

# ISLAND Vertical one

**Pennoni Traffic Impact Study**  
Pennoni Associates, Inc

## DEVELOPER

**Philadelphia Management**  
1411 Walnut Street  
Philadelphia, PA 19102

**Lubert-Adler Partners**  
The Cira Centre  
2929 Arch Street  
Philadelphia, PA 19104-2868

**Neducsin Properties**  
161 Leverington Avenue  
Philadelphia, PA 19127

## ARCHITECT

**Stephen Varenhorst Architects**  
1100 East Hector Street, Suite 313  
Conshohocken, PA 19428

# SVA

# ISLAND **venice one**

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**Flood Hazard Analysis**

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**Topographic Survey**

SVA (Stephen Varenhorst Architects)  
**Zoning Plan & Zoning Information  
Illustrative Site Plan & Section**

**SVA**



# TRAFFIC IMPACT STUDY

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# VENICE ISLAND APARTMENTS

THE CITY OF PHILADELPHIA  
Pennsylvania

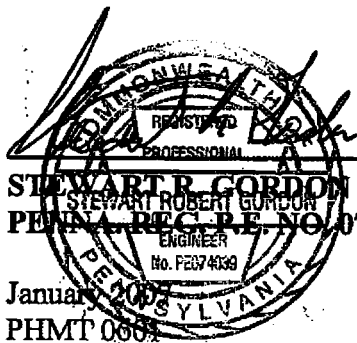
*Prepared For:*

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**PHILADELPHIA MANAGEMENT**  
1411 Walnut St., 3<sup>rd</sup> Floor  
Philadelphia, PA 19102

*Prepared By:*

**Pennoni Associates, Inc.**  
515 Grove Street, Suite 2C  
Haddon Heights, NJ 08035



**STEWART R. GORDON**  
PENNA. REG. P.E. NO. 074039  
ENGINEER  
No. PE074039  
January 2008  
PHMT 0008

**VENICE ISLAND APARTMENTS  
TRAFFIC IMPACT STUDY  
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## INTRODUCTION

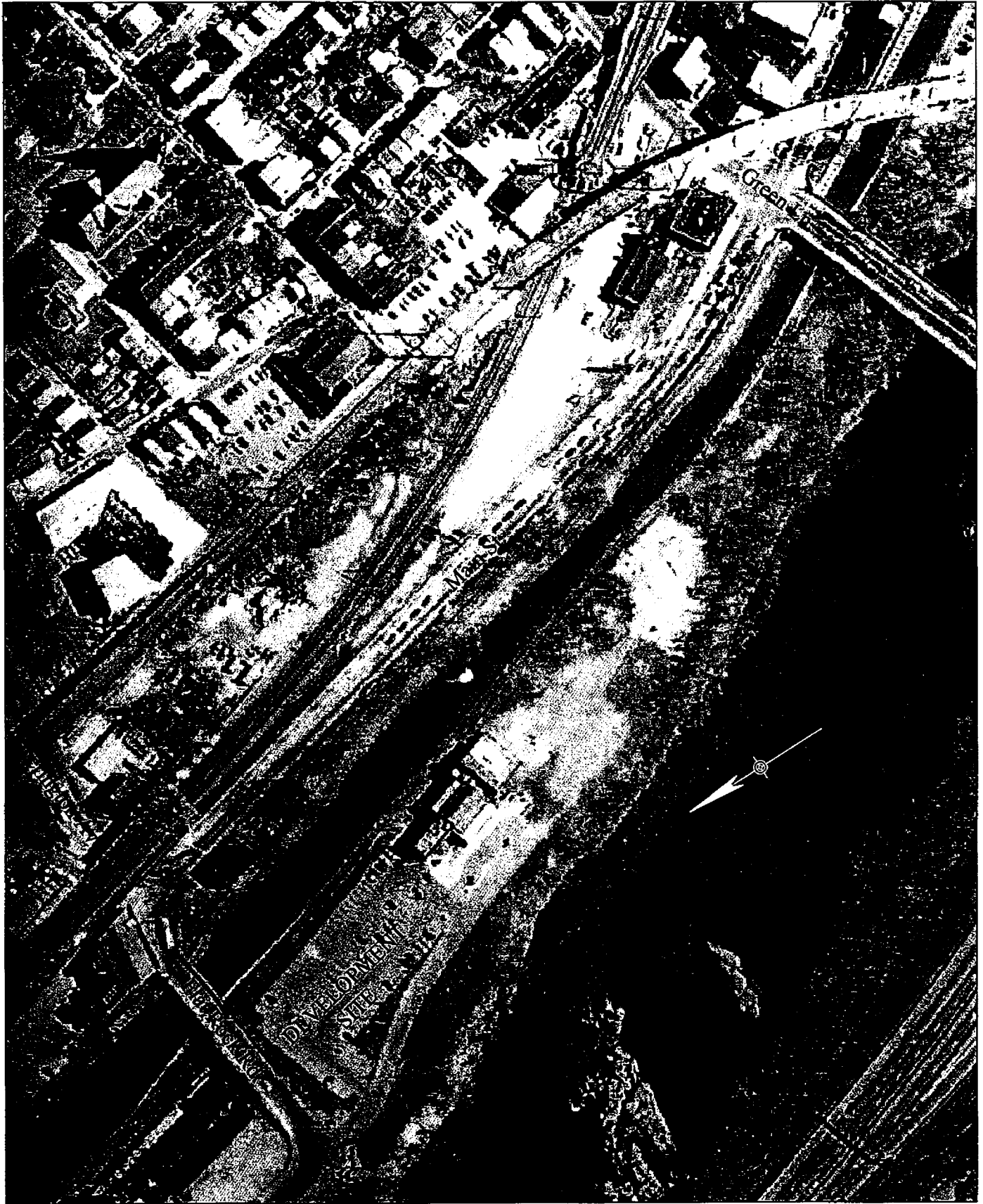
Pennoni Associates, Inc. (Pennoni) is pleased to submit this Traffic Impact Study on behalf of Philadelphia Management for the proposed residential development on Venice Island. This development will be situated between Flat Rock Road and Green Lane in the Manayunk section of Philadelphia, Pennsylvania.

Venice Island Apartments will be comprised of 280 apartment units, consisting of 200 one bedroom apartments and 80 two bedroom apartments. There will be at grade parking consisting of at least 360 parking spaces in order to conform to the parking requirements of the Manayunk Overlay District. ~~\_\_\_\_\_~~

The location of Venice Island Apartments and the general study area are shown on **FIGURE 1**.

Specific elements included in this study are:

- ◆ An inventory of the roadway facilities in the vicinity of this project, including the existing physical and traffic operating characteristics,
- ◆ Peak hour capacity analysis of the study intersections for existing conditions,
- ◆ Pre-development traffic volumes for completion year,
- ◆ Critical hour capacity analysis of the study intersections for pre-development conditions,
- ◆ Distribution and assignment of the new vehicle trips to be generated by the Venice Island Apartments development,
- ◆ Total post-development traffic volumes, including the development traffic,
- ◆ Critical hour capacity analysis of the study intersections and site access for post-development conditions.



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CONSULTING ENGINEERS  
515 GROVE STREET  
HADDON HEIGHTS, NJ 08035

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Philadelphia, PA

FIGURE 1  
PROJECT LOCATION  
(AERIAL PHOTOGRAPH)

## EXISTING TRAFFIC CONDITIONS

### **Existing Roadway Facilities**

In general, sidewalk, and curbing are provided on the streets within the study area. The following roadways within the immediate vicinity of the project site were evaluated as part of this study:

- **Main Street.** Main Street is a two way, two lane north-south collector roadway. The road is 36 feet wide with sidewalks and curbing throughout. Main Street provides access to down town Manayunk, and I-76 via Green Lane.
- **Flat Rock Road.** Flat Rock Road is a two way, two lane local road that runs east-west within the vicinity of the study area. It is 34 feet wide, with no sidewalks or curbing. The westbound direction of this local road provides access to a self storage facility and Jefferson Smurfit Corporation.
- **Leverington Avenue.** Leverington Avenue is a two way, two lane east-west roadway within the vicinity of the study area. The pavement surface, markings, sidewalk and curbing are in average condition.
- **Green Lane.** Green Lane is a east-west arterial roadway. It is 36 feet wide with two lanes east of Main Street and four lanes west of Main Street. This road allows for direct access to I-76. The pavement surface, markings, sidewalk and curbing are in average condition.

### **Existing Intersections**

- **Leverington Avenue/Flat Rock Road and Main Street.** See Photos 1 and 2. The westbound approach (Leverington Avenue) contains a left and right turn lane. The eastbound approach (Flat Rock Road) contains one effective through lane which transitions into a through lane and a right turn lane onto Main Street. The northbound approach of Main Street contains a left and right turn lane.

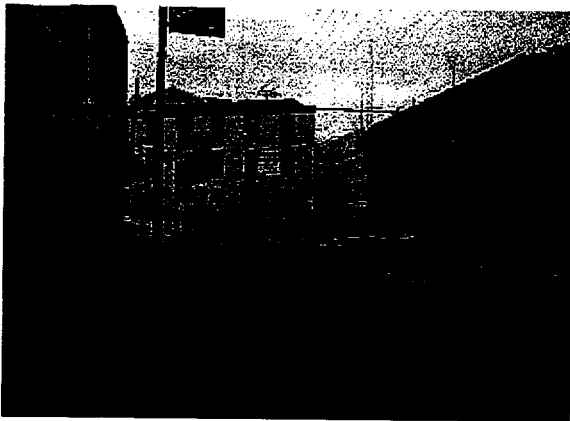


Photo 1: Main Street, looking northbound, at intersection with Leverington Ave./Flat Rock Rd.

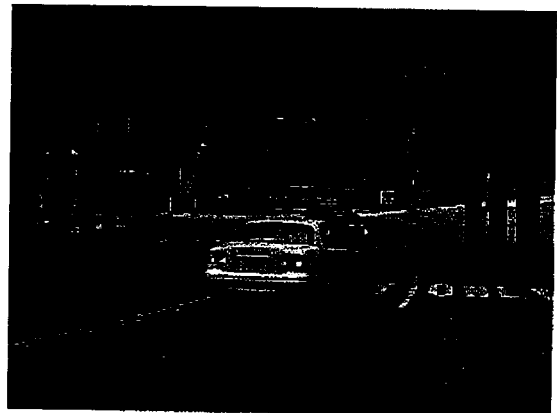


Photo 2: Leverington Avenue, looking eastbound, at Main Street.

- **Green Lane and Main Street.** See Photos 3 and 4. The eastbound approach (Green Lane) contains a shared through/right lane and a designated left turn lane. The westbound approach (Green Lane) contains a shared through/left/right lane; however, based on field observations, the approach operates as a shared through/right lane and a shared through/left lane. The southbound approach (Main Street) contains a designated right turn lane and a shared through/left turn lane. The northbound approach (Main Street) contains a shared through/right and a left turn lane.



Photo 3: Green Lane, looking eastbound at Main Street intersection.



Photo 4: Main Street, looking southbound, at Green Lane intersection.

The following two intersections were analyzed for existing and future capacity restraints as part of this study:

1. Main Street and Leverington Avenue/Flat Rock Road
2. Main Street and Green Lane.



### Existing Traffic Volumes

Turning movement counts, including heavy vehicles, parking maneuvers, bus blockages, and pedestrian counts, were conducted on an average weekday (Tuesday, October 11, 2005) between the hours of 7:00 - 9:00 A.M. and 4:00 - 6:00 P.M. at the study intersections. Pedestrians, heavy vehicles and transit buses were also counted.

The count data are provided in **APPENDIX A**.

The proposed development site is located within the Philadelphia area. This area is densely populated with a variety of residential and commercial developments. Additionally, a variety of transit options, including the RT 61 SEPTA bus, and the SEPTA R6 rail line are all within close proximity to the proposed development.

The existing turning movement traffic volumes for the intersections within the study area are illustrated on **FIGURE 2**.

### Existing Levels of Service

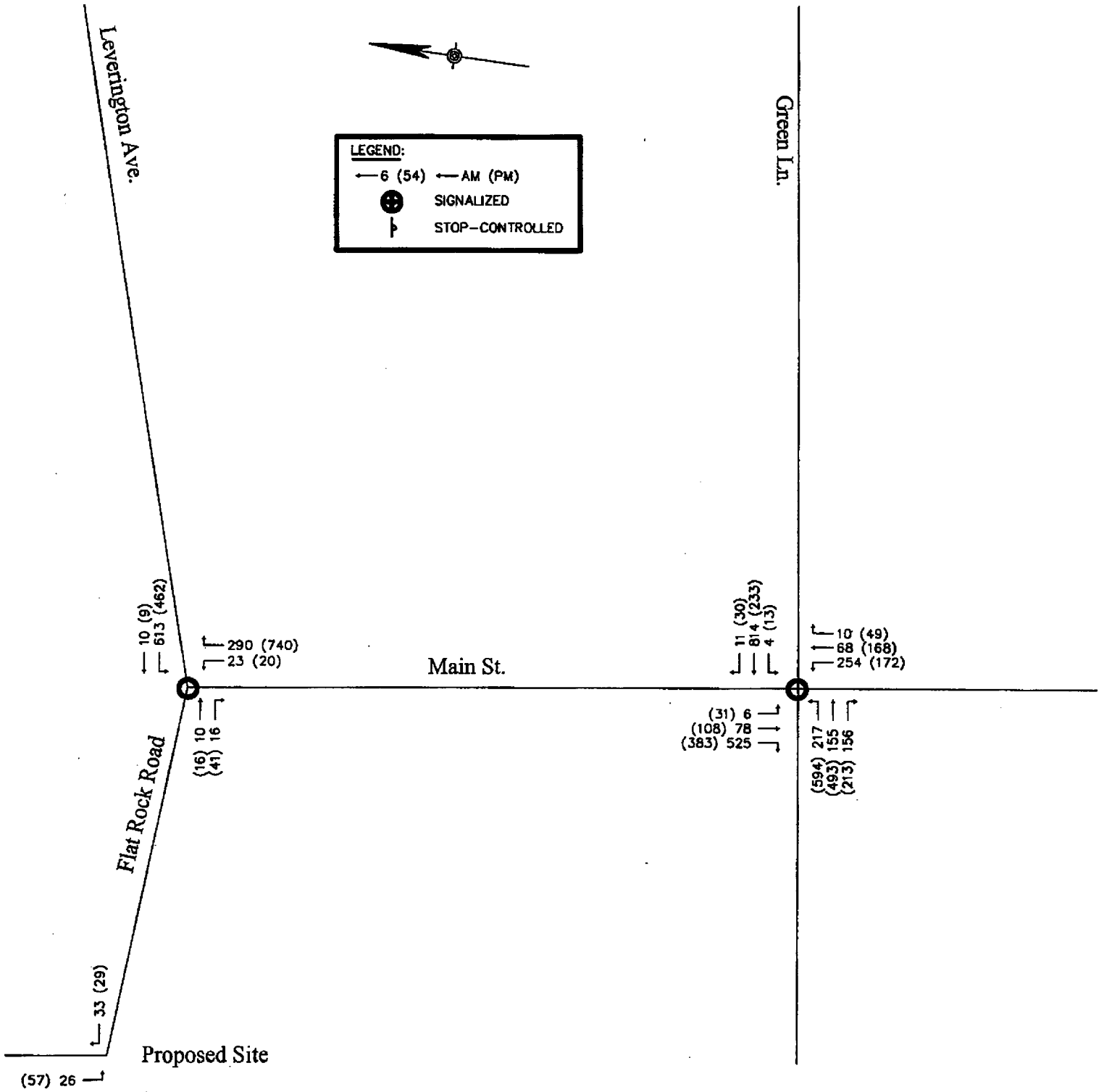
The peak hours of operation were evaluated at the study intersections. The analyses were performed in accordance with the procedures outlined in the Highway Capacity Manual 2000 ed., Special Report 209, published by the Transportation Research Board, Washington D.C., using the Trafficware's Software, Synchro. The results of these analyses provide Level of Service, volume/capacity descriptions and average seconds of delay for the intersection movements. Existing signal timing data was provided by the City of Philadelphia, Department of Streets and verified in the field.

Level of Service is a measure of vehicle operator satisfaction with the driving experience. For the study intersections this has been quantified with designations "A" through "F" for the signalized intersection and "a" through "f" for unsignalized intersections based on the average vehicle delay per each approach and the overall intersection. The Level of Service concept is a rating system established to objectively evaluate the operational adequacy of an intersection or roadway. Definitions of the Levels of Service are contained in **APPENDIX B**.

Average Delay refers to the time a vehicle arriving at the intersection must wait before proceeding through the intersection. The volume/capacity ratio compares the number of vehicles attempting to utilize an approach or intersection to the capacity of the approach or intersection for a specific time period. As the traffic volumes near the capacity of the approach or intersection, congestion occurs. A V/C of 1.0 indicates that the volumes equal the estimated capacity of the intersection or approach.

*are you kidding?*  
Under the existing conditions, all study intersections operate at acceptable Levels of Service, with all movements operating with acceptable Level of Service "D/d" or better during both peak hours. The westbound approach on Green Lane was analyzed with two lanes instead of one lane per existing striping. Based on field observations during the data collection, it was observed that the approach operates as two lanes, with a shared through/right and a shared through/left lane.

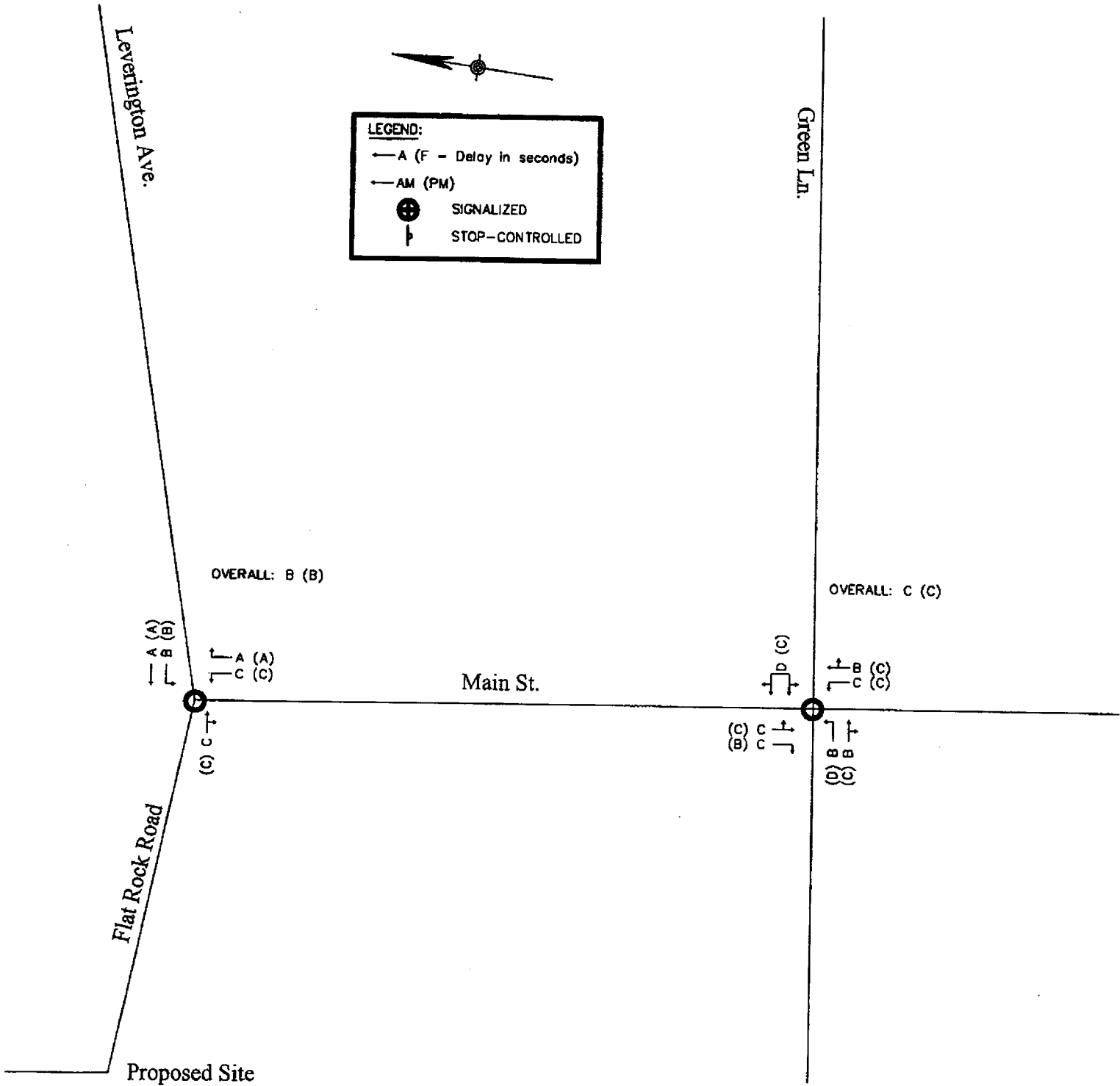
Results of the existing conditions analysis are illustrated on **FIGURE 3**. Summary outputs from the analysis software are provided in **APPENDIX C** and summarized in **APPENDIX H**.



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FIGURE 2  
 EXISTING VOLUME  
 2005



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FIGURE 3  
 EXISTING LEVELS  
 OF SERVICE

## **FUTURE “PRE-DEVELOPMENT” TRAFFIC CONDITIONS**

### **Pre-Development Traffic Volumes**

In order to assess the impact of the traffic generated by the proposed residential development, an analysis of the future traffic conditions was conducted. This analysis considers general volume growth and does not include the development traffic.

An evaluation of future traffic conditions must first account for the traffic volume increases that are expected to occur throughout the region over this period. To account for traffic volume increases from general growth, existing traffic volumes were increased by an annual growth factor of 1% as pre comments made by Charles Denny of Philadelphia Streets Department. In addition, site traffic was added to account for the Venice Lofts, a residential development on Flat Rock Road that will be completed by the end of 2007. The traffic volumes anticipated to be generated by Venice Lofts were projected using the Trip Generation Manual, Seventh Edition, by the Institute of Transportation Engineers, 2003. The trip generation **rate** for ITE Land Use Code 230 *Condominium/Townhouse* was utilized based on 128 units per a discussion with the Venice Loft sales office. The estimated traffic expected to be generated by the Venice Lofts is **63** new vehicle trips (**11** entering/ **52** exiting) in the weekday morning peak hour and **74** new vehicle trips (**50** entering/ **24** exiting) in the weekday evening peak hour. The traffic for Venice lofts was distributed to the study area roadways based on existing traffic patterns. **FIGURE 4** illustrates the projected pre-development traffic volumes. A summary of future traffic volumes is provided in **APPENDIX D**.

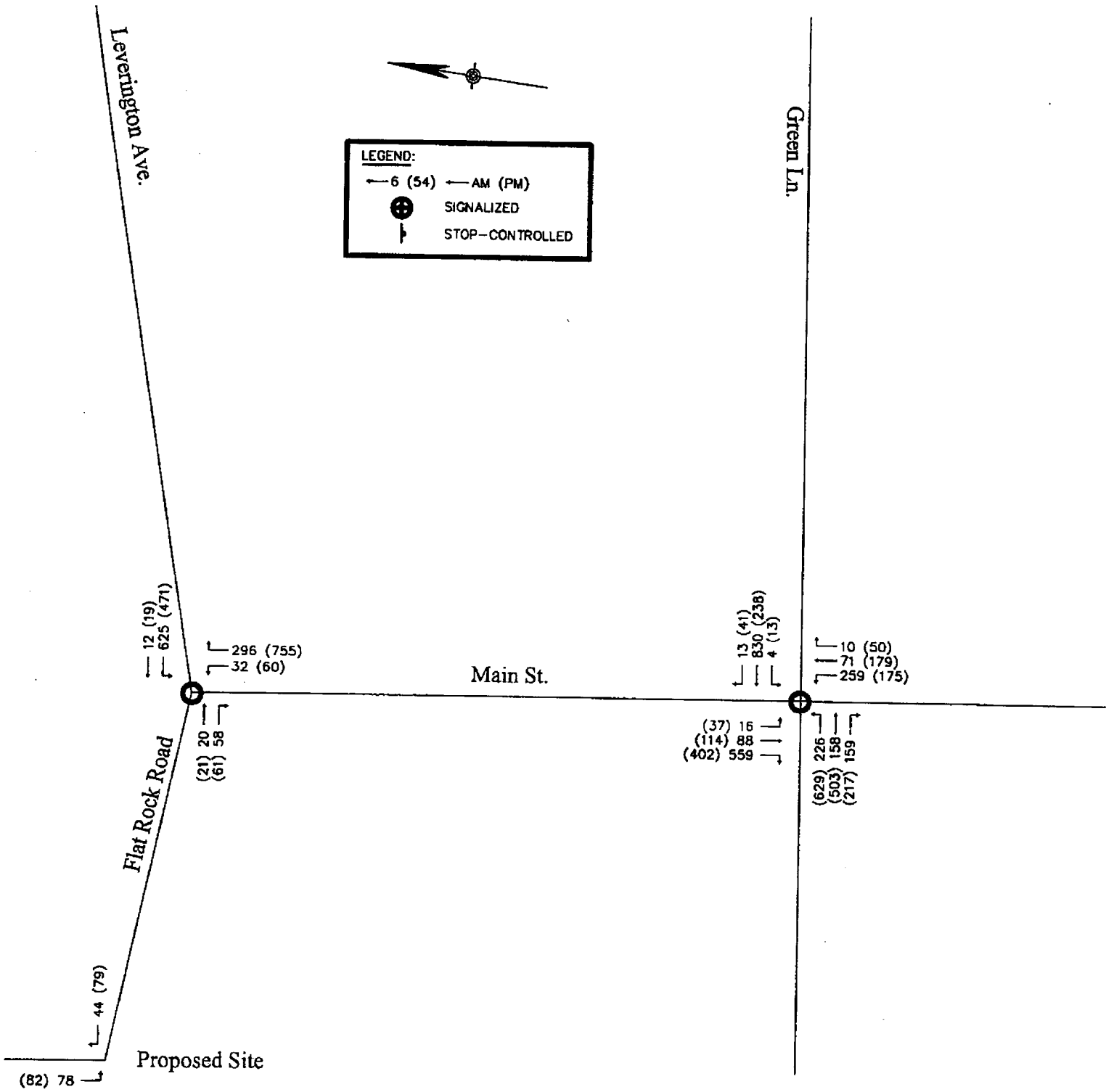
### **Pre-Development Levels of Service**

Operations of the study intersections during the peak hours were evaluated based on the projected pre-development peak hour traffic volumes. **FIGURE 5** illustrates the results of the pre-development analyses.

The results of the pre-development evaluations indicate that all study intersections will operate at overall acceptable LOS “D/d” and/or otherwise maintain their Existing conditions, *except* for the following movements:

1. At the signalized intersection of Green Lane and Main Street: the eastbound left movement on Green Lane degrades from LOS “D” to LOS “E” during the evening peak hour.

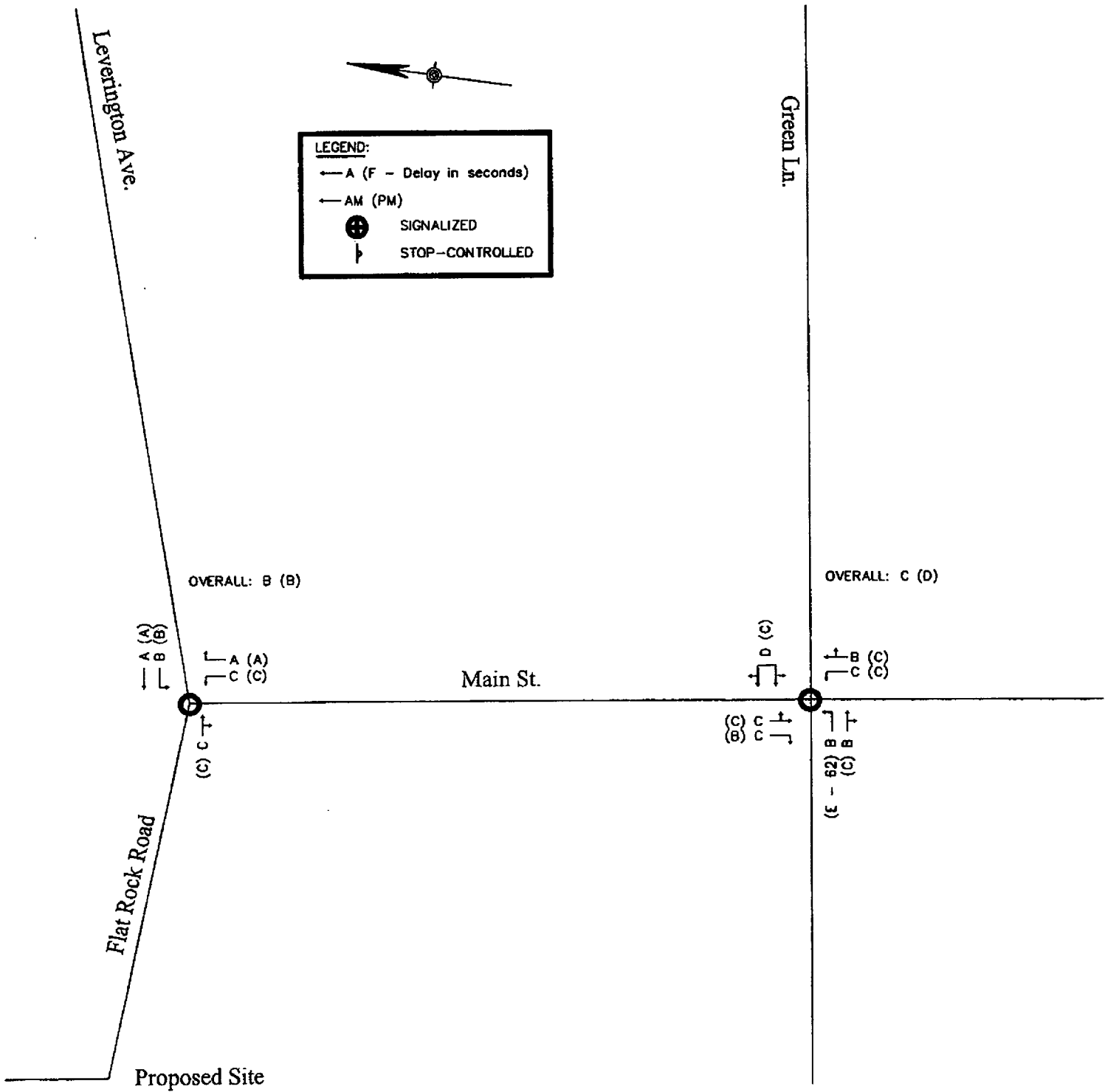
Summary outputs of the pre-development analysis are provided in **APPENDIX E** and summarized in **APPENDIX H**.



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FIGURE 4  
 PRE-DEVELOPMENT  
 VOLUME



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FIGURE 5  
 PRE-DEVELOPMENT LEVELS  
 OF SERVICE

## **DEVELOPMENT TRAFFIC**

### **Project Description**

Philadelphia Management proposes to construct a residential development on Venice Island. This proposed development will be comprised of 280 apartment units, consisting of one and two bedroom apartments. There will be at grade parking consisting of a minimum of 360 parking spaces.

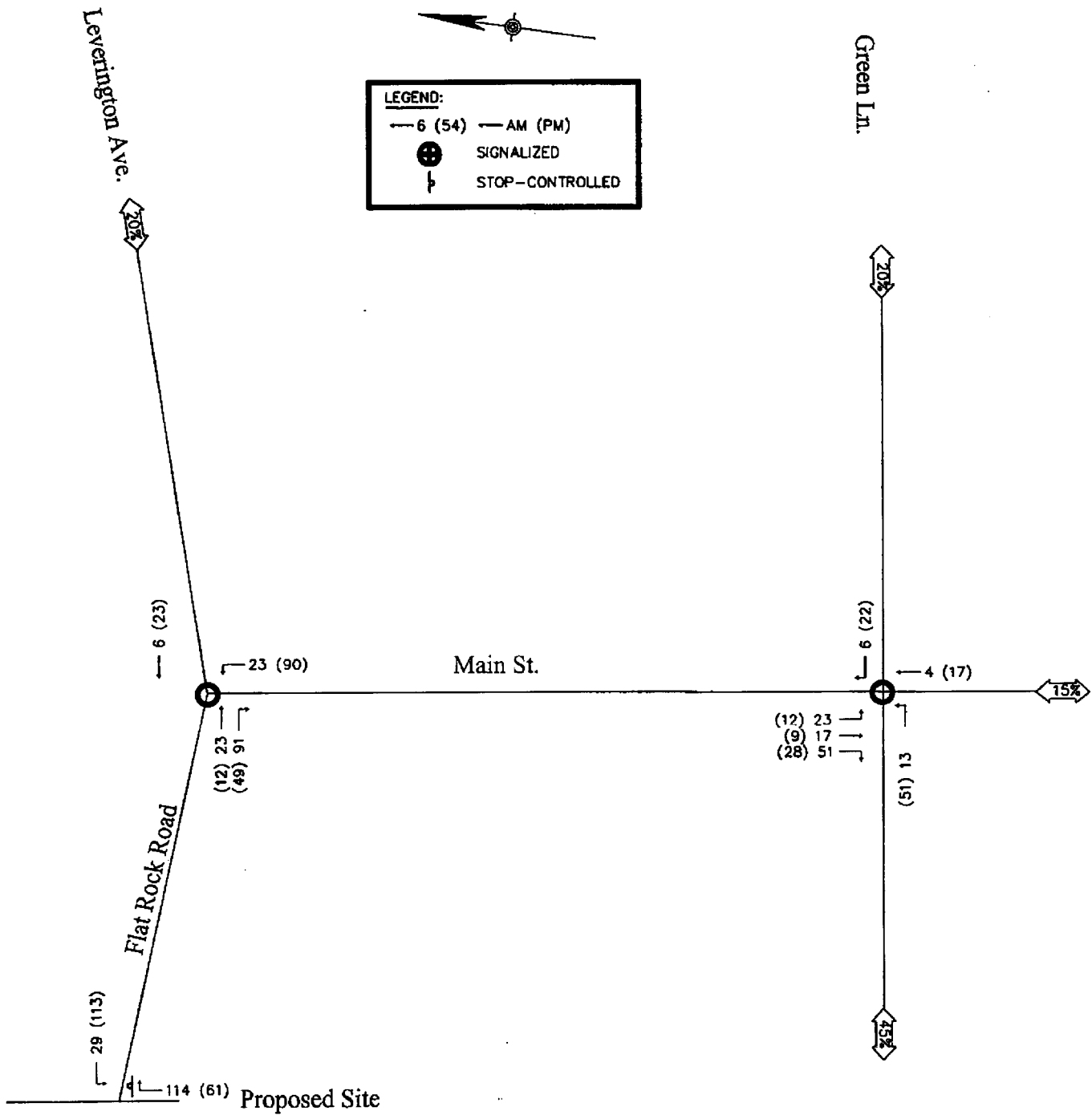
### **Trip Generation**

The traffic volumes anticipated to be generated by the proposed development were projected using the Trip Generation Manual, Seventh Edition, by the Institute of Transportation Engineers, 2003. The trip generation rate for ITE Land Use Code 220 *Apartments* was utilized based on the respective number of units. The estimated traffic expected to be generated by the proposed development is 143 new vehicle trips (29 entering/ 114 exiting) in the weekday morning peak hour and 174 new vehicle trips (113 entering/ 61 exiting) in the weekday evening peak hour. Although bus and rail opportunities exist for the proposed development, no reduction of vehicle trip generation was utilized. The vehicle trip generation thus represents a conservative estimate, as alternate transit modal shifts could represent between 30 and 40 percent reductions.

