Supplement to Interchange Modification Report

I-95 / Route 630 Interchange

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1 Executive Summary

1.1 Introduction

The Virginia Department of Transportation is requesting that the Federal Highway Administration (FHWA) provided supplemental approval relating to the proposed improvements for the I-95/Route 630 interchange. The original Interchange Modification Report dated June 2011 recommended Alternative A2 as the preferred alternative, a modified split diamond (MSD) on new Route 630 Alignment. Subsequently, a new alternative, Alternative F, a diverging-diamond interchange (DDI) on new Route 630 Alignment, has been developed. This document will supplement the original Interchange Modification Report and will justify the recommended improvements through analysis of forecasted conditions.

1.2 Purpose and Need

The purpose of the proposed interchange improvements is to enhance safety and provide additional capacity to address current and projected levels of demand at the I-95/Route 630 interchange. The Virginia Department of Transportation (VDOT) and Stafford County identified the relocation of the interchange at I-95/Route 630 as an Interstate road system improvement project under VDOT's 2009-2014 Six-Year Improvement Program (SYIP). This is required due to the future growth and projected traffic volumes along Route 630. The projected development along the Route 630 corridor will further increase traffic volumes reducing the Level of Service (LOS) and causing congestion through the I-95/Route 630 interchange.

By 2037, traffic volumes are expected to increase such that the intersections along Route 630 at the I-95 Northbound On/Off Ramp and the I-95 Southbound On/Off Ramp will operate at a failing LOS during the AM and PM peak hours. This will cause queuing onto the Interstate and affect operations along the Interstate. Route 630 will be vastly congested due to the limited left-turn storage at the interchange, which will then block the through lanes. In addition, failing levels of service are anticipated at Red Oak Drive and Austin Ridge Drive along Route 630. Modifications to the I-95/Route 630 interchange are necessary to accommodate the projected traffic volumes thus reducing expected congestion and motorist delay through the study area.

1.3 Screening of Alternatives

Six concepts (five Build alternatives and one No-Build alternative) were developed for the I-95/Route 630 Interchange Modification Report (IMR) dated June 2011. Each of the alternatives provided a four-lane typical section on Route 630 with provisions for future widening to the median to provide six lanes. The five build alternatives provided for a shared-use path for pedestrians and bicyclists to allow for access from the Stafford County Courthouse to the west either through or around the interchange. These alternatives were analyzed for traffic operations, overall environmental impacts, right-of-way impacts, utility impacts, and construction cost. Based on the analyses conducted for the June 2011 study, Build Alternative A2 was identified as the Preferred Build Alternative because it provides the best traffic operations at the lowest cost and with the fewest utility impacts.

Due to the escalation of construction costs, a more cost-effective alternative, Alternative F, is

presented here and discussed in comparison with the previous preferred alternative (Alternative A2) from the IMR, dated June 2011. The only alternatives that will be discussed in this document are Alternative A2 and the new Alternative F.

1.4 Summary of Findings

The new Preferred Build Alternative, Alternative F, is expected to meet the target of Level of Service (LOS) C in 2017 at all locations at and east of the interchange. By 2037, the Preferred Build Alternative is expected to operate better than Alternative A2. However, microsimulation analysis shows that by 2037, the two-lane section on southbound Wyche Road at the intersection of Route 630 is expected exceed the capacity for a two-lane roadway. As a result, improvements to Wyche Road from Route 630 to the park-and-ride entrance drive are proposed to provide a four-lane section. These improvements will be needed between 2017 and 2037.

1.5 FHWA Policy Requirements

The previous IMR that was developed in June 2011 and approved by FHWA did not include the eight FHWA Interstate access policy requirements for the proposed project. The FHWA *Access to the Interstate System* policy published in August 2010 states that the FHWA's decision to approve a request is dependent on the proposal satisfying and documenting the eight policy points. Hence, this supplement includes detailed responses for the policy requirements.

Policy Requirement 1 – Need for the Access Point Revision

The need being addressed by the request cannot be adequately satisfied by existing interchanges to the Interstate, and/or local roads and streets in the corridor can neither provide the desired access, nor can they be reasonably improved (such as access control along surface streets, improving traffic control, modifying ramp terminals and intersections, adding turn bays or lengthening storage) to satisfactorily accommodate the design-year traffic demands.

Under existing conditions the interchange is operating acceptably except during the PM peak hour when left-turning traffic queues into the through lanes along Route 630. This impacts traffic operations at the ramp intersections and impedes through traffic along Route 630. Furthermore, Stafford County has identified the area around the Route 630 interchange as an Urban Development Area which means it is anticipated that denser development will occur in the area. The continued development will further increase traffic volumes, degrading the Level of Service (LOS) and causing congestion through the I-95/Route 630 interchange. The LOS analysis conducted in this report shows that by 2037, traffic volumes are expected to increase such that the intersections along Route 630 at the I-95 On- and Off-Ramps will operate at a failing LOS during both the AM and PM peak hours. This will cause queuing onto the Interstate and affect operations along the Interstate. The analysis presented in this report for the 2037 No-Build conditions takes into consideration all the background programmed projects in the study area, optimized signal timings, and other reasonable improvements that could be made to accommodate the growth in demand.

The adjacent interchange north of the subject interchange is located more than 2.5 miles away, and the adjacent interchange to the south is located approximately 3.5 miles away. The only other local roadway linking these interchanges is US 1, which operates at or above capacity and already

accommodates diversions from I-95 due to congestion. It is not reasonable to expect that motorists having destinations along Route 630 will use adjacent interchanges. Accordingly, the proposed project addresses the need for capacity and safety improvements at this interchange.

Policy Requirement 2 – Reasonable Alternatives

The need being addressed by the request cannot be adequately satisfied by reasonable transportation system management (such as ramp metering, mass transit, and HOV facilities), geometric design, and alternative improvements to the Interstate without the proposed change(s) in access.

A transportation system management (TSM) option was not developed for this project due to the rural nature of the project location. However, the project does take into account the future Express Lanes along I-95 and provides for an expanded and relocated park-and-ride lot to facilitate mass transit and ride-sharing. There is a need for improvement of the interchange due to the expected significant increase in demand along Route 630 due to proposed developments in the vicinity of this interchange. VDOT and Stafford County identified the need to relocate Route 630 and this interchange to accommodate this growth and projected demand. The relocation of Route 630 aligns with the regional plans for a direct connection to US 1 at Hospital Center Boulevard and provides for a park-and-ride lot for mass transit and I-95 Express Lanes users. Any additional reasonable TSM strategies applied alone will not meet the needs at this interchange.

Policy Requirement 3 – Operational and Collision Analysis

An operational and safety analysis has concluded that the proposed change in access does not have a significant adverse impact on the safety and operation of the Interstate facility (which includes mainline lanes, existing, new, or modified ramps, ramp intersections with crossroad) or on the local street network based on both the current and the planned future traffic projections. The analysis shall, particularly in urbanized areas, include at least the first adjacent existing or proposed interchange on either side of the proposed change in access. The crossroads and the local street network, to at least the first major intersection on either side of the proposed change in access, shall be included in this analysis to the extent necessary to fully evaluate the safety and operational impacts that the proposed change in access and other transportation improvements may have on the local street network. Requests for a proposed change in access must include a description and assessment of the impacts and ability of the proposed changes to safely and efficiently collect, distribute and accommodate traffic on the Interstate facility, ramps, intersection of ramps with crossroad, and local streets. Each request must also include a conceptual plan of the type and location of the signs proposed to support each design alternative.

The study area for the operational and safety analysis performed as part of this IMR satisfies the required extents in the FHWA requirements for roadway network analysis and is illustrated in **Figure 3-1**. It includes the Garrisonville Road interchange that is located more than 2.5 miles north, and the Centerport Parkway interchange that is located approximately 3.5 miles to the south of the Route 630 interchange. The study area also includes one intersection on each side of the interchanges.

Information presented in this report demonstrates that the Preferred Build Alternative will reduce the potential for vehicle crashes within the study area. As per FHWA's *Informational Guide for Diverging Diamond Interchange* (DDI), the DDI design significantly reduces the number of vehicle-to-

vehicle conflict points compared to a conventional diamond interchange. The DDI also reduces the severity of conflicts, as conflicts between left-turning movements and the opposing through movements are eliminated. The remaining conflicts are reduced to merge conflicts for turning movements, and the reduced speed crossover conflict of the two through movements.

Analyses based on the Highway Capacity Manual (HCM) presented in this report show that the Preferred Build Alternative will improve traffic operations on roadways within the study area when compared to the No-Build Alternative in the opening year and design year. Queuing analyses was also conducted using SimTraffic software to estimate the 95th percentile queues along the arterial network. The analysis showed no significant queuing along any of the approaches. Microsimulation analyses were also conducted using CORSIM to supplement the deterministic HCM-based analyses. It also confirmed the findings that the Preferred Build Alternative will improve the traffic operations when compared to the No-Build Alternative.

Supporting documentation also includes a functional signing plan (**Figure 5-1**) and assumptions used in developing a signing concept, as provided in Section 5.5.

Policy Requirement 4 – Access Connections and Design

The proposed access connects to a public road only and will provide for all traffic movements. Less than ``full interchanges'' may be considered on a case-by-case basis for applications requiring special access for managed lanes (e.g., transit, HOVs, HOT lanes) or park-and-ride lots. The proposed access will be designed to meet or exceed current standards.

The Build Alternative proposed in the IMR will retain the current full directional access between I-95 and Route 630.

The design of the Preferred Build Alternative has been advanced to a conceptual level and will be further refined during subsequent stages of design activities. The design of the proposed improvements under the Preferred Alternative is intended to meet or exceed American Association of State Highway and Transportation Officials (AASHTO) design standards, where feasible. At this stage of project development, the design does not require any Design Waivers or Design Exceptions. VDOT will process any Design Waiver or Design Exception documentation during final design of the project if needed.

Policy Requirement 5 – Land Use and Transportation Plans

The proposal considers and is consistent with local and regional land use and transportation plans. Prior to receiving final approval, all requests for new or revised access must be included in an adopted Metropolitan Transportation Plan, in the adopted Statewide or Metropolitan Transportation Improvement Program (STIP or TIP), and the Congestion Management Process within transportation management areas, as appropriate, and as specified in 23 CFR part 450, and the transportation conformity requirements of 40 CFR parts 51 and 93.

The proposed improvements are consistent with local and regional land-use plans including the latest version of comprehensive plans prepared and adopted by Stafford County. The improvements are also consistent with the George Washington Regional Commission/Fredericksburg Area Metropolitan Planning Organization's (GWRC/FAMPO) Constrained Long Range Transportation Plan (CLRP), which was adopted in April 2013. Funding for the Project was allocated in VDOT's current

Six-Year Improvement Program (SYIP 2016-2021).

The project is also included in FY2015-2018 TIP that was adopted June 16, 2014 (by FAMPO Resolution 14-14), updated June 19, 2015 and is included in FY2015-FY2018 STIP that was approved the FHWA on September 30, 2014.

Policy Requirement 6 – Future Interchanges

In corridors where the potential exists for future multiple interchange additions, a comprehensive corridor or network study must accompany all requests for new or revised access with recommendations that address all of the proposed and desired access changes within the context of a longer-range system or network plan.

FAMPO's CLRP reflects a comprehensive summary of transportation needs throughout the region, including improvements at the study interchange. The study area includes one interchange on each side of I-95 (north and south) and takes into accounts all programmed, formally documented and approved interchange access in the vicinity of this project. There will be no other planned access between Route 630 interchange and the adjacent interchanges within the study area. The traffic analysis presented in this IMR considered all of the elements in the plan that affect the project corridor. All proposed improvements and revised access points are supported by these comprehensive network study recommendations.

Policy Requirement 7 – Coordination

When a new or revised access point is due to a new, expanded, or substantial change in current or planned future development or land use, requests must demonstrate appropriate coordination has occurred between the development and any proposed transportation system improvement. The request must describe the commitments agreed upon to assure adequate collection and dispersion of the traffic resulting from the development with the adjoining local street network and Interstate access point.

The project is not associated with any specific private development or change in land use. Rather, it is being advanced to respond to the cumulative effect of regional and local changes in land use and increasing congestion resulting from increased commuter and regional travel activity oriented to and from the Washington, DC, metropolitan area. The proposed improvements and revised access points will not be used to provide access between any new or expanded development. They were formulated to respond to forecasted travel demand in the area.

The traffic volume forecasts are based on the most recent version of the FAMPO (Version 3.0) travel demand model available at the time of the analyses. The inputs and outputs of the travel demand model were endorsed by VDOT and reflect the demand associated with all programmed land use within the model's coverage area. Additionally, new trips anticipated to be generated by several development projects including the proposed park-and-ride lot located adjacent to the interchange were also incorporated into the forecasts.

Policy Requirement 8 – Environmental Process

The proposal can be expected to be included as an alternative in the required environmental evaluation, review and processing. The proposal should include supporting information and current status of the environmental processing.

In compliance with state and federal laws, VDOT is preparing an updated Environmental Assessment document (EA) to identify potential environmental impacts associated with the Build Alternative. The revised EA will amend or update the previously approved EA. The environmental document will include consideration of the No-Action (No-Build) alternative, as well as the Preferred Build Alternative identified in this IMR document. Environmental investigations and documentation are currently underway by VDOT.

2 Background

Interstate 95 (I-95) serves both Interstate through traffic as well as regional commuter traffic oriented to the Washington, DC, Fredericksburg, and Richmond metropolitan areas. The interchange of I-95/Route 630 Courthouse Road is located near Stafford, Virginia, and is one of four access points to I-95 in Stafford County. The nearest interchange along I-95 to the north is I-95/Route 610 (Garrisonville Road) interchange located more than 2.5 miles to the north of the Route 630 interchange. Approximately 3.5 miles to the south of the Route 630 interchange is the I-95/Route 8900 (Centreport Parkway) interchange.

The project for which this supplement is written involves improvements to the I-95/Route 630 interchange to increase capacity to accommodate the forecasted traffic demand in the area.

2.1 Purpose and Need

The purpose of the proposed interchange improvements is to enhance safety and provide additional capacity to address current and projected levels of demand at the I-95/Route 630 interchange. The Virginia Department of Transportation (VDOT) and Stafford County identified the relocation of the interchange at I-95/Route 630 as an Interstate road system improvement project under VDOT's 2009-2014 Six-Year Improvement Program (SYIP). This is required due to the future growth and projected traffic volumes along Route 630. Stafford County identified the area around the Route 630 interchange as an Urban Development Area, which means it is anticipated that denser development will occur in the area. This continued development will further increase traffic volumes reducing the Level of Service (LOS) and causing congestion through the I-95/Route 630 interchange.

By 2037, traffic volumes are expected to increase such that the intersections along Route 630 at the I-95 Northbound On/Off Ramp and the I-95 Southbound On/Off Ramp will operate at a failing LOS during the AM and PM peak hours. This will cause queuing onto the Interstate and effect operations along the Interstate. Route 630 will be vastly congested due to the limited left-turn storage at the interchange, which will then block the through lanes. In addition, failing levels of service are anticipated at Red Oak Drive and Austin Ridge Drive along Route 630. Modifications to the I-95/Route 630 interchange are necessary to accommodate the projected traffic volumes thus reducing expected congestion and motorist delay through the study area.

2.2 Related Highway/Land Development Projects

Roadway improvement projects have been identified by Stafford County and VDOT for the county's road system. The following projects are also included in the Fredericksburg Area Metropolitan Planning Organization (FAMPO) constrained regional long-range plan:

- Route 630 (Courthouse Road) – Widen two lanes to four lanes from Route 742 (Cedar Lane) to Route 648 (Shelton Shop Road).
- US 1 – Widen four lanes to six lanes from US 17 to Prince William County Line.
- I-95 Rest Area Access Study – Provide new interchange between Route 3 and Rappahannock River
- Route 648 (Shelton Shop Road) – Widen two lanes to four lanes from Route 610

(Garrisonville Road) to Route 627(Mountain View Road).

- Route 641 (Onville Road) – Widen two lanes to four lanes from Route 610 (Garrisonville Road) to MCB Quantico.
- Route 610 (Garrisonville Road) – Widen five lanes to six lanes from Route 648 (Shelton Shop Road) to Route 641 (Onville Road).
- I-95 – Construct two reversible Express Lanes from north of I-95 interchange #143 to I-95 interchange #126.

Projects that are complete but were part of the original IMR include the following:

- I-95 – Construct two reversible Express Lanes from the Prince William County Line to north of I-95 interchange #143.
- Route 610 (Garrisonville Road) – Widen two lanes to four lanes from west of Route 643 (Joshua Road) to east of Route 643 (Joshua Road).
- Route 610 (Garrisonville Road) – Widen four lanes to six lanes from Route 684 (Mine Road) to Route 641 (Onville Road).

Traffic volume projections and operational analyses conducted for this study reflect these other projects where the preceding narrative indicates it is proper to do so.

3 Study Area

The I-95/Route 630 interchange provides access to the Stafford and Moores Corner area of north-central Virginia. Among the major destinations in the area is the Stafford County Courthouse area which consists of the Stafford Courthouse, County Government buildings, Stafford Hospital Center, a public safety building, fire/rescue stations, offices, shops and homes. There are several unincorporated communities in the area surrounding this interchange. Stafford is nearby, approximately 1 mile to the east. Five miles to the north of I-95 and Route 630 is the town of Aquia; Fritters Corner is located 6 miles in the southeast direction; Leeland is located 8 miles to the south; Ramoth is 4 miles to the west; and Moores Corner is located 5 miles to the northwest.

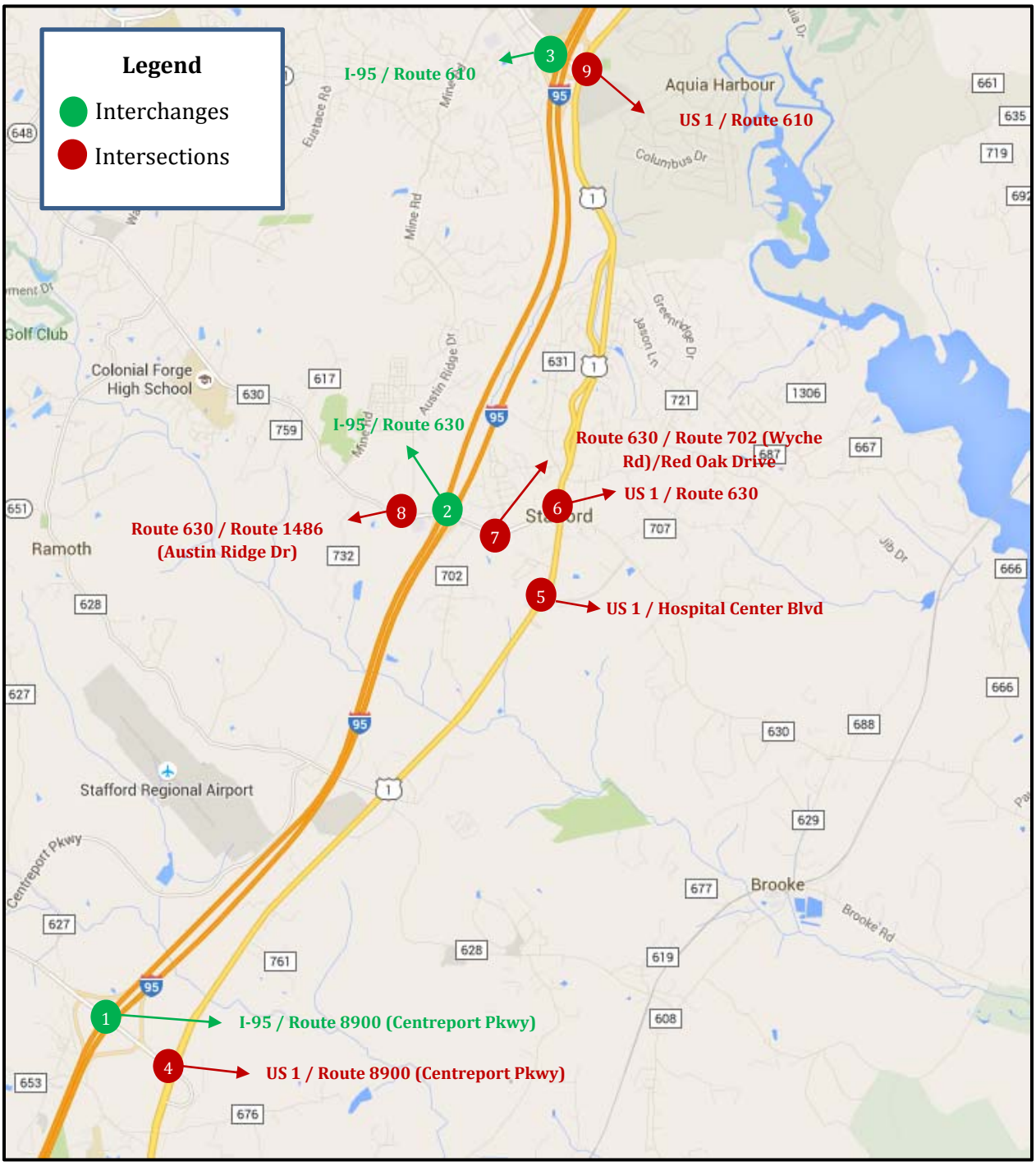
The interchange of I-95 and Route 630 is located in Stafford County in the north-central part of Virginia. It is approximately 10 miles north of Fredericksburg, approximately 40 miles south of Washington, DC, and approximately 65 miles north of Richmond.

Figure 3-1 shows the study area map.

The interchanges and intersections within the study area are listed below:

1. Centreport Pkwy(Route 8900)/I-95 interchange
2. Courthouse Rd (Route 630)/I-95 interchange
3. Garrisonville Rd (Route 610)/I-95 interchange
4. Jefferson Davis Hwy (US 1)/Centreport Pkwy (Route 8900) intersection
5. Jefferson Davis Hwy (US 1)/Hospital Center Blvd intersection
6. Jefferson Davis Hwy (US 1)/Courthouse Rd (Route 630) intersection
7. Courthouse Rd (Route 630)/Wyche Rd (Route 702)
8. Courthouse Rd (Route 630)/Austin Ridge Dr (Route 1486)
9. Jefferson Davis Hwy (US 1)/Garrisonville Rd (Route 610) intersection

Figure 3-1: Study Area



4 Alternatives

Under the June 2011 IMR, sketch plans of nine interchange alternatives were developed by VDOT for consideration, out of which five were carried forward for geometric refinement and detailed study. These five alternatives along with the No Build condition were evaluated based on cost and traffic operations. Alternative A2 was carried forward as the recommended preferred alternative under the June 2011 IMR. At the time, the diverging-diamond concept was not prevalent in the United States. In recent times, with the adoption of the DDI concept throughout various parts of the country and the successful implementation of the DDI concept in Virginia, VDOT has proposed to include this design as an alternative for this interchange.

This section details the original preferred alternative, Alternative A2; the new DDI concept, Alternative F; and a brief summary of comparison between the two alternatives.

4.1 Alternative A2: Modified Split Diamond on New Route 630 Alignment

This alternative splits Route 630 into a one-way pair from Red Oak Drive extended to relocated Austin Ridge Drive. The existing alignment of Route 630 is used for the westbound roadway through the interchange but diverges to the south around the existing intersection with Wyche Road. Eastbound Route 630 follows a new alignment that crosses over I-95 about 800 feet south of the existing bridges. These two sections come together at the Red Oak Drive extension and continue to become the fourth leg at the existing intersection of Hospital Center Boulevard and US 1.

The ramp from I-95 northbound diverges as a single ramp that then splits into two separate ramps to carry traffic to eastbound and westbound Route 630. The I-95 southbound ramp will be a two-lane diverge with the second lane starting as a choice lane from I-95. The ramps from Route 630 to southbound and northbound I-95 create independent merges onto I-95. Movements from southbound I-95 to eastbound Route 630 and from eastbound Route 630 to northbound I-95 are provided via directional ramps that converge and diverge on the left-hand side of eastbound Route 630 and create an approximate 1,000-foot-long weaving area. The intersection of Route 630 eastbound and the I-95 northbound to Route 630 westbound intersection will be signalized. The four-legged intersection of Route 630 westbound and the ramp to I-95 SB/U-turn ramp will be evaluated during design for signalization. Finally, ramps to southbound I-95 and from northbound I-95 diverge and converge from the right-hand side of eastbound Route 630.

Pedestrians and bicyclists will be provided a shared-use path along the westbound alignment of Route 630. This provides the safest route that has the least interference from free-flow interchange movements.

The park-and-ride lot stays in the same general location but is reconfigured to fit between the eastbound and westbound Route 630 roadways and the directional ramp from southbound I-95. Access will be via a left-in/left-out driveway about 500 feet west of the ramp junction. U-turn roadways are provided east and west of the interchange to provide full access to and from the lot.

Approximately 1000 feet west of the interchange, Austin Ridge Drive is relocated to a new intersection about 500 feet west of the existing intersection where the two sections of Route 630 come together. This provides a better intersection layout and meets the VDOT criteria for intersection spacing at an interchange.

Alternative A2 includes a left-hand merge and diverge area on eastbound Route 630 with the directional ramps to and from I-95.

To the east of the interchange, Wyche Road is closed just south of the eastbound Route 630 roadway. Access from the properties along Wyche Road is provided via an extension of Venture Drive that connects to Route 630 at the extension of Red Oak Drive. East of Red Oak Drive, Route 630 continues to US 1 at the existing intersection with Hospital Center Boulevard. **Figure 4-1** depicts this alternative.

4.2 Alternative F: Diverging-Diamond Interchange on New Route 630 Alignment

Under this new alternative, new bridges would be constructed parallel to and south of the existing Route 630. This configuration would allow the existing bridges to remain in service during construction and would allow the overall project to be phased. Route 630 will follow a new alignment that crosses over I-95 about 800 feet south of the existing bridges. Route 630 will continue east to become the fourth leg at the existing intersection of Hospital Center Boulevard and US 1. Alternative F is shown in **Figure 4-2**.

The DDI configuration involves elongated, skewed crossover intersections along the minor roadway (in this case, Route 630) and generally requires that access points be located further from the ramp termini than existing conditions allow. The Route 630 alignment shift to the south of the existing alignment would likely result in the need to acquire and relocate one additional parcel.

The existing Route 630 under I-95 will be retained for future use by pedestrians and bicyclists, which will also includes the installation of two - 10’ x 10’ box culverts under the proposed north ramps. This provides the safest route that has the least interference from free-flow interchange movements.

Wyche Road is proposed to be cut for the new alignment of Route 630. A cul-de-sac is planned at the north end of the existing Wyche Road; however, Wyche Road is proposed to be relocated and intersect with the new Route 630 alignment approximately 600 feet to the east at the intersection of Red Oak Drive and newly aligned Route 630.

Off of Red Oak Drive, the park-and-ride lot is relocated to the northeast quadrant of the interchange. Access will be via a signalized intersection at Red Oak Drive/Wyche Road and the realigned Route 630, located approximately 900 feet east of the of the interchange ramp. The park-and-ride location does not preclude the addition of spaces in the future; however, the park-and-ride will be provided with the same number of spaces as are provided by Alternative A2. A direct connection (spur) from the parking lot to Route 630 was also examined as a free-flow movement to expeditiously allow vehicles to exit the parking lot to travel west on Courthouse Road. It was determined from the traffic operations analysis that the spur was not required to meet acceptable levels of service.

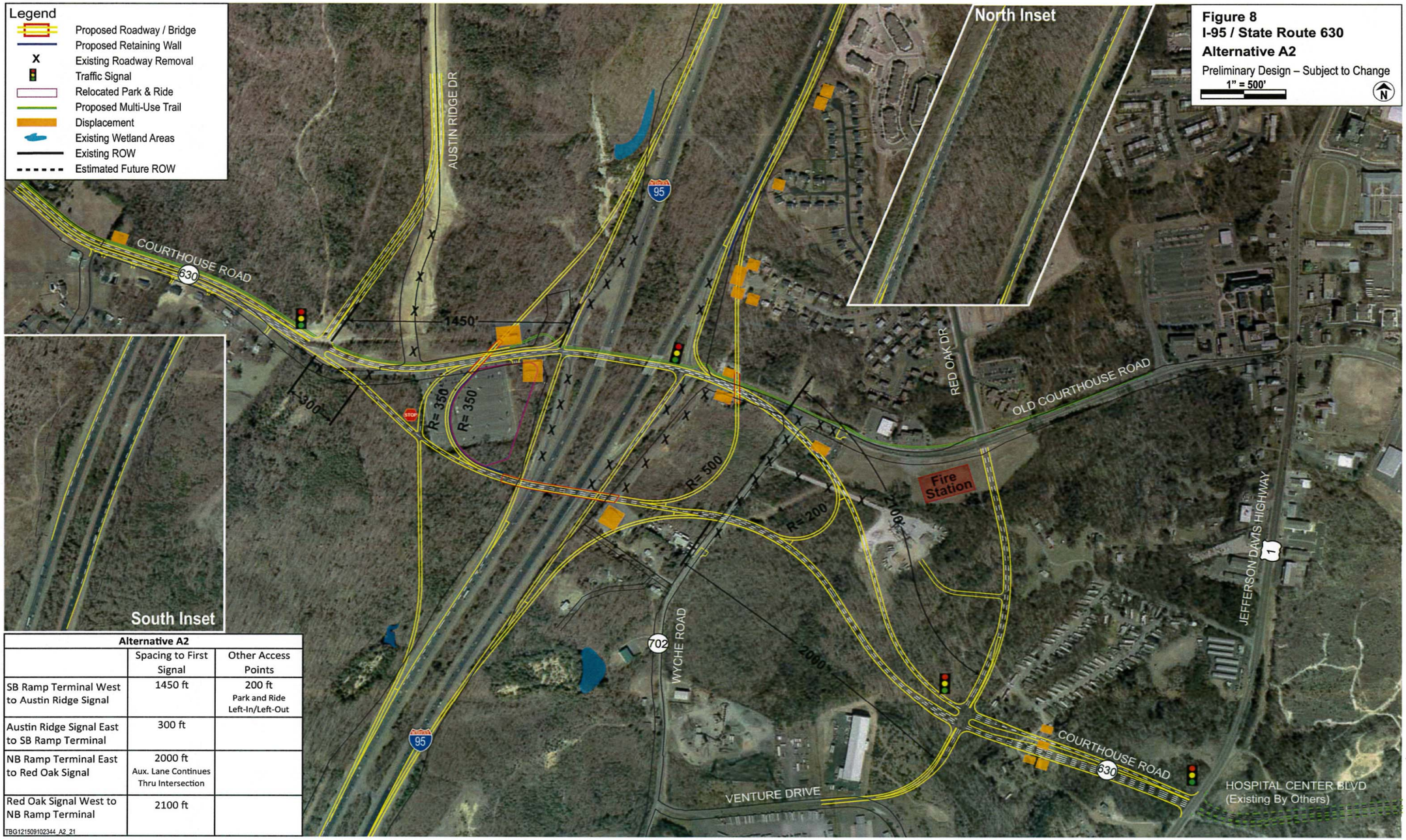
Approximately 1000 feet west of the interchange, Austin Ridge Drive is relocated to a new

intersection about 500 feet west of the existing intersection. This provides a better intersection layout and meets the VDOT criteria for intersection spacing at an interchange.

The following interchange refinements proposed for Alternative F from the original preferred alternative, Alternative A2, are as follows:

- Revise interchange type from Diamond interchange to a Diverging-Diamond interchange.
- Increase northbound off-ramp to Route 630 from one lane to two lanes.
- Change from two northbound on-ramps (one lane each) to one 2-lane on-ramp.

Figure 4-1: Geometric Layout of Build Alternative A2



Alternative A2		
	Spacing to First Signal	Other Access Points
SB Ramp Terminal West to Austin Ridge Signal	1450 ft	200 ft Park and Ride Left-In/Left-Out
Austin Ridge Signal East to SB Ramp Terminal	300 ft	
NB Ramp Terminal East to Red Oak Signal	2000 ft Aux. Lane Continues Thru Intersection	
Red Oak Signal West to NB Ramp Terminal	2100 ft	

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Figure 4-2: Geometric Layout of Build Alternative F

4.3 Evaluation Criteria

The following described the technical criteria used by VDOT to evaluate Build Alternative F. Criteria are comparative among the alternatives studied.

Traffic Operations

Level-of-Service (LOS) at each intersection and freeway segment were developed using the same HCM methodologies as the previous IMR to develop performance measures within the study area. These measures allow for ranking of the performance of each of the alternatives under consideration. These criteria provide an overall assessment of the degree to which each design alternative provides additional operating capacity to address current and projected traffic demand.

The Measures of Effectiveness (MOEs) presented in the June 2011 IMR for alternatives evaluation used several programs. For the DDI alternative evaluation, we applied the same methodology and used the same programs/versions to stay consistent with the previous effort.

For Freeways:

- **Level of Service** – HCS program was used for all freeways segment types – basic, merge, diverge, and weave
- **Travel Times/Speeds and % Throughput** – CORSIM was used to supplement HCS analysis for Freeways only (same 10 random seeds were used as in the previous IMR)

For Arterials:

- **Intersection LOS and Delay** – HCM Methodology Intersection Capacity Analysis reported from Synchro
- **95th Percentile Queues** – are reported from SimTraffic (averaged over 5 iterations)

Construction Cost

This criterion addresses the projected project development cost for each alternative. Construction costs were computed based on the quantity takeoffs for Alternative F, as shown in **Figure 4-1,** and the costs are presented in **Table 11-1**. Costs are calculated using the recent construction unit cost data published within the past year by VDOT for the Fredericksburg District.

A 12.5 percent contingency was included for roadway construction engineering and inspections services (CEI) and a 15 percent contingency was included for bridge CEI. Costs also include a 20 percent contingency for construction. Construction cost totals include construction costs, incentives, contingencies, utility relocations and environmental mitigation.

Right-of-Way Impacts

This criterion evaluates the degree to which each alternative impacts properties currently under private ownership. Required right-of-way for each alternative was established by summating the proposed width of various roadways and roadside features such as sidewalk, buffer strips, and retaining walls. Right-of-way widths were rounded to achieve even integer width values (60 feet, 75 feet, 100 feet, etc.). Right-of-way acquisition costs for each alternative are shown in **Table 11-1**.

Required right-of-way areas were mapped and overlayed upon base mapping of existing right-of-way. Areas were then computed as the difference between existing and required rights-of-way. If a given parcel was impacted such that the remainder parcel measured less than one-half acre, the parcel was considered to be a total take. If a parcel were bisected, remnant parcels measuring less than one-half acre were assumed to be acquired. Reported values are the total areas of fee acquisition, permanent easements, and temporary easements.

The right of way costs developed were based on recent acquisitions completed, anticipated right of way costs and estimated conservative utility easements that will be required.

5 Roadway Geometry

5.1 Design Criteria

Design criteria and guidance in these documents were applied to roadways within the project limits based on the functional classification and design speed of each roadway. **Table 5-1** summarizes the design criteria for each roadway within the project limits. Where these values cannot be achieved, Design Exceptions will be pursued.

Table 5-1: Design Criteria

	VA Route 630	US 1 [1]	Ramps	Austin Ridge	Wyche Road
Functional Classification	Urban Major Collector GS-7	Urban Principal Arterial GS-5	Ramp GS-R	Urban Collector GS-7	Urban Collector GS-7
ADT	45,000	39,000	5,500 - 18,000	12,000	1700
Truck Percentage	10%	5%	8% - 15%	unknown	
Design Speed	40 mph	50 mph	35 mph - 50 mph[4]	40 mph	40 mph
Access Control	Partial	Partial	Full	N/A	N/A
Intersection Spacing [2]	660 ft/440 ft	2640 ft/1320 ft	None	660 ft/440 ft	660 ft/440 ft
Distance from Ramp Terminal to First Major Intersection [3]	1320 ft	N/A	N/A	1320 ft	1320 ft
Number of Lanes	4-6	4	1-2	4	2
Lane Width	12 ft	12 ft	12 ft - 16 ft [5]	12 ft	11 ft
Superelevation Standard	TC-5.11U emax 4.0%	TC-5.11U emax 4.0%	TC-5.11R emax 8.0%	TC-5.11U emax 4.0%	TC-5.11U emax 4.0%
Right-of-Way Width	90 ft - 110 ft	existing	varies	87 ft – 103 ft	50 ft
Paved Shoulder Width	N/A	N/A	8 ft RT/ 4 ft LT	N/A	N/A
Curb and Gutter	Yes (CG-6)	Yes (CG-7)	No	Yes (CG-6)	Yes (CG-6)
Sidewalk Width / Shared-Use Path (SUP)	5 ft Sidewalk/ 10 ft SUP (western end only)	5 ft Sidewalk/ 10 ft SUP	None	None	None
Bicycle Lane	Shared-Use Path	Shared-Use Path	None	No	No
Terrain	Rolling	Rolling	Rolling	Rolling	Rolling
Minimum Radius	536’	929’	316’ – 760’	536’	536’
Minimum Stopping Sight Distance	305’	425’	250’ – 425’	305’	305’
Clear Zone	10.5’	18’	12’ – 18’	10.5’	10.5’
Slope Standard	2:1/ 3:1 [6]	2:1	CS-4B	2:1/ 3:1 [6]	2:1/ 3:1 [6]
Minimum Front Ditch Width	N/A	N/A	10’	N/A	N/A
Minimum Front Ditch Slope	N/A	N/A	6:1	N/A	N/A

1 Route 1 is classified as urban north of Route 630 and rural south of Route 630. For purposes of this project, the urban design standards will be used.
2 Intersection spacing taken from VDOT Road Design Manual, Appendix F, Table 2-2. First number is for signalized intersections; second number is for unsignalized intersections and full-access entrances.
3 Spacing taken from VDOT Road Design Manual, Appendix F, Table 2-3 and Figure 2-9.
4 Higher range of ramp design speeds will be used for directional type ramps. Lower range will be used for loop ramps and terminals at Route 630.
5 12 ft will be used per lane on multi-lane ramps. Single lane ramps will be 16 ft wide.
6 3:1 and flatter slopes will be used when right-of-way is behind the sidewalk (or sidewalk space) in residential or other areas where the slope will be maintained by the property owner.

Design Vehicle

Roadways improvements accommodate a WB-67 as the design vehicle. Use of this design vehicle requires wide pavement areas to accommodate turning movements at intersections.

Future Interstate Widening

The proposed bridge carrying Route 630 over I-95 will be designed to accommodate future widening of I-95 by one travel lane in each direction. The Interstate widening is identified as a regional transportation need in the GWRC/FAMPO 2040 Long-Range Transportation Plan. The DDI bridges will also accommodate the future I-95 Express Lanes that are planned to be in the median

5.2 Design Exceptions

There are no additional anticipated Design Exceptions associated with the conceptual design of the Preferred Build Alternative.

5.3 Design Waivers

There are no additional anticipated Design Waivers associated with the conceptual design of the Preferred Build Alternative.

5.4 Proposed Limited Access Line

The project will establish a new Limited Access (L/A) line through the interchange area, as shown in **Appendix B**. The proposed changes to the L/A will comply with AASHTO guidance for extension of L/A lines and extend to the first intersection, in accordance with the Access Management Standards in Appendix F of the Road Design Manual .

The proposed changes to the L/A lines are considered conceptual and are subject to public review and input. Public involvement activities will allow for public review of the proposed improvements as part of the final design of the project.

5.5 Interchange Signage and Pavement Markings

Figure 5-1 illustrates the proposed conceptual interchange signage and pavement markings to a conceptual level for the Preferred Build Alternative. The layout was developed to comply with current MUTCD and VDOT standards for Interstates and other state highways.

The layout focuses on large-scale guide signs needed for motorist orientation and directional aid but does not identify regulatory and warning signs that will be needed. The signing and pavement marking layout is subject to refinement and further detailing during final design activities and reflects the following considerations:

- Proposed signage has been designed for Route 630 to provide directional guidance and lane use orientation to vehicles. Specifically, proposed signage provides route number, town destination, and cardinal direction information for each lane in advance of each intersection.
- Proposed pavement markings for Route 630 are coordinated with the layout and messages on the proposed overhead signage. In addition to the traditional arrow symbols, the proposed design incorporates I-95 shield graphics and cardinal direction messages for the respective

lanes. Together the proposed signage and pavement markings are designed to enhance opportunities for vehicles to orient themselves to the correct lane in advance of decision points and minimize the potential for downstream weaving and last-minute lane changes.

- Since the new ramps are much longer, the ramp terminal and advanced signing along I-95 should be shifted to accommodate the newly located gore points. Other existing signage on I-95 is proposed to remain in place.

Figure 5-1: Conceptual Signage and Marking Plan for Alternative F – Exhibit A

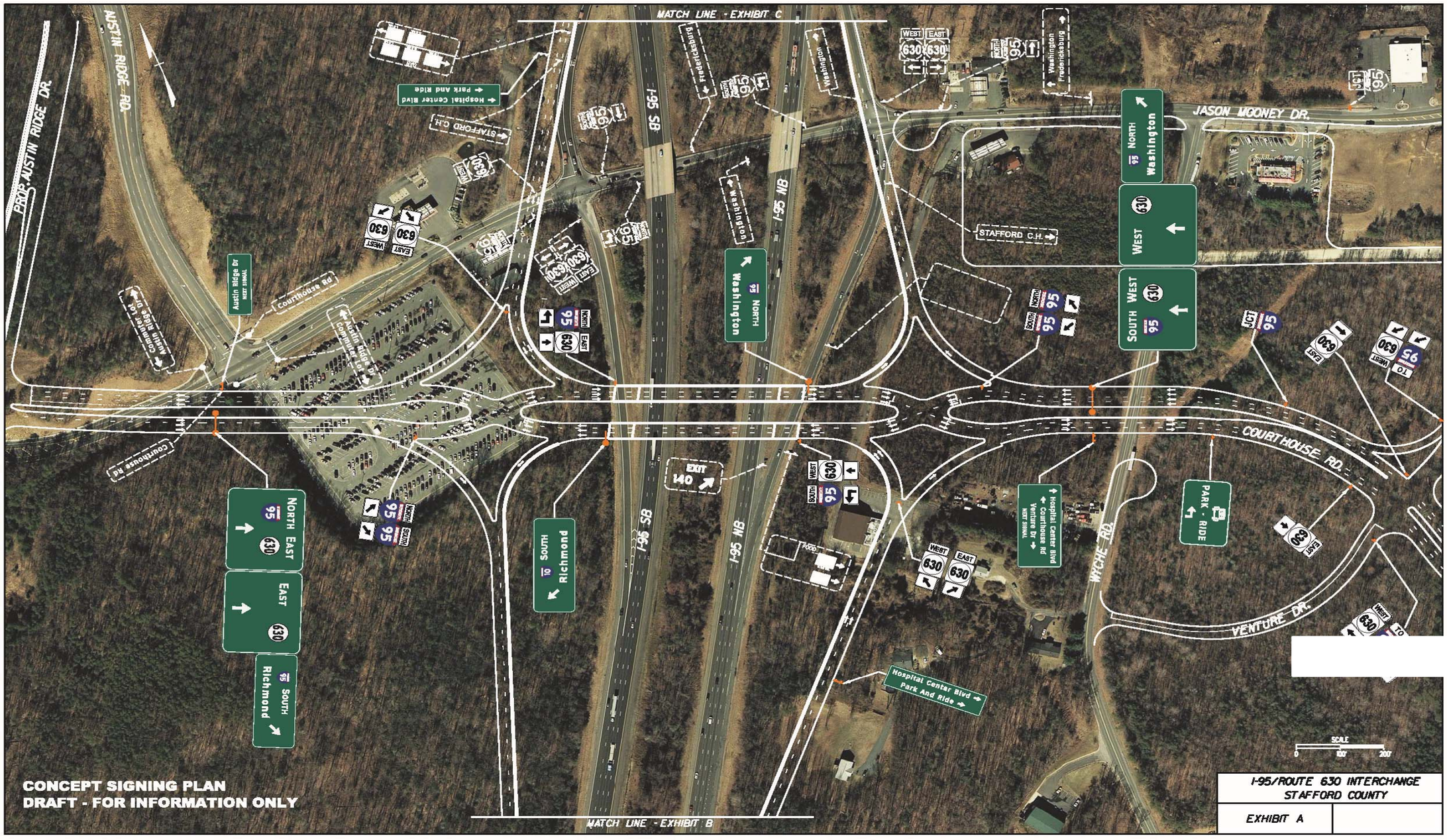


Figure 5-2: Conceptual Signage and Marking Plan for Alternative F – Exhibit B

Figure 5-3: Conceptual Signage and Marking Plan for Alternative F – Exhibit C

6 Traffic Volume Projections

This chapter provides an overview of the methodology used for forecasting traffic volumes from the existing volumes and the assumptions used in the process.

6.1 Traffic Analysis Years

Traffic operational analyses were performed for the same year as the previous Interchange Modification Report, dated June 2011. At that time, the construction was anticipated to be completed by 2017 which was considered as the opening year and the design year was determined to be 2037. Since the June 2011 IMR, the schedule of the project was updated and it is now anticipated that the opening year will be 2020. However, to stay consistent with the analysis done for all other alternatives in the previous IMR, the same opening year (2017) and design year (2037) were maintained for this supplement. Traffic volumes were developed for the Alternative F for both 2017 and 2037. Volumes from the previous IMR were used to compare with Alternative F. Operational analyses were performed for AM and PM peak hour conditions for Year 2017 and 2037.

6.2 Traffic Data Collection

Recent traffic data was gathered from VDOT from various traffic impact studies near the I-95/Route 630 interchange to include VDOT Traffic Data.

I-95 Traffic Count Data

The traffic data for the I-95 mainline was obtained from permanent station counts from VDOT's traffic monitoring program for the years 2010 through 2015. The data included volumes on I-95 mainline in the northbound and southbound directions for four stations for 24 hours each day of these years. The four stations include:

- I-95 Northbound - North of I-95/Route 630 Interchange
- I-95 Northbound - South of I-95/Route 630 Interchange
- I-95 Southbound - South of I-95/Route 630 Interchange
- I-95 Southbound - North of I-95/Route 630 Interchange

The latest data available was for the month of April 2015. The peak-hour volumes were identified for AM and PM peak periods for an average weekday including Tuesday, Wednesday and Thursday. It was identified that the level of quality of the traffic count data for two stations was poor. These include the I-95 NB - South of I-95/Route 630 Interchange and I-95 SB - South of I-95/Route 630 Interchange. Hence, data from these stations was not used for comparison purpose.

Embrey Mill Retail Rezoning Study

Embrey Mill Retail commercial development rezoning study was used to obtain the traffic volume data for intersections in and around the interchange. The development is located on a parcel of approximately 16 acres in size within the northeast quadrant of the Courthouse Road (Route 630)/Mine Road (Route 684) intersection.

The traffic count data collected in June 2013 was used for the study. The 2013 counts were extracted from the study for the following:

- I-95 NB off-ramp to Courthouse Road
- I-95 NB on-ramp from Courthouse Road
- I-95 SB off-ramp to Courthouse Road
- I-95 SB on-ramp from Courthouse Road
- I-95 NB ramps/Courthouse Road intersection
- I-95 SB ramps/Courthouse Road intersection
- PnR Driveway/Austin Ridge Drive/Courthouse Road intersection

George Washington Village Study

George Washington Village development study was also used to obtain the traffic volume data for the other intersections in and around the study interchange. The study used the 2011 counts for existing conditions, and that data was extracted from the study for the following:

- I-95 NB off-ramp to Centreport Parkway
- I-95 NB on-ramp from Centreport Parkway
- I-95 SB off-ramp to Centreport Parkway
- I-95 SB on-ramp from Centreport Parkway

Westgate Center Study

Westgate Center mixed-use rezoning study is another data source that was considered to obtain the traffic counts for intersections in and around the interchange. The development is located on an approximate 73.3-acre site in the northwest quadrant of the I-95/Courthouse Road interchange. The count data available from the study was for the year 2010 for the following:

- I-95 NB ramps/Courthouse Road
- I-95 SB ramps/Courthouse Road
- PnR/Austin Ridge Drive/Courthouse Road

More recent count data was available for these intersections from the Embrey Mill study; therefore, the data from this study was not used.

Technical Memo

A memorandum was prepared that compared the gathered traffic counts in the study area for the I-95/Route 630 interchange with the traffic volumes in the previous IMR for this interchange. The memo concluded that the traffic volumes and patterns have not changed and can be used to conduct the additional analyses for the DDI (Diverging-Diamond Interchange) design option at this interchange. This memo, dated May 21, 2015, is included in **Appendix A.**

6.3 Forecasting Methodology and Assumptions

Traffic volumes were developed from the Alternatives A2 volumes developed for the previous IMR and applied to the Alternative F concept. Traffic volumes were assigned based on the logical path vehicles would take based on where trips are originating and where they are destined to under the two alternatives. The only difference between the two alternatives is that under Alternative A2, the proposed new park-and-ride lot was located between the eastbound and westbound Rte. 630 west of the I-95 southbound off-ramp. Under the proposed Alternative F, the park-and-ride is located in the northeast quadrant of the interchange. Table 6-1 and Table 6-2 shows how the volume coming in and out of the park-and-ride (PnR) lot was distributed to the different destinations within the study area for the AM and PM peak hours.

