

***Downtown Lakewood Township  
Traffic and Pedestrian Circulation  
Study***

***Township of Lakewood  
Ocean County, New Jersey***

***Prepared by:***

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## **INTRODUCTION**

Lakewood has experienced significant population growth from 1990 (population 45,048) to 2005 (population 67,910) (source: North Jersey Transportation Planning Authority). The Township continues to grow in population. This has resulted in traffic and pedestrian circulation issues in the Downtown area. Double-parked delivery vehicles, garbage collection runs, lack of parking and loading zones all contribute to the traffic congestion and circulation issues. This study evaluated the current, as well as future, traffic and pedestrian circulation conditions in the Downtown area. The study area is bounded by Main Street/North Lake Drive to the south, County Line Road to the north, Lakewood Avenue to the west and Lexington Avenue to the east. A project Location Map is shown in **EXHIBIT 1**.

The Central Business District (CBD) of Downtown Lakewood consists of a five-block section along Clifton Avenue between Fifth Street and NJ Route 88 (Main Street). Route 9 (Madison Avenue) between NJ Route 88 (Main Street) and Ninth Street is heavily used by commuters and local traffic during the peak periods. Forest Avenue between Fourth Street and Ninth Street experiences high pedestrian and vehicular traffic in conjunction with Beth Medrash Govoha (BMG). Both BMG and Georgian Court University contribute to pedestrian and traffic issues along Lakewood Drive.

Recognizing the need to resolve these issues and plan for future economic growth, T&M Associates conducted this traffic and pedestrian circulation study addressing the Township's Downtown traffic concerns. The results of that study are contained herein.

## TRAFFIC OPERATIONS

In order to analyze the operating conditions at the various intersections within the study area, vehicle and pedestrian traffic counts were conducted on Tuesday, October, 16, 2007 from 7 AM to 10 AM, from 12 PM to 3 PM (Midday) and from 3:30 PM to 6:30 PM. Tuesday, October 16, 2007 was considered a typical weekday. These 9-hour traffic turning movement counts were conducted at the following intersections:

- 1) County Line Road with Forest Avenue
- 2) Forest Avenue with Seventh Street
- 3) Forest Avenue with Sixth Street
- 4) Forest Avenue with Fourth Street

Also, 30-minute, sample, turning movement counts were collected throughout the AM, Midday and PM peak periods at an additional 28 intersections within the study area along Lakewood Avenue, Private Way, Route 9, Clifton Avenue and Lexington Avenue. Based on the traffic data collected, these sample traffic volumes were adjusted to the AM, Midday and PM peak hour equivalents. Six intersections within the study area were not counted. The traffic volumes at these six intersections were estimated based on the actual traffic volume data of the adjacent intersections. These intersections are noted by a shaded rectangle on the traffic volume figures.

Automatic Traffic Recorders (ATRs) traffic data were also collected at eight locations, five along Clifton Avenue, Lexington Avenue and Route 9 and three at the intersection of Lakewood Avenue with N. Lake Drive. The ATRs were installed from Monday, October 15, 2007 to Tuesday, October 23, 2007 and continuously collected traffic volumes in 15-minute increments. The Jewish Calendar was consulted prior to scheduling the traffic data collection effort. The AM, Midday and PM peak hour traffic volumes are summarized in **EXHIBITS 2, 3 and 4**.

## Traffic Observations

Traffic observations made during our field reconnaissance generally include the following:

- Traffic is heavier and congestion more prevalent toward the southern end of the study area between Fourth Street and Main Street. Afternoon traffic is generally heavier than morning or midday traffic.
- Vehicles wishing to park along Clifton Avenue block through vehicles by waiting (essentially double-parked) for parked vehicles to exit the desired space.
- Delivery trucks double park on Clifton Avenue while unloading goods, thus partially blocking Clifton Avenue and slowing or blocking through vehicles.
- Pedestrian traffic is generally high within the Downtown and requires turning vehicles to yield before proceeding. Additionally, pedestrians often ignore signal indications and cross against the vehicles right of way or cross at midblock.
- School bus activity is particularly high in the AM peak period and causes delays and back-ups that generally subside shortly after the buses depart.
- An operational problem at one intersection often causes back-ups that block the operation of an adjacent upstream intersection.
- U-turns and parallel parking at the post office create momentary traffic disruptions and potential safety concerns (**Photos 4 and 5**).



**Photo 4**



**Photo 5**

### **Intersection Capacity Analysis**

Intersection capacity analyses were conducted at each study intersection. The analyses calculate the average vehicle delay and Level of Service for each lane group or approach. Level of Service (LOS) is a comparative measure used to describe various levels of traffic operating conditions. Influencing factors include traffic volume, number of pedestrians, lane configuration, type of control (stop or signal), percentage of trucks, parking maneuvers, etc. The Appendix contains a more detailed description of LOS, which varies from A (relatively free flow, with minimal delays) to F (congested). For urban areas, LOS “D” is generally considered the lower limit of acceptable operation. An Exhibit titled “Traffic Operations” is included in this report.

Level of Service analyses quantitatively measure delay, in seconds, for intersection approaches and for the entire intersection. For this study, LOS was calculated using the Synchro (Version 6) traffic software based on methods contained in the current Highway Capacity Manual published by the Transportation Research Board, a unit of the National Research Council.

The following narrative summarizes the existing LOS of the lane group for the various

peak traffic hours analyzed at each of the intersections contained within the study area. The existing LOS results are summarized, along with the year 2007 Existing Peak Hour Traffic Volumes, in **EXHIBITS 2, 3 and 4**.

### **Route 9 (Madison Avenue)**

Route 9 is major arterial roadway that traverses Lakewood in a north-south direction. Route 9 is under the jurisdiction of the NJDOT. In the Downtown area, Route 9 is a four-lane roadway with centerline marking and no curbside parking. The intersections of Route 9 with Main Street, Second Street, Fourth Street, Sixth Street, Ninth Street and Courtney Road are signalized. The other intersections along Route 9 are unsignalized, with the side street stop-controlled. During the peak periods, traffic congestion is the worst between Main Street and Fourth Street. Overall, Levels of Service along Route 9 are LOS B or better during the AM, Midday and PM peak hours. However, average vehicle delay at the stop-controlled, side street approaches is greater than at the signalized side street approaches at Route 9. At the intersections of Route 9 with First Street, the westbound approach operates at LOS F during the AM peak hour and both First Street approaches operate at LOS F during the Midday and PM peak hours. At the unsignalized intersections of Route 9 with Seventh Street and Eighth Street, both the eastbound and westbound approaches operate at LOS F during the AM, Midday and PM peak hours. Traffic and pedestrian volumes should be monitored on a continuous basis to determine if a traffic signal is warranted, particularly at Seventh Street.

### **Clifton Avenue**

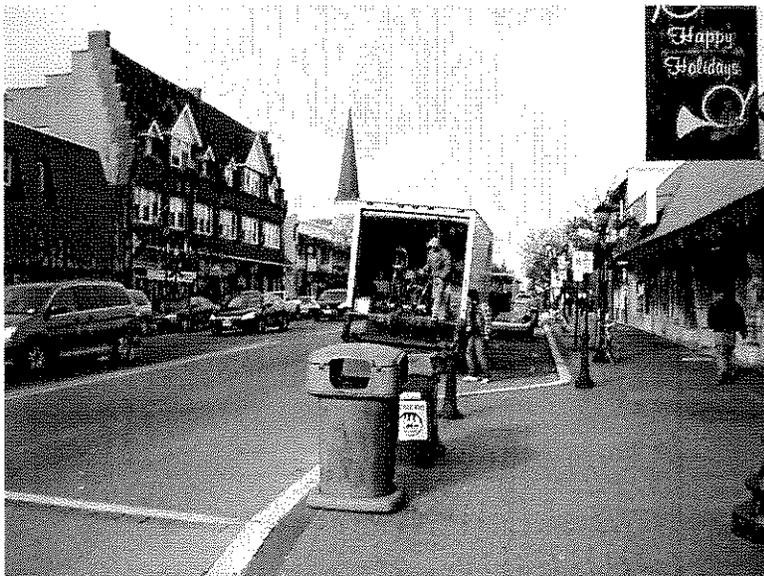
Clifton Avenue is a local street that provides one travel lane in each direction and runs in a north-south direction, parallel to Route 9, one block to the east of Route 9. The east-west cross streets of First Street and Third Street are one-way westbound. Second Street is one-way eastbound, only to the east of Clifton Avenue.

Clifton Avenue from Main Street to Fifth Street is the primary Downtown business area. The area consists of stores, restaurants, a movie theater, a service station, churches, the municipal complex, the “Red Square Plaza” and various other business related activities.

Clifton Avenue has been improved through the installation of streetscape and traffic calming features, including new curbs, brick sidewalks and crosswalks, decorative lighting, benches, trees, and curb/sidewalk “bump-outs” at certain intersections to reduce crosswalk lengths (**Photos 1 and 2**).



**Photo 1**



**Photo 2**

Unmetered, on-street parking is available along both sides of Clifton Avenue. Delivery trucks often double park along Clifton Avenue while making deliveries. Similarly, automobiles were observed occasionally double parked along Clifton Avenue. There are

several surface parking lots, including three municipal parking lots, located one block on either side of Clifton Avenue between First and Fifth Streets. The on-street parking along Clifton Avenue is utilized throughout the weekday business hours. A separate Downtown Parking Study report provides more detail on the parking situation (Also being prepared by T&M Associates).

