



COMMONWEALTH of VIRGINIA  
DEPARTMENT OF TRANSPORTATION  
87 Deacon Road  
Fredericksburg, VA 22405

GREGORY A. WHIRLEY  
ACTING COMMISSIONER

April 30, 2010

Northumberland County  
Attn: Mr. W. H. Shirley  
P. O. Box 129  
Heathsville, VA. 22473

Re: Bluff Point Planned Mixed-Use Development Rezoning Review  
Chapter 527 TIA (1<sup>st</sup>) & Signal Warrant Analysis (1<sup>st</sup>)  
Northumberland County, Rt. 200, 608 & 669

Dear Mr. Shirley:

This office has reviewed the referenced traffic impact analysis and signal warrant study in conjunction with the VDOT Central Traffic Regional Operations Center, and we offer the following comments:

1. The signal warrant study prepared by Vettra recommends justification of a signal at the Route 200/Route 608 intersection at full build out in 2019. We concur with this assessment. The consultant justified a signal based on satisfaction of four warrants. For planning purposes, we consider only Warrant 1 (Eight-Hour Vehicular Volumes). However, Vettra indicated the intersection meets Warrant 1, using the reduction factor to 70 percent of all threshold volumes allowable because the intersection resides within an isolated community with a population of less than 10,000. We normally do not consider the reduction to 70 percent of all threshold volumes. But in this case, background traffic plus the proposed Bluff Point development will generate westbound Route 608 left turn volumes in excess of over 300 vehicles during each of three hours in the morning and at least 200 left turn vehicles for every other hour of the day between 6:00 a.m. and 7:00 p.m. Given these volumes in conjunction with traffic on Route 200, we can agree to the installation of a signal. However, construction of auxiliary lanes must occur at the intersection before we give final approval to signal installation (see recommendations and requirements as listed in comments #3 & #4 below).
2. The scoping document found within the TIA contains the following discrepancies:
  - a. Build-out Year is stated as 2018 in the scoping document but 2019 in the TIA (causing the Design Year of "build-out plus six years" to be off by a year, as well.)
  - b. Acreage of the site is stated as 922 acres in the scoping document, but 898 acres in the TIA.
  - c. Trip distribution was not assigned at project scoping. The scoping document states that the distribution is "TBD – per counts (to be pre-approved by staff)". On page 18 of the TIA, it is stated, "Year 2019/2025 site-generated trips were assigned to the road network based on pre-scope approved distributions..." which is apparently not the case (based upon the scoping document). Also, on page 11 of the TIA, it is stated that "Future trip distributions are based

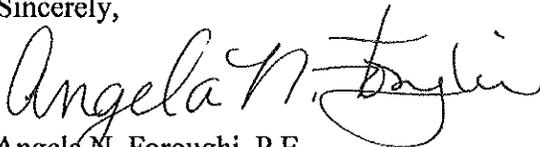
scope approved distributions...” which is apparently not the case (based upon the scoping document). Also, on page 11 of the TIA, it is stated that “Future trip distributions are based on prior TIA’s...” (without mentioning any specific documents), and finally, “All trip distributions utilized in this TIA have been pre-approved by County and VDOT staff.” While the distributions utilized in the TIA appear to be reasonable, this office does not have any record of a subsequent agreement between parties on what the assumed trip distributions should have been.

- d. It appears that approximate current destinations (%’s) were used to assign future distributions, as suggested in the scoping document. Due to the fact that the proposed development will be the overwhelming producer of traffic on the subject roadways, the use of existing destinations as the basis for future distributions may be misleading.
  - e. An annual growth rate of 2% was applied to determine background growth. No traffic from other nearby projects was considered. The TIA states, “No other planned/approved development projects within the immediate vicinity were identified by staff.” It should be noted that there are eight land development projects of various sizes and compositions around the Town of Kilmarnock. The eight development projects are Kilmarnock Glen, Crossroads at the Chesapeake, Kilmarnock Town Center, Grace Hill, Springwood, Seastar Condos, Tartan Village, and Kilmarnock Entertainment Center. The completion of these developments may have an impact upon future traffic not captured in a flat 2% AGR.
  - f. Trip Generation assumptions and computations appear to be accurate, based upon the 7th Edition of the ITE Manual.
  - g. The TIA states that the (2019) build-out of the Bluff Point development “will cause some traffic impact only at the un-signalized Rt. 200/Bluff Point Rd. intersection” and that the 2025 levels of service “will essentially be the same as for Year 2019.” While this is a bit of an understatement, it is the Route 200/Route 608 intersection that requires significant mitigation. At build-out, this intersection, left unimproved, would operate at a LOS F in the AM Peak Hour, the PM Peak Hour and the Saturday Peak Hour.
3. The recommended off-site roadway improvements to the existing roadway network to include design, construction, and necessary additional right-of-way acquisition are as follows due to signification traffic volume increases directly related to this development at all the following locations:
- a. Traffic Signal at the intersection of Rt. 200 and Rt. 608 by full build-out year 2019, or at a time when VDOT determines that installation of the signal is necessary based upon an updated developer’s signal warrant analysis.
  - b. Right turn lane for northbound Rt. 200 at the intersection with Rt. 608 in accordance with the design requirements of the VDOT Road Design Manual.
  - c. Left turn lane for southbound Rt. 200 at the intersection with Rt. 608 in accordance with the design requirements of the VDOT Road Design Manual.
  - d. Dedicated left turn lane for westbound Rt. 608 at the approach to Rt. 200 in accordance with the VDOT Road Design Manual for left turn.
  - e. Dedicated right turn lane for westbound Rt. 608 at the approach to Rt. 200 in accordance with the VDOT Road Design Manual.
  - f. Left turn lane for eastbound Rt. 608 at the approach to the intersection with Rt. 669/Rt. 608 intersection in accordance with the VDOT Road Design Manual.
  - g. Reconstruction of Rt. 608 from Rt. 200 to the end of the development limits with 12’ lane widths, 8’ shoulders, and in accordance with the VDOT Road Design Manual.
  - h. Reconstruction of Rt. 669 from the intersection of Rt. 608 to the end of the development limits with 12’ lanes, 8’ shoulders, and in accordance with the VDOT Road Design Manual.
4. The required roadway improvements directly associated with this development are as follows:
- a. Left turn lane for east bound Rt. 669 at the approach to the intersection with the proposed entrance to Rt. 669 in accordance with the VDOT Road Design Manual.

- b. Left turn lane for eastbound Rt. 608 (Jarvis Road) at the approach to the intersection with the proposed entrance in accordance with the VDOT Road Design Manual.
5. From a capacity standpoint, the intersection of Rt. 3 and Rt. 200 currently operates at a level of service (LOS) "C" for both the AM and PM peaks. However, the intersection resides within the downtown area of Kilmarnock and contains some substandard lane widths (i.e., less than 12 feet). Motorists must also contend with tight turning radii and on-street parking maneuvers. Anecdotal evidence suggests that frequent backups occur on Route 3 due to the prevailing roadway geometry, parking maneuvers within proximity to the intersection, and pedestrian traffic. While the Highway Capacity Manual's (HCM) methodology considers the impact of parking maneuvers and pedestrians on intersection capacity, we could not model these conditions without the appropriate data. The HCM indicates northbound right turn queues already spill over beyond the limits of the 75-foot turn lane.
6. Our analysis of future conditions (Year 2019) for the intersection of Rt. 3 and Rt. 200 indicates LOS of "C" in the AM peak and "D" in the PM peak, with increases of 28.2 percent in delay (seconds per vehicle) in the AM peak and 86.9 percent in the PM peak. We expect exacerbation of the conditions noted above (comment #5) with the addition of site traffic. Also, HCM predicts southbound left turn queues will spill over beyond the physical limits of the left turn lane that measures 175 feet in length. Vetra counted 16 left turn vehicles in 2009 and expects 133 total left turns as a result of development. The analysis for existing conditions revealed sufficient storage to accommodate the current 16 left turns.
7. Provide full size (36" X 24") copies of the General Development Plan for review with the TIA. The 8 ½" X 11" plan included in the Analysis is too small to review. This plan shall include intersection sight lines for each proposed entrance to a VDOT maintained roadway.

Once these comments are addressed, submit revised documents with a comment response letter to the County. Should you have any questions concerning this review, contact Mr. Chad Brooks at 804.761.2148.

Sincerely,



Angela N. Foroughi, P.E.  
Acting Director of Transportation & Land Use  
Fredericksburg District

Cc: VDOT, Mr. Sean Trapani  
VDOT, Mr. Stephen Haynes  
VDOT, Mr. Dave Dreis  
Bluff Point Holdings, LLC  
VETTRA Company, Mr. Vernon E. Torney



Home > Submission

Home Submissions

**LandTrack :: Submission Details**

**1. Submission Details**

Project Id	66-200-20100319-662	Submission #	1
Project Name	Bluff Point	Locality Project Id	
VDOT District	Fredericksburg	Jurisdiction	County Of Northumberland
Locality Contact	E. Luttrell Tadlock	TIA Preparer	Vern E. Torney - Vettra Company

**2. Location**

Routes Added

Route No	Street Name	Principal Route	Average Daily Traffic (ADT)
200	Dupont Memorial Highway	<input checked="" type="checkbox"/>	4900.00
608	Bluff Point Road	<input checked="" type="checkbox"/>	1900.00
	Bluff Point Road	<input checked="" type="checkbox"/>	1400.00
	Jarvis Point Road	<input checked="" type="checkbox"/>	60.00

Print

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**Section Links**

1 2 3 4 5

Details

Submission Type(s)	• Zoning TIA Review	Principal Parcel Id	0
Type of Development	Mixed Use - Commercial/Residential	Acreage	898.00
Residential Units	523.00	Commercial Sqr Ft	34000.00
Additional Vehicles Per Hour (VPH)	745.00	Additional Vehicles Per Day (VPD)	7204.00

**4. Work Tracking**

VDOT Contact	Stephen Haynes	VDOT Requested Meeting on TIA	No
Scope of Work Meeting Held	Yes	Locality's Deadline for VDOT's Review	
Date Locality Received TIA		TIA Regulation Deadline for VDOT's Review	5/3/2010
Date VDOT Received TIA	3/19/2010	Date VDOT Completed Review	4/30/2010
Status	Review Complete - Revision Required		

**5. TIA Submittal and Official VDOT Response**

Attachments

Name	Type	Size	Description	Date
bluff_point_tia_body.pdf	pdf	1757433		3/22/2010
Bluff Point Planned Mixed Use Dev. Chapter 527 rezoning.pdf	pdf	1593251		5/3/2010

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## **TRAFFIC IMPACT ANALYSIS**

for

### **BLUFF POINT**

*PUD Special Exception*

Northumberland County, Virginia

*prepared for:*

**Bluff Point Holdings, LLC**

P.O. Box 1072

Urbanna, Virginia 23175

434/774-7916

*prepared by:*

**Vernon E. Torney, AICP**

President

VETTRA Company

703/590-4932

December 15, 2009

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*-- with Mitigation --*

## 1) INTRODUCTION AND SUMMARY

### a) Purpose and Objectives

The purpose of this Traffic Impact Analysis (TIA) is to examine potential traffic impact of the proposed "Bluff Point" mixed-use development project (site) on the future area road network. Objectives are to identify possible mitigation measures to offset any potential site traffic impact identified in this TIA.

### b) Executive Summary

This Traffic Impact Analysis (TIA) examined the potential traffic impact of the proposed "Bluff Point" mixed-use development project (site) project upon the future area road network. The "site", located along the east side of Bluff Point Rd. (Rt.608/669) and along the banks of Chesapeake Bay in southeastern Northumberland County, is under a PUD Special Exception application for a 898-acre mixed-use (residential, lodging, recreational, institutional, and commercial uses) project.

This TIA analyzed "worst-case" future (Year 2019 and 2025) AM, PM, & SAT (Saturday) peak hour traffic conditions at six (6) key intersections plus three (3) links along Bluff Point Road and Jarvis Point Road. Proposed "worst-case" land uses and associated traffic for the Bluff Point "site" were included within the analyses. Traffic impact was determined by comparing, via standard intersection capacity analyses, the future site-buildout (2019) "background" (without site-generated traffic) and future "total" (with site traffic) intersection conditions. Daily traffic (VPD) volumes were also provided for the roadway sections adjacent to the proposed site. All scope, methodology, and assumption parameters within this TIA are in strict adherence to those originally set by County & VDOT staff at a scoping meeting on September 29, 2008 and affirmed in a October 21, 2008 "final" scoping confirmation package. The "study area" includes Bluff Point Rd. from Rt.200 (to the north/west) to south of Navajo Rd. (to the south/east) in southeastern Northumberland County located just north of the Town of Kilmarnock.

Existing intersection analyses (utilizing the HCS analysis package) show that all analyzed *unsignalized* (stop-controlled) intersections currently operate at "very good/acceptable" (LOS=A-B) Levels Of Service during the AM, PM, & SAT peak hours. All road links currently operate at "excellent" (LOS=A) levels.

With increased background traffic volumes yet no public or private area roadway network improvements, Yr. 2019 "Background" (without site traffic) intersection capacity analyses indicate worsened AM, PM, & SAT peak hour Levels Of Service conditions (from LOS=B to C) at the *unsignalized* Rt.200/Bluff Point Rd. intersection only. All other intersections and road links remain at existing 2009 Levels Of Service.

The Bluff Point "site", located along the east side of Bluff Point Rd. (Rt.608/669) and the banks of Chesapeake Bay, is proposed to utilize three (3) "full-access" site entrances: 1) the main site entrance along the east side of Bluff Point Rd. located just south of existing Navajo Road, 2) secondary site entrances along the north and south side of Jarvis Point Rd. at a location approximately 2,300 feet east of Bluff Point Road, and 3) another secondary site entrance along the south side of Jarvis Point Rd. at a location approximately 670 feet west of Monarch Shores Lane. The proposed mixed-use project will include residential (single-family detached and attached), lodging (resort hotel), recreational (marina), institutional (nature center, chapel), and commercial (postal station, specialty retail, restaurant) uses and is anticipated for a Yr. 2019 buildout. Under a "worst-case" land use and trip generation scenario, the Bluff Point "site" may generate up to 7,204 new one-way vehicle-trips (3,602 vehicles visiting the site) per day with 487 AM peak hour, 632 PM peak hour, and 745 SAT peak hour vehicle-trips. Conservative "internal capture" trip discounts of 10 and 25 percent are assumed for residential uses and marina uses, respectively. No "pass by capture" trip discounts have been assumed.

