PARKVILLE APARTMENTS

MISSOURI HIGHWAY 9 & CLARK AVENUE

PARKVILLE, MISSOURI

TRAFFIC IMPACT STUDY

REVISED MARCH 2015

OA Project No. 2013-0508

STATE OF MISSOURI
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1.0 INTRODUCTION & OBJECTIVE

This report studies traffic impacts regarding the proposed Parkville Apartment building located in the southeast quadrant of Missouri Highway 9 (Route 9) and Clark Avenue. The approximate location of the development is shown on the vicinity map, **Figure 1**.

The objective of this study is to evaluate the existing traffic and roadway conditions and the traffic impacts expected from the proposed development.

The Missouri Department of Transportation (MoDOT) *Access Management Guidelines* were used as a reference tool for determining access spacing and auxiliary lanes. The appropriate intersection geometrics and traffic control improvements necessary to accommodate the increased traffic on the study area roadways were identified. For the purpose of this study the Existing, Existing plus Development, and Future Year 2033 scenarios were evaluated for the AM and PM peak hour periods. Both MoDOT and City of Parkville, Missouri staff were contacted regarding the scope of the project.

The study area intersections included:

- Route 9 and NW 62nd Street
- Route 9 and Clark Avenue
- Site drives as necessary

2.0 DESCRIPTION OF PROPOSED DEVELOPMENT

The proposed development is bound by Route 9 to the west, 62nd Street to the north, residential housing to the east, and Riss Lake to the south. The lot directly north of the proposed development is City owned property and proposed to be a park. The proposed development includes an apartment building consisting of approximately 50 units.

A traffic study was completed for the property in 2001, by Bucher, Willis, & Ratliff. At that time the study documented the Lake Pointe Professional Centre consisting of three general office buildings totaling 50,464 square feet. This study was revised by Olsson Associates in 2013, with a proposed development consisting of two office buildings with 56,000 square feet total. A comparison of the proposed two office buildings and the proposed apartments can be found in **Section 4.1**.

Access to the site is proposed via one full access drive. Drive 1 will be located directly across from Clark Avenue approximately 350 feet south of 62nd Street. The site plan for the proposed development is illustrated in **Figure 2**.

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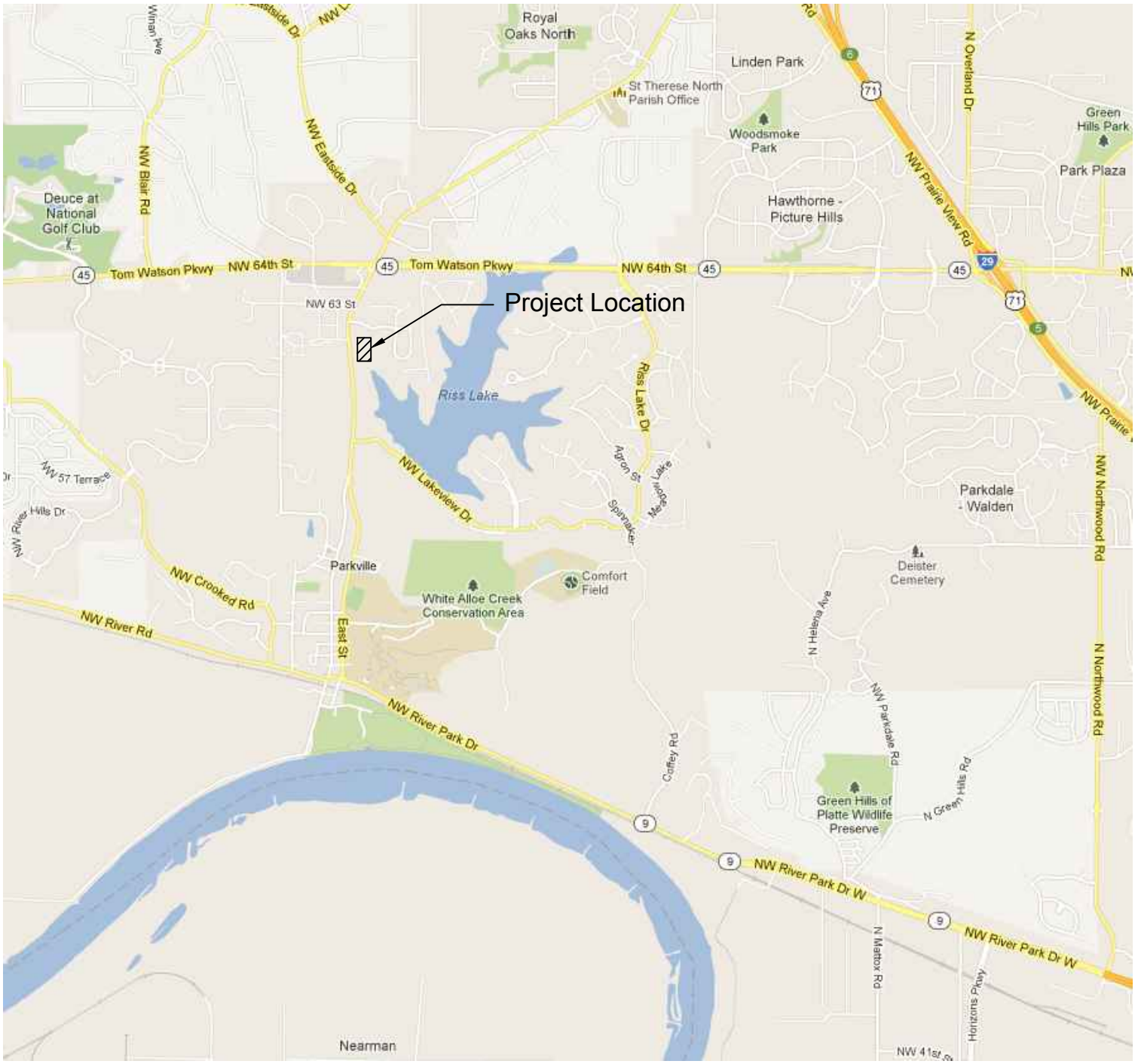


Source: Google Maps

PROJECT NO: 013-0508	Vicinity Map	OLSSON ASSOCIATES	FIGURE
DRAWN BY: JMS		7301 West 133rd Street Suite 200 Overland Park, KS 66213-4750 TEL 913.381.1170 FAX 913.381.1174	1
DATE: 03/11/2013			

PROJECT NO: 013-0508	Site Plan	OLSSON ASSOCIATES	7301 West 133rd Street Suite 200 Overland Park, KS 66213-4750 TEL 913.381.1170 FAX 913.381.1174	FIGURE
DRAWN BY: JMS				2
DATE: 03/11/2013				

3.0 EXISTING ROADWAY AND TRAFFIC CONDITIONS

Completing an analysis of the existing traffic and roadway conditions in the vicinity of the development site allows for a comparison to aid in determining the impact of the proposed development to the surrounding roadway network.

3.1 Existing Roadway Classification and Characteristics

Route 9 is a north/south undivided minor arterial roadway with a posted speed limit of 35 mph. The roadway is a two-lane section with a southbound auxiliary left-turn lane at NW 62nd Street with a painted median between 62nd Street and Clark Avenue. There are northbound and eastbound auxiliary left-turn lanes present at Clark Avenue. Also, a northbound auxiliary left-turn lane is present at the Private Drive.

NW 62nd Street is a two-lane undivided local street serving the Pine Crest Subdivision with a posted speed limit of 25 mph. The intersection of Route 9 and NW 62nd Street is an unsignalized intersection and is stop controlled on NW 62nd Street. It continues east into the Pine Crest Subdivision intersecting NW 62nd Terrace and NW Pineridge Road before ending at the intersection of NW Pineridge Circle.

Clark Avenue is a two-lane divided east/west collector roadway with a posted speed limit of 25 mph. Clark Avenue serves as an access road to the community buildings and existing businesses within the current development located to the west of Route 9. Clark Avenue is currently a stop controlled, T-intersection at Route 9.

Two existing access drives are located on the east side of Route 9 approximately 85 and 120 feet south of the intersection of Route 9 with Clark Avenue. The northern most access drive leads to a house, owned by the City, and continues on to 62nd Street. The access along 62nd Street will be removed once construction for the proposed park begins. The second access drive leads to a sewer pump station.

3.2 Data Collection

Traffic count data for this study was collected by the City of Parkville, Missouri. Parkville collected AM and PM peak hour traffic count data for the intersection of Route 9 and NW 62nd Street in January 2012 from 7:00 to 9:00 AM and 4:00 to 6:00 PM. Parkville also collected traffic count data for the intersection of Route 9 and Clark Avenue from 7:30 to 8:30 AM and from 5:00 to 6:00 PM on February 5, 2013.

For the intersection of Route 9 with NW 62nd Street the traffic count data determined that the AM peak hour is 7:30 to 8:30 AM and the PM peak hour is 5:00 to 6:00 PM. Volumes were balanced between intersections to represent the most recent count data.

The existing volumes are illustrated in **Figure 3** and existing intersection geometrics and traffic control are illustrated in **Figure 4**.

3.3 Auxiliary Turn Lanes

MoDOT *Access Management Guidelines,* located in the MoDOT *Engineering Policy Guide* (EPG) section 940.9.8, were used to determine whether auxiliary turn lanes are currently warranted at the three study intersections. The guidelines state that dedicated left and right-turn lanes should be provided in situations where traffic volumes and speeds are relatively high and conflicts are likely to develop at public road intersections and driveways between through and turning traffic.

Right-Turn

Using existing volumes at the two study intersections, EPG section 940.8.9 "Right Turn Lane Guidelines for Two-Lane Roadways" was utilized to determine if existing conditions warrant the need for right-turn lanes. Following the procedure outline in the EPG, it was determined that a dedicated right-turn lane is warranted for the southbound movement on Route 9 at Clark Avenue under existing conditions. According to city staff, right-of-way for a future southbound right-turn lane is to be dedicated as a part of the Mosaic Development. All other right-turn movements do not warrant a dedicated right-turn lane. Right-turn lane warrant analysis sheets can be found in the **Appendix**.

Left-Turn

Left-turn auxiliary lanes are in place for all left-turn movements at the two study intersections. There is no need for an additional left-turn lane at either of the study intersections.

3.4 Signal Warrant Analysis

The Manual on Uniform Traffic Control Devices (MUTCD- 2009 Edition) provides eight signal warrants for evaluation of signalization at intersections. Typically, traffic signal warrants are based on a complete review of traffic information including volumes, pedestrians, accident experience, and traffic progression. The preliminary need for signalization at the study intersections was evaluated based on the Peak Hour Warrant (Warrant 3) contained in the MUTCD.

Signal warrant analysis was completed for the intersections of Route 9 with NW 62nd Street and Clark Avenue. Based on Warrant 3, none of the study intersections satisfy the peak hour warrant criteria for signalization based on existing conditions. Signal warrant analysis sheets can be found in the **Appendix**.

3.5 Capacity Analysis

Unsignalized capacity analyses were performed in accordance with Chapter 17 of the Highway Capacity Manual (HCM) using the Highway Capacity Software (HCS+2010), version 6.1. For simplicity, the amount of delay is equated to a grade or Level of Service (LOS) based on thresholds of driver acceptance. A letter grade between A and F is assigned, where LOS A represents the best operation. **Table 1** represents the LOS associated with intersection control delay, in seconds per vehicle (sec/veh), for signalized and unsignalized intersections.

Table 1: Intersection Level of Service Summary

Level-of-Service Criteria		
Level of Service (LOS)	**Stop Control** Approach Delay sec/veh	**Signal Control** Control Delay sec/veh
A	≤ 10	≤ 10
B	>10 and ≤ 15	>10 and ≤ 20
C	>15 and ≤ 25	>20 and ≤ 35
D	>25 and ≤ 35	>35and ≤ 55
E	>35 and ≤ 50	>55 and ≤ 80
F	>50	>80

All movements at the two unsignalized study intersections are currently operating at an acceptable LOS C or better with the exception of the eastbound left-turn movement at the intersection of Route 9 with Clark Avenue which operates at a LOS E in the PM peak hour. The queue length at this intersection does not exceed the available storage length or disrupt other traffic movements.

Unsignalized side street movements can be expected to operate at a lower level of service during peak hour periods as higher major street movements are accommodated.

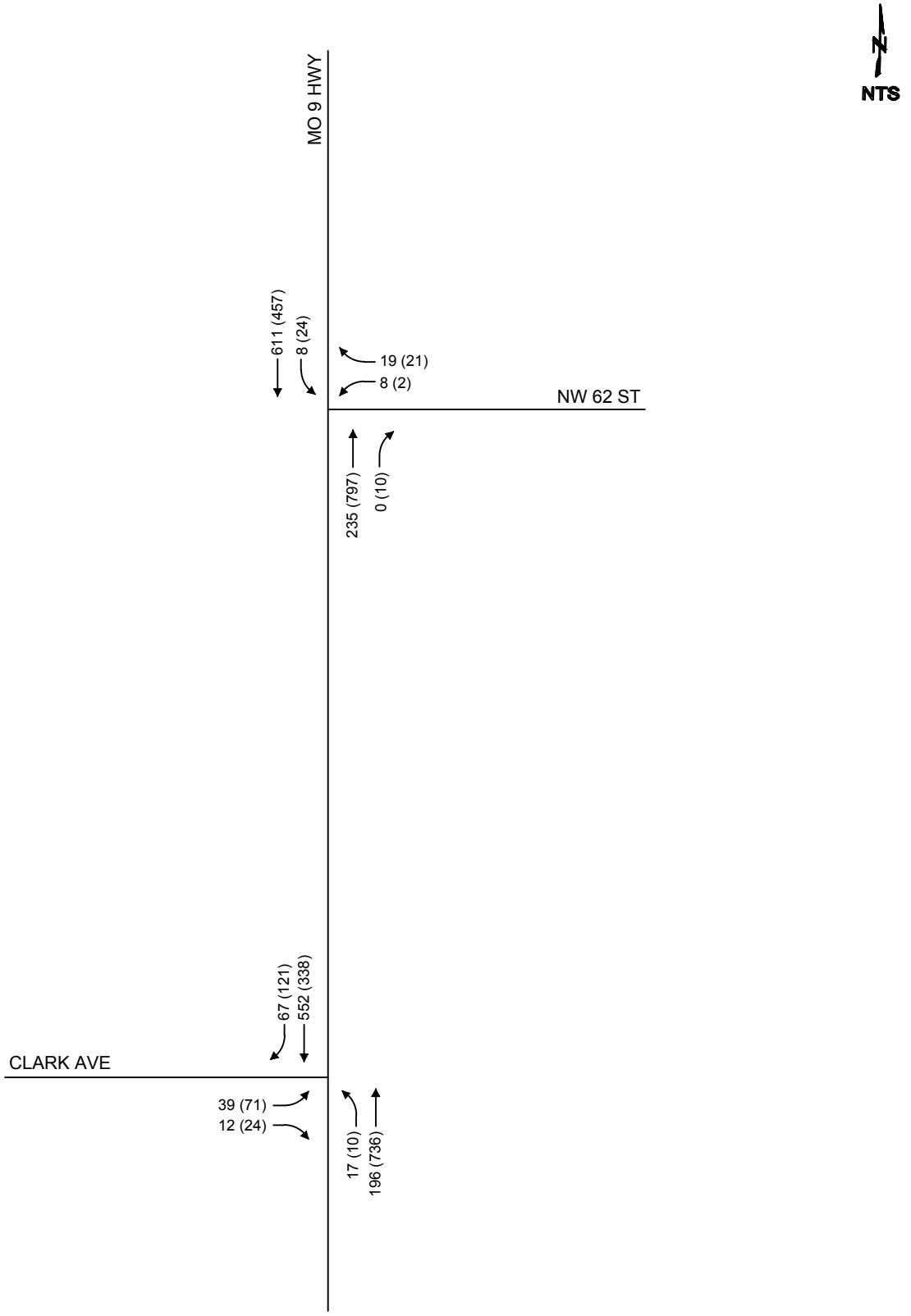
Figure 5 illustrates existing conditions level of service. Capacity analysis sheets are included in the Appendix.

3.6 Existing Conditions Recommendations

Study intersections are currently operating at acceptable levels of service with the exception of the eastbound left-turn movement at the intersection of Route 9 and Clark Avenue in the PM peak hour period which operates at a LOS E. The queue length at this intersection does not exceed the available storage length or disrupt other traffic movements. No improvements are recommended based on the existing operations.

Route 9 & Clark Avenue

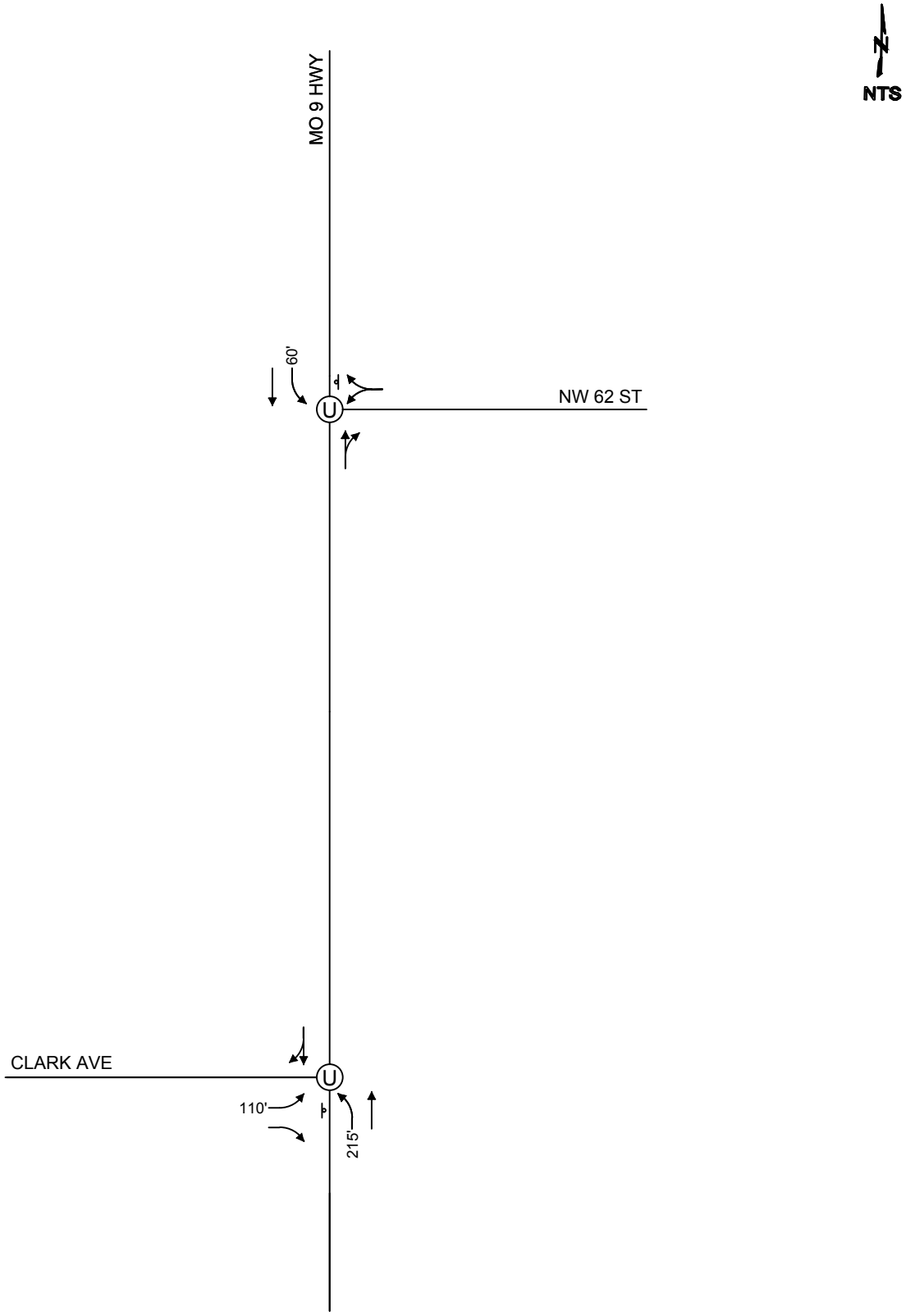
- Per the MoDOT EPG a dedicated right-turn lane is warranted for the southbound movement at the intersection. According to city staff, right-of-way for a future southbound right-turn lane is to be dedicated as a part of the Mosaic Development.



LEGEND

XX (XX) - AM (PM) Peak Hour Volumes

PROJECT NO: 013-0508	Existing Peak Hour Volumes	OLSSON ASSOCIATES	7301 West 133rd Street Suite 200 Overland Park, KS 66213-4750 TEL 913.381.1170 FAX 913.381.1174	FIGURE
DRAWN BY: JMS				3
DATE: 03/11/2013				



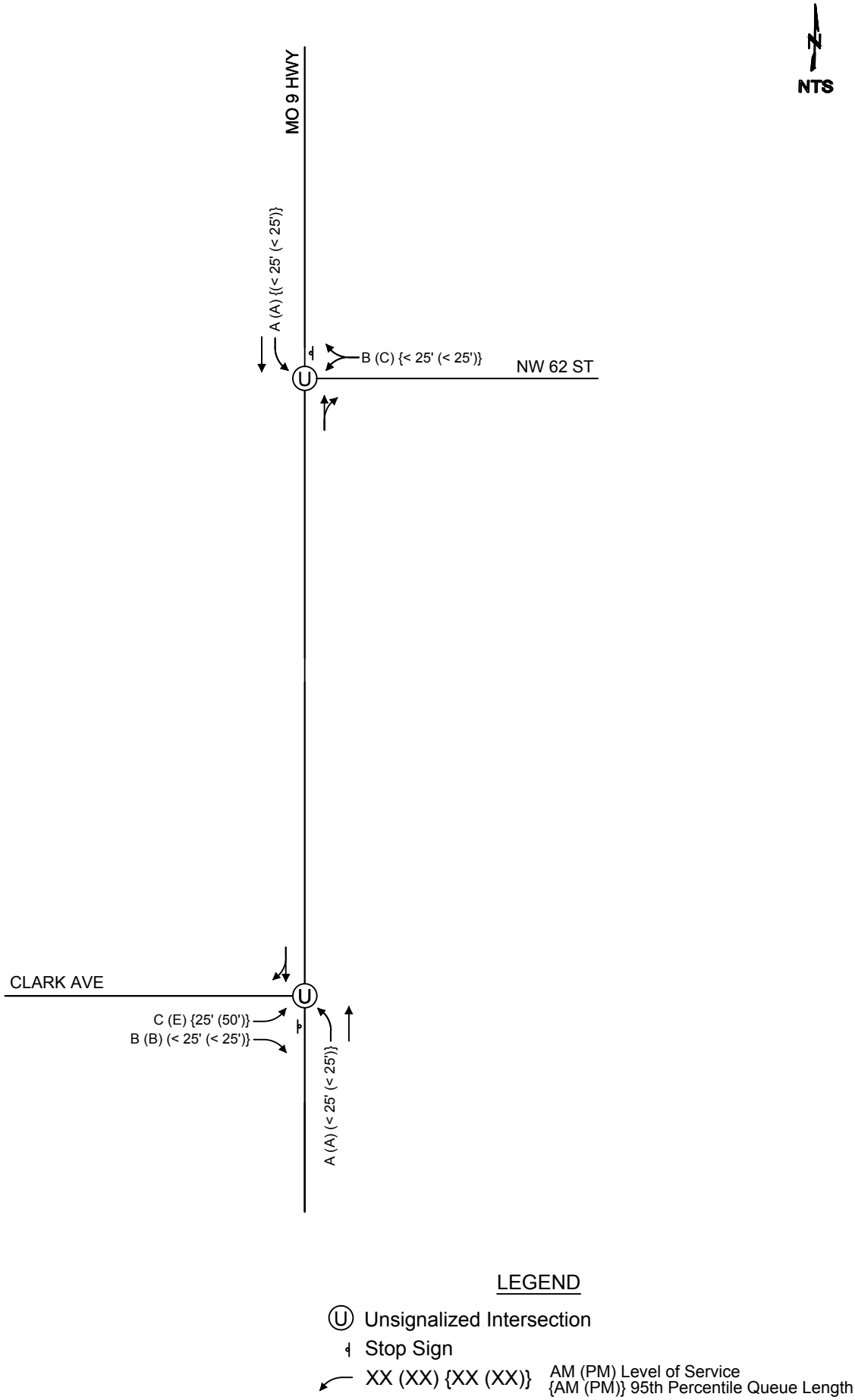
LEGEND

U Unsignalized Intersection

Stop Sign

XX' Turn Bay Storage Length

PROJECT NO: 013-0508	Existing Lane Configurations and Traffic Control	OLSSON ASSOCIATES	7301 West 133rd Street Suite 200 Overland Park, KS 66213-4750 TEL 913.381.1170 FAX 913.381.1174	FIGURE
DRAWN BY: JMS				4
DATE: 03/11/2013				



PROJECT NO: 013-0508	Existing Level of Service	OLSSON ASSOCIATES 7301 West 133rd Street Suite 200 Overland Park, KS 66213-4750 TEL 913.381.1170 FAX 913.381.1174	FIGURE
DRAWN BY: JMS			5
DATE: 03/11/2013			

4.0 EXISTING PLUS DEVELOPMENT CONDITIONS

The proposed development site consists of an apartment building with approximately 50 units. The existing plus development scenario reviews expected operations of the roadway network based on the addition of proposed development traffic to existing traffic volumes.

4.1 Trip Generation and Distribution

Trip generation characteristics expected for the site are shown in **Table 2**. These characteristics are based on trip generation data included in the Institute of Transportation Engineers (ITE) *Trip Generation Manual* (9th Edition). For trip generation determination the site was classified as Apartments as described in the trip generation manual. The proposed development is expected to generate 427 daily trips on an average weekday. The site is expected to generate 29 trips and 46 trips during the AM and PM peak hours, respectively.

Table 2: Proposed Development Trip Generation

Daily Trip Generation									
ITE Code/Page	Land Use	Size		Trip Gen. Avg. Rate/Eq.	Daily Trips	Trip Distribution Enter	Trip Distribution Exit	Daily Trips Enter	Daily Trips Exit
220/333	Apartments	50	Units	Equation	427	50%	50%	214	213
Total		**50**			**427**			**214**	**213**
AM Peak Hour Trip Generation									
ITE Code/Page	Land Use	Size		Trip Gen. Avg. Rate/Eq.	AM Peak Hour Trips	Trip Distribution Enter	Trip Distribution Exit	AM Peak Hour Trips Enter	AM Peak Hour Trips Exit
220/334	Apartments	50	Units	Equation	29	20%	80%	6	23
Total		**50**			**29**			**6**	**23**
PM Peak Hour Trip Generation									
ITE Code/Page	Land Use	Size		Trip Gen. Avg. Rate/Eq.	PM Peak Hour Trips	Trip Distribution Enter	Trip Distribution Exit	PM Peak Hour Trips Enter	PM Peak Hour Trips Exit
220/335	Apartments	50	Units	Equation	46	65%	35%	30	16
Total		**50**			**46**			**30**	**16**

An alternate proposed land use for this area consists of two general office buildings totaling 56,000 SF. A trip generation estimate was run for the proposed office buildings using the ITE Trip Generation Manual. A comparison was run for the two different land uses for this location. The two office buildings were estimated to incur approximately 140 AM peak hour trips, and 220 PM peak hour trips.

A comparison of the proposed apartments and the proposed two office buildings is illustrated in **Table 3**. The complete ITE Trip Generation estimates for the proposed two office buildings can be found in the **Appendix**.

Table 3: Trip Generation Comparison

Daily Comparison			
Office Land Use			
	Enter	Exit	Total
Office	500	498	998
Total	500	498	998
Proposed (Apartment) Land Use			
	Enter	Exit	Total
Apartments	214	213	427
Total	214	213	427
Difference			
Total	**-286**	**-285**	**-571**

AM Peak Hour Comparison			
Office Land Use			
	Enter	Exit	Total
Office	124	16	140
Total	124	16	140
Proposed (Apartment) Land Use			
	Enter	Exit	Total
Apartments	6	23	29
Total	6	23	29
Difference			
Total	**-118**	**7**	**-111**

PM Peak Hour Comparison			
Office Land Use			
	Enter	Exit	Total
Office	38	182	220
Total	38	182	220
Proposed (Apartment) Land Use			
	Enter	Exit	Total
Apartments	30	16	46
Total	30	16	46
Difference			
Total	**-8**	**-166**	**-174**

The AM and PM peak hour trips for the proposed apartments are significantly less than the proposed two office buildings by 111 trips and 174 trips respectively. The office land use has a higher number of trips during a shorter period of time; whereas the proposed apartment land use has trips spread more evenly throughout the day.

