Planning | Transportation | Land Development | Environmental

Vanasse Hangen Brustlin, Inc.
101 Walnut Street
Post Office Box 9151
Watertown, MA 02471-9151
617.924.1770 • Fax 617.924.2286
www.vhb.com

Memorandum

To: Inessa Rifkin
Russian School of Mathematics
200 Wells Avenue
Newton, MA 02459

Date: June 25, 2013

Project No.: 12350.00

From: Randall C. Hart
Director of Transportation Planning & Engineering, LD

Re: Traffic Assessment Memorandum
Russian Mathematics School
200 Wells Avenue
Newton, Massachusetts

Introduction

This memo has been prepared to provide a review of existing traffic conditions at the Russian School of Mathematics (RSM) and Dance Fever site located at 200 Wells Avenue, as well as future conditions evaluation with the proposed site modifications and operational protocols in place. Currently the school portion of the facility is permitted for up to 10 students per class room. Based on information provided by the Proponent, current enrollment is beyond the permitted levels. To accommodate the current operations of the school and to allow for some limited future growth, the applicant is seeking modification to its special permit to allow:

- up to 200 students in the school at any given time
- up to a maximum of 15 students per class
- up to 17 classes to occur at any one time
- up to 28 employees on site at any one time

As part of the permitting necessary to continue operations at this location and support the request that is being made, modifications to the existing site plan and the introduction of a traffic circulation and parking management plan, including protocols for afternoon drop-off/pick-up and general site circulation has become necessary and is being proposed. The focus of this document is to assess the traffic access and operational conditions only. It should be noted that a separate and distinct parking assessment has been completed by Planning Horizons and is included under separate heading within the application.

Under existing conditions, the property has two full access driveways and parking areas along Wells, one on the east (parking lot B) and west side of the building (parking lot A). Parking lot A driveway provides access to the primary parking area for the site and includes a total of 49 parking spaces. Parking lot B driveway provides access to approximately 14 parking spaces. This area is designated for student drop off only and there is a 5 minute parking limitation. Currently the eastern and western driveways/parking areas are not connected. As part of revisions to the site being considered under this application, a parent drop-off and pick-up connector roadway is being proposed which would connect the two parking areas. This connector road would be one-way from west to east and will be used exclusively for the purpose of parent drop-off and pick-up only (no extended parking).

Weekly classes and instruction for activities at both RSM and Dance Fever primarily occur between 3:00 pm and 9:00 pm on weekdays and between 8:00 am and 7 pm on weekends. Most of the existing programs are geared toward the school age population with Dance Fever offering some later evening classes for adults. The vast majority of students in both schools are driven to the facility and dropped-off/picked-up when the session is

over. Carpooling is encouraged and frequently more than one child per household is enrolled in concurrent classes.

Safety Assessment

To identify potential vehicle crash trends at the two site driveways, reported vehicular crash data for the study-area intersections was obtained from MassDOT for the years 2006 through 2010, the most recent five-year history available. A summary of the MassDOT vehicle crash history and crash rates is presented in Table 1. This data is contained in the Attachments for reference.

The 2010 MassDOT average crash rates for unsignalized intersections for District 6 is 0.58. As shown in Table 1, the only site driveway with recorded crashes is the Lot B driveway location which observed a total of 2 accidents over the 5 years of date that was reviewed.

Table 1 Vehicular Crash Summary (2006-2010)

	Wells Avenue and LOT B Driveway	Wells Avenue and LOT A Driveway
Year		
2006	0	0
2007	1	0
2008	1	0
2009	0	0
2010	0	0
Total	2	0
Average	0.40	0
Collision Type		0
Angle	0	0
Head-on	0	0
Rear-end	0	0
Rear-to-Rear	1	0
Sideswipe, opposite direction	0	0
Sideswipe, same direction	0	0
Single vehicle crash	0	0
Unknown	0	0
Not reported	1	0
Total	2	0
Crash Severity		0
Fatal injury	0	0
Non-fatal injury	1	0
Property damage only (none injured)	1	0
Not Reported	0	0
Unknown	0	0
Total	2	0
Time of Day		0
Weekday, 7:00 AM - 9:00 AM	0	0
Weekday, 4:00 PM - 6:00 PM	0	0
Saturday, 11:00 AM - 2:00 PM	0	0
Weekday, other time	2	0
Weekend, other time	0	0
Total	2	0
Pavement Conditions		0
Dry	2	0
Wet	0	0
Snow	0	0
Ice	0	0
Sand, mud, dirt, oil, gravel	0	0
Water (standing, moving)	0	0
Slush	0	0
Other	0	0
Unknown	0	0
Not reported	0	0
Total	2	0
MassDOT Crash Rates	0.36	0.00

*Represents Crash Rate per Million Entering Vehicles Miles (MEV); State Average is 0.60 and Local MassDOT District (6) is 0.58 For unsignalized intersections

Based on the crash data, it can be concluded that neither site driveway currently has significant crash frequency. In addition, based on anecdotal information provided by the Proponent, there are no known or perceived safety issues associated with access and operations of the site driveways.

Existing Traffic Conditions

For the purpose of assessing existing and future traffic conditions at the site driveway and along Wells Avenue in the vicinity of the site, manual turning movement and automatic traffic recorder counts were conducted. Specifically, manual turning movement counts were conducted at each site driveway between the hours of 2-4 PM on a weekday to capture key parent drop-off and pick-up periods in April of 2013. All traffic count sheets are included in the appendix of this document along with networks of the peak traffic activity at the site driveways during the afternoon peak period. In addition, an automatic traffic recorder (ATR) count was conducted along Wells Avenue in front of the site for 48 hour period. The ATR count collected both vehicular movement and vehicle speed. A summary of the ATR count is provided below in Table 2.

Table 2 ATR Data Summary

Location	Daily[a] Weekday	Weekday Morning Peak Hour Volume[b]	K Factor[c]	Dir. Dist.[d]	Weekday Evening Peak Hour Volume	K Factor	Dir. Dist.	85th Percentile Speed (mph) EB	WB
Wells Avenue, west of #181 Driveway	2,000	145	7.2%	EB 68%	170	8.5%	EB 81%	33	29

Source: Vanasse Hangen Brustlin, Inc. Based on automatic traffic recorder (ATR) counts conducted in June 2011
a average daily traffic (ADT) volume expressed in vehicles per day
b peak period traffic volumes expressed in vehicles per hour
c percent of daily traffic that occurs during the peak period
d directional distribution of peak period traffic
Note: peak hours do not necessarily coincide with the peak hours of the individual intersection turning movement counts

Sight Distance

A sight distance analysis, in conformance with guidelines of the American Association of State Highway and Transportation Officials (AASHTO) was performed at the existing site access driveways on Wells Avenue. Stopping Sight Distance (SSD) is the distance required for a vehicle approaching an intersection from either direction to perceive, react and come to a complete stop before colliding with an object in the road, in this case the exiting vehicle from a driveway. In this respect, SSD can be considered as the minimum visibility criterion for the safe operation of an unsignalized intersection.

Intersection Sight Distance (ISD) is based on the time required for perception, reaction and completion of the desired critical exiting maneuver (left turn) once the driver on a minor street approach decided to execute the maneuver. Calculation for the critical ISD includes the time to (1) turn left, and to clear the half of the intersection without conflicting with the vehicles approaching from the left; and (2) accelerate to the operating speed of the roadway without causing approaching vehicles to unduly reduce their speed (in the case of the right-in/right-out driveway only this portion applies). In this context, ISD can be considered as a desirable visibility criterion for the safe operation of an unsignalized intersection. Essentially, while SSD is the minimum distance needed to avoid collisions, ISD is the minimum distance needed so that mainline motorists will not have to substantially reduce their speed due to turning vehicles. To maintain the safe operation of an unsignalized intersection, ISD should be greater than or equal to the stopping sight distance, though it is desirable to meet ISD requirements by themselves.

To calculate the required ISD and SSD at the existing site driveways along Wells Avenue the observed 85th percentile speed of 33 mph was used (even though the 85th percentile speed .WB was 28 mph). Table 3 summarizes the sight distance analysis.

Table 3 Sight Distance Analysis Summary

	Stopping Sight Distance			Intersection Sight Distance		
	Traveling	Required [a]	Measured	Looking	Required [a]	Measured
Lot A Driveway	Eastbound [a]	230 feet	210 feet	East	365 feet	250 feet
	Westbound	230 feet	270 feet	West	320 feet	190 feet
Lot B Driveway	Eastbound [a]	230 feet	240feet	East	365 feet	240 feet
	Westbound	230 feet	260 feet	West	320 feet	210 feet

Source: Based on guidelines established in A Policy on the Geometric Design of Highways and Streets, American Association of State Highway and Transportation Officials (AASHTO), 2004

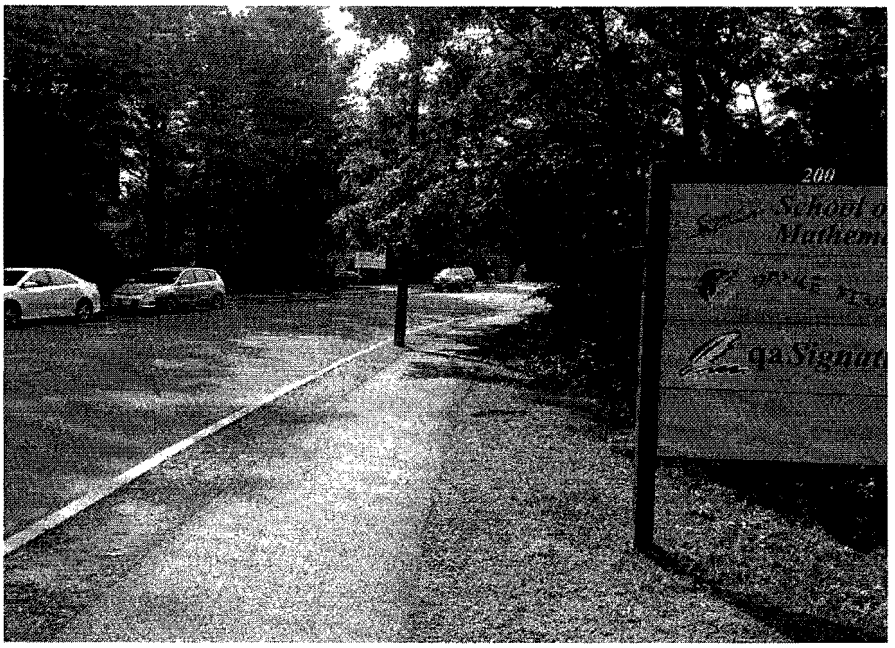
a Based on measured 85th percentile speed

As outlined in Table 3, the critical stopping sight distance approaching the Lot A and Lot B driveways is 230 feet which is currently met or exceeded for all movements with the exception of the eastbound approach to the LOT A driveway which currently has approximately 210 feet of visibility. As outlined in the table, current field conditions fall short of meeting intersection sight distance (ISD) requirements. Meeting the SSD requirements at both driveways should be the minimum sight distance that needs to be provided although it is highly desirable to meet both SSD and ISD at each location.

Existing features which limit the sight distance in this area included a horizontal curve in the roadway coupled with vegetation overgrowth. Pictures at each site driveway were taken in June 2013 to represent exiting conditions.

Lot A Driveway looking west

Lot A Driveway looking East



Lot B Driveway looking West

As shown in the photographs, it is the combination of horizontal roadway curvature and the overgrowth that causes limitation in sight lines. To improve on the existing condition, and meet the SSD requirements at a minimum, clearing and pruning along the site frontage to the west of the Lot B site driveway is necessary and should be completed immediately. In addition, additional trimming on all both sides of each driveway should be considered to increase the available ISD to the extent possible and practical. To supplement clearing proposed, relocating the STOP signs and accompanying stop lines closer to Wells Avenue (approximately 2-4 feet behind sidewalk) will also have a positive influence on available sight lines, as would the relocation of panel sign located immediately to the east of the east driveway. For the purpose of demonstrating the changes required to meet the SSD minimum, refer to sight-distance figure in the Appendix which outlines the areas that need to be cleared to improve sight lines.

Under current conditions, parking along the south side of Wells Avenue is signed to not allow parking except on Saturdays Sundays and Holidays along the site frontage. Given the horizontal profile of the roadway in this area and the need to maximize sight lines for access and egress to the site, we strongly recommend that existing parking restrictions be modified to **not** allow parking along the south side of Wells Avenue in the area of the site frontage at any time.

Site Plan Modification and Operational Protocols

As described earlier, as part of the permitting process for the project, long term onsite enhancements are being proposed. Additionally, in the short term, the recent deployment of a police detail, employing a parking lot attendant, and reopening lot B have considerably improved operational conditions on site. Future enhancements proposed include the following:

- Modification to the existing site plan to accommodate a parent drop-off and pick-up lane along the front of the existing building. This controlled area will be one-way (west to east), and will be used exclusively for parent drop and pick-up only.
- Protocols for access, parking, and drop-off including staggering classes that are spread by 15 minute intervals. Protocols include:
    - Students will be dropped off and picked up in the new parent drop-off and pick-up lane. This driveway connection between parking lots will allow for live parking exclusively. All other vehicles will be directed

to parking lot A. Parent will have the option to park and walk their child into the school when necessary as well.

- Teacher and administrators will park in lot B and, if necessary, in lot A, closest to Wells Avenue.
- A parking attendant will monitor the site driveway between 3:00 and 7:00 PM on weekdays to insure student pedestrian safety and to keep traffic circulating through the parking lot.
- Regular reminders will be sent to parent regarding parking procedures, pick-up and drop-off protocols, and to reinforce that there shall be no parking on Wells Avenue.
- Both RSM and Dance Fever will further develop and promote carpool programs that will be aimed at further reducing vehicular trips to the site. For example, reduced tuition rates and other incentives will be offered to parents who continually demonstrate viable carpooling arrangements.
- Lease arrangements (temporary or long term) will be sought to allow for teacher and administrator parking based on monitoring the extent to which the above outlined improvements will address identified concerns.

Traffic Operational Analyses

Measuring existing traffic volumes and projecting future traffic volumes quantifies traffic within the study area. To assess quality of flow, roadway capacity analyses were conducted with respect to the 2013 existing conditions with the proposed site plan modification and operational protocols in place. Capacity analyses provide an indication of the adequacy of the roadway facilities to serve the anticipated traffic demands. The analysis summary, Table 4, contains the results of operational analyses at each site driveway with the revised site plan and assumed operational protocols in place. The analysis is limited to the afternoon peak hour which is the critical peak period for combination of site traffic activity and ambient background traffic volumes.

Level-of-Service and Delay Criteria

Level-of-service (LOS) is the term used to denote the different operating conditions that occur on a given roadway segment under various traffic volume loads. It is a qualitative measure of the effect of a number of factors including roadway geometrics, speed, travel delay, freedom to maneuver, and safety. Level-of-service provides an index to the operational qualities of a roadway segment or an intersection. Level-of-service designations range from A to F, with LOS A representing the best operating conditions and LOS F representing the worst operating conditions.

For unsignalized intersections, the analysis assumes that traffic on the mainline is not affected by traffic on the side streets. The LOS is determined primarily for left turns from the main street and all movements from the minor street (site driveways in this case). The study of an unsignalized intersection is, for the most part, done by observing the most critical movement, which is most often the left turn out of the side street. The evaluation criteria used to analyze intersections is based on the 2000 Highway Capacity Manual (HCM)[1] and are included in the Attachments.