Most of the street approaches to Clifton Avenue are stop-controlled. Traffic signals are located at Main Street, Second Street and Fourth Street. During the AM, Midday and PM peak periods, traffic congestion is the worst from Main Street to Fifth Street. Overall, Levels of Service along Clifton Avenue are LOS D or better during the AM, Midday and PM peak hours. During the AM peak hour, the stop-controlled, westbound approach of Third Street operates at LOS E. During the Midday peak hour, most side street approaches operate at LOS E or better. However, the eastbound and westbound approaches of Sixth Street, Eighth Street and Ninth Street and the westbound approach of Ninth Street operate at an unacceptable LOS F. During the PM peak hour, most side street approaches operate at LOS E or better. However, the westbound First Street approach operates at an unacceptable LOS F. The intersections of Clifton Avenue with Second Street and with Fourth Street operate at acceptable LOS D or better during all peak hours. **EXHIBITS 2, 3 and 4** illustrate the LOS for each approach of each intersection.

### **Lexington Avenue**

Lexington Avenue is local, major, collector roadway that traverses Lakewood in a north-south direction. Lexington Avenue is two blocks east of Route 9, one block east of Clifton Avenue. It is a two-lane roadway with centerline marking and on-street parking prohibited. All of the intersections along Lexington Avenue are stop-controlled on the side street approaches. During the AM and PM peak periods, Levels of Service at the Lexington Avenue intersections are LOS E or better. During the Midday peak hour, the eastbound Second Street, westbound Third Street, eastbound Sixth Street, eastbound and westbound Eighth Street approaches operate at LOS F. **EXHIBITS 2, 3 and 4** illustrate the LOS for these intersections.

## **Forest Avenue**

Forest Avenue is local, minor, collector roadway that traverses in a north-south direction. Forest Avenue is one block west of Route 9. It is a two-lane roadway with centerline marking and limited on-street parking. Only the traffic at the intersections of Forest Avenue with Fourth Street, Sixth Street and Seventh Street were counted and analyzed. All of the side streets that intersect with Forest Avenue are stop-controlled. Due to the proximity of the Beth Medrash Govoha and Georgian Court University campuses, these intersections experience high vehicular and pedestrian volumes during various peak periods throughout the day. High volumes of pedestrians cross Forest Avenue to and from the Beth Medrash Govoha during the start and end of their day and evening sessions. During the AM peak hour, the side street approaches of Fourth Street, Sixth Street and Seventh Street operate at unacceptable LOS F. For the Midday and PM peak hours, these side streets operate at LOS E or better. **EXHIBITS 2, 3 and 4** illustrate the Levels of Services at these intersections.

Pedestrian movement counts were conducted at the intersections of Forest Avenue with Fourth Street, Sixth Street and Seventh Street, from 7 AM to 10 AM, 12 PM to 3 PM and 3:30 PM to 6:30 PM. The volume of pedestrians using all of the four crosswalks at each intersection was counted. The highest volume of pedestrians crossing Forest Avenue at Fourth Street was 310 pedestrians per hour between 9 AM and 10 AM. At Sixth Street, the highest volume was 73 pedestrians per hour crossing Forest Avenue between 3:30 PM and 4:30 PM. At the Seventh Street crossing, the highest volume was 204 pedestrians per hour between 1:30 PM and 2:30 PM. Based on the Highway Capacity Manual's Average Flow LOS Criteria for Walkways and the eight-foot crosswalks, these peak hour pedestrian volumes operate at acceptable LOS A. Although the number of pedestrians does peak considerably compared to off-peak periods, in our observations, the crosswalks were never congested or overcrowded. In addition, a Township Police Crossing Guard is stationed at Seventh Street during the afternoon and evening peak periods, except during winter months when sunset is early. The Crossing Guard stops

Forest Avenue traffic to allow pedestrians to cross safely and without having to wait long for gaps in the traffic flow.

### **Private Way**

Private Way is local roadway that connects North Lake Drive with Ninth Street. Private Way is two blocks west of Route 9, one block west of Forest Avenue. It is a two-lane roadway with no pavement markings and on-street parking is permitted. The intersections of Private Way with Seventh Street and Eighth Street were counted and analyzed. All of the intersecting side streets along Private Way are stop-controlled. Traffic volumes in this area experience peak vehicular and pedestrian activity due to the demand for on-street parking by Beth Medrash Govoha students. During all peak hours, all movements at the Private Way intersections of Seventh Street and Eighth Street operate at acceptable LOS B or better. **EXHIBITS 2, 3 and 4** illustrate the existing LOS for these intersections.

### **Lakewood Avenue**

Lakewood Avenue is local roadway that extends from North Lake Drive to Ninth Street. Lakewood Avenue is three blocks west of Route 9. It is a two-lane roadway with no pavement markings and on-street parking is permitted. The approaches of the intersections of Lakewood Avenue at North Lake Drive and Sixth Streets were counted and analyzed. The Lakewood Avenue approach is stop-controlled at North Lake Drive, while the Sixth Street approach is stop-controlled at Lakewood Avenue. Traffic volumes in this area experience high pedestrian and vehicular volumes due to the demand for on-street parking by Georgian Court University and Beth Medrash Govoha students. During the AM, Midday and PM peak hours, all movements operate at acceptable LOS B or better. **EXHIBITS 2, 3 and 4** summarize these LOS.

### **Future Traffic Conditions**

A 1% annual growth factor was applied to the year 2007 existing traffic volumes to calculate the year 2017 traffic volumes. An evaluation of the effectiveness of several improvement recommendations was conducted. Among the measures considered are

prohibiting left turning and through movements at certain unsignalized intersections along Route 9, additional traffic signals along Clifton Avenue and Lexington Avenue, and designating certain two-way, east-west streets as one-way streets. The pedestrian crossings and vehicular movements along Clifton Avenue and Route 9 (Madison Avenue) intersections were also evaluated. These traffic volumes and projected Levels of Service are shown in **EXHIBITS 9, 10 and 11**. The study intersections are expected to operate at acceptable LOS E or better in the year 2017 with a 1% annual background growth and the proposed improvement schemes.

Lakewood can effectively manage growth through local land use, parking improvements and local shuttle bus service. New local shuttle bus stops would affect some on-street parking and needs to be considered in relation to overall effectiveness of the circulation and pedestrian issues.

## **CRASH ANALYSIS**

Crash records for the three-year period of January 2004 to December 2006 were obtained from the NJDOT web site. The limit of the crash analysis is bounded by Main Street/ North Lake Drive to the south, County Line Road to the north, Lakewood Avenue to the west and Lexington Avenue to the east.

Over the three-year period, 1,022 collisions occurred within the project limits as shown on **EXHIBIT 5A**. The majority of the crashes involved rear end type and right angle type. There were 257 rear end crashes (25% of total) and 355 right angle crashes (35% of total). Pedestrian and bicycle impacts were not as common, with only 23 crashes involving pedestrians or bicyclists over this three-year period (3% of the total).

In the Downtown area, the majority of crashes along Route 9 (Madison Avenue) occurred at Second Street (66 crashes), Fourth Street (60 crashes), Fifth Street (51 crashes), Ninth Street (47 crashes) and County Line Road (62 crashes). With the exception of Fifth Street, these intersections are signalized. The other signalized intersection of Madison Avenue with Sixth Street experienced 34 crashes during this three-year period. Approximately 72% of all crashes that occurred at the unsignalized intersection of Route 9 with Third Street, Fifth Street, Seventh Street, and and Eighth Street were right angle and rear end crashes. Again, these types of crashes are attributable to the left turn and through movements at these unsignalized intersections.

Along Clifton Avenue, most crashes occurred at Second Street (33 crashes) and Ninth Street (25 crashes). Second Street at Clifton Avenue is signalized intersection and Ninth Street at Clifton Avenue is not signalized.

There were 32 crashes reported in the three-year period along Lexington Avenue at the intersection with Second Street and 16 crashes reported at the intersection with Fourth Street.

**EXHIBIT 5B** summarizes the crash data for 2004, 2005 and 2006 by type of crash for the unsignalized intersections along Route 9. The purpose of this summary was to determine if there were enough crashes that could be corrected with a traffic signal. Typically, these crashes would be right angle and left turn crashes. The conclusion drawn from **EXHIBIT 5B** is that there were less than 5 correctable crashes in a 12-month period, which does not meet the warrant for a traffic signal. Another measure of crashes is to compare the frequency of crashes with the Statewide Average. The right angle crashes along Route 9, Clifton Avenue and Lexington Avenue are above the Statewide Average for right angle crashes. This is an indication that improvements should be investigated.

## IMPROVEMENT STRATEGIES

In order to mitigate some of the issues related to poor Level of Service and high crash frequency, we are proposing a series of improvement strategies. These improvement strategies were applied to the existing 2007 traffic volumes to show how these strategies would improve the traffic operations in the existing condition. A traffic analysis of the traffic volumes projected to the year 2017 was also performed to determine the longevity of these improvements on the future traffic volumes. By implementing these strategies, the LOS F at approximately 10 intersections would be eliminated.

### Route 9 (Madison Avenue)

- Turning Restrictions from Side Streets: Due to poor Levels of Service of the unsignalized side street approaches to Route 9, prohibit left and through movements from the unsignalized side streets of First Street, Third Street, Fifth Street, Seventh Street and Eighth Street. These turning restrictions would also help to mitigate the crash issues related to right angle and left turn type crashes at First Street, Third Street, Fifth Street, Seventh Street, and Eighth Street. “Right Turn Only” signs would be placed on First Street, Third Street, Fifth Street, Seventh Street and Eighth Street at the approaches to Route 9. These improvements would require signage along Clifton Avenue and Forest Avenue to direct motorists to the signalized intersections for turning left onto and crossing Route 9. Encouraging motorists to cross Route 9 or make left turns onto Route 9 at signalized intersections and allowing right turns to be made onto Route 9 at unsignalized intersections permits traffic to move about safely and efficiently by spreading the traffic demand over several cross streets, but only permitting conflicting movements to be made at traffic signals. Implementation of these turn restrictions would require NJDOT investigation and approval.
- Traffic Signal Coordination: Develop a coordinated traffic signal system along Route 9 from County Line Road through Main Street. NJDOT Bureau of Traffic Engineering & Investigation is conducting a study to coordinate and optimize the traffic signals from County Line Road to the north into Howell and Freehold. The traffic signals should be coordinated for a particular travel speed to improve

safety. Route 9 is posted for 35 MPH between Sixth Street and Main Street. Signage should be posted to inform motorists that the traffic signals are coordinated for the particular travel speed. Coordinating the traffic signals from Main Street to Courtney Road would help to reduce vehicle delay and improve air quality. Re-evaluating the traffic signal timing may improve safety if the yellow and all red clearance intervals do not meet current standards. Re-evaluating the pedestrian walk times may improve pedestrian safety. Reducing excessive queues along Route 9 may help the traffic operation of the adjacent unsignalized intersections. Improving the travel time and reducing the average delay along Route 9 may encourage through traffic to divert from Clifton Avenue and Forest Avenue to Route 9. This would improve traffic operations along Clifton Avenue and Forest Avenue. A request to NJDOT Bureau of Traffic Engineering & Investigation would be required to initiate coordinating these traffic signals along Route 9.

