Department of Transportation (VDOT)
RDM = Roadway Design Manual (2011), Virginia Department of Transportation (VDOT)
RDG = Roadside Design Guide (2011), American Assoc. of State Highway & Transportation Officials (AASHTO)
AASHTO = American Assoc. of State Highway & Transportation Officials - A Policy on Geometric Design of Highways and Streets (2011)

Roadway Inventory and Major Design Criteria

Project	95 EXPRESS LANES FREDERICKSBURG EXTENSION
Subject	ROADWAY DESIGN
Task	DESIGN CRITERIA

Design Criteria
Rural Minor Arterial, 40 MPH

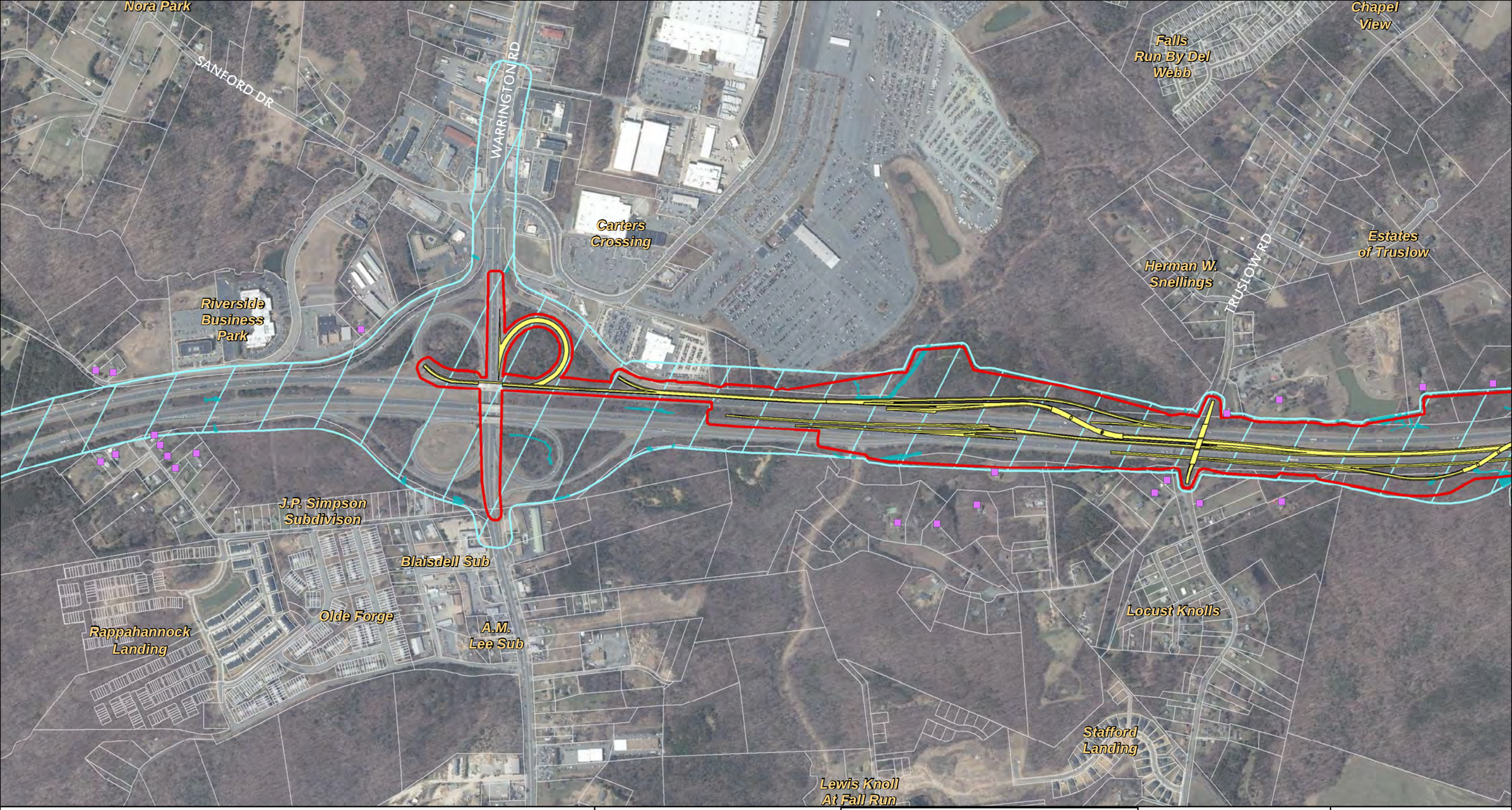
Location: Russell Road

DESIGN ELEMENT	DESIGN VALUE	SOURCE
Facility Type	Rural Minor Arterial *Rolling Terrain*	VDOT
Design Speed (DS) ***Posted Speed***	40 MPH 35 MPH	RDM, Appendix A, GS-2 VDOT
Minimum Lane Widths ***Rdwy Shldr Widths*** ***Bridge Shldr Widths***	12' - Travel Lane Outside: 8' Paved Min. Total (Graded & Paved) Cut & Fill: 10' Min. Total (Graded & Paved) Fill w/GR: 14' 10'	RDM, Appendix A, GS-2 RDM, Appendix A, GS-2 RDM, Appendix A, GS-2 RDM, Appendix A, GS-2 RDM, Appendix A, GS-2, Footnote (7)
Maximum Grade	6%	AASHTO, Table 7-2
Pavement Cross Slopes (Tangent)	2%	AASHTO, Pages 4-5 and 4-6
Minimum Grade (Barrier Wall & Gutter Sections)	0.3% Minimum 0.5% Desirable	AASHTO, Page 3-119
Min. Stopping Sight Distance	305' (Grades <3%) 333' (Downgrades 3% - 6%)	RDM, Appendix A, GS-2 AASHTO, Table 3-2