Unsignalized Site Driveway Capacity Analyses

Table 4 presents a summary of the capacity analyses for the unsignalized site driveways along Wells Avenue. The capacity analyses worksheets are included in the Attachments.

1 Highway Capacity Manual, HCM2000, Transportation Research Board, Washington, DC (2000).

Table 3
Unsignalized Intersection Capacity – Morning and Afternoon Peak Periods

Location	Peak Period	Critical Movement	2013 Build Conditions				Proposed Conditions			
			Dem [a]	v/c [b]	Del [c]	LOS [d]	Dem	v/c	Del	LOS
Wells Avenue at East Site Driveway	Weekday Afternoon	NB LTR	109	0.36	16	C	157	0.48	17	C
		SB LTR	23	0.04	10	A	23	0.04	10	A
Wells Avenue at West Side Driveway	Weekday Afternoon	NBLR	48	0.16	14	B	0	0	0	A

a demand in vehicles per hour for unsignalized intersections; the demand applies to only the most critical street approach or lane group
b volume-to-capacity ratio for the critical movement
c delay of critical approach only, rounded to the nearest whole second
d level of service of the critical movement
LT left turn
RT right turn

As outlined in Table 4, the traffic operations at both access driveways currently operate at LOS C or better during the critical afternoon peak period. With the proposed site access circulation and drop-off/pick-up protocols in place, and the associated redistribution of traffic that will create, operations of both site driveways has been maintained at LOS C or better and This represents good operations for site driveway movements during the critical period of site traffic activity.

Conclusion

This memo has been prepared to provide a review of existing and future traffic conditions at the Russian School of Mathematics (RSM) and Dance Fever site with the proposed site modifications and operational protocols in place. Currently the school portion of the facility is permitted for up to 10 students per class room and current enrollment is beyond the permitted levels. Given the popularity of the school the applicant is seeking modification to its special permit to allow:

- up to 200 students in the school at any given time
- up to a maximum of 15 students per class
- up to 17 classes to occur at any one time
- up to 28 employees on site at any one time

To improve on existing facilities and operations, the Proponent is proposing modifications to the existing site plan and the introduction of a traffic/parking management plan that includes protocols for student drop-off and pick-up. Review of accidents records in at the two site access driveways indicates that there are limited at the Lot B driveway (2 accidents in 5 years) and no recorded accidents at the Lot A driveway. The calculated accident rate at the western driveway falls well below the MassDOT average accident rate for unsignalized intersections. Review of available sight distance indicates that the with the proposed access modifications adequate stopping sight distance is available at both driveways with the exception of the eastbound approach to the east driveway. To improve sight distance at this location to meet the minimum required, clearing of existing vegetation is strongly recommended as discussed above and outlined in the figure contained in the appendix. In addition, additional clearing to improve on ISD, moving the STOP signs/stop bar forward (2-4 feet) behind sidewalk, and relocating the existing panel sign on the east side of the Lot A driveway (by a few feet further into the site) will all contribute to improving the overall sight lines for each driveway. Operations of the site driveways during

peak traffic conditions with the proposed site modification and protocols in place is expected to be at LOS C or better which is well within the acceptable range.

Attachments

- Site Plan
- Accident Records
- Traffic Projection Spreadsheets
- Traffic Count Sheets
- Sight Distance Spreadsheet
- SYNCHRO Analysis Sheets

Site Plan

PARKING LOT A			
REGULATION	REQUIRED	EXISTING	PROPOSED
STANDARD PARKING SPACE (WxD)	9.0'x19.0'	VARIES	-
HANDICAP PARKING SPACE (WxD)	12.0'x19.0'	VARIES	-
PARKING LOT FRONT SETBACK	25.0'	38.5'	-
PARKING LOT SIDE SETBACK	20.0'	8.8'**	-
ENTRANCE/EXIT DRIVEWAY WIDTH	20.0'	23.7'	-
MANEUVERING SPACE (DxW) FOR END STALL	5.0'x9.0'	5.3'x19.3'	-
HANDICAP SPACES	4%/MIN. 3	3	-
MINIMUM AISLE WIDTH	24.0'	19.8'	-

*2.0' OVERHANG SECTION 30-19 (h) (2)d)
**PRE-EXISTING NON-CONFORMING

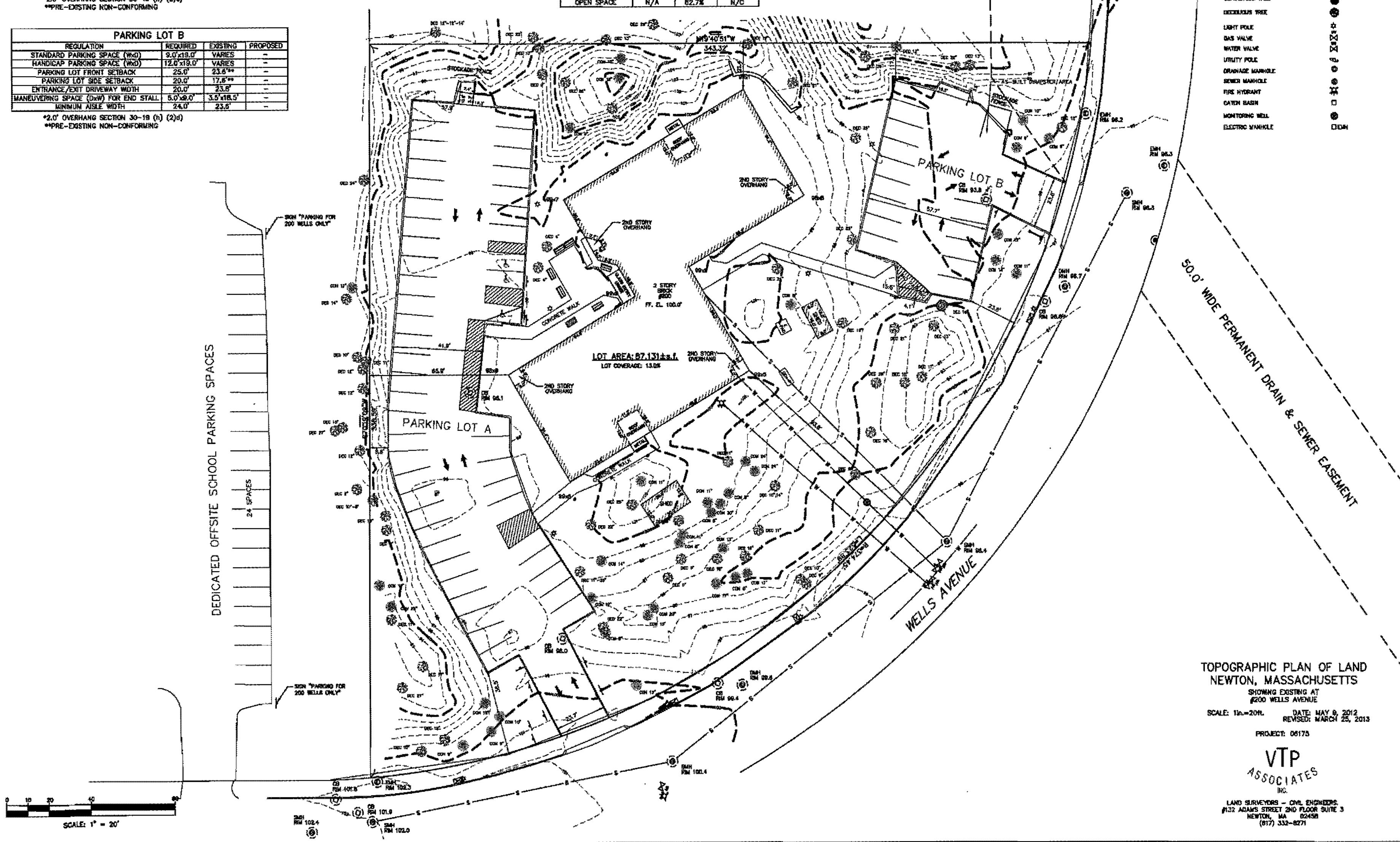
PARKING LOT B			
REGULATION	REQUIRED	EXISTING	PROPOSED
STANDARD PARKING SPACE (WxD)	9.0'x19.0'	VARIES	-
HANDICAP PARKING SPACE (WxD)	12.0'x19.0'	VARIES	-
PARKING LOT FRONT SETBACK	25.0'	23.6'**	-
PARKING LOT SIDE SETBACK	20.0'	17.6'**	-
ENTRANCE/EXIT DRIVEWAY WIDTH	20.0'	23.6'	-
MANEUVERING SPACE (DxW) FOR END STALL	5.0'x9.0'	3.5'x18.5'	-
MINIMUM AISLE WIDTH	24.0'	23.6'	-

*2.0' OVERHANG SECTION 30-19 (h) (2)d)
**PRE-EXISTING NON-CONFORMING

TOTAL EXISTING OFFSITE PARKING SPACES 24

AS-BUILT PARKING SPACES 61
AS-BUILT HANDICAP SPACES 3
TOTAL AS-BUILT SPACES 64

ZONING CHART			
NEWTON, MASSACHUSETTS			
ZONE: LMD	SUBMISSION: PROPOSED		
REGULATION	REQUIRED	EXISTING	PROPOSED
LOT AREA	20,000.0s.f.	87,131±s.f.	N/A
FRONT SETBACK	25.0'	83.6'	N/A
SIDE SETBACK	20.0'	65.9'	N/A
SIDE SETBACK	20.0'	21.4'	N/A
BUILD HEIGHT	36.0'	24.6'	N/A
MAX. STORIES	3	2	N/A
AVERAGE GRADE	N/A	99.4'	N/A
LOT COVERAGE	25.0%	13.0%	N/A
OPEN SPACE	N/A	82.7%	N/C



TOPOGRAPHIC PLAN OF LAND
NEWTON, MASSACHUSETTS
SHOWING EXISTING AT
#200 WELLS AVENUE

SCALE: 1in.=20ft. DATE: MAY 8, 2012
REVISED: MARCH 25, 2013

PROJECT: 06175

VTP ASSOCIATES INC.

LAND SURVEYORS - CIVIL ENGINEERS
#132 ADAMS STREET 2ND FLOOR SUITE 3
NEWTON, MA 02458
(617) 332-8271

PARKING LOT A			
REGULATION	REQUIRED	EXISTING	PROPOSED
STANDARD PARKING SPACE (WxD)	9.0'x19.0'	VARIES	–
HANDICAP PARKING SPACE (WxD)	12.0'x19.0'	VARIES	–
PARKING LOT FRONT SETBACK	25.0'	38.5'	–
PARKING LOT SIDE SETBACK	20.0'	6.8'**	–
ENTRANCE/EXIT DRIVEWAY WIDTH	20.0'	23.7'	–
MANEUVERING SPACE (D/W) FOR END STALL	5.0'+9.0'	5.3'+18.3'	–
HANDICAP SPACES	1/6/MIN. 3	3	–
MINIMUM AISLE WIDTH	24.0'	19.8'	–

*2.0' OVERHANG SECTION 30-19 (h) (2)d)
**PRE-EXISTING NON-CONFORMING

PARKING LOT B			
REGULATION	REQUIRED	EXISTING	PROPOSED
STANDARD PARKING SPACE (WxD)	9.0'x19.0'	VARIES	–
HANDICAP PARKING SPACE (WxD)	12.0'x19.0'	VARIES	–
PARKING LOT FRONT SETBACK	25.0'	23.6'**	–
PARKING LOT SIDE SETBACK	20.0'	17.6'**	–
ENTRANCE/EXIT DRIVEWAY WIDTH	20.0'	23.8'	–
MANEUVERING SPACE (D/W) FOR END STALL	5.0'+9.0'	3.9'+18.5'	–
MINIMUM AISLE WIDTH	24.0'	23.9'	–

*2.0' OVERHANG SECTION 30-19 (h) (2)d)
**PRE-EXISTING NON-CONFORMING

NOTE: THE EXISTING DIMENSIONAL REQUIREMENTS FOR PARKING LOT A AND PARKING LOT B HAVE BEEN APPROVED BY BOARD ORDER 325-05.

TOTAL EXISTING OFFSITE PARKING SPACES 24

TOTAL SPACES 62

PARKING LOT A
PARKING SPACES 45
HANDICAP 3

PARKING LOT B
PARKING SPACES 14

ZONING CHART			
NEWTON, MASSACHUSETTS			
ZONE: LMD	SUBMISSION: PROPOSED		
REGULATION	REQUIRED	EXISTING	PROPOSED
LOT AREA	20,000.0s.f.	87,131± s.f.	N/A
FRONT SETBACK	25.0'	93.6'	N/A
SIDE SETBACK	20.0'	65.9'	N/A
SIDE SETBACK	20.0'	21.4'	N/A
BUILD HEIGHT	36.0'	24.8'	N/A
MAX. STORIES	3	2	N/A
AVERAGE GRADE	N/A	99.4'	N/A
LOT COVERAGE	25.0%	13.0%	N/C
OPEN SPACE	N/A	62.7%	58.1%

LEGEND

STORM SEWER — D —
SANITARY SEWER — S —
WATER MAIN — W —
OVERHEAD ELECTRIC — OE —
CONTOUR — 21 —
BUILDING
CHAINLINK FENCE — x —
PROPERTY LINE w/ BEARING DISTANCE — N89°23'39"W 348.41 —
CONIFEROUS TREE
DECIDUOUS TREE
LIGHT POLE
GAS VALVE
WATER VALVE
UTILITY POLE
DRAINAGE MANHOLE
SEWER MANHOLE
FIRE HYDRANT
CATCH BASIN
MONITORING WELL
ELECTRIC MANHOLE — EMH

PARKING LOT A
PARKING LOT B
DEDICATED OFFSITE SCHOOL PARKING SPACES
24 SPACES
SIGN "PARKING FOR 200 WELLS ONLY"
LOT AREA 87,131± s.f.
2 STORY BRICK #200 FF. EL. 101.0'
2ND STORY OVERHANG
CONCRETE WALK
EXISTING SIGN TO BE RELOCATED
PROPOSED DRIVEWAY
PROPOSED 4' WIDE CROSSWALK
PROPOSED PLAYGROUND
PROPOSED ONE(1) HOUR PARKING SIGN
PROPOSED CHAINLINK FENCE
PROPOSED STOP SIGN
SHED
STOCKADE FENCE
AS-BUILT RUNESTON AREA
50.0' WIDE PERMANENT DRAIN & SEWER EASEMENT
WELLS AVENUE
N19°40'51"W 343.32'
SCALE: 1" = 20'

TOPOGRAPHIC SITE PLAN
NEWTON, MASSACHUSETTS
SHOWING PROPOSED CONDITIONS AT #200 WELLS AVENUE
SCALE: 1in.=20ft. DATE: MARCH 25, 2013
PROJECT: 212137

