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**Memorandum**

To: Gershman Brown Crowley Inc.  
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Date: October 6, 2011

Project No.: 41545.29

From: Kwame Aidoo P.E.  
Vahid Karimi, P.E., FITE

Re: Preliminary Engineering Report  
Traffic Control Signal Improvements  
Route 12 (Kings Highway) at Hurlbutt  
Road Intersection  
Gales Ferry, CT

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## Introduction

Vanasse Hangen Brustlin, Inc. (VHB) has been retained by Gershman Brown Crowley Inc. to provide engineering design services relative to traffic control signal design improvements at the intersection of Route 12 (Kings Highway) and Hurlbutt Road in Gales Ferry, Connecticut.

## Project Description

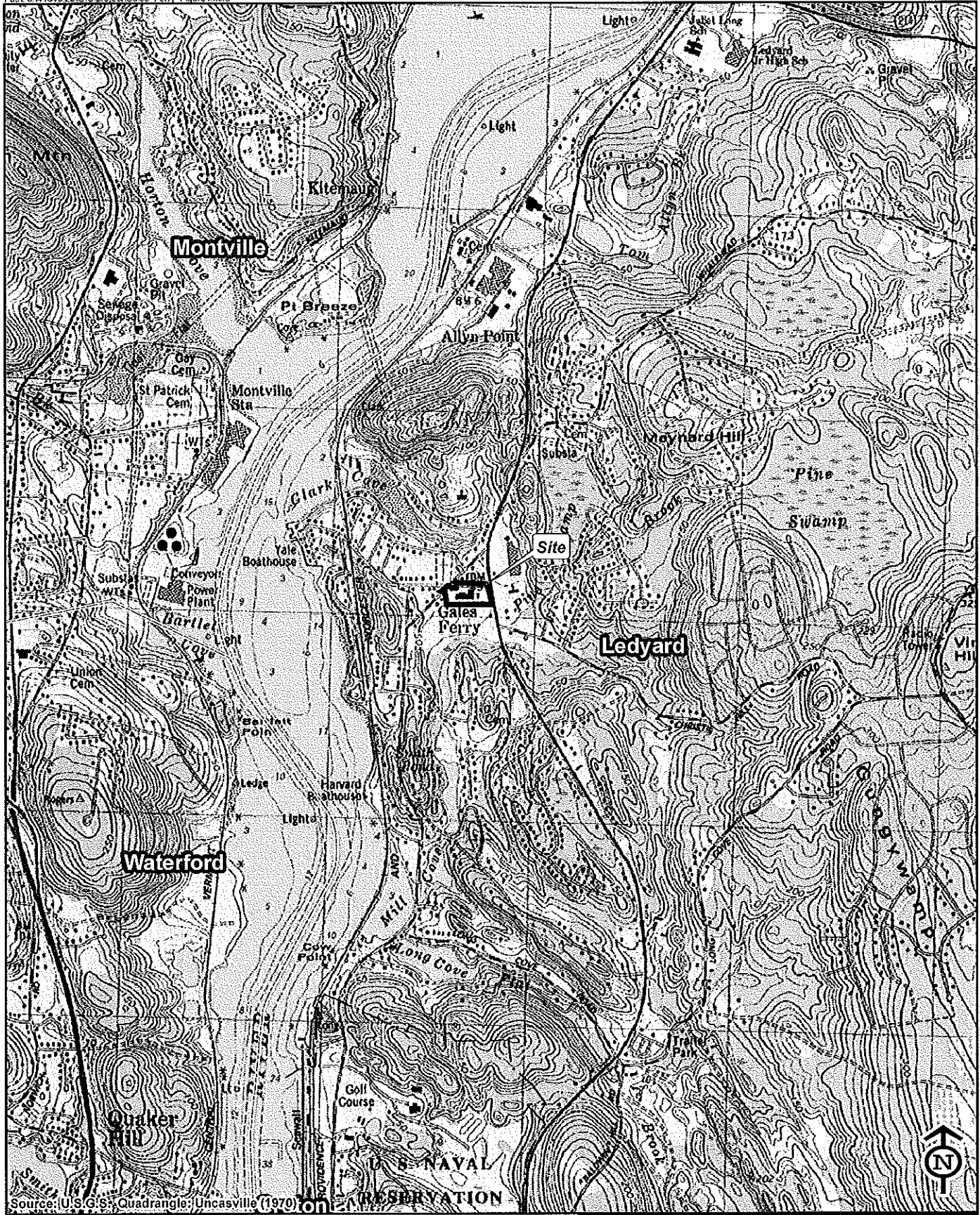
The scope of work for this project entails full installation of a traffic control signal of Route 12 (Kings Highway) and Hurlbutt Road in Gales Ferry, Connecticut. The installation of a traffic control signal is considered in conjunction with the completion of a proposed pharmacy development on a vacant 1.89 acre parcel located at the southwest quadrant of the intersection of Route 12 and Hurlbutt Road in Gales Ferry, CT. The traffic signal will also serve access driveway to shopping center across from Hurlbutt Road. The proposed development site is depicted on *Figure 1*.