Table 6-1: AM peak hour – 2037 volume calculations for the relocated PnR lot in the northeast quadrant

	95 S	95 N	Rte 630 E	Rte 630 W	Austin Ridge	*Total*
OUT of PnR	15*	5*	10*	10	10	***50***
IN to PnR	10**	35**	20**	40	25	***130***

** Alternative A2 volumes (30 vehicles) exiting the PnR lot proportionally distributed*

*** Alternative A2 volumes (65 vehicles) entering the PnR lot proportionally distributed*

Table 6-2: PM peak hour – 2037 volume calculations for the relocated PnR lot in the northeast quadrant

	95 S	95 N	Rte 630 E	Rte 630 W	Austin Ridge	*Total*
OUT of PnR	150*	50*	100*	125	45	***470***
IN to PnR	20**	60**	40**	15	10	***145***

** Alternative A2 volumes (300 vehicles) exiting the PnR lot proportionally distributed*

*** Alternative A2 volumes (120 vehicles) entering the PnR lot proportionally distributed*

Peak AM and PM traffic volumes for Alternative F are shown in **Figures 6-1 through 6-4** for Years 2017 and 2037, respectively. Volumes for Alternative A2 are provided in **Appendix C.**

Figure 6-1: 2017 Alternative F Volumes for AM peak hours

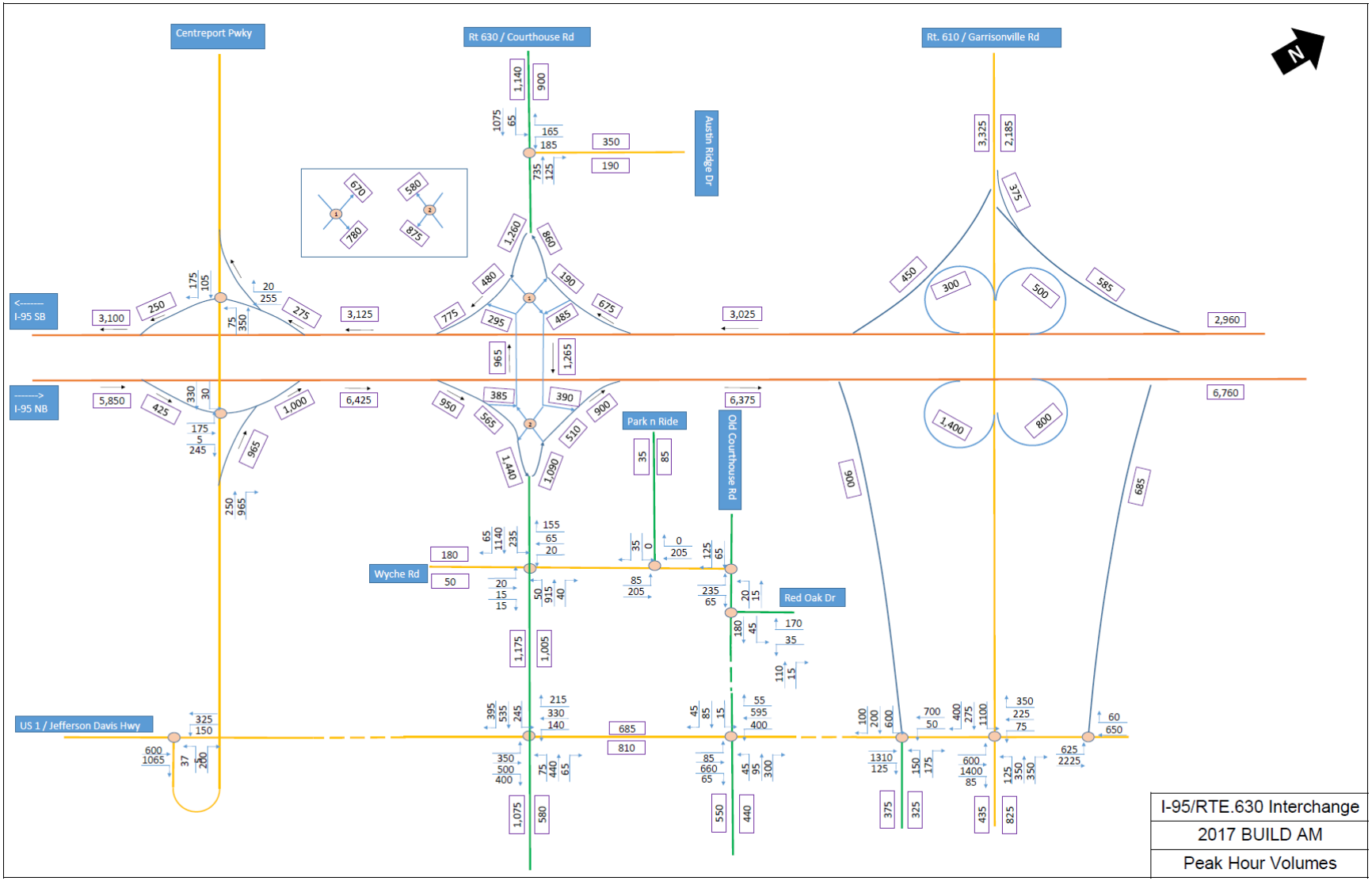


Figure 6-2: 2017 Alternative F Volumes for PM peak hours

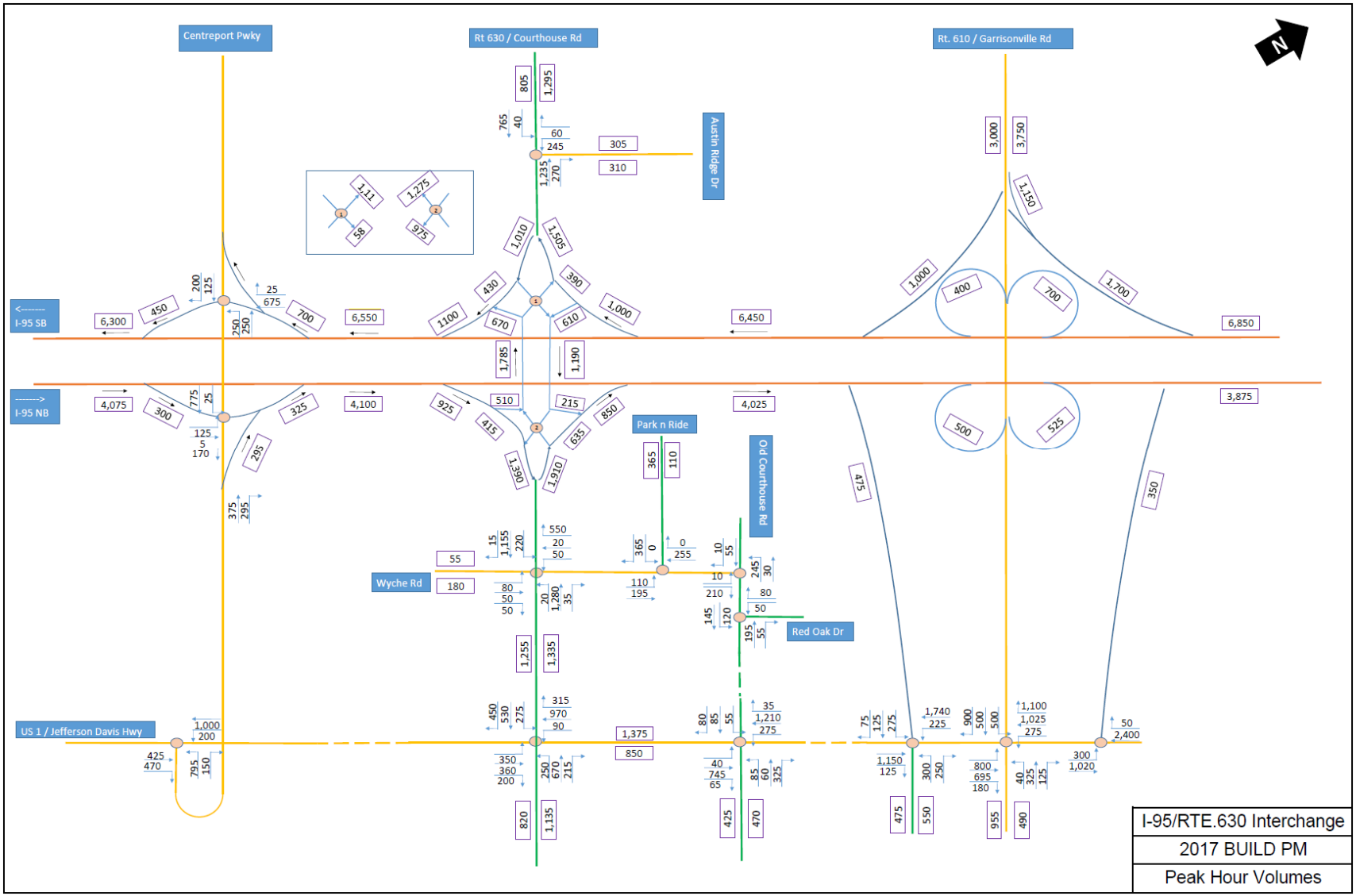


Figure 6-3: 2037 Alternative F Volumes for AM peak hours

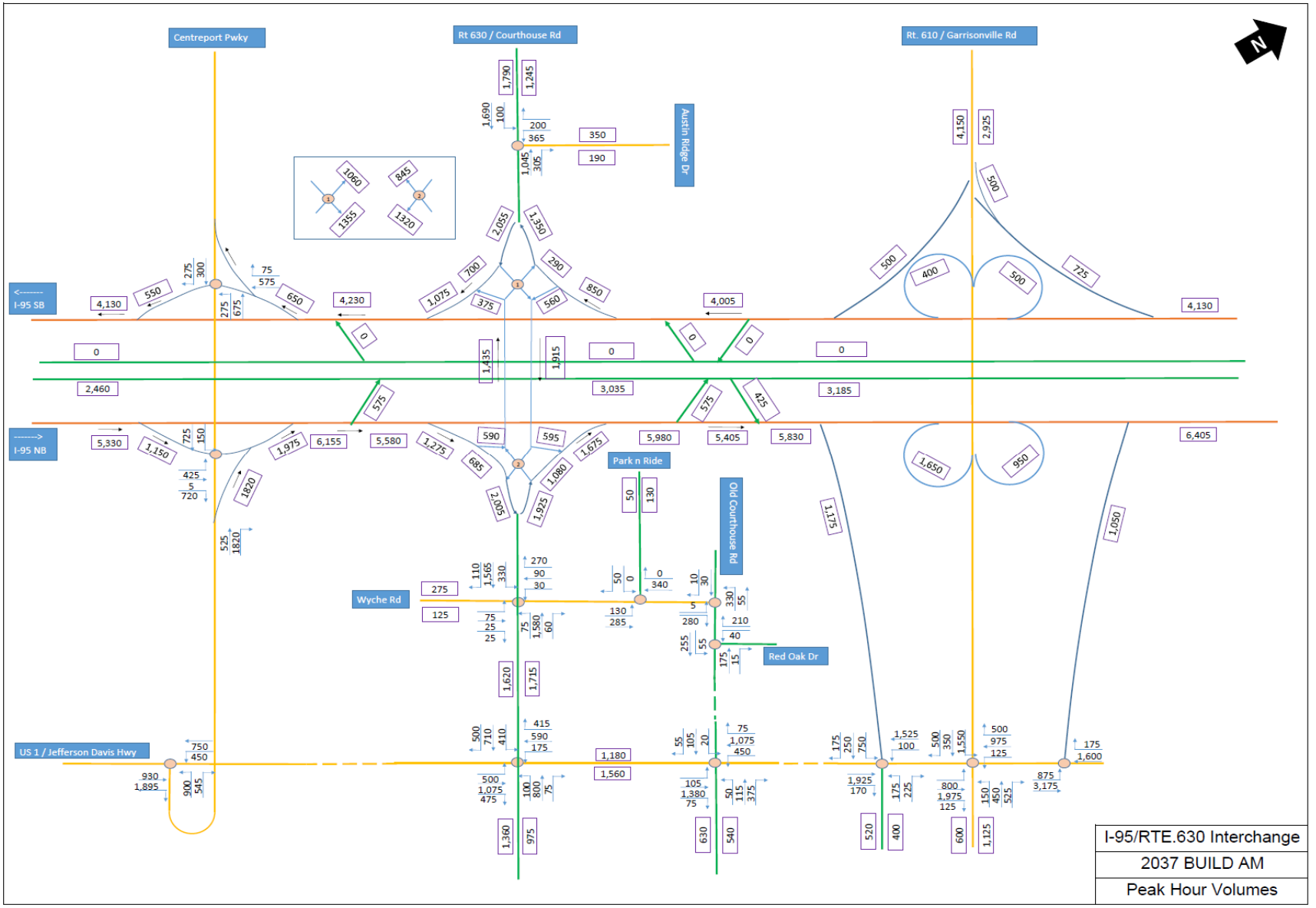
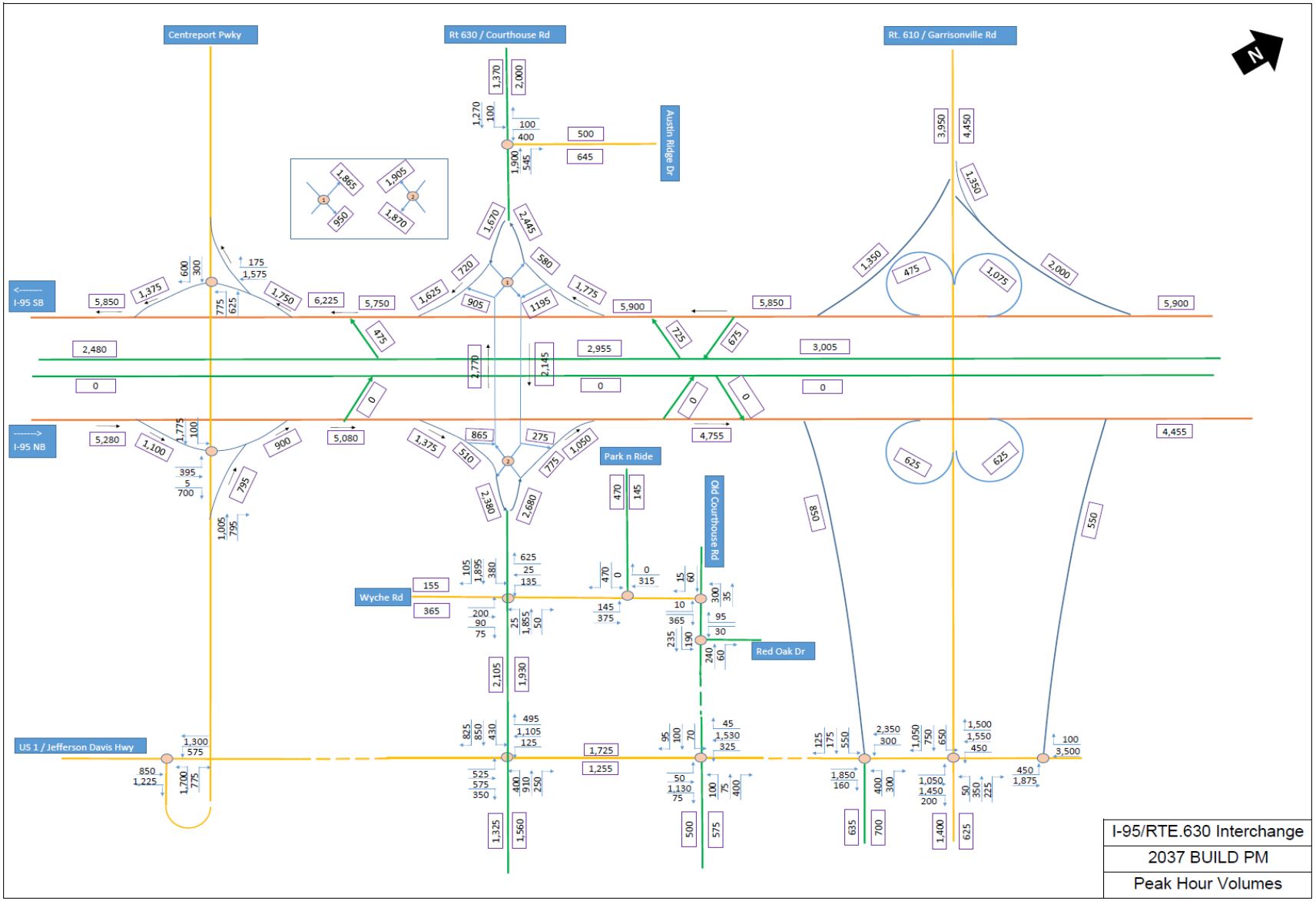


Figure 6-4: 2037 Alternative F Volumes for PM peak hours



7 Traffic Operational Analyses

The operational analyses were conducted for the I-95/Route 630 interchange for Alternative F keeping the methods and assumptions consistent with the previous IMR. Analyses were conducted for two future-conditions years: Opening Year (2017) and Design Year (2037) as described in Section 6.1.

7.1 Methodology

Level-of-Service (LOS) at each intersection and freeway segments were developed using the same HCM methodologies as the previous IMR to develop performance measures within the study area. These measures allow for ranking of the performance of each of the alternatives under consideration. These criteria provide an overall assessment of the degree to which each design alternative provides additional operating capacity to address current and projected traffic demand.

The Measures of Effectiveness (MOEs) presented in the June 2011 IMR for alternatives evaluation used several programs. For the DDI alternative evaluation, the same methodology was applied; and to stay consistent, the same software programs/versions were used as with the previous effort.

For Freeways:

- **Level of Service** – HCS program was used for all freeways segment types – basic, merge, diverge, and weave
- **Travel Times/Speeds and % Throughput** – CORSIM was used to supplement HCS analysis for Freeways only (same 10 random seeds were used as in the previous IMR)

For Arterials:

- **Intersection LOS and Delay** – HCM Methodology Intersection Capacity Analysis reported from Synchro
- **95th Percentile Queues** – reported from SimTraffic. Models were developed based on the base Synchro files that were developed and calibrated for the previous IMR. An average of five (5) iterations of simulation runs were made following the guidance in the *VDOT Traffic Operations Analysis Tool Guidebook*.

The operational analyses focused on the typical weekday AM and PM peak hours in the study area. The methodology remains consistent with the previous IMR, dated June 2011, which was approved by FHWA.

7.2 Traffic Operations Analysis

Detailed traffic operations analyses were conducted for Alternative A2 under the previous IMR. This section details the findings of the operational analyses for the Alternative F along with a comparison analysis for the two Build Alternatives as shown in **Table 7-1**. **Section 4.3** presents the other comparison criteria, the results of the comparison process and the identification of the Preferred Build Alternative – Alternative F. CORSIM and Synchro outputs are provided in **Appendix C – Traffic Software Analysis Results.**

Analysis results for the new Preferred Alternative – Alternative F, and the Preferred Alternative in the June 2011 IMR – Alternative A2, are presented in **Table 7-1** and graphically in **Figures 7-1**

through 7-4 for the years 2017 and 2037, respectively.

Table 7-1: Level of Service comparison of Alternative A2 and Alternative F

	Peak Hour	Alternative F		Alternative A2	
		2017	2037	2017	2037
Intersection					
Rte.630 @ Austin Ridge	AM	B	C	B	B
	PM	B	B	B	C
Rte.630 @ Wyche Rd/Red Oak Dr	AM	C	C	B	C
	PM	B	D	B	D
Rte.630 crossover @ I-95 SB Ramp	AM	C	C	-	-
	PM	C	D	-	-
Rte.630 EB @ Off-Ramp from I-95 SB	AM	A	A	-	-
	PM	A	C	-	-
Rte.630 WB @ Off-Ramp from I-95 SB	AM	A	A	-	-
	PM	A	B	-	-
Rte.630 crossover @ I-95 NB Ramp	AM	C	C	-	-
	PM	B	C	-	-
Rte.630 EB @ Off-Ramp from I-95 NB	AM	B	B	-	-
	PM	A	B	-	-
Rte.630 WB @ Off-Ramp from I-95 NB	AM	A	B	-	-
	PM	A	B	-	-
Rte.630 WB @ I-95 NB Ramp	AM	-	-	A	C
	PM	-	-	B	C
Rte.630 EB @ I-95 SB Ramp	AM	-	-	A	A
	PM	-	-	A	A
Freeway Segment					
Diverge: I-95 NB Ramp to Rte. 630	AM	C	A	C	C
	PM	B	A	B	C
Diverge: I-95 SB Ramp to Rte. 630	AM	A	A	A	A
	PM	A	A	A	A
Merge: Rte.630 to I-95 NB Ramp	AM	B	D	-	-
	PM	A	B	-	-
Merge: Rte.630 to I-95 SB Ramp	AM	A	B	-	-
	PM	C	C	-	-
Merge: Rte.630 EB to I-95 NB Ramp	AM	-	-	D	D
	PM	-	-	B	C
Merge: Rte.630 WB to I-95 NB Ramp	AM	-	-	D	D
	PM	-	-	C	C
Merge: Rte.630 EB to I-95 SB Ramp	AM	-	-	B	C
	PM	-	-	D	D
Merge: Rte.630 WB to I-95 SB Ramp	AM	-	-	B	B
	PM	-	-	D	C

Figure 7-1: Alternative F MOEs during peak hours for Opening Year (2017) Conditions

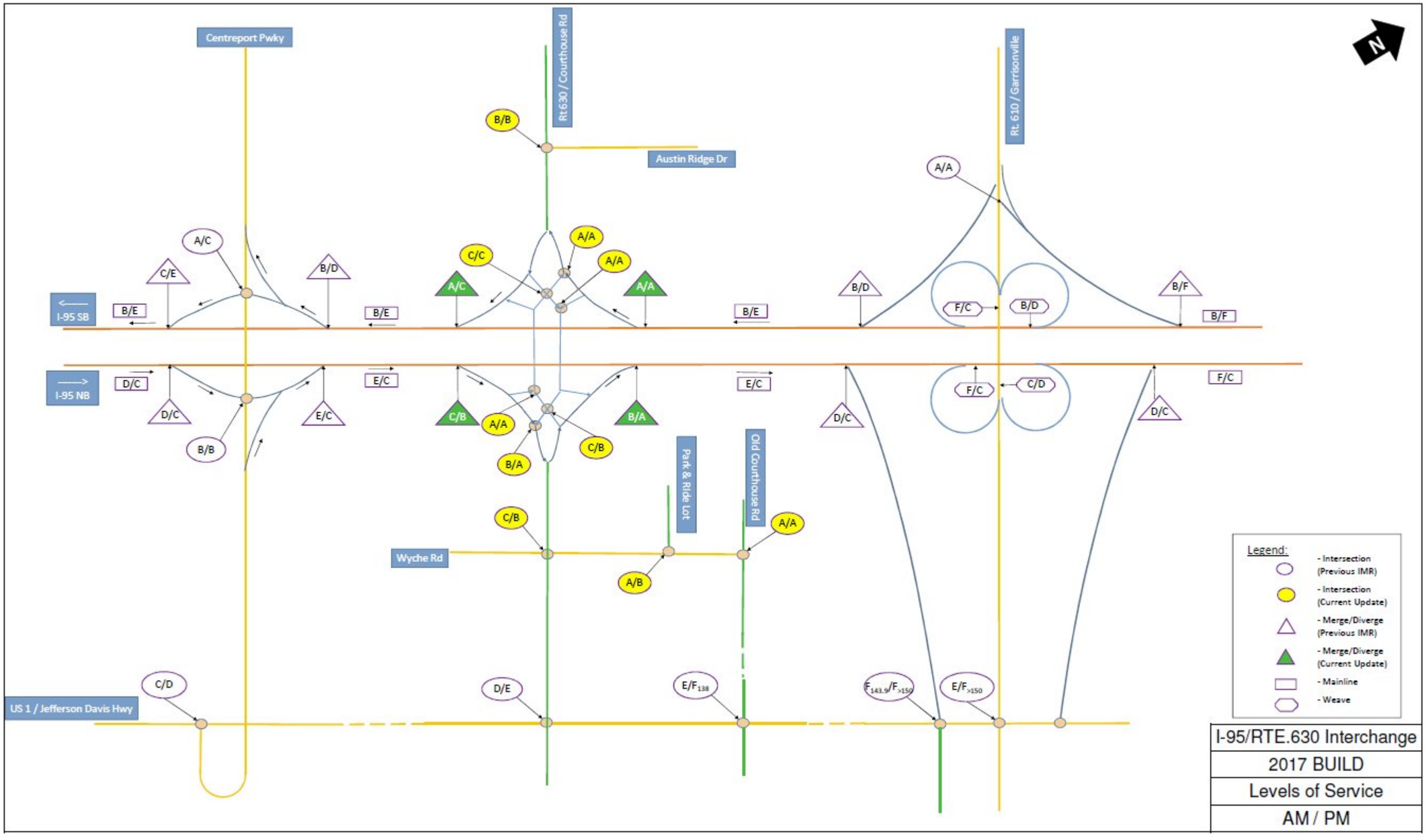


Figure 7-2: Alternative A2 MOEs during peak hours Opening Year (2017) Conditions

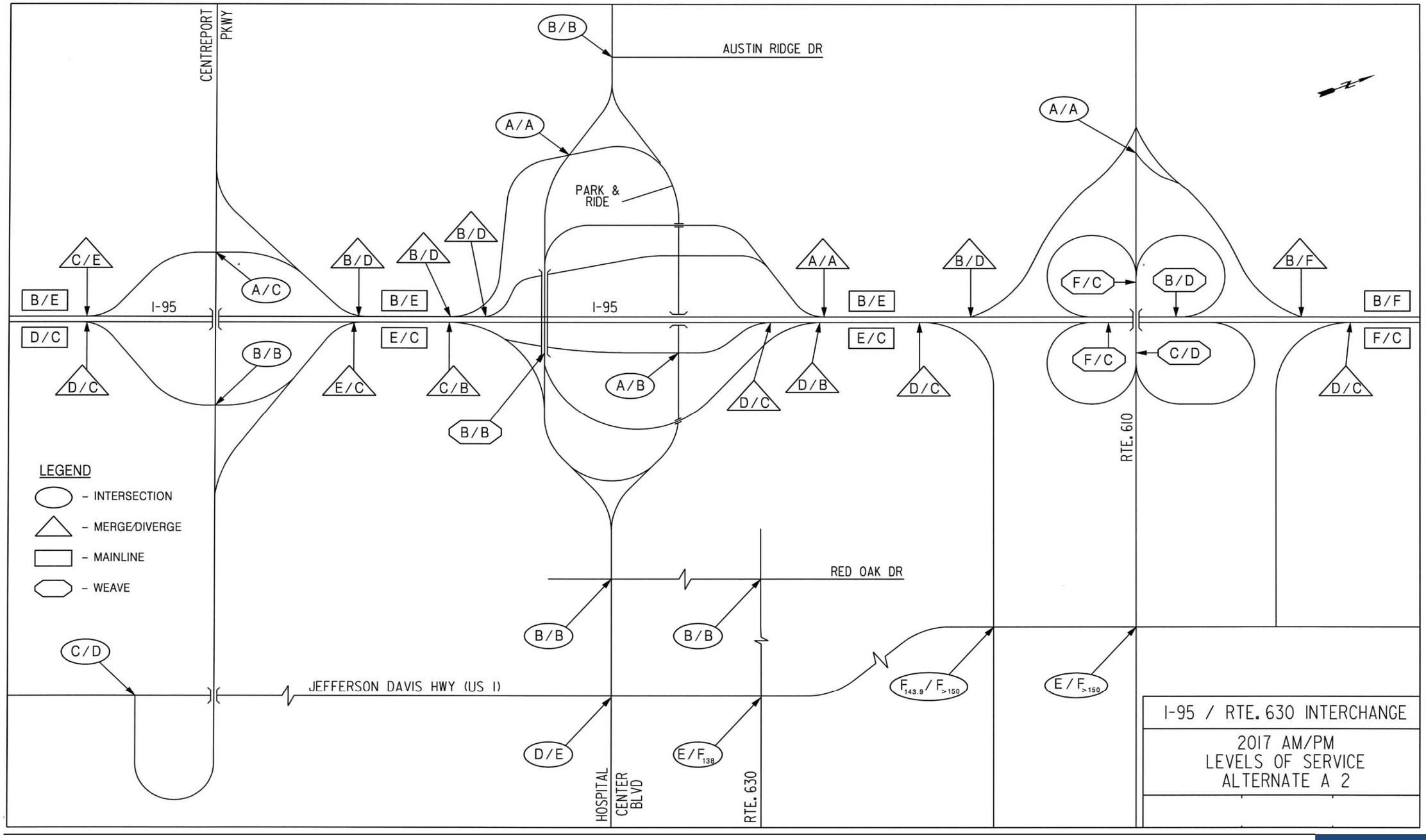


Figure 7-3: Alternative F MOEs during peak hours for Design Year (2037) Conditions

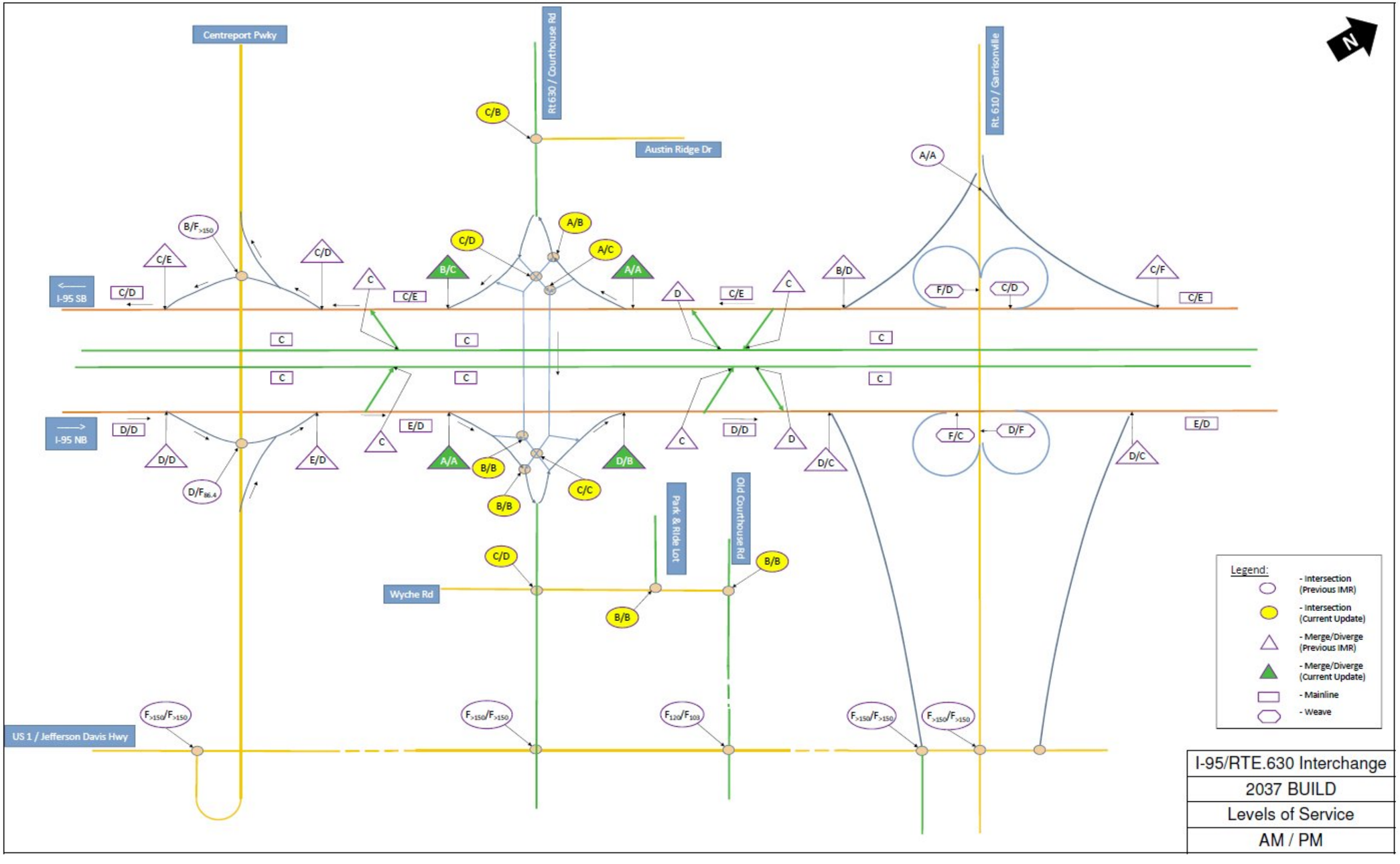
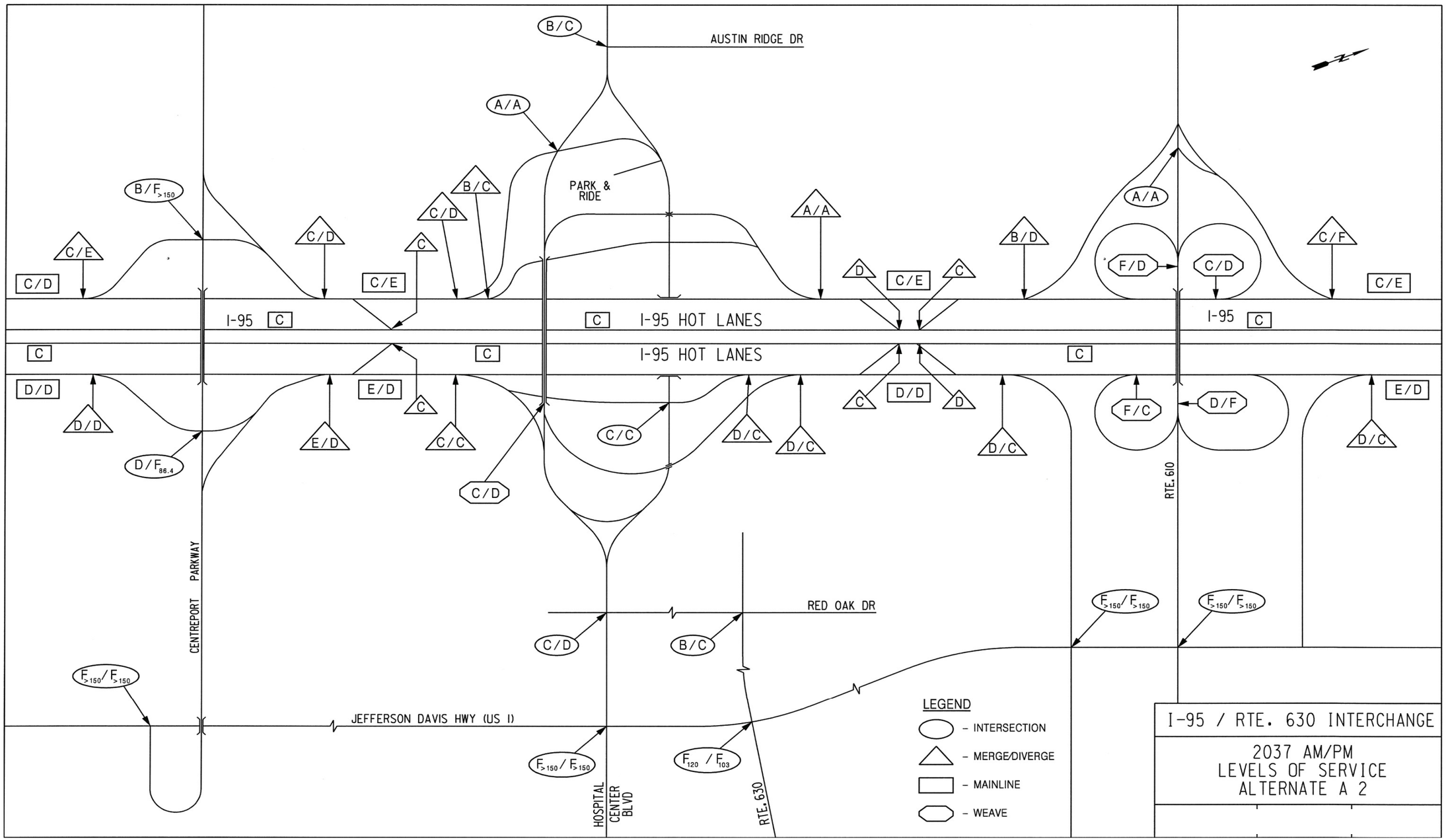


Figure 7-4: Alternative A2 MOEs during peak hours for Design Year (2037) Conditions



7.3 Summary of Findings

Alternative F provides acceptable operations along the I-95 northbound and southbound ramp merge and diverge (LOS C or better for both AM and PM peak hours). The LOS along the mainline and other interchanges does not change between the Modified-Diamond Interchange design and the DDI design. Alternative F performs equal to or better than Alternative A2 in most locations as per the LOS tables and graphics above, to accommodate the updated 2037 travel patterns and projected travel demand. As seen in the 95th percentile queue results in **Appendix C,** the queues on the off-ramps are less than the storage distance for the proposed ramps in Alternative F.

There are two locations where Alternative F does not operate as well as Alternative A2. During the 2017 AM peak hour at the intersection of Wyche Road and Route 630, the LOS drops from B to C, which is expected since the additional traffic is funneled through this intersection to the relocated park and ride lot. During the 2037 AM peak hour at the intersection of Route 630 and Austin Ridge Road, the LOS drops from B to C as well. Both these locations still operate an LOS C, which is an acceptable level of service.

8 Safety Analysis

The Virginia Department of Transportation (VDOT) provided police reported crash data for the I-95 and Route 630 study area during a three-year period from January 1, 2012 to December 31, 2014. The data consists of reported crashes occurring along I-95 between Route 630 Ramp Terminals, from approximately 0.3 miles. Table 8-1 below presents the crash summary.

Table 8-1: I95 Rt. 630, Stafford Crash History: 1-1-2012 through 12-31-2014

	Crash Type								Severity		
Total	**RE**	**A**	**HO**	**SS**	**Non**	**FO**	**DE**	**NS**	**F**	**PI**	**PD**
I-95 NB On-Ramp From Route 630 Merge to 1,000 Feet North											
9	5	0	0	3	0	0	1	0	0	2	7
I-95 NB Between Route 630 Ramp Terminals – 0.33 miles											
29	15	1	0	1	0	8	4	0	0	3	26
I-95 NB Off-Ramp To Route 630 Merge to 1,000 Feet South											
15	9	0	0	2	0	2	2	0	0	3	12
I-95 SB On-Ramp From Route 630 Merge to 1,000 Feet South											
20	11	2	0	4	0	3	0	0	0	6	14
I-95 SB Between Route 630 Ramp Terminals – 0.30 miles											
37	24	2	0	5	0	3	2	1	0	7	30
I-95 SB Off-ramp to Route 630 Gore to 1,000 Feet North											
15	11	0	0	1	0	2	1	0	0	6	9
Route 630 at I-95 Ramps From 250 Feet East of NB Ramp Int. to 250 Feet West of SB Ramp Int.											
18	8	8	1	1	0	0	0	0	0	3	15
TOTALS											
143	83	13	1	17	0	18	10	1	0	30	113

Key: RE – Rear End; HO – Head-on; SS – Sideswipe; Non – Non Collision; FO – Fixed Object Off Road; DE – Deer; NS – Not Stated; F – Fatal; PI – Personal Injury; PD – Property Damage

The crash data collected along I-95 reveals there were 143 reported crashes within the study area during the three-year period. Of the crashes reported, 83 were rear end crashes, 18 were related to a fixed object off the road, 17 were sideswipe crashes, 13 were angle crashes, 10 were deer related, one was head-on type crashes; one crash was categorized as non-stated. Twenty-three percent of the crashes resulted in an injury. No fatalities were recorded within the study period.

The majority of the crashes on I-95 occurred in the southbound direction. This included 46 rear-end crashes and ten sideswipe crashes with most of these occurring near the merge and diverge points. These types of crashes can be associated with congestion. The projected increase in traffic will further increase congestion thereby increasing the possibility of a further increase in crashes.

The crash data collected for Route 630 indicates that there were 18 crashes reported during the study period. Of these crashes, eight were rear-end crashes, eight were angle crashes, one was same direction sideswipes and one crash was recorded as non-collision. Twenty-percent of the crashes

along Route 630 resulted in injuries. No fatalities were recorded along Route 630.

Information presented in this report demonstrates that the Preferred Build Alternative will reduce the potential for vehicle crashes within the study area. As per FHWA's *Diverging Diamond Interchange Informational Guide*, the DDI design significantly reduces the number of vehicle-to-vehicle conflict points compared to a conventional diamond interchange. Table 8-2 (Exhibit 4-3, *Diverging Diamond Interchange Informational Guide)* presents the comparison of conflict points between a conventional diamond interchange and DDI. Conventional diamond interchanges have 26 conflict points, and DDIs have 14. The DDI also reduces the severity of conflicts, as conflicts between left-turning movements and the opposing through movements are eliminated. The remaining conflicts are reduced to merge conflicts for turning movements and the reduced speed crossover conflict of the two through movements.

Table 8-2: Conflict Point Comparison

	Crossing	Merging	Diverging	Total
Conventional diamond	10	8	8	26
DDI	2	6	6	14

All the relevant crash information is included in Appendix D.

9 Land Use Compatibility

The existing land uses in the study area did not change from the previously submitted IMR, dated June 2011; therefore, no additional analysis was conducted.

10 Environmental Compliance

As of the date of this document, VDOT is currently preparing a revised Environmental Assessment (EA) for the interchange improvement project. The EA will identify environmental resources that are expected to be impacted by the proposed improvements. Environmental commitments, if any, identified in the NEPA process will be reflected in the final design of the project.

11 Preferred Alternative

In the previous IMR, dated June 2011, the previous preferred alternative was Alternative A-2, a Modified Split Diamond on New Route 630 Alignment. Alternative F is a Diverging-Diamond Interchange on New Route 630 Alignment is now recommended as the preferred alternative and is the purpose of this supplement. Alternative F was analyzed to determine if this alternative was meeting or exceeding the results of the previous preferred alternative, Alternative A2, for traffic operations, overall environmental impacts, right-of-way impacts, utility impacts, and construction cost.

11.1 Traffic Operations

As discussed in **Chapter 7,** Alternative F provides acceptable operations along the I-95 northbound and southbound ramp merge and diverge (LOS C or better for both AM and PM peak hour). The LOS along the mainline and other interchanges does not change between the Alternative A2 and the Alternative F. Alternative F is suitable and better than Alternative A2 to accommodate the 2037 travel patterns and projected travel demand. The only location that the Alternative F does not operate as well as Alternative A2 is at the intersection of Wyche Road and Route 630 during the 2017 AM peak hour. The LOS drops from B to C, which is expected since the additional traffic is funneled through this intersection to the relocated park-and-ride lot.

11.2 Construction Costs

From the previous IMR, Alternative A2 construction cost is proposed to be $119M; however, the proposed construction costs were refined for Alternative A2 during the design process. The values from the table below for Alternative A2 were presented at the VDOT public hearing on the interchange project on November 29, 2012 . Preliminary cost estimates were prepared for Alternative F as shown below in Table 11-1. As shown, construction cost reductions of approximately $14M were realized by utilizing Alternative F instead of Alternative A2. Also shown in Table 11-1, the right of way costs for Alternative F is reduced by over $19M.

Table 11-1: Total Cost for Alternative F

	Alternative 2A	Alternative F
Preliminary Engineering	$ 15,872,909	$ 14,765,059
Right of Way	$ 57,898,687	$ 38,531,016
Construction	$ 110,051,887	$ 96,165,988
TOTAL	$ 183,823,483	$ 149,462,063

11.3 Alternative F: I-95/Route 630 Interchange Layout Refinements from Alternative A2

The following layout refinements are proposed for the Diverging-Diamond interchange:

- Change interchange type from a modified Split-Diamond interchange to a Diverging-Diamond interchange.
- Increase northbound off-ramp to Route 630 from one lane to two lanes.
- Change from two northbound on-ramps (one lane each) to one 2-lane on-ramp.

11.4 Right-of-Way

Based on the preliminary design, conservative Right-of-Way limits were established. These limits may be adjusted as the design is advanced and more detailed topographic data is acquired. **Table 11-2** shows a comparison of the right-of-way requirements for Alternative A2 and Alternative F. As seen in the table, the right-of-way requirements are much lower with Alternative F. The Commonwealth of Virginia has purchased part of the required right of way for the previously preferred alternative. The right of way purchased includes 2.8 acres of partial commercial property, 1.0 acre of partial residential, one (1) residential displacement and four (4) commercial displacements. These right of way impacts summarized below for Alternative A2 were provided in the previous IJR, dated June 2011. The design for Alternative A2 was refined during the design development process, which reduced the amount of Alternative A2 right of way impacts. For comparison, the previous IJR results for Alternative A2 are provided with the new Alternative F impacts.

Table 11-2: Right-of-Way Impacts

	A2	F
Partial Acquisitions		
Residential (acres)	8.7	12.5
Commercial (acres)	3.4	18.7
Open Land (acres)	76.9	23.7
Displacements		
Residential (each)	12	5
Commercial (each)	7	9

Appendix A:
Technical Memo, May 2015

From: Elliott.Moore@dot.gov [mailto:Elliott.Moore@dot.gov]
Sent: Wednesday, July 08, 2015 3:24 PM
To: Arel, William D., P.E. (VDOT)
Cc: raj.paradkar@ch3m.com; Beardsley, David (VDOT)
Subject: RE: I-95/Rt-630 IMR Traffic Volumes Memo

Bill,

Thanks for setting up the phone conference this afternoon. Based on our discussion, I don't have any further comments on the traffic volumes memorandum and I concur with its findings. Let me know if you need anything else, thanks.

S. Elliott Moore, PE
Area Engineer for Fredericksburg and NoVA

FHWA - Virginia Division
400 N. 8th Street, Room 750
Richmond, VA 23219

(804) 775-3338 (desk)
(804) 775-3356 (fax)

http://www.fhwa.dot.gov/vadiv/

From: Arel, William D., P.E. (VDOT) [mailto:William.Arel@VDOT.Virginia.gov]
Sent: Wednesday, July 08, 2015 2:20 PM
To: Moore, Elliott (FHWA)
Subject: FW: I-95/Rt-630 IMR Traffic Volumes Memo

From: Raj.Paradkar@ch2m.com [mailto:Raj.Paradkar@ch2m.com]
Sent: Tuesday, July 07, 2015 1:10 PM
To: Arel, William D., P.E. (VDOT); Beardsley, David (VDOT)
Cc: Lara.Hegler@CH2M.com; Marlon.Smoker@CH2M.com; Shropshire, Michelle, PE (VDOT); Nanditha.Paradkar@ch2m.com
Subject: RE: I-95/Rt-630 IMR Traffic Volumes Memo

Bill/David,

Below are the responses to Elliott's comments. Please review them and let me know if you are okay to share with Elliott.

- Where exactly are the permanent station counters north and south of the Rte. 630 interchange?
  VDOT's Traffic Monitoring System (TMS) section manages over 600 permanent continuous traffic count stations (CCS) across the state. The stations north of Rt-630 are Automatic Vehicle

Classification (AVC) - which provides vehicle volume, classification and speed. Sensors are two inductance loops and one piezoeletric sensor in each lane. The stations south of Rt-630 are Wavetronix (WTX) which provides vehicle volume and speed. Sensor is radar detection installed in side-fire mode.

- Page 6 states that the data in Table 2 was "within an acceptable variability from the projected growth". How is "acceptable variability" defined? Some of these numbers were off by as much as 40-50%. I do realize that most of the volumes from 2009 seem to be much higher than what's out there today, which would mean that if our updated model shows favorable results, those results could be expected to be achievable in the field.
  The two locations along I-95 south of the Rt-630 interchange where the difference is showing very high in both AM and PM, is due to the quality of data from the Permanent CCS (see above). There is a footnote in the table identifying this fact. So the count data we received identified the fact that this data is not very reliable at those locations. However north of the interchange and the other ramps/intersections the difference reflects the fact that in most locations the projected IMR growth is higher (negative) than the count data in the field. So your interpretation is correct that our IMR volumes are on the higher side and if we can achieve favorable results in our models, then the findings would be conservative. So even though the variability exists between the volumes compared but it is acceptable since it is higher (negative) in the IMR compared to field.
- Two of the locations I'm concerned with (I-95 mainlines south of the Rte. 630 interchange) don't have quality data to compare to the old report. Are there any other sources of data that we can use to compare these section?
  For these locations we relied more on the I-95 SB on-ramp from Courthouse Rd (-16% in AM & -12% in PM) and the I-95 NB off-ramp to Courthouse Rd (-1% in AM and -7% in PM) data along with the mainline count data north of Courthouse (Rt-630) data. Back-calculating from the ramp data we were able to estimate the mainline data south of the Rt-630 interchange and found it to pass the reasonable conservative test. We were not able to locate a more recent count at this location from any other studies.

TECHNICAL MEMORANDUM

CH2MHILL®

I-95/Route 630 Interchange Modification Report

PREPARED FOR: David Beardsley (VDOT)

PREPARED BY: CH2M HILL: Nanditha Paradkar, Raj Paradkar and Lara Hegler

SUBJECT: I-95/Route 630 Interchange: Comparison of Traffic Volumes

DATE: 05/11/2015

cc: Michelle Shropshire, P.E. (VDOT); William D. Arel, P.E. (VDOT)

I. Overview/Introduction

The purpose of this memorandum is to compare recent traffic counts in the study area for the I-95/Route 630 interchange with the traffic volumes in the 2009 Interchange Modification Report (IMR) for this interchange. If the traffic volumes and patterns have not changed, they can be used to conduct the additional analyses for the DDI (Diverging-Diamond Interchange) design option at this interchange. This memo presents a comparison of the available traffic count data gathered from various traffic impact studies near the I-95/Route 630 interchange with that of traffic volumes developed for the 2009 IMR.

II. Study Area

The interchange of I-95 and Route 630 is located in Stafford County in the north-central part of Virginia. It is approximately 10 miles north of Fredericksburg, approximately 40 miles south of Washington, D.C., and approximately 65 miles north of Richmond. Figure 1 shows the study area map.

The interchanges and intersections within the study area are listed below:

1. Centreport Pkwy/I-95 interchange
2. Courthouse Rd (Route 630)/I-95 interchange
3. Garrisonville Rd (Route 610)/I-95 interchange
4. Jefferson Davis Hwy (US 1)/Centreport Pkwy intersection
5. Jefferson Davis Hwy (US 1)/Hospital Center Blvd intersection
6. Jefferson Davis Hwy (US 1)/Courthouse Rd (Route 630) intersection
7. Jefferson Davis Hwy (US 1)/Garrisonville Rd (Route 610) intersection

I-95/Route 630 Interchange: Comparison of Traffic Volumes

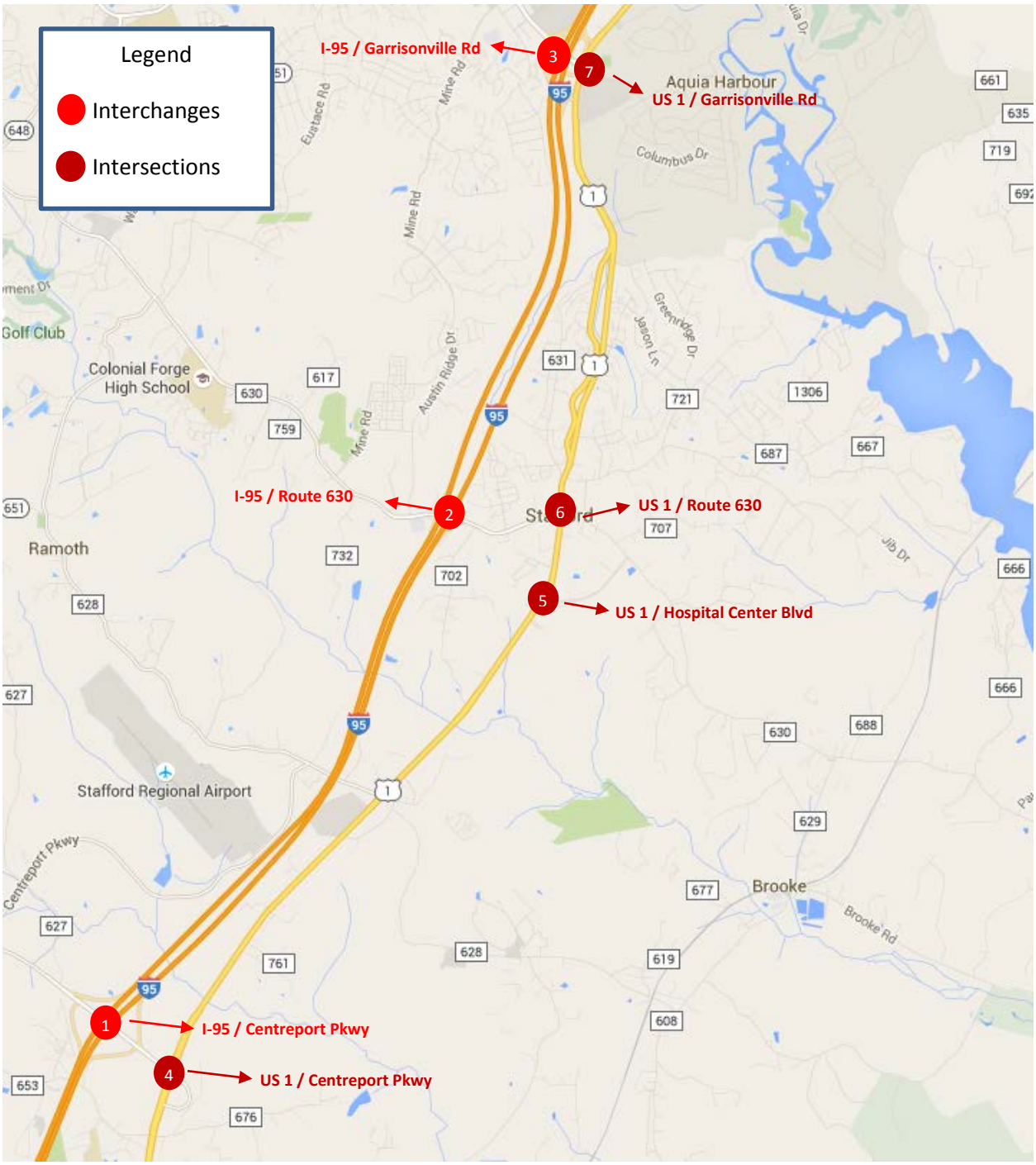


Figure 1: Study Area Map

III. Data

The traffic count data was gathered from various data sources and studies that include:

- VDOT's Permanent Station Count Data
- Traffic Impact Analysis Study for Embrey Mill Retail Rezoning

- Traffic Impact Analysis Study for George Washington Village
- Traffic Impact Analysis Study for Westgate Center at Stafford Courthouse

VDOT Traffic Data

The traffic data for the I-95 mainline was obtained from permanent station counts from VDOT's traffic monitoring program for the years 2010 through 2015. The data included volumes on I-95 mainline in the northbound and southbound directions for four stations for 24 hours each day of these years. The four stations include:

- I-95 Northbound - North of I-95/Rt. 630 Interchange
- I-95 Northbound - South of I-95/Rt. 630 Interchange
- I-95 Southbound - South of I-95/Rt. 630 Interchange
- I-95 Southbound - North of I-95/Rt. 630 Interchange

The latest data available was for the month of April 2015. The peak-hour volumes were identified for AM and PM peak periods for an average weekday including Tuesday, Wednesday and Thursday. It was identified that the level of quality of the traffic count data for two stations was poor. These include the I-95 NB - South of I-95/Rt. 630 Interchange and I-95 SB - South of I-95/Rt. 630 Interchange. Hence, data from these stations was not used for comparison purpose.

Embrey Mill Retail Rezoning Study

Embrey Mill Retail commercial development rezoning study was used to obtain the traffic volume data for intersections in and around the interchange. The development is located on a parcel of approximately 16 acres in size within the northeast quadrant of the Courthouse Road (Route 630)/Mine Road (Route 684) intersection.

The traffic count data collected in June 2013 was used for the study. The 2013 counts were extracted from the study for the following:

- I-95 NB off-ramp to Courthouse Road
- I-95 NB on-ramp from Courthouse Road
- I-95 SB off-ramp to Courthouse Road
- I-95 SB on-ramp from Courthouse Road
- I-95 NB ramps/Courthouse Road intersection
- I-95 SB ramps/Courthouse Road intersection
- PnR Driveway/Austin Ridge Drive/Courthouse Road intersection

George Washington Village Study

George Washington Village development study was also used to obtain the traffic volume data for the other intersections in and around the study interchange. The study used the 2011 counts for existing conditions and that data was extracted from the study for the following:

- I-95 NB off-ramp to Centreport Parkway
- I-95 NB on-ramp from Centreport Parkway
- I-95 SB off-ramp to Centreport Parkway
- I-95 SB on-ramp from Centreport Parkway

Westgate Center Study

Westgate Center mixed-use rezoning study is another data source that was considered to obtain the traffic counts for intersections in and around the interchange. The development is located on an approximate 73.3 acre site in the northwest quadrant of the I-95/Courthouse Road interchange. The count data available from the study was for the year 2010 for the following:

- I-95 NB ramps/Courthouse Road
- I-95 SB ramps/Courthouse Road
- PnR/Austin Ridge Drive/Courthouse Road

More recent count data was available for these intersections from the Embrey Mill study; therefore, the data from this study was not used.

