TRAFFIC IMPACT STUDY
THE PRESERVE

ESSEX, OLD SAYBROOK
AND
WESTBROOK, CONNECTICUT

Prepared for:

RIVER SOUND DEVELOPMENT, LLC

Prepared By:

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Meriden, Connecticut

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EXECUTIVE SUMMARY

The Preserve, a residential and golf course community, is proposed on a 900± acre parcel located primarily in the Town of Old Saybrook, Connecticut. Route 153 roughly borders the site to the west and the Valley Railroad line to the east. The development will provide 248 residential units and an 18-hole golf course. Access will be provided at two unsignalized site roadway intersections. One roadway intersection will be located along Route 154 in Westbrook, between the Westbrook/Essex Town Line and Monahan Road, and the other intersection will be located along Bokum Road in Old Saybrook, just south of the Old Saybrook/Essex Town Line.

This study analyzed the traffic operational and capacity impacts of the development, projected to generate, during the golf season, about 210, 265 and 305 vehicle trips on the nearby street network during the weekday morning, weekday afternoon and Saturday peak hours respectively. These figures were derived from *Trip Generation*, published by the Institute of Transportation Engineers, (ITE) using the number and type of residential units and the golf course. The work effort included field reconnaissance and observation, collection of traffic volume data, an origin-destination study, projection of traffic demand, and capacity analyses.

Traffic improvements recommended to mitigate projected impacts due to The Preserve generated traffic volumes include the following:

- **Route 154 at Bokum Road** – Located in Old Saybrook, this intersection is unsignalized. Poor levels of service, as defined by delay, are projected for the critical approach/movement, Bokum Road left turns. The Bokum Road approach, however, is projected to operate under capacity during both the background and full build conditions. Preliminary investigation for signalization indicates that the intersection is not projected to meet traffic signal warrants during either the background or full build conditions. Minimal by-pass width is currently provided along Route 154 northbound.

  Modification of the Bokum Road approach geometry is recommended. Currently Bokum Road is split by a large triangular island as it approaches Route 154, which allows two-way traffic along Bokum Road both north and south of the island. This project presents the opportunity to revise the Bokum Road approach to a more standard "T" type intersection. When this improvement is implemented, the Bokum Road approach should provide two-lanes; separate left and right turn lanes. Minor widening along Route 154 to provide an adequate left turn bypass width is also recommended.

- **Route 153 at The Preserve** access road – Widen Route 153, by approximately 6 feet, to provide a by-pass lane for left turns into the site driveway. The site driveway approach to Route 153 should provide separate left and right turn lanes. In order to maintain adequate sight distance looking to the left from the site driveway along Route 153, minor clearing of vegetation will be necessary.

- **Bokum Road at The Preserve** access road – a minor widening of Bokum Road and flattening of the horizontal curve in the immediate vicinity of the proposed Preserve access road will improve operations and increase available sight distance.

Several of the unsignalized study intersections were projected to have critical approaches operating at poor LOS, some over capacity, during the background condition (without The Preserve traffic). Level of Service (LOS) is defined by delay, and can be poor, even with capacity available. The installation of traffic signals based on projections several years into the future is not common practice, and should not be done unless there is a demonstrated need, and Warrants contained in the Manual on Uniform Traffic Control Devices (MUTCD) are satisfied. The following are suggestions for potential future consideration/implementation, independent of The Preserve:

- **Route 153 at S.R. 621 and Route 9 Southbound On Ramp** – Located in Essex. Under background conditions, the critical approach (S.R. 621) is anticipated to operate over capacity and with poor levels of service. It is recommended that this intersection be monitored for installation of a traffic signal. If signalized, the S.R. 621 approach should be re-striped to provide a two lane approach to Route 153 and should consist of a shared left/through lane and an exclusive right turn lane.

- **Route 153 at Mares Hill Road** – This intersection is located in Essex. It is anticipated that the critical approach, Mares Hill Road, will operate with poor LOS, but with reserve capacity under background conditions. It is recommended that this intersection be monitored for signalization.

- **Route 153 at McVeagh Road** – Located in Westbrook. Under the background conditions, the McVeagh Road approach to the intersection is projected to operate with poor LOS but with reserve capacity during the weekday afternoon peak hour. It is recommended that the McVeagh Road approach, currently 22 feet wide, be formally striped for separate left and right turn lanes.

- **Route 154 at I-95 Northbound Off Ramp** – This intersection is located in Old Saybrook. It is recommended that the intersection be monitored for installation of a traffic signal.

- **Route 154 at V.F.W. Highway and Route 9 Northbound On Ramp** – Located in Old Saybrook. The critical approach, V.F.W. Highway, is projected to operate at poor LOS and over capacity for the background condition during the weekday afternoon and Saturday midday peak hours. It is recommended that the intersection be monitored for installation of a traffic signal.

Three currently signalized intersections were projected to have individual movements operating at poor LOS and/or over capacity. If the need develops in the future, minor traffic signal timing changes can be implemented at: Route 153 at Bokum Road and Westbrook Road (SR604); Route 153 at Route 166 (Spencer Plains Road) and Hunters Ridge Drive; Route 153 at I-95 NB ramps.

The study also incorporated traffic volumes associated with potential development of three sites: the Pianta parcel, located along Bokum Road adjacent to the proposed road

for The Preserve; and an automobile dealership and a supermarket along Flat Rock Place. Since none of the three projects are approved at the time of this report, they are not included in the base analyses. Appendices III and IV incorporate traffic from those projects. Overall traffic system capacity exists to accommodate all the projects, although operational improvements, such as bypass lanes or traffic signalization may become necessary at some point in time.

I. INTRODUCTION

A traffic study was conducted for The Preserve, a residential and golf course community located primarily in the Town of Old Saybrook, Connecticut. Traffic operations at key intersections along the likely approach routes were reviewed, specifically to determine their current operating parameters, and the ability to absorb The Preserve traffic.

The development will contain 248 residential units; 24 Estate Lots (single family homes), 45 ¾ acre Lots (single family homes), 79 Village Detached (single family homes) and 100 Village Attached (townhouse style). These residences will have access to an 18-hole golf course and a member only grill room also located on the 900± acre site. Access will be provided via two full movement unsignalized roadways. One site roadway intersection is to be located in the Town of Westbrook along Route 153 (Essex Road) between the Essex/Westbrook Town Line to the north and Monahan Road to the south. The second site roadway intersection is to be located along Bokum Road in the Town of Old Saybrook, south of the Old Saybrook/Essex Town Line.

This study reviewed the traffic operational and capacity characteristics of the nearby street network during the weekday morning and afternoon commuter, and mid-day Saturday, peak hours. The work effort included a review of a previous study for the site, field reconnaissance and observation, collection of peak period and daily traffic volume information, an origin-destination study, projection of travel demand and capacity analyses.

Capacity analyses were performed at key intersections to evaluate the existing levels of service (LOS) and delays. These were compared to that which would be expected after development. Where appropriate, recommendations were made to improve traffic operations at the primary impacted intersections.

Traffic volumes from the potential development of the Pianta parcel, located adjacent to The Preserve on Bokum Road as well as an automobile dealership and supermarket along Flat Rock Place were incorporated into the analyses in Appendices III and IV.

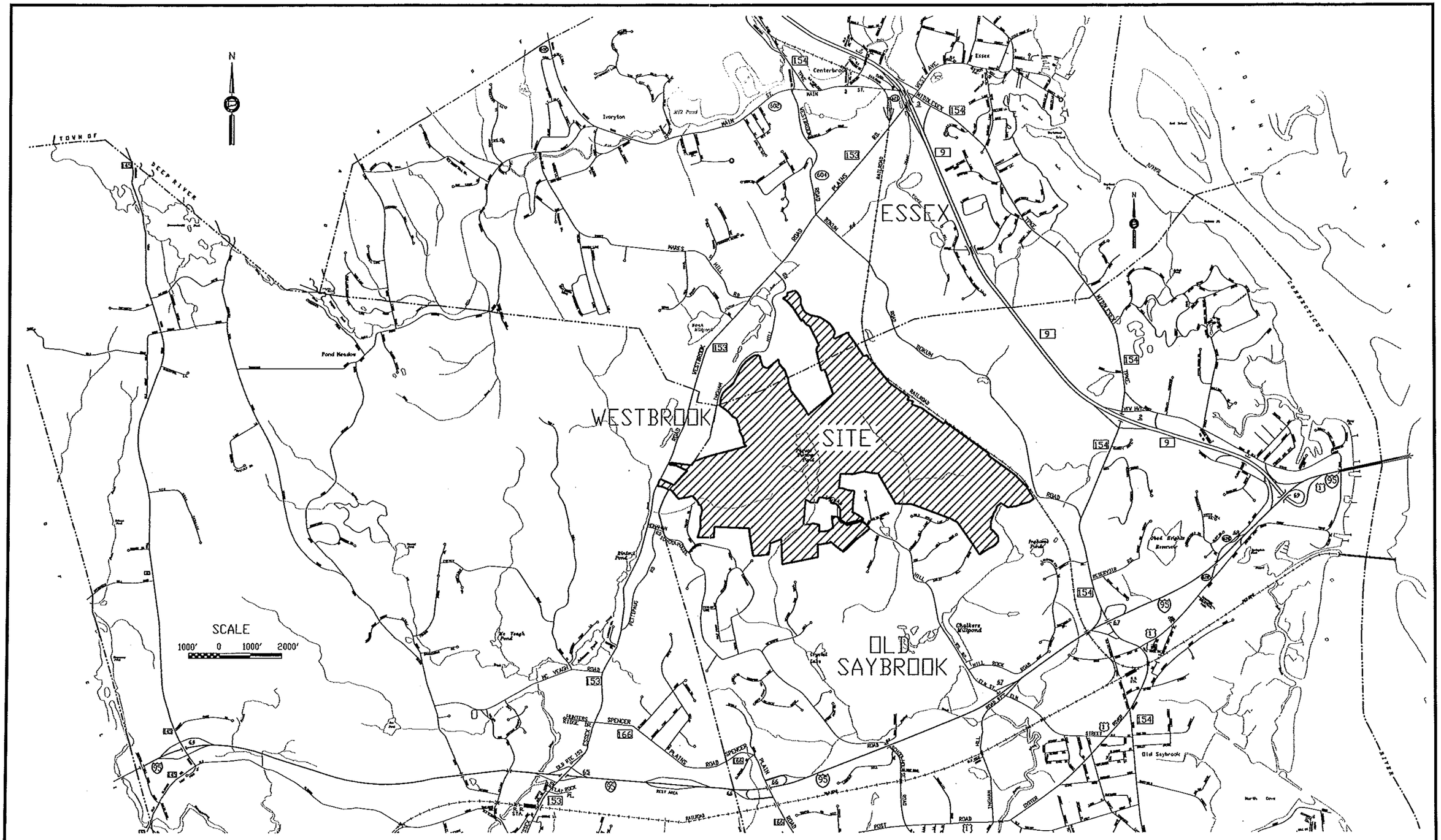
II. EXISTING CONDITIONS

An investigation of the existing conditions of the adjacent roadway network formed the basis for determining the traffic impacts of the proposed development. This investigation included review of a previous study for the site, a detailed field reconnaissance, research of pertinent planning and traffic data at local and State agencies, and a traffic counting program.

Access Network

As illustrated in Figure 1, the site is roughly bordered to the east by the Valley Railroad line, the north by the Old Saybrook/Westbrook Town Line, and the west by Route 153 and miscellaneous properties. Key roads in the site vicinity include Route 153 (Essex and Westbrook Roads), Route 154 (Middlesex Turnpike) and Bokum Road.

Route 153 (Essex and Westbrook Roads), in the vicinity of the site, is a north-south, two-lane facility. Adjacent land uses are primarily residential or undeveloped. Commercial development can be found further north near Centerbrook and Essex center and to the south at the I-95 interchange. Route 153 north of the site provides access to Route 9 at Interchange #3 in Essex. South of the site, Route 153 provides access to I-95 at Interchange #65 in Westbrook. The posted speed limit is 35 miles per hour at the Essex and Westbrook center ends, and is 40 miles per hour in the less developed areas near the site.



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LOCATION PLAN

THE PRESERVE
ESSEX, OLD SAYBROOK AND WESTBROOK, CT

Designed	L.A.S.
Drawn	L.A.S.
Checked	F.M.G.
Approved	R.A.L.
Scale	1" = 3000'
Project No.	01C955B
Date	MAY 2004
CAD File	TL0C01C95501

FIGURE 1

Date: 11/05/02

Route 154 (Middlesex Turnpike) is a two-lane, north-south facility, which provides access to I-95 south of the site via interchange #67 in Old Saybrook, Route 9 via Interchange #2 in Old Saybrook, and Route 9 north of the site at interchange #3 in Essex. Route 154 has a speed limit of 40 miles per hour in the vicinity of Bokum Road.

Bokum Road is a two lane local street, which has a posted speed limit of 25 miles per hour. It connects Route 153 in Essex with Route 154 in Old Saybrook. It is generally about 20 feet in width with rolling horizontal and vertical alignment. There is an at grade crossing with the Valley Railroad about 2,000 feet southeast of the Route 153 intersection. The crossing is controlled by flashing railroad crossing signs, no gates are provided. The Valley railroad operates from May through October, with additional Thanksgiving and Christmas service. Spring and fall operation is Friday-Sunday and all week during the summer. There are typically four trains per day, with an additional dinner excursion on weekends.

Intersection Geometrics and Control

For the moderate level of traffic generation expected, a large number of intersections were selected for evaluation, some more than two miles from the site. Although the development parcel is indeed very large, the number of residential units is not extraordinary. The following fourteen intersections along the major travel routes were included in the study area:

Route 153 (Town of Essex) at:

- West Avenue and Route 9 (Interchange #3) Northbound On Ramp (unsignalized)
- Route 154 (signalized)
- S.R. 621 and Route 9 (Interchange #3) Southbound On Ramp (unsignalized)
- Westbrook Road (S.R. 604) and Bokum Road (signalized)
- Mares Hill Road (unsignalized)

Route 153 (Town of Westbrook) at:

- Monahan Road/Schoolhouse Road (unsignalized)
- McVeagh Road (unsignalized)
- Route 166 (Spencer Plains Rd.) and Hunters Ridge Rd. (signalized)
- Interstate 95 (Interchange #65) Southbound Ramps (signalized)
- Interstate 95 (interchange #65) Northbound Ramps (signalized)

Route 154 (Town of Old Saybrook) at:

- Interstate 95 (Interchange #67) Northbound Off Ramp (unsignalized)
- Bokum Road (unsignalized)
- Route 9 (Interchange #2) Southbound Ramps (unsignalized)
- V.F.W. Highway and Route 9 (Interchange #2) Northbound On Ramp (unsignalized)

The unsignalized intersection of **Route 153 at West Avenue and Route 9 Northbound On Ramp** is three-legged. The Route 9 Northbound On Ramp forms the westerly leg. Route 153 forms the southerly leg, and West Avenue the northerly leg. A left turn lane is provided on northbound Route 153 for traffic turning left onto the ramp.

Route 153 at Route 154 is a four way intersection controlled by a traffic signal. Both Route 154 approaches provide an exclusive left turn lane and a shared through/right lane. At both of these approaches to the intersection the eastbound and westbound Route 154 travel lanes are separated by a raised median. The Route 153 northbound

and southbound approaches each provide a two lane approach. The traffic signal has advance left turn phasing for Route 154

The four-legged intersection of **Route 153 at S.R. 621 and Route 9 Southbound On Ramp** is controlled by a stop sign on S.R. 621 and a flashing beacon. Each Route 153 approach to the intersection has an exclusive left turn lane and a shared through/right turn lane. The S.R. 621 approach provides a single lane.

Route 153 at Bokum Road and Westbrook Road (S.R. 604) is a four-way signalized intersection. The Route 153 and Bokum Road approaches provide an exclusive left turn lane and a shared through/right turn lane each, while the Westbrook Road approach has a shared left/through and a right turn lane, and a small channelizing island. The traffic signal has advance left turn phasing for Route 153.

The unsignalized "T" type intersection of **Route 153 at Mares Hill Road** provides a single lane at each approach. The Mares Hill Road approach is slightly skewed to Route 153 and is controlled by a stop sign.

Route 153 at Monahan Road/Schoolhouse Road is also a "T" type intersection with single lane provided at each approach. Monahan Road, also known as, Schoolhouse Road in the Town of Old Saybrook, is controlled with a stop sign.

Route 153 at McVeagh Road is a "T" type intersection with single lane approaches. The McVeagh Road approach is wide, stop controlled and has a small median island.

Route 153 at Route 166 (Spencer Plains Road) and Hunters Ridge Road is a signalized intersection with the side streets offset by about 175 feet. The traffic signal provides a southbound advance left turn phase, and separate traffic phasing for each of the side streets. The northbound Route 153 and Hunters Ridge Road approaches to the intersection have single lanes. An exclusive left turn lane is provided southbound on Route 153 at Route 166, and Route 166 has two approach lanes.

Route 153 at the Interstate 95 (Interchange #65) Southbound Ramps is a signalized intersection. The off ramp approach provides two lanes. Northbound Route 153 has a left turn lane and a through lane, while southbound Route 153 has a through lane and a right turn lane. The traffic signal provides a southbound delayed left turn phase. The traffic signal is coordinated with the one to the south.

The intersection of **Route 153 at Interstate 95 (Interchange #65) Northbound Ramps** is controlled by a multi-phase traffic signal, which also controls Flat Rock Place, the access to the Tanger Outlets and Norris Avenue. It is coordinated with the signalized intersection to the north. At the Interstate 95 Northbound Ramp intersection, Route 153 northbound has a through lane and a right turn lane and southbound has a left turn lane and a through lane. The Interstate 95 off ramp has two right turn lanes and a left/through lane. At the Flat Rock Place intersection, Route 153 northbound provides a

left turn lane and two through lanes and southbound provides two left turn lanes and a through lane. Flat Rock Place has two right turn lanes and a left/through lane. Norris Avenue provides a single lane approach.

Route 154 at Interstate 95 (Interchange #67) Northbound Off Ramp is an unsignalized "T" type intersection. The off ramp approach provides an exclusive left turn lane and a channelized right turn lane at the eastbound approach to the intersection. The northbound and southbound Route 154 approaches each consist of a single lane.

The intersection of **Route 154 at Bokum Road** is unsignalized. Bokum Road features a small triangular island that permits two way traffic on all sides. Thus, Bokum Road has two separate approaches to Route 154, one north of the island and one south of the island. Both approaches provide a single stop controlled lane. The Route 154 northbound and southbound approaches each provide a single lane.

Route 154 at Route 9 (Interchange #2) Southbound Ramps is an unsignalized intersection. The Route 9 southbound off ramp forms the westerly leg, the Route 9 Northbound on ramp forms the easterly leg and Route 154 the northerly and southerly legs. Each approach provides one lane with the off ramp approach stop controlled.

Route 154 at V.F.W. Highway and the Route 9 (Interchange #2) Northbound On Ramp is an unsignalized intersection. The V.F.W. Highway is the easterly leg of the

intersection, the on ramp the westerly leg, and Route 154 the northerly and southerly legs. Each approach to the intersection provides a single lane with the V.F.W. Highway approach stop controlled. The V.F.W. Highway provides access to Route 154 from the Route 9 (Interchange #2) northbound off ramp.

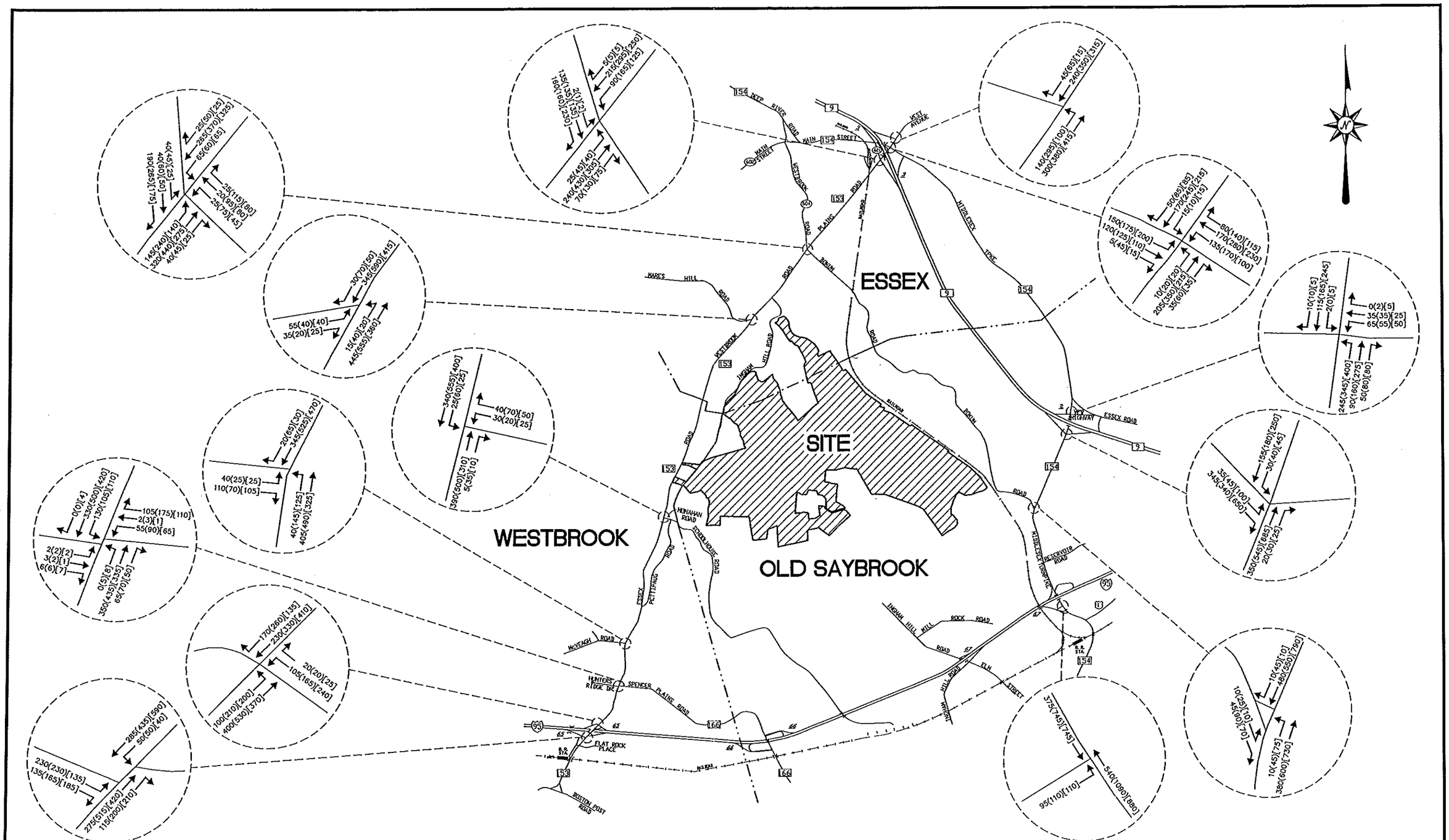
Current Peak Hour Traffic Volumes

Turning movement data was recorded at each of the above intersections during the expected peak times of site activity, which are typically on a summer weekday morning (7:00-9:00), weekday afternoon (4:00-6:00 PM) and Saturday midday (11:00-2:00 PM). These current peak hour traffic volumes are illustrated in Figure 2.

Peak hour traffic volumes on Essex Road (Route 153) past the site were approximately 800 vehicles during both the weekday morning and Saturday periods, and 1,200 during the weekday afternoon period. Peak hour traffic volumes on Bokum Road were approximately 150 vehicles during the weekday morning, 225 during the weekday afternoon and 250 during the Saturday peak periods respectively.

Average Daily Traffic

Average daily traffic (ADT) data was obtained for State roads in the immediate site vicinity from the Connecticut Department of Transportation (CTDOT). Most of the roadways close to the site carry light to moderate volumes. Route 153 generally experienced an ADT along the corridor of between 9,000 and 12,000 trips. Volumes



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CURRENT TRAFFIC VOLUMES

THE PRESERVE
ESSEX, OLD SAYBROOK AND WESTBROOK, CT

LEGEND
PEAK HOUR VOLUMES
WEEKDAY MORNING: XXX
WEEKDAY AFTERNOON: (XXX)
SATURDAY MIDDAY: [XXX]

FIGURE 2

CAD File:fLOC95501

The intersection of **Route 154 with Bokum Road** had 19 accidents. Eight involved northbound Route 154 vehicles turning left into Bokum Road being rear-ended. Six involved vehicles leaving Bokum Road being rear-ended.

The **Route 154 at V.F.W. Highway and Route 9 Northbound On Ramp** intersection had 14 accidents. Seven involved vehicles crossing Route 154 to enter Route 9 being hit by Route 154 through traffic.

The intersection of **Route 153 with the I-95 Northbound Ramps** had 9 accidents. Six were rear end accidents, common for a signalized intersection.

Table 1
Accident Data

Intersection	Accidents (1999-2002)
Route 153 at I95 NB ramps	9
Route 153 at I95 SB ramps	4
Route 153 at Spencer Plains Rd. (Route 166)	2
Route 153 at McVeagh Road	5
Route 153 at Monahan Road	3
Route 153 at Mares Hill Road	6
Route 153 at Ingham Hill Road	3
Route 153 at Bokum Road/Westbrook Road	5
Route 153 at SR621/Rte 9 SB on ramp	5
Route 153 at Route 154	27
Route 154 at I95 NB off ramp	2
Route 154 at I95 SB on ramps	2
Route 154 at Reservoir Road	6
Route 154 at Connolly Drive	6
Route 154 at Bokum Road	19
Route 154 at Route 9 SB ramps	4
Route 154 at VFW Highway/Route 9 NB on ramp	14
Route 154 at Essex Road	6

III. ANTICIPATED TRAFFIC CONDITIONS

Peak hour traffic volumes expected at The Preserve were estimated, assigned to the roadway network, and superimposed onto projected background traffic volumes. This methodology provides a year of completion estimate for analysis.