## Existing Conditions

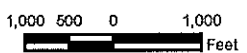
### Study Area Roadways and Study Area Intersections

Route 12 is a principal arterial roadway with a posted speed limit of 35 miles per hour within the vicinity of the project site. Hurlbutt Road is a two-lane (one lane in each direction) local road with a posted speed limit of 25 miles per hour within the vicinity of the project site.

Hurlbutt Road intersects Route 12 from the west, and the Ocean State shopping center driveway intersects Route 12 from the east to form a four-legged unsignalized intersection. The northbound Route 12 approach consists of a shared left-through lane and a shared right-through lane. The southbound Route 12 approach consists of a single lane. The eastbound Hurlbutt Road and



Source: U.S.G.S. Quadrangle: Uncasville (1970)



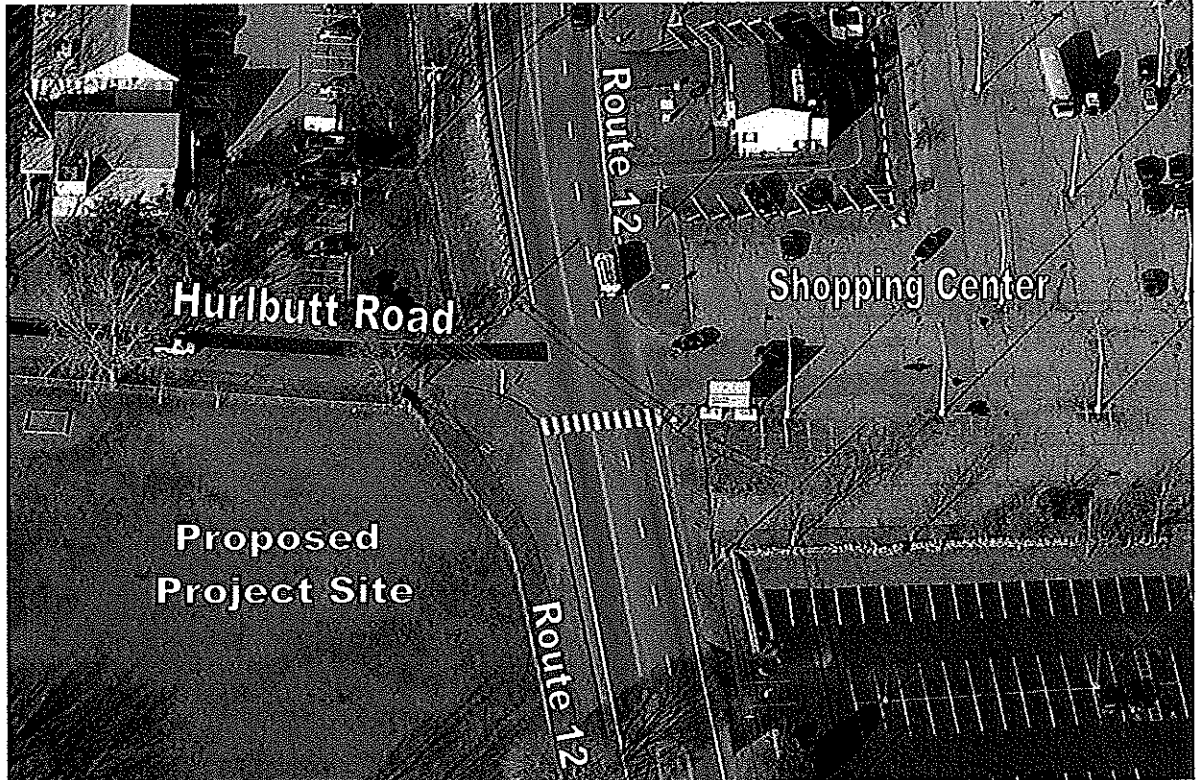
Quadrangle Location

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Figure 1  
Site Location Map  
7 Hurlbutt Road  
Ledyard, Connecticut

westbound shopping center driveway approaches each consist of a single lane that operates under stop-sign control. The eastbound Hurlbutt Road approach is designated as right-turn only.

An aerial view of the project site and the study intersections is depicted below.



Aerial view of Route 12 at Hurlbutt Road/Shopping Center Drive<sup>1</sup>

<sup>1</sup> Image obtained from Bing Maps: <http://www.bing.com/maps>, accessed 5/24/11