IV. Data Analysis and Findings

This section summarizes the traffic volumes that were used in the 2009 IMR and the latest count data available.

Traffic Volumes for 2009 IMR

Existing (2009) traffic volumes were developed from the traffic counts that were conducted throughout the study area in addition to the traffic count data which was gathered from automated traffic recording stations located south of Route 630 along the mainline of I-95. Traffic counts were performed by conducting turning movement counts, video, and placing portable tubes across the roadway.

Table 1 summarizes the traffic count data from the 2009 IMR for the interchange including I-95 mainline volumes, ramps and the total intersection volumes (sum of all approaches). The table shows volumes for the existing traffic year (2009) and design year (2037) for AM and PM peak hours. The table also shows the annualized growth rate.

Table 1: Traffic Volume from Existing 2009 IMR

Location	AM			PM		
	2009	2037	Annual Growth	2009	2037	Annual Growth
I-95 Mainline Volumes						
I-95 NB - North of I-95/Rt. 630 Interchange	5210	9015	3%	3205	4755	2%
I-95 NB - South of I-95/Rt. 630 Interchange	5355	8615	2%	3330	5080	2%
I-95 SB - South of I-95/Rt. 630 Interchange	2530	4230	2%	5515	8705	2%

I-95/Route 630 Interchange: Comparison of Traffic Volumes

I-95 SB - North of I-95/Rt. 630 Interchange	2365	4005	2%	5425	8855	2%
Ramps						
I-95 NB off-ramp to Courthouse Rd	525	1275	5%	385	1375	9%
I-95 NB on-ramp from Courthouse Rd	380	1675	12%	260	1050	11%
I-95 SB off-ramp to Courthouse Rd	230	850	10%	430	1775	11%
I-95 SB on-ramp from Courthouse Rd	395	1075	6%	520	1625	8%
I-95 NB off-ramp to Centreport Pkwy	320	1150	9%	185	1100	18%
I-95 NB on-ramp from Centreport Pkwy	585	1975	8%	205	900	12%
I-95 SB off-ramp to Centreport Pkwy	125	650	15%	425	1750	11%
I-95 SB on-ramp from Centreport Pkwy	205	550	6%	270	1375	15%
Intersection Volumes (TOTAL)						
I-95 NB ramps/Courthouse Rd	1855	5040	6%	1820	7295	11%
I-95 SB ramps/Courthouse Rd	1565	4345	6%	2025	6345	8%
VDOT P n R Driveway/Austin Ridge Dr/Courthouse Rd	1470	3835	6%	1780	4940	6%
US 1/Courthouse Rd	2195	6415	7%	2505	7105	7%
Centreport Pkwy/I-95 NB	1260	4370	9%	1070	4775	12%
Centreport Pkwy/I-95 SB	675	2175	8%	990	4050	11%

Traffic Volumes for Existing IMR vs. Latest Volumes

The latest count data is available for 2015 traffic year for I-95 mainline; 2013 traffic year for ramps of I-95/Rt. 630 interchange and Austin Ridge/Rt. 630 intersection; and 2011 traffic year for US 1/Courthouse Rd intersection and Centreport Pkwy/I-95 interchange. The volumes from the existing IMR were projected from 2009 to these latest traffic year volumes based on linear interpolation and the annual growth rate shown in Table 1. The projected volumes from the existing IMR and the latest count data are summarized in Table 2. The percentage difference in the volumes is summarized in this table. A negative number indicates that the projected IMR volumes are higher than the latest count data.

.

I-95/Route 630 Interchange: Comparison of Traffic Volumes

Table 2: Traffic Volumes from Existing IMR vs. Latest Counts

Location	AM			PM		
	IMR Volume	Latest Counts	% Delta	IMR Volume	Latest Counts	% Delta
I-95 Mainline Volumes	**2015 Counts, VDOT Permanent Station Counts**					
I-95 NB - North of I-95/Rt. 630 Interchange	6080	4700	-23%	3552	3651	3%
*I-95 NB - South of I-95/Rt. 630 Interchange	6093	3075	-50%	3723	1732	-53%
*I-95 SB - South of I-95/Rt. 630 Interchange	2917	1616	-45%	6235	3168	-49%
I-95 SB - North of I-95/Rt. 630 Interchange	2739	2986	9%	6203	4478	-28%
Ramps	**2013 Counts, Embrey Mill Retail Rezoning Study**					
I-95 NB off-ramp to Courthouse Rd	641	633	-1%	547	510	-7%
I-95 NB on-ramp from Courthouse Rd	602	503	-16%	393	318	-19%
I-95 SB off-ramp to Courthouse Rd	332	238	-28%	657	511	-22%
I-95 SB on-ramp from Courthouse Rd	501	420	-16%	697	610	-12%
I-95 NB off-ramp to Centreport Pkwy	382	502	31%	256	154	-40%
I-95 NB on-ramp from Centreport Pkwy	688	371	-46%	258	198	-23%
I-95 SB off-ramp to Centreport Pkwy	165	156	-6%	525	545	4%
I-95 SB on-ramp from Centreport Pkwy	230	179	-22%	355	394	11%
Intersection Volumes	**2013 Counts, Embrey Mill Retail Rezoning Study**					
I-95 NB ramps/Courthouse Rd	2354	2124	-10%	2737	2212	-19%
I-95 SB ramps/Courthouse Rd	2002	1745	-13%	2716	2332	-14%
VDOT P n R Driveway/Austin Ridge Dr/Courthouse Rd	1838	1673	-9%	2276	2002	-12%
Intersection Volumes	**2011 Counts, George Washington Village Study**					
US 1/Courthouse Rd	2507	2298	-8%	2844	2499	-12%
Centreport Pkwy/I-95 NB	1492	1330	-11%	1351	1123	-17%
Centreport Pkwy/I-95 SB	786	864	10%	1221	1230	1%

** Poor quality data from VDOT*

As seen in Table 2, most of the mainline volumes, ramps, and intersections for the projected IMR volumes are higher than the latest counts in the field. The current traffic count data are within an acceptable variability from the projected growth that was assumed in the 2009 IMR. Hence, it can be concluded that using the traffic data from the 2009 IMR for the traffic operation analysis is acceptable for assessing future traffic at the I-95/Route 630 interchange.

V. Next Steps/Conclusion

The Virginia Department of Transportation is seeking to explore a new alternative for the reconstruction of the interchange of I-95 and Route 630 in Stafford County, Virginia. The design will be in accordance with VDOT and AASHTO design standards that are current at the time of Notice to Proceed. The interchange configuration will be based on a revised preferred alternative for a Diverging-Diamond Interchange (DDI). Based on the above findings, we conclude that the traffic volumes from the 2009 IMR will be used to assess future traffic operations and analysis of the DDI alternative. CORSIM will be utilized to conduct traffic analysis and prepare a supplement to the existing IMR, which will include highlighting the rationale and operational acceptability of the DDI as the new preferred alternative for the IMR.

Appendix B:
Design Plans


DIVERGING DIAMOND DRAFT CONCEPT
PROPOSED LIMITED ACCESS
PROPOSED RIGHT OF WAY
I - 95


ROUTE 630
AUSTIN RIDGE DRIVE
I - 95
I - 95
COURT HOUSE ROAD
PARK & RIDE
LOT
WYCHE ROAD
ROUTE 630
ROUTE 1


I - 95
DIVERGING DIAMOND DRAFT CONCEPT
PROPOSED LIMITED ACCESS
PROPOSED RIGHT OF WAY

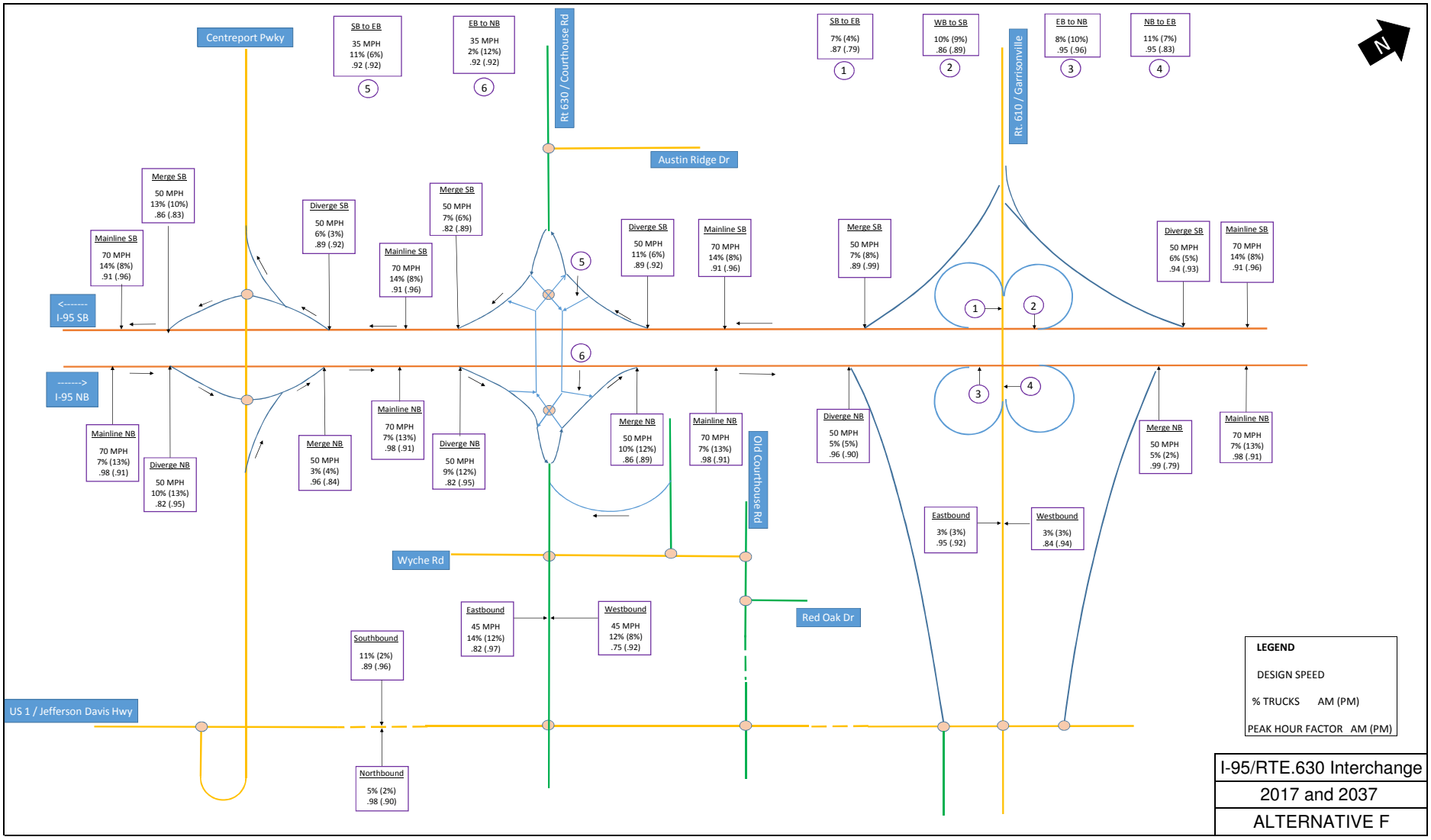
Appendix C:
Traffic Software Analysis Results

Alternative F

Design Speeds

Truck Percentages

Peak Hour Factor



I-95/RTE.630 Interchange

2017 and 2037

ALTERNATIVE F

2037 Alternative F

95th Percentile Queues

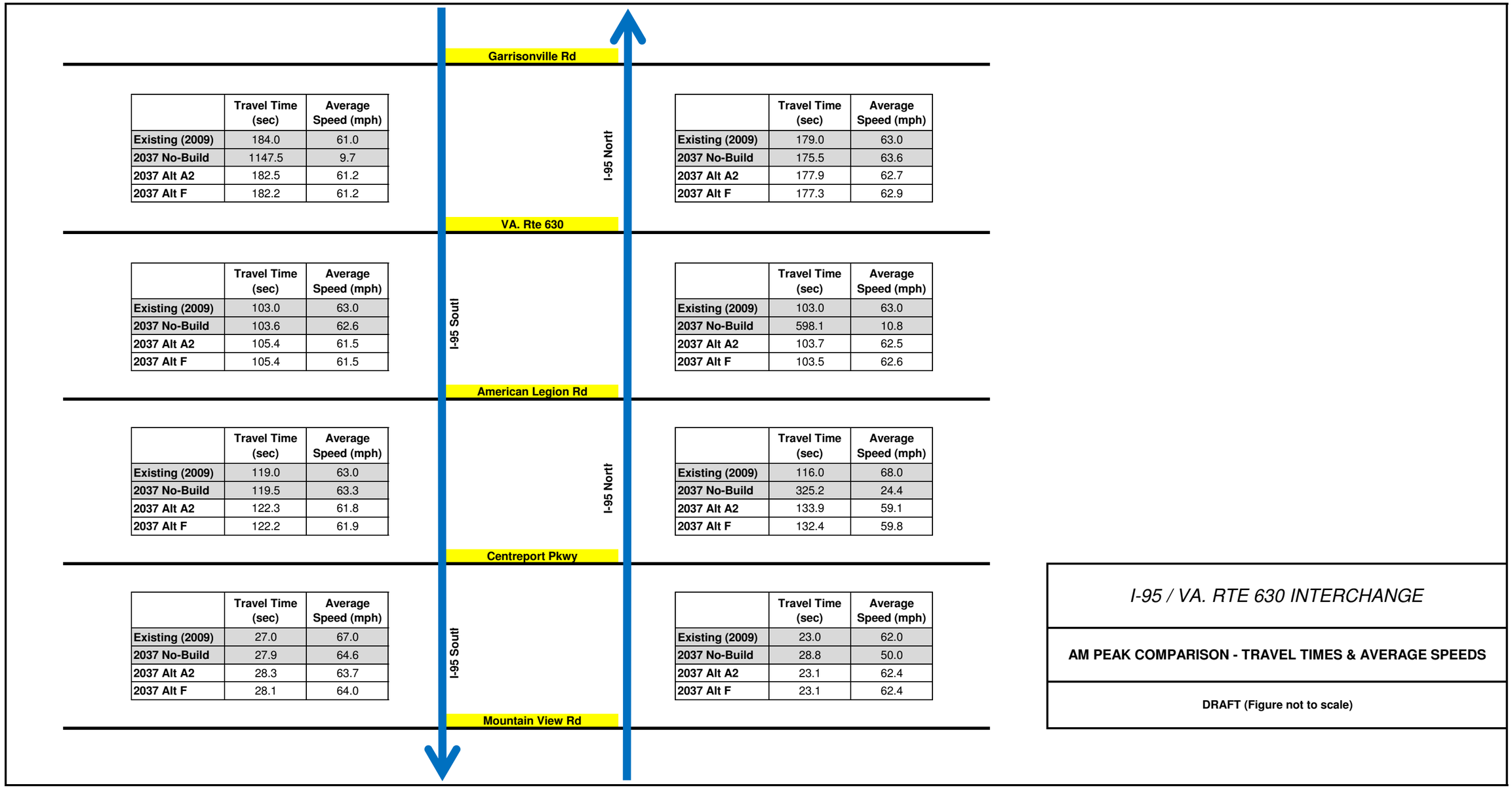
Delays

I-95 and Route 630 DDI Interchange: 95th Percentile Queues and Delays for 2037 Build

Intersection		Peak Hour	Approach							
			Northbound		Southbound		Eastbound		Westbound	
			Queue (ft)	Delay (s/v)	Queue (ft)	Delay (s/v)	Queue (ft)	Delay (s/v)	Queue (ft)	Delay (s/v)
25	Rte.630 @ Austin Ridge	AM			SBL: 354 SBR: 100	35.2 34	EBL: 424 EBT: 1098	29.4 23.7	WBT: 163 WBR: 61	19.2 1.9
		PM			SBL: 222 SBR: 96	66.9 49.6	EBL: 152 EBT: 247	58.1 6.6	WBT: 218 WBR: 80	9.9 0.5
24	Rte.630 crossover @ I-95 SB Ramp	AM					EBT: 111	31.4	WBT: 125	19.1
		PM					EBT: 106	30.8	WBT: 121	38.6
12	Rte.630 WB @ I-95 SB Ramp	AM			SBR: 268	34.5			WBT: 52	1.4
		PM			SBR: 296	42.5			WBT: 105	7.6
5	Rte.630 EB @ I-95 SB Ramp	AM			SBL: 179	15.4	EBT: 90	6.3		
		PM			SBL: 276	38.8	EBT: 66	1.6		
11	Rte.630 crossover @ I-95 NB Ramp	AM					EBT: 126	38.4	WBT: 49	22.8
		PM					EBT: 119	35.7	WBT: 59	26.5
14	Rte.630 WB @ I-95 NB Ramp	AM	NBL: 240	31.5					WBT: 66	3.5
		PM	NBL: 265	27.6					WBT: 76	8.3
8	Rte.630 EB @ I-95 NB Ramp	AM	NBR: 386	31.5			EBT: 77	8.1		
		PM	NBR: 364	41.4			EBT: 99	3.8		
35	Rte.630 @ Wyche Rd	AM	NBL: 134 NBT/R: 120	50.7 50.3	SBL: 81 SBT: 131 SBR: N/A*	47.5 55 0.3	EBL: 161 EBT: 310 EBT/R: 335	24 23.2 23.2	WBL: 100 WBT: 1138 WBR: 71	11.6 24.8 9.5
		PM	NBL: 198 NBT/R: 954	56.4 62.6	SBL: 147 SBT: 452 SBR: N/A*	89.1 57.3 0.9	EBL: 236 EBT: 660 EBT/R: 195	112.9 6.8 6.8	WBL: 84 WBT: 1034 WBR: 80	27.9 59.1 10.8

Note: - SimTraffic outputs were used for 95% queue results
- Synchro based HCM methodology outputs were used for delay results

Travel Times
&
Average Speeds
AM & PM Peak



	Travel Time (sec)	Average Speed (mph)
Existing (2009)	184.0	61.0
2037 No-Build	1147.5	9.7
2037 Alt A2	182.5	61.2
2037 Alt F	182.2	61.2

	Travel Time (sec)	Average Speed (mph)
Existing (2009)	179.0	63.0
2037 No-Build	175.5	63.6
2037 Alt A2	177.9	62.7
2037 Alt F	177.3	62.9

	Travel Time (sec)	Average Speed (mph)
Existing (2009)	103.0	63.0
2037 No-Build	103.6	62.6
2037 Alt A2	105.4	61.5
2037 Alt F	105.4	61.5

	Travel Time (sec)	Average Speed (mph)
Existing (2009)	103.0	63.0
2037 No-Build	598.1	10.8
2037 Alt A2	103.7	62.5
2037 Alt F	103.5	62.6

	Travel Time (sec)	Average Speed (mph)
Existing (2009)	119.0	63.0
2037 No-Build	119.5	63.3
2037 Alt A2	122.3	61.8
2037 Alt F	122.2	61.9

	Travel Time (sec)	Average Speed (mph)
Existing (2009)	116.0	68.0
2037 No-Build	325.2	24.4
2037 Alt A2	133.9	59.1
2037 Alt F	132.4	59.8

	Travel Time (sec)	Average Speed (mph)
Existing (2009)	27.0	67.0
2037 No-Build	27.9	64.6
2037 Alt A2	28.3	63.7
2037 Alt F	28.1	64.0

	Travel Time (sec)	Average Speed (mph)
Existing (2009)	23.0	62.0
2037 No-Build	28.8	50.0
2037 Alt A2	23.1	62.4
2037 Alt F	23.1	62.4

I-95 / VA. RTE 630 INTERCHANGE

AM PEAK COMPARISON - TRAVEL TIMES & AVERAGE SPEEDS

DRAFT (Figure not to scale)

	Travel Time (sec)	Average Speed (mph)
Existing (2009)	197.0	59.0
2037 No-Build	1113.2	10.0
2037 Alt A2	189.6	58.9
2037 Alt F	189.8	58.8

	Travel Time (sec)	Average Speed (mph)
Existing (2009)	172.0	65.0
2037 No-Build2	169.0	66.0
2037 Alt A2	174.7	63.9
2037 Alt F	175.5	63.6

	Travel Time (sec)	Average Speed (mph)
Existing (2009)	146.0	47.0
2037 No-Build1	118.6	54.6
2037 Alt A2	108.4	59.8
2037 Alt F	106.7	60.7

	Travel Time (sec)	Average Speed (mph)
Existing (2009)	103.0	63.0
2037 No-Build	7753.5	0.8
2037 Alt A2	109.4	59.2
2037 Alt F	103.6	62.5

	Travel Time (sec)	Average Speed (mph)
Existing (2009)	170.0	50.0
2037 No-Build1	144.8	52.2
2037 Alt A2	129.4	58.4
2037 Alt F	125.8	60.1

	Travel Time (sec)	Average Speed (mph)
Existing (2009)	118.0	67.0
2037 No-Build	2861.2	2.8
2037 Alt A2	133.2	59.5
2037 Alt F	130.6	60.6

	Travel Time (sec)	Average Speed (mph)
Existing (2009)	43.0	50.0
2037 No-Build1	32.7	55.0
2037 Alt A2	32.6	55.3
2037 Alt F	28.9	62.2

	Travel Time (sec)	Average Speed (mph)
Existing (2009)	23.0	62.0
2037 No-Build2	219.4	6.6
2037 Alt A2	23.4	61.4
2037 Alt F	23.1	62.5

Notes:

1 In the No-Build scenario, severe queue back-up on I-95 SB mainline due to the congestion at SB off-ramp at VA. Rte 630 is causing only fewer vehicles to reach downstream. Hence, the travel times and average speeds reported by the CORSIM microsimulation for I-95 mainline, south of VA. Rte 630 IS NOT representative of actual traffic stream.

2 In the No-Build scenario, severe queue back-up on I-95 NB mainline due to the congestion at NB off-ramp at VA. Rte 630 is causing only fewer vehicles to reach downstream. Hence, the travel times and average speeds reported by the CORSIM microsimulation for I-95 mainline, north of VA. Rte 630 IS NOT representative of actual traffic stream. This congestion leads to a ripple effect and shows an impact on the I-95 NB mainline upstream, approaching Centreport Pkwy

I-95 / VA. RTE 630 INTERCHANGE

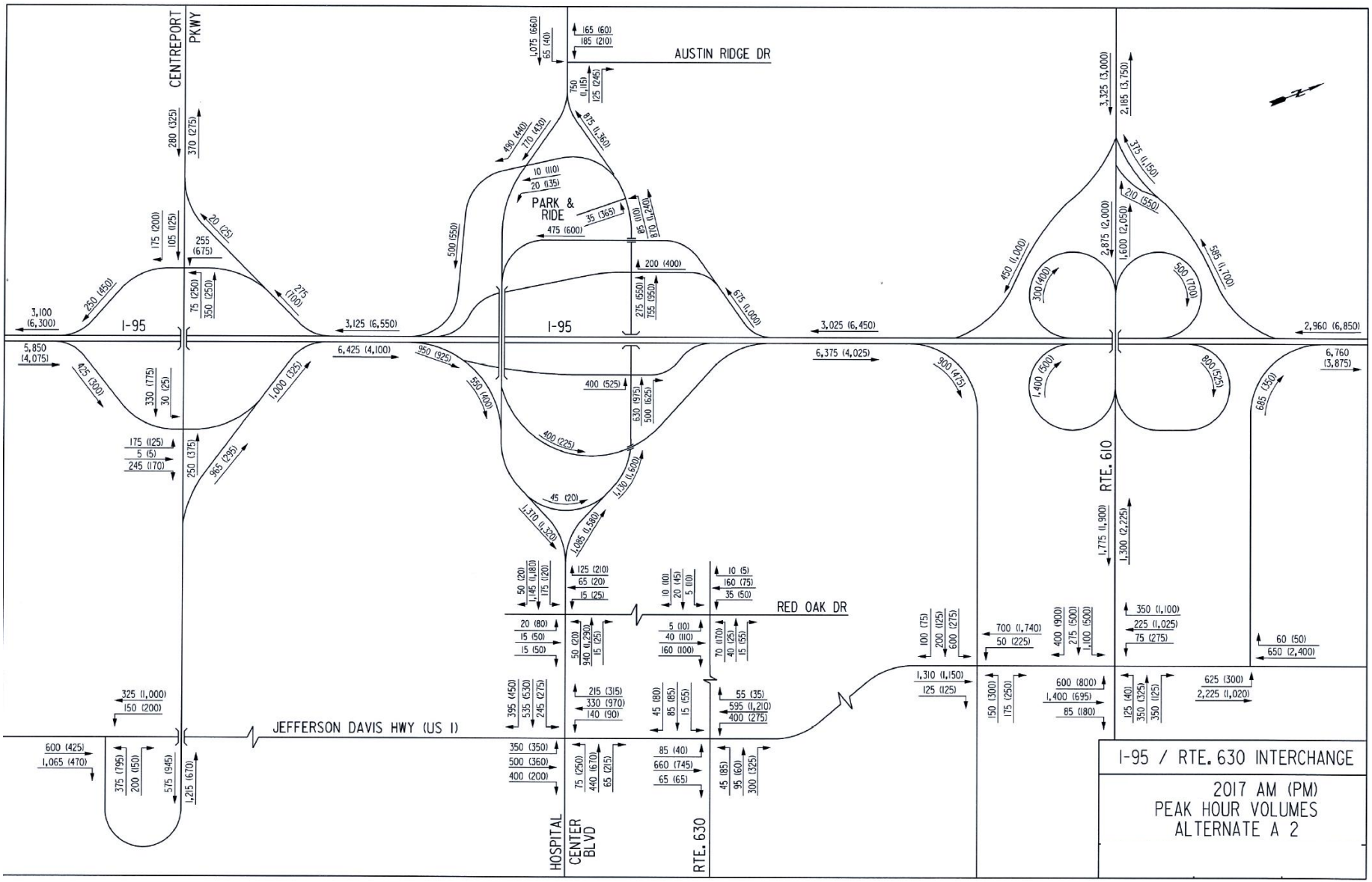
PM PEAK COMPARISON - TRAVEL TIMES & AVERAGE SPEEDS

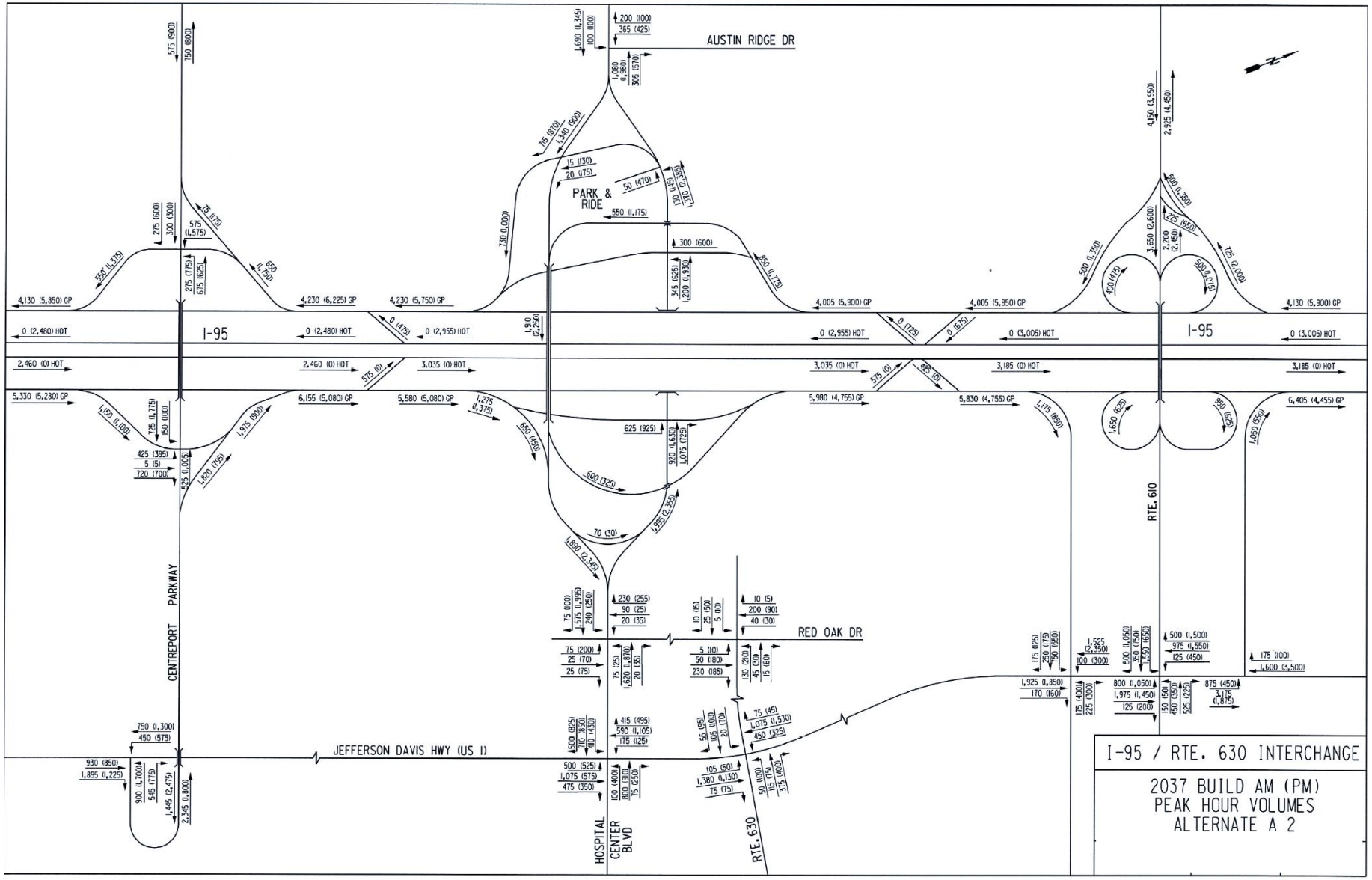
DRAFT (Figure not to scale)

Alternative A2
2017 & 2037

Volumes

AM & PM Peak Hour


CENTREPORT PKWY
AUSTIN RIDGE DR
PARK & RIDE
I-95
I-95
RED OAK DR
RTE. 610
JEFFERSON DAVIS HWY (US 1)
HOSPITAL
CENTER BLVD
RTE. 630
I-95 / RTE. 630 INTERCHANGE
2017 AM (PM)
PEAK HOUR VOLUMES
ALTERNATE A 2


AUSTIN RIDGE DR
PARK & RIDE
I-95
I-95
RTE. 610
CENTREPORT PARKWAY
JEFFERSON DAVIS HWY (US 1)
RED OAK DR
HOSPITAL CENTER BLVD
RTE. 630
I-95 / RTE. 630 INTERCHANGE
2037 BUILD AM (PM)
PEAK HOUR VOLUMES
ALTERNATE A 2

Alternative F

CORSIM Results

2037 BUILD ALT 'F' AM

CORSIM FREEWAY Link Lookup Table

										Volumes			
Node A	Node B	Link A-B	Road	Direction	Type	Location Details	HCM Segment Type	Link Length (ft)	Total # of lanes	Input Ramp Volumes	Input Mainline Vols	Simulated Volumes	% Volume Thruput Modeled
100	102	(100, 102)	I-95	NB	GP	btwn Truslow Rd & Centerport Pkwy Off-Ramp	Basic	2126	3	-	5330	5329	100%
102	104	(102, 104)	I-95	NB	GP	btwn Truslow Rd & Centerport Pkwy Off-Ramp	Diverge	1446	3	-	5330	5327	100%
104	106	(104, 106)	I-95	NB	GP	btwn Centerport Pkwy Off & On Ramps	Basic	1621	3	1150	4180	4169	100%
106	108	(106, 108)	I-95	NB	GP	btwn Centerport Pkwy Off & On Ramps	Basic	1810	3	-	4180	4170	100%
108	110	(108, 110)	I-95	NB	GP	btwn Centerport Pkwy On-Ramp & NB HOT Off-Ramp	Merge	1471	3	1975	6155	6142	100%
110	112	(110, 112)	I-95	NB	GP	btwn Centerport Pkwy On-Ramp & NB HOT Off-Ramp	Basic	1695	3	-	6155	6142	100%
112	114	(112, 114)	I-95	NB	GP	btwn Centerport Pkwy On-Ramp & NB HOT Off-Ramp	Basic	2099	3	-	6155	6146	100%
114	116	(114, 116)	I-95	NB	GP	btwn Centerport Pkwy On-Ramp & NB HOT Off-Ramp	Diverge	2095	3	-	6155	6146	100%
116	118	(116, 118)	I-95	NB	GP	btwn NB HOT Off-Ramp & American Legion Bridge	Basic	1875	3	575	5580	5568	100%
118	120	(118, 120)	I-95	NB	GP	btwn American Legion Bridge & Rte 630 Off-Ramp	Basic	2060	3	-	5580	5571	100%
120	122	(120, 122)	I-95	NB	GP	btwn American Legion Bridge & Rte 630 Off-Ramp	Basic	1950	3	-	5580	5572	100%
122	124	(122, 124)	I-95	NB	GP	btwn American Legion Bridge & Rte 630 Off-Ramp	Diverge	2566	3	-	5580	5571	100%
124	126	(124, 126)	I-95	NB	GP	btwn Rte 630 Off & On Ramp	Basic	1274	3	1275	4305	4266	99%
126	128	(126, 128)	I-95	NB	GP	btwn Rte 630 Off & On Ramp	Basic	1485	3	-	4305	4267	99%
128	130	(128, 130)	I-95	NB	GP	btwn Rte 630 Off & On Ramp	Basic	1832	3	-	4305	4270	99%
130	132	(130, 132)	I-95	NB	GP	btwn Rte 630 Off & On Ramp	Basic	1909	3	-	4305	4272	99%
132	134	(132, 134)	I-95	NB	GP	btwn Rte 630 On-Ramp & NB HOT Off-Ramp	Merge	2708	3	1675	5980	5755	96%
134	136	(134, 136)	I-95	NB	GP	btwn Rte 630 On-Ramp & NB HOT Off-Ramp	Basic	839	3	-	5980	5755	96%
136	138	(136, 138)	I-95	NB	GP	btwn Rte 630 On-Ramp & NB HOT Off-Ramp	Diverge	2007	3	-	5980	5752	96%
138	140	(138, 140)	I-95	NB	GP	btwn NB HOT Off-Ramp & NB HOT On-Ramp	Basic	2090	3	575	5405	5180	96%
140	142	(140, 142)	I-95	NB	GP	btwn NB HOT On-Ramp & US-1/Aquia Center Off-Ramp	Merge	2050	3	425	5830	5600	96%
142	144	(142, 144)	I-95	NB	GP	btwn NB HOT On-Ramp & US-1/Aquia Center Off-Ramp	Diverge	1436	3	-	5830	5597	96%
144	146	(144, 146)	I-95	NB	GP	btwn US-1/Aquia Center Off-Ramp & Garrisonville Rd EB On-Ramp	Basic	1260	3	1175	4655	4377	94%
146	148	(146, 148)	I-95	NB	GP	btwn US-1/Aquia Center Off-Ramp & Garrisonville Rd EB On-Ramp	Basic	1140	3	-	4655	4377	94%
148	150	(148, 150)	I-95	NB	GP	btwn Garrisonville Rd EB On-Ramp & Garrisonville Rd WB Off-Ramp	Weave	905	3	1650	6305	6024	96%
150	152	(150, 152)	I-95	NB	GP	btwn Garrisonville Rd WB Off-Ramp & US-1 On-Ramp	Basic	785	3	950	5355	4883	91%
152	154	(152, 154)	I-95	NB	GP	btwn US-1 On-Ramp to Russell Rd	Merge	1735	3	1050	6405	5936	93%
154	156	(154, 156)	I-95	NB	GP	btwn US-1 On-Ramp to Russell Rd	Basic	1695	3	-	6405	5934	93%
302	304	(302, 304)	I-95	SB	GP	btwn Russell Rd On-Ramp & Garrisonville Rd WB Off-Ramp	Basic	1771	3	-	4130	4128	100%
304	306	(304, 306)	I-95	SB	GP	btwn Russell Rd On-Ramp & Garrisonville Rd WB Off-Ramp	Diverge	1768	3	-	4130	4128	100%
306	308	(306, 308)	I-95	SB	GP	btwn Garrisonville Rd WB Off & On Ramps	Basic	900	3	725	3405	3393	100%
308	310	(308, 310)	I-95	SB	GP	btwn Garrisonville Rd WB On-Ramp & Garrisonville Rd EB Off-Ramp	Weave	728	3	500	3905	3891	100%
310	312	(310, 312)	I-95	SB	GP	btwn Garrisonville Rd EB Off & On Ramps	Basic	909	3	400	3505	3443	98%
312	314	(312, 314)	I-95	SB	GP	btwn Garrisonville Rd EB On-Ramp & SB HOT Off-Ramp	Merge	1500	3	500	4005	3940	98%
314	316	(314, 316)	I-95	SB	GP	btwn Garrisonville Rd EB On-Ramp & SB HOT Off-Ramp	Basic	1972	3	-	4005	3938	98%
316	318	(316, 318)	I-95	SB	GP	btwn Garrisonville Rd EB On-Ramp & SB HOT Off-Ramp	Diverge	1800	3	-	4005	3939	98%
318	320	(318, 320)	I-95	SB	GP	btwn SB HOT Off-Ramp & SB HOT On-Ramp	Basic	1760	3	0	4005	3938	98%
320	322	(320, 322)	I-95	SB	GP	btwn SB HOT On-Ramp & Rte 630 Off-Ramp	Merge	1983	3	0	4005	3938	98%
322	324	(322, 324)	I-95	SB	GP	btwn SB HOT On-Ramp & Rte 630 Off-Ramp	Basic	1664	3	-	4005	3938	98%
324	326	(324, 326)	I-95	SB	GP	btwn SB HOT On-Ramp & Rte 630 Off-Ramp	Diverge	2453	3	-	4005	3939	98%
326	328	(326, 328)	I-95	SB	GP	btwn Rte 630 Off-Ramp to Rte 630 On-Ramp	Basic	1448	3	850	3155	3092	98%
328	330	(328, 330)	I-95	SB	GP	btwn Rte 630 Off-Ramp to Rte 630 On-Ramp	Basic	824	3	-	3155	3091	98%
330	332	(330, 332)	I-95	SB	GP	btwn Rte 630 Off-Ramp to Rte 630 On-Ramp	Basic	1049	3	-	3155	3091	98%
332	334	(332, 334)	I-95	SB	GP	btwn Rte 630 Off-Ramp & Rte 630 On-Ramp	Basic	1648	3	-	3155	3094	98%
334	336	(334, 336)	I-95	SB	GP	btwn Rte 630 On-Ramp & American Legion Bridge	Merge	2781	3	1075	4230	3991	94%
336	338	(336, 338)	I-95	SB	GP	btwn Rte 630 On-Ramp & American Legion Bridge	Basic	767	3	-	4230	3993	94%
338	340	(338, 340)	I-95	SB	GP	btwn Rte 630 On-Ramp & American Legion Bridge	Basic	1957	3	-	4230	3990	94%
340	342	(340, 342)	I-95	SB	GP	btwn Rte 630 On-Ramp & American Legion Bridge	Basic	1940	3	-	4230	3987	94%
342	344	(342, 344)	I-95	SB	GP	btwn American Legion Bridge & SB HOT On-Ramp	Basic	2040	3	-	4230	3992	94%
344	346	(344, 346)	I-95	SB	GP	btwn American Legion Bridge & SB HOT On-Ramp	Merge	2021	3	0	4230	3991	94%
346	348	(346, 348)	I-95	SB	GP	btwn SB HOT On-Ramp & Centerport Pkwy Off-Ramp	Basic	2053	3	-	4230	3988	94%
348	350	(348, 350)	I-95	SB	GP	btwn SB HOT On-Ramp & Centerport Pkwy Off-Ramp	Basic	1919	3	-	4230	3990	94%
350	352	(350, 352)	I-95	SB	GP	btwn SB HOT On-Ramp & Centerport Pkwy Off-Ramp	Diverge	1525	3	-	4230	3989	94%
352	354	(352, 354)	I-95	SB	GP	btwn Centerport Pkwy Off & On Ramps	Basic	1396	3	650	3580	3367	94%
354	356	(354, 356)	I-95	SB	GP	btwn Centerport Pkwy Off & On Ramps	Basic	1507	3	-	3580	3366	94%
356	358	(356, 358)	I-95	SB	GP	btwn Centerport Pkwy On-Ramp & Truslow Rd	Merge	1421	3	550	4130	3907	95%
358	360	(358, 360)	I-95	SB	GP	btwn Centerport Pkwy On-Ramp & Truslow Rd	Basic	2125	3		4130	3909	95%

2037 BUILD ALT 'F' PM

CORSIM FREEWAY Link Lookup Table

Node A	Node B	Link A-B	Road	Direction	Type	Location Details	HCM Segment Type	Link Length (ft)	Total # of lanes	Volumes			
										Input Ramp Volumes	Input Mainline Vols	Simulated Volumes	% Volume Thruput Modeled
100	102	(100, 102)	I-95	NB	GP	btwn Truslow Rd & Centerport Pkwy Off-Ramp	Basic	2126	3	-	5280	5278	100%
102	104	(102, 104)	I-95	NB	GP	btwn Truslow Rd & Centerport Pkwy Off-Ramp	Diverge	1446	3	-	5280	5278	100%
104	106	(104, 106)	I-95	NB	GP	btwn Centerport Pkwy Off & On Ramps	Basic	1621	3	1100	4180	4184	100%
106	108	(106, 108)	I-95	NB	GP	btwn Centerport Pkwy Off & On Ramps	Basic	1810	3	-	4180	4184	100%
108	110	(108, 110)	I-95	NB	GP	btwn Centerport Pkwy On-Ramp & NB HOT Off-Ramp	Merge	1471	3	900	5080	5085	100%
110	112	(110, 112)	I-95	NB	GP	btwn Centerport Pkwy On-Ramp & NB HOT Off-Ramp	Basic	1695	3	-	5080	5083	100%
112	114	(112, 114)	I-95	NB	GP	btwn Centerport Pkwy On-Ramp & NB HOT Off-Ramp	Basic	2099	3	-	5080	5085	100%
114	116	(114, 116)	I-95	NB	GP	btwn Centerport Pkwy On-Ramp & NB HOT Off-Ramp	Diverge	2095	3	-	5080	5084	100%
116	118	(116, 118)	I-95	NB	GP	btwn NB HOT Off-Ramp & American Legion Bridge	Basic	1875	3	0	5080	5081	100%
118	120	(118, 120)	I-95	NB	GP	btwn American Legion Bridge & Rte 630 Off-Ramp	Basic	2060	3	-	5080	5084	100%
120	122	(120, 122)	I-95	NB	GP	btwn American Legion Bridge & Rte 630 Off-Ramp	Basic	1950	3	-	5080	5086	100%
122	124	(122, 124)	I-95	NB	GP	btwn American Legion Bridge & Rte 630 Off-Ramp	Diverge	2566	3	-	5080	5088	100%
124	126	(124, 126)	I-95	NB	GP	btwn Rte 630 Off & On Ramp	Basic	1274	3	1375	3705	3695	100%
126	128	(126, 128)	I-95	NB	GP	btwn Rte 630 Off & On Ramp	Basic	1485	3	-	3705	3696	100%
128	130	(128, 130)	I-95	NB	GP	btwn Rte 630 Off & On Ramp	Basic	1832	3	-	3705	3694	100%
130	132	(130, 132)	I-95	NB	GP	btwn Rte 630 Off & On Ramp	Basic	1909	3	-	3705	3692	100%
132	134	(132, 134)	I-95	NB	GP	btwn Rte 630 On-Ramp & NB HOT Off-Ramp	Merge	2708	3	1050	4755	4446	93%
134	136	(134, 136)	I-95	NB	GP	btwn Rte 630 On-Ramp & NB HOT Off-Ramp	Basic	839	3	-	4755	4450	94%
136	138	(136, 138)	I-95	NB	GP	btwn Rte 630 On-Ramp & NB HOT Off-Ramp	Diverge	2007	3	-	4755	4454	94%
138	140	(138, 140)	I-95	NB	GP	btwn NB HOT Off-Ramp & NB HOT On-Ramp	Basic	2090	3	0	4755	4448	94%
140	142	(140, 142)	I-95	NB	GP	btwn NB HOT On-Ramp & US-1/Aquia Center Off-Ramp	Merge	2050	3	0	4755	4452	94%
142	144	(142, 144)	I-95	NB	GP	btwn NB HOT On-Ramp & US-1/Aquia Center Off-Ramp	Diverge	1436	3	-	4755	4450	94%
144	146	(144, 146)	I-95	NB	GP	btwn US-1/Aquia Center Off-Ramp & Garrisonville Rd EB On-Ramp	Basic	1260	3	850	3905	3643	93%
146	148	(146, 148)	I-95	NB	GP	btwn US-1/Aquia Center Off-Ramp & Garrisonville Rd EB On-Ramp	Basic	1140	3	-	3905	3641	93%
148	150	(148, 150)	I-95	NB	GP	btwn Garrisonville Rd EB On-Ramp & Garrisonville Rd WB Off-Ramp	Weave	905	3	625	4530	4263	94%
150	152	(150, 152)	I-95	NB	GP	btwn Garrisonville Rd WB Off-Ramp & US-1 On-Ramp	Basic	785	3	625	3905	3584	92%
152	154	(152, 154)	I-95	NB	GP	btwn US-1 On-Ramp to Russell Rd	Merge	1735	3	550	4455	4135	93%
154	156	(154, 156)	I-95	NB	GP	btwn US-1 On-Ramp to Russell Rd	Basic	1695	3	-	4455	4135	93%
302	304	(302, 304)	I-95	SB	GP	btwn Russell Rd On-Ramp & Garrisonville Rd WB Off-Ramp	Basic	1771	3	-	5900	5897	100%
304	306	(304, 306)	I-95	SB	GP	btwn Russell Rd On-Ramp & Garrisonville Rd WB Off-Ramp	Diverge	1768	3	-	5900	5891	100%
306	308	(306, 308)	I-95	SB	GP	btwn Garrisonville Rd WB Off & On Ramps	Basic	900	3	2000	3900	3921	100%
308	310	(308, 310)	I-95	SB	GP	btwn Garrisonville Rd WB On-Ramp & Garrisonville Rd EB Off-Ramp	Weave	728	3	1075	4975	4994	100%
310	312	(310, 312)	I-95	SB	GP	btwn Garrisonville Rd EB Off & On Ramps	Basic	909	3	475	4500	4418	98%
312	314	(312, 314)	I-95	SB	GP	btwn Garrisonville Rd EB On-Ramp & SB HOT Off-Ramp	Merge	1500	3	1350	5850	5770	99%
314	316	(314, 316)	I-95	SB	GP	btwn Garrisonville Rd EB On-Ramp & SB HOT Off-Ramp	Basic	1972	3	-	5850	5769	99%
316	318	(316, 318)	I-95	SB	GP	btwn Garrisonville Rd EB On-Ramp & SB HOT Off-Ramp	Diverge	1800	3	-	5850	5769	99%
318	320	(318, 320)	I-95	SB	GP	btwn SB HOT Off-Ramp & SB HOT On-Ramp	Basic	1760	3	675	5175	5104	99%
320	322	(320, 322)	I-95	SB	GP	btwn SB HOT On-Ramp & Rte 630 Off-Ramp	Merge	1983	3	725	5900	5828	99%
322	324	(322, 324)	I-95	SB	GP	btwn SB HOT On-Ramp & Rte 630 Off-Ramp	Basic	1664	3	-	5900	5827	99%
324	326	(324, 326)	I-95	SB	GP	btwn SB HOT On-Ramp & Rte 630 Off-Ramp	Diverge	2453	3	-	5900	5827	99%
326	328	(326, 328)	I-95	SB	GP	btwn Rte 630 Off-Ramp to Rte 630 On-Ramp	Basic	1448	3	1775	4125	3954	96%
328	330	(328, 330)	I-95	SB	GP	btwn Rte 630 Off-Ramp to Rte 630 On-Ramp	Basic	824	3	-	4125	3952	96%
330	332	(330, 332)	I-95	SB	GP	btwn Rte 630 Off-Ramp to Rte 630 On-Ramp	Basic	1049	3	-	4125	3953	96%
332	334	(332, 334)	I-95	SB	GP	btwn Rte 630 Off-Ramp & Rte 630 On-Ramp	Basic	1648	3	-	4125	3951	96%
334	336	(334, 336)	I-95	SB	GP	btwn Rte 630 On-Ramp & American Legion Bridge	Merge	2781	3	1625	5750	5252	91%
336	338	(336, 338)	I-95	SB	GP	btwn Rte 630 On-Ramp & American Legion Bridge	Basic	767	3	-	5750	5253	91%
338	340	(338, 340)	I-95	SB	GP	btwn Rte 630 On-Ramp & American Legion Bridge	Basic	1957	3	-	5750	5265	92%
340	342	(340, 342)	I-95	SB	GP	btwn Rte 630 On-Ramp & American Legion Bridge	Basic	1940	3	-	5750	5261	91%
342	344	(342, 344)	I-95	SB	GP	btwn American Legion Bridge & SB HOT On-Ramp	Basic	2040	3	-	5750	5255	91%
344	346	(344, 346)	I-95	SB	GP	btwn American Legion Bridge & SB HOT On-Ramp	Merge	2021	3	475	6225	5729	92%
346	348	(346, 348)	I-95	SB	GP	btwn SB HOT On-Ramp & Centerport Pkwy Off-Ramp	Basic	2053	3	-	6225	5733	92%
348	350	(348, 350)	I-95	SB	GP	btwn SB HOT On-Ramp & Centerport Pkwy Off-Ramp	Basic	1919	3	-	6225	5742	92%
350	352	(350, 352)	I-95	SB	GP	btwn SB HOT On-Ramp & Centerport Pkwy Off-Ramp	Diverge	1525	3	-	6225	5741	92%
352	354	(352, 354)	I-95	SB	GP	btwn Centerport Pkwy Off & On Ramps	Basic	1396	3	1750	4475	4087	91%
354	356	(354, 356)	I-95	SB	GP	btwn Centerport Pkwy Off & On Ramps	Basic	1507	3	-	4475	4082	91%
356	358	(356, 358)	I-95	SB	GP	btwn Centerport Pkwy On-Ramp & Truslow Rd	Merge	1421	3	1375	5850	5452	93%
358	360	(358, 360)	I-95	SB	GP	btwn Centerport Pkwy On-Ramp & Truslow Rd	Basic	2125	3		5850	5449	93%

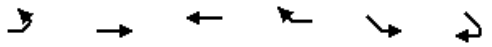
Alternative F

HCM Based

SYNCHRO Reports

2017 & 2037

AM & PM Peak Hours



Movement	EBL	EBT	WBT	WBR	SEL	SER
Lane Configurations		↑↑↑			↰↰	
Volume (vph)	0	780	0	0	485	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)		7.0			7.0	
Lane Util. Factor		0.91			0.97	
Frt		1.00			1.00	
Flt Protected		1.00			0.95	
Satd. Flow (prot)		5085			3433	
Flt Permitted		1.00			0.95	
Satd. Flow (perm)		5085			3433	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	848	0	0	527	0
RTOR Reduction (vph)	0	0	0	0	17	0
Lane Group Flow (vph)	0	848	0	0	510	0
Turn Type		NA			Prot	
Protected Phases		4			8	
Permitted Phases						
Actuated Green, G (s)		26.0			50.0	
Effective Green, g (s)		26.0			50.0	
Actuated g/C Ratio		0.29			0.56	
Clearance Time (s)		7.0			7.0	
Vehicle Extension (s)		3.0			3.0	
Lane Grp Cap (vph)		1469			1907	
v/s Ratio Prot		c0.17			c0.15	
v/s Ratio Perm						
v/c Ratio		0.58			0.27	
Uniform Delay, d1		27.3			10.4	
Progression Factor		0.22			1.00	
Incremental Delay, d2		1.4			0.1	
Delay (s)		7.4			10.5	
Level of Service		A			B	
Approach Delay (s)		7.4	0.0		10.5	
Approach LOS		A	A		B	

Intersection Summary			
HCM 2000 Control Delay	8.6	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.37		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	14.0
Intersection Capacity Utilization	40.6%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBT	EBR	WBL	WBT	NEL	NER
Lane Configurations	↑↑↑					↱
Volume (vph)	875	0	0	0	0	565
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	7.0					7.0
Lane Util. Factor	0.91					1.00
Frt	1.00					0.86
Flt Protected	1.00					1.00
Satd. Flow (prot)	5085					1611
Flt Permitted	1.00					1.00
Satd. Flow (perm)	5085					1611
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	951	0	0	0	0	614
RTOR Reduction (vph)	0	0	0	0	0	5
Lane Group Flow (vph)	951	0	0	0	0	609
Turn Type	NA					Prot
Protected Phases	4					8
Permitted Phases						
Actuated Green, G (s)	26.0					50.0
Effective Green, g (s)	26.0					50.0
Actuated g/C Ratio	0.29					0.56
Clearance Time (s)	7.0					7.0
Vehicle Extension (s)	3.0					3.0
Lane Grp Cap (vph)	1469					895
v/s Ratio Prot	c0.19					c0.38
v/s Ratio Perm						
v/c Ratio	0.65					0.68
Uniform Delay, d1	28.0					14.3
Progression Factor	0.27					1.00
Incremental Delay, d2	1.7					2.1
Delay (s)	9.4					16.4
Level of Service	A					B
Approach Delay (s)	9.4			0.0	16.4	
Approach LOS	A			A	B	