Background Traffic Volumes

Background traffic volumes represent the traffic volumes present on the roadway system for the anticipated year of development completion, 2010 for The Preserve, before the development is completed and generating the full traffic loading. Background traffic volumes were developed by increasing the existing peak hour traffic volumes, see Figure 2, by an annual growth rate to reflect local and regional growth trends in the area. Additional traffic volumes are added for other developments that are under construction or approved which are anticipated to significantly increase traffic volumes within the study area.

A review of historical traffic count data along these corridors indicated that a traffic volume growth rate of 1.5 percent per year would be more than adequate to simulate the future traffic flows. The peak hour traffic volumes were increased by 1.5 percent per year resulting in 2010 base traffic volumes.

A conversation with representatives of the Towns of Essex, Old Saybrook and Westbrook, Planning Offices during the initial phases of this study revealed no large

developments in the site's vicinity, which would be likely to significantly affect traffic operations at the studied locations. There were, however, three smaller developments under construction in Essex and Old Saybrook and include:

- A **Medical and Commercial Office Development** (24,000± square feet) was under construction and located along the southerly side of Bokum Road just east of Route 153.

- A **Retail Market** (3,600± square feet) was currently under construction along the easterly side of Route 153 in the Town of Essex north of Bokum Road.

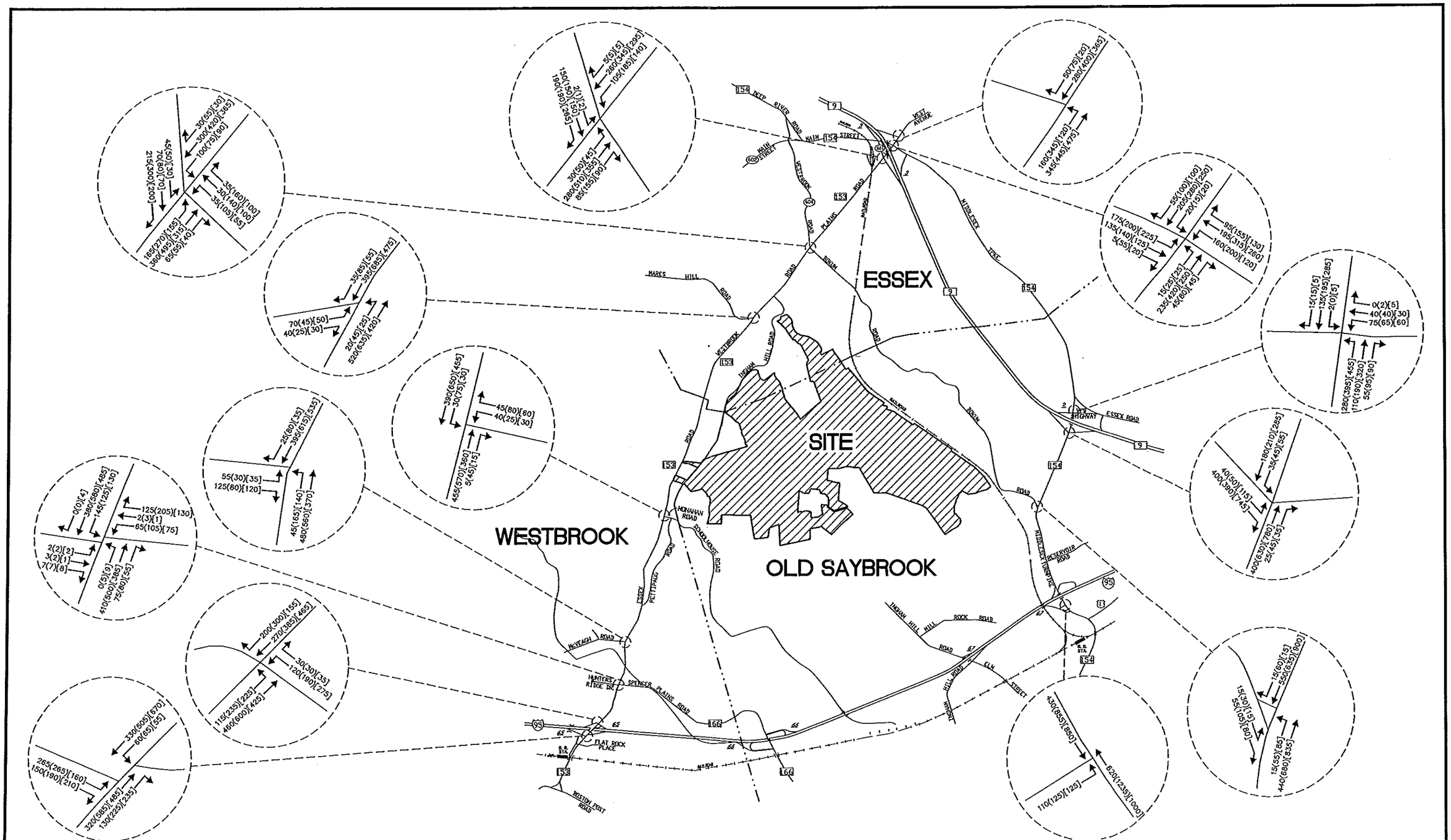
- A **Professional Office Building** (6,000± square feet) was under construction within the southwesterly quadrant of the Route 154 intersection with Brenda Lane in the Town of Old Saybrook. This intersection is located south of Route 9 (Interchange #2).

Traffic volumes associated with the Medical and Commercial Office Development and the Professional Office Building were superimposed onto the base traffic volumes. Due to the small size of the Retail Market, traffic volumes for this development were assumed to be part of the annual growth rate. The resultant traffic volumes, the background traffic volumes, are shown in Figure 3.

Site Access

Access to the site is proposed via two unsignalized driveways; one driveway to be located along Route 153 (Essex Road) about 750 feet north of Monahan Road in the Town of Westbrook and one driveway to be located along Bokum Road approximately 200 feet south of the Essex/Old Saybrook Town Line.

The Connecticut Department of Transportation maintains intersection sight distance (ISD) guidelines. Based on these guidelines a minimum ISD of 550 feet is suggested



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BACKGROUND TRAFFIC VOLUMES

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LEGEND
PEAK HOUR VOLUMES
WEEKDAY MORNING: XXX
WEEKDAY AFTERNOON: (XXX)
SATURDAY MIDDAY: [XXX]

FIGURE 3

CAD File: TFL095502

when looking both to the left and the right from The Preserve driveway along Route 153. This requirement is easily met when looking to the right. However, looking to the left the sight distance is blocked by vegetation. With minor clearing, the sight distance needs for the site access roadway along Route 153 can be met.

Applying the same guidelines at the site driveway along Bokum Road a sight distance of 360 feet should be provided from The Preserve driveway approach when looking to both the left and the right along Bokum Road. Minor improvements are proposed to meet these needs and improve operations.

Trip Distribution

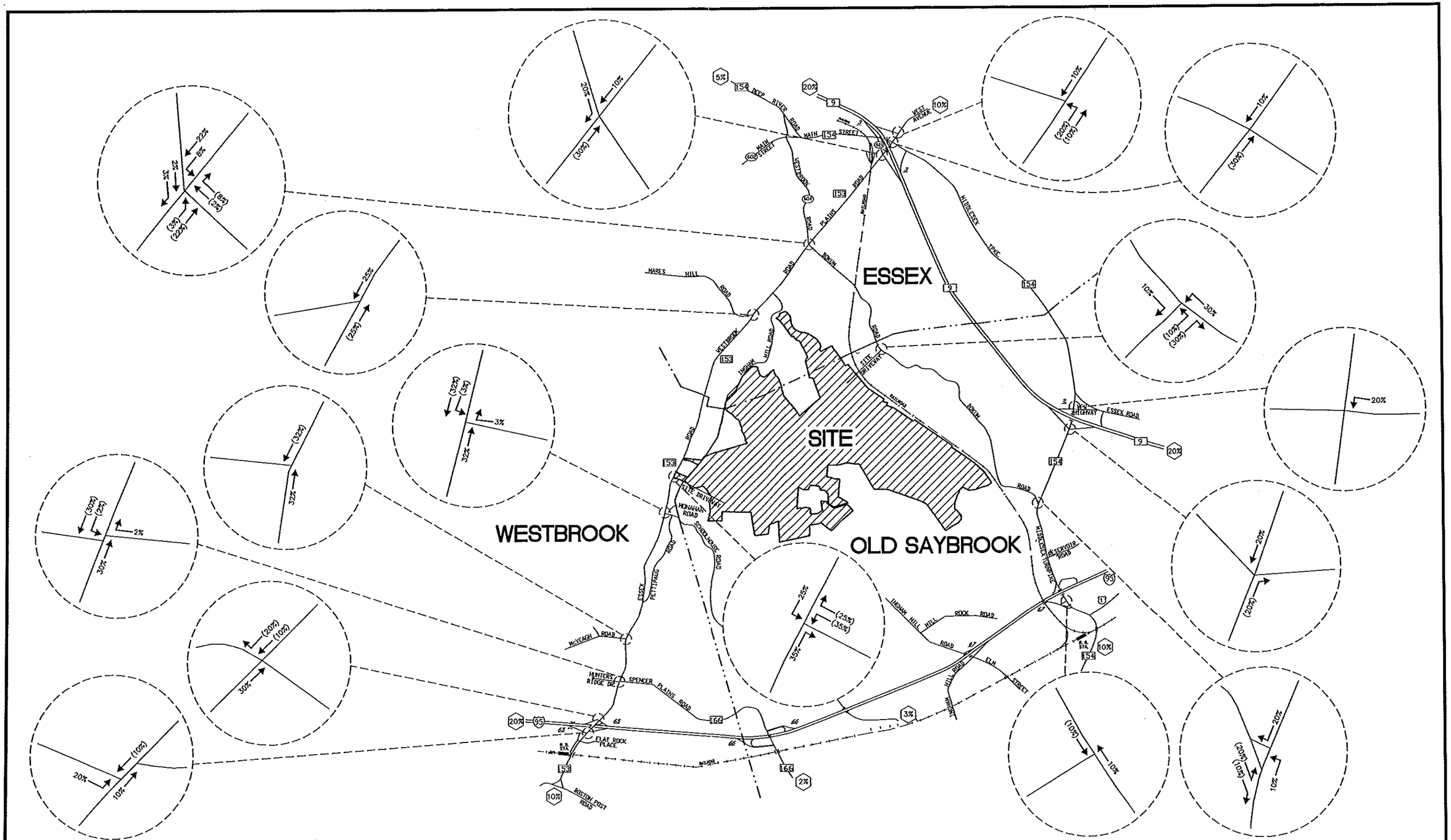
Trip distribution is the projected percentage of the site traffic oriented along specific directions and routes to arrive at and depart the site. The trip distribution of the development's traffic along the existing roadway network was based on current area population, journey to work data, an origin and destination study conducted in the area, and the proposed Preserve access.

Regionally, approximately 20 percent of the site traffic is expected to be oriented to and from the north along Route 9. I-95 is expected to carry about 20 percent of site traffic to and from the south, and 20 percent to and from the north. The more localized roadway system will contribute the remaining traffic, likely to be oriented as follows: 5 percent via Route 154 to and from the north of Route 9; 10 percent via Route 154 to and from the south of I-95; 10 percent via Route 153 to and from the north of Route 9; 10 percent via

Route 153 to and from the south of I-95, and 5 percent via Route 166 (Spencer Plains Road) and Schoolhouse Road south of I-95. The anticipated trip distribution is depicted in Figure 4. A traffic origin and destination (O&D) study was conducted to determine usage characteristics along Bokum and Schoolhouse Roads, as well as from a nearby neighborhood. A summary of that study is included in Appendix I.

Site Traffic Volumes

Trip generation defines the number of trips oriented to and from a particular land use. Typically, trip generation rates quantify a per unit relationship between the size of a specific land use and the number of vehicle trips generated per unit of time. The rates for residential land uses and golf course were taken from the Institute of Transportation Engineers (ITE) Trip Generation, 7th edition. The grill room in the clubhouse is for members only and will not be available for banquets, etc., or public use. No additional traffic is expected from its operation. Table 2 summarizes the trip generation of the various land uses for the peak hours.



ARCHITECTURE ENGINEERING PLANNING LANDSCAPE ARCHITECTURE LAND SURVEYING ENVIRONMENTAL SCIENCES ANALYTICAL SERVICES	355 Research Parkway Meriden, CT 06450 (203) 630-1406 (203) 630-2615 Fax	**TRIP DISTRIBUTION** THE PRESERVE ESSEX, OLD SAYBROOK AND WESTBROOK, CT	**LEGEND** PEAK HOUR VOLUMES REGIONAL DISTRIBUTION: (X) WEEKDAY MORNING: XXX WEEKDAY AFTERNOON: (XXX) SATURDAY MIDDAY: [XXX]

FIGURE 4

CAD File: TFL095501

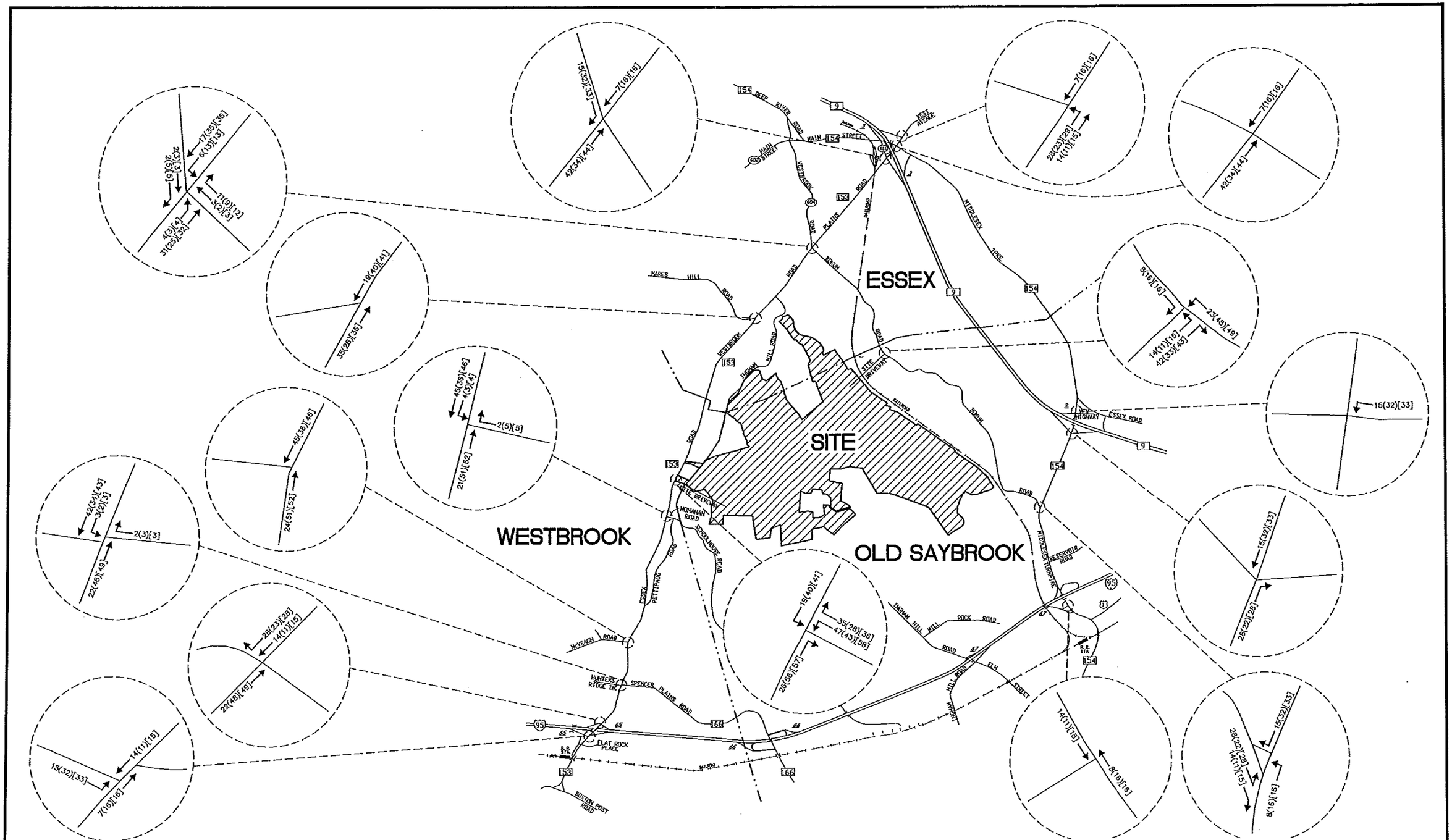
Table 2
Anticipated Peak Hour Trip Generation

	Weekday AM Peak Hour			Weekday PM Peak Hour			Saturday Midday Peak Hour		
	In	Out	Total	In	Out	Total	In	Out	Total
Estate Lots - (24 Single Family Units)*	5	14	19	16	9	25	12	11	23
¾ Acre Lots - (45 Single Family Units)*	8	26	34	29	17	46	23	20	43
Village Detached - (79 Single Family Units)*	15	45	60	51	30	81	42	35	77
Village Attached - (100 Town House Units)	9	43	52	40	20	60	39	33	72
Golf course	35	10	45	20	30	50	45	45	90
Total**	**72**	**138**	**210**	**156**	**106**	**262**	**161**	**144**	**305**

* Trips were generated based on the total number of single family units and broken out proportionately by lot type.

** Total volume assumes all golf course trips are external (none from The Preserve residents) and all land use peak hours are concurrent.

While it is unlikely that the various uses would peak during the same time period, and that all golf course traffic would originate off site, for the purpose of providing a conservative traffic analysis, the individual land use volumes were added directly to arrive at the "Total". It is much more likely that the various types of uses would peak at different times, with some overlap possible. In addition, many of the golf course users would be residents of the development, thus their traffic would not leave the "site". The site traffic volumes were assigned onto the adjacent roadway network, given the trip distribution shown in Figure 4. The site traffic generated is depicted in Figure 5.



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GENERATED TRAFFIC VOLUMES

THE PRESERVE
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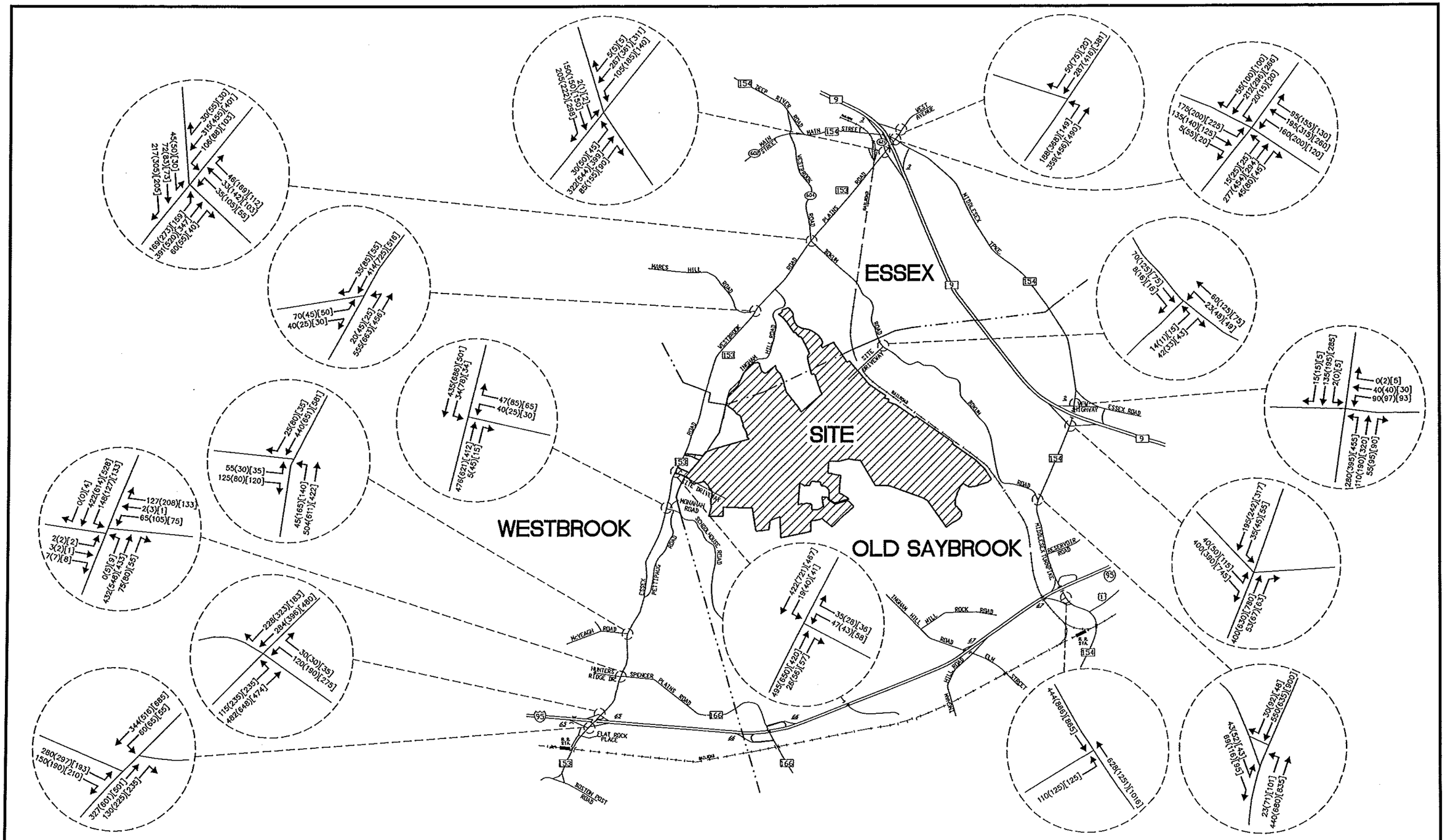
LEGEND
PEAK HOUR VOLUMES
WEEKDAY MORNING: XXX
WEEKDAY AFTERNOON: (XXX)
SATURDAY MIDDAY: [XXX]

FIGURE 5

CAD File: TFLOC95501

Full Development Traffic Volumes

The anticipated traffic volumes generated by the proposed development were superimposed onto the background traffic volumes to establish the full development traffic volumes as depicted in Figure 6.



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FULL DEVELOPMENT TRAFFIC VOLUMES

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LEGEND
PEAK HOUR VOLUMES
WEEKDAY MORNING: XXX
WEEKDAY AFTERNOON: (XXX)
SATURDAY MIDDAY: [XXX]

FIGURE 6

CAD File: TFL0095501

IV. ROADWAY ADEQUACY

Roadway adequacy determinations were performed for the existing, background, and full build traffic conditions to simulate the traffic impact of the proposed development on the adjacent roadway network. These roadway adequacy determinations were based on the methodology described in the Highway Capacity Manual (HCM), Millennium Edition, published by the Transportation Research Board.

Signalized Intersections

Signalized intersections are analyzed in terms of vehicle capacity and total delay. Capacity is the maximum rate of vehicle flow through an intersection given typical operating conditions. The number of vehicles traveling through an intersection is divided by the capacity of the intersection to determine an overall volume to capacity ratio (v/c). A v/c value under 1.00 indicates that the number of vehicles traveling through an intersection is less than capacity.

As stated in the HCM, level of service for signalized intersections is defined in terms of total delay, designated control delay. Control delay is the average delay per vehicle for an analysis period due to deceleration, stopping and acceleration at the traffic signal. The associated levels of service are summarized in Table 3.

Table 3
Signalized Intersection – Levels of Service

Level of Service	Control Delay (seconds/vehicle)
A	< 10.0
B	10.1-20.0
C	20.1-35.0
D	35.1-55.0
E	55.1-80.0
F	> 80.0

Level of service A represents the optimum level where most motorists arrive at the subject intersection during the green phase and thus experience virtually no delay. Conversely, level of service F indicates that motorists are delayed over a minute while traveling through the intersection, and implies a complete breakdown of some movement(s) at that location. Level of service D is usually considered the limit of acceptable motorist delay.

Unsignalized Intersections

Unsignalized intersections are evaluated in terms of average total (control) delay for the critical movement (usually the side street) as well as the capacity of that roadway approach. This analysis is based on the random arrival of vehicles, and the associated gaps generated by this random arrival within the traffic stream. The relationship between levels of service and average control delay are summarized in Table 4.

Table 4
Unsignalized Intersection - Levels of Service

Level of Service	Control Delay (seconds/vehicle)
A	< 10.0
B	10.1-15.0
C	15.1-25.0
D	25.1-35.0
E	35.1-50.0
F	> 50.0

This analysis does not consider in any great detail the gap creating effect that can occur with the presence of nearby traffic signals. If the traffic flow is not completely random, the analysis often yields overly conservative results. When level of service E or F results, investigation for signalization is often considered. However, when the main road volumes are high, the analyses can yield poor levels of service for the side street movements, even when their flow rate is low. There may be adequate capacity, just a long wait for the appropriate gap. If fact, signalization may not reduce side street delays significantly. Other than for all way stops, there is no overall intersection level of service definition for unsignalized intersections.

Intersection Analyses

The following intersections were analyzed as part of this study:

Route 153 (Town of Essex) at:

- West Avenue and Route 9 (Interchange #3) Northbound On Ramp (unsignalized)
- Route 154 (signalized)
- S.R. 621 and Route 9 (Interchange #3) Southbound On Ramp (unsignalized)
- Westbrook Road (S.R. 604) and Bokum Road (signalized)

- Mares Hill Road (unsignalized)

Route 153 (Town of Westbrook) at:

- Monahan Road/Schoolhouse Road (unsignalized)
- Preserve Driveway (unsignalized)
- McVeagh Road (unsignalized)
- Route 166 (Spencer Plains Rd.) and Hunters Ridge Rd. (signalized)
- Interstate 95 (Interchange #65) Southbound Ramps (signalized)
- Interstate 95 (interchange #65) Northbound Ramps (signalized)

Bokum Road at:

- Preserve Driveway (Town of Old Saybrook)

Route 154 (Town of Old Saybrook) at:

- Interstate 95 (Interchange #67) Northbound Off Ramp (unsignalized)
- Bokum Road (unsignalized)
- Route 9 (Interchange #2) Southbound Ramps (unsignalized)
- V.F.W. Highway and Route 9 (Interchange #2) Northbound On Ramp (unsignalized)

Table 5 shows the results of the analyses.