**Existing Traffic Volumes**

To assess existing traffic conditions in the vicinity of the site, peak hour turning movement volumes were recorded at the Route 12/Hurlbutt Road intersection during the typical weekday evening peak hours (4:00 PM to 6:00 PM) on Friday, May 13, 2011 and during the typical Saturday midday peak hours (11:00 AM to 1:00 PM) on Saturday, May 21, 2011. Roadway networks depicting the existing Friday evening and Saturday midday peak hour traffic volumes are presented on *Figure 2*.

In addition to the manual turning movement traffic volume and pedestrian counts, Automatic Traffic Recorders (ATR) were installed to collect directional traffic volumes and vehicle speed data on Route 12 and Hurlbutt Road adjacent to the development site. The volumes count data was collected in 15-minute intervals and is summarized in *Table 1*. The 85<sup>th</sup> percentile speeds along Route 12 in the northbound and southbound directions were found to be 41 miles per hour and 43 miles per hour, respectively. The 85<sup>th</sup> percentile speeds along Hurlbutt Road in the eastbound and westbound directions were found to be 30 miles per hour and 29 miles per hour, respectively.

**Table 1  
 Observed Traffic Volumes**

Location	Direction	Weekday		
		ADT*	AM** Peak Hour	PM** Peak Hour
Route 12 <sup>1</sup> south of Hurlbutt Road	Northbound	7,044	307	628
	<u>Southbound</u>	<u>7,017</u>	<u>464</u>	<u>522</u>
	Total	14,061	771	1,150
Hurlbutt Road <sup>2</sup> west of Route 12	Eastbound	572	25	58
	<u>Westbound</u>	<u>713</u>	<u>47</u>	<u>65</u>
	Total	1,285	72	123

\* Average daily traffic expressed in vehicles per day.