Horizontal Curves ***Minimum Radius @ 8%*** ***Minimum Radius w/o Super. (NC)***	Des. Min. L = 15 x V (MPH) = 600' 446' 5410'	AASHTO, Page 3-111 RDM, Appendix A, GS-3 RBS, TC-5.11, Pg. 803.36
Crest Vertical Curve	Min. K = 44 Min. L = 3 x DS = 120' L=KA (where A=Algebraic Dif in Grades in %)	AASHTO, Table 3-34 AASHTO, Page 3-153
Sag Vertical Curve	Min. K = 64 Min. L = 3 x DS = 120' L=KA (where A=Algebraic Dif in Grades in %)	AASHTO, Table 3-36 AASHTO, Page 3-161
Superelevation	e max = 0.08 Transition Relative Gradient = 0.58 Runoff (2/3 Outside and 1/3 Inside Curve)	RBS, TC-5.11, Pg. 803.36 RBS, TC-5.11, Pg. 803.20 RBS, TC-5.11, Pg. 803.06
Minimum Vertical Clearance (Roadway Over Roadway)	16'-6" (Minimum)	RDM, Appendix A, GS-2, Footnote (7)
Clear Zone (Recoverable Terrain)	16' with 4:1 Front Slopes	RDM, Table A-2-1/RDG, Table 3.1

EXCEPTION / WAIVER	DESCRIPTION	REMARKS
DESIGN EXCEPTION	N/A	
DESIGN WAIVER	N/A	

RBS = Road and Bridge Standards (2016), Virginia Department of Transportation (VDOT)
RDM = Roadway Design Manual (2011), Virginia Department of Transportation (VDOT)
RDG = Roadside Design Guide (2011), American Assoc. of State Highway & Transportation Officials (AASHTO)
AASHTO = American Assoc. of State Highway & Transportation Officials - A Policy on Geometric Design of Highways and Streets (2011)

APPENDIX B
MAP OF BUILD ALTERNATIVE



Legend

- Limits of Disturbance
- Inventory Corridor
- Proposed Improvements
- Parks
- Impacted Noise Receptors
- Wetlands/Streams
- Parcels
- Military Facilities