Intersection Summary			
HCM 2000 Control Delay	12.1	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.67		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	14.0
Intersection Capacity Utilization	63.6%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations		↑↑↑									↑↑↑	
Volume (vph)	0	875	0	0	0	0	0	0	0	0	580	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		7.0									7.0	
Lane Util. Factor		0.91									0.91	
Frt		1.00									1.00	
Flt Protected		1.00									1.00	
Satd. Flow (prot)		5085									5085	
Flt Permitted		1.00									1.00	
Satd. Flow (perm)		5085									5085	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	951	0	0	0	0	0	0	0	0	630	0
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	951	0	0	0	0	0	0	0	0	630	0
Turn Type		NA									NA	
Protected Phases		4									8	
Permitted Phases												
Actuated Green, G (s)		26.0									50.0	
Effective Green, g (s)		26.0									50.0	
Actuated g/C Ratio		0.29									0.56	
Clearance Time (s)		7.0									7.0	
Vehicle Extension (s)		3.0									3.0	
Lane Grp Cap (vph)		1469									2825	
v/s Ratio Prot		c0.19									c0.12	
v/s Ratio Perm												
v/c Ratio		0.65									0.22	
Uniform Delay, d1		28.0									10.1	
Progression Factor		1.05									0.43	
Incremental Delay, d2		2.1									0.0	
Delay (s)		31.4									4.4	
Level of Service		C									A	
Approach Delay (s)		31.4			0.0			0.0			4.4	
Approach LOS		C			A			A			A	

Intersection Summary			
HCM 2000 Control Delay	20.6	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.37		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	14.0
Intersection Capacity Utilization	39.8%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	WBT	WBR	SWL	SWR
Lane Configurations			↑↑↑			↱
Volume (vph)	0	0	670	0	0	190
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)			7.0			7.0
Lane Util. Factor			0.91			1.00
Frt			1.00			0.86
Flt Protected			1.00			1.00
Satd. Flow (prot)			5085			1611
Flt Permitted			1.00			1.00
Satd. Flow (perm)			5085			1611
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	728	0	0	207
RTOR Reduction (vph)	0	0	0	0	0	139
Lane Group Flow (vph)	0	0	728	0	0	68
Turn Type			NA			Prot
Protected Phases			8			4
Permitted Phases						
Actuated Green, G (s)			50.0			26.0
Effective Green, g (s)			50.0			26.0
Actuated g/C Ratio			0.56			0.29
Clearance Time (s)			7.0			7.0
Vehicle Extension (s)			3.0			3.0
Lane Grp Cap (vph)			2825			465
v/s Ratio Prot			c0.14			c0.04
v/s Ratio Perm						
v/c Ratio			0.26			0.15
Uniform Delay, d1			10.4			23.8
Progression Factor			0.15			1.00
Incremental Delay, d2			0.0			0.7
Delay (s)			1.6			24.4
Level of Service			A			C
Approach Delay (s)		0.0	1.6		24.4	
Approach LOS		A	A		C	

Intersection Summary			
HCM 2000 Control Delay	6.6	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.22		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	14.0
Intersection Capacity Utilization	39.7%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBT	EBR	WBL	WBT	NWL	NWR
Lane Configurations						
Volume (vph)	0	0	0	580	385	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)				7.0	7.0	
Lane Util. Factor				0.91	0.97	
Frt				1.00	1.00	
Flt Protected				1.00	0.95	
Satd. Flow (prot)				5085	3433	
Flt Permitted				1.00	0.95	
Satd. Flow (perm)				5085	3433	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	630	418	0
RTOR Reduction (vph)	0	0	0	0	297	0
Lane Group Flow (vph)	0	0	0	630	121	0
Turn Type				NA	Prot	
Protected Phases				8	4	
Permitted Phases						
Actuated Green, G (s)				50.0	26.0	
Effective Green, g (s)				50.0	26.0	
Actuated g/C Ratio				0.56	0.29	
Clearance Time (s)				7.0	7.0	
Vehicle Extension (s)				3.0	3.0	
Lane Grp Cap (vph)				2825	991	
v/s Ratio Prot				c0.12	c0.04	
v/s Ratio Perm						
v/c Ratio				0.22	0.12	
Uniform Delay, d1				10.1	23.6	
Progression Factor				0.03	1.00	
Incremental Delay, d2				0.0	0.3	
Delay (s)				0.3	23.8	
Level of Service				A	C	
Approach Delay (s)	0.0			0.3	23.8	
Approach LOS	A			A	C	

Intersection Summary			
HCM 2000 Control Delay	9.7	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.19		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	14.0
Intersection Capacity Utilization	33.9%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations		↑↑↑									↑↑↑	
Volume (vph)	0	780	0	0	0	0	0	0	0	0	670	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		7.0									7.0	
Lane Util. Factor		0.91									0.91	
Frt		1.00									1.00	
Flt Protected		1.00									1.00	
Satd. Flow (prot)		5085									5085	
Flt Permitted		1.00									1.00	
Satd. Flow (perm)		5085									5085	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	848	0	0	0	0	0	0	0	0	728	0
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	848	0	0	0	0	0	0	0	0	728	0
Turn Type		NA									NA	
Protected Phases		4									8	
Permitted Phases												
Actuated Green, G (s)		26.0									50.0	
Effective Green, g (s)		26.0									50.0	
Actuated g/C Ratio		0.29									0.56	
Clearance Time (s)		7.0									7.0	
Vehicle Extension (s)		3.0									3.0	
Lane Grp Cap (vph)		1469									2825	
v/s Ratio Prot		c0.17									c0.14	
v/s Ratio Perm												
v/c Ratio		0.58									0.26	
Uniform Delay, d1		27.3									10.4	
Progression Factor		1.43									0.62	
Incremental Delay, d2		1.5									0.0	
Delay (s)		40.6									6.4	
Level of Service		D									A	
Approach Delay (s)		40.6			0.0			0.0			6.4	
Approach LOS		D			A			A			A	

Intersection Summary			
HCM 2000 Control Delay	24.8	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.37		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	14.0
Intersection Capacity Utilization	39.7%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (vph)	65	1075	735	125	185	165
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	6.0	6.0	6.0	6.0	6.0
Lane Util. Factor	1.00	0.95	0.95	1.00	0.97	1.00
Frt	1.00	1.00	1.00	0.85	1.00	0.85
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1770	3539	3539	1583	3433	1583
Flt Permitted	0.28	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	525	3539	3539	1583	3433	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	71	1168	799	136	201	179
RTOR Reduction (vph)	0	0	0	74	0	137
Lane Group Flow (vph)	71	1168	799	62	201	42
Turn Type	pm+pt	NA	NA	Perm	Prot	Perm
Protected Phases	7	4	8		6	
Permitted Phases	4			8		6
Actuated Green, G (s)	59.0	57.0	40.7	40.7	21.0	21.0
Effective Green, g (s)	59.0	57.0	40.7	40.7	21.0	21.0
Actuated g/C Ratio	0.66	0.63	0.45	0.45	0.23	0.23
Clearance Time (s)	4.0	6.0	6.0	6.0	6.0	6.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	514	2241	1600	715	801	369
v/s Ratio Prot	0.02	c0.33	0.23		c0.06	
v/s Ratio Perm	0.07			0.04		0.03
v/c Ratio	0.14	0.52	0.50	0.09	0.25	0.11
Uniform Delay, d1	10.0	9.0	17.4	14.0	28.1	27.2
Progression Factor	1.00	1.00	1.29	2.86	1.00	1.00
Incremental Delay, d2	0.1	0.9	0.2	0.1	0.8	0.6
Delay (s)	10.1	9.9	22.7	40.3	28.8	27.8
Level of Service	B	A	C	D	C	C
Approach Delay (s)		9.9	25.2		28.3	
Approach LOS		A	C		C	

Intersection Summary			
HCM 2000 Control Delay	18.3	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.47		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	45.0%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis
29: Old Courthouse Rd

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Volume (vph)	25	10	195	50	5	200
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	27	11	212	54	5	217

Direction, Lane #	EB 1	WB 1	WB 2	NB 1	NB 2
Volume Total (vph)	38	212	54	5	217
Volume Left (vph)	0	212	0	5	0
Volume Right (vph)	11	0	0	0	217
Hadj (s)	-0.14	0.53	0.03	0.53	-0.67
Departure Headway (s)	5.1	5.6	5.1	5.8	4.6
Degree Utilization, x	0.05	0.33	0.08	0.01	0.28
Capacity (veh/h)	663	616	673	586	736
Control Delay (s)	8.4	10.2	7.3	7.7	8.3
Approach Delay (s)	8.4	9.6		8.2	
Approach LOS	A	A		A	

Intersection Summary			
Delay	8.9		
Level of Service	A		
Intersection Capacity Utilization	27.5%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
31: Wyche Rd & PnR Road

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	0	35	85	205	205	0
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	38	92	223	223	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)				596		
pX, platoon unblocked	0.99					
vC, conflicting volume	630	223	223			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	622	223	223			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	95	93			
cM capacity (veh/h)	415	817	1346			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1
Volume Total	38	92	223	223
Volume Left	0	92	0	0
Volume Right	38	0	0	0
cSH	817	1346	1700	1700
Volume to Capacity	0.05	0.07	0.13	0.13
Queue Length 95th (ft)	4	6	0	0
Control Delay (s)	9.6	7.9	0.0	0.0
Lane LOS	A	A		
Approach Delay (s)	9.6	2.3		0.0
Approach LOS	A			

Intersection Summary			
Average Delay	1.9		
Intersection Capacity Utilization	28.8%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis
35: Wyche Rd & Rt 630 #1

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Volume (vph)	235	1140	65	50	915	40	20	15	15	20	65	155
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0		6.0	6.0	6.0	6.0	6.0		6.0	6.0	4.0
Lane Util. Factor	1.00	0.91		1.00	0.95	1.00	1.00	1.00		1.00	1.00	1.00
Frt	1.00	0.99		1.00	1.00	0.85	1.00	0.93		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1770	5044		1770	3539	1583	1770	1723		1770	1863	1583
Flt Permitted	0.12	1.00		0.20	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	229	5044		369	3539	1583	1770	1723		1770	1863	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	255	1239	71	54	995	43	22	16	16	22	71	168
RTOR Reduction (vph)	0	4	0	0	0	26	0	15	0	0	0	0
Lane Group Flow (vph)	255	1306	0	54	995	17	22	17	0	22	71	168
Turn Type	pm+pt	NA		pm+pt	NA	Perm	Split	NA		Split	NA	Free
Protected Phases	7	4		3	8		2	2		6	6	
Permitted Phases	4			8		8						Free
Actuated Green, G (s)	49.8	49.8		36.6	36.6	36.6	4.5	4.5		7.7	7.7	90.0
Effective Green, g (s)	49.8	49.8		36.6	36.6	36.6	4.5	4.5		7.7	7.7	90.0
Actuated g/C Ratio	0.55	0.55		0.41	0.41	0.41	0.05	0.05		0.09	0.09	1.00
Clearance Time (s)	6.0	6.0		6.0	6.0	6.0	6.0	6.0		6.0	6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	421	2791		212	1439	643	88	86		151	159	1583
v/s Ratio Prot	c0.12	0.26		0.01	c0.28		c0.01	0.01		0.01	c0.04	
v/s Ratio Perm	0.22			0.09		0.01						0.11
v/c Ratio	0.61	0.47		0.25	0.69	0.03	0.25	0.20		0.15	0.45	0.11
Uniform Delay, d1	16.4	12.1		18.6	22.0	16.0	41.1	41.0		38.1	39.1	0.0
Progression Factor	1.64	1.42		1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	1.8	0.4		0.6	2.7	0.1	1.5	1.1		0.4	2.0	0.1
Delay (s)	28.8	17.7		19.2	24.8	16.1	42.6	42.1		38.6	41.1	0.1
Level of Service	C	B		B	C	B	D	D		D	D	A
Approach Delay (s)		19.5			24.2			42.3			14.5	
Approach LOS		B			C			D			B	

Intersection Summary			
HCM 2000 Control Delay	21.2	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.61		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	24.0
Intersection Capacity Utilization	61.1%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	WBT	WBR	SEL	SER
Lane Configurations		↑↑↑			↰↰	
Volume (vph)	0	580	0	0	610	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)		7.0			7.0	
Lane Util. Factor		0.91			0.97	
Frt		1.00			1.00	
Flt Protected		1.00			0.95	
Satd. Flow (prot)		5085			3433	
Flt Permitted		1.00			0.95	
Satd. Flow (perm)		5085			3433	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	630	0	0	663	0
RTOR Reduction (vph)	0	0	0	0	133	0
Lane Group Flow (vph)	0	630	0	0	530	0
Turn Type		NA			Prot	
Protected Phases		4			8	
Permitted Phases						
Actuated Green, G (s)		39.0			47.0	
Effective Green, g (s)		39.0			47.0	
Actuated g/C Ratio		0.39			0.47	
Clearance Time (s)		7.0			7.0	
Vehicle Extension (s)		3.0			3.0	
Lane Grp Cap (vph)		1983			1613	
v/s Ratio Prot		c0.12			c0.15	
v/s Ratio Perm						
v/c Ratio		0.32			0.33	
Uniform Delay, d1		21.2			16.6	
Progression Factor		0.32			1.00	
Incremental Delay, d2		0.4			0.5	
Delay (s)		7.3			17.2	
Level of Service		A			B	
Approach Delay (s)		7.3	0.0		17.2	
Approach LOS		A	A		B	

Intersection Summary			
HCM 2000 Control Delay	12.3	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.32		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	14.0
Intersection Capacity Utilization	40.3%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBT	EBR	WBL	WBT	NEL	NER
Lane Configurations	↑↑↑					↱
Volume (vph)	975	0	0	0	0	415
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	7.0					7.0
Lane Util. Factor	0.91					1.00
Frt	1.00					0.86
Flt Protected	1.00					1.00
Satd. Flow (prot)	5085					1611
Flt Permitted	1.00					1.00
Satd. Flow (perm)	5085					1611
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	1060	0	0	0	0	451
RTOR Reduction (vph)	0	0	0	0	0	14
Lane Group Flow (vph)	1060	0	0	0	0	437
Turn Type	NA					Prot
Protected Phases	4					8
Permitted Phases						
Actuated Green, G (s)	39.0					47.0
Effective Green, g (s)	39.0					47.0
Actuated g/C Ratio	0.39					0.47
Clearance Time (s)	7.0					7.0
Vehicle Extension (s)	3.0					3.0
Lane Grp Cap (vph)	1983					757
v/s Ratio Prot	c0.21					c0.27
v/s Ratio Perm						
v/c Ratio	0.53					0.58
Uniform Delay, d1	23.5					19.3
Progression Factor	0.05					1.00
Incremental Delay, d2	0.9					3.2
Delay (s)	2.1					22.5
Level of Service	A					C
Approach Delay (s)	2.1			0.0	22.5	
Approach LOS	A			A	C	

Intersection Summary			
HCM 2000 Control Delay	8.2	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.56		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	14.0
Intersection Capacity Utilization	56.2%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations		↑↑↑									↑↑↑	
Volume (vph)	0	975	0	0	0	0	0	0	0	0	1275	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		7.0									7.0	
Lane Util. Factor		0.91									0.91	
Frt		1.00									1.00	
Flt Protected		1.00									1.00	
Satd. Flow (prot)		5085									5085	
Flt Permitted		1.00									1.00	
Satd. Flow (perm)		5085									5085	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	1060	0	0	0	0	0	0	0	0	1386	0
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	1060	0	0	0	0	0	0	0	0	1386	0
Turn Type		NA									NA	
Protected Phases		4									8	
Permitted Phases												
Actuated Green, G (s)		39.0									47.0	
Effective Green, g (s)		39.0									47.0	
Actuated g/C Ratio		0.39									0.47	
Clearance Time (s)		7.0									7.0	
Vehicle Extension (s)		3.0									3.0	
Lane Grp Cap (vph)		1983									2389	
v/s Ratio Prot		c0.21									c0.27	
v/s Ratio Perm												
v/c Ratio		0.53									0.58	
Uniform Delay, d1		23.5									19.3	
Progression Factor		0.86									0.45	
Incremental Delay, d2		1.0									0.8	
Delay (s)		21.1									9.6	
Level of Service		C									A	
Approach Delay (s)		21.1			0.0			0.0			9.6	
Approach LOS		C			A			A			A	

Intersection Summary			
HCM 2000 Control Delay	14.6	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.56		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	14.0
Intersection Capacity Utilization	55.1%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	WBT	WBR	SWL	SWR
Lane Configurations			↑↑↑			↱
Volume (vph)	0	0	1115	0	0	390
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)			7.0			7.0
Lane Util. Factor			0.91			1.00
Frt			1.00			0.86
Flt Protected			1.00			1.00
Satd. Flow (prot)			5085			1611
Flt Permitted			1.00			1.00
Satd. Flow (perm)			5085			1611
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	1212	0	0	424
RTOR Reduction (vph)	0	0	0	0	0	20
Lane Group Flow (vph)	0	0	1212	0	0	404
Turn Type			NA			Prot
Protected Phases			8			4
Permitted Phases						
Actuated Green, G (s)			47.0			39.0
Effective Green, g (s)			47.0			39.0
Actuated g/C Ratio			0.47			0.39
Clearance Time (s)			7.0			7.0
Vehicle Extension (s)			3.0			3.0
Lane Grp Cap (vph)			2389			628
v/s Ratio Prot			c0.24			c0.25
v/s Ratio Perm						
v/c Ratio			0.51			0.64
Uniform Delay, d1			18.4			24.8
Progression Factor			0.08			1.00
Incremental Delay, d2			0.7			5.0
Delay (s)			2.1			29.8
Level of Service			A			C
Approach Delay (s)		0.0	2.1		29.8	
Approach LOS		A	A		C	

Intersection Summary			
HCM 2000 Control Delay	9.3	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.57		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	14.0
Intersection Capacity Utilization	57.4%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBT	EBR	WBL	WBT	NWL	NWR
Lane Configurations				↑↑↑	↰↰	
Volume (vph)	0	0	0	1275	510	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)				7.0	7.0	
Lane Util. Factor				0.91	0.97	
Frt				1.00	1.00	
Flt Protected				1.00	0.95	
Satd. Flow (prot)				5085	3433	
Flt Permitted				1.00	0.95	
Satd. Flow (perm)				5085	3433	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	1386	554	0
RTOR Reduction (vph)	0	0	0	0	23	0
Lane Group Flow (vph)	0	0	0	1386	531	0
Turn Type				NA	Prot	
Protected Phases				8	4	
Permitted Phases						
Actuated Green, G (s)				47.0	39.0	
Effective Green, g (s)				47.0	39.0	
Actuated g/C Ratio				0.47	0.39	
Clearance Time (s)				7.0	7.0	
Vehicle Extension (s)				3.0	3.0	
Lane Grp Cap (vph)				2389	1338	
v/s Ratio Prot				c0.27	c0.15	
v/s Ratio Perm						
v/c Ratio				0.58	0.40	
Uniform Delay, d1				19.3	22.0	
Progression Factor				0.10	1.00	
Incremental Delay, d2				0.8	0.9	
Delay (s)				2.8	22.9	
Level of Service				A	C	
Approach Delay (s)	0.0			2.8	22.9	
Approach LOS	A			A	C	

Intersection Summary			
HCM 2000 Control Delay	8.5	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.50		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	14.0
Intersection Capacity Utilization	50.9%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
24: Rt 630 #1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations		↑↑↑									↑↑↑	
Volume (vph)	0	580	0	0	0	0	0	0	0	0	1115	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		7.0									7.0	
Lane Util. Factor		0.91									0.91	
Frt		1.00									1.00	
Flt Protected		1.00									1.00	
Satd. Flow (prot)		5085									5085	
Flt Permitted		1.00									1.00	
Satd. Flow (perm)		5085									5085	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	630	0	0	0	0	0	0	0	0	1212	0
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	630	0	0	0	0	0	0	0	0	1212	0
Turn Type		NA									NA	
Protected Phases		4									8	
Permitted Phases												
Actuated Green, G (s)		39.0									47.0	
Effective Green, g (s)		39.0									47.0	
Actuated g/C Ratio		0.39									0.47	
Clearance Time (s)		7.0									7.0	
Vehicle Extension (s)		3.0									3.0	
Lane Grp Cap (vph)		1983									2389	
v/s Ratio Prot		c0.12									c0.24	
v/s Ratio Perm												
v/c Ratio		0.32									0.51	
Uniform Delay, d1		21.2									18.4	
Progression Factor		0.96									0.94	
Incremental Delay, d2		0.4									0.7	
Delay (s)		20.8									18.0	
Level of Service		C									B	
Approach Delay (s)		20.8			0.0			0.0			18.0	
Approach LOS		C			A			A			B	

Intersection Summary			
HCM 2000 Control Delay	19.0	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.42		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	14.0
Intersection Capacity Utilization	57.4%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (vph)	40	765	1235	270	245	60
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	6.0	6.0	6.0	6.0	6.0
Lane Util. Factor	1.00	0.95	0.95	1.00	0.97	1.00
Frt	1.00	1.00	1.00	0.85	1.00	0.85
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1770	3539	3539	1583	3433	1583
Flt Permitted	0.11	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	208	3539	3539	1583	3433	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	43	832	1342	293	266	65
RTOR Reduction (vph)	0	0	0	131	0	49
Lane Group Flow (vph)	43	832	1342	162	266	16
Turn Type	pm+pt	NA	NA	Perm	Prot	Perm
Protected Phases	7	4	8		6	
Permitted Phases	4			8		6
Actuated Green, G (s)	63.0	63.0	55.4	55.4	25.0	25.0
Effective Green, g (s)	63.0	63.0	55.4	55.4	25.0	25.0
Actuated g/C Ratio	0.63	0.63	0.55	0.55	0.25	0.25
Clearance Time (s)	4.0	6.0	6.0	6.0	6.0	6.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	187	2229	1960	876	858	395
v/s Ratio Prot	0.01	c0.24	c0.38		c0.08	
v/s Ratio Perm	0.14			0.10		0.01
v/c Ratio	0.23	0.37	0.68	0.19	0.31	0.04
Uniform Delay, d1	11.1	8.9	16.0	11.1	30.5	28.4
Progression Factor	1.00	1.00	0.52	0.09	1.00	1.00
Incremental Delay, d2	0.6	0.1	1.7	0.4	0.9	0.2
Delay (s)	11.7	9.1	10.0	1.4	31.4	28.6
Level of Service	B	A	B	A	C	C
Approach Delay (s)		9.2	8.5		30.9	
Approach LOS		A	A		C	

Intersection Summary			
HCM 2000 Control Delay	11.3	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.57		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	51.1%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis
29: Old Courthouse Rd

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Volume (vph)	55	10	245	30	10	185
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	60	11	266	33	11	201

Direction, Lane #	EB 1	WB 1	WB 2	NB 1	NB 2
Volume Total (vph)	71	266	33	11	201
Volume Left (vph)	0	266	0	11	0
Volume Right (vph)	11	0	0	0	201
Hadj (s)	-0.06	0.53	0.03	0.53	-0.67
Departure Headway (s)	5.2	5.7	5.2	6.0	4.8
Degree Utilization, x	0.10	0.42	0.05	0.02	0.27
Capacity (veh/h)	650	615	669	564	702
Control Delay (s)	8.8	11.5	7.2	7.9	8.4
Approach Delay (s)	8.8	11.0		8.4	
Approach LOS	A	B		A	

Intersection Summary			
Delay	9.8		
Level of Service	A		
Intersection Capacity Utilization	30.2%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	0	365	110	195	255	0
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	397	120	212	277	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)				596		
pX, platoon unblocked						
vC, conflicting volume	728	277	277			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	728	277	277			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	48	91			
cM capacity (veh/h)	354	762	1286			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1
Volume Total	397	120	212	277
Volume Left	0	120	0	0
Volume Right	397	0	0	0
cSH	762	1286	1700	1700
Volume to Capacity	0.52	0.09	0.12	0.16
Queue Length 95th (ft)	76	8	0	0
Control Delay (s)	14.7	8.1	0.0	0.0
Lane LOS	B	A		
Approach Delay (s)	14.7	2.9		0.0
Approach LOS	B			

Intersection Summary			
Average Delay	6.8		
Intersection Capacity Utilization	52.1%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis
35: Wyche Rd & Rt 630 #1

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Volume (vph)	220	1155	15	20	1280	35	80	50	50	50	20	550
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0		6.0	6.0	6.0	6.0	6.0		6.0	6.0	4.0
Lane Util. Factor	1.00	0.91		1.00	0.95	1.00	1.00	1.00		1.00	1.00	1.00
Frt	1.00	1.00		1.00	1.00	0.85	1.00	0.93		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1770	5076		1770	3539	1583	1770	1723		1770	1863	1583
Flt Permitted	0.09	1.00		0.17	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	161	5076		312	3539	1583	1770	1723		1770	1863	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	239	1255	16	22	1391	38	87	54	54	54	22	598
RTOR Reduction (vph)	0	1	0	0	0	20	0	39	0	0	0	0
Lane Group Flow (vph)	239	1270	0	22	1391	18	87	69	0	54	22	598
Turn Type	pm+pt	NA		pm+pt	NA	Perm	Split	NA		Split	NA	Free
Protected Phases	7	4		3	8		2	2		6	6	
Permitted Phases	4			8		8						Free
Actuated Green, G (s)	64.4	56.8		49.4	47.8	47.8	10.2	10.2		7.4	7.4	100.0
Effective Green, g (s)	64.4	56.8		49.4	47.8	47.8	10.2	10.2		7.4	7.4	100.0
Actuated g/C Ratio	0.64	0.57		0.49	0.48	0.48	0.10	0.10		0.07	0.07	1.00
Clearance Time (s)	6.0	6.0		6.0	6.0	6.0	6.0	6.0		6.0	6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	274	2883		177	1691	756	180	175		130	137	1583
v/s Ratio Prot	c0.09	0.25		0.00	0.39		0.05	0.04		0.03	0.01	
v/s Ratio Perm	c0.47			0.06		0.01						c0.38
v/c Ratio	0.87	0.44		0.12	0.82	0.02	0.48	0.40		0.42	0.16	0.38
Uniform Delay, d1	31.6	12.4		18.9	22.5	13.8	42.4	42.0		44.2	43.4	0.0
Progression Factor	0.87	0.57		1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	21.8	0.4		0.3	4.7	0.1	2.0	1.5		2.1	0.6	0.7
Delay (s)	49.2	7.5		19.2	27.1	13.8	44.5	43.5		46.4	43.9	0.7
Level of Service	D	A		B	C	B	D	D		D	D	A
Approach Delay (s)		14.1			26.6			43.9			5.8	
Approach LOS		B			C			D			A	

Intersection Summary			
HCM 2000 Control Delay	18.9	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.86		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	24.0
Intersection Capacity Utilization	73.7%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	WBT	WBR	SEL	SER
Lane Configurations		↑↑↑			↰↰	
Volume (vph)	0	1355	0	0	560	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)		7.0			7.0	
Lane Util. Factor		0.91			0.97	
Frt		1.00			1.00	
Flt Protected		1.00			0.95	
Satd. Flow (prot)		5085			3433	
Flt Permitted		1.00			0.95	
Satd. Flow (perm)		5085			3433	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	1473	0	0	609	0
RTOR Reduction (vph)	0	0	0	0	2	0
Lane Group Flow (vph)	0	1473	0	0	607	0
Turn Type		NA			Prot	
Protected Phases		4			8	
Permitted Phases						
Actuated Green, G (s)		41.0			65.0	
Effective Green, g (s)		41.0			65.0	
Actuated g/C Ratio		0.34			0.54	
Clearance Time (s)		7.0			7.0	
Vehicle Extension (s)		3.0			3.0	
Lane Grp Cap (vph)		1737			1859	
v/s Ratio Prot		c0.29			c0.18	
v/s Ratio Perm						
v/c Ratio		0.85			0.33	
Uniform Delay, d1		36.6			15.3	
Progression Factor		0.10			1.00	
Incremental Delay, d2		2.8			0.1	
Delay (s)		6.3			15.4	
Level of Service		A			B	
Approach Delay (s)		6.3	0.0		15.4	
Approach LOS		A	A		B	

Intersection Summary			
HCM 2000 Control Delay	9.0	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.53		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	14.0
Intersection Capacity Utilization	53.8%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBT	EBR	WBL	WBT	NEL	NER
Lane Configurations	↑↑↑					↱
Volume (vph)	1320	0	0	0	0	685
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	7.0					7.0
Lane Util. Factor	0.91					1.00
Frt	1.00					0.86
Flt Protected	1.00					1.00
Satd. Flow (prot)	5085					1611
Flt Permitted	1.00					1.00
Satd. Flow (perm)	5085					1611
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	1435	0	0	0	0	745
RTOR Reduction (vph)	0	0	0	0	0	1
Lane Group Flow (vph)	1435	0	0	0	0	744
Turn Type	NA					Prot
Protected Phases	4					8
Permitted Phases						
Actuated Green, G (s)	41.0					65.0
Effective Green, g (s)	41.0					65.0
Actuated g/C Ratio	0.34					0.54
Clearance Time (s)	7.0					7.0
Vehicle Extension (s)	3.0					3.0
Lane Grp Cap (vph)	1737					872
v/s Ratio Prot	c0.28					c0.46
v/s Ratio Perm						
v/c Ratio	0.83					0.85
Uniform Delay, d1	36.2					23.4
Progression Factor	0.15					1.00
Incremental Delay, d2	2.5					8.1
Delay (s)	8.1					31.5
Level of Service	A					C
Approach Delay (s)	8.1			0.0	31.5	
Approach LOS	A			A	C	

Intersection Summary			
HCM 2000 Control Delay	16.1	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.84		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	14.0
Intersection Capacity Utilization	79.6%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations		↑↑↑									↑↑↑	
Volume (vph)	0	1320	0	0	0	0	0	0	0	0	845	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		7.0									7.0	
Lane Util. Factor		0.91									0.91	
Frt		1.00									1.00	
Flt Protected		1.00									1.00	
Satd. Flow (prot)		5085									5085	
Flt Permitted		1.00									1.00	
Satd. Flow (perm)		5085									5085	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	1435	0	0	0	0	0	0	0	0	918	0
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	1435	0	0	0	0	0	0	0	0	918	0
Turn Type		NA									NA	
Protected Phases		4									8	
Permitted Phases												
Actuated Green, G (s)		41.0									65.0	
Effective Green, g (s)		41.0									65.0	
Actuated g/C Ratio		0.34									0.54	
Clearance Time (s)		7.0									7.0	
Vehicle Extension (s)		3.0									3.0	
Lane Grp Cap (vph)		1737									2754	
v/s Ratio Prot		c0.28									c0.18	
v/s Ratio Perm												
v/c Ratio		0.83									0.33	
Uniform Delay, d1		36.2									15.4	
Progression Factor		0.96									1.48	
Incremental Delay, d2		3.7									0.0	
Delay (s)		38.4									22.8	
Level of Service		D									C	
Approach Delay (s)		38.4			0.0			0.0			22.8	
Approach LOS		D			A			A			C	

Intersection Summary			
HCM 2000 Control Delay	32.3	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.52		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	14.0
Intersection Capacity Utilization	70.2%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	WBT	WBR	SWL	SWR
Lane Configurations			↑↑↑			↱
Volume (vph)	0	0	1060	0	0	290
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)			7.0			7.0
Lane Util. Factor			0.91			1.00
Frt			1.00			0.86
Flt Protected			1.00			1.00
Satd. Flow (prot)			5085			1611
Flt Permitted			1.00			1.00
Satd. Flow (perm)			5085			1611
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	1152	0	0	315
RTOR Reduction (vph)	0	0	0	0	0	42
Lane Group Flow (vph)	0	0	1152	0	0	273
Turn Type			NA			Prot
Protected Phases			8			4
Permitted Phases						
Actuated Green, G (s)			65.0			41.0
Effective Green, g (s)			65.0			41.0
Actuated g/C Ratio			0.54			0.34
Clearance Time (s)			7.0			7.0
Vehicle Extension (s)			3.0			3.0
Lane Grp Cap (vph)			2754			550
v/s Ratio Prot			c0.23			c0.17
v/s Ratio Perm						
v/c Ratio			0.42			0.50
Uniform Delay, d1			16.3			31.3
Progression Factor			0.08			1.00
Incremental Delay, d2			0.1			3.2
Delay (s)			1.4			34.5
Level of Service			A			C
Approach Delay (s)		0.0	1.4		34.5	
Approach LOS		A	A		C	

Intersection Summary			
HCM 2000 Control Delay	8.5	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.45		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	14.0
Intersection Capacity Utilization	58.3%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBT	EBR	WBL	WBT	NWL	NWR
Lane Configurations						
Volume (vph)	0	0	0	845	590	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)				7.0	7.0	
Lane Util. Factor				0.91	0.97	
Frt				1.00	1.00	
Flt Protected				1.00	0.95	
Satd. Flow (prot)				5085	3433	
Flt Permitted				1.00	0.95	
Satd. Flow (perm)				5085	3433	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	918	641	0
RTOR Reduction (vph)	0	0	0	0	148	0
Lane Group Flow (vph)	0	0	0	918	493	0
Turn Type				NA	Prot	
Protected Phases				8	4	
Permitted Phases						
Actuated Green, G (s)				65.0	41.0	
Effective Green, g (s)				65.0	41.0	
Actuated g/C Ratio				0.54	0.34	
Clearance Time (s)				7.0	7.0	
Vehicle Extension (s)				3.0	3.0	
Lane Grp Cap (vph)				2754	1172	
v/s Ratio Prot				c0.18	c0.14	
v/s Ratio Perm						
v/c Ratio				0.33	0.42	
Uniform Delay, d1				15.4	30.4	
Progression Factor				0.22	1.00	
Incremental Delay, d2				0.1	1.1	
Delay (s)				3.5	31.5	
Level of Service				A	C	
Approach Delay (s)	0.0			3.5	31.5	
Approach LOS	A			A	C	

Intersection Summary			
HCM 2000 Control Delay	15.0	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.37		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	14.0
Intersection Capacity Utilization	44.8%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations		↑↑↑									↑↑↑	
Volume (vph)	0	1355	0	0	0	0	0	0	0	0	1060	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		7.0									7.0	
Lane Util. Factor		0.91									0.91	
Frt		1.00									1.00	
Flt Protected		1.00									1.00	
Satd. Flow (prot)		5085									5085	
Flt Permitted		1.00									1.00	
Satd. Flow (perm)		5085									5085	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	1473	0	0	0	0	0	0	0	0	1152	0
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	1473	0	0	0	0	0	0	0	0	1152	0
Turn Type		NA									NA	
Protected Phases		4									8	
Permitted Phases												
Actuated Green, G (s)		41.0									65.0	
Effective Green, g (s)		41.0									65.0	
Actuated g/C Ratio		0.34									0.54	
Clearance Time (s)		7.0									7.0	
Vehicle Extension (s)		3.0									3.0	
Lane Grp Cap (vph)		1737									2754	
v/s Ratio Prot		c0.29									c0.23	
v/s Ratio Perm												
v/c Ratio		0.85									0.42	
Uniform Delay, d1		36.6									16.3	
Progression Factor		0.76									1.16	
Incremental Delay, d2		3.4									0.1	
Delay (s)		31.4									19.1	
Level of Service		C									B	
Approach Delay (s)		31.4			0.0			0.0			19.1	
Approach LOS		C			A			A			B	

Intersection Summary			
HCM 2000 Control Delay	26.0	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.58		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	14.0
Intersection Capacity Utilization	58.3%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
25: Rt 630 #1 & Austin Ridge

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (vph)	100	1690	1045	305	365	200
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	6.0	6.0	6.0	6.0	6.0
Lane Util. Factor	1.00	0.95	0.95	1.00	0.97	1.00
Frt	1.00	1.00	1.00	0.85	1.00	0.85
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1770	3539	3539	1583	3433	1583
Flt Permitted	0.13	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	241	3539	3539	1583	3433	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	109	1837	1136	332	397	217
RTOR Reduction (vph)	0	0	0	189	0	96
Lane Group Flow (vph)	109	1837	1136	143	397	121
Turn Type	pm+pt	NA	NA	Perm	Prot	Perm
Protected Phases	7	4	8		6	
Permitted Phases	4			8		6
Actuated Green, G (s)	75.0	73.0	51.8	51.8	35.0	35.0
Effective Green, g (s)	75.0	73.0	51.8	51.8	35.0	35.0
Actuated g/C Ratio	0.62	0.61	0.43	0.43	0.29	0.29
Clearance Time (s)	4.0	6.0	6.0	6.0	6.0	6.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	369	2152	1527	683	1001	461
v/s Ratio Prot	0.04	c0.52	0.32		c0.12	
v/s Ratio Perm	0.14			0.09		0.08
v/c Ratio	0.30	0.85	0.74	0.21	0.40	0.26
Uniform Delay, d1	28.9	19.1	28.5	21.3	34.0	32.6
Progression Factor	1.00	1.00	0.61	0.08	1.00	1.00
Incremental Delay, d2	0.4	4.6	1.8	0.1	1.2	1.4
Delay (s)	29.4	23.7	19.2	1.9	35.2	34.0
Level of Service	C	C	B	A	D	C
Approach Delay (s)		24.0	15.3		34.8	
Approach LOS		C	B		C	

Intersection Summary			
HCM 2000 Control Delay	22.5	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.73		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	67.1%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis
29: Old Courthouse Rd

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Volume (vph)	30	10	330	55	5	280
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	33	11	359	60	5	304

Direction, Lane #	EB 1	WB 1	WB 2	NB 1	NB 2
Volume Total (vph)	43	359	60	5	304
Volume Left (vph)	0	359	0	5	0
Volume Right (vph)	11	0	0	0	304
Hadj (s)	-0.12	0.53	0.03	0.53	-0.67
Departure Headway (s)	5.7	5.9	5.4	6.3	5.1
Degree Utilization, x	0.07	0.59	0.09	0.01	0.43
Capacity (veh/h)	588	589	634	537	667
Control Delay (s)	9.1	16.0	7.8	8.2	10.8
Approach Delay (s)	9.1	14.8		10.8	
Approach LOS	A	B		B	

Intersection Summary			
Delay	12.9		
Level of Service	B		
Intersection Capacity Utilization	34.9%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	0	50	130	285	340	0
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	54	141	310	370	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)				596		
pX, platoon unblocked	0.95					
vC, conflicting volume	962	370	370			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	934	370	370			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	92	88			
cM capacity (veh/h)	247	676	1189			

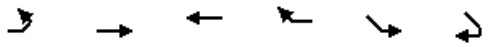
Direction, Lane #	EB 1	NB 1	NB 2	SB 1
Volume Total	54	141	310	370
Volume Left	0	141	0	0
Volume Right	54	0	0	0
cSH	676	1189	1700	1700
Volume to Capacity	0.08	0.12	0.18	0.22
Queue Length 95th (ft)	7	10	0	0
Control Delay (s)	10.8	8.4	0.0	0.0
Lane LOS	B	A		
Approach Delay (s)	10.8	2.6		0.0
Approach LOS	B			

Intersection Summary			
Average Delay	2.0		
Intersection Capacity Utilization	38.4%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis
35: Wyche Rd & Rt 630 #1

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Volume (vph)	330	1565	110	75	1580	60	75	25	25	30	90	270
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0		6.0	6.0	6.0	6.0	6.0		6.0	6.0	4.0
Lane Util. Factor	0.97	0.91		1.00	0.95	1.00	1.00	1.00		1.00	1.00	1.00
Frt	1.00	0.99		1.00	1.00	0.85	1.00	0.93		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	3433	5035		1770	3539	1583	1770	1723		1770	1863	1583
Flt Permitted	0.05	1.00		0.09	1.00	1.00	0.68	1.00		0.72	1.00	1.00
Satd. Flow (perm)	194	5035		166	3539	1583	1265	1723		1345	1863	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	359	1701	120	82	1717	65	82	27	27	33	98	293
RTOR Reduction (vph)	0	5	0	0	0	26	0	24	0	0	0	0
Lane Group Flow (vph)	359	1816	0	82	1717	39	82	30	0	33	98	293
Turn Type	pm+pt	NA		pm+pt	NA	pm+ov	pm+pt	NA		pm+pt	NA	Free
Protected Phases	7	4		3	8	1	5	2		1	6	
Permitted Phases	4			8		8	2			6		Free
Actuated Green, G (s)	86.3	74.7		76.1	69.6	72.8	14.8	11.6		14.8	11.6	120.0
Effective Green, g (s)	86.3	74.7		76.1	69.6	72.8	14.8	11.6		14.8	11.6	120.0
Actuated g/C Ratio	0.72	0.62		0.63	0.58	0.61	0.12	0.10		0.12	0.10	1.00
Clearance Time (s)	6.0	6.0		6.0	6.0	6.0	6.0	6.0		6.0	6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	452	3134		192	2052	1039	169	166		177	180	1583
v/s Ratio Prot	c0.08	c0.36		0.02	c0.49	0.00	0.01	0.02		0.00	c0.05	
v/s Ratio Perm	0.50			0.25		0.02	0.05			0.02		c0.19
v/c Ratio	0.79	0.58		0.43	0.84	0.04	0.49	0.18		0.19	0.54	0.19
Uniform Delay, d1	35.8	13.4		10.1	20.6	9.5	48.6	49.8		47.0	51.7	0.0
Progression Factor	0.53	1.70		1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	5.1	0.4		1.5	4.3	0.0	2.2	0.5		0.5	3.3	0.3
Delay (s)	24.0	23.2		11.6	24.8	9.5	50.7	50.3		47.5	55.0	0.3
Level of Service	C	C		B	C	A	D	D		D	E	A
Approach Delay (s)		23.3			23.7			50.6			16.6	
Approach LOS		C			C			D			B	

Intersection Summary			
HCM 2000 Control Delay	23.7	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.79		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	24.0
Intersection Capacity Utilization	78.9%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL	EBT	WBT	WBR	SEL	SER
Lane Configurations		↑↑↑			↰↰	
Volume (vph)	0	950	0	0	1195	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)		7.0			7.0	
Lane Util. Factor		0.91			0.97	
Frt		1.00			1.00	
Flt Protected		1.00			0.95	
Satd. Flow (prot)		5085			3433	
Flt Permitted		1.00			0.95	
Satd. Flow (perm)		5085			3433	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	1033	0	0	1299	0
RTOR Reduction (vph)	0	0	0	0	60	0
Lane Group Flow (vph)	0	1033	0	0	1239	0
Turn Type		NA			Prot	
Protected Phases		4			8	
Permitted Phases						
Actuated Green, G (s)		60.0			56.0	
Effective Green, g (s)		60.0			56.0	
Actuated g/C Ratio		0.46			0.43	
Clearance Time (s)		7.0			7.0	
Vehicle Extension (s)		3.0			3.0	
Lane Grp Cap (vph)		2346			1478	
v/s Ratio Prot		c0.20			c0.36	
v/s Ratio Perm						
v/c Ratio		0.44			0.84	
Uniform Delay, d1		23.7			33.0	
Progression Factor		0.05			1.00	
Incremental Delay, d2		0.6			5.9	
Delay (s)		1.6			38.8	
Level of Service		A			D	
Approach Delay (s)		1.6	0.0		38.8	
Approach LOS		A	A		D	

Intersection Summary			
HCM 2000 Control Delay	22.4	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.63		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	14.0
Intersection Capacity Utilization	64.1%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBT	EBR	WBL	WBT	NEL	NER
Lane Configurations	↑↑↑					↱
Volume (vph)	1870	0	0	0	0	510
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	7.0					7.0
Lane Util. Factor	0.91					1.00
Frt	1.00					0.86
Flt Protected	1.00					1.00
Satd. Flow (prot)	5085					1611
Flt Permitted	1.00					1.00
Satd. Flow (perm)	5085					1611
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	2033	0	0	0	0	554
RTOR Reduction (vph)	0	0	0	0	0	1
Lane Group Flow (vph)	2033	0	0	0	0	553
Turn Type	NA					Prot
Protected Phases	4					8
Permitted Phases						
Actuated Green, G (s)	60.0					56.0
Effective Green, g (s)	60.0					56.0
Actuated g/C Ratio	0.46					0.43
Clearance Time (s)	7.0					7.0
Vehicle Extension (s)	3.0					3.0
Lane Grp Cap (vph)	2346					693
v/s Ratio Prot	c0.40					c0.34
v/s Ratio Perm						
v/c Ratio	0.87					0.80
Uniform Delay, d1	31.4					32.1
Progression Factor	0.05					1.00
Incremental Delay, d2	2.3					9.3
Delay (s)	3.8					41.4
Level of Service	A					D
Approach Delay (s)	3.8			0.0	41.4	
Approach LOS	A			A	D	

Intersection Summary			
HCM 2000 Control Delay	11.8	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.83		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	14.0
Intersection Capacity Utilization	84.6%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations		↑↑↑									↑↑↑	
Volume (vph)	0	1870	0	0	0	0	0	0	0	0	1905	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		7.0									7.0	
Lane Util. Factor		0.91									0.91	
Frt		1.00									1.00	
Flt Protected		1.00									1.00	
Satd. Flow (prot)		5085									5085	
Flt Permitted		1.00									1.00	
Satd. Flow (perm)		5085									5085	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	2033	0	0	0	0	0	0	0	0	2071	0
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	2033	0	0	0	0	0	0	0	0	2071	0
Turn Type		NA									NA	
Protected Phases		4									8	
Permitted Phases												
Actuated Green, G (s)		60.0									56.0	
Effective Green, g (s)		60.0									56.0	
Actuated g/C Ratio		0.46									0.43	
Clearance Time (s)		7.0									7.0	
Vehicle Extension (s)		3.0									3.0	
Lane Grp Cap (vph)		2346									2190	
v/s Ratio Prot		c0.40									c0.41	
v/s Ratio Perm												
v/c Ratio		0.87									0.95	
Uniform Delay, d1		31.4									35.5	
Progression Factor		1.03									0.59	
Incremental Delay, d2		3.3									5.6	
Delay (s)		35.7									26.5	
Level of Service		D									C	
Approach Delay (s)		35.7			0.0			0.0			26.5	
Approach LOS		D			A			A			C	

Intersection Summary			
HCM 2000 Control Delay	31.1	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.90		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	14.0
Intersection Capacity Utilization	84.6%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	WBT	WBR	SWL	SWR
Lane Configurations			↑↑↑			↱
Volume (vph)	0	0	1865	0	0	580
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)			7.0			7.0
Lane Util. Factor			0.91			1.00
Frt			1.00			0.86
Flt Protected			1.00			1.00
Satd. Flow (prot)			5085			1611
Flt Permitted			1.00			1.00
Satd. Flow (perm)			5085			1611
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	2027	0	0	630
RTOR Reduction (vph)	0	0	0	0	0	1
Lane Group Flow (vph)	0	0	2027	0	0	629
Turn Type			NA			Prot
Protected Phases			8			4
Permitted Phases						
Actuated Green, G (s)			56.0			60.0
Effective Green, g (s)			56.0			60.0
Actuated g/C Ratio			0.43			0.46
Clearance Time (s)			7.0			7.0
Vehicle Extension (s)			3.0			3.0
Lane Grp Cap (vph)			2190			743
v/s Ratio Prot			c0.40			c0.39
v/s Ratio Perm						
v/c Ratio			0.93			0.85
Uniform Delay, d1			35.0			30.9
Progression Factor			0.12			1.00
Incremental Delay, d2			3.4			11.5
Delay (s)			7.6			42.5
Level of Service			A			D
Approach Delay (s)		0.0	7.6		42.5	
Approach LOS		A	A		D	

Intersection Summary			
HCM 2000 Control Delay	15.8	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.88		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	14.0
Intersection Capacity Utilization	83.6%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBT	EBR	WBL	WBT	NWL	NWR
Lane Configurations				↑↑↑	↰↰	
Volume (vph)	0	0	0	1905	865	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)				7.0	7.0	
Lane Util. Factor				0.91	0.97	
Frt				1.00	1.00	
Flt Protected				1.00	0.95	
Satd. Flow (prot)				5085	3433	
Flt Permitted				1.00	0.95	
Satd. Flow (perm)				5085	3433	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	2071	940	0
RTOR Reduction (vph)	0	0	0	0	1	0
Lane Group Flow (vph)	0	0	0	2071	939	0
Turn Type				NA	Prot	
Protected Phases				8	4	
Permitted Phases						
Actuated Green, G (s)				56.0	60.0	
Effective Green, g (s)				56.0	60.0	
Actuated g/C Ratio				0.43	0.46	
Clearance Time (s)				7.0	7.0	
Vehicle Extension (s)				3.0	3.0	
Lane Grp Cap (vph)				2190	1584	
v/s Ratio Prot				c0.41	c0.27	
v/s Ratio Perm						
v/c Ratio				0.95	0.59	
Uniform Delay, d1				35.5	25.9	
Progression Factor				0.12	1.00	
Incremental Delay, d2				4.1	1.6	
Delay (s)				8.3	27.6	
Level of Service				A	C	
Approach Delay (s)	0.0			8.3	27.6	
Approach LOS	A			A	C	

Intersection Summary			
HCM 2000 Control Delay	14.4	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.76		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	14.0
Intersection Capacity Utilization	73.2%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
24: Rt 630 #1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations		↑↑↑									↑↑↑	
Volume (vph)	0	950	0	0	0	0	0	0	0	0	1865	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		7.0									7.0	
Lane Util. Factor		0.91									0.91	
Frt		1.00									1.00	
Flt Protected		1.00									1.00	
Satd. Flow (prot)		5085									5085	
Flt Permitted		1.00									1.00	
Satd. Flow (perm)		5085									5085	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	1033	0	0	0	0	0	0	0	0	2027	0
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	1033	0	0	0	0	0	0	0	0	2027	0
Turn Type		NA									NA	
Protected Phases		4									8	
Permitted Phases												
Actuated Green, G (s)		60.0									56.0	
Effective Green, g (s)		60.0									56.0	
Actuated g/C Ratio		0.46									0.43	
Clearance Time (s)		7.0									7.0	
Vehicle Extension (s)		3.0									3.0	
Lane Grp Cap (vph)		2346									2190	
v/s Ratio Prot		c0.20									c0.40	
v/s Ratio Perm												
v/c Ratio		0.44									0.93	
Uniform Delay, d1		23.7									35.0	
Progression Factor		1.28									0.95	
Incremental Delay, d2		0.5									5.3	
Delay (s)		30.8									38.6	
Level of Service		C									D	
Approach Delay (s)		30.8			0.0			0.0			38.6	
Approach LOS		C			A			A			D	

Intersection Summary			
HCM 2000 Control Delay	36.0	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.67		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	14.0
Intersection Capacity Utilization	83.6%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
25: Rt 630 #1 & Austin Ridge

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (vph)	100	1270	1900	545	400	100
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	6.0	6.0	6.0	6.0	6.0
Lane Util. Factor	1.00	0.95	0.95	1.00	0.97	1.00
Frt	1.00	1.00	1.00	0.85	1.00	0.85
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1770	3539	3539	1583	3433	1583
Flt Permitted	0.04	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	80	3539	3539	1583	3433	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	109	1380	2065	592	435	109
RTOR Reduction (vph)	0	0	0	166	0	63
Lane Group Flow (vph)	109	1380	2065	426	435	46
Turn Type	pm+pt	NA	NA	Perm	Prot	Perm
Protected Phases	7	4	8		6	
Permitted Phases	4			8		6
Actuated Green, G (s)	100.0	98.0	87.0	87.0	20.0	20.0
Effective Green, g (s)	100.0	98.0	87.0	87.0	20.0	20.0
Actuated g/C Ratio	0.77	0.75	0.67	0.67	0.15	0.15
Clearance Time (s)	4.0	6.0	6.0	6.0	6.0	6.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	152	2667	2368	1059	528	243
v/s Ratio Prot	c0.04	0.39	c0.58		c0.13	
v/s Ratio Perm	0.51			0.27		0.03
v/c Ratio	0.72	0.52	0.87	0.40	0.82	0.19
Uniform Delay, d1	43.2	6.5	17.1	9.7	53.3	47.9
Progression Factor	1.00	1.00	0.46	0.00	1.00	1.00
Incremental Delay, d2	14.9	0.2	2.0	0.5	13.6	1.7
Delay (s)	58.1	6.6	9.9	0.5	66.9	49.6
Level of Service	E	A	A	A	E	D
Approach Delay (s)		10.4	7.8		63.4	
Approach LOS		B	A		E	

Intersection Summary			
HCM 2000 Control Delay	15.1	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.85		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	82.8%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Volume (vph)	60	15	300	35	10	365
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	65	16	326	38	11	397