Future Year 2019 "Total" conditions (with "buildout" site traffic) analyses reveal that the addition of "site" traffic will change LOS's to "failing/unacceptable" levels at the *unsignalized* Rt.200/Bluff Point Rd. intersection only – from LOS=C to F. All other intersections and road links maintain "acceptable" Levels Of Service. Future Year 2025 "Total" conditions reflect the same results as for Yr. 2019 conditions.

Incremental impact analysis (comparing Year 2019 “background” vs. “total” LOS), reveals that the addition of site traffic will cause some traffic impact (for all 3 peak hours) only at the *unsignalized* Rt.200/Bluff Point Rd. intersection. Significant queue lengths also impact this intersection. All other intersections and road links will remain at “background” levels or “acceptable” (LOS=D or better) Levels Of Service, thus indicating no significant impact. Since traffic impact is indicated at the above-noted intersection, the following impact “mitigation measure” is warranted and recommended. With the implementation of this measure, the impacted peak hour Level Of Service will improve to “background” or better Levels Of Service.

<u>Intersection</u>	<u>Mitigation Measures</u>	<u>Yr. 2019</u>					
		<u>Pre-Mitig. “Total” LOS</u>			<u>Post-Mitig “Total” LOS</u>		
		<u>AM</u>	<u>PM</u>	<u>SAT</u>	<u>AM</u>	<u>PM</u>	<u>SAT</u>
-- Rt.200/Bluff Point Rd.	-- Install Traffic Signal	F	F	F	D	C	D

Six (6) years later (at Year 2025) with further increased ambient background traffic volumes, all peak hour Levels Of Service and incremental impact results will essentially be the same as for Year 2019.

Based upon the assumed “scoped” parameters, the analytical evaluations and comparisons within this TIA have shown that the proposed “Bluff Point” will have minimal and manageable impact on the area network which can be mitigated with the recommended mitigation measure identified herein.

## 2) BACKGROUND INFORMATION

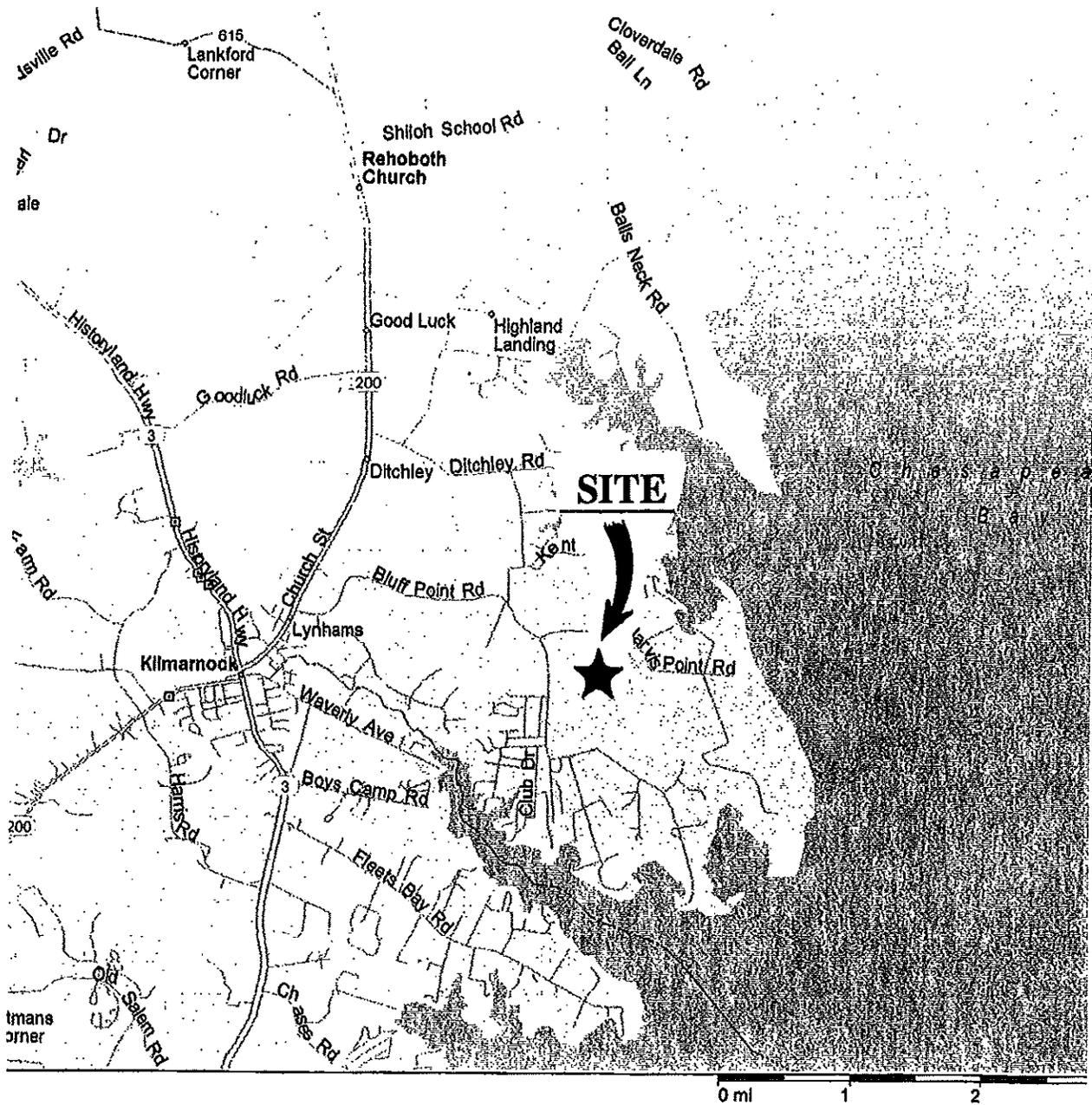
### a) “Background” (Non-Existent) Development and Transportation Improvements

In accordance with the latest Northumberland County Comprehensive Plan, VDOT Six-Year Primary and Secondary Road Plans, and as directed by VDOT and County staff, the future Year 2019 & 2025 area roadway networks were assumed to be the same as the existing network. No programmed public or private improvements are assumed along any roads within the study area. Figure 1 shows the general location of the “site” project.

### b) Proposed “Bluff Point” Site Development

#### Site Development Plan/Access

The Bluff Point “site”, located along the east side of Bluff Point Rd. (Rt.608/669) and along the banks of Chesapeake Bay, is proposed to utilize three (3) “full-access” site entrances: 1) the main site entrance along the east side of Bluff Point Rd. located just south of existing Navajo Road, 2) secondary site entrances along the north and south side of Jarvis Point Rd. at a location approximately 2,300 feet east of Bluff Point Road, and 3) another secondary site entrance along the south side of Jarvis Point Rd. at a location approximately 670 feet west of Monarch Shores Lane. Figure 1 shows the general location of the “site” within the vicinity and Figure 2 presents the “Bluff Point” general development plan.



Source: Hart Howerton, Dec. 2009

12/15/09



Site Location

FIGURE  
1



Source: Hart Howerton, Dec. 2009

12/15/09



**"Bluff Point"  
General Development Plan**

**FIGURE  
2**

### **c) Scope & Study Area**

This Traffic Impact Analysis (TIA) examined the potential traffic impact of the proposed "Bluff Point" (site) project upon the future area road network. The "site" is located along the east side of Bluff Point Rd. (Rt.608/669) and along the banks of Chesapeake Bay in southeastern Northumberland County, and is under a PUD Special Exception application for a 898-acre mixed-use (residential, lodging, recreational, institutional, and commercial uses) project -- see **Figure 1** for the general site location.

This TIA analyzed "worst-case" future (Year 2019 and 2025) AM, PM, & SAT (Saturday) peak hour traffic conditions at six (6) key intersections plus three (3) links along Bluff Point Road and Jarvis Point Road. Proposed "worst-case" land uses and associated traffic for the Bluff Point "site" were included within the analyses. Traffic impact was determined by comparing, via standard intersection capacity analyses, the future site-buildout (2019) "background" (without site-generated traffic) and "total" (with site traffic) intersection conditions.

Daily traffic (VPD) volumes are also provided for the roadway sections adjacent to the proposed site. All scope, methodology, and assumption parameters within this TIA are in strict adherence to those originally set by County & VDOT staff at a scoping meeting on September 29, 2008 and affirmed in a October 21, 2008 "final" scoping confirmation package -- see **Appendix A** for the final scoping documentation. The "study area" includes Bluff Point Rd. from Rt.200 (north/west) to south of Navajo Rd. (south/east) in southeastern Northumberland County and located just north of the Town of Kilmarnock.

### **d) Plan of Proposed Site**

**Figure 2** presents the proposed "Bluff Point" general development plan.

### **e) Plan of Nearby Uses**

**Figure 2** presents the proposed "Bluff Point" general development plan also showing the adjacent nearby parcels. Existing adjacent uses are vacant or large parcel residential uses.

#### **f) Existing Road Network and Roadways**

Figures 1 & 2 show the existing roads on the vicinity and site plans.

The immediate study area, as outlined by County & VDOT staff at the scoping meeting, includes Rt.200, Bluff Point Rd., Jarvis Point Rd., and Navajo Road. Descriptions of these roads follow:

- **Rt.200 (J. Dupont Memorial Hwy.):** Rt.200 is a two (2) lane minor arterial roadway, traversing the immediate study area in a north-south direction between Rt.360 to the north and Rt.3 (at Town of Kilmarnock) to the south. Rt.200 currently has 12-foot travel lanes with approximately one (1) to three (3) foot width gravel shoulders and good-to-excellent geometrics. Within the study area, this road has a 55 mph posted speed limit.
- **Bluff Point Road (Rt.608/669):** Bluff Point Road is a two (2) lane collector facility traversing in a predominant east-west direction between Rt.200 to the west and dead-ends to the south/east past the "site". Bluff Point Road, within the immediate study area, currently has 10-foot travel lanes with none or very little width gravel shoulders and fair-to-good geometrics. Within the study area, this road has an unposted speed limit.
- **Jarvis Point Rd. (Rt.608):** Jarvis Point Road is also a two (2) lane collector facility traversing in an east-west direction between Bluff Point Rd. (Rt.608/669) to the west and dead ends to the east. Jarvis Point Road, within the immediate study area, currently has 9-foot travel lanes with none or very little width gravel shoulders and fair-to-good geometrics. Within the study area, this road has an unposted speed limit.
- **Navajo Road (Rt.1105):** Navajo Road is a two (2) lane residential local road traversing in an east-west direction located to the west of Bluff Point Rd. serving a residential subdivision. Navajo Road, within the immediate study area, currently has approximately 18-foot pavement width with minimal width gravel shoulders and fair-to-good geometrics.

#### **g) Programmed Improvements**

No programmed public or private improvements are planned, programmed or assumed along Bluff Point Rd. or any other roads within the study area.

### 3) ANALYSIS OF EXISTING CONDITIONS

#### a) Existing 2009 Intersection Traffic Volumes

Existing AM, PM, & SAT peak period "intersection turn movement" counts were conducted by VETTRA Company on Thursday, October 23<sup>rd</sup> and Saturday, October 25<sup>th</sup>, 2008 for all existing intersections and road links in the study area plus the Rt.3/Rt.200 intersection within the Town of Kilmarnock -- see **Appendix B** for the AM/PM/SAT "intersection turn movement" count printouts. Along the Rt.200 and Bluff Point Rd. corridors the weekday AM peak hour was measured occurring 8:00-9:00am. Along the Rt.200 corridor the weekday PM peak hour was measured occurring 4:30-5:30pm, but the Bluff Point Rd. corridor PM peak hour occurred 4:00-5:00pm. The SAT (Saturday) peak hour was measured 11:30am-12:30pm along the Rt.200 corridor, but at 10:00-11:00am along the Bluff point Rd. corridor. **Figure 3** presents the Existing 2009 AM/PM/SAT Peak Hour Turn Movement Volumes, factored up 2 percent to 2009 levels from the 2008 counts. The latest (2008) VDOT traffic counts along Bluff Point Rd. within the study area range 480-1,900 vehicles per day (vpd) -- 480 vpd just south of the proposed "site" main entrance and 1,900 vpd near Rt.200. See **Appendix B** for the 2008 VDOT ADT printouts.

#### b) Existing 2009 Intersection & Link Capacity Analysis

Based on the above intersection volumes, existing intersection geometric conditions and observed operations, the existing three (3) intersections and three (3) road links along Bluff Point Rd. were analyzed via the HCS v.5.21 capacity analysis package. **Table 1** and **Figure 4** present the results of the capacity analyses, showing the computed Levels Of Service (LOS) and overall Intersection Delay for the AM, PM, & SAT peak hours, respectively. **Appendix C** provides general LOS information and criteria while **Appendix D** includes the HCS summary printouts for these *unsignalized* (stop-controlled) intersections and road links.

Existing intersection analyses (utilizing the HCS analysis package) show that all analyzed *unsignalized* (stop-controlled) intersections currently operate at "very good/acceptable" (LOS=A-B) Levels Of Service during the AM, PM, & SAT peak hours. All road links currently operate at "excellent" (LOS=A) levels.