### **Trip Distribution and Assignment**

The new vehicle trips generated by Venice Island Apartments were distributed and assigned to the roadway network based on a combined evaluation of existing traffic patterns and the proposed development access location onto Flat Rock Road.

**FIGURE 6** illustrates the anticipated distribution of project traffic and the assignment of the new trips to the roadway network in the vicinity of the project.



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FIGURE 6  
 TRIP DISTRIBUTION



## **FUTURE "POST-DEVELOPMENT" TRAFFIC CONDITIONS**

### **Post-Development Traffic Volumes**

The traffic volumes generated by the proposed Venice Island Apartments were added to the pre-development traffic volumes to provide the post-development traffic volumes. These traffic volumes are illustrated on **FIGURE 7**.

### **Post-Development Levels of Service**

Traffic conditions were evaluated for the weekday morning and evening peak hours assuming the post-development traffic volumes. **FIGURE 8** illustrates the future Levels of Service.

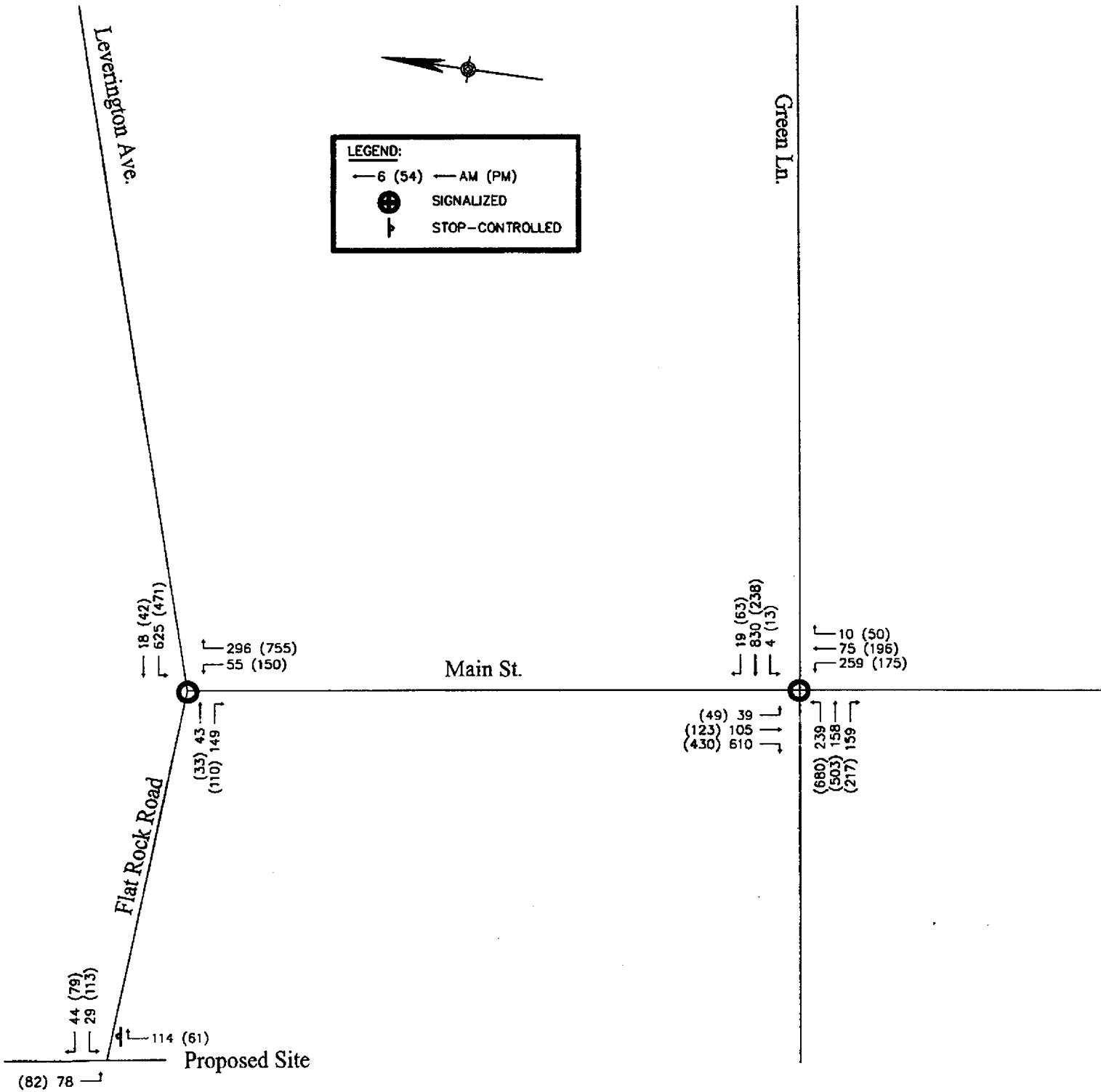
The results of the post-development evaluations indicate that all study intersections will operate at overall acceptable LOS "D/d" and/or otherwise maintain their pre-development conditions, *except* for the following movements:

1. At the signalized intersection of Green Lane and Main Street: the eastbound left turn movement from Green Lane degrades from LOS "E" to LOS "F" during the evening peak hour.

Summary outputs of the analysis are provided in **APPENDIX F** and summarized in **APPENDIX H**.

## **INTERSECTION DEFICIENCIES**

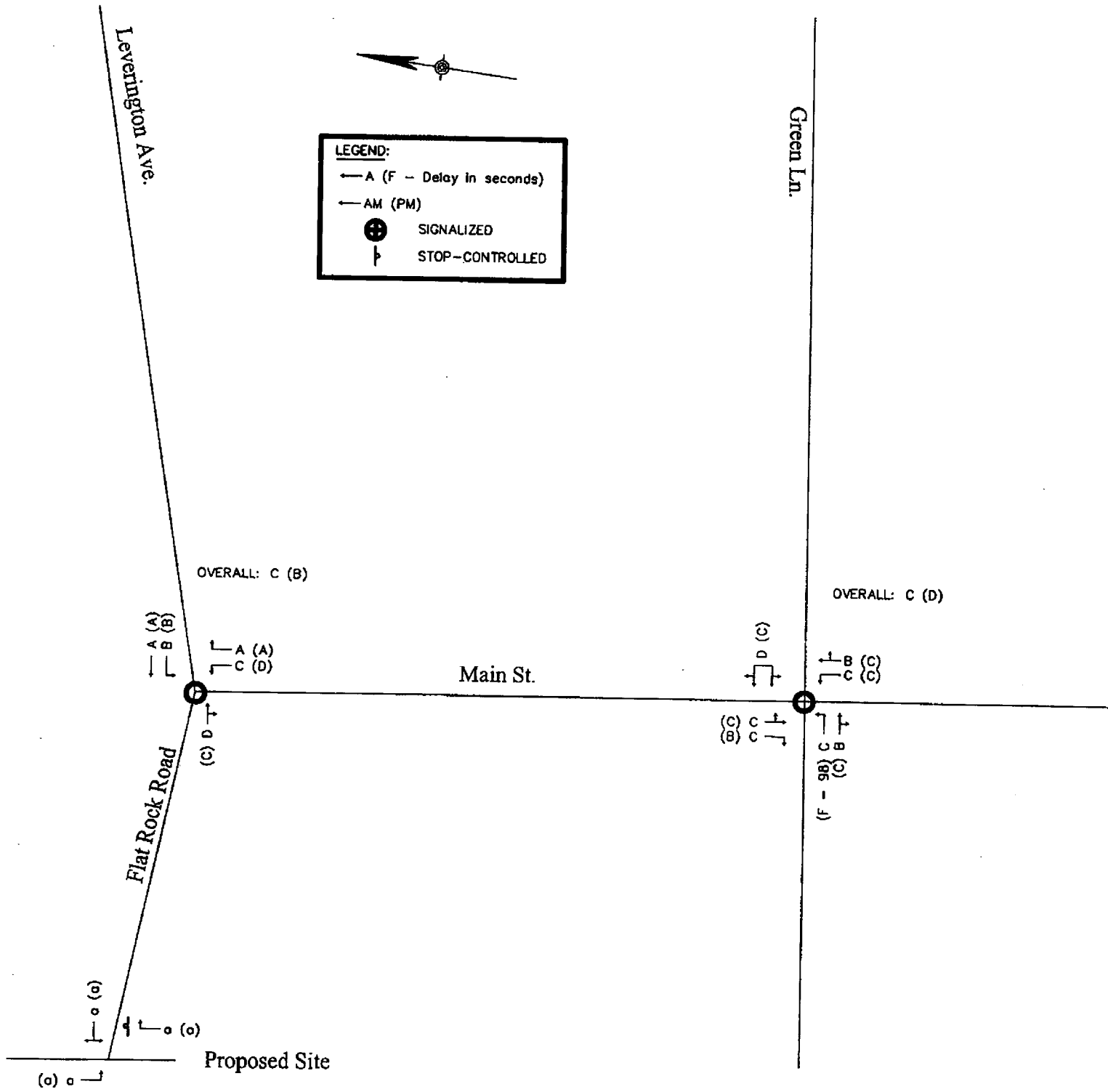
Based on the existing roadway geometry and traffic timings, the eastbound left turn movement from Green Lane to Main Street will operate at deficient Level of Service during pre and post-development. The deficient operating conditions can be mitigated by optimization the traffic signal timing. The signal timing optimization will change the Level of Service from "F" to "D". **FIGURE 9** illustrates the Levels of Service of the mitigated conditions. Analyses of the mitigated conditions are included in **APPENDIX G** and summarized in **APPENDIX H**.



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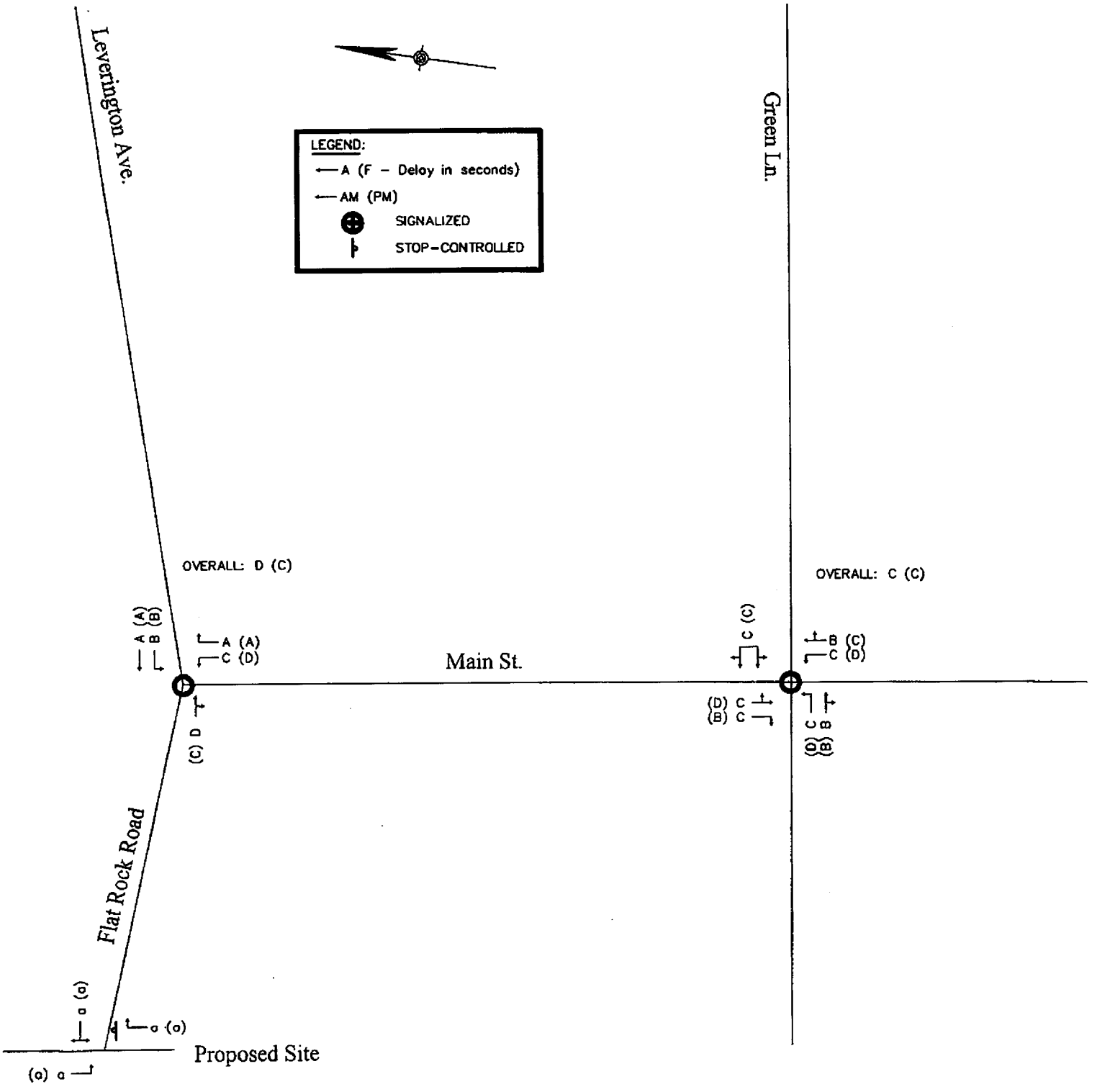
FIGURE 7  
 POST-DEVELOPMENT  
 VOLUME



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FIGURE 8  
 POST-DEVELOPMENT LEVELS  
 OF SERVICE



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FIGURE 9  
 MITIGATED POST-DEVELOPMENT  
 LEVELS OF SERVICE

## CONCLUSIONS AND RECOMMENDATIONS

Philadelphia Management proposes to construct a residential development on Venice Island, in the Manayunk section of Philadelphia. This proposed development will be comprised of 280 apartment units, consisting of 200 one bedroom apartments and 80 two bedroom apartments. As an ancillary accommodation, there will be at grade parking consisting of at least 360 parking spaces in order to conform to the parking requirements of the Manayunk Overlay District.

The traffic volumes anticipated to be generated by the proposed development were projected using the Trip Generation Manual, Seventh Edition, by the Institute of Transportation Engineers, 2003. The trip generation **rate** for ITE Land Use Code 220 *Apartments* was utilized based on the respective number of units. The estimated traffic expected to be generated by the proposed development is **143** new vehicle trips (**29** entering/ **114** exiting) in the weekday morning peak hour and **174** new vehicle trips (**113** entering/ **61** exiting) in the weekday evening peak hour.

Under the existing and pre-development conditions, all signalized study intersections operate at acceptable Levels of Service, with all movements operating with acceptable Level of Service "D/d" or better during both peak hours except for the eastbound left turn movement at the intersection of Green Lane and Main Street

The results of the post-development evaluations indicate that all study intersections will operate at overall acceptable LOS "D/d" and/or otherwise maintain their pre-development conditions, *except* for the eastbound left turn movement on Green Lane at Main Street. Degradation at this location can be mitigated, however, through traffic signal re-timing. In addition it is recommended that the westbound approach of Green Lane at Main Street be re-striped to reflect actual operating conditions. Based on the preceding analyses it has been determined that the traffic generated by the Venice Island Apartments will not result in a significant negative impact on the roadway network in the vicinity of the project.

Per request of Charles Denny of the Philadelphia Streets Department, the signalized intersections at Belmont Avenue and the I-76 interchange were reviewed to determine if any roadway improvements are planned. It was found that Lower Merion Township is developing roadway and signalization plans to improve traffic operation at the Belmont Avenue interchange with I-76.

*W/hun?*

***VENICE ISLAND APARTMENTS***  
***TRAFFIC IMPACT STUDY***

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**APPENDIX A**

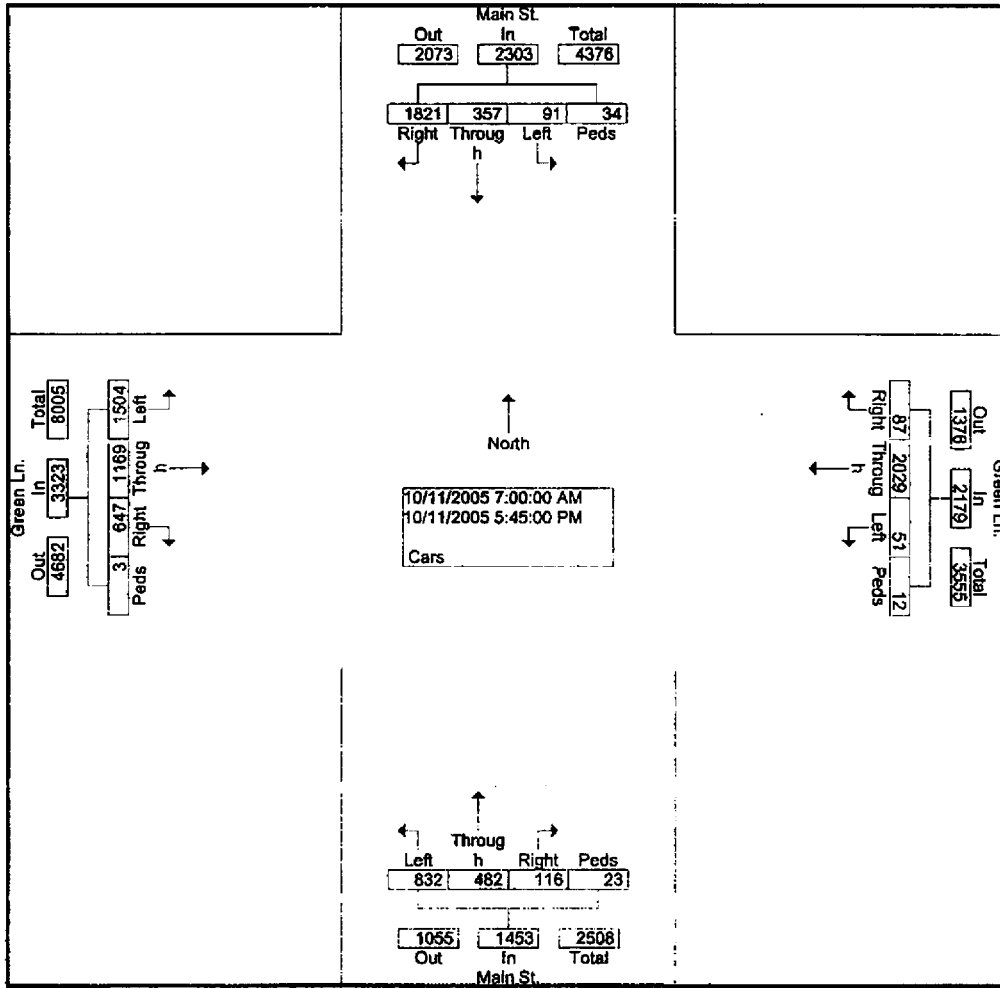
**TRAFFIC COUNTS**

PENNONI ASSOCIATES INC.  
 ONE DREXEL PLAZA  
 3001 MARKET STREET  
 PHILADELPHIA, PA 19104

File Name : MAINST~  
 Site Code : 00000000  
 Start Date : 10/11/200  
 Page No : 1

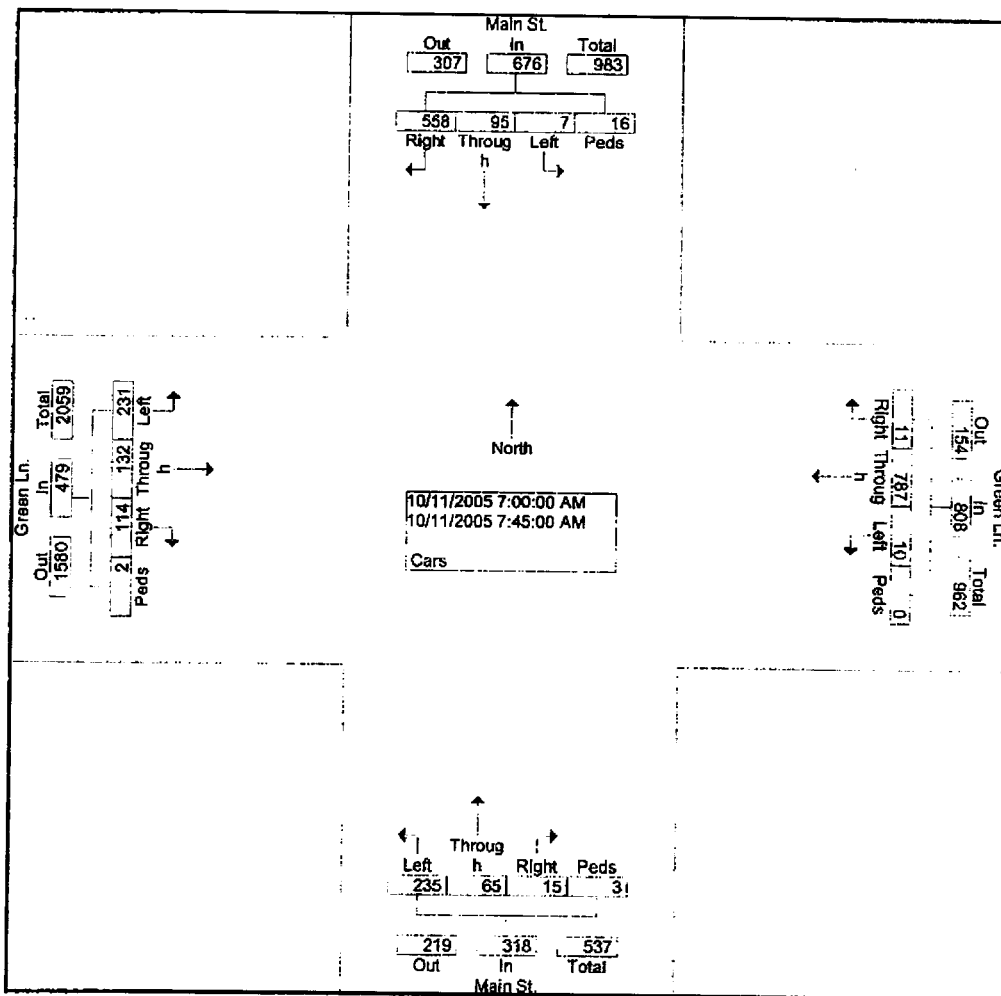
Groups Printed- Cars

Start Time	Main St. Southbound				Green Ln. Westbound				Main St. Northbound				Green Ln. Eastbound				Int. Total
	Right	Throu g h	Left	Peds	Right	Throu g h	Left	Peds	Right	Throu g h	Left	Peds	Right	Throu g h	Left	Peds	
Factor	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	
07:00 AM	135	27	7	0	5	182	3	0	10	25	62	0	27	23	67	0	
07:15 AM	146	18	0	0	2	215	3	0	4	13	65	1	15	26	55	0	573
07:30 AM	127	28	0	15	2	189	2	0	0	12	47	0	28	41	44	2	563
07:45 AM	150	22	0	1	2	201	2	0	1	15	61	2	44	42	65	0	537
Total	558	95	7	16	11	787	10	0	15	65	235	3	114	132	231	2	608
08:00 AM	123	18	2	2	2	203	0	0	2	13	68	3	33	29	52	0	2281
08:15 AM	126	16	1	1	3	212	1	0	0	11	66	1	29	40	48	0	550
08:30 AM	122	18	3	0	4	197	0	0	5	20	56	0	46	44	47	0	555
08:45 AM	138	23	2	2	3	173	11	0	8	29	49	0	40	47	69	0	562
Total	509	75	8	5	12	785	12	0	15	73	239	4	148	160	216	0	594
***BREAK***																	
04:00 PM	101	26	18	4	11	58	1	0	10	47	56	0	37	101	116	0	
04:15 PM	76	25	8	1	6	49	5	1	8	51	35	4	41	105	99	1	586
04:30 PM	99	16	13	0	5	57	5	2	11	51	49	3	43	93	132	0	515
04:45 PM	99	19	6	2	12	60	8	0	9	38	46	1	52	85	120	0	579
Total	375	86	45	7	34	224	17	3	38	187	186	8	173	384	467	1	555
05:00 PM	92	26	8	1	5	54	5	4	10	38	46	3	39	125	150	0	2235
05:15 PM	99	21	11	3	9	78	3	0	8	42	43	3	71	109	139	0	606
05:30 PM	102	31	7	2	6	59	3	3	10	47	42	2	48	124	154	0	639
05:45 PM	86	23	5	0	10	42	1	2	20	30	41	0	54	135	147	0	640
Total	379	101	31	6	30	233	12	9	48	157	172	8	212	493	590	0	596
Grand Total	1821	357	91	34	87	2029	51	12	116	482	832	23	647	1169	1504	3	2481
Apprch %	79.1	15.5	4.0	1.5	4.0	93.1	2.3	0.6	8.0	33.2	57.3	1.6	19.5	35.2	45.3	0.1	9258
Total %	19.7	3.9	1.0	0.4	0.9	21.9	0.6	0.1	1.3	5.2	9.0	0.2	7.0	12.6	16.2	0.0	

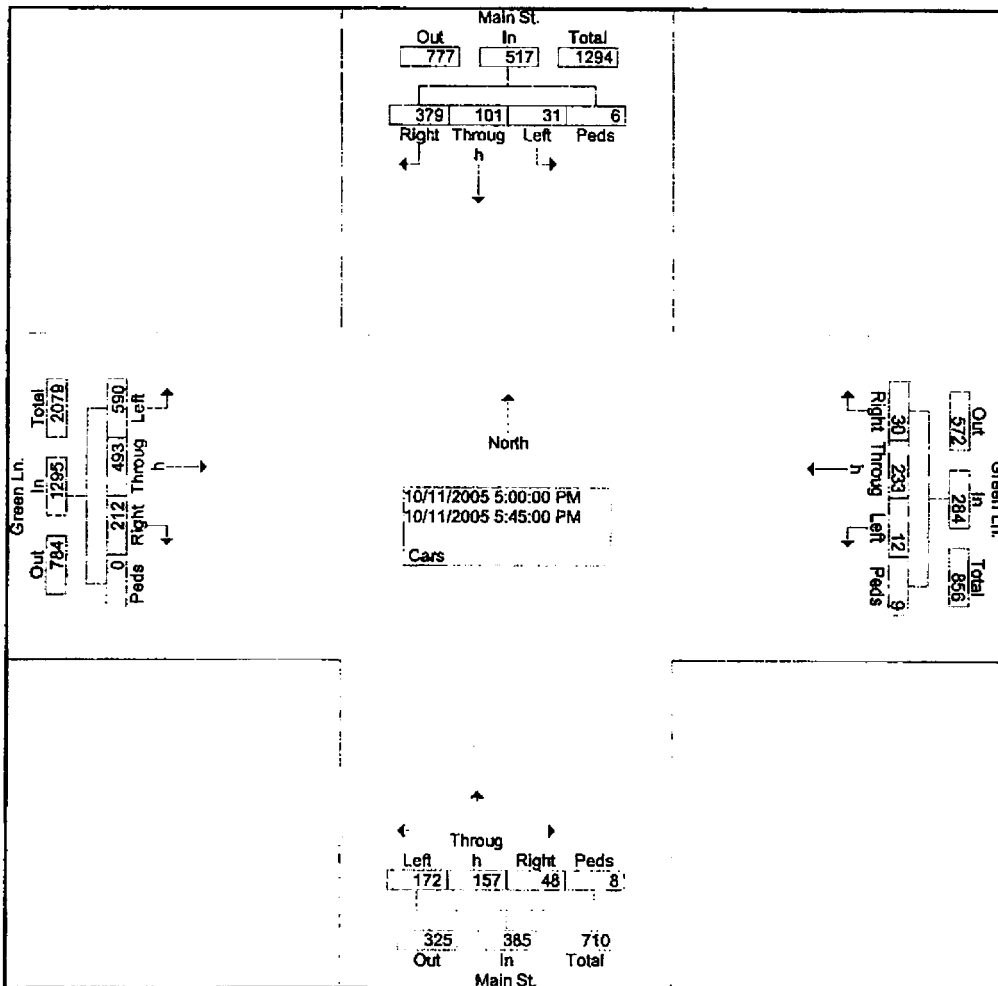




Start Time	Main St. Southbound					Green Ln. Westbound					Main St. Northbound					Green Ln. Eastbound					Int. Total
	Right	Thro	Left	Peds	App. Total	Right	Thro	Left	Peds	App. Total	Right	Thro	Left	Peds	App. Total	Right	Thro	Left	Peds	App. Total	
Peak Hour From 07:00 AM to 12:30 PM - Peak 1 of 1																					
Intersection	07:00 AM																				
Volume	558	95	7	16	676	11	787	10	0	808	15	65	235	3	318	114	132	231	2	479	2281
Percent	82.5	14.1	1.0	2.4		1.4	97.4	1.2	0.0		4.7	20.4	73.9	0.9		23.8	27.6	48.2	0.4		
Volume Peak	150	22	0	1	173	2	201	2	0	205	1	15	61	2	79	44	42	65	0	151	608
Factor																					0.936
High Int.	07:45 AM																				
Volume Peak	150	22	0	1	173	2	215	3	0	220	10	25	62	0	97	44	42	65	0	151	
Factor																					0.977
						0.918					0.820					0.793					



Start Time	Main St. Southbound					Green Ln. Westbound					Main St. Northbound					Green Ln. Eastbound					In Total
	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	
Peak Hour From 12:45 PM to 05:45 PM - Peak 1 of 1																					
Intersection 05:00 PM	379	101	31	6	517	30	233	12	9	284	48	157	172	8	385	212	493	590	0	1295	248
Volume	73.3	19.5	6.0	1.2		10.6	82.0	4.2	3.2		12.5	40.8	44.7	2.1		16.4	38.1	45.6	0.0		
Percent	102	31	7	2	142	6	59	3	3	71	10	47	42	2	101	48	124	154	0	326	640
Volume																					
Peak Factor																					
High Int. 05:30 PM						05:15 PM					05:30 PM					05:45 PM					
Volume	102	31	7	2	142	9	78	3	0	90	10	47	42	2	101	54	135	147	0	336	
Peak Factor	0.910					0.789					0.953					0.964					

