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July 11, 1985

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Enclosed for your information is some material which I circulated to members of the Alewife Transportation Advisory Committee, which was developed by Steven Kaiser.

As you can see from my cover letter, it is not clear to me that Mr. Kaiser's conclusions are necessarily correct, but they seem sound and are problematic if valid. It is my hope that EOTC will give them serious consideration prior to pushing through with its "Interim Access" solutions.

Sincerely,

Peter Shelley
Senior Counsel

Enclosure
PS/mgw



Conservation Law Foundation of New England, Inc.

3 Joy Street
Boston, Massachusetts
02108-1497
(617) 742-2540

June 27, 1985

TO: All Alewife Transportation Advisory Committee Members

The Conservation Law Foundation of New England, Inc. has not played a role of any significance to date relative to the environmental and planning issues surrounding the traffic proposals for the Alewife Triangle area. In part, our silence has been based on our belief that your advisory committee, particularly through Mr. Meyer's representation, already serves to present common issues to the Executive Office of Transportation and Construction (EOTC). Our involvement, therefore, was seen to be redundant. Our silence has also been based on our belief that EOTC made plausible arguments in support of its positions relative to these proposals in the documents which were developed, even though CLF disagreed with those positions and many of the premises on which they were based.

New information has been developed by a traffic consultant, Steven Kaiser, which I have enclosed that calls into question in a dramatic way those EOTC positions and premises relative to the Interim Access Project. Several conclusions seem obvious to me:

1. If Mr. Kaiser's analysis is accurate, the Interim Access Project may materially worsen the condition at Alewife, not only environmentally (as we already believed) but also with respect to volume capacity and safety.

2. If Mr. Kaiser's analysis is accurate, there is no pressing traffic problem which will be solved by the Interim Access Project; therefore, there is no apparent reason to do this project independent of the Permanent Improvements.

I recognize that it is difficult to change positions that many of you have taken to date in reliance on the EOTC material presented to you on the benefits of this project. Indeed, as I said above, CLF did not fight the project because of its reliance on that same material. I would submit that circumstances are now different due to Mr. Kaiser's work. As he points out in his 6/25/85 Memorandum, the data to the analysis he did was not available until recently, even though one would have assumed it would have been.

We at CLF do not have the expertise to rebut Mr. Kaiser's conclusions or methodologies. On their face, they seem logical

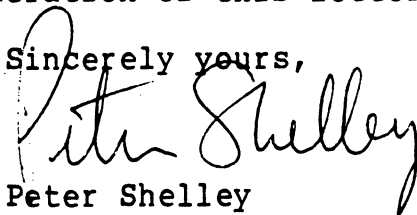
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Conservation Law Foundation of New England, Inc.

and well supported. EOTC, on the other hand, can critique the memoranda and should feel obligated to do so prior to further expenditures of public money on the Interim Access Project. The purpose of this letter is to urge you, the members of the Alewife Transportation Advisory Committee, to exert whatever influence you have to halt further work on the Interim Access Project until the questions raised by the attached memoranda are resolved to your satisfaction by EOTC.

Thank you for your consideration of this letter.

Sincerely yours,

A handwritten signature in cursive script that reads "Peter Shelley". The signature is written in dark ink and is positioned above the typed name and title.

Peter Shelley
Senior Counsel

Enclosures

cc: Hon. Frederick P. Salvucci

Stephen Kaiser
6/25/85

PRELIMINARY TECHNICAL MEMORANDUM :
ACCIDENT AND SAFETY IMPLICATIONS OF THE PROPOSED
INTERIM ACCESS, compared to EXISTING NO-BUILD CONDITIONS

This PRELIMINARY Technical Memorandum assembles available accident statistics and provides an assessment of future accident likelihood in the Alewife area, both with and without the proposed Interim Access highway proposal. The goal is to highlight special safety priorities and identify where new construction will be a step forward or backward relative to reducing future accidents.

In this analysis, "safety" is measured in terms of the number and severity of accidents. Because the statistics are somewhat sketchy, both total accidents and injury accidents will be discussed. Some locations are often perceived as "unsafe" although the accident rates may be lower than expected, while other locations may be thought of as "safe" or no problem, yet have a higher than expected accident frequency. This report reviews the traditional measures of accident records, rather than psychological safety.

Generally, heavy traffic areas tend to have more reported accidents. Roads are often measured in terms of an accident rate based on USAGE. Usage of road SEGMENTS is usually means "millions of vehicle-miles traveled." USAGE of INTERSECTIONS is measured by "millions of approaching vehicles."

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INTERSECTION accidents in the Alewife area are stressed below for three reasons :

1. Because most accidents occur at intersections;
2. The safety concerns at Alewife are primarily related to intersections;
3. The best data prepared so far is for intersections.

To my knowledge, there has been no statistical safety analysis performed for the Interim Access road proposal. The lack of good data hindered any effort in 1984 to assess accident records, and it was not until 1985 that traffic accident statistics for the Alewife area were prepared by the consultant for the Mass. DPW as part of the major roadway reconstruction project. The purpose of this Technical Memo is to evaluate the Interim Access design using available safety information.

PART A : RECENT (1978-1980) ACCIDENT DATA

The February 7, 1985 memorandum by FST discussed 1980 Alewife conditions and provided peak hour and daily traffic figures for the study area, as well as accident data for the period 1978-1980. The statistics do vary from year to year, but several conclusions can still be drawn :

1. A 3-year summary of accidents provides a reasonably good time span.
2. Reporting variations are unlikely to exaggerate accident locations one against another.
3. Traffic counts as well as accident statistics often vary and neither represents an exact science. However, we do the best we can with the data available.

Unfortunately, the information presented so far has been basically raw accident statistics, with some projections for 1990 conditions. Combine these statistics with traffic counts, and we can calculate accident rates for the 20 intersections in the Alewife area. Overall, there are 3 rotaries, 10 signalized intersections and 7 unsignalized intersections.

The results, as calculated in Appendix A, demonstrate the following :

1. Even with the adjustment for traffic volumes, the more heavily traveled roads tend to have more accidents.
2. For comparable levels of approach traffic, rotaries have about the same number of TOTAL ACCIDENTS as do signalized intersections. However, rotaries have only about half the number of INJURY accidents.
3. There is no clear correlation between accident experience and the antiquity of the intersection. In other words, 1930s to 1950s intersections have comparable accident records as do 1960s and 1970s installations. In other words, MODERN does not necessarily mean more safety, nor does it mean less safety.
4. Some intersections have much better safety records than one might otherwise predict -- such as the two Alewife rotaries, Brighton and Cross Streets and Route 2 and Lake. Others (based on clearly inferior design or field installation) are more predictable, such as the Fresh Pond/Concord rotary and the Pleasant/Leonard signal. These results supports the conclusions of NCHRP Report #197 which found that signalization does not necessarily improve safety, but that design details are much more important.

5. The reconstruction of Route 2 in 1968 produced 4 new intersections in the study area, a pair at Pleasant Street (signalized) and a pair at Lake Street. The Pleasant Street signals had four times the total accidents and 10 times the injury accidents, while handling only 2/3 more traffic than Lake Street. While the two locations do have some differences in geometrics and approach traffic, the accident history suggests that fewer accidents would result from NOT signalizing the intersection.

No conclusions can be drawn about the following issues, due to lack of detailed statistical data :

- * Proportion of accidents attributed to negligent operator error (speeding, alcohol, etc.)
- * Time of day or weather conditions
- * Severity of injury accidents and total injuries.
- * Accident records concerning the new Alewife Intersections near the MBTA station (completed 1984-85)

PART B : SAFETY/ACCIDENT IMPLICATIONS OF THE INTERIM ACCESS PROJECT

There are five ways to assess the safety implications of the Interim Access proposal :

- B-1. Compare historical data on rotaries vs. signalized intersections, using either Alewife data or other state/Federal information
- B-2. Attribute accident reduction/increase to a new intersection based on its technology or modern design.
- B-3. Evaluate accident predictions from preliminary estimates in the long-range Highway study by Mass DPW.
- B-4. Seek to analyse rotaries and signals to understand which design elements tend to contribute to accidents
- B-5. Assess individual design aspects of the Interim Access design and compare to the existing rotary.

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B-1. HISTORICAL DATA AT ALEWIFE

The data indicates that busy rotaries and signalized intersections have comparable accident rates, but rotaries have only half as many injury accidents.

CONCLUSIONS : With the INTERIM ACCESS, total accidents would remain the same, but injury accidents would almost double.

B-2. EFFECTS OF NEW TECHNOLOGY

There is no evidence that MODERN designs are generally safer or more dangerous than older road designs. (See Appendix A, pp. A-5, A-6)

B-3. PUBLISHED PREDICTIONS OF INTERIM ACCESS ACCIDENT RECORD

The April 22, 1985 consultant memo to Mass. DPW estimated that for 1990 traffic conditions, the Interim Access alternative would show reductions in accidents and daily traffic volumes, compared to the No Build existing case :

INTERIM ACCESS vs. NO-BUILD =====	REDUCTION IN ACCIDENTS	REDUCTION IN TRAFFIC
Route 2 Rotary area	5 %	5 %
Alewife Brook Parkway (from rotary to Triangle)	10 %	20 %
Alewife Brook Parkway & Triangle/T signal	10 %	10 %

This data can be expanded to indicate the changes in accident rate and number of injury accidents :

	NUMBER OF ACCIDENTS	ACCIDENT RATE	NUMBER OF INJURY ACCIDENTS
Route 2 Rotary area	- 5 %	SAME	+ 90 %
Alewife Brook Parkway (from rotary to Triangle)	- 10 %	10% Higher	- 10 %
Alewife Brook Parkway & Triangle/T signal	- 10 %	SAME	- 10 %
Ramps + Garage Access Road (not discussed in consultant memo)	(higher)	?	(higher)

These results appear consistent with B-1 above and historical Alewife area accident data : comparable total accidents but increased injury accidents at traffic signals vs. rotaries.

B-4. ANALYSIS OF DESIGN ELEMENTS OF SIGNALIZED INTERSECTION AND ROTARIES

Accident data is simply not available to judge the specific design attributes of individual locations. However, some degree of reasonable analysis can be presented to explain the possible causes for different types and occurrence of accidents for signals vs. rotaries. Why do rotaries appear to half only half the INJURY accident rate of signals?

The most persuasive logic is that rotaries tend to produce smaller angle collisions -- sideswipes and fender benders. Collision energy and severity are reduced. Still, the predominance of rotary accidents would appear to be sideswipes and rear-enders. The probable cause is the indecision over yielding, plus the varied stops-and-starts that occur in weaving, while higher speed traffic is approaching from the rear. Some of the collisions may be the result of excessive aggression, but numerous collisions result from indecision and inability to take sudden evasive action when a collision is threatened. Drivers "freezing" up or following too closely could be significant factors in rotary accidents.

Signalized intersections have much clearer indication of rights-of-way with less indecision, but the types of accidents are different. Extensive studies have shown that up to 80% of the accidents are angle or cross collisions. Such accidents tend to be more severe and produce more serious injuries. Signalized intersections are usually required to be fairly level, so that turns cannot be banked as they may be at rotaries. Skidding and loss of control on turns could be more significant.

Signals do provide for a more orderly designation of right of way and generally more than 99% of drivers are obedient. However, signals also provide a distraction from the traffic and roadway surface itself, and green signals have a tendency to cause drivers to speed up.

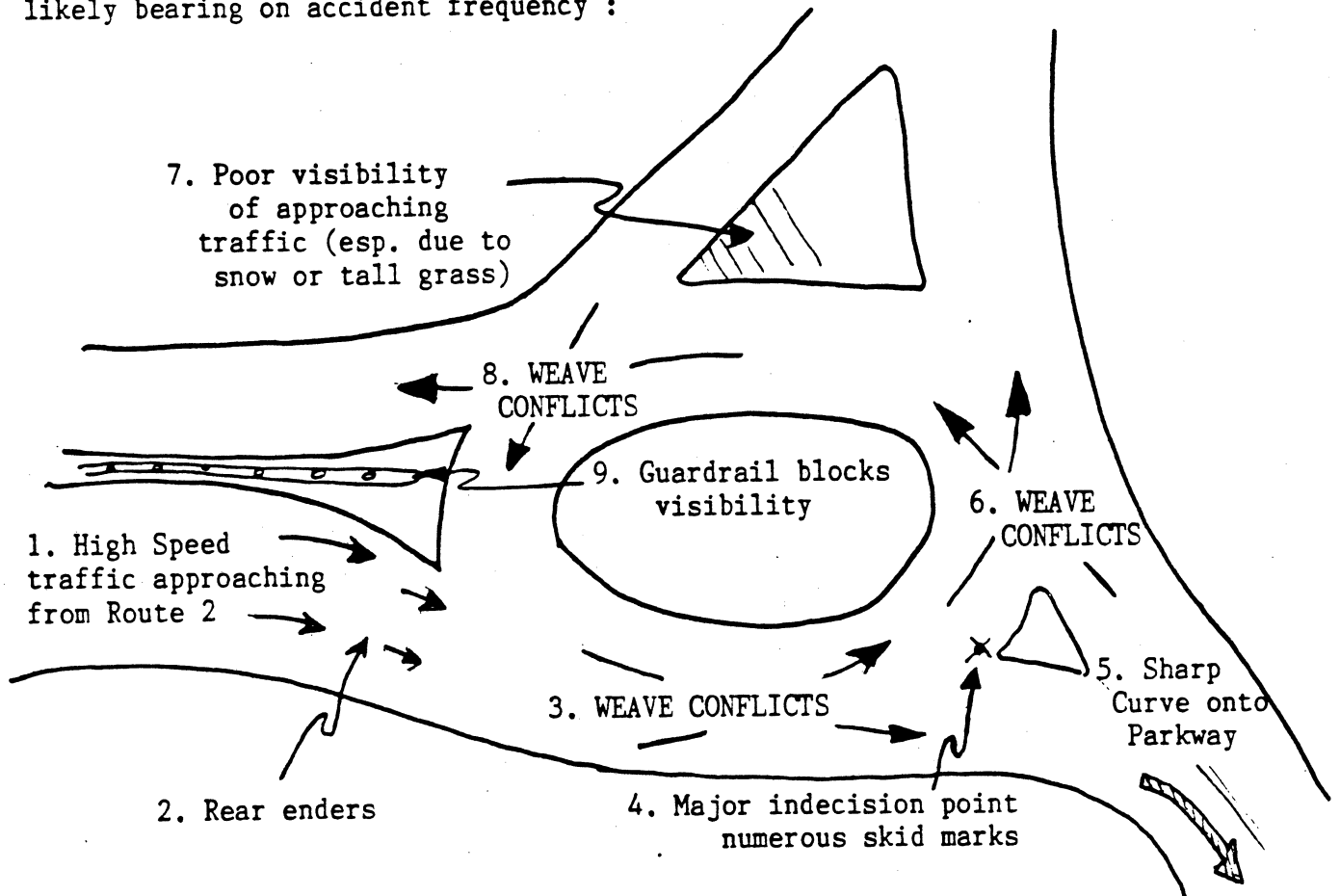
The following table provides a brief analysis of the types of accident which may occur and the injury potential from each, based on a judgmental 4-star system. Even though this assessment is partly empirical/partly theoretical, it does provide a result which is consistent with the 2:1 injury accident ratio of signals vs. rotaries.

TYPE OF ACCIDENT	SIGNAL			ROTARY		
	Est. %	Injury Potential		Est. %	Injury Potential	
WEAVE SIDESWIPE/ LANE CHANGE	5 %	*	(0.05*)	60 %	*	(0.60*)
REAREND	20 %	***	(0.60*)	30 %	***	(0.90*)
CROSS MOVEMENT	70 %	****	(2.80*)	5 %	****	(0.20*)
HEAD ON RUN OFF ROAD	5 %	***	(0.15*)	5 %	***	(0.15*)
WRONG WAY	<1 %	****	-	<1 %	****	-
			3.60*			1.85*

Note that this discussion considers AVERAGE rotaries and AVERAGE signals. Some rotaries are better/worse than others and the same can be said for signals. The next step is to consider specific Alewife design issues relative to safety conditions.

B-5 SPECIFIC SAFETY ISSUES IN INTERIM ACCESS INTERSECTION DESIGN

The existing rotary has the following characteristics which have a likely bearing on accident frequency :



1. HIGH SPEED TRAFFIC approaching from Route 2 has been slowed from 60-70 MPH coming down Belmont Hill and 55-60 past the Bowling alley and 45-50 coming over the railroad bridge. Almost all inbound vehicles must slow down to 35 MPH at the right-hand curve into the Parkway (5). Generally, the slowing down of vehicles from existing high-speed Route 2 works remarkably well and the curves are well banked also. Nevertheless, many "expressway-drowsy" drivers will come too fast into the rotary, be unprepared for the first weave or the right/left decision.
2. High speed vehicle coming over the railroad bridge can encounter slowed traffic in front of them. Or there can be sudden unexpected stops, creating REAR END Accidents.

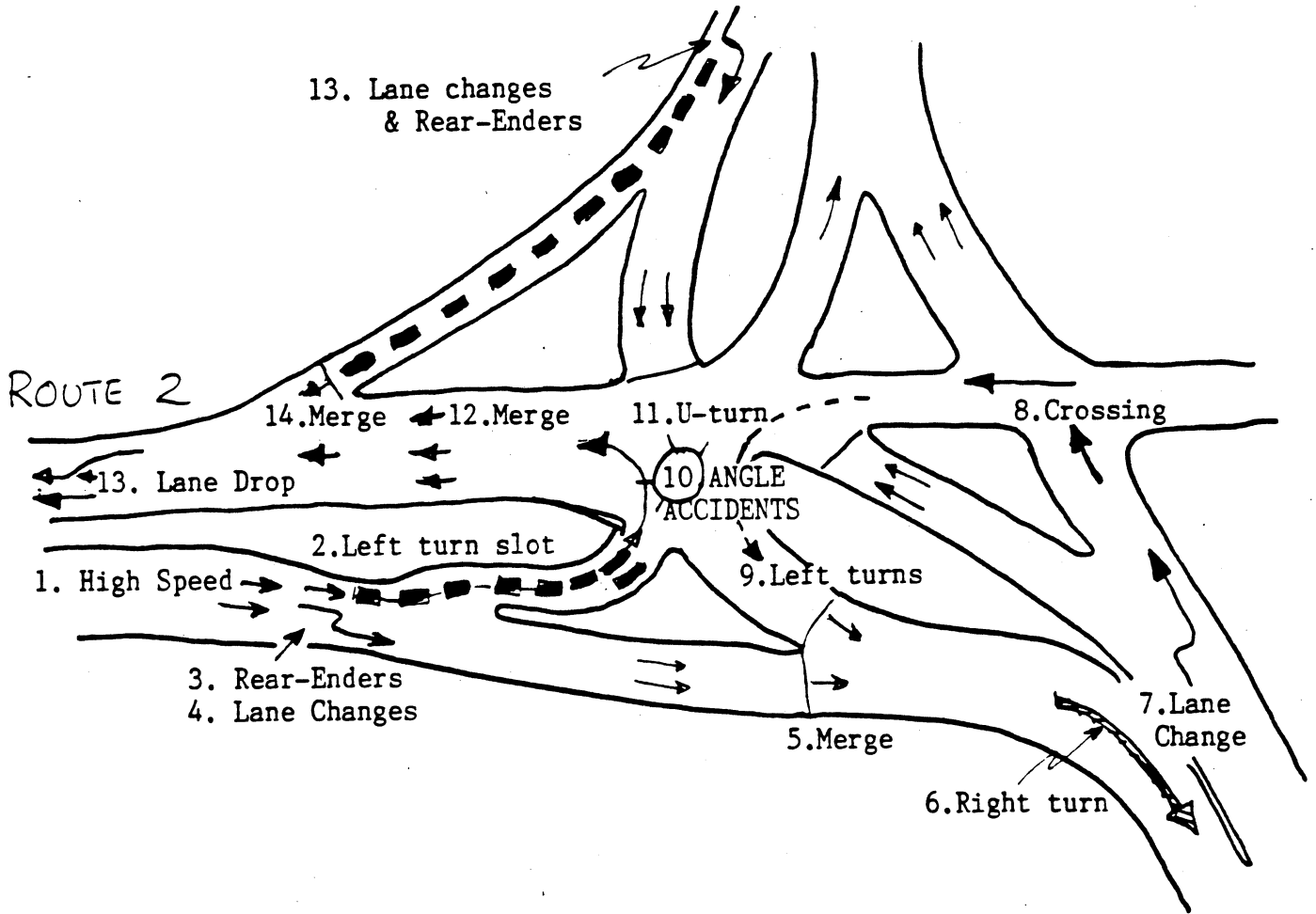
3. It would appear that the most accident-prone weave (based on skid marks and guardrail damage) is the inbound weave, where Route 2 traffic meets the Parkway.
4. Poor signing and truck bans cause many trucks to stop just short of the Parkway. Most of the skid marks are just at the Parkway North/South split.
5. A sharp and slightly bumpy turn (35 MPH max) moves traffic onto the narrow, undivided Alewife Brook Parkway. Most cars seem to do a good navigation job of making this transition. The snake-line approach of the rotary may help drivers to slow down and get their steering reflexes sharpened up for the actual sharp turn itself. This situation may be safer than a simple sweeping right turn.
6. WEAVE CONFLICTS — This weave appears to be the busiest one at the rotary, but it also has the best visibility. The approaching Parkway traffic also is moving the slowest of the 3 approach legs to the rotary.
7. POOR VISIBILITY from the lowest point of the rotary, towards the parkway traffic coming from Mass. Avenue. Vehicles within the rotary can see very little, especially those in the left lanes. The triangular approach island blocks the view, if there is any significant growth of grass or accumulation of plowed snow.
8. WEAVE CONFLICTS -- the traffic coming from Mass. Avenue usually is moving fairly fast and tends to intimidate the traffic within the rotary.
9. VISIBILITY for traffic within the rotary going south is blocked by the median guardrail of Route 2.

Overall, the Route 2 rotary should be expected to serve as a "lightning rod" for accidents, as speeding cars come off Route 2 and should serve to shield other intersections (both signals and rotaries). However, the data demonstrates that the rotary is #11 out of 17 in terms of total accident rate and is #7 out of 17 in injuries. The rotary is simply doing better than we would normally expect. A similar situation occurs on Route 2 in Concord and Acton, where the Concord rotary (despite 5 approach legs) is perceived as less of an accident priority than the Piper Road signal.

THE INTERIM ACCESS 4-LEGGED SIGNALLED INTERSECTION

The new intersection would have four approach legs, rather than the existing three legs of the rotary. According to NCHRP #197, an increase in the number of approach legs tends to increase the number of accidents.

In addition, it would have the following design characteristics :



#	LOCATION	SAFETY DIFFERENCE VS ROTARY	SIGNIFICANCE (Estimated)
1.	High Speed Approach Traffic, Rt. 2	Better/Worse	+ + + / -
2.	Entrance into left turn slot	Better/Worse	+ / -
3.	Rear enders on Route 2	Worse	- -
4.	Lane changes (Left to right) on Route 2	Worse	- -
5.	Signalized merge	Better	+ + +
6.	Curve onto Parkway (rear-enders?)	Better/worse	+ / -
7.	Lane changes (Left to Right) on Outbound Parkway	Worse	-
8.	Parkway and Triangle Ramp crossing (replace Weave)	Better	+ +
9.	Illegal left turn from Triangle/Grace ramp	Worse	- -
10.	Center crossing	Worse	- - - -
11.	U-turn Route 2 (reverse direction)	Worse	-
12.	Merge of outbound lanes into Route 2 (3-lanes)	Worse	-
13.	Lane changes on southbound Parkway	Worse	-
14.	Signalized merge	Better	+ +
15.	Lane drop on Route 2	Worse	-

The above listing involves many judgment calls, with much room for discussion, with professional agreements and disagreements. However, it does not appear that the new intersection offers evidence of important safety advances which will outweigh the special angle accident potentials of signals, especially those located at the ends of expressways. The new intersection lacks the curve banking opportunities of the existing rotary and makes no advances on a strategy to slow down 70 MPH expressway traffic and promote its adjustment to 35 MPH parkway conditions. Preferably, most of this adjustment should occur prior to the introduction of cross-moving traffic and pedestrians. Transferring speeds towards Rindge Avenue would be a most unfortunate consequence if it occurred.

Existing rotary signing is rather poor, so that the area can be rather awkward for new or infrequent drivers. Improved signing associated with the Interim Access project should assist the driver and compensate for the additional complexity and confusion of the new 4-legged intersection.

===== CONCLUSIONS =====

The Interim Access proposal includes a 4-legged channelized intersection to replace the Route 2 rotary. Due to special conditions and elements of the design, it is likely that both total accidents and injury accidents will increase in the future. The rotary's tendency towards sideswipe accidents will be replaced by the new intersection's higher likelihood of angle collisions. Adding a 4th leg to this intersection will increase the conflicts and potential for collision. The access road from the MBTA station/triangle area also includes a driveway to the Grace property : the net result will be a greater potential for conflicting (illegal) turning movements within the new channelized intersection.

One safety uncertainty is the ability of cars from inbound Route 2 to make the left move towards Mass. Avenue. Drivers will be watching the traffic signals, other vehicles around them, the changing curvature of the road (which affects vehicle speeds), and any cross traffic at the intersection itself. The steering movements are right-left-right-left, which may sound complex, but will stimulate alertness before drivers reach the actual signalized intersection. This energetic steering activity is actually preferably to a straightaway and a simple curve -- which could be similar to a "dead man's" curve.

For this reason, the inbound right turn from Route 2 may be more of a safety problem, because it will have smoother geometrics which encourage higher approach speeds, in contrast to the existing right-left-right steering movements for the rotary.

In summary, the design of the Interim Access replacement for the Route 2 rotary does not show evidence of a net reduction in likely accident totals and particularly for injury accidents. All evidence assessed in this technical memo indicates that injury accidents will increase, rather than decrease. The primary cause for this situation is the lower severity of the most common rotary accidents (sideswips) compared to the angle collisions at signals.