#### c) Crash Data

According to VDOT/DMV crash data statistics for the latest available 16-month period, the following crash data were compiled for the three (3) road links analyzed within this TIA:

<u>Road Links (n/y to s/e)</u>	<u>Date</u>	<u>Time</u>	<u>Type</u>	<u>Severity</u>	<u>Pavement</u>
A) Bluff Point Rd. (w. of Kent Pt.)	--	none on record	--		
B) Bluff Point Rd. (s. of Jarvis Pt.)	--	none on record	--		
C) Jarvis Point Rd. (e. of Bluff Pt.)	12/12/08	9:00pm	Run off, hit tree, partial ejection	1 Fatality	Dry

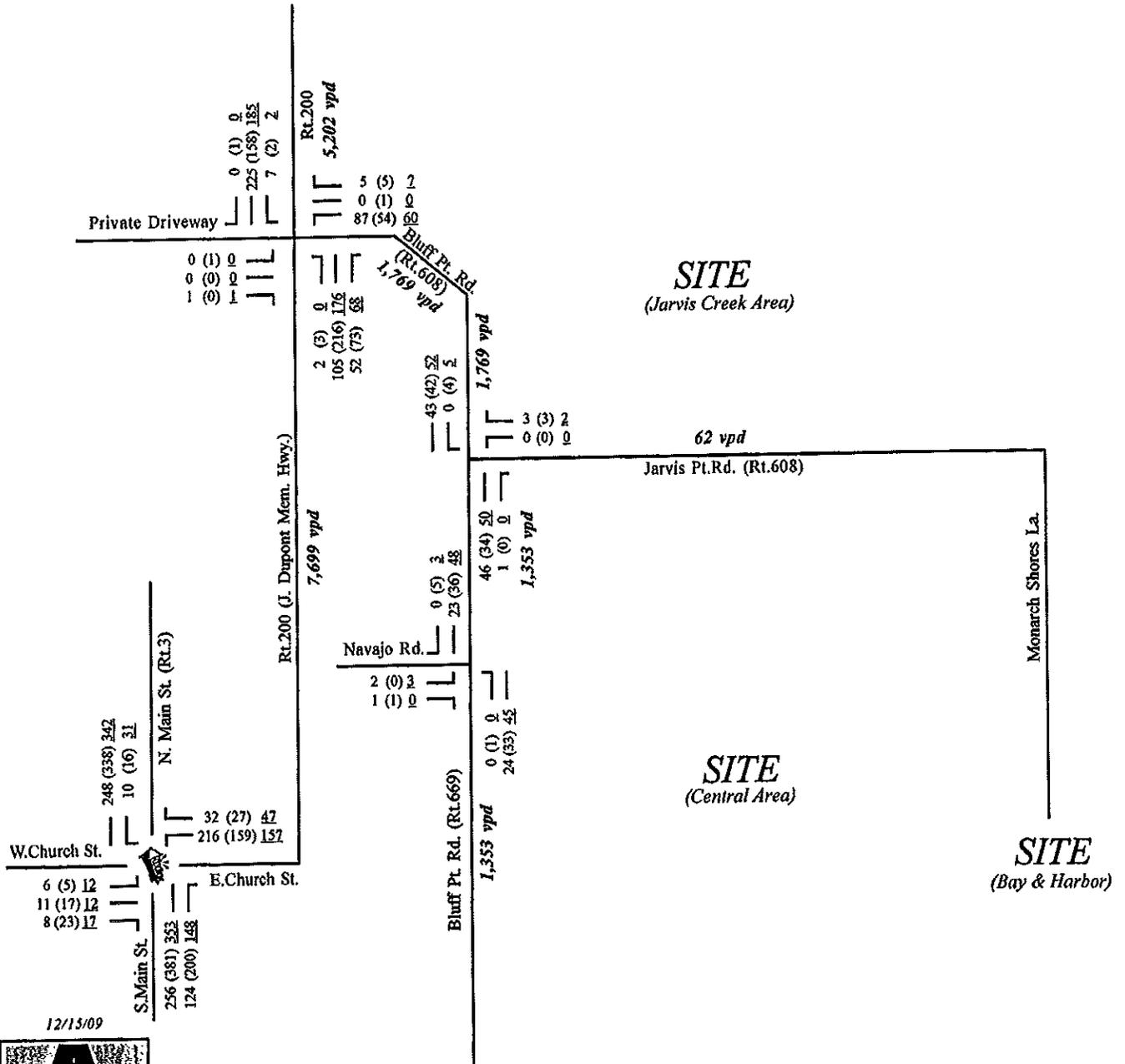
**d-f) Mode, Speed, Sight – N/A, not requested/scoped**

**LEGEND**

123 (123) 123 = AM (PM) SAT Pk. Hr. Traffic Volumes

1,234 vpd = Daily Traffic Volume (veh. per day)

 = Traffic Signal



**Existing 2009 Roadway Network and Daily & AM/PM/SAT Peak Hour Traffic Volumes**

**FIGURE 3**

**TABLE 1**  
**Existing 2009 Intersection & Link Level Of Service Summary**

<u>Intersections (n/w to s/e)</u>	AM PEAK HOUR			PM PEAK HOUR			SAT PK. HR.		
	<u>Inters.</u>	<u>Lane Group</u>		<u>Inters.</u>	<u>Lane Group</u>		<u>Inters.</u>	<u>Lane Group</u>	
	<u>LOS</u>	<u>Apch.</u>	<u>LOS/Dly.</u>	<u>LOS</u>	<u>Apch.</u>	<u>LOS/Dly.</u>	<u>LOS</u>	<u>Apch.</u>	<u>LOS/Dly.</u>
<u>Unsignalized</u>									
1) Rt.200/Bluff Point Rd.	B/14.9	NBLTR	A/7.9	B/13.6	NBLTR	A/7.6	B/13.1	NBLTR	A/7.7
		SBLTR	A/7.7		SBLTR	A/8.0		SBLTR	A/7.8
		WBLTR	B/14.9		WBLTR	B/13.6		WBLTR	B/13.3
		EBLTR	A/9.8		EBLTR	B/12.5		EBLTR	A/9.4
2) Bluff Point/Jarvis Point Rd.	A/8.8	SBLT	A/7.4	A/8.6	SBLT	A/7.3	A/8.6	SBLT	A/7.4
		WBLR	A/8.8		WBLR	A/8.6		WBLR	A/8.6
3) Bluff Point Rd./Navajo Rd.	A/8.9	NBLT	A/7.3	A/8.6	NBLT	A/7.4	A/9.2	NBLT	A/7.4
		EBLR	A/8.9		EBLR	A/8.6		EBLR	A/9.2
<u>Road Links (n/w to s/e)</u>									
	<u>LOS</u>	<u>V/C Ratio</u>		<u>LOS</u>	<u>V/C Ratio</u>		<u>LOS</u>	<u>V/C Ratio</u>	
A) Bluff Point Rd. N.(w.of Kent Pt.)	A	0.05		A	0.05		A	0.05	
B) Bluff Point Rd. S.(s.of Jarvis Pt.)	A	0.04		A	0.03		A	0.04	
C) Jarvis Point Rd. (e.of Bluff Pt.)	A	0.00		A	0.00		A	0.00	

Legend:

LOS = Level Of Service & Avg. Vehicular Delay (seconds) - for "Critical/Worst Lane Group" -- See Appendix C

LOS/Dly. = Level Of Service & Avg. Vehicular Delay (seconds) - for "Lane Group"

Apch. = Approach

WBLTR = WestBound Left, Thru, Right (lane group designations)

**LEGEND**

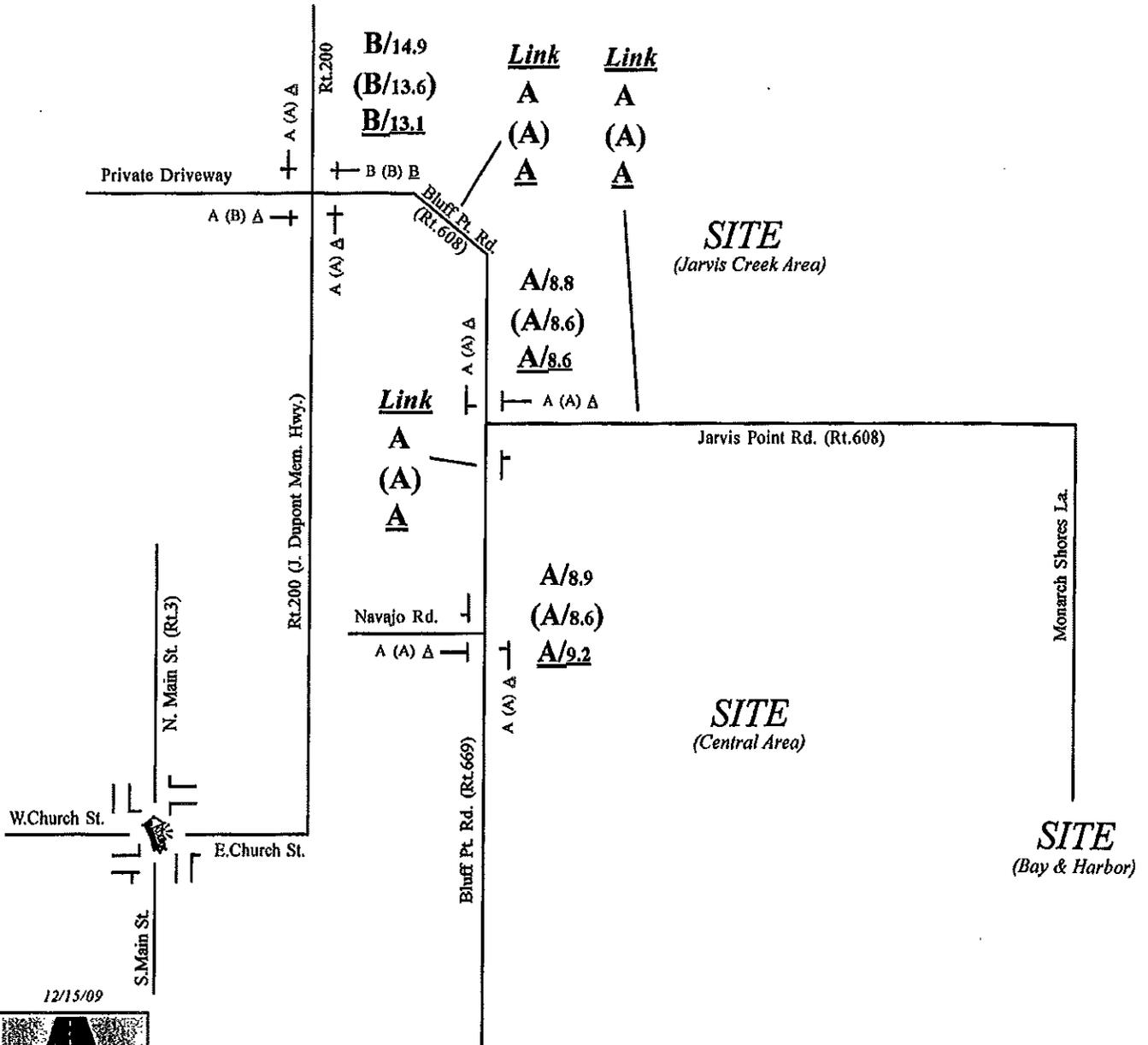


= Traffic Signal

**A/1.2** = AM Pk.Hr. LOS/Delay (sec.)

**(A/1.2)** = PM Pk.Hr. LOS/Delay (sec.)

**A/1.2** = SAT Pk.Hr. LOS/Delay (sec.)



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**Existing 2009 AM/PM/SAT Peak Hour  
Intersection/Link Geometry & Levels Of Service**

**FIGURE  
4**

#### 4) FUTURE "BACKGROUND" TRAFFIC CONDITIONS (without development)

##### a) Methodology and Assumptions

The AM, PM, & SAT peak hour analyses and evaluations of all *signalized* and *unsignalized* intersections are in accordance with 2000 Highway Capacity Manual (HCM) methodology (acceptable @ LOS "D") utilizing the HCS (version 5.21) software package. All weekday trip generation rates are based on the ITE Trip Generation Manual (7th Edition) -- 2003. Future trip distributions are based on prior TIA's, existing traffic patterns/distributions derived from existing traffic counts, and/or gravity-based computer modeling -- also utilized for determining any distributional adjustments (diversions) due to changes in the roadway network or market conditions. All trip distributions utilized within this TIA have been pre-approved by County and VDOT staff. Since no programmed private or public improvements are assumed to be completed by Year 2019 or 2025, future "grown" traffic volumes have not been diverted in accordance with any new road network.

The following general assumptions, agreed by County & VDOT staff at the pre-analysis scoping meeting, and amended per recent changes in the site GDP, are incorporated within this study (see **Appendix A** for original scoping information):

- Non-phased TIA – per Chapter 527 Regs
- Non-phased commercial development (for TIA) – PUD Special Exception (2019 Buildout)
- Assume no functional interparcel connections with site
- One (1) "site" access scenario to be analyzed:
  - One (1) "full access" (@ proposed "T" unsignalized int. on Rt.669 so. of Navajo Rd.)
  - One (1) "full access" (@ proposed 4-way unsignalized intersection on Rt.608-W.)
  - One (1) "full access" (@ proposed "T" unsignalized intersection on Rt.608-E.)
- One (1) "site" trip generation scenario:
  - Res.: 395 du SF detached (cottages/lots)
  - Res.: 128 du Condo Townhomes
  - Resort Hotel: 90 rooms
  - Marina: 228 berths (98 in water + 130 dry storage)
  - Nature Center: 1,500 gsf
  - Chapel/Church: 2,000 gsf (80 seats)
  - Postal station: 1,000 gsf
  - Spec. Retail shops: 27,500 gsf
  - Quality Restaurant: 6,000 gsf
- No 24-hour "link" counts required – document latest (2008) VDOT ADT counts
- Classified 2008 weekday AM(6-9), PM(4-7) & SAT(10a-2p) in-field traffic counts required at ints.:
  - Rt.608 (Bluff Point Rd.) @ Rt.200
  - Rt.608/669 (Bluff Point Rd.) @ Rt.608 (Jarvis Point Rd.)
  - Rt.669 (Bluff Point Rd.) @ Navajo Rd. (Rt.1105)
  - Rt.3 (Main St.) @ Rt.200 (E. Church St.) – *for intersection volume purposes only*
- No volume balancing required
- Existing 2009 AM/PM/SAT peak hour HCS LOS analyses required for following intersections:
  - #1) Rt.608 (Bluff Point Rd.) @ Rt.200 -- *unsignalized*
  - #2) Rt.608/669 (Bluff Point Rd.) @ Rt.608 (Jarvis Point Rd.) – *unsignalized "T"*
  - #3) Rt.669 (Bluff Point Rd.) @ Navajo Rd. (Rt.1105) – *unsignalized "T"*
- Existing 2009 AM/PM/SAT peak hour HCS LOS analyses required for following links:
  - A) Rt.608 (Bluff Point Rd.) – at a location just west of Kent Point Rd.
  - B) Rt.669 (Bluff Point Rd.) – at a location between Jarvis Point Rd. & Navajo Rd.
  - C) Rt.608 (Jarvis Point Rd.) – at a location just east of Bluff Point Rd.
- No (0) "other" area developments to be included in 2019/2025 "background" traffic conditions