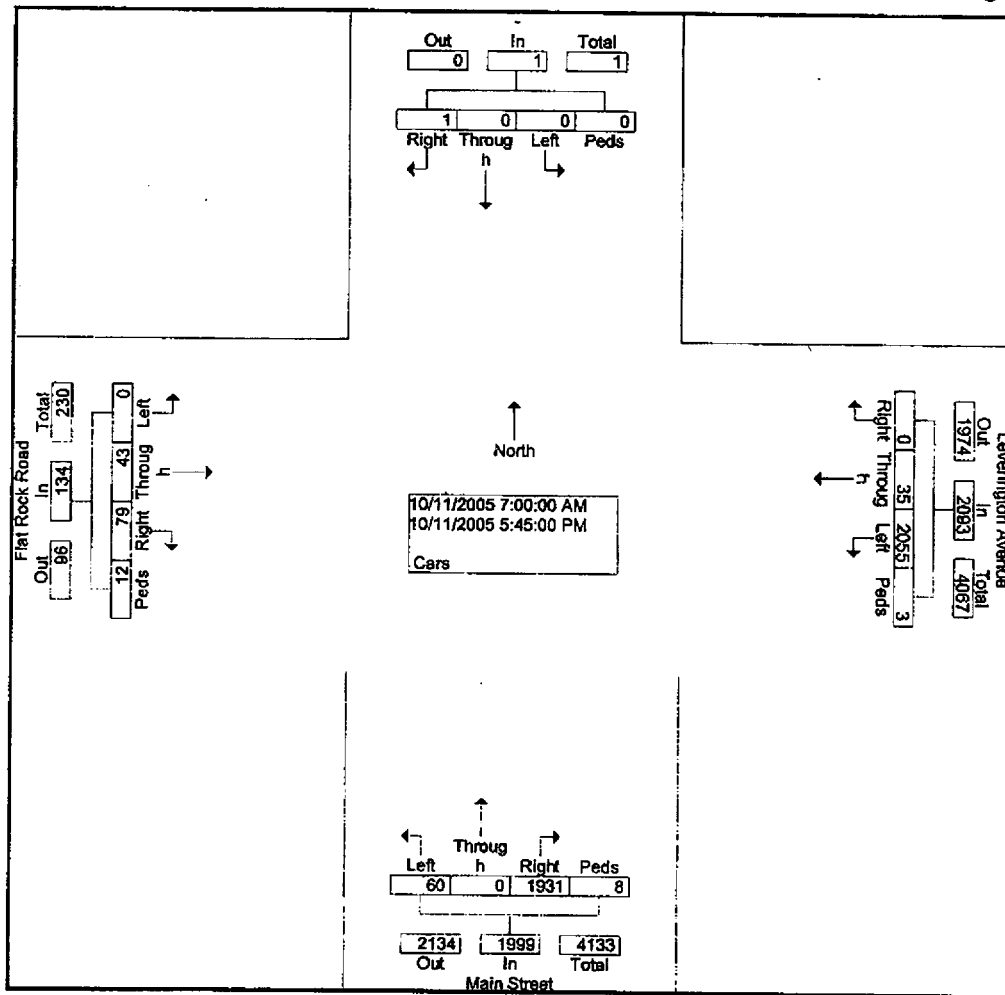


PENNONI ASSOCIATES INC.  
 ONE DREXEL PLAZA  
 3001 MARKET STREET  
 PHILADELPHIA, PA 19104

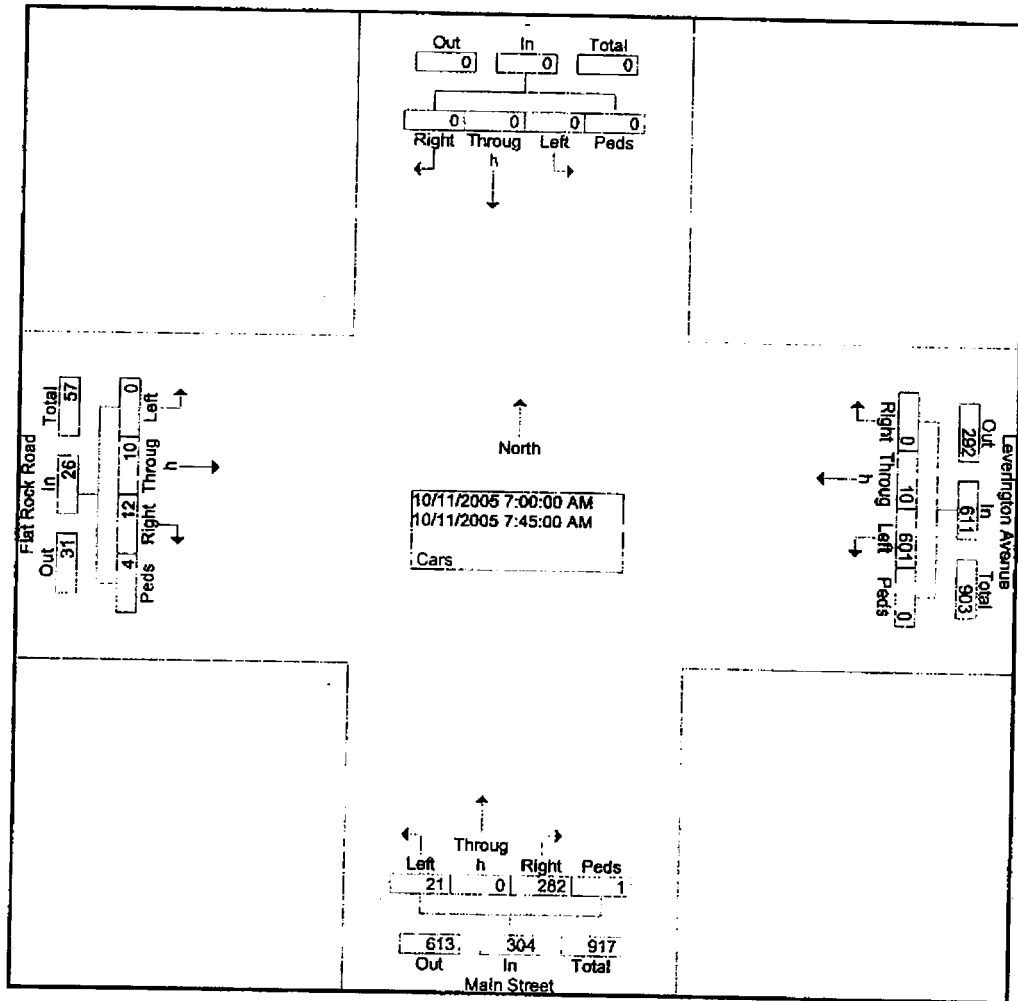
File Name : MAINST~  
 Site Code : 00000000  
 Start Date : 10/11/200  
 Page No : 1

Groups Printed- Cars

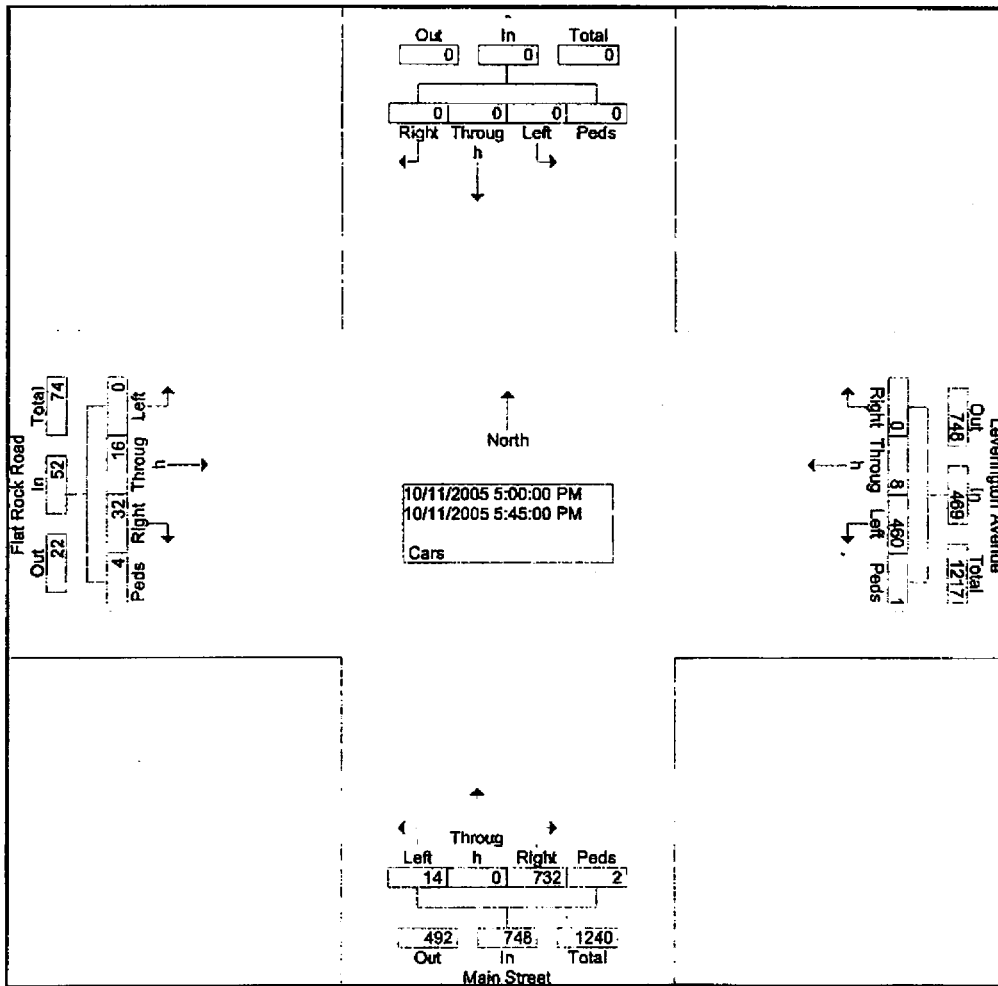
Start Time	Southbound				Leverington Avenue Westbound				Main Street Northbound				Flat Rock Road Eastbound				Int. Total
	Right	Throu gh	Left	Peds	Right	Throu gh	Left	Peds	Right	Throu gh	Left	Peds	Right	Throu gh	Left	Peds	
Factor	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	
07:00 AM	0	0	0	0	0	4	167	0	75	0	7	1	4	5	0	1	264
07:15 AM	0	0	0	0	0	2	131	0	79	0	6	0	2	4	0	2	226
07:30 AM	0	0	0	0	0	2	160	0	55	0	2	0	1	0	0	0	220
07:45 AM	0	0	0	0	0	2	143	0	73	0	6	0	5	1	0	1	231
Total	0	0	0	0	0	10	601	0	282	0	21	1	12	10	0	4	941
08:00 AM	0	0	0	0	0	0	135	0	55	0	3	2	4	0	0	2	201
08:15 AM	0	0	0	0	0	3	132	0	58	0	5	0	3	1	0	0	202
08:30 AM	0	0	0	0	0	3	125	0	67	0	3	0	6	0	0	0	204
08:45 AM	0	0	0	0	0	3	141	0	93	0	4	0	2	1	0	0	244
Total	0	0	0	0	0	9	533	0	273	0	15	2	15	2	0	2	851
***BREAK***																	
04:00 PM	1	0	0	0	0	2	129	0	156	0	3	0	5	2	0	0	298
04:15 PM	0	0	0	0	0	2	103	0	152	0	1	1	1	7	0	0	267
04:30 PM	0	0	0	0	0	2	119	2	171	0	4	0	8	3	0	1	310
04:45 PM	0	0	0	0	0	2	110	0	165	0	2	2	6	3	0	1	291
Total	1	0	0	0	0	8	461	2	644	0	10	3	20	15	0	2	1166
05:00 PM	0	0	0	0	0	4	115	0	180	0	4	0	12	2	0	0	317
05:15 PM	0	0	0	0	0	1	120	0	186	0	3	0	5	3	0	1	319
05:30 PM	0	0	0	0	0	2	117	0	196	0	1	1	14	8	0	1	340
05:45 PM	0	0	0	0	0	1	108	1	170	0	6	1	1	3	0	2	293
Total	0	0	0	0	0	8	460	1	732	0	14	2	32	16	0	4	1269
Grand Total	1	0	0	0	0	35	2055	3	1931	0	60	8	79	43	0	12	4227
Apprch %	100.0	0.0	0.0	0.0	0.0	1.7	98.2	0.1	96.6	0.0	3.0	0.4	59.0	32.1	0.0	9.0	
Total %	0.0	0.0	0.0	0.0	0.0	0.8	48.6	0.1	45.7	0.0	1.4	0.2	1.9	1.0	0.0	0.3	



Start Time	Southbound					Leverington Avenue Westbound					Main Street Northbound					Flat Rock Road Eastbound					Int. Total
	Right	Thro	Left	Ped	App.	Right	Thro	Left	Ped	App.	Right	Thro	Left	Ped	App.	Right	Thro	Left	Ped	App.	
Peak Hour From 07:00 AM to 12:30 PM - Peak 1 of 1																					
Intersection	07:00 AM																				
Volume	0	0	0	0	0	0	10	801	0	611	282	0	21	1	304	12	10	0	4	26	941
Percent	0.0	0.0	0.0	0.0	0	0.0	1.6	98.4	0.0	92.8	0.0	6.9	0.3	46.2	38.5	0.0	15.4				
Volume	0	0	0	0	0	0	4	167	0	171	75	0	7	1	83	4	5	0	1	10	264
Peak Factor																					
High Int.	6:45:00 AM					07:00 AM					07:15 AM					07:00 AM					
Volume	0	0	0	0	0	0	4	167	0	171	79	0	6	0	85	4	5	0	1	10	
Peak Factor						0.893					0.894					0.650					



Start Time	Southbound					Leverington Avenue Westbound					Main Street Northbound					Fiat Rock Road Eastbound					Int. Total
	Right	Through	Left	Peds	App. Total	Right	Through	Left	Peds	App. Total	Right	Through	Left	Peds	App. Total	Right	Through	Left	Peds	App. Total	
Peak Hour From 12:45 PM to 05:45 PM - Peak 1 of 1																					
Intersection	05:00 PM																				
Volume	0	0	0	0	0	0	8	460	1	469	732	0	14	2	748	32	16	0	4	52	1269
Percent	0.0	0.0	0.0	0.0		0.0	1.7	98.1	0.2		97.9	0.0	1.9	0.3		61.5	30.8	0.0	7.7		
05:30 Volume	0	0	0	0	0	0	2	117	0	119	196	0	1	1	198	14	8	0	1	23	340
Peak Factor																					
High Int.																					
Volume	0	0	0	0	0	05:15 PM					05:30 PM					05:30 PM					
Peak Factor											0.969					0.944					0.565



***VENICE ISLAND APARTMENTS  
TRAFFIC IMPACT STUDY***

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**APPENDIX B**

**LEVEL OF SERVICE DEFINITIONS**

## LEVEL OF SERVICE

Level of Service is a term used to describe vehicle operator satisfaction with the driving experience. Research has determined that operator satisfaction is based primarily on travel speed and delay. In urban environments these factors, travel speed and delay, are primarily controlled by the operation of intersections.

By utilizing models to simulate the flow of traffic at intersections, the average delay experienced by vehicles can be estimated. These models consider such factors as traffic volumes, roadway geometry, traffic control, and driver behavior. Levels of Service designations based on a comparison of the average delays calculated by the models with perceived acceptable delays.

The following tables illustrate the guidelines used for designating Levels of Service at Intersections:

Level of Service Criteria  
for Signalized Intersections<sup>(1)</sup>

A	< 10
B	> 10 and ≤ 20
C	> 20 and ≤ 35
D	> 35 and ≤ 55
E	> 55 and ≤ 80
F	> 80

<sup>(1)</sup> Table 6-3, Level of Service from Control Delay (2000 HCM)

Level of Service Criteria  
for Unsignalized Intersections<sup>(2)</sup>

a	< 10
b	> 10 and ≤ 15
c	> 15 and ≤ 25
d	> 25 and ≤ 35
e	> 35 and ≤ 40
f	> 50

<sup>(1)</sup> Table 6-4, Level of Service Criteria for TWSC and AWSC intersections (2000 HCM)



***VENICE ISLAND APARTMENTS  
TRAFFIC IMPACT STUDY***

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**APPENDIX C**

**2005 EXISTING CONDITIONS  
SIGNAL TIMINGS &  
LEVEL OF SERVICE ANALYSIS**

MAIN WEVERINGTON + FLAT ROCK RD.

WORK ORDER  
11931

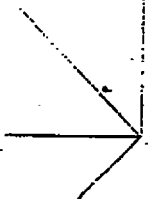
TYPE  
SIGNAL

INVESTIGATION DIST.

LOCATION  
LEVERINGTON AVE & MAIN ST

INVESTIGATED BY	DATE	WORK COMPLETED BY	DATE
<i>Ch... (signature)</i>	6/5/96		
APPROVED BY	DATE	WORK INSPECTED BY	DATE
	6/5/96		

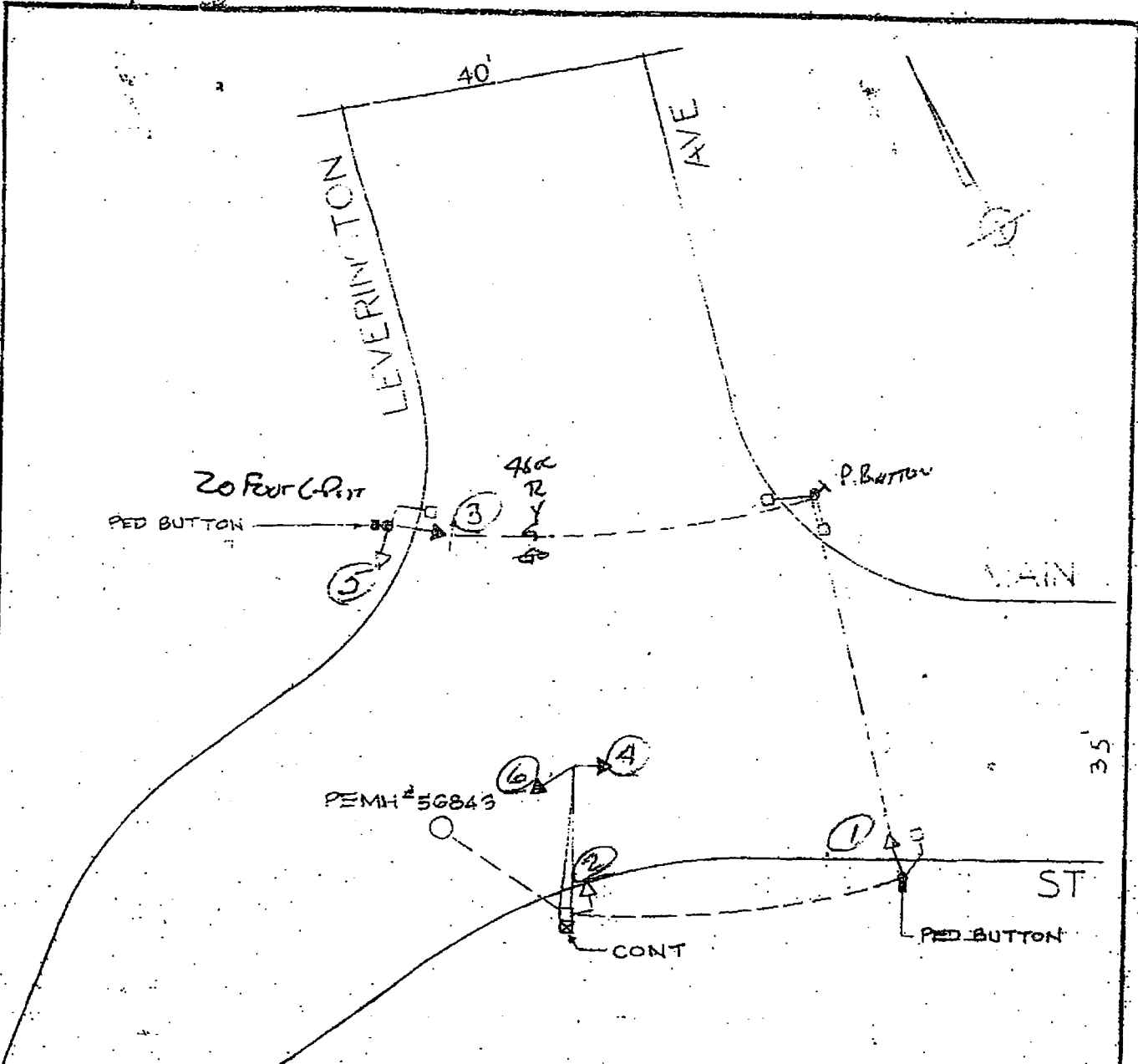
INVESTIGATION NUMBER \*



INDICATE NORTH

SIGNAL 182 LEVERINGTON/06B	40.0	2.4	10.4	4.0	2.4	10.4	4.0	2.4	10.4	4.0	2.4
SIGNAL B MAIN ST Rt Turn	50	5	3	13	5	3	13	5	3	13	5
SIGNAL 4 MAIN ST	50	55	58	71	79	92	97	0	92	97	0
SIGNAL 586 LEVERINGTON/FLAT ROCK											
PER SIGNAL											
SECONDS											
PERCENT											
PIN SETTING											

\*D-4904  
ACTUATION  
REPLACE 'C'



*MHO/Approved 6/5/96 C.H.M.*

**MAIN ST & LEVERINGTON AVE  
SIGNAL REVISION**

**TRAFFIC ENGINEERING DIVISION  
DEPARTMENT OF STREETS  
CITY OF PHILADELPHIA**

DRAWN BY SMALL	SCALE 1"=20'		
CHECKED BY	REVISIONS	DRAWING NO. <b>A 210-140-C</b>	
DATE			

APPROVED \_\_\_\_\_  
TRAFFIC ENGINEER

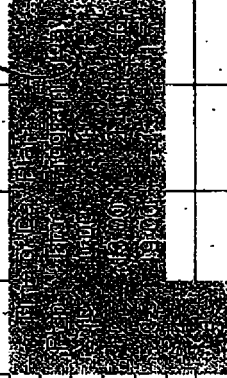
APPROVED \_\_\_\_\_  
CITY TRAFFIC ENGINEER

WORK ORDER S30002 GREEN & MAIN TD# 3

Prepared by Charles J Denny  
 Approved by Charles Denny  
 WORK COMPLETED BY *AW Evans*  
 INSPECTED BY *[Signature]*  
 Date 9/27/02 Date 1/8/03  
 Date 1-7-03 Date

#	PHASE	Intervals	Time																Minimums		Max	
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	flash	G		M
2	NB Main	(2,3)	G	G	G	Y	R	R	R	R	R	R	R	R	R	R	R	R	R	12		
5	NB Main	Left Turn (1)	<G/G	<Y/G	G	Y	R	R	R	R	R	R	R	R	R	R	R	R	R	7		
6	SB Main	(4,5,7,13)	R	R	R	Y	R	R	R	R	R	R	R	R	R	R	R	R	R	12		
9	SB Main	Right Turn (6)	R	R	R	Y	R	R/G>	R/G>	R	R	R	R	R	R	R	R	R	R	3		
4	EB Green	(9)	R	R	R	R	R	G	G	G	G	G	G	G	G	G	G	G	G	12		
7	EB Green	Left Turn (8)	R	R	R	R	R	<G/G	<Y/G	G	G	G	G	G	G	G	G	G	G	7		
8	WB Green	(10,11,12)	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	12		
3																						
P2																						
P6																						
P4																						
P8																						
	AM Peak Program 1	<i>AW Evans</i>	7	3	2	21	3	2	20	3	2	22	3	2	90	Sec						
	PM Peak Program 2	<i>AW Evans</i>	7	3	2	21	3	2	24	3	2	18	3	2	90	Sec						
	Off Peak Program 3																					
Instructions			Please modify signal timings as shown.																			
			OFFSETS	R1	0	R2	0	R3	0													

*Southbound*



SB main st.  
 NB Left Turn gets to S green @ 11:00am?

**WORK ORDER**

64037

8' LOUVERS  
SIGNALS  
REMOVED TO

COMPLETE

INDICATE NORTH

LOCATION

Green LA

WORK COMPLETED BY [Signature] DATE 3/17/02

INVESTIGATED BY

[Signature]

APPROVED BY

[Signature]

INVESTIGATION DIST.

313

WORK INSPECTED BY

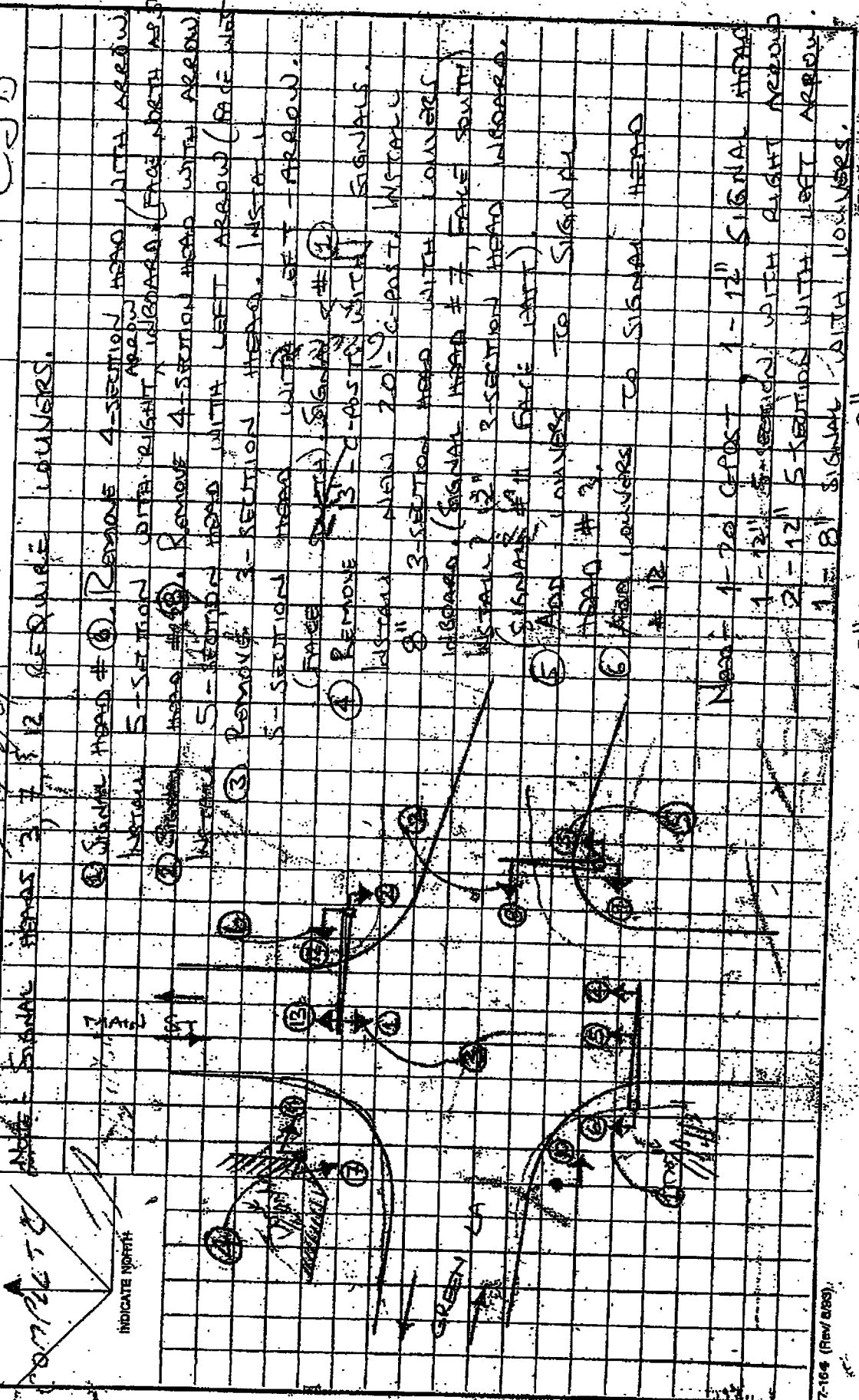
[Signature]

DATE

3/19/02

INVESTIGATION NUMBER

CJD



Existing AM

1: Leverington Avenue & Main St

HCM Signalized Intersection Capacity Analysis

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	1800	1900	1900	1900	1900	1900
Ideal Flow (vphpl)	4.0	4.0	4.0	4.0	4.0	4.0
Total Lost time (s)	1.00	1.00	1.00	1.00	1.00	1.00
Lane Util. Factor	0.82	1.00	1.00	1.00	1.00	0.85
Flt Protected	1.00	1.00	1.00	1.00	1.00	1.00
Satd. Flow (prot)	1723	1805	1696	1703	1417	1417
Satd. Flow (beam)	1723	1805	1696	1703	1417	1417
Volume (vph)	10	18	818	10	23	280
Peak-hour factor, PHF	0.83	0.80	0.80	0.90	0.91	0.91
Adj. Flow (vph)	16	25	691	11	25	319
RTOR Reduction (vph)	21	0	0	0	0	53
Lane Group Flow (vph)	20	0	681	11	25	286
Heavy Vehicles (%)	0%	2%	0%	12%	6%	14%
Turn Type	SPR					
Protected Phases	6 2 2 4 4 2					
Permitted Phases	pbtov					
Actuated Green, G (s)	10.4	40.0	40.0	10.4	58.8	58.8
Effective Green, g (s)	12.8	42.4	42.4	12.8	58.2	58.2
Actuated g/C Ratio	0.16	0.53	0.53	0.16	0.74	0.74
Clearance Time (s)	6.4	6.4	6.4	6.4	6.4	6.4
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp-Cap (vph)	276	857	899	272	1049	1049
v/s Ratio Prot	<0.01	<0.36	0.01	0.01	<0.17	<0.17
v/s Ratio Perm						
Uniform Delay, d1	0.07	0.71	0.01	0.09	0.23	0.23
Progression Factor	1.00	14.2	8.9	28.6	3.2	3.2
Incremental Delay, d2	0.5	1.00	1.00	1.00	1.00	1.00
Delay (s)	28.1	16.7	8.9	28.3	3.7	3.7
Level of Service	C	B	A	C	A	A
Approach Delay (s)	28.1	18.5	5.8			
Approach LOS	C	B	A			
Intersection Summary						
HCM Average Control Delay	14.8					
HCM Volume to Capacity ratio	0.50					
Actuated Cycle Length (s)	80.0					
Intersection Capacity Utilization	50.6%					
Analysis Period (min)	16					
Critical Lane Group	C					
HCM Level of Service	B					
Sum of lost time (s)	12.0					
ICU Level of Service	A					

Existing AM

6: Green Lane & Main St

HCM Signalized Intersection Capacity Analysis

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1800	1900
Ideal Flow (vphpl)	12	12	12	12	12	12	12	12	12	12	12	12
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Flt Protected	1.00	0.92	1.00	1.00	1.00	1.00	0.98	1.00	1.00	1.00	1.00	0.86
Satd. Flow (prot)	1703	1703	1703	1703	1703	1703	1723	1723	1723	1723	1825	1524
Satd. Flow (beam)	1703	1703	1703	1703	1703	1703	1723	1723	1723	1723	1825	1524
Volume (vph)	217	155	156	4	814	11	254	88	10	8	78	525
Peak-hour factor, PHF	0.87	0.87	0.87	0.88	0.95	0.86	0.95	0.95	0.95	0.88	0.88	0.88
Adj. Flow (vph)	246	178	179	4	848	11	267	72	11	7	89	597
RTOR Reduction (vph)	0	40	0	0	1	0	0	0	0	0	0	42
Lane Group Flow (vph)	246	317	0	0	862	0	267	77	0	0	86	556
Heavy Vehicles (%)	0%	0%	6%	1%	1%	0%	3%	9%	2%	0%	4%	6%
Turn Type	pmt-pt											
Protected Phases	3 8											
Permitted Phases	pmt											
Actuated Green, G (s)	47.0	47.0	47.0	4	22.0	33.0	33.0	33.0	2	2	21.0	41.0
Effective Green, g (s)	48.0	48.0	48.0	4	23.0	34.0	34.0	34.0	2	2	22.0	43.0
Actuated g/C Ratio	0.53	0.53	0.53	0.26	0.26	0.38	0.38	0.38	0.24	0.24	0.24	0.48
Clearance Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lane Grp-Cap (vph)	477	910	469	651	985	469	651	651	440	440	796	796
v/s Ratio Prot	0.12	0.19	0.18	0.18	<0.22	0.18	0.18	0.18	0.05	0.05	0.20	<0.16
v/s Ratio Perm	0.52	0.36	0.52	0.36	0.88	0.57	0.57	0.57	0.22	0.22	0.70	0.70
Uniform Delay, d1	14.8	12.0	14.8	12.0	32.1	21.4	18.2	18.2	27.1	27.1	18.4	18.4
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	4.0	1.1	4.0	1.1	10.8	4.9	4.9	4.9	4.9	4.9	5.0	5.0
Delay (s)	18.9	13.1	18.9	13.1	42.9	26.3	18.6	18.6	24.5	24.5	23.4	23.4
Level of Service	B	B	B	B	D	C	B	B	C	C	C	C
Approach Delay (s)	18.9	13.1	18.9	13.1	42.9	26.3	18.6	18.6	24.5	24.5	23.4	23.4
Approach LOS	B	B	B	B	D	C	B	B	C	C	C	C
Intersection Summary												
HCM Average Control Delay	28.5											
HCM Volume to Capacity ratio	0.74											
Actuated Cycle Length (s)	80.0											
Intersection Capacity Utilization	79.5%											
Analysis Period (min)	15											
Critical Lane Group	C											
HCM Level of Service	C											
Sum of lost time (s)	12.0											
ICU Level of Service	D											

Existing PM

1: Leveirington Avenue & Main St

HCM Signalized Intersection Capacity Analysis

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	1900	1900	1900	1900	1900	1900
Ideal Flow (vphpl)	4.0	4.0	4.0	4.0	4.0	4.0
Total Lost time (s)	1.00	1.00	1.00	1.00	1.00	1.00
Lane Util. Factor	0.90	1.00	1.00	1.00	0.85	1.00
Flt. Protected	1634	1738	1863	1703	1495	
Satd. Flow (prot)	1.00	0.95	1.00	0.95	1.00	
Satd. Flow (perm)	1834	1738	1863	1703	1495	
Volume (vph)	16	41	482	9	20	740
Peak-hour factor, PHF	0.68	0.58	0.87	0.97	0.93	0.93
Adj. Flow (vph)	28	71	478	9	22	798
RTOR Reduction (vph)	80	0	0	0	0	207
Lane Group Flow (vph)	39	0	478	9	22	588
Heavy Vehicles (%)	0%	7%	4%	2%	6%	8%
Turn Type	Split					
Protected Phases	6	2	2	2	4	4, 2
Permitted Phases	p+pt					
Actuated Green, G (s)	10.4	40.0	40.0	10.4	58.8	
Effective Green, g (s)	12.8	42.4	42.4	12.8	58.2	
Actuated g/C Ratio	0.16	0.63	0.53	0.16	0.74	
Clearance Time (s)	6.4	6.4	6.4	6.4	6.4	
Lane Grp Cap (vph)	281	920	987	272	1106	
vs Ratio Prot	0.02	0.27	0.00	0.01	0.39	
vs Ratio Perm						
via Ratio	0.15	0.52	0.01	0.08	0.53	
Uniform Delay, d1	28.9	12.2	8.9	28.6	4.5	
Progression Factor	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	1.2	2.1	0.0	0.8	1.8	
Delay (s)	30.1	14.3	8.9	29.2	6.3	
Level of Service	C	B	A	C	A	
Approach Delay (s)	30.1	14.2	6.8			
Approach LOS	C	B	A			
Intersection Summary						
HCM Average Control Delay	11.1					
HCM Volume to Capacity ratio	0.46					
Actuated Cycle Length (s)	80.0					
Intersection Capacity Utilization	55.5%					
Analysis Period (min)	15					
Critical Lane Group	B					
HCM Level of Service	B					
Sum of lost time (s)	8.0					
ICU Level of Service	B					