Table 5
Peak Hour Level of Service Summary

Intersection	Existing	Background	Build
Route 153 at:			
West Avenue and Route 9 NB On Ramp[3]	A (A) [A]	A (B) [A]	A (B) [A]
Route 154[2]	B (C) [C]	B (C) [C]	B (C) [C]
S.R. 621 and Route 9 SB On Ramp[1]	D (F) [F]	F (F) [F]	F (F) [F]
Bokum Road and S.R. 604 (Westbrook Rd)[2]	B (C) [B]	B (C) [B]	B (C) [B]
Mares Hill Road[1]	C (E) [C]	C (F) [C]	C (F) [D]
Monahan Road/ Schoolhouse Road[1]	C (C) [B]	C (D) [B]	C (D) [C]
Preserve Driveway[1]	N/A	N/A	C (F) [C]
McVeagh Road[1]	C (D) [C]	C (F) [C]	C (F) [D]
Route 166 (Spencer Plains Road) and Hunters Ridge Road[2]	B (C) [B]	C (C) [C]	C (D) [C]
I-95 SB Ramps[2]	A (A) [B]	A (B) [B]	A (B) [B]
I-95 NB ramps[2]	A (A) [A]	B (A) [A]	B (B) [A]
Bokum Road at Preserve Driveway[1]	N/A	N/A	A (A) [A]
Route 154 at:			
I-95 NB Off Ramp[1]	D (F) [F]	F (F) [F]	F (F) [F]
Bokum Road[4]	C (D) [F]	C (E) [F]	D (F) [F]
Route 9 SB Ramps[1]	B (C) [F]	C (C) [F]	C (C) [F]
V.F.W. Highway and Route 9 NB On Ramp[1]	C (F) [F]	E (F) [F]	E (F) [F]

Weekday morning Peak Hour = X; Weekday afternoon peak hour = (X);
Saturday midday Peak Hour = [X]
[1]Stop control, side street egress movement LOS
[2]Signalized, overall intersection LOS
[3]Unsignalized, left turn from West Ave.
[4]Unsignalized, left turn from Bokum Road

All of the signalized intersections within the study area are anticipated to operate at an overall LOS D or better. Some individual movements, however, may present problems

if not addressed. It is projected that the northbound Route 153 left turn movement at the intersection of **Route 153 at Bokum Road and S.R. 604 (Westbrook Road)** may operate at a less than desirable LOS E during the weekday afternoon peak hour under background conditions and LOS F under build volumes. Reallocation of a minimal amount of green time from the side street phase to the Route 153 left turn phase would provide an acceptable LOS C for this approach.

At the **Route 153 intersection with the I-95 NB ramps**, the left/through movement from the ramp is projected to operate at LOS E during the afternoon period under build conditions. This intersection operates under a complex traffic signalization scheme with the adjacent Flat Rock Road/Norris Avenue intersection. A minor traffic signal timing change would restore the movement to an acceptable level of service.

At the **Route 153 intersection with Route 166 (Spencer Plains Road) and Hunters Ridge Drive**, the northbound Route 154 through movement is projected to operate at LOS E during the afternoon period under build conditions. A minor traffic signal timing change would result in acceptable operations.

As illustrated in Table 5, critical movements at several of the unsignalized intersections are anticipated to operate at LOS F during at least one of the study peak periods for the background and/or build condition. These intersections include:

Route 153 at:

- S.R. 621 and Route 9 SB On Ramp
- Mares Hill Road

- McVeagh Road

Route 154 at:

- I-95 NB Off Ramp
- Bokum Road
- Route 9 SB Ramps
- V.F.W. Highway and Route 9 NB On Ramp

This is not an unusual situation along corridors where daily traffic volumes exceed 10,000 vehicles. The segment of Route 153 between the Bokum Road/Westbrook Road and Route 166 (Spencer Plains Road) signalized intersections is over three miles in length. While traffic signals are not a panacea, they can create gaps in the traffic stream that can be used by those at nearby locations for easier access. A comparison of the side street LOS and capacity for the background and full build conditions, the amount of Preserve traffic added through the intersection, and to the critical movement or approach, a preliminary signal warrant investigation, and accident experience review were conducted to determine potential improvements at these unsignalized intersections. The Preserve should be responsible for undertaking some of the improvements associated with its direct impact. Other improvements may be implemented over time by others as a normal occurrence, if the need develops.

It should be noted that a traffic control signal should not be installed unless there is a need, it will improve traffic operations, and it is warranted as described in the Manual on Uniform Traffic Control Devices, published by the Federal Highway Administration. Projections of volumes and traffic operational characteristics of side street flow at unsignalized intersections six years into the future are not typically used to make

decisions about signalization in the near term. The State Traffic Commission (STC) and Connecticut Department of Transportation will have ultimate say regarding traffic signalization. This project will be reviewed by the STC as a major traffic generator under Section 14-311 of the Connecticut General Statutes.

The critical approach (S.R. 621) at the intersection of **Route 153 at S.R. 621 and Route 9 Southbound On Ramp** is projected to operate at poor LOS during the background condition, without the addition of development traffic. Specifically, the S.R. 621 approach is projected to operate at LOS F during the weekday morning, weekday afternoon and Saturday midday peak hours. Review of the capacity analyses indicates that during the weekday afternoon and Saturday midday peak hours the approach is anticipated to operate well over capacity. Preliminary signal warrant investigation was conducted and it was determined that the intersection is anticipated to meet Warrant 2 "Four-Hour Vehicular Volume" during the background condition.

It is recommended that this intersection be monitored for signalization in the future. If signalized the S.R. 621 approach should be re-striped to provide a shared left/through lane and an exclusive right turn lane. With signalization this intersection is anticipated to operate at LOS B during the weekday morning, weekday afternoon, and Saturday midday peak hours. If signalized, it should be coordinated with the adjacent signalized intersection (Route 153 at Route 154), about 450 feet to the north.

The **Mares Hill Road** approach at **Route 153** is projected to operate at LOS F during the weekday afternoon under the background condition. However, the approach is anticipated to operate at only about 60 percent of capacity. The background LOS for the remaining study periods is LOS C.

Under the full build conditions, the projected Mares Hill Road LOS is F during the weekday afternoon peak hour with approach capacity utilization at about 65 percent. The weekday afternoon and Saturday midday peak hours are anticipated to operate at LOS C and D respectively. This intersection appears to meet Warrant 2 under background conditions, without The Preserve traffic volumes. It is recommended that this intersection be monitored for signalization in the future. Should this intersection be signalized it is anticipated to operate at LOS A during the weekday morning, weekday afternoon, and Saturday midday peak hours.

The **McVeagh Road** approach at **Route 153** is also projected to operate at LOS F during the weekday afternoon peak hour for the background condition. Similar to the Mares Hill Road approach, there is still excess capacity. The approach is projected to be at about 75 percent of capacity. The morning and Saturday midday peak hours are anticipated to operate at LOS C.

With the addition of The Preserve traffic volumes, the McVeagh Road approach is anticipated to operate at LOS C during the weekday morning peak hour, LOS F (about 85 percent capacity) during the weekday afternoon peak hour and LOS D during the

Saturday midday peak hour. The intersection does not appear to meet traffic signal Warrant #2 for either the background or full build conditions.

Capacity analyses for the McVeagh Road approach were conducted assuming a single lane. This approach is currently approximately 22 feet wide. It is recommended that the McVeagh Road approach be formally striped as a two-lane approach, separate left and right turn lanes, allowing right turning vehicles (which make up about 35 to 40 percent of the approach traffic) to by-pass vehicles waiting to turn left onto Route 153. A recent review of this intersection by the STC in conjunction with a school expansion made no improvement recommendations.

The LOS summarized in Table 5 for the intersection of **Route 154 at I-95 Northbound Off Ramp** represents the projected LOS for vehicles utilizing the off ramp left turn lane. This approach is projected to operate at poor LOS during the background condition, specifically, LOS F during all three peak periods. In addition, the off ramp left turn lane is projected to operate well over capacity for both the weekday afternoon and Saturday midday peak hours. The intersection meets traffic signal Warrant #2 under the background condition. It is recommended that this intersection be monitored for signalization. It should be noted that this is an existing capacity issue and that the proposed development is anticipated to add an insignificant amount of traffic to this intersection (through traffic only, no additional ramp traffic).

At the intersection of **Route 154 at Bokum Road**, the left turns from the Bokum Road approach for the background traffic volume condition are projected to operate at LOS E during the weekday afternoon and LOS F during the Saturday midday peak hours. The corresponding capacity utilization is at about 25-30 percent. The intersection does not meet traffic signal Warrant #2 under the background condition.

Given full build conditions, the left turns at the Bokum Road approach are anticipated to operate at LOS F during both the weekday afternoon and Saturday midday peak hours. However, the approach remains under capacity. The intersection is not anticipated to meet traffic signal Warrant 2 during the full build condition. Minimal by-pass width is currently provided along Route 154 northbound.

It is recommended that the Bokum Road approach geometry be modified by The Preserve. Currently Bokum Road as is split by a large triangular island it approaches Route 154, which allows two-way traffic along Bokum Road both north and south of the island. The Preserve project represents the opportunity to revise the Bokum Road approach to a more standard "T" type intersection. Should this improvement be implemented, the Bokum Road approach should provide two-lanes; separate left and right turn lanes. The opportunity exists for some landscaping improvements in the new "green" area.

The **Route 9 Southbound Off Ramp** approach to the intersection of **Route 154** under the background condition is projected to operate at LOS F, and over capacity, during

the Saturday midday peak hour. The remaining peak hours are anticipated to operate at LOS C. This intersection does not meet traffic signal Warrant #2 for the background condition. The intersection is anticipated to maintain the background LOS under the full build condition and is not anticipated to meet Warrant #2. The LOS and capacity issues are an existing condition. The Preserve development is anticipated to add Route 154 through traffic only at this intersection.

The V.F.W. Highway approach at the intersection of **Route 154 at V.F.W. Highway and Route 9 Northbound On Ramp,** during the background condition, is projected to operate at LOS E during the weekday morning peak hour and LOS F during the weekday afternoon and Saturday midday peak hours. During the weekday afternoon and Saturday peak hours, the V.F.W. Highway approach is projected to be over capacity. The intersection does not appear to meet traffic signal Warrant #2 under the background conditions. With the addition of The Preserve traffic, the critical V.F.W. Highway approach is projected to remain at LOS E during the weekday morning peak hour and LOS F (and over capacity) during the weekday afternoon and Saturday midday peak hours. It is recommended that the intersection be monitored for future signalization. With signalization, it is anticipated that this intersection will operate at LOS A, B and C during the weekday morning, weekday afternoon, and Saturday midday peak hours, respectively. Signalization at this location might create enough gaps in the Route 154 flow to aid operations at the Route 9 Southbound Ramps, just to the south.

Improvements at the intersection of **Route 153 at The Preserve access road** are also recommended, and include a by-pass lane along Route 153 southbound. Route 153 is approximately 30 feet wide adjacent to the site with a 12 foot wide travel lane and a 2 foot wide shoulder in the southbound direction. Route 153 would need to be widened by about 6 feet to provide the by-pass area. The site driveway approach is anticipated to operate at LOS F during the weekday afternoon peak hour if a single exit lane is provided. Although this approach is projected to only be at about 55 percent capacity during this peak hour, it is recommended that separate left and right turn lanes be provided to allow right turning vehicles to by-pass vehicles waiting to turn left.

Off-site roadway improvements, minor widening and flattening of the horizontal curve, are proposed for **Bokum Road at The Preserve** access road. Analyses indicate that a single lane (with stop control) at The Preserve access road approach to Bokum Road will be adequate to accommodate the exiting site traffic volumes.

V. CONCLUSIONS AND RECOMMENDATIONS

Overall, system capacity exists to accommodate site traffic volumes. However, some improvements will be necessary to accommodate site traffic while maintaining acceptable levels of service at specific locations. Potential traffic improvements to be implemented by The Preserve to mitigate projected impacts due to generated traffic volumes include the following:

- **Route 154 at Bokum Road** – Provide a by-pass lane for northbound Route 154 left turns. Modify the Bokum Road approach geometry to remove the large triangular island on Bokum Road, which allows two-way traffic along Bokum Road both north and south of the island, and provide a more standard "T" type intersection. Should this improvement be implemented, the Bokum Road approach should provide two-lanes; separate left and right turn lanes.

- **Route 153 at The Preserve** access road – Widen Route 153 to provide a southbound by-pass lane. Provide separate left and right turn lanes on The Preserve approach to Route 153. Install a stop sign. In order to maintain adequate sight distance looking to the left from the site driveway along Route 153, minor clearing of vegetation will be necessary.

- **Bokum Road at The Preserve access road.** Analyses indicate that a single lane at the site driveway approach to Bokum Road will be adequate to accommodate the exiting site traffic volumes. Geometric improvements, consisting of minor widening and horizontal curve flattening will enhance operations and provide adequate intersection sight distance

Several of the unsignalized study intersections were projected to have critical approaches operating at poor LOS, some over capacity, during the background condition (without The Preserve traffic). The following are suggestions for potential future consideration/implementation, independent of The Preserve:

- **Route 153 at S.R. 621 and Route 9 Southbound On Ramp** – It is recommended that this intersection be monitored for installation of a traffic signal. If signalized the eastbound S.R. 621 approach to Route 153 should be re-striped to provide a shared left/through lane and an exclusive right turn lane.

- **Route 153 at Mares Hill Road** – It is recommended that this intersection be monitored for signalization.

- **Route 153 at McVeagh Road** – It is recommended that the McVeagh Road approach, currently 22 feet wide, be formally striped for separate left and right turn lanes.

- **Route 154 at I-95 Northbound Off Ramp** – It is recommended that the intersection be monitored for installation of a traffic signal.

- **Route 154 at V.F.W. Highway and Route 9 Northbound On Ramp** – It is recommended that the intersection be monitored for installation of a traffic signal.

Three of the signalized study intersections were projected to have movements operating at poor LOS and/or over capacity, during the background condition (without The Preserve traffic). At the following intersections, minor traffic signal timing changes can be implemented, if the need develops: Route 153 at Bokum Road and Westbrook Road (SR604); Route 153 at Route 166 (Spencer Plains Road) and Hunters Ridge Drive; Route 153 at I-95 NB ramps.

Appendices III and IV incorporate volumes from potential projects (not as yet approved and/or submitted) on the adjacent Pianta parcel and along Flat Rock Place.

APPENDIX I

ORIGIN – DESTINATION STUDY

use of Schoolhouse Road by The Preserve traffic appeared unlikely. The Preserve traffic oriented towards I-95 would use either the full interchange (#65) at Route 153 in Westbrook, the partial interchange (#67) at Route 154, south of Bokum Road in Old Saybrook, or by connection from the Route 9 interchange with Route 154, north of Bokum Road. Westbrook Center lies about 2.5 miles to the west, near Route 153. Thus, the use of Schoolhouse Road from The Preserve for that destination has no merit.

This primary use of Schoolhouse Road by The Preserve traffic would be to reach the Old Saybrook shopping area along Route 1. Schoolhouse Road intersects Route 1 in an area where immediate land development attracting traffic is generally limited to small commercial uses. The more intense retail uses, Stop and Shop, Wal*Mart, etc., on Route 1 begin about a mile to the east, in the vicinity of Elm Street and Route 154. To reach the Old Saybrook retail area from The Preserve site using Schoolhouse Road one would leave The Preserve, travel about 0.3 miles south on Route 153 and turn onto Schoolhouse Road. One then travels about 2.9 miles along Schoolhouse Road to reach Route 1. From there, it is about another 1.5 miles to the retail area, a total trip length of about 4.7 miles. Driving this route takes about 9 minutes. Another option for those leaving The Preserve at Route 153 is to travel south to Route 166 (Spencer Plain Road), which leads to Route 1. This route is about 5.1 miles to the Old Saybrook business area, and takes about 9.5 minutes to traverse, although on better roadways.

Leaving The Preserve via Bokum Road, one would travel about 1.7 miles to reach Route 154, and another 1.7 miles to the retail area, a total trip length of about 3.4 miles. This route takes about 7 minutes to drive. Table 1 summarizes the travel distances and times from The Preserve to the Old Saybrook shopping area by the three routes.

Table 1
Travel from The Preserve to Old Saybrook Shopping Area

Travel Route	Distance	Travel Time
Route 153/Schoolhouse Road/Route 1	4.7 miles	9 min.
Route 153/Route 166 (Spencer Plains Rd.)/ Route 1	5.1 miles	9.5 min.
Bokum Road/Route 154/Route 1	3.4 miles	7 min.

Note: Travel external to site only

Those Preserve properties located near the Bokum Road access, the estate homes and to a great degree, the village units, would have no reason to utilize Schoolhouse

Road. The travel distance between Route 153 and Bokum Road through the Preserve site is about 2.5 miles. Those heading to the Old Saybrook shopping area via the Route 153 access will have to decide whether traveling over a secondary road (Schoolhouse) is worth the small savings in time and distance as compared to the Route 166 alternative.

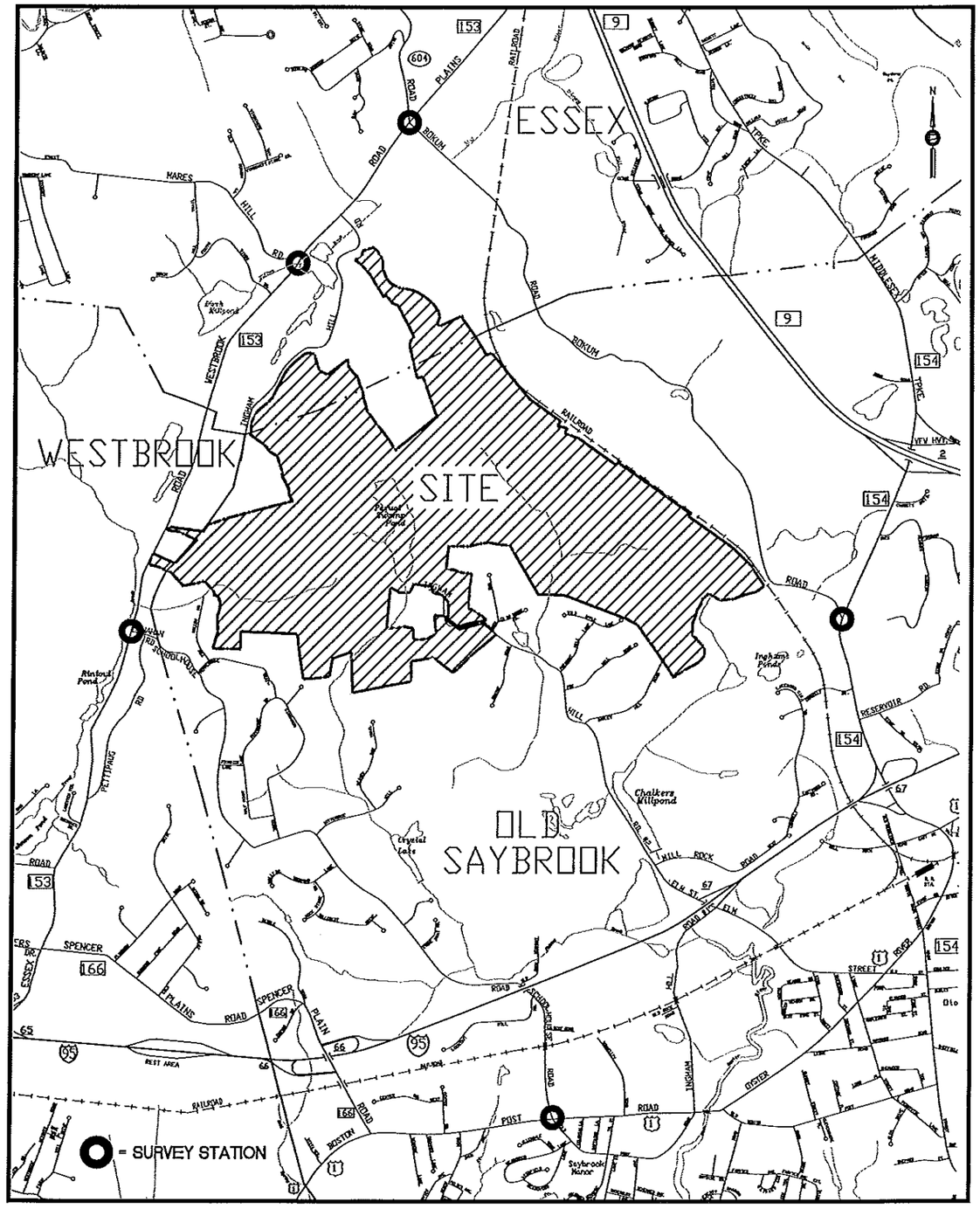
From a traffic capacity standpoint, none of the study area intersections were anticipated to experience overall capacity problems associated with The Preserve. Therefore, long delays should not become a deciding factor in choosing a travel route.

Origin/Destination Study

An origin/destination (O&D) study was performed to determine the usage on Schoolhouse and Bokum Roads. Sampling stations were established at each end of the subject street, Route 153 and Route 1 for Schoolhouse Road; and Route 153 and Route 154 for Bokum Road. In addition, a station was established at Mares Hill Road, to see what percentage of trips from that residential area utilize each street. See Figure OD. License plate numbers of passing vehicles were recorded on each street, at each location. The surveys were conducted for two hours each on a weekday afternoon, and late on a Saturday morning. By matching plates at each end of Bokum Road, for example, one can determine the proportion of "through" traffic. For the purpose of this study, a "through trip" is defined as a vehicle entering the road at one and found exiting at the other end. For example, a vehicle entering Bokum Road at Route 153 found to later exit at Route 154 constitutes a through trip. Table 2 shows the results of the O&D study, which indicates that a noteworthy portion of the trips on these roads are through.

Table 2
O&D Study Results

Traffic Entering	Total Trips		Through Trips		%Through Trips	
	PM	SAT	PM	SAT	PM	SAT
Bokum Road						
From Route 153	305	320	70	75	23	23
From Route 154	215	150	80	70	37	47
Schoolhouse Road						
From Route 153	115	80	45	30	39	38
From Route 1	275	210	35	30	13	14



Companies

ORIGIN/DESTINATION STUDY

THE PRESERVE

ESSEX, OLD SAYBROOK AND WESTBROOK, CT

APRIL 2004

FIG. OD

CAD File TLOC01C95501

The Mares Hill Road intersection was used to determine the usage of Bokum and Schoolhouse Roads by traffic from a nearby neighborhood. In a manner similar to the through traffic analysis, vehicles entering and exiting Mares Hill Road were traced to the Bokum Road and Schoolhouse Road intersections. Table 3 shows the results of that study task.

Table 3
Mares Hill Road – Trip Origins and Destinations

Travel Pattern	% Trips	
	PM	SAT
To/from Bokum Road	18	13
To/from Schoolhouse Road	4	6
To/from Rte 153 North*	49	54
To/from Rte 153 South**	29	27
Total	**100**	**100**

*Excludes Bokum trips
**Excludes Schoolhouse trips

About half the Mares Hill Road traffic was oriented to/from the north beyond Bokum Road. If one considers both Bokum Road and Schoolhouse Road as routes oriented to/from the south relative to Mares Hill Road, then the other half of the traffic is directed there. Looking at the overall trip distribution assumed for the Preserve, one comes up with comparable figures, 55% to/from the north and 45% to/from the south.

The usage of Schoolhouse Road by Mares Hill Road traffic provides an indication of the maximum potential Preserve traffic use of this route. Since The Preserve will have direct access on Bokum Road, Schoolhouse Road will have less traffic circulation value than from the Mares Hill Road area. The Preserve driveway on Route 153 was assumed to be utilized by 60% of site traffic and the Bokum Road site driveway by 40%. No Preserve traffic was previously assigned to Schoolhouse Road. As indicated, Schoolhouse Road is of limited travel benefit, its primary function would be as a way to reach the Route 1 shopping area. For most of The Preserve traffic, the Bokum Road route would be shorter and quicker. Given the Mares Hill Road usage of Schoolhouse Road in the 4-6% range, The Preserve usage should be much less. Even a 2-3% usage would only amount to about 60-90 daily trips. Table 4 shows the current daily traffic volumes on Bokum and Schoolhouse Roads, the projected increase associated with The Preserve, and the total.