- No (0) public transportation network improvement project assumed by design years (2019/2025)
- No (0) private transp. improvements by design years (2019/2025)
- Use 2.0% annual growth rate for all roads (compounded to "background" design years)
- Yr. 2019 "Background" AM/PM/SAT pk.hr. HCS LOS analyses required for intersections:
  - #1) Rt.608 (Bluff Point Rd.) @ Rt.200 -- *unsignalized*
  - #2) Rt.608/669 (Bluff Point Rd.) @ Rt.608 (Jarvis Point Rd.) -- *unsignalized "T"*
  - #3) Rt.669 (Bluff Point Rd.) @ Navajo Rd. (Rt.1105) -- *unsignalized "T"*
- Yr. 2019 "Background" AM/PM/SAT peak hour HCS LOS analyses required for following links:
  - A) Rt.608 (Bluff Point Rd.) -- at a location just west of Kent Point Rd.
  - B) Rt.669 (Bluff Point Rd.) -- at a location between Jarvis Point Rd. & Navajo Rd.
  - C) Rt.608 (Jarvis Point Rd.) -- at a location just east of Bluff Point Rd.
- Utilize 7th Ed. ITE avg. "adj.street" Daily, AM, PM, SAT peak hour trip rates:
  - Res.: 395 du SF detached (cottages/lots) – ITE #210
  - Res.: 128 du Condo Townhomes – ITE #230
  - Resort Hotel: 90 rooms – ITE #330
  - Marina: 228 berths (98 in water + 130 dry storage) – ITE #420 – *use 228 berths*
  - Nature Center: 1,500 gsf -- use ITE #520 (Elem.School) – *use AM rate also for SAT*
  - Chapel/Church: 2,000 gsf (80 seats) – ITE #560 -- *use gsf variable*
  - Postal station: 1,000 gsf – ITE #732
  - Spec. Retail shops: 27,500 gsf – ITE #814
  - Quality Restaurant: 6,000 gsf – ITE #931
  - use 15% internal capture trip discount for Res. uses only
  - use 25% internal capture trip discount for Marina use only
  - use 0% pass-by capture discount for all uses
- Utilize "site" AM/PM/SAT trip distributions per site use/location and existing traffic info/counts
  - *distributions to staff for approval prior to analyses*
- Yr. 2019 & 2025 "Total" (w/site traffic) AM/PM/SAT pk.hr. HCS LOS analyses required for following intersections:
  - #1) Rt.608 (Bluff Point Rd.) @ Rt.200 (E. Church St.) -- *unsignalized*
  - #2) Rt.608/669 (Bluff Point Rd.) @ Rt.608 (Jarvis Point Rd.) -- *unsignalized "T"*
  - #3) Rt.669 (Bluff Point Rd.) @ Navajo Rd. (Rt.1105) -- *unsignalized "T"*
  - #4) Rt.669 (Bluff Point Rd.) @ proposed main site ent. (Rt.1105) -- *unsignalized "T"*
  - #5) Rt.608 (Jarvis Point Rd.) @ proposed Site Entrances W. -- *unsignalized*
  - #6) Rt.608 (Jarvis Point Rd.) @ proposed "T" Site Entrance E. -- *unsignalized*
- Yr. 2019 & 2025 AM/PM/SAT peak hour HCS LOS analyses required for following links:
  - A) Rt.608 (Bluff Point Rd.) -- at a location just west of Kent Point Rd.
  - B) Rt.669 (Bluff Point Rd.) -- at a location between Jarvis Point Rd. & Navajo Rd.
  - C) Rt.608 (Jarvis Point Rd.) -- at a location just east of Bluff Point Rd.
- Mitigation Investigation/Solving for all intersections identified (mainline "coordinated operations")
- Utilize HCS+ v.5.21 software modeling package w/defaults (in-field phf's & arrival type 3)
  - use field-collected "heavy vehicle factors" (%)
- Future weekday VPD's on adjacent roadways provided per VDOT ADT's or 0.10 PM "K" factor
- Maintain minimum LOS=D as "acceptable" for overall intersection & lane groups
- Provide 95% Queuing analyses for Rt.200/Rt.608 intersection only (all movements)
- Provide Accident Data (last 12 months for following intersection and three (3) links:
  - #1) Rt.608 (Bluff Point Rd.) @ Rt.200 (E. Church St.)
    - A) Rt.608 (Bluff Point Rd.) -- between Clifton Landing Rd. and Kent Point Rd.
    - B) Rt.669 (Bluff Point Rd.) -- between Jarvis Point Rd. & Navajo Rd.
    - C) Rt.608 (Jarvis Point Rd.) -- between Bluff Point Rd. and Landon Hall La.
- Provide narrative of Bike/Ped opportunities and accommodations with site development
- No other capacity/operations analyses required
- Provide three (3) TIA's to County w/two (2) computer disks incl. executive summary & e-files

### **Traffic Growth Trends/"Grown" Traffic Volumes**

In order to project future traffic volumes, the existing volumes must first be "grown" (or factored) to the future year. This is performed prior to adding (to the network) the traffic associated with any "other" nearby planned developments. As calculated from VDOT historic counts and concurred with County & VDOT staff, a two (2) percent per annum increase was utilized for all ambient background traffic. **Figure 5a** shows the "grown" Yr. 2019 AM/PM/SAT traffic volumes and **Figure 5b** shows the "grown" Yr. 2025 AM/PM/SAT traffic volumes.

### **"Other" Area Planned Developments**

No (0) "other" planned/approved development projects within the immediate vicinity were identified by staff. The purpose of identifying and analyzing "other" developments is to add the traffic associated with each of these development projects to the future "grown" traffic volumes. The addition of the "grown" and "other" traffic to the road network typically comprises the future "background" traffic.

### **Future "Background" Traffic Volumes**

The summation of the Yr. 2019 "grown" plus "other" development traffic typically comprises the future AM/PM/SAT "background" traffic volumes. However, since there is no "other" development traffic, the Yr. 2019 & 2025 "grown" traffic volumes (shown on **Figures 5a & 5b**, respectively) are also the "background" traffic volumes. Two-way, daily traffic projections for the adjacent roadways are also provided.

### **b) Future "Background" Intersection & Link Capacity Analysis**

The derived "background" traffic volumes, with assumed geometrics, were subjected to the HCS *unsignalized* intersection and two-lane link capacity analyses. **Table 2** and **Figure 6** present the results of the Year 2019 "Background" capacity analyses, showing the computed Levels Of Service (LOS) and vehicular delays at the three (3) "background" intersections and road links for AM/PM/SAT peak hours, respectively. **Appendix E** includes the HCS printouts for all peak hours at the "background" intersections and road links. All HCS analyses in this TIA utilize default variables where appropriate.

With increased background traffic volumes yet no public or private area roadway network improvements, Yr. 2019 "Background" (without site traffic) intersection capacity analyses indicate worsened AM, PM, & SAT peak hour Levels Of Service conditions (from LOS=B to C) at the *unsignalized* Rt.200/Bluff Point Rd. intersection only. All other intersections and road links remain at existing 2009 Levels of Service.

### **c) Mode – N/A, not requested/scoped**

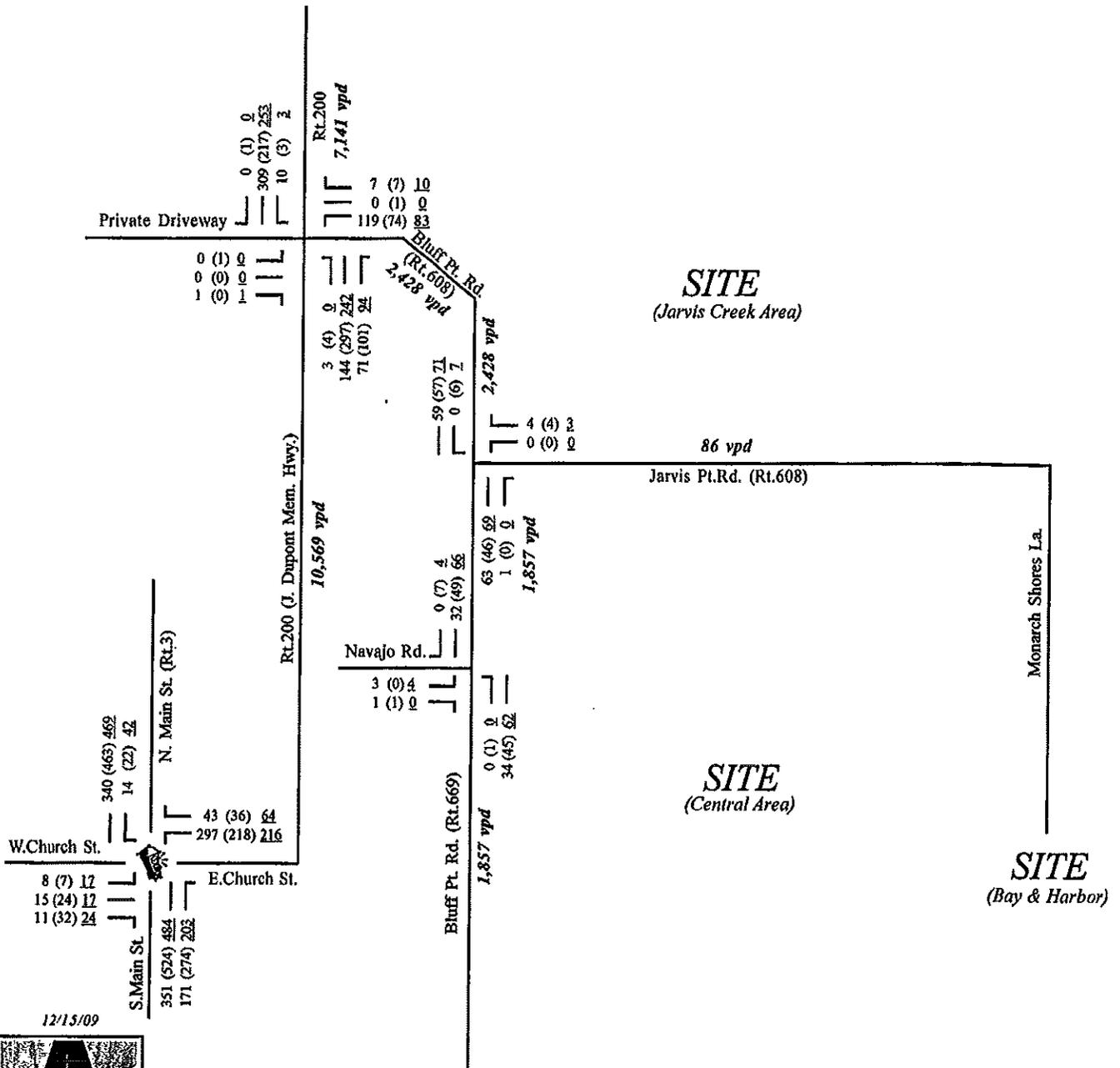


**LEGEND**

123 (123) 123 = AM (PM) SAT Pk. Hr. Traffic Volumes

1,234 vpd = Daily Traffic Volume (veh. per day)

 = Traffic Signal



12/15/09



**Yr. 2025 "Grown/Background" Daily & AM/PM/SAT Peak Hour Traffic Volumes**

**FIGURE 5b**

**TABLE 2**  
**Year 2019 "Background" Intersection & Link Level Of Service Summary**

<u>Intersections (n/w to s/e)</u> (Avail.)	AM PEAK HOUR			PM PEAK HOUR			SAT PK. HR.		
	<u>Inters.</u>	<u>Lane Group</u>		<u>Inters.</u>	<u>Lane Group</u>		<u>Inters.</u>	<u>Lane Group</u>	
	<u>LOS</u>	<u>Apch.</u>	<u>LOS/Dly.</u>	<u>LOS</u>	<u>Apch.</u>	<u>LOS/Dly.</u>	<u>LOS</u>	<u>Apch.</u>	<u>LOS/Dly. (High')</u>
<b><u>Unsignalized</u></b>									
1) Rt.200/Bluff Point Rd. (inf.)	C/18.9	NBLTR	A/8.0	C/15.9	NBLTR	A/7.7	C/15.5	NBLTR	A/7.8 (25') <sup>a</sup>
(inf.)		SBLTR	A/7.8		SBLTR	A/8.2		SBLTR	A/8.0 (25') <sup>a</sup>
(inf.)		WBLTR	C/18.9		WBLTR	C/15.9		WBLTR	C/15.5 (48') <sup>a</sup>
(inf.)		EBLTR	B/10.2		EBLTR	B/13.9		EBLTR	A/9.7 (25') <sup>p</sup>
2) Bluff Point/Jarvis Point Rd.	A/8.9	SBLT	A/7.4	A/8.6	SBLT	A/7.3	A/8.7	SBLT	A/7.4
		WBLR	A/8.9		WBLR	A/8.6		WBLR	A/8.7
3) Bluff Point Rd./Navajo Rd.	A/9.0	NBLT	A/7.4	A/8.7	NBLT	A/7.4	A/9.4	NBLT	A/7.5
		EBLR	A/9.0		EBLR	A/8.7		EBLR	A/9.4
<b><u>Road Links (n/w to s/e)</u></b>									
	<u>LOS</u>	<u>V/C Ratio</u>		<u>LOS</u>	<u>V/C Ratio</u>		<u>LOS</u>	<u>V/C Ratio</u>	
A) Bluff Point Rd. N.(w.of Kent Pt.)	A	0.07		A	0.06		A	0.06	
B) Bluff Point Rd. S.(s.of Jarvis Pt.)	A	0.05		A	0.04		A	0.05	
C) Jarvis Point Rd. (e.of Bluff Pt.)	A	0.00		A	0.00		A	0.00	

**Legend:**

- LOS = Level Of Service & Avg. Vehicular Delay (seconds) - for "Critical/Worst Lane Group" -- See Appendix C
- LOS/Dly.= Level Of Service & Avg. Vehicular Delay (seconds) - for "Lane Group"
- Apch. = Approach
- WBLTR = WestBound Left, Thru, Right (lane group designations)
- Avail. = Available lane stacking space (ft.) -- *inf.* = infinite
- High' = Highest 95% Back-Of-Queue length (ft.) -- a/p/s identifies highest peak hour (25 ft. headways)