Direction, Lane #	EB 1	WB 1	WB 2	NB 1	NB 2
Volume Total (vph)	82	326	38	11	397
Volume Left (vph)	0	326	0	11	0
Volume Right (vph)	16	0	0	0	397
Hadj (s)	-0.09	0.53	0.03	0.53	-0.67
Departure Headway (s)	6.0	6.3	5.8	6.4	5.2
Degree Utilization, x	0.14	0.57	0.06	0.02	0.57
Capacity (veh/h)	554	553	590	538	671
Control Delay (s)	9.9	16.0	7.9	8.3	13.6
Approach Delay (s)	9.9	15.2		13.4	
Approach LOS	A	C		B	

Intersection Summary			
Delay	13.8		
Level of Service	B		
Intersection Capacity Utilization	33.3%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	0	470	145	375	315	0
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	511	158	408	342	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)				596		
pX, platoon unblocked	0.94					
vC, conflicting volume	1065	342	342			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1036	342	342			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	27	87			
cM capacity (veh/h)	209	700	1217			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1
Volume Total	511	158	408	342
Volume Left	0	158	0	0
Volume Right	511	0	0	0
cSH	700	1217	1700	1700
Volume to Capacity	0.73	0.13	0.24	0.20
Queue Length 95th (ft)	159	11	0	0
Control Delay (s)	22.7	8.4	0.0	0.0
Lane LOS	C	A		
Approach Delay (s)	22.7	2.3		0.0
Approach LOS	C			

Intersection Summary			
Average Delay	9.1		
Intersection Capacity Utilization	63.7%	ICU Level of Service	B
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis
35: Wyche Rd & Rt 630 #1

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Volume (vph)	380	1895	105	25	1855	50	200	90	75	135	25	625
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0		6.0	6.0	6.0	6.0	6.0		6.0	6.0	4.0
Lane Util. Factor	0.97	0.91		1.00	0.95	1.00	1.00	1.00		1.00	1.00	1.00
Frt	1.00	0.99		1.00	1.00	0.85	1.00	0.93		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	3433	5045		1770	3539	1583	1770	1735		1770	1863	1583
Flt Permitted	0.06	1.00		0.06	1.00	1.00	0.46	1.00		0.64	1.00	1.00
Satd. Flow (perm)	209	5045		112	3539	1583	848	1735		1199	1863	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	413	2060	114	27	2016	54	217	98	82	147	27	679
RTOR Reduction (vph)	0	5	0	0	0	22	0	23	0	0	0	0
Lane Group Flow (vph)	413	2169	0	27	2016	32	217	157	0	147	27	679
Turn Type	pm+pt	NA		pm+pt	NA	pm+ov	pm+pt	NA		pm+pt	NA	Free
Protected Phases	7	4		3	8	1	5	2		1	6	
Permitted Phases	4			8		8	2			6		Free
Actuated Green, G (s)	80.5	80.5		71.6	71.6	77.6	29.1	17.1		15.6	9.6	130.0
Effective Green, g (s)	80.5	80.5		71.6	71.6	77.6	29.1	17.1		15.6	9.6	130.0
Actuated g/C Ratio	0.62	0.62		0.55	0.55	0.60	0.22	0.13		0.12	0.07	1.00
Clearance Time (s)	6.0	6.0		6.0	6.0	6.0	6.0	6.0		6.0	6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	409	3124		92	1949	1017	285	228		170	137	1583
v/s Ratio Prot	c0.09	0.43		0.01	c0.57	0.00	c0.08	0.09		0.04	0.01	
v/s Ratio Perm	0.54			0.16		0.02	c0.09			0.06		0.43
v/c Ratio	1.01	0.69		0.29	1.03	0.03	0.76	0.69		0.86	0.20	0.43
Uniform Delay, d1	43.8	16.5		26.1	29.2	10.8	45.0	53.9		55.3	56.6	0.0
Progression Factor	1.81	0.37		1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	33.8	0.6		1.8	29.9	0.0	11.4	8.7		33.8	0.7	0.9
Delay (s)	112.9	6.8		27.9	59.1	10.8	56.4	62.6		89.1	57.3	0.9
Level of Service	F	A		C	E	B	E	E		F	E	A
Approach Delay (s)		23.7			57.4			59.2			17.8	
Approach LOS		C			E			E			B	

Intersection Summary			
HCM 2000 Control Delay	37.2	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	1.00		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	24.0
Intersection Capacity Utilization	98.9%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

Alternative F
SimTraffic Reports
2037
AM & PM Peak Hour

2: Ramp C & Rt 630 #1 Performance by movement

Movement	EBT	EBR	All
Denied Del/Veh (s)	0.0	0.0	0.0
Total Del/Veh (s)	63.3	17.4	47.9

3: Ramp C Performance by movement

Movement	SBT	SER	All
Denied Del/Veh (s)	0.0	0.0	0.0
Total Del/Veh (s)	0.4	1.2	0.9

5: Rt 630 #1 & Ramp D Performance by movement

Movement	EBT	SEL	All
Denied Del/Veh (s)	0.0	0.0	0.0
Total Del/Veh (s)	9.2	14.8	11.1

6: Rt 630 #1 & Ramp A Performance by movement

Movement	EBL	EBT	All
Denied Del/Veh (s)	0.0	0.0	0.0
Total Del/Veh (s)	9.1	10.1	9.8

8: Ramp B & Rt 630 #1 Performance by movement

Movement	EBT	NER	All
Denied Del/Veh (s)	0.0	0.0	0.0
Total Del/Veh (s)	6.3	20.5	11.8

11: Rt 630 #1 Performance by movement

Movement	EBT	SWT	All
Denied Del/Veh (s)	0.0	0.0	0.0
Total Del/Veh (s)	22.0	6.5	15.5

12: Rt 630 #1 & Ramp D Performance by movement

Movement	WBT	SWR	All
Denied Del/Veh (s)	0.0	0.0	0.0
Total Del/Veh (s)	3.8	32.3	10.1

13: Ramp C & Rt 630 #1 Performance by movement

Movement	WBL	WBT	All
Denied Del/Veh (s)	0.0	0.0	0.0
Total Del/Veh (s)	13.8	15.2	14.8

14: Ramp B & Rt 630 #1 Performance by movement

Movement	WBT	NWL	All
Denied Del/Veh (s)	0.0	0.0	0.0
Total Del/Veh (s)	4.5	34.3	17.1

15: Ramp B Performance by movement

Movement	NBT	NBR	All
Denied Del/Veh (s)	0.5	0.4	0.4
Total Del/Veh (s)	10.2	4.1	6.9

16: Rt 630 #1 & Ramp A Performance by movement

Movement	WBT	WBR	All
Denied Del/Veh (s)	0.0	0.1	0.1
Total Del/Veh (s)	24.4	22.4	23.3

18: Ramp A Performance by movement

Movement	NBT	NWR	All
Denied Del/Veh (s)	0.0	0.0	0.0
Total Del/Veh (s)	1.3	2.0	1.8

20: Ramp D Performance by movement

Movement	SBT	SBR	All
Denied Del/Veh (s)	0.3	2.4	1.0
Total Del/Veh (s)	1.2	1.8	1.5

24: Rt 630 #1 Performance by movement

Movement	EBT	NWT	All
Denied Del/Veh (s)	0.0	0.0	0.0
Total Del/Veh (s)	21.2	17.5	19.3

25: Rt 630 #1 & Austin Ridge Performance by movement

Movement	EBL	EBT	WBT	WBR	SBL	SBR	All
Denied Del/Veh (s)	385.5	387.4	0.0	0.0	1.7	3.4	189.3
Total Del/Veh (s)	108.5	142.1	9.8	3.2	50.2	16.9	68.0

27: Rt 630 #1 Performance by movement

Movement	WBR	SET	All
Denied Del/Veh (s)	0.0	0.0	0.0
Total Del/Veh (s)	1.2	34.1	18.9

29: Old Courthouse Rd Performance by movement

Movement	EBT	EBR	WBL	WBT	NBL	NBR	All
Denied Del/Veh (s)	0.1	0.1	3.6	0.8	0.0	0.0	1.8
Total Del/Veh (s)	7.6	2.5	6.5	7.3	5.3	5.2	6.1

31: Wyche Rd & PnR Road Performance by movement

Movement	EBR	NBL	NBT	SBT	All
Denied Del/Veh (s)	0.0	0.0	0.0	0.0	0.0
Total Del/Veh (s)	2.8	5.2	1.7	0.9	1.9

35: Wyche Rd & Rt 630 #1 Performance by movement

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Denied Del/Veh (s)	0.0	0.0	0.0	91.9	105.4	112.0	4.0	0.4	0.3	0.0	0.0	0.0
Total Del/Veh (s)	30.2	12.6	11.7	45.3	82.0	107.5	78.2	51.8	24.6	56.1	52.6	2.4

35: Wyche Rd & Rt 630 #1 Performance by movement

Movement	All
Denied Del/Veh (s)	44.9
Total Del/Veh (s)	44.1

38: Rt 630 #1 Performance by movement

Movement	EBT	WBR	All
Denied Del/Veh (s)	0.0	0.0	0.0
Total Del/Veh (s)	1.8	10.5	6.1

Total Network Performance

Denied Del/Veh (s)	130.2
Total Del/Veh (s)	129.1

Intersection: 2: Ramp C & Rt 630 #1

Movement	EB	EB	EB	B10	B10	B10
Directions Served	T	T	TR	T	T	T
Maximum Queue (ft)	448	407	426	212	189	203
Average Queue (ft)	426	237	259	190	115	72
95th Queue (ft)	438	440	466	223	207	205
Link Distance (ft)	352	352	352	137	137	137
Upstream Blk Time (%)	74	3	4	68	10	5
Queuing Penalty (veh)	517	23	31	474	67	33
Storage Bay Dist (ft)						
Storage Blk Time (%)						
Queuing Penalty (veh)						

Intersection: 3: Ramp C

Movement	SB	SE
Directions Served	T	R
Maximum Queue (ft)	41	23
Average Queue (ft)	2	1
95th Queue (ft)	26	9
Link Distance (ft)	184	190
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 5: Rt 630 #1 & Ramp D

Movement	EB	EB	EB	SE	SE
Directions Served	T	T	T	L	L
Maximum Queue (ft)	94	53	35	197	171
Average Queue (ft)	71	16	5	116	101
95th Queue (ft)	90	46	24	179	165
Link Distance (ft)	47	47	47	184	184
Upstream Blk Time (%)	62	6	1	1	0
Queuing Penalty (veh)	287	26	4	1	0
Storage Bay Dist (ft)					
Storage Blk Time (%)					
Queuing Penalty (veh)					

Intersection: 6: Rt 630 #1 & Ramp A

Movement	EB	EB	EB	EB
Directions Served	L	T	T	T
Maximum Queue (ft)	15	192	168	160
Average Queue (ft)	1	100	85	58
95th Queue (ft)	11	173	156	136
Link Distance (ft)		408	408	408
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)	50			
Storage Blk Time (%)	0	29		
Queuing Penalty (veh)	0	175		

Intersection: 8: Ramp B & Rt 630 #1

Movement	EB	EB	EB	NE
Directions Served	T	T	T	R
Maximum Queue (ft)	72	86	86	363
Average Queue (ft)	12	25	32	257
95th Queue (ft)	44	67	77	386
Link Distance (ft)	77	77	77	255
Upstream Blk Time (%)	0	2	5	10
Queuing Penalty (veh)	2	7	23	74
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 11: Rt 630 #1

Movement	EB	EB	EB	SW	SW	SW
Directions Served	T	T	T	T	T	T
Maximum Queue (ft)	127	118	117	54	53	47
Average Queue (ft)	109	107	100	38	36	25
95th Queue (ft)	120	121	126	49	46	49
Link Distance (ft)	36	36	36	34	34	34
Upstream Blk Time (%)	55	54	53	41	37	18
Queuing Penalty (veh)	247	242	239	118	107	52
Storage Bay Dist (ft)						
Storage Blk Time (%)						
Queuing Penalty (veh)						

Intersection: 12: Rt 630 #1 & Ramp D

Movement	WB	WB	WB	SW
Directions Served	T	T	T	R
Maximum Queue (ft)	69	70	34	268
Average Queue (ft)	7	15	5	173
95th Queue (ft)	34	52	22	268
Link Distance (ft)	138	138	138	184
Upstream Blk Time (%)				9
Queuing Penalty (veh)				28
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 13: Ramp C & Rt 630 #1

Movement	WB	WB	WB	WB
Directions Served	L	T	T	T
Maximum Queue (ft)	59	368	385	366
Average Queue (ft)	2	105	125	88
95th Queue (ft)	23	307	321	278
Link Distance (ft)		413	413	413
Upstream Blk Time (%)		5	3	1
Queuing Penalty (veh)		23	16	7
Storage Bay Dist (ft)	50			
Storage Blk Time (%)		15		
Queuing Penalty (veh)		59		

Intersection: 14: Ramp B & Rt 630 #1

Movement	WB	WB	WB	NW	NW
Directions Served	T	T	T	L	L
Maximum Queue (ft)	70	61	31	240	250
Average Queue (ft)	30	21	3	151	164
95th Queue (ft)	66	53	19	218	240
Link Distance (ft)	38	38	38	154	154
Upstream Blk Time (%)	15	8	1	11	15
Queuing Penalty (veh)	44	22	3	35	46
Storage Bay Dist (ft)					
Storage Blk Time (%)					
Queuing Penalty (veh)					

Intersection: 15: Ramp B

Movement	NB	NB
Directions Served	T	R
Maximum Queue (ft)	385	227
Average Queue (ft)	63	30
95th Queue (ft)	335	162
Link Distance (ft)	1313	1313
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 16: Rt 630 #1 & Ramp A

Movement	WB	WB	WB	WB
Directions Served	T	T	T	R
Maximum Queue (ft)	288	268	319	76
Average Queue (ft)	187	151	285	75
95th Queue (ft)	299	266	320	76
Link Distance (ft)	289	289	289	
Upstream Blk Time (%)	3	0	4	
Queuing Penalty (veh)	18	3	26	
Storage Bay Dist (ft)				50
Storage Blk Time (%)			5	71
Queuing Penalty (veh)			49	204

Intersection: 18: Ramp A

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 20: Ramp D

Movement	SB
Directions Served	R
Maximum Queue (ft)	57
Average Queue (ft)	4
95th Queue (ft)	26
Link Distance (ft)	
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	500
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 24: Rt 630 #1

Movement	EB	EB	EB	NW	NW	NW
Directions Served	T	T	T	T	T	T
Maximum Queue (ft)	111	100	120	130	112	102
Average Queue (ft)	88	83	88	104	100	84
95th Queue (ft)	104	108	111	123	111	125
Link Distance (ft)	79	79	79	51	51	51
Upstream Blk Time (%)	64	34	35	28	34	24
Queuing Penalty (veh)	298	158	161	102	121	86
Storage Bay Dist (ft)						
Storage Blk Time (%)						
Queuing Penalty (veh)						

Intersection: 25: Rt 630 #1 & Austin Ridge

Movement	EB	EB	EB	WB	WB	WB	SB	SB	SB
Directions Served	L	T	T	T	T	R	L	L	R
Maximum Queue (ft)	325	889	897	161	188	70	239	286	157
Average Queue (ft)	185	788	790	92	107	34	111	150	64
95th Queue (ft)	424	1098	1092	147	163	61	202	247	129
Link Distance (ft)		844	844	339	339	339		782	
Upstream Blk Time (%)		55	56						
Queuing Penalty (veh)		0	0						
Storage Bay Dist (ft)	300						400		400
Storage Blk Time (%)	0	62							
Queuing Penalty (veh)	0	64							

Intersection: 27: Rt 630 #1

Movement	SE	SE
Directions Served	T	T
Maximum Queue (ft)	361	402
Average Queue (ft)	328	333
95th Queue (ft)	441	478
Link Distance (ft)	339	339
Upstream Blk Time (%)	26	21
Queuing Penalty (veh)	270	218
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 29: Old Courthouse Rd

Movement	EB	WB	WB	NB	NB
Directions Served	TR	L	T	L	R
Maximum Queue (ft)	54	106	52	29	117
Average Queue (ft)	23	51	27	5	60
95th Queue (ft)	47	84	49	22	100
Link Distance (ft)	628		664	280	
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (ft)		250			200
Storage Blk Time (%)					
Queuing Penalty (veh)					

Intersection: 31: Wyche Rd & PnR Road

Movement	EB	NB	SB
Directions Served	LR	L	TR
Maximum Queue (ft)	37	98	4
Average Queue (ft)	23	32	0
95th Queue (ft)	41	72	0
Link Distance (ft)	350	515	280
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 35: Wyche Rd & Rt 630 #1

Movement	SE	SE	SE	SE	SE	NW	NW	NW	NW	NE	NE	SW
Directions Served	L	L	T	T	TR	L	T	T	R	L	TR	L
Maximum Queue (ft)	186	188	284	327	355	124	979	993	75	153	153	118
Average Queue (ft)	70	100	135	180	208	45	904	947	20	71	48	31
95th Queue (ft)	136	161	256	310	335	100	1138	1061	71	134	120	81
Link Distance (ft)			407	407	407		950	950			758	
Upstream Blk Time (%)					0		13	51				
Queuing Penalty (veh)					0		0	0				
Storage Bay Dist (ft)	250	250				100			50	150		100
Storage Blk Time (%)		0	1			1	26	48	0	2	0	1
Queuing Penalty (veh)		0	2			5	20	30	1	1	0	1

Intersection: 35: Wyche Rd & Rt 630 #1

Movement	SW
Directions Served	T
Maximum Queue (ft)	149
Average Queue (ft)	75
95th Queue (ft)	131
Link Distance (ft)	515
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	5
Queuing Penalty (veh)	2

Intersection: 38: Rt 630 #1

Movement	WB	WB	WB	B34	B34
Directions Served	R	R	R	T	T
Maximum Queue (ft)	116	115	352	345	349
Average Queue (ft)	12	9	230	41	79
95th Queue (ft)	83	74	404	244	298
Link Distance (ft)	253	253	253	407	407
Upstream Blk Time (%)	0		21	0	0
Queuing Penalty (veh)	1		135	2	2
Storage Bay Dist (ft)					
Storage Blk Time (%)					
Queuing Penalty (veh)					

Network Summary

Network wide Queuing Penalty: 5013

2: Ramp C & Rt 630 #1 Performance by movement

Movement	EBT	EBR	All
Denied Del/Veh (s)	0.0	0.0	0.0
Total Del/Veh (s)	16.6	5.3	11.8

3: Ramp C Performance by movement

Movement	SBT	SER	All
Denied Del/Veh (s)	0.0	0.0	0.0
Total Del/Veh (s)	0.5	1.0	0.8

5: Rt 630 #1 & Ramp D Performance by movement

Movement	EBT	SEL	All
Denied Del/Veh (s)	0.0	0.0	0.0
Total Del/Veh (s)	4.7	27.1	17.2

6: Rt 630 #1 & Ramp A Performance by movement

Movement	EBL	EBT	All
Denied Del/Veh (s)	0.0	0.0	0.0
Total Del/Veh (s)	13.9	23.9	22.6

8: Ramp B & Rt 630 #1 Performance by movement

Movement	EBT	NER	All
Denied Del/Veh (s)	0.0	0.0	0.0
Total Del/Veh (s)	6.8	28.0	11.4

11: Rt 630 #1 Performance by movement

Movement	EBT	SWT	All
Denied Del/Veh (s)	0.0	0.0	0.0
Total Del/Veh (s)	12.9	7.2	10.7

12: Rt 630 #1 & Ramp D Performance by movement

Movement	WBT	SWR	All
Denied Del/Veh (s)	0.0	0.0	0.0
Total Del/Veh (s)	7.8	25.9	12.7

13: Ramp C & Rt 630 #1 Performance by movement

Movement	WBL	WBT	All
Denied Del/Veh (s)	0.0	0.0	0.0
Total Del/Veh (s)	8.8	18.1	15.6

14: Ramp B & Rt 630 #1 Performance by movement

Movement	WBT	NWL	All
Denied Del/Veh (s)	0.0	0.0	0.0
Total Del/Veh (s)	6.2	23.5	13.4

15: Ramp B Performance by movement

Movement	NBT	NBR	All
Denied Del/Veh (s)	0.5	0.4	0.5
Total Del/Veh (s)	10.2	3.1	7.6

16: Rt 630 #1 & Ramp A Performance by movement

Movement	WBT	WBR	All
Denied Del/Veh (s)	0.0	0.0	0.0
Total Del/Veh (s)	45.4	14.6	36.5

18: Ramp A Performance by movement

Movement	NBT	NWR	All
Denied Del/Veh (s)	0.0	0.0	0.0
Total Del/Veh (s)	1.3	1.4	1.4

20: Ramp D Performance by movement

Movement	SBT	SBR	All
Denied Del/Veh (s)	0.7	1.9	1.1
Total Del/Veh (s)	11.0	10.1	10.7

24: Rt 630 #1 Performance by movement

Movement	EBT	NWT	All
Denied Del/Veh (s)	0.0	0.0	0.0
Total Del/Veh (s)	15.4	16.2	15.9

25: Rt 630 #1 & Austin Ridge Performance by movement

Movement	EBL	EBT	WBT	WBR	SBL	SBR	All
Denied Del/Veh (s)	2.4	0.5	0.0	0.0	1.2	3.4	0.4
Total Del/Veh (s)	54.2	9.0	7.3	3.8	65.8	29.9	15.1

27: Rt 630 #1 Performance by movement

Movement	WBT	WBR	SET	All
Denied Del/Veh (s)		0.0	0.0	0.0
Total Del/Veh (s)		1.4	1.6	1.5

29: Old Courthouse Rd Performance by movement

Movement	EBT	EBR	WBL	WBT	NBL	NBT	NBR	All
Denied Del/Veh (s)	0.1	0.2	3.6	0.8	0.0	0.0	0.0	1.4
Total Del/Veh (s)	7.8	3.2	6.2	7.2	4.8	0.7	5.3	5.9

31: Wyche Rd & PnR Road Performance by movement

Movement	EBR	NBL	NBT	SBT	All
Denied Del/Veh (s)	0.0	0.0	0.0	0.0	0.0
Total Del/Veh (s)	18.8	5.0	1.9	4.7	8.9

35: Wyche Rd & Rt 630 #1 Performance by movement

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Denied Del/Veh (s)	0.0	0.0	0.0	859.0	805.7	833.8	96.9	90.5	93.7	0.0	0.0	0.0
Total Del/Veh (s)	36.4	6.6	6.1	245.8	249.0	237.6	220.5	208.4	177.0	168.2	126.1	12.7

35: Wyche Rd & Rt 630 #1 Performance by movement

Movement	All
Denied Del/Veh (s)	292.8
Total Del/Veh (s)	85.9

38: Rt 630 #1 Performance by movement

Movement	EBT	WBR	All
Denied Del/Veh (s)	0.0	0.0	0.0
Total Del/Veh (s)	2.4	27.9	13.1

Total Network Performance

Denied Del/Veh (s)	195.5
Total Del/Veh (s)	129.9

Intersection: 2: Ramp C & Rt 630 #1

Movement	EB	EB	EB	B10	B10
Directions Served	T	T	TR	T	T
Maximum Queue (ft)	362	295	309	33	8
Average Queue (ft)	210	155	124	2	0
95th Queue (ft)	327	265	289	19	6
Link Distance (ft)	352	352	352	137	137
Upstream Blk Time (%)	1	0	0		
Queuing Penalty (veh)	6	0	1		
Storage Bay Dist (ft)					
Storage Blk Time (%)					
Queuing Penalty (veh)					

Intersection: 3: Ramp C

Movement	SB	SE
Directions Served	T	R
Maximum Queue (ft)	49	19
Average Queue (ft)	2	1
95th Queue (ft)	38	11
Link Distance (ft)	184	190
Upstream Blk Time (%)	0	
Queuing Penalty (veh)	1	
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 5: Rt 630 #1 & Ramp D

Movement	EB	EB	EB	SE	SE
Directions Served	T	T	T	L	L
Maximum Queue (ft)	73	43	17	267	277
Average Queue (ft)	25	8	3	244	241
95th Queue (ft)	66	33	19	262	276
Link Distance (ft)	47	47	47	184	184
Upstream Blk Time (%)	15	2	1	34	30
Queuing Penalty (veh)	48	6	2	211	181
Storage Bay Dist (ft)					
Storage Blk Time (%)					
Queuing Penalty (veh)					

Intersection: 6: Rt 630 #1 & Ramp A

Movement	EB	EB	EB	EB
Directions Served	L	T	T	T
Maximum Queue (ft)	15	391	388	389
Average Queue (ft)	1	297	287	266
95th Queue (ft)	11	396	390	374
Link Distance (ft)		408	408	408
Upstream Blk Time (%)		1	1	1
Queuing Penalty (veh)		9	8	7
Storage Bay Dist (ft)	50			
Storage Blk Time (%)	0	33		
Queuing Penalty (veh)	0	92		

Intersection: 8: Ramp B & Rt 630 #1

Movement	EB	EB	EB	NE
Directions Served	T	T	T	R
Maximum Queue (ft)	78	112	99	348
Average Queue (ft)	28	42	32	243
95th Queue (ft)	75	99	90	364
Link Distance (ft)	77	77	77	255
Upstream Blk Time (%)	3	12	10	10
Queuing Penalty (veh)	18	74	67	50
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 11: Rt 630 #1

Movement	EB	EB	EB	SW	SW	SW
Directions Served	T	T	T	T	T	T
Maximum Queue (ft)	123	134	125	63	62	47
Average Queue (ft)	110	109	108	42	41	34
95th Queue (ft)	117	119	117	59	57	43
Link Distance (ft)	36	36	36	34	34	34
Upstream Blk Time (%)	47	48	42	55	49	38
Queuing Penalty (veh)	300	305	269	359	316	250
Storage Bay Dist (ft)						
Storage Blk Time (%)						
Queuing Penalty (veh)						

Intersection: 12: Rt 630 #1 & Ramp D

Movement	WB	WB	WB	SW
Directions Served	T	T	T	R
Maximum Queue (ft)	100	121	69	283
Average Queue (ft)	32	62	20	256
95th Queue (ft)	77	105	57	296
Link Distance (ft)	138	138	138	184
Upstream Blk Time (%)		0		31
Queuing Penalty (veh)		0		183
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 13: Ramp C & Rt 630 #1

Movement	WB	WB	WB	WB
Directions Served	L	T	T	T
Maximum Queue (ft)	15	324	322	304
Average Queue (ft)	1	179	190	160
95th Queue (ft)	11	285	287	264
Link Distance (ft)		413	413	413
Upstream Blk Time (%)		1	0	0
Queuing Penalty (veh)		6	3	0
Storage Bay Dist (ft)	50			
Storage Blk Time (%)	0	28		
Queuing Penalty (veh)	1	263		

Intersection: 14: Ramp B & Rt 630 #1

Movement	WB	WB	WB	NW	NW
Directions Served	T	T	T	L	L
Maximum Queue (ft)	77	68	31	251	249
Average Queue (ft)	55	23	8	191	195
95th Queue (ft)	76	56	28	265	254
Link Distance (ft)	38	38	38	154	154
Upstream Blk Time (%)	44	11	0	15	20
Queuing Penalty (veh)	286	69	2	65	90
Storage Bay Dist (ft)					
Storage Blk Time (%)					
Queuing Penalty (veh)					

Intersection: 15: Ramp B

Movement	NB	NB
Directions Served	T	R
Maximum Queue (ft)	491	206
Average Queue (ft)	126	14
95th Queue (ft)	385	109
Link Distance (ft)	1313	1313
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 16: Rt 630 #1 & Ramp A

Movement	WB	WB	WB	WB
Directions Served	T	T	T	R
Maximum Queue (ft)	308	319	332	76
Average Queue (ft)	295	219	224	68
95th Queue (ft)	303	337	357	97
Link Distance (ft)	289	289	289	
Upstream Blk Time (%)	55	5	5	
Queuing Penalty (veh)	505	45	47	
Storage Bay Dist (ft)				50
Storage Blk Time (%)			28	8
Queuing Penalty (veh)			220	54

Intersection: 18: Ramp A

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 20: Ramp D

Movement	SB	SB	SB
Directions Served	T	T	R
Maximum Queue (ft)	334	311	309
Average Queue (ft)	142	102	115
95th Queue (ft)	293	261	276
Link Distance (ft)	1213	1213	
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			500
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 24: Rt 630 #1

Movement	EB	EB	EB	NW	NW	NW
Directions Served	T	T	T	T	T	T
Maximum Queue (ft)	97	111	104	138	125	124
Average Queue (ft)	87	88	75	108	103	98
95th Queue (ft)	100	106	106	121	113	118
Link Distance (ft)	79	79	79	51	51	51
Upstream Blk Time (%)	37	26	12	35	45	36
Queuing Penalty (veh)	120	85	40	220	288	229
Storage Bay Dist (ft)						
Storage Blk Time (%)						
Queuing Penalty (veh)						

Intersection: 25: Rt 630 #1 & Austin Ridge

Movement	EB	EB	EB	WB	WB	WB	SB	SB	SB
Directions Served	L	T	T	T	T	R	L	L	R
Maximum Queue (ft)	168	260	282	212	222	95	336	388	126
Average Queue (ft)	85	124	142	144	162	47	171	234	45
95th Queue (ft)	152	221	247	203	218	80	294	354	100
Link Distance (ft)		844	844	339	339	339		782	
Upstream Blk Time (%)									
Queuing Penalty (veh)									
Storage Bay Dist (ft)	300						400		400
Storage Blk Time (%)		0						0	
Queuing Penalty (veh)		0						0	

Intersection: 27: Rt 630 #1

Movement	B1
Directions Served	T
Maximum Queue (ft)	18
Average Queue (ft)	1
95th Queue (ft)	11
Link Distance (ft)	138
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 29: Old Courthouse Rd

Movement	EB	WB	WB	NB	NB
Directions Served	TR	L	T	L	R
Maximum Queue (ft)	65	94	49	34	127
Average Queue (ft)	31	45	24	6	62
95th Queue (ft)	51	74	49	27	105
Link Distance (ft)	628		664	280	
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (ft)		250			200
Storage Blk Time (%)					
Queuing Penalty (veh)					

Intersection: 31: Wyche Rd & PnR Road

Movement	EB	B33	NB	SB
Directions Served	LR	T	L	TR
Maximum Queue (ft)	280	61	78	64
Average Queue (ft)	121	16	30	13
95th Queue (ft)	275	121	64	102
Link Distance (ft)	350	268	515	280
Upstream Blk Time (%)	6	5		1
Queuing Penalty (veh)	0	0		2
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 35: Wyche Rd & Rt 630 #1

Movement	SE	SE	SE	SE	SE	B34	B34	NW	NW	NW	NW	NE
Directions Served	L	L	T	T	TR	T	T	L	T	T	R	L
Maximum Queue (ft)	259	266	254	236	217	23	5	125	994	992	75	175
Average Queue (ft)	97	128	65	115	127	1	0	21	965	963	24	169
95th Queue (ft)	201	236	185	195	195	12	4	84	1027	1034	80	198
Link Distance (ft)			407	407	407	253	253		950	950		
Upstream Blk Time (%)									73	75		
Queuing Penalty (veh)									0	0		
Storage Bay Dist (ft)	250	250						100			50	150
Storage Blk Time (%)	0	2	0						78	73	0	62
Queuing Penalty (veh)	3	16	0						20	37	1	104

Intersection: 35: Wyche Rd & Rt 630 #1

Movement	NE	SW	SW	SW
Directions Served	TR	L	T	R
Maximum Queue (ft)	800	125	420	458
Average Queue (ft)	537	113	178	121
95th Queue (ft)	954	147	452	368
Link Distance (ft)	758		515	515
Upstream Blk Time (%)	34		5	1
Queuing Penalty (veh)	0		22	3
Storage Bay Dist (ft)		100		
Storage Blk Time (%)	18	60	0	
Queuing Penalty (veh)	38	15	0	

Intersection: 38: Rt 630 #1

Movement	EB	WB	WB	WB	B34	B34	B34
Directions Served	T	R	R	R	T	T	T
Maximum Queue (ft)	7	357	274	290	432	467	483
Average Queue (ft)	0	330	48	61	413	429	432
95th Queue (ft)	5	345	200	227	467	498	572
Link Distance (ft)	207	253	253	253	407	407	407
Upstream Blk Time (%)		73	1	2	23	25	20
Queuing Penalty (veh)		668	12	19	214	230	185
Storage Bay Dist (ft)							
Storage Blk Time (%)							
Queuing Penalty (veh)							

Network Summary

Network wide Queuing Penalty: 6993

HCS Reports

I-95 Corridor between Centreport Pkwy and Rte 610

2017 Build - Alternative F

- **Freeway Segment Analysis**
- **Merge Analysis**
- **Diverge Analysis**

I-95 Corridor between Centreport Pkwy and Rte 610

2017 Build - Alternative F

Freeway Segment Analysis

BASIC FREEWAY SEGMENTS WORKSHEET

General Information

Analyst	*SLE*
Agency or Company	*JMT*
Date Performed	*3/16/2010*
Analysis Time Period	*AM Peak Hour*

Site Information

Highway/Direction of Travel	*I-95 Northbound*
From/To	*Rte 628 to Ctrport Pkwy*
Jurisdiction	*VDOT*
Analysis Year	*Build 2017*

Project Description *070675_I-95 Corridor between Centerport Pkwy and Rte 610*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*5850*	veh/h	Peak-Hour Factor, PHF	*0.98*
AADT		veh/day	%Trucks and Buses, P_T	*7*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.966*

Speed Inputs

Lane Width	*12.0*	ft
Rt-Side Lat. Clearance	*6.0*	ft
Number of Lanes, N	*3*	
Total Ramp Density, TRD	*0.50*	ramps/mi
FFS (measured)		mph
Base free-flow Speed, BFFS	*75.4*	mph

Calc Speed Adj and FFS

f_{LW}	*0.0*	mph
f_{LC}	*0.0*	mph
TRD Adjustment	*1.8*	mph
FFS	*73.6*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*2059*	pc/h/ln
S	*62.6*	mph
D = v_p / S	*32.9*	pc/mi/ln
LOS	*D*	

Design (N)

Design (N)

Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h/ln
S	mph
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8
E_T - Exhibits 10-10, 11-11, 11-13	f_{LC} - Exhibit 11-9
f_p - Page 11-18	TRD - Page 11-11
LOS, S, FFS, v_p - Exhibits 11-2, 11-3	

BASIC FREEWAY SEGMENTS WORKSHEET

General Information

Analyst	*SLE*
Agency or Company	*JMT*
Date Performed	*3/16/2010*
Analysis Time Period	*PM Peak Hour*

Site Information

Highway/Direction of Travel	*I-95 Northbound*
From/To	*Rte 628 to Ctrport Pkwy*
Jurisdiction	*VDOT*
Analysis Year	*Build 2017*

Project Description *070675_I-95 Corridor between Centerport Pkwy and Rte 610*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*4075*	veh/h	Peak-Hour Factor, PHF	*0.91*
AADT		veh/day	%Trucks and Buses, P_T	*13*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.939*

Speed Inputs

Lane Width	*12.0*	ft
Rt-Side Lat. Clearance	*6.0*	ft
Number of Lanes, N	*3*	
Total Ramp Density, TRD	*0.50*	ramps/mi
FFS (measured)		mph
Base free-flow Speed, BFFS	*75.4*	mph

Calc Speed Adj and FFS

f_{LW}	*0.0*	mph
f_{LC}	*0.0*	mph
TRD Adjustment	*1.8*	mph
FFS	*73.6*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1590*	pc/h/ln
S	*71.1*	mph
D = v_p / S	*22.3*	pc/mi/ln
LOS	*C*	

Design (N)

Design (N)

Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h/ln
S	mph
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8
E_T - Exhibits 11-10, 11-11, 11-13	f_{LC} - Exhibit 11-9
f_p - Page 11-18	TRD - Page 11-11
LOS, S, FFS, v_p - Exhibits 11-2, 11-3	

BASIC FREEWAY SEGMENTS WORKSHEET

General Information		Site Information	
Analyst	*ASM*	Highway/Direction of Travel	*I-95 Northbound*
Agency or Company	*CH2M*	From/To	*Ctrport Pkwy to Rte 630*
Date Performed	*7/22/2015*	Jurisdiction	*VDOT*
Analysis Time Period	*AM Peak Hour*	Analysis Year	*Build 2017*

Project Description *070675_I-95 Corridor between Centerport Pkwy and Rte 610*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*6425*	veh/h	Peak-Hour Factor, PHF	*0.98*
AADT		veh/day	%Trucks and Buses, P_T	*7*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.966*

Speed Inputs

Lane Width	*12.0*	ft
Rt-Side Lat. Clearance	*6.0*	ft
Number of Lanes, N	*3*	
Total Ramp Density, TRD	*0.50*	ramps/mi
FFS (measured)		mph
Base free-flow Speed, BFFS	*75.4*	mph

Calc Speed Adj and FFS

f_{LW}	*0.0*	mph
f_{LC}	*0.0*	mph
TRD Adjustment	*1.8*	mph
FFS	*73.6*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*2262*	pc/h/ln
S	*57.4*	mph
D = v_p / S	*39.4*	pc/mi/ln
LOS	*E*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h/ln
S		mph
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8
E_T - Exhibits 11-10, 11-11, 11-13	f_{LC} - Exhibit 11-9
f_p - Page 11-18	TRD - Page 11-11
LOS, S, FFS, v_p - Exhibits 11-2, 11-3	

BASIC FREEWAY SEGMENTS WORKSHEET

General Information		Site Information	
Analyst	*ASM*	Highway/Direction of Travel	*I-95 Northbound*
Agency or Company	*CH2M*	From/To	*Centerport Pkwy to Courthouse*
Date Performed	*7/22/2015*	Jurisdiction	*VDOT*
Analysis Time Period	*PM Peak Hour*	Analysis Year	*Build 2017*

Project Description *070675_I-95 Corridor between Centerport Pkwy and Rte 610*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*4100*	veh/h	Peak-Hour Factor, PHF	*0.91*
AADT		veh/day	%Trucks and Buses, P_T	*13*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.939*

Speed Inputs

Lane Width	*12.0*	ft
Rt-Side Lat. Clearance	*6.0*	ft
Number of Lanes, N	*3*	
Total Ramp Density, TRD	*0.50*	ramps/mi
FFS (measured)		mph
Base free-flow Speed, BFFS	*75.4*	mph

Calc Speed Adj and FFS

f_{LW}	*0.0*	mph
f_{LC}	*0.0*	mph
TRD Adjustment	*1.8*	mph
FFS	*73.6*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1599*	pc/h/ln
S	*71.0*	mph
D = v_p / S	*22.5*	pc/mi/ln
LOS	*C*	

Design (N)

Design (N)

Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h/ln
S	mph
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8
E_T - Exhibits 11-10, 11-11, 11-13	f_{LC} - Exhibit 11-9
f_p - Page 11-18	TRD - Page 11-11
LOS, S, FFS, v_p - Exhibits 11-2, 11-3	

BASIC FREEWAY SEGMENTS WORKSHEET

General Information		Site Information	
Analyst	*ASM*	Highway/Direction of Travel	*I-95 Northbound*
Agency or Company	*CH2M*	From/To	*Rte 630 to Rte 610*
Date Performed	*7/22/2015*	Jurisdiction	*VDOT*
Analysis Time Period	*AM Peak Hour*	Analysis Year	*Build 2017*

Project Description *070675_I-95 Corridor between Centerport Pkwy and Rte 610*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*6375*	veh/h	Peak-Hour Factor, PHF	*0.98*
AADT		veh/day	%Trucks and Buses, P_T	*7*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.966*

Speed Inputs

Lane Width	*12.0*	ft
Rt-Side Lat. Clearance	*6.0*	ft
Number of Lanes, N	*3*	
Total Ramp Density, TRD	*0.50*	ramps/mi
FFS (measured)		mph
Base free-flow Speed, BFFS	*75.4*	mph

Calc Speed Adj and FFS

f_{LW}	*0.0*	mph
f_{LC}	*0.0*	mph
TRD Adjustment	*1.8*	mph
FFS	*73.6*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*2244*	pc/h/ln
S	*57.9*	mph
D = v_p / S	*38.8*	pc/mi/ln
LOS	*E*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h/ln
S		mph
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8
E_T - Exhibits 11-10, 11-11, 11-13	f_{LC} - Exhibit 11-9
f_p - Page 11-18	TRD - Page 11-11
LOS, S, FFS, v_p - Exhibits 11-2, 11-3	

BASIC FREEWAY SEGMENTS WORKSHEET

General Information

Analyst	*ASM*
Agency or Company	*CH2M*
Date Performed	*7/22/2015*
Analysis Time Period	*PM Peak Hour*

Site Information

Highway/Direction of Travel	*I-95 Northbound*
From/To	*Rte 630 to Rte 610*
Jurisdiction	*VDOT*
Analysis Year	*Build 2017*

Project Description *070675_I-95 Corridor between Centerport Pkwy and Rte 610*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*4025*	veh/h	Peak-Hour Factor, PHF	*0.91*
AADT		veh/day	%Trucks and Buses, P_T	*13*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.939*

Speed Inputs

Lane Width	*12.0*	ft
Rt-Side Lat. Clearance	*6.0*	ft
Number of Lanes, N	*3*	
Total Ramp Density, TRD	*0.50*	ramps/mi
FFS (measured)		mph
Base free-flow Speed, BFFS	*75.4*	mph

Calc Speed Adj and FFS

f_{LW}	*0.0*	mph
f_{LC}	*0.0*	mph
TRD Adjustment	*1.8*	mph
FFS	*73.6*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1570*	pc/h/ln
S	*71.4*	mph
D = v_p / S	*22.0*	pc/mi/ln
LOS	*C*	

Design (N)

Design (N)

Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h/ln
S	mph
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8
E_T - Exhibits 10-10, 11-11, 11-13	f_{LC} - Exhibit 11-9
f_p - Page 11-18	TRD - Page 11-11
LOS, S, FFS, v_p - Exhibits 11-2, 11-3	

BASIC FREEWAY SEGMENTS WORKSHEET

General Information

Analyst	*ASM*
Agency or Company	*CH2M*
Date Performed	*8/31/2015*
Analysis Time Period	*AM Peak Hour*

Site Information

Highway/Direction of Travel	*I-95 Northbound*
From/To	*Rte 610 to Telegraph Rd*
Jurisdiction	*VDOT*
Analysis Year	*Build 2017*

Project Description *070675_I-95 Corridor between Centerport Pkwy and Rte 610*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*6760*	veh/h	Peak-Hour Factor, PHF	*0.91*
AADT		veh/day	%Trucks and Buses, P_T	*7*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.966*

Speed Inputs

Lane Width	*12.0*	ft
Rt-Side Lat. Clearance	*6.0*	ft
Number of Lanes, N	*3*	
Total Ramp Density, TRD	*0.50*	ramps/mi
FFS (measured)		mph
Base free-flow Speed, BFFS	*75.4*	mph

Calc Speed Adj and FFS

f_{LW}	*0.0*	mph
f_{LC}	*0.0*	mph
TRD Adjustment	*1.8*	mph
FFS	*73.6*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*2563*	pc/h/ln
S	*48.0*	mph
D = v_p / S	*53.4*	pc/mi/ln
LOS	*F*	

Design (N)

Design (N)

Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h/ln
S	mph
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8
E_T - Exhibits 10-10, 11-11, 11-13	f_{LC} - Exhibit 11-9
f_p - Page 11-18	TRD - Page 11-11
LOS, S, FFS, v_p - Exhibits 11-2, 11-3	

BASIC FREEWAY SEGMENTS WORKSHEET

General Information

Analyst	*SLE*
Agency or Company	*JMT*
Date Performed	*3/16/2010*
Analysis Time Period	*PM Peak Hour*

Site Information

Highway/Direction of Travel	*I-95 Northbound*
From/To	*Rte 610 to Telegraph Rd*
Jurisdiction	*VDOT*
Analysis Year	*Build 2017*

Project Description *070675_I-95 Corridor between Centerport Pkwy and Rte 610*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*3875*	veh/h	Peak-Hour Factor, PHF	*0.91*
AADT		veh/day	%Trucks and Buses, P_T	*13*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.939*

Speed Inputs

Lane Width	*12.0*	ft
Rt-Side Lat. Clearance	*6.0*	ft
Number of Lanes, N	*3*	
Total Ramp Density, TRD	*0.50*	ramps/mi
FFS (measured)		mph
Base free-flow Speed, BFFS	*75.4*	mph

Calc Speed Adj and FFS

f_{LW}	*0.0*	mph
f_{LC}	*0.0*	mph
TRD Adjustment	*1.8*	mph
FFS	*73.6*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1512*	pc/h/ln
S	*72.1*	mph
D = v_p / S	*21.0*	pc/mi/ln
LOS	*C*	

Design (N)

Design (N)

Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h/ln
S	mph
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8
E_T - Exhibits 10-10, 11-11, 11-13	f_{LC} - Exhibit 11-9
f_p - Page 11-18	TRD - Page 11-11
LOS, S, FFS, v_p - Exhibits 11-2, 11-3	

BASIC FREEWAY SEGMENTS WORKSHEET

General Information

Analyst	*SLE*
Agency or Company	*JMT*
Date Performed	*3/16/2010*
Analysis Time Period	*AM Peak Hour*

Site Information

Highway/Direction of Travel	*I-95 Southbound*
From/To	*Telegraph Rd to Rte 610*
Jurisdiction	*VDOT*
Analysis Year	*Build 2017*

Project Description *070675_I-95 Corridor between Centerport Pkwy and Rte 610*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*2960*	veh/h	Peak-Hour Factor, PHF	*0.91*
AADT		veh/day	%Trucks and Buses, P_T	*14*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.935*

Speed Inputs

Lane Width	*12.0*	ft
Rt-Side Lat. Clearance	*6.0*	ft
Number of Lanes, N	*3*	
Total Ramp Density, TRD	*0.50*	ramps/mi
FFS (measured)		mph
Base free-flow Speed, BFFS	*75.4*	mph

Calc Speed Adj and FFS

f_{LW}	*0.0*	mph
f_{LC}	*0.0*	mph
TRD Adjustment	*1.8*	mph
FFS	*73.6*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1160*	pc/h/ln
S	*74.7*	mph
D = v_p / S	*15.5*	pc/mi/ln
LOS	*B*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h/ln
S		mph
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8
E_T - Exhibits 10-10, 11-11, 11-13	f_{LC} - Exhibit 11-9
f_p - Page 11-18	TRD - Page 11-11
LOS, S, FFS, v_p - Exhibits 11-2, 11-3	

BASIC FREEWAY SEGMENTS WORKSHEET

General Information

Analyst	*SLE*
Agency or Company	*JMT*
Date Performed	*3/16/2010*
Analysis Time Period	*PM Peak Hour*

Site Information

Highway/Direction of Travel	*I-95 Southbound*
From/To	*Telegraph Rd to Rte 610*
Jurisdiction	*VDOT*
Analysis Year	*Build 2017*

Project Description *070675_I-95 Corridor between Centerport Pkwy and Rte 610*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*6850*	veh/h	Peak-Hour Factor, PHF	*0.96*
AADT		veh/day	%Trucks and Buses, P_T	*8*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.962*

Speed Inputs

Lane Width	*12.0*	ft
Rt-Side Lat. Clearance	*6.0*	ft
Number of Lanes, N	*3*	
Total Ramp Density, TRD	*0.50*	ramps/mi
FFS (measured)		mph
Base free-flow Speed, BFFS	*75.4*	mph

Calc Speed Adj and FFS

f_{LW}	*0.0*	mph
f_{LC}	*0.0*	mph
TRD Adjustment	*1.8*	mph
FFS	*73.6*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*2474*	pc/h/ln
S	*50.9*	mph
D = v_p / S	*48.6*	pc/mi/ln
LOS	*F*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h/ln
S		mph
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8
E_T - Exhibits 10-10, 11-11, 11-13	f_{LC} - Exhibit 11-9
f_p - Page 11-18	TRD - Page 11-11
LOS, S, FFS, v_p - Exhibits 11-2, 11-3	

BASIC FREEWAY SEGMENTS WORKSHEET

General Information

Analyst	*ASM*
Agency or Company	*CH2M*
Date Performed	*7/22/2015*
Analysis Time Period	*AM Peak Hour*

Site Information

Highway/Direction of Travel	*I-95 Southbound*
From/To	*Rte 610 to Rte 630*
Jurisdiction	*VDOT*
Analysis Year	*Build 2017*

Project Description *070675_I-95 Corridor between Centerport Pkwy and Rte 610*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*3025*	veh/h	Peak-Hour Factor, PHF	*0.91*
AADT		veh/day	%Trucks and Buses, P_T	*14*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.935*

Speed Inputs

Lane Width	*12.0*	ft
Rt-Side Lat. Clearance	*6.0*	ft
Number of Lanes, N	*3*	
Total Ramp Density, TRD	*0.50*	ramps/mi
FFS (measured)		mph
Base free-flow Speed, BFFS	*75.4*	mph

Calc Speed Adj and FFS

f_{LW}	*0.0*	mph
f_{LC}	*0.0*	mph
TRD Adjustment	*1.8*	mph
FFS	*73.6*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1186*	pc/h/ln
S	*74.6*	mph
D = v_p / S	*15.9*	pc/mi/ln
LOS	*B*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h/ln
S		mph
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8
E_T - Exhibits 10-10, 11-11, 11-13	f_{LC} - Exhibit 11-9
f_p - Page 11-18	TRD - Page 11-11
LOS, S, FFS, v_p - Exhibits 11-2, 11-3	

BASIC FREEWAY SEGMENTS WORKSHEET

General Information

Analyst	*ASM*
Agency or Company	*CH2M*
Date Performed	*7/22/2015*
Analysis Time Period	*PM Peak Hour*

Site Information

Highway/Direction of Travel	*I-95 Southbound*
From/To	*Rte 610 to Rte 630*
Jurisdiction	*VDOT*
Analysis Year	*Build 2017*

Project Description *070675_I-95 Corridor between Centerport Pkwy and Rte 610*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*6450*	veh/h	Peak-Hour Factor, PHF	*0.96*
AADT		veh/day	%Trucks and Buses, P_T	*8*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.962*

Speed Inputs

Lane Width	*12.0*	ft
Rt-Side Lat. Clearance	*6.0*	ft
Number of Lanes, N	*3*	
Total Ramp Density, TRD	*0.50*	ramps/mi
FFS (measured)		mph
Base free-flow Speed, BFFS	*75.4*	mph

Calc Speed Adj and FFS

f_{LW}	*0.0*	mph
f_{LC}	*0.0*	mph
TRD Adjustment	*1.8*	mph
FFS	*73.6*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*2329*	pc/h/ln
S	*55.4*	mph
D = v_p / S	*42.0*	pc/mi/ln
LOS	*E*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h/ln
S		mph
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8
E_T - Exhibits 10-10, 11-11, 11-13	f_{LC} - Exhibit 11-9
f_p - Page 11-18	TRD - Page 11-11
LOS, S, FFS, v_p - Exhibits 11-2, 11-3	

BASIC FREEWAY SEGMENTS WORKSHEET

General Information

Analyst	*ASM*
Agency or Company	*CH2M*
Date Performed	*7/22/2015*
Analysis Time Period	*AM Peak Hour*

Site Information

Highway/Direction of Travel	*I-95 Southbound*
From/To	*Rte 630 to Cntrport Pkwy*
Jurisdiction	*VDOT*
Analysis Year	*Build 2017*

Project Description *070675_I-95 Corridor between Centerport Pkwy and Rte 610*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*3125*	veh/h	Peak-Hour Factor, PHF	*0.91*
AADT		veh/day	%Trucks and Buses, P_T	*14*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.935*

Speed Inputs

Lane Width	*12.0*	ft
Rt-Side Lat. Clearance	*6.0*	ft
Number of Lanes, N	*3*	
Total Ramp Density, TRD	*0.50*	ramps/mi
FFS (measured)		mph
Base free-flow Speed, BFFS	*75.4*	mph

Calc Speed Adj and FFS

f_{LW}	*0.0*	mph
f_{LC}	*0.0*	mph
TRD Adjustment	*1.8*	mph
FFS	*73.6*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1225*	pc/h/ln
S	*74.4*	mph
D = v_p / S	*16.5*	pc/mi/ln
LOS	*B*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h/ln
S		mph
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8
E_T - Exhibits 10-10, 11-11, 11-13	f_{LC} - Exhibit 11-9
f_p - Page 11-18	TRD - Page 11-11
LOS, S, FFS, v_p - Exhibits 11-2, 11-3	

BASIC FREEWAY SEGMENTS WORKSHEET

General Information

Analyst	*ASM*
Agency or Company	*CH2M*
Date Performed	*7/22/2015*
Analysis Time Period	*PM Peak Hour*

Site Information

Highway/Direction of Travel	*I-95 Southbound*
From/To	*Rte 630 to Cntrport Pkwy*
Jurisdiction	*VDOT*
Analysis Year	*Build 2017*

Project Description *070675_I-95 Corridor between Centerport Pkwy and Rte 610*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*6550*	veh/h	Peak-Hour Factor, PHF	*0.96*
AADT		veh/day	%Trucks and Buses, P_T	*8*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.962*

Speed Inputs

Lane Width	*12.0*	ft
Rt-Side Lat. Clearance	*6.0*	ft
Number of Lanes, N	*3*	
Total Ramp Density, TRD	*0.50*	ramps/mi
FFS (measured)		mph
Base free-flow Speed, BFFS	*75.4*	mph