Existing PM

6: Green Lane & Main St

HCM Signalized Intersection Capacity Analysis

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	1800	1900	1800	1900	1900	1900	1900	1900	1900	1900	1900	1900
Ideal Flow (vphpl)	12	12	12	16	16	16	12	12	12	12	12	12
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Flt. Protected	1703	1782	1782	1752	1709	1752	1709	1752	1709	1752	1824	1824
Satd. Flow (prot)	0.38	1.00	1.00	0.81	0.81	0.81	1.00	1.00	1.00	1.00	0.89	1.00
Satd. Flow (perm)	638	1782	1782	3612	3612	3612	1709	1709	1709	3612	1644	1824
Volume (vph)	594	493	213	13	233	30	172	168	49	31	108	383
Peak-hour factor, PHF	0.97	0.97	0.87	0.80	0.80	0.80	0.84	0.84	0.84	0.84	0.92	0.92
Adj. Flow (vph)	612	508	220	16	291	38	183	179	52	34	117	416
RTOR Reduction (vph)	0	17	0	0	10	0	12	0	0	0	0	117
Lane Group Flow (vph)	612	771	0	0	335	0	183	219	0	0	151	299
Heavy Vehicles (%)	6%	0%	6%	1%	1%	0%	3%	9%	2%	0%	4%	6%
Turn Type	p+pt											
Protected Phases	3	8	8	4	4	4	1	6	1	6	2	3
Permitted Phases	p+pt											
Actuated Green, G (s)	47.0	47.0	47.0	18.0	18.0	18.0	33.0	33.0	33.0	21.0	45.0	45.0
Effective Green, g (s)	48.0	48.0	48.0	18.0	18.0	18.0	34.0	34.0	34.0	22.0	47.0	47.0
Actuated g/C Ratio	0.53	0.53	0.53	0.21	0.21	0.21	0.38	0.38	0.38	0.24	0.52	0.52
Clearance Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lane Grp Cap (vph)	838	850	850	763	763	763	424	424	424	402	864	864
vs Ratio Prot	0.27	0.40	0.40	0.09	0.09	0.09	0.12	0.12	0.12	0.09	0.10	0.10
vs Ratio Perm												
via Ratio	0.86	0.75	0.75	0.44	0.44	0.44	0.43	0.43	0.43	0.38	0.35	0.35
Uniform Delay, d1	16.2	16.3	16.3	30.9	30.9	30.9	19.7	20.0	20.0	28.3	12.5	12.5
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	27.5	5.4	5.4	1.8	1.8	1.8	3.2	3.2	3.2	2.7	1.1	1.1
Delay (s)	43.8	21.7	21.7	32.7	32.7	32.7	22.9	21.4	21.4	31.0	13.8	13.8
Level of Service	D	C	C	C	C	C	C	C	C	C	C	B
Approach Delay (s)	31.8			32.7			22.1			18.3		
Approach LOS	C			C			C			B		
Intersection Summary												
HCM Average Control Delay	27.5											
HCM Volume to Capacity ratio	0.73											
Actuated Cycle Length (s)	90.0											
Intersection Capacity Utilization	79.2%											
Analysis Period (min)	16											
Critical Lane Group	C											
HCM Level of Service	C											
Sum of lost time (s)	8.0											
ICU Level of Service	D											

***VENICE ISLAND APARTMENTS***  
***TRAFFIC IMPACT STUDY***

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**APPENDIX D**

**FUTURE TRAFFIC VOLUMES**



Project #: PHMT 0601  
 Location: Manayunk, Philadelphia

ITE Code	Land Use	Size	Daily	AM	Enter	Exit	PM	Enter	Exit
220	Apartment Residential 7th Edition	280 du equation rate	1,833	141	20%	80%	172	65%	35%
			1,881		28	113		112	60
					29	114		113	61

back ground traffic

ITE Code	Land Use	Size	Daily	AM	Enter	Exit	PM	Enter	Exit
230	Condominium/Townhouse Residential 7th Edition	128 du equation rate	803	56	17%	83%		67%	33%
			750		11	52		50	24
					10	46	67	45	22

Future Volumes (AM PEAK)

		Background Traffic							
		Am	Enter	Exit	Pre-Development		Enter	Exit	Post-Dev
		2005	Distrib	Assign	1.0%	Completion	20	80	Completion
					2	2007	Distrib	Assign	2007
Main Street & Leverington Avenue	NB L	23	80%	9	0	32	80%	23	55
	NB R	290	0%	0	6	296	0%	0	296
Main Street & Green Lane	WB L	613	0%	0	12	625	0%	0	625
	WB T	10	20%	2	0	12	20%	6	18
Main Street & Green Lane	EB T	10	-20%	10	0	20	-20%	23	43
	EB R	16	-80%	42	0	58	-80%	91	149
						0			
						0			
Main Street & Green Lane	EB L	217	45%	5	4	226	45%	13	239
	EB T	155	0%	0	3	158	0%	0	158
Main Street & Green Lane	EB R	156	0%	0	3	159	0%	0	159
	NB L	254	0%	0	5	259	0%	0	259
Main Street & Green Lane	NB T	68	15%	2	1	71	15%	4	75
	NB R	10	0%	0	0	10	0%	0	10
Main Street & Green Lane	WB L	4	0%	0	0	4	0%	0	4
	WB T	814	0%	0	16	830	0%	0	830
Main Street & Green Lane	WB R	11	20%	2	0	13	20%	6	19
	SB L	6	-20%	10	0	16	-20%	23	39
Main Street & Green Lane	SB T	78	-15%	8	2	88	-15%	17	105
	SB R	525	-45%	23	11	559	-45%	51	610

Future Volumes (PM PEAK)

		Background Traffic							
		PM	Enter	Exit	Pre-Development		Enter	Exit	Post-Dev
		2005	Distrib	Assign	1.0%	Completion	65	35	Completion
					2	2007	Distrib	Assign	2007
Main Street & Leverington Avenue	NB L	20	80%	40	0	60	80%	90	150
	NB R	740	0%	0	15	755	0%	0	755
Main Street & Green Lane	WB L	482	0%	0	9	471	0%	0	471
	WB T	9	20%	10	0	19	20%	23	42
Main Street & Green Lane	EB T	16	-20%	5	0	21	-20%	12	33
	EB R	41	-80%	19	1	61	-80%	49	110
Main Street & Green Lane	EB L	594	45%	23	12	629	45%	51	680
	EB T	493	0%	0	10	503	0%	0	503
Main Street & Green Lane	EB R	213	0%	0	4	217	0%	0	217
	NB L	172	0%	0	3	175	0%	0	175
Main Street & Green Lane	NB T	168	15%	8	3	179	15%	17	196
	NB R	49	0%	0	1	50	0%	0	50
Main Street & Green Lane	WB L	13	0%	0	0	13	0%	0	13
	WB T	233	0%	0	5	238	0%	0	238
Main Street & Green Lane	WB R	30	20%	10	1	41	20%	22	63
	SB L	31	-20%	5	1	37	-20%	12	49
Main Street & Green Lane	SB T	108	-15%	4	2	114	-15%	9	123
	SB R	383	-45%	11	8	402	-45%	28	430

***VENICE ISLAND APARTMENTS***  
***TRAFFIC IMPACT STUDY***

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**APPENDIX E**

**PRE-DEVELOPMENT CONDITIONS**  
**LEVEL OF SERVICE ANALYSIS**

PRE-DEVELOPMENT AM  
1: Leverington Avenue & Main St

HCM Signalized Intersection Capacity Analysis

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	1900	1800	1900	1900	1900	1800
Ideal Flow (vphpl)	4.0	4.0	4.0	4.0	4.0	4.0
Total Lost time (s)	1.00	1.00	1.00	1.00	1.00	1.00
Lane Util. Factor	0.90	1.00	1.00	1.00	0.85	1.00
Fit Protected	1.00	0.95	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1885	1805	1698	1703	1417	1417
Fit Permitted	1.00	0.95	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1685	1805	1698	1703	1417	1417
Volume (vph)	20	58	625	12	32	296
Peak-hour factor, PHF	0.63	0.63	0.90	0.90	0.91	0.81
Adj. Flow (vph)	32	92	694	13	35	325
RTOR Reduction (vph)	77	0	0	0	0	85
Lane Group Flow (vph)	47	0	664	13	35	241
Heavy Vehicles (%)	0%	2%	0%	12%	6%	14%
Turn Type	Split					
Protected Phases	0	2	2	2	4	4, 2
Permitted Phases	pm+pt					
Actuated Green, G (s)	10.4	40.0	40.0	10.4	58.8	58.8
Effective Green, g (s)	12.8	42.4	42.4	12.8	59.2	59.2
Actuated g/C Ratio	0.16	0.53	0.53	0.16	0.74	0.74
Clearance Time (s)	6.4	6.4	6.4	6.4	6.4	6.4
Lane Grp Cap (vph)	270	857	898	272	1049	1049
via Ratio Prot	60.03	60.38	0.01	0.02	60.17	60.17
via Ratio Perm	0.77	0.73	0.01	0.13	0.23	0.23
Uniform Delay, d1	28.0	14.4	8.9	28.8	3.3	3.3
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	1.4	4.8	0.0	1.0	0.5	0.5
Delay (s)	30.4	19.1	8.9	29.8	3.8	3.8
Level of Service	C	B	A	C	A	A
Approach Delay (s)	30.4	16.9	6.3	6.3	6.3	6.3
Approach LOS	C	B	A	A	A	A
Intersection Summary	HCM Level of Service					
HCM Average Control Delay	16.3					
HCM Volume to Capacity ratio	0.53					
Actuated Cycle Length (s)	80.0					
Intersection Capacity Utilization	51.3%					
Analysis Period (min)	15					
Critical Lane Group	B					
Sum of lost time (s)	12.0					
ICU Level of Service	A					

PRE-DEVELOPMENT AM  
6: Green Lane & Main St

HCM Signalized Intersection Capacity Analysis

Movement	EBT	EBR	WBL	WBT	NBL	NBR	SBL	SBT	SBR	
Lane Configurations	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Ideal Flow (vphpl)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Total Lost time (s)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Lane Util. Factor	0.95	1.00	0.95	1.00	0.95	1.00	0.99	1.00	0.85	
Fit Protected	1.00	0.95	1.00	0.95	1.00	1.00	1.00	1.00	1.00	
Satd. Flow (prot)	1709	1708	4041	1752	1724	1824	1824	1824	1824	
Fit Permitted	0.15	1.00	0.95	0.56	1.00	0.96	1.00	1.00	1.00	
Satd. Flow (perm)	266	1706	3653	1028	1724	1757	1824	1824	1824	
Volume (vph)	228	158	4	850	13	259	71	10	16	
Peak-hour factor, PHF	0.87	0.87	0.96	0.96	0.96	0.85	0.85	0.88	0.88	
Adj. Flow (vph)	260	182	183	4	865	14	273	75	11	
RTOR Reduction (vph)	0	40	0	0	0	0	0	0	0	
Lane Group Flow (vph)	280	325	0	882	0	273	80	0	0	
Heavy Vehicles (%)	5%	0%	6%	1%	0%	3%	9%	2%	0%	
Turn Type	pm+pt						Perm		pm+ov	
Protected Phases	3	8	4	4	6	6	2	2	3	
Permitted Phases	pm+pt						Perm		pm+ov	
Actuated Green, G (s)	47.0	47.0	22.0	22.0	33.0	33.0	21.0	21.0	41.0	
Effective Green, g (s)	48.0	48.0	23.0	23.0	34.0	34.0	22.0	22.0	43.0	
Actuated g/C Ratio	0.53	0.53	0.28	0.28	0.38	0.38	0.24	0.24	0.48	
Clearance Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	
Lane Grp Cap (vph)	477	910	985	985	452	851	429	429	766	
via Ratio Prot	0.13	0.19	0.05	0.05	0.05	0.05	0.07	0.07	0.22	
via Ratio Perm	0.18	0.36	0.09	0.09	0.17	0.17	0.26	0.26	0.75	
Uniform Delay, d1	15.1	12.1	32.3	32.3	21.7	18.3	27.5	27.5	19.1	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	4.4	1.1	12.3	12.3	5.9	0.4	1.8	1.8	6.4	
Delay (s)	19.5	13.2	44.7	44.7	27.6	18.7	29.1	29.1	25.5	
Level of Service	B	B	D	D	C	B	C	C	C	
Approach Delay (s)	15.8	15.8	44.7	44.7	25.5	25.5	26.1	26.1	26.1	
Approach LOS	B	B	D	D	C	C	C	C	C	
Intersection Summary	HCM Level of Service									
HCM Average Control Delay	28.8									
HCM Volume to Capacity ratio	0.78									
Actuated Cycle Length (s)	80.0									
Intersection Capacity Utilization	82.4%									
Analysis Period (min)	15									
Critical Lane Group	C									
Sum of lost time (s)	12.0									
ICU Level of Service	E									

PRE-DEVELOPMENT PM  
1: Leverington Avenue & Main St

HCM Signalized Intersection Capacity Analysis

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	1900	1900	1900	1900	1900	1900
Ideal Flow (vphpl)	4.0	4.0	4.0	4.0	4.0	4.0
Total Lost time (s)	1.00	1.00	1.00	1.00	1.00	1.00
Lane Util. Factor	0.96	0.96	0.96	0.96	0.96	0.96
Fit Protected	1624	1736	1863	1703	1495	
Satd. Flow (prot)	1.00	0.95	1.00	0.95	1.00	
Satd. Flow (perm)	1624	1736	1863	1703	1495	
Volume (vph)	21	61	471	19	60	765
Peak-hour factor, PHF	0.58	0.86	0.97	0.97	0.83	0.83
Adj. Flow (vph)	38	105	486	20	85	812
RTOR Reduction (vph)	88	0	0	0	0	211
Lane Group Flow (vph)	53	0	486	20	85	601
Heavy Vehicles (%)	0%	7%	4%	2%	6%	6%
Turn Type	Split					
Protected Phases	6	2	2	2	4	4, 2
Permitted Phases	pm+ov					
Actuated Green, G (s)	10.4	40.0	40.0	40.0	10.4	56.8
Effective Green, g (s)	12.8	42.4	42.4	42.4	12.8	59.2
Actuated g/C Ratio	0.18	0.53	0.53	0.18	0.74	
Clearance Time (s)	8.4	8.4	8.4	8.4	8.4	
Lane Grp Cap (vph)	260	920	987	272	1108	
v/s Ratio Prot	60.03	0.28	0.01	0.04	60.40	
v/s Ratio Perm	0.20	0.53	0.02	0.24	0.54	
Uniform Delay, d1	28.2	12.3	8.9	28.3	4.5	
Progression Factor	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	1.8	2.2	0.0	2.1	1.8	
Delay (s)	30.9	14.4	9.0	31.4	6.4	
Level of Service	C	B	A	C	A	
Approach Delay (s)	30.9		14.2	8.3		
Approach LOS	C		B	A		
Intersection Summary						
HCM Average Control Delay	12.4					
HCM Volume to Capacity ratio	0.46					
Actuated Cycle Length (s)	80.0					
Intersection Capacity Utilization	58.3%					
Analysis Period (min)	15					
Critical Lane Group	B					
HCM Level of Service	B					
Sum of lost time (s)	8.0					
ICU Level of Service	B					

PRE-DEVELOPMENT PM  
6: Green Lane & Main St

HCM Signalized Intersection Capacity Analysis

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Ideal Flow (vphpl)	12	12	12	12	12	12	12	12	12	12	12	12
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	0.96	0.96	0.96	1.00	0.87	1.00	1.00	1.00	1.00
Fit Protected	1624	1703	1782	3963	1710	1710	1822	1524	1822	1524	1822	1524
Satd. Flow (prot)	1.00	0.95	1.00	0.91	0.91	0.91	0.48	1.00	0.88	1.00	0.88	1.00
Satd. Flow (perm)	1624	1703	1782	3963	1710	1710	889	1710	1616	1524	1616	1524
Volume (vph)	629	503	217	13	238	41	175	179	50	37	114	402
Peak-hour factor, PHF	0.97	0.97	0.80	0.80	0.80	0.80	0.94	0.94	0.84	0.92	0.82	0.82
Adj. Flow (vph)	646	519	224	16	288	51	186	180	53	40	124	437
RTOR Reduction (vph)	0	17	0	0	14	0	0	11	0	0	0	111
Lane Group Flow (vph)	648	726	0	0	351	0	186	232	0	0	164	328
Heavy Vehicles (%)	0%	0%	0%	1%	1%	0%	3%	9%	2%	0%	4%	8%
Turn Type	pm+pt											
Protected Phases	3	6	4	4	4	6	6	6	6	2	2	3
Permitted Phases	pm+ov											
Actuated Green, G (s)	47.0	47.0	18.0	18.0	18.0	33.0	33.0	33.0	33.0	21.0	21.0	45.0
Effective Green, g (s)	48.0	48.0	18.0	18.0	18.0	34.0	34.0	34.0	34.0	22.0	22.0	47.0
Actuated g/C Ratio	0.53	0.53	0.21	0.21	0.21	0.38	0.38	0.38	0.38	0.24	0.24	0.52
Clearance Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lane Grp Cap (vph)	627	950	760	760	760	413	646	646	385	884	385	884
v/s Ratio Prot	60.29	0.41	0.10	0.10	0.10	60.04	0.14	0.14	0.10	0.10	0.10	0.11
v/s Ratio Perm	0.26	1.03	0.76	0.46	0.46	0.45	0.38	0.38	0.42	0.38	0.42	0.38
Uniform Delay, d1	17.9	16.5	31.0	31.0	31.0	19.8	20.2	20.2	28.6	12.8	12.8	28.6
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	44.8	5.8	2.0	2.0	2.0	3.5	1.6	1.6	3.2	1.3	1.3	3.2
Delay (s)	62.1	22.4	33.0	33.0	33.0	23.3	21.7	21.7	31.8	14.0	14.0	31.8
Level of Service	E	C	C	C	C	C	C	C	C	C	C	B
Approach Delay (s)	40.9		33.0	33.0	33.0	22.4			18.9			
Approach LOS	D		C	C	C	C			B			
Intersection Summary												
HCM Average Control Delay	32.3											
HCM Volume to Capacity ratio	0.78											
Actuated Cycle Length (s)	90.0											
Intersection Capacity Utilization	81.8%											
Analysis Period (min)	15											
Critical Lane Group	C											
HCM Level of Service	C											
Sum of lost time (s)	8.0											
ICU Level of Service	D											

***VENICE ISLAND APARTMENTS***  
***TRAFFIC IMPACT STUDY***

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**APPENDIX F**

**POST-DEVELOPMENT CONDITIONS**  
**LEVEL OF SERVICE ANALYSIS**

POST-DEVELOPMENT AM  
1: Flat Rock Road & Main St

HCM Signalized Intersection Capacity Analysis

Movement	EBT	ESR	WBL	WBT	NBL	NBR
Lane Configurations	1800	1800	1900	1900	1900	1900
Ideal Flow (vphpl)	4.0	4.0	4.0	4.0	4.0	4.0
Total Lost time (s)	1.00	1.00	1.00	1.00	1.00	1.00
Lane Util. Factor	0.80	1.00	1.00	1.00	0.86	1.00
Flt Protected	1.00	0.95	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1675	1805	1696	1703	1417	1417
Flt Permitted	1.00	0.95	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1675	1805	1696	1703	1417	1417
Volume (vph)	43	149	625	18	65	298
Peak-hour factor, PHF	0.83	0.83	0.90	0.90	0.91	0.91
Adj. Flow (vph)	88	237	694	20	60	325
RTOR Reduction (vph)	167	0	0	0	0	85
Lane Group Flow (vph)	148	0	694	20	60	241
Heavy Vehicles (%)	0%	2%	0%	12%	6%	14%
Turn Type	Split					
Protected Phases	6	2	2	2	4	4, 2
Permitted Phases	pTov					
Actuated Green, G (s)	10.4	40.0	40.0	10.4	58.8	58.8
Effective Green, g (s)	12.8	42.4	42.4	12.8	59.2	59.2
Actuated g/C Ratio	0.16	0.53	0.53	0.16	0.74	0.74
Clearance Time (s)	6.4	6.4	6.4	6.4	6.4	6.4
Lane Grp Cap (vph)	288	957	899	272	1049	1049
v/s Ratio Prot	c0.18	c0.38	0.01	0.04	c0.23	
v/s Ratio Perm						
Uniform Delay, d1	0.65	0.73	0.02	0.22	0.23	0.23
Progression Factor	1.00	14.4	8.9	29.3	3.3	3.3
Incremental Delay, d2	8.0	4.8	0.0	1.9	0.5	1.00
Delay (s)	38.9	19.1	9.0	31.1	3.8	3.8
Level of Service	D	B	A	C	A	A
Approach Delay (s)	38.9		18.8	8.0		
Approach LOS	D		B	A		
Intersection Summary						
HCM Average Control Delay	20.2					
HCM Volume to Capacity ratio	0.73					
Actuated Cycle Length (s)	60.0					
Intersection Capacity Utilization	59.4%					
Analysis Period (min)	15					
c Critical Lane Group						

POST-DEVELOPMENT AM  
6: Green Lane & Main St

HCM Signalized Intersection Capacity Analysis

Movement	EBL	EBT	EBR	WBL	WBT	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Ideal Flow (vphpl)	12	12	12	16	16	12	12	12	12	12	12	
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor	1.00	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Flt Protected	1.00	0.95	1.00	1.00	1.00	0.98	1.00	0.98	1.00	0.98	1.00	
Satd. Flow (prot)	1703	1706	1706	4037	4037	1752	1725	1822	1524	1822	1524	
Flt Permitted	0.15	1.00	0.95	0.95	0.95	0.48	1.00	0.90	1.00	0.90	1.00	
Satd. Flow (perm)	268	1706	268	3850	3850	892	1725	1686	1524	1686	1524	
Volume (vph)	239	168	159	4	830	19	259	75	10	99	105	
Peak-hour factor, PHF	0.87	0.87	0.87	0.96	0.96	0.95	0.95	0.95	0.88	0.88	0.88	
Adj. Flow (vph)	275	182	183	4	865	20	273	79	11	44	119	
RTOR Reduction (vph)	0	40	0	0	1	0	0	0	0	0	0	
Lane Group Flow (vph)	275	325	0	0	888	0	273	84	0	163	659	
Heavy Vehicles (%)	6%	0%	8%	1%	1%	0%	3%	9%	2%	0%	6%	
Turn Type	pTov											
Protected Phases	3	8		4		1	6			2	3	
Permitted Phases	pTov											
Actuated Green, G (s)	47.0	47.0	47.0	22.0	22.0	33.0	33.0	33.0	21.0	21.0	41.0	
Effective Green, g (s)	48.0	48.0	48.0	23.0	23.0	34.0	34.0	34.0	22.0	22.0	43.0	
Actuated g/C Ratio	0.53	0.53	0.53	0.26	0.26	0.38	0.38	0.38	0.24	0.24	0.46	
Clearance Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	
Lane Grp Cap (vph)	477	910	910	984	984	413	662	407	796	407	796	
v/s Ratio Prot	0.13	0.21	0.17	0.23	0.23	0.06	0.05	0.10	0.25	0.10	0.25	
v/s Ratio Perm												
Uniform Delay, d1	0.58	0.36	0.36	0.90	0.90	0.66	0.13	0.40	0.83	0.40	0.83	
Progression Factor	15.8	12.1	12.1	32.4	32.4	22.3	18.3	28.5	20.3	28.5	20.3	
Incremental Delay, d2	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Delay (s)	5.0	1.1	1.1	13.0	13.0	6.1	0.4	2.8	9.6	2.8	9.6	
Level of Service	C	B	B	D	D	C	B	C	C	C	C	
Approach Delay (s)	16.4		16.4	45.4	45.4	30.4	18.7	31.4	29.9	31.4	29.9	
Approach LOS	B		B	D	D	C	B	C	C	C	C	
Intersection Summary												
HCM Average Control Delay	31.6											
HCM Volume to Capacity ratio	0.87											
Actuated Cycle Length (s)	90.0											
Intersection Capacity Utilization	85.8%											
Analysis Period (min)	15											
c Critical Lane Group												

POST-DEVELOPMENT AM HCM Unsignalized Intersection Capacity Analysis  
 11: Flat Roack Road & Proposed Site

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop
Volume (vph)	29	44	0	114	78	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	32	48	0	124	85	0
Direction, Lane #	WB 1	WB 2	NB 1	SB 1		
Volume Total (vph)	32	48	124	85		
Volume Left (vph)	32	0	0	85		
Volume Right (vph)	0	48	124	0		
Head (s)	0.5	-0.7	-0.6	0.2		
Departure Headway (s)	5.4	4.2	3.6	4.4		
Degree Utilization, x	0.05	0.06	0.12	0.10		
Capacity (veh/h)	500	617	867	806		
Control Delay (s)	7.3	6.1	6.7	7.5		
Approach Delay (s)	6.6		6.7	7.5		
Approach LOS	A		A	A		
Intersection Summary						
Delay			6.9			
HCM Level of Service			A			A
Intersection Capacity Utilization			18.0%			
Analysis Period (min)			15			

POST-DEVELOPMENT PM  
1: Flat Rock Road & Main St

HCM Signalized Intersection Capacity Analysis

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	1800	1800	1800	1800	1800	1800
Ideal Flow (vphpl)	4.0	4.0	4.0	4.0	4.0	4.0
Total Lost time (s)	1.00	1.00	1.00	1.00	1.00	1.00
Lane Util. Factor	0.90	0.95	1.00	0.95	1.00	0.85
Fit Protected	1816	1738	1863	1703	1485	1485
Satd. Flow (prot)	1816	0.85	1.00	0.95	1.00	0.85
Fit Permitted	1816	1738	1863	1703	1485	1485
Satd. Flow (perm)	33	110	471	42	160	755
Volume (vph)	0.58	0.58	0.97	0.97	0.83	0.83
Peak-hour factor, PHF	57	190	488	43	161	812
Adj. Flow (vph)	150	0	0	0	0	180
RTOR Reduction (vph)	97	0	488	43	161	632
Lane Group Flow (vph)	0%	7%	4%	2%	6%	8%
Heavy Vehicles (%)	Spill					
Turn Type	6	2	2	4	4	2
Protected Phases	pm-pt					
Permitted Phases	pm-pt					
Actuated Green, G (s)	10.4	40.0	40.0	10.4	58.8	58.8
Effective Green, G (s)	12.8	42.4	42.4	12.8	59.2	59.2
Actuated g/C Ratio	0.18	0.53	0.53	0.16	0.74	0.74
Clearance Time (s)	6.4	6.4	6.4	6.4	6.4	6.4
Lane Grp Cap (vph)	259	920	987	272	1106	1106
v/s Ratio Prot	c0.15	0.28	0.02	0.08	c0.54	
v/s Ratio Perm	0.37	0.53	0.04	0.59	0.57	
Uniform Delay, d1	30.0	12.3	9.0	31.2	4.7	
Progression Factor	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	4.1	2.2	0.1	9.1	2.1	
Delay (s)	34.1	14.4	9.1	40.3	6.8	
Level of Service	C	B	A	D	A	
Approach Delay (s)	34.1	14.0	12.4			
Approach LOS	C	B	B			
Intersection Summary						
HCM Average Control Delay	15.9					
HCM Volume to Capacity ratio	0.77					
Actuated Cycle Length (s)	80.0					
Intersection Capacity Utilization	61.8%					
Analysis Period (min)	15					
c Critical Lane Group						

POST-DEVELOPMENT PM  
6: Green Lane & Main St

HCM Signalized Intersection Capacity Analysis

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Ideal Flow (vphpl)	12	12	12	12	12	12	12	12	12	12	12	12
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Fit Protected	1703	1782	1782	1703	1782	1782	1703	1782	1782	1782	1703	1782
Satd. Flow (prot)	1703	1782	1782	1703	1782	1782	1703	1782	1782	1782	1703	1782
Fit Permitted	1703	1782	1782	1703	1782	1782	1703	1782	1782	1782	1703	1782
Satd. Flow (perm)	558	1762	1762	558	1762	1762	558	1762	1762	1762	558	1762
Volume (vph)	880	503	217	13	238	63	175	196	50	49	123	441
Peak-hour factor, PHF	0.97	0.97	0.80	0.80	0.80	0.80	0.94	0.94	0.94	0.92	0.92	0.92
Adj. Flow (vph)	701	519	224	16	298	79	186	209	53	53	134	479
RTOR Reduction (vph)	0	17	0	0	24	0	0	10	0	0	0	109
Lane Group Flow (vph)	701	726	0	0	369	0	166	252	0	0	187	370
Heavy Vehicles (%)	6%	0%	6%	1%	1%	0%	3%	9%	2%	0%	4%	6%
Turn Type	pm-pt	pm-pt	pm-pt	pm-pt	pm-pt	pm-pt	pm-pt	pm-pt	pm-pt	pm-pt	pm-pt	pm-pt
Protected Phases	3	8	4	4	4	4	6	6	2	2	3	3
Permitted Phases	8	47.0	47.0	47.0	47.0	47.0	33.0	33.0	21.0	21.0	45.0	45.0
Actuated Green, G (s)	48.0	48.0	48.0	48.0	48.0	48.0	34.0	34.0	22.0	22.0	47.0	47.0
Effective Green, g (s)	0.53	0.53	0.53	0.53	0.53	0.53	0.38	0.38	0.24	0.24	0.52	0.52
Clearance Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lane Grp Cap (vph)	616	950	756	393	647	381	884	884	381	381	884	884
v/s Ratio Prot	c0.32	0.42	0.11	0.14	0.14	0.15	c0.15	c0.15	0.12	0.12	0.16	0.16
v/s Ratio Perm	c0.29	1.14	0.78	0.49	0.47	0.39	0.49	0.47	0.48	0.48	0.43	0.43
v/c Ratio	18.3	16.5	31.2	19.8	20.4	29.2	13.2	13.2	29.2	29.2	13.2	13.2
Uniform Delay, d1	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Progression Factor	80.6	5.8	2.2	4.0	1.8	4.5	1.8	1.8	4.5	4.5	1.8	1.8
Incremental Delay, d2	88.9	22.4	33.5	23.9	22.2	33.7	14.8	14.8	33.7	33.7	14.8	14.8
Delay (s)	88.9	22.4	33.5	23.9	22.2	33.7	14.8	14.8	33.7	33.7	14.8	14.8
Level of Service	F	C	C	C	C	C	C	C	C	C	C	B
Approach Delay (s)	59.5	33.5	33.5	33.5	33.5	33.5	22.9	22.9	20.1	20.1	33.5	33.5
Approach LOS	E	C	C	C	C	C	C	C	C	C	C	C
Intersection Summary												
HCM Average Control Delay	41.6											
HCM Volume to Capacity ratio	0.91											
Actuated Cycle Length (s)	80.0											
Intersection Capacity Utilization	84.5%											
Analysis Period (min)	15											
c Critical Lane Group												



POST-DEVELOPMENT PM HCM Unsignalized Intersection Capacity Analysis  
 11: Flat Rock Road & Proposed Site

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	Stop	Stop	Stop	Stop	Stop	Stop
Sign Control	114	78	0	81	82	0
Volume (vph)	0.92	0.92	0.92	0.92	0.92	0.92
Peak Hour Factor	124	88	0	66	89	0
Hourly flow rate (vph)	WB 1	WB 2	NB 1	SB 1		
Direction, Lane #	124	88	86	89		
Volume Total (vph)	124	0	0	89		
Volume Left (vph)	0	86	66	0		
Volume Right (vph)	0.5	-0.7	-0.8	0.2		
Headway (s)	5.7	4.5	4.0	4.7		
Departure Headway (s)	0.20	0.11	0.07	0.12		
Degree Utilization, x	504	607	865	757		
Capacity (veh/h)	7.8	6.4	7.0	7.9		
Control Delay (s)	7.3	A	A	A		
Approach Delay (s)	A					
Approach LOS						
Intersection Summary						
Delay	7.4					
HCM Level of Service	A					
Intersection Capacity Utilization	17.5%					
Analysis Period (min)	15					
					ICU Level of Service	A

***VENICE ISLAND APARTMENTS***  
***TRAFFIC IMPACT STUDY***

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**APPENDIX G**

**POST-DEVELOPMENT CONDITIONS  
ANALYSIS AFTER IMPROVEMENTS**

RE-TIMED POST-DEVELOPMENT AM HCM Signalized Intersection Capacity Analysis  
 8: Green Lane & Main St

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Ideal Flow (vphpl)	12	12	12	12	12	12	12	12	12	12	12	12
Lane Width	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Total Lost time (s)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lane Util. Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Fit Protected	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Satd. Flow (prot)	1703	1706	1706	1706	1706	1706	1706	1706	1706	1706	1706	1706
Fit Permitted	0.15	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Satd. Flow (perm)	266	1706	1706	1706	1706	1706	1706	1706	1706	1706	1706	1706
Volume (vph)	239	158	159	4	830	19	259	76	10	39	105	810
Peak-hour factor, PHF	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87
Adj. Flow (vph)	275	182	183	4	865	20	273	79	11	44	119	683
RTOR Reduction (vph)	0	40	40	0	0	0	0	0	0	0	0	34
Lane Group Flow (vph)	275	325	0	0	888	0	273	84	0	0	163	659
Heavy Vehicles (%)	6%	0%	0%	1%	1%	0%	3%	9%	2%	0%	4%	6%
Turn Type	pm+pt	pm+pt	pm+pt	Perm	pm+pt	Perm	pm+pt	Perm	pm+ov	pm+ov	pm+ov	pm+ov
Protected Phases	3	8	8	4	4	4	6	6	2	2	3	3
Permitted Phases	8	8	8	4	4	4	6	6	2	2	3	3
Actuated Green, G (s)	47.0	47.0	47.0	22.0	23.0	23.0	33.0	33.0	21.0	41.0	41.0	41.0
Effective Green, g (s)	48.0	48.0	48.0	23.0	24.0	24.0	34.0	34.0	22.0	43.0	43.0	43.0
Actuated g/C Ratio	0.53	0.53	0.53	0.26	0.26	0.26	0.38	0.38	0.24	0.48	0.48	0.48
Clearance Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lane Grp Cap (vph)	477	810	810	884	413	652	407	788	407	788	788	788
v/s Ratio Prot	0.13	0.21	0.21	c0.23	c0.19	c0.19	0.06	0.06	0.10	0.25	0.25	0.25
v/s Ratio Perm	0.17	0.38	0.38	0.90	0.86	0.86	0.19	0.19	0.40	0.83	0.83	0.83
Uniform Delay, d1	15.8	12.1	12.1	32.4	32.4	32.4	22.3	18.3	28.6	20.3	20.3	20.3
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	5.0	1.1	1.1	13.0	13.0	13.0	8.1	0.4	2.9	9.6	9.6	9.6
Delay (s)	20.8	13.2	13.2	45.4	45.4	45.4	30.4	18.7	31.4	29.6	29.6	29.6
Level of Service	C	B	B	D	D	D	C	B	C	C	C	C
Approach Delay (s)	18.4	18.4	18.4	46.4	46.4	46.4	27.5	27.5	30.2	30.2	30.2	30.2
Approach LOS	B	B	B	D	D	D	C	C	C	C	C	C

Intersection Summary

HCM Average Control Delay	31.6	HCM Level of Service	C
HCM Volume to Capacity ratio	0.87		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	85.8%	ICU Level of Service	E
Analysis Period (min)	15		
Critical Lane Group			

RE-TIMED POST-DEVELOPMENT PM HCM Signalized Intersection Capacity Analysis  
 6: Green Lane & Main St