Table 4
Daily Traffic Volumes

Location	Current Trips		Preserve Trips		Total Trips	
	Weekday	Sat.	Weekday	Sat.	Weekday	Sat.
Bokum Rd.						
North of site driveway	1875	1425	300	300	2175	1725
South of Site driveway	1875	1425	900	900	2775	2325
Schoolhouse Rd.[1]	2000	1775	60	90	2060	1865

[1] – vicinity of Kitteridge Hill

APPENDIX II

CAPACITY ANALYSES

(SEE SEPARATE VOLUME)

APPENDIX III

PIANTA PARCEL ANALYSES

PIANTA PARCEL TRAFFIC ANALYSIS

August 2004

Introduction

The purpose of this analysis is address the potential traffic impact of the development of the "Pianta" parcel. The parcel is located along Bokum Road, adjacent to the proposed Preserve access road. The assumed development, based on a conceptual site plan, for traffic analysis purposes, provides 35 "village" type detached units. Table 1 shows the expected peak period trip generation for the Pianta parcel

Table 1
Pianta Parcel - Generated Traffic Volumes

	AM Peak	PM Peak	SAT Peak
In	6	24	17
Out	21	11	16
Total	27	35	33

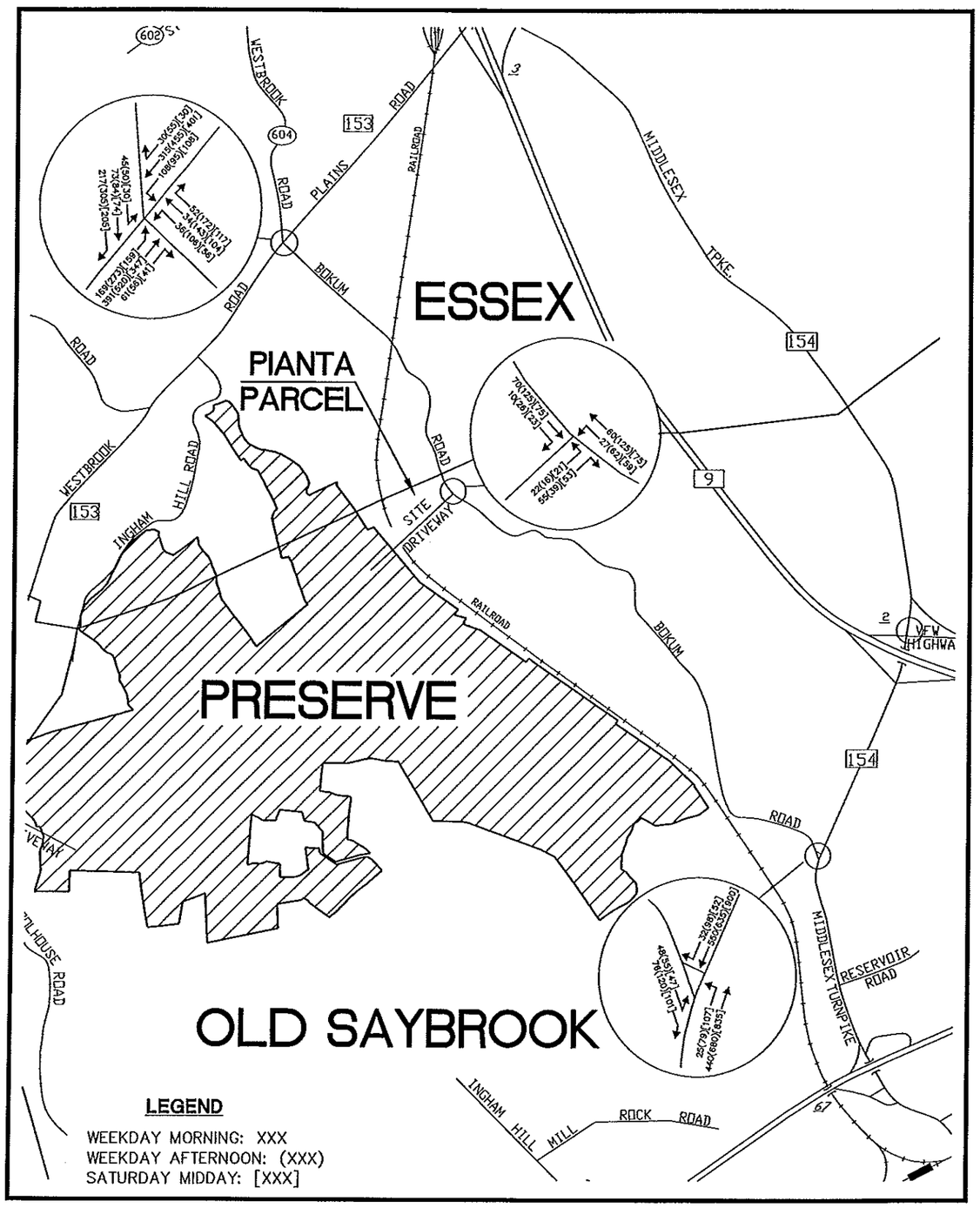
Given the location of the parcel, it was assumed that all Pianta traffic would use Bokum Road. The projected volumes were assigned to the adjacent roadway network, which included three intersections along Bokum Road: the Preserve access, Route 153 and Route 154. Beyond these points, the added traffic volumes are so minimal as to be inconsequential, and considered included in the background growth figures.

The Pianta traffic was added to The Preserve volumes and the three intersections reanalyzed under the new scenario. The attached figure shows the peak period traffic volumes with Pianta traffic. Table 2 summarizes the peak period levels of service at the three intersections for existing, background, The Preserve and added Pianta traffic volume scenarios.

Table 2
Peak Hour Level of Service Summary

Intersection	Existing	Background	Preserve	+ Pianta
Route 153 at Bokum Road and S.R. 604 (Westbrook Rd)[2]	B (C) [B]	B (C) [B]	B (C) [B]	B (C) [B]
Bokum Road at Preserve driveway[1]	N/A	N/A	A (A) [A]	A (B) [A]
Route 154 at Bokum Road[3]	C (D) [F]	C (E) [F]	D (F) [F]	D (F) [F]

Weekday morning Peak Hour = X; Weekday afternoon peak hour = (X); Saturday midday Peak Hour = [X]
[1]Stop control, side street egress movement LOS
[2]Signalized, overall intersection LOS
[3]Unsignalized, left turn from Bokum Road



BL Companies

PEAK HOUR TRAFFIC VOLUMES
PIANTA PARCEL ADDED
ESSEX, OLD SAYBROOK AND WESTBROOK, CT

SCHEMATIC, NOT TO SCALE

CAD File: TFLOC95501

Route 154 at Bokum Road

TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	*FMG*	Intersection	*ROUTE 154 AT BOKUM ROAD*
Agency/Co.	*BL COMPANIES (#01C955B)*	Jurisdiction	*OLD SAYBROOK, CT*
Date Performed	*8/13/2004*	Analysis Year	*FULL BUILD W/PIANTA*
Analysis Time Period	*AM PK (154@BOKAMBUPI)*		

Project Description	*THE PRESERVE*
East/West Street: *BOKUM ROAD*	North/South Street: *ROUTE 154*
Intersection Orientation: *North-South*	Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	*25*	*440*	*0*	*0*	*550*	*32*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR	*27*	*488*	*0*	*0*	*611*	*35*
Percent Heavy Vehicles	*2*	--	--	*0*	--	--
Median Type	*Undivided*					
RT Channelized			*0*			*0*
Lanes	*0*	*1*	*0*	*0*	*1*	*0*
Configuration	*LT*					*TR*
Upstream Signal		*0*			*0*	

Minor Street	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	*0*	*0*	*0*	*48*	*0*	*76*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR	*0*	*0*	*0*	*53*	*0*	*84*
Percent Heavy Vehicles	*0*	*0*	*0*	*2*	*0*	*0*
Percent Grade (%)		*0*			*0*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*0*			*0*
Lanes	*0*	*0*	*0*	*1*	*0*	*1*
Configuration				*L*		*R*

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	*LT*					*L*		*R*
v (vph)	*27*					*53*		*84*
C (m) (vph)	*939*					*207*		*487*
v/c	*0.03*					*0.26*		*0.17*
95% queue length	*0.09*					*0.98*		*0.62*
Control Delay	*8.9*					*28.3*		*13.9*
LOS	*A*					*D*		*B*
Approach Delay	--	--				*19.5*		
Approach LOS	--	--				*C*		

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TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	*FMG*	Intersection	*ROUTE 154 AT BOKUM ROAD*
Agency/Co.	*BL COMPANIES (#01C955B)*	Jurisdiction	*OLD SAYBROOK, CT*
Date Performed	*8/13/2004*	Analysis Year	*FULL BUILD W/PIANTA*
Analysis Time Period	*PM PK (154@BOKPMBUPI)*		

Project Description *THE PRESERVE*

East/West Street: *BOKUM ROAD*	North/South Street: *ROUTE 154*
Intersection Orientation: *North-South*	Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	*79*	*680*	*0*	*0*	*635*	*98*
Peak-Hour Factor, PHF	*0.97*	*0.97*	*0.97*	*0.97*	*0.97*	*0.97*
Hourly Flow Rate, HFR	*81*	*701*	*0*	*0*	*654*	*101*
Percent Heavy Vehicles	*2*	--	--	*0*	--	--
Median Type	*Undivided*					
RT Channelized			*0*			*0*
Lanes	*0*	*1*	*0*	*0*	*1*	*0*
Configuration	*LT*					*TR*
Upstream Signal		*0*			*0*	

Minor Street	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	*0*	*0*	*0*	*55*	*0*	*120*
Peak-Hour Factor, PHF	*0.97*	*0.97*	*0.97*	*0.97*	*0.97*	*0.97*
Hourly Flow Rate, HFR	*0*	*0*	*0*	*56*	*0*	*123*
Percent Heavy Vehicles	*0*	*0*	*0*	*2*	*0*	*0*
Percent Grade (%)		*0*			*0*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*0*			*0*
Lanes	*0*	*0*	*0*	*1*	*0*	*1*
Configuration				*L*		*R*

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	*LT*					*L*		*R*
v (vph)	*81*					*56*		*123*
C (m) (vph)	*855*					*110*		*440*
v/c	*0.09*					*0.51*		*0.28*
95% queue length	*0.31*					*2.32*		*1.13*
Control Delay	*9.7*					*67.6*		*16.3*
LOS	*A*					*F*		*C*
Approach Delay	--	--				*32.4*		
Approach LOS	--	--				*D*		

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TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	*FMG*	Intersection	*ROUTE 154 AT BOKUM ROAD*
Agency/Co.	*BL COMPANIES (#01C955B)*	Jurisdiction	*OLD SAYBROOK, CT*
Date Performed	*8/13/2004*	Analysis Year	*FULL BUILD W/PIANTA*
Analysis Time Period	*SAT PK (154@BOKSATBUPI)*		

Project Description *THE PRESERVE*

East/West Street: *BOKUM ROAD* | North/South Street: *ROUTE 154*

Intersection Orientation: *North-South* | Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	*107*	*835*	*0*	*0*	*900*	*52*
Peak-Hour Factor, PHF	*0.93*	*0.93*	*0.93*	*0.93*	*0.93*	*0.93*
Hourly Flow Rate, HFR	*115*	*897*	*0*	*0*	*967*	*55*
Percent Heavy Vehicles	*2*	--	--	*0*	--	--
Median Type	*Undivided*					
RT Channelized			*0*			*0*
Lanes	*0*	*1*	*0*	*0*	*1*	*0*
Configuration	*LT*					*TR*
Upstream Signal		*0*			*0*	

Minor Street	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	*0*	*0*	*0*	*47*	*0*	*101*
Peak-Hour Factor, PHF	*0.93*	*0.93*	*0.93*	*0.93*	*0.93*	*0.93*
Hourly Flow Rate, HFR	*0*	*0*	*0*	*50*	*0*	*108*
Percent Heavy Vehicles	*0*	*0*	*0*	*2*	*0*	*0*
Percent Grade (%)		*0*			*0*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*0*			*0*
Lanes	*0*	*0*	*0*	*1*	*0*	*1*
Configuration				*L*		*R*

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	*LT*					*L*		*R*
v (vph)	*115*					*50*		*108*
C (m) (vph)	*679*					*46*		*300*
v/c	*0.17*					*1.09*		*0.36*
95% queue length	*0.61*					*4.59*		*1.58*
Control Delay	*11.4*					*299.5*		*23.6*
LOS	*B*					*F*		*C*
Approach Delay	--	--				*110.9*		
Approach LOS	--	--				*F*		

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Bokum Road at The Preserve access road

TWO-WAY STOP CONTROL SUMMARY

General Information

Analyst	*FMG*
Agency/Co.	*BL COMPANIES (#01C955B)*
Date Performed	*8/13/2004*
Analysis Time Period	*AM PK (BOC@SITEAMBUPI)*

Site Information

Intersection	*BOCUM ROAD AT SITE DRIVEWAY*
Jurisdiction	*OLD SAYBROOK*
Analysis Year	*FULL BUILD W/PIANTA*

Project Description *THE PRESERVE*

East/West Street: *BOCUM ROAD* | North/South Street: *SITE DRIVEWAY*

Intersection Orientation: *East-West* | Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	*0*	*70*	*10*	*27*	*60*	*0*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR	*0*	*77*	*11*	*30*	*66*	*0*
Percent Heavy Vehicles	*0*	--	--	*2*	--	--
Median Type	*Undivided*					
RT Channelized			*0*			*0*
Lanes	*0*	*1*	*0*	*0*	*1*	*0*
Configuration			*TR*	*LT*		
Upstream Signal		*0*			*0*	

Minor Street	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	*22*	*0*	*55*	*0*	*0*	*0*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR	*24*	*0*	*61*	*0*	*0*	*0*
Percent Heavy Vehicles	*2*	*0*	*2*	*0*	*0*	*0*
Percent Grade (%)		*0*			*0*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*0*			*0*
Lanes	*0*	*0*	*0*	*0*	*0*	*0*
Configuration		*LR*				

Delay, Queue Length, and Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration		*LT*		*LR*				
v (vph)		*30*		*85*				
C (m) (vph)		*1508*		*906*				
v/c		*0.02*		*0.09*				
95% queue length		*0.06*		*0.31*				
Control Delay		*7.4*		*9.4*				
LOS		*A*		*A*				
Approach Delay	--	--		*9.4*				
Approach LOS	--	--		*A*				

TWO-WAY STOP CONTROL SUMMARY

General Information

Analyst	*FMG*
Agency/Co.	*BL COMPANIES (#01C955B)*
Date Performed	*8/13/2004*
Analysis Time Period	*PM PK (BOC@SITEPMBUPI)*

Site Information

Intersection	*BOCUM ROAD AT SITE DRIVEWAY*
Jurisdiction	*OLD SAYBROOK*
Analysis Year	*FULL BUILD W/PIANTA*

Project Description *THE PRESERVE*

East/West Street: *BOCUM ROAD* | North/South Street: *SITE DRIVEWAY*

Intersection Orientation: *East-West* | Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	*0*	*125*	*26*	*62*	*125*	*0*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR	*0*	*138*	*28*	*68*	*138*	*0*
Percent Heavy Vehicles	*0*	--	--	*2*	--	--
Median Type	*Undivided*					
RT Channelized			*0*			*0*
Lanes	*0*	*1*	*0*	*0*	*1*	*0*
Configuration			*TR*	*LT*		
Upstream Signal		*0*			*0*	

Minor Street	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	*16*	*0*	*39*	*0*	*0*	*0*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR	*17*	*0*	*43*	*0*	*0*	*0*
Percent Heavy Vehicles	*2*	*0*	*2*	*0*	*0*	*0*
Percent Grade (%)		*0*			*0*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*0*			*0*
Lanes	*0*	*0*	*0*	*0*	*0*	*0*
Configuration		*LR*				

Delay, Queue Length, and Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration		*LT*		*LR*				
v (vph)		*68*		*60*				
C (m) (vph)		*1412*		*763*				
v/c		*0.05*		*0.08*				
95% queue length		*0.15*		*0.26*				
Control Delay		*7.7*		*10.1*				
LOS		*A*		*B*				
Approach Delay	--	--		*10.1*				
Approach LOS	--	--		*B*				

TWO-WAY STOP CONTROL SUMMARY

General Information

Analyst	*FMG*
Agency/Co.	*BL COMPANIES (#01C955B)*
Date Performed	*8/13/2004*
Analysis Time Period	*SAT PK (BOC@SITESATBUPI)*

Site Information

Intersection	*BOCUM ROAD AT SITE DRIVEWAY*
Jurisdiction	*OLD SAYBROOK*
Analysis Year	*FULL BUILD W/PIANTA*

Project Description *THE PRESERVE*

East/West Street: *BOCUM ROAD* | North/South Street: *SITE DRIVEWAY*

Intersection Orientation: *East-West* | Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	*0*	*75*	*23*	*59*	*75*	*0*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR	*0*	*83*	*25*	*65*	*83*	*0*
Percent Heavy Vehicles	*0*	--	--	*2*	--	--
Median Type	*Undivided*					
RT Channelized			*0*			*0*
Lanes	*0*	*1*	*0*	*0*	*1*	*0*
Configuration			*TR*	*LT*		
Upstream Signal		*0*			*0*	

Minor Street	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	*21*	*0*	*53*	*0*	*0*	*0*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR	*23*	*0*	*58*	*0*	*0*	*0*
Percent Heavy Vehicles	*2*	*0*	*2*	*0*	*0*	*0*
Percent Grade (%)		*0*			*0*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*0*			*0*
Lanes	*0*	*0*	*0*	*0*	*0*	*0*
Configuration		*LR*				

Delay, Queue Length, and Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration		*LT*		*LR*				
v (vph)		*65*		*81*				
C (m) (vph)		*1483*		*847*				
v/c		*0.04*		*0.10*				
95% queue length		*0.14*		*0.32*				
Control Delay		*7.5*		*9.7*				
LOS		*A*		*A*				
Approach Delay	--	--		*9.7*				
Approach LOS	--	--		*A*				

Route 153 at Bokum Road and
S.R. 604 (Westbrook Road)

SHORT REPORT

General Information		Site Information	
Analyst		Intersection	RTE 153/WESTBROOK/BOCUM
Agency or Co.	BL COMPANIES (01C955B)	Area Type	All other areas
Date Performed	8/13/2004	Jurisdiction	ESSEX
Time Period	AM PK (BOCAMBUPI)	Analysis Year	FULL BUILD W/PIANTA

Volume and Timing Input

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Num. of Lanes	0	1	1	1	1	0	1	1	0	1	1	0
Lane group		LT	R	L	TR		L	TR		L	TR	
Volume (vph)	45	73	217	36	34	52	169	391	61	108	315	30
% Heavy veh	2	2	2	2	2	2	2	2	2	2	2	2
PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Actuated (P/A)	A	A	A	A	A	A	A	A	A	A	A	A
Startup lost time		2.0	2.0	2.0	2.0		2.0	2.0		2.0	2.0	
Ext. eff. green		2.0	2.0	2.0	2.0		2.0	2.0		2.0	2.0	
Arrival type		3	3	3	3		3	3		3	3	
Unit Extension		3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Ped/Bike/RTOR Volume	0		0	0		5	0		0	0		0
Lane Width		11.0	11.0	11.0	12.0		11.0	12.0		11.0	12.0	
Parking/Grade/Parking	N	0	N	N	0	N	N	0	N	N	0	N
Parking/hr												
Bus stops/hr		0	0	0	0		0	0		0	0	
Unit Extension		3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	

Phasing	EW Perm	02	03	04	Excl. Left	NS Perm	07	08
Timing	G = 25.0	G =	G =	G =	G = 6.0	G = 28.0	G =	G =
	Y = 4	Y =	Y =	Y =	Y = 4	Y = 5	Y =	Y =

Duration of Analysis (hrs) = 0.25 | Cycle Length C = 72.0

Lane Group Capacity, Control Delay, and LOS Determination

	EB			WB			NB			SB		
Adj. flow rate		126	231	38	86		180	481		115	367	
Lane group cap.		551	532	383	590		424	710		338	715	
v/c ratio		0.23	0.43	0.10	0.15		0.42	0.68		0.34	0.51	
Green ratio		0.35	0.35	0.35	0.35		0.53	0.39		0.53	0.39	
Unif. delay d1		16.7	18.1	15.9	16.2		10.1	18.3		10.7	16.8	
Delay factor k		0.11	0.11	0.11	0.11		0.11	0.25		0.11	0.12	
Increm. delay d2		0.2	0.6	0.1	0.1		0.7	2.6		0.6	0.6	
PF factor		1.000	1.000	1.000	1.000		1.000	1.000		1.000	1.000	
Control delay		16.9	18.6	16.0	16.3		10.7	20.9		11.3	17.4	
Lane group LOS		B	B	B	B		B	C		B	B	
Apprch. delay		18.0		16.2			18.1			16.0		
Approach LOS		B		B			B			B		
Intersec. delay		17.3		Intersection LOS						B		

SHORT REPORT

General Information		Site Information	
Analyst		Intersection	RTE 153/WESTBROOK/BOCUM
Agency or Co.	BL COMPANIES (01C955B)	Area Type	All other areas
Date Performed	8/13/2004	Jurisdiction	ESSEX
Time Period	PM PK (BOCPMBUWIPI)	Analysis Year	FULL BUILD W/IMP/PIANTA

Volume and Timing Input

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Num. of Lanes	0	1	1	1	1	0	1	1	0	1	1	0
Lane group		LT	R	L	TR		L	TR		L	TR	
Volume (vph)	50	84	305	108	143	172	273	520	56	95	455	55
% Heavy veh	2	2	2	2	2	2	2	2	2	2	2	2
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
Actuated (P/A)	A	A	A	A	A	A	A	A	A	A	A	A
Startup lost time		2.0	2.0	2.0	2.0		2.0	2.0		2.0	2.0	
Ext. eff. green		2.0	2.0	2.0	2.0		2.0	2.0		2.0	2.0	
Arrival type		3	3	3	3		3	3		3	3	
Unit Extension		3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Ped/Bike/RTOR Volume	0		0	0		5	0		0	0		0
Lane Width		11.0	11.0	11.0	12.0		11.0	12.0		11.0	12.0	
Parking/Grade/Parking	N	0	N	N	0	N	N	0	N	N	0	N
Parking/hr												
Bus stops/hr		0	0	0	0		0	0		0	0	
Unit Extension		3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	

Phasing	EW Perm	02	03	04	Excl. Left	NS Perm	07	08
Timing	G = 23.0	G =	G =	G =	G = 8.0	G = 28.0	G =	G =
	Y = 4	Y =	Y =	Y =	Y = 4	Y = 5	Y =	Y =

Duration of Analysis (hrs) = 0.25 | Cycle Length C = 72.0

Lane Group Capacity, Control Delay, and LOS Determination

	EB			WB			NB			SB		
Adj. flow rate		145	332	117	337		297	626		103	555	
Lane group cap.		417	489	326	547		331	714		290	713	
v/c ratio		0.35	0.68	0.36	0.62		0.90	0.88		0.36	0.78	
Green ratio		0.32	0.32	0.32	0.32		0.56	0.39		0.56	0.39	
Unif. delay d1		18.8	21.3	18.8	20.8		12.8	20.4		11.9	19.3	
Delay factor k		0.11	0.25	0.11	0.20		0.42	0.40		0.11	0.33	
Increm. delay d2		0.5	3.8	0.7	2.1		25.7	11.9		0.8	5.5	
PF factor		1.000	1.000	1.000	1.000		1.000	1.000		1.000	1.000	
Control delay		19.3	25.1	19.5	22.9		38.4	32.3		12.7	24.8	
Lane group LOS		B	C	B	C		D	C		B	C	
Apprch. delay		23.3		22.0			34.3			22.9		
Approach LOS		C		C			C			C		
Intersec. delay		27.0		Intersection LOS						C		

SHORT REPORT

General Information		Site Information	
Analyst	FMG	Intersection	RTE 153/WESTBROOK/BOCUM
Agency or Co.	BL COMPANIES (01C955B)	Area Type	All other areas
Date Performed	8/13/2004	Jurisdiction	ESSEX
Time Period	SAT PK (BOCSATBUPI)	Analysis Year	FULL BUILD W/PIANTA

Volume and Timing Input

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Num. of Lanes	0	1	1	1	1	0	1	1	0	1	1	0
Lane group		LT	R	L	TR		L	TR		L	TR	
Volume (vph)	30	74	205	56	104	117	159	347	41	108	401	30
% Heavy veh	2	2	2	2	2	2	2	2	2	2	2	2
PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Actuated (P/A)	A	A	A	A	A	A	A	A	A	A	A	A
Startup lost time		2.0	2.0	2.0	2.0		2.0	2.0		2.0	2.0	
Ext. eff. green		2.0	2.0	2.0	2.0		2.0	2.0		2.0	2.0	
Arrival type		3	3	3	3		3	3		3	3	
Unit Extension		3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Ped/Bike/RTOR Volume	0		0	0		5	0		0	0		0
Lane Width		11.0	11.0	11.0	12.0		11.0	12.0		11.0	12.0	
Parking/Grade/Parking	N	0	N	N	0	N	N	0	N	N	0	N
Parking/hr												
Bus stops/hr		0	0	0	0		0	0		0	0	
Unit Extension		3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	

Phasing	EW Perm	02	03	04	Excl. Left	NS Perm	07	08
Timing	G = 25.0	G =	G =	G =	G = 6.0	G = 28.0	G =	G =
	Y = 4	Y =	Y =	Y =	Y = 4	Y = 5	Y =	Y =

Duration of Analysis (hrs) = 0.25 — Cycle Length C = 72.0

Lane Group Capacity, Control Delay, and LOS Determination

	EB			WB			NB			SB		
Adj. flow rate		112	220	60	232		171	417		116	463	
Lane group cap.		555	532	397	597		351	713		386	717	
v/c ratio		0.20	0.41	0.15	0.39		0.49	0.58		0.30	0.65	
Green ratio		0.35	0.35	0.35	0.35		0.53	0.39		0.53	0.39	
Unif. delay d1		16.5	17.9	16.2	17.7		10.9	17.4		10.0	18.0	
Delay factor k		0.11	0.11	0.11	0.11		0.11	0.18		0.11	0.22	
Increm. delay d2		0.2	0.5	0.2	0.4		1.1	1.2		0.4	2.0	
PF factor		1.000	1.000	1.000	1.000		1.000	1.000		1.000	1.000	
Control delay		16.7	18.4	16.4	18.2		12.0	18.6		10.4	20.0-	
Lane group LOS		B	B	B	B		B	B		B	B	
Apprch. delay		17.8		17.8			16.7			18.1		
Approach LOS		B		B			B			B		
Intersec. delay		17.5		Intersection LOS						B		

APPENDIX IV

FLAT ROCK PLACE DEVELOPMENT ANALYSES

FLAT ROCK PLACE DEVELOPMENT
TRAFFIC ANALYSIS

August 2004

The purpose of this analysis is to incorporate the added traffic associated with two potential developments along Flat Rock Place, a supermarket and an automobile dealership, into the traffic analysis for The Preserve. Typically, only traffic volumes expected from approved projects are included as "background" when preparing traffic impact studies. However, the two projects along Flat Rock Place were working their way through the approval process in Westbrook at the time of preparation of this report. Since they were not approved, they were not considered in the main body of the study. This supplementary analysis was prepared to provide a more comprehensive look at potential future traffic conditions in The Preserve area, in the event the two Flat Rock Place projects are approved. Table 1 FR shows the expected peak period trip generation for the two projects.