Trip distribution was developed for the proposed site based on review of the area and existing traffic volumes. The distribution for the trips generated from the site is illustrated in **Table 4**.

Table 4: Trip Distribution

Direction		***Entering/Exiting***
North	From/To MO 9 North	55%
West	From/To Clark Avenue	5%
South	From/To MO 9 South	40%

The AM and PM peak hour trips for the proposed development, following distribution and assignment to the roadway network, are illustrated in **Figure 6**. The resulting existing plus development peak hour traffic volumes are illustrated in **Figure 7**.

4.2 Access

Access to the site is proposed via one full access drive. Drive 1 will be located directly across from Clark Avenue along Route 9. Drive 1 will consist of two exiting lanes and one entering lane. It is recommended that the two exiting lanes consist of a thru/right-turn lane and a left-turn lane with at least 40 feet of storage. Clark Avenue should convert the existing right-turn lane into a thru/right turn lane.

4.3 Auxiliary Turn Lanes

Auxiliary turn lane analysis was performed using the methodologies described in **Section 3.3**.

Right-Turn

Based on existing plus development volumes, no additional auxiliary right-turn lanes are warranted for the study intersections. Right-turn lane warrant analysis sheets can be found in the **Appendix**.

Left-Turn

Based on existing plus development volumes an auxiliary left-turn lane is warranted for the southbound direction on Route 9 at the intersection of Clark Avenue/Drive 1, during both the AM and PM peak hour periods. It is recommended that a left-turn lane be striped between NW 62nd Street and Clark Avenue in the existing pavement available along Route 9. Left-turn lane warrant analysis sheets can be found in the **Appendix**.

4.4 Signal Warrant Analysis

Signal warrant analysis for the existing plus development scenario was performed following the methodologies described in **Section 3.4**.

Signal warrant analysis for Warrant 3, Peak Hour Warrant 3, was completed for the intersections of Route 9 with NW 62nd Street and Clark Avenue under the existing plus development scenario. Based on Warrant 3, none of the study intersections satisfy the peak hour warrant criteria for signalization. Signal warrant analysis sheets can be found in the **Appendix**.

4.5 Capacity Analysis

Capacity analysis was performed using the methodologies described in **Section 3.5**. Operations at the intersection of Route 9 and NW 62nd Street are expected to continue to operate acceptably.

Side street left-turn movements at the intersection of Route 9 and Clark Avenue/Drive 1 are expected to operate below a LOS D during the PM peak hour period. The eastbound and westbound left-turn movements are expected to operate at LOS F and E respectively, during the PM peak hour period. The 95th-percentile queue length is not expected to exceed the available storage length for any of the movements at this intersection. The 95th-percentile queue represents the queue length that has a 5 percent probability of being exceeded during the peak hour period. Thus the queuing, if it were to occur, would be expected to be a limited occurrence.

Unsignalized side street movements can be expected to operate at a lower level of service during peak hour periods as higher major street movements are accommodated.

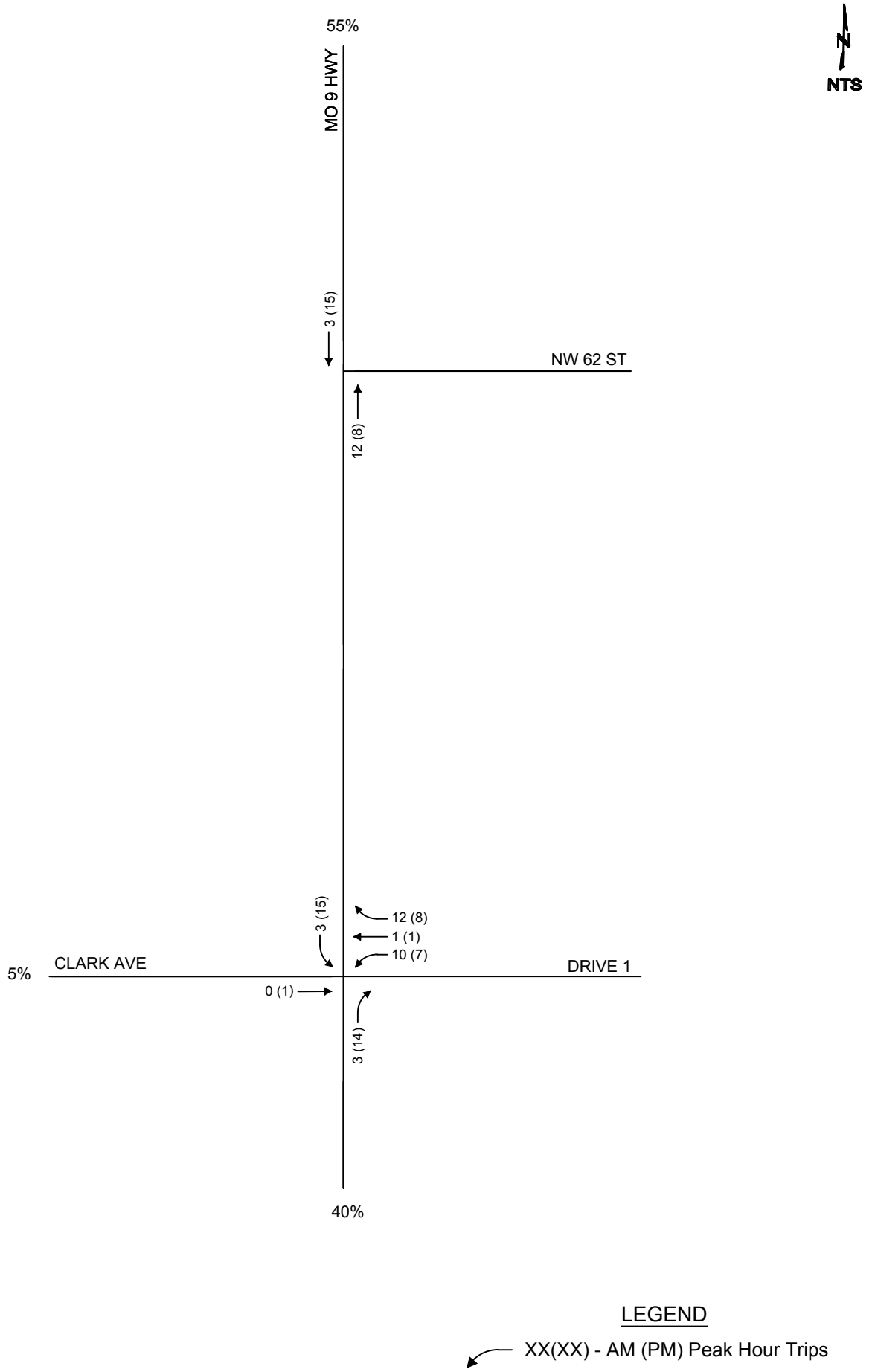
The existing plus development intersection geometrics and traffic control for the study area intersections are illustrated in **Figure 8**, and **Figure 9** illustrates level of service associated with each movement. Capacity analysis sheets are included in the **Appendix**.

4.6 Existing plus Development Recommendations

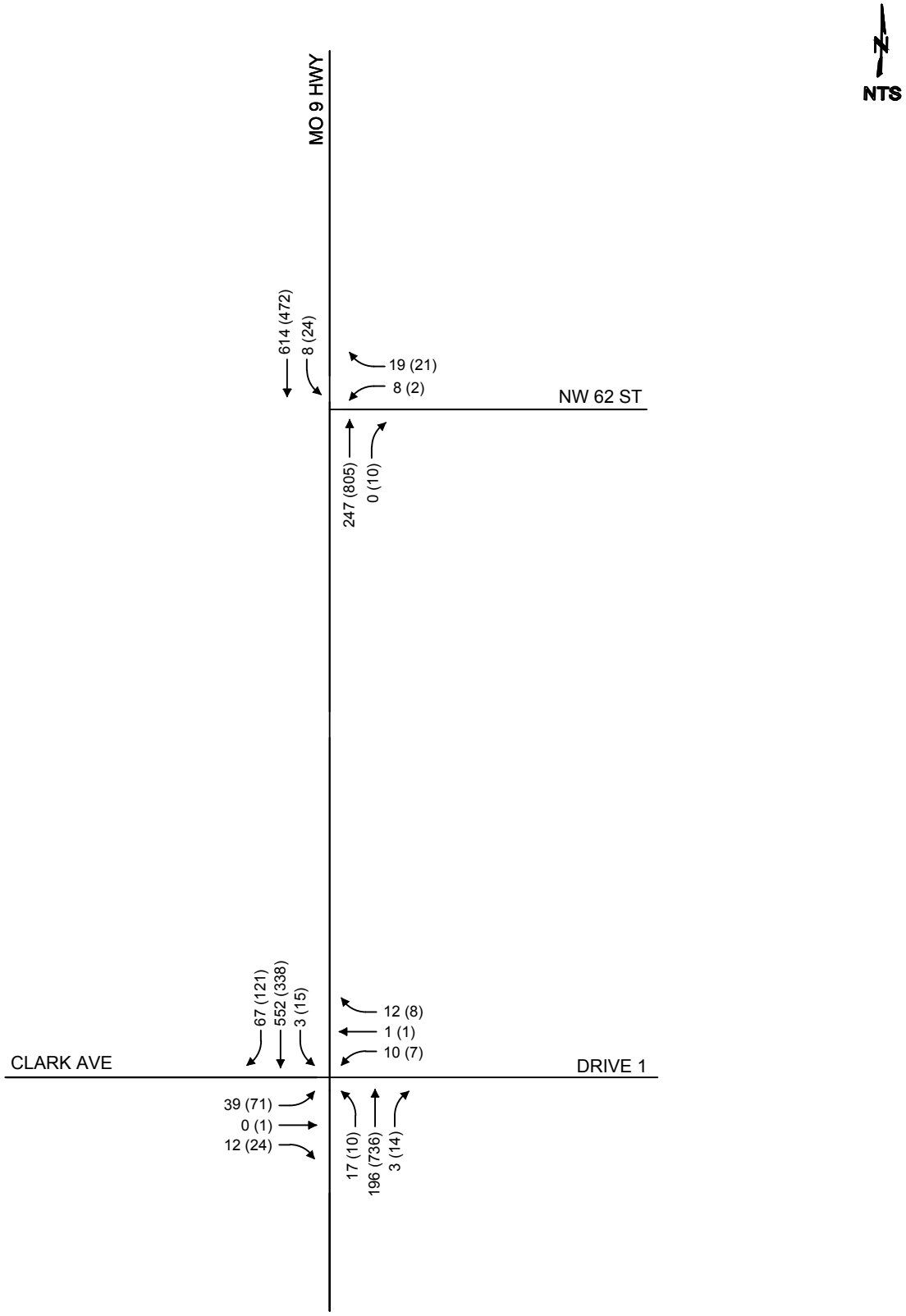
Comparing the operations of the existing roadway network to the existing plus development roadway network conditions operations are minimally effected. Unsignalized side street movements can be expected to operate at a lower level of service during peak hour periods as higher major street movements are accommodated. The following roadway improvements are recommended for the site:

Route 9 & Clark Avenue

- Convert the exiting eastbound right-turn auxiliary lane into a thru/right-turn lane.
- Add a southbound left-turn lane with a minimum of 150 feet of storage at the intersection. This can be accomplished by restriping the existing pavement.
- Drive 1 should provide two exiting lanes, one thru/right-turn lane and one left-turn lane with a minimum of 40 feet of storage.



PROJECT NO: 013-0508	Existing Plus Development Trip Distribution	OLSSON ASSOCIATES	FIGURE
DRAWN BY: JMS		7301 West 133rd Street Suite 200 Overland Park, KS 66213-4750 TEL 913.381.1170 FAX 913.381.1174	6
DATE: 03/11/2013			



LEGEND

XX (XX) - AM (PM) Peak Hour Volumes

PROJECT NO: 013-0508	Existing Plus Development Peak Hour Volumes	OLSSON ASSOCIATES	7301 West 133rd Street Suite 200 Overland Park, KS 66213-4750 TEL 913.381.1170 FAX 913.381.1174	FIGURE
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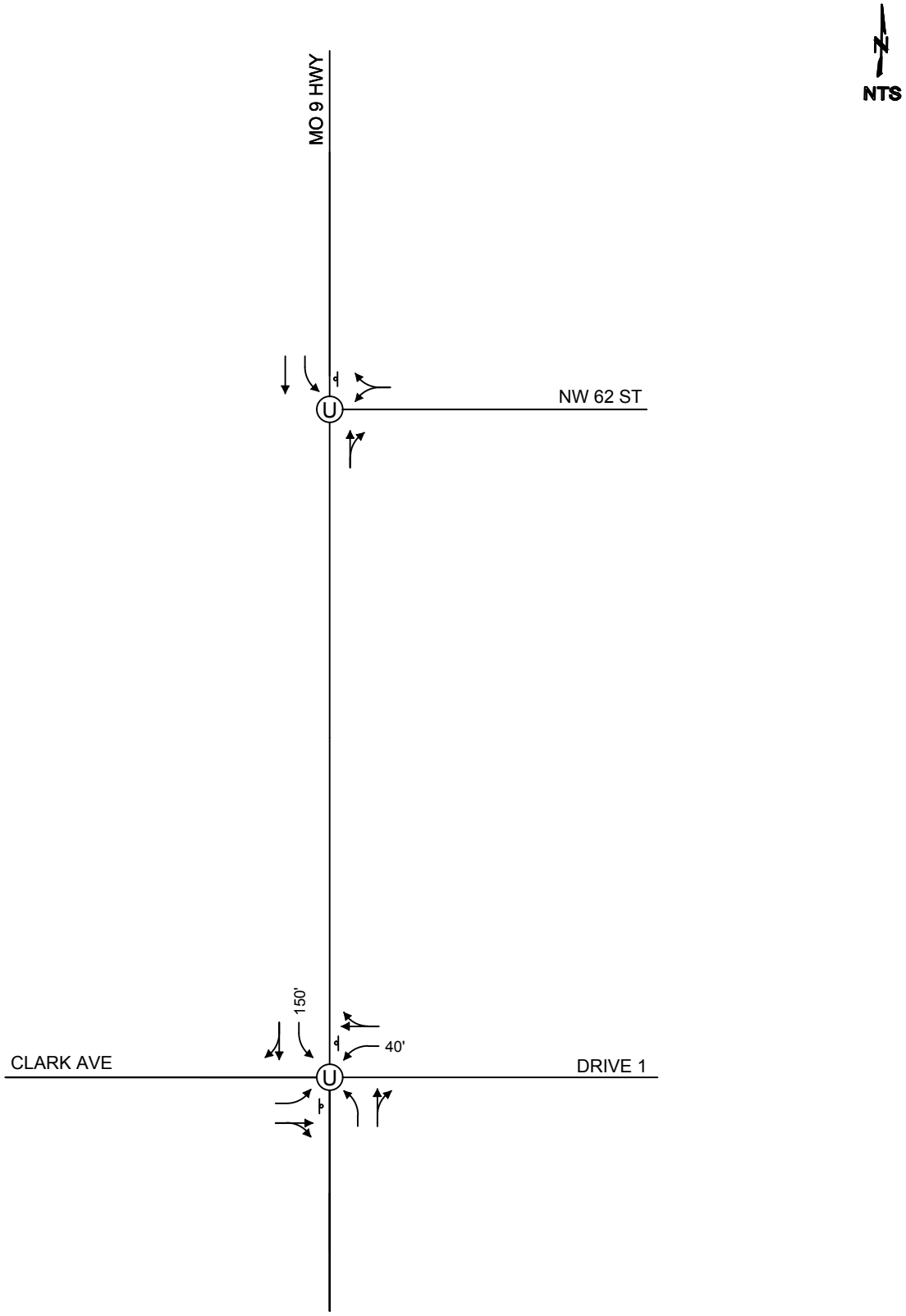
DATE: 03/11/2013				



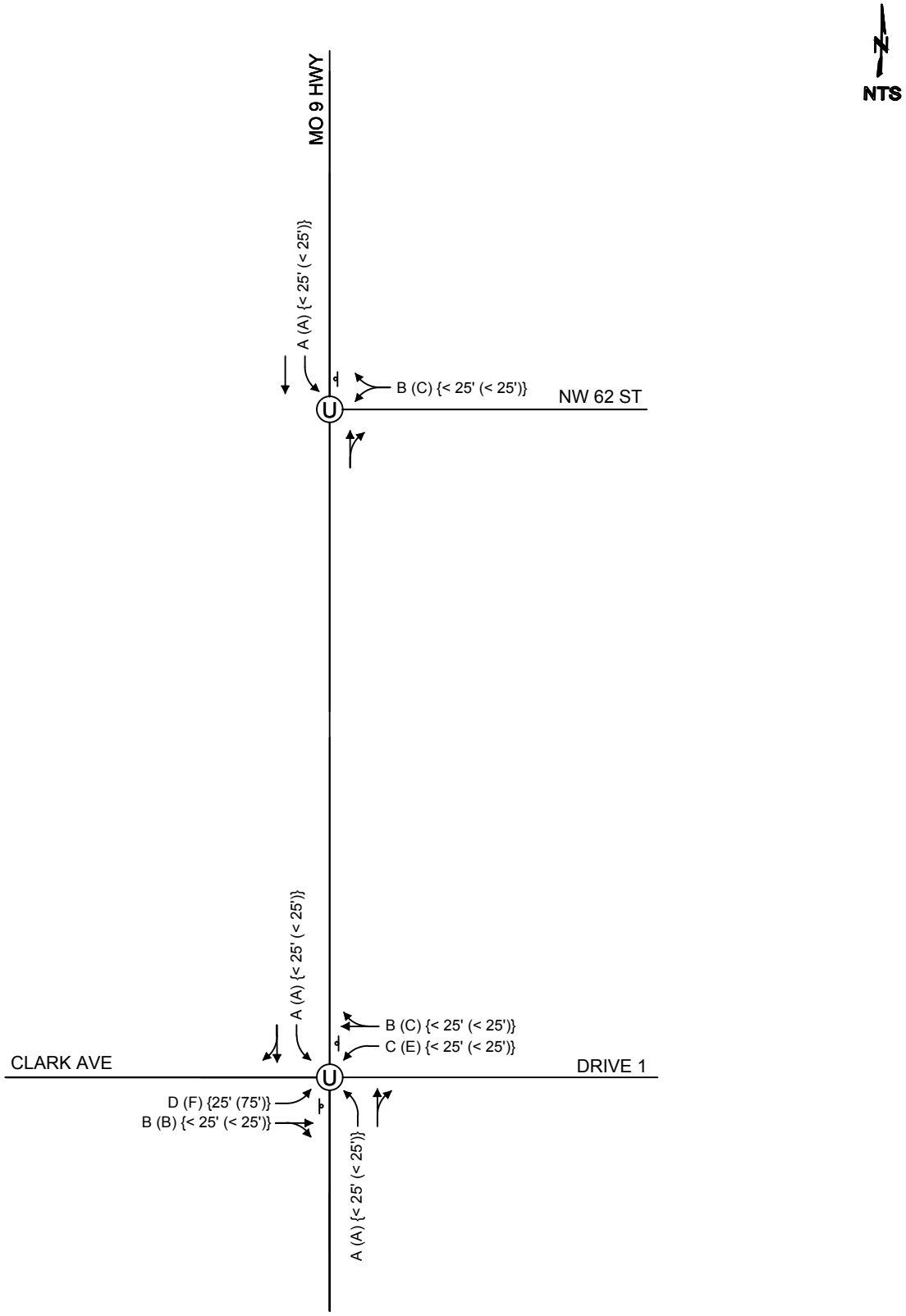
LEGEND

U Unsignalized Intersection

Stop Sign

XX' Turn Bay Storage Length

PROJECT NO: 013-0508	Existing Plus Development Lane Configurations and Traffic Control	OLSSON ASSOCIATES	FIGURE
DRAWN BY: JMS		7301 West 133rd Street Suite 200 Overland Park, KS 66213-4750 TEL 913.381.1170 FAX 913.381.1174	8
DATE: 03/11/2013			



LEGEND

Ⓤ Unsignalized Intersection

Stop Sign

XX (XX) {XX (XX)} AM (PM) Level of Service
{AM (PM)} 95th Percentile Queue Length

PROJECT NO: 013-0508	Existing Plus Development Level of Service	OLSSON ASSOCIATES	FIGURE
DRAWN BY: JMS		7301 West 133rd Street Suite 200 Overland Park, KS 66213-4750 TEL 913.381.1170 FAX 913.381.1174	9
DATE: 03/11/2013			

5.0 FUTURE YEAR 2033 CONDITIONS

Historical traffic count data and a review of the study area were used to develop a growth rate for traffic volumes along study area roadways. Based on historical traffic count data conducted by MoDOT, there has been an approximately 1% annual increase in volumes from the year 2004 to 2010 near the intersection of Route 9 and Missouri Route 45 and thus a 1% annual growth rate was assumed. The growth rate was applied to the existing thru volumes, along Route 9, at study intersections to obtain future year background volumes.

The background additional volumes were added to the existing plus development volumes resulting in the future year 2033 traffic volumes, illustrated in **Figure 10**. Future year 2033 intersection geometrics and traffic control for the study area intersections are illustrated in **Figure 11**.

5.1 Auxiliary Turn Lanes

Auxiliary turn lane analyses were performed using the methodologies described in **Section 3.3**.

Right-Turn

Based on the existing plus development condition with a 1% annual growth rate applied to generate the peak hour volumes in the future condition, no additional auxiliary right-turn lanes are warranted for the study intersections. Right-turn lane warrant analysis sheets can be found in the **Appendix**.

5.2 Signal Warrant Analysis

Signal warrant analyses for the future year 2033 scenario were performed using the methodologies described in **Section 3.4**. Based on Warrant 3, none of the study intersections satisfy the peak hour warrant criteria for signalization based on the future year 2033 conditions. Signal warrant analysis sheets can be found in the **Appendix**.

5.3 Capacity Analysis

Capacity analyses were performed using the methodologies described in **Section 3.5**. All movements at the two unsignalized study intersections operate at an acceptable LOS D or better under the future condition with the following exceptions.

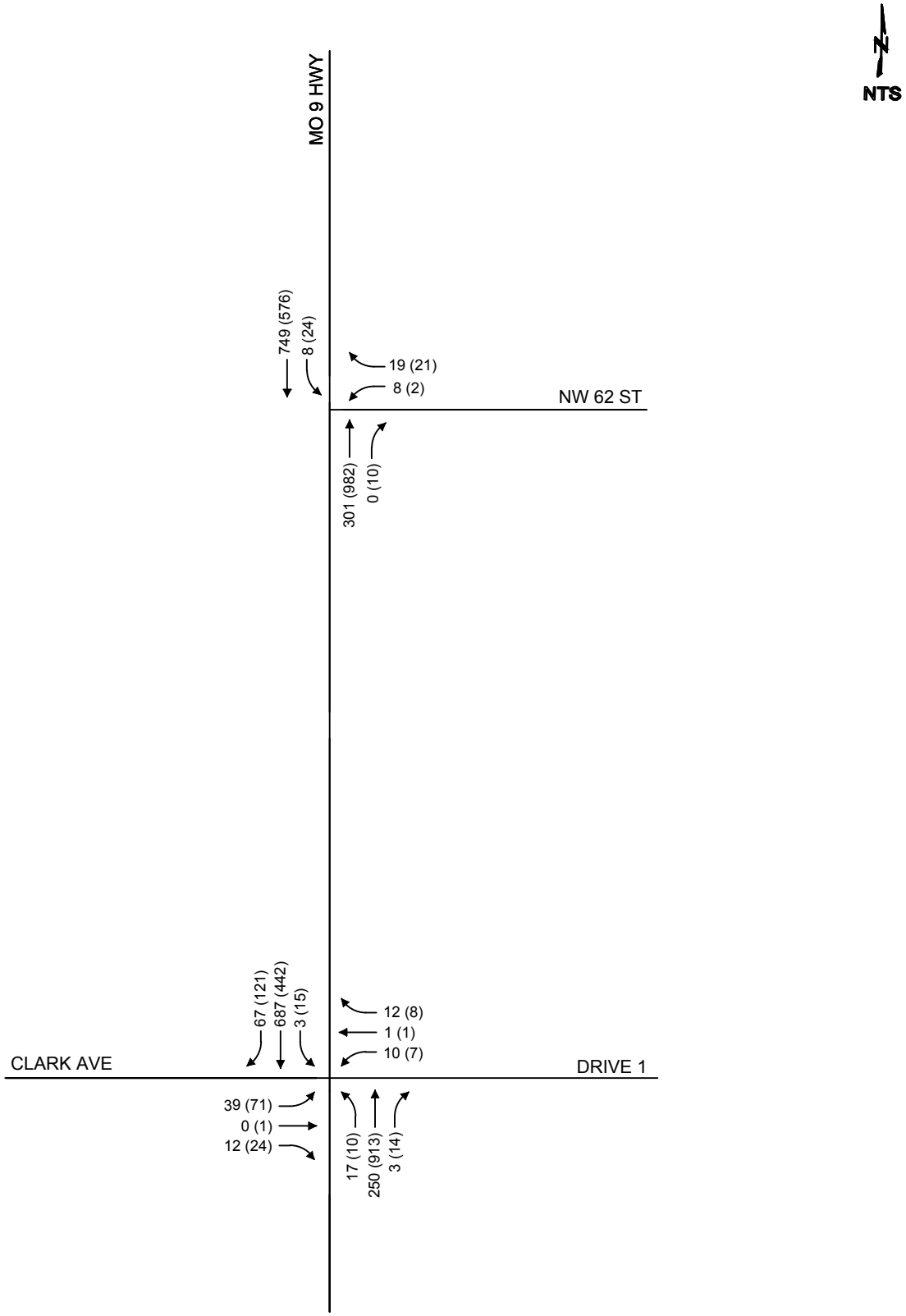
At the intersection of Route 9 and Clark Avenue/Drive 1 during the AM peak hour period the eastbound left-turn movement is expected to operate at a LOS E. During the PM peak hour period the eastbound and westbound left-turn movements are expected to operate at a LOS F. The 95th-percentile queue length for the eastbound left-turn movement is expected to be exceed the available storage length during the PM peak hour period, queuing back 5 vehicles. If queuing were to occur, the medical center building drives could be blocked making it difficult to execute a left-turn movement out of the site. This, if it were to occur, is expected to be a limited occurrence and is not anticipated to occur during the other periods of the day.

Unsignalized side street movements can be expected to operate at a lower level of service during the peak hour periods as higher major street movements are accommodated. The addition of turn lanes along the side streets will minimally improve the level of service for the intersection of Route 9 and Clark Avenue.

Increased queuing and delay along the corridor during the future scenario can be attributed to an increase in background traffic volumes, and is not necessarily associated with the proposed development. **Figure 12** illustrates level of service for the future year scenario. Capacity analysis sheets are included in the **Appendix**.