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Ideal Flow (vphpl)	12	12	12	12	12	12	12	12	12	12	12	12
Lane Width	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Total Lost time (s)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lane Util. Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Fit Protected	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Satd. Flow (prot)	1703	1782	1782	1782	1782	1782	1782	1782	1782	1782	1782	1782
Fit Permitted	0.27	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Satd. Flow (perm)	484	1782	1782	3570	3570	3570	704	1712	1712	1712	1537	1524
Volume (vph)	680	503	217	13	238	63	175	196	50	48	123	430
Peak-hour factor, PHF	0.97	0.97	0.97	0.80	0.80	0.80	0.94	0.94	0.94	0.92	0.92	0.92
Adj. Flow (vph)	701	519	224	18	298	79	186	209	53	53	134	467
RTOR Reduction (vph)	0	17	0	0	25	0	0	10	0	0	0	77
Lane Group Flow (vph)	701	728	0	0	368	0	186	252	0	0	187	390
Heavy Vehicles (%)	6%	0%	0%	1%	1%	0%	3%	9%	2%	0%	4%	6%
Turn Type	pm+pt	pm+pt	pm+pt	Perm	pm+pt	Perm	pm+pt	Perm	pm+ov	pm+ov	pm+ov	pm+ov
Protected Phases	3	8	8	4	4	4	6	6	2	2	3	3
Permitted Phases	8	8	8	4	4	4	6	6	2	2	3	3
Actuated Green, G (s)	47.0	47.0	47.0	22.0	23.0	23.0	33.0	33.0	21.0	41.0	41.0	41.0
Effective Green, g (s)	48.0	48.0	48.0	23.0	24.0	24.0	34.0	34.0	22.0	43.0	43.0	43.0
Actuated g/C Ratio	0.53	0.53	0.53	0.26	0.26	0.26	0.38	0.38	0.24	0.48	0.48	0.48
Clearance Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lane Grp Cap (vph)	477	810	810	884	413	652	407	788	407	788	788	788
v/s Ratio Prot	0.13	0.21	0.21	c0.23	c0.19	c0.19	0.06	0.06	0.10	0.25	0.25	0.25
v/s Ratio Perm	0.17	0.38	0.38	0.90	0.86	0.86	0.19	0.19	0.40	0.83	0.83	0.83
Uniform Delay, d1	15.8	12.1	12.1	32.4	32.4	32.4	22.3	18.3	28.6	20.3	20.3	20.3
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	5.0	1.1	1.1	13.0	13.0	13.0	8.1	0.4	2.9	9.6	9.6	9.6
Delay (s)	20.8	13.2	13.2	45.4	45.4	45.4	30.4	18.7	31.4	29.6	29.6	29.6
Level of Service	C	B	B	D	D	D	C	B	C	C	C	C
Approach Delay (s)	18.4	18.4	18.4	46.4	46.4	46.4	27.5	27.5	30.2	30.2	30.2	30.2
Approach LOS	B	B	B	D	D	D	C	C	C	C	C	C

Intersection Summary

HCM Average Control Delay	28.8	HCM Level of Service	C
HCM Volume to Capacity ratio	0.81		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	64.5%	ICU Level of Service	E
Analysis Period (min)	15		
Critical Lane Group			

***VENICE ISLAND APARTMENTS***  
***TRAFFIC IMPACT STUDY***

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**APPENDIX H**

**LEVEL OF SERVICE SUMMARY TABLE**

Level of Service

Intersection	Movement	Morning Peak 2007 Completion		Evening Peak 2007 Completion		Retiming			
		Existing	Pre-Development	Post-Development	Existing	Pre-Development	Post-Development	AM	PM
Leverington Avenue & Main Street	Eastbound Thru/Right	C	C	D	C	C	C		
	Westbound Left	B	B	B	B	B	B		
	Westbound Thru	A	A	A	A	A	A		
	Northbound Left	C	C	C	C	C	C		
	Northbound Right	A	A	A	A	A	A		
Green Lane & Main Street	Eastbound Left	B	B	C	E-62	F-98	D	D	D
	Eastbound Thru/Right	B	B	B	C	C	C	B	B
	Westbound	D	D	D	C	C	C	D	D
	Northbound Left	C	C	C	C	C	C	C	C
	Northbound Thru/Right	B	B	B	C	C	C	C	C
Main Street	Southbound Thru/Left	C	C	C	C	C	C	D	D
	Southbound Right	C	C	C	B	B	B	B	B



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CONSULTING ENGINEERS

# TRAFFIC IMPACT STUDY

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# VENICE ISLAND APARTMENTS

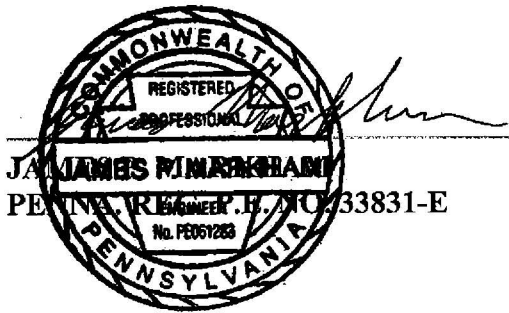
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THE CITY OF PHILADELPHIA  
Pennsylvania

*Prepared For:*

---

**NEDUCSIN MANAGEMENT**  
161 Leverington Ave., Suite 100  
Philadelphia, PA 19127



**JAMES P. MINARIK**  
PENNSYLVANIA REGISTERED PROFESSIONAL ENGINEER No. PE061268  
PE 33831-E

*Prepared By:*

---

**Pennoni Associates, Inc.**  
3001 Market Street, Suite 200  
Philadelphia, PA 19104

Revised December 2005  
October 2005  
NEDU 0501

**VENICE ISLAND APARTMENTS  
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## INTRODUCTION

Pennonni Associates, Inc. (PAI) is pleased to submit this Traffic Impact Study on behalf of Neducsin Management for the proposed residential development at Venice Island. This development will be situated between Flat Rock Road and Green Lane in the Manayunk section of Philadelphia, Pennsylvania.

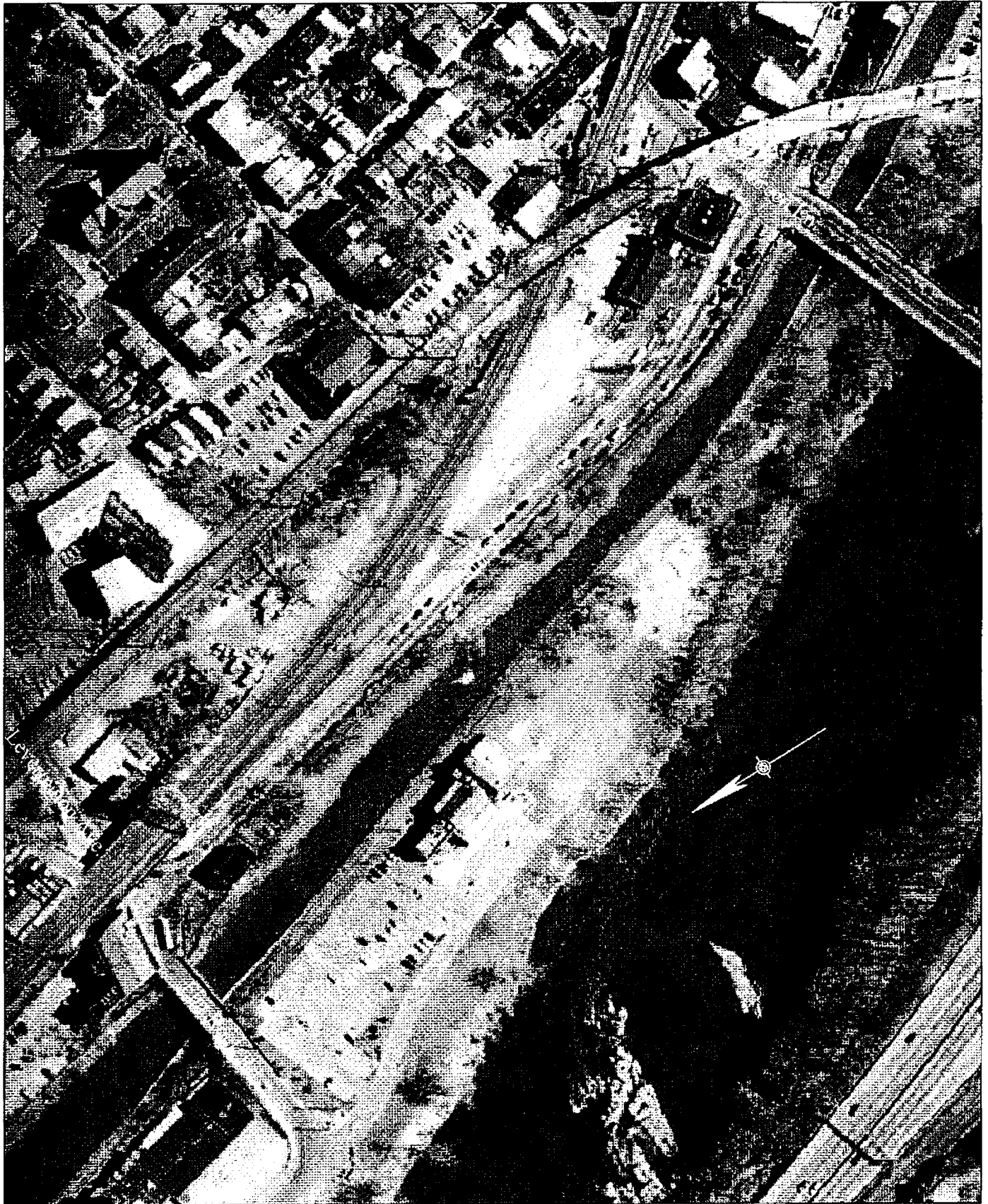
Venice Island Apartments will be comprised of 276 apartment units, consisting of 146 studios and one bedroom apartments and 130 two bedroom apartments. As an ancillary accommodation, there will be an indoor garage consisting of 406 parking spaces, with 397 spaces dedicated and accessible only to the residents of this development and the remaining 9 spaces provided for lobby parking.

The location of Venice Island Apartments and the general study area are shown on **FIGURE 1**.

Specific elements included in this study are:

- ◆ An inventory of the roadway facilities in the vicinity of this project, including the existing physical and traffic operating characteristics,
- ◆ Peak hour capacity analysis of the study intersections for existing conditions,
- ◆ Pre-development traffic volumes for completion year,
- ◆ Critical hour capacity analysis of the study intersections for pre-development conditions,
- ◆ Distribution and assignment of the new vehicle trips to be generated by the Venice Island Apartments development,
- ◆ Total post-development traffic volumes, including the development traffic,
- ◆ Critical hour capacity analysis of the study intersections and site access for post-development conditions.





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FIGURE 1  
PROJECT LOCATION  
AERIAL PHOTOGRAPH

## EXISTING TRAFFIC CONDITIONS

### **Existing Roadway Facilities**

In general, sidewalk, and curbing are provided on the streets within the study area. The following roadways within the immediate vicinity of the project site were evaluated as part of this study:

- **Main Street.** Main Street is a two way, two lane north-south collector roadway. The road is 36 feet wide with sidewalks and curbing throughout. Main Street provides access to down town Manayunk, and I-76 via Green Lane.
- **Flat Rock Road.** Flat Rock Road is a two way, two lane local road that runs east-west within the vicinity of the study area. It is 34 feet wide, with no sidewalks or curbing. The westbound direction of this local road provides access to a self storage facility and Jefferson Smurfit Corporation.
- **Leverington Avenue.** Leverington Avenue is a two way, two lane east-west roadway within the vicinity of the study area. The pavement surface, markings, sidewalk and curbing are in average condition.
- **Green Lane.** Green Lane is a east-west arterial roadway. It is 36 feet wide with two lanes east of Main Street and four lanes west of Main Street. This road allows for direct access to I-76. The pavement surface, markings, sidewalk and curbing are in average condition.

### **Existing Intersections**

- **Leverington Avenue/Flat Rock Road and Main Street.** See Photos 1 and 2. The westbound approach (Leverington Avenue) contains a left and right turn lane. The eastbound approach (Flat Rock Road) contains one effective through lane which transitions into a through lane and a right turn lane onto Main Street. The northbound approach of Main Street contains a left and right turn lane.



Photo 1: Main Street, looking northbound, at intersection with Leverington Ave./Flat Rock Rd.



Photo 2: Leverington Avenue, looking eastbound, at Main Street.

- **Green Lane and Main Street.** See Photos 3 and 4. The eastbound approach (Green Lane) contains a shared through/right lane and a designated left turn lane. The westbound approach (Green Lane) contains a shared through/left/right lane; however, based on field observations, the approach operates as a shared through/right lane and a shared through/left lane. The southbound approach (Main Street) contains a designated right turn lane and a shared through/left turn lane. The northbound approach (Main Street) contains a shared through/right and a left turn lane.



Photo 3: Green Lane, looking eastbound at Main Street intersection.



Photo 4: Main Street, looking southbound, at Green Lane intersection.

The following two intersections were analyzed for existing and future capacity restraints as part of this study:

1. Main Street and Leverington Avenue/Flat Rock Road
2. Main Street and Green Lane.

### Existing Traffic Volumes

Turning movement counts, including heavy vehicles, parking maneuvers, bus blockages, and pedestrian counts, were conducted on an average weekday (Tuesday, October 11, 2005) between the hours of 7:00 - 9:00 A.M. and 4:00 - 6:00 P.M. at the study intersections. Pedestrians, heavy vehicles and transit buses were also counted.

The count data are provided in **APPENDIX A**.

The proposed development site is located within the Philadelphia area. This area is densely populated with a variety of residential and commercial developments. Additionally, a variety of transit options, including the RT 61 SEPTA bus, and the SEPTA R6 rail line are all within close proximity to the proposed development.

The existing turning movement traffic volumes for the intersections within the study area are illustrated on **FIGURE 2**.

### Existing Levels of Service

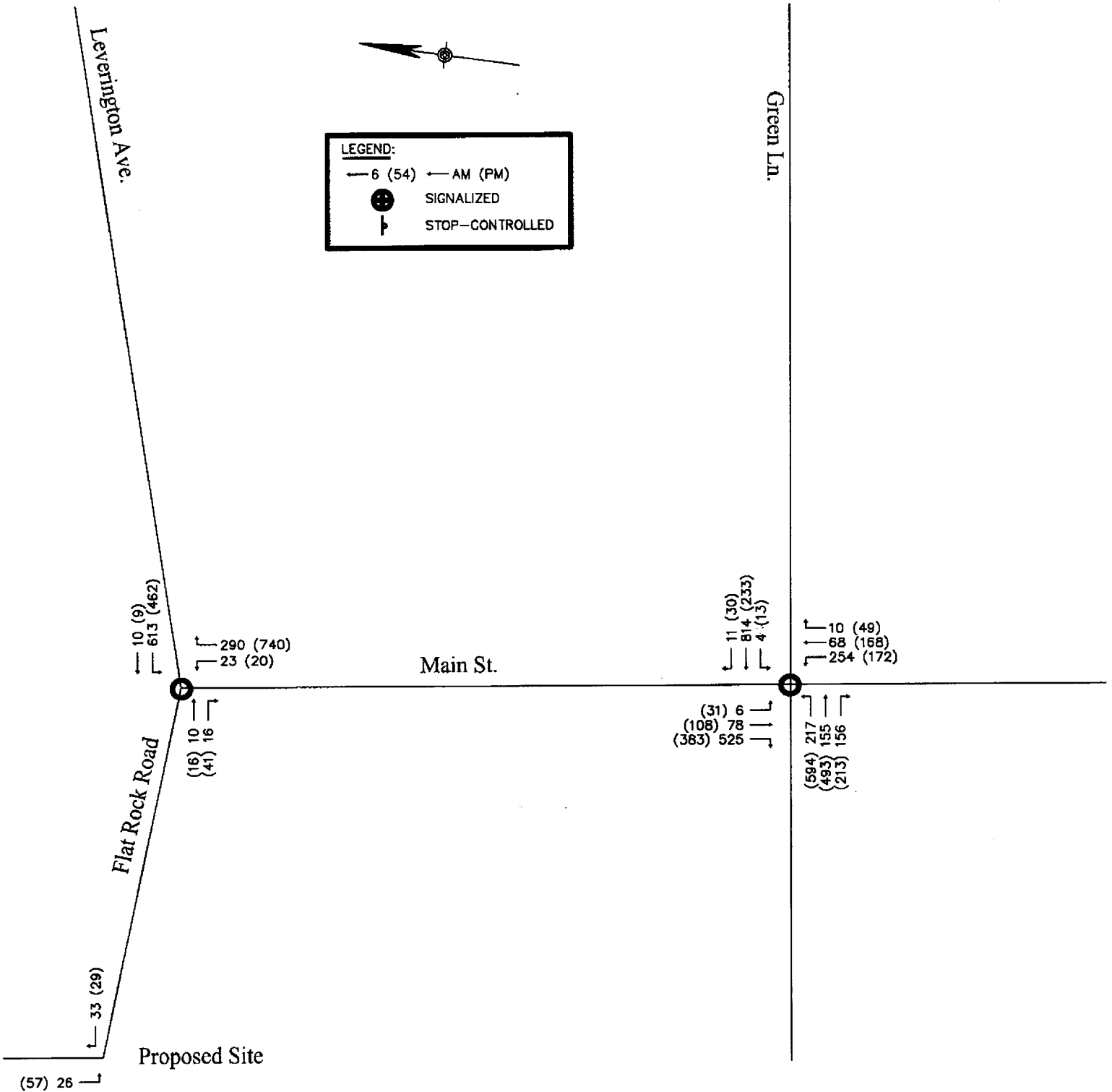
The peak hours of operation were evaluated at the study intersections. The analyses were performed in accordance with the procedures outlined in the Highway Capacity Manual 2000 ed., Special Report 209, published by the Transportation Research Board, Washington D.C., using the Trafficware's Software, Synchro. The results of these analyses provide Level of Service, volume/capacity descriptions and average seconds of delay for the intersection movements. Existing signal timing data was provided by the City of Philadelphia, Department of Streets and verified in the field.

Level of Service is a measure of vehicle operator satisfaction with the driving experience. For the study intersections this has been quantified with designations "A" through "F" for the signalized intersection and "a" through "f" for unsignalized intersections based on the average vehicle delay per each approach and the overall intersection. The Level of Service concept is a rating system established to objectively evaluate the operational adequacy of an intersection or roadway. Definitions of the Levels of Service are contained in **APPENDIX B**.

Average Delay refers to the time a vehicle arriving at the intersection must wait before proceeding through the intersection. The volume/capacity ratio compares the number of vehicles attempting to utilize an approach or intersection to the capacity of the approach or intersection for a specific time period. As the traffic volumes near the capacity of the approach or intersection, congestion occurs. A V/C of 1.0 indicates that the volumes equal the estimated capacity of the intersection or approach.

Under the existing conditions, all study intersections operate at acceptable Levels of Service, with all movements operating with acceptable Level of Service "D/d" or better during both peak hours. The westbound approach on Green Lane was analyzed with two lanes instead of one lane per existing striping. Based on field observations during the data collection, it was observed that the approach operates as two lanes, with a shared through/right and a shared through/left lane.

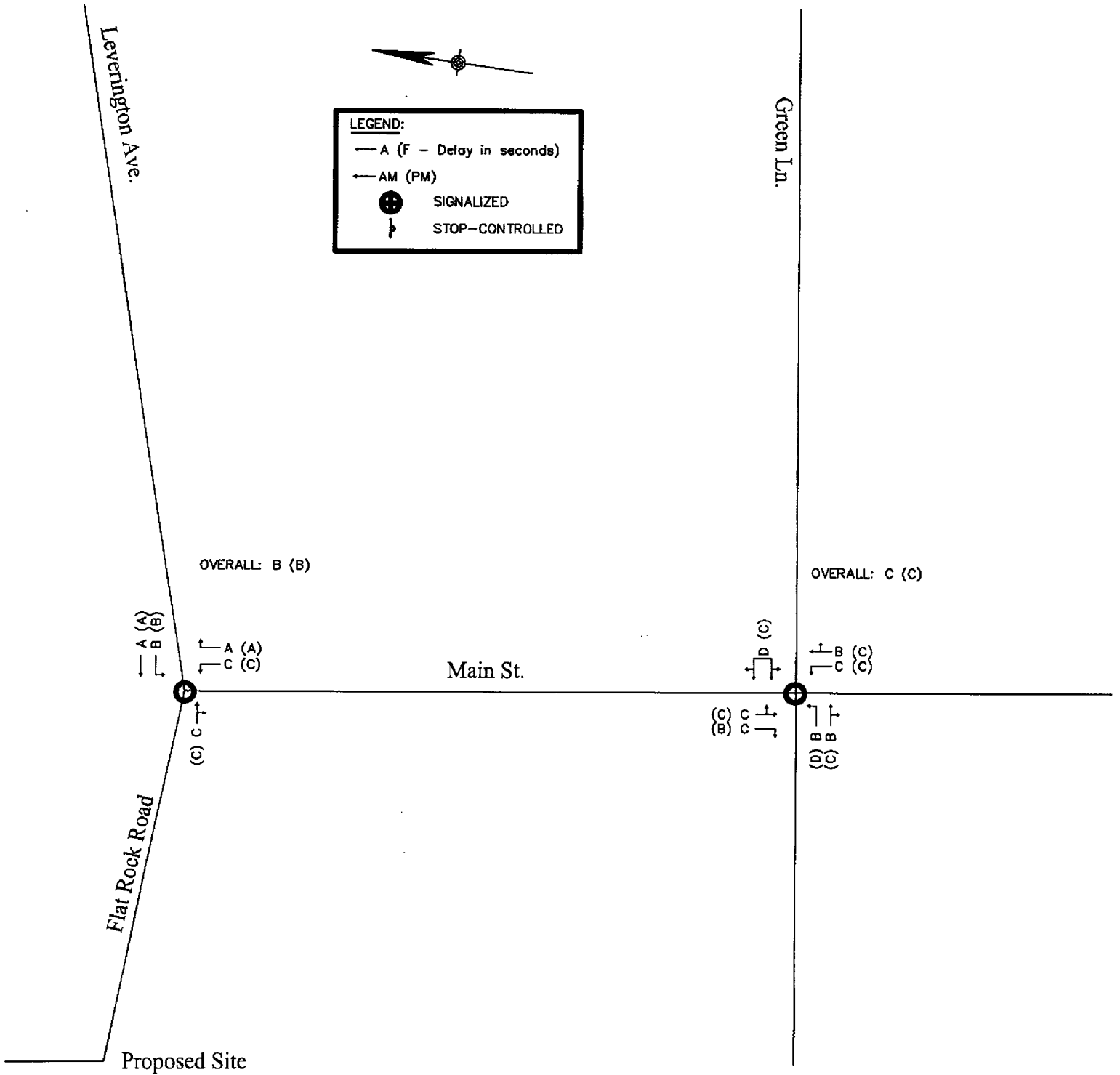
Results of the existing conditions analysis are illustrated on **FIGURE 3**. Summary outputs from the analysis software are provided in **APPENDIX C**.



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FIGURE 2  
 EXISTING VOLUME  
 2005



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FIGURE 3  
 EXISTING LEVELS  
 OF SERVICE

## **FUTURE “PRE-DEVELOPMENT” TRAFFIC CONDITIONS**

### **Pre-Development Traffic Volumes**

In order to assess the impact of the traffic generated by the proposed residential development, an analysis of the future traffic conditions was conducted. This analysis considers general volume growth and does not include the development traffic.

An evaluation of future traffic conditions must first account for the traffic volume increases that are expected to occur throughout the region over this period. To account for traffic volume increases from general growth, existing traffic volumes were increased by an annual growth factor of 1% as pre comments made by Charles Denny of Philadelphia Streets Department. In addition, site traffic was added to account for the Venice Lofts, a residential development on Flat Rock Road that will be completed by the end of 2006. The traffic for Venice lofts was distributed to the study area roadways based on existing traffic patterns. **FIGURE 4** illustrates the projected pre-development traffic volumes. A summary of future traffic volumes is provided in **APPENDIX D**.

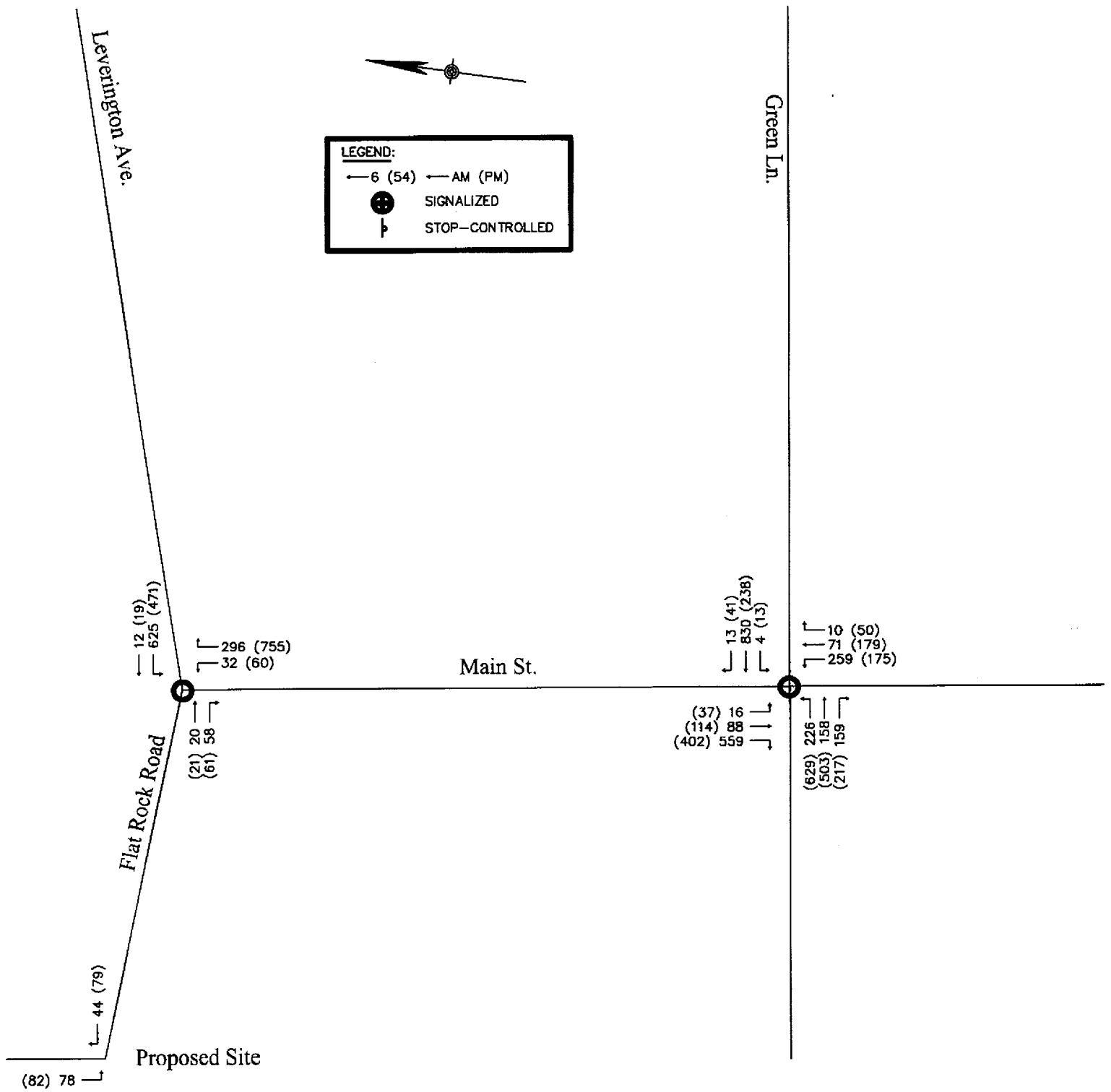
### **Pre-Development Levels of Service**

Operations of the study intersections during the peak hours were evaluated based on the projected pre-development peak hour traffic volumes. **FIGURE 5** illustrates the results of the pre-development analyses.

The results of the pre-development evaluations indicate that all study intersections will operate at overall acceptable LOS “D/d” and/or otherwise maintain their Existing conditions, *except* for the following movements:

1. At the signalized intersection of Green Lane and Main Street: the eastbound left movement on Green Lane degrades from LOS “D” to LOS “F” during the evening peak hour.

Summary outputs of the pre-development analysis are provided in **APPENDIX E**.

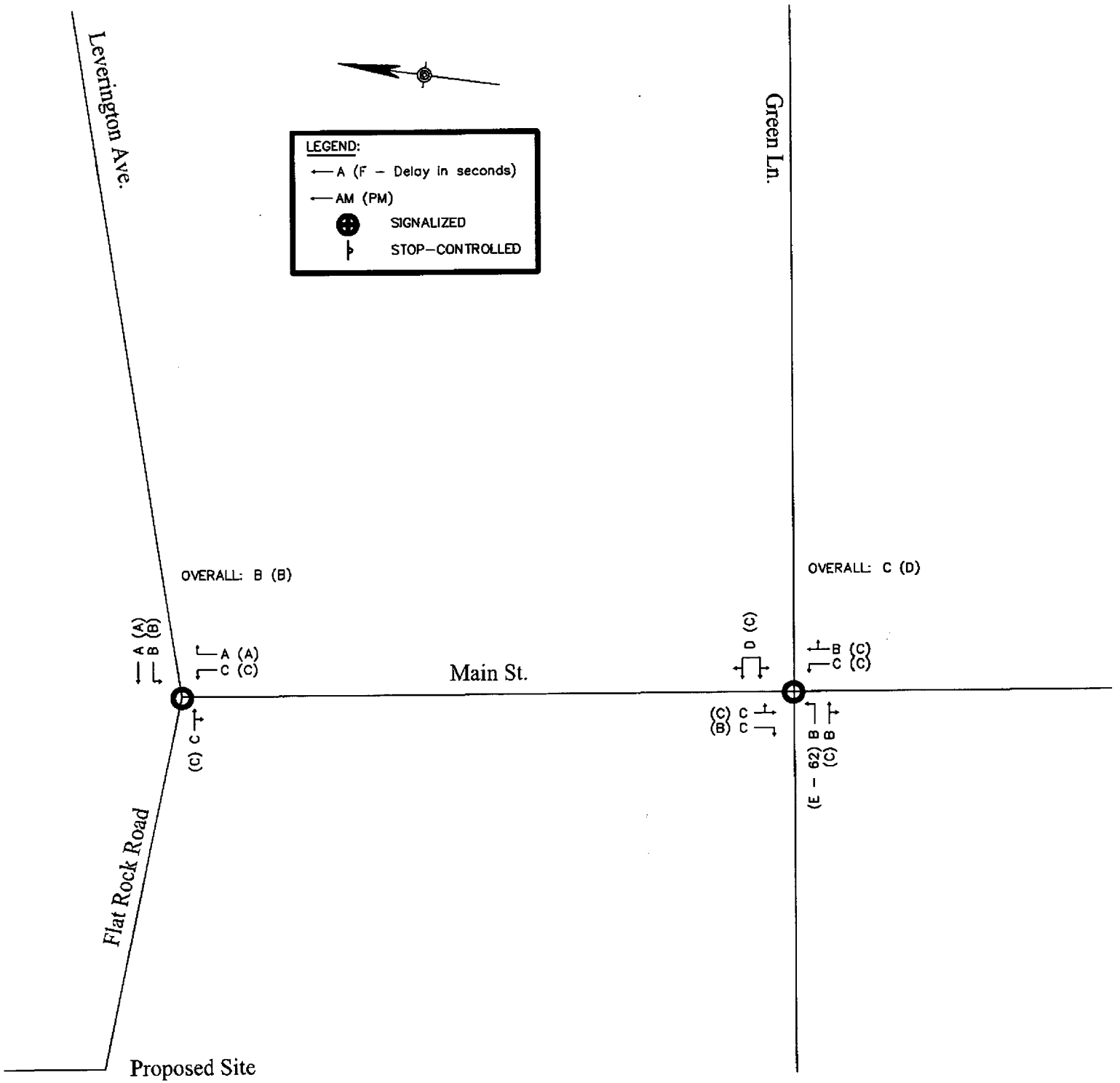


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FIGURE 4  
 PRE-DEVELOPMENT  
 VOLUME





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FIGURE 5  
 PRE-DEVELOPEMENT LEVELS  
 OF SERVICE

## **DEVELOPMENT TRAFFIC**

### **Project Description**

Neducsin Management proposes to construct a residential development on Venice Island. This proposed development will be comprised of 276 apartment units, consisting of studios, one and two bedroom apartments. As an ancillary accommodation, there will be an indoor garage consisting of 406 parking spaces, with 397 spaces dedicated and accessible only to the residents of this development and the remaining 9 spaces provided for lobby parking.