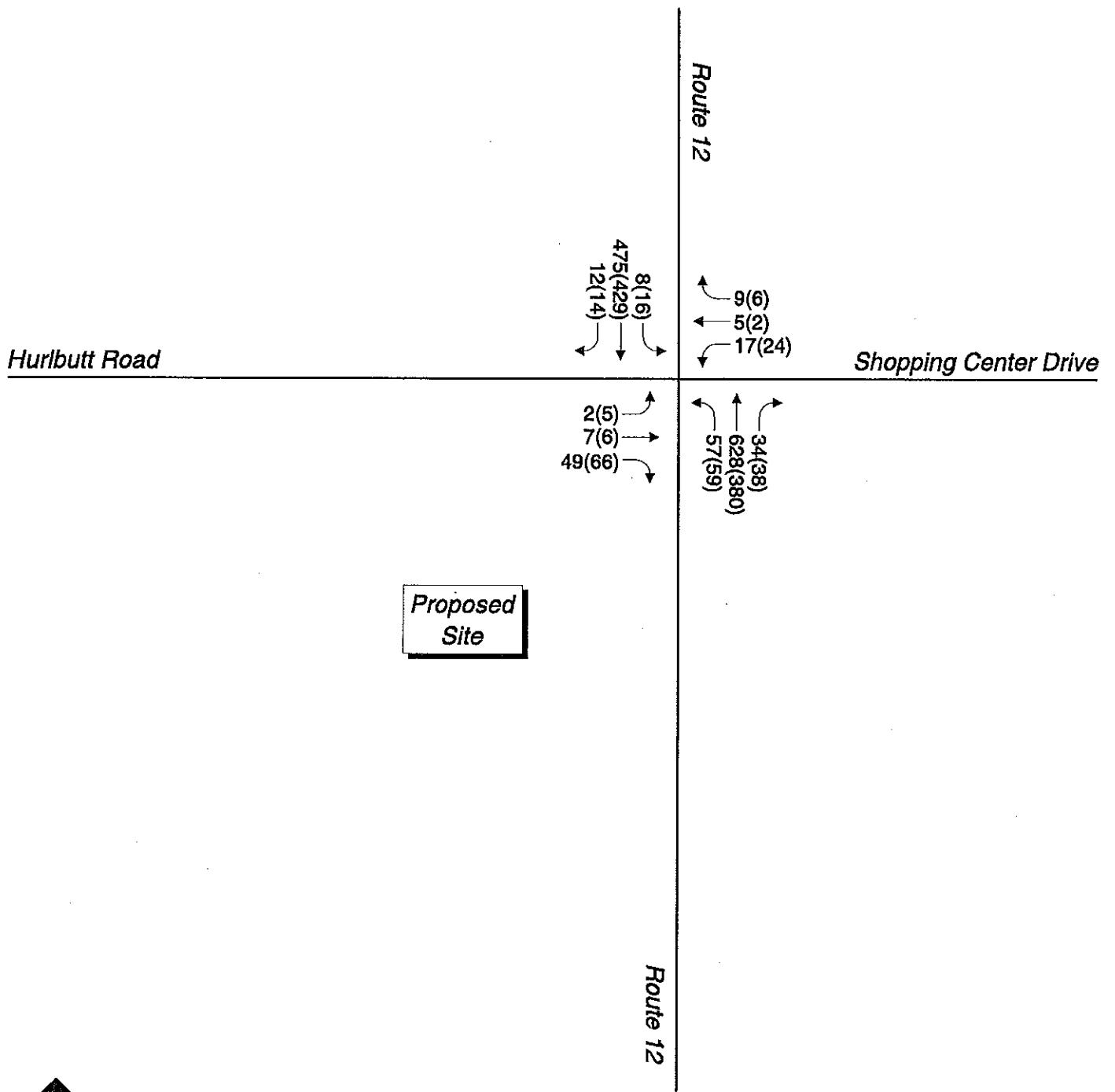
\*\* Hourly Traffic expressed in vehicles per hour.

1 Data collected by RHS Consulting Designs, LLC from June 28, 2011 to June 30, 2011.

2 Data collected by RHS Consulting Designs, LLC from June 1, 2011 through June 7, 2011.

**Accident History**

Accident records at the Route 12 at Hurlbutt Road intersection were obtained from the Connecticut Department of Transportation Bureau of Planning and Research for the most recent three year period, January 2006 through December 2008. According to these records, 16 accidents occurred at the study intersection during the three year analysis period. Approximately 56 percent (9 total) of these accidents were of the property damage only type, and an injury occurred in the remaining 44 percent (7 total) of the accidents. Angle accidents, which comprised 31 percent of the total accidents, were the most common collision type to occur at this intersection.



**Proposed Site**

↑  
Not to Scale

Key: PM PEAK (SAT PEAK)

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Figure 2 October 2011

2011 Existing Conditions  
 Peak Hour Traffic Volumes  
 Route 12 at Hurlbutt Road/Shopping Center Drive  
 Gales Ferry, Connecticut

## Existing Operational Analysis

### Unsignalized Intersection Capacity Analysis

Unsignalized intersection capacity analysis was performed at the Route 12/Hurlbutt Road intersection under existing conditions.

The westbound shopping center drive approach at the Route 12/Hurlbutt Road intersection currently operates at level of service 'E' or better during the peak hours. The eastbound Hurlbutt Road approach currently operates at level of service 'C' or better during the peak.