- Way Finding Signage: Plan and implement a way finding signage program to direct motorists to parking facilities, direct pedestrians to shuttle bus stops and other points of interest in the Downtown. In addition, signs to direct motorists to the signalized intersections at Route 9 should be included in the signage program. There are many examples throughout NJ. Examples include “Destination Jersey City” signage program, where the City of Jersey City developed a color scheme and logo. The Township of Livingston has also developed a sign program with a yellow and green color scheme that directs motorists to St. Barnabas Hospital, and several “downtown” locations. West Orange has developed a sign program that emphasizes the historic nature of the Township with Thomas A. Edison as a key feature.
- Additional One-Way Streets: Additional one-way streets within the Downtown are not recommended because the demand of east-west traffic within the Downtown requires that the full capacity of these existing east-west streets be preserved. The east-west traffic volumes currently exceed the east-west street capacity. Turning movements from the unsignalized side street approaches at

Route 9 operate at LOS F. If Second Street, Fourth Street, Fifth Street and Sixth Street were converted to one-way streets, that would reduce the capacity of east-west travel by four lanes. This would result in unacceptable traffic operations for cross-town traffic.

The Levels of Service of the year 2007 AM, Midday, and PM Peak Hour Traffic Volumes with Improvements are illustrated in **EXHIBITS 6, 7 and 8**. The LOS F originally shown at the unsignalized intersections along Route 9 (Madison Avenue) would be improved to acceptable LOS C or better. The impact of the diversion of traffic along Clifton Avenue and Forest Avenue to avoid the left and through movements at the unsignalized intersections of Route 9 are expected to not have a negative impact on the operations of the intersections along Clifton Avenue and Lexington Avenue. The LOS for the majority of the intersections within the study area would operate at acceptable Levels of Service with the improvements in place. Pedestrian volumes should be continually monitored at Route 9 and Seventh Street to determine if a traffic signal is warranted.

### **Clifton Avenue Intersections**

- To improve the capacity of Clifton Avenue, remove the double-parked, loading vehicles from Clifton Avenue and provide loading areas on the side streets at the closest parking space to Clifton Avenue (**Photo 3**). Signing of loading and unloading zones along the side streets are recommended to be codified in the Township Ordinance.



**Photo 3**

- Double-parked vehicles also block the view of motorists traveling along Clifton Avenue from seeing pedestrians trying to cross Clifton Avenue. By removing the double-parked vehicles, the sight distance for pedestrian crossing the street will be improved. This recommendation will improve traffic circulation.
- Enforcement of illegally parked and stopped vehicles would also help to improve the traffic flow along Clifton Avenue and would improve visibility of pedestrians trying to cross Clifton Avenue.
- Signage should be implemented that guide pedestrians to cross at signalized intersections. “Yield to Pedestrians in Crosswalks” signs should be installed in the crosswalks along Clifton Avenue.
- Implement a separate signal phase for pedestrians, stopping traffic in all directions during this phase at existing and proposed traffic signals. This would eliminate pedestrian/vehicle conflicts, increasing pedestrian safety. It would also eliminate the traffic congestion caused by turning vehicles waiting for pedestrians to clear the crosswalk. However, vehicle delays would increase since vehicular green time would be reduced.
- In order to facilitate better east-west travel within the Downtown, we recommend new traffic signals be studied at the intersections of Sixth Street and Ninth Street

along Clifton Avenue. Locating traffic signals at Sixth Street and Ninth Street would follow the pattern of traffic signals along Route 9 (Madison Avenue). Crash records, traffic volumes and pedestrian volumes should continue to be evaluated along Clifton Avenue at these intersections. Based on current traffic and crash data, Traffic Signal Warrants are not met. Traffic Signal Warrant studies should be conducted at the intersections of Clifton Avenue with Ninth Street and Sixth Street. Continually monitor crash records, traffic volumes and pedestrian volumes to determine when the Traffic Signal Warrants are met.

### **Lexington Avenue Intersections**

- In order to facilitate better east-west travel in Downtown Lakewood, traffic signals should be studied at the intersections of Lexington Avenue with Fourth, Sixth and Ninth streets. Continuing evaluation of traffic volumes, pedestrian volumes and crash records should be performed. Based on current traffic and crash data, Traffic Signal Warrants are not met. Traffic Signal Warrant Study should be conducted at the intersections of Lexington Avenue with Fourth Street, with Sixth Street and with Ninth Street. If warrants cannot be satisfied, continually monitor crash records, traffic and pedestrian volumes to determine when the Traffic Signal Warrants are met.

### **Forest Avenue Intersections**

- The traffic operations of the intersections of Forest Avenue with Fourth Street, Sixth Street and Seventh Street should be monitored and Traffic Signal Warrant studies, specifically the Pedestrian Volume Warrant, should be conducted.
- Additional street lighting should be installed at the Forest Avenue intersections of Fourth Street, Sixth Street and Seventh Street to increase pedestrian safety. This is especially important during the winter months when students of BMG are leaving school in the dark. Coordination of lighting locations with future shuttle bus stops is required.

- Additional crosswalk treatments and pedestrian crossing signage should be installed to alert motorists of the large number of pedestrians crossing Forest Avenue.

### **Beth Medrash Govoha (BMG) Campus**

- Near the BMG Campus, install a traffic signal at the intersection of Forest Avenue with Seventh Street. This would improve pedestrian safety during the school's peak arrival and dismissal hours.
- Install a traffic signal at Sixth Street and Forest Avenue to create a signalized east-west route from Forest Avenue to Lexington Avenue.
- Construct additional parking facilities to meet the demand by BMG students.
- Create loading and drop-off areas away from the BMG Campus area for students commuting to the school. Shuttle buses would take students to/from the campus buildings and downtown.
- Create one-way streets around BMG. Recommend implementing one-way streets for Seventh Street (westbound) and Sixth Street (eastbound) between Lakewood Avenue and Forest Avenue. This would promote better vehicular circulation around BMG and result in the ability to implement approximately 150 on-street parking spaces along Sixth and Seventh streets for BMG students.

### **Lakewood Avenue with North Lake Drive**

- The existing traffic volumes at this intersection meet Traffic Signal Warrant number 2 – Four Hour Vehicle Volume of the Manual on Uniform Traffic Control Devices (MUTCD). Installation of a traffic signal should be considered at this intersection.

## **IMPLEMENTATION SCHEDULE**

Implementation of the strategies recommended in this report will improve circulation in the Downtown area.

The Circulation study recommends a combination of strategies to improve traffic and pedestrian flow. We have provided a list of these recommendations as Early-Action, Short-Term and Long-Term. Early-Action recommendations could be implemented within one year. Short-Term recommendations could be implemented in one to four years and Long-Term Recommendations could be implemented in a timeframe of more than four years. The implementation of any new traffic signals, turning restrictions and one-way streets will require approval from NJDOT Bureau of Traffic Engineering & Investigation.

### **Early Action Recommendations:**

- Prior to modifications of turn restrictions, implement a way finding signage program to inform motorists of where to make left turns and where to cross Route 9 at signalized intersections.
- Designate time-restricted loading zones on First, Second, Third, and Fourth streets near Clifton Avenue. This would require designating an over-sized parking space for loading vehicles such as FedEx, UPS, food delivery trucks, mail trucks, etc. This would remove double-parked vehicles from Clifton Avenue, improving vehicle capacity and improving safety.
- Improve pedestrian crossings by implementing upgraded signage such as in-road “Yield to Pedestrian in Crosswalk” signs, educational program for the pedestrians by distributing flyers about pedestrian safety to pedestrians and motorists.
- Enforce parking regulations, pedestrian regulations, and loading, unloading and double-parking regulations
- Signs encouraging left turns and cross traffic to use the signalized intersection of Route 9

These Early Action recommendations do not require approval from NJDOT.

**Short-Term Recommendations:**

- Restrict left turning movements from side streets at unsignalized intersections along Madison Avenue (Route 9).
- Implement one-way streets for Seventh Street westbound and Sixth Street eastbound between Forest Avenue and Lakewood Avenue. This will enable approximately 150 new on-street parking to be implemented.
- Traffic signal coordination along Route 9 (Madison Avenue)
- Improve ambient lighting at Forest Avenue with Seventh Street

The lighting improvements would not require NJDOT approval. All other recommendations would require approval from NJDOT.

Under a Safe Corridor initiative, NJDOT is currently studying Route 9 between MP 100 and MP 110. One of the potential improvements of that study would be left turn lanes on Route 9 at signalized intersections. If the curb-to-curb width is at least 56 feet, a 10-foot left turn lane, an 11-foot through lane and a 12-foot through-right lane would be recommended.

**Long-Term Recommendations:**

- Installation of new traffic signals along Clifton Avenue, Lexington Avenue and Forest Avenue based on continual evaluation of traffic volumes and crash records and a Traffic Signal Warrant study.
- Installation of a new traffic signal is warranted at the intersection of North Lake Drive and Lakewood Avenue
- Monitor traffic and pedestrian volumes to see if Traffic Signal Warrants are met for the intersection of Route 9 with Seventh Street.