VTP ASSOCIATES INC.
LAND SURVEYORS - CIVIL ENGINEERS 132
ADAMS STREET 2ND FLOOR SUITE 3
NEWTON, MA 02458
(617) 332-8271

Accident Records

Traffic Counts

Moving Massachusetts Forward. massDOT Highway

INTERSECTION CRASH RATE WORKSHEET

CITY/TOWN : Newton COUNT DATE : 5/1/2013

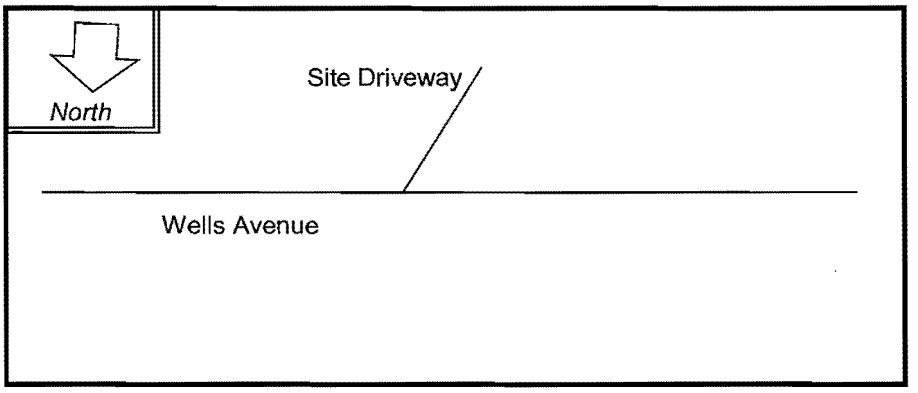
DISTRICT : 6 UNSIGNALIZED : X SIGNALIZED :

~ INTERSECTION DATA ~

MAJOR STREET : Wells Avenue

MINOR STREET(S) : West Site Driveway

INTERSECTION DIAGRAM (Label Approaches)



PEAK HOUR VOLUMES

APPROACH :	1	2	3	4	5	Total Peak Hourly Approach Volume
DIRECTION :	EB	WB	NB	SB		
PEAK HOURLY VOLUMES (PM) :	170	40	48			258

" K " FACTOR : **0.085**

INTERSECTION ADT (**V**) = TOTAL DAILY APPROACH VOLUME : **3,035**

TOTAL # OF CRASHES : 2

OF YEARS : 5

AVERAGE # OF CRASHES PER YEAR (**A**) : **0.40**

CRASH RATE CALCULATION : **0.36**

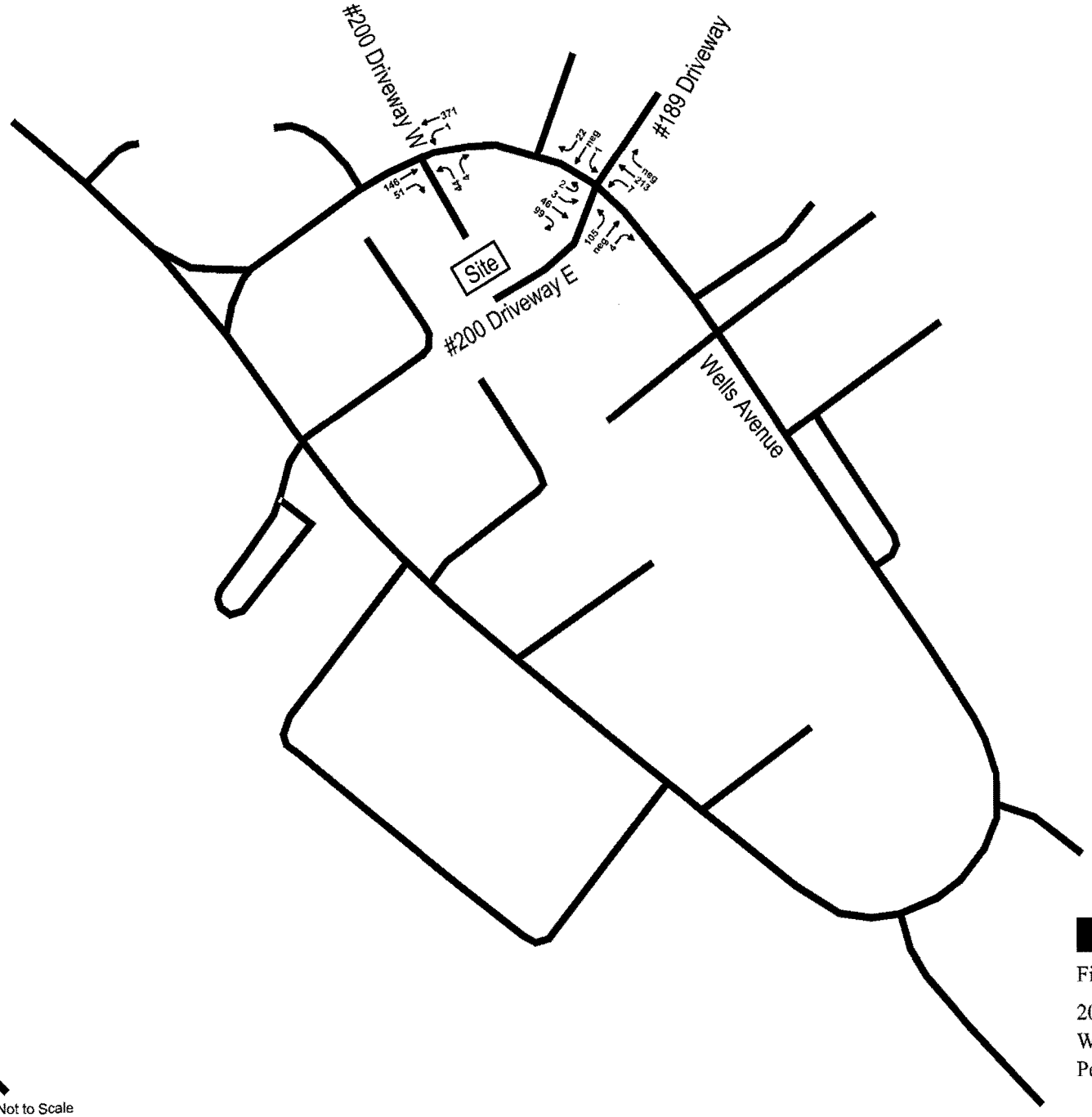
RATE = $\frac{(A * 1{,}000{,}000)}{(V * 365)}$

Comments :

Project Title & Date:

Traffic Protections

\\mawatn\ts\12350.00\docs\VARIOUS\graphics\SCHOOL.dwg



Vanasse Hangen Brustlin, Inc.

Figure 1

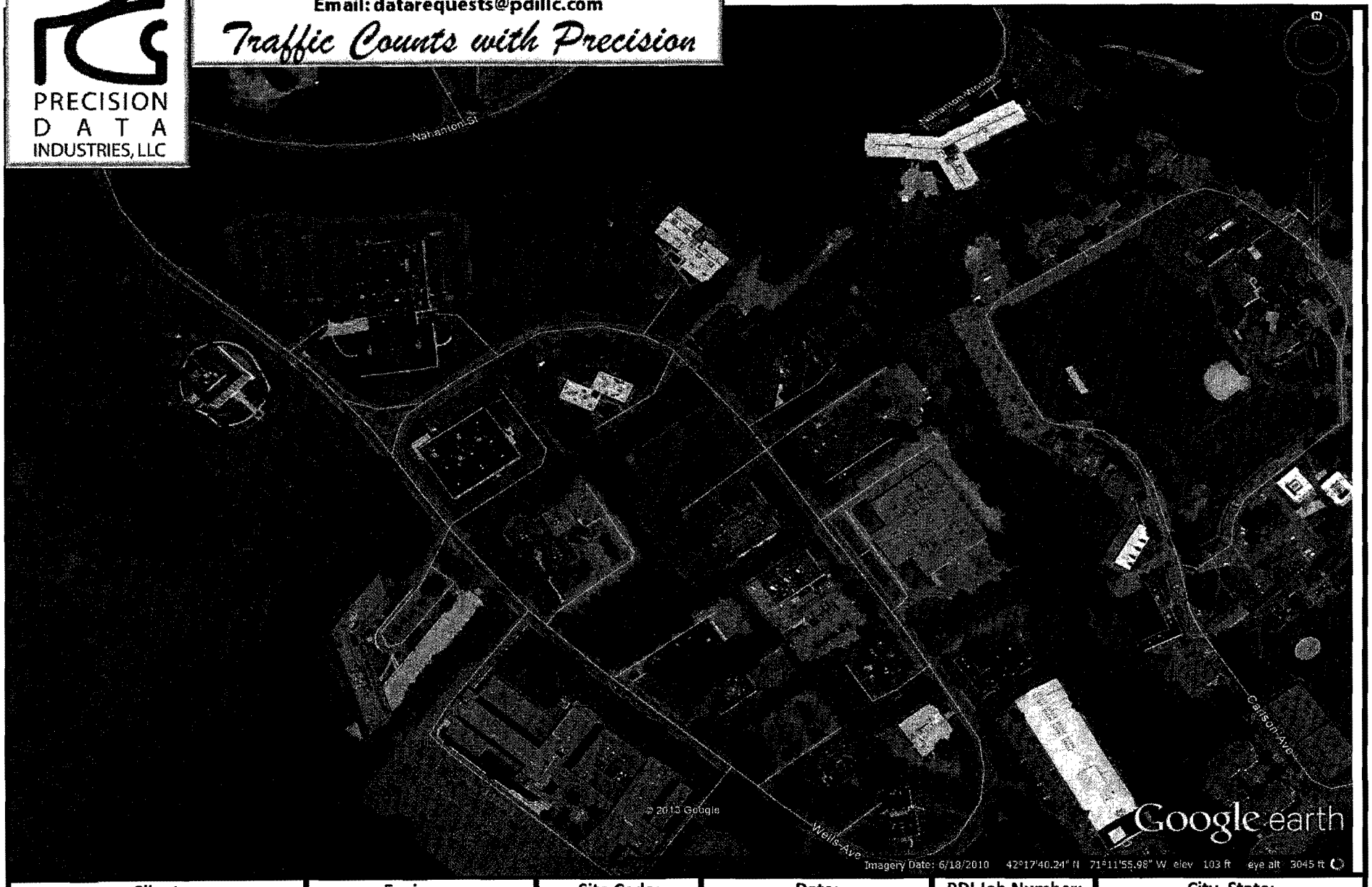
2013 Existing Conditions
Weekday Evening
Peak Hour Traffic Volumes

Not to Scale

PRECISION DATA INDUSTRIES, LLC
Office: 508.481.3999 Fax: 508.545.1234
Email: datarequests@pdillc.com

Traffic Counts with Precision

PRECISION DATA INDUSTRIES, LLC



Client:	Engineer:	Site Code:	Date:	PDI Job Number:	City, State:
VHB	R. Hart	12350.00	Wed 4/10 thru Thurs 4/11/13	133293	Newton, MA

Wells Avenue
just west of #181 Driveway
City, State: Newton, MA
Client: VHB/ R. Hart

EB

PRECISION
D A T A
INDUSTRIES, LLC
P.O. Box 301 Berlin, MA 01503
Office: 508.481.3999 Fax: 508.545.1234
Email: datarequests@pdillc.com

133293 A CLASS
Site Code: 12350.00

Start Time	Bikes	Cars & Trailers	2 Axle Long	Buses	2 Axle 6 Tire	3 Axle Single	4 Axle Single	<5 Axl Double	5 Axle Double	>6 Axl Double	<6 Axl Multi	6 Axle Multi	>6 Axl Multi	Total
04/10/1														
3	0	1	0	0	0	0	0	0	0	0	0	0	0	1
01:00	0	2	0	0	0	0	0	0	0	0	0	0	0	2
02:00	0	7	0	0	0	0	0	0	0	0	0	0	0	7
03:00	0	7	0	0	0	0	0	0	0	0	0	0	0	7
04:00	0	11	0	0	1	0	0	0	0	0	0	0	0	12
05:00	0	13	8	0	1	0	0	0	0	0	0	0	0	22
06:00	0	22	12	0	2	1	0	0	0	0	0	0	0	37
07:00	0	36	9	0	4	0	1	1	0	0	0	0	0	51
08:00	0	87	11	1	1	0	0	0	0	0	0	0	0	100
09:00	0	63	5	0	2	0	0	1	0	0	0	0	0	71
10:00	0	40	10	0	2	0	0	0	0	0	0	0	0	52
11:00	0	37	7	0	0	0	0	0	0	0	0	0	0	44
12 PM	0	48	4	0	3	1	0	0	0	0	0	0	0	56
13:00	0	53	8	0	0	0	0	0	0	0	0	0	0	61
14:00	0	49	6	0	0	0	0	0	0	0	0	0	0	55
15:00	0	48	5	0	0	0	0	0	0	0	0	0	0	53
16:00	1	35	8	0	1	0	0	0	0	0	0	0	0	45
17:00	0	18	2	0	1	0	0	0	0	0	0	0	0	21
18:00	2	21	3	0	0	0	0	0	0	0	0	0	0	26
19:00	0	14	2	0	0	0	0	0	0	0	0	0	0	16
20:00	0	8	0	0	0	0	0	0	0	0	0	0	0	8
21:00	0	7	3	0	0	0	0	0	0	0	0	0	0	10
22:00	0	2	0	0	0	0	0	0	0	0	0	0	0	2
23:00	0	1	1	0	0	0	0	0	0	0	0	0	0	2
Total	3	630	104	1	18	2	1	2	0	0	0	0	0	761
Percent	0.4%	82.8%	13.7%	0.1%	2.4%	0.3%	0.1%	0.3%	0.0%	0.0%	0.0%	0.0%	0.0%	
AM Peak		08:00	06:00	08:00	07:00	06:00	07:00	07:00						08:00
Vol.		87	12	1	4	1	1	1						100
PM Peak	18:00	13:00	13:00		12:00	12:00								13:00
Vol.	2	53	8		3	1								61

Wells Avenue
just west of #181 Driveway
City, State: Newton, MA
Client: VHB/ R. Hart

EB

PRECISION
D A T A
INDUSTRIES, LLC
P.O. Box 301 Berlin, MA 01503
Office: 508.481.3999 Fax: 508.545.1234
Email: datarequests@pdillc.com

133293 A CLASS
Site Code: 12350.00

Start Time	Bikes	Cars & Trailers	2 Axle Long	Buses	2 Axle 6 Tire	3 Axle Single	4 Axle Single	<5 Axl Double	5 Axle Double	>6 Axl Double	<6 Axl Multi	6 Axle Multi	>6 Axl Multi	Total
04/11/1														
3	0	1	0	0	0	0	0	0	0	0	0	0	0	1
01:00	0	3	0	0	0	0	0	0	0	0	0	0	0	3
02:00	0	6	1	0	0	0	0	0	0	0	0	0	0	7
03:00	0	6	0	0	0	0	0	0	0	0	0	0	0	6
04:00	0	10	1	0	0	0	0	0	0	0	0	0	0	11
05:00	0	18	9	0	2	0	0	0	0	0	0	0	0	29
06:00	0	13	15	1	0	0	0	0	0	0	0	0	0	29
07:00	0	40	14	0	2	1	0	0	0	0	0	0	0	57
08:00	0	77	4	0	2	0	0	0	0	0	0	0	0	83
09:00	0	70	9	0	1	0	0	0	0	0	0	0	0	80
10:00	0	48	2	2	1	0	0	0	0	0	0	0	0	53
11:00	0	33	7	0	0	2	0	0	0	0	0	0	0	42
12 PM	0	41	5	0	0	0	0	0	0	0	0	0	0	46
13:00	0	48	4	0	0	0	0	0	0	0	0	0	0	52
14:00	0	47	8	0	0	0	0	0	0	0	0	0	0	55
15:00	0	34	7	0	0	0	0	0	0	0	0	0	0	41
16:00	0	25	3	0	0	0	0	0	0	0	0	0	0	28
17:00	0	21	1	0	1	0	0	0	0	0	0	0	0	23
18:00	0	21	4	0	0	0	0	0	0	0	0	0	0	25
19:00	0	13	2	0	0	0	0	0	0	0	0	0	0	15
20:00	0	7	5	0	0	0	0	0	0	0	0	0	0	12
21:00	0	5	0	0	0	0	0	0	0	0	0	0	0	5
22:00	0	3	2	0	0	0	0	0	0	0	0	0	0	5
23:00	0	4	0	0	0	0	0	0	0	0	0	0	0	4
Total	0	594	103	3	9	3	0	0	0	0	0	0	0	712
Percent	0.0%	83.4%	14.5%	0.4%	1.3%	0.4%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
AM Peak		08:00	06:00	10:00	05:00	11:00								08:00
Vol.		77	15	2	2	2								83
PM Peak		13:00	14:00		17:00									14:00
Vol.		48	8		1									55
Total		1224	207	4	27	5	1	2	0	0	0	0	0	1473