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APPENDIX A

ANALYSIS OF ACCIDENT STATISTICS FOR THE ALEWIFE AREA

SUMMARY :

Based on available data on traffic flows and accidents, the following conclusions can be drawn :

1. For comparable traffic volumes, rotaries have about the same number of total accidents as signalized intersections. Rotaries have only about half as many INJURY accidents as signalized intersections.
2. Of the three Alewife rotaries, the one with the most accidents is at Fresh Pond Parkway & Concord Avenue (small diameter, 4-approaches, poorly defined curbs and driveways). The Route 2 rotary and the Alewife Brook Parkway/Concord Avenue rotary both have better injury accident rates than does, for example, the Route I-495/Rt. 9 cloverleaf interchange in Westboro.
3. The signalized intersection with the highest accidents (Alewife & Rindge) has been replaced by two T-intersections as part of the MBTA station construction. No information is available on the effects on safety.
4. There is no clear trend to indicate that modern intersection improvements either reduce or increase accidents. The signal with the worst accident rate (Pleasant and Leonard) is an obviously obsolete installation dating from about 1940. The signal with the best accident rate is at Brighton and Cross Streets, and dates from about 1955.

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..... ACCIDENT STATISTICS AND ACCIDENT RATES

Highway safety is a significant issue at Alewife, but unfortunately safety studies are quite rare. In the entire history of Alewife from 1970 on, only five public documents discussing safety :

1. Alewife Environmental Overview Summary (Mass DPW) by Fay-Spofford -- 1975
2. Mugar Development EIR by Vanasse-Hangen -- 1980
3. Alewife Triangle EIR (Spaulding + Slye) by Vanasse-Hangen -- 1982
4. Memorandum on Alewife Traffic Analysis, Feb. 7, 1985 by Fay-Spofford
5. Memorandum on Alewife Traffic Data Presentation, April 22, 1985 by FST

Between 1975 and 1984 the safety issue at Alewife was seldom discussed. The MEPA review process was limited to dealing with environmental issues only. There were no requirements for safety studies in EIRs.

The Feb. 1985 memo contains accident data for three years (1978-1980) while the 1975 EOS also contains data for three years (1972-1974). There are some dramatic differences in the figures :

	TOTAL ACCIDENTS	
	1972-1974	1978-1980
	=====	=====
1. Route 2 Rotary	181	151
2. Alewife and Rindge Signal ..	89	270
3. Alewife/Concord Rotary	42	163
4. Fresh Pond/Concord Rotary ..	78	282

Meanwhile, traffic approaching the intersections daily has been rising :

	DAILY APPROACH TRAFFIC	
	1975	1980
	=====	=====
1. Route 2 Rotary	62,800	73,000
2. Alewife and Rindge Signal ..	55,200	63,000
3. Alewife/Concord Rotary	56,600	65,500
4. Fresh Pond/Concord Rotary ..	53,000	66,500

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ANALYSIS

The safety statistics are not clearly comparable from the early 1970s to the late 1970s. At Rindge Avenue, the February 1985 study includes sections of Alewife Brook Parkway in addition to the signalized intersection. The Alewife/Concord rotary also includes two adjacent unsignalized intersections (Wheeler St. and Concord Lane).

Even allowing for variations in assembling the data, the differences are simply too large to be realistic. While there was a 20% drop in accidents at the Route 2 rotary, accidents at the other three locations increased by 200% to 300%. The most likely explanation is that the 1972-74 data is flawed and may only represent one-year of accident figures for many of the locations.

Other factors which can contribute to variations in the data are :

1. Reporting of accidents may have been different. Better computer systems and less loss of paper reports on accidents?
2. Early reports consider only accidents within the intersection, not on approaches.
3. Minor improvements to the Route 2 rotary in 1974 by the DPW, including new lighting, guardrail, signing and reflectors.
4. Safety improvements at the Route 2 rotary transferred many of the accidents to Rindge Avenue or the other two rotaries.
5. 55 MPH speed limit may have reduced the average speed of vehicles approaching the Route 2 rotary.
6. Major growth in curbside activity, such as the Fresh Pond fruit stand.
7. Efforts by MDC in mid-1970s to encourage shopping center traffic to use the rotaries, rather than make left turns off the parkway.
8. Growth in traffic
9. The ban against truck traffic on the Parkway in late 1974.
10. The general trend towards reduction in accidents in elsewhere in Massachusetts and nationwide. (1972-1985)

ANALYSIS OF THE 1978-1980 ACCIDENT DATA AT ALEWIFE

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One simple way to compare busy intersections with lightly traveled ones is to measure accidents vs. the number of approaching vehicles. For example, the Route 2 rotary has 73,000 cars going through on an average weekday and 151 accidents in 3 years. Total annual traffic is typically equivalent to about 300-340 weekdays, or about 960 days over three years. The accident rate at the rotary is therefore 215 accidents per 100 million vehicles.

The rate for ALL Accidents is about the same for the average of three Alewife rotaries and for the average of the three major signalized intersections : 300 accidents per 100 million vehicles. However, the rotaries have an injury rate which is half that of signalized intersections (25 vs. 48).

No data is available on the new Rindge Avenue signalized intersections on the Parkway. Improved traffic signal visibility and separate turning phases should help, but vehicle speeds will also be higher because of the parkway widening.

BASIC ACCIDENT AND TRAFFIC DATA FOR ALEWIFE AREA

INTERSECTION	Est. Date	type	1980 Weekday	1978-1980		Accidents/100	
			Approaching Traffic	3-year Total	accidents Injury	million vehs. Total Injury	
Mass.Ave. & Lake St.	1975	Signal	26,500	34	3	130	12
" " & Alewife P	1975	Signal	54,500	134	26	255	50
Route 2 & Pleasant	1968	Sgnl(2)	54,000	101	30	195	58
" " & Lake St.	1968	Unsig.	32,000	25	3	81	10
" " & Rotary	1933	Rotary	73,000	151	11	215	16
Alewife & Rindge	1955	Signal	63,000	270	34	445	56
" & Concord Ave.	1930	Rotary	65,500	163	7	260	11
Fresh Pond & Concord	1930	Rotary	66,500	282	31	440	49
" " & Huron	1956	Signal	54,000	89	19	170	37
Concord & Fawcett	1950	Unsig.	22,000	18	1	85	5
" & Smith Place	1950	Unsig.	22,000	33	2	155	9
" & Blanchard	1972	Signal	28,500	36	11	130	40
Brighton & Cross	1955	Signal	19,000	7	2	40	11
Cross St. & Lake St.	1950	Unsig.	16,500	16	9	100	57
Pleasant & Brighton	1950	Signal	19,000	46	6	250	33
" & Leonard	1940	Signal	18,500	49	11	275	62
Leonard & Concord	1940	Unsig.	28,500	39	8	80	16
Common & Concord	1950	Unsig.	22,000				

SUMMARY :

ROTARIES (3)	1930-33	205,000	596	49	300	25
MAJOR SIGNALS (3)	1956-75	171,500	493	79	300	48
MINOR SIGNALS (7)	1940-75	165,600	273	61	170	39

OTHER LOCATIONS (For Comparison)

INTERSECTION	Est. Date	type	1980 weekday	3-year accidents		Accidents/100	
			Approaching Traffic	Total	Injury	million vehs. Total Injury	
LEXINGTON			(1980)	(1977-1979)			
Hartwell Ave/Rt.225	1970	Signal	25,000	60	-	250	-
" " Wood St.	1970	Unsig.	18,500	11	6	60	34
" " /Maguire Rd.	1970	Unsig.	25,500	31	8	130	33
BURLINGTON				(1980-1981)			
MiddlexTP/Bedford St	1955	Signal	35,500	72	-	420	-
Crosby Dr/Middx.TP	1960	Unsig.	20,000	30	-	310	-
" " Rt.62	1955	Unsig.	32,000	28	-	180	-
WESTBOROUGH				(1978-1979)			
Rt.9 & Lyman St.	1970	S	39,500	65	21	340	111
Rt.9 & Main St.ramps	1934	U(2)	23,500	89	12	790	106
Flanders & Research	1975	U	8,000	1	0	26	0
Computer & Lyons St.	1975	U	10,000	1	0	21	0
Rt.I-495/Rt.9	1967	INTCH	60,000	30	8	105	28
Flanders Rd/Rt.9	1975	U(2)	18,500	15	4	170	45
MARLBOROUGH				(1979-1980)			
Route 20 & Glen St.	1965	S	24,000	13	4	115	35

The safest intersections in the Alewife area are listed from top to bottom, for ALL types of accidents. For the most dangerous intersections, read from the bottom up.

Rank	ALL ACCIDENTS	Type	Year Built	1978-1980 Accidents/100 million vehicles
1.	Brighton and Cross Street	Signal	c. 1955	40
2.	Belmont Center (Common/ Concord/Leonard)	Unsignalized (two)	c. 1950	80
3.	Route 2/Lake Street	Unsignalized (two)	1968	81
4.	Concord Ave./Fawcett	Unsignalized	c. 1950	85
5.	Cross St./ Lake St.	Unsignalized	c. 1950	100
6.	Concord + Blanchard	Signal	1972	130
7.	Mass. Ave. and Lake	Signal	c. 1975	130
8.	Concord + Smith Place	Unsignalized	c. 1950	155
9.	Fresh Pond + Huron	Signal	1956	170
10.	Route 2 and Pleasant (Rt. 60)	Signal (two)	1968	195
11.	Route 2/Alewife	Rotary	1933	215
12.	Pleasant St. + Brighton	Signal	c. 1950	250
13.	Mass. Ave. + Alewife	Signal	1975	255
14.	Alewife/Concord Ave. + 2 nearby intersections	Rotary (unsignalized)	1930	265
15.	Pleasant and Leonard	Signal	c. 1940	275
16.	Fresh Pond / Concord Ave + nearby parkway	Rotary	1930	440
17.	Alewife + Rindge Avenue + nearby parkway	Signal	1956	445

Similarly, for INJURY accident, the safety rankings at Alewife are :

<u>Rank</u>	<u>INJURY ACCIDENTS ONLY</u>	Type	Year Built	1978-1980 INJURY Accidents/ 100 million veh.
1.	Concord Ave./Fawcett	Unsignalized	c. 1950	5
2.	Concord + Smith Place	Unsignalized	c. 1950	9
3.	Route 2/Lake Street -	Unsignalized (two)	1968	10
4.	Brighton and Cross Street	Signal	c. 1955	11
5.	Alewife/Concord Ave. + 2 nearby intersections	Rotary (unsignalized)	1930	11
6.	Mass. Ave. and Lake	Signal	c. 1955	12
7.	Route 2/Alewife	Rotary	1933	16
8.	Belmont Center (Common/ Concord/Leonard)	Unsignalized (two)	c. 1950	16
9.	Pleasant St. + Brighton	Signal	c. 1950	33
10.	Fresh Pond + Huron	Signal	1956	37
11.	Concord + Blanchard	Signal	1972	40
12.	Fresh Pond / Concord Ave + nearby parkway	Rotary	1930	49
13.	Mass. Ave. + Alewife	Signal	1975	50
14.	Alewife + Rindge Avenue + nearby parkway	Signal	1956	56
15.	Cross St./ Lake St.	Unsignalized	c. 1950	57
16.	Route 2 and Pleasant (Rt. 60)	Signal (two)	1968	58
17.	Pleasant and Leonard	Signal	c. 1940	62

PRELIMINARY TECHNICAL MEMORANDUM ON PROJECTED
1987 TRAFFIC FLOWS IN THE ALEWIFE AREA .

NOTE : This technical report is PRELIMINARY. The results have been checked by the author, but have not been subject to peer review by other engineers to assess the accuracy of the methodology and calculations. This PRELIMINARY memo is intended to serve as the subject for this necessary engineering review.

=====

The purpose of this Preliminary Technical Memorandum is to provide the engineering calculations of traffic capacity and flow conditions in the immediate area of the Alewife Triangle area. Traffic projections for the year 1987 (as shown in the EIR for the Interim Access project) are the basis for comparing the proposed Interim Access highway construction with the existing roadway system capacity.

===== INTERSECTIONS ANALYSED : =====

Three intersections along Alewife Brook Parkway are the main focus :

- (1) Rindge Avenue
- (2) Triangle Road (to T-station and Triangle area)
- (3) Route 2 at the present rotary.

===== TRAFFIC VOLUME CONDITIONS ASSESSED : =====

The Draft EIR for the Interim Access roadways is the basic source of the traffic demand volumes for 1987 AM and PM. The original figures represent the UNCONSTRAINED flow, since severe congestion occurs at several locations, with V/C significantly exceeding 1.00.

Existing conditions impose constraints on the traffic flow, particularly the bottleneck at Mass. Avenue and Alewife Brook Parkway, and the limited length (250 feet) of the left turn from the Parkway into the Triangle area. This (partially) CONSTRAINED CASE allows for additional peak hour growth of 100 cars in the peak direction (vs. 600 increase in demand) or a net reduction of 500 cars/hour compared to the Unconstrained case. Such additional growth could be achieved by modified signal timing at the Mass. Avenue signal. Similarly, the left turn limitation reduces left turns into the triangle (during the morning only) by about 250 cars.

With the (Partially) CONSTRAINED case, Mass. Avenue was adjusted for being an external bottleneck, with the assumption that traffic would divert to other routes. The resulting capacity calculations would indicate where and how severe are the bottlenecks for the No-Build or Interim Access roadway designs. (NOTE : This method presumes that there is NO backing up of traffic from one intersection into another, especially from Mass. Avenue into the Rotary area. Traffic signals are also optimally timed for efficiency.)

The FULLY CONSTRAINED analysis takes each roadway alternative and redistributes traffic flows until volumes do not exceed capacity. Backups from nearby intersections are assumed to be insignificant and traffic signals are optimally timed. The net result is a set of Alewife intersections whereby VOLUMES do not exceed CAPACITY, which is the realistic ultimate condition. The key "bottom line" is how many trips must be deleted from the road system to create this balance.

The reductions were made primarily to growth traffic from the triangle area where possible, although in some cases reductions were distributed proportional to existing volumes. The subtracted car trips would be explained in terms of more ride-sharing, travel in the off-peak, use of transit, or reduced development intensities or occupancy.

===== SUMMARY OF THREE TRAFFIC CONDITIONS =====

To summarize, this report presents traffic results for THREE CONDITIONS of traffic volumes at Alewife :

- (1) UNCONSTRAINED FLOW -- with calculations of V/C ratios at each intersection (assuming no traffic backups or capacity limits anywhere at Alewife)
- (2) (Partially) CONSTRAINED FLOW -- with reductions in certain 1987 approach volumes due to congestion at Mass. Avenue & Alewife and the left turn from the Parkway to the Triangle. New V/C ratios are calculated.
- (3) FULLY CONSTRAINED FLOW -- for the No-Build and Interim Access, volumes are reduced wherever V/C exceeds 1.00. The bottom line : how many traffic demand trips CANNOT be serviced by the highway system in the peak hour?

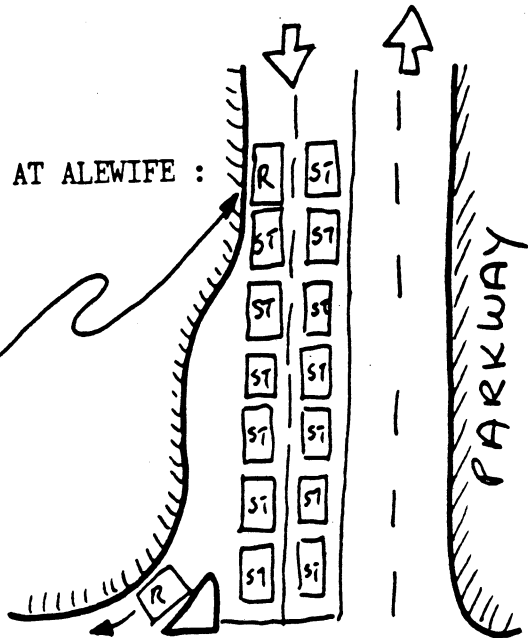
===== ANALYSIS METHOD USED : =====

Because of heavy turning movements and tight lane configurations, TURN BLOCKAGE is a very significant factor at Alewife. Existing lane capacity volumes were calibrated by observation. (Appendix A describes the principles of turn blockage events and calculations, as well as additional capacity method assumptions).

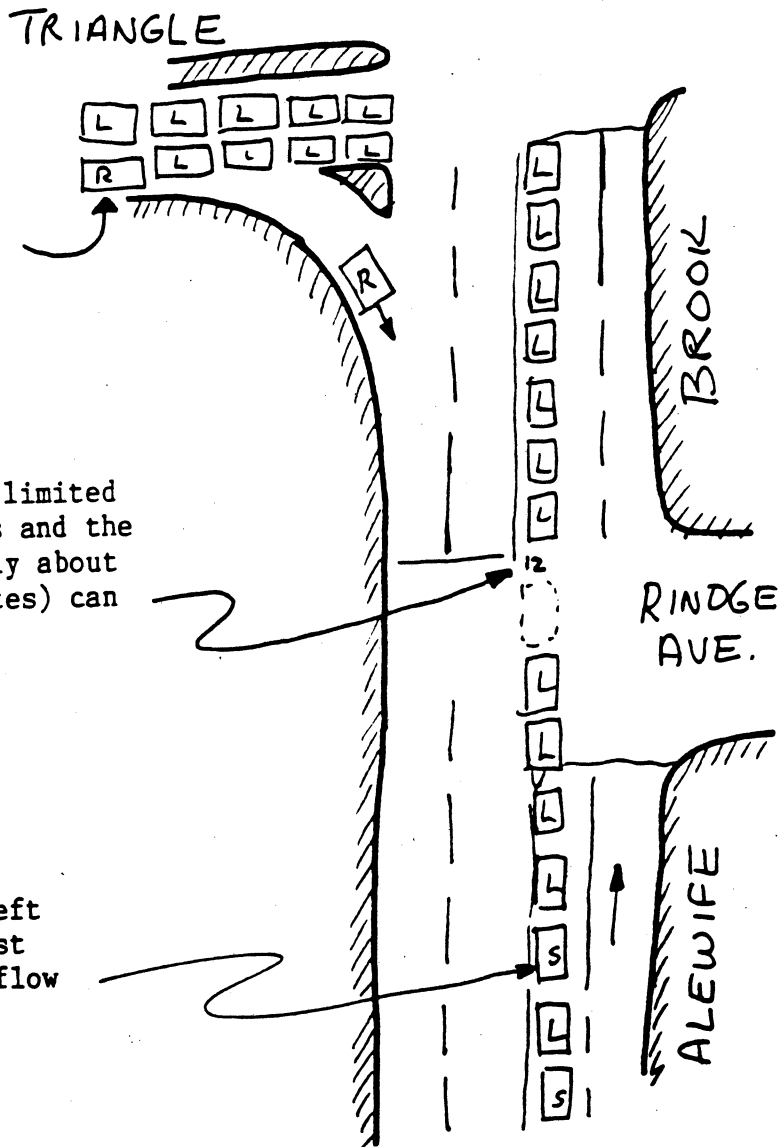
QUALITATIVE DESCRIPTION OF TURN BLOCKAGE AT ALEWIFE :

Turn Blockage in the Rindge Avenue area can take some of the following forms :

* Inbound Right Turn towards Triangle is blocked by waiting through traffic

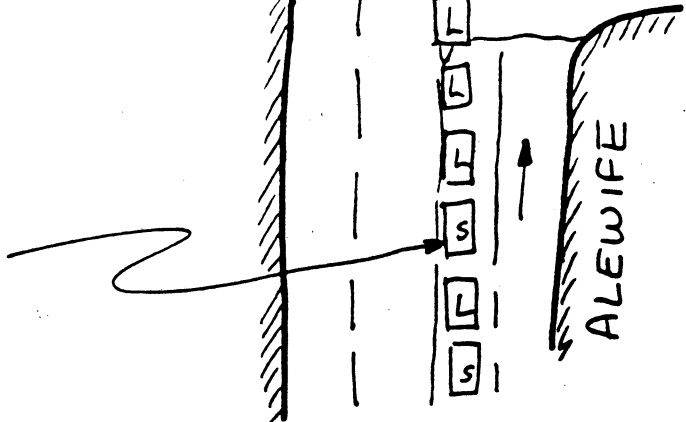


* Inbound Right Turn traffic from the Triangle to the Parkway is blocked by traffic waiting to turn Left.

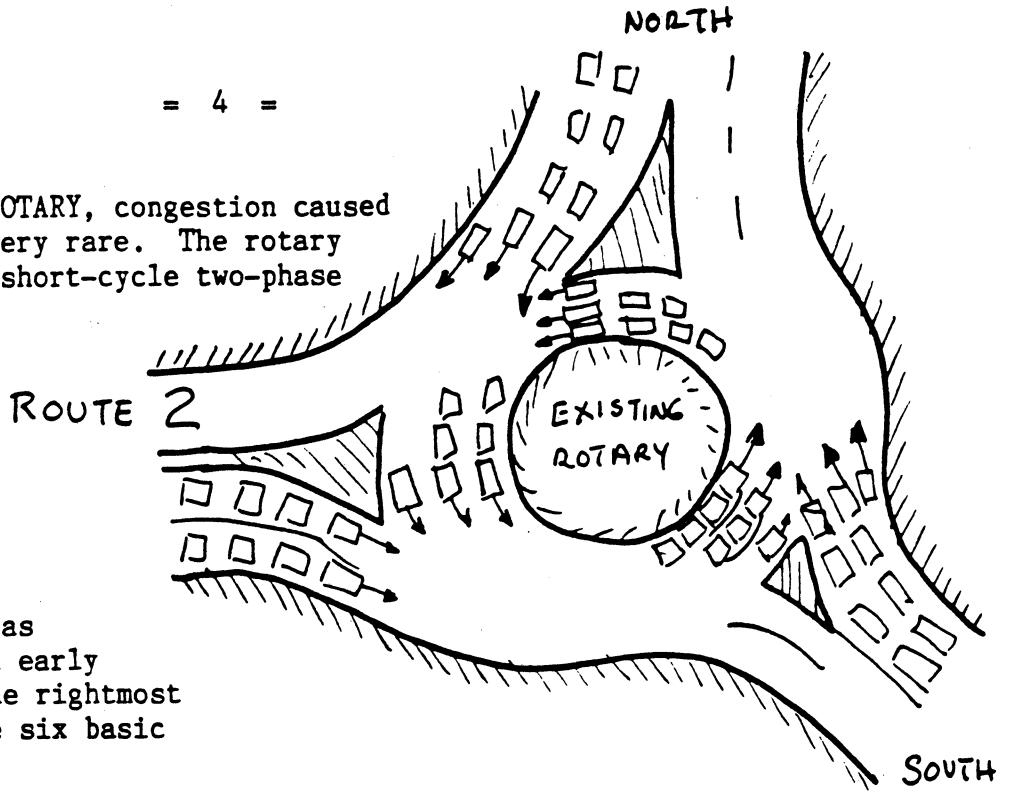


* The left turn traffic is currently limited by the closeness of the two signals and the shortage of the left-turn slot. Only about 12 cars every signal cycle (2 minutes) can fit into this slot.

* Outbound Parkway traffic turning Left into the Triangle area backs up past Rindge Avenue and blocks out free flow of the Left Lane of the Parkway



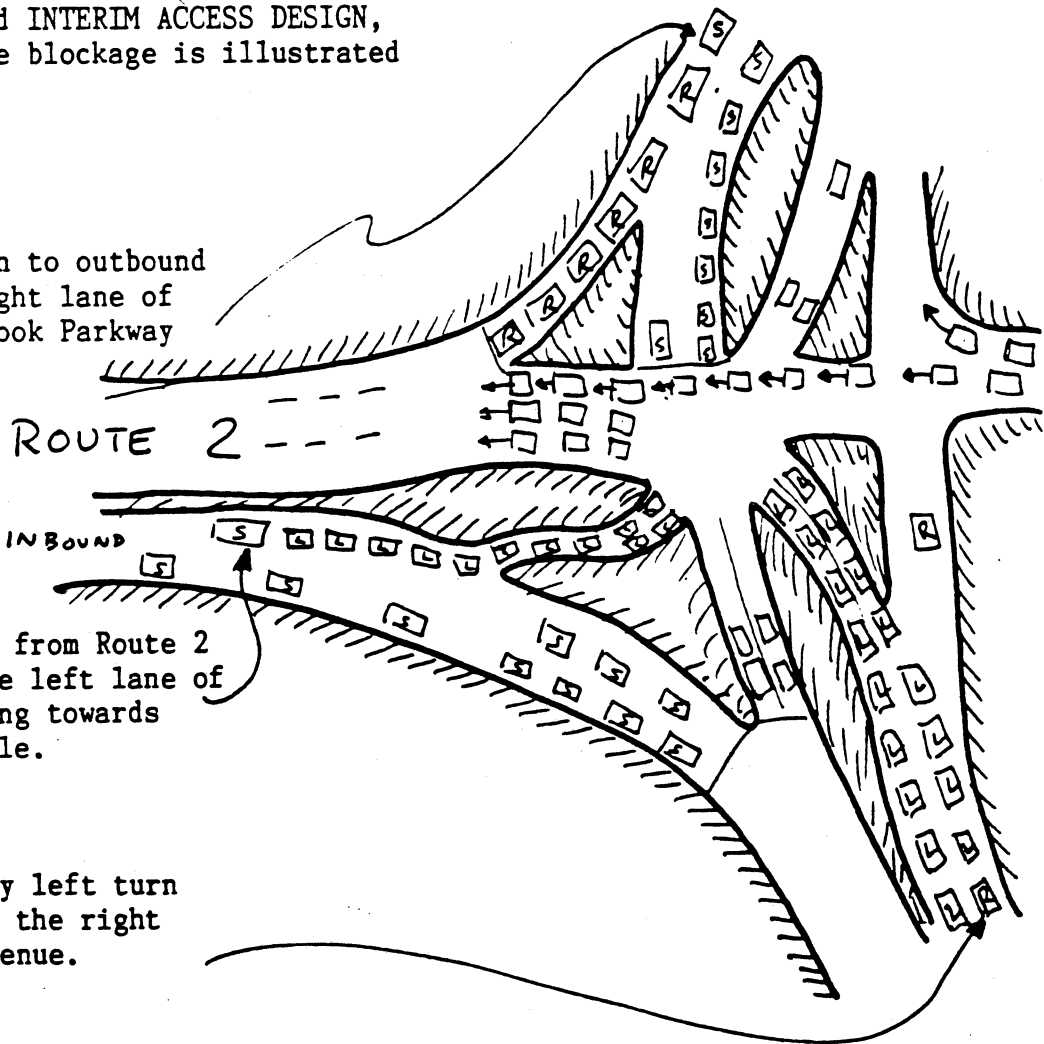
At the existing ROTARY, congestion caused by the rotary itself is very rare. The rotary tends to function like a short-cycle two-phase traffic signal.