These recommendations will require NJDOT approval.

# ***EXHIBITS***

## **TRAFFIC OPERATIONS**

Capacity analysis, a procedure used to estimate the traffic-carrying ability of roadway facilities over a range of defined operating conditions, was performed using the 2000 Highway Capacity Manual (HCM) and 2000 Highway Capacity Software (HCS 5.21).

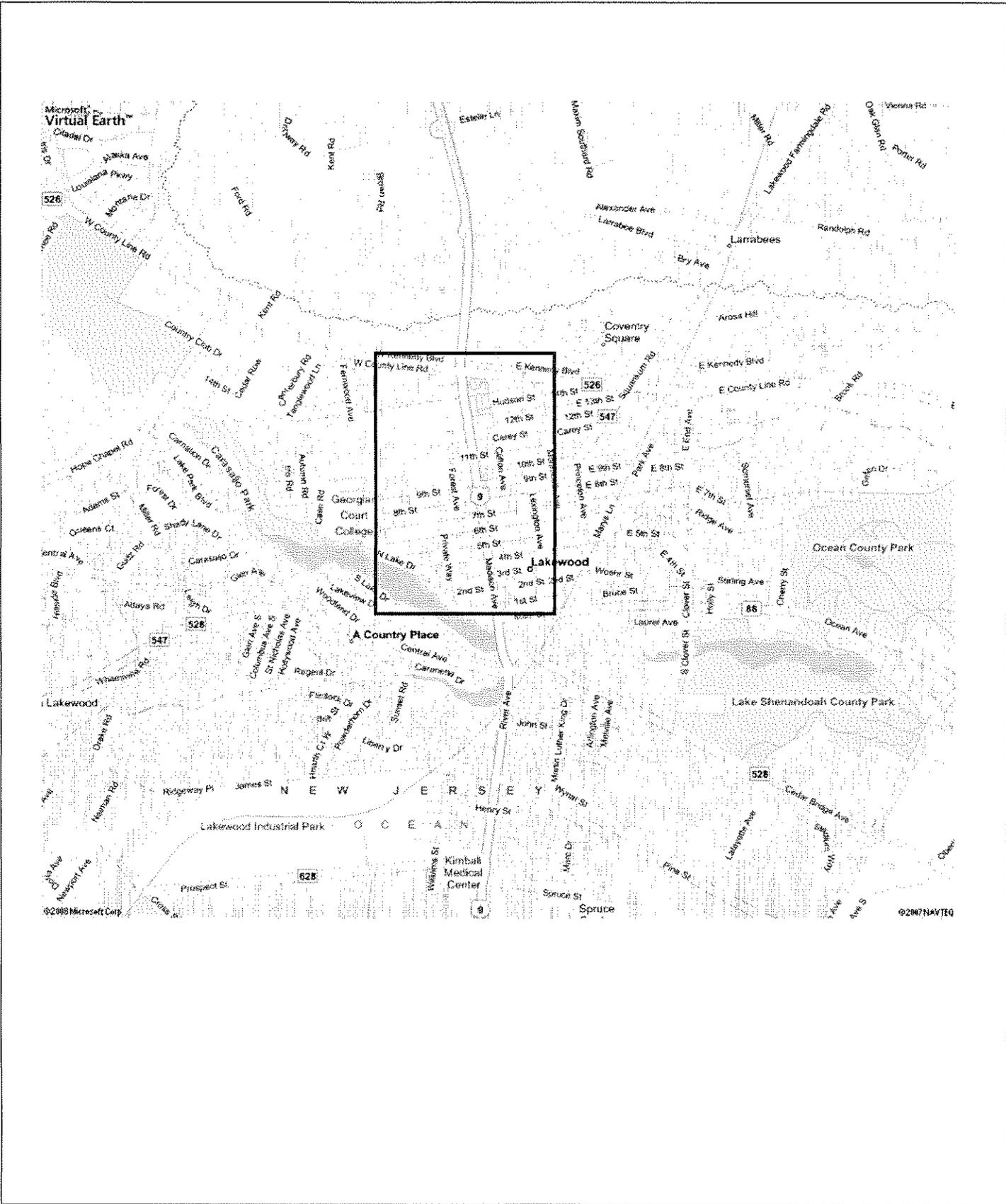
For a signalized intersection, Level of Service (LOS) A indicates operations with delay less than 10 seconds per vehicle, while LOS F describes operations with delay in excess of 80 seconds per vehicle.

For an unsignalized intersection, LOS A indicates operations with delay less than 10 seconds per vehicle, while LOS F describes operations with delay in excess of 50 seconds per vehicle.

### **LEVEL OF SERVICE /AVERAGE DELAY CRITERIA \***

	Level Of Service (LOS)	Signalized Delay Range (average delay, sec/veh)	Unsignalized Delay Range (average delay in sec/veh)
	A	≤10	≤10
	B	>10 and ≤20	>10 and ≤15
	C	>20 and ≤35	>15 and ≤25
	D	>35 and ≤55	>25 and ≤35
	E	>55 and ≤80	>35 and ≤50
	F	>80	>50

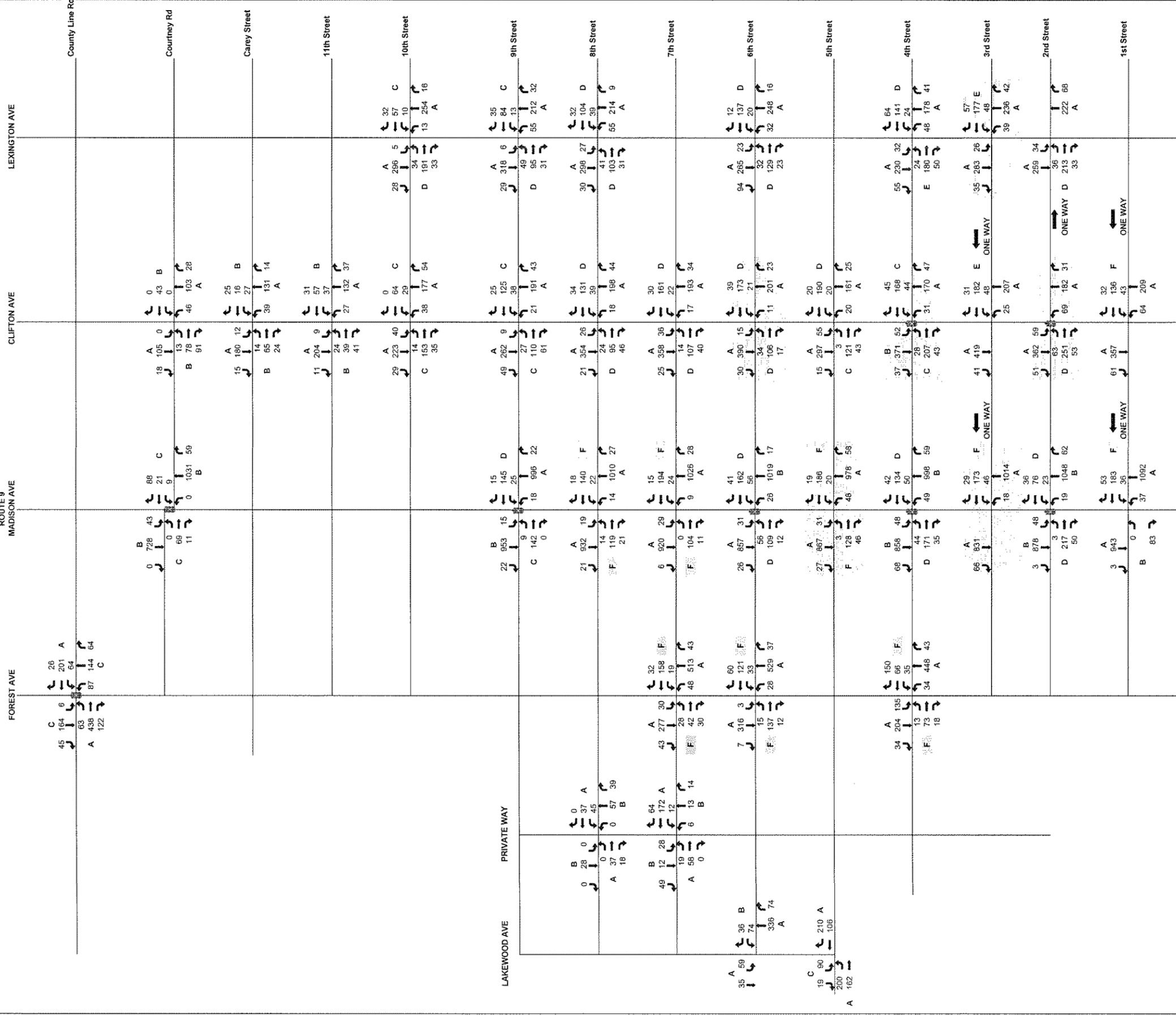
\* Sources: Highway Capacity Manual (2000 Edition) & SimTraffic Version 5.0