The results of the unsignalized intersection capacity analysis are summarized in *Table 2*. Synchro reports of the unsignalized intersection capacity analysis are included in the Appendix.

**Table 2**  
**Unsignalized Intersection Capacity Analysis**

Location/Movement	2011 Existing Condition		
	Demand*	Delay**	LOS***
<b>Route 12 at Hurlbutt Road</b>			
<u>Weekday Afternoon Peak Hour</u>			
- Eastbound Hurlbutt Road	58	15.6	C
- Westbound Shopping Center	31	37.9	E
- Northbound Route 12 (left lane)	371	1.8	A
- Southbound Route 12	495	0.3	A
<u>Saturday Midday Peak Hour</u>			
- Eastbound Hurlbutt Road	77	14.0	B
- Westbound Shopping Center	32	29.4	D
- Northbound Route 12 (left lane)	249	2.4	A
- Southbound Route 12	459	0.4	A

Source: Vanasse Hangen Brustlin, Inc.

\* Demand in Vehicles per Hour

\*\* Delay = Average Control Delay in Seconds per Vehicle

\*\*\* Level of Service for the Critical Movement

## Traffic Signal Warrant Analysis

The warrants outlined in the 2009 Edition of the Manual on Uniform Traffic Control Devices (MUTCD) were used to evaluate the installation of a traffic control signal at the Route 12 at Hurlbutt Road intersection. The MUTCD defines nine warrants that can be considered as grounds for the installation of a traffic control signal, and it is only necessary to meet one of these warrants to justify the installation of a traffic signal. The three warrants most likely to apply to conditions at the Route 12 at Hurlbutt Road intersection are the Eight-Hour Vehicular Volume Warrant (Warrant 1), the Four-Hour Vehicular Volume Warrant (Warrant 2), and the Peak Hour Warrant (Warrant 3). These three warrants are evaluated based on the conflicting traffic volumes on the major street (Route 12) and the minor street (Hurlbutt Road) over a specified period of time.

The existing hourly major street and minor street traffic volumes were established based on automatic traffic recorder data collected along Route 12 and Hurlbutt Road, respectively. As discussed previously, the daily and peak hour traffic volumes generated by the proposed

CVS/pharmacy were forecasted using ITE Land Use Code 881 (Pharmacy/Drugstore with Drive-Through Window). The hourly site-generated traffic volumes during off-peak hours were forecasted by applying the factors in the Hourly Variation in Shopping Center Traffic table in the ITE Trip Generation Manual to the daily site-generated traffic volumes. These hourly traffic volumes were added to the existing traffic volumes based on the directional distribution of site-generated traffic to establish the major street and minor street hourly traffic volumes under Build conditions.

Based on these calculations, the traffic volumes at the Route 12 at Hurlbutt Road intersection are expected to meet the Eight Hour Vehicular Volumes Warrant (Warrant 1) under further Build conditions. Therefore, the installation of a traffic signal at the Route 12 at Hurlbutt Road intersection will be warranted upon completion of the proposed CVS/pharmacy development.

Hourly traffic volume calculations and additional information regarding the traffic signal warrant analysis is included in the Appendix.