Wells Avenue
just west of #181 Driveway
City, State: Newton, MA
Client: VHB/ R. Hart

WB

PRECISION
D A T A
INDUSTRIES, LLC
P.O. Box 301 Berlin, MA 01503
Office: 508.481.3999 Fax: 508.545.1234
Email: datarequests@pdillc.com

133293 A CLASS
Site Code: 12350.00

Start Time	Bikes	Cars & Trailers	2 Axle Long	Buses	2 Axle 6 Tire	3 Axle Single	4 Axle Single	<5 Axl Double	5 Axle Double	>6 Axl Double	<6 Axl Multi	6 Axle Multi	>6 Axl Multi	Total
04/10/1														
3	0	1	1	0	0	0	0	0	0	0	0	0	0	2
01:00	0	2	0	0	0	0	0	0	0	0	0	0	0	2
02:00	0	0	1	0	0	0	0	0	0	0	0	0	0	1
03:00	0	1	0	0	0	0	0	0	0	0	0	0	0	1
04:00	0	4	0	0	0	0	0	0	0	0	0	0	0	4
05:00	0	3	2	0	0	0	0	0	0	0	0	0	0	5
06:00	0	3	0	0	1	0	0	0	0	0	0	0	0	4
07:00	0	23	10	0	2	2	0	0	0	0	0	0	0	37
08:00	0	40	4	0	4	0	0	0	0	0	0	0	0	48
09:00	0	43	5	0	2	0	0	0	0	0	0	0	0	50
10:00	0	72	9	0	2	0	0	0	0	0	0	0	0	83
11:00	0	72	10	1	3	0	0	0	0	0	0	0	0	86
12 PM	4	88	8	1	1	0	0	1	0	0	0	0	0	103
13:00	3	72	15	0	1	0	0	0	0	0	0	0	0	91
14:00	0	88	19	0	0	0	0	1	0	0	0	0	0	108
15:00	0	99	11	1	1	0	0	0	0	0	0	0	0	112
16:00	1	122	8	0	1	0	0	0	0	0	0	0	0	132
17:00	0	142	5	0	0	0	0	1	0	0	0	0	0	148
18:00	0	83	5	0	2	0	0	0	0	0	0	0	0	90
19:00	1	77	4	0	0	0	0	0	0	0	0	0	0	82
20:00	0	32	1	0	0	0	0	0	0	0	0	0	0	33
21:00	0	35	3	0	0	0	0	0	0	0	0	0	0	38
22:00	0	20	1	0	0	0	0	0	0	0	0	0	0	21
23:00	0	6	0	0	0	0	0	0	0	0	0	0	0	6
Total	9	1128	122	3	20	2	0	3	0	0	0	0	0	1287
Percent	0.7%	87.6%	9.5%	0.2%	1.6%	0.2%	0.0%	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	
AM Peak		10:00	07:00	11:00	08:00	07:00								11:00
Vol.		72	10	1	4	2								86
PM Peak	12:00	17:00	14:00	12:00	18:00			12:00						17:00
Vol.	4	142	19	1	2			1						148

Wells Avenue
just west of #181 Driveway
City, State: Newton, MA
Client: VHB/ R. Hart

WB

PRECISION
D A T A
INDUSTRIES, LLC
P.O. Box 301 Berlin, MA 01503
Office: 508.481.3999 Fax: 508.545.1234
Email: datarequests@pdillc.com

133293 A CLASS
Site Code: 12350.00

Start Time	Bikes	Cars & Trailers	2 Axle Long	Buses	2 Axle 6 Tire	3 Axle Single	4 Axle Single	<5 Axl Double	5 Axle Double	>6 Axl Double	<6 Axl Multi	6 Axle Multi	>6 Axl Multi	Total
04/11/1														
3	0	2	0	0	0	0	0	0	0	0	0	0	0	2
01:00	0	3	0	0	0	0	0	0	0	0	0	0	0	3
02:00	0	0	1	0	0	0	0	0	0	0	0	0	0	1
03:00	0	1	0	0	0	0	0	0	0	0	0	0	0	1
04:00	0	3	1	0	0	0	0	0	0	0	0	0	0	4
05:00	0	4	1	0	1	0	0	0	0	0	0	0	0	6
06:00	0	6	2	1	0	0	0	0	0	0	0	0	0	9
07:00	0	29	7	0	1	0	0	0	0	0	0	0	0	37
08:00	0	36	4	0	1	1	0	0	0	0	0	0	0	42
09:00	1	41	7	0	2	0	0	0	0	0	0	0	0	51
10:00	2	58	13	1	0	0	0	0	0	0	0	0	0	74
11:00	1	78	7	2	3	0	0	0	0	0	0	0	0	91
12 PM	1	97	9	0	1	1	0	0	0	0	0	0	0	109
13:00	0	71	11	1	1	1	0	0	0	0	0	0	0	85
14:00	0	73	22	0	1	0	0	0	0	0	0	0	0	96
15:00	1	79	13	1	0	1	0	0	0	0	0	0	0	95
16:00	0	125	10	0	2	0	0	0	0	0	0	0	0	137
17:00	1	136	9	0	1	0	0	0	0	0	0	0	0	147
18:00	1	90	10	0	0	0	0	0	0	0	0	0	0	101
19:00	0	54	4	0	0	0	0	0	0	0	0	0	0	58
20:00	0	30	4	0	0	0	0	0	0	0	0	0	0	34
21:00	0	35	2	0	0	0	0	0	0	0	0	0	0	37
22:00	0	27	1	0	0	0	0	0	0	0	0	0	0	28
23:00	0	13	0	0	0	0	0	0	0	0	0	0	0	13
Total	8	1091	138	6	14	4	0	0	0	0	0	0	0	1261
Percent	0.6%	86.5%	10.9%	0.5%	1.1%	0.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
AM Peak	10:00	11:00	10:00	11:00	11:00	08:00								11:00
Vol.	2	78	13	2	3	1								91
PM Peak	12:00	17:00	14:00	13:00	16:00	12:00								17:00
Vol.	1	136	22	1	2	1								147
Total		2219	260	9	34	6	0	3	0	0	0	0	0	2548

Wells Avenue
just west of #181 Driveway
City, State: Newton, MA
Client: VHB/ R. Hart

EB

PRECISION
D A T A
INDUSTRIES, LLC
P.O. Box 301 Berlin, MA 01503
Office: 508.481.3999 Fax: 508.545.1234
Email: datarequests@pdillc.com

133293 A SPEED
Site Code: 12350.00

Start Time	1 14	15 19	20 24	25 29	30 34	35 39	40 44	45 49	50 54	55 59	60 64	65 69	70 9999	Total	85th % ile	Ave Speed
04/10/1																
3	0	0	0	0	1	0	0	0	0	0	0	0	0	1	*	32
01:00	0	0	0	0	1	1	0	0	0	0	0	0	0	2	*	34
02:00	0	0	0	0	3	2	2	0	0	0	0	0	0	7	33	36
03:00	0	0	0	1	3	2	0	**1**	0	0	0	0	0	7	33	35
04:00	2	0	2	1	4	2	1	0	0	0	0	0	0	12	34	26
05:00	0	0	2	11	5	4	0	0	0	0	0	0	0	22	35	30
06:00	0	4	11	10	10	2	0	0	0	0	0	0	0	37	31	26
07:00	4	6	14	13	10	1	**3**	0	0	0	0	0	0	51	30	23
08:00	8	**14**	**16**	**22**	**21**	**16**	3	0	0	0	0	0	0	**100**	34	25
09:00	**10**	13	9	13	15	10	1	0	0	0	0	0	0	71	33	22
10:00	8	10	13	5	13	2	1	0	0	0	0	0	0	52	30	21
11:00	11	**7**	10	9	6	0	**1**	0	0	0	0	0	0	44	27	18
12 PM	**13**	6	12	10	11	3	1	0	0	0	0	0	0	56	30	20
13:00	6	6	**17**	10	**15**	**7**	0	0	0	0	0	0	0	**61**	33	23
14:00	7	7	12	**15**	12	2	0	0	0	0	0	0	0	55	30	22
15:00	**7**	**5**	**10**	12	**14**	**4**	1	0	0	0	0	0	0	**53**	32	23
16:00	5	4	7	**13**	13	2	1	0	0	0	0	0	0	45	31	24
17:00	2	3	9	6	1	0	0	0	0	0	0	0	0	21	27	20
18:00	2	3	3	7	10	1	0	0	0	0	0	0	0	26	32	25
19:00	2	0	3	5	5	1	0	0	0	0	0	0	0	16	32	24
20:00	0	1	1	2	4	0	0	0	0	0	0	0	0	8	32	27
21:00	1	0	4	5	0	0	0	0	0	0	0	0	0	10	27	22
22:00	0	0	0	0	2	0	0	0	0	0	0	0	0	2	*	32
23:00	0	0	1	0	1	0	0	0	0	0	0	0	0	2	*	27
%	11.6%	11.7%	20.5%	22.3%	23.7%	8.1%	2.0%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%			
AM Peak	09:00	08:00	08:00	08:00	08:00	08:00	07:00	03:00						08:00		
Vol.	10	14	16	22	21	16	3	1						100		
Midday Peak	12:00	11:00	13:00	14:00	13:00	13:00	11:00							13:00		
Vol.	13	7	17	15	15	7	1							61		
PM Peak	15:00	15:00	15:00	16:00	15:00	15:00	15:00							15:00		
Vol.	7	5	10	13	14	4	1							53		

% iles

15th Percentile :	10 MPH
50th Percentile :	23 MPH
85th Percentile :	32 MPH
95th Percentile :	36 MPH

Stats

10 MPH Pace Speed :	23-32 MPH
Number in Pace :	299
Percent in Pace :	39.3%
Number of Vehicles > 25 MPH :	345
Percent of Vehicles > 25 MPH :	45.4%
Mean Speed(Average) :	23 MPH

PRECISION
D A T A
INDUSTRIES, LLC
P.O. Box 301 Berlin, MA 01503
Office: 508.481.3999 Fax: 508.545.1234
Email: datarequests@pdillc.com

Wells Avenue
just west of #181 Driveway
City, State: Newton, MA
Client: VHB/ R. Hart

133293 A SPEED
Site Code: 12350.00

EB

Start Time	1 14	15 19	20 24	25 29	30 34	35 39	40 44	45 49	50 54	55 59	60 64	65 69	70 9999	Total	85th % ile	Ave Speed
04/11/1																
3	0	0	0	0	0	1	0	0	0	0	0	0	0	1	*	37
01:00	0	0	0	0	1	2	0	0	0	0	0	0	0	3	*	35
02:00	0	0	0	1	2	1	**1**	**2**	0	0	0	0	0	7	*	38
03:00	1	0	0	0	1	3	0	1	0	0	0	0	0	6	36	30
04:00	0	0	0	2	6	2	0	**1**	0	0	0	0	0	11	34	33
05:00	3	0	4	8	12	2	0	0	0	0	0	0	0	29	32	26
06:00	3	0	10	5	6	4	0	1	0	0	0	0	0	29	34	25
07:00	5	9	**16**	13	10	3	1	0	0	0	0	0	0	57	30	22
08:00	8	5	12	**19**	**27**	11	1	0	0	0	0	0	0	**83**	34	25
09:00	**10**	**16**	10	16	11	**16**	1	0	0	0	0	0	0	80	35	23
10:00	6	6	10	10	11	9	1	0	0	0	0	0	0	53	34	24
11:00	3	**7**	12	9	9	2	0	0	0	0	0	0	0	42	30	22
12 PM	6	7	**13**	8	8	4	0	0	0	0	0	0	0	46	31	21
13:00	**7**	7	5	**12**	13	7	**1**	0	0	0	0	0	0	52	33	23
14:00	7	7	6	8	**14**	**13**	0	0	0	0	0	0	0	**55**	35	24
15:00	**6**	**6**	6	**7**	**9**	**6**	**1**	0	0	0	0	0	0	**41**	34	23
16:00	4	0	**11**	5	6	2	0	0	0	0	0	0	0	28	31	23
17:00	3	2	5	7	4	2	0	0	0	0	0	0	0	23	31	23
18:00	6	3	6	5	4	1	0	0	0	0	0	0	0	25	28	19
19:00	0	4	2	5	4	0	0	0	0	0	0	0	0	15	30	23
20:00	0	2	1	4	4	1	0	0	0	0	0	0	0	12	32	26
21:00	2	0	1	0	2	0	0	0	0	0	0	0	0	5	*	18
22:00	0	0	2	0	2	1	0	0	0	0	0	0	0	5	*	29
23:00	0	1	1	0	1	1	0	0	0	0	0	0	0	4	*	25
%	11.2%	11.5%	18.7%	20.2%	23.5%	13.2%	1.0%	0.7%	0.0%	0.0%	0.0%	0.0%	0.0%			
AM Peak	09:00	09:00	07:00	08:00	08:00	09:00	02:00	02:00						08:00		
Vol.	10	16	16	19	27	16	1	2						83		
Midday Peak	13:00	11:00	12:00	13:00	14:00	14:00	13:00							14:00		
Vol.	7	7	13	12	14	13	1							55		
PM Peak	15:00	15:00	16:00	15:00	15:00	15:00	15:00							15:00		
Vol.	6	6	11	7	9	6	1							41		

% iles	
15th Percentile :	10 MPH
50th Percentile :	24 MPH
85th Percentile :	33 MPH
95th Percentile :	37 MPH

Stats	
10 MPH Pace Speed :	24-33 MPH
Number in Pace :	265
Percent in Pace :	37.2%
Number of Vehicles > 25 MPH :	341
Percent of Vehicles > 25 MPH :	47.9%
Mean Speed(Average) :	24 MPH

Wells Avenue
just west of #181 Driveway
City, State: Newton, MA
Client: VHB/ R. Hart

WB

PRECISION
D A T A
INDUSTRIES, LLC
P.O. Box 301 Berlin, MA 01503
Office: 508.481.3999 Fax: 508.545.1234
Email: datarequests@pdillc.com