Noise Barriers

- Existing
- Future
- Feasible and Reasonable

0 200 400 800 1,200 1,600 Feet

1 in = 800 ft

1 2 3 4 5 6 7

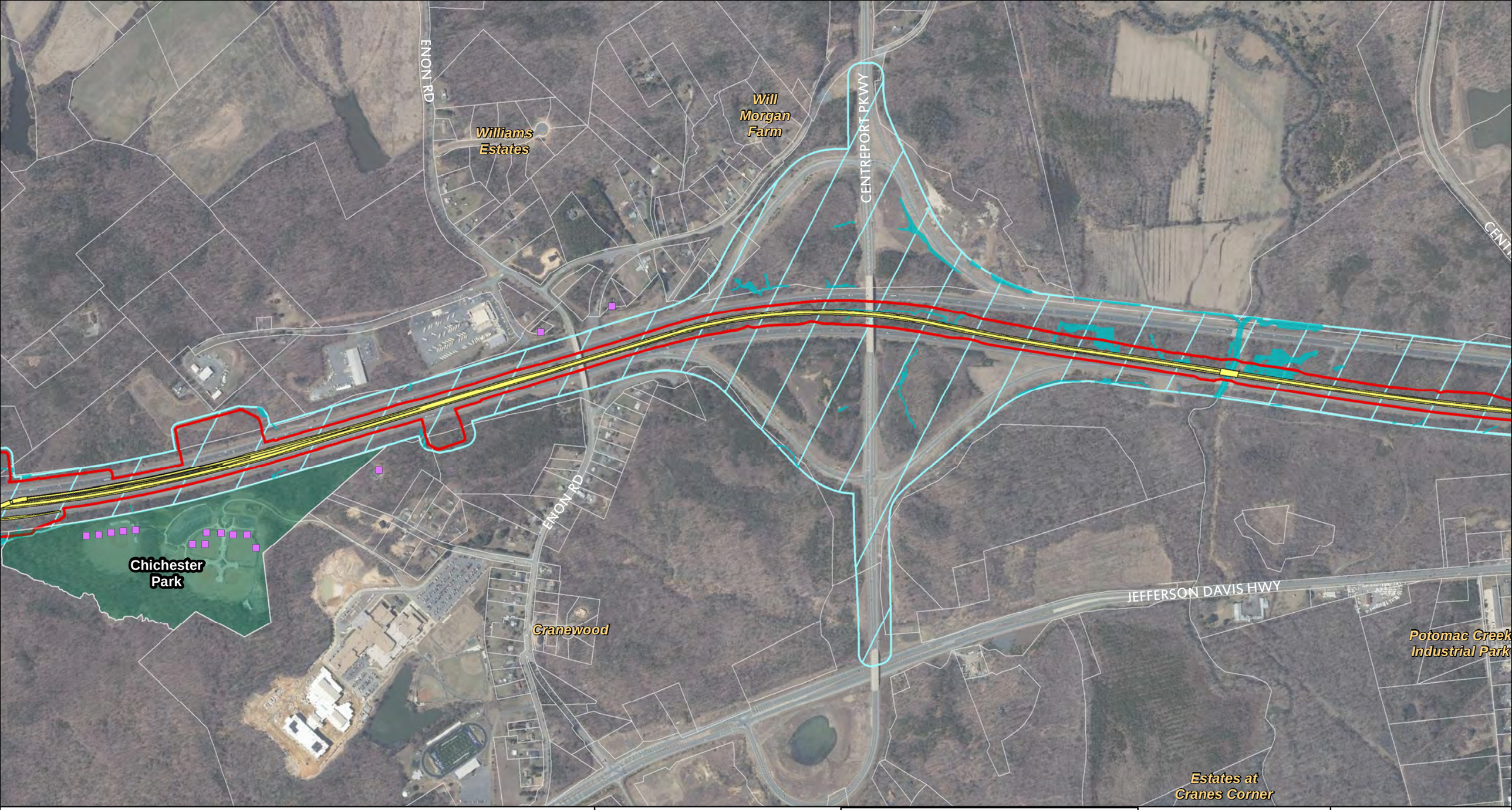
Sheet 1 of 7

U.S. Department of Transportation
Federal Highway Administration

VDOT

Interstate 95 Express Lanes Fredericksburg Extension Study

Build Alternative



Legend

- Limits of Disturbance
- Inventory Corridor
- Proposed Improvements
- Parks
- Impacted Noise Receptors
- Wetlands/Streams
- Parcels
- Military Facilities