Most approaches operate as basically two-lanes, with early and occasional flow in the rightmost third lane on five of the six basic approaches.

For the proposed INTERIM ACCESS DESIGN, typical queuing and lane blockage is illustrated below (not to scale) :

- * Single Lane right turn to outbound Route 2 blocks off right lane of southbound Alewife Brook Parkway through movement.



- * Single Lane left turn from Route 2 Inbound blocks off the left lane of Route 2 traffic heading towards Fresh Pond and Triangle.

- * Heavy outbound Parkway left turn to Route 2 blocks off the right turn towards Mass. Avenue.

This technical memo is limited in traffic scope and does NOT include consideration of the following additional traffic issues :

1. Consequences of Mass. Avenue/Alewife afternoon traffic queues backing up into the rotary area/new intersection and causing Level-of-Service F congestion along the Parkway, thus negating the effects of any road changes.
2. Inefficient traffic signal timing
3. Consequences of changes in congestion or delays on the Parkway system from the Concord rotaries to Huron Avenue.
4. Increases or decreases in diversions to local streets in Arlington, Belmont and Cambridge.
5. Any consideration of periodic events, such as weather, retail peaks, accidents/breakdowns, etc. No allowance for traffic growth from development or land use patterns outside the Alewife area has been made.

=====

Based on the analyses in Appendices B through D (Unconstrained through Fully Constrained Conditions), the traffic capacity results are shown on the next page. Under the FULLY CONSTRAINED case, the Interim Access proposal can service about 200 fewer cars in both the AM and PM peak than would be expected with the existing roadway or "No-Build" case.

INTERSECTION	AM PEAK		PM PEAK	
	EXISTING	INTERIM ACCESS	EXISTING	INTERIM ACCESS
1987 WITH UNCONSTRAINED TRAFFIC VOLUMES APPENDIX B				
ROUTE 2 ROTARY/SIGNALS	1.04	1.37	1.27	1.31
ALEWIFE & TRIANGLE	1.31	1.01	1.27	0.81
ALEWIFE & RINDGE AVE.	1.14	1.14	0.88	0.88
** WORST BOTTLENECK **	1.31	1.37	1.27	1.31
----- Change	Increase 0.06		Increase 0.04	
** TRAFFIC DEMAND NOT SERVICED	0	0	0	0
1987 WITH (Partially) CONSTRAINED TRAFFIC VOLUMES APPENDIX C				
ROUTE 2 ROTARY/SIGNALS	0.91	1.18	1.18	1.24
ALEWIFE & TRIANGLE	1.03	0.76	1.19	0.72
ALEWIFE & RINDGE AVE.	1.03	1.03	0.88	0.88
** WORST BOTTLENECK **	1.03	1.18	1.19	1.24
----- Change	Increase 0.15		Increase 0.05	
** TRAFFIC DEMAND NOT SERVICED	760	760	500	500
1987 WITH FULLY CONSTRAINED TRAFFIC VOLUMES APPENDIX D				
ROUTE 2 ROTARY/SIGNALS	0.88	0.99	1.00	1.01
ALEWIFE & TRIANGLE	1.01	0.74	0.99	0.63
ALEWIFE & RINDGE AVE.	0.87	0.83	0.83	0.83
** WORST BOTTLENECK **	1.01	0.99	1.00	1.01
----- PEAK HOUR				
** TRAFFIC DEMAND NOT SERVICED	900	1100	1200	1400

APPENDIX A . METHODS TO CALCULATE TURN BLOCKAGE
AND RESULTING INTERSECTION CAPACITY

Of all the adjustments which must be made to intersection capacity calculations, the significance of TURN BLOCKAGE often overwhelms other factors, such as lane width, number of phases or cycle length. There are six types of turn blockage which can occur (see Figure 1) :

1. The primary lanes block off a RIGHT turn lane
2. The primary lanes block off a LEFT turn slot
3. The RIGHT turn lane backs up into one of the through lanes
4. The LEFT turn lane backs up into one of the through lanes
5. (T-intersection) The RIGHT turn lane backs up into the left turn lane.
6. (T-intersection) The LEFT turn lane backs up into the right turn lane.

If turn blockage is ignored (as it often is in traditional simple capacity calculations), the intersection may appear to have a more favorable calculated volume/capacity ratio. The lesson of turn blockage analysis is that estimates of traffic flow when the signal turns green are primarily dependent on the QUEUEING of traffic while the signal is red. Critical volume flows depend on the length of the queue -- which may contain a mixture of turning and non-turning traffic.

The dynamics of turn blockage are dependent on the road geometry as well as the volume and directional distribution of traffic approaching the intersection. The longer the turn slot or dividing island, the less likely is turn blockage to occur -- because there is more queueing room for waiting traffic. Generally, the higher the traffic volumes, the more likely is turn blockage to occur. Any lane which shares two or more movements could be subject to turn blockage, and alternating blockage could occur on the same approach.

By far the most common occurrence is through traffic blocking out a free right turn. The next most common is through traffic which blocks out access to a left turn slot. Left turn slots which are too short can cause traffic to queue into (and block) through lanes. A relatively rare case is a heavy right turn which backs up into the through travel lane.

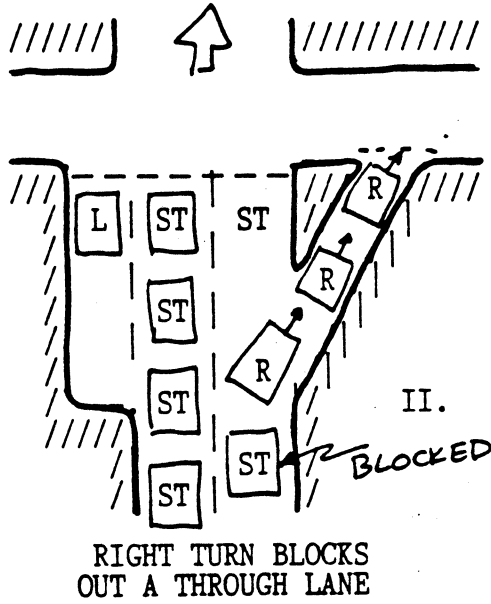
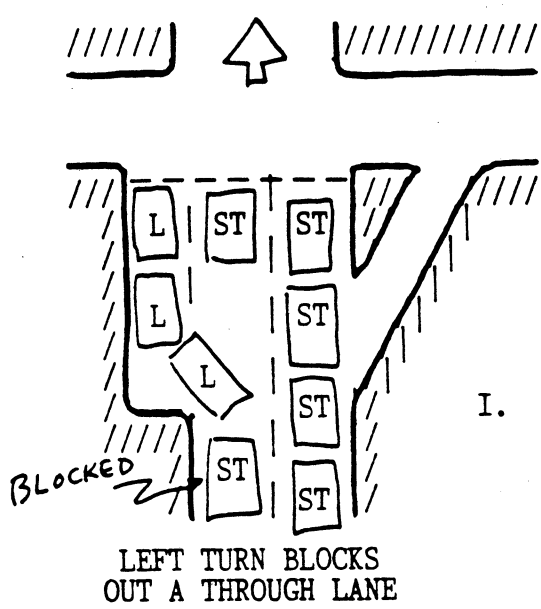
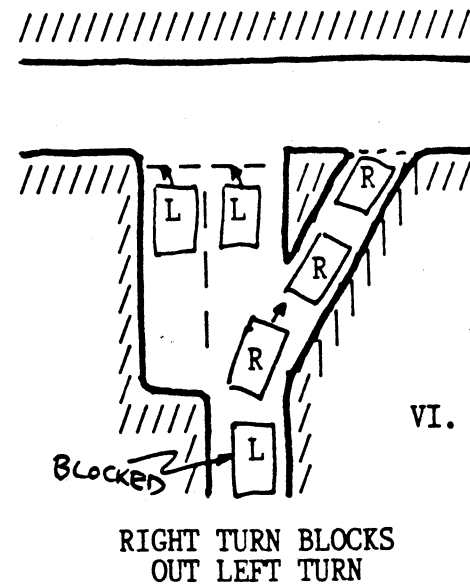
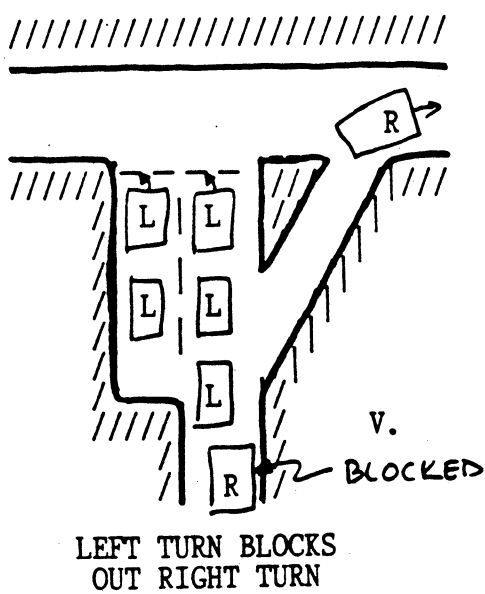
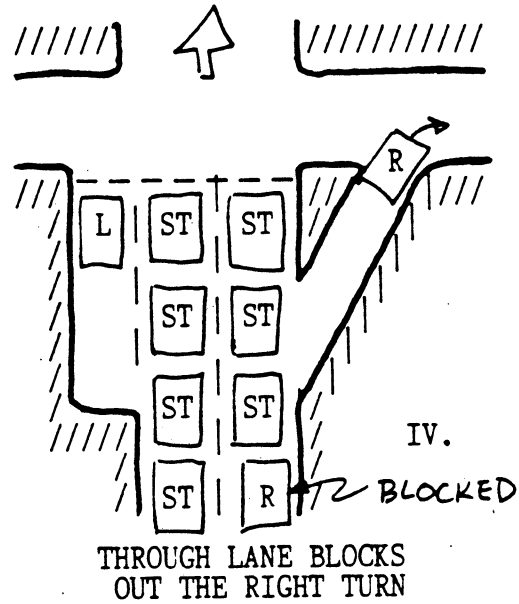
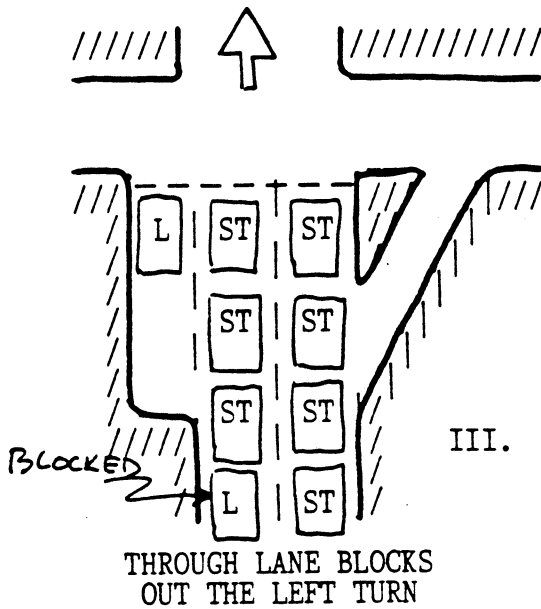
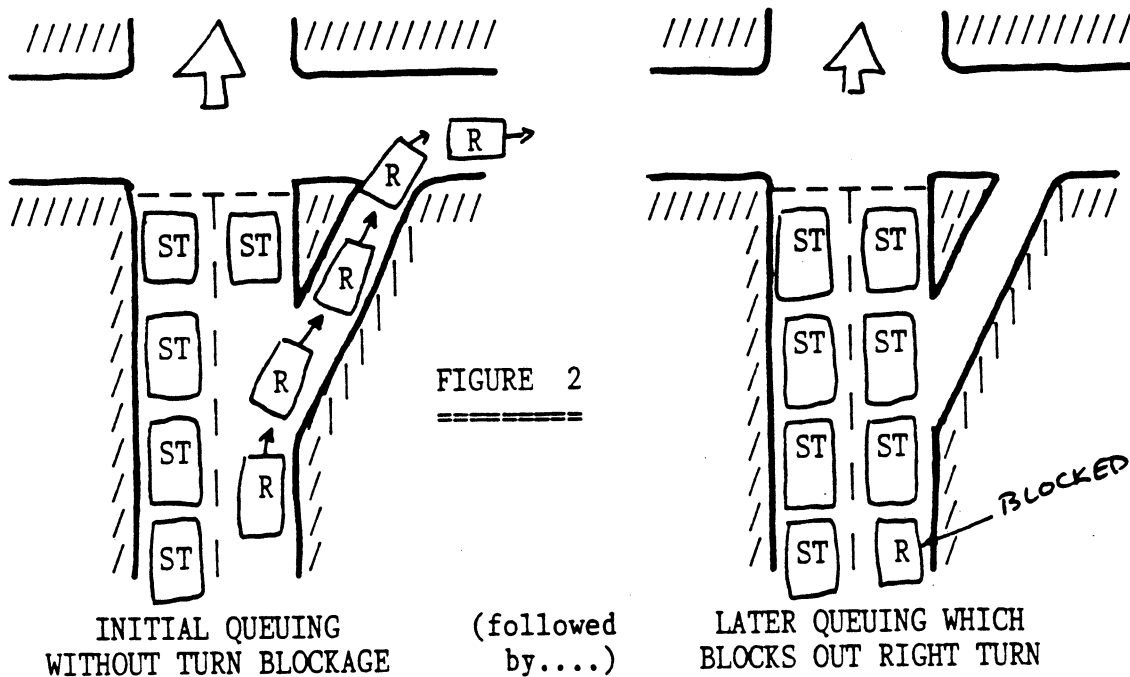


FIGURE 1
SIX
EXAMPLES
OF
TURN
BLOCKAGE



**** THE CASE OF A THROUGH MOVEMENT WHICH BLOCKS RIGHT TURNS ****

If traffic flushes out and then encounters a Stop Light, there will be an initial period when no right turn blockage occurs. The second or remaining period contains all the turn blocking. Any blocked right turn vehicles must be added to the through movement.



When the right turns R become blocked, the only way they can move through is as part of the straight movement phase ST. These blocked R cars must be counted as voids or "ghosts" in the stream of ST cars in the right lane. Even though R-cars turn right, they leave voids or gaps in the stream of ST-cars. During the straight movement, the longer left lane is composed only of ST-cars, while the right lane moving into the intersection is composed of ST-cars and "ghosts" of blocked R-cars.

The number of ST-cars in the right lane determines when blocking begins. The distance of this initial blocking queue is called the Blocking Distance. For example, if 8 cars in the right lane block off the right turn, the Blocking Distance is 168 feet (at a queue density of 21-feet per car).

In most cases, the maximum queue lengths in the two approach lanes should be about equal. Approaching traffic will tend to shift lanes to maintain this equality, as long as right turn volumes remain generally low. The capacity calculation method utilized in this analysis proceeds as follows :

1. List traffic volumes and number of vehicles per signal cycle
(e.g. 30 cycles per hour for a 120-second cycle or "dial")
2. Estimate the percentage distribution or mix of traffic in each lane.
(100% through traffic in left lane; right lane could be 30%/70% or 50/50 or 80/20, etc.)

3. Calculate the queue in each lane when turn blockage first begins
4. Calculate the total maximum queue in each lane, including blocked right turn vehicles.
5. If queues in each lane are unequal (more than 10% difference), adjust the lane distribution mix and recalculate.
6. When queues are virtually equal, take the average queue length and multiply by the number of signal cycles/hour to get the critical volumes.
7. Sum the critical lanes and divide by the critical lane capacity to produce a volume/capacity ratio.

When right turn volumes are close to lane capacity (in the 1500-1900/hr range), through-traffic in the right lane will be much reduced and may be insufficient to cause turn blockage. Indeed, virtually all the through traffic will approach in the left lane, but some of this traffic will shift lanes and switch over into the right lane as shown below :

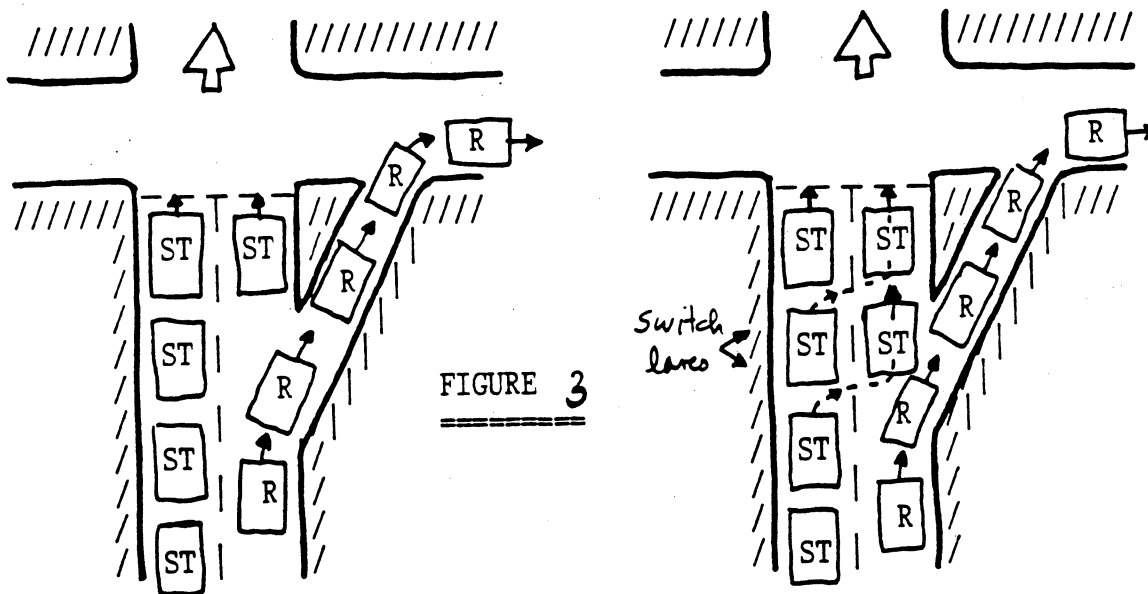


FIGURE 3

LANE SWITCHING OCCURRING DUE TO HEAVY RIGHT TURN VOLUMES

A reasonable assumption given Alewife conditions is that 3/4 of the Blocking Distance would be filled by lane switching cars, while all other ST-cars would queue up in the left lane. The right lane would have very heavy flow with no lengthy queuing, while the maximum length of the stop-start left lane queue would determine the critical lane volume.

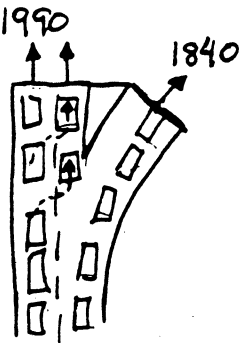
Similarly, when the right turn is the cause of right lane blockage, lane switching to 3/4 of the blocking distance would occur. Because the right turns would usually get more green time than the through movement, queuing from a heavy right turn can result in significantly larger flow volumes in the right lane as well as longer peak queues. The length of the right lane queue represents the critical volume for the merging movements to the right, while the length of the left lane queue represents the critical lane contribution of the intersection movements to the left.

A sample calculation sheet shown below indicates how the volumes and queues are calculated :

INTERSECTION LOCATION "A"

DESIGN PLAN B

1987 AM PEAK

PHASE A	↑	↑	↗	
 <p>CRITICAL VOLUME = 1550</p>	1990		1840	Lane Capacity = 1900 cars/hour
	66.3		61.3	Vehicle Density = 21 ft./car
	100%	5%	95%	Cycle Length = 120 or 30 /hour
		410'		Peak Hour Demand Volumes
	51.7	or 19.5 veh	61.3	Average Volumes on each cycle
	wait	wait	flow	Shared Lane Split (Approach)
51.7	Maximum Queue		Blocking Distance	
1550	Queue Volume		Overall, 3/4 of blocking dist. is filled. (3/4 x 19.5 = 14.6) including cars shifting lanes.	
51.7	64.3		Heavy 1840 right turn prevents right turn blockage.	
1550	1930		Lane volume/cycle	
			Peak Hour lane volume(Max.1900)	
PHASE A Vol. = 1550 B = 720 (Unconstrained Volumes -- no consideration of effects of limited left turn slot length) C = 220 TOTAL = 2490 V/C = 1.31				Calc.by SHK June 13, 1985

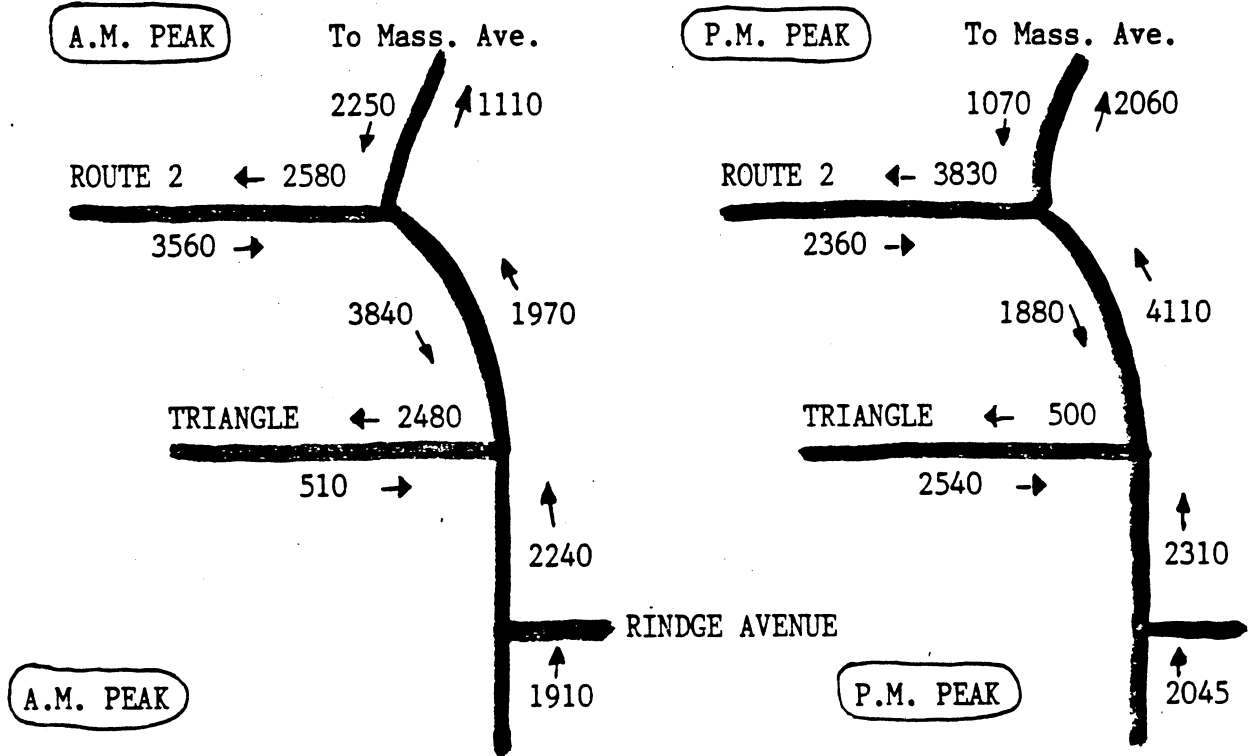
Lane capacities at Alewife were measured from field observations in May and June 1985. Through movements on the Parkway demonstrated a capability to move 1800-2000 cars per lane during the peak hours, with 1900 being an average figure during the fully-loaded peak hour periods. Rindge Avenue was somewhat restricted by its narrow approach and tight left hand turn, but was only about 10% less, with a lane capacity of 1700 cars/lane per hour.

Vehicle density in a queue was measured in the range of 19-22 cars in a 450-ft. length of parkway. The average queue of 21 cars translates into a queuing density of 21 feet per car.

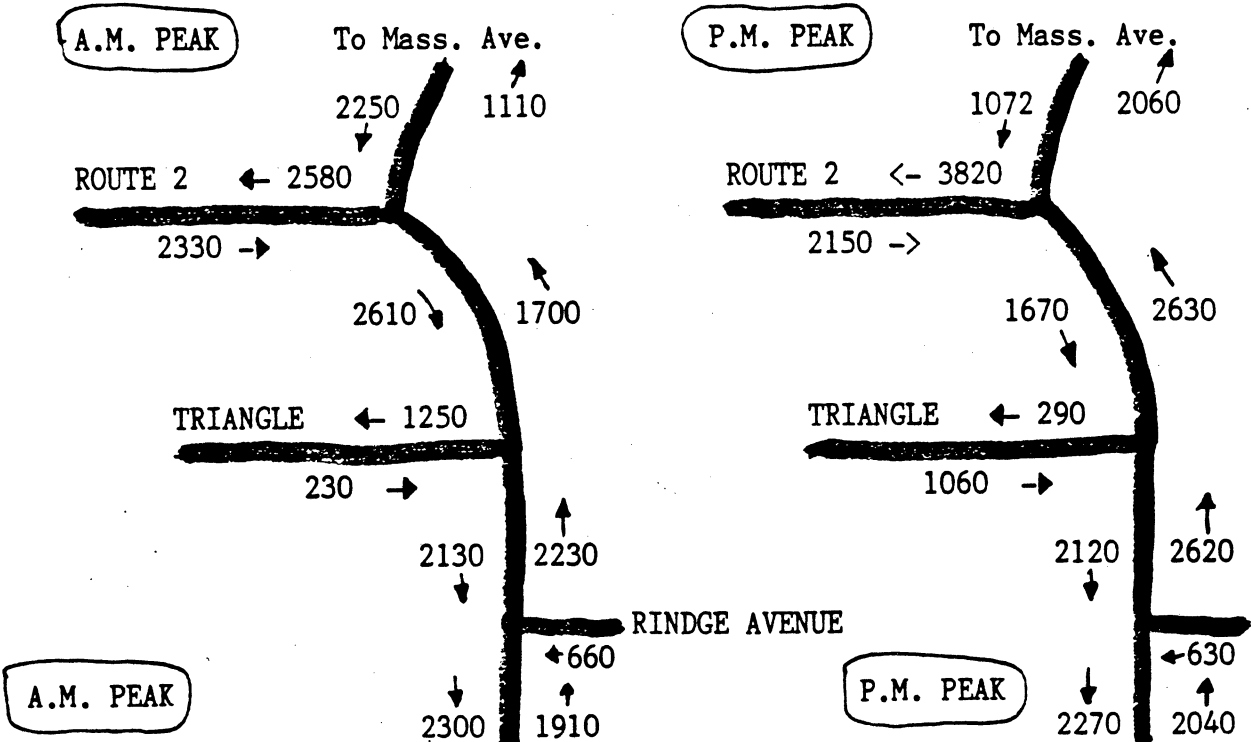
Existing signal timing at Rindge Avenue varies notably, with a 120-second average cycle length. The Interim Access design specifies 120-second timing dials.