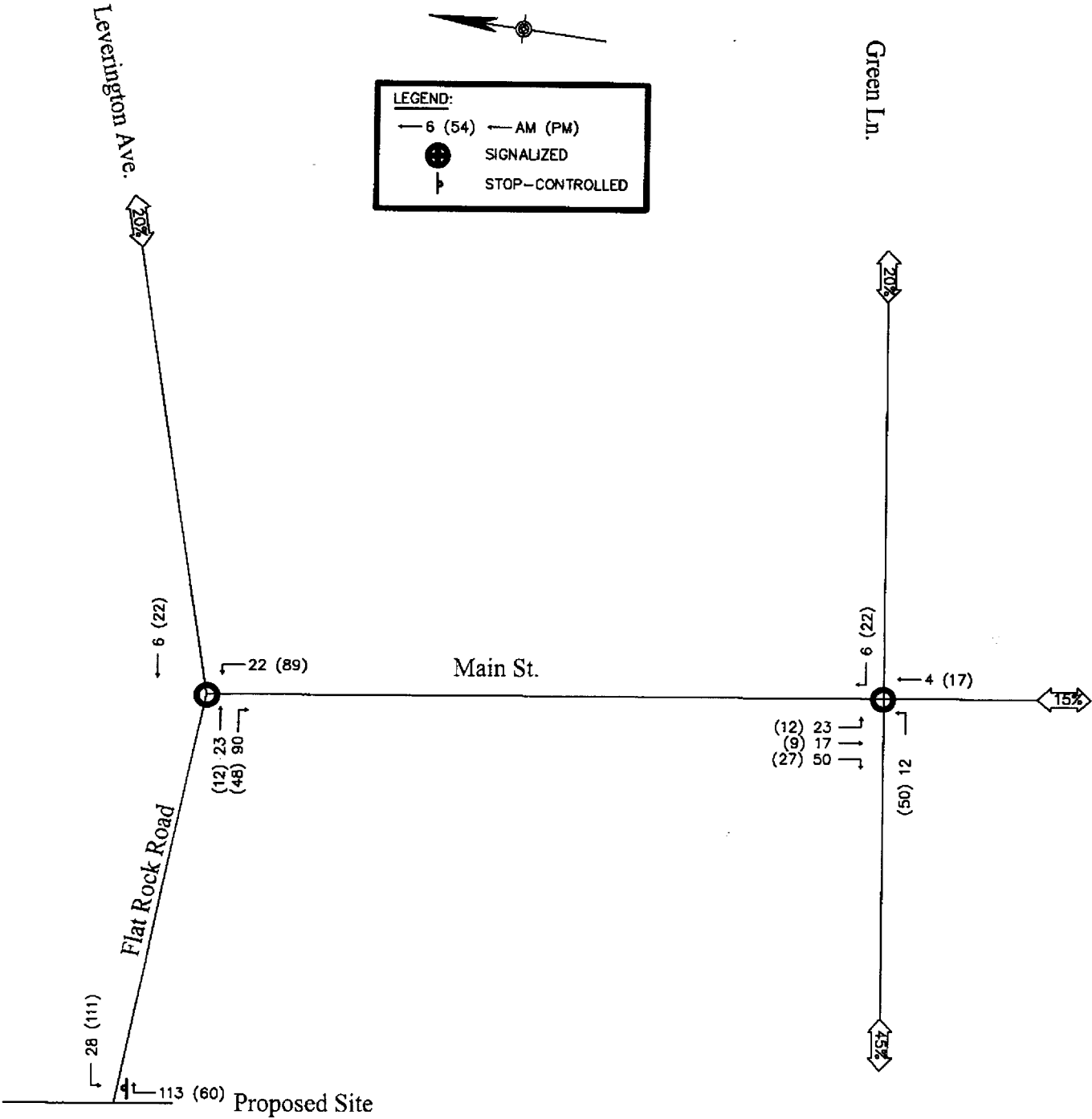
### **Trip Generation**

The traffic volumes anticipated to be generated by the proposed development were projected using the Trip Generation Manual, Seventh Edition, by the Institute of Transportation Engineers, 2003. The trip generation rate for ITE Land Use Code 220 *Apartments* was utilized based on the respective number of units. The estimated traffic expected to be generated by the proposed development is 141 new vehicle trips (28 entering/ 113 exiting) in the weekday morning peak hour and 171 new vehicle trips (111 entering/ 60 exiting) in the weekday evening peak hour.

### **Trip Distribution and Assignment**

The new vehicle trips generated by Venice Island Apartments were distributed and assigned to the roadway network based on a combined evaluation of existing traffic patterns and the proposed development access location onto Flat Rock Road.

**FIGURE 6** illustrates the anticipated distribution of project traffic and the assignment of the new trips to the roadway network in the vicinity of the project.



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FIGURE 6  
 TRIP DISTRIBUTION

## **FUTURE “POST-DEVELOPMENT” TRAFFIC CONDITIONS**

### **Post-Development Traffic Volumes**

The traffic volumes generated by the proposed Venice Island Apartments were added to the pre-development traffic volumes to provide the post-development traffic volumes. These traffic volumes are illustrated on **FIGURE 7**.

### **Post-Development Levels of Service**

Traffic conditions were evaluated for the weekday morning and evening peak hours assuming the post-development traffic volumes. **FIGURE 8** illustrates the future Levels of Service.

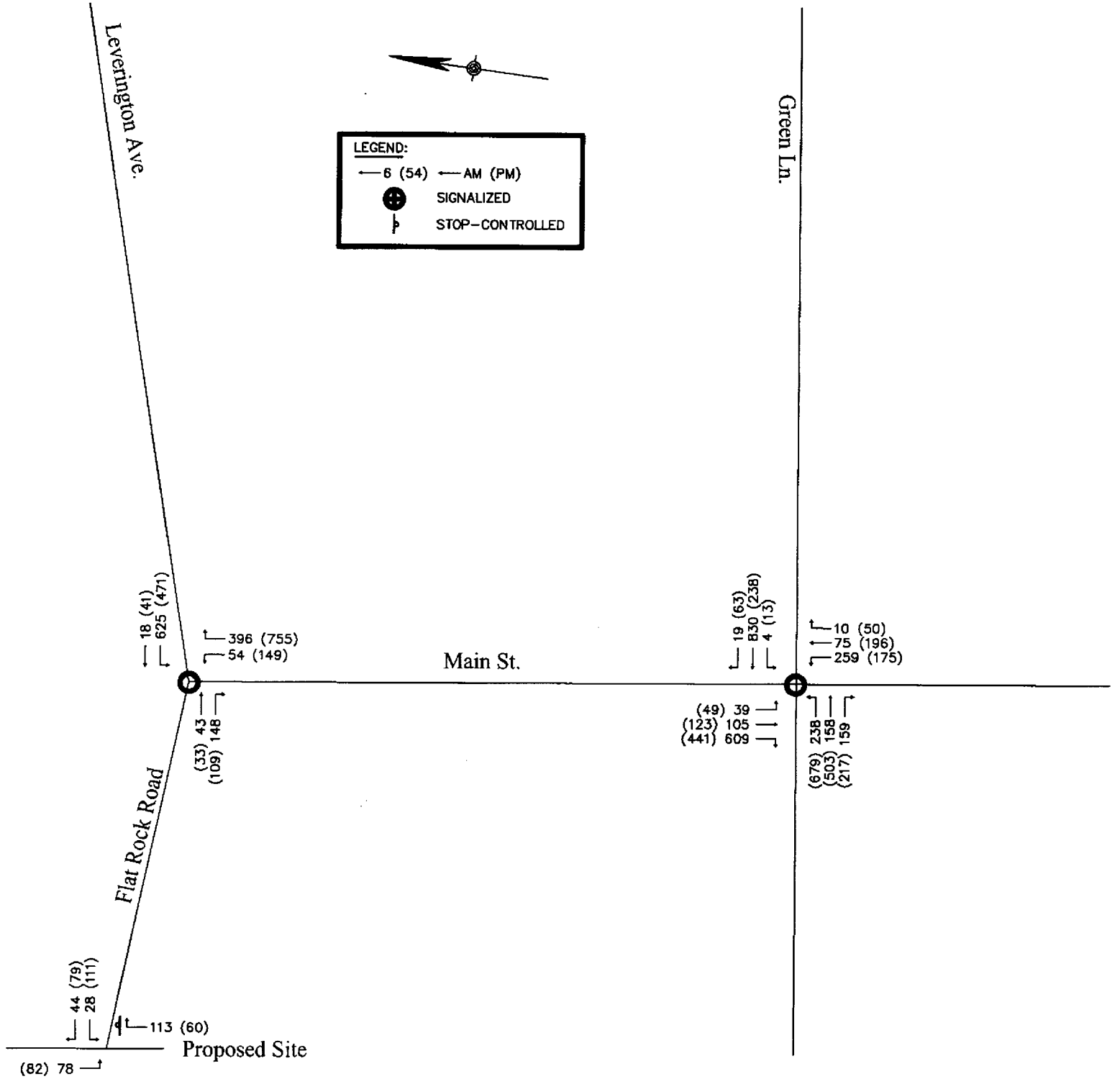
The results of the post-development evaluations indicate that all study intersections will operate at overall acceptable LOS “D/d” and/or otherwise maintain their pre-development conditions, *except* for the following movements:

1. At the signalized intersection of Green Lane and Main Street: the eastbound left turn movement from Green Lane degrades further within LOS “F” during the evening peak hour.

Summary outputs of the analysis are provided in **APPENDIX F**.

## **INTERSECTION DEFICIENCIES**

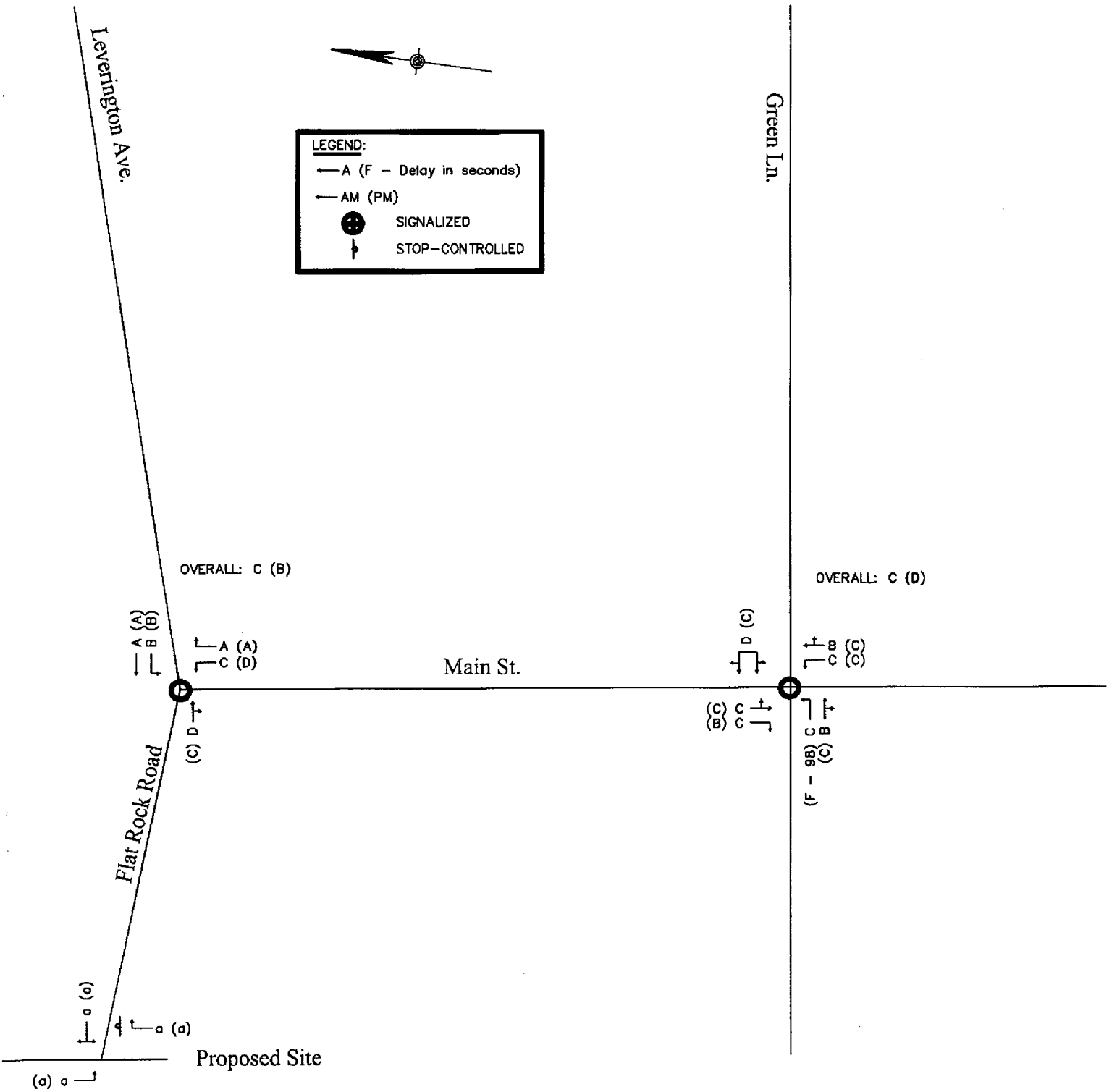
Based on the existing roadway geometry and traffic timings, the eastbound left turn movement from Green Lane to Main Street will operate at deficient Level of Service during pre and post-development. The deficient operating conditions can be mitigated by optimization of traffic signal timing. The signal timing optimization will change the Level of Service from “E” to “D”. **Figure 9** illustrates the mitigated Levels of Service. Analyses of the mitigated conditions are included in **APPENDIX G**.



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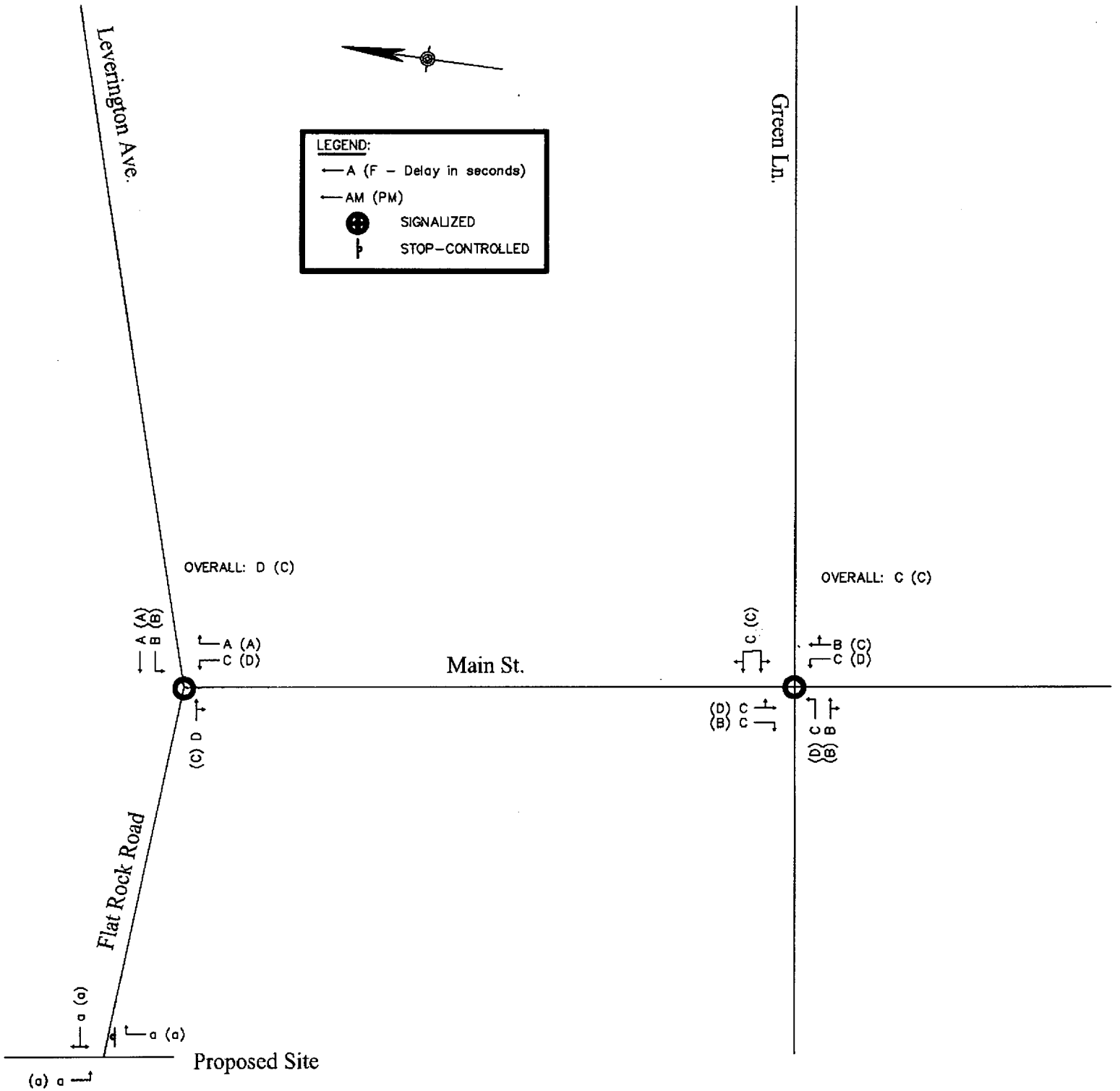
FIGURE 7  
 POST-DEVELOPMENT  
 VOLUME



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FIGURE 8  
 POST-DEVELOPEMENT LEVELS  
 OF SERVICE



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FIGURE 9  
 RE-TIMED POST-DEVELOPEMENT  
 LEVELS OF SERVICE

## CONCLUSIONS AND RECOMMENDATIONS

Neducsin Management proposes to construct a residential development on Venice Island, in the Manayunk section of Philadelphia. This proposed development will be comprised of 276 apartment units, consisting of 146 studios and one bedroom apartments and 130 two bedroom apartments. As an ancillary accommodation, there will be an indoor garage consisting of 406 parking spaces, with 397 spaces dedicated and accessible only to the residents of this development and the remaining 9 spaces provided for lobby parking.

The traffic volumes anticipated to be generated by the proposed development were projected using the Trip Generation Manual, Seventh Edition, by the Institute of Transportation Engineers, 2003. The trip generation rate for ITE Land Use Code 220 *Apartments* was utilized based on the respective number of units. The estimated traffic expected to be generated by the proposed development is 141 new vehicle trips (28 entering/ 113 exiting) in the weekday morning peak hour and 171 new vehicle trips (111 entering/ 60 exiting) in the weekday evening peak hour.

Under the existing and pre-development conditions, all signalized study intersections operate at acceptable Levels of Service, with all movements operating with acceptable Level of Service "D/d" or better during both peak hours except for the eastbound left turn movement at the intersection of Green Lane and Main Street.

The results of the post-development evaluations indicate that all study intersections will operate at overall acceptable LOS "D/d" and/or otherwise maintain their pre-development conditions, *except* for the eastbound left turn movement on Green Lane at Main Street. Degradation at this location can be mitigated, however, through traffic signal re-timing. In addition it is recommended that the westbound approach of Green Lane at Main Street be re-stripped to reflect actual operating conditions. Based on the preceding analyses it has been determined that the traffic generated by the Venice Island Apartments will not result in a significant negative impact on the roadway network in the vicinity of the project.

Per request of Charles Denny of the Philadelphia Streets Department, the signalized intersections at Belmont Avenue and the I-76 interchange were reviewed to determine if any roadway improvements are planned. It was found that Lower Marion Township is developing roadway and signalization plans to improve traffic operation at the Belmont Avenue interchange with I-76.



Table 3 95% Queue

Intersection	Movement	Morning Peak 2007 Completion			Evening Peak 2007 Completion			Retiming	
		Existing	Pre-Development	Post-Development	Existing	Pre-Development	Post-Development	AM Post-Development	PM Post-Development
Leverington Avenue & Main Street	Eastbound Thru/Right	20	29	60	22	24	30		
	Westbound Left	341	388	388	228	234	234		
	Westbound Thru	9	11	14	9	14	24		
	Northbound Left	33	42	62	31	66	#162		
	Northbound Right	16	16	16	23	23	37		
	Southbound Thru/Left	136	145	156	#444	#504	#588		#570
	Southbound Right	133	137	137	441	458	458		407
	Northbound Left	#352	#365	#369	104	109	113		131
	Northbound Thru/Right	176	181	181	122	123	123		138
	Eastbound Left	57	59	62	144	152	\$166		186
	Eastbound Thru/Right	83	99	133	128	138	157		#185
	Westbound	331	375	#502	95	113	142		162

Table 2 Level of Service

Intersection	Movement	Morning Peak				Evening Peak				Retiming	
		Existing	Pre-Development	Post-Development	2007 Completion	Existing	Pre-Development	Post-Development	2007 Completion	AM Post-Development	PM Post-Development
Leverington Avenue & Main Street	Eastbound Thru/Right	C	C	D		C	C	C			
	Westbound Left	B	B	B		B	B	B			
	Westbound Thru	A	A	A		A	A	A			
	Northbound Left	C	C	C		C	C	D			
Street	Northbound Right	A	A	A		A	A	A			
	Eastbound Left	B	B	C		D	E-62	F-98			D
Green Lane & Main	Eastbound Thru/Right	B	B	B		C	C	C			B
	Westbound	D	D	D		C	C	C			D
	Northbound Left	C	C	C		C	C	C			C
Main Street	Northbound	B	B	B		C	C	C			C
	Thru/Right										
Street	Southbound Thru/Left	C	C	C		C	C	C			D
	Southbound Right	C	C	C		B	B	B			B

***VENICE ISLAND APARTMENTS***  
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**APPENDIX A**

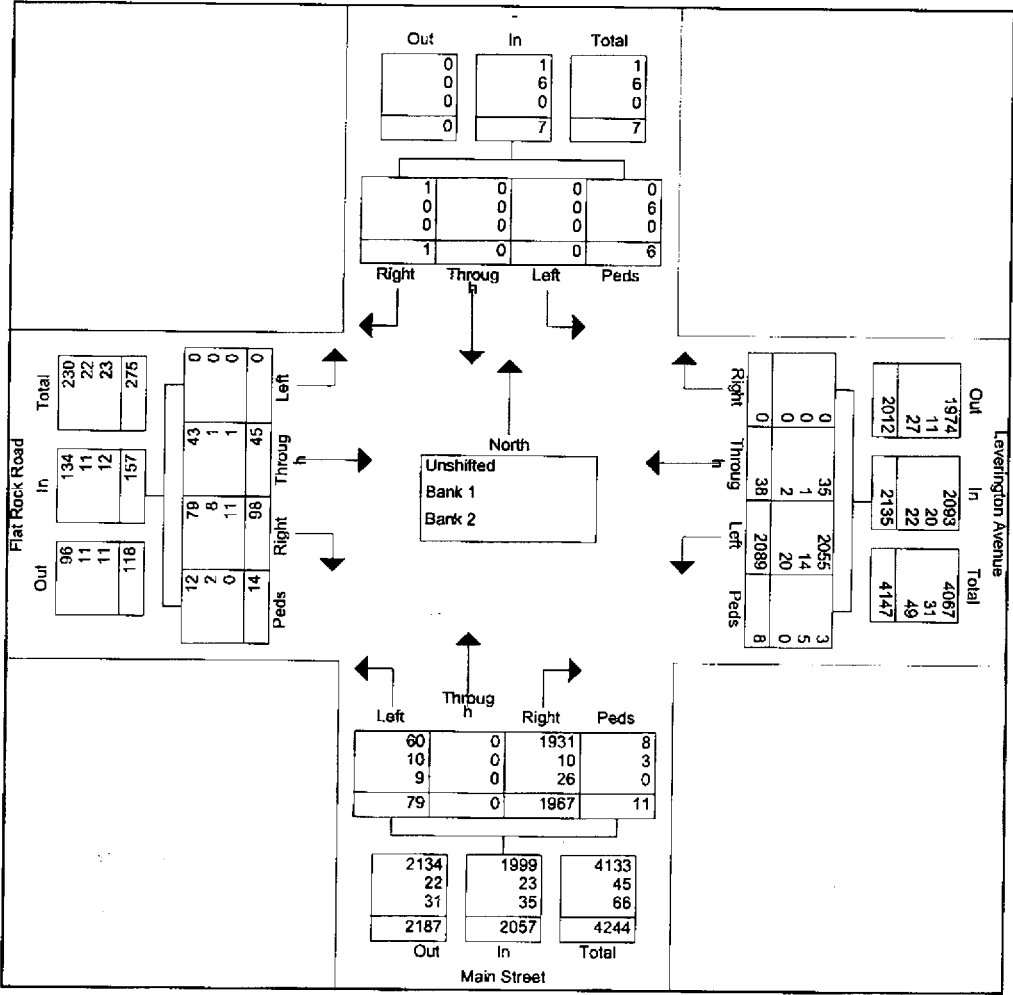
**TRAFFIC COUNTS**

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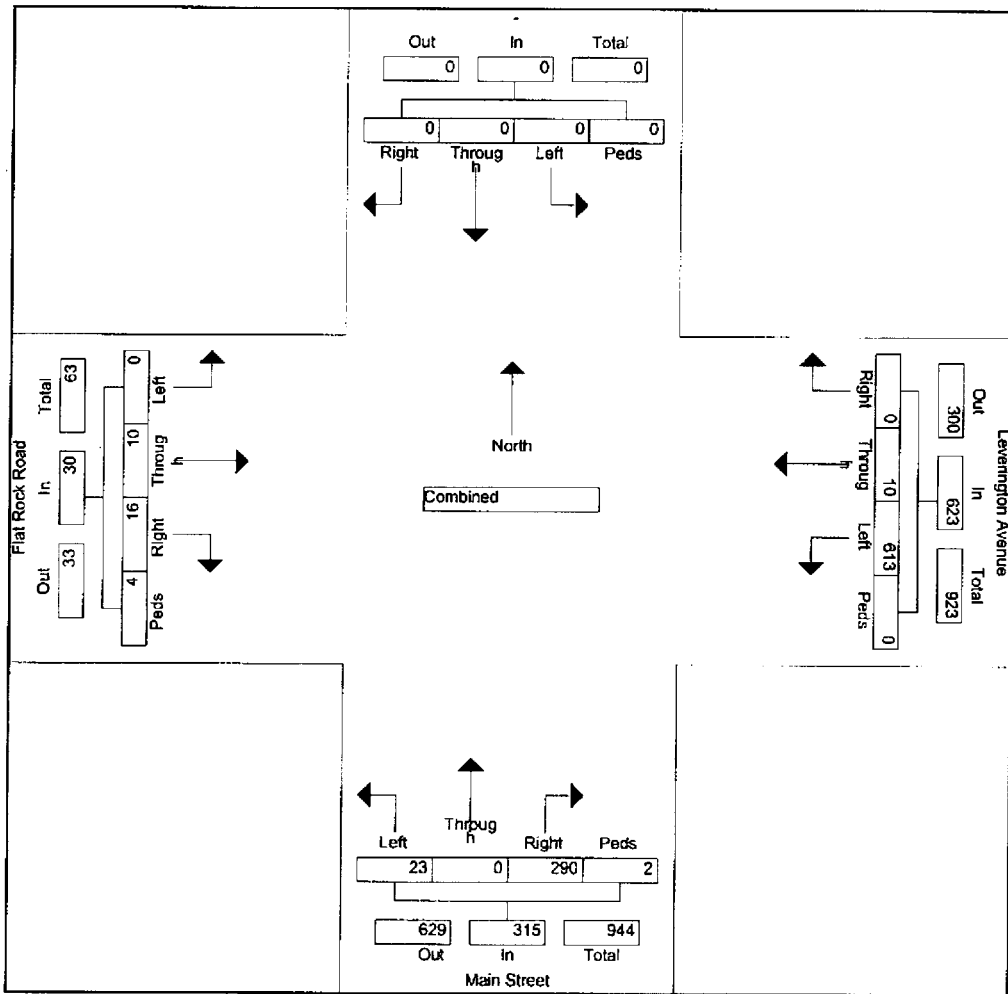
File Name : Main St. and Leverington Ave.  
 Site Code : 00000000  
 Start Date : 10/11/2005  
 Page : 1

Groups Printed: Unshifted - Bank 1 - Bank 2

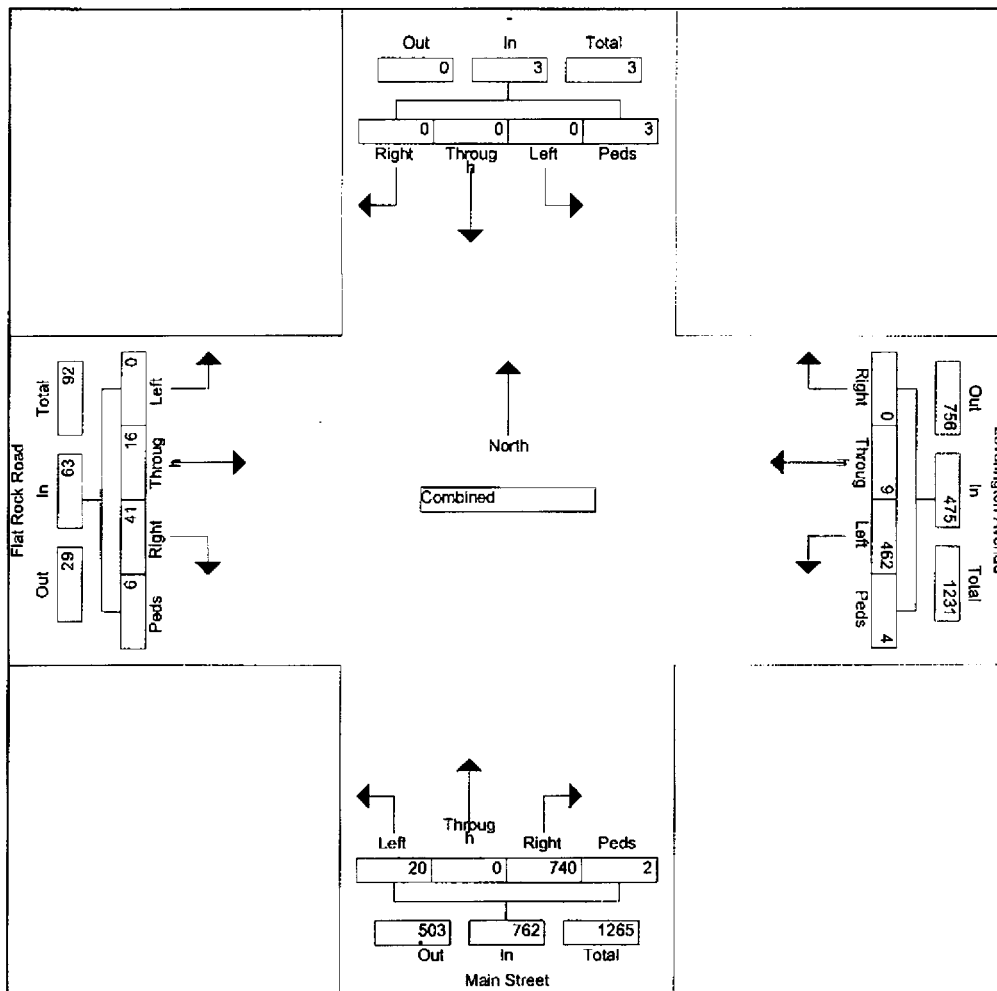
Start Time	Southbound				Leverington Avenue Westbound				Main Street Northbound				Flat Rock Road Eastbound				Int. Total
	Left	Throug h	Right	Peds	Left	Throug h	Right	Peds	Left	Throug h	Right	Peds	Left	Throug h	Right	Peds	
Factor	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	
07:00	0	0	0	0	170	4	0	0	8	0	76	1	0	5	6	1	271
07:15	0	0	0	0	133	2	0	0	7	0	80	0	0	4	3	2	231
07:30	0	0	0	0	164	2	0	0	2	0	58	1	0	0	2	0	229
07:45	0	0	0	0	146	2	0	0	6	0	76	0	0	1	5	1	237
Total	0	0	0	0	613	10	0	0	23	0	290	2	0	10	16	4	968
08:00	0	0	0	1	138	0	0	0	6	0	58	3	0	0	5	2	213
08:15	0	0	0	0	135	3	0	0	5	0	61	0	0	1	3	0	208
08:30	0	0	0	0	129	3	0	0	5	0	70	0	0	0	6	0	213
08:45	0	0	0	0	143	3	0	0	5	0	98	0	0	1	3	0	253
Total	0	0	0	1	545	9	0	0	21	0	287	3	0	2	17	2	887
***BREAK***																	
16:00	0	0	1	0	132	3	0	0	4	0	158	1	0	3	6	0	308
16:15	0	0	0	1	104	2	0	1	2	0	154	1	0	7	3	0	275
16:30	0	0	0	0	121	2	0	2	6	0	172	0	0	4	8	1	316
16:45	0	0	0	1	112	3	0	1	3	0	166	2	0	3	7	1	299
Total	0	0	1	2	469	10	0	4	15	0	650	4	0	17	24	2	1198
17:00	0	0	0	1	116	4	0	1	5	0	182	0	0	2	14	0	325
17:15	0	0	0	1	121	1	0	1	4	0	188	0	0	3	6	1	326
17:30	0	0	0	0	117	3	0	0	4	0	199	1	0	8	17	2	351
17:45	0	0	0	1	108	1	0	2	7	0	171	1	0	3	4	3	301
Total	0	0	0	3	462	9	0	4	20	0	740	2	0	16	41	6	1303
Grand Total	0	0	1	6	2089	38	0	8	79	0	1967	11	0	45	98	14	4356
Apprch %	0.0	0.0	14.3	85.7	97.8	1.8	0.0	0.4	3.8	0.0	95.6	0.5	0.0	28.7	62.4	8.9	
Total %	0.0	0.0	0.0	0.1	48.0	0.9	0.0	0.2	1.8	0.0	45.2	0.3	0.0	1.0	2.2	0.3	



Start Time	Southbound					Leverington Avenue Westbound					Main Street Northbound					Flat Rock Road Eastbound					Int. Total
	Left	Throug h	Rig ht	Ped s	App. Total	Left	Throug h	Rig ht	Ped s	App. Total	Left	Throug h	Rig ht	Ped s	App. Total	Left	Throug h	Rig ht	Ped s	App. Total	
Peak Hour From 07:00 to 12:30 - Peak 1 of 1																					
Intersection 07:00																					
Volume	0	0	0	0	0	613	10	0	0	623	23	0	290	2	315	0	10	16	4	30	968
Percent	0.0	0.0	0.0	0.0		98.4	1.6	0.0	0.0		7.3	0.0	92.1	0.6		0.0	33.3	53.3	13.3		
High Int. 6:45:00 AM																					
Volume	0	0	0	0	0	170	4	0	0	174	8	0	80	1	87	0	5	6	2	12	271
Peak Factor						0.895					0.905					0.625					0.893



Start Time	Southbound					Leverington Avenue Westbound					Main Street Northbound					Flat Rock Road Eastbound					Int. Total				
	Left	Throug h	Rig ht	Ped s	App. Total	Left	Throug h	Rig ht	Ped s	App. Total	Left	Throug h	Rig ht	Ped s	App. Total	Left	Throug h	Rig ht	Ped s	App. Total					
Intersection 17:00																									
Volume	0	0	0	3	3	462	9	0	4	475	20	0	740	2	762	0	16	41	6	63	1303				
Percent	0.0	0.0	0.0	100.0		97.3	1.9	0.0	0.8		2.6	0.0	97.1	0.3		0.0	25.4	65.1	9.5						
High Int. 17:00																									
Volume Peak Factor	0	0	0	1	1	121	4	0	2	123	7	0	199	1	204	0	8	17	3	27	0.750	0.965	0.934	0.583	0.928