133293 A SPEED
Site Code: 12350.00

Start Time	1 14	15 19	20 24	25 29	30 34	35 39	40 44	45 49	50 54	55 59	60 64	65 69	70 9999	Total	85th % ile	Ave Speed
04/10/1																
3	0	0	1	0	1	0	0	0	0	0	0	0	0	2	*	27
01:00	0	0	0	1	1	0	0	0	0	0	0	0	0	2	*	29
02:00	1	0	0	0	0	0	0	0	0	0	0	0	0	1	*	8
03:00	0	0	0	1	0	0	0	0	0	0	0	0	0	1	*	27
04:00	2	0	0	2	0	0	0	0	0	0	0	0	0	4	*	15
05:00	0	1	0	3	1	0	0	0	0	0	0	0	0	5	26	25
06:00	0	1	0	2	1	0	0	0	0	0	0	0	0	4	*	24
07:00	2	6	11	10	8	0	0	0	0	0	0	0	0	37	30	23
08:00	**3**	**7**	8	16	**13**	1	0	0	0	0	0	0	0	48	31	24
09:00	2	7	**13**	**19**	7	**2**	0	0	0	0	0	0	0	**50**	29	23
10:00	8	7	14	39	14	1	0	0	0	0	0	0	0	83	30	23
11:00	16	10	19	29	8	**3**	**1**	0	0	0	0	0	0	86	28	20
12 PM	21	9	**36**	30	5	2	0	0	0	0	0	0	0	103	27	19
13:00	**22**	11	18	30	10	0	0	0	0	0	0	0	0	91	28	19
14:00	17	**12**	32	**33**	**12**	2	0	0	0	0	0	0	0	**108**	28	20
15:00	**17**	11	27	34	**20**	**3**	0	0	0	0	0	0	0	112	29	21
16:00	**26**	21	34	33	17	1	0	0	0	0	0	0	0	132	28	19
17:00	23	**22**	**46**	**44**	12	1	0	0	0	0	0	0	0	**148**	27	20
18:00	7	10	27	32	12	2	0	0	0	0	0	0	0	90	29	22
19:00	4	5	18	35	19	1	0	0	0	0	0	0	0	82	30	25
20:00	2	1	5	15	10	0	0	0	0	0	0	0	0	33	31	25
21:00	1	3	5	15	13	1	0	0	0	0	0	0	0	38	32	26
22:00	1	1	3	12	4	0	0	0	0	0	0	0	0	21	30	25
23:00	0	0	0	2	4	0	0	0	0	0	0	0	0	6	32	30
%	13.6%	11.3%	24.6%	34.0%	14.9%	1.6%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%			
AM Peak	08:00	08:00	09:00	09:00	08:00	09:00								09:00		
Vol.	3	7	13	19	13	2								50		
Midday Peak	13:00	14:00	12:00	14:00	14:00	11:00	11:00							14:00		
Vol.	22	12	36	33	12	3	1							108		
PM Peak	16:00	17:00	17:00	17:00	15:00	15:00								17:00		
Vol.	26	22	46	44	20	3								148		

% iles	
15th Percentile :	9 MPH
50th Percentile :	22 MPH
85th Percentile :	29 MPH
95th Percentile :	32 MPH

Stats	
10 MPH Pace Speed :	21-30 MPH
Number in Pace :	619
Percent in Pace :	48.1%
Number of Vehicles > 25 MPH :	484
Percent of Vehicles > 25 MPH :	37.6%
Mean Speed(Average) :	21 MPH

Wells Avenue
just west of #181 Driveway
City, State: Newton, MA
Client: VHB/ R. Hart

WB

PRECISION
D A T A
INDUSTRIES, LLC
P.O. Box 301 Berlin, MA 01503
Office: 508.481.3999 Fax: 508.545.1234
Email: datarequests@pdillc.com

133293 A SPEED
Site Code: 12350.00

Start	1	15	20	25	30	35	40	45	50	55	60	65	70	Total	85th	Ave
Time	14	19	24	29	34	39	44	49	54	59	64	69	9999		% ile	Speed
04/11/1																
3	0	0	0	0	2	0	0	0	0	0	0	0	0	2	*	32
01:00	0	0	1	1	1	0	0	0	0	0	0	0	0	3	*	27
02:00	0	1	0	0	0	0	0	0	0	0	0	0	0	1	*	15
03:00	0	0	0	1	0	0	0	0	0	0	0	0	0	1	*	27
04:00	0	0	1	1	2	0	0	0	0	0	0	0	0	4	*	28
05:00	2	1	0	2	1	0	0	0	0	0	0	0	0	6	*	17
06:00	0	0	2	4	2	1	0	0	0	0	0	0	0	9	28	28
07:00	1	6	2	19	9	0	0	0	0	0	0	0	0	37	30	24
08:00	2	5	5	17	13	0	0	0	0	0	0	0	0	42	30	25
09:00	5	4	13	24	5	0	0	0	0	0	0	0	0	51	28	22
10:00	7	9	17	27	13	1	0	0	0	0	0	0	0	74	29	22
11:00	13	9	14	37	14	3	1	0	0	0	0	0	0	91	29	22
12 PM	16	10	28	41	13	1	0	0	0	0	0	0	0	109	28	21
13:00	12	12	24	28	8	1	0	0	0	0	0	0	0	85	27	20
14:00	13	6	20	37	17	3	0	0	0	0	0	0	0	96	30	22
15:00	18	11	17	32	15	2	0	0	0	0	0	0	0	95	29	20
16:00	21	18	31	41	23	3	0	0	0	0	0	0	0	137	29	21
17:00	23	9	43	52	19	0	1	0	0	0	0	0	0	147	28	21
18:00	15	12	34	27	10	3	0	0	0	0	0	0	0	101	28	20
19:00	3	4	11	27	10	3	0	0	0	0	0	0	0	58	30	25
20:00	3	5	6	12	8	0	0	0	0	0	0	0	0	34	30	22
21:00	2	1	3	13	13	5	0	0	0	0	0	0	0	37	34	27
22:00	1	0	6	12	8	1	0	0	0	0	0	0	0	28	31	27
23:00	2	0	2	2	6	1	0	0	0	0	0	0	0	13	33	25
%	12.6%	9.8%	22.2%	36.2%	16.8%	2.2%	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%			
AM Peak	09:00	07:00	09:00	09:00	08:00	06:00								09:00		
Vol.	5	6	13	24	13	1								51		
Midday Peak	12:00	13:00	12:00	12:00	14:00	11:00	11:00							12:00		
Vol.	16	12	28	41	17	3	1							109		
PM Peak	17:00	16:00	17:00	17:00	16:00	21:00	17:00							17:00		
Vol.	23	18	43	52	23	5	1							147		

% iles

15th Percentile : 9 MPH
50th Percentile : 23 MPH
85th Percentile : 29 MPH
95th Percentile : 33 MPH

Stats

10 MPH Pace Speed : 22-31 MPH
Number in Pace : 624
Percent in Pace : 49.5%
Number of Vehicles > 25 MPH : 528
Percent of Vehicles > 25 MPH : 41.9%
Mean Speed(Average) : 22 MPH

Wells Avenue
just west of #181 Driveway
City, State: Newton, MA
Client: VHB/ R. Hart

PRECISION
D A T A
INDUSTRIES, LLC
P.O. Box 301 Berlin, MA 01503
Office: 508.481.3999 Fax: 508.545.1234
Email: datarequests@pdillc.com

133293 A VOLUME
Site Code: 12350.00

Start Time	EB A.M.		EB P.M.		WB A.M.		WB P.M.		Combined A.M.		Combined P.M.		10-Apr-13 Wed
12:00	0		12		0		27		0		39		
12:15	0		11		1		23		1		34		
12:30	0		14		0		28		0		42		
12:45	1	1	19	56	1	2	25	103	2	3	44	159	
01:00	1		17		0		24		1		41		
01:15	0		11		1		22		1		33		
01:30	1		12		1		23		2		35		
01:45	0	2	21	61	0	2	22	91	0	4	43	152	
02:00	1		22		0		33		1		55		
02:15	1		11		0		23		1		34		
02:30	3		10		1		20		4		30		
02:45	2	7	12	55	0	1	32	108	2	8	44	163	
03:00	1		9		1		20		2		29		
03:15	1		14		0		38		1		52		
03:30	0		22		0		27		0		49		
03:45	5	7	8	53	0	1	27	112	5	8	35	165	
04:00	5		13		1		37		6		50		
04:15	3		12		0		35		3		47		
04:30	2		8		2		29		4		37		
04:45	2	12	12	45	1	4	31	132	3	16	43	177	
05:00	3		5		0		36		3		41		
05:15	3		2		0		38		3		40		
05:30	6		7		2		43		8		50		
05:45	10	22	7	21	3	5	31	148	13	27	38	169	
06:00	6		7		0		23		6		30		
06:15	11		8		1		24		12		32		
06:30	9		7		1		23		10		30		
06:45	11	37	4	26	2	4	20	90	13	41	24	116	
07:00	19		5		7		33		26		38		
07:15	11		3		4		10		15		13		
07:30	11		3		12		20		23		23		
07:45	10	51	5	16	14	37	19	82	24	88	24	98	
08:00	22		2		14		9		36		11		
08:15	15		2		9		9		24		11		
08:30	29		2		13		10		42		12		
08:45	34	100	2	8	12	48	5	33	46	148	7	41	
09:00	27		5		14		20		41		25		
09:15	14		1		11		8		25		9		
09:30	19		1		9		4		28		5		
09:45	11	71	3	10	16	50	6	38	27	121	9	48	
10:00	18		1		20		6		38		7		
10:15	12		0		22		6		34		6		
10:30	14		1		19		1		33		2		
10:45	8	52	0	2	22	83	8	21	30	135	8	23	
11:00	13		1		16		3		29		4		
11:15	6		0		18		2		24		2		
11:30	16		1		20		0		36		1		
11:45	9	44	0	2	32	86	1	6	41	130	1	8	
Total	406		355		323		964		729		1319		
Percent	55.7%		26.9%		44.3%		73.1%						
Day Total			761				1287				2048		
Peak	08:15		01:15		11:00		04:45		08:30		03:15		
Vol.	105		66		86		148		154		186		
P.H.F.	0.772		0.750		0.672		0.860		0.837		0.894		

Wells Avenue
just west of #181 Driveway
City, State: Newton, MA
Client: VHB/ R. Hart

PRECISION
D A T A
INDUSTRIES, LLC
P.O. Box 301 Berlin, MA 01503
Office: 508.481.3999 Fax: 508.545.1234
Email: datarequests@pdillc.com

133293 A VOLUME
Site Code: 12350.00

Start Time	EB A.M.		EB P.M.		WB A.M.		WB P.M.		Combined A.M.		Combined P.M.		11-Apr-13 Thu
12:00	1		10		1		21		2		31		
12:15	0		11		0		33		0		44		
12:30	0		9		1		23		1		32		
12:45	0	1	16	46	0	2	32	109	0	3	48	155	
01:00	0		14		2		32		2		46		
01:15	1		14		1		17		2		31		
01:30	1		12		0		18		1		30		
01:45	1	3	12	52	0	3	18	85	1	6	30	137	
02:00	1		24		0		31		1		55		
02:15	1		9		0		22		1		31		
02:30	3		11		0		22		3		33		
02:45	2	7	11	55	1	1	21	96	3	8	32	151	
03:00	1		7		0		20		1		27		
03:15	2		10		0		28		2		38		
03:30	0		12		1		23		1		35		
03:45	3	6	12	41	0	1	24	95	3	7	36	136	
04:00	3		8		0		33		3		41		
04:15	6		8		2		41		8		49		
04:30	1		6		2		37		3		43		
04:45	1	11	6	28	0	4	26	137	1	15	32	165	
05:00	4		7		2		44		6		51		
05:15	5		3		1		36		6		39		
05:30	4		5		1		26		5		31		
05:45	16	29	8	23	2	6	41	147	18	35	49	170	
06:00	10		8		1		30		11		38		
06:15	7		9		2		28		9		37		
06:30	6		4		3		28		9		32		
06:45	6	29	4	25	3	9	15	101	9	38	19	126	
07:00	17		3		7		16		24		19		
07:15	14		5		11		19		25		24		
07:30	14		5		8		13		22		18		
07:45	12	57	2	15	11	37	10	58	23	94	12	73	
08:00	9		6		15		8		24		14		
08:15	20		3		9		11		29		14		
08:30	25		1		12		13		37		14		
08:45	29	83	2	12	6	42	2	34	35	125	4	46	
09:00	22		3		10		14		32		17		
09:15	19		1		14		8		33		9		
09:30	19		1		15		9		34		10		
09:45	20	80	0	5	12	51	6	37	32	131	6	42	
10:00	14		1		19		10		33		11		
10:15	17		3		17		9		34		12		
10:30	10		1		22		5		32		6		
10:45	12	53	0	5	16	74	4	28	28	127	4	33	
11:00	16		1		22		5		38		6		
11:15	6		1		30		4		36		5		
11:30	14		2		10		3		24		5		
11:45	6	42	0	4	29	91	1	13	35	133	1	17	
Total	401		311		321		940		722		1251		
Percent	55.5%		24.9%		44.5%		75.1%						
Day Total			712				1261				1973		
Peak	08:15		01:15		11:00		04:15		08:30		04:15		
Vol.	96		62		91		148		137		175		
P.H.F.	0.828		0.646		0.758		0.841		0.926		0.795		

N/S:#189 Driveway/ #200 Driveway East
E/W: Wells Avenue
City, State: Newton, MA
Client: VHB/ R. Hart

PRECISION DATA INDUSTRIES, LLC
P.O. Box 301 Berlin, MA 01503
Office: 508.481.3999 Fax: 508.545.1234
Email: datarequests@pdillc.com

File Name : 133293 A
Site Code : 12350.00
Start Date : 4/11/2013
Page No : 1

Groups Printed- Cars - Heavy Vehicles

	#189 Wells Avenue From North				Wells Avenue From East				#200 Wells Avenue East From South				Wells Avenue From West				
Start Time	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Int. Total
03:00 PM	0	0	0	0	1	31	0	0	0	0	3	0	8	13	0	0	56
03:15 PM	3	0	0	0	0	26	2	0	1	0	6	0	20	16	1	0	75
03:30 PM	2	0	0	0	1	22	0	0	5	0	21	0	16	12	1	0	80
03:45 PM	0	0	0	0	0	33	0	0	0	0	16	0	7	19	0	0	75
Total	5	0	0	0	2	112	2	0	6	0	46	0	51	60	2	0	286
04:00 PM	3	0	0	0	0	40	2	0	0	0	2	0	3	12	0	0	62
04:15 PM	2	0	0	0	2	51	1	0	0	0	3	0	4	9	0	0	72
04:30 PM	3	0	0	0	0	37	0	0	2	0	3	0	3	9	0	0	57
04:45 PM	3	0	1	0	0	33	1	0	0	0	2	0	12	14	0	0	66
Total	11	0	1	0	2	161	4	0	2	0	10	0	22	44	0	0	257
05:00 PM	8	0	0	0	0	71	2	0	0	0	12	0	10	11	1	0	115
05:15 PM	5	0	0	0	0	41	2	0	0	0	14	0	28	8	0	0	98
05:30 PM	2	0	0	0	0	49	2	0	2	0	33	0	37	15	1	2	143
05:45 PM	7	0	1	0	0	52	1	0	2	0	46	0	24	12	1	0	146
Total	22	0	1	0	0	213	7	0	4	0	105	0	99	46	3	2	502
06:00 PM	3	0	0	0	0	32	0	0	0	0	15	0	12	8	1	0	71
06:15 PM	4	0	0	0	0	36	0	0	1	0	8	0	11	11	0	2	73
06:30 PM	1	0	1	0	1	27	1	0	0	0	7	0	9	7	1	0	55
06:45 PM	4	0	0	0	0	13	3	0	0	0	14	0	16	4	0	1	55
Total	12	0	1	0	1	108	4	0	1	0	44	0	48	30	2	3	254
Grand Total	50	0	3	0	5	594	17	0	13	0	205	0	220	180	7	5	1299
Apprch %	94.3	0	5.7	0	0.8	96.4	2.8	0	6	0	94	0	53.4	43.7	1.7	1.2	
Total %	3.8	0	0.2	0	0.4	45.7	1.3	0	1	0	15.8	0	16.9	13.9	0.5	0.4	
Cars	50	0	3	0	5	587	17	0	13	0	205	0	220	174	7	5	1286
% Cars	100	0	100	0	100	98.8	100	0	100	0	100	0	100	96.7	100	100	99
Heavy Vehicles	0	0	0	0	0	7	0	0	0	0	0	0	0	6	0	0	13
% Heavy Vehicles	0	0	0	0	0	1.2	0	0	0	0	0	0	0	3.3	0	0	1