APPENDIX B CALCULATIONS OF QUEUES AND V/C RATIOS
FOR UNCONSTRAINED 1987 AM + PM DEMAND VOLUMES

EXISTING OR NO-BUILD ROAD SYSTEM



INTERIM ACCESS ROAD SYSTEM



ALEWIFE and TRIANGLE ROAD

QUEUES/CAPACITY

NO BUILD - 120

1987 AM

	↑	↑	↗	Lane Capacity = 1900 cars/hour Vehicle Density = 21 ft./car Cycle Length = 120 or 30 /hour Peak Hour Demand Volumes Average Volumes on each cycle Shared Lane Split (Approach) Blocking Distance
	1990 66.3 100%	410' or 19.5 veh	1840 61.3 95%	
51.7 wait	14.6 wait	61.3 flow		
51.7 1550 51.7 1550	Maximum Queue Queue Volume	64.3 1930		

	↑	↑	↑	Vehicle Density = 21 ft./car Cycle Length = 120 or 30 /hour Peak Hour Demand Volumes Average Volumes on each cycle Shared Lane Split (Estimated) Blocking Distance
	630 21.0 70%	(300')	1605 53.5 30%	
300'	-			Vehicles until Blocking starts (Left Turn Slot filled) Vehicles after Blocking starts (LT queue blocks Parkway lane) Maximum Queue for Left turn Peak Hour queue volumes 32% of the time the left lane is blocked LL Vol. = 30.0 RL Volume = 44.7 Same V/C per lane
14.3 wait	6.1 flow	30.5 flow		
6.7 wait	2.9 wait	14.2 flow		
23.9 *		1340		
720 *				

	↑	↑	↑	Vehicle Density = 21 ft./car Cycle Length = 120 or 30 /hour Peak Hour Demand Volumes Average Volumes on each cycle Shared Lane Split (Estimated) Blocking Distance
	370 12.3 100%	60'	140 4.7 50%	
4.8 wait	2.9 wait	2.9 flow		Vehicles until Blocking starts Vehicles after Blocking starts (blockage is 40% of the time) Maximum Queue Peak Hour queue volumes Lane volume/cycle Peak Hour lane volume
3.0 wait	1.8 wait	1.8 wait		
7.8 235 7.8 235	6.5 195 9.4 280			

PHASE A Vol. = 1550 B = 720 C = 220 TOTAL = 2490 V/C = 1.31 (Unconstrained Volumes -- no consideration of effects of limited left turn slot length)	Calc. by SHK June 13, 1985
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ALEWIFE and TRIANGLE ROAD

QUEUES/CAPACITY

INTERIM ACCESS - 120

1987 AM

<p>PHASE A</p> <p>CRITICAL VOLUME = 1110</p>	<p>↑</p> <p>1990 66.3 100%</p> <p>22.2 wait 13.1 wait 35.3 1060 35.3 1060</p>	<p>↑</p> <p>620 20.7 40%</p> <p>19.5 wait 11.6 wait 38.7 1160 51.7 1550</p> <p>410'</p>	<p>↗</p> <p>620 13.0 7.7 wait</p>	<p>Lane Capacity = 1900 cars/hour Vehicle Density = 21 ft./car Cycle Length = 120 or 30 /hour Peak Hour Demand Volumes Average Volumes on each cycle Shared Lane Split (Estimated) Blocking Distance</p> <hr/> <p>Vehicles until Blocking starts flow</p> <p>Vehicles after Blocking starts (blocking = 40% of the time) Maximum Queue Peak Hour queue volumes Lane volume/cycle Peak Hour lane volume</p>
<p>PHASE B</p> <p>CRITICAL VOLUME = 720</p>	<p>↑</p> <p>630 21.0 70%</p> <p>14.3 wait 6.7 wait 23.9 *</p> <p>720 *</p> <p>LL Vol. = 30.0</p>	<p>↑</p> <p>1605 53.5 30%</p> <p>6.1 flow 2.9 wait</p> <p>1340</p> <p>RL Volume = 44.7</p>	<p>↑</p> <p>100%</p> <p>30.5 flow 14.2 flow</p>	<p>Vehicle Density = 21 ft./car Cycle Length = 120 or 30 /hour Peak Hour Demand Volumes Average Volumes on each cycle Shared Lane Split (Estimated) Blocking Distance</p> <hr/> <p>Vehicles until Blocking starts flow</p> <p>Vehicles after Blocking starts (Blocking = 30% of the time) Maximum Queue for Left turn Peak Hour queue volumes Same V/C per lane</p>
<p>PHASE C</p> <p>CRITICAL VOLUME = 90</p>	<p>↑</p> <p>90 3.0 100%</p> <p>1.5 wait</p>	<p>↑</p> <p>60'</p> <p>1.5 wait</p>	<p>↗</p> <p>140 4.7 4.7 flow</p>	<p>Vehicle Density = 21 ft./car Cycle Length = 120 or 30 /hour Peak Hour Demand Volumes Average Volumes on each cycle Shared Lane Split (Estimated) Blocking Distance</p> <hr/> <p>Vehicles until Blocking starts flow</p> <p>NO BLOCKING OCCURS</p>
<p>PHASE A Vol. = 1110 B = 720 ... (Unconstrained volumes -- no consideration C = 90 ... of limited left turn slot length) TOTAL = 1920 V/C = 1.01</p>				<p>Calc. by SHK June 13, 1985</p>

ALEWIFE and TRIANGLE ROAD

QUEUES/CAPACITY

NO BUILD - 120

1987 PM

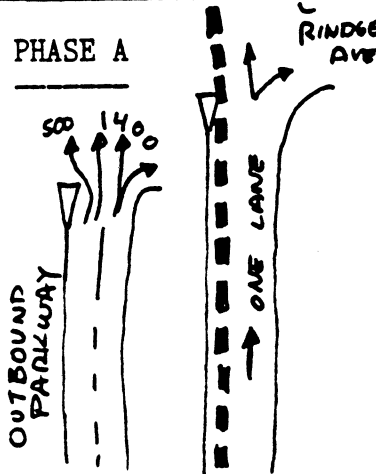
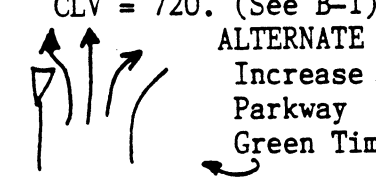
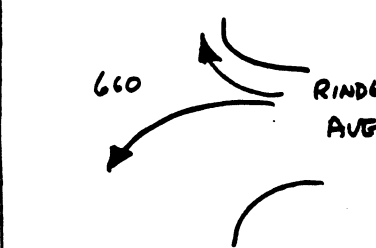
<p>PHASE A</p> <p>CRITICAL VOLUME = 820</p>	<table border="1"> <thead> <tr> <th>↑</th> <th>↑</th> <th>↗</th> </tr> </thead> <tbody> <tr> <td>1560</td> <td></td> <td>320</td> </tr> <tr> <td>52.0</td> <td></td> <td>10.7</td> </tr> <tr> <td>100%</td> <td>70%</td> <td>30%</td> </tr> <tr> <td></td> <td>410'</td> <td></td> </tr> <tr> <td>21.4</td> <td>19.5</td> <td>8.4</td> </tr> <tr> <td>wait</td> <td>wait</td> <td>flow</td> </tr> <tr> <td>5.8</td> <td>5.4</td> <td>2.3</td> </tr> <tr> <td>wait</td> <td>wait</td> <td>wait</td> </tr> <tr> <td>27.2</td> <td>27.2</td> <td></td> </tr> <tr> <td>820</td> <td>820</td> <td></td> </tr> <tr> <td>27.2</td> <td>35.6</td> <td></td> </tr> <tr> <td>820</td> <td>1070</td> <td></td> </tr> </tbody> </table>	↑	↑	↗	1560		320	52.0		10.7	100%	70%	30%		410'		21.4	19.5	8.4	wait	wait	flow	5.8	5.4	2.3	wait	wait	wait	27.2	27.2		820	820		27.2	35.6		820	1070		<p>Lane Capacity = 1900 cars/hour Vehicle Density = 21 ft./car Cycle Length = 120 or 30 /hour Peak Hour Demand Volumes Average Volumes on each cycle Shared Lane Split (Estimated) Blocking Distance</p> <hr/> <p>Vehicles until Blocking starts</p> <p>Vehicles after Blocking starts (Blocking = 20% of the time) Maximum Queue Peak Hour queue volumes Lane volume/cycle Peak Hour lane volume</p>
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<p>PHASE C</p> <p>CRITICAL VOLUME = 1250</p>	<table border="1"> <thead> <tr> <th>↑</th> <th>↑</th> <th>↗</th> </tr> </thead> <tbody> <tr> <td>1980</td> <td></td> <td>560</td> </tr> <tr> <td>66.0</td> <td></td> <td>18.7</td> </tr> <tr> <td>100%</td> <td>55%</td> <td>45%</td> </tr> <tr> <td></td> <td>60'</td> <td></td> </tr> <tr> <td>5.6</td> <td>2.9</td> <td>2.4</td> </tr> <tr> <td>wait</td> <td>wait</td> <td>flow</td> </tr> <tr> <td>38.0</td> <td>20.0</td> <td>16.3</td> </tr> <tr> <td>wait</td> <td>wait</td> <td>wait</td> </tr> <tr> <td>43.6</td> <td>39.2</td> <td></td> </tr> <tr> <td>1310</td> <td>1180</td> <td></td> </tr> <tr> <td>43.6</td> <td>41.6</td> <td></td> </tr> <tr> <td>1310</td> <td>1250</td> <td></td> </tr> </tbody> </table>	↑	↑	↗	1980		560	66.0		18.7	100%	55%	45%		60'		5.6	2.9	2.4	wait	wait	flow	38.0	20.0	16.3	wait	wait	wait	43.6	39.2		1310	1180		43.6	41.6		1310	1250		<p>Vehicle Density = 21 ft./car Cycle Length = 120 or 30 /hour Peak Hour Demand Volumes Average Volumes on each cycle Shared Lane Split (Estimated) Blocking Distance</p> <hr/> <p>Vehicles until Blocking starts</p> <p>Vehicles after Blocking starts (Blocking = 87% of the time) Maximum Queue Peak Hour queue volumes Lane volume/cycle Peak Hour lane volume</p>
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<p>PHASE A Vol. = 820 B = 180 C = 1250 TOTAL = 2250 V/C = 1.18 (not Critical)</p> <p>PHASE AB Vol. = 1170 C = 1250 TOTAL = 2420 V/C = 1.27</p>		<p>Calc. by SHK June 11, 1985</p>																																							

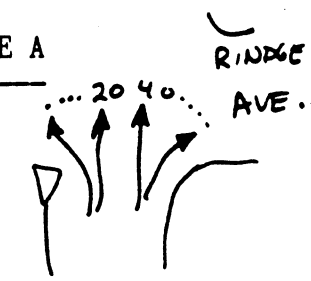


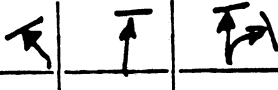
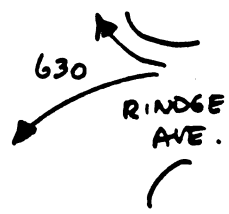
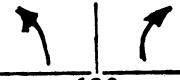
ALEWIFE and TRIANGLE ROAD

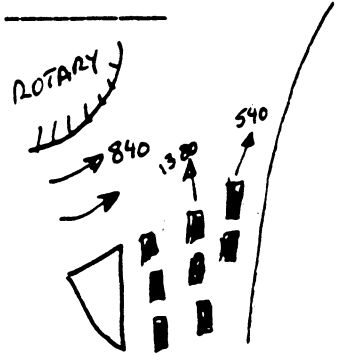
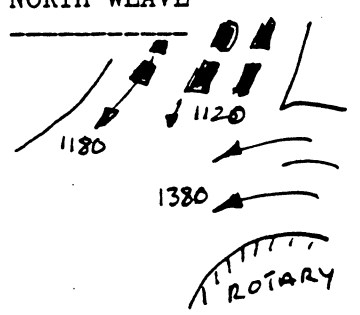
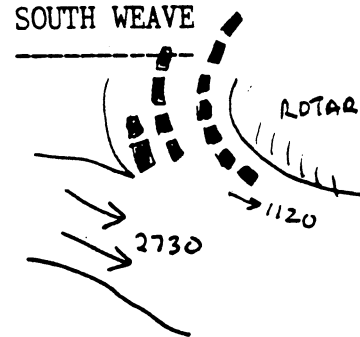
QUEUES/CAPACITY

INTERIM ACCESS - 120 1987 PM

PHASE	Diagram	Up Arrow	Up Arrow	Up Arrow	Notes
PHASE A	<p>CRITICAL VOLUME = 800</p>	<p>1560 52.0 100%</p>	<p>85% 410'</p>	<p>110 3.7 15%</p>	<p>Lane Capacity = 1900 cars/hour Vehicle Density = 21 ft./car Cycle Length = 120 or 30 /hour Peak Hour Demand Volumes Average Volumes on each cycle Shared Lane Split (Estimated) Blocking Distance</p> <hr/> <p>Vehicles until Blocking starts wait 28.7 flow 3.4 wait 2.8 0.3 Vehicles after Blocking starts (Blocking = 5 % of the time) Maximum Queue Peak Hour queue volumes Lane volume/cycle Peak Hour lane volume</p>
PHASE AB	<p>CRITICAL VOLUME = 1170</p>	<p>180 6.0 15% 300'</p>	<p>2130 71.0 85% (300')</p>	<p>100% -</p>	<p>Vehicle Density = 21 ft./car Cycle Length = 120 or 30 /hour Peak Hour Demand Volumes Average Volumes on each cycle Shared Lane Split (Estimated) Blocking Distance</p> <hr/> <p>Vehicles until Blocking starts (Left turn slot blocked) wait 2.5 14.3 16.7 Vehicles after Blocking starts (Blocking = 70% of the time) wait 3.5 20.0 23.4 Maximum Queue for Left turn Peak Hour queue volumes</p>
PHASE C	<p>CRITICAL VOLUME = 360</p>	<p>500 16.7 100%</p>	<p>20% 60'</p>	<p>80%</p>	<p>Vehicle Density = 21 ft./car Cycle Length = 120 or 30 /hour Peak Hour Demand Volumes Average Volumes on each cycle Shared Lane Split (Estimated) Blocking Distance</p> <hr/> <p>Vehicles until Blocking starts wait 7.5 flow 2.9 11.6 Vehicles after Blocking starts (Blocking = 40% of the time) wait 4.6 1.8 7.1 Maximum Queue Peak Hour queue volumes Lane volume/cycle Peak Hour lane volume</p>
<p>PHASE A Vol. = 800 B = 180 C = 360 TOTAL = 1340 V/C = 0.71 (not Critical)</p>		<p>PHASE AB Vol. = 1170 C = 360</p>		<p>Calc. by SHK June 11, 1985</p>	
		<p>> TOTAL = 1530 < > V/C = 0.81 <</p>			

<p>PHASE A</p>  <p>CRITICAL VOLUME = 1080</p>	<table border="1"> <tr> <td>500</td> <td>1400</td> </tr> <tr> <td>16.7</td> <td>46.7</td> </tr> <tr> <td>60%</td> <td>40%</td> </tr> <tr> <td colspan="2">+4.3 already in turn</td> </tr> <tr> <td>10.0</td> <td>6.7</td> </tr> <tr> <td>wait</td> <td>flow</td> </tr> <tr> <td>6.7</td> <td>4.5</td> </tr> <tr> <td>wait</td> <td>wait</td> </tr> <tr> <td>21.2</td> <td>35.9</td> </tr> <tr> <td>640</td> <td>1080</td> </tr> <tr> <td>27.9</td> <td>Lane vol/cycle</td> </tr> <tr> <td>840</td> <td>Lane Volume</td> </tr> </table>	500	1400	16.7	46.7	60%	40%	+4.3 already in turn		10.0	6.7	wait	flow	6.7	4.5	wait	wait	21.2	35.9	640	1080	27.9	Lane vol/cycle	840	Lane Volume	<p>Lane Capacity = 1900 veh/hour Vehicle Density = 21 ft./car Cycle Length = 120 or 30 /hour Peak Hour Demand Volumes Average Volumes on each cycle Shared Lane Split (Estimated) slot (from Rindge)</p> <hr/> <p>Vehicles until Blocking starts (14.3 - 4.3 = 10.0) Vehicles during Blocking phase (Blockage = 37% of the time) Maximum Queue Peak Hour queue volumes Left Lane blocked 37% of time Right lane flows 100% of time</p>
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16.7	46.7																									
60%	40%																									
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<p>PHASE B</p> <p>With present signal timing, about 12 sec. of all-red clear or 190 veh/hr. In 1987, CLV = 720. (See B-1)</p> <p>ALTERNATE : Increase Parkway Green Time</p>  <p>CRITICAL VOLUME = 290 (ALTERNATE) CRITICAL VOLUME = 720 (WITH EXISTING ALL RED CLEAR PHASE)</p>	<table border="1"> <tr> <td>60%</td> <td>40%</td> <td>100%</td> </tr> <tr> <td>6.7</td> <td>4.5</td> <td>14.4</td> </tr> <tr> <td>flow</td> <td>flow</td> <td>flow</td> </tr> <tr> <td>200</td> <td>135</td> <td>430</td> </tr> <tr> <td colspan="2">290</td> <td>290</td> </tr> </table>	60%	40%	100%	6.7	4.5	14.4	flow	flow	flow	200	135	430	290		290	<p>Vehicle Density = 21 ft./car Cycle Length = 120 or 30 /hour Shared Lane Split (Estimated)</p> <hr/> <p>ALTERNATE : Continue Parkway GREEN phase while left turn to triangle flushes out. (See Phase A above)</p> <p>Peak Hour queue volumes Pedestrian Phase/All Red Clear CLEAR PHASE)</p>									
60%	40%	100%																								
6.7	4.5	14.4																								
flow	flow	flow																								
200	135	430																								
290		290																								
<p>PHASE C</p>  <p>CRITICAL VOLUME = 360</p>	<table border="1"> <tr> <td>-</td> <td>660</td> </tr> <tr> <td></td> <td>22.0</td> </tr> <tr> <td colspan="2">No Blocking of turns; narrow lanes and slow turn speeds result in 10% less lane capacity (from field measurements).</td> </tr> <tr> <td>730</td> <td>360</td> </tr> <tr> <td>360</td> <td>360</td> </tr> </table>	-	660		22.0	No Blocking of turns; narrow lanes and slow turn speeds result in 10% less lane capacity (from field measurements).		730	360	360	360	<p>Vehicle Density = 21 ft./car Cycle Length = 120 or 30 /hour Peak Hour Demand Volumes Average Volumes on each cycle</p> <p>Adjusted Peak Hour volumes Each Lane</p>														
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730	360																									
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<p>PHASE A Vol. = 1080 B = 720 C = 360 TOTAL = 2160 V/C = 1.14</p>	<p>ALTERNATE : PHASE A Vol. = 1080 B = 290 C = 360 TOTAL = 1730 V/C = 0.91</p>	<p>Calc. by SHK Checked: SHK 6-13-85</p>																								

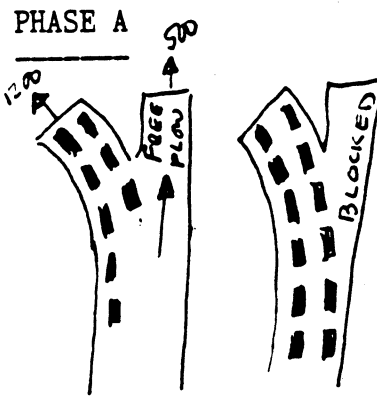
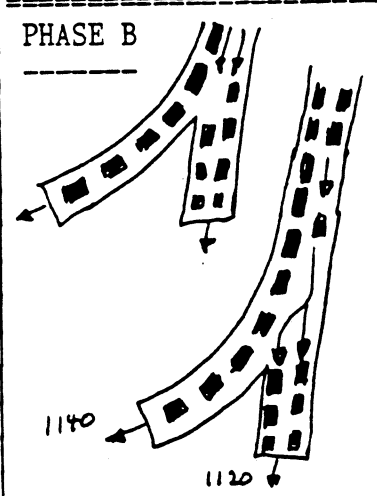
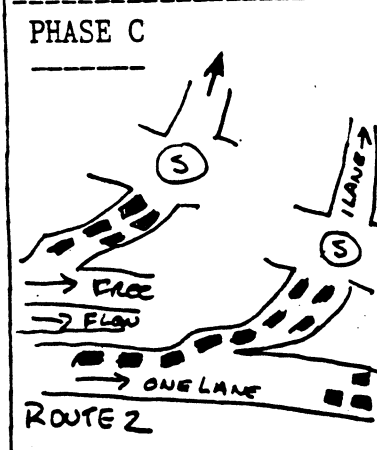
<p>PHASE A</p>  <p>CRITICAL VOLUME = 1020</p>		<p>2040 68.0</p> <hr/> <p>68.0 flow</p> <p>34.0 34.0 1020 1020</p>	<p>Lane Capacity = 1900 veh/hour Vehicle Density = 21 ft./car Cycle Length = 120 or 30 /hour Peak Hour Demand Volumes Average Volumes on each cycle</p> <hr/> <p>Vehicles per Signal Cycle NO BLOCKAGE Maximum Queue Peak Hour queue volumes</p>
<p>PHASE B</p>  <p>CRITICAL VOLUME = 320</p>		<p>With present signal timing, about 12-seconds of all-red-clear is used — or 190 veh/hour equivalent. In 1987, the CLV = 180 or 6 cars per cycle (see A-2) SOLUTION : Because there is extra capacity, insert a REGULAR PEDESTRIAN PHASE as Phase B (20 sec.) $20/120 \times 1900 = 320$ vph equivalent</p>	<p>Vehicle Density = 21 ft./car Cycle Length = 120 or 30 /hour</p> <hr/> <p>Pedestrian Phase/All Red Clear</p>
<p>PHASE C</p>  <p>CRITICAL VOLUME = 340</p>		<p>630 21.0</p> <hr/> <p>No Blocking of turns; narrow lanes and slow turn speeds result in 10% less lane capacity (measured) .</p> <p>690 340 340</p>	<p>Vehicle Density = 21 ft./car Cycle Length = 120 or 30 /hour Peak Hour Demand Volumes Average Volumes on each cycle</p> <hr/> <p>Adjusted Peak Hour volumes Each Lane</p>
<p>PHASE A Vol. = 1020 B = 320 C = 340 TOTAL = 1680 V/C = 0.88 with Pedestrian Phase/All Red Clear</p>			<p>Calc. by SHK Checked: SHK 6-11-85</p>

<p>EAST WEAVE</p>  <p>CRITICAL VOLUME = 880 CRITICAL VOLUME = 420</p>	<p>↑</p> <p>1380 23.0 100%</p> <p>4.5 wait 9.5 wait 14.0 850</p>	<p>↑</p> <p>50% 60'</p> <p>2.9 wait 6.1 wait 15.1 910</p>	<p>↑</p> <p>540 9.0 50%</p> <p>2.9 lane3 6.1 lane2</p>	<p>Lane Capacity = 1900 veh/hour Vehicle Density = 21 ft./car Cycle Length = 60 or 60 /hour Peak Hour Demand Volumes Average Volumes per cycle Shared Lane Split (Estimated) Blocking Distance</p> <hr/> <p>Vehicles until Lane 3 Blocked</p> <p>Vehicles in two lanes only (Blocking = 70% of the time) Maximum Queue Peak Hour queuing volumes</p>
<p>NORTH WEAVE</p>  <p>CRITICAL VOLUME = 940 CRITICAL VOLUME = 880</p>	<p>↑</p> <p>1120 18.7 100%</p> <p>18.7 + 12.6 wait 15.7 940</p>	<p>↑</p> <p>10% 150'</p> <p>15.7 940</p>	<p>↑</p> <p>1180 19.7 90%</p> <p>7.1 lane3 12.6 lane2</p>	<p>Lane Capacity = 1900 veh/hour Vehicle Density = 21 ft./car Cycle Length = 60 or 60 /hour Peak Hour Demand Volumes Average Volumes per cycle Shared Lane Split (Estimated) Blocking Distance</p> <hr/> <p>Vehicles until Lane 3 Blocked</p> <p>Vehicles queueing in 2-lanes Maximum Queue Peak Hour queuing volumes</p> <p>..... From East Weave above</p>
<p>SOUTH WEAVE</p>  <p>CRITICAL VOLUME = 610 CRITICAL VOLUME = 1360</p>	<p>↑</p> <p>150'</p> <p>7.1 wait 3.1 wait 10.2 610</p>	<p>↑</p> <p>100' 100'</p> <p>4.8 wait 0.3 wait 5.1 305</p>	<p>↑</p> <p>1120 18.7 150'</p> <p>2.4 lane3 -</p> <p>2.4 150</p>	<p>Lane Capacity = 1900 veh/hour Vehicle Density = 21 ft./car Cycle Length = 60 or 60 /hour Peak Hour Demand Volumes Average Volume per cycle Blocking Distance Estimated Lane Distribution</p> <hr/> <p>Vehicles until Lane 3 full</p> <p>Vehicles queueing in 2 lanes Maximum Queue Peak Hour queuing volumes</p>
<p>EAST WEAVE</p> <p>PHASE A Vol. = 880 B = 420</p> <p>TOTAL = 1300 V/C = 0.68</p>	<p>NORTH WEAVE</p> <p>PHASE A Vol. = 940 B = 880</p> <p>TOTAL = 1820 V/C = 0.96</p>	<p>SOUTH WEAVE</p> <p>PHASE A Vol. = 610 B = 1360</p> <p>TOTAL = 1970 V/C = 1.04</p>	<p>Calc by SHK Checked SHK 6-18-85</p>	

ROUTE 2/ALEWIFE SIGNAL

QUEUEING/CAPACITY

INTERIM ACCESS - 120 1987 AM.