5.4 Future Year 2033 Recommendations

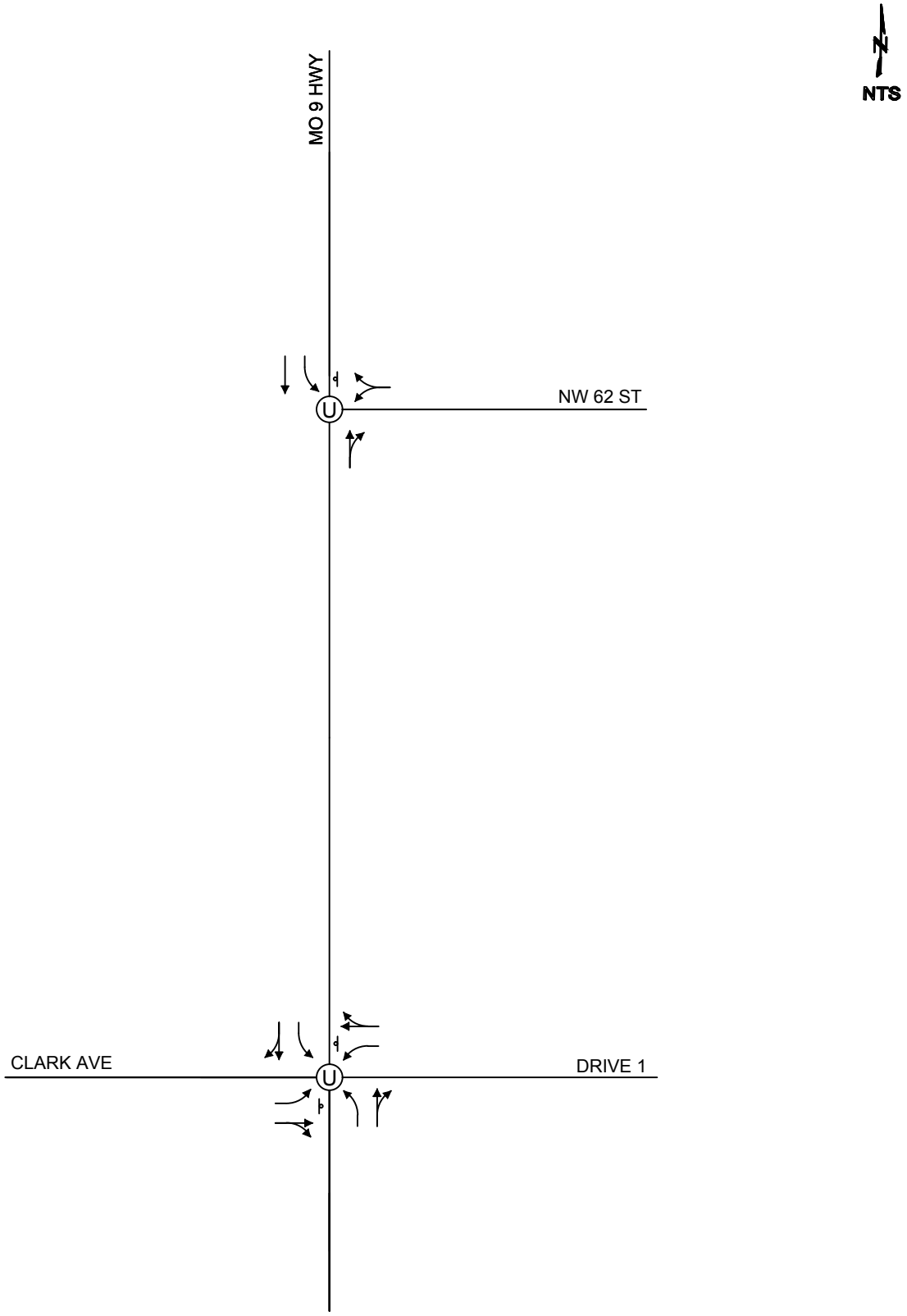
In the future scenario, during the AM and PM peak hour periods the intersection of Route 9 and Clark Avenue is expected to have poor levels of service along the side streets. Incremental increases in queuing and delay along the corridor during the future scenario can be attributed to an increase in background traffic volumes, and is not necessarily associated with the proposed development. The addition of turn lanes along the side streets will minimally improve the level of service at the intersection of Route 9 and Clark Avenue. A traffic signal is not warranted at either of the study intersections and thus, no improvements are recommended based on the future year 2033 conditions.



LEGEND

XX (XX) - AM (PM) Peak Hour Volumes

PROJECT NO: 013-0508	Future Year 2033 Peak Hour Volumes	OLSSON ASSOCIATES 7301 West 133rd Street Suite 200 Overland Park, KS 66213-4750 TEL 913.381.1170 FAX 913.381.1174	FIGURE
DRAWN BY: JMS			10
DATE: 03/11/2013			

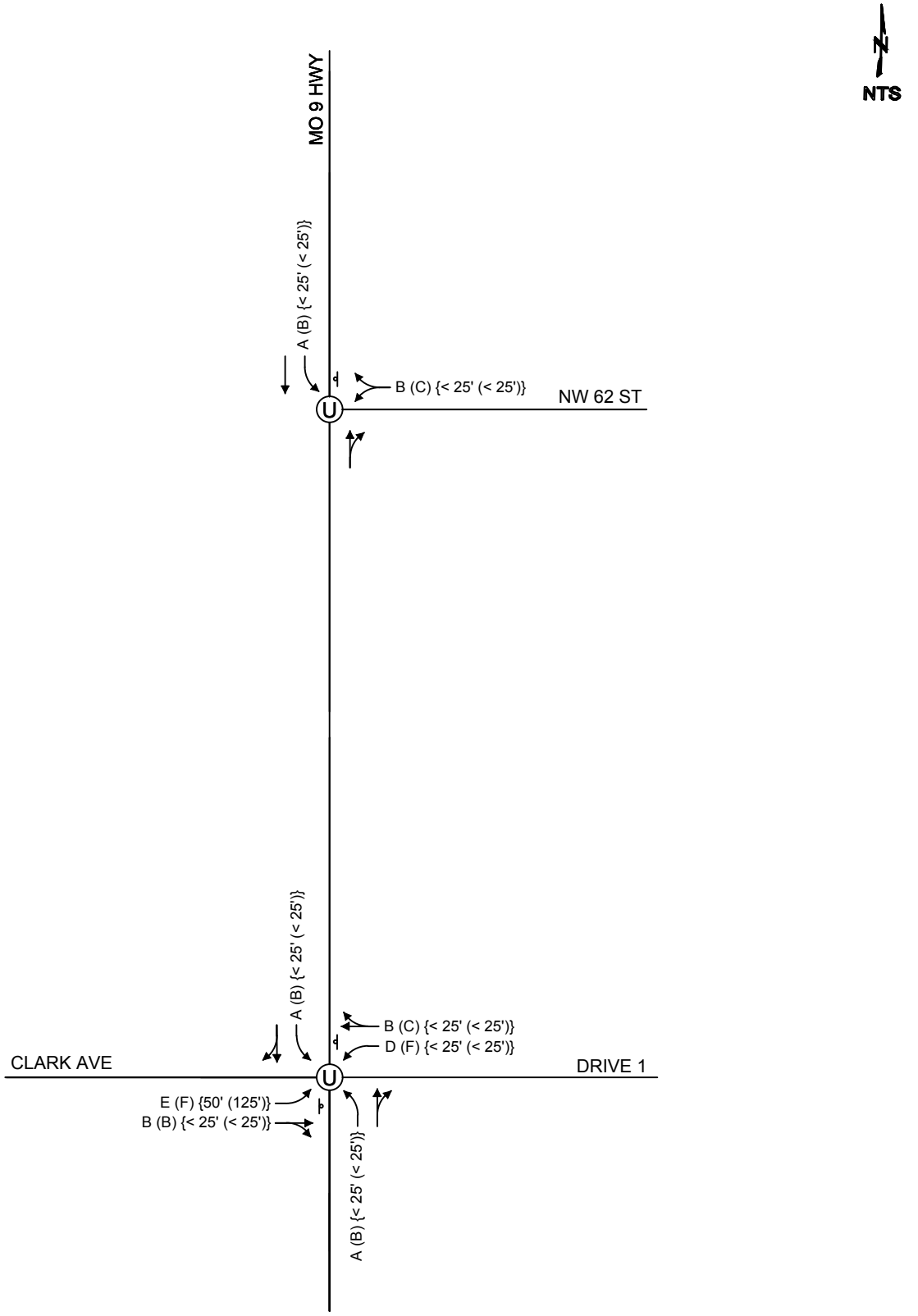


LEGEND

Ⓤ Unsignalized Intersection

Stop Sign

PROJECT NO: 013-0508	Future Year 2033 Lane Configurations and Traffic Control	OLSSON ASSOCIATES	FIGURE
DRAWN BY: JMS		7301 West 133rd Street Suite 200 Overland Park, KS 66213-4750 TEL 913.381.1170 FAX 913.381.1174	11
DATE: 03/11/2013			



LEGEND

Ⓤ Unsignalized Intersection

Stop Sign

XX (XX) {XX (XX)} AM (PM) Level of Service {AM (PM)} 95th Percentile Queue Length

PROJECT NO: 013-0508	Future Year 2033 Level of Service	OLSSON ASSOCIATES	FIGURE
DRAWN BY: JMS		7301 West 133rd Street Suite 200 Overland Park, KS 66213-4750 TEL 913.381.1170 FAX 913.381.1174	12
DATE: 03/11/2013			

6.0 RECOMMENDATIONS & CONCLUSIONS

This study considered the impact of the proposed Parkville apartment building located in the southwest quadrant of Route 9 and Clark Avenue. A traffic study was completed for the property in 2001, by Bucher, Willis, & Ratliff. At that time the study documented the Lake Pointe Professional Centre consisting of three general office buildings totaling 50,464 square feet. This study was revised by Olsson Associates in 2013, with a proposed development consisting of two 28,000 square foot office buildings. The office land use generates more trips than the apartment building consisting of 50 units, currently being proposed.

Considering the existing, existing plus development, and future year conditions analysis was completed to determine the current and expected operations of the corridor. Based on the results of the capacity analyses and field observations, the following conclusions and recommendations are made for the study area.

Existing Conditions

Study intersections are currently operating at acceptable levels of service with the exception of the eastbound left-turn movement at the intersection of Route 9 and Clark Avenue in the PM peak hour period which operates at a LOS E. The queue length at this intersection does not exceed the available storage length or disrupt other traffic movements. No improvements are recommended based on the existing operations.

Route 9 & Clark Avenue

- Per the MoDOT EPG a dedicated right-turn lane is warranted for the southbound movement at the intersection. According to city staff, right-of-way for a future southbound right-turn lane is to be dedicated as a part of the Mosaic Development.

Existing plus Development Conditions

Comparing the operations of the existing roadway network to the existing plus development roadway network conditions operations are minimally effected. Unsignalized side street movements can be expected to operate at a lower level of service during peak hour periods as higher major street movements are accommodated. The following roadway improvements are recommended for the site:

Route 9 & Clark Avenue

- Convert the exiting eastbound right-turn auxiliary lane into a thru/right-turn lane.
- Add a southbound left-turn lane with a minimum of 150 feet of storage at the intersection. This can be accomplished by restriping the existing pavement.
- Drive 1 should provide two exiting lanes, one thru/right-turn lane and one left-turn lane with a minimum of 40 feet of storage.

Future Year 2033 Conditions

In the future scenario, during the AM and PM peak hour periods the intersection of Route 9 and Clark Avenue is expected to have poor levels of service along the side streets. Incremental increases in queuing and delay along the corridor during the future scenario can be attributed to an increase in background traffic volumes, and is not necessarily associated with the proposed development. The addition of turn lanes along the side streets will minimally improve the level of service at the intersection of Route 9 and Clark Avenue. A traffic signal is not warranted at either of the study intersections and thus, no improvements are recommended based on the future year 2033 conditions.

APPENDIX:

- Existing Conditions
  - Traffic Count Data
  - Capacity Analysis
  - Turn Analysis
  - Signal Warrant Analysis
- Existing plus Development Conditions
  - Capacity Analysis
  - Turn Analysis
  - Signal Warrant Analysis
- Future Year 2033 Conditions
  - Growth Volumes
  - Capacity Analysis
  - Turn Analysis
  - Signal Warrant Analysis