**DOWNTOWN TRAFFIC & PEDESTRIAN  
CIRCULATION STUDY  
LAKEWOOD, NJ  
SEPTEMBER 2008**

**LOCATION MAP**

**EXHIBIT 1**



EXISTING TRAFFIC SIGNAL  
 ESTIMATED VOLUMES

NOT TO SCALE



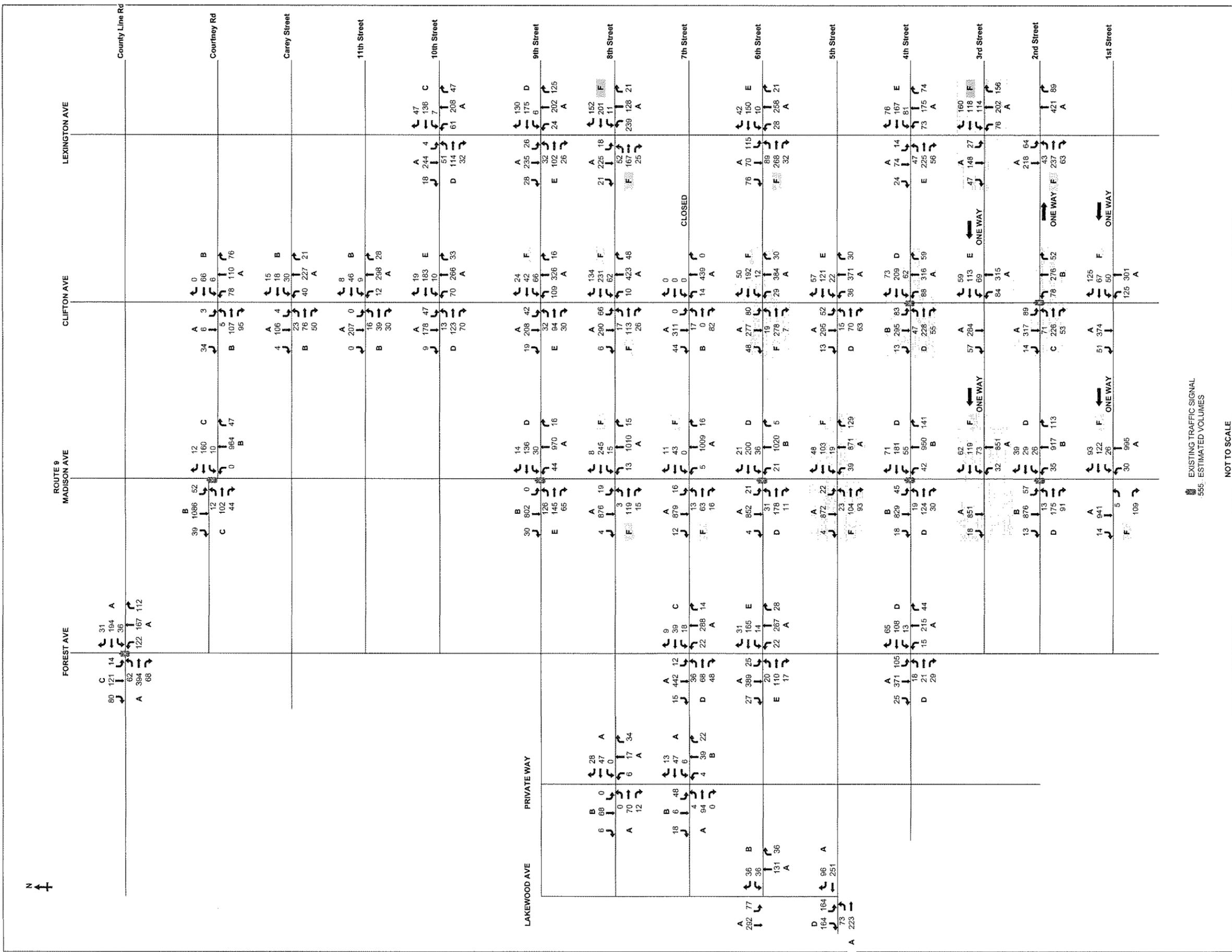
DOWNTOWN TRAFFIC AND PEDESTRIAN CIRCULATION STUDY

LAKEWOOD, NJ  
SEPTEMBER 2008

2007 Existing Peak Hour Volumes  
AM Peak Hour

BALANCED HOURLY & SAMPLE COUNTS

EXHIBIT 2



EXISTING TRAFFIC SIGNAL  
-555- ESTIMATED VOLUMES

NOT TO SCALE

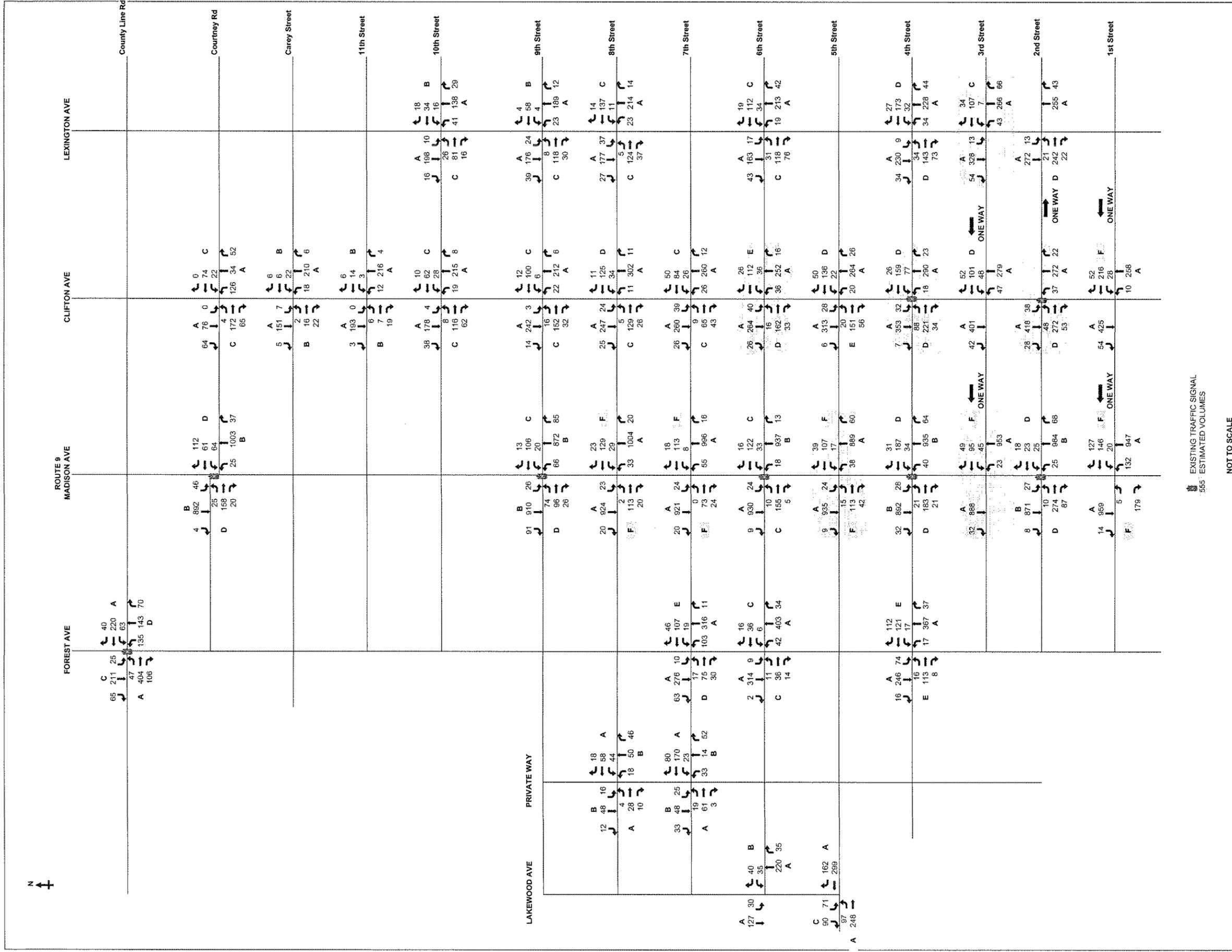


DOWNTOWN TRAFFIC AND PEDESTRIAN CIRCULATION STUDY

LAKEWOOD, NJ  
SEPTEMBER 2008

2007 Existing Peak Hour Volumes  
Midday Peak Hour  
BALANCED HOURLY & SAMPLE COUNTS

EXHIBIT 3



EXISTING TRAFFIC SIGNAL  
565 ESTIMATED VOLUMES

NOT TO SCALE



DOWNTOWN TRAFFIC AND PEDESTRIAN CIRCULATION STUDY

LAKEWOOD, NJ  
SEPTEMBER 2008

2007 Existing Peak Hour Volumes  
PM Peak Hour  
BALANCED HOURLY & SAMPLE COUNTS

EXHIBIT 4

CRASH DATA 2004, 2005 AND 2006

NUMBER OF CRASHES AT THE INTERSECTIONS

		NORTH - SOUTH STREETS					Total	
		LAKEWOOD AVE	PRIVATE WAY	FOREST AVE	CLIFTON AVE	MADISON AVE		LEXINGTON AVE
EAST - WEST STREETS	1st ST	-	-	0	17	44	18	79
	2nd ST	-	1	6	33	66	32	138
	3rd ST	-	0	5	18	19	7	49
	4th ST	-	0	10	13	60	16	99
	5th ST	-	1	7	15	51	4	78
	6th ST	1	2	4	14	34	11	66
	7th ST	3	0	12	10	36	11	72
	8th ST	0	1	5	8	33	8	55
	9th ST	1	4	7	25	47	10	94
	10th ST	-	-	2	14	27	4	47
	11th ST	-	-	0	4	19	5	28
	12th ST	-	-	1	3	9	0	13
	13th ST	-	-	2	0	6	0	8
	14th ST	-	-	16	1	12	0	29
	15th ST	-	-	0	0	5	0	5
	CAREY ST	-	-	1	5	19	7	32
	COUNTY LINE RD	-	-	8	9	62	2	81
COURTNEY RD	-	-	0	11	24	5	40	
N. LAKE DR	7	1	1	0	0	0	9	
<b>Total</b>	<b>12</b>	<b>10</b>	<b>87</b>	<b>200</b>	<b>573</b>	<b>140</b>	<b>1022</b>	