Table 1 FR
Flat Rock Place Developments- Generated Traffic Volumes

	AM Peak			PM Peak			SAT Peak		
	In	Out	Total	In	Out	Total	In	Out	Total
Auto Dealership[1]	62	22	84	39	61	100	61	69	130
Supermarket[2]	100	70	170	320	320	640	320	320	640
Total	162	92	254	359	381	740	381	389	770

[1] – Ref: Bubaris Assoc., May 2004
[2] – Ref: BL Companies, July 2004, including pass-by

The volumes projected for those two developments were assigned to the adjacent roadway network, which included several intersections along Route 153. Figure 5 FR shows the peak hour volumes from the Flat Rock Place projects added to the street network. Beyond these points, the added traffic volumes are so minimal as to be inconsequential, and considered included in the background growth figures.

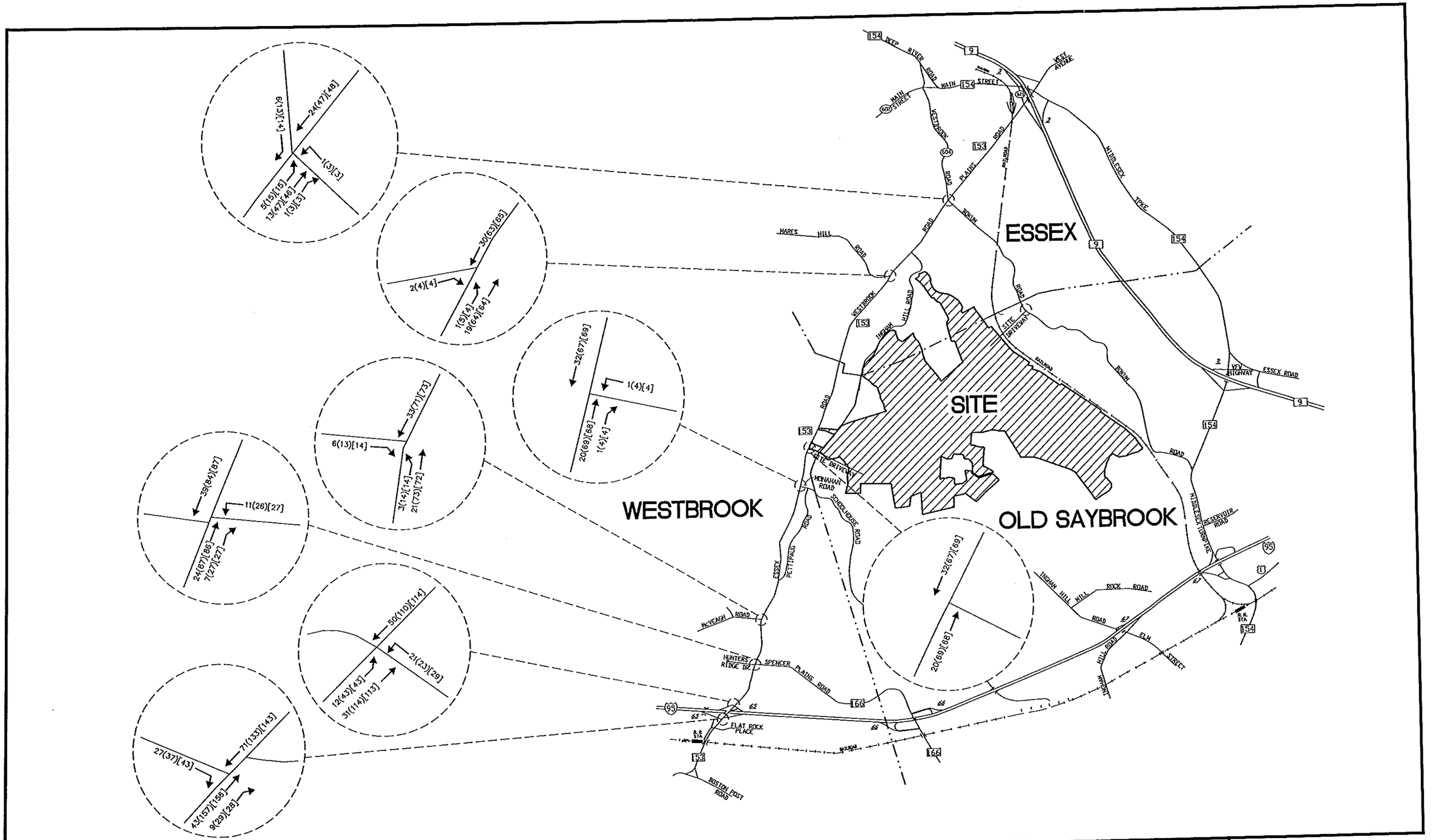
The Flat Rock Place projects traffic was added to The Preserve volumes (plus Pianta parcel) and the intersections reanalyzed under the new scenario. Figure 6 FR shows the resulting peak period traffic volumes with Flat Rock Place traffic. Table 2 FR summarizes the peak period levels of service at the study intersections for the various traffic volume scenarios.

Table 2 FR
Peak Hour Level of Service Summary

Intersection	Existing	Background	Preserve + Pianta	+ Flat Rock Pl.
Route 153 at Bokum Road and S.R. 604 (Westbrook Rd)[2]	B (C) [B]	B (C) [B]	B (C) [B][3]	B (C) [B][3]
Route 153 at Preserve driveway[1]	N/A	N/A	C (F) [D][3]	D (F) [E][3]
Route 153 at Mares Hill Road[1]	C (E) [C]	C (F) [C]	C (F) [D]	D (F) [D]
Route 153 at Schoolhouse Road[1]	C (C) [B]	C (D) [B]	C (D) [C]	C (E) [C]
Route 153 at McVeagh Road[1]	C (D) [C]	C (F) [C]	C (F) [D]	D (F) [E]
Route 153 at Spencer Plains Road and Hunters Ridge Drive[2]	B (C) [B]	C (C) [C]	C (C) [C][3]	C (C) [C][3]
Route 153 at I-95 SB ramps[2]	A (A) [B]	A (B) [B]	A (B) [B]	A (B) [C]
Route 153 at I-93 NB ramps[2]	A (A) [A]	B (A) [A]	B (B) [A]	B (B) [A][4]

Weekday morning Peak Hour = X; Weekday afternoon peak hour = (X); Saturday midday Peak Hour = [X]
[1]Stop control, critical side street egress movement LOS
[2]Signalized, overall intersection LOS
[3]With proposed Preserve mitigation
[4]With proposed Supermarket mitigation

As is the case for background volumes and with added Preserve traffic, several of the unsignalized intersections show poor levels of service for the side street exiting movements during one or more of the peak periods. While adequate capacity is normally available, traffic must wait for gaps in the main roadway stream, in order to make the traffic maneuver. This is not unusual along corridors where daily traffic volumes exceed 10,000 vehicles per day. At some point in time, signalization may be warranted and needed at one or more of those locations, which in turn, may create gaps for egress from other locations. Such decisions are not normally made based on traffic projections for projects not approved and several years into the future.



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FLAT ROCK PL. GENERATED TRAFFIC VOLUMES

THE PRESERVE

ESSEX, OLD SAYBROOK AND WESTBROOK, CT

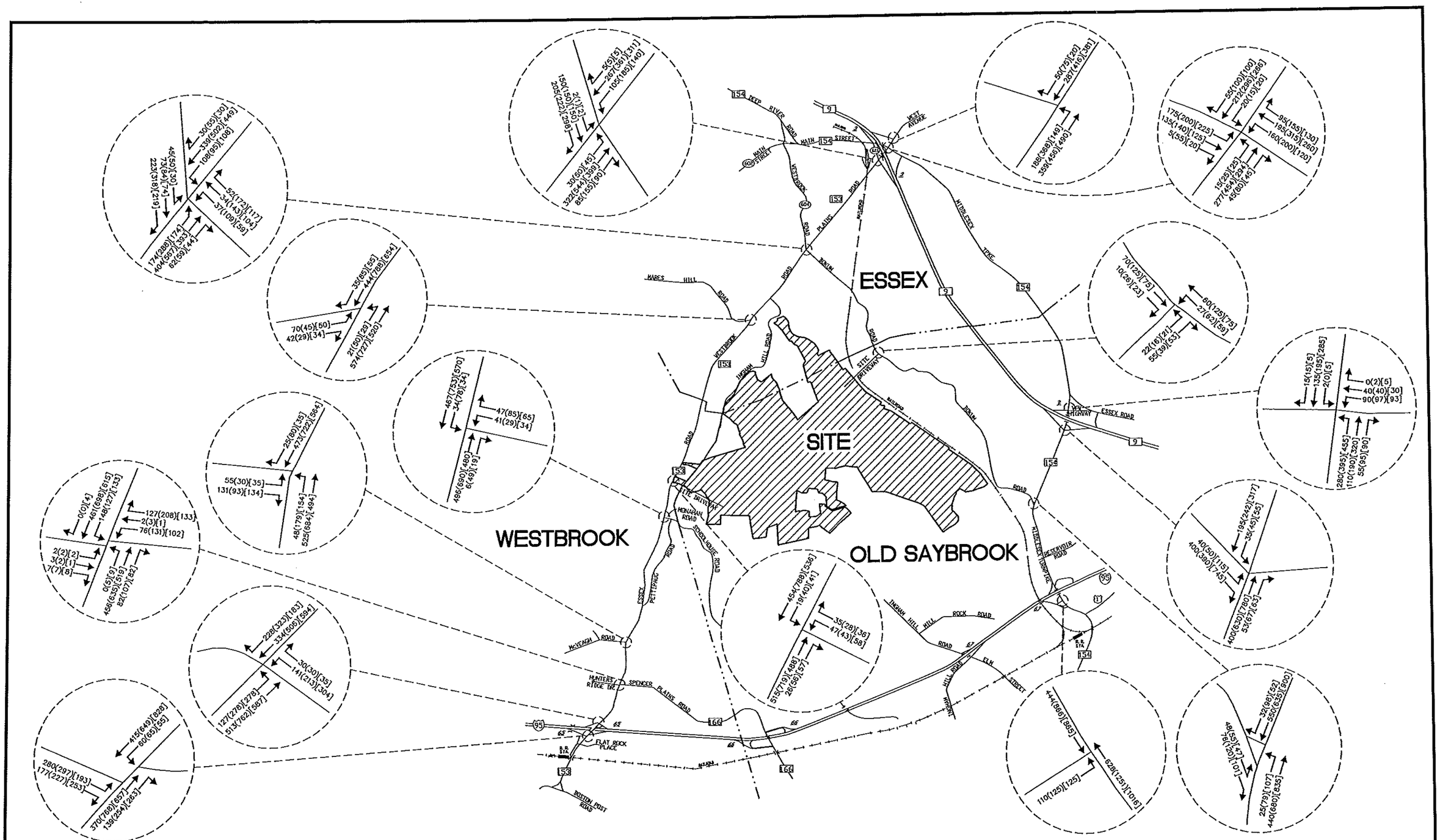
LEGEND

PEAK HOUR VOLUMES

WEEKDAY MORNING: XXX
WEEKDAY AFTERNOON: (XXX)
SATURDAY MIDDAY: [XXX]

FIGURE 5 FR

CAD File: TFL0C95501



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BUILD TRAFFIC VOLUMES W/FLAT ROCK PLACE

THE PRESERVE

ESSEX, OLD SAYBROOK AND WESTBROOK, CT

LEGEND

PEAK HOUR VOLUMES

WEEKDAY MORNING: XXX
WEEKDAY AFTERNOON: (XXX)
SATURDAY MIDDAY: [XXX]

FIGURE 6 FR

CAD File: TFLOC95501

Route 153 at Bokum Road and S.R. 604 (Westbrook Road)

SHORT REPORT

General Information		Site Information	
Analyst	FMG	Intersection	RTE 153/WESTBROOK/BOCUM
Agency or Co.	BL COMPANIES (01C955)	Area Type	All other areas
Date Performed	8/31/2004	Jurisdiction	ESSEX
Time Period	AM PK (BOCAMBUPIFR)	Analysis Year	FULL BUILD + FLAT ROCK

Volume and Timing Input

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Num. of Lanes	0	1	1	1	1	0	1	1	0	1	1	0
Lane group		LT	R	L	TR		L	TR		L	TR	
Volume (vph)	45	73	223	37	34	52	174	404	62	108	339	30
% Heavy veh	2	2	2	2	2	2	2	2	2	2	2	2
PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Actuated (P/A)	A	A	A	A	A	A	A	A	A	A	A	A
Startup lost time		2.0	2.0	2.0	2.0		2.0	2.0		2.0	2.0	
Ext. eff. green		2.0	2.0	2.0	2.0		2.0	2.0		2.0	2.0	
Arrival type		3	3	3	3		3	3		3	3	
Unit Extension		3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Ped/Bike/RTOR Volume	0		0	0		5	0		0	0		0
Lane Width		11.0	11.0	11.0	12.0		11.0	12.0		11.0	12.0	
Parking/Grade/Parking	N	0	N	N	0	N	N	0	N	N	0	N
Parking/hr												
Bus stops/hr		0	0	0	0		0	0		0	0	
Unit Extension		3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	

Phasing	EW Perm	02	03	04	Excl. Left	NS Perm	07	08
Timing	G = 25.0	G =	G =	G =	G = 6.0	G = 28.0	G =	G =
	Y = 4	Y =	Y =	Y =	Y = 4	Y = 5	Y =	Y =

Duration of Analysis (hrs) = 0.25 — Cycle Length C = 72.0

Lane Group Capacity, Control Delay, and LOS Determination

	EB			WB			NB			SB		
Adj. flow rate		126	237	39	86		185	496		115	393	
Lane group cap.		551	532	383	590		404	710		327	716	
v/c ratio		0.23	0.45	0.10	0.15		0.46	0.70		0.35	0.55	
Green ratio		0.35	0.35	0.35	0.35		0.53	0.39		0.53	0.39	
Unif. delay d1		16.7	18.1	15.9	16.2		10.3	18.5		10.8	17.1	
Delay factor k		0.11	0.11	0.11	0.11		0.11	0.26		0.11	0.15	
Increm. delay d2		0.2	0.6	0.1	0.1		0.8	3.0		0.7	0.9	
PF factor		1.000	1.000	1.000	1.000		1.000	1.000		1.000	1.000	
Control delay		16.9	18.7	16.0	16.3		11.1	21.5		11.5	18.0	
Lane group LOS		B	B	B	B		B	C		B	B	
Apprch. delay		18.1			16.2			18.7			16.5	
Approach LOS		B			B			B			B	
Intersec. delay		17.7			Intersection LOS						B	

SHORT REPORT

General Information		Site Information	
Analyst	FMG	Intersection	RTE 153/WESTBROOK/BOCUM
Agency or Co.	BL COMPANIES (01C955)	Area Type	All other areas
Date Performed	8/31/2004	Jurisdiction	ESSEX
Time Period	PM PK (BOCPMBUWIPIFR)	Analysis Year	BUILD W/IMP+ FLAT ROCK

Volume and Timing Input

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Num. of Lanes	0	1	1	1	1	0	1	1	0	1	1	0
Lane group		LT	R	L	TR		L	TR		L	TR	
Volume (vph)	50	84	318	109	143	172	288	567	59	95	502	55
% Heavy veh	2	2	2	2	2	2	2	2	2	2	2	2
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
Actuated (P/A)	A	A	A	A	A	A	A	A	A	A	A	A
Startup lost time		2.0	2.0	2.0	2.0		2.0	2.0		2.0	2.0	
Ext. eff. green		2.0	2.0	2.0	2.0		2.0	2.0		2.0	2.0	
Arrival type		3	3	3	3		3	3		3	3	
Unit Extension		3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Ped/Bike/RTOR Volume	0		0	0		5	0		0	0		0
Lane Width		11.0	11.0	11.0	12.0		11.0	12.0		11.0	12.0	
Parking/Grade/Parking	N	0	N	N	0	N	N	0	N	N	0	N
Parking/hr												
Bus stops/hr		0	0	0	0		0	0		0	0	
Unit Extension		3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	

Phasing	EW Perm	02	03	04	Excl. Left	NS Perm	07	08
Timing	G = 21.0	G =	G =	G =	G = 8.0	G = 30.0	G =	G =
	Y = 4	Y =	Y =	Y =	Y = 4	Y = 5	Y =	Y =
Duration of Analysis (hrs) = 0.25						Cycle Length C = 72.0		

Lane Group Capacity, Control Delay, and LOS Determination

	EB			WB			NB			SB		
Adj. flow rate		145	346	118	337		313	680		103	606	
Lane group cap.		351	447	287	499		328	765		290	765	
v/c ratio		0.41	0.77	0.41	0.68		0.95	0.89		0.36	0.79	
Green ratio		0.29	0.29	0.29	0.29		0.58	0.42		0.58	0.42	
Unif. delay d1		20.5	23.3	20.5	22.5		14.1	19.5		11.8	18.3	
Delay factor k		0.11	0.32	0.11	0.25		0.46	0.41		0.11	0.34	
Increm. delay d2		0.8	8.3	1.0	3.6		37.6	12.5		0.8	5.7	
PF factor		1.000	1.000	1.000	1.000		1.000	1.000		1.000	1.000	
Control delay		21.3	31.6	21.5	26.1		51.7	31.9		12.5	24.0	
Lane group LOS		C	C	C	C		D	C		B	C	
Apprch. delay	28.6			24.9			38.1			22.3		
Approach LOS	C			C			D			C		
Intersec. delay	29.9			Intersection LOS						C		

SHORT REPORT

General Information		Site Information	
Analyst	FMG	Intersection	RTE
Agency or Co.	BL COMPANIES (01C955)		153/WESTBROOK/BOCUM
Date Performed	8/31/2004	Area Type	All other areas
Time Period	SAT PK (BOCSATBUPIFR)	Jurisdiction	ESSEX
		Analysis Year	FULL BUILD + FLAT ROCK

Volume and Timing Input

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Num. of Lanes	0	1	1	1	1	0	1	1	0	1	1	0
Lane group		LT	R	L	TR		L	TR		L	TR	
Volume (vph)	30	74	219	59	104	117	174	393	44	108	449	30
% Heavy veh	2	2	2	2	2	2	2	2	2	2	2	2
PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Actuated (P/A)	A	A	A	A	A	A	A	A	A	A	A	A
Startup lost time		2.0	2.0	2.0	2.0		2.0	2.0		2.0	2.0	
Ext. eff. green		2.0	2.0	2.0	2.0		2.0	2.0		2.0	2.0	
Arrival type		3	3	3	3		3	3		3	3	
Unit Extension		3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Ped/Bike/RTOR Volume	0		0	0		5	0		0	0		0
Lane Width		11.0	11.0	11.0	12.0		11.0	12.0		11.0	12.0	
Parking/Grade/Parking	N	0	N	N	0	N	N	0	N	N	0	N
Parking/hr												
Bus stops/hr		0	0	0	0		0	0		0	0	
Unit Extension		3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	

Phasing	EW Perm	02	03	04	Excl. Left	NS Perm	07	08
Timing	G = 25.0	G =	G =	G =	G = 6.0	G = 28.0	G =	G =
	Y = 4	Y =	Y =	Y =	Y = 4	Y = 5	Y =	Y =
Duration of Analysis (hrs) = 0.25						Cycle Length C = 72.0		

Lane Group Capacity, Control Delay, and LOS Determination

	EB			WB			NB			SB		
Adj. flow rate		112	235	63	232		187	470		116	515	
Lane group cap.		555	532	397	597		313	714		346	718	
v/c ratio		0.20	0.44	0.16	0.39		0.60	0.66		0.34	0.72	
Green ratio		0.35	0.35	0.35	0.35		0.53	0.39		0.53	0.39	
Unif. delay d1		16.5	18.1	16.2	17.7		11.8	18.1		10.5	18.6	
Delay factor k		0.11	0.11	0.11	0.11		0.19	0.23		0.11	0.28	
Increm. delay d2		0.2	0.6	0.2	0.4		3.1	2.2		0.6	3.5	
PF factor		1.000	1.000	1.000	1.000		1.000	1.000		1.000	1.000	
Control delay		16.7	18.7	16.4	18.2		14.9	20.3		11.1	22.1	
Lane group LOS		B	B	B	B		B	C		B	C	
Apprch. delay	18.1			17.8			18.8			20.1		
Approach LOS	B			B			B			C		
Intersec. delay	18.9			Intersection LOS						B		

Route 153 at The Preserve access road

TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	FMG	Intersection	ROUTE 153 AT SITE DRIVEWAY
Agency/Co.	BL COMPANIES	Jurisdiction	WESTBROOK
Date Performed	8/31/2004	Analysis Year	BUILD W/IMPROVEMENTS
Analysis Time Period	AM PK (153@SITEAMBUFR)		

Project Description	THE PRESERVE (#01C955) + FLAT ROCK PROJECTS		
East/West Street:	SITE DRIVEWAY	North/South Street:	ROUTE 153
Intersection Orientation:	North-South	Study Period (hrs):	0.25

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	0	515	26	19	454	0
Peak-Hour Factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Hourly Flow Rate, HFR	0	572	28	21	504	0
Percent Heavy Vehicles	0	--	--	2	--	--
Median Type	Undivided					
RT Channelized			0			0
Lanes	0	1	0	0	1	0
Configuration			TR	LT		
Upstream Signal		0			0	

Minor Street	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	47	0	35	0	0	0
Peak-Hour Factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Hourly Flow Rate, HFR	52	0	38	0	0	0
Percent Heavy Vehicles	2	0	2	0	0	0
Percent Grade (%)	0			0		
Flared Approach		N			N	
Storage		0			0	
RT Channelized			0			0
Lanes	1	0	1	0	0	0
Configuration	L		R			

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration		LT	L		R			
v (vph)		21	52		38			
C (m) (vph)		977	220		510			
v/c		0.02	0.24		0.07			
95% queue length		0.07	0.89		0.24			
Control Delay		8.8	26.4		12.6			
LOS		A	D		B			
Approach Delay	--	--	20.6					
Approach LOS	--	--	C					

>

TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	*FMG*	Intersection	*ROUTE 153 AT SITE DRIVEWAY*
Agency/Co.	*BL COMPANIES*	Jurisdiction	*WESTBROOK*
Date Performed	*8/31/2004*	Analysis Year	*BUILD W/IMPROVEMENTS*
Analysis Time Period	*PM PK (153@SITEPMBUFR)*		

Project Description *THE PRESERVE (#01C955) + FLAT ROCK PROJECTS*

East/West Street: *SITE DRIVEWAY*	North/South Street: *ROUTE 153*
Intersection Orientation: *North-South*	Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	*0*	*719*	*56*	*40*	*788*	*0*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR	*0*	*798*	*62*	*44*	*875*	*0*
Percent Heavy Vehicles	*0*	--	--	*2*	--	--
Median Type	*Undivided*					
RT Channelized			*0*			*0*
Lanes	*0*	*1*	*0*	*0*	*1*	*0*
Configuration			*TR*	*LT*		
Upstream Signal		*0*			*0*	

Minor Street	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	*43*	*0*	*28*	*0*	*0*	*0*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR	*47*	*0*	*31*	*0*	*0*	*0*
Percent Heavy Vehicles	*2*	*0*	*2*	*0*	*0*	*0*
Percent Grade (%)	*0*			*0*		
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*0*			*0*
Lanes	*1*	*0*	*1*	*0*	*0*	*0*
Configuration	*L*		*R*			

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration		*LT*	*L*		*R*			
v (vph)		*44*	*47*		*31*			
C (m) (vph)		*781*	*84*		*370*			
v/c		*0.06*	*0.56*		*0.08*			
95% queue length		*0.18*	*2.48*		*0.27*			
Control Delay		*9.9*	*92.3*		*15.6*			
LOS		*A*	*F*		*C*			
Approach Delay	--	--	*61.8*					
Approach LOS	--	--	*F*					

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TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	*FMG*	Intersection	*ROUTE 153 AT SITE DRIVEWAY*
Agency/Co.	*BL COMPANIES*	Jurisdiction	*WESTBROOK*
Date Performed	*5/13/2004*	Analysis Year	*BUILD W/IMPROVEMENTS*
Analysis Time Period	*SAT PK (153@SITESATBUFR)*		

Project Description	*THE PRESERVE (#01C955) + FLAT ROCK PROJECTS*
East/West Street: *SITE DRIVEWAY*	North/South Street: *ROUTE 153*
Intersection Orientation: *North-South*	Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	*0*	*488*	*57*	*41*	*536*	*0*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR	*0*	*542*	*63*	*45*	*595*	*0*
Percent Heavy Vehicles	*0*	--	--	*2*	--	--
Median Type	*Undivided*					
RT Channelized			*0*			*0*
Lanes	*0*	*1*	*0*	*0*	*1*	*0*
Configuration			*TR*	*LT*		
Upstream Signal		*0*			*0*	

Minor Street	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	*58*	*0*	*36*	*0*	*0*	*0*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR	*64*	*0*	*40*	*0*	*0*	*0*
Percent Heavy Vehicles	*2*	*0*	*2*	*0*	*0*	*0*
Percent Grade (%)		*0*			*0*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*0*			*0*
Lanes	*1*	*0*	*1*	*0*	*0*	*0*
Configuration	*L*		*R*			

Delay, Queue Length, and Level of Service

	NB	SB	Westbound			Eastbound		
Approach								
Movement	1	4	7	8	9	10	11	12
Lane Configuration		*LT*	*L*		*R*			
v (vph)		*45*	*64*		*40*			
C (m) (vph)		*973*	*179*		*518*			
v/c		*0.05*	*0.36*		*0.08*			
95% queue length		*0.15*	*1.51*		*0.25*			
Control Delay		*8.9*	*35.9*		*12.5*			
LOS		*A*	*E*		*B*			
Approach Delay	--	--	*26.9*					
Approach LOS	--	--	*D*					