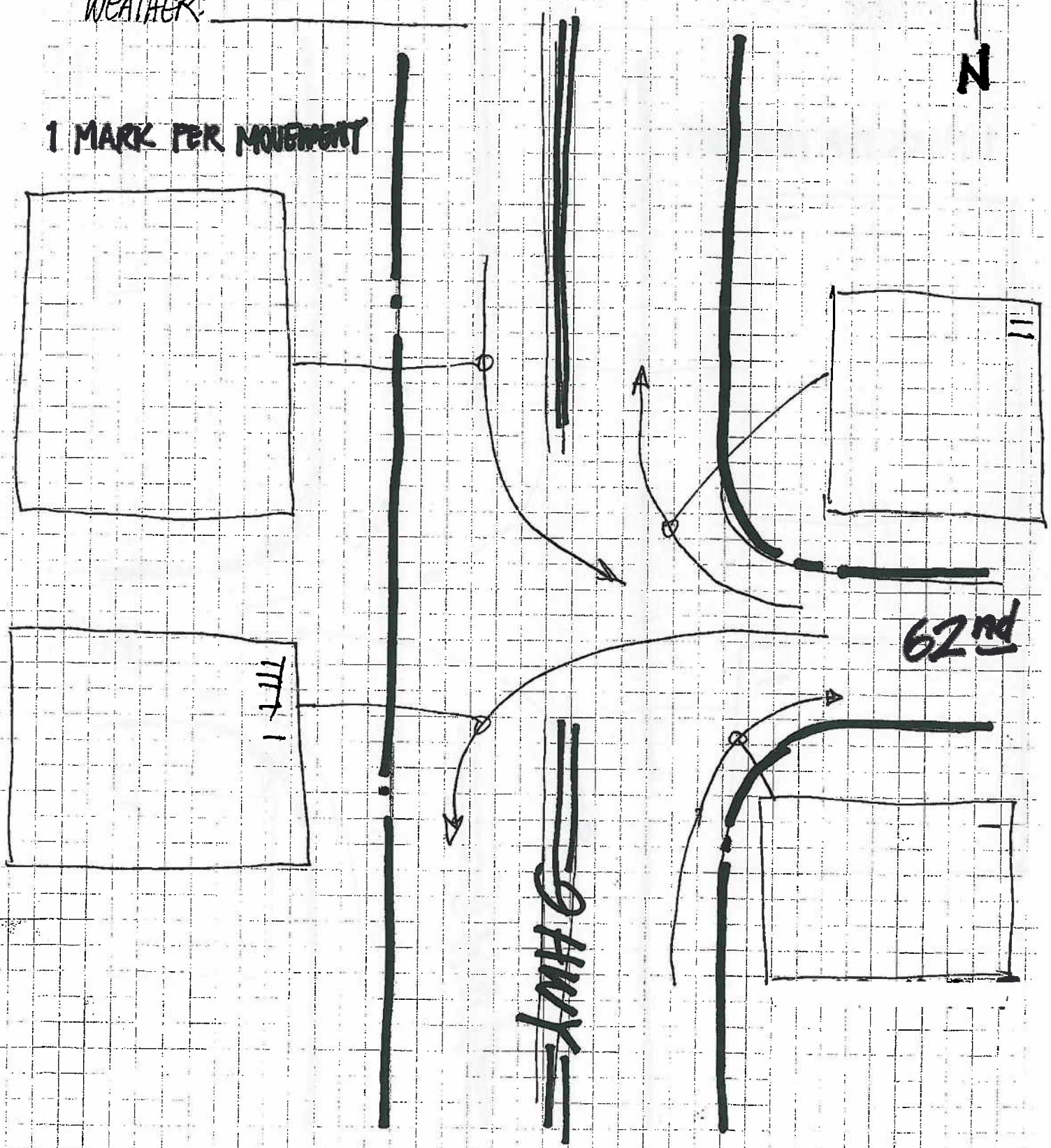
Traffic Count Data

JANUARY 4, 2011

15 Minute Interval From 7:00 AM to 7:15 AM

WEATHER: _____

1 MARK PER MOVEMENT

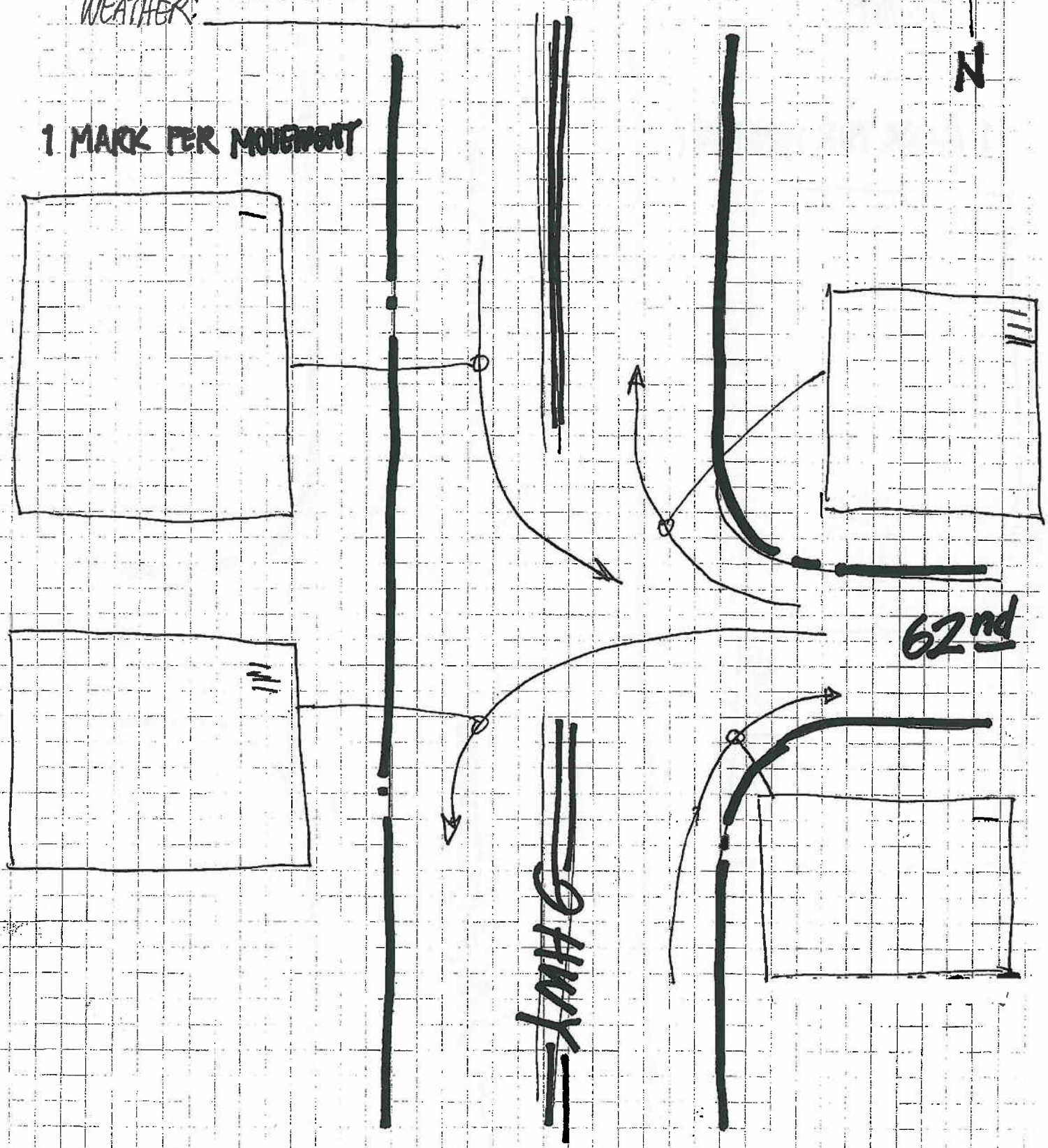


JANUARY 4, 2011

15 Minute Interval From 7:15 AM to 7:30 AM

WEATHER: _____

1 MARK PER MOVEMENT

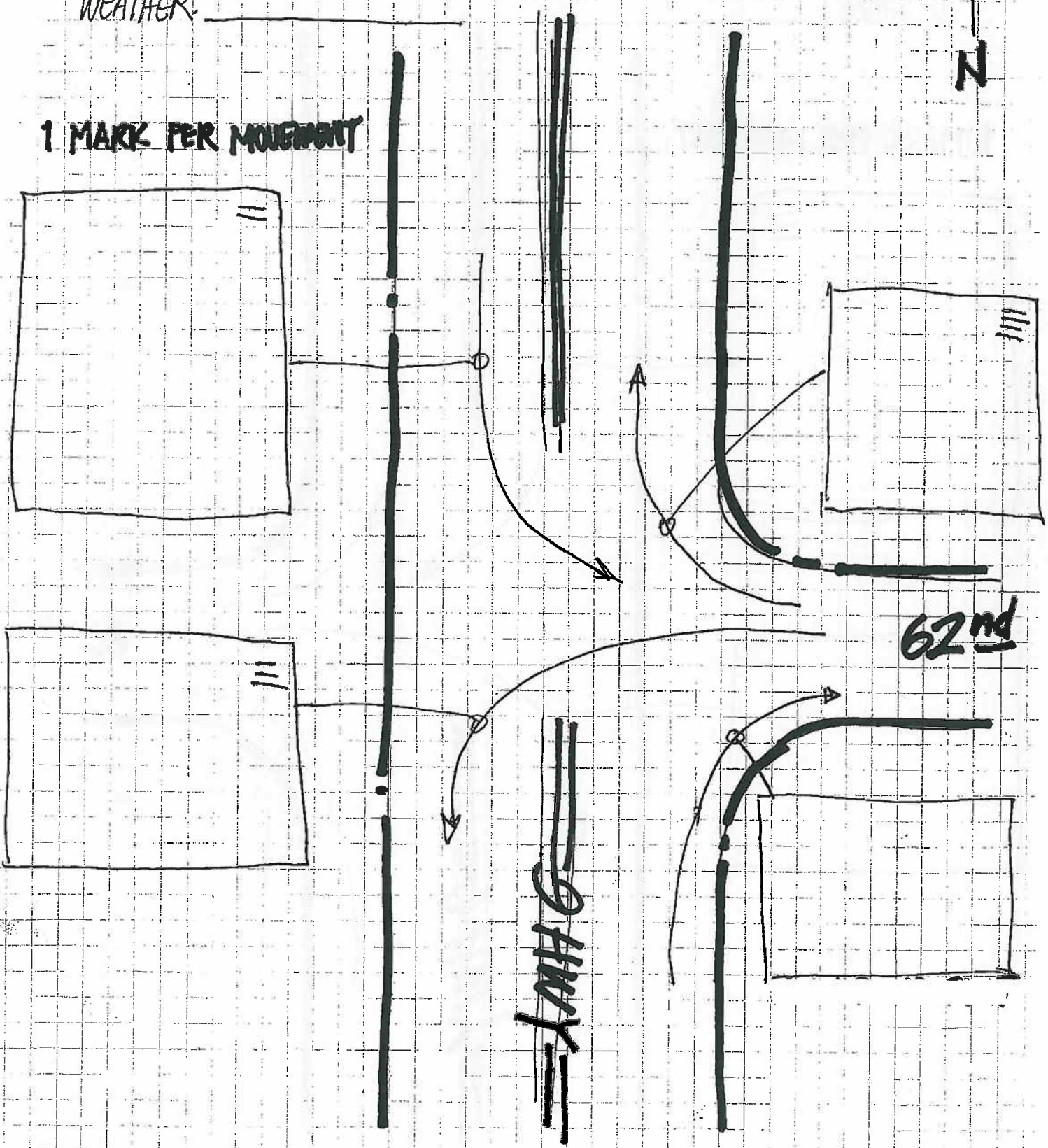


JANUARY 4, 2011

15 Minute Interval From 7:30 AM to 7:45 AM

WEATHER: _____

1 MARK PER MOVEMENT

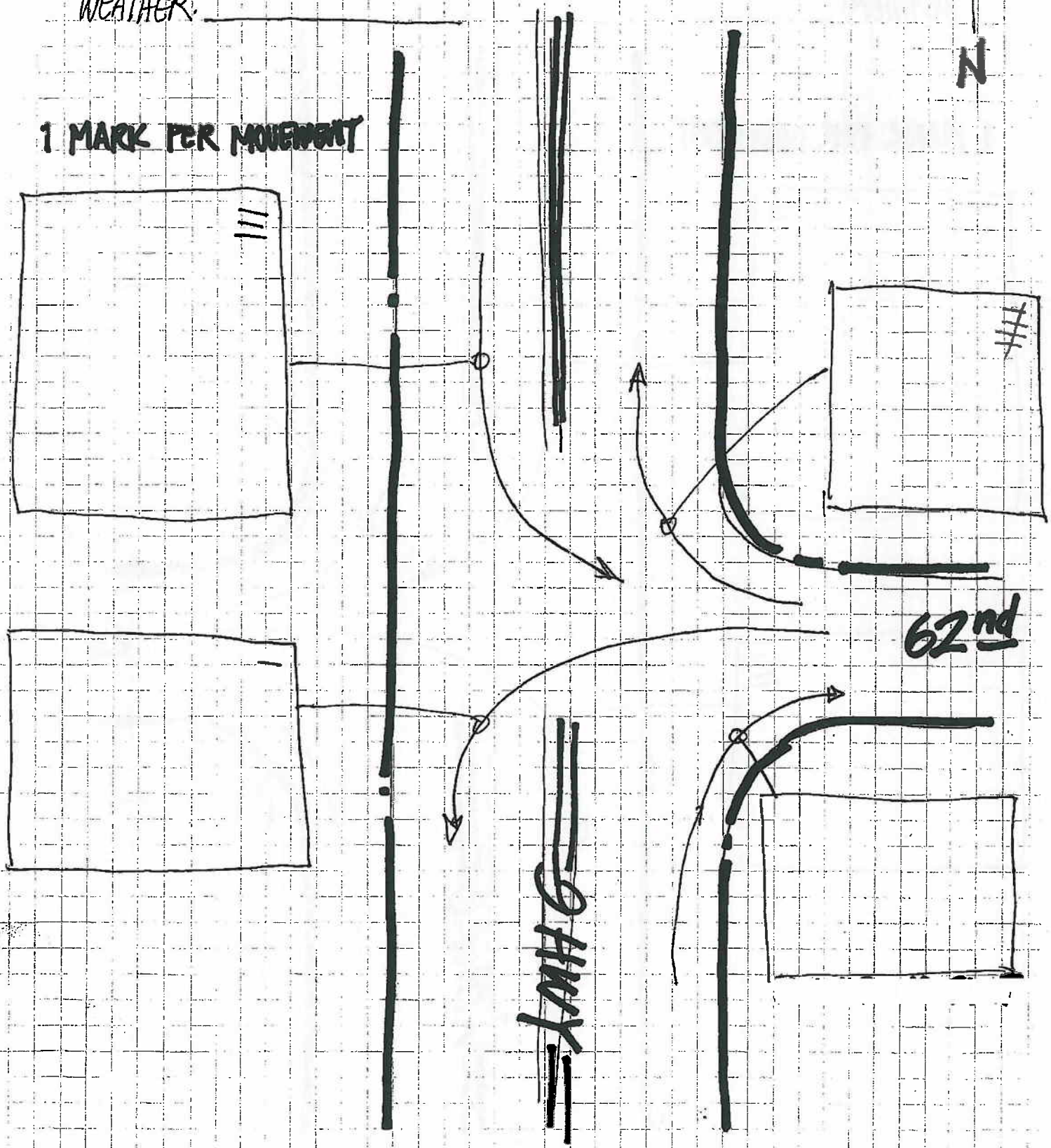


JANUARY 4, 2011

15 Minute Interval From 7:45 AM to 8:00 AM

WEATHER: _____

1 MARK PER MOVEMENT

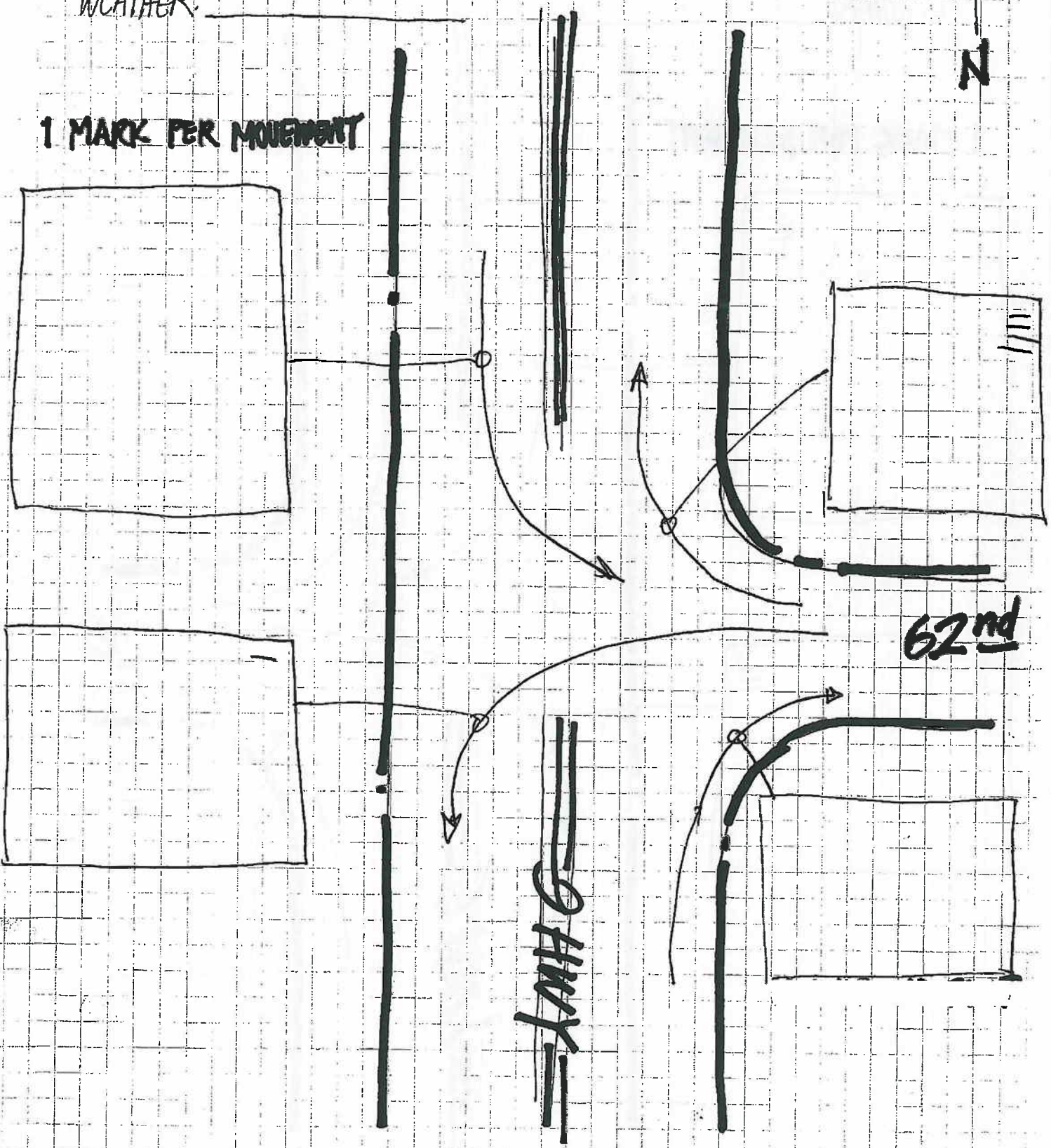


JANUARY 4, 2011

15 Minute Interval From 8:00 AM to 8:15 AM

WEATHER: _____

1 MARK PER MOVEMENT

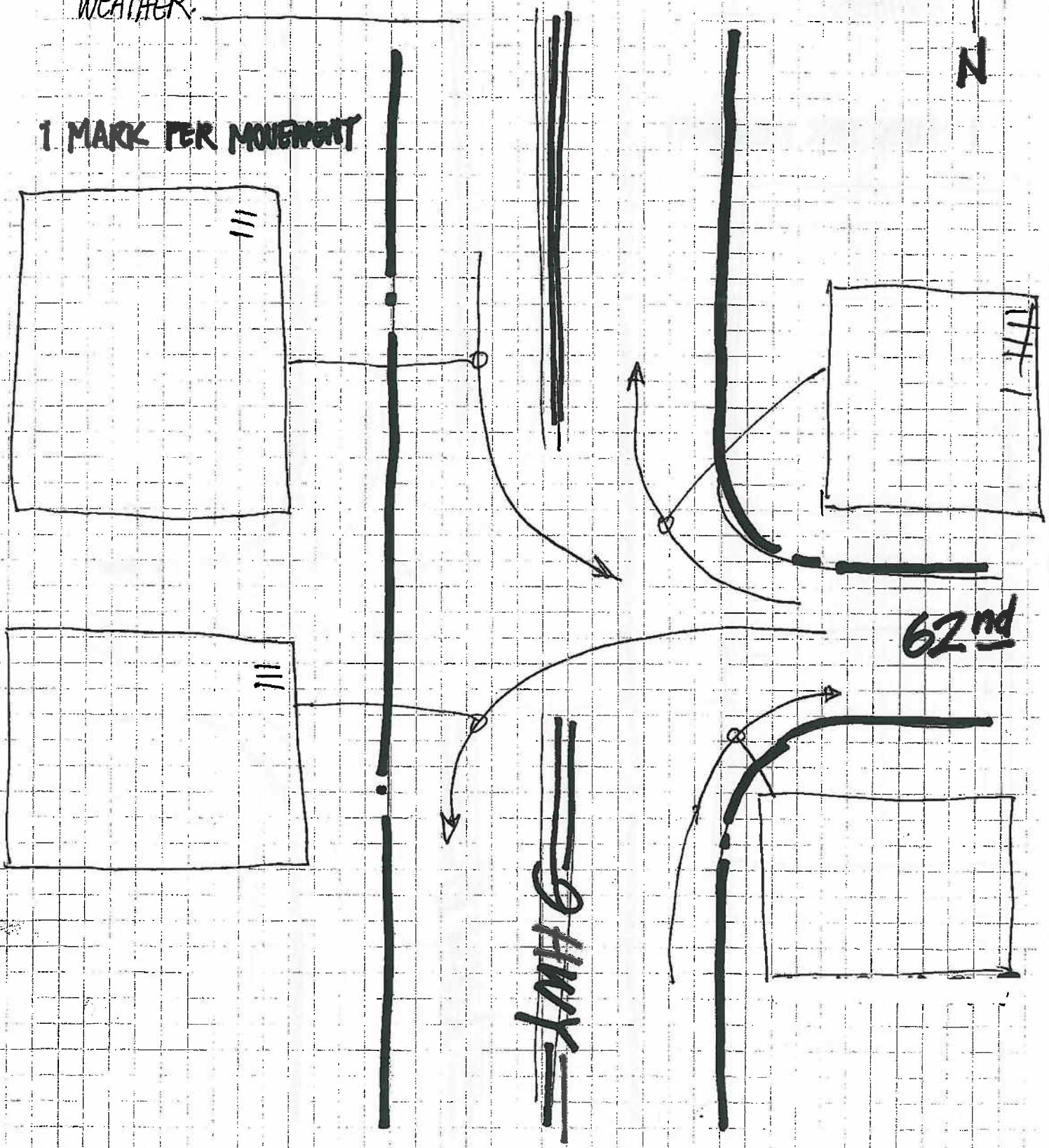


JANUARY 4, 2011

15 Minute Interval From 8:15 AM to 8:30 AM

WEATHER: _____

1 MARK PER MOVEMENT

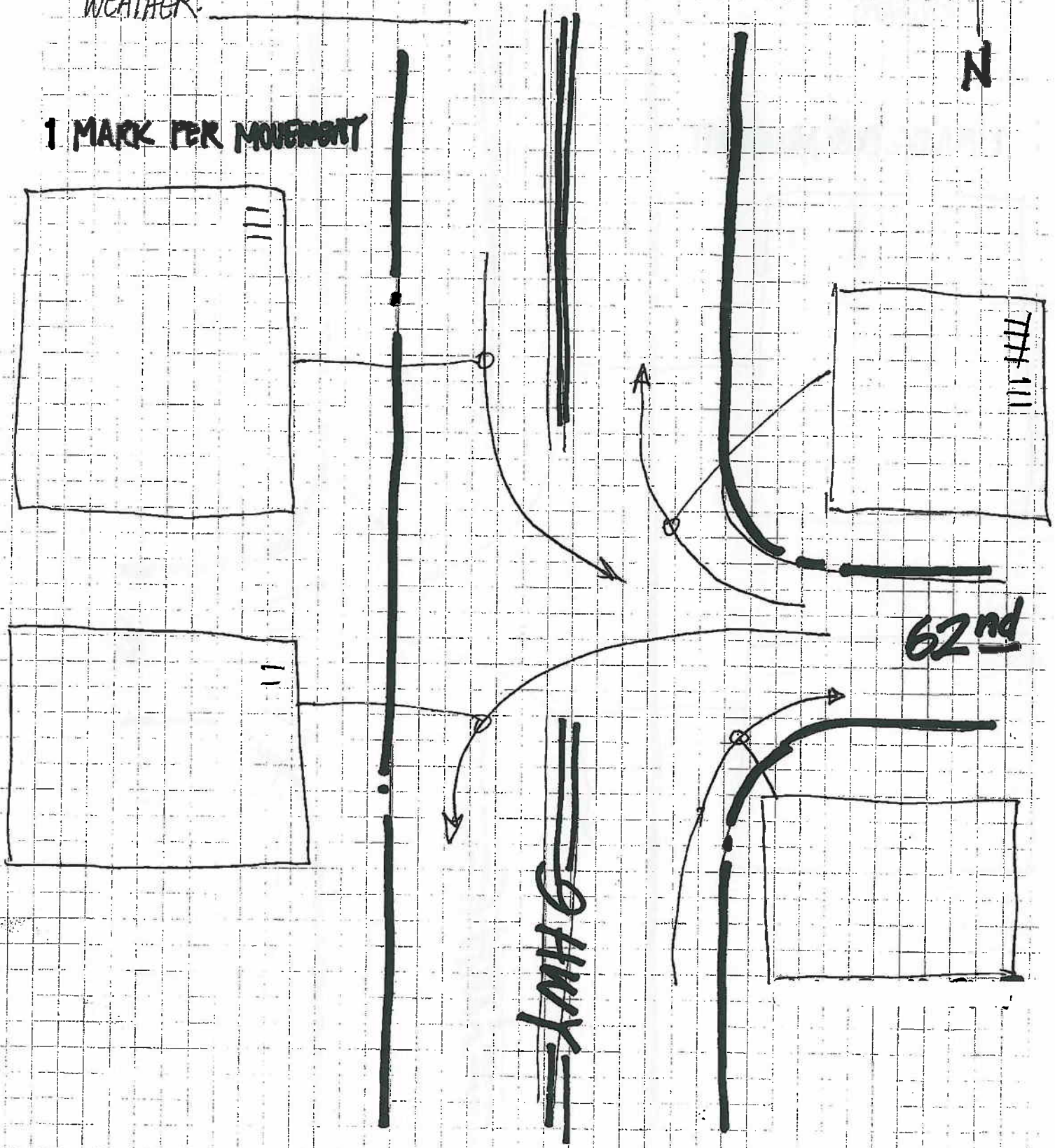


JANUARY 4, 2011

15 Minute Interval From 8:30 AM to 8:45 AM

WEATHER: _____

1 MARK PER MOVEMENT

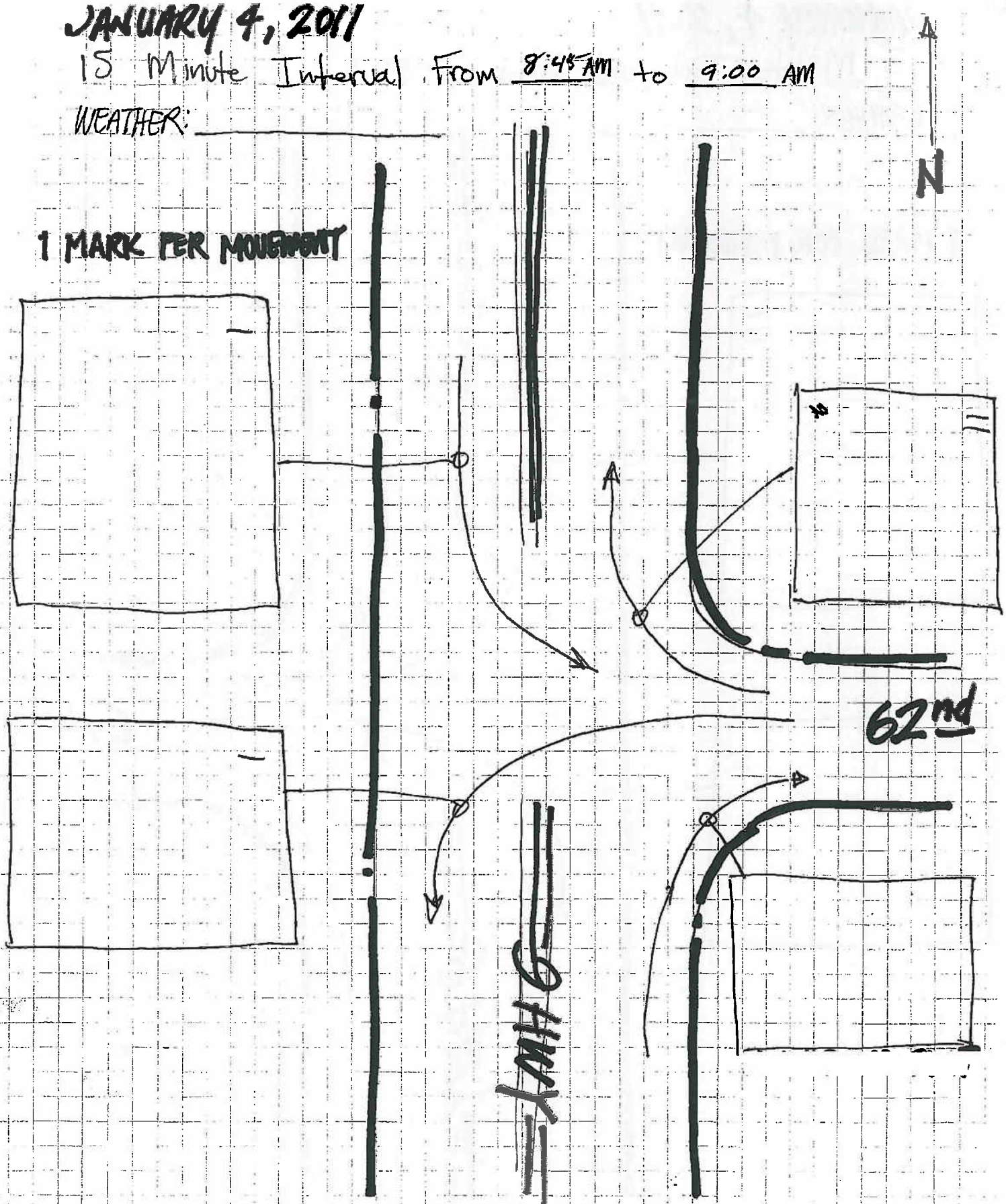


JANUARY 4, 2011

15 Minute Interval From 8:45 AM to 9:00 AM

WEATHER: _____

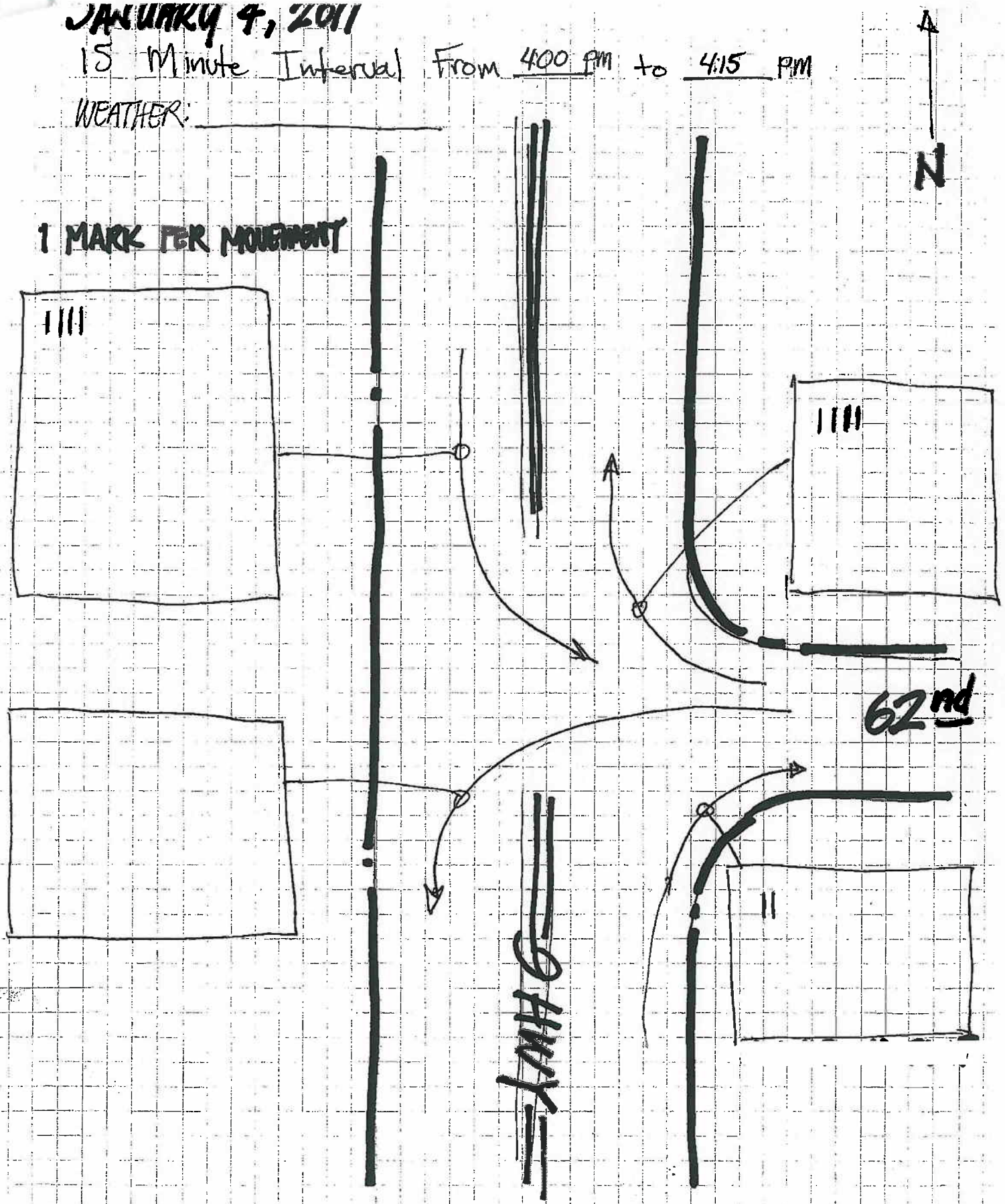
1 MARK PER MOVEMENT



JANUARY 4, 2011

15 Minute Interval From 4:00 PM to 4:15 PM

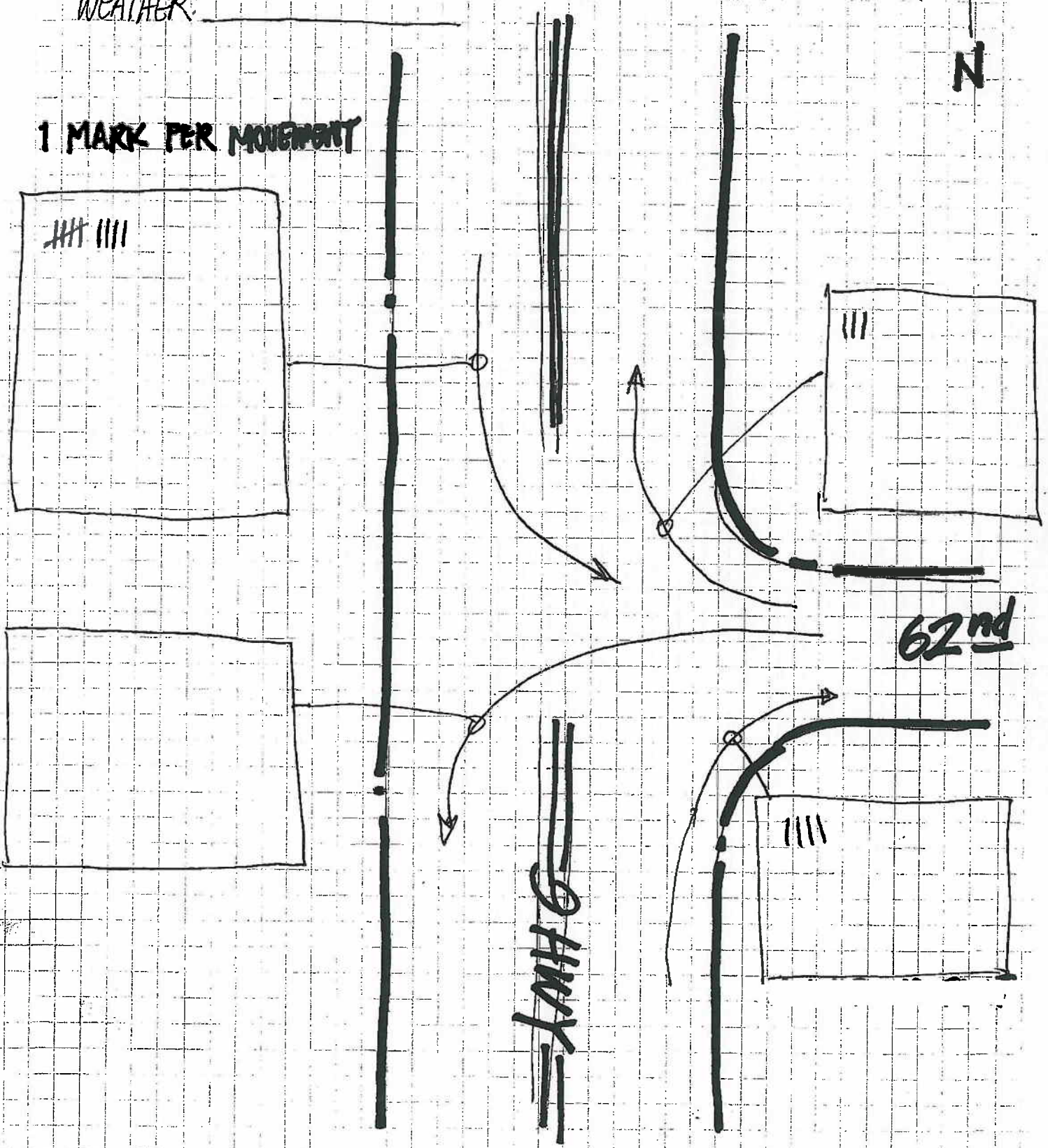
WEATHER: _____



JANUARY 4, 2011

15 Minute Interval From 4:15 PM to 4:30 PM

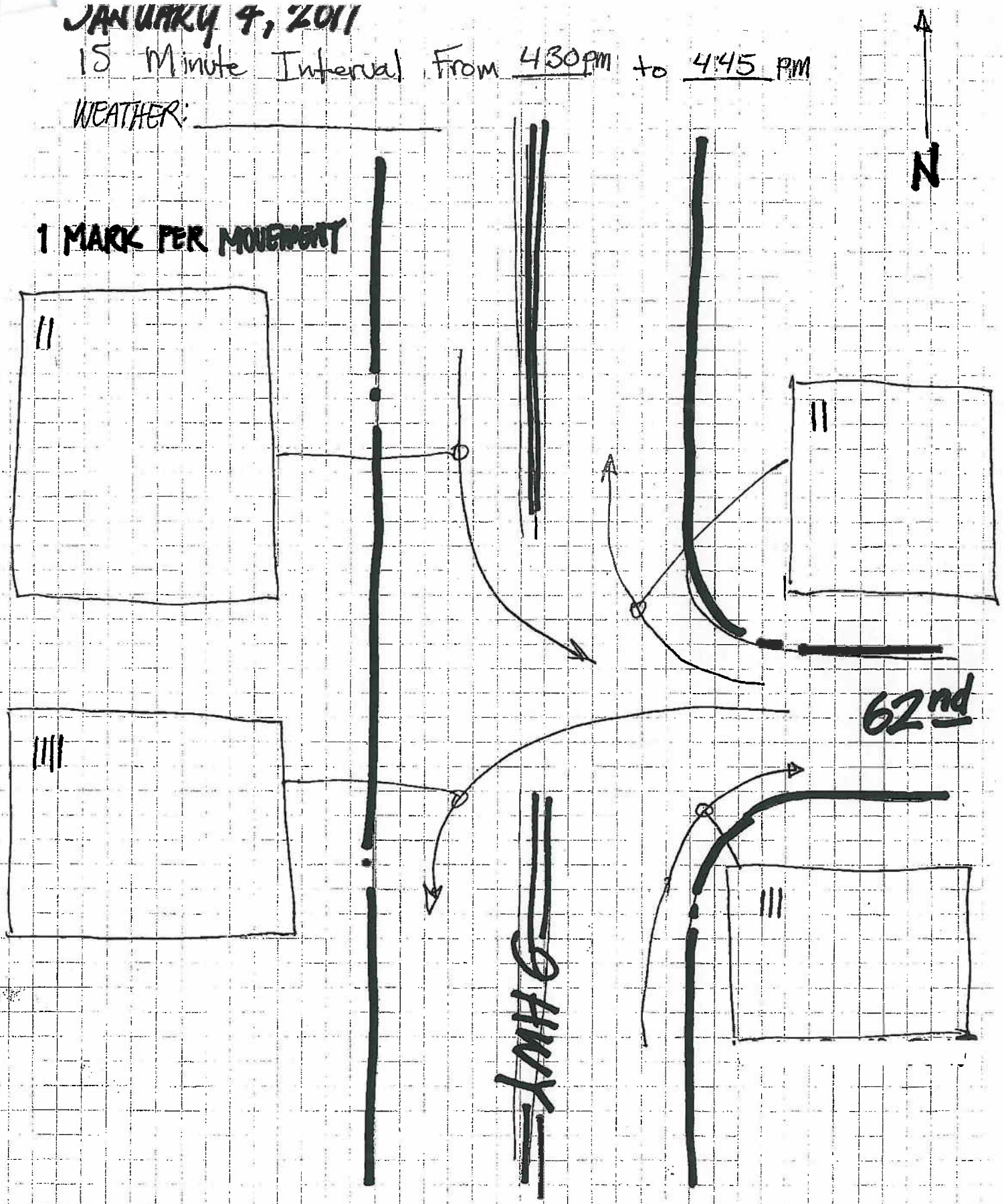
WEATHER: _____



JANUARY 4, 2011

15 Minute Interval From 430pm to 4:45 PM

WEATHER: _____

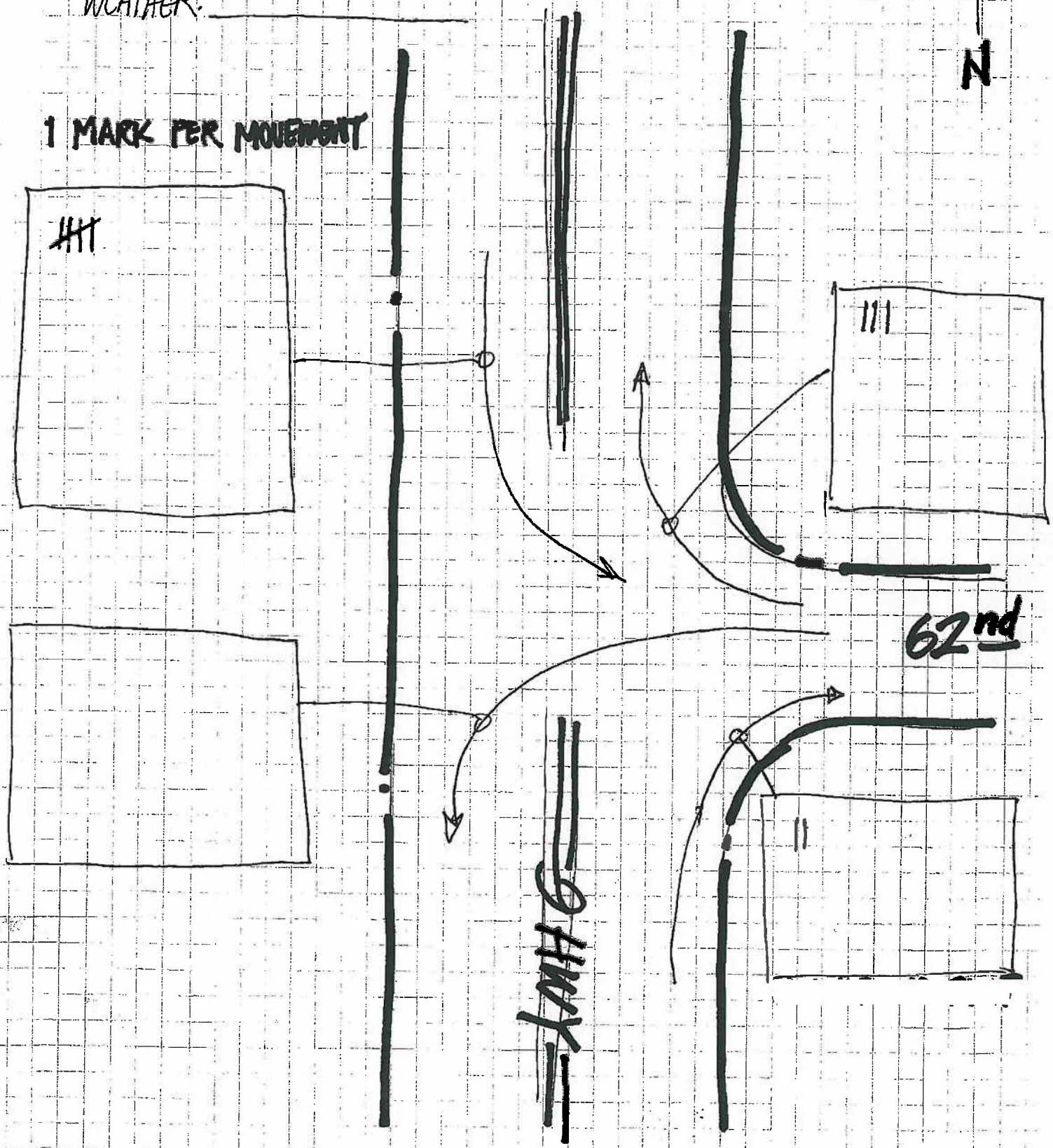


JANUARY 4, 2011

15 Minute Interval From 4:45 PM to 5:00 PM

WEATHER: _____

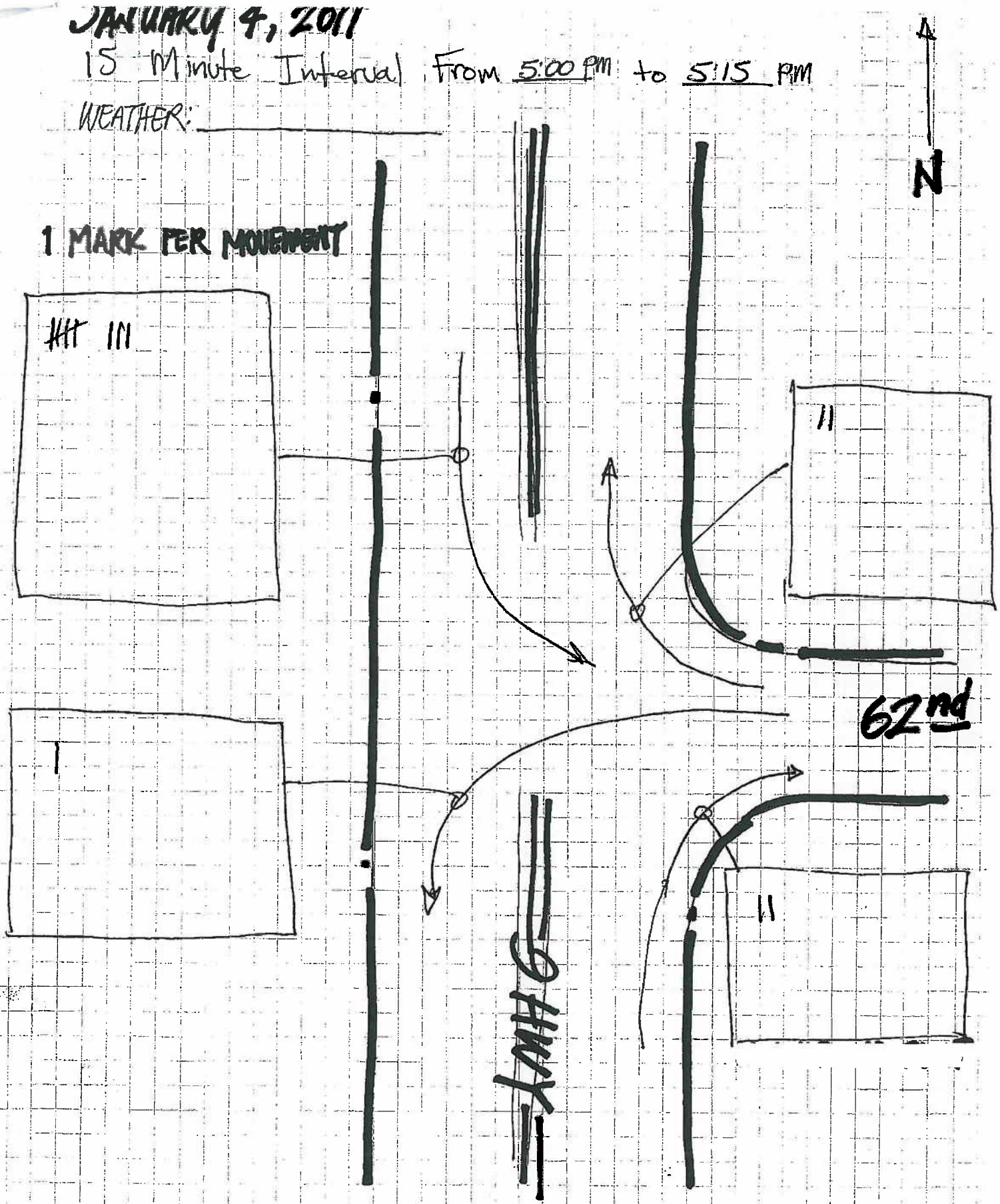
1 MARK PER MOVEMENT



JANUARY 4, 2011

15 Minute Interval From 5:00 PM to 5:15 PM

WEATHER: _____

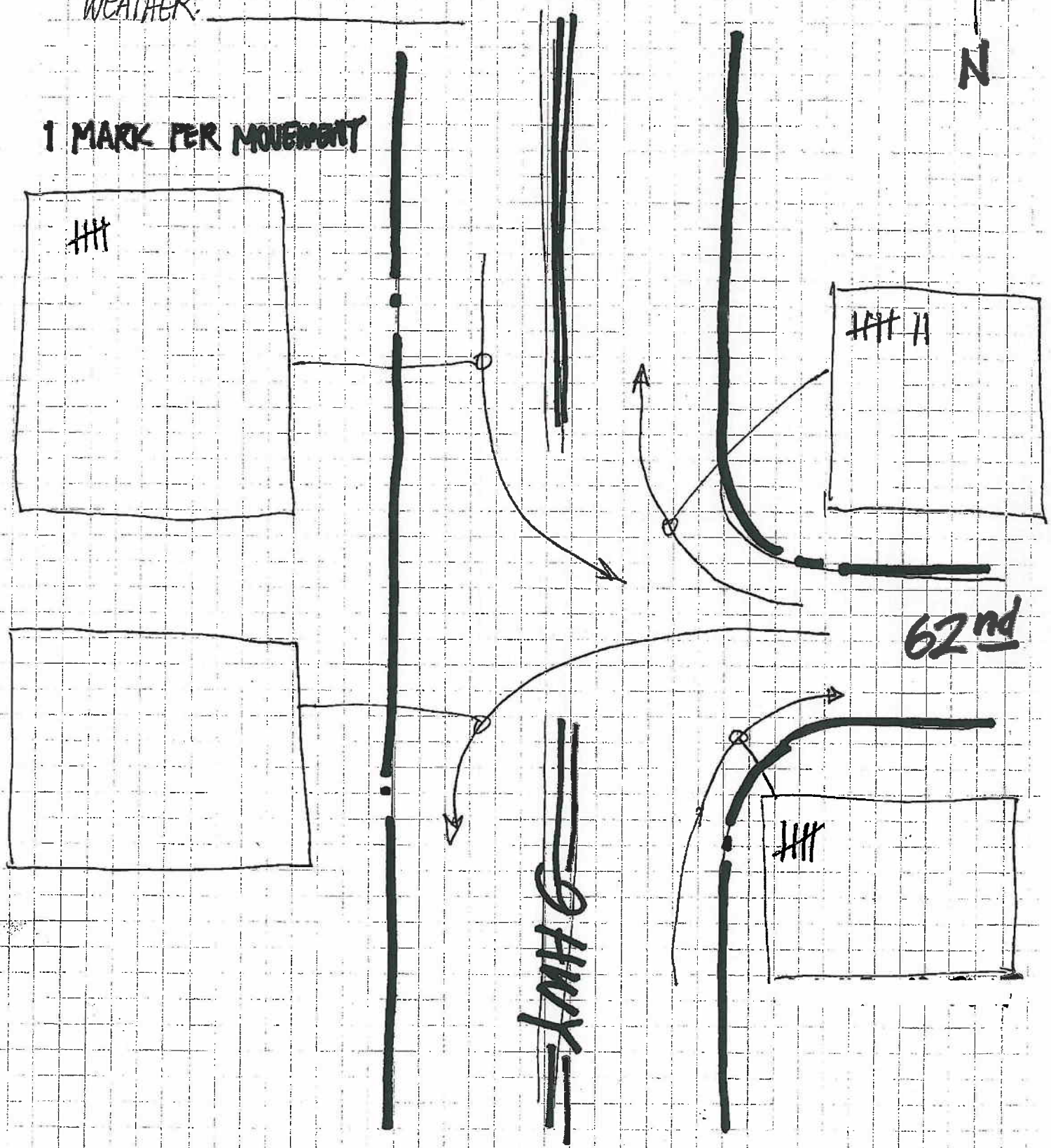


JANUARY 4, 2011

15 Minute Interval From 5:15 PM to 5:30 PM

WEATHER: _____

1 MARK PER MOVEMENT

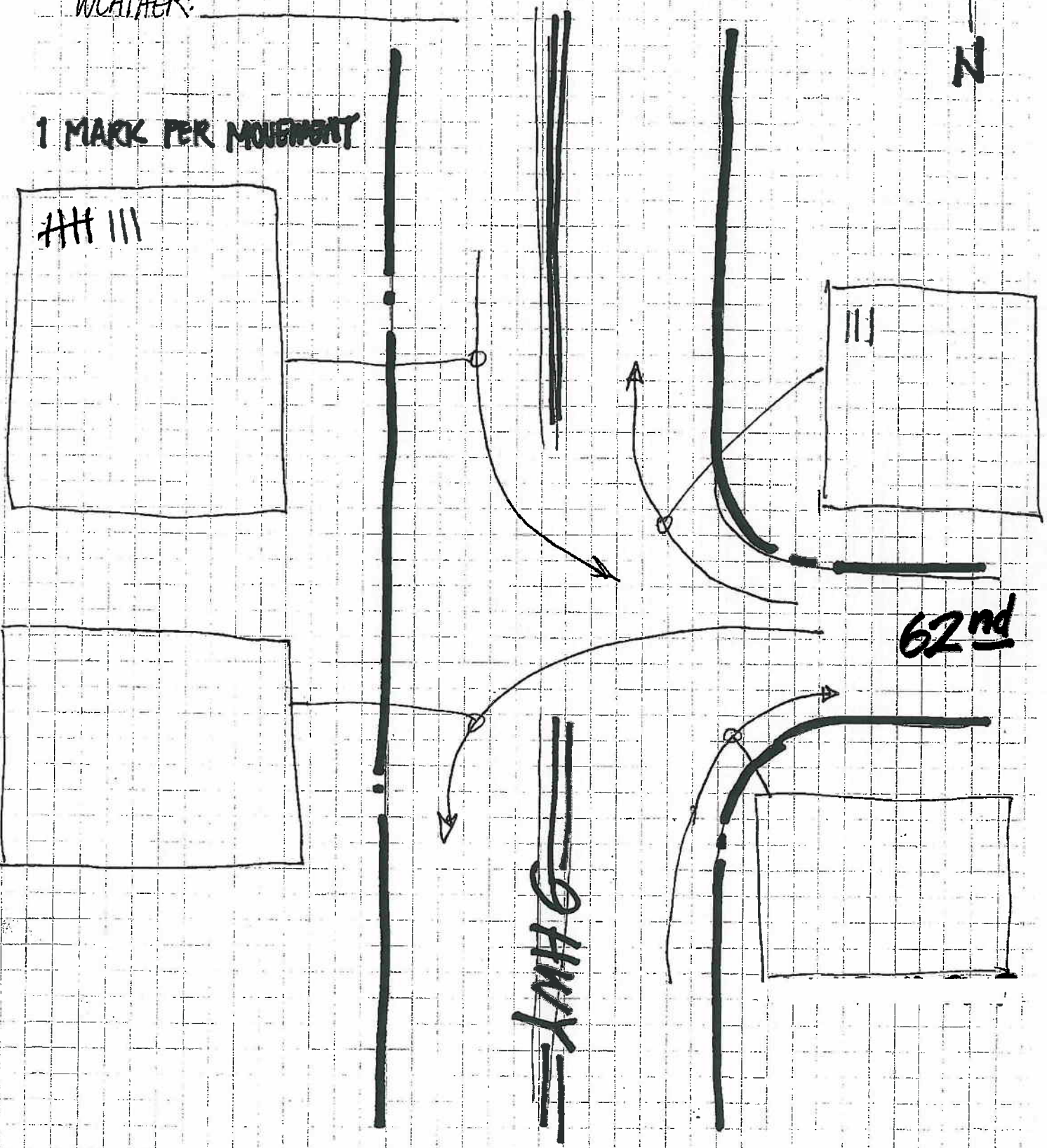


JANUARY 4, 2011

15 Minute Interval From 5:30 PM to 5:45 PM

WEATHER: _____

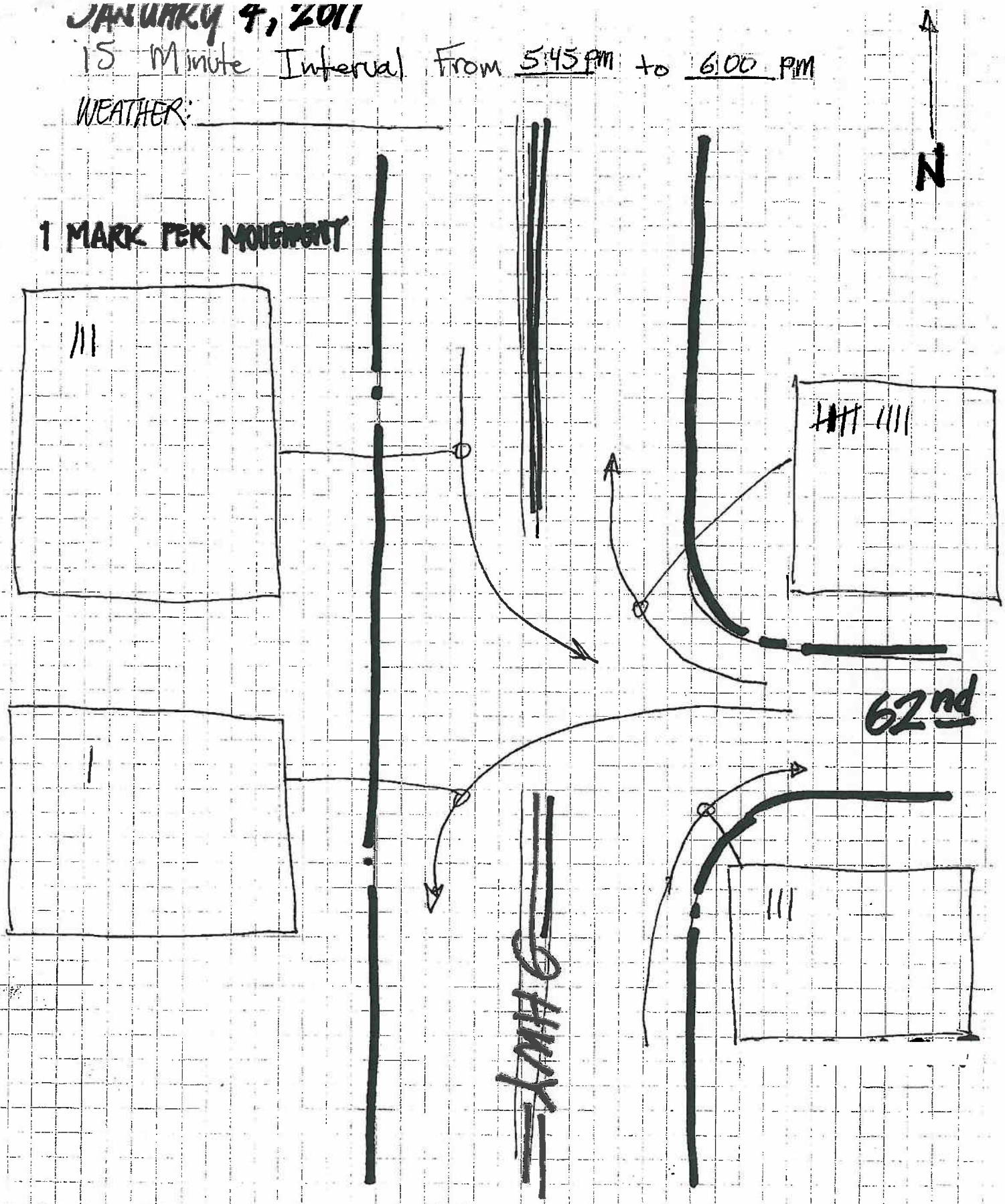
1 MARK PER MOVEMENT



JANUARY 4, 2011

15 Minute Interval From 5:45 PM to 6:00 PM

WEATHER: _____



AM PEAK HOUR TURNING MOVEMENT COUNTS

North/South Street: **MO 9 HIGHWAY**	
East/West Street: **CLARK AVENUE**	
Date: **2-5-13**	
Time Period: **7:30 - 8:30 AM**	
Conditions: **Sunny. No rain or inclement weather.**	

NORTH

	Southbound Right	Southbound Thru
7:30 - 7:45	21	147
7:45 - 8:00	18	127
8:00 - 8:15	11	131
8:15 - 8:30	17	147

z

	Eastbound Left	Eastbound Right
7:30 - 7:45	4	2
7:45 - 8:00	16	4
8:00 - 8:15	12	4
8:15 - 8:30	7	2

	Northbound Left	Northbound Thru
7:30 - 7:45	1	55
7:45 - 8:00	11	45
8:00 - 8:15	2	39
8:15 - 8:30	3	57

PM PEAK HOUR TURNING MOVEMENT COUNTS

North/South Street: **MO 9 HIGHWAY**	
East/West Street: **CLARK AVENUE**	
Date: **2-5-13**	
Time Period: **5:00 - 6:00 PM**	
Conditions: **Cloudy. No rain or inclement weather.**	

NORTH

	Southbound Right	Southbound Thru
5:00 - 5:15	30	92
5:15 - 5:30	32	80
5:30 - 5:45	27	72
5:45 - 6:00	32	94

	Eastbound Left	Eastbound Right
5:00 - 5:15	16	8
5:15 - 5:30	18	9
5:30 - 5:45	17	2
5:45 - 6:00	20	5

	Northbound Left	Northbound Thru
5:00 - 5:15	2	172
5:15 - 5:30	4	173
5:30 - 5:45	1	209
5:45 - 6:00	3	182

Capacity Analysis

TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	*JMS*	Intersection	*MO9 & NW 62nd St.*
Agency/Co.	*Olsson Associates*	Jurisdiction	*City of Parkville, MO*
Date Performed	*03/14/2013*	Analysis Year	*Existing Conditions*
Analysis Time Period	*AM*		

Project Description *013-0508*

East/West Street: *NW 62nd* | North/South Street: *MO 9*

Intersection Orientation: *North-South* | Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)		*235*	*0*	*8*	*611*	
Peak-Hour Factor, PHF	*1.00*	*0.92*	*0.92*	*0.92*	*0.92*	*1.00*
Hourly Flow Rate, HFR (veh/h)	*0*	*255*	*0*	*8*	*664*	*0*
Percent Heavy Vehicles	*0*	--	--	*2*	--	--
Median Type	*Undivided*					
RT Channelized			*0*			*0*
Lanes	*0*	*1*	*0*	*1*	*1*	*0*
Configuration			*TR*	*L*	*T*	
Upstream Signal		*0*			*0*	

Minor Street	Eastbound			Westbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)				*8*		*19*
Peak-Hour Factor, PHF	*1.00*	*1.00*	*1.00*	*0.92*	*1.00*	*0.92*
Hourly Flow Rate, HFR (veh/h)	*0*	*0*	*0*	*8*	*0*	*20*
Percent Heavy Vehicles	*0*	*0*	*0*	*2*	*0*	*2*
Percent Grade (%)		*0*			*0*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*0*			*0*
Lanes	*0*	*0*	*0*	*0*	*0*	*0*
Configuration					*LR*	

Delay, Queue Length, and Level of Service

Approach	Northbound	Southbound	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration		*L*		*LR*				
v (veh/h)		*8*		*28*				
C (m) (veh/h)		*1310*		*530*				
v/c		*0.01*		*0.05*				
95% queue length		*0.02*		*0.17*				
Control Delay (s/veh)		*7.8*		*12.2*				
LOS		*A*		*B*				
Approach Delay (s/veh)	--	--	*12.2*					
Approach LOS	--	--	*B*					

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TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	*JMS*	Intersection	*MO9 & Clark Avenue*