Signalized Intersection

CRASH TYPE	Number of	
	Type	% of Total
UNKNOWN	8	1%
<b>SAME DIRECTION (REAR END)</b>	<b>257</b>	<b>25%</b>
SAME DIRECTION (SIDESWIPE)	96	9%
<b>RIGHT ANGLE</b>	<b>355</b>	<b>35%</b>
HEAD ON	18	2%
OPP. DIRECTION (SIDESWIPE)	8	1%
STRUCK PARKED VEHICLE	66	6%
LEFT TURN / U TURN	81	8%
BACKING	11	1%
ENCROACHMENT	3	0%
OVERTURNED	1	0%
FIXED OBJECT	18	2%
ANIMAL	1	0%
PEDESTRIAN	16	2%
PEDALCYCLIST	7	1%
NON-FIXED OBJECT	2	0%
RAILCAR-VEHICLE	0	0%
N/A	0	0%
OTHER	74	7%
<b>TOTAL</b>	<b>1022</b>	

CRASH DATA 2004, 2005 AND 2006

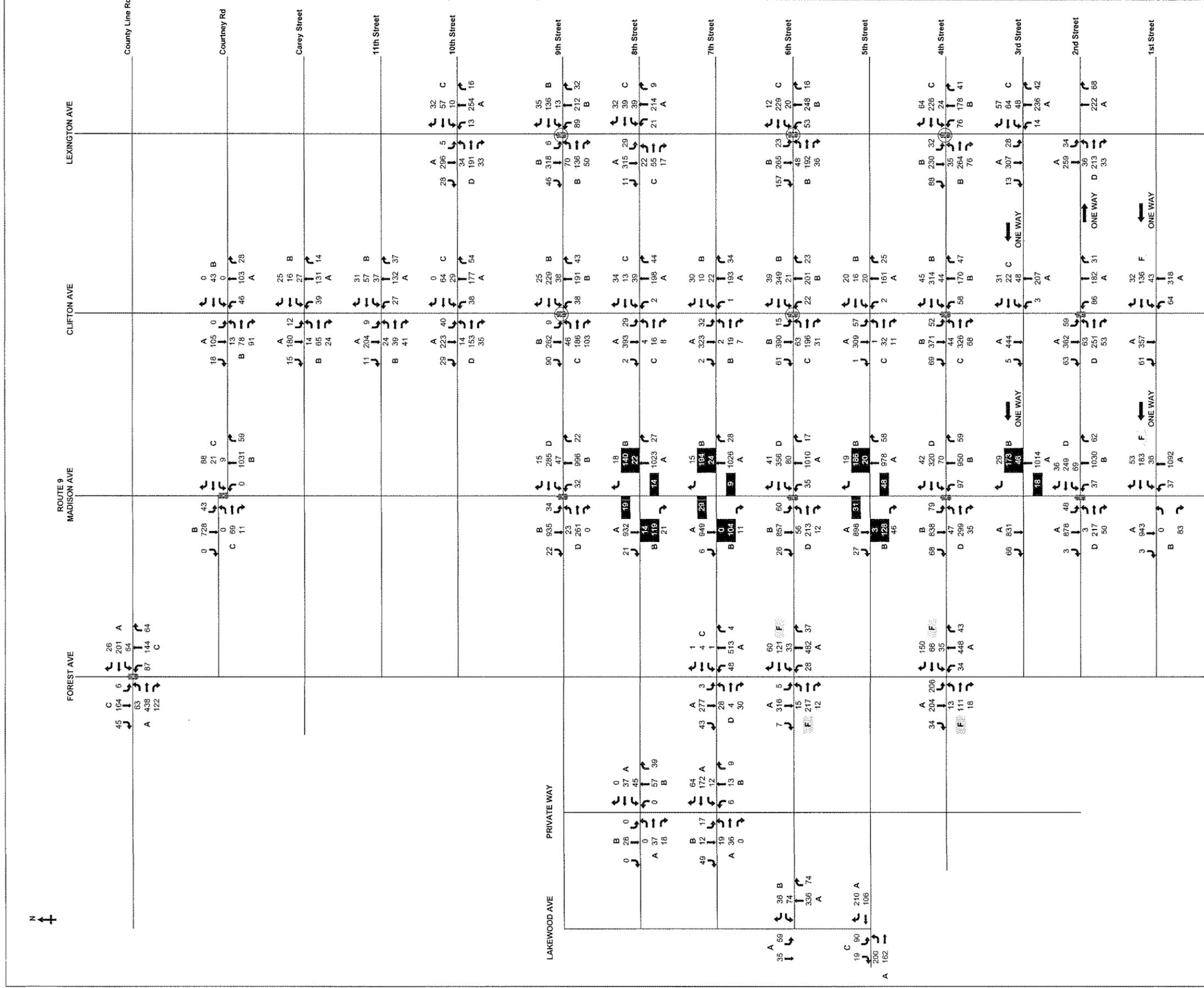
KEY TYPES OF CRASHES AT  
 UNSIGNALIZED INTERSECTIONS

IMPROVEMENT STRATEGY	CRASH LOCATION	CROSS STREET	Number of Left Turn Collisions	Total Number of Collisions	% of Total	* State Average %
Prohibit Route 9 Left Turns and Cross Street Left/Throughs	Route 9	First Street	6	44	14%	4.3%
	Route 9	Third Street	0	19	0%	4.3%
	Route 9	Fifth Street	1	51	2%	4.3%
	Route 9	Seventh Street	1	36	3%	4.3%
	Route 9	Eighth Street	1	32	3%	4.3%
Install Traffic Signal	Clifton Avenue	Sixth Street	1	14	7%	4.3%
	Clifton Avenue	Ninth Street	0	26	0%	4.3%
	Lexington Avenue	Fourth Street	0	16	0%	4.3%
	Lexington Avenue	Sixth Street	0	11	0%	4.3%
	Lexington Avenue	Ninth Street	0	10	0%	4.3%

	CRASH LOCATION	CROSS STREET	Number of Right Angle Collisions	Total Number of Collisions	% of Total	* State Average %
Prohibit Route 9 Left Turns and Cross Street Left/Throughs	Route 9	First Street	15	44	34%	20.4%
	Route 9	Third Street	5	19	26%	20.4%
	Route 9	Fifth Street	25	51	49%	20.4%
	Route 9	Seventh Street	13	36	36%	20.4%
	Route 9	Eighth Street	11	32	34%	20.4%
Install Traffic Signal	Clifton Avenue	Sixth Street	8	14	57%	20.4%
	Clifton Avenue	Ninth Street	9	26	35%	20.4%
	Lexington Avenue	Fourth Street	9	16	56%	20.4%
	Lexington Avenue	Sixth Street	6	11	55%	20.4%
	Lexington Avenue	Ninth Street	6	10	60%	20.4%

\* Source: NJDOT Bureau of Safety Programs Accident Summary

	CRASH LOCATION	CROSS STREET	Sum of LTs & RAs	Average Annual
Traffic Signal Warrant: 5 Correctable Accidents in 12-month Period	Clifton Avenue	Sixth Street	9	3
	Clifton Avenue	Ninth Street	9	3
	Lexington Avenue	Fourth Street	9	3
	Lexington Avenue	Sixth Street	6	2
	Lexington Avenue	Ninth Street	6	2



EXISTING TRAFFIC SIGNAL    Percent Growth: 0.0%  
 Number of Years: 0  
 PROPOSED TRAFFIC SIGNAL    Growth Factor: 1.00  
 NOT TO SCALE

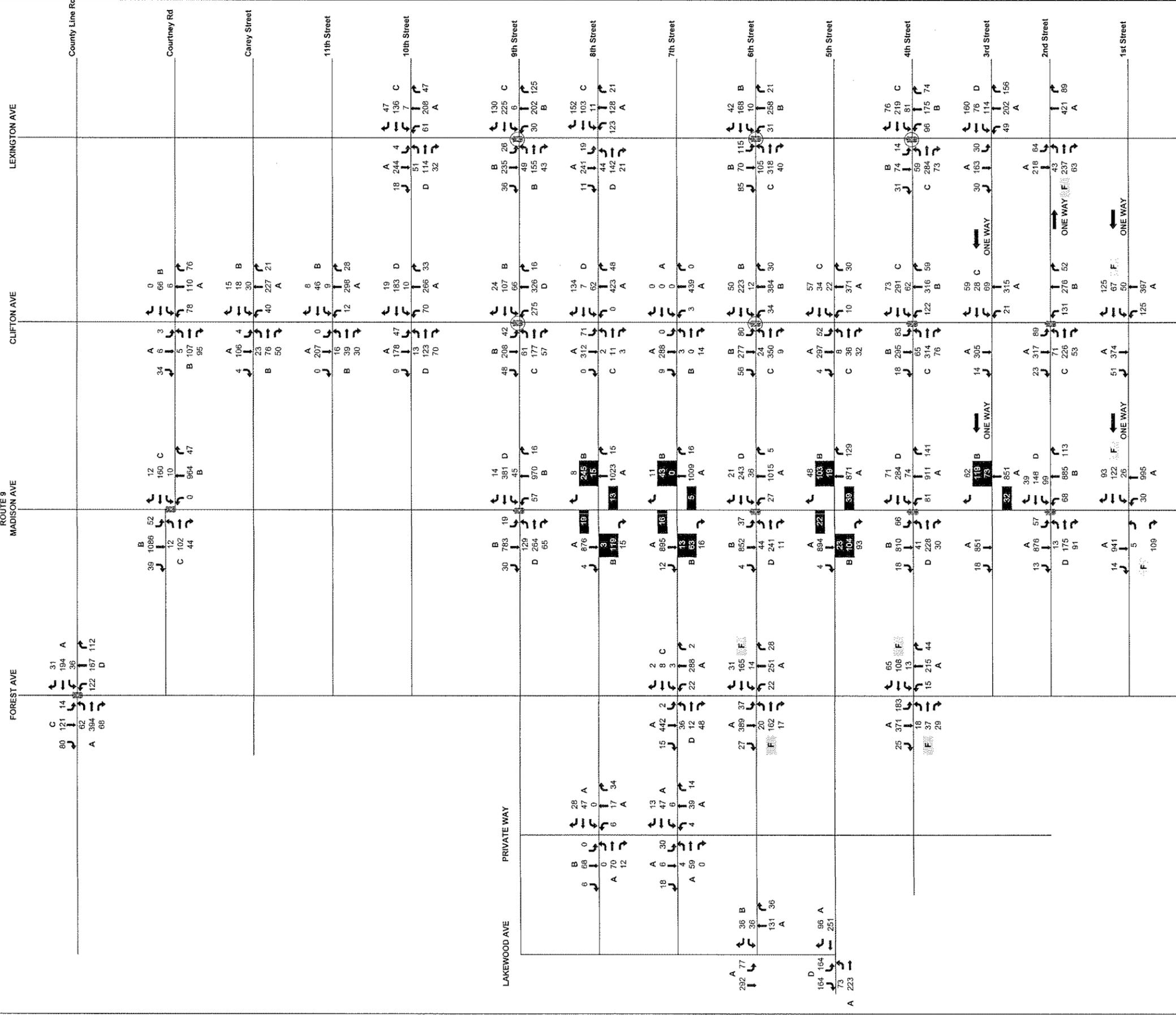
MOVEMENT ELIMINATED AND VOLUMES REDISTRIBUTED  
 TO ADJACENT SIGNALIZED INTERSECTION