	#189 Wells Avenue From North					Wells Avenue From East					#200 Wells Avenue East From South					Wells Avenue From West					
Start Time	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 03:00 PM to 06:30 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 05:00 PM																					
05:00 PM	8	0	0	0	8	0	71	2	0	73	0	0	12	0	12	10	11	1	0	22	115
05:15 PM	5	0	0	0	5	0	41	2	0	43	0	0	14	0	14	28	8	0	0	36	98
05:30 PM	2	0	0	0	2	0	49	2	0	51	2	0	33	0	35	37	15	1	2	55	143
05:45 PM	7	0	1	0	8	0	52	1	0	53	2	0	46	0	48	24	12	1	0	37	146
Total Volume	22	0	1	0	23	0	213	7	0	220	4	0	105	0	109	99	46	3	2	150	502
% App. Total	95.7	0	4.3	0		0	96.8	3.2	0		3.7	0	96.3	0		66	30.7	2	1.3		
PHF	.688	.000	.250	.000	.719	.000	.750	.875	.000	.753	.500	.000	.571	.000	.568	.669	.767	.750	.250	.682	.860
Cars	22	0	1	0	23	0	209	7	0	216	4	0	105	0	109	99	46	3	2	150	498
% Cars	100	0	100	0	100	0	98.1	100	0	98.2	100	0	100	0	100	100	100	100	100	100	99.2
Heavy Vehicles	0	0	0	0	0	0	4	0	0	4	0	0	0	0	0	0	0	0	0	0	4
% Heavy Vehicles	0	0	0	0	0	0	1.9	0	0	1.8	0	0	0	0	0	0	0	0	0	0	0.8

N/S:#189 Driveway/ #200 Driveway East
E/W: Wells Avenue
City, State: Newton, MA
Client: VHB/ R. Hart

PRECISION DATA INDUSTRIES, LLC
P.O. Box 301 Berlin, MA 01503
Office: 508.481.3999 Fax: 508.545.1234
Email: datarequests@pdillc.com

File Name : 133293 A
Site Code : 12350.00
Start Date : 4/11/2013
Page No : 1

Groups Printed- Cars

	#189 Wells Avenue From North				Wells Avenue From East				#200 Wells Avenue East From South				Wells Avenue From West				
Start Time	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Int. Total
03:00 PM	0	0	0	0	1	31	0	0	0	0	3	0	8	13	0	0	56
03:15 PM	3	0	0	0	0	25	2	0	1	0	6	0	20	13	1	0	71
03:30 PM	2	0	0	0	1	21	0	0	5	0	21	0	16	12	1	0	79
03:45 PM	0	0	0	0	0	33	0	0	0	0	16	0	7	19	0	0	75
Total	5	0	0	0	2	110	2	0	6	0	46	0	51	57	2	0	281
04:00 PM	3	0	0	0	0	40	2	0	0	0	2	0	3	12	0	0	62
04:15 PM	2	0	0	0	2	50	1	0	0	0	3	0	4	9	0	0	71
04:30 PM	3	0	0	0	0	37	0	0	2	0	3	0	3	9	0	0	57
04:45 PM	3	0	1	0	0	33	1	0	0	0	2	0	12	12	0	0	64
Total	11	0	1	0	2	160	4	0	2	0	10	0	22	42	0	0	254
05:00 PM	8	0	0	0	0	70	2	0	0	0	12	0	10	11	1	0	114
05:15 PM	5	0	0	0	0	41	2	0	0	0	14	0	28	8	0	0	98
05:30 PM	2	0	0	0	0	49	2	0	2	0	33	0	37	15	1	2	143
05:45 PM	7	0	1	0	0	49	1	0	2	0	46	0	24	12	1	0	143
Total	22	0	1	0	0	209	7	0	4	0	105	0	99	46	3	2	498
06:00 PM	3	0	0	0	0	32	0	0	0	0	15	0	12	7	1	0	70
06:15 PM	4	0	0	0	0	36	0	0	1	0	8	0	11	11	0	2	73
06:30 PM	1	0	1	0	1	27	1	0	0	0	7	0	9	7	1	0	55
06:45 PM	4	0	0	0	0	13	3	0	0	0	14	0	16	4	0	1	55
Total	12	0	1	0	1	108	4	0	1	0	44	0	48	29	2	3	253
Grand Total	50	0	3	0	5	587	17	0	13	0	205	0	220	174	7	5	1286
Apprch %	94.3	0	5.7	0	0.8	96.4	2.8	0	6	0	94	0	54.2	42.9	1.7	1.2	
Total %	3.9	0	0.2	0	0.4	45.6	1.3	0	1	0	15.9	0	17.1	13.5	0.5	0.4	

	#189 Wells Avenue From North					Wells Avenue From East					#200 Wells Avenue East From South					Wells Avenue From West					
Start Time	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 03:00 PM to 06:30 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 05:00 PM																					
05:00 PM	8	0	0	0	8	0	70	2	0	72	0	0	12	0	12	10	11	1	0	22	114
05:15 PM	5	0	0	0	5	0	41	2	0	43	0	0	14	0	14	28	8	0	0	36	98
05:30 PM	2	0	0	0	2	0	49	2	0	51	2	0	33	0	35	37	15	1	2	55	143
05:45 PM	7	0	1	0	8	0	49	1	0	50	2	0	46	0	48	24	12	1	0	37	143
Total Volume	22	0	1	0	23	0	209	7	0	216	4	0	105	0	109	99	46	3	2	150	498
% App. Total	95.7	0	4.3	0		0	96.8	3.2	0		3.7	0	96.3	0		66	30.7	2	1.3		
PHF	.688	.000	.250	.000	.719	.000	.746	.875	.000	.750	.500	.000	.571	.000	.568	.669	.767	.750	.250	.682	.871

N/S:#189 Driveway/ #200 Driveway East
E/W: Wells Avenue
City, State: Newton, MA
Client: VHB/ R. Hart

PRECISION
D A T A
INDUSTRIES, LLC
P.O. Box 301 Berlin, MA 01503
Office: 508.481.3999 Fax: 508.545.1234
Email: datarequests@pdillc.com

File Name : 133293 A
Site Code : 12350.00
Start Date : 4/11/2013
Page No : 1

Groups Printed- Heavy Vehicles

	#189 Wells Avenue From North				Wells Avenue From East				#200 Wells Avenue East From South				Wells Avenue From West				
Start Time	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Int. Total
03:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03:15 PM	0	0	0	0	0	1	0	0	0	0	0	0	0	3	0	0	4
03:30 PM	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1
03:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	2	0	0	0	0	0	0	0	3	0	0	5
04:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:15 PM	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1
04:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	2
Total	0	0	0	0	0	1	0	0	0	0	0	0	0	2	0	0	3
05:00 PM	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1
05:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:45 PM	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	3
Total	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	4
06:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1
06:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
06:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
06:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1
Grand Total	0	0	0	0	0	7	0	0	0	0	0	0	0	6	0	0	13
Apprch %	0	0	0	0	0	100	0	0	0	0	0	0	0	100	0	0	
Total %	0	0	0	0	0	53.8	0	0	0	0	0	0	0	46.2	0	0	

	#189 Wells Avenue From North					Wells Avenue From East					#200 Wells Avenue East From South					Wells Avenue From West					
Start Time	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 03:00 PM to 06:30 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 03:00 PM																					
03:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03:15 PM	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	3	0	0	3	4
03:30 PM	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	1
03:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Volume	0	0	0	0	0	0	2	0	0	2	0	0	0	0	0	0	3	0	0	3	5
% App. Total	0	0	0	0		0	100	0	0		0	0	0	0		0	100	0	0		
PHF	.000	.000	.000	.000	.000	.000	.500	.000	.000	.500	.000	.000	.000	.000	.000	.000	.250	.000	.000	.250	.313

N/S:#189 Driveway/ #200 Driveway East
E/W: Wells Avenue
City, State: Newton, MA
Client: VHB/ R. Hart

PRECISION
D A T A
INDUSTRIES, LLC
P.O.Box 301 Berlin, MA 01503
Office: 508.481.3999 Fax: 508.545.1234
Email: datarequests@pdillc.com

File Name : 133293 A
Site Code : 12350.00
Start Date : 4/11/2013
Page No : 1

Groups Printed- Peds and Bicycles

	#189 Wells Avenue From North				Wells Avenue From East				#200 Wells Avenue East From South				Wells Avenue From West				
Start Time	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Int. Total
03:00 PM	0	0	0	1	0	0	0	0	0	0	0	4	0	0	0	0	5
03:15 PM	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	2
03:30 PM	0	0	0	1	0	0	0	0	0	0	0	3	0	0	0	1	5
03:45 PM	0	0	0	3	0	0	0	0	0	0	0	10	0	0	0	1	14
Total	0	0	0	5	0	0	0	0	0	0	0	18	0	0	0	3	26
04:00 PM	0	0	0	2	0	0	0	0	0	0	0	2	0	0	0	0	4
04:15 PM	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	3
04:30 PM	0	0	0	0	0	0	0	0	0	0	0	6	0	0	0	0	6
04:45 PM	0	0	0	0	0	0	0	5	0	0	0	2	0	0	0	0	7
Total	0	0	0	2	0	0	0	5	0	0	0	13	0	0	0	0	20
05:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:15 PM	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	2
05:30 PM	0	0	0	1	0	0	0	2	0	0	0	2	0	0	0	3	8
05:45 PM	0	0	0	0	0	0	0	2	0	0	0	4	0	0	0	2	8
Total	0	0	0	1	0	0	0	5	0	0	0	7	0	0	0	5	18
06:00 PM	0	0	0	2	0	0	0	0	0	0	0	1	0	0	0	0	3
06:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
06:30 PM	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
06:45 PM	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1
Total	0	0	0	3	0	0	0	1	0	0	0	1	0	0	0	0	5
Grand Total	0	0	0	11	0	0	0	11	0	0	0	39	0	0	0	8	69
Apprch %	0	0	0	100	0	0	0	100	0	0	0	100	0	0	0	100	
Total %	0	0	0	15.9	0	0	0	15.9	0	0	0	56.5	0	0	0	11.6	

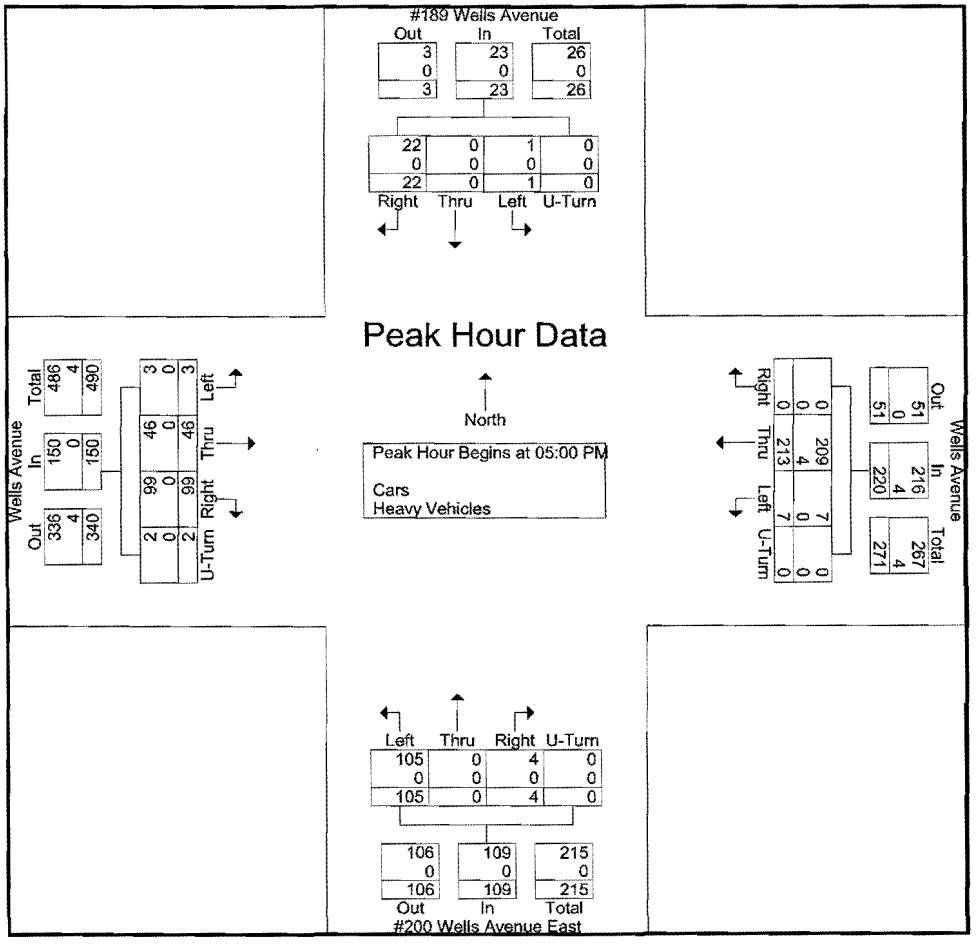
	#189 Wells Avenue From North					Wells Avenue From East					#200 Wells Avenue East From South					Wells Avenue From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 03:00 PM to 06:30 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 03:45 PM																					
03:45 PM	0	0	0	3	3	0	0	0	0	0	0	0	0	10	10	0	0	0	1	1	14
04:00 PM	0	0	0	2	2	0	0	0	0	0	0	0	0	2	2	0	0	0	0	0	4
04:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	3	3	0	0	0	0	0	3
04:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	6	6	0	0	0	0	0	6
Total Volume	0	0	0	5	5	0	0	0	0	0	0	0	0	21	21	0	0	0	1	1	27
% App. Total	0	0	0	100		0	0	0	0		0	0	0	100		0	0	0	100		
PHF	.000	.000	.000	.417	.417	.000	.000	.000	.000	.000	.000	.000	.000	.525	.525	.000	.000	.000	.250	.250	.482

N/S:#189 Driveway/ #200 Driveway East
E/W: Wells Avenue
City, State: Newton, MA
Client: VHB/ R. Hart

PRECISION DATA INDUSTRIES, LLC
P.O. Box 301 Berlin, MA 01503
Office: 508.481.3999 Fax: 508.545.1234
Email: datarequests@pdillc.com