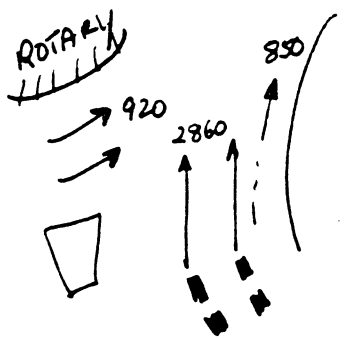



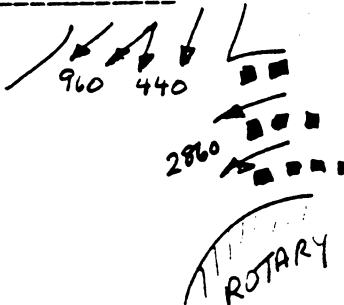



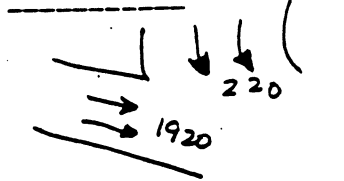


<p>PHASE A</p>  <p>CRITICAL VOLUME = 660</p>	<table border="1"> <thead> <tr> <th>↑</th> <th>↑</th> <th>↗</th> </tr> </thead> <tbody> <tr> <td>1200</td> <td></td> <td>500</td> </tr> <tr> <td>40.0</td> <td></td> <td>16.7</td> </tr> <tr> <td>100%</td> <td>50%</td> <td>50%</td> </tr> <tr> <td></td> <td>260'</td> <td></td> </tr> <tr> <td>17.4</td> <td>12.4</td> <td>12.4</td> </tr> <tr> <td>wait</td> <td>wait</td> <td>flow</td> </tr> <tr> <td>6.0</td> <td>4.3</td> <td>4.3</td> </tr> <tr> <td>wait</td> <td>wait</td> <td>wait</td> </tr> <tr> <td>23.4</td> <td>21.0</td> <td></td> </tr> <tr> <td>= 700</td> <td>630</td> <td></td> </tr> <tr> <td>23.4</td> <td>33.4</td> <td></td> </tr> <tr> <td>700</td> <td>1000</td> <td></td> </tr> </tbody> </table>	↑	↑	↗	1200		500	40.0		16.7	100%	50%	50%		260'		17.4	12.4	12.4	wait	wait	flow	6.0	4.3	4.3	wait	wait	wait	23.4	21.0		= 700	630		23.4	33.4		700	1000		<p>Lane Capacity = 1900 veh/hour Vehicle Density = 21 ft./car Cycle Length = 120 or 30 /hour Peak Hour Demand Volumes Average Volumes on each cycle Shared Lane Split (Estimated) Blocking Distance</p> <hr/> <p>Vehicles until Blocking starts</p> <p>Vehicles after Blocking starts (Blocking = 25% of the time) Maximum Queue Peak Hour queuing volumes Lane volume/cycle Peak Hour lane volume</p>
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6.0	4.3	4.3																																							
wait	wait	wait																																							
23.4	21.0																																								
= 700	630																																								
23.4	33.4																																								
700	1000																																								
<p>PHASE B</p>  <p>CRITICAL VOLUME = 860</p>	<table border="1"> <thead> <tr> <th>↑</th> <th>↑</th> <th>↗</th> </tr> </thead> <tbody> <tr> <td>1120</td> <td></td> <td>1140</td> </tr> <tr> <td>37.3</td> <td></td> <td>38.0</td> </tr> <tr> <td>100%</td> <td>10%</td> <td>90%</td> </tr> <tr> <td></td> <td>200'</td> <td>280</td> </tr> <tr> <td>27.5</td> <td>7.1</td> <td>13.3</td> </tr> <tr> <td>wait</td> <td>wait</td> <td>lane3</td> </tr> <tr> <td>switch << -1.3</td> <td>1.4</td> <td>24.7</td> </tr> <tr> <td>28.8</td> <td>40.7</td> <td></td> </tr> <tr> <td>860</td> <td>1270</td> <td></td> </tr> <tr> <td>28.8</td> <td>-</td> <td></td> </tr> <tr> <td>860</td> <td>-</td> <td></td> </tr> </tbody> </table>	↑	↑	↗	1120		1140	37.3		38.0	100%	10%	90%		200'	280	27.5	7.1	13.3	wait	wait	lane3	switch << -1.3	1.4	24.7	28.8	40.7		860	1270		28.8	-		860	-		<p>Vehicle Density = 21 ft./car Cycle Length = 120 or 30 /hour Peak Hour Demand Volumes Average Volumes on each cycle Shared Lane Split (Estimated) Blocking Distance</p> <hr/> <p>Vehicles until Blocking starts (3/4 x 9.5 = 7.1 full)</p> <p>Vehicles after Blocking starts (thru cars in Right T. Queue Maximum Queue (60% blocking) Peak Hour queuing volumes Lane volume/cycle Peak Hour lane volume</p>			
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↖	↑	↑																																							
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<p>CENTER SIGNAL</p> <p>PHASE A Vol. = 660 B = 860 C = 980</p> <p>TOTAL = 2500 V/C = 1.32 V/C = 1.37 (including 0.05 all-red-clear)</p>	<p>EAST SIGNAL</p> <p>A Vol. = 250 A' = 320</p> <p>TOTAL = 570 V/C = 0.30</p>	<p>WEST SIGNAL</p> <p>A Vol. = 660 B' = 1270</p> <p>TOTAL = 1930 V/C = 1.02</p>	<p>SOUTH SIGNAL</p> <p>B Vol. = 940 C = 850</p> <p>TOTAL = 1790 V/C = 0.94</p> <p>Calc by SHK Checked SHK 6-13-85</p>																																						

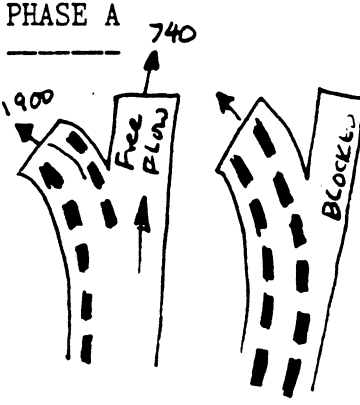
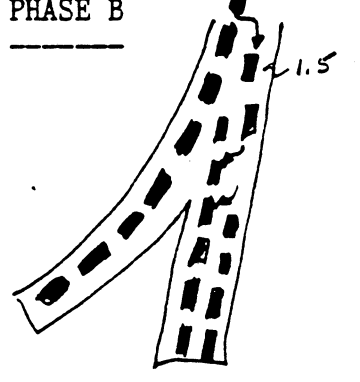
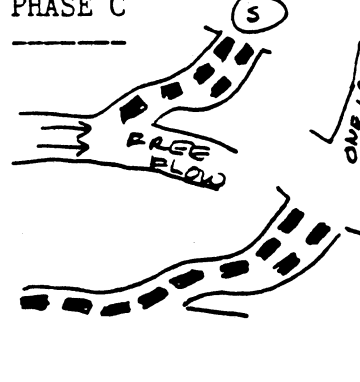
ROUTE 2 ROTARY/ALEWIFE

QUEUEING & CAPACITY

NO BUILD

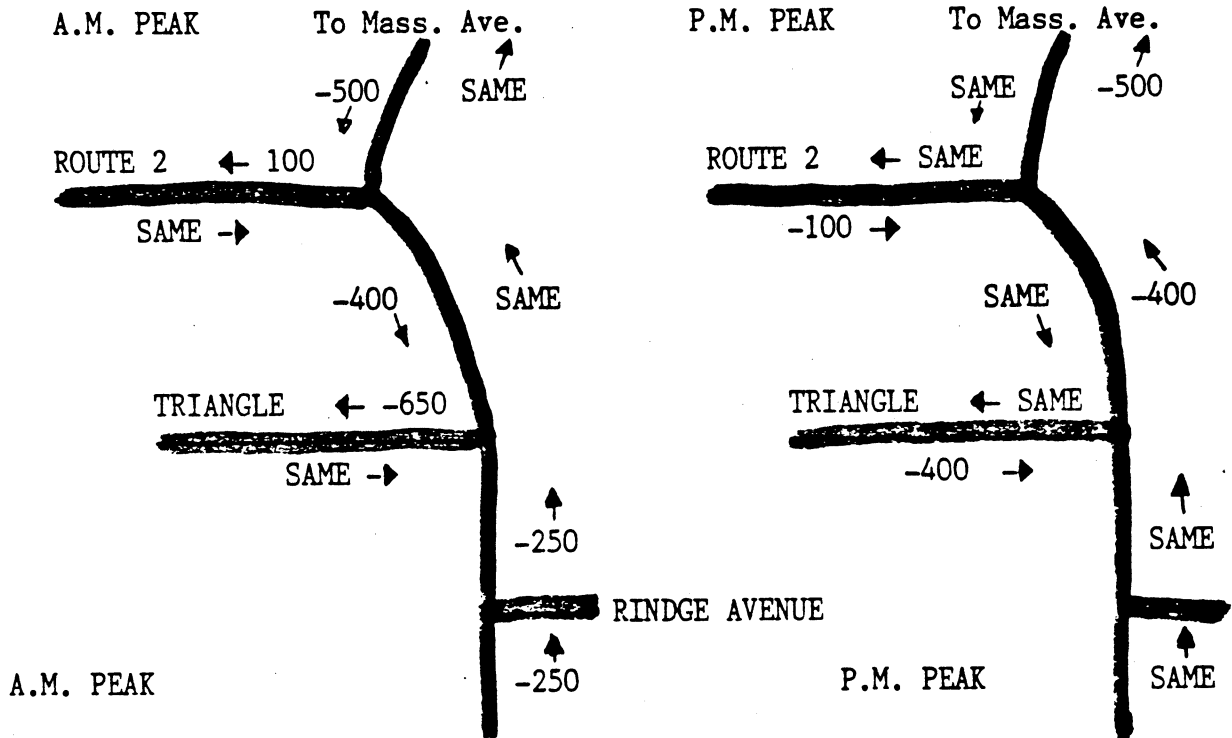
1987 PM

<p>EAST WEAVE</p>  <p>CRITICAL VOLUME = 1950 CRITICAL VOLUME = 460</p>	 2860 47.6 100% 4.7 wait 29.0 wait 33.7 2020	 40% 60' 1.9 wait 11.7 wait 31.5 1890	 1250 20.8 60% 60' 2.9 lane3 17.9 lane2 Maximum Queue Peak Hour queuing volumes	<p>Lane Capacity = 1900 veh/hour Vehicle Density = 21 ft./car Cycle Length = 60 or 60 /hour Peak Hour Demand Volumes Average Volumes per cycle Shared Lane Split (Estimated) Blocking Distance</p> <hr/> <p>Vehicles until Lane 3 Blocked</p> <p>Vehicles in two lanes only</p> <p>Maximum Queue Peak Hour queuing volumes</p>
<p>NORTH WEAVE</p>  <p>CRITICAL VOLUME = 490 CRITICAL VOLUME = 1680</p>	 440 7.3 150' 7.3 + 8.9 wait 8.1 490	 150' 8.9 8.1 490	 960 16.0 150' 7.1 lane3 8.9 lane2 Maximum Queue Peak Hour queuing volumes	<p>Lane Capacity = 1900 veh/hour Vehicle Density = 21 ft./car Cycle Length = 60 or 60 /hour Peak Hour Demand Volumes Average Volumes per cycle Blocking Distance</p> <hr/> <p>Vehicles until Lane 3 Blocked</p> <p>Vehicles queueing in 2-lanes</p> <p>Maximum Queue Peak Hour queuing volumes Initial queue of 3,4,5 cars in 3 lanes (12 cars) Final 3/4 of 2860 move @ 1950 or 1.5 lanes (net 1.7L)</p>
<p>SOUTH WEAVE</p>  <p>CRITICAL VOLUME = 220 CRITICAL VOLUME = 960</p>	 2.6 wait 220	 440 7.3 2.6 wait 220	- -	<p>Lane Capacity = 1900 veh/hour Vehicle Density = 21 ft./car Cycle Length = 60 or 60 /hour Peak Hour Demand Volumes Average Volume per cycle</p> <hr/> <p>Vehicles queueing in 2 lanes</p> <p>Peak Hour queuing volumes</p>
<p>EAST WEAVE</p> <p>PHASE A Vol. = 460 B = 1950</p> <p>TOTAL = 2410 V/C = 1.27</p>	<p>NORTH WEAVE</p> <p>PHASE A Vol. = 1680 B = 490</p> <p>TOTAL = 2170 V/C = 1.14</p>	<p>SOUTH WEAVE</p> <p>PHASE A Vol. = 220 B = 960</p> <p>TOTAL = 1180 V/C = 0.62</p>	<p>Calc by SHK Checked SHK 6-19-85</p>	

<p>PHASE A</p>  <p>CRITICAL VOLUME = 1130</p>	<p>↑</p> <p>1900 63.3 100%</p> <p>19.4 wait 19.3 wait 38.7 1160 38.7 1160</p>	<p>↑</p> <p>740 24.7 50%</p> <p>12.4 wait 12.3 wait 37.0 1110 49.4 1480</p>	<p>↑</p> <p>740 24.7 50%</p> <p>12.4 flow 12.3 wait 37.0 1110 49.4 1480</p>	<p>Lane Capacity = 1900 veh/hour Vehicle Density = 21 ft./car Cycle Length = 120 or 30 /hour Peak Hour Demand Volumes Average Volumes on each cycle Shared Lane Split (Estimated) Blocking Distance</p> <hr/> <p>Vehicles until Blocking starts Vehicles after Blocking starts (Blocking = 50% of the time) Maximum Queue Peak Hour queuing volumes Lane volume/cycle Peak Hour lane volume</p>
<p>PHASE B</p>  <p>CRITICAL VOLUME = 260</p>	<p>↑</p> <p>440 14.7 100%</p> <p>7.1 wait 8.6 260 13.4 400</p>	<p>↑</p> <p>800 26.7 90%</p> <p>6.3 wait 1.5 26.7 800 28.2 850</p>	<p>↑</p> <p>800 26.7 90%</p> <p>13.3 lane3 13.4 lane2 13.3 13.4 28.2 850</p>	<p>Vehicle Density = 21 ft./car Cycle Length = 120 or 30 /hour Peak Hour Demand Volumes Average Volumes on each cycle Shared Lane Split (Estimated) Blocking Distance</p> <hr/> <p>Vehicles until Blocking starts (3/4 x 8.5 = 6.3 shift lanes) Vehicles after Blocking starts (thru cars in Right T. Queue) Maximum Queue (50% blocking) Peak Hour queuing volumes Lane volume/cycle Peak Hour lane volume</p>
<p>PHASE C</p>  <p>CRITICAL VOLUME = 1000</p>	<p>↑</p> <p>920 30.7 90%</p> <p>7.6 wait 23.1 wait 33.3 1000</p>	<p>↑</p> <p>10%</p> <p>0.8 flow 2.6 wait 530</p>	<p>↑</p> <p>1230 41.0 100%</p> <p>9.4 flow 28.6 flow 700</p>	<p>Vehicle Density = 21 ft./car Cycle Length = 120 or 30 /hour Peak Hour Demand Volumes Average Volumes on each cycle Shared Lane Split (Estimated) Blocking Distance</p> <hr/> <p>Vehicles until Blocking starts Vehicles after Blocking starts (Blocking = 70% of the time) Maximum Queue for Left turn Peak Hour queuing volumes (3/4 x 700 + 700 = 1230)</p>
<p>CENTER SIGNAL</p> <p>PHASE A Vol. = 1130 B = 260 C = 1000 TOTAL = 2390 V/C = 1.26 V/C = 1.31 (with 0.05 all-red-clear)</p>	<p>EAST SIGNAL</p> <p>A Vol. = 370 A' = 1130 TOTAL = 1500 V/C = 0.79</p>	<p>WEST SIGNAL</p> <p>A Vol. = 800 B' = 1130 TOTAL = 1930 V/C = 1.02</p>	<p>SOUTH SIGNAL</p> <p>B Vol. = 260 C = 700 TOTAL = 960 V/C = 0.51</p>	<p>Calc by SHK 6-11-85 Checked SHK 6-13-85</p>

APPENDIX C CALCULATIONS OF QUEUES AND V/C RATIOS
FOR (partially) CONSTRAINED 1987 AM + PM DEMAND VOLUMES

EXISTING OR NO-BUILD ROAD SYSTEM



INTERIM ACCESS ROAD SYSTEM

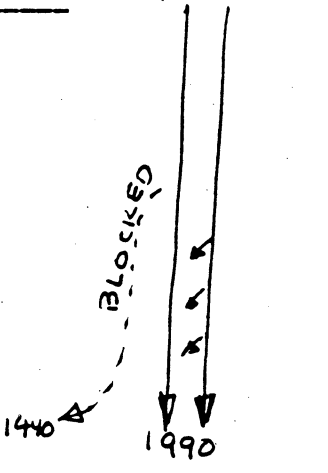
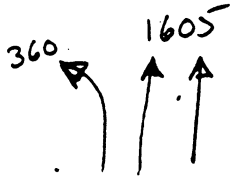
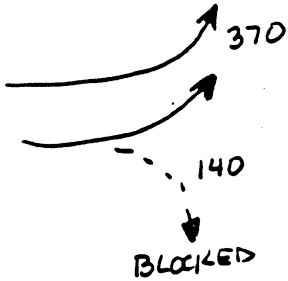
SAME ADJUSTMENTS TO 1987 PEAK VOLUMES AS ABOVE

(Partial constraints are due to capacity limitations
at Mass. Avenue and Alewife Brook Parkway signal;
Also limited capacity of left turn slot
into triangle from outbound Alewife Brook Parkway)

ALEWIFE and TRIANGLE ROAD

QUEUES/CAPACITY

===== CONSTRAINED
NO BUILD - 120 1987 AM

<p>PHASE A</p> <p align="center"><i>See Diagram PP. B-1</i></p>  <p>CRITICAL VOLUME = 1370</p>	<table border="1"> <thead> <tr> <th>↑</th> <th>↑</th> <th>↗</th> </tr> </thead> <tbody> <tr> <td>1990</td> <td></td> <td>1440</td> </tr> <tr> <td>66.3</td> <td></td> <td>48.0</td> </tr> <tr> <td>100%</td> <td>20%</td> <td>80%</td> </tr> <tr> <td></td> <td>410'</td> <td></td> </tr> <tr> <td>44.3</td> <td>9.8</td> <td>39.2</td> </tr> <tr> <td>-9.8</td> <td>+9.8</td> <td>-</td> </tr> <tr> <td>wait</td> <td>wait</td> <td>flow</td> </tr> <tr> <td>11.1</td> <td>2.5</td> <td>9.8</td> </tr> <tr> <td>wait</td> <td>wait</td> <td>wait</td> </tr> <tr> <td>45.6</td> <td>31.9</td> <td></td> </tr> <tr> <td>1370</td> <td>960</td> <td></td> </tr> <tr> <td>55.4</td> <td>61.3</td> <td></td> </tr> <tr> <td>1660</td> <td>1840</td> <td></td> </tr> </tbody> </table>	↑	↑	↗	1990		1440	66.3		48.0	100%	20%	80%		410'		44.3	9.8	39.2	-9.8	+9.8	-	wait	wait	flow	11.1	2.5	9.8	wait	wait	wait	45.6	31.9		1370	960		55.4	61.3		1660	1840		<p>Lane Capacity = 1900 cars/hour Vehicle Density = 21 ft./car Cycle Length = 120 or 30 /hour Peak Hour Demand Volumes Average Volumes on each cycle Shared Lane Split (Approach) Blocking Distance</p> <hr/> <p>Vehicles until Blocking begins at 19.5 (half of block due to lane shifting, estimate) Vehicles after Blocking begins (Blockage occurs) Maximum Queue Peak Hour queue volumes Lane volume/cycle Peak Hour lane volume(Max.1900)</p>
↑	↑	↗																																										
1990		1440																																										
66.3		48.0																																										
100%	20%	80%																																										
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<p>PHASE B</p>  <p>CRITICAL VOLUME = 360</p>	<table border="1"> <thead> <tr> <th>↙</th> <th>↑</th> <th>↑</th> </tr> </thead> <tbody> <tr> <td>360</td> <td>1605</td> <td></td> </tr> <tr> <td>12.0</td> <td>53.5</td> <td></td> </tr> <tr> <td>250'</td> <td>(250')</td> <td>-</td> </tr> <tr> <td>12.0</td> <td>53.5</td> <td></td> </tr> <tr> <td>wait</td> <td>flow</td> <td>flow</td> </tr> </tbody> </table>	↙	↑	↑	360	1605		12.0	53.5		250'	(250')	-	12.0	53.5		wait	flow	flow	<p>Vehicle Density = 21 ft./car Cycle Length = 120 or 30 /hour Peak Hour Demand Volumes Average Volumes on each cycle Blocking Distance of slot</p> <hr/> <p>Vehicles until Blocking Starts (Left Turn Slot filled) Left turn Slot length limits capacity to 360 compared with the 1987 demand of 630. The remaining 290 cars could not make it past Rindge Ave. Signal.</p>																								
↙	↑	↑																																										
360	1605																																											
12.0	53.5																																											
250'	(250')	-																																										
12.0	53.5																																											
wait	flow	flow																																										
<p>PHASE C</p>  <p>CRITICAL VOLUME = 220</p>	<table border="1"> <thead> <tr> <th>↙</th> <th>↙</th> <th>↗</th> </tr> </thead> <tbody> <tr> <td>370</td> <td></td> <td>140</td> </tr> <tr> <td>12.3</td> <td></td> <td>4.7</td> </tr> <tr> <td>100%</td> <td>50%</td> <td>50%</td> </tr> <tr> <td></td> <td>60'</td> <td></td> </tr> <tr> <td>4.8</td> <td>2.9</td> <td>2.9</td> </tr> <tr> <td>wait</td> <td>wait</td> <td>flow</td> </tr> <tr> <td>3.0</td> <td>1.8</td> <td>1.8</td> </tr> <tr> <td>wait</td> <td>wait</td> <td>wait</td> </tr> <tr> <td>7.8</td> <td>6.5</td> <td></td> </tr> <tr> <td>235</td> <td>195</td> <td></td> </tr> <tr> <td>7.8</td> <td>9.4</td> <td></td> </tr> <tr> <td>235</td> <td>280</td> <td></td> </tr> </tbody> </table>	↙	↙	↗	370		140	12.3		4.7	100%	50%	50%		60'		4.8	2.9	2.9	wait	wait	flow	3.0	1.8	1.8	wait	wait	wait	7.8	6.5		235	195		7.8	9.4		235	280		<p>Vehicle Density = 21 ft./car Cycle Length = 120 or 30 /hour Peak Hour Demand Volumes Average Volumes on each cycle Shared Lane Split (Estimated) Blocking Distance</p> <hr/> <p>Vehicles until Blocking starts Vehicles after Blocking starts (blockage is 40% of the time) Maximum Queue Peak Hour queue volumes Lane volume/cycle Peak Hour lane volume</p>			
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7.8	9.4																																											
235	280																																											
<p>PHASE A Vol. = 1370 B = 360 .. Constrained C = 220 Volumes TOTAL = 1950 V/C = 1.03</p>		<p>Calc. by SHK June 13, 1985 Right lane of 1840 has V/C = 0.97</p>																																										

ALEWIFE and TRIANGLE ROAD

QUEUES/CAPACITY

INTERIM ACCESS - 120

CONSTRAINED
1987 AM

PHASE	Diagram	Volume	Percentage	Wait	Flow	Blocking Distance	Notes
PHASE A (see B-2)		1990 66.3 220	100% 80%	24.8 wait 12.2 wait 37.0 1110 37.0 1110	19.5 wait 9.6 wait 31.5 950 36.4 1090	410'	Lane Capacity = 1900 cars/hour Vehicle Density = 21 ft./car Cycle Length = 120 or 30 /hour Peak Hour Demand Volumes Average Volumes on each cycle Shared Lane Split (Estimated) Blocking Distance Vehicles until Blocking starts Vehicles after Blocking starts (blocking = 40% of the time) Maximum Queue Peak Hour queue volumes Lane volume/cycle Peak Hour lane volume
PHASE B		360 12.0 250'	(250')	12.0 wait	53.5 flow	-	Vehicle Density = 21 ft./car Cycle Length = 120 or 30 /hour Peak Hour Demand Volumes Average Volumes on each cycle Blocking Distance of slot Vehicles until Blocking Starts (Left Turn Slot filled) Left Turn Slot limits Left turns to 360/hour
PHASE C		90 3.0 140	100%	1.5 wait	1.5 wait	60'	Vehicle Density = 21 ft./car Cycle Length = 120 or 30 /hour Peak Hour Demand Volumes Average Volumes on each cycle Shared Lane Split (Estimated) Blocking Distance Vehicles until Blocking starts NO BLOCKING OCCURS
PHASE A Vol. = 1030 B = 360 ... Constrained C = 50 Modific.) TOTAL = 1440 V/C = 0.76							Calc. by SHK June 13, 1985 6/19/85

ALEWIFE and TRIANGLE ROAD

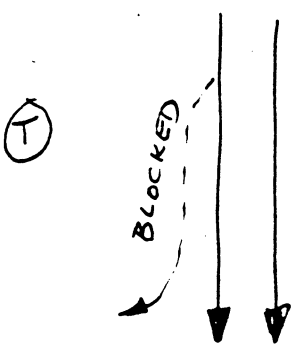
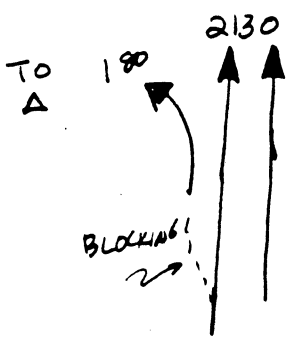
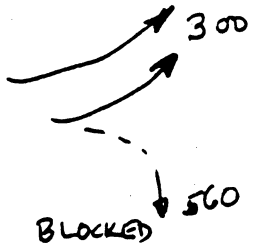
QUEUES/CAPACITY