## Future Conditions

### Future Growth

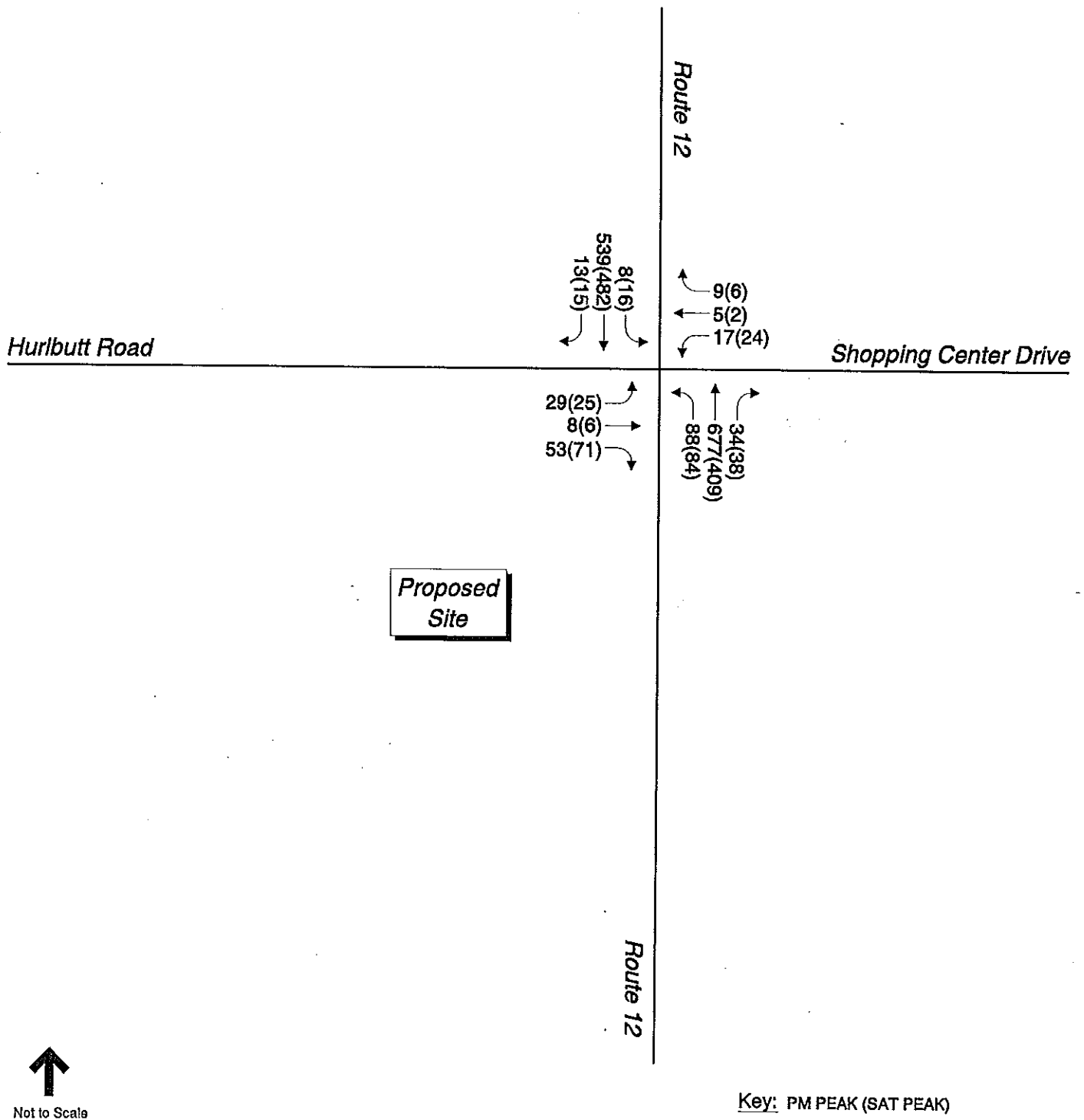
As mentioned previously, the existing turning movement counts were used to establish existing conditions and as a basis to forecast future traffic volumes at the study area intersections.

Traffic growth is typically a function of expected land development, economic activity, and changes in demographics in the region. To estimate a rate at which traffic can be expected to grow during the study period, historical traffic growth and nearby planned developments were reviewed and carefully considered.

To determine the average annual traffic growth rate in the study area resulting from regional growth rate, discussions were held with representatives from Connecticut Department of Transportation (CTDOT). As recommended by the CTDOT forecasting unit, an average annual growth rate of 1.5 percent per year was deemed appropriate to conservatively estimate traffic volume growth between years 2011 and 2016. Applying this growth rate to field observed turning movement counts results in the projected future 2016 base background traffic volumes.

Based on discussions with the Town of Ledyard Planning and Development Department, it was determined that there are no other planned developments within the vicinity of the proposed CVS/pharmacy development that will impact the adjacent roadway system.

The projected 2016 design year traffic volumes at the study intersections was assumed to include the anticipated CVS/pharmacy site-generated traffic volumes in addition to the projected future 2016 base background traffic volumes. *Figure 3* presents the resulting 2016 design year peak hour traffic volumes.