Agency/Co.	*Olsson Associates*	Jurisdiction	*City of Parkville, MO*
Date Performed	*03/14/2013*	Analysis Year	*Existing Conditions*
Analysis Time Period	*AM*		

Project Description *013-0508*

East/West Street: *Clark Ave* | North/South Street: *MO 9*

Intersection Orientation: *North-South* | Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)	*17*	*196*			*552*	*67*
Peak-Hour Factor, PHF	*0.39*	*0.86*	*1.00*	*1.00*	*0.94*	*0.80*
Hourly Flow Rate, HFR (veh/h)	*43*	*227*	*0*	*0*	*587*	*83*
Percent Heavy Vehicles	*2*	--	--	*0*	--	--
Median Type	*Undivided*					
RT Channelized			*0*			*0*
Lanes	*1*	*1*	*0*	*0*	*1*	*0*
Configuration	*L*	*T*				*TR*
Upstream Signal		*0*			*0*	

Minor Street	Eastbound			Westbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)	*39*		*12*			
Peak-Hour Factor, PHF	*0.61*	*1.00*	*0.75*	*1.00*	*1.00*	*1.00*
Hourly Flow Rate, HFR (veh/h)	*63*	*0*	*16*	*0*	*0*	*0*
Percent Heavy Vehicles	*2*	*0*	*2*	*0*	*0*	*0*
Percent Grade (%)		*0*			*0*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*0*			*0*
Lanes	*1*	*0*	*1*	*0*	*0*	*0*
Configuration	*L*		*R*			

Delay, Queue Length, and Level of Service

Approach	Northbound	Southbound	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	*L*					*L*		*R*
v (veh/h)	*43*					*63*		*16*
C (m) (veh/h)	*920*					*278*		*483*
v/c	*0.05*					*0.23*		*0.03*
95% queue length	*0.15*					*0.85*		*0.10*
Control Delay (s/veh)	*9.1*					*21.7*		*12.7*
LOS	*A*					*C*		*B*
Approach Delay (s/veh)	--	--				*19.9*		
Approach LOS	--	--				*C*		

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TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	*JMS*	Intersection	*MO9 & NW 62nd St.*
Agency/Co.	*Olsson Associates*	Jurisdiction	*City of Parkville, MO*
Date Performed	*03/14/2013*	Analysis Year	*Existing Conditions*
Analysis Time Period	*PM*		

Project Description *013-0508*

East/West Street: *NW 62nd* | North/South Street: *MO 9*

Intersection Orientation: *North-South* | Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)		*797*	*10*	*24*	*457*	
Peak-Hour Factor, PHF	*1.00*	*0.92*	*0.92*	*0.92*	*0.92*	*1.00*
Hourly Flow Rate, HFR (veh/h)	*0*	*866*	*10*	*26*	*496*	*0*
Percent Heavy Vehicles	*0*	--	--	*2*	--	--
Median Type	*Undivided*					
RT Channelized			*0*			*0*
Lanes	*0*	*1*	*0*	*1*	*1*	*0*
Configuration			*TR*	*L*	*T*	
Upstream Signal		*0*			*0*	

Minor Street	Eastbound			Westbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)				*2*		*21*
Peak-Hour Factor, PHF	*1.00*	*1.00*	*1.00*	*0.92*	*1.00*	*0.92*
Hourly Flow Rate, HFR (veh/h)	*0*	*0*	*0*	*2*	*0*	*22*
Percent Heavy Vehicles	*0*	*0*	*0*	*2*	*0*	*2*
Percent Grade (%)		*0*			*0*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*0*			*0*
Lanes	*0*	*0*	*0*	*0*	*0*	*0*
Configuration					*LR*	

Delay, Queue Length, and Level of Service

Approach	Northbound	Southbound	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration		*L*		*LR*				
v (veh/h)		*26*		*24*				
C (m) (veh/h)		*771*		*313*				
v/c		*0.03*		*0.08*				
95% queue length		*0.10*		*0.25*				
Control Delay (s/veh)		*9.8*		*17.5*				
LOS		*A*		*C*				
Approach Delay (s/veh)	--	--	*17.5*					
Approach LOS	--	--	*C*					

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TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	*JMS*	Intersection	*MO9 & Clark Avenue*
Agency/Co.	*Olsson Associates*	Jurisdiction	*City of Parkville, MO*
Date Performed	*03/14/2013*	Analysis Year	*Existing Conditions*
Analysis Time Period	*PM*		

Project Description *013-0508*

East/West Street: *Clark Ave* | North/South Street: *MO 9*

Intersection Orientation: *North-South* | Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)	*10*	*736*			*338*	*121*
Peak-Hour Factor, PHF	*0.63*	*0.88*	*1.00*	*1.00*	*0.90*	*0.95*
Hourly Flow Rate, HFR (veh/h)	*15*	*836*	*0*	*0*	*375*	*127*
Percent Heavy Vehicles	*2*	--	--	*0*	--	--
Median Type	*Undivided*					
RT Channelized			*0*			*0*
Lanes	*1*	*1*	*0*	*0*	*1*	*0*
Configuration	*L*	*T*				*TR*
Upstream Signal		*0*			*0*	

Minor Street	Eastbound			Westbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)	*71*		*24*			
Peak-Hour Factor, PHF	*0.89*	*1.00*	*0.67*	*1.00*	*1.00*	*1.00*
Hourly Flow Rate, HFR (veh/h)	*79*	*0*	*35*	*0*	*0*	*0*
Percent Heavy Vehicles	*2*	*0*	*2*	*0*	*0*	*0*
Percent Grade (%)		*0*			*0*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*0*			*0*
Lanes	*1*	*0*	*1*	*0*	*0*	*0*
Configuration	*L*		*R*			

Delay, Queue Length, and Level of Service

Approach	Northbound	Southbound	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	*L*					*L*		*R*
v (veh/h)	*15*					*79*		*35*
C (m) (veh/h)	*1062*					*174*		*619*
v/c	*0.01*					*0.45*		*0.06*
95% queue length	*0.04*					*2.12*		*0.18*
Control Delay (s/veh)	*8.4*					*41.8*		*11.2*
LOS	*A*					*E*		*B*
Approach Delay (s/veh)	--	--				*32.4*		
Approach LOS	--	--				*D*		

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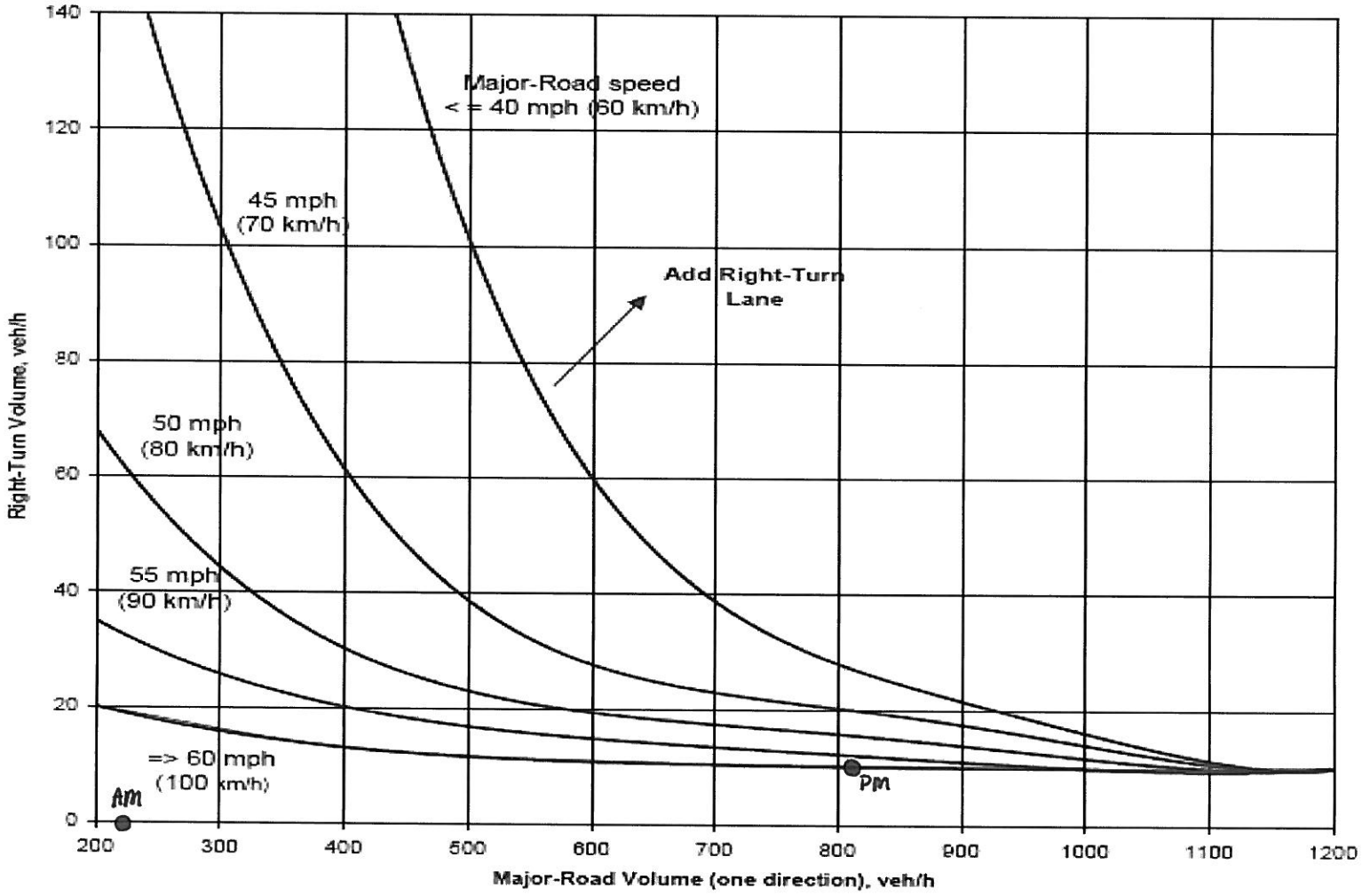
Turn Analysis