Noise Barriers

- Existing
- Future
- Feasible and Reasonable

0 200 400 800 1,200 1,600 Feet

1 in = 800 ft

1 2 3 4 5 6 7

Sheet 2 of 7

U.S. Department of Transportation Federal Highway Administration

VDOT

Interstate 95 Express Lanes Fredericksburg Extension Study

Build Alternative

CENTREPORT PKWY

RAMOTH CHURCH RD

North Stafford Industrial Park

Tayor Bott Industrial Park

Penny Industrial Park

Evans Mobile Home Park

Ellison Estates

Potomac Creek Industrial Park

Cranes Corner Industrial Park

JEFFERSON DAVIS HWY

Legend

- Limits of Disturbance
- Inventory Corridor
- Proposed Improvements
- Parks
- Impacted Noise Receptors
- Wetlands/Streams
- Parcels
- Military Facilities

Noise Barriers

- Existing
- Future
- Feasible and Reasonable

0 200 400 800 1,200 1,600 Feet

1 in = 800 ft

1 2 3 4 5 6 7

Sheet 3 of 7

U.S. Department of Transportation Federal Highway Administration

VDOT

Interstate 95 Express Lanes Fredericksburg Extension Study

Build Alternative

Embrey Mill
AUSTIN RIDGE DR
Austin Ridge
COURTHOUSE RD
Westgate At Stafford Courthouse
Westgate Center
Wyche Prop
Stafford Oaks
Moncure Estates
Bells Valley (Moncure Valley)
Azalea Woods
WYCHE RD
Courthouse Square
Townes of Ashleigh
Belandres
Canterbury Village
Woodmont
Summit Ridge
Wyche Industrial Park
JEFFERSON DAVIS HWY
COURTHOUSE RD
Courthouse Square at Stafford
Paradise Estates Mobile Home Park
Somerset Landing
Tamarlane
Austin Run Townhouses
Crescent Pointe

Legend

- Limits of Disturbance
- Inventory Corridor
- Proposed Improvements
- Parks
- Impacted Noise Receptors
- Wetlands/Streams
- Parcels
- Military Facilities