Calc Speed Adj and FFS

f_{LW}	*0.0*	mph
f_{LC}	*0.0*	mph
TRD Adjustment	*1.8*	mph
FFS	*73.6*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*2365*	pc/h/ln
S	*54.4*	mph
D = v_p / S	*43.5*	pc/mi/ln
LOS	*E*	

Design (N)

Design (N)

Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h/ln
S	mph
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8
E_T - Exhibits 10-10, 11-11, 11-13	f_{LC} - Exhibit 11-9
f_p - Page 11-18	TRD - Page 11-11
LOS, S, FFS, v_p - Exhibits 11-2, 11-3	

BASIC FREEWAY SEGMENTS WORKSHEET

General Information

Analyst	*SLE*
Agency or Company	*JMT*
Date Performed	*3/16/2010*
Analysis Time Period	*AM Peak Hour*

Site Information

Highway/Direction of Travel	*I-95 Southbound*
From/To	*Cntrport Pkwy to Rte 628*
Jurisdiction	*VDOT*
Analysis Year	*Build 2017*

Project Description *070675_I-95 Corridor between Centerport Pkwy and Rte 610*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*3100*	veh/h	Peak-Hour Factor, PHF	*0.91*
AADT		veh/day	%Trucks and Buses, P_T	*14*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.935*

Speed Inputs

Lane Width	*12.0*	ft
Rt-Side Lat. Clearance	*6.0*	ft
Number of Lanes, N	*3*	
Total Ramp Density, TRD	*0.50*	ramps/mi
FFS (measured)		mph
Base free-flow Speed, BFFS	*75.4*	mph

Calc Speed Adj and FFS

f_{LW}	*0.0*	mph
f_{LC}	*0.0*	mph
TRD Adjustment	*1.8*	mph
FFS	*73.6*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1215*	pc/h/ln
S	*74.5*	mph
D = v_p / S	*16.3*	pc/mi/ln
LOS	*B*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h/ln
S		mph
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8
E_T - Exhibits 11-10, 11-11, 11-13	f_{LC} - Exhibit 11-9
f_p - Page 11-18	TRD - Page 11-11
LOS, S, FFS, v_p - Exhibits 11-2, 11-3	

BASIC FREEWAY SEGMENTS WORKSHEET

General Information		Site Information	
Analyst	*SLE*	Highway/Direction of Travel	*I-95 Southbound*
Agency or Company	*JMT*	From/To	*Cntrport Pkwy to Rte 628*
Date Performed	*3/16/2010*	Jurisdiction	*VDOT*
Analysis Time Period	*PM Peak Hour*	Analysis Year	*Build 2017*

Project Description *070675_I-95 Corridor between Centerport Pkwy and Rte 610*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*6300*	veh/h	Peak-Hour Factor, PHF	*0.96*
AADT		veh/day	%Trucks and Buses, P_T	*8*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.962*

Speed Inputs

Lane Width	*12.0*	ft
Rt-Side Lat. Clearance	*6.0*	ft
Number of Lanes, N	*3*	
Total Ramp Density, TRD	*0.50*	ramps/mi
FFS (measured)		mph
Base free-flow Speed, BFFS	*75.4*	mph

Calc Speed Adj and FFS

f_{LW}	*0.0*	mph
f_{LC}	*0.0*	mph
TRD Adjustment	*1.8*	mph
FFS	*73.6*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*2275*	pc/h/ln
S	*57.0*	mph
D = v_p / S	*39.9*	pc/mi/ln
LOS	*E*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h/ln
S		mph
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8
E_T - Exhibits 11-10, 11-11, 11-13	f_{LC} - Exhibit 11-9
f_p - Page 11-18	TRD - Page 11-11
LOS, S, FFS, v_p - Exhibits 11-2, 11-3	

I-95 Corridor between Centreport Pkwy and Rte 610

2017 Build - Alternative F

Merge Analysis

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	ASM	Freeway/Dir of Travel	I-95 Northbound
Agency or Company	CH2M	Junction	Rte 630 to I-95
Date Performed	7/23/2015	Jurisdiction	VDOT
Analysis Time Period	AM Peak Hour	Analysis Year	Build 2017

Project Description 070675_I-95 Corridor between Centerport Pkwy and Rte 610

Inputs

Upstream Adj Ramp		Downstream Adj Ramp
☑ Yes ☐ On	Number of Lanes, N: 3	☐ Yes ☐ On
☐ No ☑ Off	Acceleration Lane Length, L_A: 1400	☑ No ☐ Off
L_{up} = 2100 ft	Deceleration Lane Length L_D:	L_{down} = ft
V_u = 950 veh/h	Freeway Volume, V_F: 5475	V_D = veh/h
	Ramp Volume, V_R: 900	
	Freeway Free-Flow Speed, S_{FF}: 70.0	
	Ramp Free-Flow Speed, S_{FR}: 50.0	

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	5475	0.98	Level	7	0	0.966	1.00	5782
Ramp	900	0.86	Level	10	0	0.952	1.00	1099
UpStream	950	0.82	Level	9	0	0.957	1.00	1211
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 0.555 using Equation (Exhibit 13-6)

V_{12} = 3209 pc/h

V_3 or V_{av34} 2573 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☑ Yes ☐ No

If Yes,V_{12a} = 3304 pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	6881	Exhibit 13-8		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	4403	Exhibit 13-8	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734 v_R + 0.0078 V_{12} - 0.00627 L_A$

D_R = 18.6 (pc/mi/ln)

LOS = B (Exhibit 13-2)

Speed Determination

M_S = 0.310 (Exibit 13-11)

S_R= 61.3 mph (Exhibit 13-11)

S_0= 62.4 mph (Exhibit 13-11)

S = 61.7 mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes,V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086 V_{12} - 0.009 L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

D_s = (Exhibit 13-12)

S_R= mph (Exhibit 13-12)

S_0= mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	ASM	Freeway/Dir of Travel	I-95 Northbound
Agency or Company	CH2M	Junction	Rte 630 to I-95
Date Performed	7/23/2015	Jurisdiction	VDOT
Analysis Time Period	PM Peak Hour	Analysis Year	Build 2017

Project Description 070675_I-95 Corridor between Centerport Pkwy and Rte 610

Inputs

Upstream Adj Ramp		Downstream Adj Ramp
☑ Yes ☐ On	Number of Lanes, N: 3	☐ Yes ☐ On
☐ No ☑ Off	Acceleration Lane Length, L_A: 1400	☑ No ☐ Off
L_{up} = 2100 ft	Deceleration Lane Length L_D:	L_{down} = ft
V_u = 925 veh/h	Freeway Volume, V_F: 3175	V_D = veh/h
	Ramp Volume, V_R: 850	
	Freeway Free-Flow Speed, S_{FF}: 70.0	
	Ramp Free-Flow Speed, S_{FR}: 50.0	

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	3175	0.91	Level	13	0	0.939	1.00	3716
Ramp	850	0.89	Level	12	0	0.943	1.00	1012
UpStream	925	0.95	Level	12	0	0.943	1.00	1032
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 0.555 using Equation (Exhibit 13-6)

V_{12} = 2062 pc/h

V_3 or V_{av34} 1654 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☑ Yes ☐ No

If Yes,V_{12a} = 2123 pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	4728	Exhibit 13-8		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	3135	Exhibit 13-8	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734 v_R + 0.0078 V_{12} - 0.00627 L_A$

D_R = 8.8 (pc/mi/ln)

LOS = A (Exhibit 13-2)

Speed Determination

M_S = 0.081 (Exibit 13-11)

S_R= 67.7 mph (Exhibit 13-11)

S_0= 66.1 mph (Exhibit 13-11)

S = 67.2 mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes,V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086 V_{12} - 0.009 L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

D_s = (Exhibit 13-12)

S_R= mph (Exhibit 13-12)

S_0= mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	ASM	Freeway/Dir of Travel	I-95 Northbound
Agency or Company	CH2M	Junction	Rte 630 WB to I-95 NB
Date Performed	8/31/2015	Jurisdiction	VDOT
Analysis Time Period	AM Peak Hour	Analysis Year	Build 2017

Project Description 070675_I-95 Corridor between Centerport Pkwy and Rte 610

Inputs

Upstream Adj Ramp		Downstream Adj Ramp
☑ Yes ☐ On	Number of Lanes, N: 3	☐ Yes ☐ On
☐ No ☑ Off	Acceleration Lane Length, L_A: 1080	☑ No ☐ Off
L_{up} = 3150 ft	Deceleration Lane Length L_D:	L_{down} = ft
V_u = 425 veh/h	Freeway Volume, V_F: 5425	V_D = veh/h
	Ramp Volume, V_R: 1000	
	Freeway Free-Flow Speed, S_{FF}: 70.0	
	Ramp Free-Flow Speed, S_{FR}: 50.0	

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	5425	0.98	Level	7	0	0.966	1.00	5729
Ramp	1000	0.86	Level	10	0	0.952	1.00	1221
UpStream	425	0.82	Level	9	0	0.957	1.00	542
DownStream								

Merge Areas | **Diverge Areas**

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = 2179.82 (Equation 13-6 or 13-7)

P_{FM} = 0.608 using Equation (Exhibit 13-6)

V_{12} = 3482 pc/h

V_3 or V_{av34} 2247 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	6950	Exhibit 13-8		No

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	4703	Exhibit 13-8	4600:All	Yes

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = 34.8 (pc/mi/ln)

LOS = D (Exhibit 13-2)

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

M_S = 0.643 (Exibit 13-11)

S_R = 52.0 mph (Exhibit 13-11)

S_0 = 63.7 mph (Exhibit 13-11)

S = 55.3 mph (Exhibit 13-13)

Speed Determination

D_s = (Exhibit 13-12)

S_R = mph (Exhibit 13-12)

S_0 = mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	ASM	Freeway/Dir of Travel	I-95 Northbound
Agency or Company	CH2M	Junction	Rte 630 WB to I-95
Date Performed	8/31/2015	Jurisdiction	VDOT
Analysis Time Period	PM Peak Hour	Analysis Year	Build 2017

Project Description 070675_I-95 Corridor between Centerport Pkwy and Rte 610

Inputs

Upstream Adj Ramp			Downstream Adj Ramp
☐ Yes ☐ On	Number of Lanes, N	3	☑ Yes ☑ On
☑ No ☐ Off	Acceleration Lane Length, L_A	1080	☐ No ☐ Off
L_{up} = ft	Deceleration Lane Length L_D		L_{down} = 550 ft
V_u = veh/h	Freeway Volume, V_F	3775	V_D = 925 veh/h
	Ramp Volume, V_R	325	
	Freeway Free-Flow Speed, S_{FF}	70.0	
	Ramp Free-Flow Speed, S_{FR}	50.0	

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	3775	0.91	Level	13	0	0.939	1.00	4418
Ramp	325	0.89	Level	12	0	0.943	1.00	387
UpStream								
DownStream	925	0.89	Level	12	0	0.943	1.00	1102

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 0.608 using Equation (Exhibit 13-6)

V_{12} = 2685 pc/h

V_3 or V_{av34} 1733 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes,V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	4805	Exhibit 13-8		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	3072	Exhibit 13-8	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = 22.5 (pc/mi/ln)

LOS = C (Exhibit 13-2)

Speed Determination

M_S = 0.297 (Exibit 13-11)

S_R= 61.7 mph (Exhibit 13-11)

S_0= 65.6 mph (Exhibit 13-11)

S = 63.0 mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes,V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

D_s = (Exhibit 13-12)

S_R= mph (Exhibit 13-12)

S_0= mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	ASM	Freeway/Dir of Travel	I-95 Southbound
Agency or Company	CH2M	Junction	Rte 630 to I-95
Date Performed	7/23/2015	Jurisdiction	VDOT
Analysis Time Period	AM Peak Hour	Analysis Year	Build 2017

Project Description 070675_I-95 Corridor between Centerport Pkwy and Rte 610

Inputs

Upstream Adj Ramp		Downstream Adj Ramp
☑ Yes ☐ On	Number of Lanes, N: 3	☐ Yes ☐ On
☐ No ☑ Off	Acceleration Lane Length, L_A: 1200	☑ No ☐ Off
L_{up} = 2100 ft	Deceleration Lane Length L_D:	L_{down} = ft
V_u = 675 veh/h	Freeway Volume, V_F: 2350	V_D = veh/h
	Ramp Volume, V_R: 775	
	Freeway Free-Flow Speed, S_{FF}: 70.0	
	Ramp Free-Flow Speed, S_{FR}: 50.0	

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	2350	0.91	Level	14	0	0.935	1.00	2763
Ramp	775	0.82	Level	7	0	0.966	1.00	978
UpStream	675	0.89	Level	11	0	0.948	1.00	800
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 0.555 using Equation (Exhibit 13-6)

V_{12} = 1533 pc/h

V_3 or V_{av34} 1230 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☑ Yes ☐ No

If Yes,V_{12a} = 1578 pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	3741	Exhibit 13-8		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	2556	Exhibit 13-8	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734 v_R + 0.0078 V_{12} - 0.00627 L_A$

D_R = 6.8 (pc/mi/ln)

LOS = A (Exhibit 13-2)

Speed Determination

M_S = 0.081 (Exibit 13-11)

S_R= 67.7 mph (Exhibit 13-11)

S_0= 67.5 mph (Exhibit 13-11)

S = 67.7 mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes,V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086 V_{12} - 0.009 L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

D_s = (Exhibit 13-12)

S_R= mph (Exhibit 13-12)

S_0= mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	ASM	Freeway/Dir of Travel	I-95 Southbound
Agency or Company	CH2M	Junction	Rte 630 to I-95
Date Performed	7/23/2015	Jurisdiction	VDOT
Analysis Time Period	PM Peak Hour	Analysis Year	Build 2017

Project Description 070675_I-95 Corridor between Centerport Pkwy and Rte 610

Inputs

Upstream Adj Ramp		Downstream Adj Ramp
☑ Yes ☐ On	Number of Lanes, N: 3	☐ Yes ☐ On
☐ No ☑ Off	Acceleration Lane Length, L_A: 1200	☑ No ☐ Off
L_{up} = 2100 ft	Deceleration Lane Length L_D:	L_{down} = ft
V_u = 1000 veh/h	Freeway Volume, V_F: 5450	V_D = veh/h
	Ramp Volume, V_R: 1100	
	Freeway Free-Flow Speed, S_{FF}: 70.0	
	Ramp Free-Flow Speed, S_{FR}: 50.0	

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	5450	0.96	Level	8	0	0.962	1.00	5904
Ramp	1100	0.89	Level	6	0	0.971	1.00	1273
UpStream	1000	0.92	Level	6	0	0.971	1.00	1120
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 0.555 using Equation (Exhibit 13-6)

V_{12} = 3277 pc/h

V_3 or V_{av34} 2627 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☑ Yes ☐ No

If Yes,V_{12a} = 3373 pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	7177	Exhibit 13-8		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	4646	Exhibit 13-8	4600:All	Yes

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734 v_R + 0.0078 V_{12} - 0.00627 L_A$

D_R = 22.9 (pc/mi/ln)

LOS = C (Exhibit 13-2)

Speed Determination

M_S = 0.437 (Exibit 13-11)

S_R= 57.8 mph (Exhibit 13-11)

S_0= 62.1 mph (Exhibit 13-11)

S = 59.2 mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes,V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086 V_{12} - 0.009 L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

D_s = (Exhibit 13-12)

S_R= mph (Exhibit 13-12)

S_0= mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

I-95 Corridor between Centreport Pkwy and Rte 610

2017 Build - Alternative F

Diverge Analysis

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	ASM	Freeway/Dir of Travel	I-95 Northbound
Agency or Company	CH2M	Junction	I-95 to Rte 630
Date Performed	8/31/2015	Jurisdiction	VDOT
Analysis Time Period	AM Peak Hour	Analysis Year	Build 2017

Project Description 070675_I-95 Corridor between Centerport Pkwy and Rte 610

Inputs

Upstream Adj Ramp		Downstream Adj Ramp
☐ Yes ☐ On	Number of Lanes, N: 3	☑ Yes ☑ On
☑ No ☐ Off	Acceleration Lane Length, L_A:	☐ No ☐ Off
L_{up} = ft	Deceleration Lane Length L_D: 1500	L_{down} = 3150 ft
V_u = veh/h	Freeway Volume, V_F: 6425	V_D = 900 veh/h
	Ramp Volume, V_R: 950	
	Freeway Free-Flow Speed, S_{FF}: 70.0	
	Ramp Free-Flow Speed, S_{FR}: 50.0	

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	6425	0.98	Level	7	0	0.966	1.00	6786
Ramp	950	0.82	Level	9	0	0.957	1.00	1211
UpStream								
DownStream	900	0.86	Level	10	0	0.952	1.00	1099

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = using Equation (Exhibit 13-6)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 13-8		

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

M_S = (Exibit 13-11)

S_R = mph (Exhibit 13-11)

S_0 = mph (Exhibit 13-11)

S = mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = 0.535 using Equation (Exhibit 13-7)

V_{12} = 4192 pc/h

V_3 or V_{av34} 2594 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F	6786	Exhibit 13-8	7200	No
$V_{FO} = V_F - V_R$	5575	Exhibit 13-8	7200	No
V_R	1211	Exhibit 13-10	2100	No

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	4192	Exhibit 13-8	4400:All	No

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

D_R = 26.8 (pc/mi/ln)

LOS = C (Exhibit 13-2)

Speed Determination

D_s = 0.342 (Exhibit 13-12)

S_R = 60.4 mph (Exhibit 13-12)

S_0 = 70.6 mph (Exhibit 13-12)

S = 63.9 mph (Exhibit 13-13)

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	ASM	Freeway/Dir of Travel	I-95 Northbound
Agency or Company	CH2M	Junction	I-95 to Rte 630
Date Performed	8/31/2015	Jurisdiction	VDOT
Analysis Time Period	PM Peak Hour	Analysis Year	Build 2017

Project Description 070675_I-95 Corridor between Centerport Pkwy and Rte 610

Inputs

Upstream Adj Ramp		Downstream Adj Ramp
☐ Yes ☐ On	Number of Lanes, N: 3	☑ Yes ☑ On
☑ No ☐ Off	Acceleration Lane Length, L_A:	☐ No ☐ Off
L_{up} = ft	Deceleration Lane Length L_D: 1500	L_{down} = 3150 ft
V_u = veh/h	Freeway Volume, V_F: 4100	V_D = 850 veh/h
	Ramp Volume, V_R: 925	
	Freeway Free-Flow Speed, S_{FF}: 70.0	
	Ramp Free-Flow Speed, S_{FR}: 50.0	

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	4100	0.91	Level	13	0	0.939	1.00	4798
Ramp	925	0.95	Level	12	0	0.943	1.00	1032
UpStream								
DownStream	850	0.89	Level	12	0	0.943	1.00	1012

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = using Equation (Exhibit 13-6)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 13-8		

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

M_S = (Exibit 13-11)

S_R = mph (Exhibit 13-11)

S_0 = mph (Exhibit 13-11)

S = mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = 0.593 using Equation (Exhibit 13-7)

V_{12} = 3264 pc/h

V_3 or V_{av34} 1534 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F	4798	Exhibit 13-8	7200	No
$V_{FO} = V_F - V_R$	3766	Exhibit 13-8	7200	No
V_R	1032	Exhibit 13-10	2100	No

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	3264	Exhibit 13-8	4400:All	No

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

D_R = 18.8 (pc/mi/ln)

LOS = B (Exhibit 13-2)

Speed Determination

D_s = 0.326 (Exhibit 13-12)

S_R = 60.9 mph (Exhibit 13-12)

S_0 = 74.7 mph (Exhibit 13-12)

S = 64.7 mph (Exhibit 13-13)

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	ASM	Freeway/Dir of Travel	I-95 Southbound
Agency or Company	CH2M	Junction	I-95 to Rte 630
Date Performed	7/22/2015	Jurisdiction	VDOT
Analysis Time Period	AM Peak Hour	Analysis Year	Build 2017

Project Description 070675_I-95 Corridor between Centerport Pkwy and Rte 610

Inputs

Upstream Adj Ramp		Downstream Adj Ramp
☐ Yes ☐ On	Number of Lanes, N: 3	☑ Yes ☑ On
☑ No ☐ Off	Acceleration Lane Length, L_A:	☐ No ☐ Off
L_{up} = ft	Deceleration Lane Length L_D: 1500	L_{down} = 4000 ft
V_u = veh/h	Freeway Volume, V_F: 3025	V_D = 775 veh/h
	Ramp Volume, V_R: 675	
	Freeway Free-Flow Speed, S_{FF}: 70.0	
	Ramp Free-Flow Speed, S_{FR}: 50.0	

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	3025	0.91	Level	14	0	0.935	1.00	3557
Ramp	675	0.89	Level	11	0	0.948	1.00	800
UpStream								
DownStream	775	0.82	Level	7	0	0.966	1.00	978

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = using Equation (Exhibit 13-6)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 13-8		

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

M_S = (Exibit 13-11)

S_R = mph (Exhibit 13-11)

S_0 = mph (Exhibit 13-11)

S = mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = 0.450 using Equation (Exhibit 13-7)

V_{12} = 2041 pc/h

V_3 or V_{av34} 1516 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F	3557	Exhibit 13-8	7200	No
$V_{FO} = V_F - V_R$	2757	Exhibit 13-8	7200	No
V_R	800	Exhibit 13-10	4200	No

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	2041	Exhibit 13-8	4400:All	No

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

D_R = -8.3 (pc/mi/ln)

LOS = A (Exhibit 13-2)

Speed Determination

D_s = 0.305 (Exhibit 13-12)

S_R = 61.5 mph (Exhibit 13-12)

S_0 = 74.8 mph (Exhibit 13-12)

S = 66.5 mph (Exhibit 13-13)

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	ASM	Freeway/Dir of Travel	I-95 Southbound
Agency or Company	CH2M	Junction	I-95 to Rte 630
Date Performed	7/22/2015	Jurisdiction	VDOT
Analysis Time Period	PM Peak Hour	Analysis Year	Build 2017

Project Description 070675_I-95 Corridor between Centerport Pkwy and Rte 610

Inputs

Upstream Adj Ramp		Downstream Adj Ramp
☐ Yes ☐ On	Number of Lanes, N: 3	☑ Yes ☑ On
☑ No ☐ Off	Acceleration Lane Length, L_A:	☐ No ☐ Off
L_{up} = ft	Deceleration Lane Length L_D: 1500	L_{down} = 4000 ft
V_u = veh/h	Freeway Volume, V_F: 6450	V_D = 1100 veh/h
	Ramp Volume, V_R: 1000	
	Freeway Free-Flow Speed, S_{FF}: 70.0	
	Ramp Free-Flow Speed, S_{FR}: 50.0	

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	6450	0.96	Level	8	0	0.962	1.00	6988
Ramp	1000	0.92	Level	6	0	0.971	1.00	1120
UpStream								
DownStream	1100	0.89	Level	6	0	0.971	1.00	1273

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = using Equation (Exhibit 13-6)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 13-8		

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

M_S = (Exibit 13-11)

S_R= mph (Exhibit 13-11)

S_0= mph (Exhibit 13-11)

S = mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = 0.450 using Equation (Exhibit 13-7)

V_{12} = 3761 pc/h

V_3 or V_{av34} 3227 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☑ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☑ Yes ☐ No

If Yes, V_{12a} = 3993 pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F	6988	Exhibit 13-8	7200	No
$V_{FO} = V_F - V_R$	5868	Exhibit 13-8	7200	No
V_R	1120	Exhibit 13-10	4200	No

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	3761	Exhibit 13-8	4400:All	No

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

D_R = 8.4 (pc/mi/ln)

LOS = A (Exhibit 13-2)

Speed Determination

D_s = 0.334 (Exhibit 13-12)

S_R= 60.7 mph (Exhibit 13-12)

S_0= 69.0 mph (Exhibit 13-12)

S = 64.0 mph (Exhibit 13-13)

I-95 Corridor between Centreport Pkwy and Rte 610

2037 Build - Alternative F

- **Freeway Segment Analysis**
- **Merge Analysis**
- **Diverge Analysis**

I-95 Corridor between Centreport Pkwy and Rte 610

2037 Build - Alternative F

Freeway Segment Analysis

BASIC FREEWAY SEGMENTS WORKSHEET

General Information		Site Information	
Analyst	*TMM*	Highway/Direction of Travel	*I-95 Northbound*
Agency or Company	*JMT*	From/To	*Rte 628 to Ctrport Pkwy*
Date Performed	*8/18/2009*	Jurisdiction	*VDOT*
Analysis Time Period	*AM Peak Hour*	Analysis Year	*Build 2037*

Project Description *070675_I-95 Corridor between Centerport Pkwy and Rte 610*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*5330*	veh/h	Peak-Hour Factor, PHF	*0.98*
AADT		veh/day	%Trucks and Buses, P_T	*7*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.966*

Speed Inputs

Lane Width	*12.0*	ft
Rt-Side Lat. Clearance	*6.0*	ft
Number of Lanes, N	*3*	
Total Ramp Density, TRD	*0.50*	ramps/mi
FFS (measured)		mph
Base free-flow Speed, BFFS	*75.4*	mph

Calc Speed Adj and FFS

f_{LW}	*0.0*	mph
f_{LC}	*0.0*	mph
TRD Adjustment	*1.8*	mph
FFS	*73.6*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1876*	pc/h/ln
S	*66.5*	mph
D = v_p / S	*28.2*	pc/mi/ln
LOS	*D*	

Design (N)

Design (N)

Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h/ln
S	mph
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8
E_T - Exhibits 11-10, 11-11, 11-13	f_{LC} - Exhibit 11-9
f_p - Page 11-18	TRD - Page 11-11
LOS, S, FFS, v_p - Exhibits 11-2, 11-3	

BASIC FREEWAY SEGMENTS WORKSHEET

General Information

Analyst	*TMM*
Agency or Company	*JMT*
Date Performed	*8/18/2009*
Analysis Time Period	*PM Peak Hour*

Site Information

Highway/Direction of Travel	*I-95 Northbound*
From/To	*Rte 628 to Ctrport Pkwy*
Jurisdiction	*VDOT*
Analysis Year	*2037 Build*

Project Description *070675_I-95 Corridor between Centerport Pkwy and Rte 610*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*5280*	veh/h	Peak-Hour Factor, PHF	*0.91*
AADT		veh/day	%Trucks and Buses, P_T	*13*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.939*

Speed Inputs

Lane Width	*12.0*	ft
Rt-Side Lat. Clearance	*6.0*	ft
Number of Lanes, N	*3*	
Total Ramp Density, TRD	*0.50*	ramps/mi
FFS (measured)		mph
Base free-flow Speed, BFFS	*75.4*	mph

Calc Speed Adj and FFS

f_{LW}	*0.0*	mph
f_{LC}	*0.0*	mph
TRD Adjustment	*1.8*	mph
FFS	*73.6*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*2060*	pc/h/ln
S	*62.6*	mph
D = v_p / S	*32.9*	pc/mi/ln
LOS	*D*	

Design (N)

Design (N)

Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h/ln
S	mph
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8
E_T - Exhibits 11-10, 11-11, 11-13	f_{LC} - Exhibit 11-9
f_p - Page 11-18	TRD - Page 11-11
LOS, S, FFS, v_p - Exhibits 11-2, 11-3	

BASIC FREEWAY SEGMENTS WORKSHEET

General Information		Site Information	
Analyst	*ASM*	Highway/Direction of Travel	*I-95 Northbound*
Agency or Company	*CH2M*	From/To	*Ctrport Pkwy to Rte 630*
Date Performed	*7/23/2015*	Jurisdiction	*VDOT*
Analysis Time Period	*AM Peak Hour*	Analysis Year	*2037 Build*

Project Description *070675_I-95 Corridor between Centerport Pkwy and Rte 610*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*6155*	veh/h	Peak-Hour Factor, PHF	*0.98*
AADT		veh/day	%Trucks and Buses, P_T	*7*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.966*

Speed Inputs

Lane Width	*12.0*	ft
Rt-Side Lat. Clearance	*6.0*	ft
Number of Lanes, N	*3*	
Total Ramp Density, TRD	*0.50*	ramps/mi
FFS (measured)		mph
Base free-flow Speed, BFFS	*75.4*	mph

Calc Speed Adj and FFS

f_{LW}	*0.0*	mph
f_{LC}	*0.0*	mph
TRD Adjustment	*1.8*	mph
FFS	*73.6*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*2167*	pc/h/ln
S	*59.9*	mph
D = v_p / S	*36.2*	pc/mi/ln
LOS	*E*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h/ln
S		mph
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8
E_T - Exhibits 11-10, 11-11, 11-13	f_{LC} - Exhibit 11-9
f_p - Page 11-18	TRD - Page 11-11
LOS, S, FFS, v_p - Exhibits 11-2, 11-3	

BASIC FREEWAY SEGMENTS WORKSHEET

General Information

Analyst	*ASM*
Agency or Company	*CH2M*
Date Performed	*7/23/2015*
Analysis Time Period	*PM Peak Hour*

Site Information

Highway/Direction of Travel	*I-95 Northbound*
From/To	*Ctrport Pkwy to Rte 630*
Jurisdiction	*VDOT*
Analysis Year	*2037 Build*

Project Description *070675_I-95 Corridor between Centerport Pkwy and Rte 610*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*5080*	veh/h	Peak-Hour Factor, PHF	*0.91*
AADT		veh/day	%Trucks and Buses, P_T	*13*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.939*

Speed Inputs

Lane Width	*12.0*	ft
Rt-Side Lat. Clearance	*6.0*	ft
Number of Lanes, N	*3*	
Total Ramp Density, TRD	*0.50*	ramps/mi
FFS (measured)		mph
Base free-flow Speed, BFFS	*75.4*	mph

Calc Speed Adj and FFS

f_{LW}	*0.0*	mph
f_{LC}	*0.0*	mph
TRD Adjustment	*1.8*	mph
FFS	*73.6*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1982*	pc/h/ln
S	*64.3*	mph
D = v_p / S	*30.8*	pc/mi/ln
LOS	*D*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h/ln
S		mph
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8
E_T - Exhibits 11-10, 11-11, 11-13	f_{LC} - Exhibit 11-9
f_p - Page 11-18	TRD - Page 11-11
LOS, S, FFS, v_p - Exhibits 11-2, 11-3	

BASIC FREEWAY SEGMENTS WORKSHEET

General Information

Analyst	*ASM*
Agency or Company	*CH2M*
Date Performed	*7/23/2015*
Analysis Time Period	*AM Peak Hour*

Site Information

Highway/Direction of Travel	*I-95 Northbound*
From/To	*Rte 630 to Rte 610*
Jurisdiction	*VDOT*
Analysis Year	*2037 Build*

Project Description *070675_I-95 Corridor between Centerport Pkwy and Rte 610*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*5980*	veh/h	Peak-Hour Factor, PHF	*0.98*
AADT		veh/day	%Trucks and Buses, P_T	*7*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.966*

Speed Inputs

Lane Width	*12.0*	ft
Rt-Side Lat. Clearance	*6.0*	ft
Number of Lanes, N	*3*	
Total Ramp Density, TRD	*0.50*	ramps/mi
FFS (measured)		mph
Base free-flow Speed, BFFS	*75.4*	mph

Calc Speed Adj and FFS

f_{LW}	*0.0*	mph
f_{LC}	*0.0*	mph
TRD Adjustment	*1.8*	mph
FFS	*73.6*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*2105*	pc/h/ln
S	*61.5*	mph
D = v_p / S	*34.2*	pc/mi/ln
LOS	*D*	

Design (N)

Design (N)

Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h/ln
S	mph
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8
E_T - Exhibits 10-10, 11-11, 11-13	f_{LC} - Exhibit 11-9
f_p - Page 11-18	TRD - Page 11-11
LOS, S, FFS, v_p - Exhibits 11-2, 11-3	

BASIC FREEWAY SEGMENTS WORKSHEET

General Information		Site Information	
Analyst	*ASM*	Highway/Direction of Travel	*I-95 Northbound*
Agency or Company	*CH2M*	From/To	*Rte 630 to Rte 610*
Date Performed	*7/23/2015*	Jurisdiction	*VDOT*
Analysis Time Period	*PM Peak Hour*	Analysis Year	*2037 Build*

Project Description *070675_I-95 Corridor between Centerport Pkwy and Rte 610*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*4755*	veh/h	Peak-Hour Factor, PHF	*0.91*
AADT		veh/day	%Trucks and Buses, P_T	*13*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.939*

Speed Inputs

Lane Width	*12.0*	ft
Rt-Side Lat. Clearance	*6.0*	ft
Number of Lanes, N	*3*	
Total Ramp Density, TRD	*0.50*	ramps/mi
FFS (measured)		mph
Base free-flow Speed, BFFS	*75.4*	mph

Calc Speed Adj and FFS

f_{LW}	*0.0*	mph
f_{LC}	*0.0*	mph
TRD Adjustment	*1.8*	mph
FFS	*73.6*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1855*	pc/h/ln
S	*66.9*	mph
D = v_p / S	*27.7*	pc/mi/ln
LOS	*D*	

Design (N)

Design (N)

Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h/ln
S	mph
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8
E_T - Exhibits 11-10, 11-11, 11-13	f_{LC} - Exhibit 11-9
f_p - Page 11-18	TRD - Page 11-11
LOS, S, FFS, v_p - Exhibits 11-2, 11-3	

BASIC FREEWAY SEGMENTS WORKSHEET

General Information

Analyst	*SLE*
Agency or Company	*JMT*
Date Performed	*3/18/2010*
Analysis Time Period	*AM Peak Hour*

Site Information

Highway/Direction of Travel	*I-95 Northbound*
From/To	*Rte 610 to Telegraph Rd*
Jurisdiction	*VDOT*
Analysis Year	*2037 Build*

Project Description *070675_I-95 Corridor between Centerport Pkwy and Rte 610*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*6405*	veh/h	Peak-Hour Factor, PHF	*0.98*
AADT		veh/day	%Trucks and Buses, P_T	*7*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.966*

Speed Inputs

Lane Width	*12.0*	ft
Rt-Side Lat. Clearance	*6.0*	ft
Number of Lanes, N	*3*	
Total Ramp Density, TRD	*0.50*	ramps/mi
FFS (measured)		mph
Base free-flow Speed, BFFS	*75.4*	mph

Calc Speed Adj and FFS

f_{LW}	*0.0*	mph
f_{LC}	*0.0*	mph
TRD Adjustment	*1.8*	mph
FFS	*73.6*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*2255*	pc/h/ln
S	*57.6*	mph
D = v_p / S	*39.2*	pc/mi/ln
LOS	*E*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h/ln
S		mph
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8
E_T - Exhibits 10-10, 11-11, 11-13	f_{LC} - Exhibit 11-9
f_p - Page 11-18	TRD - Page 11-11
LOS, S, FFS, v_p - Exhibits 11-2, 11-3	

BASIC FREEWAY SEGMENTS WORKSHEET

General Information		Site Information	
Analyst	*SLE*	Highway/Direction of Travel	*I-95 Northbound*
Agency or Company	*JMT*	From/To	*Rte 610 to Telegraph Rd*
Date Performed	*3/18/2010*	Jurisdiction	*VDOT*
Analysis Time Period	*PM Peak Hour*	Analysis Year	*2037 Build*

Project Description *070675_I-95 Corridor between Centerport Pkwy and Rte 610*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*4455*	veh/h	Peak-Hour Factor, PHF	*0.91*
AADT		veh/day	%Trucks and Buses, P_T	*13*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.939*

Speed Inputs

Lane Width	*12.0*	ft
Rt-Side Lat. Clearance	*6.0*	ft
Number of Lanes, N	*3*	
Total Ramp Density, TRD	*0.50*	ramps/mi
FFS (measured)		mph
Base free-flow Speed, BFFS	*75.4*	mph

Calc Speed Adj and FFS

f_{LW}	*0.0*	mph
f_{LC}	*0.0*	mph
TRD Adjustment	*1.8*	mph
FFS	*73.6*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1738*	pc/h/ln
S	*69.0*	mph
D = v_p / S	*25.2*	pc/mi/ln
LOS	*C*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h/ln
S		mph
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8
E_T - Exhibits 11-10, 11-11, 11-13	f_{LC} - Exhibit 11-9
f_p - Page 11-18	TRD - Page 11-11
LOS, S, FFS, v_p - Exhibits 11-2, 11-3	

BASIC FREEWAY SEGMENTS WORKSHEET

General Information

Analyst	*SLE*
Agency or Company	*JMT*
Date Performed	*3/18/2010*
Analysis Time Period	*AM Peak Hour*

Site Information

Highway/Direction of Travel	*I-95 Southbound*
From/To	*Telegraph Rd to Rte 610*
Jurisdiction	*VDOT*
Analysis Year	*2037 Build*

Project Description *070675_I-95 Corridor between Centerport Pkwy and Rte 610*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*4130*	veh/h	Peak-Hour Factor, PHF	*0.91*
AADT		veh/day	%Trucks and Buses, P_T	*14*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.935*

Speed Inputs

Lane Width	*12.0*	ft
Rt-Side Lat. Clearance	*6.0*	ft
Number of Lanes, N	*3*	
Total Ramp Density, TRD	*0.50*	ramps/mi
FFS (measured)		mph
Base free-flow Speed, BFFS	*75.4*	mph

Calc Speed Adj and FFS

f_{LW}	*0.0*	mph
f_{LC}	*0.0*	mph
TRD Adjustment	*1.8*	mph
FFS	*73.6*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1619*	pc/h/ln
S	*70.8*	mph
D = v_p / S	*22.9*	pc/mi/ln
LOS	*C*	

Design (N)

Design (N)

Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h/ln
S	mph
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8
E_T - Exhibits 10-10, 11-11, 11-13	f_{LC} - Exhibit 11-9
f_p - Page 11-18	TRD - Page 11-11
LOS, S, FFS, v_p - Exhibits 11-2, 11-3	

BASIC FREEWAY SEGMENTS WORKSHEET

General Information

Analyst	*SLE*
Agency or Company	*JMT*
Date Performed	*3/18/2010*
Analysis Time Period	*PM Peak Hour*

Site Information

Highway/Direction of Travel	*I-95 Southbound*
From/To	*Telegraph Rd to Rte 610*
Jurisdiction	*VDOT*
Analysis Year	*2037 Build*

Project Description *070675_I-95 Corridor between Centerport Pkwy and Rte 610*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*5900*	veh/h	Peak-Hour Factor, PHF	*0.96*
AADT		veh/day	%Trucks and Buses, P_T	*8*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.962*

Speed Inputs

Lane Width	*12.0*	ft
Rt-Side Lat. Clearance	*6.0*	ft
Number of Lanes, N	*3*	
Total Ramp Density, TRD	*0.50*	ramps/mi
FFS (measured)		mph
Base free-flow Speed, BFFS	*75.4*	mph

Calc Speed Adj and FFS

f_{LW}	*0.0*	mph
f_{LC}	*0.0*	mph
TRD Adjustment	*1.8*	mph
FFS	*73.6*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*2131*	pc/h/ln
S	*60.8*	mph
D = v_p / S	*35.0*	pc/mi/ln
LOS	*E*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h/ln
S		mph
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8
E_T - Exhibits 11-10, 11-11, 11-13	f_{LC} - Exhibit 11-9
f_p - Page 11-18	TRD - Page 11-11
LOS, S, FFS, v_p - Exhibits 11-2, 11-3	

BASIC FREEWAY SEGMENTS WORKSHEET

General Information

Analyst	*ASM*
Agency or Company	*CH2M*
Date Performed	*7/23/2015*
Analysis Time Period	*AM Peak Hour*

Site Information

Highway/Direction of Travel	*I-95 Southbound*
From/To	*Rte 610 to Rte 630*
Jurisdiction	*VDOT*
Analysis Year	*2037 Build*

Project Description *070675_I-95 Corridor between Centerport Pkwy and Rte 610*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*4005*	veh/h	Peak-Hour Factor, PHF	*0.91*
AADT		veh/day	%Trucks and Buses, P_T	*14*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.935*

Speed Inputs

Lane Width	*12.0*	ft
Rt-Side Lat. Clearance	*6.0*	ft
Number of Lanes, N	*3*	
Total Ramp Density, TRD	*0.50*	ramps/mi
FFS (measured)		mph
Base free-flow Speed, BFFS	*75.4*	mph

Calc Speed Adj and FFS

f_{LW}	*0.0*	mph
f_{LC}	*0.0*	mph
TRD Adjustment	*1.8*	mph
FFS	*73.6*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1570*	pc/h/ln
S	*71.4*	mph
D = v_p / S	*22.0*	pc/mi/ln
LOS	*C*	

Design (N)

Design (N)

Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h/ln
S	mph
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8
E_T - Exhibits 10-10, 11-11, 11-13	f_{LC} - Exhibit 11-9
f_p - Page 11-18	TRD - Page 11-11
LOS, S, FFS, v_p - Exhibits 11-2, 11-3	

BASIC FREEWAY SEGMENTS WORKSHEET

General Information

Analyst	*ASM*
Agency or Company	*CH2M*
Date Performed	*7/2/32015*
Analysis Time Period	*PM Peak Hour*

Site Information

Highway/Direction of Travel	*I-95 Southbound*
From/To	*Rte 610 to Rte 630*
Jurisdiction	*VDOT*
Analysis Year	*2037 Build*

Project Description *070675_I-95 Corridor between Centerport Pkwy and Rte 610*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*5900*	veh/h	Peak-Hour Factor, PHF	*0.96*
AADT		veh/day	%Trucks and Buses, P_T	*8*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.962*

Speed Inputs

Lane Width	*12.0*	ft
Rt-Side Lat. Clearance	*6.0*	ft
Number of Lanes, N	*3*	
Total Ramp Density, TRD	*0.50*	ramps/mi
FFS (measured)		mph
Base free-flow Speed, BFFS	*75.4*	mph

Calc Speed Adj and FFS

f_{LW}	*0.0*	mph
f_{LC}	*0.0*	mph
TRD Adjustment	*1.8*	mph
FFS	*73.6*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*2131*	pc/h/ln
S	*60.8*	mph
D = v_p / S	*35.0*	pc/mi/ln
LOS	*E*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h/ln
S		mph
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8
E_T - Exhibits 11-10, 11-11, 11-13	f_{LC} - Exhibit 11-9
f_p - Page 11-18	TRD - Page 11-11
LOS, S, FFS, v_p - Exhibits 11-2, 11-3	

BASIC FREEWAY SEGMENTS WORKSHEET

General Information

Analyst	*ASM*
Agency or Company	*CH2M*
Date Performed	*7/23/2015*
Analysis Time Period	*AM Peak Hour*

Site Information

Highway/Direction of Travel	*I-95 Southbound*
From/To	*Rte 630 to Cntrport Pkwy*
Jurisdiction	*VDOT*
Analysis Year	*2037 Build*

Project Description *070675_I-95 Corridor between Centerport Pkwy and Rte 610*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*4230*	veh/h	Peak-Hour Factor, PHF	*0.91*
AADT		veh/day	%Trucks and Buses, P_T	*14*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.935*

Speed Inputs

Lane Width	*12.0*	ft
Rt-Side Lat. Clearance	*6.0*	ft
Number of Lanes, N	*3*	
Total Ramp Density, TRD	*0.50*	ramps/mi
FFS (measured)		mph
Base free-flow Speed, BFFS	*75.4*	mph

Calc Speed Adj and FFS

f_{LW}	*0.0*	mph
f_{LC}	*0.0*	mph
TRD Adjustment	*1.8*	mph
FFS	*73.6*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1658*	pc/h/ln
S	*70.2*	mph
D = v_p / S	*23.6*	pc/mi/ln
LOS	*C*	

Design (N)

Design (N)

Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h/ln
S	mph
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8
E_T - Exhibits 10-10, 11-11, 11-13	f_{LC} - Exhibit 11-9
f_p - Page 11-18	TRD - Page 11-11
LOS, S, FFS, v_p - Exhibits 11-2, 11-3	

BASIC FREEWAY SEGMENTS WORKSHEET

General Information

Analyst	*ASM*
Agency or Company	*CH2M*
Date Performed	*7/23/2015*
Analysis Time Period	*PM Peak Hour*

Site Information

Highway/Direction of Travel	*I-95 Southbound*
From/To	*Rte 630 to Cntrport Pkwy*
Jurisdiction	*VDOT*
Analysis Year	*2037 Build*

Project Description *070675_I-95 Corridor between Centerport Pkwy and Rte 610*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*6225*	veh/h	Peak-Hour Factor, PHF	*0.96*
AADT		veh/day	%Trucks and Buses, P_T	*8*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.962*

Speed Inputs

Lane Width	*12.0*	ft
Rt-Side Lat. Clearance	*6.0*	ft
Number of Lanes, N	*3*	
Total Ramp Density, TRD	*0.50*	ramps/mi
FFS (measured)		mph
Base free-flow Speed, BFFS	*75.4*	mph

Calc Speed Adj and FFS

f_{LW}	*0.0*	mph
f_{LC}	*0.0*	mph
TRD Adjustment	*1.8*	mph
FFS	*73.6*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*2248*	pc/h/ln
S	*57.8*	mph
D = v_p / S	*38.9*	pc/mi/ln
LOS	*E*	

Design (N)

Design (N)

Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h/ln
S	mph
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8
E_T - Exhibits 11-10, 11-11, 11-13	f_{LC} - Exhibit 11-9
f_p - Page 11-18	TRD - Page 11-11
LOS, S, FFS, v_p - Exhibits 11-2, 11-3	

I-95 Corridor between Centreport Pkwy and Rte 610

2037 Build - Alternative F

Merge Analysis

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	ASM	Freeway/Dir of Travel	I-95 Northbound
Agency or Company	CH2M	Junction	Rte 630 EB to I-95 NB
Date Performed	7/23/2015	Jurisdiction	VDOT
Analysis Time Period	AM Peak Hour	Analysis Year	Build 2037

Project Description 070675_I-95 Corridor between Centerport Pkwy and Rte 610

Inputs

Upstream Adj Ramp

☑ Yes ☑ On

☐ No ☐ Off

L_{up} = 2100 ft

V_u = 1275 veh/h

Number of Lanes, N	3
Acceleration Lane Length, L_A	1500
Deceleration Lane Length L_D	
Freeway Volume, V_F	4305
Ramp Volume, V_R	1675
Freeway Free-Flow Speed, S_{FF}	70.0
Ramp Free-Flow Speed, S_{FR}	50.0

Downstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	4305	0.98	Level	7	0	0.966	1.00	4547
Ramp	1675	0.86	Level	10	0	0.952	1.00	2045
UpStream	1275	0.86	Level	10	0	0.952	1.00	1557
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 0.555 using Equation (Exhibit 13-6)

V_{12} = 2524 pc/h

V_3 or V_{av34} 2023 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☑ Yes ☐ No

If Yes,V_{12a} = 2598 pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	6592	Exhibit 13-8		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	4643	Exhibit 13-8	4600:All	Yes

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = 18.8 (pc/mi/ln)

LOS = B (Exhibit 13-2)

Speed Determination

M_S = 0.376 (Exibit 13-11)

S_R= 59.5 mph (Exhibit 13-11)

S_0= 64.8 mph (Exhibit 13-11)

S = 60.9 mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes,V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

D_s = (Exhibit 13-12)

S_R= mph (Exhibit 13-12)

S_0= mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	ASM	Freeway/Dir of Travel	I-95 Northbound
Agency or Company	CH2M	Junction	Rte 630 EB to I-95
Date Performed	7/23/2015	Jurisdiction	VDOT
Analysis Time Period	PM Peak Hour	Analysis Year	Build 2037

Project Description 070675_I-95 Corridor between Centerport Pkwy and Rte 610

Inputs

Upstream Adj Ramp		Downstream Adj Ramp
☑ Yes ☑ On	Number of Lanes, N: 3	☐ Yes ☐ On
☐ No ☐ Off	Acceleration Lane Length, L_A: 1500	☑ No ☐ Off
L_{up} = 2100 ft	Deceleration Lane Length L_D:	L_{down} = ft
V_u = 1375 veh/h	Freeway Volume, V_F: 3705	V_D = veh/h
	Ramp Volume, V_R: 1050	
	Freeway Free-Flow Speed, S_{FF}: 70.0	
	Ramp Free-Flow Speed, S_{FR}: 50.0	

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	3705	0.91	Level	13	0	0.939	1.00	4336
Ramp	1050	0.89	Level	12	0	0.943	1.00	1251
UpStream	1375	0.89	Level	12	0	0.943	1.00	1638
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 0.555 using Equation (Exhibit 13-6)

V_{12} = 2406 pc/h

V_3 or V_{av34} 1930 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☑ Yes ☐ No

If Yes,V_{12a} = 2477 pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	5587	Exhibit 13-8		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	3728	Exhibit 13-8	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734 v_R + 0.0078 V_{12} - 0.00627 L_A$

D_R = 12.0 (pc/mi/ln)

LOS = B (Exhibit 13-2)

Speed Determination

M_S = 0.133 (Exibit 13-11)

S_R= 66.3 mph (Exhibit 13-11)

S_0= 65.1 mph (Exhibit 13-11)

S = 65.9 mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes,V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086 V_{12} - 0.009 L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

D_s = (Exhibit 13-12)

S_R= mph (Exhibit 13-12)

S_0= mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	ASM	Freeway/Dir of Travel	I-95 Southbound
Agency or Company	CH2M	Junction	Rte 630 WB to I-95
Date Performed	7/23/2015	Jurisdiction	VDOT
Analysis Time Period	AM Peak Hour	Analysis Year	Build 2037

Project Description 070675_I-95 Corridor between Centerport Pkwy and Rte 610

Inputs

Upstream Adj Ramp		Downstream Adj Ramp
☑ Yes ☐ On	Number of Lanes, N: 3	☐ Yes ☐ On
☐ No ☑ Off	Acceleration Lane Length, L_A: 1260	☑ No ☐ Off
L_{up} = 2100 ft	Deceleration Lane Length L_D:	L_{down} = ft
V_u = 850 veh/h	Freeway Volume, V_F: 3155	V_D = veh/h
	Ramp Volume, V_R: 1075	
	Freeway Free-Flow Speed, S_{FF}: 70.0	
	Ramp Free-Flow Speed, S_{FR}: 50.0	

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	3155	0.91	Level	14	0	0.935	1.00	3710
Ramp	1075	0.82	Level	7	0	0.966	1.00	1357
UpStream	850	0.89	Level	11	0	0.948	1.00	1008
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 0.555 using Equation (Exhibit 13-6)

V_{12} = 2059 pc/h

V_3 or V_{av34} 1651 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☑ Yes ☐ No

If Yes,V_{12a} = 2120 pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	5067	Exhibit 13-8		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	3477	Exhibit 13-8	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734 v_R + 0.0078 V_{12} - 0.00627 L_A$

D_R = 13.0 (pc/mi/ln)

LOS = B (Exhibit 13-2)

Speed Determination

M_S = 0.145 (Exibit 13-11)

S_R= 65.9 mph (Exhibit 13-11)

S_0= 66.1 mph (Exhibit 13-11)

S = 66.0 mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes,V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086 V_{12} - 0.009 L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

D_s = (Exhibit 13-12)

S_R= mph (Exhibit 13-12)

S_0= mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	ASM	Freeway/Dir of Travel	I-95 Southbound
Agency or Company	CH2M	Junction	Rte 630 WB to I-95
Date Performed	7/23/2015	Jurisdiction	VDOT
Analysis Time Period	PM Peak Hour	Analysis Year	Build 2037

Project Description 070675_I-95 Corridor between Centerport Pkwy and Rte 610

Inputs

Upstream Adj Ramp		Downstream Adj Ramp
☑ Yes ☐ On	Number of Lanes, N: 3	☐ Yes ☐ On
☐ No ☑ Off	Acceleration Lane Length, L_A: 1260	☑ No ☐ Off
L_{up} = 2100 ft	Deceleration Lane Length L_D:	L_{down} = ft
V_u = 1775 veh/h	Freeway Volume, V_F: 4125	V_D = veh/h
	Ramp Volume, V_R: 1625	
	Freeway Free-Flow Speed, S_{FF}: 70.0	
	Ramp Free-Flow Speed, S_{FR}: 50.0	

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	4125	0.96	Level	8	0	0.962	1.00	4469
Ramp	1625	0.89	Level	6	0	0.971	1.00	1881
UpStream	1775	0.89	Level	6	0	0.971	1.00	2054
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 0.555 using Equation (Exhibit 13-6)

V_{12} = 2480 pc/h

V_3 or V_{av34} 1989 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☑ Yes ☐ No

If Yes,V_{12a} = 2553 pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	6350	Exhibit 13-8		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	4434	Exhibit 13-8	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734 v_R + 0.0078 V_{12} - 0.00627 L_A$

D_R = 20.3 (pc/mi/ln)

LOS = C (Exhibit 13-2)

Speed Determination

M_S = 0.348 (Exibit 13-11)

S_R= 60.3 mph (Exhibit 13-11)

S_0= 64.9 mph (Exhibit 13-11)

S = 61.6 mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes,V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086 V_{12} - 0.009 L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

D_s = (Exhibit 13-12)

S_R= mph (Exhibit 13-12)