Right Turn Lane Analysis for Northbound MO 9 & NW 62nd Street (Existing Conditions)

	x	y
AM Point	235	0
PM Point	807	10

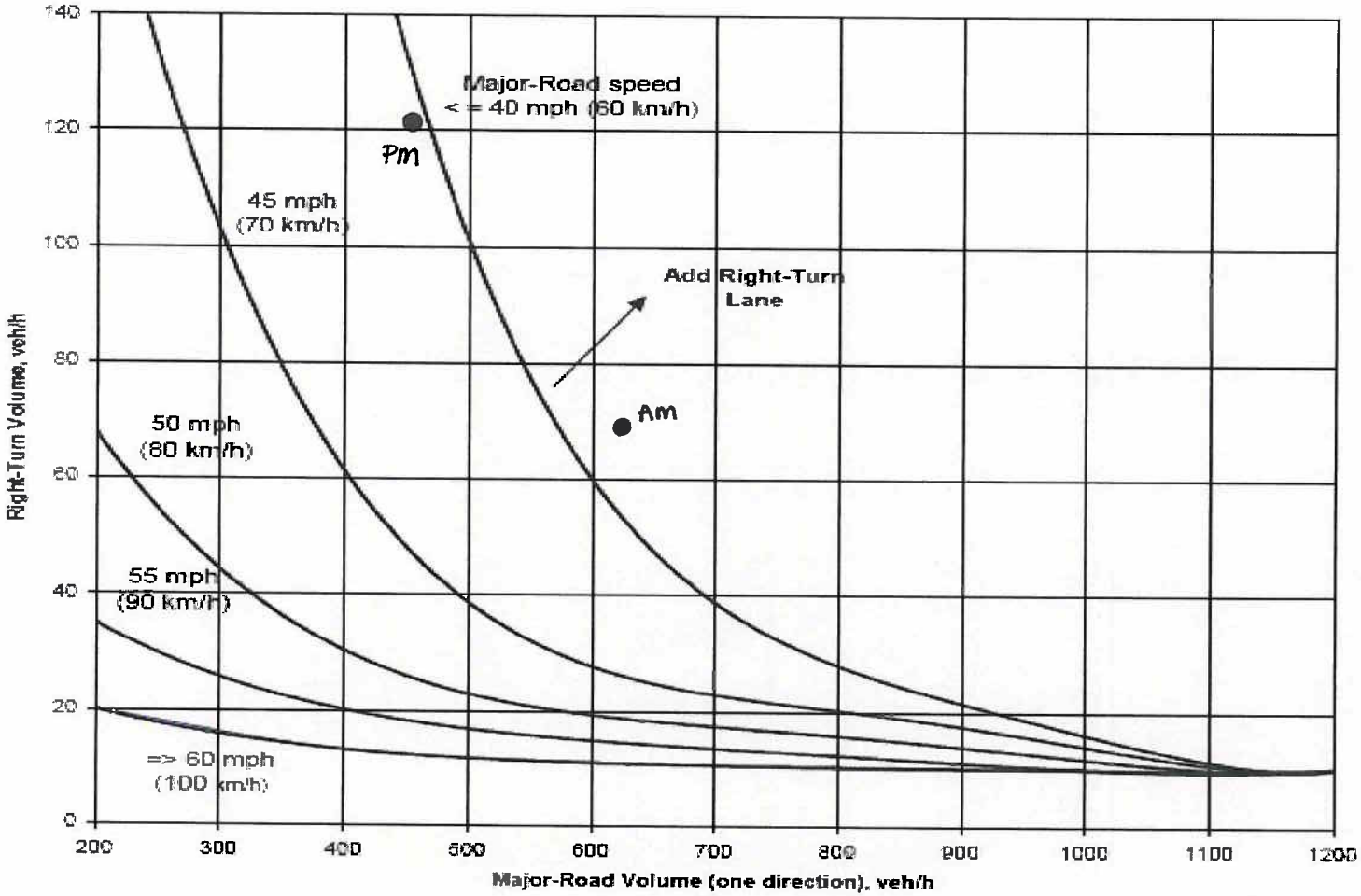
Time Period	Right Turn Volume	Through Volume	Major Road Speed	Major Road Volume
AM	0	235	35	235
PM	10	797	35	807



Right Turn Lane Analysis for Southbound MO 9 & Clark Avenue (Existing Conditions)

	x	y
AM Point	619	67
PM Point	459	121

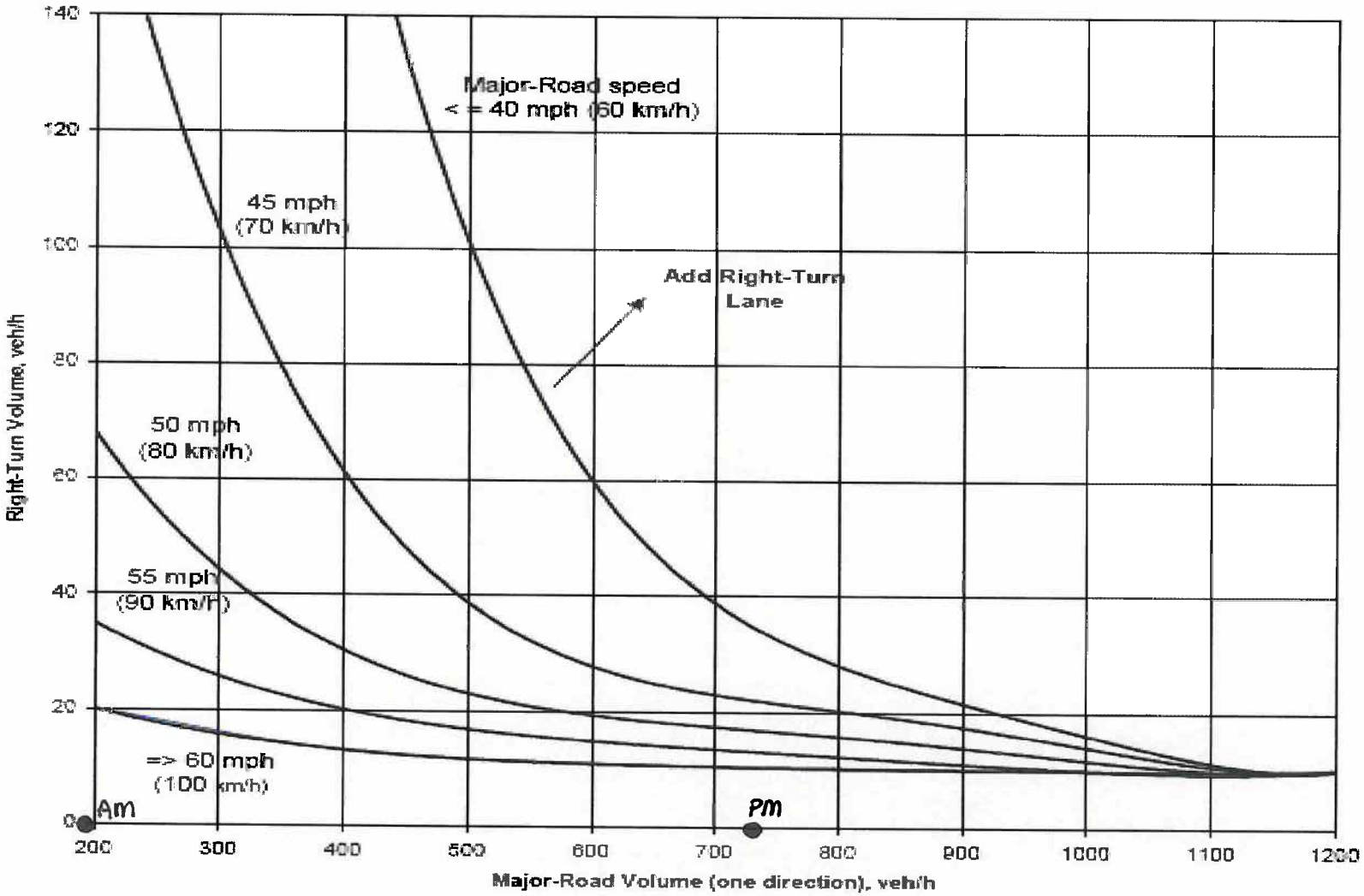
Time Period	Right Turn Volume	Through Volume	Major Road Speed	Major Road Volume
AM	67	552	35	619
PM	121	338	35	459



Right Turn Lane Analysis for Northbound MO 9 & Clark Avenue (Existing Conditions)

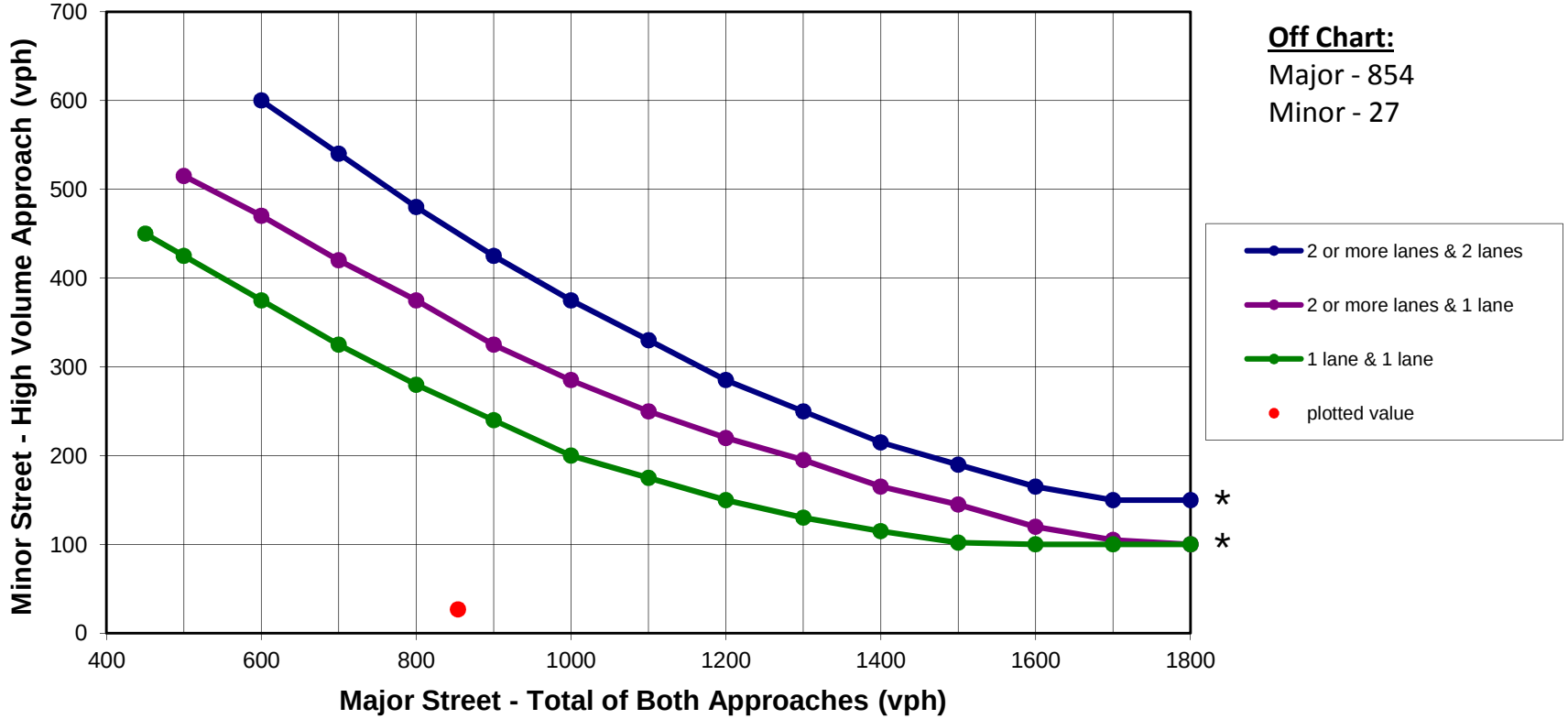
	x	y
AM Point	196	0
PM Point	736	0

Time Period	Right Turn Volume	Through Volume	Major Road Speed	Major Road Volume
AM	0	196	35	196
PM	0	736	35	736



Signal Warrant Analysis

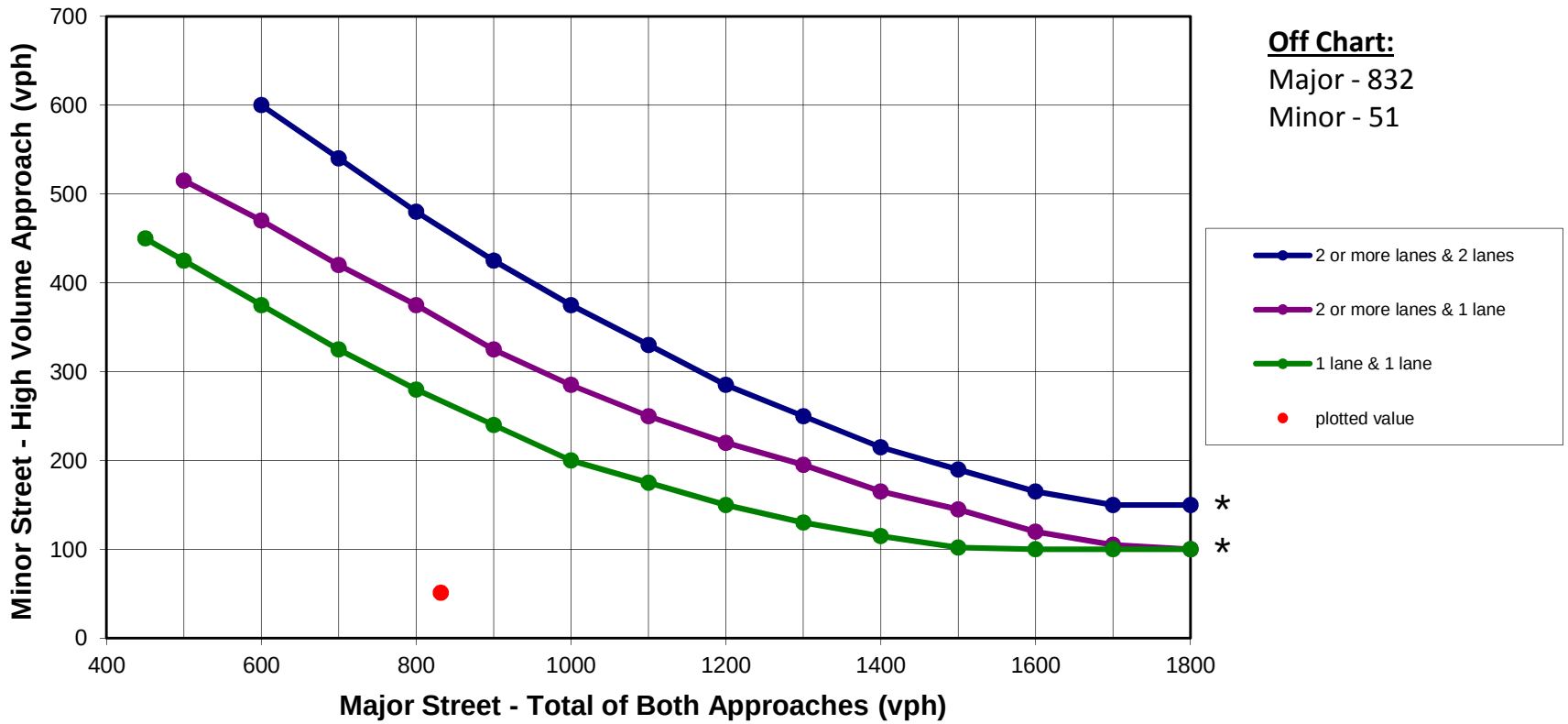
Existing AM Peak Hour Volume Warrant
Missouri Route 9 & NW 62nd Street



Off Chart:
Major - 854
Minor - 27

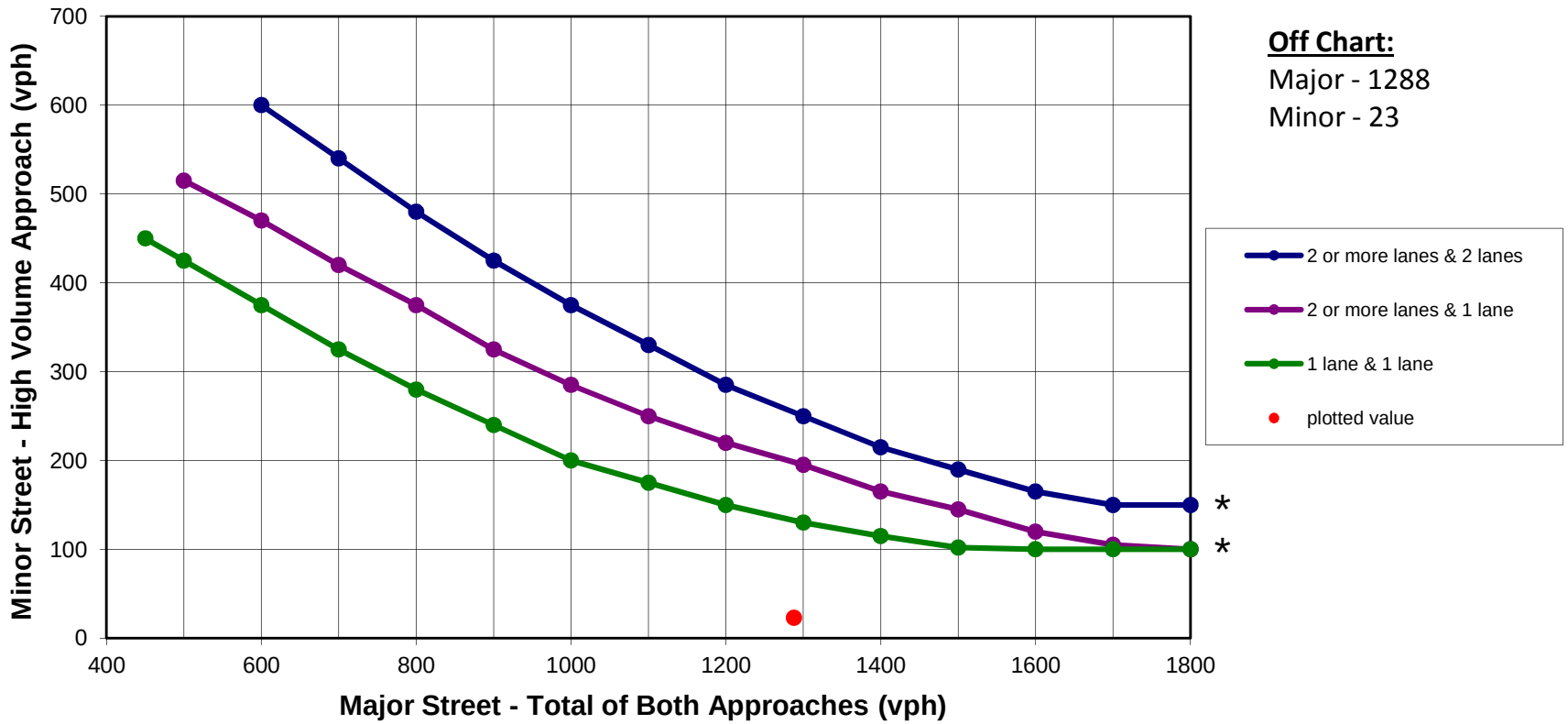
*Note: 150 vph applies as the lower threshold volume for a minor street approach with two or more lanes

Existing AM Peak Hour Volume Warrant
Missouri Route 9 & Clark Avenue



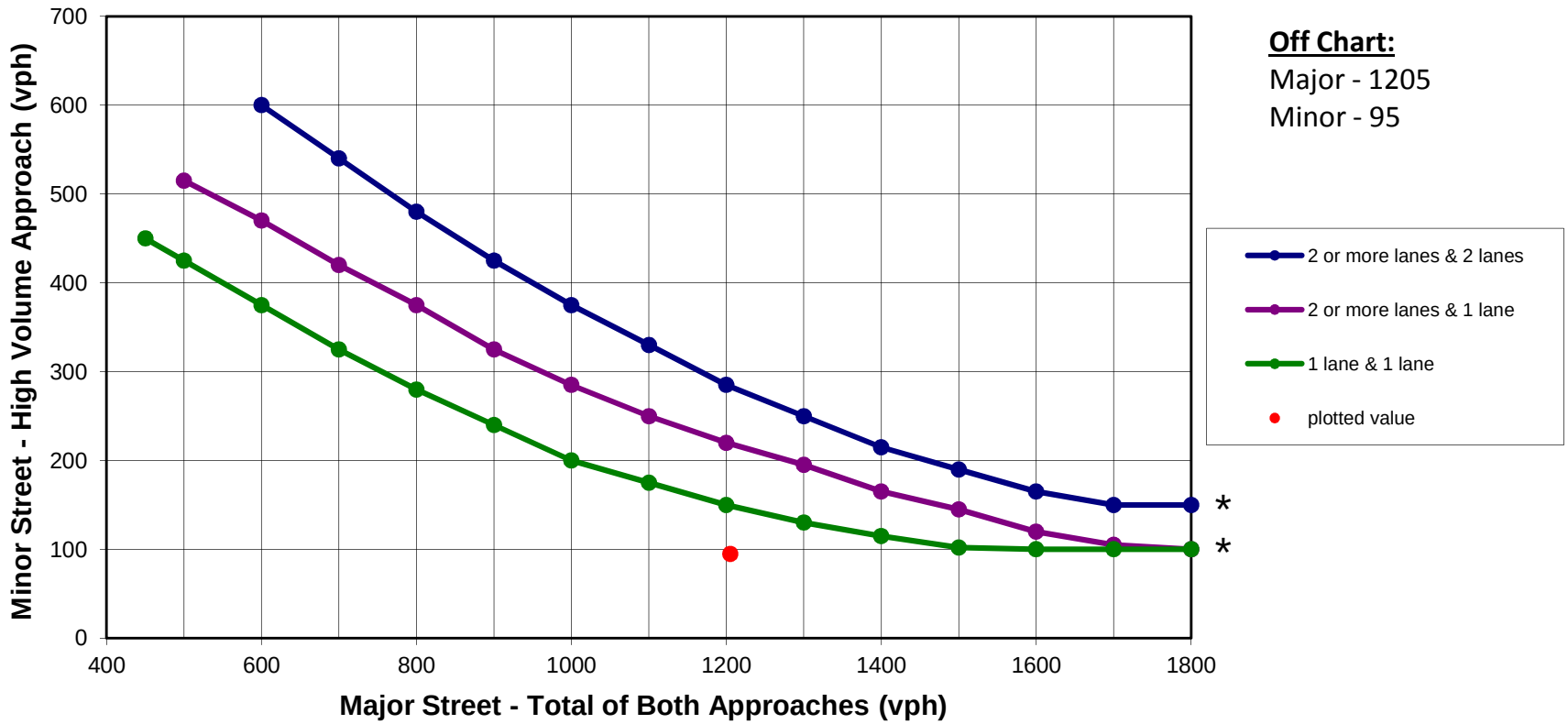
*Note: 150 vph applies as the lower threshold volume for a minor street approach with two or more lanes

Existing PM Peak Hour Volume Warrant
Missouri Route 9 & NW 62nd Street



*Note: 150 vph applies as the lower threshold volume for a minor street approach with two or more lanes

Existing PM Peak Hour Volume Warrant
Missouri Route 9 & Clark Avenue



*Note: 150 vph applies as the lower threshold volume for a minor street approach with two or more lanes

Daily Trip Generation

ITE Code/Page	Land Use	Size		Trip Gen. Avg. Rate/Eq.	Daily Trips	Trip Distribution Enter	Trip Distribution Exit	Daily Trips Enter	Daily Trips Exit
710/1259	General Office Building	28,000	SF	Equation	499	50%	50%	250	249
710/1259	General Office Building	28,000	SF	Equation	499	50%	50%	250	249
Total					**998**			**500**	**498**

AM Peak Hour Trip Generation

ITE Code/Page	Land Use	Size		Trip Gen. Avg. Rate/Eq.	AM Peak Hour Trips	Trip Distribution Enter	Trip Distribution Exit	AM Peak Hour Trips Enter	AM Peak Hour Trips Exit
710/1260	General Office Building	28,000	SF	Equation	70	88%	12%	62	8
710/1260	General Office Building	28,000	SF	Equation	70	88%	12%	62	8
Total					**140**			**124**	**16**

PM Peak Hour Trip Generation

ITE Code/Page	Land Use	Size		Trip Gen. Avg. Rate/Eq.	PM Peak Hour Trips	Trip Distribution Enter	Trip Distribution Exit	PM Peak Hour Trips Enter	PM Peak Hour Trips Exit
710/1261	General Office Building	28,000	SF	Equation	110	17%	83%	19	91
710/1261	General Office Building	28,000	SF	Equation	110	17%	83%	19	91
Total					**220**			**38**	**182**

Capacity Analysis

TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	*JMS*	Intersection	*MO9 & NW 62nd St.*
Agency/Co.	*Olsson Associates*	Jurisdiction	*City of Parkville, MO*
Date Performed	*03/14/2013*	Analysis Year	*Existing + Development*
Analysis Time Period	*AM*		

Project Description *013-0508*

East/West Street: *62nd St* | North/South Street: *MO 9*

Intersection Orientation: *North-South* | Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)		*247*	*0*	*8*	*614*	
Peak-Hour Factor, PHF	*1.00*	*0.92*	*0.92*	*0.92*	*0.92*	*1.00*
Hourly Flow Rate, HFR (veh/h)	*0*	*268*	*0*	*8*	*667*	*0*
Percent Heavy Vehicles	*0*	--	--	*2*	--	--
Median Type	*Undivided*					
RT Channelized			*0*			*0*
Lanes	*0*	*1*	*0*	*1*	*1*	*0*
Configuration			*TR*	*L*	*T*	
Upstream Signal		*0*			*0*	

Minor Street	Eastbound			Westbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)				*8*		*19*
Peak-Hour Factor, PHF	*1.00*	*1.00*	*1.00*	*0.92*	*1.00*	*0.92*
Hourly Flow Rate, HFR (veh/h)	*0*	*0*	*0*	*8*	*0*	*20*
Percent Heavy Vehicles	*0*	*0*	*0*	*2*	*0*	*2*
Percent Grade (%)	*0*			*0*		
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*0*			*0*
Lanes	*0*	*0*	*0*	*0*	*0*	*0*
Configuration					*LR*	

Delay, Queue Length, and Level of Service

Approach	Northbound	Southbound	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration		*L*		*LR*				
v (veh/h)		*8*		*28*				
C (m) (veh/h)		*1296*		*519*				
v/c		*0.01*		*0.05*				
95% queue length		*0.02*		*0.17*				
Control Delay (s/veh)		*7.8*		*12.3*				
LOS		*A*		*B*				
Approach Delay (s/veh)	--	--	*12.3*					
Approach LOS	--	--	*B*					