Noise Barriers

- Existing
- Future
- Feasible and Reasonable

0 200 400 800 1,200 1,600 Feet

1 in = 800 ft

1 2 3 4 5 6 7

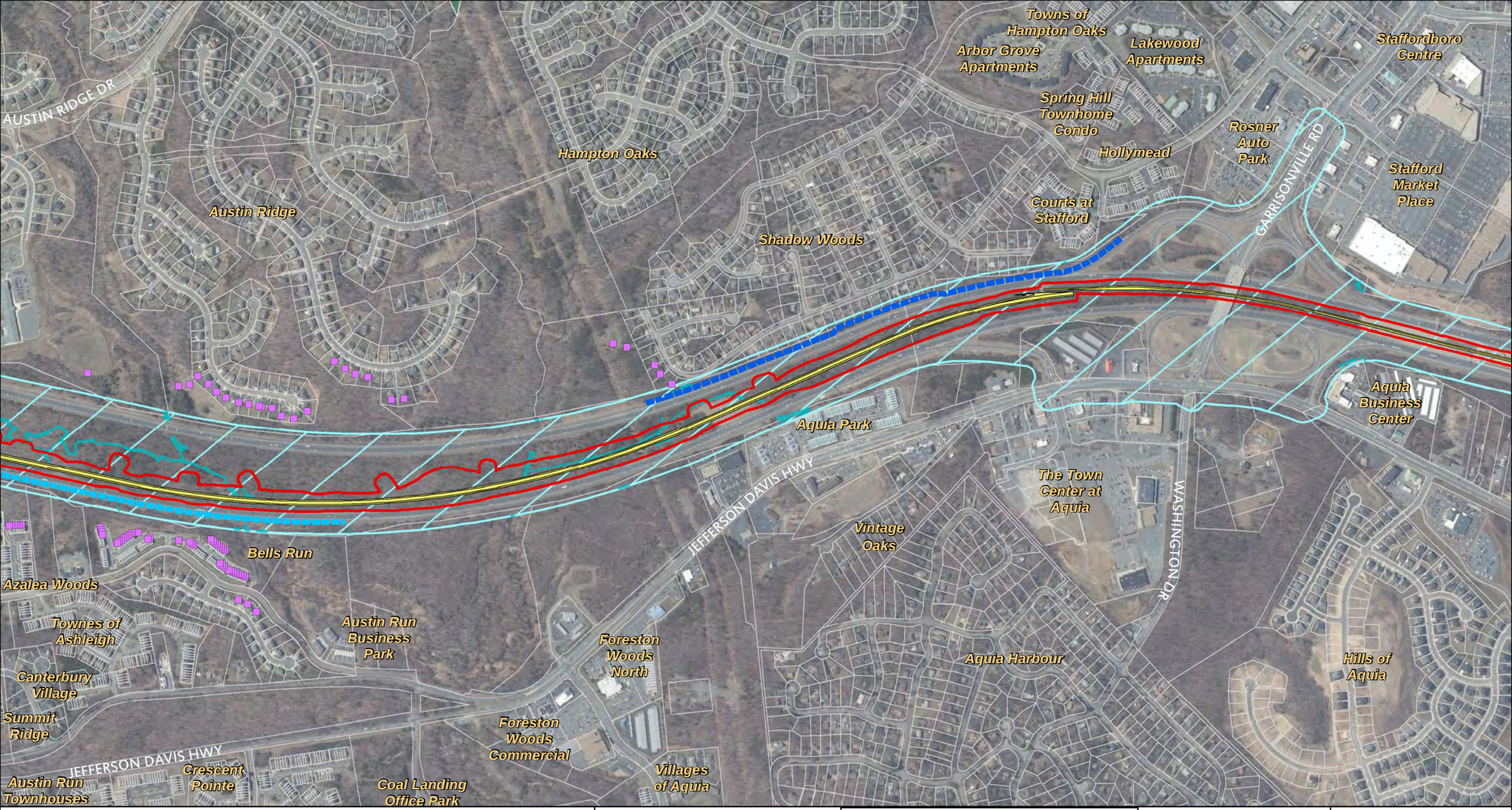
Sheet 4 of 7

U.S. Department of Transportation Federal Highway Administration

VDOT

Interstate 95 Express Lanes Fredericksburg Extension Study

Build Alternative



Legend

- Limits of Disturbance
- Inventory Corridor
- Proposed Improvements
- Parks
- Impacted Noise Receptors
- Wetlands/Streams
- Parcels
- Military Facilities

Noise Barriers

- Existing
- Future
- Feasible and Reasonable

0 200 400 800 1,200 1,600 Feet

1 in = 800 ft

1 2 3 4 5 6 7

Sheet 5 of 7

U.S. Department of Transportation Federal Highway Administration

VDOT

Interstate 95 Express Lanes Fredericksburg Extension Study

Build Alternative

Riley Estates
DOC STONE RD
Hampton Arliss Estates
Sunningdale Meadows Condo
Foxwood Village Mobile Home Park
Staffordborough
Stafford Market Place
Woodstream
Smith Lake Park
Marine Corps Base Quantico
Aquia Business Center
Port Aquia Commercial
Potomac Hills
Taylors Mobile Home Park
JEFFERSON DAVIS HWY
Sunnyside (Vasquez)
Guinn's Mobile Home Park
TELEGRAPH RD
Hills of Aquia
Widewater Village At Stafford
Sunnyside Estates
Sunnyside Mobile Home Park
Brentsmill
TELEGRAPH RD
OLYMPIC DR
Griffis Estates

Legend

- Limits of Disturbance
- Inventory Corridor
- Proposed Improvements
- Parks
- Impacted Noise Receptors
- Wetlands/Streams
- Parcels
- Military Facilities