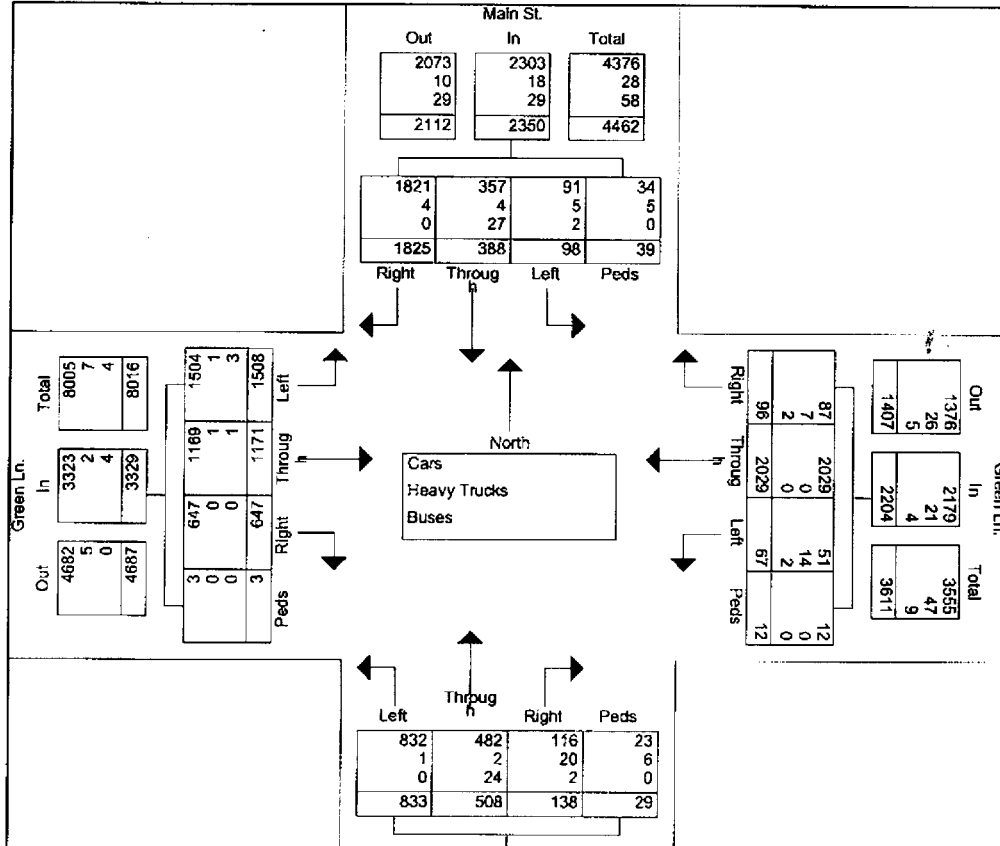
PENNONI ASSOCIATES INC.  
 ONE DREXEL PLAZA  
 3001 MARKET STREET  
 PHILADELPHIA, PA 19104

File Name : Main St. and Green Ln.  
 Site Code : 00000000  
 Start Date : 10/11/2005  
 Page : 1

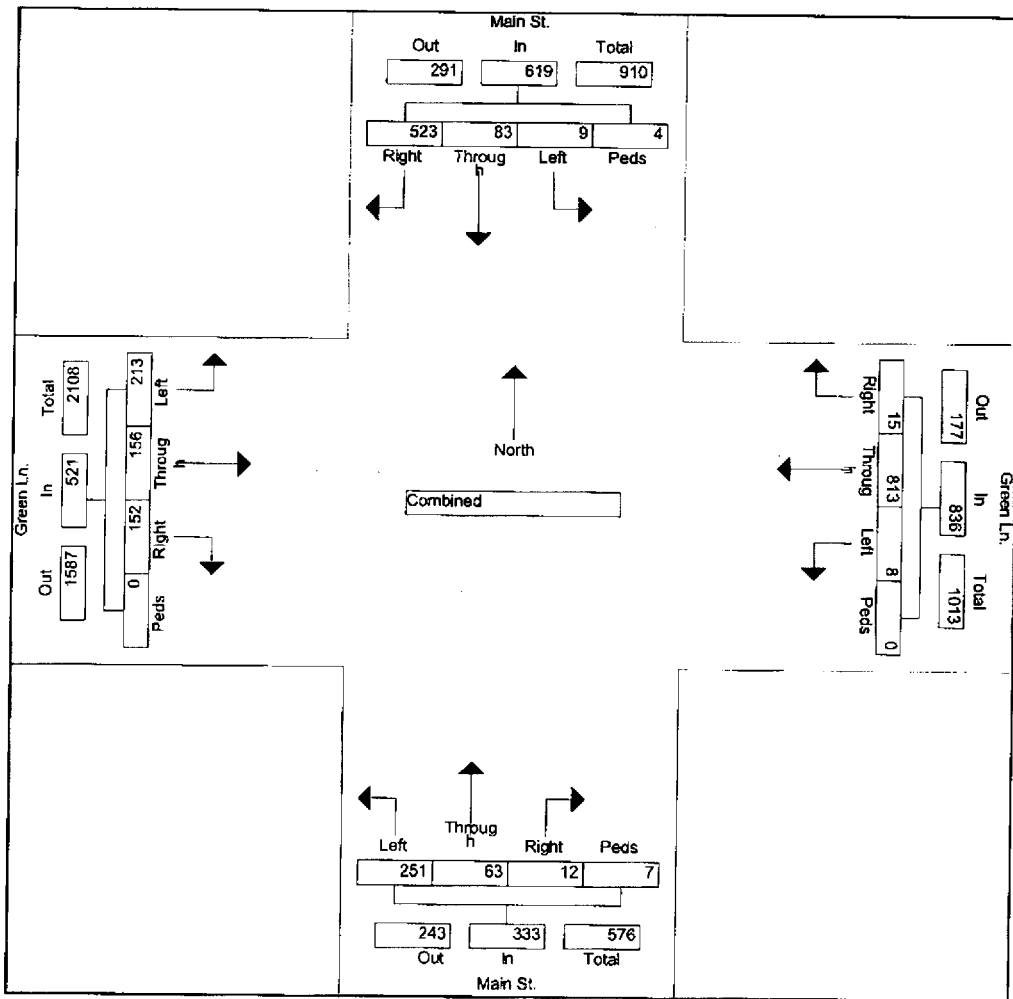
Groups Printed: Cars - Heavy Trucks - Buses

Start Time	Main St. Southbound				Green Ln. Westbound				Main St. Northbound				Green Ln. Eastbound				Int. Total
	Left	Throug h	Right	Peds	Left	Throug h	Right	Peds	Left	Throug h	Right	Peds	Left	Throug h	Right	Peds	
Factor	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	
07:00	7	28	135	0	4	182	5	0	62	28	11	0	68	23	27	0	580
07:15	1	20	146	0	3	215	3	0	65	15	4	1	55	26	15	0	569
07:30	0	28	127	15	2	189	2	0	48	14	3	0	44	41	28	2	543
07:45	0	25	150	1	3	201	2	0	81	16	2	2	66	43	44	0	616
Total	8	101	558	16	12	787	12	0	236	73	20	3	233	133	114	2	2308
08:00	2	20	124	2	2	203	2	0	68	14	3	4	52	29	33	0	558
08:15	3	16	127	1	2	212	5	0	66	12	2	1	48	40	29	0	564
08:30	4	22	122	0	1	197	6	0	56	21	5	0	47	44	46	0	571
08:45	2	26	138	2	13	173	5	0	49	30	11	0	70	48	40	0	607
Total	11	84	511	5	18	785	18	0	239	77	21	5	217	161	148	0	2300
***BREAK***																	
16:00	19	28	102	4	1	58	11	0	56	50	13	0	116	101	37	0	596
16:15	9	26	76	1	7	49	7	1	35	51	10	4	99	105	41	1	522
16:30	13	17	99	0	6	57	5	2	49	54	11	3	132	93	43	0	584
16:45	7	20	99	2	7	60	12	0	46	39	11	1	120	85	52	0	561
Total	48	91	376	7	21	224	35	3	186	194	45	8	467	384	173	1	2263
17:00	8	29	92	1	7	54	5	4	46	40	12	3	150	125	39	0	615
17:15	11	23	99	7	5	78	10	0	43	43	9	6	139	109	71	0	653
17:30	7	35	103	3	3	59	6	3	42	48	11	3	154	124	48	0	649
17:45	5	25	86	0	1	42	10	2	41	33	20	1	148	135	54	0	603
Total	31	112	380	11	16	233	31	9	172	164	52	13	591	493	212	0	2520
Grand Total	98	388	1825	39	67	2029	96	12	833	508	138	29	1508	1171	647	3	9391
Apprch %	4.2	16.5	77.7	1.7	3.0	92.1	4.4	0.5	55.2	33.7	9.2	1.9	45.3	35.2	19.4	0.1	
Total %	1.0	4.1	19.4	0.4	0.7	21.6	1.0	0.1	8.9	5.4	1.5	0.3	16.1	12.5	6.9	0.0	

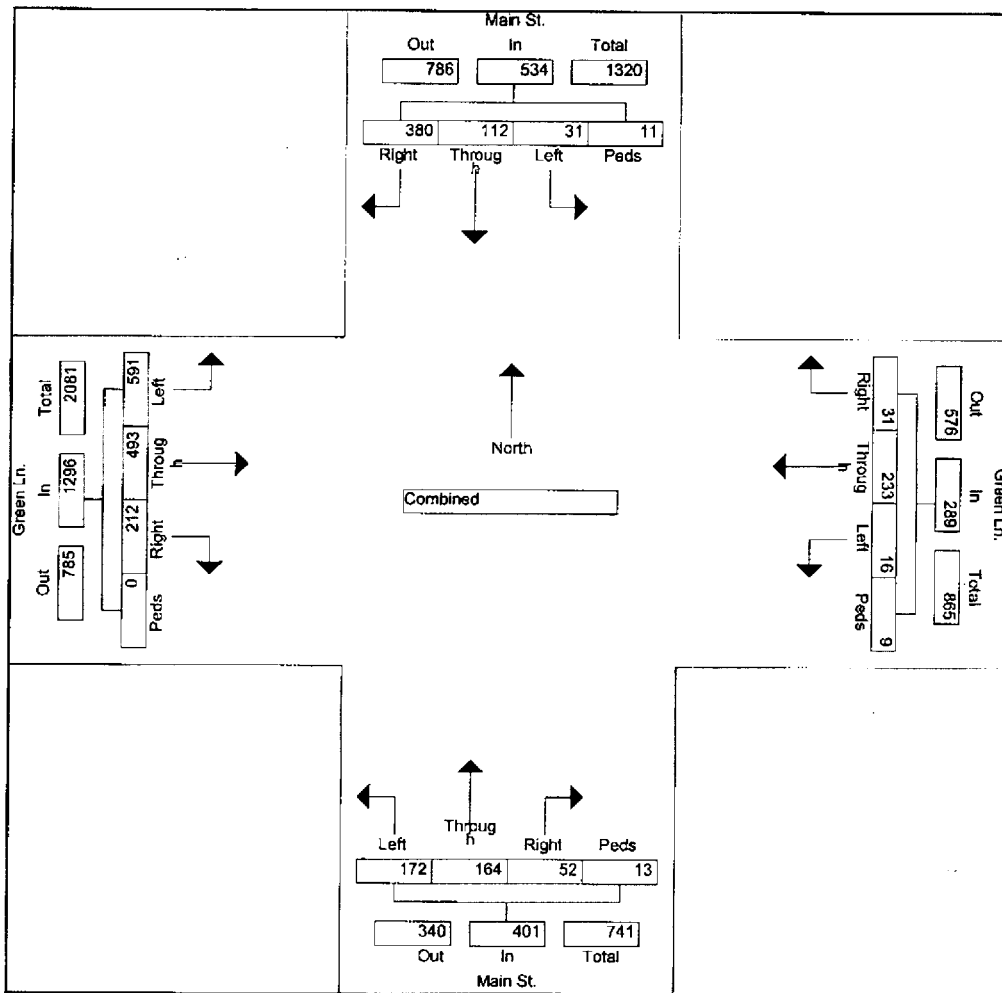




Start Time	Main St. Southbound					Green Ln. Westbound					Main St. Northbound					Green Ln. Eastbound					Int. Total
	Left	Throug h	Rig ht	Ped s	App. Total	Left	Throug h	Rig ht	Ped s	App. Total	Left	Throug h	Rig ht	Ped s	App. Total	Left	Throug h	Rig ht	Ped s	App. Total	
Peak Hour From 07:00 to 12:30 - Peak 1 of 1																					
Intersection 07:45																					
Volume	9	83	523	4	619	8	813	15	0	836	251	63	12	7	333	213	156	152	0	521	2309
Percent	1.5	13.4	84.5	0.6		1.0	97.2	1.8	0.0		75.4	18.9	3.6	2.1		40.9	29.9	29.2	0.0		
High Int. 07:45																					
Volume	4	25	150	2	176	3	212	6	0	219	68	21	5	4	89	66	44	46	0	153	616
Peak Factor	0.879					0.954					0.935					0.851					0.937



Start Time	Main St. Southbound					Green Ln. Westbound					Main St. Northbound					Green Ln. Eastbound					Int. Total
	Left	Throug h	Rig ht	Ped s	App. Total	Left	Throug h	Rig ht	Ped s	App. Total	Left	Throug h	Rig ht	Ped s	App. Total	Left	Throug h	Rig ht	Ped s	App. Total	
Peak Hour From 12:45 to 17:45 - Peak 1 of 1																					
Intersection																					
17:00	31	112	380	11	534	16	233	31	9	289	172	164	52	13	401	591	493	212	0	1296	2520
Volume	31	112	380	11	534	16	233	31	9	289	172	164	52	13	401	591	493	212	0	1296	2520
Percent	5.8	21.0	71.2	2.1		5.5	80.6	10.7	3.1		42.9	40.9	13.0	3.2		45.6	38.0	16.4	0.0		
High Int.	17:30																				
17:30	11	35	103	7	148	7	78	10	4	93	46	48	20	6	104	154	135	71	0	337	653
Volume	11	35	103	7	148	7	78	10	4	93	46	48	20	6	104	154	135	71	0	337	653
Peak Factor					0.902					0.777					0.964					0.961	0.965



***VENICE ISLAND APARTMENTS***  
***TRAFFIC IMPACT STUDY***

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**APPENDIX B**

**LEVEL OF SERVICE DEFINITIONS**

## LEVEL OF SERVICE

Level of Service is a term used to describe vehicle operator satisfaction with the driving experience. Research has determined that operator satisfaction is based primarily on travel speed and delay. In urban environments these factors, travel speed and delay, are primarily controlled by the operation of intersections.

By utilizing models to simulate the flow of traffic at intersections, the average delay experienced by vehicles can be estimated. These models consider such factors as traffic volumes, roadway geometry, traffic control, and driver behavior. Levels of Service designations based on a comparison of the average delays calculated by the models with perceived acceptable delays.

The following tables illustrate the guidelines used for designating Levels of Service at Intersections:

Level of Service Criteria  
for Signalized Intersections<sup>(1)</sup>

Level of Service	Control Delay (seconds)
A	< 10
B	> 10 and ≤ 20
C	> 20 and ≤ 35
D	> 35 and ≤ 55
E	> 55 and ≤ 80
F	> 80

<sup>(1)</sup> Table 6-3, Level of Service from Control Delay (2000 HCM)

Level of Service Criteria  
for Unsignalized Intersections<sup>(2)</sup>

Level of Service	Control Delay (seconds)
a	< 10
b	> 10 and ≤ 15
c	> 15 and ≤ 25
d	> 25 and ≤ 35
e	> 35 and ≤ 40
f	> 50

<sup>(1)</sup> Table 6-4, Level of Service Criteria for TWSC and AWSC intersections (2000 HCM)

***VENICE ISLAND APARTMENTS***  
***TRAFFIC IMPACT STUDY***

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**APPENDIX C**

**2005 EXISTING CONDITIONS**  
**LEVEL OF SERVICE ANALYSIS**

Existing AM

1. Leverington Avenue & Main St

HCM Signalized Intersection Capacity Analysis

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	1900	1900	1900	1900	1900	1900
Ideal Flow (vphpl)	4.0	4.0	4.0	4.0	4.0	4.0
Total Lost time (s)	1.00	1.00	1.00	1.00	1.00	0.85
Lane Util. Factor	0.92	1.00	1.00	1.00	1.00	0.85
Fit Protected	1.00	0.95	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1723	1805	1696	1703	1417	1417
Fit Permitted	1.00	0.85	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1723	1805	1696	1703	1417	1417
Volume (vph)	10	16	613	10	23	290
Peak-hour factor, PHF	0.63	0.63	0.90	0.90	0.91	0.91
Adj. Flow (vph)	16	25	681	11	25	319
RTOR Reduction (vph)	21	0	0	0	0	83
Lane Group Flow (vph)	20	0	681	11	25	236
Heavy Vehicles (%)	0%	2%	0%	12%	6%	14%
Turn Type	Split					
Protected Phases	6	2	2	2	4	4, 2
Permitted Phases	pm+pt					
Actuated Green, G (s)	10.4	40.0	40.0	10.4	56.8	56.8
Effective Green, g (s)	12.8	42.4	42.4	12.8	59.2	59.2
Actuated g/C Ratio	0.16	0.53	0.53	0.16	0.74	0.74
Clearance Time (s)	6.4	6.4	6.4	6.4	6.4	6.4
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	276	957	899	272	1049	1049
v/s Ratio Prot	c0.01	c0.38	0.01	0.01	c0.17	c0.17
v/s Ratio Perm	0.07	0.71	0.01	0.09	0.23	0.23
Uniform Delay, d1	28.6	14.2	8.9	28.6	3.2	3.2
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.5	4.5	0.0	0.7	0.5	0.5
Delay (s)	29.1	18.7	8.9	29.3	3.7	3.7
Level of Service	C	B	A	C	A	A
Approach Delay (s)	29.1	18.5	5.6	5.6	5.6	5.6
Approach LOS	C	B	A	A	A	A

Intersection Summary

HCM Average Control Delay	14.8	HCM Level of Service	B
HCM Volume to Capacity ratio	0.50		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	50.6%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Existing AM

6. Green Lane & Main St

HCM Signalized Intersection Capacity Analysis

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Ideal Flow (vphpl)	12	12	12	16	16	16	12	12	12	12	12	12
Lane Width	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Total Lost time (s)	1.00	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.85
Lane Util. Factor	1.00	0.92	1.00	1.00	0.95	1.00	0.95	1.00	0.98	1.00	1.00	0.85
Fit Protected	0.95	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	1.00	1.00	0.85
Satd. Flow (prot)	1703	1708	1708	1703	1703	1703	1703	1703	1703	1703	1703	1524
Fit Permitted	0.15	1.00	0.95	0.95	0.95	0.95	1.00	1.00	1.00	0.98	1.00	0.85
Satd. Flow (perm)	266	1708	1708	3855	1085	1723	1085	1723	1085	1723	1085	1524
Volume (vph)	217	155	156	4	814	11	254	68	10	6	78	525
Peak-hour factor, PHF	0.87	0.87	0.87	0.96	0.96	0.96	0.95	0.95	0.95	0.88	0.88	0.88
Adj. Flow (vph)	249	178	179	4	848	11	267	72	11	7	89	597
RTOR Reduction (vph)	0	40	0	0	1	0	0	6	0	0	0	42
Lane Group Flow (vph)	249	317	0	0	862	0	267	77	0	0	96	555
Heavy Vehicles (%)	6%	0%	6%	1%	1%	0%	9%	9%	2%	0%	4%	6%
Turn Type	pm+pt											
Protected Phases	3	8	8	4	4	4	1	6	2	2	3	3
Permitted Phases	pm+pt											
Actuated Green, G (s)	47.0	47.0	47.0	23.0	23.0	23.0	33.0	33.0	2	2	21.0	41.0
Effective Green, g (s)	48.0	48.0	48.0	23.0	23.0	23.0	34.0	34.0	2	2	22.0	43.0
Actuated g/C Ratio	0.53	0.53	0.53	0.26	0.26	0.26	0.38	0.38	0.24	0.24	0.24	0.48
Clearance Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lane Grp Cap (vph)	477	910	910	985	985	985	469	651	440	440	796	796
v/s Ratio Prot	0.12	0.19	0.12	0.16	0.16	0.16	c0.05	0.04	c0.16	c0.16	0.05	0.20
v/s Ratio Perm	0.52	0.35	0.35	0.88	0.88	0.88	0.57	0.12	0.22	0.22	0.70	0.20
Uniform Delay, d1	14.8	12.0	12.0	32.1	32.1	32.1	21.4	18.2	27.1	27.1	18.4	18.4
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	4.0	1.1	1.1	10.8	10.8	10.8	4.9	0.4	1.1	1.1	5.0	5.0
Delay (s)	18.9	13.1	13.1	42.9	42.9	42.9	26.3	18.6	28.3	28.3	23.4	23.4
Level of Service	B	B	B	D	D	D	C	B	C	C	C	C
Approach Delay (s)	15.5	15.5	15.5	42.9	42.9	42.9	24.5	24.5	24.1	24.1	24.1	24.1
Approach LOS	B	B	B	D	D	D	C	C	C	C	C	C

Intersection Summary

HCM Average Control Delay	28.5	HCM Level of Service	C
HCM Volume to Capacity ratio	0.74		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	79.5%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Existing PM

1: Leverington Avenue & Main St

HCM Signalized Intersection Capacity Analysis

Existing PM

6: Green Lane & Main St

HCM Signalized Intersection Capacity Analysis

Movement	EBT	EBR	WBL	WBT	NBL	NBR	EBL	EBT	EBR	WBL	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Ideal Flow (vphpl)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Total Lost time (s)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lane Util. Factor	0.90	0.90	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Fit Protected	1634	1736	1863	1703	1495												
Satd. Flow (prot)	1.00	0.95	1.00	0.95	1.00												
Fit Permitted	1634	1736	1863	1703	1495												
Satd. Flow (perm)	16	41	462	9	20	740											
Volume (vph)	0.58	0.58	0.97	0.97	0.93	0.93											
Peak-hour factor, PHF	28	71	476	9	22	796											
Adj. Flow (vph)	60	0	0	0	0	207											
RTOR Reduction (vph)	39	0	476	9	22	589											
Lane Group Flow (vph)	0%	7%	4%	2%	6%	8%											
Heavy Vehicles (%)	Split																
Turn Type	6	2	2	2	4	4.2											
Protected Phases	pm+pt																
Permitted Phases	10.4	40.0	40.0	10.4	56.8												
Actuated Green, G (s)	12.8	42.4	42.4	12.8	59.2												
Effective Green, g (s)	0.16	0.53	0.53	0.16	0.74												
Actuated g/C Ratio	6.4	6.4	6.4	6.4	6.4												
Clearance Time (s)	261	920	987	272	1106												
Lane Grp Cap (vph)	c0.02	0.27	0.00	0.01	c0.39												
v/s Ratio Prot	0.15	0.52	0.01	0.08	0.53												
v/s Ratio Perm	28.9	12.2	8.9	28.6	4.5												
Uniform Delay, d1	1.00	1.00	1.00	1.00	1.00												
Progression Factor	1.2	2.1	0.0	0.6	1.8												
Incremental Delay, d2	30.1	14.3	8.9	29.2	6.3												
Delay (s)	C	B	A	C	A												
Level of Service	C	B	A	C	A												
Approach Delay (s)	30.1	14.2	6.9														
Approach LOS	C	B	A														
Intersection Summary																	
HCM Average Control Delay	11.1																
HCM Volume to Capacity ratio	0.46																
Actuated Cycle Length (s)	80.0																
Intersection Capacity Utilization	55.8%																
Analysis Period (min)	15																
c Critical Lane Group																	

Movement	EBL	EBT	EBR	WBL	WBT	NBL	NBT	NBR	SBL	SBT	SBR						
Lane Configurations	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900						
Ideal Flow (vphpl)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0						
Total Lost time (s)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00						
Lane Util. Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95						
Fit Protected	1703	1782	3979	1752	1709	1822	1524										
Satd. Flow (prot)	0.36	1.00	0.91	0.50	1.00	0.89	1.00										
Fit Permitted	638	1782	3612	927	1709	1644	1524										
Volume (vph)	594	493	213	13	233	30	172	168	49	31	108						
Peak-hour factor, PHF	0.97	0.97	0.97	0.80	0.80	0.80	0.94	0.94	0.84	0.92	0.92						
Adj. Flow (vph)	612	508	220	16	291	38	183	179	52	34	117						
RTOR Reduction (vph)	0	17	0	0	10	0	12	0	0	0	117						
Lane Group Flow (vph)	612	711	0	0	335	0	183	219	0	0	151						
Heavy Vehicles (%)	6%	0%	6%	1%	1%	0%	3%	9%	2%	0%	4%						
Turn Type	pm+pt	pm+pt	pm+pt	pm+pt	pm+pt	pm+pt	pm+pt	pm+pt	pm+pt	pm+pt	pm+pt						
Protected Phases	3	8	4	4	4	1	6	1	6	2	3						
Permitted Phases	8	47.0	47.0	18.0	33.0	33.0	33.0	33.0	21.0	45.0	2						
Actuated Green, G (s)	48.0	48.0	48.0	19.0	34.0	34.0	34.0	34.0	22.0	47.0	2						
Effective Green, g (s)	0.53	0.53	0.53	0.21	0.38	0.38	0.38	0.38	0.24	0.52	2						
Actuated g/C Ratio	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	2						
Clearance Time (s)	636	950	763	424	646	402	664										
Lane Grp Cap (vph)	c0.27	0.40	0.09	0.09	0.10	0.10	0.10										
v/s Ratio Prot	0.96	0.75	0.44	0.43	0.34	0.38	0.35										
v/s Ratio Perm	16.2	16.3	30.9	19.7	20.0	28.3	12.5										
Uniform Delay, d1	1.00	1.00	1.00	1.00	1.00	1.00	1.00										
Progression Factor	27.5	5.4	1.8	3.2	1.4	1.1	1.1										
Incremental Delay, d2	43.8	21.7	32.7	22.9	21.4	2.7	2.7										
Delay (s)	D	C	C	C	C	C	C										
Level of Service	D	C	C	C	C	C	C										
Approach Delay (s)	31.8	32.7	32.7	22.1	22.1	18.3	18.3										
Approach LOS	C	C	C	C	C	B	B										
Intersection Summary																	
HCM Average Control Delay	27.5																
HCM Volume to Capacity ratio	0.73																
Actuated Cycle Length (s)	90.0																
Intersection Capacity Utilization	79.2%																
Analysis Period (min)	15																
c Critical Lane Group																	



***VENICE ISLAND APARTMENTS***  
***TRAFFIC IMPACT STUDY***

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**APPENDIX D**

**FUTURE TRAFFIC VOLUMES**

Project #: NEDU 0501

Location: Manayunk, Philadelphia

ITE Code	Land Use	Size	Daily	AM	Enter	Exit	PM	Enter	Exit
220	Apartment	276 du	1,809	139	20%	80%	169	65%	35%
	Residential	equation	1,830	141	28	111	110	110	59
	7th Edition	rate			28	113	171	111	60

Venice Lofts

back ground traffic									
230	Condominium/Townhouse	128 du	803	63	17%	83%	74	67%	33%
	Residential	equation	750	56	11	52	50	50	24
	7th Edition	rate			10	46	67	45	22

Future Volumes (AM PEAK)

	Am	Background Traffic				Pre-Development	Enter	Exit	Post-Dev
		Enter	Exit	1.0%	Completion				
	2005	17	83	2	2007	20	80	Completion	2007
		Distrib	Assign	2	Distrib	Assign			
Main Street	23	80%	9	0	80%	22	54		
&	290	0%	0	6	0%	0	296		
Leverington	613	0%	0	12	0%	0	625		
Avenue	10	20%	2	0	20%	6	18		
	10	-20%	10	0	-20%	23	43		
	16	-80%	42	0	-80%	90	148		
	217	45%	5	4	45%	12	238		
	155	0%	0	3	0%	0	158		
	156	0%	0	3	0%	0	159		
Main Street	254	0%	0	5	0%	0	259		
&	68	15%	2	1	15%	4	75		
Green Lane	10	0%	0	0	0%	0	10		
	4	0%	0	0	0%	0	4		
	814	0%	0	16	0%	0	830		
	11	20%	2	0	20%	6	19		
	6	-20%	10	0	-20%	23	39		
	78	-15%	8	2	-15%	17	105		
	525	-45%	23	11	-45%	50	609		

Future Volumes (PM PEAK)

Background Traffic

	PM 2005	Enter 67	Exit 33	Pre-Development		Enter 65	Exit 35	Post-Dev Completion
				1.0%	Completion			
			Assign	2	2007	Distrib	Assign	2007
NB L	20	80%	40	0	60	80%	89	149
NBR	740	0%	0	15	755	0%	0	755
WB L	462	0%	0	9	471	0%	0	471
WBT	9	20%	10	0	19	20%	22	41
EB T	16	-20%	5	0	21	-20%	12	33
EBR	41	-80%	19	1	61	-80%	48	109
EB L	594	45%	23	12	629	45%	50	679
EB T	493	0%	0	10	503	0%	0	503
EBR	213	0%	0	4	217	0%	0	217
NB L	172	0%	0	3	175	0%	0	175
NBT	168	15%	8	3	179	15%	17	196
NBR	49	0%	0	1	50	0%	0	50
WB L	13	0%	0	0	13	0%	0	13
WBT	233	0%	0	5	238	0%	0	238
WB R	30	20%	10	1	41	20%	22	63
SB L	31	-20%	5	1	37	-20%	12	49
SB T	108	-15%	4	2	114	-15%	9	123
SB R	383	-45%	11	8	402	-45%	39	441

***VENICE ISLAND APARTMENTS***  
***TRAFFIC IMPACT STUDY***

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**APPENDIX E**

**PRE-DEVELOPMENT CONDITIONS**  
**LEVEL OF SERVICE ANALYSIS**

PRE-DEVELOPMENT AM  
1: Leverington Avenue & Main St

PRE-DEVELOPMENT AM  
1: Leverington Avenue & Main St

PRE-DEVELOPMENT AM  
6: Green Lane & Main St

HCM Signalized Intersection Capacity Analysis

HCM Signalized Intersection Capacity Analysis

HCM Signalized Intersection Capacity Analysis

Movement	EBT	EBR	WBL	WBT	NBL	NBR	EBT	EBR	WBL	WBT	NBL	NBR	EBT	EBR	WBL	WBT	NBL	NBR	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	1900		1900		1900		1900		1900		1900		1900		1900		1900		1900		1900		1900	
Ideal Flow (vphpl)	4.0		4.0		4.0		4.0		4.0		4.0		4.0		4.0		4.0		4.0		4.0		4.0	
Total Lost time (s)	1.00		1.00		1.00		1.00		1.00		1.00		1.00		1.00		1.00		1.00		1.00		1.00	
Lane Util. Factor	0.90		1.00		1.00		0.85		1.00		0.85		1.00		0.95		1.00		1.00		0.99		1.00	
Flt Protected	1.00		0.95		1.00		1.00		0.95		1.00		1.00		0.95		1.00		1.00		0.99		1.00	
Satd. Flow (prot)	1685		1805		1696		1703		1417		1417		1417		4041		1752		1724		1824		1524	
Flt Permitted	1.00		0.95		1.00		1.00		0.95		1.00		1.00		0.95		1.00		1.00		0.96		1.00	
Satd. Flow (perm)	1685		1805		1696		1703		1417		1417		1417		4041		1752		1724		1824		1524	
Volume (vph)	20		58		625		12		32		296		226		158		159		4		830		71	
Peak-hour factor, PHF	0.63		0.63		0.90		0.90		0.91		0.91		0.87		0.87		0.87		0.96		0.96		0.95	
Adj. Flow (vph)	32		92		694		13		35		325		260		182		183		4		865		14	
RTOR Reduction (vph)	77		0		0		0		85		241		0		40		0		0		0		0	
Lane Group Flow (vph)	47		0		694		13		35		241		0		40		0		0		0		0	
Heavy Vehicles (%)	0%		2%		0%		12%		6%		14%		6%		0%		6%		1%		0%		3%	
Turn Type	6		2		2		4		4		2		4		2		4		2		4		2	
Protected Phases	6		2		2		4		4		2		4		2		4		2		4		2	
Permitted Phases	6		2		2		4		4		2		4		2		4		2		4		2	
Actuated Green, G (s)	10.4		40.0		40.0		10.4		58.8		47.0		47.0		22.0		33.0		33.0		34.0		34.0	
Effective Green, g (s)	12.8		42.4		42.4		12.8		59.2		48.0		48.0		23.0		34.0		34.0		34.0		34.0	
Actuated g/C Ratio	0.16		0.53		0.53		0.16		0.74		0.53		0.53		0.26		0.38		0.38		0.38		0.38	
Clearance Time (s)	6.4		6.4		6.4		6.4		6.4		6.4		6.4		6.4		6.4		6.4		6.4		6.4	
Lane Grp Cap (vph)	270		957		899		272		1049		477		910		985		452		651		429		796	
v/s Ratio Prot	c0.03		c0.38		0.01		0.02		c0.17		0.13		0.19		c0.23		c0.05		0.05		c0.17		c0.17	
v/s Ratio Perm	0.17		0.73		0.01		0.13		0.23		0.16		0.36		0.89		0.60		0.12		0.07		0.22	
Uniform Delay, d1	29.0		14.4		8.9		28.8		3.3		15.1		12.1		32.3		21.7		18.3		27.5		19.1	
Progression Factor	1.00		1.00		1.00		1.00		1.00		1.00		1.00		1.00		1.00		1.00		1.00		1.00	
Incremental Delay, d2	1.4		4.8		0.0		1.0		0.5		4.4		1.1		12.3		5.9		0.4		1.6		6.4	
Delay (s)	30.4		19.1		8.9		29.8		3.8		19.5		13.2		44.7		27.6		18.7		29.1		25.5	
Level of Service	C		B		A		C		A		B		B		D		C		B		C		C	
Approach Delay (s)	30.4		18.9		6.3		A		A		15.8		B		D		44.7		25.5		26.1		C	
Approach LOS	C		B		A		A		A		B		B		D		D		C		C		C	
Intersection Summary	16.3		16.3		16.3		16.3		16.3		16.3		16.3		16.3		16.3		16.3		16.3		16.3	
HCM Average Control Delay	0.53		0.53		0.53		0.53		0.53		0.53		0.53		0.53		0.53		0.53		0.53		0.53	
HCM Volume to Capacity ratio	80.0		80.0		80.0		80.0		80.0		80.0		80.0		80.0		80.0		80.0		80.0		80.0	
Actuated Cycle Length (s)	51.3%		51.3%		51.3%		51.3%		51.3%		51.3%		51.3%		51.3%		51.3%		51.3%		51.3%		51.3%	
Intersection Capacity Utilization	15		15		15		15		15		15		15		15		15		15		15		15	
Analysis Period (min)	15		15		15		15		15		15		15		15		15		15		15		15	
Critical Lane Group	B		B		B		B		B		B		B		B		B		B		B		B	