NO BUILD - 120

CONSTRAINED

1987 PM

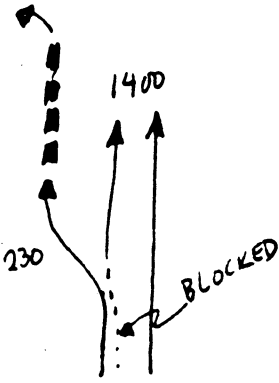
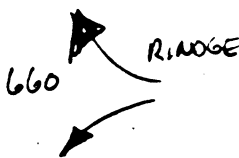
PHASE	Diagram	Volume	Avg. Vol.	Shared Lane Split	Blocking Dist.	Wait	Flow	Wait	Queue	Peak Hour Queue	Peak Hour Lane Vol.	
PHASE A		1560 320	52.0 10.7	100% 70% 30%	410'	21.4 wait 5.8 wait 27.2 820 27.2 820	19.5 wait 5.4 wait 27.2 820 35.6 1070	8.4 flow 2.3 wait 27.2 820 35.6 1070	21.4 5.8 27.2 820 27.2 820	19.5 5.4 27.2 820 35.6 1070	8.4 2.3 27.2 820 35.6 1070	Lane Capacity = 1900 cars/hour Vehicle Density = 21 ft./car Cycle Length = 120 or 30 /hour Peak Hour Demand Volumes Average Volumes on each cycle Shared Lane Split (Estimated) Blocking Distance Vehicles until Blocking starts Vehicles after Blocking starts (Blocking = 20% of the time) Maximum Queue Peak Hour queue volumes Lane volume/cycle Peak Hour lane volume
PHASE AB		180 2130 210	6.0 71.0	15% 85% 100%	300' (300') -	1.5 4.5 wait 41.0 1230	6.9 56.5 + 7.2R wait 82.0 41.0 1230	6.9 7.2R wait 41.0 1230	1.5 4.5 41.0 1230	6.9 7.2R 41.0 1230	6.9 7.2R 41.0 1230	Vehicle Density = 21 ft./car Cycle Length = 120 or 30 /hour Peak Hour Demand Volumes Average Volumes on each cycle Shared Lane Split (Estimated) Blocking Distance Vehicles from Rindge Avenue Vehicles from Alewife Outbound (2-lane flow past Rindge) Vehicles waiting per cycle Maximum Queue per lane Peak Hour queue volumes
PHASE C		1580 560	52.6 18.7	100% 50% 50%	60'	5.3 wait 28.9 wait 34.2 1030 34.2 1030	2.9 wait 15.8 wait 34.5 1030 37.4 1120	2.9 flow 15.8 wait 34.5 1030 37.4 1120	5.3 28.9 34.2 1030 34.2 1030	2.9 15.8 34.5 1030 37.4 1120	2.9 15.8 34.5 1030 37.4 1120	Vehicle Density = 21 ft./car Cycle Length = 120 or 30 /hour Peak Hour Demand Volumes Average Volumes on each cycle Shared Lane Split (Estimated) Blocking Distance Vehicles until Blocking starts Vehicles after Blocking starts (Blocking = 87% of the time) Maximum Queue Peak Hour queue volumes Lane volume/cycle Peak Hour lane volume
PHASE A Vol. = 820 B = 180 C = 1030 TOTAL = 2030 V/C = 1.07 (not Critical)		PHASE AB Vol. = 1230 C = 1030		Calc. by SHK June 13, 1985 6/15/85								
		> TOTAL = 2260 < > V/C = 1.19 <										

<p>PHASE A</p>  <p>CRITICAL VOLUME = 800</p>	↑	↑	↗	<p>Lane Capacity = 1900 cars/hour Vehicle Density = 21 ft./car Cycle Length = 120 or 30 /hour Peak Hour Demand Volumes Average Volumes on each cycle Shared Lane Split (Estimated) Blocking Distance</p> <hr/> <p>Vehicles until Blocking starts Vehicles after Blocking starts (Blocking = 5 % of the time) Maximum Queue Peak Hour queue volumes Lane volume/cycle Peak Hour lane volume</p>
	1560 52.0 100%	85% 410'	110 3.7 15%	
	28.7 wait 2.8 wait 31.5 940 31.5 940	19.5 wait 1.9 wait 21.7 650 25.1 750	3.4 flow 0.3 wait 21.7 650 25.1 750	
<p>PHASE AB</p>  <p>CRITICAL VOLUME = 1170</p>	↙	↑	↑	<p>Vehicle Density = 21 ft./car Cycle Length = 120 or 30 /hour Peak Hour Demand Volumes Average Volumes on each cycle Shared Lane Split (Estimated) Blocking Distance</p> <hr/> <p>Vehicles until Blocking starts (Left turn slot blocked) Vehicles after Blocking starts (Blocking = 70% of the time) Maximum Queue for Left turn Peak Hour queue volumes</p>
	180 6.0 15% 300'	2130 71.0 85% (300')	100% -	
	2.5 wait 3.5 wait 37.8 * 1135 *	14.3 wait 20.0 wait 40.1 1205	16.7 wait 23.4 wait 40.1 1205	
<p>PHASE C</p>  <p>CRITICAL VOLUME = 190</p>	↙	↙	↗	<p>Vehicle Density = 21 ft./car Cycle Length = 120 or 30 /hour Peak Hour Demand Volumes Average Volumes on each cycle Shared Lane Split (Estimated) Blocking Distance</p> <hr/> <p>Vehicles until Blocking starts Vehicles after Blocking starts (Blocking = 12% of the time) Maximum Queue Peak Hour queue volumes Lane volume/cycle Peak Hour lane volume</p>
	300 10.0 100%	15% 60'	560 18.7 85%	
	5.9 wait 0.8 wait 6.7 200 12.1 360	2.9 wait 0.4 wait 5.6 170 22.0 660	16.4 flow 2.3 wait 16.4 170 22.0 660	
<p>PHASE A Vol. = 800 B = 180 C = 190 TOTAL = 1170 V/C = 0.62 (not Critical)</p>		<p>PHASE AB Vol. = 1170 C = 190</p>		<p>Calc. by SHK June 13, 1985</p>
		<p>> TOTAL = 1360 < > V/C = 0.72 <</p>		

ALEWIFE + RINDGE Ave.




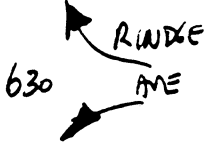


QUEUING & CAPACITY

BOTH INTERIM ACCESS CONstrained
and NO BUILD -120 1987 AM

<p>PHASE A</p>  <p>CRITICAL VOLUME = 1250</p>	<table border="1"> <tr> <td style="text-align: center;">↖</td> <td style="text-align: center;">↑</td> <td style="text-align: center;">↑</td> </tr> <tr> <td style="text-align: center;">230 7.7 60% 40% +4.3 already in turn</td> <td style="text-align: center;">1400 46.7 100%</td> <td style="text-align: center;">1400 46.7 100%</td> </tr> <tr> <td style="text-align: center;">7.7 wait 30.4 wait 50.8 -</td> <td style="text-align: center;">5.1 flow 20.4 wait</td> <td style="text-align: center;">41.7 flow 41.7 wait 41.7 1250</td> </tr> </table>	↖	↑	↑	230 7.7 60% 40% +4.3 already in turn	1400 46.7 100%	1400 46.7 100%	7.7 wait 30.4 wait 50.8 -	5.1 flow 20.4 wait	41.7 flow 41.7 wait 41.7 1250	<p>Lane Capacity = 1900 veh/hour Vehicle Density = 21 ft./car Cycle Length = 120 or 30 /hour Peak Hour Demand Volumes Average Volumes on each cycle Shared Lane Split (Estimated) slot (from Rindge)</p> <hr/> <p>Vehicles until Blocking starts 4-cycles of Vehicles in Left L. (Blockage = 37% of the time) Maximum Queue Peak Hour queue volumes Left Lane blocked 80% of time Right lane flows 100% of time</p>
↖	↑	↑									
230 7.7 60% 40% +4.3 already in turn	1400 46.7 100%	1400 46.7 100%									
7.7 wait 30.4 wait 50.8 -	5.1 flow 20.4 wait	41.7 flow 41.7 wait 41.7 1250									
<p>PHASE B</p> <p>With present signal timing, about 12 sec. of all-red clear or 190 veh/hr. In 1987, CLV = 360. (See C-1)</p> <p>CRITICAL VOLUME = 360 (WITH EXISTING ALL RED CLEAR PHASE)</p>	<table border="1"> <tr> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td></td> <td></td> </tr> </table>							<p>Vehicle Density = 21 ft./car Cycle Length = 120 or 30 /hour</p>			
<p>PHASE C</p>  <p>CRITICAL VOLUME = 360</p>	<table border="1"> <tr> <td></td> <td style="text-align: center;">↖</td> <td style="text-align: center;">↑</td> </tr> <tr> <td></td> <td style="text-align: center;">660 22.0</td> <td style="text-align: center;">660 22.0</td> </tr> <tr> <td></td> <td style="text-align: center;">730 360</td> <td style="text-align: center;">360</td> </tr> </table>		↖	↑		660 22.0	660 22.0		730 360	360	<p>Vehicle Density = 21 ft./car Cycle Length = 120 or 30 /hour Peak Hour Demand Volumes Average Volumes on each cycle</p> <p>No Blocking of turns; narrow lanes and slow turn speeds result in 10% less lane capacity (from field measurements).</p> <p>Adjusted Peak Hour volumes Each Lane</p>
	↖	↑									
	660 22.0	660 22.0									
	730 360	360									
<p>PHASE A Vol. = 1250 B = 360 C = 360 TOTAL = 1970 V/C = 1.03</p>		<p>Calc. by SHK Checked: SHK 6-13-85</p>									

ALEWIFE + RINDGE Ave.

QUEUING & CAPACITY

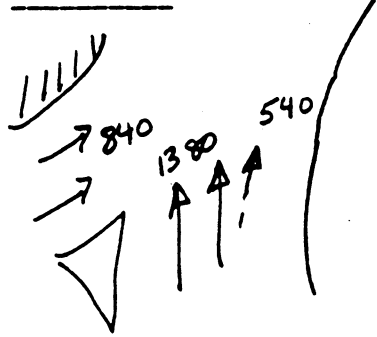
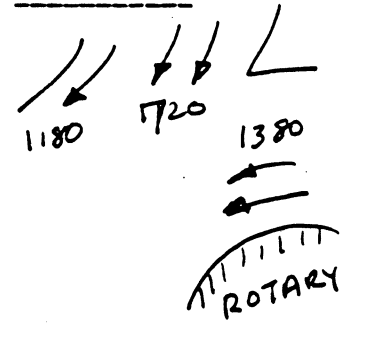
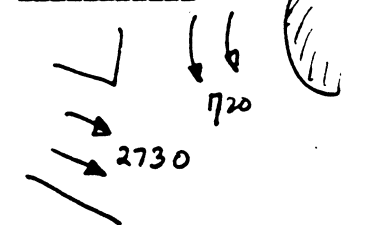
<p>PHASE A</p>  <p>CRITICAL VOLUME = 1020</p>		 2040 68.0 68.0 34.0 34.0 1020 1020	 2040 68.0 68.0 34.0 34.0 1020 1020	<p>Lane Capacity = 1900 veh/hour Vehicle Density = 21 ft./car Cycle Length = 120 or 30 /hour Peak Hour Demand Volumes Average Volumes on each cycle</p> <hr/> <p>Vehicles from Rindge Avenue NO BLOCKAGE Maximum Queue Peak Hour queue volumes</p>
<p>PHASE B</p> <p>CRITICAL VOLUME = 320</p>				<p>Vehicle Density = 21 ft./car Cycle Length = 120 or 30 /hour</p> <p>With present signal timing, about 12-seconds of all-red-clear is used — or 190 veh/hour equivalent. In 1987, the CLV = 180 or 6 cars per cycle (see A-2) SOLUTION : Because there is extra capacity, insert a REGULAR PEDESTRIAN PHASE as Phase B (20 sec.) $20/120 \times 1900 = 320$ vph equivalent</p> <p>Pedestrian Phase/All Red Clear</p>
<p>PHASE C</p>  <p>CRITICAL VOLUME = 340</p>		 630 21.0 No Blocking of turns; narrow lanes and slow turn speeds result in 10% less lane capacity (measured) . 690 340 340	 630 21.0 No Blocking of turns; narrow lanes and slow turn speeds result in 10% less lane capacity (measured) . 690 340 340	<p>Vehicle Density = 21 ft./car Cycle Length = 120 or 30 /hour Peak Hour Demand Volumes Average Volumes on each cycle</p> <p>Adjusted Peak Hour volumes Each Lane</p>
<p>PHASE A Vol. = 1020 B = 320 C = 340 TOTAL = 1680 V/C = 0.88 with Pedestrian Phase/All Red Clear</p> <p style="text-align: center;">SAME AS UNCONSTRAINED</p>				<p>Calc. by SHK Checked: SHK 6-11-85</p>

ROUTE 2 ROTARY/ALEWIFE

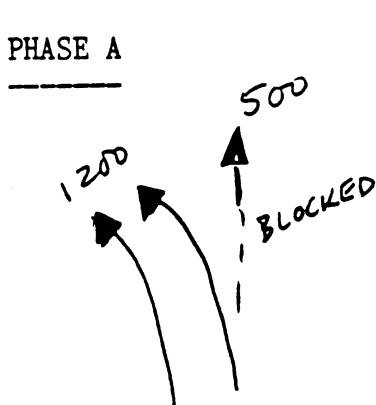



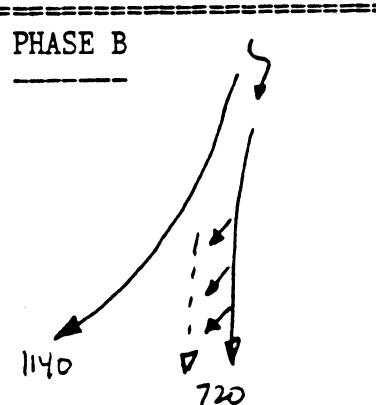



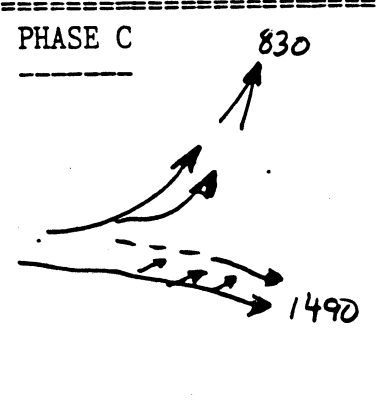



QUEUEING/CAPACITY

NO BUILD

1987 AM CONSTRAINED

EAST WEAVE	↑	↑↑	↑	Lane Capacity = 1900 veh/hour Vehicle Density = 21 ft./car Cycle Length = 60 or 60 /hour Peak Hour Demand Volumes Average Volumes per cycle Shared Lane Split (Estimated) Blocking Distance
 <p>CRITICAL VOLUME = 850 CRITICAL VOLUME = 420</p>	<p>1380 23.0 100%</p> <p>5.9 wait 8.1 wait 14.0 850</p>	<p>540 9.0 50%</p> <p>3.8 wait 5.2 wait 14.2 850</p>	<p>540 9.0 50%</p> <p>3.8 lane3 5.2 lane2</p>	<p>NO CHANGE FROM UNCONSTRAINED CASE</p> <hr/> <p>Vehicles until Lane 3 Blocked</p> <p>Vehicles in two lanes only</p> <p>Maximum Queue Peak Hour queuing volumes</p>
NORTH WEAVE	↑	↑↑	↑	Lane Capacity = 1900 veh/hour Vehicle Density = 21 ft./car Cycle Length = 60 or 60 /hour Peak Hour Demand Volumes Average Volumes per cycle Shared Lane Split (Estimated) Blocking Distance
 <p>CRITICAL VOLUME = 740 CRITICAL VOLUME = 690</p>	<p>720 12.0 100%</p> <p>12.0 + 12.6 wait 12.3 740</p>	<p>1180 19.7 10%</p> <p>12.6 12.3 740</p>	<p>1180 19.7 90%</p> <p>7.1 lane3 12.6 lane2</p>	<p>150' 150'</p> <p>Vehicles until Lane 3 Blocked</p> <p>Vehicles queueing in 2-lanes</p> <p>Maximum Queue Peak Hour queuing volumes</p>
SOUTH WEAVE	↑	↑	↑	Lane Capacity = 1900 veh/hour Vehicle Density = 21 ft./car Cycle Length = 60 or 60 /hour Peak Hour Demand Volumes Average Volume per cycle Blocking Distance Estimated Lane Distribution
 <p>CRITICAL VOLUME = 360 CRITICAL VOLUME = 1360</p>	<p>720 12.0 150'</p> <p>6.0 wait 360</p>	<p>720 12.0 100'</p> <p>4.0 wait 240</p>	<p>100' 50'</p> <p>2.0 lane3 120</p>	<p>Vehicle distribution (est). Peak Hour queuing volumes</p>
<p>EAST WEAVE PHASE A Vol. = 850 B = 420 TOTAL = 1270 V/C = 0.67</p>	<p>NORTH WEAVE PHASE A Vol. = 740 B = 690 TOTAL = 1430 V/C = 0.75</p>	<p>SOUTH WEAVE PHASE A Vol. = 360 B = 1360 TOTAL = 1720 V/C = 0.91</p>	<p>Calc by SHK Checked SHK 6-12-85</p>	

ROUTE 2/ALEWIFE SIGNAL QUEUEING/CAPACITY INTERIM ACCESS 1987 AM CONSTRAINED

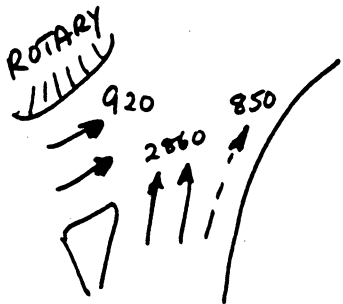
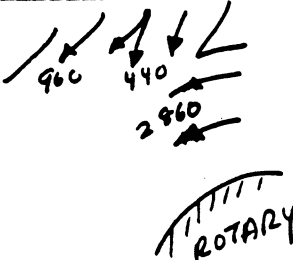
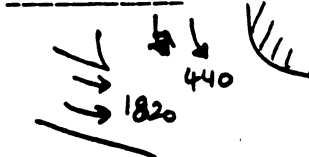
<p>PHASE A</p>  <p>CRITICAL VOLUME = 660</p>	 1200 40.0 100% 17.4 wait 6.0 wait 23.4 700 23.4 700	 500 16.7 50% 260' 12.4 wait 4.3 wait 21.0 630 33.4 1000	 500 16.7 50% 12.4 flow 4.3 wait 21.0 630 33.4 1000	<p>Lane Capacity = 1900 veh/hour Vehicle Density = 21 ft./car Cycle Length = 120 or 30 /hour Peak Hour Demand Volumes Average Volumes on each cycle Shared Lane Split (Estimated) Blocking Distance</p> <hr/> <p>Vehicles until Blocking starts Vehicles after Blocking starts (25% of phase) Maximum Queue Peak Hour queuing volumes Lane volume/cycle Peak Hour lane volume</p>
<p>PHASE B</p>  <p>CRITICAL VOLUME = 510</p>	 720 24.0 100% 15.7 wait 17.0 510 17.0 510	 1140 38.0 10% 200' 7.1 wait 1.4 ←-1.3 40.7 1270 47.8 1430	 1140 38.0 90% 280 13.3 lane3 24.7 lane2 12.8 33.9 flow 33.9 flow	<p>Vehicle Density = 21 ft./car Cycle Length = 120 or 30 /hour Peak Hour Demand Volumes Average Volumes on each cycle Shared Lane Split (Estimated) Blocking Distance</p> <hr/> <p>Vehicles until Blocking starts (3/4 x 9.5 = 7.1 full) Vehicles after Blocking starts (thru cars in Right T. Queue thru cars in Right T. Queue Maximum Queue (60% blocking) Peak Hour queuing volumes Lane volume/cycle Peak Hour lane volume</p>
<p>PHASE C</p>  <p>CRITICAL VOLUME = 980</p>	 830 27.7 90% 160' 7.6 wait 20.1 wait 29.9 980	 10% 0.8 flow 2.2 wait	 1490 49.7 100% 320' 12.8 flow 33.9 flow	<p>Vehicle Density = 21 ft./car Cycle Length = 120 or 30 /hour Peak Hour Demand Volumes Average Volumes on each cycle Shared Lane Split (Estimated) Blocking Distance</p> <hr/> <p>Vehicles until Blocking starts Vehicles after Blocking starts (70% of phase) Maximum Queue for Left turn Peak Hour queuing volumes</p> <p align="center">NO CHANGE FROM UNCONSTRAINED CASE</p>
<p>CENTER SIGNAL</p> <p>PHASE A Vol. = 660 B = 510 C = 980 TOTAL = 2150 V/C = 1.13 V/C = 1.18 with 0.05 for all-red clear</p>	<p>EAST SIGNAL</p> <p>A Vol. = 250 A' = 320 TOTAL = 570 V/C = 0.30</p>	<p>WEST SIGNAL</p> <p>A Vol. = 660 B' = 1270 TOTAL = 1930 V/C = 1.02</p>	<p>SOUTH SIGNAL</p> <p>B Vol. = 510 C = 850 TOTAL = 1360 V/C = 0.72</p>	<p>Calc by SHK Checked SHK 6-12-85</p>

ROUTE 2 ROTARY/ALEWIFE

QUEUEING & CAPACITY

NO BUILD

1987 PM

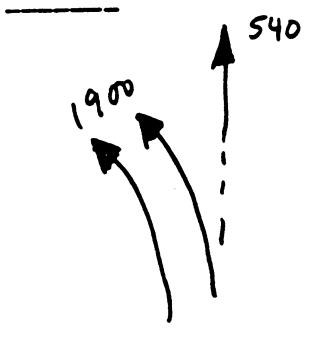
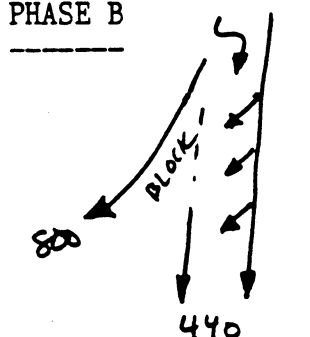
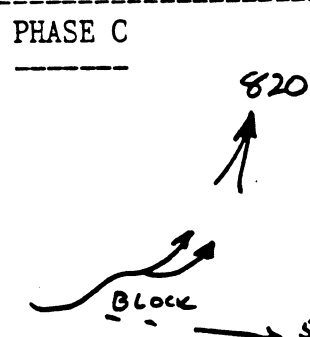
<p>EAST WEAVE</p>  <p>CRITICAL VOLUME = 1780 CRITICAL VOLUME = 460</p>	<p>↑</p> <p>2860 47.6 100%</p> <p>5.2 wait 25.4 wait 30.6 1840</p>	<p>↑</p> <p>55% 60'</p> <p>2.9 wait 14.3 wait 28.9 1730</p>	<p>↗</p> <p>850 14.1 45%</p> <p>2.4 lane3 11.7 lane2</p>	<p>Lane Capacity = 1900 veh/hour Vehicle Density = 21 ft./car Cycle Length = 60 or 60 /hour Peak Hour Demand Volumes Average Volumes per cycle Shared Lane Split (Estimated) Blocking Distance</p> <hr/> <p>Vehicles until Lane 3 Blocked</p> <p>Vehicles in two lanes only</p> <p>Maximum Queue Peak Hour queuing volumes</p>
<p>NORTH WEAVE</p>  <p>CRITICAL VOLUME = 490 CRITICAL VOLUME = 1600</p>	<p>↑</p> <p>440 7.3</p> <p>7.3 + wait 8.1 490 2860 5 12 cars, 35.6 cars, 47.6 cars,</p>	<p>↗</p> <p>150'</p> <p>8.9 8.9 lane2 8.1 490 or 47.6/cyc 4 2.4 lanes, 2860/1770 = 1.6 lanes, average 1.8 lanes, clv = 1600</p>	<p>↑</p> <p>960 16.0 150'</p> <p>7.1 8.9 lane2</p>	<p>Vehicle Density = 21 ft./car Cycle Length = 60 or 60 /hour Peak Hour Demand Volumes Average Volumes per cycle Blocking Distance</p> <hr/> <p>Vehicles until Lane 3 Blocked Vehicles queueing in 2-lanes</p> <p>Maximum Queue Peak Hour queuing volumes Peak Hour Demand Volume Initial Queue Distribution 1/4 of volume 3/4 of volume</p>
<p>SOUTH WEAVE</p>  <p>CRITICAL VOLUME = 220 CRITICAL VOLUME = 910</p>	<p>↑</p> <p>440 7.3</p> <p>2.6 wait 220</p>	<p>↑</p> <p>2.6 wait 220</p>	<p>-</p> <p>-</p>	<p>Vehicle Density = 21 ft./car Cycle Length = 60 or 60 /hour Peak Hour Demand Volumes Average Volume per cycle</p> <hr/> <p>Vehicles queueing in 2 lanes</p> <p>Peak Hour queuing volumes</p>
<p>EAST WEAVE</p> <p>PHASE A Vol. = 460 B = 1780</p> <p>TOTAL = 2240 V/C = 1.18</p>	<p>NORTH WEAVE</p> <p>PHASE A Vol. = 1600 B = 490</p> <p>TOTAL = 2090 V/C = 1.10</p>	<p>SOUTH WEAVE</p> <p>PHASE A Vol. = 220 B = 910</p> <p>TOTAL = 1180 V/C = 0.62</p>	<p>Calc by SHK Checked SHK 6-16-85</p>	