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TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	*FMG*	Intersection	*ROUTE 153/MARES HILL*
Agency/Co.	*BL Companies (#01C955)*	Jurisdiction	*ESSEX*
Date Performed	*8/31/2004*	Analysis Year	*FULL BUILD*
Analysis Time Period	*AM PK (MAREAMBUFR)*		
Project Description	*THE PRESERVE + FLAT ROCK*		
East/West Street:	*MARES HILL RD*	North/South Street:	*ROUTE 153*
Intersection Orientation:	*North-South*	Study Period (hrs):	*0.25*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	*21*	*574*	*0*	*0*	*444*	*35*
Peak-Hour Factor, PHF	*0.95*	*0.95*	*0.95*	*0.95*	*0.95*	*0.95*
Hourly Flow Rate, HFR	*22*	*604*	*0*	*0*	*467*	*36*
Percent Heavy Vehicles	*2*	--	--	*0*	--	--
Median Type	*Undivided*					
RT Channelized			*0*			*0*
Lanes	*0*	*1*	*0*	*0*	*1*	*0*
Configuration	*LT*					*TR*
Upstream Signal		*0*			*0*	

Minor Street	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	*0*	*0*	*0*	*70*	*0*	*42*
Peak-Hour Factor, PHF	*0.95*	*0.95*	*0.95*	*0.95*	*0.95*	*0.95*
Hourly Flow Rate, HFR	*0*	*0*	*0*	*73*	*0*	*44*
Percent Heavy Vehicles	*0*	*0*	*0*	*2*	*0*	*2*
Percent Grade (%)		*0*			*0*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*0*			*0*
Lanes	*0*	*0*	*0*	*0*	*0*	*0*
Configuration					*LR*	

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	*LT*						*LR*	
v (vph)	*22*						*117*	
C (m) (vph)	*1061*						*286*	
v/c	*0.02*						*0.41*	
95% queue length	*0.06*						*1.91*	
Control Delay	*8.5*						*26.0*	
LOS	*A*						*D*	
Approach Delay	--	--					*26.0*	
Approach LOS	--	--					*D*	

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TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	*FMG*	Intersection	*ROUTE 153/MARES HILL*
Agency/Co.	*BL Companies (#01C955)*	Jurisdiction	*ESSEX*
Date Performed	*8/31/2004*	Analysis Year	*FULL BUILD*
Analysis Time Period	*PM PK (MAREPMBUFR)*		
Project Description	*THE PRESERVE + FLAT ROCK*		
East/West Street:	*MARES HILL RD*	North/South Street:	*ROUTE 153*
Intersection Orientation:	*North-South*	Study Period (hrs):	*0.25*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	*50*	*727*	*0*	*0*	*788*	*85*
Peak-Hour Factor, PHF	*0.88*	*0.88*	*0.88*	*0.88*	*0.88*	*0.88*
Hourly Flow Rate, HFR	*56*	*826*	*0*	*0*	*895*	*96*
Percent Heavy Vehicles	*2*	--	--	*0*	--	--
Median Type	*Undivided*					
RT Channelized			*0*			*0*
Lanes	*0*	*1*	*0*	*0*	*1*	*0*
Configuration	*LT*					*TR*
Upstream Signal		*0*			*0*	

Minor Street	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	*0*	*0*	*0*	*45*	*0*	*29*
Peak-Hour Factor, PHF	*0.88*	*0.88*	*0.88*	*0.88*	*0.88*	*0.88*
Hourly Flow Rate, HFR	*0*	*0*	*0*	*51*	*0*	*32*
Percent Heavy Vehicles	*0*	*0*	*0*	*2*	*0*	*2*
Percent Grade (%)		*0*			*0*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*0*			*0*
Lanes	*0*	*0*	*0*	*0*	*0*	*0*
Configuration					*LR*	

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	*LT*						*LR*	
v (vph)	*56*						*83*	
C (m) (vph)	*698*						*103*	
v/c	*0.08*						*0.81*	
95% queue length	*0.26*						*4.47*	
Control Delay	*10.6*						*117.0*	
LOS	*B*						*F*	
Approach Delay	--	--				*117.0*		
Approach LOS	--	--				*F*		

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TWO-WAY STOP CONTROL SUMMARY

General Information

Analyst	*FMG*
Agency/Co.	*BL Companies (#01C955)*
Date Performed	*8/31/2004*
Analysis Time Period	*SAT PK (MARESABUFR)*

Site Information

Intersection	*ROUTE 153/MARES HILL*
Jurisdiction	*ESSEX*
Analysis Year	*FULL BUILD*

Project Description *THE PRESERVE + FLAT ROCK*

East/West Street: *MARES HILL RD*

North/South Street: *ROUTE 153*

Intersection Orientation: *North-South*

Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	*29*	*520*	*0*	*0*	*581*	*55*
Peak-Hour Factor, PHF	*0.88*	*0.88*	*0.88*	*0.88*	*0.88*	*0.88*
Hourly Flow Rate, HFR	*32*	*590*	*0*	*0*	*660*	*62*
Percent Heavy Vehicles	*2*	--	--	*0*	--	--
Median Type	*Undivided*					
RT Channelized			*0*			*0*
Lanes	*0*	*1*	*0*	*0*	*1*	*0*
Configuration	*LT*					*TR*
Upstream Signal		*0*			*0*	

Minor Street	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	*0*	*0*	*0*	*50*	*0*	*34*
Peak-Hour Factor, PHF	*0.88*	*0.88*	*0.88*	*0.88*	*0.88*	*0.88*
Hourly Flow Rate, HFR	*0*	*0*	*0*	*56*	*0*	*38*
Percent Heavy Vehicles	*0*	*0*	*0*	*2*	*0*	*2*
Percent Grade (%)		*0*			*0*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*0*			*0*
Lanes	*0*	*0*	*0*	*0*	*0*	*0*
Configuration					*LR*	

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	*LT*						*LR*	
v (vph)	*32*						*94*	
C (m) (vph)	*880*						*217*	
v/c	*0.04*						*0.43*	
95% queue length	*0.11*						*2.03*	
Control Delay	*9.2*						*33.7*	
LOS	*A*						*D*	
Approach Delay	--	--					*33.7*	
Approach LOS	--	--					*D*	

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Route 153 at Monahan Road/ Schoolhouse Road

TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	*FMG*	Intersection	*ROUTE 153/MONAHAN/SCHOOL*
Agency/Co.	*BL Companies (#01C955)*	Jurisdiction	*WESTBROOK*
Date Performed	*8/31/2004*	Analysis Year	*FULL BUILD*
Analysis Time Period			

Project Description	*THE PRESERVE + FLAT ROCK*
East/West Street: *MONAHAN/SCHOOLHOUSE*	North/South Street: *ROUTE 153*
Intersection Orientation: *North-South*	Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	*0*	*495*	*6*	*34*	*467*	*0*
Peak-Hour Factor, PHF	*0.87*	*0.87*	*0.87*	*0.87*	*0.87*	*0.87*
Hourly Flow Rate, HFR	*0*	*568*	*6*	*39*	*536*	*0*
Percent Heavy Vehicles	*2*	--	--	*2*	--	--
Median Type	*Undivided*					
RT Channelized			*0*			*0*
Lanes	*0*	*1*	*0*	*0*	*1*	*0*
Configuration			*TR*	*LT*		
Upstream Signal		*0*			*0*	

Minor Street	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	*41*	*0*	*47*	*0*	*0*	*0*
Peak-Hour Factor, PHF	*0.87*	*0.87*	*0.87*	*0.87*	*0.87*	*0.87*
Hourly Flow Rate, HFR	*47*	*0*	*54*	*0*	*0*	*0*
Percent Heavy Vehicles	*2*	*0*	*2*	*2*	*0*	*2*
Percent Grade (%)		*0*			*0*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*0*			*0*
Lanes	*0*	*0*	*0*	*0*	*0*	*0*
Configuration		*LR*				

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration		*LT*		*LR*				
v (vph)		*39*		*101*				
C (m) (vph)		*999*		*299*				
v/c		*0.04*		*0.34*				
95% queue length		*0.12*		*1.45*				
Control Delay		*8.7*		*23.1*				
LOS		*A*		*C*				
Approach Delay	--	--		*23.1*				
Approach LOS	--	--		*C*				

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TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst		Intersection	ROUTE 153/MONAHAN/SCHOOL
Agency/Co.	BL Companies (#01C955)	Jurisdiction	WESTBROOK
Date Performed	8/31/2004	Analysis Year	FULL BUILD
Analysis Time Period	PM PK (MONPMBUFR)		

Project Description	THE PRESERVE + FLAT ROCK
East/West Street:	MONAHAN/SCHOOLHOUSE
North/South Street:	ROUTE 153
Intersection Orientation:	North-South
Study Period (hrs):	0.25

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	0	690	49	78	753	0
Peak-Hour Factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91
Hourly Flow Rate, HFR	0	758	53	85	827	0
Percent Heavy Vehicles	2	--	--	2	--	--
Median Type	Undivided					
RT Channelized			0			0
Lanes	0	1	0	0	1	0
Configuration			TR	LT		
Upstream Signal		0			0	

Minor Street	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	29	0	85	0	0	0
Peak-Hour Factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91
Hourly Flow Rate, HFR	31	0	93	0	0	0
Percent Heavy Vehicles	2	0	2	2	0	2
Percent Grade (%)		0			0	
Flared Approach		N			N	
Storage		0			0	
RT Channelized			0			0
Lanes	0	0	0	0	0	0
Configuration		LR				

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration		LT		LR				
v (vph)		85		124				
C (m) (vph)		815		200				
v/c		0.10		0.62				
95% queue length		0.35		3.56				
Control Delay		9.9		48.6				
LOS		A		E				
Approach Delay	--	--	48.6					
Approach LOS	--	--	E					

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TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	*FMG*	Intersection	*ROUTE 153/MONAHAN/SCHOOL*
Agency/Co.	*BL Companies (#01C955)*	Jurisdiction	*WESTBROOK*
Date Performed	*5/17/2004*	Analysis Year	*FULL BUILD*
Analysis Time Period	*SAT PK (MONSABUFR)*		

Project Description	*THE PRESERVE + FLAT ROCK*
East/West Street: *MONAHAN/SCHOOLHOUSE*	North/South Street: *ROUTE 153*
Intersection Orientation: *North-South*	Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	*0*	*480*	*19*	*34*	*570*	*0*
Peak-Hour Factor, PHF	*0.95*	*0.95*	*0.95*	*0.95*	*0.95*	*0.95*
Hourly Flow Rate, HFR	*0*	*505*	*20*	*35*	*600*	*0*
Percent Heavy Vehicles	*2*	--	--	*2*	--	--
Median Type	*Undivided*					
RT Channelized			*0*			*0*
Lanes	*0*	*1*	*0*	*0*	*1*	*0*
Configuration			*TR*	*LT*		
Upstream Signal		*0*			*0*	

Minor Street	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	*34*	*0*	*65*	*0*	*0*	*0*
Peak-Hour Factor, PHF	*0.95*	*0.95*	*0.95*	*0.95*	*0.95*	*0.95*
Hourly Flow Rate, HFR	*35*	*0*	*68*	*0*	*0*	*0*
Percent Heavy Vehicles	*2*	*0*	*2*	*2*	*0*	*2*
Percent Grade (%)		*0*			*0*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*0*			*0*
Lanes	*0*	*0*	*0*	*0*	*0*	*0*
Configuration		*LR*				

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration		*LT*		*LR*				
v (vph)		*35*		*103*				
C (m) (vph)		*1042*		*350*				
v/c		*0.03*		*0.29*				
95% queue length		*0.10*		*1.20*				
Control Delay		*8.6*		*19.5*				
LOS		*A*		*C*				
Approach Delay	--	--	*19.5*					
Approach LOS	--	--	*C*					

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Route 153 at McVeagh Road

TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	*FMG*	Intersection	*ROUTE 153/McVEAGH*
Agency/Co.	*BL Companies (#01C955)*	Jurisdiction	*WESTBROOK*
Date Performed	*8/31/2004*	Analysis Year	*FULL BUILD*
Analysis Time Period	*AM PK (MCVAMBUFR)*		
Project Description	*THE PRESERVE + FLAT ROCK*		
East/West Street:	*McVEAGH RD*	North/South Street:	*ROUTE 153*
Intersection Orientation:	*North-South*	Study Period (hrs):	*0.25*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	*48*	*525*	*0*	*0*	*473*	*25*
Peak-Hour Factor, PHF	*0.92*	*0.92*	*0.92*	*0.92*	*0.92*	*0.92*
Hourly Flow Rate, HFR	*52*	*570*	*0*	*0*	*514*	*27*
Percent Heavy Vehicles	*2*	--	--	*0*	--	--
Median Type	*Undivided*					
RT Channelized			*0*			*0*
Lanes	*0*	*1*	*0*	*0*	*1*	*0*
Configuration	*LT*					*TR*
Upstream Signal		*0*			*0*	

Minor Street	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	*0*	*0*	*0*	*55*	*0*	*131*
Peak-Hour Factor, PHF	*0.92*	*0.92*	*0.92*	*0.92*	*0.92*	*0.92*
Hourly Flow Rate, HFR	*0*	*0*	*0*	*59*	*0*	*142*
Percent Heavy Vehicles	*0*	*0*	*0*	*2*	*0*	*2*
Percent Grade (%)		*0*			*0*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*0*			*0*
Lanes	*0*	*0*	*0*	*0*	*0*	*0*
Configuration					*LR*	

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	*LT*						*LR*	
v (vph)	*52*						*201*	
C (m) (vph)	*1028*						*357*	
v/c	*0.05*						*0.56*	
95% queue length	*0.16*						*3.31*	
Control Delay	*8.7*						*27.3*	
LOS	*A*						*D*	
Approach Delay	--	--					*27.3*	
Approach LOS	--	--					*D*	

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TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	*FMG*	Intersection	*ROUTE 153/McVEAGH*
Agency/Co.	*BL Companies (#01C955)*	Jurisdiction	*WESTBROOK*
Date Performed	*8/31/2004*	Analysis Year	*FULL BUILD*
Analysis Time Period	*PM PK (MCVPMBUFR)*		
Project Description	*THE PRESERVE + FLAT ROCK*		
East/West Street:	*McVEAGH RD*	North/South Street:	*ROUTE 153*
Intersection Orientation:	*North-South*	Study Period (hrs):	*0.25*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	*179*	*684*	*0*	*0*	*722*	*80*
Peak-Hour Factor, PHF	*0.86*	*0.86*	*0.86*	*0.86*	*0.86*	*0.86*
Hourly Flow Rate, HFR	*208*	*795*	*0*	*0*	*839*	*93*
Percent Heavy Vehicles	*2*	--	--	*0*	--	--
Median Type	*Undivided*					
RT Channelized			*0*			*0*
Lanes	*0*	*1*	*0*	*0*	*1*	*0*
Configuration	*LT*					*TR*
Upstream Signal		*0*			*0*	

Minor Street	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	*0*	*0*	*0*	*30*	*0*	*93*
Peak-Hour Factor, PHF	*0.86*	*0.86*	*0.86*	*0.86*	*0.86*	*0.86*
Hourly Flow Rate, HFR	*0*	*0*	*0*	*34*	*0*	*108*
Percent Heavy Vehicles	*0*	*0*	*0*	*2*	*0*	*2*
Percent Grade (%)		*0*			*0*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*0*			*0*
Lanes	*0*	*0*	*0*	*0*	*0*	*0*
Configuration					*LR*	

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	*LT*						*LR*	
v (vph)	*208*						*142*	
C (m) (vph)	*734*						*124*	
v/c	*0.28*						*1.15*	
95% queue length	*1.17*						*8.51*	
Control Delay	*11.8*						*193.3*	
LOS	*B*						*F*	
Approach Delay	--	--				*193.3*		
Approach LOS	--	--				*F*		

>

TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	*FMG*	Intersection	*ROUTE 153/McVEAGH*
Agency/Co.	*BL Companies (#01C955)*	Jurisdiction	*WESTBROOK*
Date Performed	*8/31/2004*	Analysis Year	*FULL BUILD*
Analysis Time Period	*SAT PK (MCVSABUFR)*		
Project Description	*THE PRESERVE + FLAT ROCK*		
East/West Street:	*McVEAGH RD*	North/South Street:	*ROUTE 153*
Intersection Orientation:	*North-South*	Study Period (hrs):	*0.25*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	*154*	*494*	*0*	*0*	*654*	*35*
Peak-Hour Factor, PHF	*0.96*	*0.96*	*0.96*	*0.96*	*0.96*	*0.96*
Hourly Flow Rate, HFR	*160*	*514*	*0*	*0*	*681*	*36*
Percent Heavy Vehicles	*2*	--	--	*0*	--	--
Median Type	*Undivided*					
RT Channelized			*0*			*0*
Lanes	*0*	*1*	*0*	*0*	*1*	*0*
Configuration	*LT*					*TR*
Upstream Signal		*0*			*0*	

Minor Street	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	*0*	*0*	*0*	*35*	*0*	*134*
Peak-Hour Factor, PHF	*0.96*	*0.96*	*0.96*	*0.96*	*0.96*	*0.96*
Hourly Flow Rate, HFR	*0*	*0*	*0*	*36*	*0*	*139*
Percent Heavy Vehicles	*0*	*0*	*0*	*2*	*0*	*2*
Percent Grade (%)		*0*			*0*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*0*			*0*
Lanes	*0*	*0*	*0*	*0*	*0*	*0*
Configuration					*LR*	

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	*LT*						*LR*	
v (vph)	*160*						*175*	
C (m) (vph)	*884*						*266*	
v/c	*0.18*						*0.66*	
95% queue length	*0.66*						*4.21*	
Control Delay	*10.0-*						*41.2*	
LOS	*A*						*E*	
Approach Delay	--	--					*41.2*	
Approach LOS	--	--					*E*	

>

Route 153 at Route 166 (Spencer Plains Road)
and Hunters Ridge Road

SHORT REPORT

General Information		Site Information	
Analyst	*fmg*	Intersection	*RTE 153/RTE 166/HUNTERS RIDGE*
Agency or Co.	*BL COMPANIES (01C955)*	Area Type	*All other areas*
Date Performed	*8/31/2004*	Jurisdiction	*WESTBROOK*
Time Period	*AM PK (166AMBUfr)*	Analysis Year	*FULL BUILD + flat rock*

Volume and Timing Input

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Num. of Lanes	*0*	*0*	*0*	*1*	*0*	*1*	*0*	*1*	*0*	*1*	*1*	*0*
Lane group		*LR*		*L*		*R*		*LT*		*L*	*T*	
Volume (vph)	*5*		*7*	*78*		*127*	*1*	*538*		*148*	*461*	
% Heavy veh	*1*		*1*	*2*		*2*	*1*	*2*		*2*	*2*	
PHF	*0.90*		*0.90*	*0.90*		*0.90*	*0.90*	*0.90*		*0.90*	*0.90*	
Actuated (P/A)	*A*		*A*	*A*		*A*	*A*	*A*		*A*	*A*	
Startup lost time		*2.0*		*2.0*		*2.0*		*2.0*		*2.0*	*2.0*	
Ext. eff. green		*2.0*		*2.0*		*2.0*		*2.0*		*2.0*	*2.0*	
Arrival type		*3*		*3*		*3*		*3*		*3*	*3*	
Unit Extension		*3.0*		*3.0*		*3.0*		*3.0*		*3.0*	*3.0*	
Ped/Bike/RTOR Volume	*0*		*0*	*0*		*5*	*0*			*0*		
Lane Width		*12.0*		*12.0*		*12.0*		*12.0*		*11.0*	*11.0*	
Parking/Grade/Parking	*N*	*0*	*N*	*N*	*0*	*N*	*N*	*0*	*N*	*N*	*0*	*N*
Parking/hr												
Bus stops/hr		*0*		*0*		*0*		*0*		*0*	*0*	
Unit Extension		*3.0*		*3.0*		*3.0*		*3.0*		*3.0*	*3.0*	

Phasing	EB Only	WB Only	03	04	SB Only	NS Perm	07	08
Timing	G = *6.0*	G = *15.0*	G =	G =	G = *6.0*	G = *30.0*	G =	G =
	Y = *6*	Y = *6*	Y =	Y =	Y = *3*	Y = *8*	Y =	Y =

Duration of Analysis (hrs) = *0.25* — Cycle Length C = *80.0*

Lane Group Capacity, Control Delay, and LOS Determination

	EB			WB			NB			SB		
Adj. flow rate		*14*		*87*		*136*		*599*		*164*	*512*	
Lane group cap.		*128*		*332*		*297*		*698*		*286*	*878*	
v/c ratio		*0.11*		*0.26*		*0.46*		*0.86*		*0.57*	*0.58*	
Green ratio		*0.08*		*0.19*		*0.19*		*0.38*		*0.49*	*0.49*	
Unif. delay d1		*34.5*		*27.8*		*28.9*		*23.0*		*15.0*	*14.7*	
Delay factor k		*0.11*		*0.11*		*0.11*		*0.39*		*0.17*	*0.17*	
Increm. delay d2		*0.4*		*0.4*		*1.1*		*10.4*		*2.8*	*1.0*	
PF factor		*1.000*		*1.000*		*1.000*		*1.000*		*1.000*	*1.000*	
Control delay		*34.9*		*28.2*		*30.0*		*33.5*		*17.8*	*15.7*	
Lane group LOS		*C*		*C*		*C*		*C*		*B*	*B*	
Apprch. delay	*34.9*			*29.3*			*33.5*			*16.2*		
Approach LOS	*C*			*C*			*C*			*B*		
Intersec. delay	*25.2*			Intersection LOS						*C*		

SHORT REPORT

General Information		Site Information	
Analyst	fmg	Intersection	RTE 153/RTE 166/HUNTERS RIDGE
Agency or Co.	BL COMPANIES (01C955)	Area Type	All other areas
Date Performed	8/31/2004	Jurisdiction	WESTBROOK
Time Period	PM PK (166PMBUwlfr)	Analysis Year	FULL BUILD w/timing change

Volume and Timing Input

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Num. of Lanes	0	0	0	1	0	1	0	1	0	1	1	0
Lane group		LR		L		R		LT		L	T	
Volume (vph)	4		7	131		209	5	742		127	698	
% Heavy veh	1		1	2		2	1	2		2	2	
PHF	0.90		0.90	0.90		0.90	0.90	0.90		0.90	0.90	
Actuated (P/A)	A		A	A		A	A	A		A	A	
Startup lost time		2.0		2.0		2.0		2.0		2.0	2.0	
Ext. eff. green		2.0		2.0		2.0		2.0		2.0	2.0	
Arrival type		3		3		3		3		3	3	
Unit Extension		3.0		3.0		3.0		3.0		3.0	3.0	
Ped/Bike/RTOR Volume	0		0	0		45	0			0		
Lane Width		12.0		12.0		12.0		12.0		11.0	11.0	
Parking/Grade/Parking	N	0	N	N	0	N	N	0	N	N	0	N
Parking/hr												
Bus stops/hr		0		0		0		0		0	0	
Unit Extension		3.0		3.0		3.0		3.0		3.0	3.0	

Phasing	EB Only	WB Only	03	04	SB Only	NS Perm	07	08
Timing	G = 6.0	G = 13.0	G =	G =	G = 4.0	G = 39.0	G =	G =
	Y = 6	Y = 6	Y =	Y =	Y = 3	Y = 8	Y =	Y =
Duration of Analysis (hrs) = 0.25						Cycle Length C = 85.0		

Lane Group Capacity, Control Delay, and LOS Determination

	EB			WB			NB			SB		
Adj. flow rate		12			146			182			830			141	776	
Lane group cap.		119			271			242			850			253	975	
v/c ratio		0.10			0.54			0.75			0.98			0.56	0.80	
Green ratio		0.07			0.15			0.15			0.46			0.54	0.54	
Unif. delay d1		37.0			33.2			34.5			22.6			14.1	15.7	
Delay factor k		0.11			0.14			0.31			0.48			0.15	0.34	
Increm. delay d2		0.4			2.2			12.4			25.1			2.7	4.7	
PF factor		1.000			1.000			1.000			1.000			1.000	1.000	
Control delay		37.3			35.4			46.9			47.7			16.8	20.4	
Lane group LOS		D			D			D			D			B	C	
Apprch. delay	37.3			41.8			47.7			19.8		
Approach LOS	D			D			D			B		
Intersec. delay	34.5			Intersection LOS						C		

SHORT REPORT

General Information		Site Information	
Analyst	*fmg*	Intersection	*RTE 153/RTE 166/HUNTERS RIDGE*
Agency or Co.	*BL COMPANIES (01C955)*	Area Type	*All other areas*
Date Performed	*8/31/2004*	Jurisdiction	*WESTBROOK*
Time Period	*SAT PK (166SATBUfr)*	Analysis Year	*FULL BUILD + flat rock*

Volume and Timing Input

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Num. of Lanes	*0*	*0*	*0*	*1*	*0*	*1*	*0*	*1*	*0*	*1*	*1*	*0*
Lane group		*LR*		*L*		*R*		*LT*		*L*	*T*	
Volume (vph)	*3*		*8*	*103*		*133*	*9*	*601*		*133*	*619*	
% Heavy veh	*1*		*1*	*2*		*2*	*1*	*2*		*2*	*2*	
PHF	*0.94*		*0.94*	*0.94*		*0.94*	*0.94*	*0.94*		*0.94*	*0.94*	
Actuated (P/A)	*A*		*A*	*A*		*A*	*A*	*A*		*A*	*A*	
Startup lost time		*2.0*		*2.0*		*2.0*		*2.0*		*2.0*	*2.0*	
Ext. eff. green		*2.0*		*2.0*		*2.0*		*2.0*		*2.0*	*2.0*	
Arrival type		*3*		*3*		*3*		*3*		*3*	*3*	
Unit Extension		*3.0*		*3.0*		*3.0*		*3.0*		*3.0*	*3.0*	
Ped/Bike/RTOR Volume	*0*		*0*	*0*		*5*	*0*			*0*		
Lane Width		*12.0*		*12.0*		*12.0*		*12.0*		*11.0*	*11.0*	
Parking/Grade/Parking	*N*	*0*	*N*	*N*	*0*	*N*	*N*	*0*	*N*	*N*	*0*	*N*
Parking/hr												
Bus stops/hr		*0*		*0*		*0*		*0*		*0*	*0*	
Unit Extension		*3.0*		*3.0*		*3.0*		*3.0*		*3.0*	*3.0*	