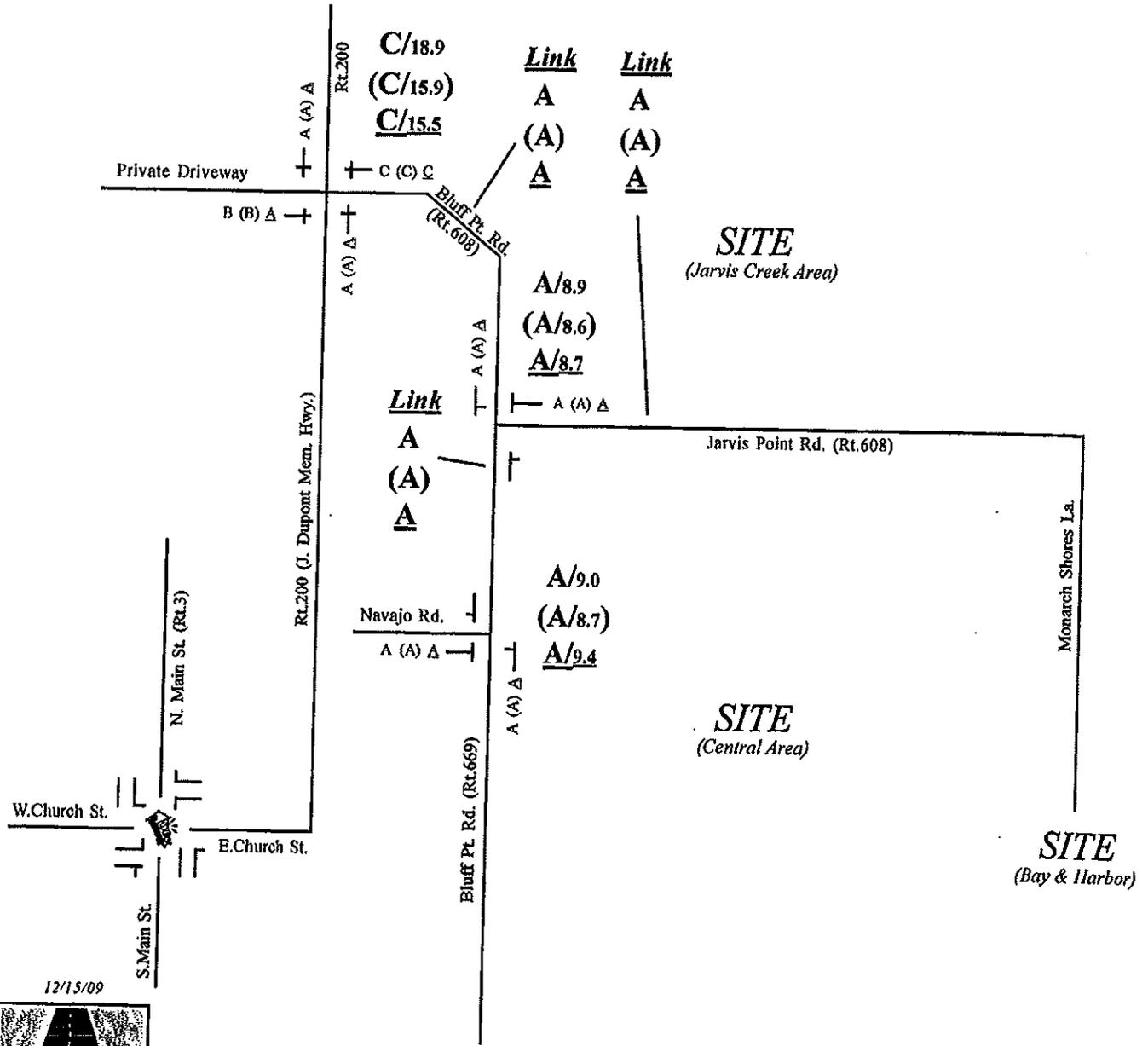
**LEGEND**

 = Traffic Signal

A/1.2 = AM Pk.Hr. LOS/Delay (sec.)

(A/1.2) = PM Pk.Hr. LOS/Delay (sec.)

A/1.2 = SAT Pk.Hr. LOS/Delay (sec.)



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**Yr. 2019 "Background" AM/PM/SAT  
Peak Hour Intersection/Link Geometry & LOS**

**FIGURE  
6**

## **5) PROPOSED SITE TRIP GENERATION**

### **a) Site Trip Generation**

The “Bluff Point” project is expected to be built out by Year 2019. Table 3 provides an itemization of the site's proposed “worst-case” land use and development densities.

Table 3 also presents the calculated Year 2019 Daily and Peak Hour (AM/PM/SAT) trip generations for the proposed “Bluff Point” development. These calculations are based on the ITE Trip Generation Manual – 7th Edition (2003) average trip rates.

Under a “worst-case” land use and trip generation scenario, the Bluff Point “site” may generate up to 7,204 new one-way vehicle-trips (3,602 vehicles visiting the site) per day with 487 AM peak hour, 632 PM peak hour, and 745 SAT peak hour vehicle-trips.

### **b) Trip Discounts and Reductions**

Conservative “internal capture” trip discounts of 10 and 25 percent are assumed for residential uses and marina uses. Respectively. No “pass by capture” trip discounts have been assumed.

### **c) Bicycle and Pedestrian Opportunities and Accommodations**

In order to promote a convenient and accessible community, Bluff Point will have a comprehensive network of pedestrian and bicycle paths that connect neighborhoods to each other and to the Harbor Village. Bluff Point will promote walking and bicycling as part of an active lifestyle. Furthermore, the commercial and retail uses in the Village are intended to conveniently meet the everyday needs of residents. Bluff Point also supports the development of a regional bicycle network on public roadways and other public property. Within Bluff Point, the following features/facilities will be offered:

1. Pedestrian walking trails connecting each neighborhood and the Harbor Village. Trails will be constructed of natural materials and site to avoid sensitive areas. Motorized vehicles such as dirt bikes and ATV's will not be permitted,
2. Interpretive signs and stations at key points along the trail network that describe natural features, the history of the land and other information,.
3. Crosswalks and/or signs where trails cross roadways,
4. Dedicated bike lanes and/or signs indicated shared bicycle use of roadways,
5. Bike racks at the Harbor Village, the Inn, the Bay Club and the Jarvis Creek Community Center.

## **6) PROPOSED SITE TRIP DISTRIBUTION AND ASSIGNMENT**

### **a) Site Trip Distribution**

Year 2019/2025 site-generated trips were assigned to the road network based on pre-scope approved distributions from the existing intersection turn movement counts and/or gravity-based computer modeling. Generalized “site” trip distributions for the uses are shown on **Figure 7**.

**TABLE 3**

**"SITE" DEVELOPMENT DENSITIES & TRIP GENERATION**

**BLUFF POINT**

FINAL VERSION

**PROPOSED DENSITIES AND TRIP RATES**

Land Uses & Densities	Quantity	Unit	ITE Avg. "Adj. &L" Trip Rates (7th Edition - 2003)				
			ITE (Code)	AM Pk.Hr.	PM Pk.Hr.	SAT Pk.Hr.	Weekday VPD
<b>BLUFF POINT - (Yr. 2018 Buildout)</b>							
<b>Residential (Jandy Creek Area - no. of R1608)</b>							
174 du Single family, detached Residential (cottages/lots)	174	du	(210)	0.75	1.01	0.94 *	10.00 **
<b>Residential (Central Area - no. of R1608)</b>							
82 du Single family, detached Residential (cottages/lots)	82	du	(210)	0.75	1.01	0.94 *	10.00 **
<b>Residential (Bay &amp; Harbor Area - Monarch Shores Dr.)</b>							
139 du Single family, detached Residential (cottages/lots)	139	du	(210)	0.75	1.01	0.94 *	10.00 **
128 du Single family, attached Res. (Townhome) condot	128	"	(230)	0.44	0.52	0.47 *	5.88
<b>Total Res. =</b>	<b>287</b>	<b>du</b>					
<b>Lodging</b>							
90 room Resort Hotel (w/private child care, golf, rec.ctr.)	90	occ.room	(930)	0.37	0.49	1.23 *	6.24 ***
<b>Recreational</b>							
228 berth Marina	228	berth	(620)	0.03	0.19	0.27 *	2.96
<b>Institutional</b>							
1,500 gsf Nature Center (use Elem. School)	1.50	Kgsf	(520)	4.89	3.13 *	4.89 **	14.49
2,000 gsf Chapel/Church	2.00	"	(560)	0.72	0.68	3.54 *	8.11
<b>Commercial</b>							
1,000 gsf Postal Station	1.00	Kgsf	(732)	8.02	10.69	5.83 *	108.18
27,500 gsf Specialty Retail Shops	27.50	"	(814)	3.69 +	2.71	4.18 ***	44.32
6,000 gsf Quality Restaurant	6.00	"	(931)	0.81	7.49	10.82 *	89.95

- Notes:**  
 du = Dwelling unit (home)  
 Kgsf = Thousand gross square feet  
 \* = "Peak Hour of Generator" trip rate  
 \*\* = Standard VDOT daily trip rate  
 \*\*\* = calculated per PM pk.hr. ratio of Resort Hotel vs. Hotel - (Resort Hotel daily rate not available)  
 + = calculated per ratio of PM "Adj. St. vs. Pk. Hr. Gen." rates - (AM "Adj. &L" rate not available)  
 \*\* = use AM Pk.Hr. rate for #520 Elem. School  
 \*\*\* = calculated per BAT ratio of Gen. Retail (#820) pk.hr. vs. daily SAT rates - (SAT pk.hr. rate not available)

**GENERATED TRIPS**

Land Uses & Densities	AM Pk.Hr.			PM Pk.Hr.			SAT Pk.Hr.			Weekday VPD
	In	Out	Total	In	Out	Total	In	Out	Total	
<b>BLUFF POINT - (Yr. 2018 Buildout)</b>										
<b>Residential (Jandy Creek Area - no. of R1608)</b>										
174 du Single family, detached Residential (cottages/lots)	33	98	131	111	65	176	88	78	164	1,740
<b>Residential (Central Area - no. of R1608)</b>										
82 du Single family, detached Residential (cottages/lots)	18	46	62	82	31	83	42	38	77	820
<b>Residential (Bay &amp; Harbor Area - Monarch Shores Dr.)</b>										
139 du Single family, detached Residential (cottages/lots)	26	78	104	89	52	140	71	60	131	1,390
128 du Single family, attached Res. (Townhome) condot	10	47	58	45	22	67	32	28	60	750
<b>Sub Total Res. =</b>	<b>36</b>	<b>128</b>	<b>161</b>	<b>133</b>	<b>74</b>	<b>207</b>	<b>103</b>	<b>86</b>	<b>181</b>	<b>2,140</b>
<b>Total Res. =</b>	<b>84</b>	<b>269</b>	<b>353</b>	<b>296</b>	<b>170</b>	<b>466</b>	<b>233</b>	<b>198</b>	<b>431</b>	<b>4,700</b>
<b>Lodging</b>										
90 room Resort Hotel (w/private child care, golf, rec.ctr.)	24	9	33	19	25	44	55	55	111	682
<b>Recreational</b>										
228 berth Marina	6	12	18	20	17	43	27	34	62	678
<b>Institutional</b>										
1,500 gsf Nature Center (use Elem. School)	4	3	7	2	3	5	4	4	7	22
2,000 gsf Chapel/Church	1	1	1	1	1	1	5	2	7	18
<b>Total Inst. =</b>	<b>5</b>	<b>4</b>	<b>8</b>	<b>3</b>	<b>3</b>	<b>6</b>	<b>9</b>	<b>6</b>	<b>14</b>	<b>40</b>
<b>Commercial</b>										
1,000 gsf Postal Station	4	4	8	6	5	11	3	3	6	108
27,500 gsf Specialty Retail Shops	49	53	102	33	42	75	57	57	115	1,219
6,000 gsf Quality Restaurant	2	2	6	30	15	45	38	22	60	550
<b>Total Comm. =</b>	<b>55</b>	<b>59</b>	<b>114</b>	<b>69</b>	<b>62</b>	<b>130</b>	<b>98</b>	<b>82</b>	<b>186</b>	<b>1,867</b>
<b>Total Site Trips =</b>	<b>174</b>	<b>383</b>	<b>527</b>	<b>412</b>	<b>277</b>	<b>689</b>	<b>423</b>	<b>381</b>	<b>604</b>	<b>7,843</b>
Internal capture discount - 10% residential trips:	-8	-27	-35	-30	-17	-47	-23	-20	-43	-470
Internal capture discount - 25% marina trips:	-2	-3	-5	-6	-4	-11	-7	-9	-16	-169
<b>Net Total Site Trips (usa) =</b>	<b>164</b>	<b>324</b>	<b>487</b>	<b>376</b>	<b>256</b>	<b>632</b>	<b>393</b>	<b>352</b>	<b>745</b>	<b>7,204</b>

Note: All computations are automatically rounded.