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Figure 3

October 2011

2016 Future Conditions  
 Peak Hour Traffic Volumes  
 Route 12 at Hurlbutt Road/Shopping Center Drive  
 Gales Ferry, Connecticut



**Recommended Intersection Improvements**

To improve operations at the intersection of Route 12 and Hurlbutt Road, it is proposed that Route 12 be restriped so that the northbound and southbound approaches each provide a through-right lane and an exclusive left-turn lane. It is expected that this restriping will improve safety and operating conditions for vehicular traffic by removing left turning vehicles from the path of the through travelling vehicles.

Traffic operations at the intersection of Route 12 and Hurlbutt Road will be controlled by a fully-actuated traffic control signal.

**Future Operational Analysis**

**Signalized Intersection Capacity Analysis**

Signalized intersection capacity analysis was used to evaluate the performance of the Route 12 at Hurlbutt Road intersection under future Build conditions. Based on the results of this capacity analysis, the Route 12 at Hurlbutt Road intersection is expected to operate at level of service 'A' during the peak hours under future 2016 design year conditions.

The results of the signalized intersection capacity analysis are summarized in *Table 3*. Synchro reports of the signalized intersection capacity analysis are included in the Appendix.

**Table 3**  
**2016 Signalized Intersection Capacity Analysis**

Roadway	Approach Lane	Weekday PM Peak Hour		Saturday Midday Peak Hour	
		LOS*	Delay**	LOS	Delay
Hurlbutt Road Shopping Center Drive Route 12	Eastbound LT-TH-RT	C	25.6	C	25.2
	Westbound LT-TH-RT	C	23.9	C	24.9
	Northbound LT	A	4.0	A	6.3
	Northbound TH-RT	A	8.0	A	8.9
	Southbound LT	A	5.4	A	7.7
	Southbound TH-RT	A	8.2	B	12.0
<b>Route 12 at Hurlbutt Road</b>	<b>Overall</b>	<b>A</b>	<b>9.6</b>	<b>B</b>	<b>12.5</b>

Source: Vanasse Hangen Brustlin, Inc.

\* Level of Service

\*\* Delay = Average control delay experienced by all vehicles entering the intersection in seconds / vehicle

## Future Queue Analysis

In addition to the level of service analysis, queue calculations were performed to evaluate adequacy of the proposed lane storages at the proposed signalized intersection. Under future conditions, at the intersection of Route 12 and Hurlbutt Road, none of the approach queues exceed available storage.

**Table 4**  
**2016 Queue Analysis**

Roadway	Approach Lane	Available Storage	Weekday PM Peak Hour	Saturday Midday Peak Hour
Hurlbutt Road	Eastbound LT-TH-RT	600'	43	45
Shopping Center Drive	Westbound LT-TH-RT	150'	27	33
Route 12	Northbound LT	150'	22	49
	Northbound TH-RT	>600'	374	321
	Southbound LT	50'	4	15
	Southbound TH-RT	>600'	244	366

Source: Vanasse Hangen Brustlin, Inc.  
 Critical queue length in feet/approach, based on 95% queue.  
**BOLD** - queue length exceeds available storage length.

## Summary of Intersection Improvements

To accommodate future traffic demands at the intersection of Route 12 and Hurlbutt Road, the following safety and capacity improvements were considered:

- Traffic operations to be controlled by an actuated traffic control signal.
- Restripe southbound Route 12 to provide an exclusive left-turn lane and a shared through/left-turn lane.
- Restripe northbound Route 12 to provide an exclusive left-turn lane and a shared through/left-turn lane.
- Provide protected/permitted phasing for Route 12 opposing left-turn movements.
- Allow all movements on Hurlbutt Road eastbound approach.
- Install loop detectors for Route 12 and Hurlbutt Road approaches and video detection for Shopping Center Drive.
- Install accessible curb ramps, crosswalk, pedestrian signal heads and push buttons for crossing Route 12 northbound approach.

Utilizing the recommended improvements, the intersection of Route 12 at Hurlbutt Road will better accommodate vehicle traffic as experienced today and as forecast in the 2016 design year.

## Appendix

- Existing Traffic Volume counts
- Network Volume Calculations
- Traffic Signal Warrant Analysis
- Synchro Reports