Noise Barriers

- Existing
- Future
- Feasible and Reasonable

0 200 400 800 1,200 1,600 Feet

1 in = 800 ft

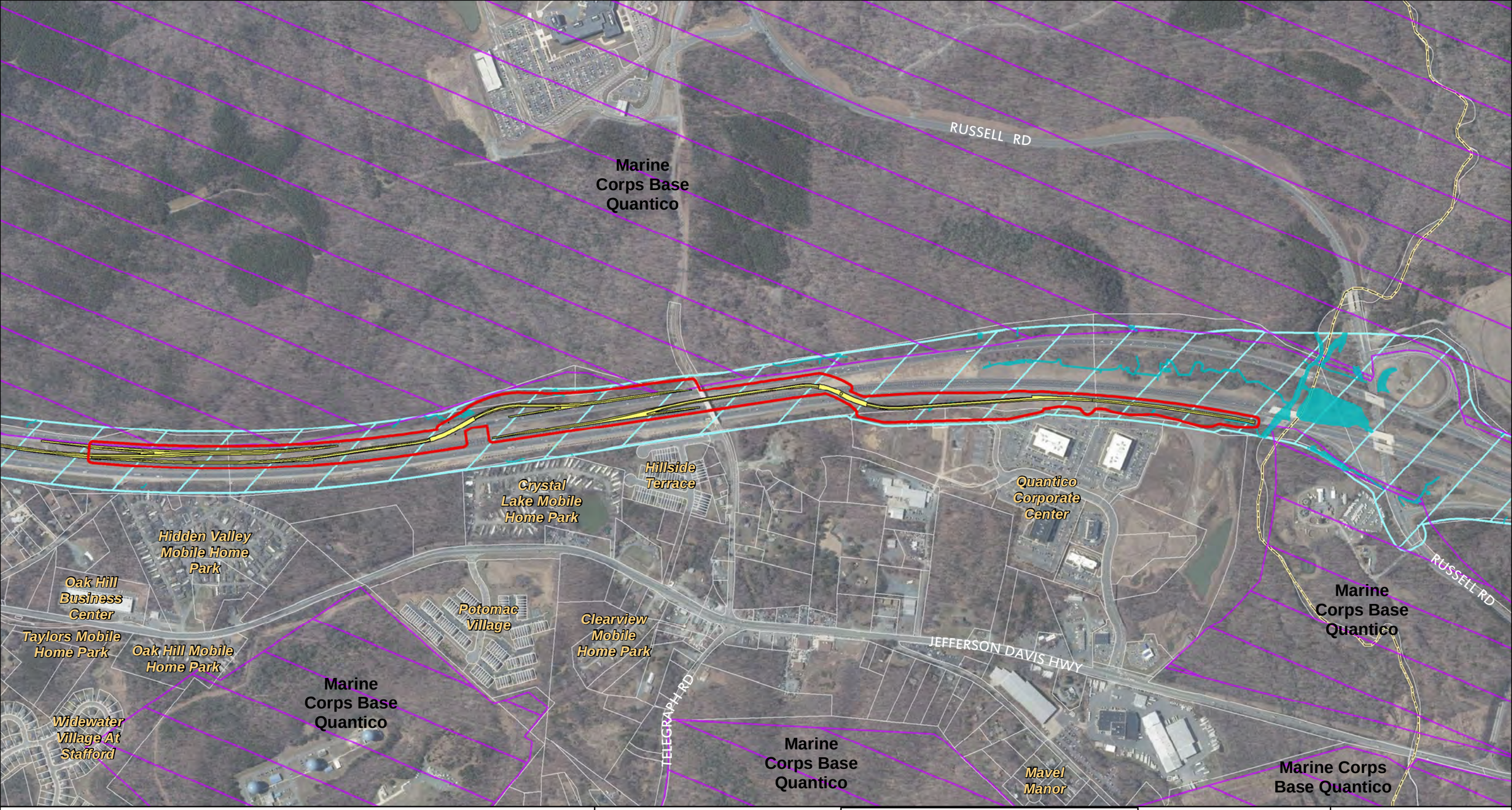
1 2 3 4 5 6 7

Sheet 6 of 7

U.S. Department of Transportation
Federal Highway Administration
VDOT

Interstate 95 Express Lanes Fredericksburg Extension Study

Build Alternative



Legend

- Limits of Disturbance
- Inventory Corridor
- Proposed Improvements
- Parks
- Impacted Noise Receptors
- Wetlands/Streams
- Parcels
- Military Facilities

Noise Barriers

- Existing
- Future
- Feasible and Reasonable

0 200 400 800 1,200 1,600 Feet

1 in = 800 ft

1 2 3 4 5 6 7

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U.S. Department of Transportation
Federal Highway Administration

VDOT

Interstate 95 Express Lanes Fredericksburg Extension Study

Build Alternative