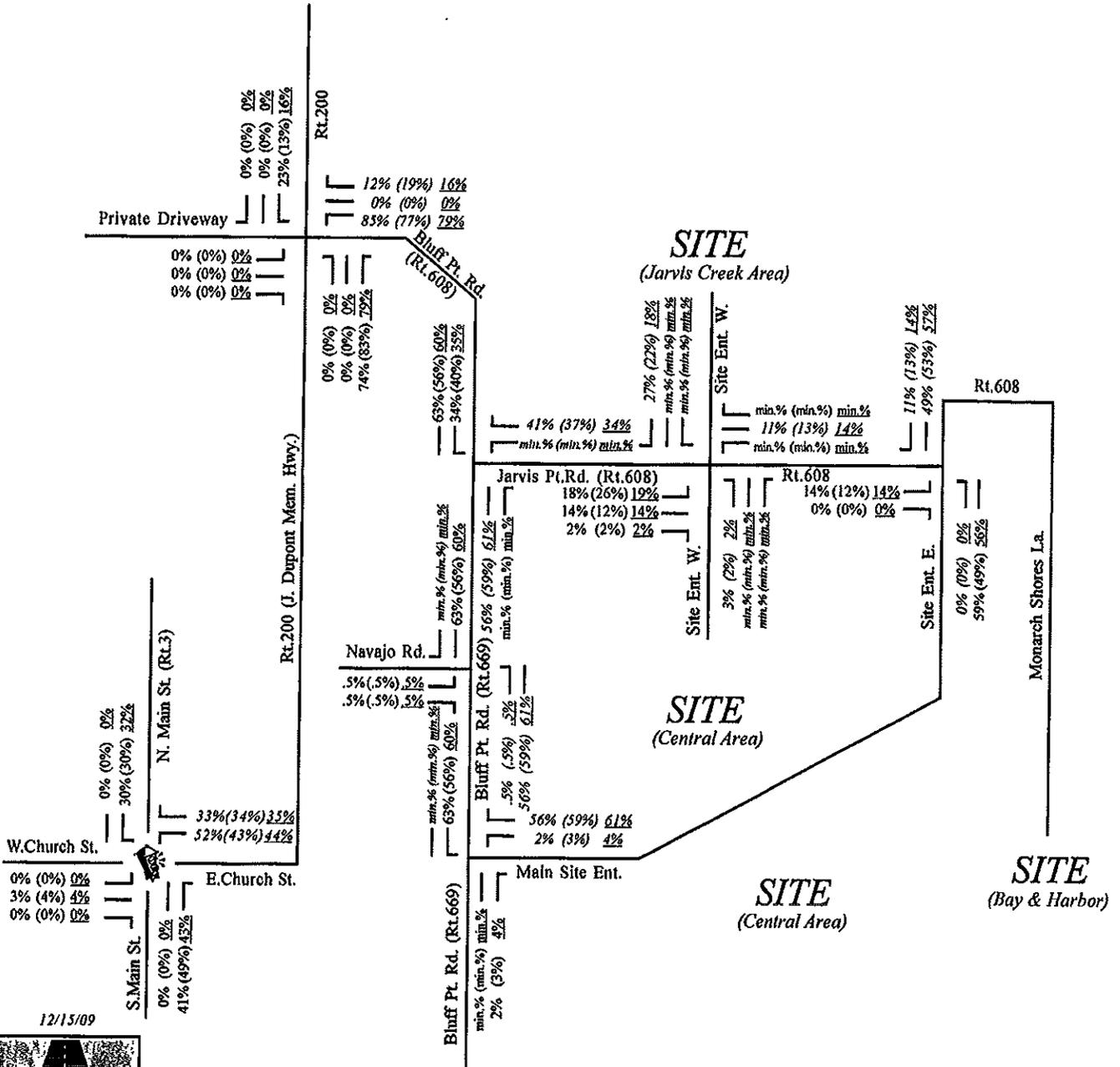
**LEGEND**

12% (12%) 12% = AM (PM) SAT Pk. Hr. Trip Distributions

-- "outbound" shown in *italics* --



= Traffic Signal



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**Yr. 2019/2025 Generalized "Site" AM/PM/SAT Peak Hour Trip Distributions**

**FIGURE**

**7**

### **b) Site Trip Assignment**

Assuming no public or private improvements or changes to the future road network, future trips (including site trips) are distributed in accordance with the same (as “background”) road network.

Based on the abovementioned site trip generation and distributions, “site” traffic volumes are assigned to the roadway network. **Figure 8** shows the Year 2019/2025 “site-related” AM/PM/SAT Peak Hour Intersection Movement Volumes.

## **7) FUTURE "TOTAL" TRAFFIC CONDITIONS (with site development)**

### **a) Future "Total" Traffic Volumes**

By totaling the future Yr. 2019 "background" (**Figure 5a**) and “site” (**Figure 8**) traffic volumes, future Year 2019 "total" volumes are developed. **Figure 9a** shows the Yr. 2019 "Total" AM/PM/SAT peak hour volumes, as well as two-way, daily traffic estimates for the adjacent roadways, respectively.

Similarly, by totaling the future Yr. 2025 "background" (**Figure 5b**) and “site” (**Figure 8**) traffic volumes, future Year 2025 "total" volumes are developed. **Figure 9b** show the Yr. 2025 "Total" AM/PM/SAT peak hour volumes, as well as two-way, daily traffic estimates for the adjacent roadways, respectively.

### **b) Future "Total" Intersection & Link Capacity Analysis**

These "total" traffic volumes, with assumed geometrics, were again subjected to the HCS *unsignalized* (stop-controlled) intersection and road link capacity analysis procedures (same as conducted for “background” conditions).

**Table 4a** presents the results of the analyses showing the Year 2019 computed Levels Of Service (LOS) and vehicular delays for the AM/PM/SAT peak hours at the analyzed intersections, as well as high 95% Back-of-Queue (BOQ) lengths. **Figure 10a** presents the LOS information in graphic format. **Appendix Fa** includes the Year 2019 AM/PM/SAT Peak Hour HCS printouts.

**Table 4b** presents the results of the analyses showing the Year 2025 computed Levels Of Service (LOS) and vehicular delays for the AM/PM/SAT peak hours at the analyzed intersections, as well as high 95% Back-of-Queue (BOQ) lengths. **Figures 10b** presents the LOS information in graphic format. **Appendix Fb** includes the Year 2025 AM/PM/SAT Peak Hour HCS printouts.

Future Year 2019 "Total" conditions (with “buildout” site traffic) analyses reveal that the addition of “site” traffic will change LOS’s to “failing/unacceptable” levels at the *unsignalized* Rt.200/Bluff Point Rd. intersection only – from LOS=C to F. All other intersections and road links maintain “acceptable” Levels Of Service. Future Year 2025 "Total" conditions reflect the same results as for Yr. 2019 conditions.

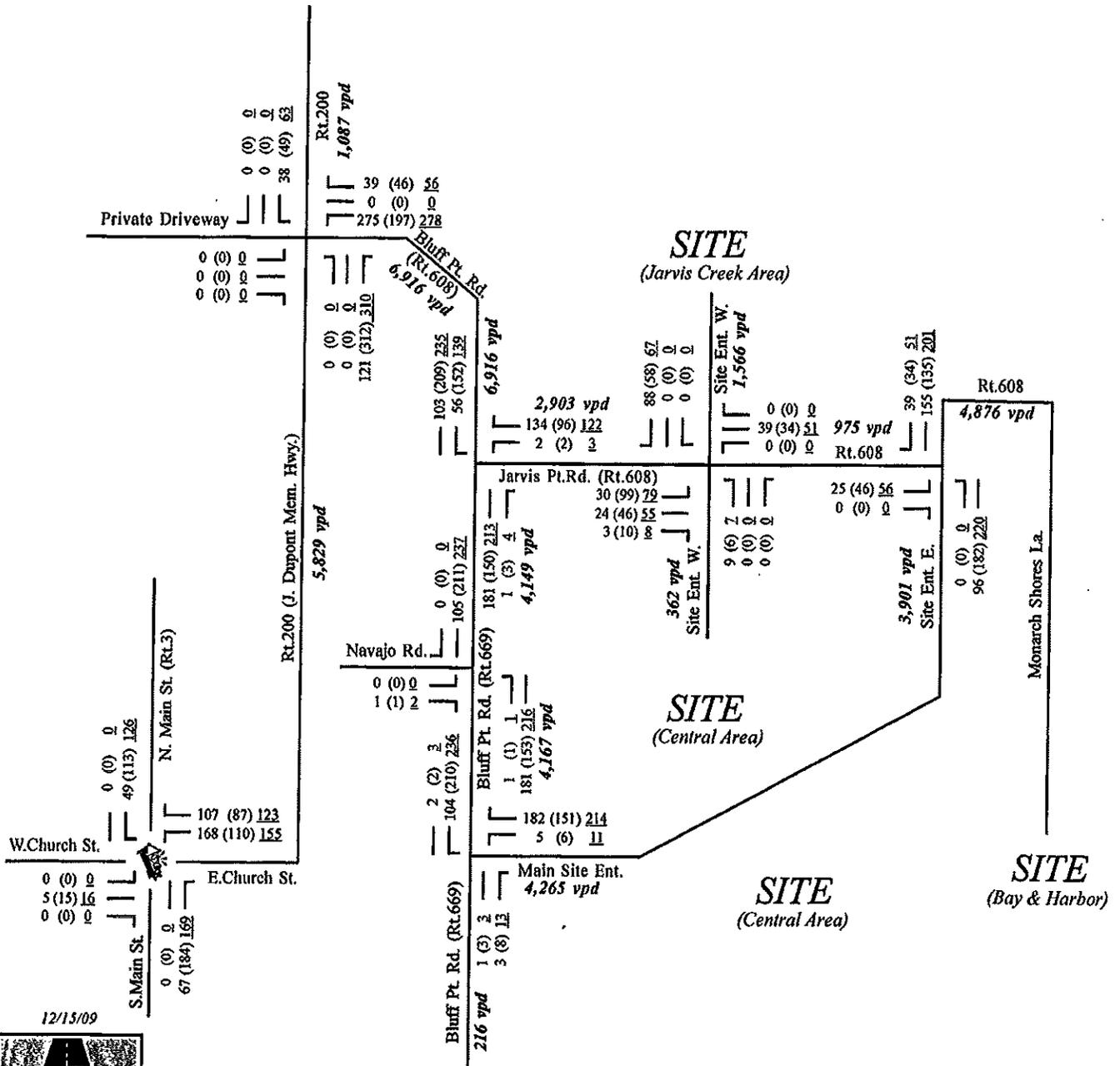
### **c) Mode – N/A, not requested/scoped**

**LEGEND**

123 (123) 123 = AM (PM) SAT Pk. Hr. Traffic Volumes

1,234 vpd = Daily Traffic Volume (veh. per day)

 = Traffic Signal



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**Yr. 2019/2025 "Site" Daily & AM/PM/SAT Peak Hour Traffic Volumes**

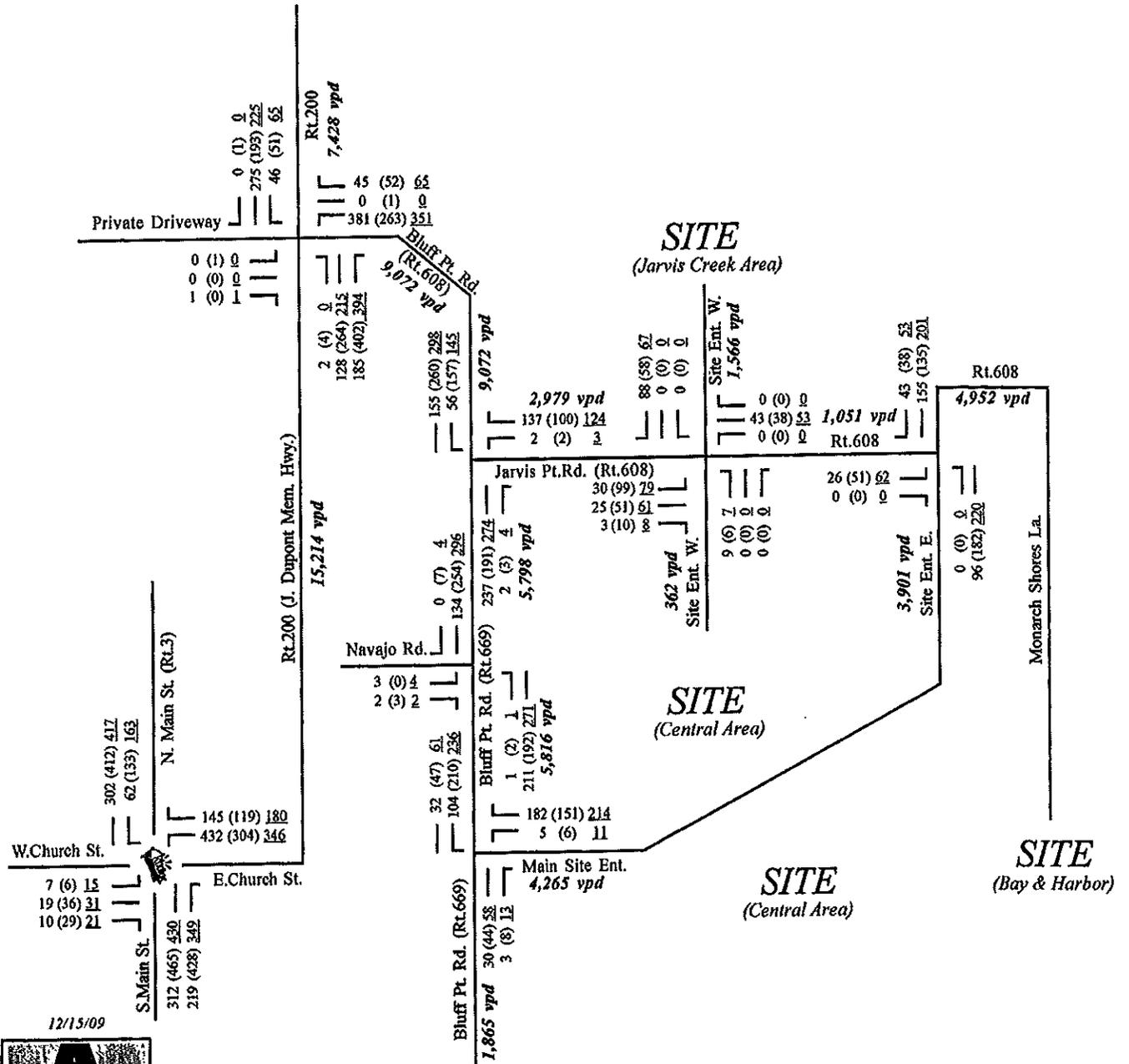
**FIGURE 8**

**LEGEND**

123 (123) 123 = AM (PM) SAT Pk. Hr. Traffic Volumes

1,234 vpd = Daily Traffic Volume (veh. per day)