Phasing	EB Only	WB Only	03	04	SB Only	NS Perm	07	08
Timing	G = *6.0*	G = *15.0*	G =	G =	G = *6.0*	G = *30.0*	G =	G =
	Y = *6*	Y = *6*	Y =	Y =	Y = *3*	Y = *8*	Y =	Y =

Duration of Analysis (hrs) = *0.25* — Cycle Length C = *80.0*

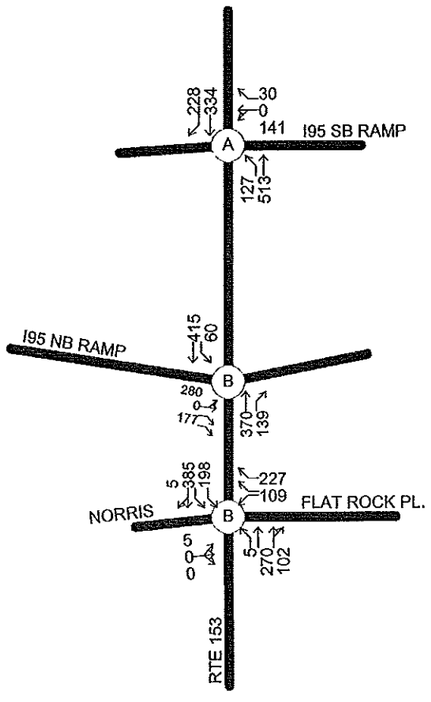
Lane Group Capacity, Control Delay, and LOS Determination

	EB			WB			NB			SB		
Adj. flow rate		*12*		*110*		*136*		*649*		*141*	*659*	
Lane group cap.		*125*		*332*		*297*		*689*		*272*	*878*	
v/c ratio		*0.10*		*0.33*		*0.46*		*0.94*		*0.52*	*0.75*	
Green ratio		*0.08*		*0.19*		*0.19*		*0.38*		*0.49*	*0.49*	
Unif. delay d1		*34.5*		*28.2*		*28.9*		*24.2*		*15.2*	*16.6*	
Delay factor k		*0.11*		*0.11*		*0.11*		*0.45*		*0.12*	*0.31*	
Increm. delay d2		*0.3*		*0.6*		*1.1*		*21.3*		*1.8*	*3.6*	
PF factor		*1.000*		*1.000*		*1.000*		*1.000*		*1.000*	*1.000*	
Control delay		*34.8*		*28.7*		*30.0*		*45.4*		*17.0*	*20.2*	
Lane group LOS		*C*		*C*		*C*		*D*		*B*	*C*	
Apprch. delay	*34.8*			*29.4*			*45.4*			*19.6*		
Approach LOS	*C*			*C*			*D*			*B*		
Intersec. delay	*31.0*			Intersection LOS						*C*		

Route 153 at I-95 Interconnected System

Map - RTE 153- WESTBROOK, CT
Levels of Service

August 31, 2004



FULL BUILD + FLAT ROCK
Data Date: 8/1/2004
Timing Plan: AM PEAK

BL COMPANIES
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Lanes, Volumes, Timings

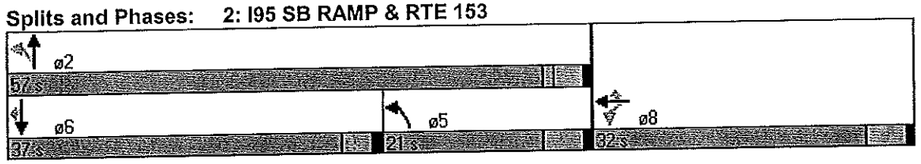
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12	11	12	12	12	12	12
Grade (%)		0%			0%			0%			0%	
Storage Length (ft)	0		0	0		260	300		0	0		120
Storage Lanes	0		0	0		1	1		0	0		1
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (ft)				50	50	50	50	50			50	50
Trailing Detector (ft)				0	0	0	0	0			0	0
Turning Speed (mph)	15		9	15		9	15		9	15		9
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt Protected						0.850						0.850
Flt Protected					0.950		0.950					
Satd. Flow (prot)	0	0	0	0	1770	1583	1711	1863	0	0	1863	1583
Frt Perm.						0.850						0.850
Flt Perm.					0.950		0.392					
Satd. Flow (perm)	0	0	0	0	1770	1583	706	1863	0	0	1863	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)						33						248
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.04	1.00	1.00	1.00	1.00	1.00
Volume (vph)	0	0	0	141	0	30	127	513	0	0	334	228
Confl. Peds. (#/hr)												
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	0	0	0	153	0	33	138	558	0	0	363	248
Lane Group Flow (vph)	0	0	0	0	153	33	138	558	0	0	363	248
Turn Type				Perm		Perm	Pm+Pt					Perm
Protected Phases					8		5	2			6	
Permitted Phases				8		8	2					6
Detector Phases				8	8	8	5	2			6	6
Minimum Initial (s)				5.0	5.0	5.0	3.0	20.0			20.0	20.0
Minimum Split (s)				21.0	21.0	21.0	9.0	25.0			24.0	24.0
Total Split (s)	0.0	0.0	0.0	32.0	32.0	32.0	21.0	57.0	0.0	0.0	37.0	37.0
Total Split (%)	0%	0%	0%	36%	36%	36%	23%	63%	0%	0%	41%	41%
Yellow Time (s)				4.0	4.0	4.0	4.0	3.0			3.0	3.0
All-Red Time (s)				1.0	1.0	1.0	1.0	1.0			1.0	1.0
Lead/Lag							Lag				Lead	Lead
Lead-Lag Optimize?												
Recall Mode				None	None	None	None	Min			Min	Min
Lane Grp Cap (vph)					326	319	596	1289			975	946
v/s Ratio Prot							0.02	0.30			0.19	
v/s Ratio Perm					0.09	0.02	0.14					0.14
Critical LG?					Yes			Yes				
Act Effct Green (s)					11.9	11.9	44.7	44.7			33.8	33.8

Lanes, Volumes, Timings

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Actuated g/C Ratio					0.18	0.18	0.69	0.69			0.52	0.52
v/c Ratio					0.47	0.10	0.23	0.43			0.37	0.26
Uniform Delay, d1					23.5	0.0	3.8	4.4			9.1	0.0
Platoon Factor					1.00	1.00	1.00	1.00			1.00	1.00
Incr. Delay, d2					1.1	0.1	0.2	1.1			1.1	0.7
Webster Delay					24.6	0.1	4.0	5.4			10.2	0.7
Webster LOS					C	A	A	A			B	A
Queue Length 50th (ft)					38	0	13	70			73	0
Queue Length 95th (ft)					84	16	38	167			154	32
Link Length (ft)		243			319			620			320	
50th Up Block Time (%)												
95th Up Block Time (%)												
Turn Bay Length (ft)						260	300					120
50th Bay Block Time %											21%	
95th Bay Block Time %											26	
Queuing Penalty (veh)												

Area Type: Other
Cycle Length: 90
Actuated Cycle Length: 64.6
Natural Cycle: 55
Control Type: Actuated-Uncoordinated
Total Lost Time: 8
Sum of Critical v/s Ratios: 0.39
Intersection v/c Ratio: 0.42
Intersection Webster Signal Delay: 7.5
Intersection LOS: A

Splits and Phases: 2: I95 SB RAMP & RTE 153



Lanes, Volumes, Timings

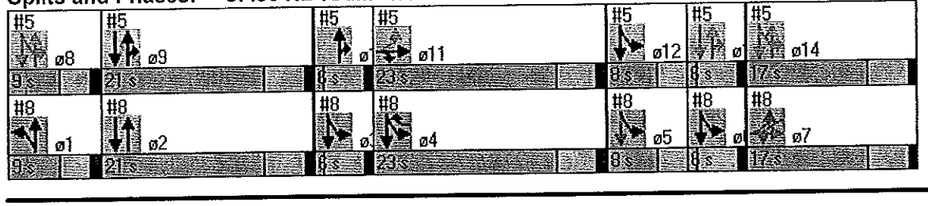
Lane Group	EBL ø1	EBT ø2	EBR ø3	WBL ø4	WBT ø5	WBR ø6	NBL ø7	NBT ø8	NBR ø9	SBL ø10	SBT ø13	SBR ø14
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12	12	12	12	12	12	12
Grade (%)		0%			0%			0%			0%	
Storage Length (ft)	0		300	0		0	0		300	100		0
Storage Lanes	0		2	0		0	0		1	1		0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (ft)	50	50	50					50	50	50	50	
Trailing Detector (ft)	0	0	0					0	0	0	0	
Turning Speed (mph)	15		9	15		9	15		9	15		9
Lane Util. Factor	1.00	1.00	0.88	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt Protected			0.850						0.850			
Flt Protected		0.950								0.950		
Satd. Flow (prot)	0	1770	2787	0	0	0	0	1863	1583	1770	1863	0
Frt Perm.			0.850						0.850			
Flt Perm.		0.950								0.526		
Satd. Flow (perm)	0	1770	2787	0	0	0	0	1863	1583	980	1863	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			192						151			
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Volume (vph)	280	0	177	0	0	0	0	370	139	60	415	0
Confl. Peds. (#/hr)												
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	304	0	192	0	0	0	0	402	151	65	451	0
Lane Group Flow (vph)	0	304	192	0	0	0	0	402	151	65	451	0
Turn Type	Perm		Prot						CustomCustom			
Protected Phases		11	11					9 10	9 10	12	9 12	
	1	2	3	4	5	6	7	8	9	10	13	14
Permitted Phases	11							13 14 8	13 14 8	8 9 14	13 14 8	
Detector Phases	11	11	11							12		
Minimum Initial (s)	5.0	5.0	5.0							3.0		
	3.0	15.0	1.0	5.0	3.0	1.0	5.0	3.0	16.0	1.0	1.0	5.0
Minimum Split (s)	11.0	11.0	11.0							6.0		
	7.0	21.0	6.0	12.0	6.0	6.0	10.0	7.0	21.0	6.0	6.0	10.0
Total Split (s)	23.0	23.0	23.0	0.0	0.0	0.0	0.0	27.0	27.0	8.0	29.0	0.0
	9.0	21.0	6.0	23.0	8.0	6.0	17.0	9.0	21.0	6.0	6.0	17.0
Total Split (%)	26%	26%	26%	0%	0%	0%	0%	30%	30%	9%	32%	0%
	10%	23%	7%	26%	9%	7%	19%	10%	23%	7%	7%	19%
Yellow Time (s)	4.0	4.0	4.0							3.0		
	3.0	4.0	4.0	4.0	3.0	4.0	4.0	3.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	1.0	1.0							0.0		
	1.0	1.0	1.0	1.0	0.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lead/Lag	Lag	Lag	Lag							Lead		
	Lead	Lag	Lead	Lag	Lead	Lag		Lead	Lag	Lead	Lag	
Lead-Lag Optimize?												
Recall Mode	None	None	None							None		
	None	Min	None	None	None	Min	None	Min	None	None	None	None
Lane Grp Cap (vph)		415	801					1009	927	632	1219	
v/s Ratio Prot			0.06							0.01	0.02	
v/s Ratio Perm		0.17						0.19	0.08	0.05	0.20	
Critical LG?		Yes@	@					Yes@	@	@	@	
Act Effct Green (s)		16.9	16.9					39.0	39.0	43.1	47.1	
Actuated g/C Ratio		0.23	0.23					0.54	0.54	0.60	0.65	
v/c Ratio		0.73	0.24					0.40	0.16	0.10	0.37	

Uniform Delay, d1	25.4	0.0			9.6	0.0	4.6	5.7
Platoon Factor	1.00	1.00			1.00	1.00	1.00	1.00
Incr. Delay, d2	6.6	0.2			0.3	0.1	0.1	0.2
Webster Delay	32.0	0.2			9.9	0.1	4.7	5.9
Webster LOS	C	A			A	A	A	A
Queue Length 50th (ft)	132	0			42	0	9	83
Queue Length 95th (ft)	#235	24			94	0	21	130
Link Length (ft)	577		344		320			620
50th Up Block Time (%)								
95th Up Block Time (%)								
Turn Bay Length (ft)		300				300	100	
50th Bay Block Time %								2%
95th Bay Block Time %								14%
Queuing Penalty (veh)								4

Area Type: Other
Cycle Length: 90
Actuated Cycle Length: 72
Natural Cycle: 80
Control Type: Actuated-Uncoordinated
Total Lost Time: 8
Sum of Critical v/s Ratios: 0.44
Intersection v/c Ratio: 0.49
Intersection Webster Signal Delay: 10.7
Intersection LOS: B
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
@ Some critical lane groups may be at other intersections sharing controller.

Splits and Phases: 5: I95 NB RAMP & RTE 153



Lanes, Volumes, Timings

Lane Group	EBL ø2	EBT ø3	EBR ø5	WBL ø6	WBT ø8	WBR ø9	NBL ø10	NBT ø11	NBR ø12	SBL ø13	SBT ø14	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	14	12	12	12	12	12	12	12	12	12	12
Grade (%)		0%			0%			0%			0%	
Storage Length (ft)	0		0	130		0	100		0	330		0
Storage Lanes	0		0	1		2	1		0	2		0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (ft)	50	50		50		50	50	50		50	50	
Trailing Detector (ft)	0	0		0		0	0	0		0	0	
Turning Speed (mph)	15		9	15		9	15		9	15		9
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	0.88	1.00	0.95	0.95	0.97	1.00	1.00
Frt Protected						0.850		0.959			0.998	
Flt Protected		0.950		0.950			0.950			0.950		
Satd. Flow (prot)	0	1888	0	1770	0	2787	1770	3394	0	3433	1859	0
Frt Perm.						0.850		0.959			0.998	
Flt Perm.		0.950		0.754			0.950			0.950		
Satd. Flow (perm)	0	1888	0	1405	0	2787	1770	3394	0	3433	1859	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)						247		61			1	
Headway Factor	1.00	0.92	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Volume (vph)	5	0	0	109	0	227	5	270	102	198	385	5
Confl. Peds. (#/hr)												
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

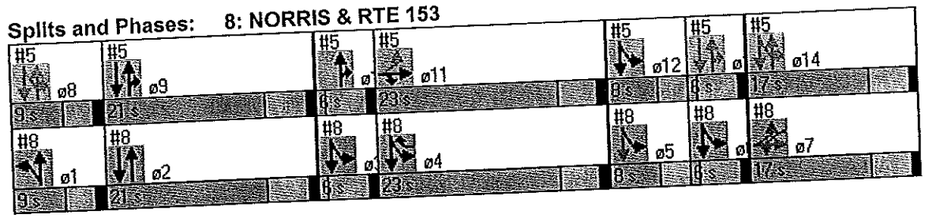
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	5	0	0	118	0	247	5	293	111	215	418	5
Lane Group Flow (vph)	0	5	0	118	0	247	5	404	0	215	423	0
Turn Type	Custom			Custom		Custom	Prot			Prot		
Protected Phases	2	3	5	6	8	4 9	1 10	1 2 11	12	3 4 5 6 13	2 3 4 6 14	
Permitted Phases	7	7		7							5	
Detector Phases	7	7		7		4	1	1 2		4		
Minimum Initial (s)	5.0 15.0	5.0 1.0	3.0	5.0 1.0	3.0	5.0 16.0	3.0 1.0	5.0	3.0	1.0	5.0	
Minimum Split (s)	10.0 21.0	10.0 6.0	6.0	10.0 6.0	7.0	12.0 21.0	7.0 6.0	11.0	6.0	6.0	10.0	
Total Split (s)	17.0 21.0	17.0 6.0	0.0 8.0	17.0 6.0	0.0 9.0	23.0 21.0	9.0 6.0	30.0 23.0	0.0 8.0	43.0 6.0	56.0 17.0	0.0
Total Split (%)	19% 23%	19% 7%	0% 9%	19% 7%	0% 10%	26% 23%	10% 7%	33% 26%	0% 9%	48% 7%	62% 19%	0%
Yellow Time (s)	4.0 4.0	4.0 4.0	3.0	4.0 4.0	3.0	4.0 4.0	3.0 4.0	4.0	3.0	4.0	4.0	
All-Red Time (s)	1.0 1.0	1.0 1.0	0.0	1.0 1.0	1.0	1.0 1.0	1.0 1.0	1.0	0.0	1.0	1.0	
Lead/Lag	Lag	Lead	Lead	Lag	Lead	Lag Lag	Lead Lead	Lag	Lead	Lag		
Lead-Lag Optimize?												
Recall Mode	None Min	None None	None	None Min	Min	None None	None None	None	None	None	None	
Lane Grp Cap (vph)		246		183		843	125	1246		1192	1175	
v/s Ratio Prot						0.07	0.00	0.12		0.06	0.23	
v/s Ratio Perm		0.00		0.08								
Critical LG?		@		Yes@		@	@	@		@	Yes@	
Act Effct Green (s)		9.4		9.4		16.9	5.1	25.6		25.0	45.5	
Actuated g/C Ratio		0.13		0.13		0.23	0.07	0.36		0.35	0.63	
v/c Ratio		0.02		0.64		0.29	0.04	0.32		0.18	0.36	

8: NORRIS & RTE 153

Uniform Delay, d1	27.2		29.7		0.0	31.2	14.1		16.4		6.3
Platoon Factor	1.00		1.00		1.00	1.00	1.00		1.00		1.00
Incr. Delay, d2	0.0		7.6		0.2	0.1	0.2		0.1		0.2
Webster Delay	27.2		37.3		0.2	31.3	14.3		16.4		6.5
Webster LOS	C		D		A	C	B		B		A
Queue Length 50th (ft)	2		52		0	2	60		48		149
Queue Length 95th (ft)	11		103		27	13	94		73		145
Link Length (ft)	195			420			420				320
50th Up Block Time (%)											
95th Up Block Time (%)											
Turn Bay Length (ft)			130			100			330		
50th Bay Block Time %											
95th Bay Block Time %							2%				
Queuing Penalty (veh)											

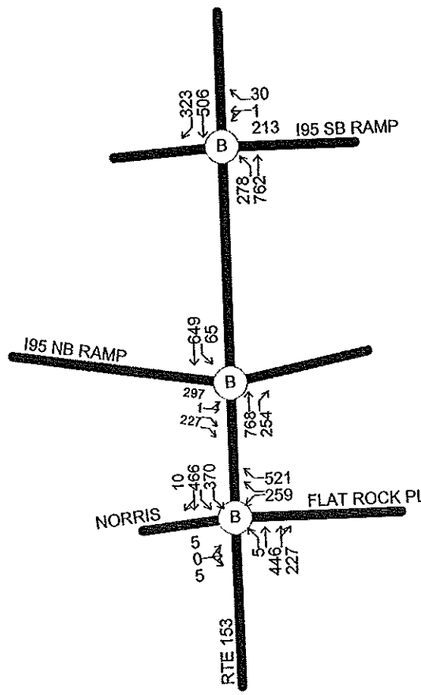
Area Type: Other
Cycle Length: 90
Actuated Cycle Length: 72
Natural Cycle: 80
Control Type: Actuated-Uncoordinated
Total Lost Time: 8
Sum of Critical v/s Ratios: 0.44
Intersection v/c Ratio: 0.49
Intersection Webster Signal Delay: 11.8
Intersection LOS: B
@ Some critical lane groups may be at other intersections sharing controller.

Splits and Phases: 8: NORRIS & RTE 153



Map - RTE 153- WESTBROOK
Levels of Service

August 31, 2004



BUILD W/TIMING CHANGES + FLAT ROCK
Data Date: 8/31/2004
Timing Plan: PM PEAK

BL COMPANIES
F:\JOBS01\01c955-F\TRAF\RT153PMFBiFR.sy6

Lanes, Volumes, Timings

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12	11	12	12	12	12	12
Grade (%)		0%			2%			-1%			1%	
Storage Length (ft)	0		0	0		260	300		0	0		120
Storage Lanes	0		0	0		1	1		0	0		1
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (ft)				50	50	50	50	50			50	50
Trailing Detector (ft)				0	0	0	0	0			0	0
Turning Speed (mph)	15		9	15		9	15		9	15		9
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt Protected						0.850						0.850
Flt Protected					0.953		0.950					
Satd. Flow (prot)	0	0	0	0	1757	1568	1719	1872	0	0	1853	1575
Frt Perm.						0.850						0.850
Flt Perm.					0.953		0.209					
Satd. Flow (perm)	0	0	0	0	1757	1568	378	1872	0	0	1853	1575
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)						33						238
Headway Factor	1.00	1.00	1.00	1.01	1.01	1.01	1.04	0.99	0.99	1.01	1.01	1.01
Volume (vph)	0	0	0	213	1	30	278	762	0	0	506	323
Confl. Peds. (#/hr)												
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	0	0	0	232	1	33	302	828	0	0	550	351
Lane Group Flow (vph)	0	0	0	0	233	33	302	828	0	0	550	351
Turn Type				Perm		Perm	Pm+Pt					Perm
Protected Phases					8		5	2			6	
Permitted Phases				8		8	2					6
Detector Phases				8	8	8	5	2			6	6
Minimum Initial (s)				5.0	5.0	5.0	3.0	20.0			20.0	20.0
Minimum Split (s)				20.0	20.0	20.0	9.0	25.0			24.0	24.0
Total Split (s)	0.0	0.0	0.0	31.0	31.0	31.0	21.0	59.0	0.0	0.0	38.0	38.0
Total Split (%)	0%	0%	0%	34%	34%	34%	23%	66%	0%	0%	42%	42%
Yellow Time (s)				4.0	4.0	4.0	4.0	3.0			3.0	3.0
All-Red Time (s)				1.0	1.0	1.0	1.0	1.0			1.0	1.0
Lead/Lag							Lag				Lead	Lead
Lead-Lag Optimize?												
Recall Mode				None	None	None	None	Coord			Coord	Coord
Lane Grp Cap (vph)					344	333	524	1340			894	883
v/s Ratio Prot							0.11	0.44			0.30	
v/s Ratio Perm					0.13	0.02	0.30					0.19
Critical LG?					Yes			Yes				
Act Effct Green (s)					17.6	17.6	64.4	64.4			43.4	43.4

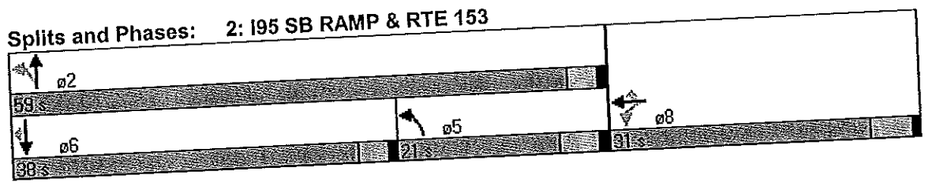
2: I95 SB RAMP & RTE 153

Lanes, Volumes, Timings

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Actuated g/C Ratio					0.20	0.20	0.72	0.72			0.48	0.48
v/c Ratio					0.68	0.10	0.58	0.62			0.62	0.40
Uniform Delay, d1					33.5	0.0	14.2	6.5			17.1	4.2
Platoon Factor					0.76	1.00	0.55	0.53			0.99	0.99
Incr. Delay, d2					5.2	0.1	1.0	1.4			3.2	1.3
Webster Delay					30.6	0.1	8.8	4.8			20.1	5.5
Webster LOS					C	A	A	A			C	A
Queue Length 50th (ft)					124	0	38	145			219	34
Queue Length 95th (ft)					183	19	m91	m265			384	107
Link Length (ft)		243			319			620			320	
50th Up Block Time (%)											15%	
95th Up Block Time (%)												120
Turn Bay Length (ft)						260	300				27%	
50th Bay Block Time %								5%			43%	4%
95th Bay Block Time %								7			122	10
Queuing Penalty (veh)												

Area Type: Other
Cycle Length: 90
Actuated Cycle Length: 90
Offset: 86 (96%), Referenced to phase 2:NBTL and 6:SBT, Start of Yellow
Natural Cycle: 60
Control Type: Actuated-Coordinated
Total Lost Time: 8
Sum of Critical v/s Ratios: 0.57
Intersection v/c Ratio: 0.63
Intersection Webster Signal Delay: 11.7
Intersection LOS: B
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 2: I95 SB RAMP & RTE 153