S_0= mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

I-95 Corridor between Centreport Pkwy and Rte 610

2037 Build - Alternative F

Diverge Analysis

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	ASM	Freeway/Dir of Travel	I-95 Northbound
Agency or Company	CH2M	Junction	I-95 to Rte 630
Date Performed	7/23/2015	Jurisdiction	VDOT
Analysis Time Period	AM Peak Hour	Analysis Year	Build 2037

Project Description 070675_I-95 Corridor between Centerport Pkwy and Rte 610

Inputs

Upstream Adj Ramp		Downstream Adj Ramp
☐ Yes ☐ On	Number of Lanes, N: 3	☑ Yes ☑ On
☑ No ☐ Off	Acceleration Lane Length, L_A:	☐ No ☐ Off
L_{up} = ft	Deceleration Lane Length L_D: 1500	L_{down} = 2100 ft
V_u = veh/h	Freeway Volume, V_F: 5580	V_D = 1675 veh/h
	Ramp Volume, V_R: 1275	
	Freeway Free-Flow Speed, S_{FF}: 70.0	
	Ramp Free-Flow Speed, S_{FR}: 50.0	

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	5580	0.98	Level	7	0	0.966	1.00	5893
Ramp	1275	0.82	Level	9	0	0.957	1.00	1625
UpStream								
DownStream	1675	0.86	Level	10	0	0.952	1.00	2045

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = using Equation (Exhibit 13-6)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 13-8		

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

M_S = (Exibit 13-11)

S_R = mph (Exhibit 13-11)

S_0 = mph (Exhibit 13-11)

S = mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = 0.450 using Equation (Exhibit 13-7)

V_{12} = 3546 pc/h

V_3 or V_{av34} 2347 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F	5893	Exhibit 13-8	7200	No
$V_{FO} = V_F - V_R$	4268	Exhibit 13-8	7200	No
V_R	1625	Exhibit 13-10	4200	No

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	3546	Exhibit 13-8	4400:All	No

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

D_R = 3.2 (pc/mi/ln)

LOS = A (Exhibit 13-2)

Speed Determination

D_s = 0.379 (Exhibit 13-12)

S_R = 59.4 mph (Exhibit 13-12)

S_0 = 71.5 mph (Exhibit 13-12)

S = 63.7 mph (Exhibit 13-13)

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	ASM	Freeway/Dir of Travel	I-95 Northbound
Agency or Company	CH2M	Junction	I-95 to Rte 630
Date Performed	7/23/2015	Jurisdiction	VDOT
Analysis Time Period	PM Peak Hour	Analysis Year	Build 2037

Project Description 070675_I-95 Corridor between Centerport Pkwy and Rte 610

Inputs

Upstream Adj Ramp		Downstream Adj Ramp
☐ Yes ☐ On	Number of Lanes, N: 3	☑ Yes ☑ On
☑ No ☐ Off	Acceleration Lane Length, L_A:	☐ No ☐ Off
L_{up} = ft	Deceleration Lane Length L_D: 1500	L_{down} = 2100 ft
V_u = veh/h	Freeway Volume, V_F: 5080	V_D = 1050 veh/h
	Ramp Volume, V_R: 1375	
	Freeway Free-Flow Speed, S_{FF}: 70.0	
	Ramp Free-Flow Speed, S_{FR}: 50.0	

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	5080	0.91	Level	13	0	0.939	1.00	5945
Ramp	1375	0.95	Level	12	0	0.943	1.00	1534
UpStream								
DownStream	1050	0.89	Level	12	0	0.943	1.00	1251

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = using Equation (Exhibit 13-6)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 13-8		

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

M_S = (Exibit 13-11)

S_R = mph (Exhibit 13-11)

S_0 = mph (Exhibit 13-11)

S = mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = 0.450 using Equation (Exhibit 13-7)

V_{12} = 3519 pc/h

V_3 or V_{av34} 2426 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F	5945	Exhibit 13-8	7200	No
$V_{FO} = V_F - V_R$	4411	Exhibit 13-8	7200	No
V_R	1534	Exhibit 13-10	4200	No

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	3519	Exhibit 13-8	4400:All	No

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

D_R = 3.0 (pc/mi/ln)

LOS = A (Exhibit 13-2)

Speed Determination

D_s = 0.371 (Exhibit 13-12)

S_R = 59.6 mph (Exhibit 13-12)

S_0 = 71.2 mph (Exhibit 13-12)

S = 63.9 mph (Exhibit 13-13)

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	ASM	Freeway/Dir of Travel	I-95 Southbound
Agency or Company	CH2M	Junction	I-95 to Rte 630
Date Performed	7/23/2015	Jurisdiction	VDOT
Analysis Time Period	AM Peak Hour	Analysis Year	Build 2037

Project Description 070675_I-95 Corridor between Centerport Pkwy and Rte 610

Inputs

Upstream Adj Ramp		Downstream Adj Ramp
☐ Yes ☐ On	Number of Lanes, N: 3	☑ Yes ☑ On
☑ No ☐ Off	Acceleration Lane Length, L_A:	☐ No ☐ Off
L_{up} = ft	Deceleration Lane Length L_D: 1500	L_{down} = 2100 ft
V_u = veh/h	Freeway Volume, V_F: 4005	V_D = 1075 veh/h
	Ramp Volume, V_R: 850	
	Freeway Free-Flow Speed, S_{FF}: 70.0	
	Ramp Free-Flow Speed, S_{FR}: 50.0	

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	4005	0.91	Level	14	0	0.935	1.00	4709
Ramp	850	0.89	Level	11	0	0.948	1.00	1008
UpStream								
DownStream	1075	0.82	Level	7	0	0.966	1.00	1357

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = using Equation (Exhibit 13-6)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 13-8		

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

M_S = (Exibit 13-11)

S_R = mph (Exhibit 13-11)

S_0 = mph (Exhibit 13-11)

S = mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = 0.450 using Equation (Exhibit 13-7)

V_{12} = 2673 pc/h

V_3 or V_{av34} 2036 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☑ Yes ☐ No

If Yes, V_{12a} = 2690 pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F	4709	Exhibit 13-8	7200	No
$V_{FO} = V_F - V_R$	3701	Exhibit 13-8	7200	No
V_R	1008	Exhibit 13-10	4200	No

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	2673	Exhibit 13-8	4400:All	No

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

D_R = -2.8 (pc/mi/ln)

LOS = A (Exhibit 13-2)

Speed Determination

D_s = 0.324 (Exhibit 13-12)

S_R = 60.9 mph (Exhibit 13-12)

S_0 = 72.8 mph (Exhibit 13-12)

S = 65.5 mph (Exhibit 13-13)

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	ASM	Freeway/Dir of Travel	I-95 Southbound
Agency or Company	CH2M	Junction	I-95 to Rte 630
Date Performed	7/23/2015	Jurisdiction	VDOT
Analysis Time Period	PM Peak Hour	Analysis Year	Build 2037

Project Description 070675_I-95 Corridor between Centerport Pkwy and Rte 610

Inputs

Upstream Adj Ramp		Downstream Adj Ramp
☐ Yes ☐ On	Number of Lanes, N: 3	☑ Yes ☑ On
☑ No ☐ Off	Acceleration Lane Length, L_A:	☐ No ☐ Off
L_{up} = ft	Deceleration Lane Length L_D: 1500	L_{down} = 2100 ft
V_u = veh/h	Freeway Volume, V_F: 5900	V_D = 1075 veh/h
	Ramp Volume, V_R: 1775	
	Freeway Free-Flow Speed, S_{FF}: 70.0	
	Ramp Free-Flow Speed, S_{FR}: 50.0	

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	5900	0.96	Level	8	0	0.962	1.00	6392
Ramp	1775	0.92	Level	6	0	0.971	1.00	1987
UpStream								
DownStream	1075	0.89	Level	6	0	0.971	1.00	1244

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = using Equation (Exhibit 13-6)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 13-8		

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

M_S = (Exibit 13-11)

S_R = mph (Exhibit 13-11)

S_0 = mph (Exhibit 13-11)

S = mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = 0.450 using Equation (Exhibit 13-7)

V_{12} = 3969 pc/h

V_3 or V_{av34} 2423 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F	6392	Exhibit 13-8	7200	No
$V_{FO} = V_F - V_R$	4405	Exhibit 13-8	7200	No
V_R	1987	Exhibit 13-10	4200	No

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	3969	Exhibit 13-8	4400:All	No

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

D_R = 8.2 (pc/mi/ln)

LOS = A (Exhibit 13-2)

Speed Determination

D_s = 0.412 (Exhibit 13-12)

S_R = 58.5 mph (Exhibit 13-12)

S_0 = 71.2 mph (Exhibit 13-12)

S = 62.7 mph (Exhibit 13-13)

Appendix D:
Safety_Analysis_Information

Report Selection Criteria:

Route Common Name: I-95N
Include Both Sides of the Route: N
Report Date Range: 1/1/2012 Through 12/31/2014
From: 140.44 To: 140.77
Distance in miles: 0.330

Collision Type: Not Provided
Commercial Endorsement Type: Not Provided
Commercial Motor Vehicle: Not Provided
Commercial Vehicle Configuration Type: Not Provided
Start Time: Not Provided
End Time: Not Provided
Days Of Week: Not Provided
Type of Driver Distraction: Not Provided
Driver Drinking Type: Not Provided
Driver Injury Type: Not Provided
Fatal Injury Type: Not Provided
First Crash Events: Not Provided
Location of First Harmful Events: Not Provided
Type of Intersection: Not Provided
Lighting Conditions: Not Provided
Most Harmful Events: Not Provided
Passenger Injury Type: Not Provided
Relation To Roadway: Not Provided
Roadway Surface Type: Not Provided
School Zones: Not Provided
Traffic Contol Type: Not Provided
Damage is VDOT Property: Not Provided
Vehicle Body Type: Not Provided
Weather Condition: Not Provided
Workzone Related: Not Provided
Workzone Workers Present: Not Provided
Jurisdiction Code as supplied by TREDS: Not Provided

Length In Miles: 0.33 DVMT: 22074.76 Crash Rate: 119.97 Death Rate: 0.00 Injury Rate: 12.41

	Total	2012	2013	2014
Total Crashes	29	10	10	9
Fatal Crashes	0	0	0	0
Injury Only Crashes	3	2	0	1
Prop. Damage Only Crashes	26	8	10	8
Property Damage Amount	166600	37700	60800	68100
Persons Killed	0	0	0	0
Persons Injured	3	2	0	1
Pedestrians Killed	0	0	0	0
Pedestrians Injured	0	0	0	0
Collision Type				
Not Provided	0	0	0	0
1. Rear End	15	7	3	5
2. Angle	1	0	0	1
3. Head On	0	0	0	0
4. Sideswipe - Same Direction	1	1	0	0
5. Sideswipe - Opposite Direction	0	0	0	0
6. Fixed Object in Road	0	0	0	0
7. Train	0	0	0	0
8. Non-Collision	0	0	0	0
9. Fixed Object - Off Road	8	1	5	2
10. Deer	4	1	2	1
11. Other Animal	0	0	0	0
12. Ped	0	0	0	0
13. Bicyclist	0	0	0	0
14. Motorcyclist	0	0	0	0
15. Backed Into	0	0	0	0
16. Other	0	0	0	0
Not Applicable	0	0	0	0
Total	29	10	10	9

	Total	2012	2013	2014
Vehicle Type				
Not Provided	0	0	0	0
1. Passenger car	20	7	6	7
2. Truck - Pick-up/Passenger Truck	10	3	2	5
3. Van	3	0	1	2
4. Truck - Single Unit Truck (2-Axles)	2	0	1	1
7. Motor Home, Recreational Vehicle	0	0	0	0
8. Special Vehicle - Oversized (Veh/Earthmover/Road Equip.)	0	0	0	0
9. Bicycle	0	0	0	0
10. Moped	0	0	0	0
11. Motorcycle	0	0	0	0
12. Emergency Vehicle (Regardless of Veh Type)	0	0	0	0
13. Bus - School Bus	0	0	0	0
14. Bus - City Transit Bus/Privately Owned Church Bus	0	0	0	0
15. Bus - Commercial Bus	0	0	0	0
16. Other (Scooter, Go-cart, Hearse, Bookmobile, Golf Cart, etc.)	0	0	0	0
18. Special Vehicle - Farm Machinery	0	0	0	0
19. Special Vehicle - ATV	0	0	0	0
21. Special Vehicle - Low Speed Vehicle	0	0	0	0
22. Truck - Sport Utility Vehicle (SUV)	13	7	3	3
23. Truck - Single Unit Truck (3 Axles or More)	2	2	0	0
25. Truck - Truck Tractor (Bobtail-No Trailer)	0	0	0	0
Not Applicable	0	0	0	0
Total	50	19	13	18

	Total	2012	2013	2014
Fixed Object				
Not Provided	0	0	0	0
1. Bank Or Ledge	0	0	0	0
2. Trees	0	0	0	0
3. Utility Pole	0	0	0	0
4. Fence Or Post	0	0	0	0
5. Guard Rail	7	0	4	3
6. Parked Vehicle	0	0	0	0
7. Tunnel, Bridge, Underpass, Culvert, etc.	1	0	1	0
8. Sign, Traffic Signal	2	1	0	1
9. Impact Cushioning Device	2	0	0	2
10. Other	0	0	0	0
11. Jersey Wall	0	0	0	0
12. Building/Structure	0	0	0	0
13. Curb	0	0	0	0
14. Ditch	0	0	0	0
15. Other Fixed Object	0	0	0	0
16. Other Traffic Barrier	0	0	0	0
17. Traffic Sign Support	0	0	0	0
18. Mailbox	0	0	0	0
Total	12	1	5	6
Lighting				
Not Provided	0	0	0	0
1. Dawn	1	0	0	1
2. Daylight	19	7	7	5
3. Dusk	1	0	1	0
4. Darkness - Road Lighted	2	0	0	2
5. Darkness - Road Not Lighted	6	3	2	1
6. Darkness - Unknown Road Lighting	0	0	0	0
7. Unknown	0	0	0	0
Not Applicable	0	0	0	0
Total	29	10	10	9

	Total	2012	2013	2014
Surface Condition				
Not Provided	0	0	0	0
1. Dry	20	9	6	5
2. Wet	7	1	4	2
3. Snowy	0	0	0	0
4. Icy	2	0	0	2
5. Muddy	0	0	0	0
6. Oil/Other Fluids	0	0	0	0
7. Other	0	0	0	0
8. Natural Debris	0	0	0	0
9. Water (Standing, Moving)	0	0	0	0
10. Slush	0	0	0	0
11. Sand, Dirt, Gravel	0	0	0	0
Not Applicable	0	0	0	0
Total	29	10	10	9
Weather Condition				
Not Provided	0	0	0	0
1. No Adverse Condition (Clear/Cloudy)	20	9	6	5
3. Fog	0	0	0	0
4. Mist	0	0	0	0
5. Rain	7	1	4	2
6. Snow	2	0	0	2
7. Sleet/Hail	0	0	0	0
8. Smoke/Dust	0	0	0	0
9. Other	0	0	0	0
10. Blowing Sand, Soil, Dirt, or Snow	0	0	0	0
11. Severe Crosswinds	0	0	0	0
Not Applicable	0	0	0	0
Total	29	10	10	9

	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday	Unknown
00:00 - 00:59	0	0	0	1	0	0	0	0
01:00 - 01:59	0	1	0	0	0	0	0	0
02:00 - 02:59	0	0	0	0	0	0	0	0
03:00 - 03:59	0	0	0	0	0	0	0	0
04:00 - 04:59	0	0	0	0	0	0	0	0
05:00 - 05:59	0	1	1	0	0	0	0	0
06:00 - 06:59	1	0	1	0	0	1	0	0
07:00 - 07:59	1	0	0	0	0	0	0	0
08:00 - 08:59	0	1	0	0	0	0	1	0
09:00 - 09:59	0	0	0	0	0	0	0	0
10:00 - 10:59	0	0	0	1	0	0	0	0
11:00 - 11:59	0	1	0	1	0	0	0	0
12:00 - 12:59	0	0	0	1	0	0	0	0
13:00 - 13:59	1	0	0	0	0	0	1	0
14:00 - 14:59	2	0	0	0	1	0	0	0
15:00 - 15:59	0	1	0	0	0	0	0	0
16:00 - 16:59	0	0	0	0	1	1	1	0
17:00 - 17:59	0	0	0	0	0	0	0	0
18:00 - 18:59	0	0	0	0	1	0	0	0
19:00 - 19:59	0	0	0	0	1	0	0	0
20:00 - 20:59	0	0	1	0	0	0	0	0
21:00 - 21:59	0	0	0	0	0	0	2	0
22:00 - 22:59	0	0	0	1	0	0	0	0
23:00 - 23:59	0	0	0	0	0	0	0	0
Unknown	0	0	0	0	0	0	0	0
Total	5	5	3	5	4	2	5	0

Report Selection Criteria:

Route Common Name: I-95S
Include Both Sides of the Route: N
Report Date Range: 1/1/2012 Through 12/31/2014
From: 140.63 To: 140.93
Distance in miles: 0.300

Collision Type: Not Provided
Commercial Endorsement Type: Not Provided
Commercial Motor Vehicle: Not Provided
Commercial Vehicle Configuration Type: Not Provided
Start Time: Not Provided
End Time: Not Provided
Days Of Week: Not Provided
Type of Driver Distraction: Not Provided
Driver Drinking Type: Not Provided
Driver Injury Type: Not Provided
Fatal Injury Type: Not Provided
First Crash Events: Not Provided
Location of First Harmful Events: Not Provided
Type of Intersection: Not Provided
Lighting Conditions: Not Provided
Most Harmful Events: Not Provided
Passenger Injury Type: Not Provided
Relation To Roadway: Not Provided
Roadway Surface Type: Not Provided
School Zones: Not Provided
Traffic Contol Type: Not Provided
Damage is VDOT Property: Not Provided
Vehicle Body Type: Not Provided
Weather Condition: Not Provided
Workzone Related: Not Provided
Workzone Workers Present: Not Provided
Jurisdiction Code as supplied by TREDS: Not Provided

Length In Miles: 0.30 DVMT: 19694.11 Crash Rate: 171.57 Death Rate: 0.00 Injury Rate: 46.37

	Total	2012	2013	2014
Total Crashes	37	20	7	10
Fatal Crashes	0	0	0	0
Injury Only Crashes	7	4	1	2
Prop. Damage Only Crashes	30	16	6	8
Property Damage Amount	251559	118303	47556	85700
Persons Killed	0	0	0	0
Persons Injured	10	6	1	3
Pedestrians Killed	0	0	0	0
Pedestrians Injured	0	0	0	0
Collision Type				
Not Provided	0	0	0	0
1. Rear End	24	13	5	6
2. Angle	2	1	1	0
3. Head On	0	0	0	0
4. Sideswipe - Same Direction	5	2	1	2
5. Sideswipe - Opposite Direction	0	0	0	0
6. Fixed Object in Road	0	0	0	0
7. Train	0	0	0	0
8. Non-Collision	0	0	0	0
9. Fixed Object - Off Road	3	1	0	2
10. Deer	2	2	0	0
11. Other Animal	0	0	0	0
12. Ped	0	0	0	0
13. Bicyclist	0	0	0	0
14. Motorcyclist	0	0	0	0
15. Backed Into	0	0	0	0
16. Other	1	1	0	0
Not Applicable	0	0	0	0
Total	37	20	7	10

	Total	2012	2013	2014
Vehicle Type				
Not Provided	0	0	0	0
1. Passenger car	43	24	8	11
2. Truck - Pick-up/Passenger Truck	2	1	1	0
3. Van	4	4	0	0
4. Truck - Single Unit Truck (2-Axles)	0	0	0	0
7. Motor Home, Recreational Vehicle	0	0	0	0
8. Special Vehicle - Oversized (Veh/Earthmover/Road Equip.)	0	0	0	0
9. Bicycle	0	0	0	0
10. Moped	0	0	0	0
11. Motorcycle	1	1	0	0
12. Emergency Vehicle (Regardless of Veh Type)	0	0	0	0
13. Bus - School Bus	0	0	0	0
14. Bus - City Transit Bus/Privately Owned Church Bus	0	0	0	0
15. Bus - Commercial Bus	0	0	0	0
16. Other (Scooter, Go-cart, Hearse, Bookmobile, Golf Cart, etc.)	0	0	0	0
18. Special Vehicle - Farm Machinery	0	0	0	0
19. Special Vehicle - ATV	0	0	0	0
21. Special Vehicle - Low Speed Vehicle	0	0	0	0
22. Truck - Sport Utility Vehicle (SUV)	21	12	4	5
23. Truck - Single Unit Truck (3 Axles or More)	5	1	1	3
25. Truck - Truck Tractor (Bobtail-No Trailer)	1	0	0	1
Not Applicable	0	0	0	0
Total	77	43	14	20

	Total	2012	2013	2014
Fixed Object				
Not Provided	0	0	0	0
1. Bank Or Ledge	2	1	0	1
2. Trees	0	0	0	0
3. Utility Pole	0	0	0	0
4. Fence Or Post	0	0	0	0
5. Guard Rail	3	1	1	1
6. Parked Vehicle	0	0	0	0
7. Tunnel, Bridge, Underpass, Culvert, etc.	0	0	0	0
8. Sign, Traffic Signal	0	0	0	0
9. Impact Cushioning Device	0	0	0	0
10. Other	0	0	0	0
11. Jersey Wall	0	0	0	0
12. Building/Structure	0	0	0	0
13. Curb	0	0	0	0
14. Ditch	0	0	0	0
15. Other Fixed Object	0	0	0	0
16. Other Traffic Barrier	0	0	0	0
17. Traffic Sign Support	0	0	0	0
18. Mailbox	0	0	0	0
Total	5	2	1	2
Lighting				
Not Provided	0	0	0	0
1. Dawn	0	0	0	0
2. Daylight	31	15	7	9
3. Dusk	1	1	0	0
4. Darkness - Road Lighted	0	0	0	0
5. Darkness - Road Not Lighted	5	4	0	1
6. Darkness - Unknown Road Lighting	0	0	0	0
7. Unknown	0	0	0	0
Not Applicable	0	0	0	0
Total	37	20	7	10

	Total	2012	2013	2014
Surface Condition				
Not Provided	0	0	0	0
1. Dry	33	19	7	7
2. Wet	4	1	0	3
3. Snowy	0	0	0	0
4. Icy	0	0	0	0
5. Muddy	0	0	0	0
6. Oil/Other Fluids	0	0	0	0
7. Other	0	0	0	0
8. Natural Debris	0	0	0	0
9. Water (Standing, Moving)	0	0	0	0
10. Slush	0	0	0	0
11. Sand, Dirt, Gravel	0	0	0	0
Not Applicable	0	0	0	0
Total	37	20	7	10
Weather Condition				
Not Provided	0	0	0	0
1. No Adverse Condition (Clear/Cloudy)	35	20	7	8
3. Fog	0	0	0	0
4. Mist	0	0	0	0
5. Rain	2	0	0	2
6. Snow	0	0	0	0
7. Sleet/Hail	0	0	0	0
8. Smoke/Dust	0	0	0	0
9. Other	0	0	0	0
10. Blowing Sand, Soil, Dirt, or Snow	0	0	0	0
11. Severe Crosswinds	0	0	0	0
Not Applicable	0	0	0	0
Total	37	20	7	10

	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday	Unknown
00:00 - 00:59	0	0	0	0	0	0	0	0
01:00 - 01:59	0	0	0	0	0	0	0	0
02:00 - 02:59	0	0	0	0	0	0	0	0
03:00 - 03:59	0	0	0	0	0	0	0	0
04:00 - 04:59	0	0	0	0	0	0	0	0
05:00 - 05:59	0	0	0	0	0	0	0	0
06:00 - 06:59	0	0	0	0	0	0	0	0
07:00 - 07:59	0	0	0	0	0	0	0	0
08:00 - 08:59	0	0	2	0	0	0	0	0
09:00 - 09:59	0	0	0	0	0	1	0	0
10:00 - 10:59	0	0	0	1	0	0	0	0
11:00 - 11:59	0	0	0	2	1	1	0	0
12:00 - 12:59	0	0	0	1	0	0	0	0
13:00 - 13:59	0	1	0	1	1	1	0	0
14:00 - 14:59	1	1	0	2	1	2	0	0
15:00 - 15:59	0	0	1	0	0	4	0	0
16:00 - 16:59	1	0	2	0	0	0	0	0
17:00 - 17:59	0	0	0	1	2	1	0	0
18:00 - 18:59	0	0	0	0	0	0	0	0
19:00 - 19:59	0	0	0	0	0	0	0	0
20:00 - 20:59	0	0	0	0	1	0	0	0
21:00 - 21:59	0	0	0	0	0	0	0	0
22:00 - 22:59	0	0	0	1	0	0	0	0
23:00 - 23:59	1	1	0	0	0	1	0	0
Unknown	0	0	0	0	0	0	0	0
Total	3	3	5	9	6	11	0	0

Report Selection Criteria:

Route Common Name: I-95N
Include Both Sides of the Route: N
Report Date Range: 1/1/2012 Through 12/31/2014
From: 140.25 To: 140.44
Distance in miles: 0.19

Collision Type: Not Provided
Commercial Endorsement Type: Not Provided
Commercial Motor Vehicle: Not Provided
Commercial Vehicle Configuration Type: Not Provided
Start Time: Not Provided
End Time: Not Provided
Days Of Week: Not Provided
Type of Driver Distraction: Not Provided
Driver Drinking Type: Not Provided
Driver Injury Type: Not Provided
Fatal Injury Type: Not Provided
First Crash Events: Not Provided
Location of First Harmful Events: Not Provided
Type of Intersection: Not Provided
Lighting Conditions: Not Provided
Most Harmful Events: Not Provided
Passenger Injury Type: Not Provided
Relation To Roadway: Not Provided
Roadway Surface Type: Not Provided
School Zones: Not Provided
Traffic Contol Type: Not Provided
Damage is VDOT Property: Not Provided
Vehicle Body Type: Not Provided
Weather Condition: Not Provided
Workzone Related: Not Provided
Workzone Workers Present: Not Provided
Jurisdiction Code as supplied by TREDS: Not Provided

Length In Miles: 0.19 DVMT: 12908.25 Crash Rate: 106.12 Death Rate: 0.00 Injury Rate: 21.22

	Total	2012	2013	2014
Total Crashes	15	3	7	5
Fatal Crashes	0	0	0	0
Injury Only Crashes	3	1	1	1
Prop. Damage Only Crashes	12	2	6	4
Property Damage Amount	60451	13950	25501	21000
Persons Killed	0	0	0	0
Persons Injured	3	1	1	1
Pedestrians Killed	0	0	0	0
Pedestrians Injured	0	0	0	0
Collision Type				
Not Provided	0	0	0	0
1. Rear End	9	0	5	4
2. Angle	0	0	0	0
3. Head On	0	0	0	0
4. Sideswipe - Same Direction	2	0	1	1
5. Sideswipe - Opposite Direction	0	0	0	0
6. Fixed Object in Road	0	0	0	0
7. Train	0	0	0	0
8. Non-Collision	0	0	0	0
9. Fixed Object - Off Road	2	2	0	0
10. Deer	2	1	1	0
11. Other Animal	0	0	0	0
12. Ped	0	0	0	0
13. Bicyclist	0	0	0	0
14. Motorcyclist	0	0	0	0
15. Backed Into	0	0	0	0
16. Other	0	0	0	0
Not Applicable	0	0	0	0
Total	15	3	7	5

	Total	2012	2013	2014
Vehicle Type				
Not Provided	0	0	0	0
1. Passenger car	14	3	8	3
2. Truck - Pick-up/Passenger Truck	2	0	1	1
3. Van	2	0	1	1
4. Truck - Single Unit Truck (2-Axles)	0	0	0	0
7. Motor Home, Recreational Vehicle	0	0	0	0
8. Special Vehicle - Oversized (Veh/Earthmover/Road Equip.)	0	0	0	0
9. Bicycle	0	0	0	0
10. Moped	0	0	0	0
11. Motorcycle	0	0	0	0
12. Emergency Vehicle (Regardless of Veh Type)	0	0	0	0
13. Bus - School Bus	0	0	0	0
14. Bus - City Transit Bus/Privately Owned Church Bus	0	0	0	0
15. Bus - Commercial Bus	0	0	0	0
16. Other (Scooter, Go-cart, Hearse, Bookmobile, Golf Cart, etc.)	0	0	0	0
18. Special Vehicle - Farm Machinery	0	0	0	0
19. Special Vehicle - ATV	0	0	0	0
21. Special Vehicle - Low Speed Vehicle	0	0	0	0
22. Truck - Sport Utility Vehicle (SUV)	6	0	2	4
23. Truck - Single Unit Truck (3 Axles or More)	3	0	1	2
25. Truck - Truck Tractor (Bobtail-No Trailer)	0	0	0	0
Not Applicable	0	0	0	0
Total	27	3	13	11

	Total	2012	2013	2014
Fixed Object				
Not Provided	0	0	0	0
1. Bank Or Ledge	0	0	0	0
2. Trees	0	0	0	0
3. Utility Pole	0	0	0	0
4. Fence Or Post	0	0	0	0
5. Guard Rail	2	2	0	0
6. Parked Vehicle	0	0	0	0
7. Tunnel, Bridge, Underpass, Culvert, etc.	0	0	0	0
8. Sign, Traffic Signal	0	0	0	0
9. Impact Cushioning Device	0	0	0	0
10. Other	0	0	0	0
11. Jersey Wall	0	0	0	0
12. Building/Structure	0	0	0	0
13. Curb	0	0	0	0
14. Ditch	0	0	0	0
15. Other Fixed Object	0	0	0	0
16. Other Traffic Barrier	0	0	0	0
17. Traffic Sign Support	0	0	0	0
18. Mailbox	0	0	0	0
Total	2	2	0	0
Lighting				
Not Provided	0	0	0	0
1. Dawn	0	0	0	0
2. Daylight	11	1	6	4
3. Dusk	0	0	0	0
4. Darkness - Road Lighted	0	0	0	0
5. Darkness - Road Not Lighted	4	2	1	1
6. Darkness - Unknown Road Lighting	0	0	0	0
7. Unknown	0	0	0	0
Not Applicable	0	0	0	0
Total	15	3	7	5

	Total	2012	2013	2014
Surface Condition				
Not Provided	0	0	0	0
1. Dry	11	2	5	4
2. Wet	3	0	2	1
3. Snowy	1	1	0	0
4. Icy	0	0	0	0
5. Muddy	0	0	0	0
6. Oil/Other Fluids	0	0	0	0
7. Other	0	0	0	0
8. Natural Debris	0	0	0	0
9. Water (Standing, Moving)	0	0	0	0
10. Slush	0	0	0	0
11. Sand, Dirt, Gravel	0	0	0	0
Not Applicable	0	0	0	0
Total	15	3	7	5
Weather Condition				
Not Provided	0	0	0	0
1. No Adverse Condition (Clear/Cloudy)	11	2	5	4
3. Fog	0	0	0	0
4. Mist	0	0	0	0
5. Rain	3	0	2	1
6. Snow	1	1	0	0
7. Sleet/Hail	0	0	0	0
8. Smoke/Dust	0	0	0	0
9. Other	0	0	0	0
10. Blowing Sand, Soil, Dirt, or Snow	0	0	0	0
11. Severe Crosswinds	0	0	0	0
Not Applicable	0	0	0	0
Total	15	3	7	5

	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday	Unknown
00:00 - 00:59	0	0	0	0	0	0	0	0
01:00 - 01:59	0	0	0	0	0	0	0	0
02:00 - 02:59	0	0	0	0	0	0	0	0
03:00 - 03:59	0	0	0	0	0	0	0	0
04:00 - 04:59	0	0	0	0	0	0	0	0
05:00 - 05:59	0	0	1	1	0	0	0	0
06:00 - 06:59	0	0	0	1	0	0	0	0
07:00 - 07:59	0	0	0	1	0	0	0	0
08:00 - 08:59	0	0	0	0	0	1	0	0
09:00 - 09:59	1	0	1	0	0	0	0	0
10:00 - 10:59	0	0	0	0	0	0	0	0
11:00 - 11:59	0	1	0	0	1	0	0	0
12:00 - 12:59	0	0	0	0	0	0	0	0
13:00 - 13:59	0	0	0	0	0	0	0	0
14:00 - 14:59	1	0	0	0	1	0	1	0
15:00 - 15:59	0	0	0	0	0	1	1	0
16:00 - 16:59	0	0	0	0	0	0	0	0
17:00 - 17:59	0	0	0	1	0	0	0	0
18:00 - 18:59	0	0	0	0	0	0	0	0
19:00 - 19:59	0	0	0	0	0	0	0	0
20:00 - 20:59	0	0	0	0	0	0	0	0
21:00 - 21:59	0	0	0	0	0	0	0	0
22:00 - 22:59	0	0	0	0	0	0	0	0
23:00 - 23:59	0	0	0	0	0	0	0	0
Unknown	0	0	0	0	0	0	0	0
Total	2	1	2	4	2	2	2	0

Report Selection Criteria:

Route Common Name: I-95N Ramp 140A
Include Both Sides of the Route: N
Report Date Range: 2/1/2012 Through 2/28/2015
From: 0.00 To: 0.19
Distance in miles: 0.19

Collision Type: Not Provided
Commercial Endorsement Type: Not Provided
Commercial Motor Vehicle: Not Provided
Commercial Vehicle Configuration Type: Not Provided
Start Time: Not Provided
End Time: Not Provided
Days Of Week: Not Provided
Type of Driver Distraction: Not Provided
Driver Drinking Type: Not Provided
Driver Injury Type: Not Provided
Fatal Injury Type: Not Provided
First Crash Events: Not Provided
Location of First Harmful Events: Not Provided
Type of Intersection: Not Provided
Lighting Conditions: Not Provided
Most Harmful Events: Not Provided
Passenger Injury Type: Not Provided
Relation To Roadway: Not Provided
Roadway Surface Type: Not Provided
School Zones: Not Provided
Traffic Contol Type: Not Provided
Damage is VDOT Property: Not Provided
Vehicle Body Type: Not Provided
Weather Condition: Not Provided
Workzone Related: Not Provided
Workzone Workers Present: Not Provided
Jurisdiction Code as supplied by TREDS: Not Provided

Length In Miles: 0.19 DVMT: (not available) Crash Rate: Death Rate: Injury Rate:

	Total	2012	2014
Total Crashes	2	1	1
Fatal Crashes	0	0	0
Injury Only Crashes	1	1	0
Prop. Damage Only Crashes	1	0	1
Property Damage Amount	3000	500	2500
Persons Killed	0	0	0
Persons Injured	1	1	0
Pedestrians Killed	0	0	0
Pedestrians Injured	0	0	0
Collision Type			
Not Provided	0	0	0
1. Rear End	2	1	1
2. Angle	0	0	0
3. Head On	0	0	0
4. Sideswipe - Same Direction	0	0	0
5. Sideswipe - Opposite Direction	0	0	0
6. Fixed Object in Road	0	0	0
7. Train	0	0	0
8. Non-Collision	0	0	0
9. Fixed Object - Off Road	0	0	0
10. Deer	0	0	0
11. Other Animal	0	0	0
12. Ped	0	0	0
13. Bicyclist	0	0	0
14. Motorcyclist	0	0	0
15. Backed Into	0	0	0
16. Other	0	0	0
Not Applicable	0	0	0
Total	2	1	1

Vehicle Type	Total	2012	2014
Not Provided	0	0	0
1. Passenger car	4	2	2
2. Truck - Pick-up/Passenger Truck	0	0	0
3. Van	0	0	0
4. Truck - Single Unit Truck (2-Axles)	0	0	0
7. Motor Home, Recreational Vehicle	0	0	0
8. Special Vehicle - Oversized (Veh/Earthmover/Road Equip.)	0	0	0
9. Bicycle	0	0	0
10. Moped	0	0	0
11. Motorcycle	0	0	0
12. Emergency Vehicle (Regardless of Veh Type)	0	0	0
13. Bus - School Bus	0	0	0
14. Bus - City Transit Bus/Privately Owned Church Bus	0	0	0
15. Bus - Commercial Bus	0	0	0
16. Other (Scooter, Go-cart, Hearse, Bookmobile, Golf Cart, etc.)	0	0	0
18. Special Vehicle - Farm Machinery	0	0	0
19. Special Vehicle - ATV	0	0	0
21. Special Vehicle - Low Speed Vehicle	0	0	0
22. Truck - Sport Utility Vehicle (SUV)	0	0	0
23. Truck - Single Unit Truck (3 Axles or More)	0	0	0
25. Truck - Truck Tractor (Bobtail-No Trailer)	0	0	0
Not Applicable	0	0	0
Total	4	2	2

	Total	2012	2014
Fixed Object			
Not Provided	0	0	0
1. Bank Or Ledge	0	0	0
2. Trees	0	0	0
3. Utility Pole	0	0	0
4. Fence Or Post	0	0	0
5. Guard Rail	0	0	0
6. Parked Vehicle	0	0	0
7. Tunnel, Bridge, Underpass, Culvert, etc.	0	0	0
8. Sign, Traffic Signal	0	0	0
9. Impact Cushioning Device	0	0	0
10. Other	0	0	0
11. Jersey Wall	0	0	0
12. Building/Structure	0	0	0
13. Curb	0	0	0
14. Ditch	0	0	0
15. Other Fixed Object	0	0	0
16. Other Traffic Barrier	0	0	0
17. Traffic Sign Support	0	0	0
18. Mailbox	0	0	0
Total	0	0	0
Lighting			
Not Provided	0	0	0
1. Dawn	0	0	0
2. Daylight	2	1	1
3. Dusk	0	0	0
4. Darkness - Road Lighted	0	0	0
5. Darkness - Road Not Lighted	0	0	0
6. Darkness - Unknown Road Lighting	0	0	0
7. Unknown	0	0	0
Not Applicable	0	0	0
Total	2	1	1

	Total	2012	2014
Surface Condition			
Not Provided	0	0	0
1. Dry	1	1	0
2. Wet	1	0	1
3. Snowy	0	0	0
4. Icy	0	0	0
5. Muddy	0	0	0
6. Oil/Other Fluids	0	0	0
7. Other	0	0	0
8. Natural Debris	0	0	0
9. Water (Standing, Moving)	0	0	0
10. Slush	0	0	0
11. Sand, Dirt, Gravel	0	0	0
Not Applicable	0	0	0
Total	2	1	1
Weather Condition			
Not Provided	0	0	0
1. No Adverse Condition (Clear/Cloudy)	1	1	0
3. Fog	0	0	0
4. Mist	0	0	0
5. Rain	1	0	1
6. Snow	0	0	0
7. Sleet/Hail	0	0	0
8. Smoke/Dust	0	0	0
9. Other	0	0	0
10. Blowing Sand, Soil, Dirt, or Snow	0	0	0
11. Severe Crosswinds	0	0	0
Not Applicable	0	0	0
Total	2	1	1

	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday	Unknown
00:00 - 00:59	0	0	0	0	0	0	0	0
01:00 - 01:59	0	0	0	0	0	0	0	0
02:00 - 02:59	0	0	0	0	0	0	0	0
03:00 - 03:59	0	0	0	0	0	0	0	0
04:00 - 04:59	0	0	0	0	0	0	0	0
05:00 - 05:59	0	0	0	0	0	0	0	0
06:00 - 06:59	0	0	0	0	0	0	0	0
07:00 - 07:59	0	0	0	0	0	0	0	0
08:00 - 08:59	0	0	0	0	0	0	0	0
09:00 - 09:59	0	1	0	0	0	0	0	0
10:00 - 10:59	0	0	0	0	0	0	0	0
11:00 - 11:59	0	0	0	0	0	0	1	0
12:00 - 12:59	0	0	0	0	0	0	0	0
13:00 - 13:59	0	0	0	0	0	0	0	0
14:00 - 14:59	0	0	0	0	0	0	0	0
15:00 - 15:59	0	0	0	0	0	0	0	0
16:00 - 16:59	0	0	0	0	0	0	0	0
17:00 - 17:59	0	0	0	0	0	0	0	0
18:00 - 18:59	0	0	0	0	0	0	0	0
19:00 - 19:59	0	0	0	0	0	0	0	0
20:00 - 20:59	0	0	0	0	0	0	0	0
21:00 - 21:59	0	0	0	0	0	0	0	0
22:00 - 22:59	0	0	0	0	0	0	0	0
23:00 - 23:59	0	0	0	0	0	0	0	0
Unknown	0	0	0	0	0	0	0	0
Total	0	1	0	0	0	0	1	0

Report Selection Criteria:

Route Common Name: I-95N
Include Both Sides of the Route: N
Report Date Range: 2/1/2012 Through 2/28/2015
From: 140.21 To: 140.44
Distance in miles: 0.23

Collision Type: Not Provided
Commercial Endorsement Type: Not Provided
Commercial Motor Vehicle: Not Provided
Commercial Vehicle Configuration Type: Not Provided
Start Time: Not Provided
End Time: Not Provided
Days Of Week: Not Provided
Type of Driver Distraction: Not Provided
Driver Drinking Type: Not Provided
Driver Injury Type: Not Provided
Fatal Injury Type: Not Provided
First Crash Events: Not Provided
Location of First Harmful Events: Not Provided
Type of Intersection: Not Provided
Lighting Conditions: Not Provided
Most Harmful Events: Not Provided
Passenger Injury Type: Not Provided
Relation To Roadway: Not Provided
Roadway Surface Type: Not Provided
School Zones: Not Provided
Traffic Contol Type: Not Provided
Damage is VDOT Property: Not Provided
Vehicle Body Type: Not Provided
Weather Condition: Not Provided
Workzone Related: Not Provided
Workzone Workers Present: Not Provided
Jurisdiction Code as supplied by TREDS: Not Provided

Length In Miles: 0.23 DVMT: 15604.67 Crash Rate: 97.01 Death Rate: 0.00 Injury Rate: 45.65

	Total	2012	2013	2014
Total Crashes	17	3	8	6
Fatal Crashes	0	0	0	0
Injury Only Crashes	5	2	1	2
Prop. Damage Only Crashes	12	1	7	4
Property Damage Amount	88951	27450	30501	31000
Persons Killed	0	0	0	0
Persons Injured	8	5	1	2
Pedestrians Killed	0	0	0	0
Pedestrians Injured	0	0	0	0
Collision Type				
Not Provided	0	0	0	0
1. Rear End	10	0	6	4
2. Angle	0	0	0	0
3. Head On	0	0	0	0
4. Sideswipe - Same Direction	2	0	1	1
5. Sideswipe - Opposite Direction	0	0	0	0
6. Fixed Object in Road	0	0	0	0
7. Train	0	0	0	0
8. Non-Collision	0	0	0	0
9. Fixed Object - Off Road	2	1	0	1
10. Deer	2	1	1	0
11. Other Animal	0	0	0	0
12. Ped	0	0	0	0
13. Bicyclist	0	0	0	0
14. Motorcyclist	0	0	0	0
15. Backed Into	0	0	0	0
16. Other	1	1	0	0
Not Applicable	0	0	0	0
Total	17	3	8	6

	Total	2012	2013	2014
Vehicle Type				
Not Provided	0	0	0	0
1. Passenger car	15	3	9	3
2. Truck - Pick-up/Passenger Truck	2	0	1	1
3. Van	2	0	1	1
4. Truck - Single Unit Truck (2-Axles)	1	1	0	0
7. Motor Home, Recreational Vehicle	0	0	0	0
8. Special Vehicle - Oversized (Veh/Earthmover/Road Equip.)	0	0	0	0
9. Bicycle	0	0	0	0
10. Moped	0	0	0	0
11. Motorcycle	0	0	0	0
12. Emergency Vehicle (Regardless of Veh Type)	0	0	0	0
13. Bus - School Bus	0	0	0	0
14. Bus - City Transit Bus/Privately Owned Church Bus	0	0	0	0
15. Bus - Commercial Bus	0	0	0	0
16. Other (Scooter, Go-cart, Hearse, Bookmobile, Golf Cart, etc.)	0	0	0	0
18. Special Vehicle - Farm Machinery	0	0	0	0
19. Special Vehicle - ATV	0	0	0	0
21. Special Vehicle - Low Speed Vehicle	0	0	0	0
22. Truck - Sport Utility Vehicle (SUV)	9	1	3	5
23. Truck - Single Unit Truck (3 Axles or More)	3	0	1	2
25. Truck - Truck Tractor (Bobtail-No Trailer)	0	0	0	0
Not Applicable	0	0	0	0
Total	32	5	15	12

	Total	2012	2013	2014
Fixed Object				
Not Provided	0	0	0	0
1. Bank Or Ledge	1	0	1	0
2. Trees	0	0	0	0
3. Utility Pole	0	0	0	0
4. Fence Or Post	0	0	0	0
5. Guard Rail	1	1	0	0
6. Parked Vehicle	0	0	0	0
7. Tunnel, Bridge, Underpass, Culvert, etc.	0	0	0	0
8. Sign, Traffic Signal	0	0	0	0
9. Impact Cushioning Device	0	0	0	0
10. Other	0	0	0	0
11. Jersey Wall	0	0	0	0
12. Building/Structure	0	0	0	0
13. Curb	0	0	0	0
14. Ditch	0	0	0	0
15. Other Fixed Object	0	0	0	0
16. Other Traffic Barrier	0	0	0	0
17. Traffic Sign Support	0	0	0	0
18. Mailbox	0	0	0	0
Total	2	1	1	0
Lighting				
Not Provided	0	0	0	0
1. Dawn	0	0	0	0
2. Daylight	13	2	7	4
3. Dusk	0	0	0	0
4. Darkness - Road Lighted	1	0	0	1
5. Darkness - Road Not Lighted	3	1	1	1
6. Darkness - Unknown Road Lighting	0	0	0	0
7. Unknown	0	0	0	0
Not Applicable	0	0	0	0
Total	17	3	8	6

	Total	2012	2013	2014
Surface Condition				
Not Provided	0	0	0	0
1. Dry	14	3	6	5
2. Wet	3	0	2	1
3. Snowy	0	0	0	0
4. Icy	0	0	0	0
5. Muddy	0	0	0	0
6. Oil/Other Fluids	0	0	0	0
7. Other	0	0	0	0
8. Natural Debris	0	0	0	0
9. Water (Standing, Moving)	0	0	0	0
10. Slush	0	0	0	0
11. Sand, Dirt, Gravel	0	0	0	0
Not Applicable	0	0	0	0
Total	17	3	8	6
Weather Condition				
Not Provided	0	0	0	0
1. No Adverse Condition (Clear/Cloudy)	14	3	6	5
3. Fog	0	0	0	0
4. Mist	0	0	0	0
5. Rain	3	0	2	1
6. Snow	0	0	0	0
7. Sleet/Hail	0	0	0	0
8. Smoke/Dust	0	0	0	0
9. Other	0	0	0	0
10. Blowing Sand, Soil, Dirt, or Snow	0	0	0	0
11. Severe Crosswinds	0	0	0	0
Not Applicable	0	0	0	0
Total	17	3	8	6

	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday	Unknown
00:00 - 00:59	0	0	0	0	0	0	0	0
01:00 - 01:59	0	0	0	0	0	0	0	0
02:00 - 02:59	0	0	0	0	0	0	0	0
03:00 - 03:59	0	0	0	0	0	0	0	0
04:00 - 04:59	0	0	0	0	0	0	0	0
05:00 - 05:59	0	0	1	1	0	0	0	0
06:00 - 06:59	0	0	0	1	0	0	0	0
07:00 - 07:59	0	1	0	1	0	0	0	0
08:00 - 08:59	0	0	0	0	0	1	0	0
09:00 - 09:59	1	0	1	0	0	0	0	0
10:00 - 10:59	0	0	0	0	0	0	0	0
11:00 - 11:59	0	1	0	0	0	0	0	0
12:00 - 12:59	0	0	0	0	0	0	0	0
13:00 - 13:59	0	0	0	0	0	0	0	0
14:00 - 14:59	1	0	0	1	1	0	1	0
15:00 - 15:59	0	0	0	0	0	1	1	0
16:00 - 16:59	0	0	0	0	0	0	0	0
17:00 - 17:59	0	0	0	1	0	0	0	0
18:00 - 18:59	0	0	0	0	0	0	0	0
19:00 - 19:59	0	0	0	0	0	0	0	0
20:00 - 20:59	0	0	0	0	0	0	0	0
21:00 - 21:59	0	0	0	0	0	0	0	0
22:00 - 22:59	0	0	0	0	1	0	0	0
23:00 - 23:59	0	0	0	0	0	0	0	0
Unknown	0	0	0	0	0	0	0	0
Total	2	2	2	5	2	2	2	0

Report Selection Criteria:

Route Common Name: I-95N
Include Both Sides of the Route: N
Report Date Range: 2/1/2012 Through 2/28/2015
From: 140.77 To: 140.84
Distance in miles: 0.07

Collision Type: Not Provided
Commercial Endorsement Type: Not Provided
Commercial Motor Vehicle: Not Provided
Commercial Vehicle Configuration Type: Not Provided
Start Time: Not Provided
End Time: Not Provided
Days Of Week: Not Provided
Type of Driver Distraction: Not Provided
Driver Drinking Type: Not Provided
Driver Injury Type: Not Provided
Fatal Injury Type: Not Provided
First Crash Events: Not Provided
Location of First Harmful Events: Not Provided
Type of Intersection: Not Provided
Lighting Conditions: Not Provided
Most Harmful Events: Not Provided
Passenger Injury Type: Not Provided
Relation To Roadway: Not Provided
Roadway Surface Type: Not Provided
School Zones: Not Provided
Traffic Contol Type: Not Provided
Damage is VDOT Property: Not Provided
Vehicle Body Type: Not Provided
Weather Condition: Not Provided
Workzone Related: Not Provided
Workzone Workers Present: Not Provided
Jurisdiction Code as supplied by TREDS: Not Provided

Length In Miles: 0.07 DVMT: 4675.65 Crash Rate: 57.13 Death Rate: 0.00 Injury Rate: 0.00

	Total	2012	2014
Total Crashes	3	2	1
Fatal Crashes	0	0	0
Injury Only Crashes	0	0	0
Prop. Damage Only Crashes	3	2	1
Property Damage Amount	15800	11800	4000
Persons Killed	0	0	0
Persons Injured	0	0	0
Pedestrians Killed	0	0	0
Pedestrians Injured	0	0	0
Collision Type			
Not Provided	0	0	0
1. Rear End	1	0	1
2. Angle	0	0	0
3. Head On	0	0	0
4. Sideswipe - Same Direction	1	1	0
5. Sideswipe - Opposite Direction	0	0	0
6. Fixed Object in Road	0	0	0
7. Train	0	0	0
8. Non-Collision	0	0	0
9. Fixed Object - Off Road	0	0	0
10. Deer	1	1	0
11. Other Animal	0	0	0
12. Ped	0	0	0
13. Bicyclist	0	0	0
14. Motorcyclist	0	0	0
15. Backed Into	0	0	0
16. Other	0	0	0
Not Applicable	0	0	0
Total	3	2	1

	Total	2012	2014
Vehicle Type			
Not Provided	0	0	0
1. Passenger car	4	2	2
2. Truck - Pick-up/Passenger Truck	0	0	0
3. Van	0	0	0
4. Truck - Single Unit Truck (2-Axles)	0	0	0
7. Motor Home, Recreational Vehicle	0	0	0
8. Special Vehicle - Oversized (Veh/Earthmover/Road Equip.)	0	0	0
9. Bicycle	0	0	0
10. Moped	0	0	0
11. Motorcycle	0	0	0
12. Emergency Vehicle (Regardless of Veh Type)	0	0	0
13. Bus - School Bus	0	0	0
14. Bus - City Transit Bus/Privately Owned Church Bus	0	0	0
15. Bus - Commercial Bus	0	0	0
16. Other (Scooter, Go-cart, Hearse, Bookmobile, Golf Cart, etc.)	0	0	0
18. Special Vehicle - Farm Machinery	0	0	0
19. Special Vehicle - ATV	0	0	0
21. Special Vehicle - Low Speed Vehicle	0	0	0
22. Truck - Sport Utility Vehicle (SUV)	0	0	0
23. Truck - Single Unit Truck (3 Axles or More)	1	1	0
25. Truck - Truck Tractor (Bobtail-No Trailer)	0	0	0
Not Applicable	0	0	0
Total	5	3	2

	Total	2012	2014
Fixed Object			
Not Provided	0	0	0
1. Bank Or Ledge	0	0	0
2. Trees	0	0	0
3. Utility Pole	0	0	0
4. Fence Or Post	0	0	0
5. Guard Rail	1	1	0
6. Parked Vehicle	0	0	0
7. Tunnel, Bridge, Underpass, Culvert, etc.	0	0	0
8. Sign, Traffic Signal	0	0	0
9. Impact Cushioning Device	0	0	0
10. Other	0	0	0
11. Jersey Wall	0	0	0
12. Building/Structure	0	0	0
13. Curb	0	0	0
14. Ditch	0	0	0
15. Other Fixed Object	0	0	0
16. Other Traffic Barrier	0	0	0
17. Traffic Sign Support	0	0	0
18. Mailbox	0	0	0
Total	1	1	0
Lighting			
Not Provided	0	0	0
1. Dawn	0	0	0
2. Daylight	1	0	1
3. Dusk	0	0	0
4. Darkness - Road Lighted	0	0	0
5. Darkness - Road Not Lighted	2	2	0
6. Darkness - Unknown Road Lighting	0	0	0
7. Unknown	0	0	0
Not Applicable	0	0	0
Total	3	2	1