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TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	*JMS*	Intersection	*MO9 & Clark Avenue*
Agency/Co.	*Olsson Associates*	Jurisdiction	*City of Parkville, MO*
Date Performed	*03/14/2013*	Analysis Year	*Existing + Development*
Analysis Time Period	*AM*		

Project Description *013-0508*

East/West Street: *Clark Ave/Drive 1* North/South Street: *MO 9*

Intersection Orientation: *North-South* Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)	*17*	*196*	*3*	*3*	*552*	*67*
Peak-Hour Factor, PHF	*0.39*	*0.86*	*0.92*	*0.92*	*0.94*	*0.80*
Hourly Flow Rate, HFR (veh/h)	*43*	*227*	*3*	*3*	*587*	*83*
Percent Heavy Vehicles	*2*	--	--	*2*	--	--
Median Type	*Undivided*					
RT Channelized			*0*			*0*
Lanes	*1*	*1*	*0*	*1*	*1*	*0*
Configuration	*L*		*TR*	*L*		*TR*
Upstream Signal		*0*			*0*	

Minor Street	Eastbound			Westbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)	*39*	*0*	*12*	*10*	*1*	*12*
Peak-Hour Factor, PHF	*0.61*	*0.92*	*0.75*	*0.92*	*0.92*	*0.92*
Hourly Flow Rate, HFR (veh/h)	*63*	*0*	*16*	*10*	*1*	*13*
Percent Heavy Vehicles	*2*	*2*	*2*	*2*	*2*	*2*
Percent Grade (%)		*0*			*0*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*0*			*0*
Lanes	*1*	*1*	*0*	*1*	*1*	*0*
Configuration	*L*		*TR*	*L*		*TR*

Delay, Queue Length, and Level of Service

Approach	Northbound	Southbound	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	*L*	*L*	*L*		*TR*	*L*		*TR*
v (veh/h)	*43*	*3*	*10*		*14*	*63*		*16*
C (m) (veh/h)	*920*	*1338*	*222*		*690*	*225*		*483*
v/c	*0.05*	*0.00*	*0.05*		*0.02*	*0.28*		*0.03*
95% queue length	*0.15*	*0.01*	*0.14*		*0.06*	*1.11*		*0.10*
Control Delay (s/veh)	*9.1*	*7.7*	*22.0*		*10.3*	*27.1*		*12.7*
LOS	*A*	*A*	*C*		*B*	*D*		*B*
Approach Delay (s/veh)	--	--	*15.2*			*24.2*		
Approach LOS	--	--	*C*			*C*		

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TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	*JMS*	Intersection	*MO9 & NW 62nd St.*
Agency/Co.	*Olsson Associates*	Jurisdiction	*City of Parkville, MO*
Date Performed	*03/14/2013*	Analysis Year	*Existing + Development*
Analysis Time Period	*PM*		

Project Description *013-0508*

East/West Street: *62nd St* | North/South Street: *MO 9*

Intersection Orientation: *North-South* | Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)		*805*	*10*	*24*	*472*	
Peak-Hour Factor, PHF	*1.00*	*0.92*	*0.92*	*0.92*	*0.92*	*1.00*
Hourly Flow Rate, HFR (veh/h)	*0*	*874*	*10*	*26*	*513*	*0*
Percent Heavy Vehicles	*0*	--	--	*2*	--	--
Median Type	*Undivided*					
RT Channelized			*0*			*0*
Lanes	*0*	*1*	*0*	*1*	*1*	*0*
Configuration			*TR*	*L*	*T*	
Upstream Signal		*0*			*0*	

Minor Street	Eastbound			Westbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)				*2*		*21*
Peak-Hour Factor, PHF	*1.00*	*1.00*	*1.00*	*0.92*	*1.00*	*0.92*
Hourly Flow Rate, HFR (veh/h)	*0*	*0*	*0*	*2*	*0*	*22*
Percent Heavy Vehicles	*0*	*0*	*0*	*2*	*0*	*2*
Percent Grade (%)		*0*			*0*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*0*			*0*
Lanes	*0*	*0*	*0*	*0*	*0*	*0*
Configuration					*LR*	

Delay, Queue Length, and Level of Service

Approach	Northbound	Southbound	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration		*L*		*LR*				
v (veh/h)		*26*		*24*				
C (m) (veh/h)		*765*		*309*				
v/c		*0.03*		*0.08*				
95% queue length		*0.11*		*0.25*				
Control Delay (s/veh)		*9.9*		*17.6*				
LOS		*A*		*C*				
Approach Delay (s/veh)	--	--	*17.6*					
Approach LOS	--	--	*C*					

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TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	*JMS*	Intersection	*MO9 & Clark Avenue*
Agency/Co.	*Olsson Associates*	Jurisdiction	*City of Parkville, MO*
Date Performed	*03/14/2013*	Analysis Year	*Existing + Development*
Analysis Time Period	*PM*		

Project Description *013-0508*

East/West Street: *Clark Ave/Drive 1* | North/South Street: *MO 9*

Intersection Orientation: *North-South* | Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)	*10*	*736*	*14*	*15*	*338*	*121*
Peak-Hour Factor, PHF	*0.63*	*0.88*	*0.92*	*0.92*	*0.90*	*0.95*
Hourly Flow Rate, HFR (veh/h)	*15*	*836*	*15*	*16*	*375*	*127*
Percent Heavy Vehicles	*2*	--	--	*2*	--	--
Median Type	*Undivided*					
RT Channelized			*0*			*0*
Lanes	*1*	*1*	*0*	*1*	*1*	*0*
Configuration	*L*		*TR*	*L*		*TR*
Upstream Signal		*0*			*0*	

Minor Street	Eastbound			Westbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)	*71*	*1*	*24*	*7*	*1*	*8*
Peak-Hour Factor, PHF	*0.89*	*0.92*	*0.67*	*0.92*	*0.92*	*0.92*
Hourly Flow Rate, HFR (veh/h)	*79*	*1*	*35*	*7*	*1*	*8*
Percent Heavy Vehicles	*2*	*2*	*2*	*2*	*2*	*2*
Percent Grade (%)		*0*			*0*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*0*			*0*
Lanes	*1*	*1*	*0*	*1*	*1*	*0*
Configuration	*L*		*TR*	*L*		*TR*

Delay, Queue Length, and Level of Service

Approach	Northbound	Southbound	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	*L*	*L*	*L*		*TR*	*L*		*TR*
v (veh/h)	*15*	*16*	*7*		*9*	*79*		*36*
C (m) (veh/h)	*1062*	*788*	*114*		*305*	*121*		*567*
v/c	*0.01*	*0.02*	*0.06*		*0.03*	*0.65*		*0.06*
95% queue length	*0.04*	*0.06*	*0.19*		*0.09*	*3.42*		*0.20*
Control Delay (s/veh)	*8.4*	*9.7*	*38.6*		*17.2*	*78.5*		*11.8*
LOS	*A*	*A*	*E*		*C*	*F*		*B*
Approach Delay (s/veh)	--	--	*26.6*			*57.6*		
Approach LOS	--	--	*D*			*F*		

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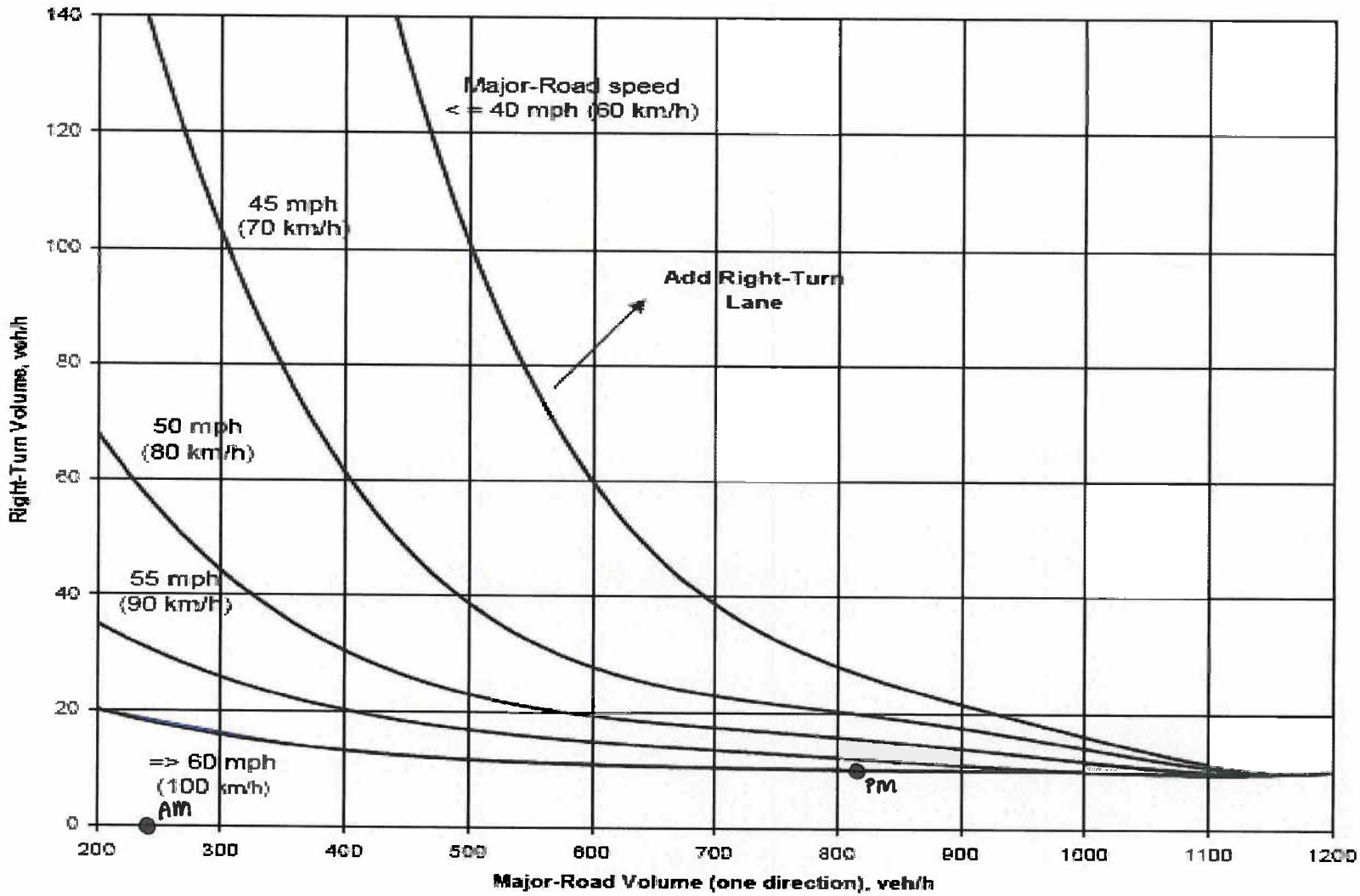
Turn Analysis

Right Turn Lane Analysis for Northbound MO 9 & NW 62nd Street (Existing + Development Conditions)

	x	y
AM Point	247	0
PM Point	815	10

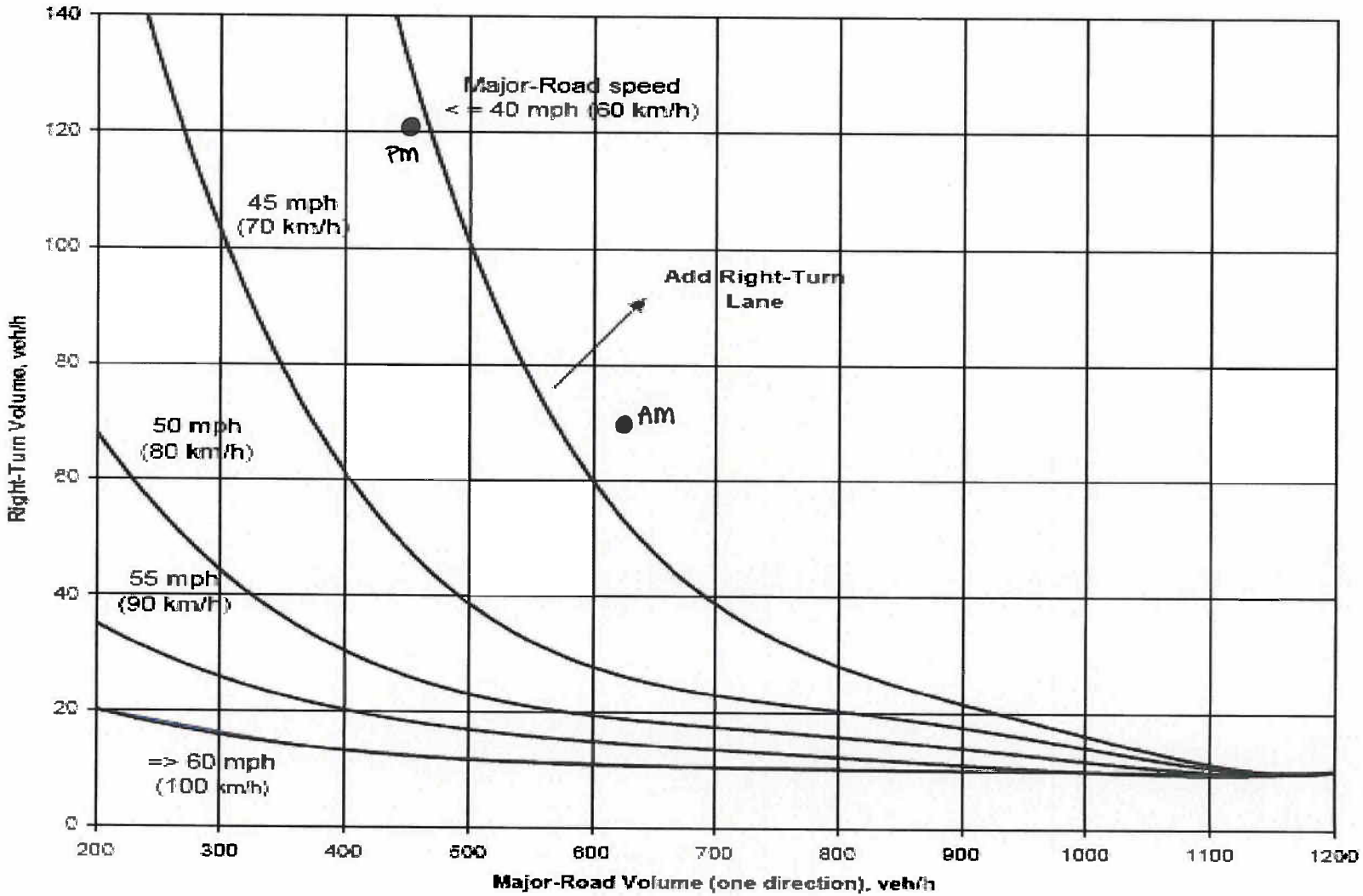
Time Period	Right Turn Volume	Through Volume	Major Road Speed	Major Road Volume
AM	0	247	35	247
PM	10	805	35	815



Right Turn Lane Analysis for Southbound MO 9 & Clark Avenue (Existing + Development Conditions)

	x	y
AM Point	619	67
PM Point	459	121

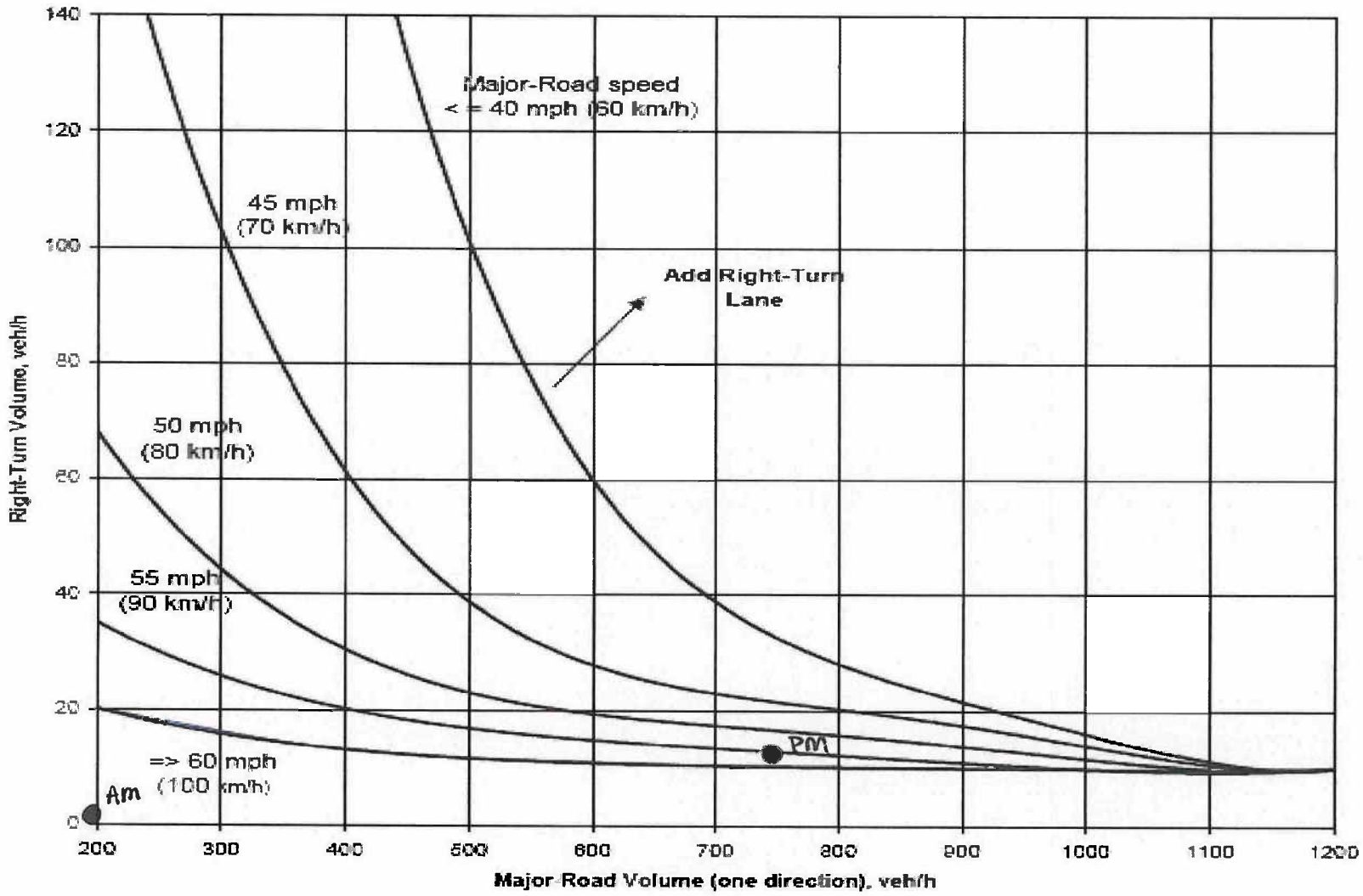
Time Period	Right Turn Volume	Through Volume	Major Road Speed	Major Road Volume
AM	67	552	35	619
PM	121	338	35	459



Right Turn Lane Analysis for Northbound MO 9 & Clark Avenue (Existing + Development Conditions)

	x	y
AM Point	199	3
PM Point	750	14

Time Period	Right Turn Volume	Through Volume	Major Road Speed	Major Road Volume
AM	3	196	35	199
PM	14	736	35	750



Left Turn Lane Analysis for Southbound MO 9 & Clark Avenue/Drive 1 (Existing + Development Conditions)

	x	y
AM Point	622	213
PM Point	474	746

Time Period	Opposing Volume	Advancing Volume	Operating Speed	Left Turn Volume	Percent Left-Turns
AM	213	622	35	3	0%
PM	746	474	35	15	2%

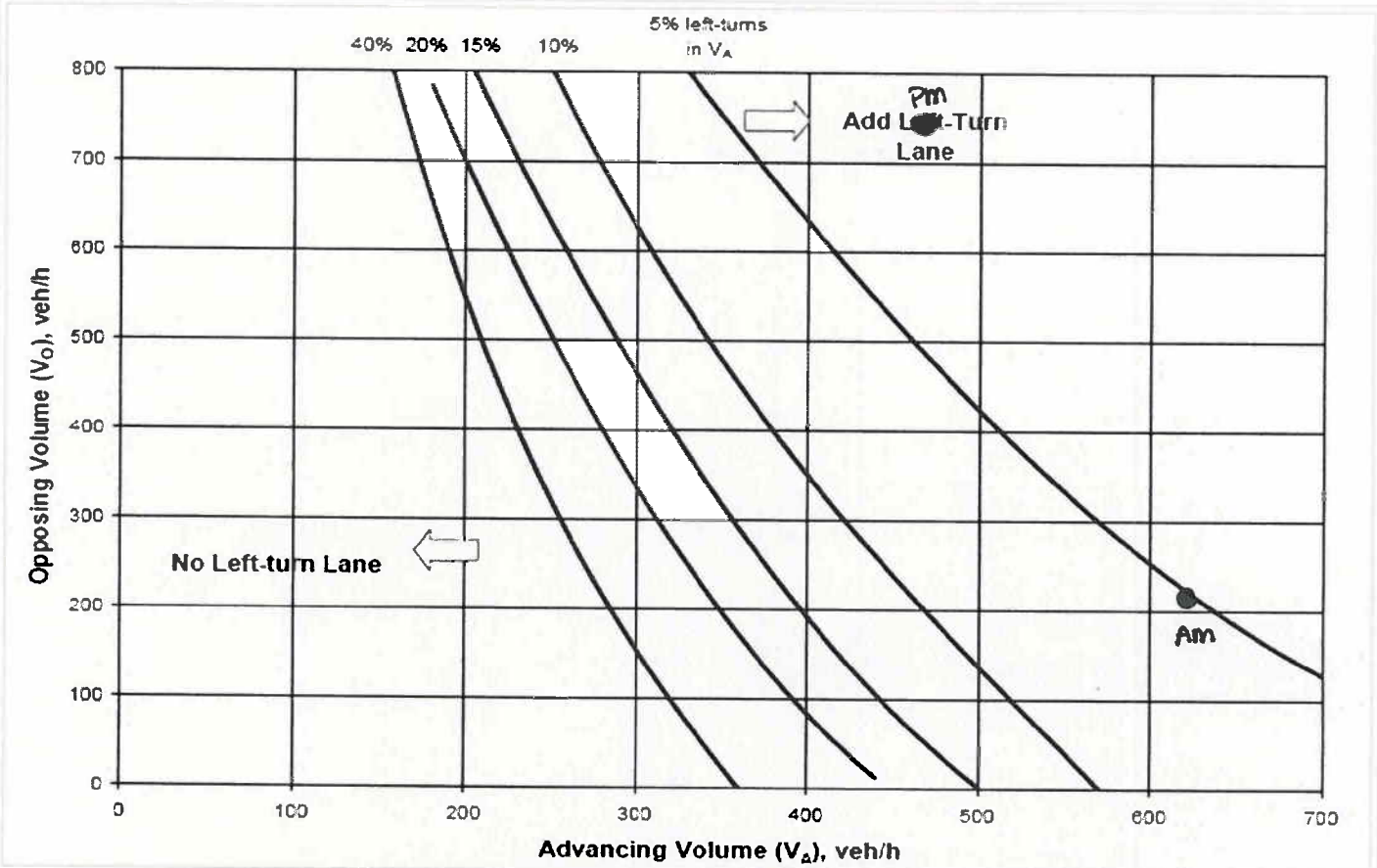
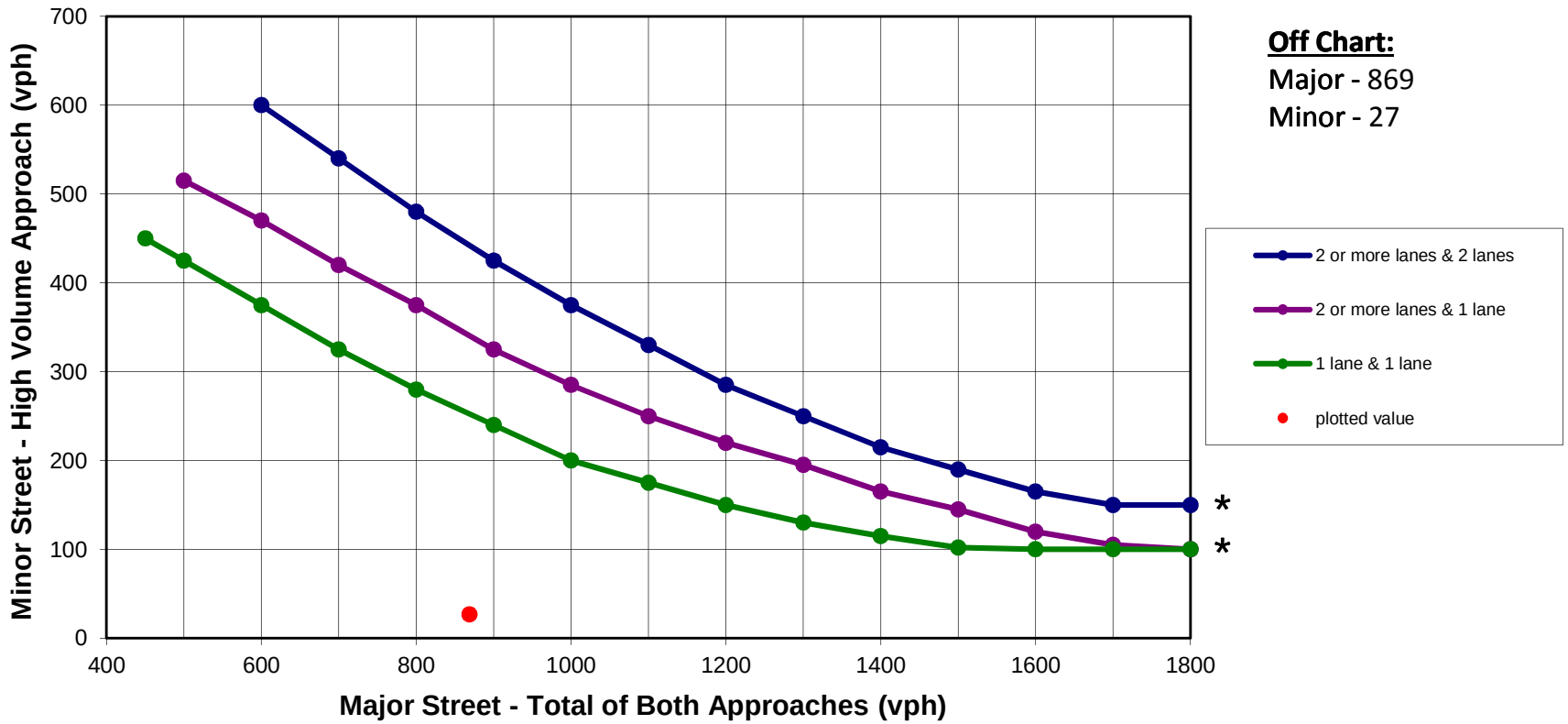


Figure 940.9.1, Left Turn Lane Guidelines for Two-Lane Road less than or equal to 40 mph