ROUTE 2/ALEWIFE SIGNAL

QUEUEING & CAPACITY

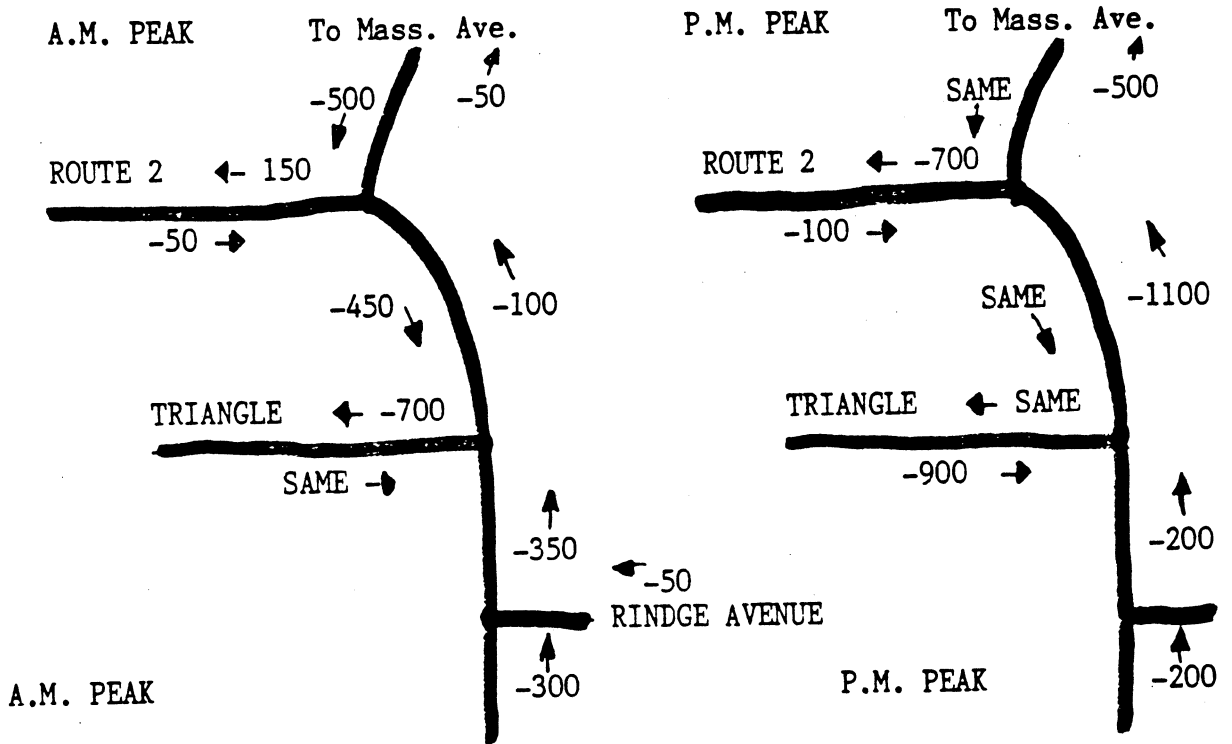
INTERIM ACCESS

1987 PM

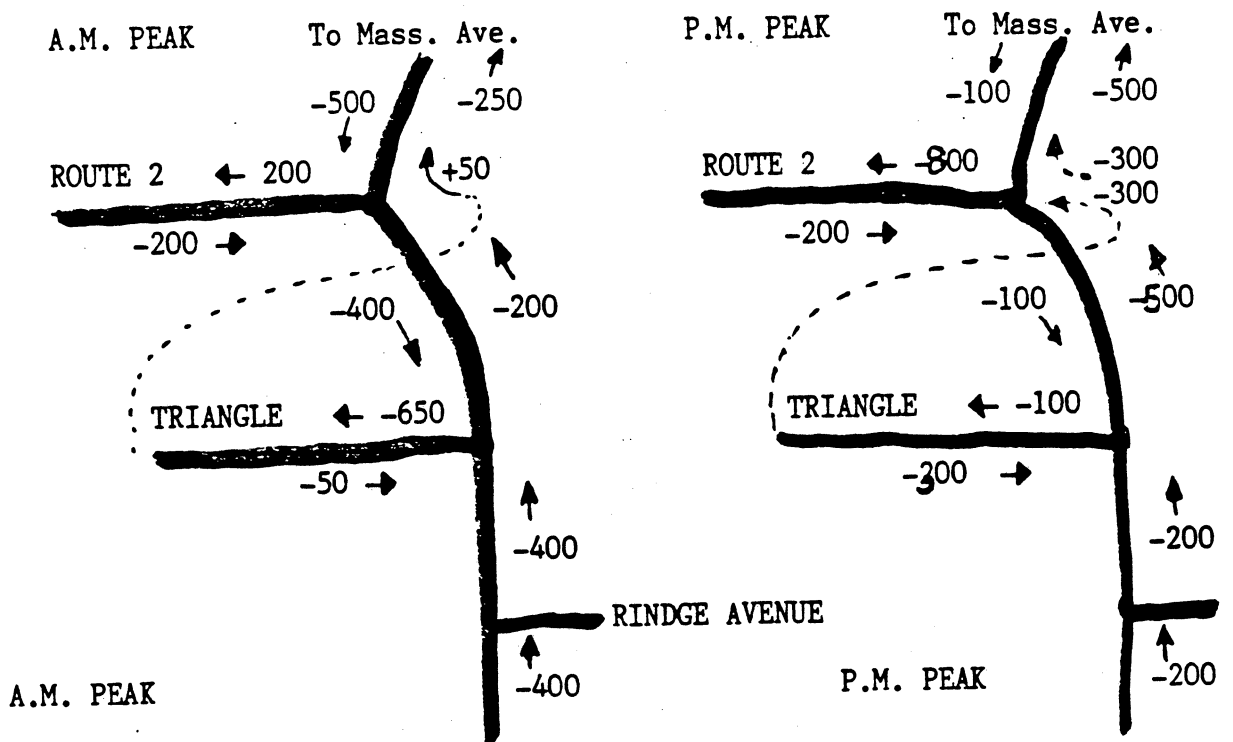
PHASE	Diagram	Left Lane	Center Lane	Right Lane	Notes
PHASE A  <p>CRITICAL VOLUME = 1090</p>	1900 63.3 100% 16.8 wait 19.6 wait 36.4 1090 36.4 1090	540 18.0 60% 260' 12.4 wait 14.5 wait 36.6 1100 44.9 1350	540 18.0 40% 8.3 flow 9.7 wait 36.6 1100 44.9 1350	Lane Capacity = 1900 veh/hour Vehicle Density = 21 ft./car Cycle Length = 120 or 30 /hour Peak Hour Demand Volumes Average Volumes on each cycle Shared Lane Split (Estimated) Blocking Distance Vehicles until Blocking starts Vehicles after Blocking starts (25% of phase) Maximum Queue Peak Hour queuing volumes Lane volume/cycle Peak Hour lane volume	
PHASE B  <p>CRITICAL VOLUME = 260</p>	800 14.7 100% 7.1 wait 8.6 260 8.6 260	440 14.7 10% 200' 6.3 wait 1.5 26.7 - 4 800 28.2 850	800 26.7 90% 280 13.3 lane3 13.4 lane2 800 850	Vehicle Density = 21 ft./car Cycle Length = 120 or 30 /hour Peak Hour Demand Volumes Average Volumes on each cycle Shared Lane Split (Estimated) Blocking Distance Vehicles until Blocking starts (3/4 x 8.5 = 6.3 shift lanes) Vehicles after Blocking starts (thru cars in Right T. Queue (50% blocking)) Maximum Queue Peak Hour queuing volumes Lane volume/cycle Peak Hour lane volume	
PHASE C  <p>CRITICAL VOLUME = 880</p>	820 27.3 90% 160' 7.6 wait 19.7 wait 29.2 880	530 10% 0.8 flow 2.2 lane1 530	1230 41.0 100% 320' 10.6 flow 27.4 flow 700	Vehicle Density = 21 ft./car Cycle Length = 120 or 30 /hour Peak Hour Demand Volumes Average Volumes on each cycle Shared Lane Split (Estimated) Blocking Distance Vehicles until Blocking starts Vehicles after Blocking starts (70% of phase) Maximum Queue for Left turn Peak Hour queuing volumes (3/4 x 700 + 700 = 1230)	
CENTER SIGNAL PHASE A Vol. = 1130 B = 260 C = 880 TOTAL = 2270 V/C = 1.19 V/C = 1.24 (incl. 0.05 All-Red-Clear)	EAST SIGNAL A Vol. = 270 A' = 1130 TOTAL = 1400 V/C = 0.74	WEST SIGNAL A Vol. = 800 B' = 1130 TOTAL = 1930 V/C = 1.02 (No change)	SOUTH SIGNAL B Vol. = 260 C = 700 TOTAL = 960 V/C = 0.81 (No Change)	Calc by SHK 6-11-85 Checked SHK 6-12-85	

APPENDIX D CALCULATIONS OF QUEUES AND V/C RATIOS
 FOR FULLY CONSTRAINED 1987 AM + PM DEMAND VOLUMES

EXISTING OR NO-BUILD ROAD SYSTEM



INTERIM ACCESS ROAD SYSTEM

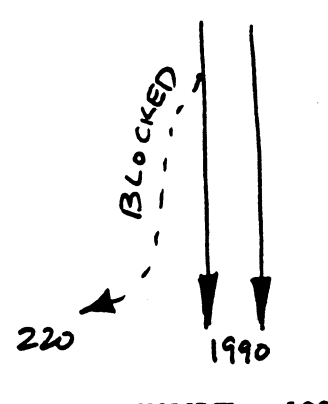
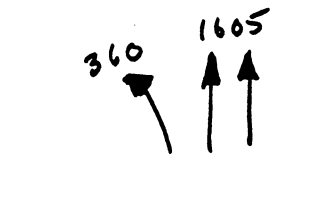
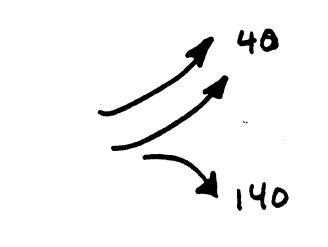


ALEWIFE and TRIANGLE ROAD

QUEUES/CAPACITY

===== FULLY CONSTRAINED
NO BUILD 1987 AM

PHASE	Diagram	Left Lane	Middle Lane	Right Lane	Notes
PHASE A	<p>Diagram: T-intersection with a blocked left lane. Lane capacity is 1900. Demand volumes are 1390 (left), 1990 (middle), and 1390 (right).</p>	<p>1990 66.3 100%</p>	<p>21% 410'</p>	<p>1390 46.3 79%</p>	<p>Lane Capacity = 1900 cars/hour Vehicle Density = 21 ft./car Cycle Length = 120 or 30 /hour Peak Hour Demand Volumes Average Volumes on each cycle Shared Lane Split (Approach) Blocking Distance</p> <hr/> <p>Vehicles until Blocking begins at 19.5 (half of block due to lane shifting, estimate) Vehicles after Blocking begins (Blockage occurs) Maximum Queue Peak Hour queue volumes Lane volume/cycle Peak Hour lane volume(Max.1900)</p>
	<p>CRITICAL VOLUME = 1330</p>	<p>43.0 -9.8 wait 11.0 wait 44.2 1330 54.0 1620</p>	<p>9.8 +9.8 wait 2.5 wait 31.5 950 58.6 1760</p>	<p>36.9 - flow 9.4 wait -</p>	
PHASE B	<p>Diagram: Left turn lane with a blocked slot. Lane capacity is 360. Demand volumes are 360 (left) and 1605 (middle).</p>	<p>360 12.0 250'</p>	<p>1605 53.5 (250')</p>	<p>-</p>	<p>Vehicle Density = 21 ft./car Cycle Length = 120 or 30 /hour Peak Hour Demand Volumes Average Volumes on each cycle Blocking Distance of slot</p> <hr/> <p>Vehicles until Blocking Starts (Left Turn Slot filled) (Left Turn Slot length limits capacity to 360 compared with the 1987 demand of 630. The remaining 270 cars could not make it past Rindge Ave. Signal.)</p>
	<p>CRITICAL VOLUME = 360</p>	<p>12.0 wait -</p>	<p>53.5 flow -</p>	<p>53.5 flow -</p>	
PHASE C	<p>Diagram: Right turn lane with a blocked lane. Lane capacity is 370. Demand volumes are 370 (left) and 140 (right).</p>	<p>370 12.3 100%</p>	<p>50% 60'</p>	<p>140 4.7 50%</p>	<p>Vehicle Density = 21 ft./car Cycle Length = 120 or 30 /hour Peak Hour Demand Volumes Average Volumes on each cycle Shared Lane Split (Estimated) Blocking Distance</p> <hr/> <p>Vehicles until Blocking starts Vehicles after Blocking starts (blockage is 40% of the time) Maximum Queue Peak Hour queue volumes Lane volume/cycle Peak Hour lane volume</p>
	<p>CRITICAL VOLUME = 220</p>	<p>4.8 wait 3.0 wait 7.8 235 7.8 235</p>	<p>2.9 wait 1.8 wait 6.5 195 9.4 280</p>	<p>2.9 flow 1.8 wait -</p>	
<p>PHASE A Vol. = 1330 B = 360 .. Constrained Volumes C = 220 TOTAL = 1910 V/C = 1.01</p>					<p>Calc. by SHK June 16, 1985</p>
<p>Right lane of 1760 has V/C = 0.93</p>					

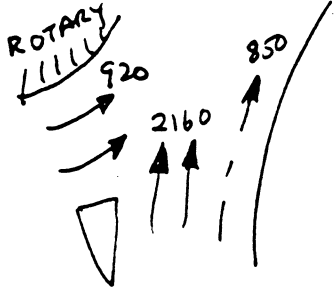


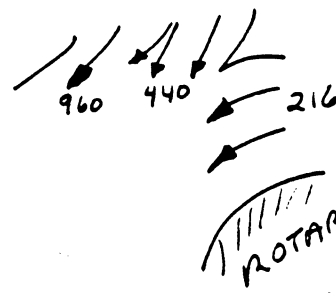


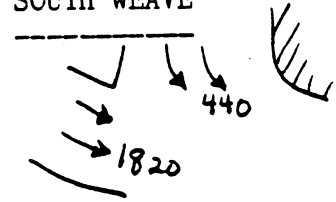


<p>PHASE A</p>  <p>CRITICAL VOLUME = 1030</p>	<p>↑</p> <p>1990 66.3 100%</p> <p>24.8 wait 12.2 wait 37.0 1110 37.0 1110</p>	<p>↑</p> <p>80% 410'</p> <p>19.5 wait 9.6 wait 31.5 950 36.4 1090</p>	<p>↗</p> <p>220 7.3 20%</p> <p>4.9 flow 2.4 wait - - -</p>	<p>Lane Capacity = 1900 cars/hour Vehicle Density = 21 ft./car Cycle Length = 120 or 30 /hour Peak Hour Demand Volumes Average Volumes on each cycle Shared Lane Split (Estimated) Blocking Distance</p> <hr/> <p>Vehicles until Blocking starts</p> <p>Vehicles after Blocking starts (blocking = 30% of the time) Maximum Queue Peak Hour queue volumes Lane volume/cycle Peak Hour lane volume</p>
<p>PHASE B</p>  <p>CRITICAL VOLUME = 360</p>	<p>↖</p> <p>360 12.0 250'</p> <p>12.0 wait Left Turn Slot</p>	<p>↑</p> <p>1605 53.5 (250')</p> <p>53.5 flow Left Turn Slot</p>	<p>↑</p> <p>-</p>	<p>Vehicle Density = 21 ft./car Cycle Length = 120 or 30 /hour Peak Hour Demand Volumes Average Volumes on each cycle Blocking Distance of slot</p> <hr/> <p>Vehicles until Blocking Starts (Left Turn Slot filled) Left Turn Slot limits Left turns to 360/hour</p>
<p>PHASE C</p>  <p>CRITICAL VOLUME = 20</p>	<p>↖</p> <p>40 1.3 100%</p> <p>0.7 wait</p>	<p>↖</p> <p>60'</p> <p>0.6 wait</p>	<p>↗</p> <p>140 4.7</p> <p>4.7 flow</p>	<p>Vehicle Density = 21 ft./car Cycle Length = 120 or 30 /hour Peak Hour Demand Volumes Average Volumes on each cycle Shared Lane Split (Estimated) Blocking Distance</p> <hr/> <p>Vehicles until Blocking starts</p> <p>NO BLOCKING OCCURS</p>
<p>PHASE A Vol. = 1030 B = 360 ... Constrained by Turn Slot length C = 20 TOTAL = 1410 V/C = 0.74</p>				<p>Calc. by SHK June 16, 1985</p>

PHASE A		←	←	↗	Lane Capacity = 1900 veh/hour Vehicle Density = 21 ft./car Cycle Length = 120 or 30 /hour Peak Hour Demand Volumes Average Volumes on each cycle Shared Lane Split (Estimated) Blocking Distance			
<p>CRITICAL VOLUME = 850</p>	1400		740					
	46.6		24.7					
	100%	45%	55%					
		260'						
	16.3	12.4	15.2		Vehicles until Blocking starts			
	wait	wait	flow					
	10.2	7.8	9.5		Vehicles after Blocking starts (40% of phase)			
	wait	wait	wait					
	26.5	29.7			Maximum Queue			
	800	890			Peak Hour queuing volumes			
	26.5	44.9			Lane volume/cycle			
	800	1350			Peak Hour lane volume			
PHASE B		←	←	↗	Vehicle Density = 21 ft./car Cycle Length = 120 or 30 /hour Peak Hour Demand Volumes Average Volumes on each cycle Shared Lane Split (Estimated) Blocking Distance			
<p>CRITICAL VOLUME = 200</p>	340		800					
	11.4		26.7					
	100%	5%	95%					
		200'	280					
	6.0	4.5	13.3		Vehicles until Blocking starts (3/4 x 6.0 = 4.5 shift lanes)			
	wait	wait	lane3					
	0.8	13.4			Vehicles after Blocking starts (thru cars in Right T. Queue)			
	wait <-0.8	1 lane2			Maximum Queue (50% blocking)			
	6.8	26.7			Peak Hour queuing volumes			
	200	800			Lane volume/cycle			
	11.3	27.5			Peak Hour lane volume			
	340	830						
PHASE C		←	↑	↑	Vehicle Density = 21 ft./car Cycle Length = 120 or 30 /hour Peak Hour Demand Volumes Average Volumes on each cycle Shared Lane Split (Estimated) Blocking Distance			
<p>CRITICAL VOLUME = 780</p>	720		1230					
	24.0		41.0					
	90%	10%	100%					
	160'		320'					
	7.6	0.8	10.6		Vehicles until Blocking starts			
	wait	flow	flow					
	16.4	2.2	27.4		Vehicles after Blocking starts (70% of phase)			
	wait	lane1	flow		Maximum Queue for Left turn			
	25.9				Peak Hour queuing volumes (3/4 x 700 + 700 = 1230)			
	780	530	700					
CENTER SIGNAL		EAST SIGNAL		WEST SIGNAL		SOUTH SIGNAL		Calc by SHK 6-16-85 Checked SHK 6-17-85
PHASE A Vol. = 850		A Vol. = 370		A Vol. = 850		B Vol. = 200		
B = 200		A' = 830		B' = 830		C = 700		
C = 780		TOTAL = 1200		TOTAL = 1680		TOTAL = 900		
TOTAL = 1830		V/C = 0.63		V/C = 0.88		V/C = 0.47		
V/C = 0.96		(No change)		(No change)		(No Change)		
V/C = 1.01 (incl. 0.05 All-Red-Clear)								

ROUTE 2 ROTARY/ALEWIFE

QUEUEING & CAPACITY

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<p>EAST WEAVE</p>  <p>CRITICAL VOLUME = 1490 CRITICAL VOLUME = 410</p>	 2160 36.0 100% 4.9 wait 19.1 wait 24.0 1440	 850 14.2 50% 60' 2.9 wait 11.3 wait 25.5 1530	<p>Lane Capacity = 1900 veh/hour Vehicle Density = 21 ft./car Cycle Length = 60 or 60 /hour Peak Hour Demand Volumes Average Volumes per cycle Shared Lane Split (Estimated) Blocking Distance</p> <hr/> <p>Vehicles until Lane 3 Blocked</p> <p>Vehicles in two lanes only</p> <p>Maximum Queue Peak Hour queuing volumes</p>
<p>NORTH WEAVE</p>  <p>CRITICAL VOLUME = 490</p> <p>CRITICAL VOLUME = 1140</p>	 440 7.3 7.3 + 8.9 wait 8.1 490 2860 5	 960 16.0 150' 8.9 8.1 490 or 47.6/cyc 4	<p>Vehicle Density = 21 ft./car Cycle Length = 60 or 60 /hour Peak Hour Demand Volumes Average Volumes per cycle Blocking Distance</p> <hr/> <p>Vehicles until Lane 3 Blocked Vehicles queueing in 2-lanes</p> <p>Maximum Queue Peak Hour queuing volumes Peak Hour Demand Volume Initial Queue Distribution 12 cars, 2.4 lanes, 1/3 of volume 24.0 cars, 2160/1380 = 1.6 lanes, 2/3 of volume 36.0 cars, average 1.9 lanes, clv = 1140</p>
<p>SOUTH WEAVE</p>  <p>CRITICAL VOLUME = 220 CRITICAL VOLUME = 910</p>	 440 7.3 2.6 wait 220	 440 7.3 2.6 wait 220	<p>Vehicle Density = 21 ft./car Cycle Length = 60 or 60 /hour Peak Hour Demand Volumes Average Volume per cycle</p> <hr/> <p>Vehicles queueing in 2 lanes</p> <p>Peak Hour queuing volumes</p>
<p>EAST WEAVE</p> <p>PHASE A Vol. = 410 B = 1490</p> <p>TOTAL = 1900 V/C = 1.00</p>	<p>NORTH WEAVE</p> <p>PHASE A Vol. = 1140 B = 490</p> <p>TOTAL = 1630 V/C = 0.86</p>	<p>SOUTH WEAVE</p> <p>PHASE A Vol. = 220 B = 910</p> <p>TOTAL = 1180 V/C = 0.62</p>	<p>Calc by SHK Checked SHK 6-16-85</p>

ROUTE 2/ALEWIFE SIGNAL

QUEUEING/CAPACITY

INTERIM ACCESS

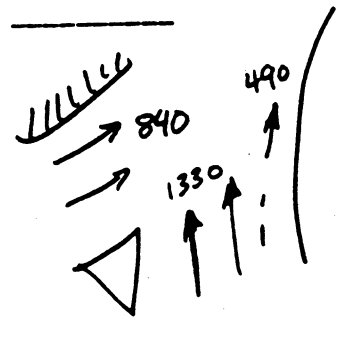
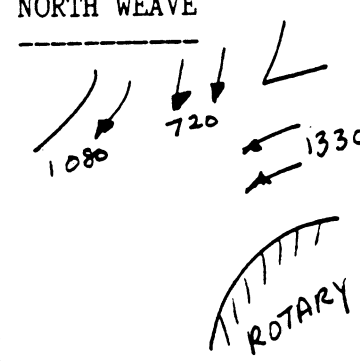
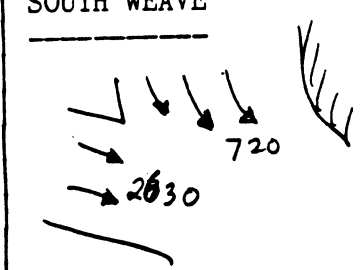
PHASE	Diagram	Left Lane	Middle Lane	Right Lane	Notes		
PHASE A		1100 36.3 100% 15.9 wait 4.6 wait 20.5 620 20.5 620	400 13.3 55% 12.4 wait 3.7 wait 19.1 570 29.4 880	400 13.3 45% 10.3 flow 3.0 wait 10.3 570 29.4 880	Lane Capacity = 1900 veh/hour Vehicle Density = 21 ft./car Cycle Length = 120 or 30 /hour Peak Hour Demand Volumes Average Volumes on each cycle Shared Lane Split (Estimated) Blocking Distance Vehicles until Blocking starts Vehicles after Blocking starts (25% of phase) Maximum Queue Peak Hour queuing volumes Lane volume/cycle Peak Hour lane volume		
CRITICAL VOLUME = 600							
PHASE B		720 24.0 100% 14.5 wait 15.7 470 16.9 510	1040 34.7 10% 7.1 wait 1.2 35.9 1080 43.0 1290	1040 34.7 90% 13.3 lane3 21.4 lane2 13.3 21.4 35.9 1080 43.0 1290	Vehicle Density = 21 ft./car Cycle Length = 120 or 30 /hour Peak Hour Demand Volumes Average Volumes on each cycle Shared Lane Split (Estimated) Blocking Distance Vehicles until Blocking starts (3/4 x 9.5 = 7.1 full) Vehicles after Blocking starts (thru cars in Right T. Queue) Maximum Queue (60% blocking) Peak Hour queuing volumes Lane volume/cycle Peak Hour lane volume		
CRITICAL VOLUME = 510							
PHASE C		630 21.0 90% 160' 7.6 wait 13.4 wait 22.8 680	10% 0.8 flow 1.8 wait 640	1490 49.7 100% 320' 12.8 flow 22.5 flow 850	Vehicle Density = 21 ft./car Cycle Length = 120 or 30 /hour Peak Hour Demand Volumes Average Volumes on each cycle Shared Lane Split (Estimated) Blocking Distance Vehicles until Blocking starts Vehicles after Blocking starts (60% of phase) Maximum Queue for Left turn Peak Hour queuing volumes		
CRITICAL VOLUME = 680							
CENTER SIGNAL PHASE A Vol. = 600 B = 510 C = 680 TOTAL = 1790 V/C = 0.94 V/C = 0.99 with 0.05 for all-red clear		EAST SIGNAL A Vol. = 200 A' = 320 TOTAL = 520 V/C = 0.27		WEST SIGNAL A Vol. = 660 B' = 860 TOTAL = 1520 V/C = 0.80		SOUTH SIGNAL B Vol. = 510 C = 850 TOTAL = 1360 V/C = 0.72	
Calc by SHK Checked SHK 6-16-85							