PRE-DEVELOPMENT PM

1: Leverington Avenue & Main St

HCM Signalized Intersection Capacity Analysis

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	1900	1900	1900	1900	1900	1900
Ideal Flow (vphpl)	4.0	4.0	4.0	4.0	4.0	4.0
Total Lost time (s)	1.00	1.00	1.00	1.00	1.00	1.00
Lane Util. Factor	0.90	0.90	0.95	0.95	0.85	0.85
Fit Protected	1.00	1.00	1.00	1.00	1.00	1.00
Satd. Flow (prot)	1624	1736	1863	1703	1495	1495
Fit Permitted	1.00	0.95	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1624	1736	1863	1703	1495	1495
Volume (vph)	21	61	471	19	60	755
Peak-hour factor, PHF	0.58	0.58	0.97	0.97	0.93	0.93
Adj. Flow (vph)	36	105	486	20	65	812
RTOR Reduction (vph)	88	0	0	0	0	211
Lane Group Flow (vph)	53	0	486	20	65	601
Heavy Vehicles (%)	0%	7%	4%	2%	6%	8%
Turn Type	Split					
Protected Phases	6	2	2	2	4	4
Permitted Phases	pm+pt					
Actuated Green, G (s)	10.4	40.0	40.0	10.4	10.4	56.8
Effective Green, g (s)	12.8	42.4	42.4	12.8	59.2	59.2
Actuated g/C Ratio	0.16	0.53	0.53	0.16	0.74	0.74
Clearance Time (s)	6.4	6.4	6.4	6.4	6.4	6.4
Lane Grp Cap (vph)	280	920	987	272	1106	1106
v/s Ratio Prot	c0.03	0.28	0.01	0.04	c0.40	c0.40
v/s Ratio Perm	0.20	0.53	0.02	0.24	0.54	0.54
Uniform Delay, d1	29.2	12.3	8.9	29.3	4.5	4.5
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	1.8	2.2	0.0	2.1	1.9	1.9
Delay (s)	30.9	14.4	9.0	31.4	6.4	6.4
Level of Service	C	B	A	C	A	A
Approach Delay (s)	30.9	14.2	8.3	31.4	6.4	6.4
Approach LOS	C	B	A	C	A	A

Intersection Summary	12.4	HCM Level of Service	B
HCM Average Control Delay	0.48		
HCM Volume to Capacity ratio	80.0	Sum of lost time (s)	8.0
Actuated Cycle Length (s)	58.3%	ICU Level of Service	B
Intersection Capacity Utilization	15		
Analysis Period (min)			
c Critical Lane Group			

PRE-DEVELOPMENT PM

6: Green Lane & Main St

HCM Signalized Intersection Capacity Analysis

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Ideal Flow (vphpl)	12	12	12	12	12	12	12	12	12	12	12	12
Lane Width	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Total Lost time (s)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lane Util. Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Fit Protected	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Satd. Flow (prot)	1703	1782	1782	1752	1710	3963	1752	1710	1822	1524	1822	1524
Fit Permitted	0.34	1.00	0.91	0.91	1.00	0.91	0.48	1.00	0.88	1.00	0.88	1.00
Satd. Flow (perm)	604	1782	3602	889	1710	3602	889	1710	1616	1524	1616	1524
Volume (vph)	629	503	217	13	238	41	175	179	50	37	114	402
Peak-hour factor, PHF	0.97	0.97	0.97	0.80	0.80	0.80	0.94	0.94	0.94	0.92	0.92	0.92
Adj. Flow (vph)	648	519	224	16	298	51	186	190	53	40	124	437
RTOR Reduction (vph)	0	17	0	0	14	0	0	11	0	0	0	111
Lane Group Flow (vph)	648	726	0	0	351	0	186	232	0	0	164	326
Heavy Vehicles (%)	6%	0%	6%	1%	1%	0%	3%	9%	2%	0%	4%	6%
Turn Type	pm+pt											
Protected Phases	3	8	4	4	1	6	1	6	2	2	3	3
Permitted Phases	Perm											
Actuated Green, G (s)	47.0	47.0	18.0	18.0	33.0	33.0	33.0	33.0	21.0	45.0	45.0	45.0
Effective Green, g (s)	48.0	48.0	19.0	19.0	34.0	34.0	34.0	34.0	22.0	47.0	47.0	47.0
Actuated g/C Ratio	0.53	0.53	0.21	0.21	0.38	0.38	0.38	0.38	0.24	0.52	0.52	0.52
Clearance Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lane Grp Cap (vph)	627	950	760	760	413	646	413	646	395	584	584	584
v/s Ratio Prot	c0.29	0.41	0.10	0.10	c0.13	0.14	c0.04	0.14	0.10	0.10	0.10	0.10
v/s Ratio Perm	1.03	0.76	0.46	0.46	0.45	0.36	0.45	0.36	0.42	0.38	0.38	0.38
Uniform Delay, d1	17.3	16.5	31.0	31.0	19.8	20.2	19.8	20.2	28.6	12.8	12.8	12.8
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	44.8	5.8	2.0	2.0	3.5	1.6	3.5	1.6	3.2	1.3	1.3	1.3
Delay (s)	62.1	22.4	33.0	33.0	23.3	21.7	23.3	21.7	31.8	14.0	14.0	14.0
Level of Service	E	C	C	C	C	C	C	C	C	C	C	B
Approach Delay (s)	40.9	D	33.0	33.0	22.4	C	22.4	C	18.9	B	18.9	B
Approach LOS	D	D	C	C	C	C	C	C	B	B	B	B

Intersection Summary	32.3	HCM Level of Service	C
HCM Average Control Delay	0.78		
HCM Volume to Capacity ratio	90.0	Sum of lost time (s)	8.0
Actuated Cycle Length (s)	81.8%	ICU Level of Service	D
Intersection Capacity Utilization	15		
Analysis Period (min)			
c Critical Lane Group			

***VENICE ISLAND APARTMENTS***  
***TRAFFIC IMPACT STUDY***

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**APPENDIX F**

**POST-DEVELOPMENT CONDITIONS**  
**LEVEL OF SERVICE ANALYSIS**

POST-DEVELOPMENT AM  
1: Flat Roack Road & Main St

POST-DEVELOPMENT AM  
6: Green Lane & Main St

HCM Signalized Intersection Capacity Analysis

HCM Signalized Intersection Capacity Analysis

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	→	→	←	←	←	←
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Fit Protected	1.00	0.95	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1675	1805	1696	1703	1417	1417
Fit Permitted	1.00	0.95	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1675	1805	1696	1703	1417	1417
Volume (vph)	43	148	625	18	54	296
Peak-hour factor, PHF	0.63	0.63	0.90	0.90	0.91	0.91
Adj. Flow (vph)	68	235	694	20	59	325
RTOR Reduction (vph)	155	0	0	0	0	85
Lane Group Flow (vph)	148	0	694	20	59	241
Heavy Vehicles (%)	0%	2%	0%	12%	6%	14%
Turn Type	Split					
Protected Phases	6	2	2	4	4	2
Permitted Phases	pm+pt					
Actuated Green, G (s)	10.4	40.0	40.0	10.4	56.8	3
Effective Green, g (s)	12.8	42.4	42.4	12.8	59.2	8
Actuated g/C Ratio	0.16	0.53	0.53	0.16	0.74	0.53
Clearance Time (s)	6.4	6.4	6.4	6.4	6.4	5.0
Lane Grp Cap (vph)	268	957	899	272	1049	477
v/s Ratio Prot	c0.09	c0.38	0.01	0.03	c0.17	0.13
v/c Ratio	0.55	0.73	0.02	0.22	0.23	0.17
Uniform Delay, d1	31.0	14.4	8.9	29.2	3.3	0.57
Progression Factor	1.00	1.00	1.00	1.00	1.00	15.7
Incremental Delay, d2	7.9	4.8	0.0	1.8	0.5	12.1
Delay (s)	38.9	19.1	9.0	31.1	3.8	20.7
Level of Service	D	B	A	C	A	C
Approach Delay (s)	38.9	18.8	8.0			16.4
Approach LOS	D	B	A			B
Intersection Summary	HCM Level of Service C					
HCM Average Control Delay	20.2					
HCM Volume to Capacity ratio	0.60					
Actuated Cycle Length (s)	80.0					
Intersection Capacity Utilization	59.3%					
Analysis Period (min)	15					
c Critical Lane Group	15					

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	←	←	←	←	←	←	←	←	←	←	←	←
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	16	16	16	12	12	12	12	12	12
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Fit Protected	1.00	0.95	1.00	1.00	1.00	1.00	0.95	1.00	0.98	1.00	0.99	1.00
Satd. Flow (prot)	1703	1706	4037	1752	1725	1752	1725	1725	1725	1822	1524	1524
Fit Permitted	0.75	1.00	0.95	0.95	0.95	0.95	1.00	1.00	1.00	0.90	0.90	1.00
Satd. Flow (perm)	266	1706	3850	892	1725	1752	1725	1725	1725	1668	1524	1524
Volume (vph)	238	158	159	4	830	19	259	75	10	39	105	609
Peak-hour factor, PHF	0.87	0.87	0.87	0.96	0.96	0.96	0.95	0.95	0.95	0.88	0.88	0.88
Adj. Flow (vph)	274	182	183	4	865	20	273	79	11	44	119	692
RTOR Reduction (vph)	0	40	0	0	1	0	0	6	0	0	0	34
Lane Group Flow (vph)	274	325	0	0	888	0	273	84	0	0	163	658
Heavy Vehicles (%)	6%	0%	6%	1%	1%	0%	3%	9%	2%	0%	4%	6%
Turn Type	pm+pt						Perm					
Protected Phases	3	8		4			1	6		2		3
Permitted Phases	pm+pt						Perm					
Actuated Green, G (s)	47.0	47.0		22.0			33.0	33.0		21.0		41.0
Effective Green, g (s)	48.0	48.0		23.0			34.0	34.0		22.0		43.0
Actuated g/C Ratio	0.53	0.53		0.26			0.38	0.38		0.24		0.48
Clearance Time (s)	5.0	5.0		5.0			5.0	5.0		5.0		5.0
Lane Grp Cap (vph)	477	910		984			413	652		407		796
v/s Ratio Prot	0.13	0.19		c0.23			c0.08	0.05		c0.19		c0.19
v/c Ratio	0.17	0.36		0.90			0.68	0.13		0.10		0.24
Uniform Delay, d1	15.7	12.1		32.4			22.3	18.3		0.40		0.83
Progression Factor	1.00	1.00		1.00			1.00	1.00		28.5		20.3
Incremental Delay, d2	5.0	1.1		13.0			8.1	0.4		1.00		1.00
Delay (s)	20.7	13.2		45.4			30.4	18.7		2.9		9.6
Level of Service	C	B		D			C	B		C		C
Approach Delay (s)	16.4	B		45.4			27.5	C		30.1		C
Approach LOS	B	B		D			C	C		C		C
Intersection Summary	HCM Level of Service C						HCM Level of Service C					
HCM Average Control Delay	31.5						HCM Level of Service C					
HCM Volume to Capacity ratio	0.84						Sum of lost time (s) 12.0					
Actuated Cycle Length (s)	90.0						Intersection Capacity Utilization 85.7%					
Intersection Capacity Utilization	85.7%						ICU Level of Service E					
Analysis Period (min)	15						c Critical Lane Group					



POST-DEVELOPMENT AM HCM Unsignalized Intersection Capacity Analysis  
 11: Flat Roack Road & Proposed Site

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↔	↔	↔	↔	↔	↔
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop
Volume (vph)	28	44	0	113	78	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	30	48	0	123	85	0
Direction, Lane #	WB 1	WB 2	NB 1	SB 1		
Volume Total (vph)	30	48	123	85		
Volume Left (vph)	30	0	0	85		
Volume Right (vph)	0	48	123	0		
HadJ (s)	0.53	-0.67	-0.57	0.23		
Departure Headway (s)	5.5	4.3	3.6	4.4		
Degree Utilization, x	0.05	0.06	0.12	0.10		
Capacity (veh/h)	625	800	964	793		
Control Delay (s)	7.5	6.3	7.1	7.9		
Approach Delay (s)	6.8		7.1	7.9		
Approach LOS	A		A	A		

Intersection: Summary

Delay	7.3
HCM Level of Service	A
Intersection Capacity Utilization	18.0%
Analysis Period (min)	15
ICU Level of Service	A

POST-DEVELOPMENT PM  
1: Flat Rock Road & Main St

POST-DEVELOPMENT PM  
6: Green Lane & Main St

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	1900	1900	1900	1900	1900	1900
Ideal Flow (vphpl)	4.0	4.0	4.0	4.0	4.0	4.0
Total Lost time (s)	1.00	1.00	1.00	1.00	1.00	1.00
Lane Util. Factor	0.90	0.90	0.95	0.95	0.95	0.85
Flt Protected	1.00	1.00	1.00	1.00	1.00	1.00
Satd. Flow (prot)	1736	1863	1703	1495		
Flt Permitted	1.00	0.95	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1616	1736	1863	1703	1495	
Volume (vph)	33	109	471	41	149	755
Peak-hour factor, PHF	0.58	0.58	0.97	0.97	0.93	0.93
Adj. Flow (vph)	57	188	486	42	160	812
RTOR Reduction (vph)	149	0	0	0	0	180
Lane Group Flow (vph)	96	0	486	42	160	632
Heavy Vehicles (%)	0%	7%	4%	2%	6%	8%
Turn Type	Split					
Protected Phases	6	2	2	2	4	4 2
Permitted Phases	pm+ov					
Actuated Green, G (s)	10.4	40.0	40.0	10.4	56.8	56.8
Effective Green, g (s)	12.8	42.4	42.4	12.8	59.2	59.2
Actuated g/C Ratio	0.16	0.53	0.53	0.16	0.74	0.74
Clearance Time (s)	6.4	6.4	6.4	6.4		
Lane Grp Cap (vph)	259	920	987	272	1106	
v/s Ratio Prot	c0.06	0.28	0.02	0.09	c0.42	
v/s Ratio Perm						
v/c Ratio	0.37	0.53	0.04	0.59	0.57	
Uniform Delay, d1	30.0	12.3	9.0	31.2	4.7	
Progression Factor	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	4.1	2.2	0.1	9.0	2.1	
Delay (s)	34.1	14.4	9.1	40.2	6.8	
Level of Service	C	B	A	D	A	
Approach Delay (s)	34.1		14.0	12.3		
Approach LOS	C		B	B		
Intersection Summary						
HCM Average Control Delay	15.9					
HCM Volume to Capacity ratio	0.54					
Actuated Cycle Length (s)	80.0					
Intersection Capacity Utilization	61.9%					
Analysis Period (min)	15					
c Critical Lane Group						

Movement	EBT	EBT	EBR	WBL	WBT	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Ideal Flow (vphpl)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Total Lost time (s)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Lane Util. Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.85	
Flt Protected	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Satd. Flow (prot)	1703	1782	3929	1752	1712							
Flt Permitted	0.31	1.00	0.91	0.45	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Satd. Flow (perm)	558	1782	3582	822	1712							
Volume (vph)	679	503	217	13	238	63	175	186	50	49	123	
Peak-hour factor, PHF	0.97	0.97	0.80	0.80	0.80	0.94	0.94	0.94	0.94	0.92	0.92	
Adj. Flow (vph)	700	519	224	16	298	79	186	209	53	53	134	
RTOR Reduction (vph)	0	17	0	0	24	0	0	0	0	0	109	
Lane Group Flow (vph)	700	726	0	0	369	0	186	252	0	0	187	
Heavy Vehicles (%)	5%	0%	6%	1%	1%	0%	3%	9%	2%	0%	6%	
Turn Type	pm+pt											
Protected Phases	3	8	8	4	4	1	6	6	2	2	3	
Permitted Phases	pm+ov											
Actuated Green, G (s)	47.0	47.0	47.0	18.0	18.0	33.0	33.0	33.0	21.0	21.0	45.0	
Effective Green, g (s)	48.0	48.0	48.0	19.0	19.0	34.0	34.0	34.0	22.0	22.0	47.0	
Actuated g/C Ratio	0.53	0.53	0.53	0.21	0.21	0.38	0.38	0.38	0.24	0.24	0.52	
Clearance Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	
Lane Grp Cap (vph)	616	950	756	393	647				381	381	864	
v/s Ratio Prot	c0.32	0.41		0.10	0.10	c0.04	0.15		0.12	0.12	0.12	
v/s Ratio Perm												
v/c Ratio	1.14	0.76	0.49	0.47	0.39	0.47	0.39	0.48	0.48	0.43	0.43	
Uniform Delay, d1	18.3	16.5	31.2	19.9	20.4	19.9	20.4	29.2	13.2	13.2	13.2	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	80.0	5.8	2.2	4.0	1.8				4.5	4.5	1.6	
Delay (s)	98.3	22.4	33.5	23.9	22.2				33.7	33.7	14.8	
Level of Service	F	C	C	C	C				C	C	B	
Approach Delay (s)	59.2		33.5	22.9					20.1	20.1		
Approach LOS	E		C	C					C	C		
Intersection Summary												
HCM Average Control Delay	41.4											
HCM Volume to Capacity ratio	0.84											
Actuated Cycle Length (s)	80.0											
Intersection Capacity Utilization	84.5%											
Analysis Period (min)	15											
c Critical Lane Group												

POST-DEVELOPMENT PM HCM Unsignalized Intersection Capacity Analysis  
 1.1: Flat Rock Road & Proposed Site

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↔	↔	↑	↔	↔	↓
Sign Control	Stop	Stop	Stop	60	82	Stop
Volume (vph)	111	79	0	0.92	0.92	0.92
Peak Hour Factor	121	86	0	65	89	0
Hourly flow rate (vph)	WB 1	WB 2	NB 1	SB 1		
Direction, Lane #	121	86	65	89		
Volume Total (vph)	121	0	0	89		
Volume Left (vph)	0	86	65	0		
Volume Right (vph)	0.53	-0.67	-0.57	0.23		
Hadl (s)	5.4	4.2	3.9	4.7		
Departure Headway (s)	0.18	0.10	0.07	0.12		
Degree Utilization, x	641	827	863	726		
Capacity (veh/h)	8.4	6.5	7.2	8.3		
Control Delay (s)	7.8		7.2	8.3		
Approach Delay (s)	A		A	A		
Approach LOS						
Intersection Summary						
Delay			7.7			
HCM Level of Service			A			A
Intersection Capacity Utilization			17.4%			
Analysis Period (min)			15			

***VENICE ISLAND APARTMENTS***  
***TRAFFIC IMPACT STUDY***

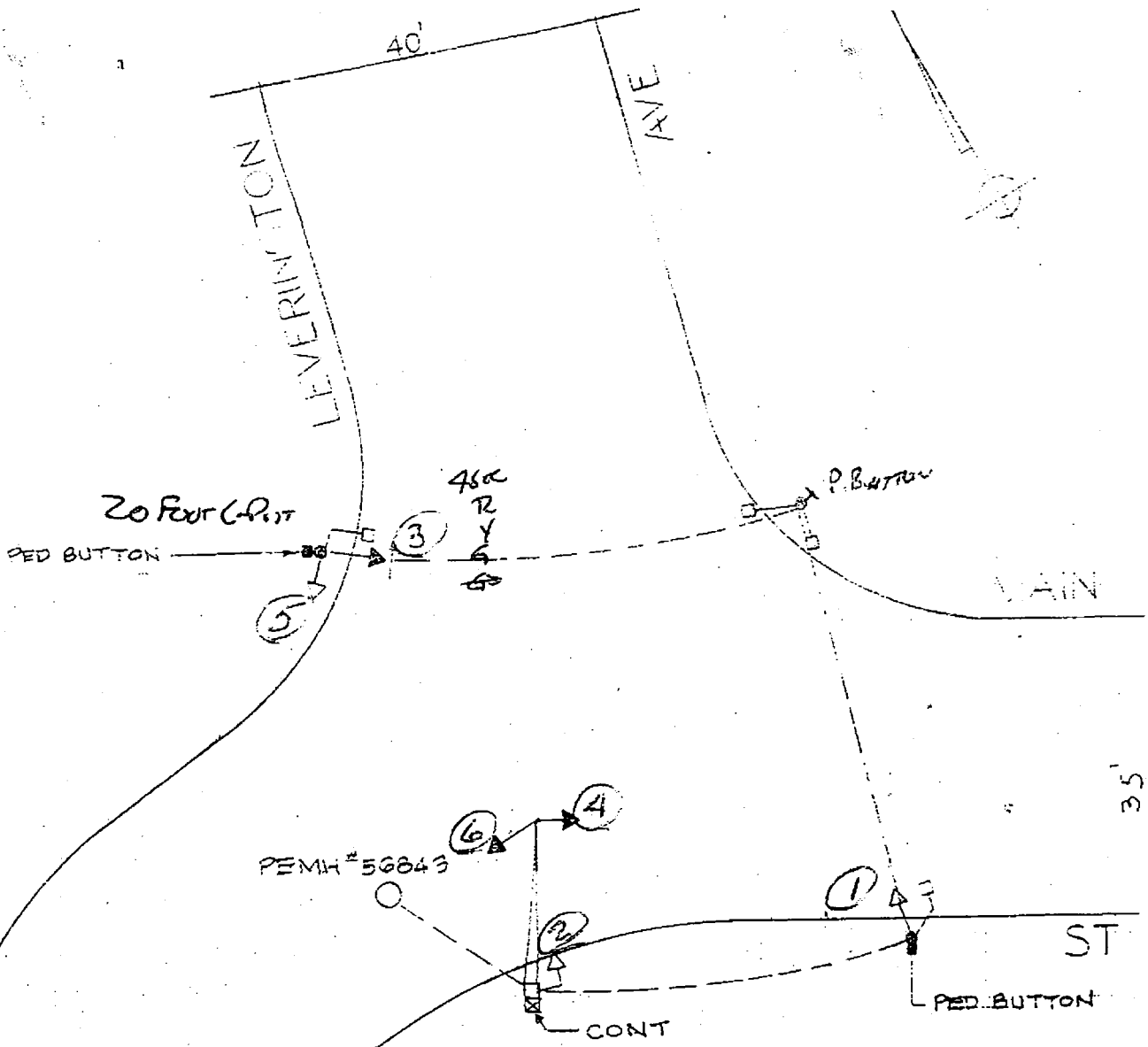
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**APPENDIX G**

**POST-DEVELOPMENT CONDITIONS  
ANALYSIS AFTER IMPROVEMENTS**

RE-TIMED POST-DEVELOPMENT PM HCM Signalized Intersection Capacity Analysis  
 6: Green Lane & Main St

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Ideal Flow (vphpl)	12	12	12	16	16	16	12	12	12	12	12	12
Lane Width	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Total Lost time (s)	1.00	1.00	1.00	0.95	0.97	0.95	1.00	0.97	1.00	0.99	1.00	0.85
Lane Util. Factor	0.95	0.95	0.95	1.00	0.95	0.95	1.00	0.97	1.00	0.99	1.00	0.85
Fit Protected	1703	1762	3930	1752	1712	1821	1524	1524	1821	1524	1524	1524
Satd Flow (prot)	0.26	1.00	0.80	0.38	1.00	0.83	1.00	0.83	1.00	0.83	1.00	0.83
Fit Permitted	470	1782	3542	694	1712	1538	1524	1538	1524	1538	1524	1524
Satd. Flow (perm)	692	514	222	14	243	63	179	200	51	49	126	449
Volume (vph)	0.97	0.97	0.97	0.80	0.80	0.80	0.94	0.94	0.94	0.92	0.92	0.92
Peak-hour factor, PHF	713	530	229	18	304	79	190	213	54	53	137	488
Adj. Flow (vph)	0	17	0	0	24	0	0	10	0	0	0	74
RTOR Reduction (vph)	713	742	0	0	377	0	190	257	0	0	190	414
Lane Group Flow (vph)	6%	0%	6%	1%	1%	0%	3%	9%	2%	0%	4%	6%
Heavy Vehicles (%)	pm+pt	pm+pt	pm+pt	pm+pt	pm+pt	pm+pt	pm+pt	pm+pt	pm+pt	pm+pt	pm+pt	pm+pt
Turn Type	3	8	8	4	4	4	1	6	6	2	2	3
Protected Phases	8	8	8	4	4	4	6	6	6	2	2	2
Permitted Phases	52.0	52.0	52.0	15.0	15.0	15.0	28.0	28.0	28.0	16.0	16.0	48.0
Actuated Green, G (s)	53.0	53.0	53.0	16.0	16.0	16.0	29.0	29.0	29.0	17.0	17.0	50.0
Effective Green, g (s)	0.59	0.59	0.59	0.18	0.18	0.18	0.32	0.32	0.32	0.19	0.19	0.56
Actuated g/C Ratio	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Clearance Time (s)	729	1049	729	630	630	630	318	552	291	291	914	914
Lane Grp Cap (vph)	c0.36	0.42	0.42	0.11	0.11	0.11	c0.05	0.15	0.15	0.12	0.12	0.17
v/s Ratio Prot	c0.22	0.98	0.71	0.60	0.60	0.60	c0.14	0.47	0.47	0.65	0.65	0.45
v/s Ratio Perm	19.6	13.0	13.0	34.0	34.0	34.0	23.7	24.3	24.3	33.8	33.8	11.9
Uniform Delay, d1	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Progression Factor	28.4	4.0	4.0	4.2	4.2	4.2	8.0	2.8	2.8	10.9	10.9	1.6
Incremental Delay, d2	48.0	17.1	17.1	38.2	38.2	38.2	31.7	27.1	27.1	44.6	44.6	13.5
Delay (s)	D	B	B	D	D	D	C	C	C	D	D	B
Level of Service	32.0	C	C	38.2	38.2	38.2	29.0	29.0	29.0	22.2	22.2	C
Approach Delay (s)	Intersection Summary											
Approach LOS	HCM Average Control Delay 30.2 HCM Level of Service C											
	HCM Volume to Capacity ratio 0.82											
	Actuated Cycle Length (s) 90.0											
	Sum of lost time (s) 8.0											
	Intersection Capacity Utilization 86.0%											
	Analysis Period (min) 15											
	c Critical Lane Group											



*M20/Approved 6/5/96 CFT*

MAIN ST &  
LEVERINGTON AVE  
SIGNAL REVISION

TRAFFIC ENGINEERING DIVISION  
DEPARTMENT OF STREETS  
CITY OF PHILADELPHIA

DRAWN BY SMALL	SCALE 1"=20'		
CHECKED BY	REVISIONS	DRAWING NO.	
DATE		A 210-140-C	

APPROVED \_\_\_\_\_  
TRAFFIC ENGINEER

APPROVED \_\_\_\_\_  
CITY TRAFFIC ENGINEER

11 MAIN WELINGTON & FLAT ROCK RD.

WORK ORDER 11931  
 TYPE SIGNAL  
 LOCATION LEVERINGTON AVE & MAIN ST.  
 INVESTIGATION DISI.  
 INVESTIGATION NUMBER 4

INVESTIGATED BY	DATE	WORK COMPLETED BY	DATE
SEE W O 11930 for instructions SEE Plan 210-1420 80 SEE CYCLE	6/5/96		
APPROVED BY	DATE	WORK INSPECTED BY	DATE
(Signature)	6/5/96		

INDICATE NORTH	Signal 182 LEVERINGTON/UB.	Signal B MAIN ST RT Turn	Signal 4 MAIN ST	Signal 5 & 6 LEVERINGTON/FLAT ROCK	PEP SIGNAL	SECONDS	PERCENT	PIN SETTING
Diagram	A R R R R R H	Y R R R R H	R R R R R H	R R R R R H	R R R R R H	40.0 50	5 13	3 13
	10.4	10.4	10.4	10.4	10.4	2.4	3	79
	58	71	79	97	0	92	97	0

\* D-490N  
ACTUATION  
REPLACE 'C'

**WORK ORDER**  
64037

LOCATION  
Green LA & Main St

INVESTIGATED BY  
Moro

DATE  
9/17/11

WORK COMPLETED BY  
*[Signature]*

DATE  
3/19/12

INVESTIGATION DIST.  
313

TYPE  
LOWERS  
& SIGNALS  
REQUIRED TO  
COMPLETE

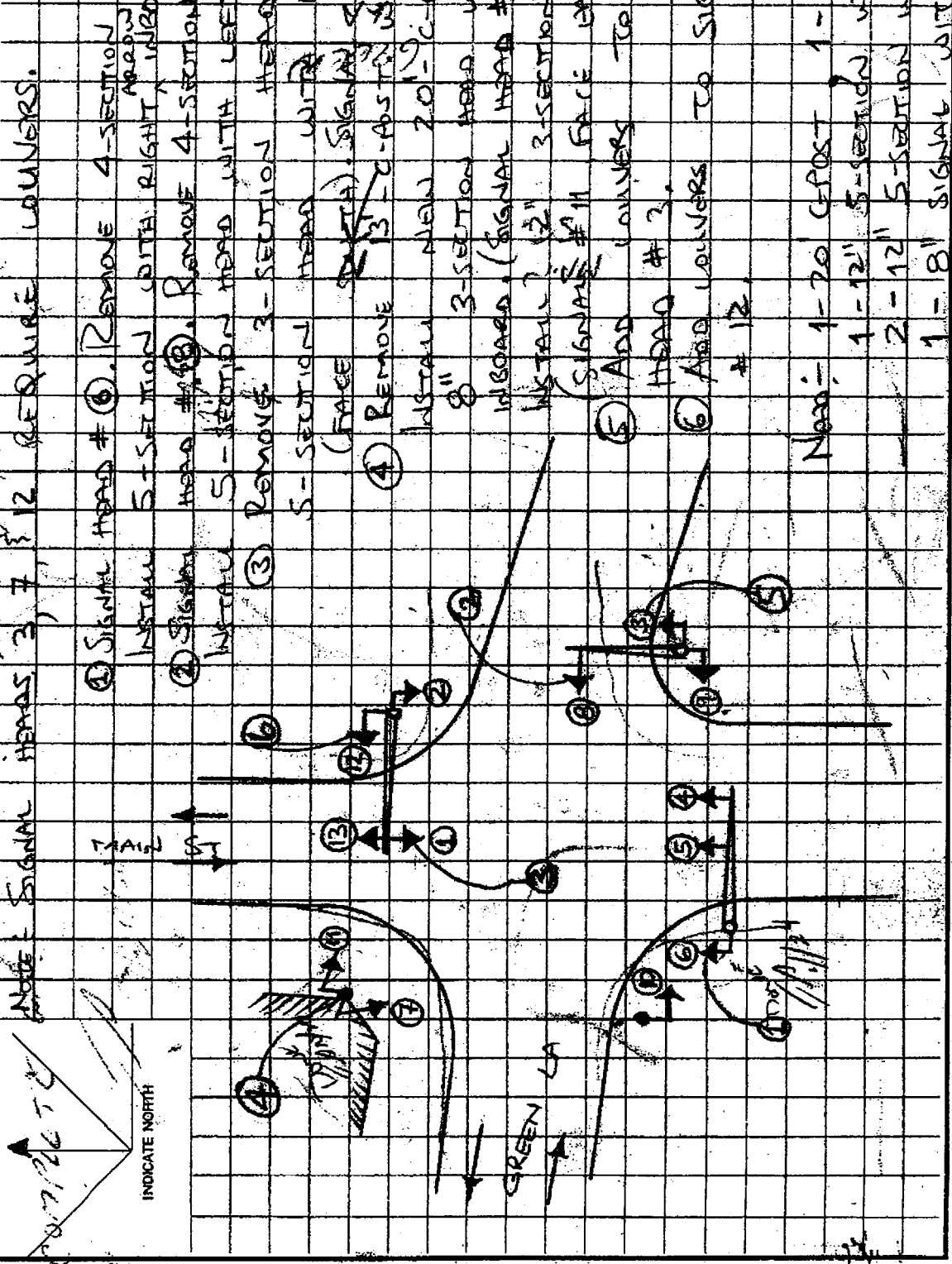
APPROVED BY  
*[Signature]*

DATE  
9/18/11

WORK INSPECTED BY  
*[Signature]*

DATE

INVESTIGATION NUMBER  
CJD





Plan	Time	Program	Day
1	0:00	1	1-7
2	13:00	2	2-6
3	19:00	1	1-7

District

**GREEN & MAIN**

Prepared by: Charles J Denny  
 Date: 9/27/02  
 WORK COMPLETED BY: A.W. Evans  
 Date: 1-7-03

Approved by: Charles Denny  
 Date: 1/6/03  
 INSPECTED BY: [Signature]

**WORK ORDER**

S30002

**SIGNAL**

#	PHASE	intervals	Minimums																Max				
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	flash	G	M	I	FH
2	NB Main	(2,3)	G	G	G	G	G	R	R	R	R	R	R	R	R	R	R	R	R	12			
5	NB Main Left Turn	(1)	<G/G	<Y/G	G	G	G	R	R	R	R	R	R	R	R	R	R	R	R	7			
6	SB Main	(4,5,7,13)	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	12			
9	SB Main Right Turn	(6)	R	R	R	R	R	R/G	R/G	R	R	R	R	R	R	R	R	R	R	3			
4	EB Green	(9)	R	R	R	R	R	G	G	G	G	G	G	G	G	G	G	G	G	12			
7	EB Green Left Turn	(8)	R	R	R	R	R	<G/G	<Y/G	G	G	G	G	G	G	G	G	G	G	7			
8	WB Green	(10,11,12)	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	12			
3																							
P2																							
P6																							
P4																							
P8																							
	AM Peak Program 1	A.W. Evans	7	3	2	2	2	2	20	3	2	22	3	2	2	2	2	2	2	90			
	PM Peak Program 2	A.W. Evans	7	3	2	2	2	2	24	3	2	18	3	2	2	2	2	2	2	90			
	Off Peak Program 3																						
			OFFSETS			R1	0	R2	0	R3	0												

Please modify signal timings as shown.

Instructions

Stack Programs  
 Time of Day Plan  
 Main Time Program Day  
 1 0:00 1 1-7  
 2 13:00 2 2-6  
 3 19:00 1 1-7

SB main st.  
 NB Left Turn gets 10 s green @ yellow