File Name : 133293 A
Site Code : 12350.00
Start Date : 4/11/2013
Page No : 1

	#189 Wells Avenue From North					Wells Avenue From East					#200 Wells Avenue East From South					Wells Avenue From West					
Start Time	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 03:00 PM to 06:30 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 05:00 PM																					
05:00 PM	8	0	0	0	8	0	71	2	0	73	0	0	12	0	12	10	11	1	0	22	115
05:15 PM	5	0	0	0	5	0	41	2	0	43	0	0	14	0	14	28	8	0	0	36	98
05:30 PM	2	0	0	0	2	0	49	2	0	51	2	0	33	0	35	37	15	1	2	55	143
05:45 PM	7	0	1	0	8	0	52	1	0	53	2	0	46	0	48	24	12	1	0	37	146
Total Volume	22	0	1	0	23	0	213	7	0	220	4	0	105	0	109	99	46	3	2	150	502
% App. Total	95.7	0	4.3	0		0	96.8	3.2	0		3.7	0	96.3	0		66	30.7	2	1.3		
PHF	.688	.000	.250	.000	.719	.000	.750	.875	.000	.753	.500	.000	.571	.000	.568	.669	.767	.750	.250	.682	.860
Cars	22	0	1	0	23	0	209	7	0	216	4	0	105	0	109	99	46	3	2	150	498
% Cars	100	0	100	0	100	0	98.1	100	0	98.2	100	0	100	0	100	100	100	100	100	100	99.2
Heavy Vehicles	0	0	0	0	0	0	4	0	0	4	0	0	0	0	0	0	0	0	0	0	4
% Heavy Vehicles	0	0	0	0	0	0	1.9	0	0	1.8	0	0	0	0	0	0	0	0	0	0	0.8



S: # 200 Driveway West
E/W: Wells Avenue
City, State: Newton, MA
Client: VHB/ R. Hart

PRECISION
D A T A
INDUSTRIES, LLC
P.O. Box 301 Berlin, MA 01503
Office: 508.481.3999 Fax: 508.545.1234
Email: datarequests@pdillc.com

File Name : 133293 B
Site Code : 12350.00
Start Date : 4/11/2013
Page No : 1

Groups Printed- Cars - Heavy Vehicles

	Wells Avenue From East			#200 Wells Avenue West From South			Wells Avenue From West			
Start Time	Thru	Left	U-Turn	Right	Left	U-Turn	Right	Thru	U-Turn	Int. Total
03:00 PM	33	0	0	0	0	0	3	25	0	61
03:15 PM	36	1	0	0	10	0	17	36	0	100
03:30 PM	46	0	0	3	16	0	15	29	0	109
03:45 PM	54	0	0	2	10	0	8	27	0	101
Total	169	1	0	5	36	0	43	117	0	371
04:00 PM	48	1	0	1	3	0	1	15	0	69
04:15 PM	61	1	0	0	5	0	4	17	0	88
04:30 PM	46	1	0	0	1	0	1	15	0	64
04:45 PM	39	0	0	2	2	0	5	23	0	71
Total	194	3	0	3	11	0	11	70	0	292
05:00 PM	103	0	0	0	3	0	3	22	0	131
05:15 PM	66	0	0	2	11	0	14	33	0	126
05:30 PM	92	1	0	1	17	0	21	55	0	187
05:45 PM	110	0	0	1	13	0	13	36	0	173
Total	371	1	0	4	44	0	51	146	0	617
06:00 PM	56	0	0	0	8	0	7	18	0	89
06:15 PM	54	1	1	2	9	0	8	21	0	96
06:30 PM	35	0	0	0	1	0	0	16	0	52
06:45 PM	33	0	0	1	1	0	1	21	0	57
Total	178	1	1	3	19	0	16	76	0	294
Grand Total	912	6	1	15	110	0	121	409	0	1574
Apprch %	99.2	0.7	0.1	12	88	0	22.8	77.2	0	
Total %	57.9	0.4	0.1	1	7	0	7.7	26	0	
Cars	907	6	1	15	110	0	121	406	0	1566
% Cars	99.5	100	100	100	100	0	100	99.3	0	99.5
Heavy Vehicles	5	0	0	0	0	0	0	3	0	8
% Heavy Vehicles	0.5	0	0	0	0	0	0	0.7	0	0.5

	Wells Avenue From East				#200 Wells Avenue West From South				Wells Avenue From West				
Start Time	Thru	Left	U-Turn	App. Total	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 03:00 PM to 06:30 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 05:00 PM													
05:00 PM	103	0	0	103	0	3	0	3	3	22	0	25	131
05:15 PM	66	0	0	66	2	11	0	13	14	33	0	47	126
05:30 PM	92	1	0	93	1	17	0	18	21	55	0	76	187
05:45 PM	110	0	0	110	1	13	0	14	13	36	0	49	173
Total Volume	371	1	0	372	4	44	0	48	51	146	0	197	617
% App. Total	99.7	0.3	0		8.3	91.7	0		25.9	74.1	0		
PHF	.843	.250	.000	.845	.500	.647	.000	.667	.607	.664	.000	.648	.825
Cars	368	1	0	369	4	44	0	48	51	146	0	197	614
% Cars	99.2	100	0	99.2	100	100	0	100	100	100	0	100	99.5
Heavy Vehicles	3	0	0	3	0	0	0	0	0	0	0	0	3
% Heavy Vehicles	0.8	0	0	0.8	0	0	0	0	0	0	0	0	0.5

S: # 200 Driveway West
E/W: Wells Avenue
City, State: Newton, MA
Client: VHB/ R. Hart

PRECISION
D A T A
INDUSTRIES, LLC
P.O. Box 301 Berlin, MA 01503
Office: 508.481.3999 Fax: 508.545.1234
Email: datarequests@pdillc.com

File Name : 133293 B
Site Code : 12350.00
Start Date : 4/11/2013
Page No : 1

Groups Printed- Cars

	Wells Avenue From East			#200 Wells Avenue West From South			Wells Avenue From West			
Start Time	Thru	Left	U-Turn	Right	Left	U-Turn	Right	Thru	U-Turn	Int. Total
03:00 PM	33	0	0	0	0	0	3	25	0	61
03:15 PM	35	1	0	0	10	0	17	35	0	98
03:30 PM	45	0	0	3	16	0	15	29	0	108
03:45 PM	54	0	0	2	10	0	8	27	0	101
Total	167	1	0	5	36	0	43	116	0	368
04:00 PM	48	1	0	1	3	0	1	15	0	69
04:15 PM	61	1	0	0	5	0	4	17	0	88
04:30 PM	46	1	0	0	1	0	1	14	0	63
04:45 PM	39	0	0	2	2	0	5	22	0	70
Total	194	3	0	3	11	0	11	68	0	290
05:00 PM	102	0	0	0	3	0	3	22	0	130
05:15 PM	66	0	0	2	11	0	14	33	0	126
05:30 PM	92	1	0	1	17	0	21	55	0	187
05:45 PM	108	0	0	1	13	0	13	36	0	171
Total	368	1	0	4	44	0	51	146	0	614
06:00 PM	56	0	0	0	8	0	7	18	0	89
06:15 PM	54	1	1	2	9	0	8	21	0	96
06:30 PM	35	0	0	0	1	0	0	16	0	52
06:45 PM	33	0	0	1	1	0	1	21	0	57
Total	178	1	1	3	19	0	16	76	0	294
Grand Total	907	6	1	15	110	0	121	406	0	1566
Apprch %	99.2	0.7	0.1	12	88	0	23	77	0	
Total %	57.9	0.4	0.1	1	7	0	7.7	25.9	0	

	Wells Avenue From East				#200 Wells Avenue West From South				Wells Avenue From West				
Start Time	Thru	Left	U-Turn	App. Total	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 03:00 PM to 06:30 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 05:00 PM													
05:00 PM	102	0	0	102	0	3	0	3	3	22	0	25	130
05:15 PM	66	0	0	66	2	11	0	13	14	33	0	47	126
05:30 PM	92	1	0	93	1	17	0	18	21	55	0	76	187
05:45 PM	108	0	0	108	1	13	0	14	13	36	0	49	171
Total Volume	368	1	0	369	4	44	0	48	51	146	0	197	614
% App. Total	99.7	0.3	0		8.3	91.7	0		25.9	74.1	0		
PHF	.852	.250	.000	.854	.500	.647	.000	.667	.607	.664	.000	.648	.821

S: # 200 Driveway West
E/W: Wells Avenue
City, State: Newton, MA
Client: VHB/ R. Hart

PRECISION
D A T A
INDUSTRIES, LLC
P.O. Box 301 Berlin, MA 01503
Office: 508.481.3999 Fax: 508.545.1234
Email: datarequests@pdillc.com

File Name : 133293 B
Site Code : 12350.00
Start Date : 4/11/2013
Page No : 1

Groups Printed- Heavy Vehicles

	Wells Avenue From East			#200 Wells Avenue West From South			Wells Avenue From West			
Start Time	Thru	Left	U-Turn	Right	Left	U-Turn	Right	Thru	U-Turn	Int. Total
03:00 PM	0	0	0	0	0	0	0	0	0	0
03:15 PM	1	0	0	0	0	0	0	1	0	2
03:30 PM	1	0	0	0	0	0	0	0	0	1
03:45 PM	0	0	0	0	0	0	0	0	0	0
Total	2	0	0	0	0	0	0	1	0	3
04:00 PM	0	0	0	0	0	0	0	0	0	0
04:15 PM	0	0	0	0	0	0	0	0	0	0
04:30 PM	0	0	0	0	0	0	0	1	0	1
04:45 PM	0	0	0	0	0	0	0	1	0	1
Total	0	0	0	0	0	0	0	2	0	2
05:00 PM	1	0	0	0	0	0	0	0	0	1
05:15 PM	0	0	0	0	0	0	0	0	0	0
05:30 PM	0	0	0	0	0	0	0	0	0	0
05:45 PM	2	0	0	0	0	0	0	0	0	2
Total	3	0	0	0	0	0	0	0	0	3
06:00 PM	0	0	0	0	0	0	0	0	0	0
06:15 PM	0	0	0	0	0	0	0	0	0	0
06:30 PM	0	0	0	0	0	0	0	0	0	0
06:45 PM	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0
Grand Total	5	0	0	0	0	0	0	3	0	8
Apprch %	100	0	0	0	0	0	0	100	0	
Total %	62.5	0	0	0	0	0	0	37.5	0	

	Wells Avenue From East				#200 Wells Avenue West From South				Wells Avenue From West				
Start Time	Thru	Left	U-Turn	App. Total	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 03:00 PM to 06:30 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 03:00 PM													
03:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
03:15 PM	1	0	0	1	0	0	0	0	0	1	0	1	2
03:30 PM	1	0	0	1	0	0	0	0	0	0	0	0	1
03:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Volume	2	0	0	2	0	0	0	0	0	1	0	1	3
% App. Total	100	0	0		0	0	0		0	100	0		
PHF	.500	.000	.000	.500	.000	.000	.000	.000	.000	.250	.000	.250	.375

S: # 200 Driveway West
E/W: Wells Avenue
City, State: Newton, MA
Client: VHB/ R. Hart

PRECISION
D A T A
INDUSTRIES, LLC
P.O. Box 301 Berlin, MA 01503
Office: 508.481.3999 Fax: 508.545.1234
Email: datarequests@pdillc.com

File Name : 133293 B
Site Code : 12350.00
Start Date : 4/11/2013
Page No : 1

Groups Printed- Peds and Bicycles

	Wells Avenue From East			#200 Wells Avenue West From South			Wells Avenue From West			
Start Time	Thru	Left	Peds	Right	Left	Peds	Right	Thru	Peds	Int. Total
03:00 PM	0	0	0	0	0	4	0	0	0	4
03:15 PM	0	0	0	0	0	0	0	0	0	0
03:30 PM	0	0	0	0	0	0	0	0	0	0
03:45 PM	0	0	1	0	0	11	0	0	0	12
Total	0	0	1	0	0	15	0	0	0	16
04:00 PM	0	0	0	0	0	2	0	0	0	2
04:15 PM	1	0	1	0	0	3	0	0	0	5
04:30 PM	0	0	0	0	0	4	0	0	0	4
04:45 PM	0	0	0	0	0	0	0	0	0	0
Total	1	0	1	0	0	9	0	0	0	11
05:00 PM	0	0	1	0	0	2	0	0	0	3
05:15 PM	0	0	0	0	0	0	0	0	0	0
05:30 PM	0	0	0	0	0	4	0	0	0	4
05:45 PM	0	0	1	0	0	5	0	0	0	6
Total	0	0	2	0	0	11	0	0	0	13
06:00 PM	0	0	1	0	0	1	0	0	0	2
06:15 PM	0	0	0	0	0	2	0	0	1	3
06:30 PM	0	0	0	0	0	4	0	0	0	4
06:45 PM	0	0	0	0	0	2	0	0	0	2
Total	0	0	1	0	0	9	0	0	1	11
Grand Total	1	0	5	0	0	44	0	0	1	51
Apprch %	16.7	0	83.3	0	0	100	0	0	100	
Total %	2	0	9.8	0	0	86.3	0	0	2	

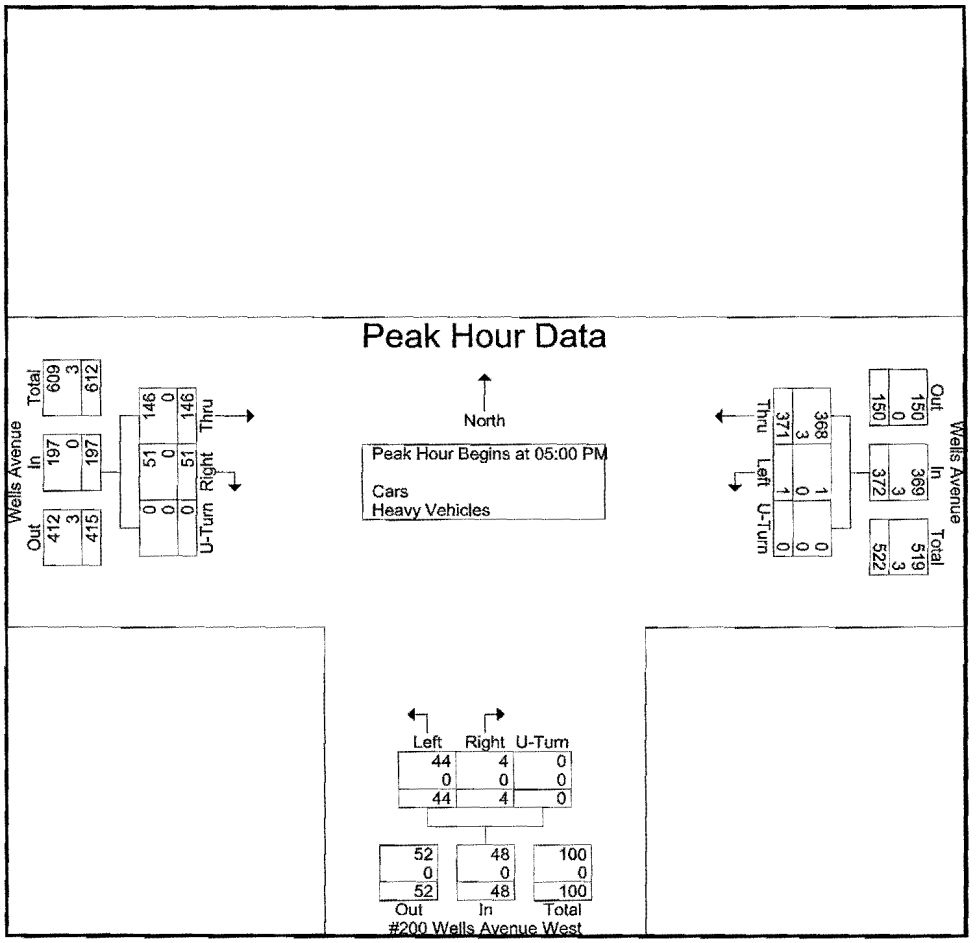
	Wells Avenue From East				#200 Wells Avenue West From South				Wells Avenue From West				
Start Time	Thru	Left	Peds	App. Total	Right	Left	Peds	App. Total	Right	Thru	Peds	App. Total	Int. Total
Peak Hour Analysis From 03:00 PM to 06:30 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 03:45 PM													
03:45 PM	0	0	1	1	0	0	11	11	0	0	0	0	12
04:00 PM	0	0	0	0	0	0	2	2	0	0	0	0	2
04:15 PM	1	0	1	2	0	0	3	3	0	0	0	0	5
04:30 PM	0	0	0	0	0	0	4	4	0	0	0	0	4
Total Volume	1	0	2	3	0	0	20	20	0	0	0	0	23
% App. Total	33.3	0	66.7		0	0	100		0	0	0		
PHF	.250	.000	.500	.375	.000	.000	.455	.455	.000	.000	.000	.000	.479