ROUTE 2 ROTARY/ALEWIFE

QUEUEING/CAPACITY



NO BUILD

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1987 AM

<p>EAST WEAVE</p>  <p>CRITICAL VOLUME = 760 CRITICAL VOLUME = 420</p>	<table border="1"> <thead> <tr> <th>←</th> <th>←</th> <th>←</th> </tr> </thead> <tbody> <tr> <td>1330</td> <td></td> <td>490</td> </tr> <tr> <td>22.1</td> <td></td> <td>8.2</td> </tr> <tr> <td>100%</td> <td>50%</td> <td>50%</td> </tr> <tr> <td></td> <td>80'</td> <td></td> </tr> <tr> <td>5.9</td> <td>3.8</td> <td>3.8</td> </tr> <tr> <td>wait</td> <td>wait</td> <td>lane3</td> </tr> <tr> <td>6.8</td> <td>4.4</td> <td>4.4</td> </tr> <tr> <td>wait</td> <td>wait</td> <td>lane2</td> </tr> <tr> <td>12.7</td> <td>12.6</td> <td></td> </tr> <tr> <td>760</td> <td>760</td> <td></td> </tr> </tbody> </table> <p align="center">NO CHANGE FROM UNCONSTRAINED CASE</p>	←	←	←	1330		490	22.1		8.2	100%	50%	50%		80'		5.9	3.8	3.8	wait	wait	lane3	6.8	4.4	4.4	wait	wait	lane2	12.7	12.6		760	760		<p>Lane Capacity = 1900 veh/hour Vehicle Density = 21 ft./car Cycle Length = 60 or 60 /hour Peak Hour Demand Volumes Average Volumes per cycle Shared Lane Split (Estimated) Blocking Distance</p> <hr/> <p>Vehicles until Lane 3 Blocked</p> <p>Vehicles in two lanes only</p> <p>Maximum Queue Peak Hour queuing volumes</p>
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<p>NORTH WEAVE</p>  <p>CRITICAL VOLUME = 690 CRITICAL VOLUME = 760</p>	<table border="1"> <thead> <tr> <th>←</th> <th>←</th> <th>←</th> </tr> </thead> <tbody> <tr> <td>720</td> <td></td> <td>1080</td> </tr> <tr> <td>12.0</td> <td></td> <td>18.0</td> </tr> <tr> <td>100%</td> <td>10%</td> <td>90%</td> </tr> <tr> <td></td> <td>150'</td> <td>150'</td> </tr> <tr> <td>12.0 + 10.9</td> <td></td> <td>7.1</td> </tr> <tr> <td>wait</td> <td></td> <td>lane3</td> </tr> <tr> <td>11.5</td> <td>11.5</td> <td>10.9</td> </tr> <tr> <td>690</td> <td>690</td> <td>lane2</td> </tr> </tbody> </table>	←	←	←	720		1080	12.0		18.0	100%	10%	90%		150'	150'	12.0 + 10.9		7.1	wait		lane3	11.5	11.5	10.9	690	690	lane2	<p>Lane Capacity = 1900 veh/hour Vehicle Density = 21 ft./car Cycle Length = 60 or 60 /hour Peak Hour Demand Volumes Average Volumes per cycle Shared Lane Split (Estimated) Blocking Distance</p> <hr/> <p>Vehicles until Lane 3 Blocked</p> <p>Vehicles queueing in 2-lanes</p> <p>Maximum Queue Peak Hour queuing volumes</p>						
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<p>SOUTH WEAVE</p>  <p>CRITICAL VOLUME = 360 CRITICAL VOLUME = 1310</p>	<table border="1"> <thead> <tr> <th>←</th> <th>←</th> <th>←</th> </tr> </thead> <tbody> <tr> <td></td> <td>720</td> <td></td> </tr> <tr> <td></td> <td>12.0</td> <td></td> </tr> <tr> <td>150'</td> <td>150'</td> <td>100'</td> </tr> <tr> <td>100'</td> <td></td> <td>50'</td> </tr> <tr> <td>6.0</td> <td>4.0</td> <td>2.0</td> </tr> <tr> <td>wait</td> <td>wait</td> <td>lane3</td> </tr> <tr> <td>360</td> <td>240</td> <td>120</td> </tr> </tbody> </table>	←	←	←		720			12.0		150'	150'	100'	100'		50'	6.0	4.0	2.0	wait	wait	lane3	360	240	120	<p>Lane Capacity = 1900 veh/hour Vehicle Density = 21 ft./car Cycle Length = 60 or 60 /hour Peak Hour Demand Volumes Average Volume per cycle Blocking Distance Estimated Lane Distribution</p> <hr/> <p>Vehicle distribution (est).</p> <p>Peak Hour queuing volumes</p>									
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<p>EAST WEAVE</p> <p>PHASE A Vol. = 760 B = 420</p> <p>TOTAL = 1180 V/C = 0.62</p>	<p>NORTH WEAVE</p> <p>PHASE A Vol. = 690 B = 760</p> <p>TOTAL = 1450 V/C = 0.76</p>	<p>SOUTH WEAVE</p> <p>PHASE A Vol. = 360 B = 1310</p> <p>TOTAL = 1670 V/C = 0.88</p>	<p>Calc by SHK Checked SHK 6-17-85 6-19-85</p>																																

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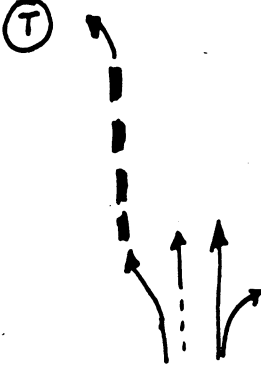
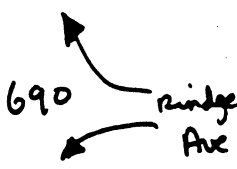
QUEUING & CAPACITY

<p>PHASE A</p> <hr/> <p style="text-align: center;">1840 ↑↑↑ PARKWAY</p> <p>CRITICAL VOLUME = 920</p>		 <p style="text-align: center;">1840 61.3</p> <hr/> <p style="text-align: center;">61.3</p> <p style="text-align: center;">30.7 30.6 920 920</p>	<p>Lane Capacity = 1900 veh/hour Vehicle Density = 21 ft./car Cycle Length = 120 or 30 /hour Peak Hour Demand Volumes Average Volumes on each cycle</p> <hr/> <p>Vehicles on Parkway, includes mixed left & right turns Maximum Queue Peak Hour queue volumes</p>
<p>PHASE B</p> <hr/> <p>CRITICAL VOLUME = 320</p>		<p>With present signal timing, about 12-seconds of all-red-clear is used — or 190 veh/hour equivalent. In 1987, the CLV = 180 or 6 cars per cycle (see A-2) SOLUTION : Because there is extra capacity, insert a REGULAR PEDESTRIAN PHASE as Phase B (20 sec.) $20/120 \times 1900 = 320$ vph equivalent</p>	<p>Vehicle Density = 21 ft./car Cycle Length = 120 or 30 /hour</p> <p>Pedestrian Phase/All Red Clear</p>
<p>PHASE C</p> <hr/> <p style="text-align: center;">630 ↖ ↗</p> <p>CRITICAL VOLUME = 340</p>		 <p style="text-align: center;">630 21.0</p> <p>No Blocking of turns; narrow lanes and slow turn speeds result in 10% less lane capacity (measured) .</p> <p style="text-align: center;">690 340 340</p>	<p>Vehicle Density = 21 ft./car Cycle Length = 120 or 30 /hour Peak Hour Demand Volumes Average Volumes on each cycle</p> <p>Adjusted Peak Hour volumes Each Lane</p>
<p>PHASE A Vol. = 920 B = 320 C = 340 TOTAL = 1580 V/C = 0.83 with Pedestrian Phase/All Red Clear</p>			<p>Calc. by SHK Checked: SHK 6-18-85</p>

ALEWIFE + RINDGE Ave.

QUEUING & CAPACITY

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<p>PHASE A</p>  <p>CRITICAL VOLUME = 850</p>	<table border="1"> <tr> <td style="text-align: center;">↙</td> <td style="text-align: center;">↑</td> <td style="text-align: center;">↗</td> </tr> <tr> <td style="text-align: center;">230 7.7 60% +4.3 already</td> <td style="text-align: center;">40%</td> <td style="text-align: center;">1000 33.3 100%</td> </tr> <tr> <td style="text-align: center;">7.7 wait 23.1 wait 38.4 -</td> <td style="text-align: center;">5.1 flow 15.3 wait</td> <td style="text-align: center;">28.2 flow 28.2 wait 28.2 850</td> </tr> </table>	↙	↑	↗	230 7.7 60% +4.3 already	40%	1000 33.3 100%	7.7 wait 23.1 wait 38.4 -	5.1 flow 15.3 wait	28.2 flow 28.2 wait 28.2 850	<p>Lane Capacity = 1900 veh/hour Vehicle Density = 21 ft./car Cycle Length = 120 or 30 /hour Peak Hour Demand Volumes Average Volumes on each cycle Shared Lane Split (Estimated) slot (from Rindge)</p> <hr/> <p>Vehicles until Blocking starts 3-cycles of Vehicles in Left L. (Right lane flows freely) Maximum Queue Peak Hour queue volumes Left Lane blocked 70% of time</p>
↙	↑	↗									
230 7.7 60% +4.3 already	40%	1000 33.3 100%									
7.7 wait 23.1 wait 38.4 -	5.1 flow 15.3 wait	28.2 flow 28.2 wait 28.2 850									
<p>PHASE B</p> <p>With present signal timing, about 12 sec. of all-red clear or 190 veh/hr. In 1987, CLV = 360. (See D-1)</p> <p>CRITICAL VOLUME = 360 (WITH EXISTING ALL RED CLEAR PHASE)</p>	<table border="1"> <tr> <td></td> <td></td> <td></td> </tr> </table>				<p>Vehicle Density = 21 ft./car Cycle Length = 120 or 30 /hour</p>						
<p>PHASE C</p>  <p>CRITICAL VOLUME = 360</p>	<table border="1"> <tr> <td style="text-align: center;">↙</td> <td style="text-align: center;">↗</td> </tr> <tr> <td style="text-align: center;">690 23.0</td> <td></td> </tr> <tr> <td style="text-align: center;">730 360</td> <td style="text-align: center;">360</td> </tr> </table>	↙	↗	690 23.0		730 360	360	<p>Vehicle Density = 21 ft./car Cycle Length = 120 or 30 /hour Peak Hour Demand Volumes Average Volumes on each cycle</p> <p>No Blocking of turns; narrow lanes and slow turn speeds result in 10% less lane capacity (from field measurements).</p> <p>Adjusted Peak Hour volumes Each Lane</p>			
↙	↗										
690 23.0											
730 360	360										
<p>PHASE A Vol. = 850 B = 360 C = 360 TOTAL = 1570 V/C = 0.83</p>		<p>Calc. by SHK Checked: SHK 6-17-85</p>									

ALEWIFE + RINDGE Ave.

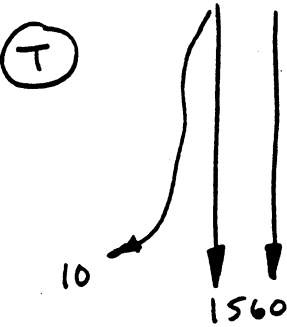
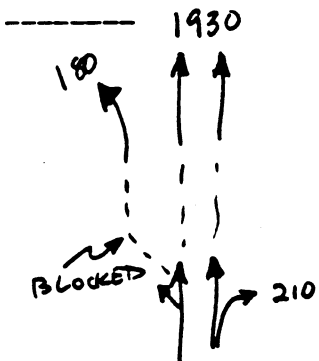
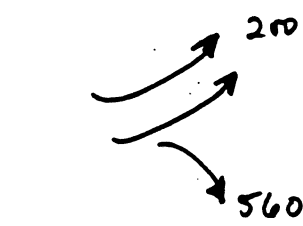
QUEUING & CAPACITY

NO BUILD

CONSTRAINED
1987 AM

<p>PHASE A</p> <p>CRITICAL VOLUME = 950</p>	<table border="1"> <tr> <td>↖</td> <td>↑</td> <td>↑</td> </tr> <tr> <td>230</td> <td></td> <td>1100</td> </tr> <tr> <td>7.7</td> <td></td> <td>36.7</td> </tr> <tr> <td>60%</td> <td>40%</td> <td>100%</td> </tr> <tr> <td colspan="3">+4.3 already in turn</td> </tr> <tr> <td>7.7</td> <td>5.1</td> <td>31.7</td> </tr> <tr> <td>wait</td> <td>flow</td> <td>flow</td> </tr> <tr> <td>23.1</td> <td>15.3</td> <td>31.7</td> </tr> <tr> <td>wait</td> <td>wait</td> <td>wait</td> </tr> <tr> <td>38.4</td> <td></td> <td>31.7</td> </tr> <tr> <td>-</td> <td></td> <td>950</td> </tr> </table>	↖	↑	↑	230		1100	7.7		36.7	60%	40%	100%	+4.3 already in turn			7.7	5.1	31.7	wait	flow	flow	23.1	15.3	31.7	wait	wait	wait	38.4		31.7	-		950	<p>Lane Capacity = 1900 veh/hour Vehicle Density = 21 ft./car Cycle Length = 120 or 30 /hour Peak Hour Demand Volumes Average Volumes on each cycle Shared Lane Split (Estimated) slot (from Rindge)</p> <hr/> <p>Vehicles until Blocking starts 3-cycles of Vehicles in Left L. (Right lane flows freely) Maximum Queue Peak Hour queue volumes Left Lane blocked 70% of time</p>
↖	↑	↑																																	
230		1100																																	
7.7		36.7																																	
60%	40%	100%																																	
+4.3 already in turn																																			
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<p>PHASE C</p> <p>CRITICAL VOLUME = 340</p>			<table border="1"> <tr> <td></td> <td>↖</td> <td>↑</td> </tr> <tr> <td></td> <td>610</td> <td></td> </tr> <tr> <td></td> <td>20.3</td> <td></td> </tr> <tr> <td colspan="3">No Blocking of turns; narrow lanes and slow turn speeds result in 10% less lane capacity (from field measurements).</td> </tr> <tr> <td></td> <td>670</td> <td></td> </tr> <tr> <td></td> <td>340</td> <td>330</td> </tr> </table> <p>Adjusted Peak Hour volumes Each Lane</p>		↖	↑		610			20.3		No Blocking of turns; narrow lanes and slow turn speeds result in 10% less lane capacity (from field measurements).				670			340	330														
	↖	↑																																	
	610																																		
	20.3																																		
No Blocking of turns; narrow lanes and slow turn speeds result in 10% less lane capacity (from field measurements).																																			
	670																																		
	340	330																																	
<p>PHASE A Vol. = 950 B = 360 C = 340 TOTAL = 1650 V/C = 0.87</p>			<p>Calc. by SHK Checked: SHK 6-17-85</p>																																

ALEWIFE and TRIANGLE ROAD QUEUES/CAPACITY INTERIM ACCESS FULLY CONSTRAINED
 1987 PM

<p>PHASE A</p>  <p>CRITICAL VOLUME = 790</p>	<p>↑</p> <p>1560 52.0 100%</p> <p>19.7 wait 6.5 wait 26.2 790 26.2 790</p>	<p>↑</p> <p>99% 410'</p> <p>19.5 wait 6.5 wait 26.0 770 26.1 780</p>	<p>↗</p> <p>10 0.3 1%</p> <p>0.2 flow 0.1 wait 26.0</p>	<p>Lane Capacity = 1900 cars/hour Vehicle Density = 21 ft./car Cycle Length = 120 or 30 /hour Peak Hour Demand Volumes Average Volumes on each cycle Shared Lane Split (Estimated) Blocking Distance</p> <hr/> <p>Vehicles until Blocking starts Vehicles after Blocking starts (Blocking = 5 % of the time) Maximum Queue Peak Hour queue volumes Lane volume/cycle Peak Hour lane volume</p>
<p>PHASE AB</p>  <p>CRITICAL VOLUME = 1130</p>	<p>↖</p> <p>180 6.0 15% 300'</p> <p>1.5 wait 4.5 wait 37.7 1130</p>	<p>↑</p> <p>1930 64.4 85% (300')</p> <p>6.9 wait 49.9 + wait 75.4 37.7 1130</p>	<p>↑</p> <p>100%</p> <p>6.9 wait 7.2R wait 37.7 1130</p>	<p>Vehicle Density = 21 ft./car Cycle Length = 120 or 30 /hour Peak Hour Demand Volumes Average Volumes on each cycle Shared Lane Split (Estimated) Blocking Distance</p> <hr/> <p>Vehicles from Rindge Avenue Vehicles from Alewife outbound (2-lane flow past Rindge Ave.) Vehicles waiting per cycle Maximum queue per lane Peak Hour queue volumes</p>
<p>PHASE C</p>  <p>CRITICAL VOLUME = 100</p>	<p>↖</p> <p>200 6.7 100%</p> <p>6.4 wait 3.4 100 3.4 100</p>	<p>↑</p> <p>10% 60'</p> <p>2.9 wait 3.3 100 22.0 660</p>	<p>↗</p> <p>560 18.7 90%</p> <p>26.1 flow 26.1 100 22.0 660</p>	<p>Vehicle Density = 21 ft./car Cycle Length = 120 or 30 /hour Peak Hour Demand Volumes Average Volumes on each cycle Shared Lane Split (Estimated) Blocking Distance</p> <hr/> <p>Vehicles to begin blocking NO BLOCKING OCCURS Maximum Queue Peak Hour queue volumes Lane volume/cycle Peak Hour lane volume</p>
<p>PHASE A Vol. = 790 B = 180 C = 100 TOTAL = 1070 V/C = 0.56 (not Critical)</p>		<p>PHASE AB Vol. = 1100 C = 100 TOTAL = 1200 V/C = 0.63</p>		<p>Calc. by SHK June 18, 1985</p>

ALEWIFE and TRIANGLE ROAD

QUEUES/CAPACITY

NO BUILD

FULLY CONSTRAINED
1987 PM

PHASE	Diagram	Left Lane	Middle Lane	Right Lane	Notes
PHASE A	<p>CRITICAL VOLUME = 820</p>	<p>1560 52.0 100%</p> <p>21.4 wait 5.8 wait 27.2 820 27.2 820</p>	<p>70% 410'</p> <p>19.5 wait 5.4 wait 27.2 820 35.6 1070</p>	<p>320 10.7 30%</p> <p>8.4 flow 2.3 wait 27.2 820 35.6 1070</p>	<p>Lane Capacity = 1900 cars/hour Vehicle Density = 21 ft./car Cycle Length = 120 or 30 /hour Peak Hour Demand Volumes Average Volumes on each cycle Shared Lane Split (Estimated) Blocking Distance</p> <hr/> <p>Vehicles until Blocking starts</p> <p>Vehicles after Blocking starts (Blocking = 20% of the time) Maximum Queue Peak Hour queue volumes Lane volume/cycle Peak Hour lane volume</p>
PHASE AB	<p>CRITICAL VOLUME = 1130</p>	<p>180 6.0 15% 300'</p> <p>1.5 LT Lane 4.5 wait 37.7 1130</p>	<p>85% (300')</p> <p>6.9 wait 49.9 + 75.4</p>	<p>1930 64.4 100%</p> <p>6.9 wait 7.2R wait 37.7 1130</p>	<p>Vehicle Density = 21 ft./car Cycle Length = 120 or 30 /hour Peak Hour Demand Volumes Average Volumes on each cycle Shared Lane Split (Estimated) Blocking Distance</p> <hr/> <p>Vehicles from Rindge Avenue</p> <p>Vehicles from Alewife Outbound (2-lane flow past Rindge) Vehicles waiting per cycle (2L) Maximum Queue per lane Peak Hour queue volumes</p>
PHASE C	<p>CRITICAL VOLUME = 760</p>	<p>1080 36.0 100%</p> <p>5.6 wait 18.2 wait 23.8 710 27.2 820</p>	<p>40% 60'</p> <p>2.9 wait 9.5 wait 26.7 800 31.1 930</p>	<p>560 18.7 60%</p> <p>4.4 flow 14.3 wait 26.7 800 31.1 930</p>	<p>Vehicle Density = 21 ft./car Cycle Length = 120 or 30 /hour Peak Hour Demand Volumes Average Volumes on each cycle Shared Lane Split (Estimated) Blocking Distance</p> <hr/> <p>Vehicles until Blocking starts</p> <p>Vehicles after Blocking starts (Blocking = 75% of the time) Maximum Queue Peak Hour queue volumes Lane volume/cycle Peak Hour lane volume</p>
<p>PHASE A Vol. = 820 B = 180 C = 760 TOTAL = 1760 V/C = 0.93 (not Critical)</p>		<p>PHASE AB Vol. = 1130 C = 760</p>		<p>Calc. by SHK June 16, 1985 6/16/85</p>	
		<p>> TOTAL = 1890 < > V/C = 0.99 <</p>			



TOWN OF ARLINGTON
OFFICE OF MASSACHUSETTS 02174
643-6700
DEPARTMENT of PLANNING and
COMMUNITY DEVELOPMENT

July 19, 1985

Cambridge City Council
City Hall
795 Massachusetts Avenue
Cambridge, Massachusetts 02139

Dear Honorable Members:

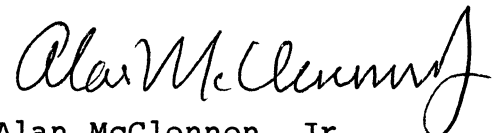
You have recently received a copy of a letter from Peter Shelley, Senior Counsel to the Conservation Law Foundation. Mr. Shelley was writing a response to several questions that I had asked him in a letter dated June 28, 1985. Since my questions were personal, I did not send copies of my letter to everyone involved at Alewife. Several of you have asked me what was in my letter since the last sentence in Mr. Shelley's letter implied that I had taken a position on Mr. Kaiser's analysis. Since I had not taken a position, I asked Mr. Shelley if he would send a clarification to you. Today I received a letter from him dated July 17, 1985, in which he states that he sees no need for clarification.

I do not believe in generating a lot of correspondence; however, I am concerned about half a story being published. Therefore, I am enclosing a copy of my letter dated June 28, 1985, and Mr. Shelley's letter dated July 17, 1985, so that

July 19, 1985

everyone copied in Mr. Shelley's letter of July 10, 1985, can have access to the full file and come to their own independent conclusion.

Very truly yours,



Alan McClennen, Jr.
Director of Planning and
Community Development

AMcC:mc

cc: Alewife Transportation Advisory Committee
Hon. Frederick P. Salvucci
Arlington Board of Selectmen
Belmont Board of Selectmen
Cambridge City Council
Senator Richard Kraus
Senator George Bachrach
Representative Mary Jane Gibson
Representative Charles F. Flaherty, Jr.

Enclosures



TOWN OF ARLINGTON

MASSACHUSETTS 02174

643-6700

DEPARTMENT of PLANNING and
COMMUNITY DEVELOPMENT

June 28, 1985

Mr. Peter Shelley, Senior Counsel
Conservation Law Foundation of New England, Inc.
3 Joy Street
Boston, Massachusetts 02108-1497

Dear Mr. Shelley:

I am in receipt of your memorandum of June 27, 1985, in which you transmitted a document prepared by Mr. Steven Kaiser. You have requested that I, as a member of the Alewife Transportation Advisory Committee, exert my influence to have all further work on the interim access project halted until the questions raised in Mr. Kaiser's memoranda are raised to my satisfaction by EOTC.

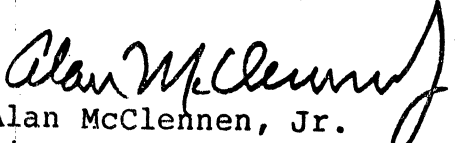
I have been appointed by the Town Manager and the Board of Selectmen of the Town of Arlington to represent the town's interest at Alewife. Since my appointment to the advisory committee, I have represented the interests of the town. Before I can take any position on Mr. Kaiser's work, I would like to have the following information: Who is Mr. Kaiser's client and what are Mr. Kaiser's qualifications as a traffic engineer?

I have known Mr. Kaiser for eleven years and I am aware of his long-term interest at Alewife through his former position at DEQE. However, before I proceed to the Board of Selectmen and the Town Manager, I need answers to my two questions.

Alewife has been an incredibly complex transportation issue. No project in this office consumes more space in our files. Many expert opinions have been voiced over the years and before I proceed to evaluate the opinion of another person, I feel that I should have the background information that would allow me to weigh Mr. Kaiser's conclusions against those of all the other traffic engineers that have worked at Alewife.

Thank you for your assistance.

Very truly yours,


Alan McClennen, Jr.
Director of Planning and
Community Development



Conservation Law Foundation of New England, Inc.

3 Joy Street
Boston, Massachusetts
02108-1497

(617) 742-2540

July 10, 1985

Alan McClennen, Jr.
Director of Planning and
Community Development
Town Hall
Arlington, MA 02174

RE: Alewife Interim Access Project

Dear Mr. McClennen:

This is in response to your letter of June 28, 1985. Although I can't really imagine that you have known Mr. Kaiser for eleven years without being fully aware of his competence and talent for traffic issues, I appreciate your caution and am providing the following for your consideration:

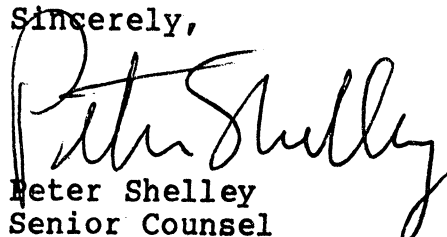
1. Mr. Kaiser performed the Alewife analysis as a public service without compensation. He has no "client" to my knowledge other than the best interests of the Alewife region.
2. Mr. Kaiser's credentials as a traffic engineer are as follows: a) He has mechanical engineering degrees from MIT in Design and Control Systems. b) He worked for five years for the MDC as a traffic engineer. c) He worked for eight years for the MEPA Unit of the Executive Office of Environmental Affairs as the traffic analyst for that office.

I guess I don't have to remind you that residents of Arlington are suffering tremendously along Lake Street and Pleasant Street because of the crush of traffic being squeezed through Alewife. Some improvements over the status quo at the rotary may reduce that side street traffic. Mr. Kaiser's point, however, is that the proposed improvements are

Conservation Law Foundation of New England, Inc.

questionable and may aggravate the problems on Arlington's streets. I don't think Arlington can afford to assume that he is completely wrong in his analysis.

Sincerely,



Peter Shelley
Senior Counsel

cc: Alewife Transportation Advisory Committee
Hon. Frederick P. Salvucci
Arlington Board of Selectmen
Belmont Board of Selectmen
Cambridge City Council
Senator Richard Kraus
Senator George Bachrach
Representative Mary Jane Gibson
Representative Charles F. Flaherty, Jr.

PS/mgw



Conservation Law Foundation of New England, Inc.

3 Joy Street
Boston, Massachusetts
02108-1497
(617) 742-2540

July 17, 1985

Mr. Alan McClennen, Jr.
Director of Planning and
Community Development
Town Hall
Arlington, Massachusetts 02174

Re: Alewife Interim Access Project

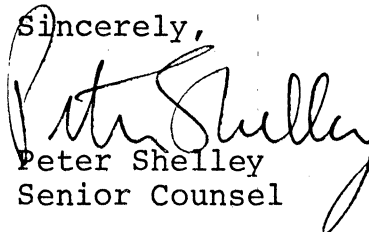
Dear Mr. McClennen:

This is in response to your telephone call to me during which you expressed your concern over the last sentence of my July 10 letter to you. That sentence was: "I don't think Arlington can afford to assume that he Steve Kaiser is completely wrong in his analysis." Your complaint apparently was that there was an implication in that sentence that you were making such an assumption.

I have reread the letter and see no need for a revision. There was no implication that you had closed your mind to Mr. Kaiser's concerns. Indeed, the purpose of my entire line of correspondence has been to urge everyone involved with this problem to keep their minds open. I am naturally pleased, therefore, to realize that you have always done so and will continue to do so. The sentence was a statement of my opinion, not an attack on your performance of your responsibilities.

I see no need to circulate this letter to the previous copy list, since I do not think your complaint is well-founded. Of course, you should feel free to pass this letter along to whomever you elect.

Sincerely,


Peter Shelley
Senior Counsel

PS:cwb

S-517A

Comm. from Peter Shelley, Senior Counsel, Conservation Law Foundation of New England, Inc.
Re: informational material Re: environmental & planning issues surrounding traffic proposals for the Alweife Triangle Area & interim access.

July 25, 1985