DOWNTOWN TRAFFIC AND PEDESTRIAN CIRCULATION STUDY  
 LAKEWOOD, NJ  
 SEPTEMBER 2008

2007 Peak Hour Volumes  
 with Improvements  
 AM Peak Hour

EXHIBIT 6



EXISTING TRAFFIC SIGNAL  
 PROPOSED TRAFFIC SIGNAL  
 NOT TO SCALE

MOVEMENT ELIMINATED AND VOLUMES REDISTRIBUTED TO ADJACENT SIGNALIZED INTERSECTION

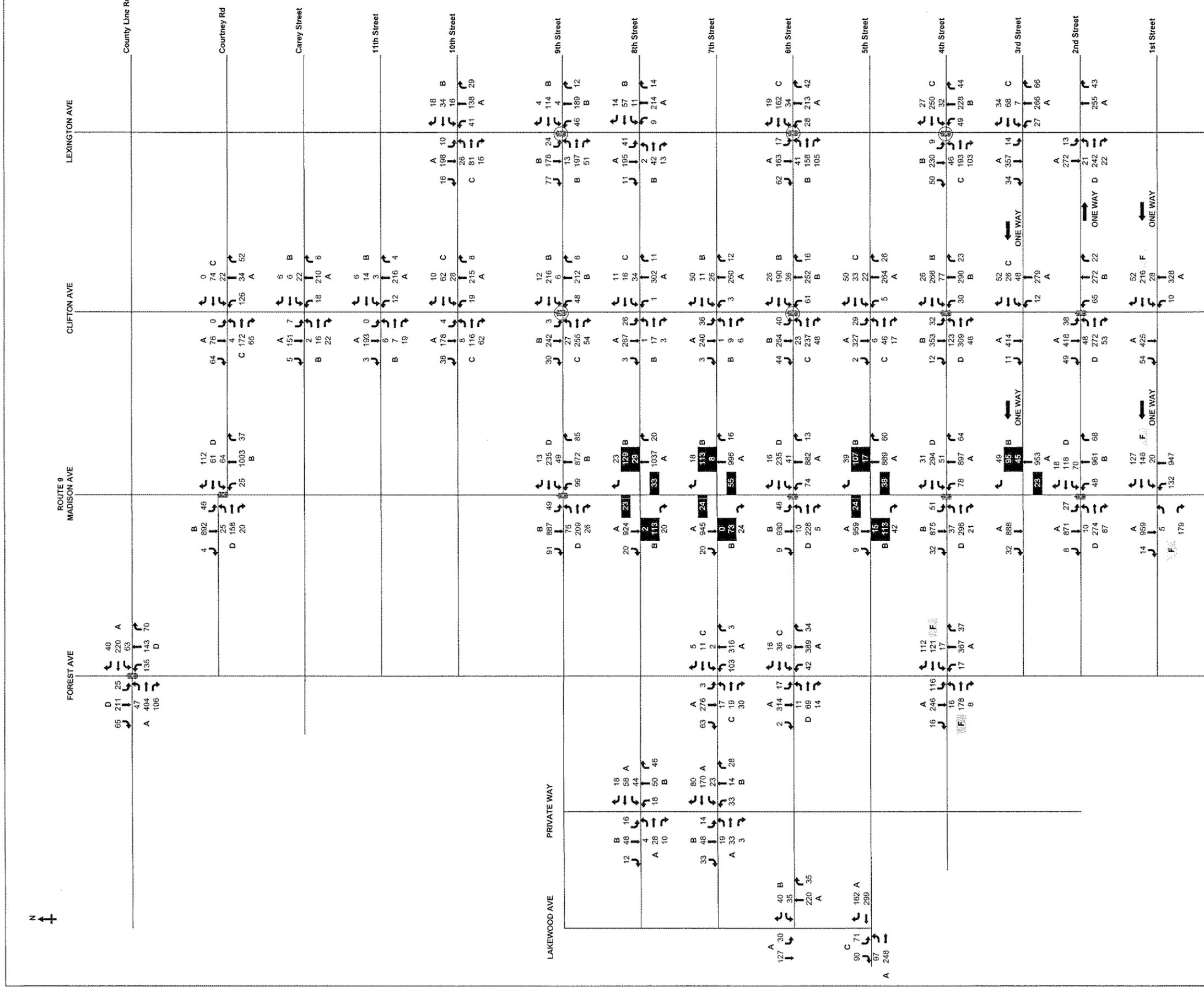
Percent Growth: 0.0%  
 Number of Years: 0  
 Growth Factor: 1.00



DOWNTOWN TRAFFIC AND PEDESTRIAN CIRCULATION STUDY  
 LAKEWOOD, NJ  
 SEPTEMBER 2008

2007 Peak Hour Volumes with Improvements  
 Midday Peak Hour

EXHIBIT 7



EXISTING TRAFFIC SIGNAL      Percent Growth: 0.0%  
 Number of Years: 0  
 PROPOSED TRAFFIC SIGNAL      Growth Factor: 1.00