Lanes, Volumes, Timings

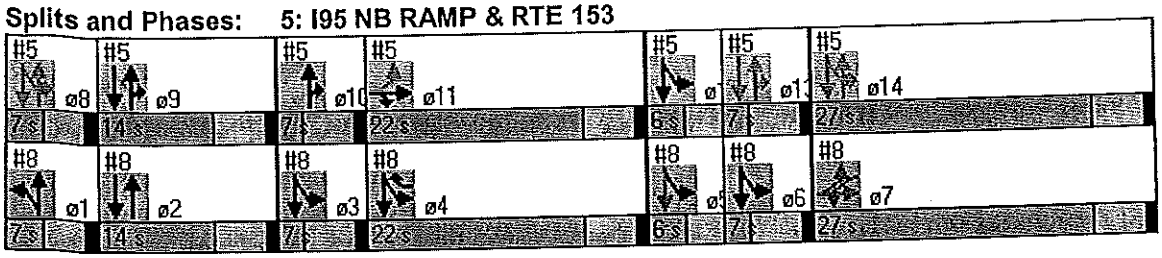
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
	ø1	ø2	ø3	ø4	ø5	ø6	ø7	ø8	ø9	ø10	ø13	ø14
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12	12	12	12	12	12	12
Grade (%)		2%			0%			0%			0%	
Storage Length (ft)	0		300	0		0	0		0	100		0
Storage Lanes	0		2	0		0	0		1	1		0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (ft)	50	50	50					50	50	50	50	
Trailing Detector (ft)	0	0	0					0	0	0	0	
Turning Speed (mph)	15		9	15		9	15		9	15		9
Lane Util. Factor	1.00	1.00	0.88	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt Protected			0.850						0.850			
Flt Protected		0.953								0.950		
Satd. Flow (prot)	0	1757	2759	0	0	0	0	1863	1583	1770	1863	0
Frt Perm.			0.850						0.850			
Flt Perm.		0.953								0.352		
Satd. Flow (perm)	0	1757	2759	0	0	0	0	1863	1583	656	1863	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			247						276			
Headway Factor	1.01	1.01	1.01	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Volume (vph)	297	1	227	0	0	0	0	768	254	65	649	0
Confl. Peds. (#/hr)												
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	323	1	247	0	0	0	0	835	276	71	705	0
Lane Group Flow (vph)	0	324	247	0	0	0	0	835	276	71	705	0
Turn Type	Perm		Prot						Custom	Custom		
Protected Phases		11	11					9 10	9 10	12	9 12	
	1	2	3	4	5	6	7	8	9	10	13	14
Permitted Phases	11						13 14 8	13 14 8		8 9 14	13 14 8	
Detector Phases	11	11	11							12		
Minimum Initial (s)	5.0	5.0	5.0							3.0		
	3.0	15.0	1.0	5.0	3.0	1.0	5.0	3.0	16.0	1.0	1.0	5.0
Minimum Split (s)	11.0	11.0	11.0							6.0		
	7.0	21.0	6.0	12.0	6.0	6.0	10.0	7.0	21.0	6.0	6.0	10.0
Total Split (s)	22.0	22.0	22.0	0.0	0.0	0.0	0.0	21.0	21.0	6.0	20.0	0.0
	7.0	14.0	7.0	22.0	6.0	7.0	27.0	7.0	14.0	7.0	7.0	27.0
Total Split (%)	24%	24%	24%	0%	0%	0%	0%	23%	23%	7%	22%	0%
	8%	16%	8%	24%	7%	8%	30%	8%	16%	8%	8%	30%
Yellow Time (s)	4.0	4.0	4.0							3.0		
	3.0	4.0	4.0	4.0	3.0	4.0	4.0	3.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	1.0	1.0							0.0		
	1.0	1.0	1.0	1.0	0.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lead/Lag	Lag	Lag	Lag							Lead		
	Lead	Lag	Lead	Lag	Lead	Lag		Lead	Lag	Lead	Lag	
Lead-Lag Optimize?												
Recall Mode	None	None	None							None		
	None	Min	None	None	None	Min	None	Min	Coord	None	None	None
Lane Grp Cap (vph)		351	749					1180	1104	474	1325	
v/s Ratio Prot			0.07					0.19	0.07	0.00	0.16	
v/s Ratio Perm		0.18						0.25	0.09	0.09	0.21	
Critical LG?		Yes@	@					Yes@	@	@	@	
Act Effct Green (s)		18.0	18.0					57.0	57.0	60.0	64.0	
Actuated g/C Ratio		0.20	0.20					0.63	0.63	0.67	0.71	
v/c Ratio		0.92	0.33					0.71	0.25	0.15	0.53	

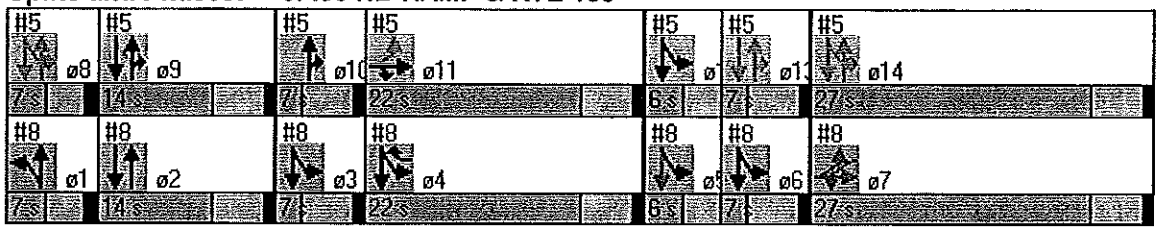
Uniform Delay, d1	35.3	0.0			11.0	0.0	4.0	6.0
Platoon Factor	1.00	1.00			0.61	1.00	0.98	0.89
Incr. Delay, d2	29.1	0.3			1.6	0.1	0.1	0.3
Webster Delay	64.4	0.3			8.3	0.1	4.0	5.7
Webster LOS	E	A			A	A	A	A
Queue Length 50th (ft)	182	0			152	0	9	112
Queue Length 95th (ft)	#340	33			287	10	m34	280
Link Length (ft)	577		344		319			620
50th Up Block Time (%)								
95th Up Block Time (%)								
Turn Bay Length (ft)		300					100	
50th Bay Block Time %								12%
95th Bay Block Time %	18%							27%
Queuing Penalty (veh)	22							13

Area Type: Other
Cycle Length: 90
Actuated Cycle Length: 90
Offset: 65 (72%), Referenced to phase 9:NBSB, Start of Yellow
Natural Cycle: 90
Control Type: Actuated-Coordinated
Total Lost Time: 8
Sum of Critical v/s Ratios: 0.68
Intersection v/c Ratio: 0.75
Intersection Webster Signal Delay: 13.1
Intersection LOS: B
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.
@ Some critical lane groups may be at other intersections sharing controller.

Splits and Phases: 5: I95 NB RAMP & RTE 153



Splits and Phases: 5: I95 NB RAMP & RTE 153



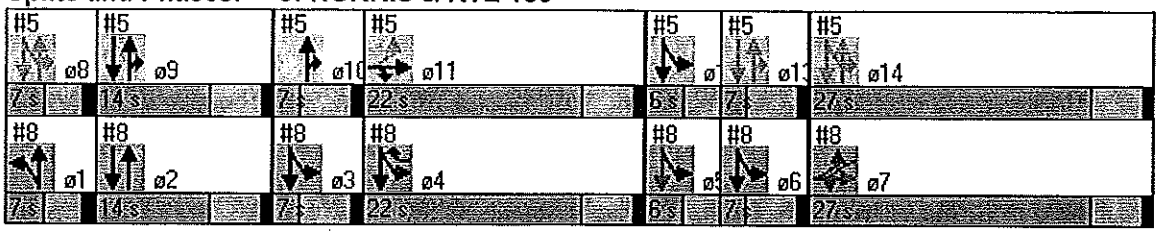
Lanes, Volumes, Timings

Lane Group	EBL ø2	EBT ø3	EBR ø5	WBL ø6	WBT ø8	WBR ø9	NBL ø10	NBT ø11	NBR ø12	SBL ø13	SBT ø14	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	14	12	12	12	12	12	12	12	12	12	12
Grade (%)		2%			0%			0%			0%	
Storage Length (ft)	0		0	130		0	100		0	0		0
Storage Lanes	0		0	1		2	1		0	2		0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (ft)	50	50		50		50	50	50		50	50	
Trailing Detector (ft)	0	0		0		0	0	0		0	0	
Turning Speed (mph)	15		9	15		9	15		9	15		9
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	*0.75	1.00	0.95	0.95	0.97	1.00	1.00
Frt Protected		0.832				0.850		0.949			0.997	
Flt Protected		0.976		0.950			0.950			0.950		
Satd. Flow (prot)	0	1597	0	1770	0	2375	1770	3359	0	3433	1857	0
Frt Perm.		0.832				0.850		0.949			0.997	
Flt Perm.		0.976		0.751			0.950			0.950		
Satd. Flow (perm)	0	1597	0	1399	0	2375	1770	3359	0	3433	1857	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		5				566		88			2	
Headway Factor	1.01	0.93	1.01	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Volume (vph)	5	0	5	259	0	521	5	446	227	370	466	10
Confl. Peds. (#/hr)												
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

Uniform Delay, d1	13.1	32.8	0.0	44.6	20.7	26.6	8.8
Platoon Factor	0.95	0.95	1.00	0.95	1.06	0.83	0.82
Incr. Delay, d2	0.0	18.6	1.1	21.8	0.8	0.3	0.2
Webster Delay	12.5	49.8	1.1	64.0	22.7	22.3	7.5
Webster LOS	B	D	A	E	C	C	A
Queue Length 50th (ft)	2	150	0	3	160	95	102
Queue Length 95th (ft)	12	#278	54	14	221	139	275
Link Length (ft)	195	420			420		319
50th Up Block Time (%)							
95th Up Block Time (%)							
Turn Bay Length (ft)		130		100			
50th Bay Block Time %		16%			22%		
95th Bay Block Time %		45%			31%		
Queuing Penalty (veh)		85			1		

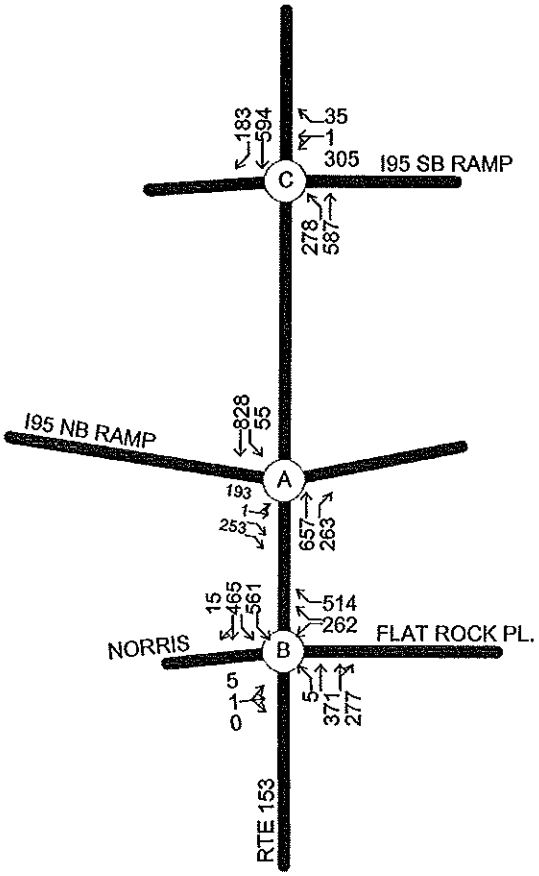
Area Type: Other
Cycle Length: 90
Actuated Cycle Length: 90
Offset: 65 (72%), Referenced to phase 9:NBSB, Start of Yellow
Natural Cycle: 90
Control Type: Actuated-Coordinated
Total Lost Time: 8
Sum of Critical v/s Ratios: 0.68
Intersection v/c Ratio: 0.75
Intersection Webster Signal Delay: 17.7
Intersection LOS: B
* User Entered Value
\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
@ Some critical lane groups may be at other intersections sharing controller.

Splits and Phases: 8: NORRIS & RTE 153



Map - RTE 153- WESTBROOK
Levels of Service

August 31, 2004



BUILD W/TIMING CHANGE + FLAT ROCK
Data Date: 8/31/2004
Timing Plan: SAT PEAK

BL COMPANIES
F:\JOBS01\01c955-F\TRAF\RT153SATBUIFR.sy6

Lanes, Volumes, Timings

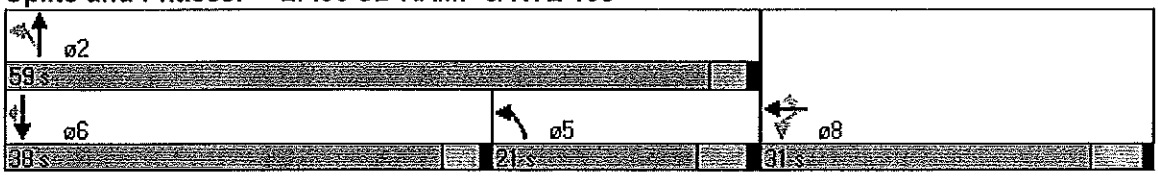
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12	11	12	12	12	12	12
Grade (%)		0%			2%			-1%			1%	
Storage Length (ft)	0		0	0		260	300		0	0		120
Storage Lanes	0		0	0		1	1		0	0		1
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (ft)				50	50	50	50	50			50	50
Trailing Detector (ft)				0	0	0	0	0			0	0
Turning Speed (mph)	15		9	15		9	15		9	15		9
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt Protected						0.850						0.850
Flt Protected					0.953		0.950					
Satd. Flow (prot)	0	0	0	0	1757	1568	1719	1872	0	0	1853	1575
Frt Perm.						0.850						0.850
Flt Perm.					0.953		0.118					
Satd. Flow (perm)	0	0	0	0	1757	1568	214	1872	0	0	1853	1575
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)						38						115
Headway Factor	1.00	1.00	1.00	1.01	1.01	1.01	1.04	0.99	0.99	1.01	1.01	1.01
Volume (vph)	0	0	0	305	1	35	278	587	0	0	594	183
Confl. Peds. (#/hr)												
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	0	0	0	332	1	38	302	638	0	0	646	199
Lane Group Flow (vph)	0	0	0	0	333	38	302	638	0	0	646	199
Turn Type				Perm		Perm	Pm+Pt					Perm
Protected Phases					8		5	2			6	
Permitted Phases				8		8	2					6
Detector Phases				8	8	8	5	2			6	6
Minimum Initial (s)				5.0	5.0	5.0	3.0	20.0			20.0	20.0
Minimum Split (s)				20.0	20.0	20.0	9.0	25.0			24.0	24.0
Total Split (s)	0.0	0.0	0.0	31.0	31.0	31.0	21.0	59.0	0.0	0.0	38.0	38.0
Total Split (%)	0%	0%	0%	34%	34%	34%	23%	66%	0%	0%	42%	42%
Yellow Time (s)				4.0	4.0	4.0	4.0	3.0			3.0	3.0
All-Red Time (s)				1.0	1.0	1.0	1.0	1.0			1.0	1.0
Lead/Lag							Lag				Lead	Lead
Lead-Lag Optimize?												
Recall Mode				None	None	None	None	Coord			Coord	Coord
Lane Grp Cap (vph)					433	415	426	1244			799	744
v/s Ratio Prot							0.13	0.34			0.35	
v/s Ratio Perm					0.19	0.02	0.34					0.12
Critical LG?					Yes		Yes				Yes	
Act Effct Green (s)					22.2	22.2	59.8	59.8			38.8	38.8

Lanes, Volumes, Timings

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Actuated g/C Ratio					0.25	0.25	0.66	0.66			0.43	0.43
v/c Ratio					0.77	0.09	0.71	0.51			0.81	0.27
Uniform Delay, d1					31.5	0.0	24.5	7.7			22.4	6.5
Platoon Factor					0.86	1.00	0.96	0.97			1.03	1.03
Incr. Delay, d2					8.0	0.1	4.3	1.2			8.6	0.9
Webster Delay					35.2	0.1	28.0	8.7			31.7	7.6
Webster LOS					D	A	C	A			C	A
Queue Length 50th (ft)					174	0	95	137			317	28
Queue Length 95th (ft)					255	19	m#192	m306			#561	79
Link Length (ft)		243			319			620			320	
50th Up Block Time (%)											6%	
95th Up Block Time (%)											35%	
Turn Bay Length (ft)						260	300					120
50th Bay Block Time %											38%	
95th Bay Block Time %					5%			7%			52%	
Queuing Penalty (veh)					1			10			90	

Area Type: Other
Cycle Length: 90
Actuated Cycle Length: 90
Offset: 86 (96%), Referenced to phase 2:NBTL and 6:SBT, Start of Yellow
Natural Cycle: 60
Control Type: Actuated-Coordinated
Total Lost Time: 8
Sum of Critical v/s Ratios: 0.67
Intersection v/c Ratio: 0.74
Intersection Webster Signal Delay: 22.1
Intersection LOS: C
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 2: I95 SB RAMP & RTE 153



Lanes, Volumes, Timings

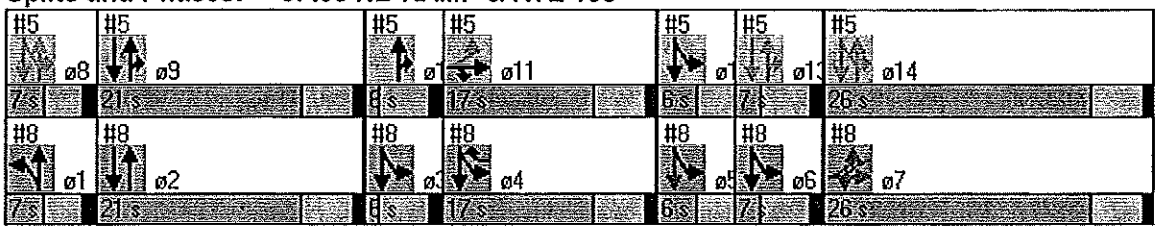
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
	ø1	ø2	ø3	ø4	ø5	ø6	ø7	ø8	ø9	ø10	ø13	ø14
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12	12	12	12	12	12	12
Grade (%)		2%			0%			0%			0%	
Storage Length (ft)	0		300	0		0	0		0	100		0
Storage Lanes	0		2	0		0	0		1	1		0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (ft)	50	50	50					50	50	50	50	
Trailing Detector (ft)	0	0	0					0	0	0	0	
Turning Speed (mph)	15		9	15		9	15		9	15		9
Lane Util. Factor	1.00	1.00	0.88	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt Protected			0.850						0.850			
Flt Protected		0.953								0.950		
Satd. Flow (prot)	0	1757	2759	0	0	0	0	1863	1583	1770	1863	0
Frt Perm.			0.850						0.850			
Flt Perm.		0.953								0.394		
Satd. Flow (perm)	0	1757	2759	0	0	0	0	1863	1583	734	1863	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			275						286			
Headway Factor	1.01	1.01	1.01	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Volume (vph)	193	1	253	0	0	0	0	657	263	55	828	0
Confl. Peds. (#/hr)												
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	210	1	275	0	0	0	0	714	286	60	900	0
Lane Group Flow (vph)	0	211	275	0	0	0	0	714	286	60	900	0
Turn Type	Perm		Prot					Custom	Custom			
Protected Phases	1	11 2	11 3	4	5	6	7	9 10 8	9 10 9	12 10	9 12 13	14
Permitted Phases	11							13 14 8	13 14 8	8 9 14	13 14 8	
Detector Phases	11	11	11							12		
Minimum Initial (s)	5.0	5.0	5.0							3.0		
	3.0	15.0	1.0	5.0	3.0	1.0	5.0	3.0	16.0	1.0	1.0	5.0
Minimum Split (s)	11.0	11.0	11.0							6.0		
	7.0	21.0	6.0	12.0	6.0	6.0	10.0	7.0	21.0	6.0	6.0	10.0
Total Split (s)	17.0	17.0	17.0	0.0	0.0	0.0	0.0	27.0	27.0	6.0	27.0	0.0
	7.0	21.0	6.0	17.0	6.0	7.0	26.0	7.0	21.0	6.0	7.0	26.0
Total Split (%)	19%	19%	19%	0%	0%	0%	0%	30%	30%	7%	30%	0%
	8%	23%	7%	19%	7%	8%	29%	8%	23%	7%	8%	29%
Yellow Time (s)	4.0	4.0	4.0							3.0		
	3.0	4.0	4.0	4.0	3.0	4.0	4.0	3.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	1.0	1.0							0.0		
	1.0	1.0	1.0	1.0	0.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lead/Lag	Lag	Lag	Lag							Lead		
	Lead	Lag	Lead	Lag	Lead	Lag		Lead	Lag	Lead	Lag	
Lead-Lag Optimize?												
Recall Mode	None	None	None							None		
	None	Min	None	None	None	Min	None	Min	Coord	None	None	None
Lane Grp Cap (vph)		254	634					1283	1179	565	1428	
v/s Ratio Prot			0.06					0.19	0.08	0.00	0.23	
v/s Ratio Perm		0.12						0.20	0.09	0.07	0.25	
Critical LG?		@	@					@	@	@	Yes@	
Act Effct Green (s)		13.0	13.0					62.0	62.0	65.0	69.0	
Actuated g/C Ratio		0.14	0.14					0.69	0.69	0.72	0.77	
v/c Ratio		0.83	0.43					0.56	0.24	0.11	0.63	

Uniform Delay, d1	37.4	0.0		7.0	0.0	2.6	4.7
Platoon Factor	1.00	1.00		0.68	1.00	0.06	0.05
Incr. Delay, d2	20.0	0.5		0.4	0.1	0.1	0.6
Webster Delay	57.5	0.5		5.2	0.1	0.2	0.8
Webster LOS	E	A		A	A	A	A
Queue Length 50th (ft)	118	0		117	0	0	0
Queue Length 95th (ft)	#238	31		225	18	m0	18
Link Length (ft)	577		344	319			620
50th Up Block Time (%)							
95th Up Block Time (%)							
Turn Bay Length (ft)		300				100	
50th Bay Block Time %							
95th Bay Block Time %							
Queuing Penalty (veh)							

Area Type: Other
Cycle Length: 90
Actuated Cycle Length: 90
Offset: 2 (2%), Referenced to phase 9:NBSB, Start of Yellow
Natural Cycle: 90
Control Type: Actuated-Coordinated
Total Lost Time: 8
Sum of Critical v/s Ratios: 0.66
Intersection v/c Ratio: 0.72
Intersection Webster Signal Delay: 6.9
Intersection LOS: A
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.
@ Some critical lane groups may be at other intersections sharing controller.

Splits and Phases: 5: I95 NB RAMP & RTE 153



Lanes, Volumes, Timings

Lane Group	EBL ø2	EBT ø3	EBR ø5	WBL ø6	WBT ø8	WBR ø9	NBL ø10	NBT ø11	NBR ø12	SBL ø13	SBT ø14	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	14	12	12	12	12	12	12	12	12	12	12
Grade (%)		2%			0%			0%			0%	
Storage Length (ft)	0		0	130		0	100		0	0		0
Storage Lanes	0		0	1		2	1		0	2		0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (ft)	50	50		50		50	50	50		50	50	
Trailing Detector (ft)	0	0		0		0	0	0		0	0	
Turning Speed (mph)	15		9	15		9	15		9	15		9
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	*0.75	1.00	0.95	0.95	0.97	1.00	1.00
Frt Protected						0.850		0.936			0.995	
Flt Protected		0.960		0.950			0.950			0.950		
Satd. Flow (prot)	0	1888	0	1770	0	2375	1770	3313	0	3433	1853	0
Frt Perm.						0.850		0.936			0.995	
Flt Perm.		0.960		0.754			0.950			0.950		
Satd. Flow (perm)	0	1888	0	1405	0	2375	1770	3313	0	3433	1853	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)						559		205			3	
Headway Factor	1.01	0.93	1.01	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Volume (vph)	5	1	0	262	0	514	5	371	277	561	465	15
Confl. Peds. (#/hr)												
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	5	1	0	285	0	559	5	403	301	610	505	16
Lane Group Flow (vph)	0	6	0	285	0	559	5	704	0	610	521	0
Turn Type	Custom			Custom		Custom	Prot			Prot		
Protected Phases						4	1	1 2		3 4 5 6 2 3 4 6		
Permitted Phases	2 7	3 7	5	6 7	8	9	10	11	12	13	14 5	
Detector Phases	7	7		7		4	1			4		
Minimum Initial (s)	5.0	5.0		5.0		5.0	3.0					
Minimum Split (s)	15.0 10.0	1.0 10.0	3.0	1.0 10.0	3.0	16.0 12.0	1.0 7.0	5.0	3.0	1.0	5.0	
Total Split (s)	21.0 26.0	6.0 26.0	6.0 0.0	6.0 26.0	7.0 0.0	21.0 17.0	6.0 7.0	11.0 28.0	6.0 0.0	6.0 36.0	10.0 51.0	0.0
Total Split (%)	21.0 29%	6.0 29%	6.0 0%	7.0 29%	7.0 0%	21.0 19%	6.0 8%	17.0 31%	6.0 0%	7.0 40%	26.0 57%	0%
Yellow Time (s)	23% 4.0	7% 4.0	7%	8% 4.0	8%	23% 4.0	7% 3.0	19%	7%	8%	29%	
All-Red Time (s)	4.0 1.0	4.0 1.0	3.0	4.0 1.0	3.0	4.0 1.0	4.0 1.0	4.0	3.0	4.0	4.0	
Lead/Lag	1.0	1.0	0.0	1.0	1.0	1.0 Lag	1.0 Lead	1.0	0.0	1.0	1.0	
Lead-Lag Optimize?	Lag	Lead	Lead	Lag	Lead	Lag	Lead	Lag	Lead	Lag		
Recall Mode	None	None		None		None	None					
Lane Grp Cap (vph)	Min	None 441	None	Min 328	Min	Coord 821	None 12	None 1483	None	None 763	None 1162	
v/s Ratio Prot						0.10	0.00	0.20		0.18	0.28	
v/s Ratio Perm		0.00		0.20								
Critical LG?		@		Yes@		@	@	@		Yes@	@	
Act Effct Green (s)		21.0		21.0		13.0	0.6	37.0		20.0	56.4	
Actuated g/C Ratio		0.23		0.23		0.14	0.01	0.41		0.22	0.63	
v/c Ratio		0.01		0.87		0.68	0.42	0.47		0.80	0.45	

Uniform Delay, d1	26.5	33.2	0.0	44.6	13.2	33.1	8.6
Platoon Factor	0.97	0.97	1.00	0.95	1.04	0.92	0.67
Incr. Delay, d2	0.0	20.9	2.3	21.8	0.2	4.8	0.2
Webster Delay	25.8	53.1	2.3	64.0	13.9	35.2	6.0
Webster LOS	C	D	A	E	B	D	A
Queue Length 50th (ft)	3	154	0	3	105	187	113
Queue Length 95th (ft)	12	#291	56	14	155	226	158
Link Length (ft)	195	420			420		319
50th Up Block Time (%)							
95th Up Block Time (%)							
Turn Bay Length (ft)		130		100			
50th Bay Block Time %		17%			7%		
95th Bay Block Time %		48%			22%		
Queuing Penalty (veh)		90					

Area Type: Other
Cycle Length: 90
Actuated Cycle Length: 90
Offset: 2 (2%), Referenced to phase 9:NBSB, Start of Yellow
Natural Cycle: 90
Control Type: Actuated-Coordinated
Total Lost Time: 8
Sum of Critical v/s Ratios: 0.66
Intersection v/c Ratio: 0.72
Intersection Webster Signal Delay: 19.1
Intersection LOS: B
* User Entered Value
\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
@ Some critical lane groups may be at other intersections sharing controller.

Splits and Phases: 8: NORRIS & RTE 153