 = Traffic Signal



**Yr. 2019 "Total" (with Site Traffic) Daily & AM/PM/SAT Peak Hour Traffic Volumes**

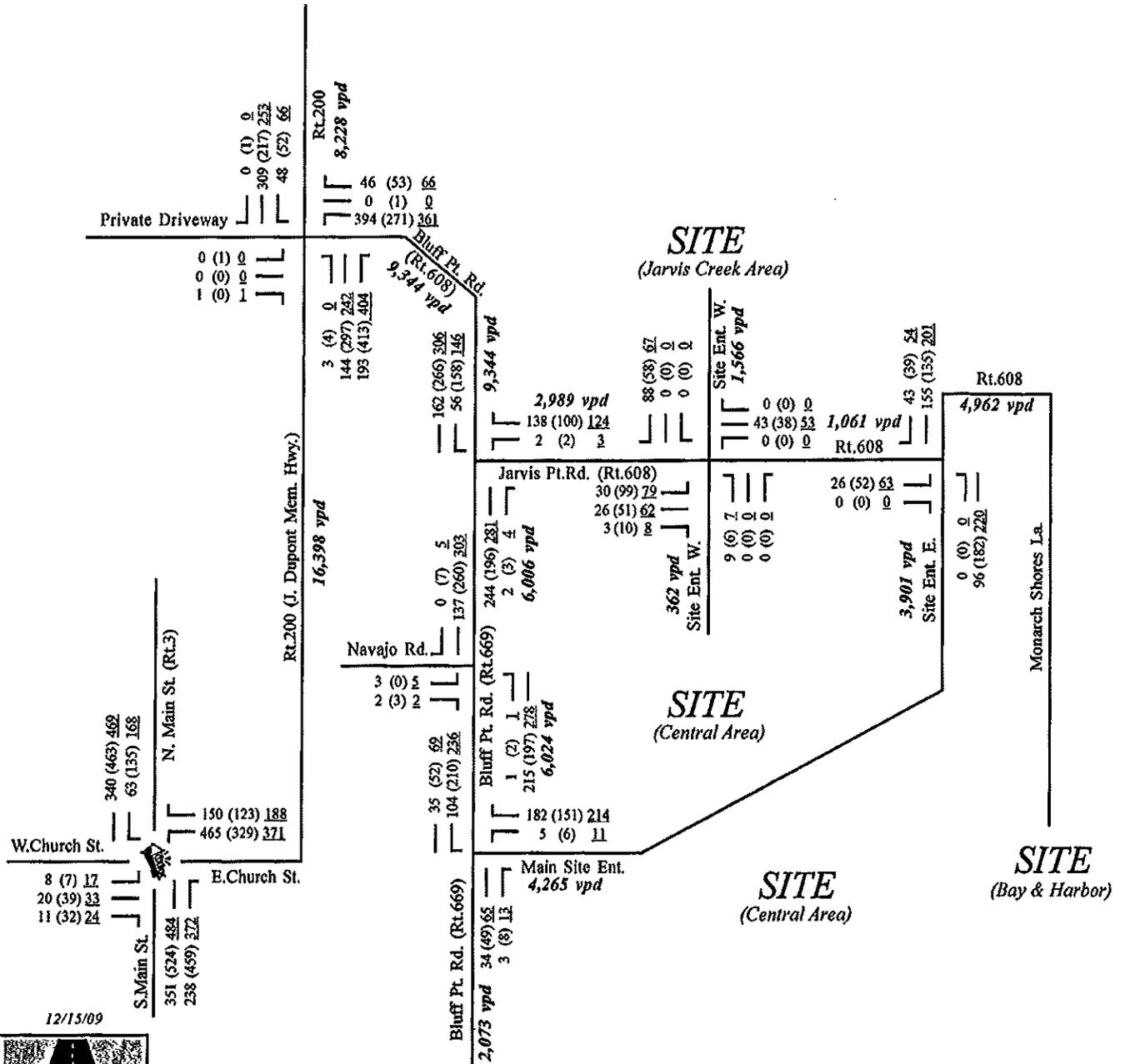
**FIGURE 9a**

**LEGEND**

123 (123) 123 = AM (PM) SAT Pk. Hr. Traffic Volumes

1,234 vpd = Daily Traffic Volume (veh. per day)

 = Traffic Signal



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**Yr. 2025 "Total" (with Site Traffic) Daily & AM/PM/SAT Peak Hour Traffic Volumes**

**FIGURE 9b**

**TABLE 4a**  
**Year 2019 "Total" Intersection & Link Level Of Service Summary**

<u>Intersections (n/w to s/e) (Avail.)</u>	AM PEAK HOUR			PM PEAK HOUR			SAT PK. HR.		
	<u>Inters.</u>	<u>Lane Group</u>		<u>Inters.</u>	<u>Lane Group</u>		<u>Inters.</u>	<u>Lane Group</u>	
	<u>LOS</u>	<u>Apch.</u>	<u>LOS/Dly.</u>	<u>LOS</u>	<u>Apch.</u>	<u>LOS/Dly.</u>	<u>LOS</u>	<u>Apch.</u>	<u>LOS/Dly. (High')</u>
<u>Unsignalized</u>									
1) Rt.200/Bluff Point Rd. (inf.)	F/504.7	NBLTR	A/8.0	F/260.1	NBLTR	A/7.7	F/537.8	NBLTR	A/7.8 (25') <sup>a</sup>
(inf.)		SBLTR	A/8.4		SBLTR	A/9.6		SBLTR	A/9.4 (25') <sup>s</sup>
(inf.)		WBLTR	F/504.7		WBLTR	F/260.1		WBLTR	F/537.8 (1032') <sup>a</sup>
(inf.)		EBLTR	B/10.2		EBLTR	C/22.7		EBLTR	A/9.7 (25') <sup>p</sup>
2) Bluff Point/Jarvis Point Rd.	C/15.3	SBLT	A/8.0	B/12.6	SBLT	A/8.4	B/14.0	SBLT	A/8.6
		WBLR	C/15.3		WBLR	B/12.6		WBLR	B/14.0
3) Bluff Point/Navajo Rd.	B/12.3	NBLT	A/7.8	B/10.6	NBLT	A/8.1	B/13.9	NBLT	A/8.3
		EBLR	B/12.3		EBLR	B/10.6		EBLR	B/13.9
4) Bluff Point/Main Site Ent.	B/10.0	SBLT	A/7.7	B/10.1	SBLT	A/8.0	B/11.3	SBLT	A/8.0
		WBLR	B/10.0		WBLR	B/10.1		WBLR	B/11.3
5) Jarvis Point Rd./Site Ents.W.	B/11.0	EBLTR	A/7.4	B/13.0	EBLTR	A/7.6	B/12.8	EBLTR	A/7.5
		WBLTR	A/7.3		WBLTR	A/7.4		WBLTR	A/7.4
		NBLTR	B/11.0		NBLTR	B/13.0		NBLTR	B/12.8
		SBLTR	A/9.1		SBLTR	A/8.9		SBLTR	A/9.0
6) Jarvis Point Rd./Site Ent.E.	B/11.1	NBLT	A/7.8	B/12.3	NBLT	A/7.7	B/14.4	NBLT	A/8.0
		EBLR	B/11.1		EBLR	B/12.3		EBLR	B/14.4
<u>Road Links (n/w to s/e)</u>	<u>LOS</u>	<u>V/C Ratio</u>		<u>LOS</u>	<u>V/C Ratio</u>		<u>LOS</u>	<u>V/C Ratio</u>	
A) Bluff Point Rd. N.(w.of Kent Pt.)	C	0.26		D	0.31		D	0.36	
B) Bluff Point Rd. S.(s.of Jarvis Pt.)	C	0.17		C	0.19		C	0.24	
C) Jarvis Point Rd. (e.of Bluff Pt.)	B	0.09		B	0.11		B	0.12	

**Legend:**

- LOS = Level Of Service & Avg. Vehicular Delay (seconds) - for "Critical/Worst Lane Group" -- See Appendix C
- LOS/Dly.= Level Of Service & Avg. Vehicular Delay (seconds) - for "Lane Group"
- Apch. = Approach
- WBLTR = WestBound Left, Thru, Right (lane group designations)
- Avail. = Available lane stacking space (ft.) -- *inf.* = infinite
- High' = Highest 95% Back-Of-Queue length (ft.) -- a/p/s identifies highest peak hour (25 ft. headways)

**TABLE 4b**  
**Year 2025 "Total" Intersection & Link Level Of Service Summary**

<u>Intersections (n/w to s/e) (Avail.)</u>	AM PEAK HOUR			PM PEAK HOUR			SAT PK. HR.		
	<u>Inters.</u>	<u>Lane Group</u>		<u>Inters.</u>	<u>Lane Group</u>		<u>Inters.</u>	<u>Lane Group</u>	
	<u>LOS</u>	<u>Apch.</u>	<u>LOS/Dly.</u>	<u>LOS</u>	<u>Apch.</u>	<u>LOS/Dly.</u>	<u>LOS</u>	<u>Apch.</u>	<u>LOS/Dly. (High')</u>
<b><u>Unsignalized</u></b>									
1) Rt.200/Bluff Point Rd. (inf.)	<b>F/649.0</b>	NBLTR	A/8.2	<b>F/364.0</b>	NBLTR	A/7.8	<b>F/685.0</b>	NBLTR	A/7.9 (25') <sup>a</sup>
(inf.)		SBLTR	A/8.5		SBLTR	A/9.9		SBLTR	A/9.6 (25') <sup>s</sup>
(inf.)		WBLTR	F/649.0		WBLTR	F/364.0		WBLTR	F/685.0 (1159) <sup>a</sup>
(inf.)		EBLTR	B/10.5		EBLTR	D/25.3		EBLTR	A/9.9 (25') <sup>p</sup>
2) Bluff Point/Jarvis Point Rd.	<b>C/15.6</b>	SBLT	A/8.1	<b>B/12.7</b>	SBLT	A/8.4	<b>B/14.1</b>	SBLT	A/8.6
		WBLR	C/15.6		WBLR	B/12.7		WBLR	B/14.1
3) Bluff Point/Navajo Rd.	<b>B/12.4</b>	NBLT	A/7.8	<b>B/10.7</b>	NBLT	A/8.2	<b>B/14.3</b>	NBLT	A/8.4
		EBLR	B/12.4		EBLR	B/10.7		EBLR	B/14.3
4) Bluff Point/Main Site Ent.	<b>B/10.1</b>	SBLT	A/7.7	<b>B/10.2</b>	SBLT	A/8.0	<b>B/11.4</b>	SBLT	A/8.1
		WBLR	B/10.1		WBLR	B/10.2		WBLR	B/11.4
5) Jarvis Point Rd./Site Ents. W.	<b>B/11.0</b>	EBLTR	A/7.4	<b>B/13.0</b>	EBLTR	A/7.6	<b>B/12.8</b>	EBLTR	A/7.5
		WBLTR	A/7.3		WBLTR	A/7.4		WBLTR	A/7.4
		NBLTR	B/11.0		NBLTR	B/13.0		NBLTR	B/12.8
		SBLTR	A/9.1		SBLTR	A/8.9		SBLTR	A/9.0
6) Jarvis Point Rd./Site Ent.E.	<b>B/11.1</b>	NBLT	A/7.8	<b>B/12.3</b>	NBLT	A/7.7	<b>B/14.5</b>	NBLT	A/8.0
		EBLR	B/11.1		EBLR	B/12.3		EBLR	B/14.5
<b><u>Road Links (n/w to s/e)</u></b>									
A) Bluff Point Rd. N.(w.of Kent Pt.)	<b>C</b>	V/C Ratio 0.27		<b>D</b>	V/C Ratio 0.31		<b>D</b>	V/C Ratio 0.37	
B) Bluff Point Rd. S.(s.of Jarvis Pt.)	<b>C</b>	V/C Ratio 0.18		<b>C</b>	V/C Ratio 0.20		<b>C</b>	V/C Ratio 0.25	
C) Jarvis Point Rd. (e.of Bluff Pt.)	<b>B</b>	V/C Ratio 0.09		<b>B</b>	V/C Ratio 0.11		<b>B</b>	V/C Ratio 0.12	

**Legend:**

- LOS = Level Of Service & Avg. Vehicular Delay (seconds) - for "Critical/Worst Lane Group" -- See Appendix C
- LOS/Dly. = Level Of Service & Avg. Vehicular Delay (seconds) - for "Lane Group"
- Apch. = Approach
- WBLTR = WestBound Left, Thru, Right (lane group designations)
- Avail. = Available lane stacking space (ft.) -- *inf.* = infinite
- High' = Highest 95% Back-Of-Queue length (ft.) -- a/p/s identifies highest peak hour (25 ft. headways)

**LEGEND**

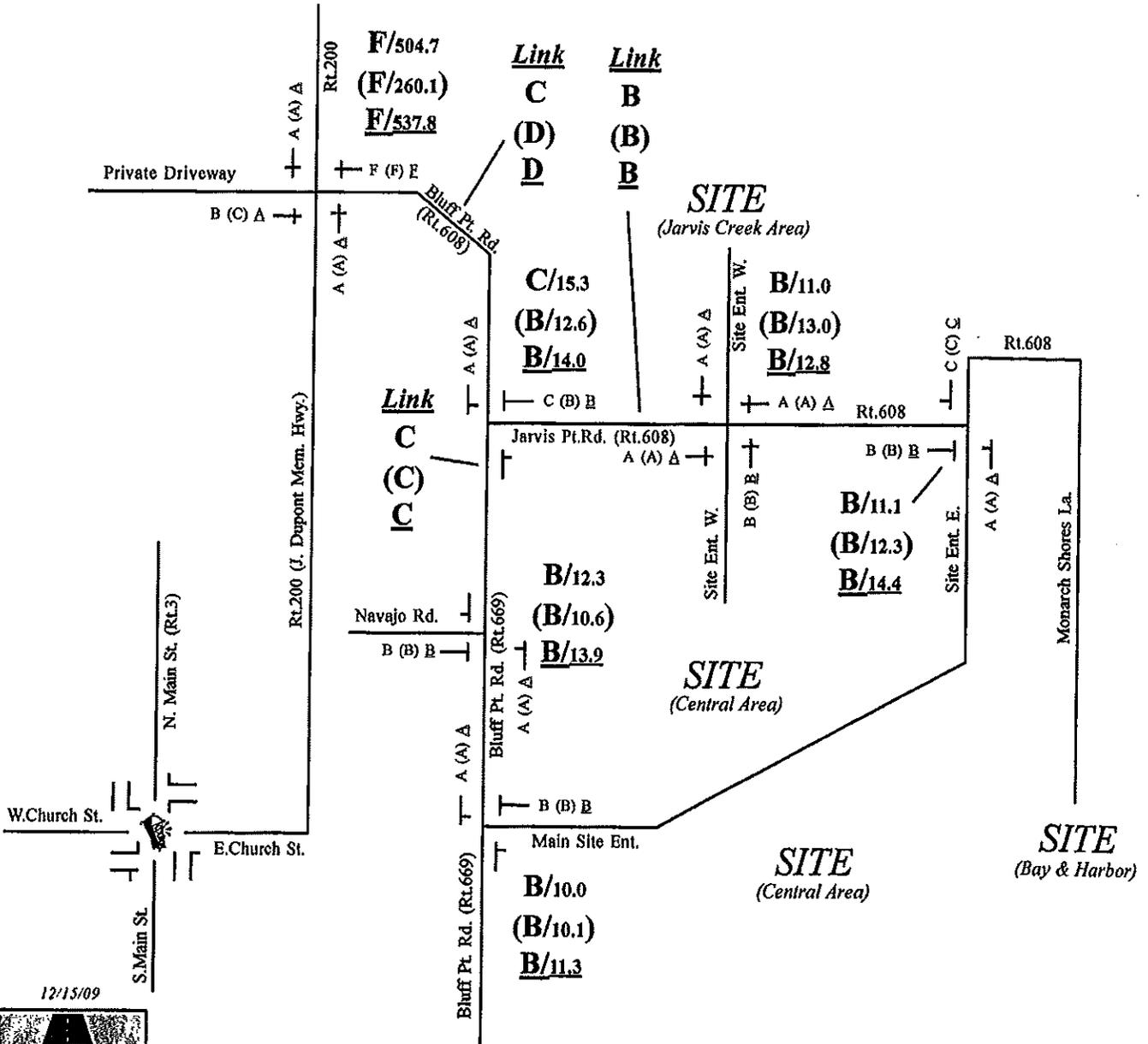


= Traffic Signal

**A/1.2** = AM Pk.Hr. LOS/Delay (sec.)

**(A/1.2)** = PM Pk.Hr. LOS/Delay (sec.)

**A/1.2** = SAT Pk.Hr. LOS/Delay (sec.)



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**Yr. 2019 "Total" (with Site Traffic) AM/PM/SAT Peak Hour Intersection/Link Geometry & LOS**