MOVEMENT ELIMINATED AND VOLUMES REDISTRIBUTED TO ADJACENT SIGNALIZED INTERSECTION

NOT TO SCALE

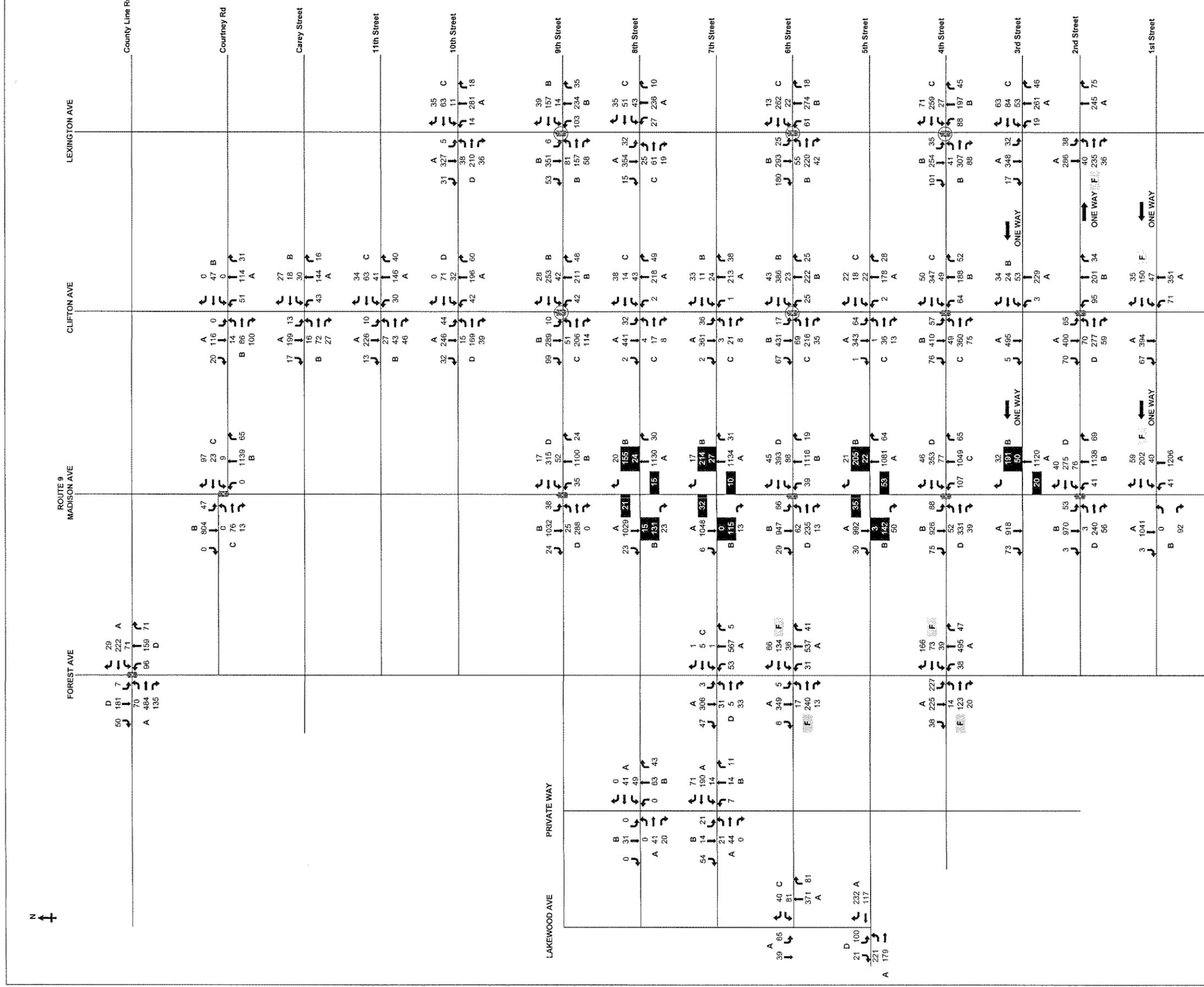


DOWNTOWN TRAFFIC AND PEDESTRIAN CIRCULATION STUDY

LAKWOOD, NJ  
 SEPTEMBER 2008

2007 Peak Hour Volumes  
 with Improvements  
 PM Peak Hour

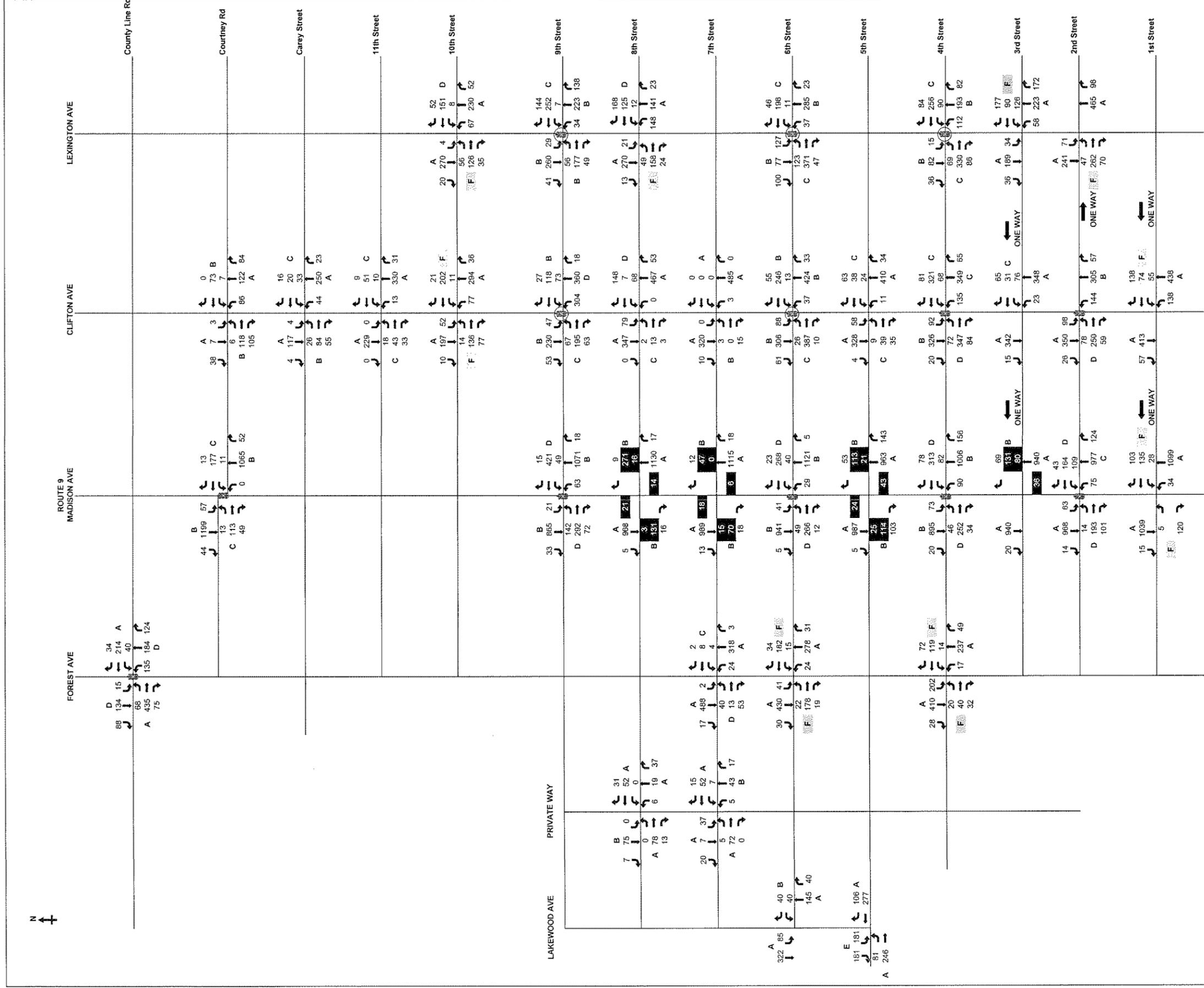
EXHIBIT 8



DOWNTOWN TRAFFIC AND PEDESTRIAN CIRCULATION STUDY  
LAKEWOOD, NJ  
SEPTEMBER 2008

2017 Peak Hour Volumes  
with Improvements  
AM Peak Hour

EXHIBIT 9



EXISTING TRAFFIC SIGNAL      Percent Growth: 1.0%  
 Number of Years: 10  
 PROPOSED TRAFFIC SIGNAL      Growth Factor: 1.10  
 NOT TO SCALE

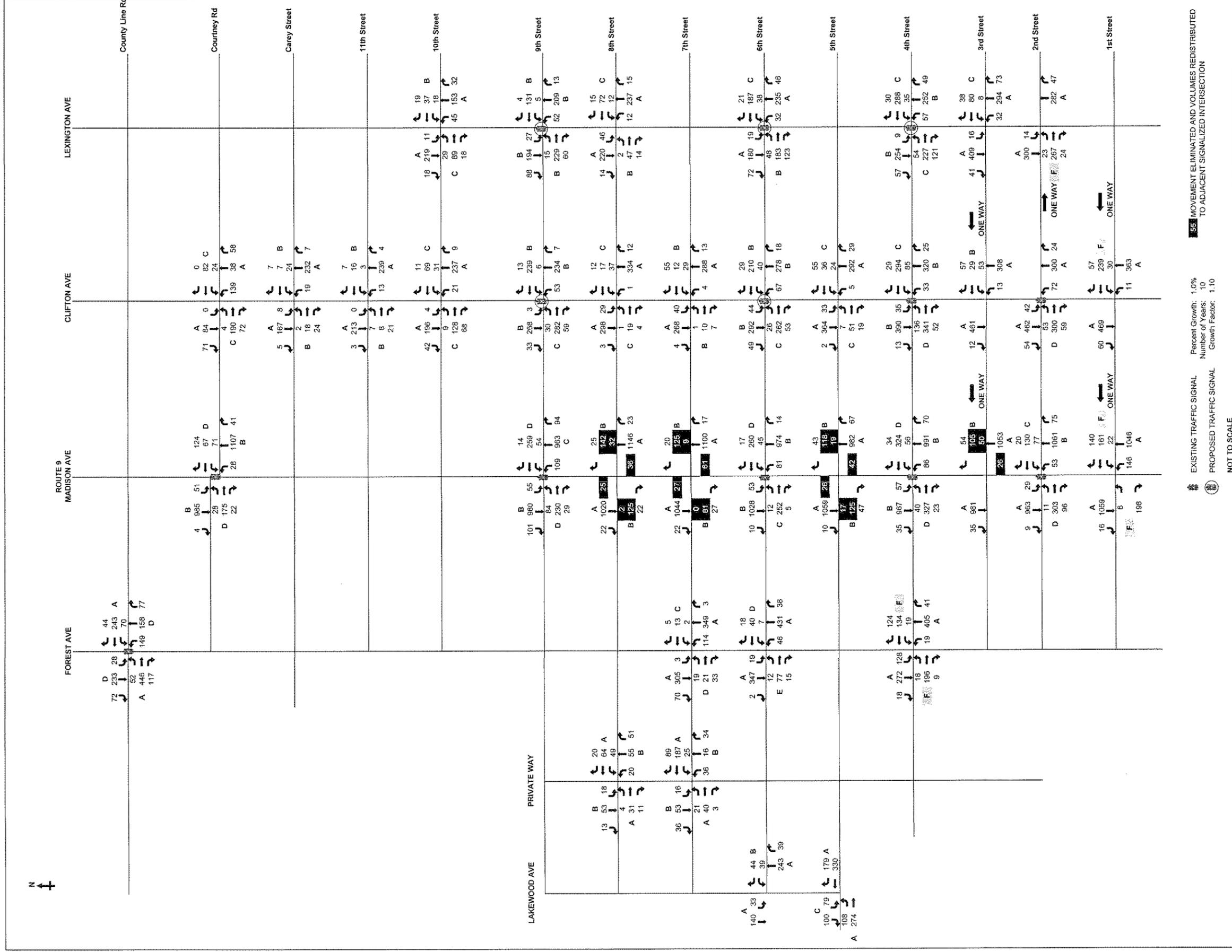
MOVEMENT ELIMINATED AND VOLUMES REDISTRIBUTED  
 TO ADJACENT SIGNALIZED INTERSECTION



DOWNTOWN TRAFFIC AND PEDESTRIAN CIRCULATION STUDY  
 LAKEWOOD, NJ  
 SEPTEMBER 2008

2017 Peak Hour Volumes  
 with Improvements  
 Midday Peak Hour

EXHIBIT 10



EXISTING TRAFFIC SIGNAL      Percent Growth: 1.0%  
 PROPOSED TRAFFIC SIGNAL      Number of Years: 10  
 NOT TO SCALE      Growth Factor: 1.10

MOVEMENT ELIMINATED AND VOLUMES REDISTRIBUTED  
 TO ADJACENT SIGNALIZED INTERSECTION



DOWNTOWN TRAFFIC AND PEDESTRIAN CIRCULATION STUDY  
 LAKEWOOD, NJ  
 SEPTEMBER 2008

2017 Peak Hour Volumes  
 with Improvements  
 PM Peak Hour

EXHIBIT 11