S: # 200 Driveway West
E/W: Wells Avenue
City, State: Newton, MA
Client: VHB/ R. Hart

PRECISION
D A T A
INDUSTRIES, LLC
P.O. Box 301 Berlin, MA 01503
Office: 508.481.3999 Fax: 508.545.1234
Email: datarequests@pdillc.com

File Name : 133293 B
Site Code : 12350.00
Start Date : 4/11/2013
Page No : 1

	Wells Avenue From East				#200 Wells Avenue West From South				Wells Avenue From West				
Start Time	Thru	Left	U-Turn	App. Total	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 03:00 PM to 06:30 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 05:00 PM													
05:00 PM	103	0	0	103	0	3	0	3	3	22	0	25	131
05:15 PM	66	0	0	66	2	11	0	13	14	33	0	47	126
05:30 PM	92	1	0	93	1	17	0	18	21	55	0	76	187
05:45 PM	110	0	0	110	1	13	0	14	13	36	0	49	173
Total Volume	371	1	0	372	4	44	0	48	51	146	0	197	617
% App. Total	99.7	0.3	0		8.3	91.7	0		25.9	74.1	0		
PHF	.843	.250	.000	.845	.500	.647	.000	.667	.607	.664	.000	.648	.825
Cars	368	1	0	369	4	44	0	48	51	146	0	197	614
% Cars	99.2	100	0	99.2	100	100	0	100	100	100	0	100	99.5
Heavy Vehicles	3	0	0	3	0	0	0	0	0	0	0	0	3
% Heavy Vehicles	0.8	0	0	0.8	0	0	0	0	0	0	0	0	0.5



PEAK HOUR FACTOR/HEAVY VEHICLE PERCENTAGE CALCULATIONS

Job Number: 12350.00
Name: Russian School of Mathematics
Location: Newton, MA
Peak Analyzed: Weekday Evening
Network Peak Hour: 5:00 - 6:00

Enter information in yellow boxes only

1 :: #189 Driveway/#200 Driveway East & Wells Avenue

Approach	NB	SB	WB	EB
Peak Hour Volume	109	23	220	150
Peak 15 min. Vol.	48	8	73	55
Heavy Vehicle Volume	0	0	4	0
PHF	0.57	0.72	0.75	0.68
HV%	0%	0%	2%	0%

2 :: #200 Driveway West & Wells Avenue

Approach	NB	SB	WB	EB
Peak Hour Volume	48	0	372	197
Peak 15 min. Vol.	18	0	110	76
Heavy Vehicle Volume	0	0	3	0
PHF	0.67		0.85	0.65
HV%	0%		1%	0%

Total
502
184
4
0.68
0.8%

Total
617
204
3
0.76
0.5%

Sight Distance

Stopping Sight Distance and Intersection Sight Distance Calculator [v0.97]
Based on 'A Policy on Geometric Design of Highways and Streets', AASHTO, 2004

Section I

Project Information

Project Number:	12350	**Analyst:**	RCH
City/Town, State:	Newton MA		
Location:	Wells Avenue	**Client:**	RSM

Street Names and Directions

Major Street name:	Route 28	EB/WB
Minor Street name:	Western Site Driveway	NB/SB
Minor Street intersects *from* the:	south	
The minor street *predominantly* serves...	Passenger Cars	
Sight distance location intersection is...	Existing	
Total number of lanes on Major Street is...	2	

Street Notes

Grade Information [enter down slope as a negative number]

Major Street Approach Grade:	0.00%	EB
	0.00%	WB
Minor Street Approach Grade:	0.00%	SB
	0.00%	NB

Major Street Speed Information

Posted		*Observed **
30	EB	33
30	WB	33

** note:* off-peak *85th percentile speeds*

Section II

ISD and SSD *Observations*

Instructions on how to observe and measure ISD and SSD are included on subsequent pages.

ISD - Intersection sight distance is the distance that is based on the time required for perception, reaction and completion of the desired critical exiting maneuver [typically, a left turn] once the driver on a minor street approach [or a site drive] decides to execute the maneuver. Calculation for the critical ISD includes the time to [1] turn left, and to clear the near half of the intersection without conflicting with the vehicles approaching from the left; and [2] upon turning left, to accelerate to the operating speed on the roadway without causing approaching vehicles on the main road to unduly reduce their speed. In this context, ISD can be considered as a *desirable* visibility criterion for the safe operation of an unsignalized intersection.

SSD - Stopping sight distance is the distance required for a vehicle approaching an intersection from either direction to perceive, react, and come to a complete stop before colliding with the exiting vehicle from a driveway. In this respect, SSD can be considered as the *minimum* visibility criterion for the safe operation of an unsignalized intersection.

			Limiting Factors:
***Observed* ISD:**	210	looking left [west]	Horizontal Curve and Mature Trees/Vegetation
(rounded to nearest 5 feet)	240	looking right [east]	Horizontal Curve and Mature Trees/Vegetation
***Observed* SSD:**	240	traveling EB	Horizontal Curve and Mature Trees/Vegetation
(rounded to nearest 5 feet)	260	traveling WB	Horizontal Curve and Mature Trees/Vegetation

Section III

ISD and SSD *Calculations* (rounded up to the next highest 5 feet) [sources: SSD - AASHTO, pp.110-117; ISD - AASHTO, pp. 650 - 664]

Cases are described in detail on subsequent pages. In summary...

B1: left turn from minor road, from stop control
B2: right turn from minor road, from stop control
B3: crossing maneuver from minor road, from stop control, assuming left- and right turns are not permitted *[otherwise, case B1 or B2 would supercede]*

***Desirable* Calculated...**		**Condition Met?**
... ISD, case B1:	365	**No**
... ISD, case B2:	320	**No**
... ISD, case B3:	320	**No**

[note: if number of lanes crossed exceeds 6, or if grades are steep, consult the manual]

***Minimum* Calculated ...**		**Condition Met?**
... ISD, case B1:	230	**No**
... ISD, case B2:	230	**Yes**
... ISD, case B3:	230	**No**

[note: minimum *ISD is equal to required SSD]*

Calculated ...			**Condition Met?**
... SSD:	230	traveling EB	**Yes**
	230	traveling WB	**Yes**

Section IV

AASHTO Guidance

Refer to AASHTO for specific guidance on SSD and ISD if presented with an unusual/atypical case.
Adequate ISD is not needed at signalized intersections, assuming traffic signal heads are visible on all approaches.
Any object that would obstruct the driver's view should be removed or lowered, if practical. Such objects include buildings, parked cars, highway structures, hedges/vegetation/trees/bushes/unmowed lawn, walls, fences, and terrain.
For ISD, an object should be considered an obstruction if it obstructs the vision of a driver whose eye height is 3.5 feet above the roadway surface and the object to be seen is 3.5 feet above the surface of the intersecting road.
Where horizontal sight restrictions occur on downgrades, particularly at the ends of long downgrades, it is desirable to provide SSD that exceeds those values indicated above (refer to page 114 of AASHTO).

Stopping Sight Distance and Intersection Sight Distance Calculator [v0.97]
Based on 'A Policy on Geometric Design of Highways and Streets', AASHTO, 2004

Section I

Project Information

Project Number:	12350	**Analyst:**	RCH
City/Town, State:	Newton MA		
Location:	Wells Avenue	**Client:**	RSM

Street Names and Directions

Major Street name:	Route 28	EB/WB
Minor Street name:	Easterm Site Driveway	NB/SB
Minor Street intersects *from* the:	south	
The minor street *predominantly* serves...	Passenger Cars	
Sight distance location intersection is...	Existing	
Total number of lanes on Major Street is...	2	

Street Notes

Grade Information [enter down slope as a negative number]

Major Street Approach Grade:	0.00%	EB
	0.00%	WB
Minor Street Approach Grade:	0.00%	SB
	0.00%	NB

Major Street Speed Information

Posted		*Observed **
30	EB	33
30	WB	33

** note:* off-peak *85th percentile speeds*

Section II

ISD and SSD *Observations*

Instructions on how to observe and measure ISD and SSD are included on subsequent pages.

ISD - Intersection sight distance is the distance that is based on the time required for perception, reaction and completion of the desired critical exiting maneuver [typically, a left turn] once the driver on a minor street approach [or a site drive] decides to execute the maneuver. Calculation for the critical ISD includes the time to [1] turn left, and to clear the near half of the intersection without conflicting with the vehicles approaching from the left; and [2] upon turning left, to accelerate to the operating speed on the roadway without causing approaching vehicles on the main road to unduly reduce their speed. In this context, ISD can be considered as a *desirable* visibility criterion for the safe operation of an unsignalized intersection.

SSD - Stopping sight distance is the distance required for a vehicle approaching an intersection from either direction to perceive, react, and come to a complete stop before colliding with the exiting vehicle from a driveway. In this respect, SSD can be considered as the *minimum* visibility criterion for the safe operation of an unsignalized intersection.

			Limiting Factors:
***Observed* ISD:**	190	looking left [west]	Horizontal Curve and Mature Trees/Vegetation
(rounded to nearest 5 feet)	250	looking right [east]	Horizontal Curve and Mature Trees/Vegetation
***Observed* SSD:**	210	traveling EB	Horizontal Curve and Mature Trees/Vegetation
(rounded to nearest 5 feet)	270	traveling WB	Horizontal Curve and Mature Trees/Vegetation

Section III

ISD and SSD *Calculations* (rounded up to the next highest 5 feet) [sources: SSD - AASHTO, pp.110-117; ISD - AASHTO, pp. 650 - 664]

Cases are described in detail on subsequent pages. In summary...

B1: left turn from minor road, from stop control
B2: right turn from minor road, from stop control
B3: crossing maneuver from minor road, from stop control, assuming left- and right turns are not permitted *[otherwise, case B1 or B2 would supercede]*

***Desirable* Calculated...**		**Condition Met?**
... ISD, case B1:	365	**No**
... ISD, case B2:	320	**No**
... ISD, case B3:	320	**No**

[note: if number of lanes crossed exceeds 6, or if grades are steep, consult the manual]

***Minimum* Calculated ...**		**Condition Met?**
... ISD, case B1:	230	**No**
... ISD, case B2:	230	**Yes**
... ISD, case B3:	230	**No**

[note: minimum *ISD is equal to required SSD]*

Calculated ...			**Condition Met?**
... SSD:	230	traveling EB	**No**
	230	traveling WB	**Yes**

Section IV

AASHTO Guidance

Refer to AASHTO for specific guidance on SSD and ISD if presented with an unusual/atypical case.
Adequate ISD is not needed at signalized intersections, assuming traffic signal heads are visible on all approaches.
Any object that would obstruct the driver's view should be removed or lowered, if practical. Such objects include buildings, parked cars, highway structures, hedges/vegetation/trees/bushes/unmowed lawn, walls, fences, and terrain.
For ISD, an object should be considered an obstruction if it obstructs the vision of a driver whose eye height is 3.5 feet above the roadway surface and the object to be seen is 3.5 feet above the surface of the intersecting road.
Where horizontal sight restrictions occur on downgrades, particularly at the ends of long downgrades, it is desirable to provide SSD that exceeds those values indicated above (refer to page 114 of AASHTO).

SYNCHRO Analysis

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations		↕			↕			↕			↕	
Volume (veh/h)	3	46	99	7	213	0	105	0	4	1	0	22
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85	0.57	0.57	0.57	0.72	0.72	0.72
Hourly flow rate (vph)	4	54	116	8	251	0	184	0	7	1	0	31
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	251			171			417	386	112	393	445	251
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	251			171			417	386	112	393	445	251
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			99			65	100	99	100	100	96
cM capacity (veh/h)	1327			1407			525	546	946	562	507	793

Direction, Lane #	SE 1	NW 1	NE 1	SW 1
Volume Total	174	259	191	32
Volume Left	4	8	184	1
Volume Right	116	0	7	31
cSH	1327	1407	534	779
Volume to Capacity	0.00	0.01	0.36	0.04
Queue Length 95th (ft)	0	0	40	3
Control Delay (s)	0.2	0.3	15.5	9.8
Lane LOS	A	A	C	A
Approach Delay (s)	0.2	0.3	15.5	9.8
Approach LOS			C	A

Intersection Summary				
Average Delay	5.1			
Intersection Capacity Utilization	34.2%	ICU Level of Service	A	
Analysis Period (min)	15			

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (veh/h)	146	51	1	371	44	4
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.85	0.85	0.85	0.85	0.67	0.67
Hourly flow rate (vph)	172	60	1	436	66	6
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			232		641	202
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			232		641	202
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		85	99
cM capacity (veh/h)			1342		442	844

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	232	438	72
Volume Left	0	1	66
Volume Right	60	0	6
cSH	1700	1342	460
Volume to Capacity	0.14	0.00	0.16
Queue Length 95th (ft)	0	0	14
Control Delay (s)	0.0	0.0	14.3
Lane LOS		A	B
Approach Delay (s)	0.0	0.0	14.3
Approach LOS			B

Intersection Summary			
Average Delay	1.4		
Intersection Capacity Utilization	30.3%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations		↕			↕			↕			↕	
Volume (veh/h)	3	46	18	7	213	0	149	0	8	1	0	22
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85	0.57	0.57	0.57	0.72	0.72	0.72
Hourly flow rate (vph)	4	54	21	8	251	0	261	0	14	1	0	31
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	251			75			369	339	65	353	349	251
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	251			75			369	339	65	353	349	251
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			99			54	100	99	100	100	96
cM capacity (veh/h)	1327			1524			565	581	1005	594	573	793

Direction, Lane #	SE 1	NW 1	NE 1	SW 1
Volume Total	79	259	275	32
Volume Left	4	8	261	1
Volume Right	21	0	14	31
cSH	1327	1524	578	782
Volume to Capacity	0.00	0.01	0.48	0.04
Queue Length 95th (ft)	0	0	64	3
Control Delay (s)	0.4	0.3	16.8	9.8
Lane LOS	A	A	C	A
Approach Delay (s)	0.4	0.3	16.8	9.8
Approach LOS			C	A

Intersection Summary			
Average Delay	7.8		
Intersection Capacity Utilization	35.8%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (veh/h)	145	150	8	371	0	0
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.85	0.85	0.85	0.85	0.67	0.67
Hourly flow rate (vph)	171	176	9	436	0	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			347		714	259
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			347		714	259
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			99		100	100
cM capacity (veh/h)			1217		398	785

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	347	446	0
Volume Left	0	9	0
Volume Right	176	0	0
cSH	1700	1217	1700
Volume to Capacity	0.20	0.01	0.00
Queue Length 95th (ft)	0	1	0
Control Delay (s)	0.0	0.2	0.0
Lane LOS		A	A
Approach Delay (s)	0.0	0.2	0.0
Approach LOS			A

Intersection Summary			
Average Delay	0.1		
Intersection Capacity Utilization	29.3%	ICU Level of Service	A
Analysis Period (min)	15		