**FIGURE 10a**

**LEGEND**

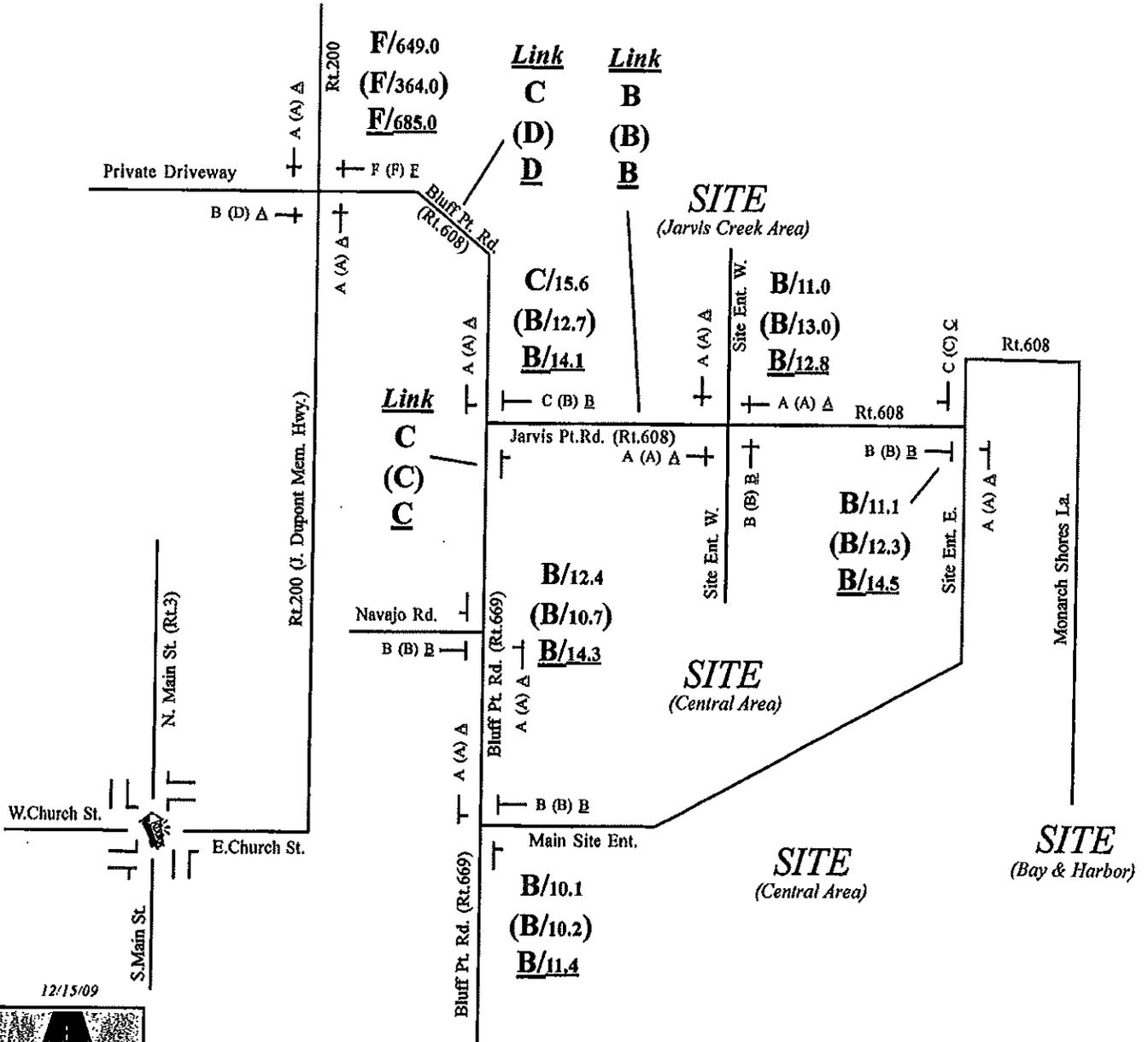


= Traffic Signal

**A/1.2** = AM Pk.Hr. LOS/Delay (sec.)

**(A/1.2)** = PM Pk.Hr. LOS/Delay (sec.)

**A/1.2** = SAT Pk.Hr. LOS/Delay (sec.)



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**Yr. 2025 "Total" (with Site Traffic) AM/PM/SAT Peak Hour Intersection/Link Geometry & LOS**

**FIGURE 10b**

**Incremental Impact Analysis**

By comparing the "Background" intersection LOS's (**Table 2**) against the "Total" intersection LOS's (**Tables 4a & 4b**), any changes in Levels Of Service at the analyzed intersections can be seen (shown in bold in the table below).

Incremental impact analysis (comparing Year 2019 "background" vs. "total" LOS), reveals that the addition of site traffic will cause some traffic impact (for all 3 peak hours) only at the *unsignalized* Rt.200/Bluff Point Rd. intersection. Significant queue lengths also impact this intersection. All other intersections and road links will remain at "background" levels or "acceptable" (LOS=D or better) Levels Of Service, thus indicating no significant impact.

Six (6) years later (at Year 2025) with further increased ambient background traffic volumes, all peak hour Levels Of Service and incremental impact results will essentially be the same as for Year 2019.

**8) RECOMMENDED IMPROVEMENTS (Impact Mitigation Measures)**

**a) Proposed Improvements (Mitigation Measures)**

Since traffic impact is indicated at the one (1) above-noted intersection, the following impact "mitigation measure" is warranted and recommended. With the implementation of this measure, the impacted peak hour Level Of Service will improve to "background" or better Levels Of Service.

<u>Intersection</u>	<u>Mitigation Measures</u>	<u>Yr. 2019</u>			<u>Post-Mitig "Total" LOS</u>		
		<u>Pre-Mitig. "Total" LOS</u>			<u>AM</u>	<u>PM</u>	<u>SAT</u>
-- Rt.200/Bluff Point Rd.	-- Install Traffic Signal	<b>F</b>	<b>F</b>	<b>F</b>	<b>D</b>	<b>C</b>	<b>D</b>

**b) TDM – N/A, not requested/scoped**

**e) Intersection Capacity Analyses with Improvements (Mitigation Measures)**

Following are the “mitigated” LOS results of the Year 2019 mitigation measures – resulting in better than “background” conditions (see Appendix G for the HCS printouts).

Figure 11 graphically presents the above recommended mitigation measures.

**TABLE 5**  
**Year 2019 "Total" Intersection & Link Level Of Service Summary**  
**-- with Mitigation --**

<u>Intersections (n/v to s/e)</u> (Avail.)	AM PEAK HOUR		PM PEAK HOUR		SAT PK. HR.	
	<u>Inters.</u>	<u>Lane Group</u>	<u>Inters.</u>	<u>Lane Group</u>	<u>Inters.</u>	<u>Lane Group</u>
<u>LOS</u>	<u>Apch.</u>	<u>LOS/Dly.</u>	<u>LOS</u>	<u>Apch.</u>	<u>LOS/Dly.</u>	<u>LOS/Dly. (High')</u>
<b><u>Signalized</u></b>						
1) Rt.200/Bluff Point Rd. (inf.) (new signal) (inf.) (inf.) (inf.)	<b>D/41.8</b>	EBLTR B/12.2 WBLTR D/42.8 NBLTR D/40.5 SBLTR D/41.7	<b>C/32.7</b>	EBLTR C/24.8 WBLTR D/50.3 NBLTR C/30.0 SBLTR B/16.6	<b>D/47.2</b>	EBLTR B/18.2 (25') <sub>p</sub> WBLTR D/48.8 (1038) <sub>a</sub> NBLTR D/49.9 (1018) <sub>s</sub> SBLTR D/39.4 (585) <sub>a</sub>
<b><u>Unsignalized</u></b>						
2) Bluff Point/Jarvis Point Rd.	<b>C/15.3</b>	SBLT A/8.0 WBLR C/15.3	<b>B/12.6</b>	SBLT A/8.4 WBLR B/12.6	<b>B/14.0</b>	SBLT A/8.6 WBLR B/14.0
3) Bluff Point/Navajo Rd.	<b>B/12.3</b>	NBLT A/7.8 EBLR B/12.3	<b>B/10.6</b>	NBLT A/8.1 EBLR B/10.6	<b>B/13.9</b>	NBLT A/8.3 EBLR B/13.9
4) Bluff Point/Main Site Ent.	<b>B/10.0</b>	SBLT A/7.7 WBLR B/10.0	<b>B/10.1</b>	SBLT A/8.0 WBLR B/10.1	<b>B/11.3</b>	SBLT A/8.0 WBLR B/11.3
5) Jarvis Point Rd./Site Ents.W.	<b>B/11.0</b>	EBLTR A/7.4 WBLTR A/7.3 NBLTR B/11.0 SBLTR A/9.1	<b>B/13.0</b>	EBLTR A/7.6 WBLTR A/7.4 NBLTR B/13.0 SBLTR A/8.9	<b>B/12.8</b>	EBLTR A/7.5 WBLTR A/7.4 NBLTR B/12.8 SBLTR A/9.0
6) Jarvis Point Rd./Site Ent.E.	<b>B/11.1</b>	NBLT A/7.8 EBLR B/11.1	<b>B/12.3</b>	NBLT A/7.7 EBLR B/12.3	<b>B/14.4</b>	NBLT A/8.0 EBLR B/14.4
<b><u>Road Links (n/v to s/e)</u></b>						
<u>LOS</u>	<u>V/C Ratio</u>	<u>LOS</u>	<u>V/C Ratio</u>	<u>LOS</u>	<u>V/C Ratio</u>	
A) Bluff Point Rd. N.(w.of Kent Pt.)	<b>C</b> 0.26	<b>D</b> 0.31		<b>D</b> 0.36		
B) Bluff Point Rd. S.(s.of Jarvis Pt.)	<b>C</b> 0.17	<b>C</b> 0.19		<b>C</b> 0.24		
C) Jarvis Point Rd. (e.of Bluff Pt.)	<b>B</b> 0.09	<b>B</b> 0.11		<b>B</b> 0.12		

**Legend:**

LOS = Level Of Service & Avg. Vehicular Delay (seconds) - for “Critical/Worst Lane Group” -- See Appendix C

LOS/Dly.= Level Of Service & Avg. Vehicular Delay (seconds) - for “Lane Group”

Apch. = Approach

WBLTR = WestBound Left, Thru, Right (lane group designations)

Avail. = Available lane stacking space (ft.) -- inf. = infinite

High' = Highest 95% Back-Of-Queue length (ft.) -- a/p/s identifies highest peak hour (25 ft. headways)



**d) Mode – N/A, not requested/scoped**

**Queuing Analysis**

HCS 95% Back-of-Queues (BOQ's) for all lane groups at the Rt.200/Bluff Point Rd. intersection are presented within **Tables 2, 4a-b, & 5**. Maximum peak hour queues are significant but within available storage. Mitigation (signal) will lessen delay and bring overall intersection delays within acceptable levels.

**9) CONCLUSIONS**

Incremental impact analysis (comparing **Year 2019** "background" vs. "total" LOS), reveals that the addition of site traffic will cause some traffic impact (for all 3 peak hours) only at the *unsignalized* Rt.200/Bluff Point Rd. intersection. Significant queue lengths also impact this intersection. All other intersections and road links will remain at "background" levels or "acceptable" (LOS=D or better) Levels Of Service, thus indicating no significant impact.

Since traffic impact is indicated at the above-noted intersection, the following impact "mitigation measure" is warranted and recommended. With the implementation of this measure, the impacted peak hour Level Of Service will improve to "background" or better Levels Of Service.

<u>Intersection</u>	<u>Mitigation Measures</u>	<u>Yr. 2019</u>			<u>Post-Mitig "Total" LOS</u>		
		<u>Pre-Mitig. "Total" LOS</u>	<u>AM</u>	<u>PM</u>	<u>SAT</u>	<u>AM</u>	<u>PM</u>
-- Rt.200/Bluff Point Rd.	-- Install Traffic Signal	F	F	F	D	C	D

Six (6) years later (at **Year 2025**) with further increased ambient background traffic volumes, all peak hour Levels Of Service and incremental impact results will essentially be the same as for Year 2019.

Traffic impact via intersection capacity analysis has been analyzed for existing and future Year 2019 conditions - "Background" (w/o site traffic) and "Total" (with site traffic). Based upon the assumed "scoped" parameters, the analytical evaluations and comparisons within this TIA have shown that the proposed "Bluff Point" mixed-use project will have minimal and manageable impact on the area network which can be mitigated with the recommended mitigation measure identified herein.