	Total	2012	2014
Surface Condition			
Not Provided	0	0	0
1. Dry	3	2	1
2. Wet	0	0	0
3. Snowy	0	0	0
4. Icy	0	0	0
5. Muddy	0	0	0
6. Oil/Other Fluids	0	0	0
7. Other	0	0	0
8. Natural Debris	0	0	0
9. Water (Standing, Moving)	0	0	0
10. Slush	0	0	0
11. Sand, Dirt, Gravel	0	0	0
Not Applicable	0	0	0
Total	3	2	1
Weather Condition			
Not Provided	0	0	0
1. No Adverse Condition (Clear/Cloudy)	3	2	1
3. Fog	0	0	0
4. Mist	0	0	0
5. Rain	0	0	0
6. Snow	0	0	0
7. Sleet/Hail	0	0	0
8. Smoke/Dust	0	0	0
9. Other	0	0	0
10. Blowing Sand, Soil, Dirt, or Snow	0	0	0
11. Severe Crosswinds	0	0	0
Not Applicable	0	0	0
Total	3	2	1

	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday	Unknown
00:00 - 00:59	0	0	0	0	0	0	0	0
01:00 - 01:59	0	0	0	0	0	0	0	0
02:00 - 02:59	0	0	0	0	0	0	1	0
03:00 - 03:59	0	0	0	0	0	0	0	0
04:00 - 04:59	0	0	0	0	0	0	0	0
05:00 - 05:59	0	0	0	0	0	0	0	0
06:00 - 06:59	0	0	0	0	0	0	0	0
07:00 - 07:59	0	0	0	0	0	0	0	0
08:00 - 08:59	0	0	0	1	0	0	0	0
09:00 - 09:59	0	0	0	0	0	0	0	0
10:00 - 10:59	0	0	0	0	0	0	0	0
11:00 - 11:59	0	0	0	0	0	0	0	0
12:00 - 12:59	0	0	0	0	0	0	0	0
13:00 - 13:59	0	0	0	0	0	0	0	0
14:00 - 14:59	0	0	0	0	0	0	0	0
15:00 - 15:59	0	0	0	0	0	0	0	0
16:00 - 16:59	0	0	0	0	0	0	0	0
17:00 - 17:59	0	0	0	0	0	0	0	0
18:00 - 18:59	0	0	0	0	0	0	0	0
19:00 - 19:59	0	0	0	0	0	0	0	0
20:00 - 20:59	0	0	0	0	0	0	0	0
21:00 - 21:59	0	0	0	1	0	0	0	0
22:00 - 22:59	0	0	0	0	0	0	0	0
23:00 - 23:59	0	0	0	0	0	0	0	0
Unknown	0	0	0	0	0	0	0	0
Total	0	0	0	2	0	0	1	0

Report Selection Criteria:

Route Common Name: I-95N
Include Both Sides of the Route: N
Report Date Range: 1/1/2012 Through 12/31/2014
From: 140.77 To: 140.96
Distance in miles: 0.19

Collision Type: Not Provided
Commercial Endorsement Type: Not Provided
Commercial Motor Vehicle: Not Provided
Commercial Vehicle Configuration Type: Not Provided
Start Time: Not Provided
End Time: Not Provided
Days Of Week: Not Provided
Type of Driver Distraction: Not Provided
Driver Drinking Type: Not Provided
Driver Injury Type: Not Provided
Fatal Injury Type: Not Provided
First Crash Events: Not Provided
Location of First Harmful Events: Not Provided
Type of Intersection: Not Provided
Lighting Conditions: Not Provided
Most Harmful Events: Not Provided
Passenger Injury Type: Not Provided
Relation To Roadway: Not Provided
Roadway Surface Type: Not Provided
School Zones: Not Provided
Traffic Contol Type: Not Provided
Damage is VDOT Property: Not Provided
Vehicle Body Type: Not Provided
Weather Condition: Not Provided
Workzone Related: Not Provided
Workzone Workers Present: Not Provided
Jurisdiction Code as supplied by TREDS: Not Provided

Length In Miles: 0.19 DVMT: 12709.71 Crash Rate: 64.67 Death Rate: 0.00 Injury Rate: 64.67

	Total	2012	2013	2014
Total Crashes	9	4	2	3
Fatal Crashes	0	0	0	0
Injury Only Crashes	2	2	0	0
Prop. Damage Only Crashes	7	2	2	3
Property Damage Amount	69350	29450	21500	18400
Persons Killed	0	0	0	0
Persons Injured	9	9	0	0
Pedestrians Killed	0	0	0	0
Pedestrians Injured	0	0	0	0
Collision Type				
Not Provided	0	0	0	0
1. Rear End	5	1	1	3
2. Angle	0	0	0	0
3. Head On	0	0	0	0
4. Sideswipe - Same Direction	3	2	1	0
5. Sideswipe - Opposite Direction	0	0	0	0
6. Fixed Object in Road	0	0	0	0
7. Train	0	0	0	0
8. Non-Collision	0	0	0	0
9. Fixed Object - Off Road	0	0	0	0
10. Deer	1	1	0	0
11. Other Animal	0	0	0	0
12. Ped	0	0	0	0
13. Bicyclist	0	0	0	0
14. Motorcyclist	0	0	0	0
15. Backed Into	0	0	0	0
16. Other	0	0	0	0
Not Applicable	0	0	0	0
Total	9	4	2	3

	Total	2012	2013	2014
Vehicle Type				
Not Provided	0	0	0	0
1. Passenger car	9	4	1	4
2. Truck - Pick-up/Passenger Truck	2	0	1	1
3. Van	3	1	1	1
4. Truck - Single Unit Truck (2-Axles)	0	0	0	0
7. Motor Home, Recreational Vehicle	0	0	0	0
8. Special Vehicle - Oversized (Veh/Earthmover/Road Equip.)	0	0	0	0
9. Bicycle	0	0	0	0
10. Moped	0	0	0	0
11. Motorcycle	0	0	0	0
12. Emergency Vehicle (Regardless of Veh Type)	0	0	0	0
13. Bus - School Bus	0	0	0	0
14. Bus - City Transit Bus/Privately Owned Church Bus	0	0	0	0
15. Bus - Commercial Bus	0	0	0	0
16. Other (Scooter, Go-cart, Hearse, Bookmobile, Golf Cart, etc.)	0	0	0	0
18. Special Vehicle - Farm Machinery	0	0	0	0
19. Special Vehicle - ATV	0	0	0	0
21. Special Vehicle - Low Speed Vehicle	0	0	0	0
22. Truck - Sport Utility Vehicle (SUV)	2	1	1	0
23. Truck - Single Unit Truck (3 Axles or More)	2	2	0	0
25. Truck - Truck Tractor (Bobtail-No Trailer)	0	0	0	0
Not Applicable	0	0	0	0
Total	18	8	4	6

	Total	2012	2013	2014
Fixed Object				
Not Provided	0	0	0	0
1. Bank Or Ledge	0	0	0	0
2. Trees	0	0	0	0
3. Utility Pole	0	0	0	0
4. Fence Or Post	0	0	0	0
5. Guard Rail	1	1	0	0
6. Parked Vehicle	0	0	0	0
7. Tunnel, Bridge, Underpass, Culvert, etc.	0	0	0	0
8. Sign, Traffic Signal	1	1	0	0
9. Impact Cushioning Device	0	0	0	0
10. Other	0	0	0	0
11. Jersey Wall	0	0	0	0
12. Building/Structure	0	0	0	0
13. Curb	0	0	0	0
14. Ditch	0	0	0	0
15. Other Fixed Object	0	0	0	0
16. Other Traffic Barrier	0	0	0	0
17. Traffic Sign Support	0	0	0	0
18. Mailbox	0	0	0	0
Total	2	2	0	0
Lighting				
Not Provided	0	0	0	0
1. Dawn	1	0	0	1
2. Daylight	5	2	1	2
3. Dusk	0	0	0	0
4. Darkness - Road Lighted	0	0	0	0
5. Darkness - Road Not Lighted	3	2	1	0
6. Darkness - Unknown Road Lighting	0	0	0	0
7. Unknown	0	0	0	0
Not Applicable	0	0	0	0
Total	9	4	2	3

	Total	2012	2013	2014
Surface Condition				
Not Provided	0	0	0	0
1. Dry	8	4	2	2
2. Wet	1	0	0	1
3. Snowy	0	0	0	0
4. Icy	0	0	0	0
5. Muddy	0	0	0	0
6. Oil/Other Fluids	0	0	0	0
7. Other	0	0	0	0
8. Natural Debris	0	0	0	0
9. Water (Standing, Moving)	0	0	0	0
10. Slush	0	0	0	0
11. Sand, Dirt, Gravel	0	0	0	0
Not Applicable	0	0	0	0
Total	9	4	2	3
Weather Condition				
Not Provided	0	0	0	0
1. No Adverse Condition (Clear/Cloudy)	8	4	2	2
3. Fog	0	0	0	0
4. Mist	0	0	0	0
5. Rain	1	0	0	1
6. Snow	0	0	0	0
7. Sleet/Hail	0	0	0	0
8. Smoke/Dust	0	0	0	0
9. Other	0	0	0	0
10. Blowing Sand, Soil, Dirt, or Snow	0	0	0	0
11. Severe Crosswinds	0	0	0	0
Not Applicable	0	0	0	0
Total	9	4	2	3

	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday	Unknown
00:00 - 00:59	0	0	0	0	0	0	1	0
01:00 - 01:59	0	0	0	0	0	0	0	0
02:00 - 02:59	0	0	0	0	0	0	1	0
03:00 - 03:59	0	0	0	0	0	0	0	0
04:00 - 04:59	0	0	0	0	0	0	0	0
05:00 - 05:59	0	0	0	0	1	0	0	0
06:00 - 06:59	0	0	0	0	0	0	0	0
07:00 - 07:59	1	1	0	0	0	0	0	0
08:00 - 08:59	0	0	0	1	0	0	0	0
09:00 - 09:59	0	0	0	0	0	0	0	0
10:00 - 10:59	0	0	0	0	0	0	0	0
11:00 - 11:59	0	0	0	0	0	0	0	0
12:00 - 12:59	0	0	0	0	0	0	0	0
13:00 - 13:59	0	0	0	0	0	0	1	0
14:00 - 14:59	0	0	0	0	0	0	0	0
15:00 - 15:59	0	0	0	0	0	0	0	0
16:00 - 16:59	0	0	0	0	0	0	0	0
17:00 - 17:59	0	0	0	0	1	0	0	0
18:00 - 18:59	0	0	0	0	0	0	0	0
19:00 - 19:59	0	0	0	0	0	0	0	0
20:00 - 20:59	0	0	0	0	0	0	0	0
21:00 - 21:59	0	0	0	1	0	0	0	0
22:00 - 22:59	0	0	0	0	0	0	0	0
23:00 - 23:59	0	0	0	0	0	0	0	0
Unknown	0	0	0	0	0	0	0	0
Total	1	1	0	2	2	0	3	0

Report Selection Criteria:

Route Common Name: I-95S Ramp 140A
Include Both Sides of the Route: N
Report Date Range: 2/1/2012 Through 2/28/2015
From: 0.00 To: 0.15
Distance in miles: 0.150

Collision Type: Not Provided
Commercial Endorsement Type: Not Provided
Commercial Motor Vehicle: Not Provided
Commercial Vehicle Configuration Type: Not Provided
Start Time: Not Provided
End Time: Not Provided
Days Of Week: Not Provided
Type of Driver Distraction: Not Provided
Driver Drinking Type: Not Provided
Driver Injury Type: Not Provided
Fatal Injury Type: Not Provided
First Crash Events: Not Provided
Location of First Harmful Events: Not Provided
Type of Intersection: Not Provided
Lighting Conditions: Not Provided
Most Harmful Events: Not Provided
Passenger Injury Type: Not Provided
Relation To Roadway: Not Provided
Roadway Surface Type: Not Provided
School Zones: Not Provided
Traffic Contol Type: Not Provided
Damage is VDOT Property: Not Provided
Vehicle Body Type: Not Provided
Weather Condition: Not Provided
Workzone Related: Not Provided
Workzone Workers Present: Not Provided
Jurisdiction Code as supplied by TREDS: Not Provided

Length In Miles: 0.15 DVMT: (not available) Crash Rate: Death Rate: Injury Rate:

	Total	2013	2014	2015
Total Crashes	4	2	1	1
Fatal Crashes	0	0	0	0
Injury Only Crashes	0	0	0	0
Prop. Damage Only Crashes	4	2	1	1
Property Damage Amount	31000	14500	1500	15000
Persons Killed	0	0	0	0
Persons Injured	0	0	0	0
Pedestrians Killed	0	0	0	0
Pedestrians Injured	0	0	0	0
Collision Type				
Not Provided	0	0	0	0
1. Rear End	1	1	0	0
2. Angle	0	0	0	0
3. Head On	0	0	0	0
4. Sideswipe - Same Direction	0	0	0	0
5. Sideswipe - Opposite Direction	0	0	0	0
6. Fixed Object in Road	0	0	0	0
7. Train	0	0	0	0
8. Non-Collision	0	0	0	0
9. Fixed Object - Off Road	2	1	0	1
10. Deer	1	0	1	0
11. Other Animal	0	0	0	0
12. Ped	0	0	0	0
13. Bicyclist	0	0	0	0
14. Motorcyclist	0	0	0	0
15. Backed Into	0	0	0	0
16. Other	0	0	0	0
Not Applicable	0	0	0	0
Total	4	2	1	1

	Total	2013	2014	2015
Vehicle Type				
Not Provided	0	0	0	0
1. Passenger car	3	2	0	1
2. Truck - Pick-up/Passenger Truck	1	0	1	0
3. Van	0	0	0	0
4. Truck - Single Unit Truck (2-Axles)	0	0	0	0
7. Motor Home, Recreational Vehicle	0	0	0	0
8. Special Vehicle - Oversized (Veh/Earthmover/Road Equip.)	0	0	0	0
9. Bicycle	0	0	0	0
10. Moped	0	0	0	0
11. Motorcycle	0	0	0	0
12. Emergency Vehicle (Regardless of Veh Type)	0	0	0	0
13. Bus - School Bus	0	0	0	0
14. Bus - City Transit Bus/Privately Owned Church Bus	0	0	0	0
15. Bus - Commercial Bus	0	0	0	0
16. Other (Scooter, Go-cart, Hearse, Bookmobile, Golf Cart, etc.)	0	0	0	0
18. Special Vehicle - Farm Machinery	0	0	0	0
19. Special Vehicle - ATV	0	0	0	0
21. Special Vehicle - Low Speed Vehicle	0	0	0	0
22. Truck - Sport Utility Vehicle (SUV)	1	1	0	0
23. Truck - Single Unit Truck (3 Axles or More)	0	0	0	0
25. Truck - Truck Tractor (Bobtail-No Trailer)	0	0	0	0
Not Applicable	0	0	0	0
Total	5	3	1	1

	Total	2013	2014	2015
Fixed Object				
Not Provided	0	0	0	0
1. Bank Or Ledge	0	0	0	0
2. Trees	0	0	0	0
3. Utility Pole	0	0	0	0
4. Fence Or Post	0	0	0	0
5. Guard Rail	2	1	1	0
6. Parked Vehicle	0	0	0	0
7. Tunnel, Bridge, Underpass, Culvert, etc.	0	0	0	0
8. Sign, Traffic Signal	0	0	0	0
9. Impact Cushioning Device	0	0	0	0
10. Other	0	0	0	0
11. Jersey Wall	0	0	0	0
12. Building/Structure	0	0	0	0
13. Curb	0	0	0	0
14. Ditch	0	0	0	0
15. Other Fixed Object	0	0	0	0
16. Other Traffic Barrier	0	0	0	0
17. Traffic Sign Support	0	0	0	0
18. Mailbox	0	0	0	0
Total	2	1	1	0
Lighting				
Not Provided	0	0	0	0
1. Dawn	0	0	0	0
2. Daylight	2	1	1	0
3. Dusk	0	0	0	0
4. Darkness - Road Lighted	0	0	0	0
5. Darkness - Road Not Lighted	2	1	0	1
6. Darkness - Unknown Road Lighting	0	0	0	0
7. Unknown	0	0	0	0
Not Applicable	0	0	0	0
Total	4	2	1	1

	Total	2013	2014	2015
Surface Condition				
Not Provided	0	0	0	0
1. Dry	4	2	1	1
2. Wet	0	0	0	0
3. Snowy	0	0	0	0
4. Icy	0	0	0	0
5. Muddy	0	0	0	0
6. Oil/Other Fluids	0	0	0	0
7. Other	0	0	0	0
8. Natural Debris	0	0	0	0
9. Water (Standing, Moving)	0	0	0	0
10. Slush	0	0	0	0
11. Sand, Dirt, Gravel	0	0	0	0
Not Applicable	0	0	0	0
Total	4	2	1	1
Weather Condition				
Not Provided	0	0	0	0
1. No Adverse Condition (Clear/Cloudy)	4	2	1	1
3. Fog	0	0	0	0
4. Mist	0	0	0	0
5. Rain	0	0	0	0
6. Snow	0	0	0	0
7. Sleet/Hail	0	0	0	0
8. Smoke/Dust	0	0	0	0
9. Other	0	0	0	0
10. Blowing Sand, Soil, Dirt, or Snow	0	0	0	0
11. Severe Crosswinds	0	0	0	0
Not Applicable	0	0	0	0
Total	4	2	1	1

	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday	Unknown
00:00 - 00:59	0	0	0	0	0	0	0	0
01:00 - 01:59	0	0	0	0	0	0	0	0
02:00 - 02:59	0	0	0	0	0	0	0	0
03:00 - 03:59	0	0	0	0	0	0	0	0
04:00 - 04:59	0	0	0	0	0	0	0	0
05:00 - 05:59	0	0	0	0	0	0	0	0
06:00 - 06:59	0	0	0	0	1	0	0	0
07:00 - 07:59	0	0	0	0	0	0	0	0
08:00 - 08:59	0	0	0	0	0	0	0	0
09:00 - 09:59	0	0	0	0	0	0	0	0
10:00 - 10:59	0	0	0	0	0	0	0	0
11:00 - 11:59	0	0	0	0	0	0	0	0
12:00 - 12:59	0	0	0	0	0	0	0	0
13:00 - 13:59	0	0	0	0	0	0	0	0
14:00 - 14:59	0	0	0	0	0	0	0	0
15:00 - 15:59	0	0	0	0	0	0	0	0
16:00 - 16:59	1	0	0	0	0	0	0	0
17:00 - 17:59	0	0	0	1	0	0	0	0
18:00 - 18:59	0	0	0	0	0	0	0	0
19:00 - 19:59	0	0	0	0	0	0	0	0
20:00 - 20:59	0	0	0	0	0	0	0	0
21:00 - 21:59	0	0	0	0	0	0	0	0
22:00 - 22:59	0	0	0	0	0	0	0	0
23:00 - 23:59	0	1	0	0	0	0	0	0
Unknown	0	0	0	0	0	0	0	0
Total	1	1	0	1	1	0	0	0

Report Selection Criteria:

Route Common Name: I-95S
Include Both Sides of the Route: N
Report Date Range: 2/1/2012 Through 2/28/2015
From: 140.93 To: 141.12
Distance in miles: 0.19

Collision Type: Not Provided
Commercial Endorsement Type: Not Provided
Commercial Motor Vehicle: Not Provided
Commercial Vehicle Configuration Type: Not Provided
Start Time: Not Provided
End Time: Not Provided
Days Of Week: Not Provided
Type of Driver Distraction: Not Provided
Driver Drinking Type: Not Provided
Driver Injury Type: Not Provided
Fatal Injury Type: Not Provided
First Crash Events: Not Provided
Location of First Harmful Events: Not Provided
Type of Intersection: Not Provided
Lighting Conditions: Not Provided
Most Harmful Events: Not Provided
Passenger Injury Type: Not Provided
Relation To Roadway: Not Provided
Roadway Surface Type: Not Provided
School Zones: Not Provided
Traffic Contol Type: Not Provided
Damage is VDOT Property: Not Provided
Vehicle Body Type: Not Provided
Weather Condition: Not Provided
Workzone Related: Not Provided
Workzone Workers Present: Not Provided
Jurisdiction Code as supplied by TREDS: Not Provided

Length In Miles: 0.19 DVMT: 12457.77 Crash Rate: 107.22 Death Rate: 0.00 Injury Rate: 64.33

	Total	2012	2013	2014	2015
Total Crashes	15	8	5	1	1
Fatal Crashes	0	0	0	0	0
Injury Only Crashes	6	5	0	1	0
Prop. Damage Only Crashes	9	3	5	0	1
Property Damage Amount	87700	53200	21000	10500	3000
Persons Killed	0	0	0	0	0
Persons Injured	9	7	0	2	0
Pedestrians Killed	0	0	0	0	0
Pedestrians Injured	0	0	0	0	0
Collision Type					
Not Provided	0	0	0	0	0
1. Rear End	11	6	4	1	0
2. Angle	0	0	0	0	0
3. Head On	0	0	0	0	0
4. Sideswipe - Same Direction	1	0	1	0	0
5. Sideswipe - Opposite Direction	0	0	0	0	0
6. Fixed Object in Road	0	0	0	0	0
7. Train	0	0	0	0	0
8. Non-Collision	0	0	0	0	0
9. Fixed Object - Off Road	2	1	0	0	1
10. Deer	1	1	0	0	0
11. Other Animal	0	0	0	0	0
12. Ped	0	0	0	0	0
13. Bicyclist	0	0	0	0	0
14. Motorcyclist	0	0	0	0	0
15. Backed Into	0	0	0	0	0
16. Other	0	0	0	0	0
Not Applicable	0	0	0	0	0
Total	15	8	5	1	1

	Total	2012	2013	2014	2015
Vehicle Type					
Not Provided	0	0	0	0	0
1. Passenger car	16	10	5	1	0
2. Truck - Pick-up/Passenger Truck	3	1	2	0	0
3. Van	0	0	0	0	0
4. Truck - Single Unit Truck (2-Axles)	0	0	0	0	0
7. Motor Home, Recreational Vehicle	0	0	0	0	0
8. Special Vehicle - Oversized (Veh/Earthmover/Road Equip.)	0	0	0	0	0
9. Bicycle	0	0	0	0	0
10. Moped	0	0	0	0	0
11. Motorcycle	1	1	0	0	0
12. Emergency Vehicle (Regardless of Veh Type)	0	0	0	0	0
13. Bus - School Bus	0	0	0	0	0
14. Bus - City Transit Bus/Privately Owned Church Bus	0	0	0	0	0
15. Bus - Commercial Bus	0	0	0	0	0
16. Other (Scooter, Go-cart, Hearse, Bookmobile, Golf Cart, etc.)	0	0	0	0	0
18. Special Vehicle - Farm Machinery	0	0	0	0	0
19. Special Vehicle - ATV	0	0	0	0	0
21. Special Vehicle - Low Speed Vehicle	0	0	0	0	0
22. Truck - Sport Utility Vehicle (SUV)	9	4	3	1	1
23. Truck - Single Unit Truck (3 Axles or More)	0	0	0	0	0
25. Truck - Truck Tractor (Bobtail-No Trailer)	0	0	0	0	0
Not Applicable	0	0	0	0	0
Total	29	16	10	2	1

	Total	2012	2013	2014	2015
Fixed Object					
Not Provided	0	0	0	0	0
1. Bank Or Ledge	1	1	0	0	0
2. Trees	0	0	0	0	0
3. Utility Pole	0	0	0	0	0
4. Fence Or Post	0	0	0	0	0
5. Guard Rail	1	0	1	0	0
6. Parked Vehicle	0	0	0	0	0
7. Tunnel, Bridge, Underpass, Culvert, etc.	0	0	0	0	0
8. Sign, Traffic Signal	0	0	0	0	0
9. Impact Cushioning Device	0	0	0	0	0
10. Other	0	0	0	0	0
11. Jersey Wall	0	0	0	0	0
12. Building/Structure	0	0	0	0	0
13. Curb	0	0	0	0	0
14. Ditch	0	0	0	0	0
15. Other Fixed Object	0	0	0	0	0
16. Other Traffic Barrier	0	0	0	0	0
17. Traffic Sign Support	0	0	0	0	0
18. Mailbox	0	0	0	0	0
Total	2	1	1	0	0
Lighting					
Not Provided	0	0	0	0	0
1. Dawn	0	0	0	0	0
2. Daylight	11	5	5	1	0
3. Dusk	0	0	0	0	0
4. Darkness - Road Lighted	0	0	0	0	0
5. Darkness - Road Not Lighted	4	3	0	0	1
6. Darkness - Unknown Road Lighting	0	0	0	0	0
7. Unknown	0	0	0	0	0
Not Applicable	0	0	0	0	0
Total	15	8	5	1	1

	Total	2012	2013	2014	2015
Surface Condition					
Not Provided	0	0	0	0	0
1. Dry	14	8	5	1	0
2. Wet	0	0	0	0	0
3. Snowy	1	0	0	0	1
4. Icy	0	0	0	0	0
5. Muddy	0	0	0	0	0
6. Oil/Other Fluids	0	0	0	0	0
7. Other	0	0	0	0	0
8. Natural Debris	0	0	0	0	0
9. Water (Standing, Moving)	0	0	0	0	0
10. Slush	0	0	0	0	0
11. Sand, Dirt, Gravel	0	0	0	0	0
Not Applicable	0	0	0	0	0
Total	15	8	5	1	1
Weather Condition					
Not Provided	0	0	0	0	0
1. No Adverse Condition (Clear/Cloudy)	14	8	5	1	0
3. Fog	0	0	0	0	0
4. Mist	0	0	0	0	0
5. Rain	0	0	0	0	0
6. Snow	1	0	0	0	1
7. Sleet/Hail	0	0	0	0	0
8. Smoke/Dust	0	0	0	0	0
9. Other	0	0	0	0	0
10. Blowing Sand, Soil, Dirt, or Snow	0	0	0	0	0
11. Severe Crosswinds	0	0	0	0	0
Not Applicable	0	0	0	0	0
Total	15	8	5	1	1

	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday	Unknown
00:00 - 00:59	0	0	0	0	0	0	0	0
01:00 - 01:59	0	0	0	0	0	0	1	0
02:00 - 02:59	0	0	0	0	0	0	0	0
03:00 - 03:59	0	0	0	0	0	0	0	0
04:00 - 04:59	0	0	0	0	0	0	0	0
05:00 - 05:59	0	0	0	0	0	0	0	0
06:00 - 06:59	0	0	0	0	0	0	0	0
07:00 - 07:59	0	0	0	0	0	0	0	0
08:00 - 08:59	0	0	0	0	0	0	0	0
09:00 - 09:59	0	0	0	0	0	1	0	0
10:00 - 10:59	0	0	0	0	0	0	0	0
11:00 - 11:59	0	0	0	0	0	0	0	0
12:00 - 12:59	0	0	0	2	0	0	0	0
13:00 - 13:59	0	0	0	1	0	0	0	0
14:00 - 14:59	0	0	0	2	0	0	0	0
15:00 - 15:59	0	0	2	0	1	0	0	0
16:00 - 16:59	0	0	0	0	0	0	0	0
17:00 - 17:59	0	0	0	0	2	1	0	0
18:00 - 18:59	0	0	0	0	0	0	0	0
19:00 - 19:59	0	0	0	0	0	0	0	0
20:00 - 20:59	0	0	0	0	0	0	0	0
21:00 - 21:59	0	0	0	0	0	0	0	0
22:00 - 22:59	0	0	0	0	0	0	0	0
23:00 - 23:59	1	1	0	0	0	0	0	0
Unknown	0	0	0	0	0	0	0	0
Total	1	1	2	5	3	2	1	0

Report Selection Criteria:

Route Common Name: I-95S
Include Both Sides of the Route: N
Report Date Range: 2/1/2012 Through 2/28/2015
From: 140.33 To: 140.63
Distance in miles: 0.30

Collision Type: Not Provided
Commercial Endorsement Type: Not Provided
Commercial Motor Vehicle: Not Provided
Commercial Vehicle Configuration Type: Not Provided
Start Time: Not Provided
End Time: Not Provided
Days Of Week: Not Provided
Type of Driver Distraction: Not Provided
Driver Drinking Type: Not Provided
Driver Injury Type: Not Provided
Fatal Injury Type: Not Provided
First Crash Events: Not Provided
Location of First Harmful Events: Not Provided
Type of Intersection: Not Provided
Lighting Conditions: Not Provided
Most Harmful Events: Not Provided
Passenger Injury Type: Not Provided
Relation To Roadway: Not Provided
Roadway Surface Type: Not Provided
School Zones: Not Provided
Traffic Contol Type: Not Provided
Damage is VDOT Property: Not Provided
Vehicle Body Type: Not Provided
Weather Condition: Not Provided
Workzone Related: Not Provided
Workzone Workers Present: Not Provided
Jurisdiction Code as supplied by TREDS: Not Provided

Length In Miles: 0.30 DVMT: 19511.06 Crash Rate: 127.79 Death Rate: 0.00 Injury Rate: 68.46

	Total	2012	2013	2014	2015
Total Crashes	28	6	7	13	2
Fatal Crashes	0	0	0	0	0
Injury Only Crashes	8	2	2	4	0
Prop. Damage Only Crashes	20	4	5	9	2
Property Damage Amount	222256	57100	71456	87900	5800
Persons Killed	0	0	0	0	0
Persons Injured	15	5	2	8	0
Pedestrians Killed	0	0	0	0	0
Pedestrians Injured	0	0	0	0	0
Collision Type					
Not Provided	0	0	0	0	0
1. Rear End	15	4	1	9	1
2. Angle	3	0	1	2	0
3. Head On	0	0	0	0	0
4. Sideswipe - Same Direction	6	2	2	1	1
5. Sideswipe - Opposite Direction	0	0	0	0	0
6. Fixed Object in Road	0	0	0	0	0
7. Train	0	0	0	0	0
8. Non-Collision	0	0	0	0	0
9. Fixed Object - Off Road	4	0	3	1	0
10. Deer	0	0	0	0	0
11. Other Animal	0	0	0	0	0
12. Ped	0	0	0	0	0
13. Bicyclist	0	0	0	0	0
14. Motorcyclist	0	0	0	0	0
15. Backed Into	0	0	0	0	0
16. Other	0	0	0	0	0
Not Applicable	0	0	0	0	0
Total	28	6	7	13	2

	Total	2012	2013	2014	2015
Vehicle Type					
Not Provided	0	0	0	0	0
1. Passenger car	28	6	5	14	3
2. Truck - Pick-up/Passenger Truck	6	1	2	3	0
3. Van	4	3	0	0	1
4. Truck - Single Unit Truck (2-Axles)	1	1	0	0	0
7. Motor Home, Recreational Vehicle	0	0	0	0	0
8. Special Vehicle - Oversized (Veh/Earthmover/Road Equip.)	0	0	0	0	0
9. Bicycle	0	0	0	0	0
10. Moped	0	0	0	0	0
11. Motorcycle	0	0	0	0	0
12. Emergency Vehicle (Regardless of Veh Type)	0	0	0	0	0
13. Bus - School Bus	0	0	0	0	0
14. Bus - City Transit Bus/Privately Owned Church Bus	0	0	0	0	0
15. Bus - Commercial Bus	0	0	0	0	0
16. Other (Scooter, Go-cart, Hearse, Bookmobile, Golf Cart, etc.)	0	0	0	0	0
18. Special Vehicle - Farm Machinery	0	0	0	0	0
19. Special Vehicle - ATV	0	0	0	0	0
21. Special Vehicle - Low Speed Vehicle	0	0	0	0	0
22. Truck - Sport Utility Vehicle (SUV)	13	2	2	9	0
23. Truck - Single Unit Truck (3 Axles or More)	5	1	3	1	0
25. Truck - Truck Tractor (Bobtail-No Trailer)	0	0	0	0	0
Not Applicable	0	0	0	0	0
Total	57	14	12	27	4

	Total	2012	2013	2014	2015
Fixed Object					
Not Provided	0	0	0	0	0
1. Bank Or Ledge	1	1	0	0	0
2. Trees	1	0	1	0	0
3. Utility Pole	0	0	0	0	0
4. Fence Or Post	0	0	0	0	0
5. Guard Rail	8	3	3	2	0
6. Parked Vehicle	0	0	0	0	0
7. Tunnel, Bridge, Underpass, Culvert, etc.	0	0	0	0	0
8. Sign, Traffic Signal	0	0	0	0	0
9. Impact Cushioning Device	0	0	0	0	0
10. Other	0	0	0	0	0
11. Jersey Wall	0	0	0	0	0
12. Building/Structure	0	0	0	0	0
13. Curb	0	0	0	0	0
14. Ditch	0	0	0	0	0
15. Other Fixed Object	0	0	0	0	0
16. Other Traffic Barrier	0	0	0	0	0
17. Traffic Sign Support	0	0	0	0	0
18. Mailbox	0	0	0	0	0
Total	10	4	4	2	0
Lighting					
Not Provided	0	0	0	0	0
1. Dawn	0	0	0	0	0
2. Daylight	23	6	5	11	1
3. Dusk	1	0	1	0	0
4. Darkness - Road Lighted	0	0	0	0	0
5. Darkness - Road Not Lighted	4	0	1	2	1
6. Darkness - Unknown Road Lighting	0	0	0	0	0
7. Unknown	0	0	0	0	0
Not Applicable	0	0	0	0	0
Total	28	6	7	13	2

	Total	2012	2013	2014	2015
Surface Condition					
Not Provided	0	0	0	0	0
1. Dry	21	5	5	9	2
2. Wet	5	1	2	2	0
3. Snowy	1	0	0	1	0
4. Icy	1	0	0	1	0
5. Muddy	0	0	0	0	0
6. Oil/Other Fluids	0	0	0	0	0
7. Other	0	0	0	0	0
8. Natural Debris	0	0	0	0	0
9. Water (Standing, Moving)	0	0	0	0	0
10. Slush	0	0	0	0	0
11. Sand, Dirt, Gravel	0	0	0	0	0
Not Applicable	0	0	0	0	0
Total	28	6	7	13	2
Weather Condition					
Not Provided	0	0	0	0	0
1. No Adverse Condition (Clear/Cloudy)	22	6	5	9	2
3. Fog	0	0	0	0	0
4. Mist	0	0	0	0	0
5. Rain	4	0	2	2	0
6. Snow	2	0	0	2	0
7. Sleet/Hail	0	0	0	0	0
8. Smoke/Dust	0	0	0	0	0
9. Other	0	0	0	0	0
10. Blowing Sand, Soil, Dirt, or Snow	0	0	0	0	0
11. Severe Crosswinds	0	0	0	0	0
Not Applicable	0	0	0	0	0
Total	28	6	7	13	2

	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday	Unknown
00:00 - 00:59	0	0	0	1	0	0	0	0
01:00 - 01:59	0	0	0	0	0	0	0	0
02:00 - 02:59	0	0	0	0	0	0	0	0
03:00 - 03:59	0	0	0	0	0	0	0	0
04:00 - 04:59	0	0	0	0	0	0	0	0
05:00 - 05:59	0	0	0	0	0	0	0	0
06:00 - 06:59	0	0	0	0	0	0	0	0
07:00 - 07:59	1	0	0	1	0	0	0	0
08:00 - 08:59	0	0	1	0	0	0	0	0
09:00 - 09:59	0	0	0	0	0	0	0	0
10:00 - 10:59	0	0	0	1	0	2	0	0
11:00 - 11:59	1	0	0	0	0	1	1	0
12:00 - 12:59	0	1	0	0	1	0	1	0
13:00 - 13:59	0	0	0	0	0	1	1	0
14:00 - 14:59	1	0	0	0	0	2	0	0
15:00 - 15:59	0	0	0	1	0	1	1	0
16:00 - 16:59	0	0	0	0	0	0	0	0
17:00 - 17:59	0	3	0	0	0	1	0	0
18:00 - 18:59	0	0	0	0	0	0	0	0
19:00 - 19:59	0	0	0	0	0	0	0	0
20:00 - 20:59	0	0	0	0	1	0	0	0
21:00 - 21:59	0	0	0	0	0	0	0	0
22:00 - 22:59	0	0	0	1	0	0	0	0
23:00 - 23:59	0	0	0	0	0	1	0	0
Unknown	0	0	0	0	0	0	0	0
Total	3	4	1	5	2	9	4	0

Report Selection Criteria:

Route Common Name: I-95S
Include Both Sides of the Route: N
Report Date Range: 1/1/2012 Through 12/31/2014
From: 140.44 To: 140.63
Distance in miles: 0.19

Collision Type: Not Provided
Commercial Endorsement Type: Not Provided
Commercial Motor Vehicle: Not Provided
Commercial Vehicle Configuration Type: Not Provided
Start Time: Not Provided
End Time: Not Provided
Days Of Week: Not Provided
Type of Driver Distraction: Not Provided
Driver Drinking Type: Not Provided
Driver Injury Type: Not Provided
Fatal Injury Type: Not Provided
First Crash Events: Not Provided
Location of First Harmful Events: Not Provided
Type of Intersection: Not Provided
Lighting Conditions: Not Provided
Most Harmful Events: Not Provided
Passenger Injury Type: Not Provided
Relation To Roadway: Not Provided
Roadway Surface Type: Not Provided
School Zones: Not Provided
Traffic Contol Type: Not Provided
Damage is VDOT Property: Not Provided
Vehicle Body Type: Not Provided
Weather Condition: Not Provided
Workzone Related: Not Provided
Workzone Workers Present: Not Provided
Jurisdiction Code as supplied by TREDS: Not Provided

Length In Miles: 0.19 DVMT: 12372.31 Crash Rate: 147.63 Death Rate: 0.00 Injury Rate: 95.96

	Total	2012	2013	2014
Total Crashes	20	7	6	7
Fatal Crashes	0	0	0	0
Injury Only Crashes	6	2	2	2
Prop. Damage Only Crashes	14	5	4	5
Property Damage Amount	177356	58600	68856	49900
Persons Killed	0	0	0	0
Persons Injured	13	5	2	6
Pedestrians Killed	0	0	0	0
Pedestrians Injured	0	0	0	0
Collision Type				
Not Provided	0	0	0	0
1. Rear End	11	5	1	5
2. Angle	2	0	1	1
3. Head On	0	0	0	0
4. Sideswipe - Same Direction	4	2	1	1
5. Sideswipe - Opposite Direction	0	0	0	0
6. Fixed Object in Road	0	0	0	0
7. Train	0	0	0	0
8. Non-Collision	0	0	0	0
9. Fixed Object - Off Road	3	0	3	0
10. Deer	0	0	0	0
11. Other Animal	0	0	0	0
12. Ped	0	0	0	0
13. Bicyclist	0	0	0	0
14. Motorcyclist	0	0	0	0
15. Backed Into	0	0	0	0
16. Other	0	0	0	0
Not Applicable	0	0	0	0
Total	20	7	6	7

	Total	2012	2013	2014
Vehicle Type				
Not Provided	0	0	0	0
1. Passenger car	22	8	5	9
2. Truck - Pick-up/Passenger Truck	5	1	2	2
3. Van	3	3	0	0
4. Truck - Single Unit Truck (2-Axles)	1	1	0	0
7. Motor Home, Recreational Vehicle	0	0	0	0
8. Special Vehicle - Oversized (Veh/Earthmover/Road Equip.)	0	0	0	0
9. Bicycle	0	0	0	0
10. Moped	0	0	0	0
11. Motorcycle	0	0	0	0
12. Emergency Vehicle (Regardless of Veh Type)	0	0	0	0
13. Bus - School Bus	0	0	0	0
14. Bus - City Transit Bus/Privately Owned Church Bus	0	0	0	0
15. Bus - Commercial Bus	0	0	0	0
16. Other (Scooter, Go-cart, Hearse, Bookmobile, Golf Cart, etc.)	0	0	0	0
18. Special Vehicle - Farm Machinery	0	0	0	0
19. Special Vehicle - ATV	0	0	0	0
21. Special Vehicle - Low Speed Vehicle	0	0	0	0
22. Truck - Sport Utility Vehicle (SUV)	7	2	1	4
23. Truck - Single Unit Truck (3 Axles or More)	4	1	2	1
25. Truck - Truck Tractor (Bobtail-No Trailer)	0	0	0	0
Not Applicable	0	0	0	0
Total	42	16	10	16

	Total	2012	2013	2014
Fixed Object				
Not Provided	0	0	0	0
1. Bank Or Ledge	1	1	0	0
2. Trees	1	0	1	0
3. Utility Pole	0	0	0	0
4. Fence Or Post	0	0	0	0
5. Guard Rail	7	3	3	1
6. Parked Vehicle	0	0	0	0
7. Tunnel, Bridge, Underpass, Culvert, etc.	0	0	0	0
8. Sign, Traffic Signal	0	0	0	0
9. Impact Cushioning Device	0	0	0	0
10. Other	0	0	0	0
11. Jersey Wall	0	0	0	0
12. Building/Structure	0	0	0	0
13. Curb	0	0	0	0
14. Ditch	0	0	0	0
15. Other Fixed Object	0	0	0	0
16. Other Traffic Barrier	0	0	0	0
17. Traffic Sign Support	0	0	0	0
18. Mailbox	0	0	0	0
Total	9	4	4	1
Lighting				
Not Provided	0	0	0	0
1. Dawn	0	0	0	0
2. Daylight	17	6	5	6
3. Dusk	2	1	1	0
4. Darkness - Road Lighted	0	0	0	0
5. Darkness - Road Not Lighted	1	0	0	1
6. Darkness - Unknown Road Lighting	0	0	0	0
7. Unknown	0	0	0	0
Not Applicable	0	0	0	0
Total	20	7	6	7

	Total	2012	2013	2014
Surface Condition				
Not Provided	0	0	0	0
1. Dry	16	6	4	6
2. Wet	4	1	2	1
3. Snowy	0	0	0	0
4. Icy	0	0	0	0
5. Muddy	0	0	0	0
6. Oil/Other Fluids	0	0	0	0
7. Other	0	0	0	0
8. Natural Debris	0	0	0	0
9. Water (Standing, Moving)	0	0	0	0
10. Slush	0	0	0	0
11. Sand, Dirt, Gravel	0	0	0	0
Not Applicable	0	0	0	0
Total	20	7	6	7
Weather Condition				
Not Provided	0	0	0	0
1. No Adverse Condition (Clear/Cloudy)	17	7	4	6
3. Fog	0	0	0	0
4. Mist	0	0	0	0
5. Rain	3	0	2	1
6. Snow	0	0	0	0
7. Sleet/Hail	0	0	0	0
8. Smoke/Dust	0	0	0	0
9. Other	0	0	0	0
10. Blowing Sand, Soil, Dirt, or Snow	0	0	0	0
11. Severe Crosswinds	0	0	0	0
Not Applicable	0	0	0	0
Total	20	7	6	7

	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday	Unknown
00:00 - 00:59	0	0	0	0	0	0	0	0
01:00 - 01:59	0	0	0	0	0	0	0	0
02:00 - 02:59	0	0	0	0	0	0	0	0
03:00 - 03:59	0	0	0	0	0	0	0	0
04:00 - 04:59	0	0	0	0	0	0	0	0
05:00 - 05:59	0	0	0	0	0	0	0	0
06:00 - 06:59	0	0	0	0	0	0	0	0
07:00 - 07:59	0	0	0	1	0	0	0	0
08:00 - 08:59	0	0	0	0	0	0	0	0
09:00 - 09:59	0	0	0	0	0	0	0	0
10:00 - 10:59	0	0	0	1	0	0	0	0
11:00 - 11:59	1	0	0	0	0	1	1	0
12:00 - 12:59	0	0	0	0	1	0	0	0
13:00 - 13:59	0	0	0	0	0	1	1	0
14:00 - 14:59	1	0	0	0	0	2	0	0
15:00 - 15:59	0	0	0	1	0	1	1	0
16:00 - 16:59	0	0	0	0	0	0	0	0
17:00 - 17:59	0	3	0	1	0	0	0	0
18:00 - 18:59	0	0	0	0	0	0	0	0
19:00 - 19:59	0	0	0	0	0	0	0	0
20:00 - 20:59	0	0	0	0	0	0	0	0
21:00 - 21:59	0	0	0	0	0	0	0	0
22:00 - 22:59	0	0	0	1	0	0	0	0
23:00 - 23:59	0	0	0	0	0	1	0	0
Unknown	0	0	0	0	0	0	0	0
Total	2	3	0	5	1	6	3	0

Report Selection Criteria:

Route Common Name: SC-630E (Stafford County)
Include Both Sides of the Route: Y
Report Date Range: 2/1/2012 Through 2/28/2015
From: 3.97 To: 4.18
Distance in miles: 0.21

Collision Type: Not Provided
Commercial Endorsement Type: Not Provided
Commercial Motor Vehicle: Not Provided
Commercial Vehicle Configuration Type: Not Provided
Start Time: Not Provided
End Time: Not Provided
Days Of Week: Not Provided
Type of Driver Distraction: Not Provided
Driver Drinking Type: Not Provided
Driver Injury Type: Not Provided
Fatal Injury Type: Not Provided
First Crash Events: Not Provided
Location of First Harmful Events: Not Provided
Type of Intersection: Not Provided
Lighting Conditions: Not Provided
Most Harmful Events: Not Provided
Passenger Injury Type: Not Provided
Relation To Roadway: Not Provided
Roadway Surface Type: Not Provided
School Zones: Not Provided
Traffic Contol Type: Not Provided
Damage is VDOT Property: Not Provided
Vehicle Body Type: Not Provided
Weather Condition: Not Provided
Workzone Related: Not Provided
Workzone Workers Present: Not Provided
Jurisdiction Code as supplied by TREDS: Not Provided

Length In Miles: 0.21 DVMT: 3743.09 Crash Rate: 428.22 Death Rate: 0.00 Injury Rate: 118.95

	Total	2012	2013	2014	2015
Total Crashes	18	6	7	4	1
Fatal Crashes	0	0	0	0	0
Injury Only Crashes	3	2	0	1	0
Prop. Damage Only Crashes	15	4	7	3	1
Property Damage Amount	110900	32800	31100	36000	11000
Persons Killed	0	0	0	0	0
Persons Injured	5	4	0	1	0
Pedestrians Killed	0	0	0	0	0
Pedestrians Injured	0	0	0	0	0
Collision Type					
Not Provided	0	0	0	0	0
1. Rear End	8	2	5	1	0
2. Angle	8	2	2	3	1
3. Head On	1	1	0	0	0
4. Sideswipe - Same Direction	0	0	0	0	0
5. Sideswipe - Opposite Direction	1	1	0	0	0
6. Fixed Object in Road	0	0	0	0	0
7. Train	0	0	0	0	0
8. Non-Collision	0	0	0	0	0
9. Fixed Object - Off Road	0	0	0	0	0
10. Deer	0	0	0	0	0
11. Other Animal	0	0	0	0	0
12. Ped	0	0	0	0	0
13. Bicyclist	0	0	0	0	0
14. Motorcyclist	0	0	0	0	0
15. Backed Into	0	0	0	0	0
16. Other	0	0	0	0	0
Not Applicable	0	0	0	0	0
Total	18	6	7	4	1

	Total	2012	2013	2014	2015
Vehicle Type					
Not Provided	0	0	0	0	0
1. Passenger car	22	7	9	5	1
2. Truck - Pick-up/Passenger Truck	4	2	2	0	0
3. Van	2	1	1	0	0
4. Truck - Single Unit Truck (2-Axles)	0	0	0	0	0
7. Motor Home, Recreational Vehicle	0	0	0	0	0
8. Special Vehicle - Oversized (Veh/Earthmover/Road Equip.)	0	0	0	0	0
9. Bicycle	0	0	0	0	0
10. Moped	0	0	0	0	0
11. Motorcycle	0	0	0	0	0
12. Emergency Vehicle (Regardless of Veh Type)	0	0	0	0	0
13. Bus - School Bus	0	0	0	0	0
14. Bus - City Transit Bus/Privately Owned Church Bus	0	0	0	0	0
15. Bus - Commercial Bus	0	0	0	0	0
16. Other (Scooter, Go-cart, Hearse, Bookmobile, Golf Cart, etc.)	0	0	0	0	0
18. Special Vehicle - Farm Machinery	0	0	0	0	0
19. Special Vehicle - ATV	0	0	0	0	0
21. Special Vehicle - Low Speed Vehicle	0	0	0	0	0
22. Truck - Sport Utility Vehicle (SUV)	7	1	2	3	1
23. Truck - Single Unit Truck (3 Axles or More)	1	1	0	0	0
25. Truck - Truck Tractor (Bobtail-No Trailer)	0	0	0	0	0
Not Applicable	0	0	0	0	0
Total	36	12	14	8	2

	Total	2012	2013	2014	2015
Fixed Object					
Not Provided	0	0	0	0	0
1. Bank Or Ledge	0	0	0	0	0
2. Trees	0	0	0	0	0
3. Utility Pole	0	0	0	0	0
4. Fence Or Post	0	0	0	0	0
5. Guard Rail	1	1	0	0	0
6. Parked Vehicle	0	0	0	0	0
7. Tunnel, Bridge, Underpass, Culvert, etc.	0	0	0	0	0
8. Sign, Traffic Signal	0	0	0	0	0
9. Impact Cushioning Device	0	0	0	0	0
10. Other	0	0	0	0	0
11. Jersey Wall	0	0	0	0	0
12. Building/Structure	0	0	0	0	0
13. Curb	0	0	0	0	0
14. Ditch	0	0	0	0	0
15. Other Fixed Object	0	0	0	0	0
16. Other Traffic Barrier	0	0	0	0	0
17. Traffic Sign Support	0	0	0	0	0
18. Mailbox	0	0	0	0	0
Total	1	1	0	0	0
Lighting					
Not Provided	0	0	0	0	0
1. Dawn	0	0	0	0	0
2. Daylight	13	5	6	2	0
3. Dusk	0	0	0	0	0
4. Darkness - Road Lighted	4	1	1	1	1
5. Darkness - Road Not Lighted	1	0	0	1	0
6. Darkness - Unknown Road Lighting	0	0	0	0	0
7. Unknown	0	0	0	0	0
Not Applicable	0	0	0	0	0
Total	18	6	7	4	1

	Total	2012	2013	2014	2015
Surface Condition					
Not Provided	0	0	0	0	0
1. Dry	15	5	5	4	1
2. Wet	3	1	2	0	0
3. Snowy	0	0	0	0	0
4. Icy	0	0	0	0	0
5. Muddy	0	0	0	0	0
6. Oil/Other Fluids	0	0	0	0	0
7. Other	0	0	0	0	0
8. Natural Debris	0	0	0	0	0
9. Water (Standing, Moving)	0	0	0	0	0
10. Slush	0	0	0	0	0
11. Sand, Dirt, Gravel	0	0	0	0	0
Not Applicable	0	0	0	0	0
Total	18	6	7	4	1
Weather Condition					
Not Provided	0	0	0	0	0
1. No Adverse Condition (Clear/Cloudy)	15	5	5	4	1
3. Fog	0	0	0	0	0
4. Mist	0	0	0	0	0
5. Rain	3	1	2	0	0
6. Snow	0	0	0	0	0
7. Sleet/Hail	0	0	0	0	0
8. Smoke/Dust	0	0	0	0	0
9. Other	0	0	0	0	0
10. Blowing Sand, Soil, Dirt, or Snow	0	0	0	0	0
11. Severe Crosswinds	0	0	0	0	0
Not Applicable	0	0	0	0	0
Total	18	6	7	4	1

	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday	Unknown
00:00 - 00:59	0	0	0	0	1	0	0	0
01:00 - 01:59	0	0	0	0	0	0	0	0
02:00 - 02:59	0	0	0	0	0	0	0	0
03:00 - 03:59	0	0	0	0	0	0	0	0
04:00 - 04:59	0	1	0	0	0	0	0	0
05:00 - 05:59	0	0	0	0	0	0	0	0
06:00 - 06:59	0	0	0	0	0	1	0	0
07:00 - 07:59	0	0	0	0	0	0	0	0
08:00 - 08:59	0	0	0	0	0	0	1	0
09:00 - 09:59	0	0	0	0	0	0	0	0
10:00 - 10:59	0	0	1	0	0	0	1	0
11:00 - 11:59	0	0	0	0	0	0	0	0
12:00 - 12:59	0	0	1	0	1	0	0	0
13:00 - 13:59	1	0	0	0	0	0	0	0
14:00 - 14:59	0	1	0	0	0	0	0	0
15:00 - 15:59	0	0	0	1	0	0	0	0
16:00 - 16:59	1	1	0	0	0	0	0	0
17:00 - 17:59	0	0	0	0	0	0	0	0
18:00 - 18:59	0	0	0	0	0	1	0	0
19:00 - 19:59	0	0	0	0	0	0	0	0
20:00 - 20:59	0	0	0	0	0	1	0	0
21:00 - 21:59	1	0	0	0	1	0	0	0
22:00 - 22:59	0	0	0	0	1	0	0	0
23:00 - 23:59	0	0	0	0	0	0	0	0
Unknown	0	0	0	0	0	0	0	0
Total	3	3	2	1	4	3	2	0