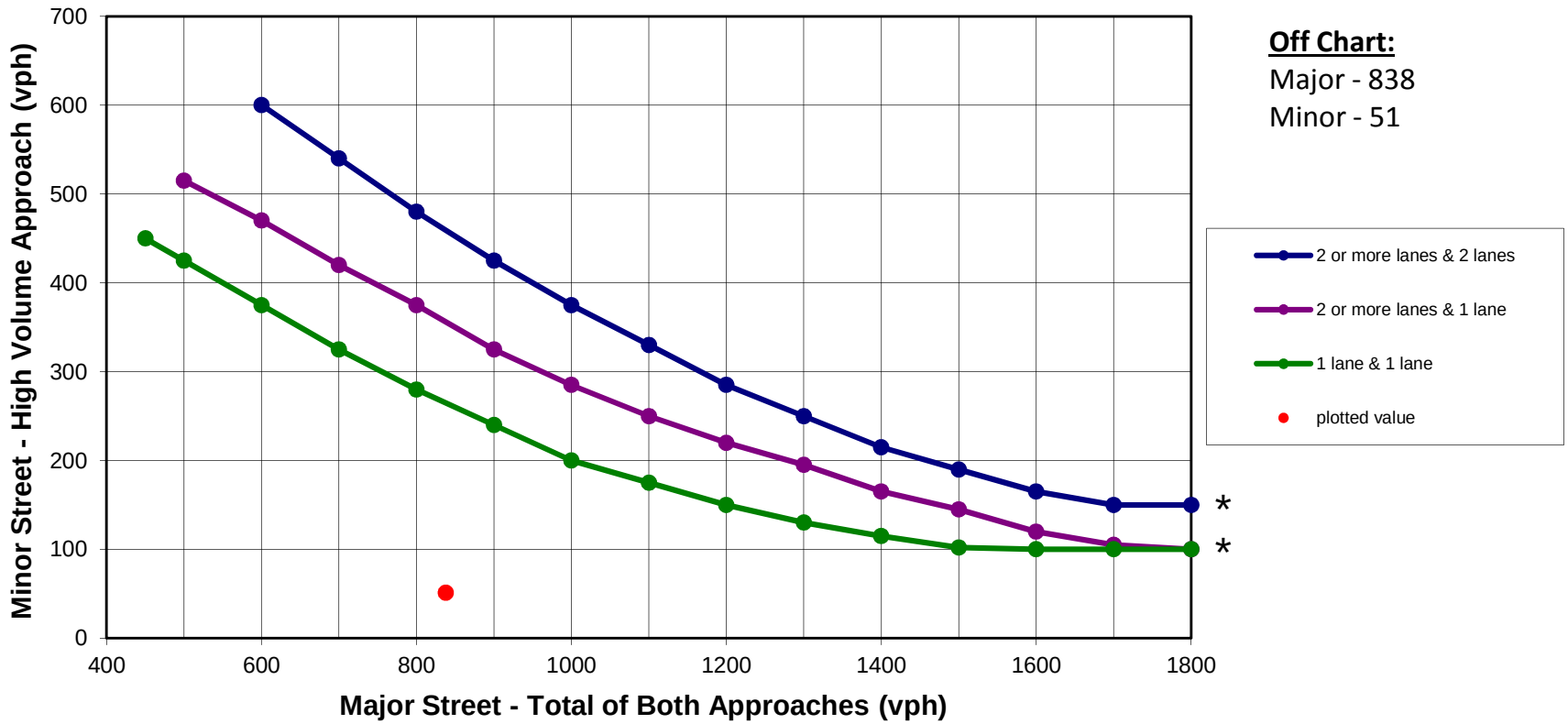
Signal Warrant Analysis

Existing + Development AM Peak Hour Volume Warrant
Missouri Route 9 & NW 62nd Street



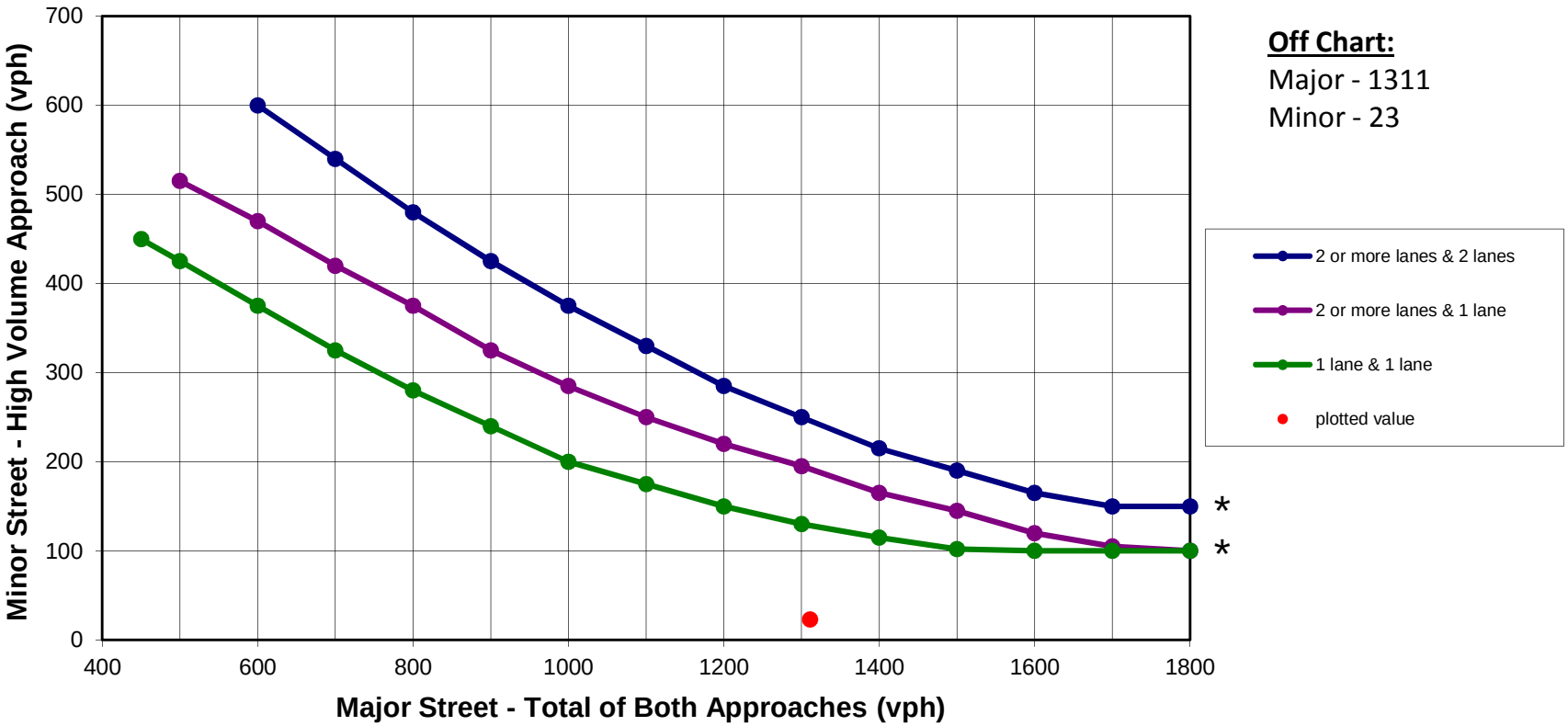
*Note: 150 vph applies as the lower threshold volume for a minor street approach with two or more lanes

Existing + Development AM Peak Hour Volume Warrant
Missouri Route 9 & Clark Avenue



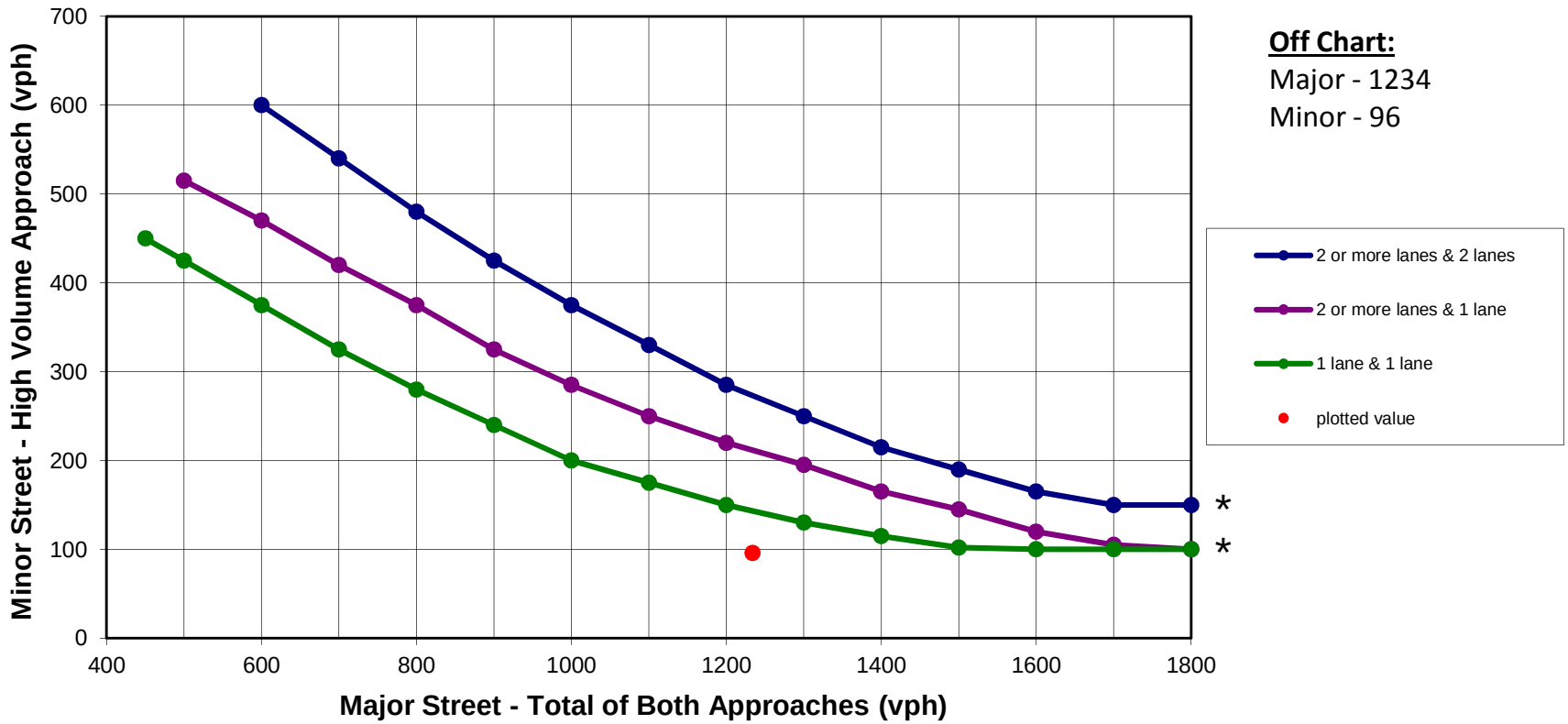
*Note: 150 vph applies as the lower threshold volume for a minor street approach with two or more lanes

Existing + Development PM Peak Hour Volume Warrant
Missouri Route 9 & NW 62nd Street



*Note: 150 vph applies as the lower threshold volume for a minor street approach with two or more lanes

Existing + Development PM Peak Hour Volume Warrant
Missouri Route 9 & Clark Avenue



*Note: 150 vph applies as the lower threshold volume for a minor street approach with two or more lanes

Growth Volumes

AM Future Volumes for Parkville Commons Development

Route 9 and NW 62nd Street												
	Eastbound			*Westbound*			*Northbound*			*Southbound*		
Year	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
2012	0	0	0	8	0	19	0	247	0	8	614	0
Growth	0.01			0.01			0.01			0.01		
Future Year	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
2032	0	0	0	8	0	19	0	301	0	8	749	0

Route 9 and Clark Avenue												
	Eastbound			*Westbound*			*Northbound*			*Southbound*		
Year	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
2012	39	0	12	10	1	12	17	196	3	3	552	67
Growth	0.01			0.01			0.01			0.01		
Future Year	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
2032	39	0	12	10	1	12	17	239	3	3	674	67

Future Year Volume = (Current Year Volume)*(1+Rate)^(time)

*Development trips added to future volumes in **Figure 10**

PM Future Volumes for Parkville Commons Development

Route 9 and NW 62nd Street												
	Eastbound			*Westbound*			*Northbound*			*Southbound*		
Year	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
2012	0	0	0	2	0	21	0	805	10	24	472	0
Annual Growth Rate	0.01			0.01			0.01			0.01		
Future Year	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
2032	0	0	0	2	0	21	0	982	10	24	576	0

Route 9 and Clark Avenue												
	Eastbound			*Westbound*			*Northbound*			*Southbound*		
Year	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
2012	71	1	24	7	1	8	10	736	14	15	338	121
Annual Growth Rate	0.01			0.01			0.01			0.01		
Future Year	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
2032	71	1	24	7	1	8	10	898	14	15	412	121

Capacity Analysis

TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	*JMS*	Intersection	*MO9 & NW 62nd St.*
Agency/Co.	*Olsson Associates*	Jurisdiction	*City of Parkville, MO*
Date Performed	*03/14/2013*	Analysis Year	*Future Year 2033*
Analysis Time Period	*AM*		

Project Description *013-0508*

East/West Street: *62nd St* | North/South Street: *MO 9*

Intersection Orientation: *North-South* | Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)		*301*	*0*	*8*	*749*	
Peak-Hour Factor, PHF	*1.00*	*0.92*	*0.92*	*0.92*	*0.92*	*1.00*
Hourly Flow Rate, HFR (veh/h)	*0*	*327*	*0*	*8*	*814*	*0*
Percent Heavy Vehicles	*0*	--	--	*2*	--	--
Median Type	*Undivided*					
RT Channelized			*0*			*0*
Lanes	*0*	*1*	*0*	*1*	*1*	*0*
Configuration			*TR*	*L*	*T*	
Upstream Signal		*0*			*0*	

Minor Street	Eastbound			Westbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)				*8*		*19*
Peak-Hour Factor, PHF	*1.00*	*1.00*	*1.00*	*0.92*	*1.00*	*0.92*
Hourly Flow Rate, HFR (veh/h)	*0*	*0*	*0*	*8*	*0*	*20*
Percent Heavy Vehicles	*0*	*0*	*0*	*2*	*0*	*2*
Percent Grade (%)		*0*			*0*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*0*			*0*
Lanes	*0*	*0*	*0*	*0*	*0*	*0*
Configuration					*LR*	

Delay, Queue Length, and Level of Service

Approach	Northbound	Southbound	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration		*L*		*LR*				
v (veh/h)		*8*		*28*				
C (m) (veh/h)		*1233*		*430*				
v/c		*0.01*		*0.07*				
95% queue length		*0.02*		*0.21*				
Control Delay (s/veh)		*7.9*		*14.0*				
LOS		*A*		*B*				
Approach Delay (s/veh)	--	--	*14.0*					
Approach LOS	--	--	*B*					

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TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	*JMS*	Intersection	*MO9 & Clark Avenue/Drive 1*
Agency/Co.	*Olsson Associates*	Jurisdiction	*City of Parkville, MO*
Date Performed	*03/14/2013*	Analysis Year	*Future Year 2033*
Analysis Time Period	*AM*		

Project Description *013-0508*

East/West Street: *Clark Avenue/Drive 1* | North/South Street: *MO 9*

Intersection Orientation: *North-South* | Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)	*17*	*250*	*3*	*3*	*687*	*67*
Peak-Hour Factor, PHF	*0.39*	*0.92*	*0.92*	*0.92*	*0.92*	*0.80*
Hourly Flow Rate, HFR (veh/h)	*43*	*271*	*3*	*3*	*746*	*83*
Percent Heavy Vehicles	*2*	--	--	*2*	--	--
Median Type	*Undivided*					
RT Channelized			*0*			*0*
Lanes	*1*	*1*	*0*	*1*	*1*	*0*
Configuration	*L*		*TR*	*L*		*TR*
Upstream Signal		*0*			*0*	

Minor Street	Eastbound			Westbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)	*39*	*0*	*12*	*10*	*1*	*12*
Peak-Hour Factor, PHF	*0.61*	*0.92*	*0.75*	*0.92*	*0.92*	*0.92*
Hourly Flow Rate, HFR (veh/h)	*63*	*0*	*16*	*10*	*1*	*13*
Percent Heavy Vehicles	*2*	*2*	*2*	*2*	*2*	*2*
Percent Grade (%)	*0*			*0*		
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*0*			*0*
Lanes	*1*	*1*	*0*	*1*	*1*	*0*
Configuration	*L*		*TR*	*L*		*TR*

Delay, Queue Length, and Level of Service

Approach	Northbound	Southbound	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	*L*	*L*	*L*		*TR*	*L*		*TR*
v (veh/h)	*43*	*3*	*10*		*14*	*63*		*16*
C (m) (veh/h)	*803*	*1289*	*158*		*620*	*161*		*391*
v/c	*0.05*	*0.00*	*0.06*		*0.02*	*0.39*		*0.04*
95% queue length	*0.17*	*0.01*	*0.20*		*0.07*	*1.69*		*0.13*
Control Delay (s/veh)	*9.7*	*7.8*	*29.3*		*10.9*	*41.1*		*14.6*
LOS	*A*	*A*	*D*		*B*	*E*		*B*
Approach Delay (s/veh)	--	--	*18.6*			*35.7*		
Approach LOS	--	--	*C*			*E*		

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TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	*JMS*	Intersection	*MO9 & NW 62nd St.*
Agency/Co.	*Olsson Associates*	Jurisdiction	*City of Parkville, MO*
Date Performed	*03/14/2013*	Analysis Year	*Future Year 2033*
Analysis Time Period	*PM*		

Project Description *013-0508*

East/West Street: *62nd St* | North/South Street: *MO 9*

Intersection Orientation: *North-South* | Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)		*982*	*10*	*24*	*576*	
Peak-Hour Factor, PHF	*1.00*	*0.92*	*0.92*	*0.92*	*0.92*	*1.00*
Hourly Flow Rate, HFR (veh/h)	*0*	*1067*	*10*	*26*	*626*	*0*
Percent Heavy Vehicles	*0*	--	--	*2*	--	--
Median Type	*Undivided*					
RT Channelized			*0*			*0*
Lanes	*0*	*1*	*0*	*1*	*1*	*0*
Configuration			*TR*	*L*	*T*	
Upstream Signal		*0*			*0*	

Minor Street	Eastbound			Westbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)				*2*		*21*
Peak-Hour Factor, PHF	*1.00*	*1.00*	*1.00*	*0.92*	*1.00*	*0.92*
Hourly Flow Rate, HFR (veh/h)	*0*	*0*	*0*	*2*	*0*	*22*
Percent Heavy Vehicles	*0*	*0*	*0*	*2*	*0*	*2*
Percent Grade (%)		*0*			*0*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*0*			*0*
Lanes	*0*	*0*	*0*	*0*	*0*	*0*
Configuration					*LR*	

Delay, Queue Length, and Level of Service

Approach	Northbound	Southbound	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration		*L*		*LR*				
v (veh/h)		*26*		*24*				
C (m) (veh/h)		*647*		*230*				
v/c		*0.04*		*0.10*				
95% queue length		*0.13*		*0.34*				
Control Delay (s/veh)		*10.8*		*22.5*				
LOS		*B*		*C*				
Approach Delay (s/veh)	--	--	*22.5*					
Approach LOS	--	--	*C*					

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TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	*JMS*	Intersection	*MO9 & Clark Avenue/Drive 1*
Agency/Co.	*Olsson Associates*	Jurisdiction	*City of Parkville, MO*
Date Performed	*03/14/2013*	Analysis Year	*Future Year 2033*
Analysis Time Period	*PM*		

Project Description *013-0508*

East/West Street: *Clark Avenue/Drive 1* | North/South Street: *MO 9*

Intersection Orientation: *North-South* | Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)	*10*	*913*	*14*	*15*	*442*	*121*
Peak-Hour Factor, PHF	*0.63*	*0.92*	*0.92*	*0.92*	*0.92*	*0.95*
Hourly Flow Rate, HFR (veh/h)	*15*	*992*	*15*	*16*	*480*	*127*
Percent Heavy Vehicles	*2*	--	--	*2*	--	--
Median Type	*Undivided*					
RT Channelized			*0*			*0*
Lanes	*1*	*1*	*0*	*1*	*1*	*0*
Configuration	*L*		*TR*	*L*		*TR*
Upstream Signal		*0*			*0*	

Minor Street	Eastbound			Westbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)	*71*	*1*	*24*	*7*	*1*	*8*
Peak-Hour Factor, PHF	*0.89*	*0.92*	*0.67*	*0.92*	*0.92*	*0.92*
Hourly Flow Rate, HFR (veh/h)	*79*	*1*	*35*	*7*	*1*	*8*
Percent Heavy Vehicles	*2*	*2*	*2*	*2*	*2*	*2*
Percent Grade (%)		*0*			*0*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*0*			*0*
Lanes	*1*	*1*	*0*	*1*	*1*	*0*
Configuration	*L*		*TR*	*L*		*TR*

Delay, Queue Length, and Level of Service

Approach	Northbound	Southbound	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	*L*	*L*	*L*		*TR*	*L*		*TR*
v (veh/h)	*15*	*16*	*7*		*9*	*79*		*36*
C (m) (veh/h)	*971*	*688*	*74*		*237*	*79*		*480*
v/c	*0.02*	*0.02*	*0.09*		*0.04*	*1.00*		*0.08*
95% queue length	*0.05*	*0.07*	*0.30*		*0.12*	*5.44*		*0.24*
Control Delay (s/veh)	*8.8*	*10.4*	*58.7*		*20.8*	*193.8*		*13.1*
LOS	*A*	*B*	*F*		*C*	*F*		*B*
Approach Delay (s/veh)	--	--	*37.4*			*137.2*		
Approach LOS	--	--	*E*			*F*		

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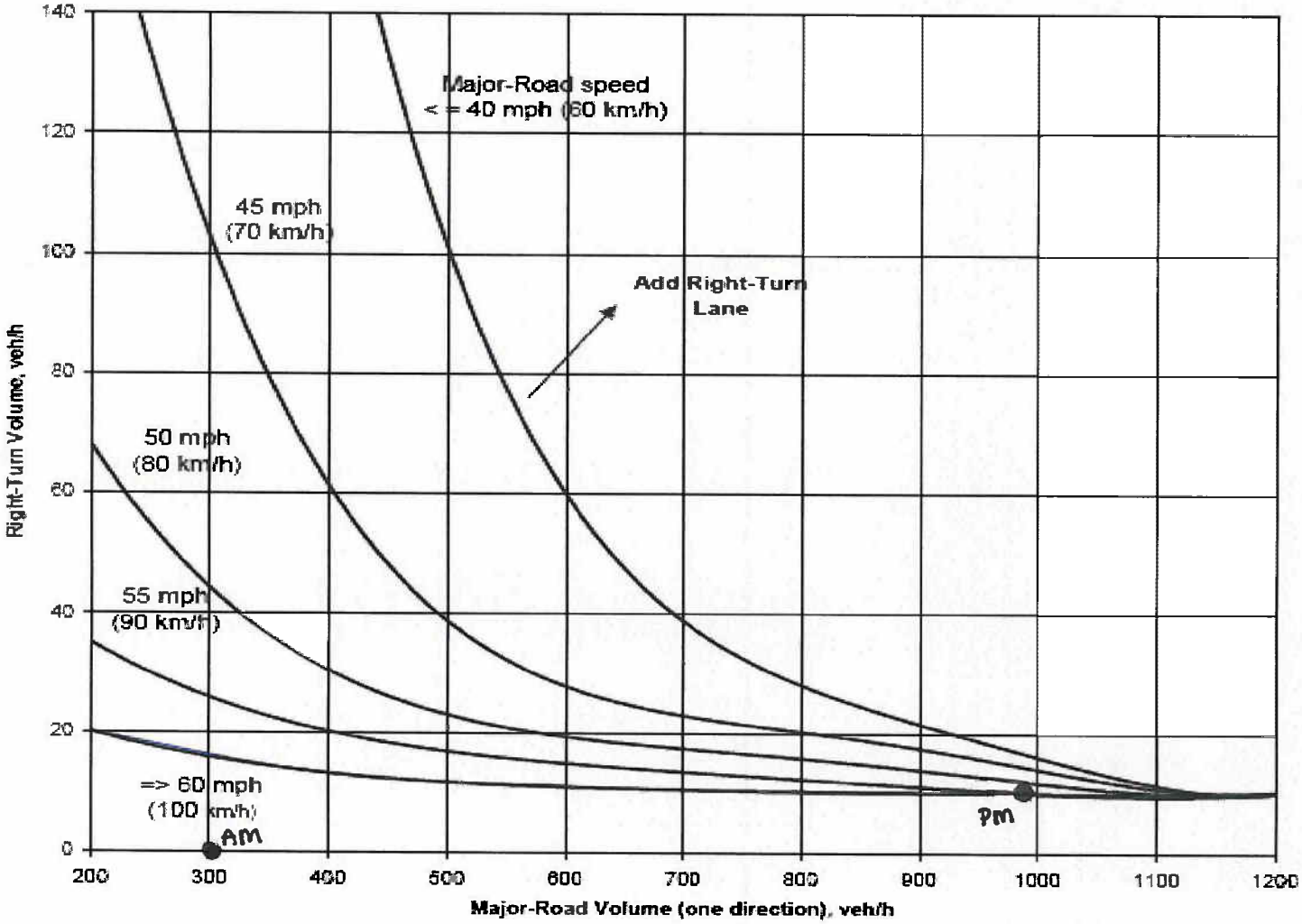
Turn Analysis

Right Turn Lane Analysis for Northbound MO 9 & NW 62nd Street (Future Conditions)

	x	y
AM Point	301	0
PM Point	992	10

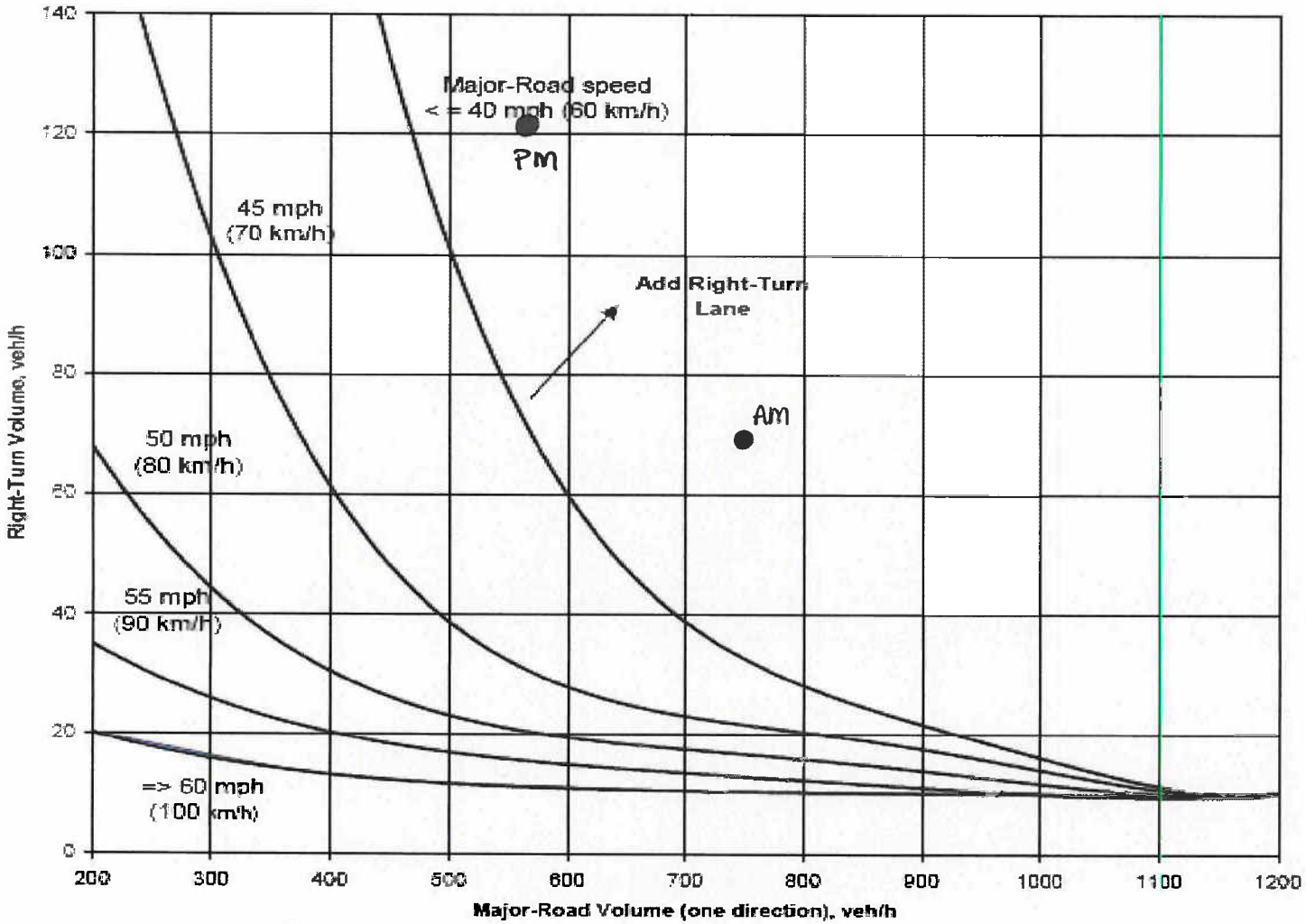
Time Period	Right Turn Volume	Through Volume	Major Road Speed	Major Road Volume
AM	0	301	35	301
PM	10	982	35	992



Right Turn Lane Analysis for Southbound MO 9 & Clark Avenue (Future Conditions)

	x	y
AM Point	754	67
PM Point	563	121

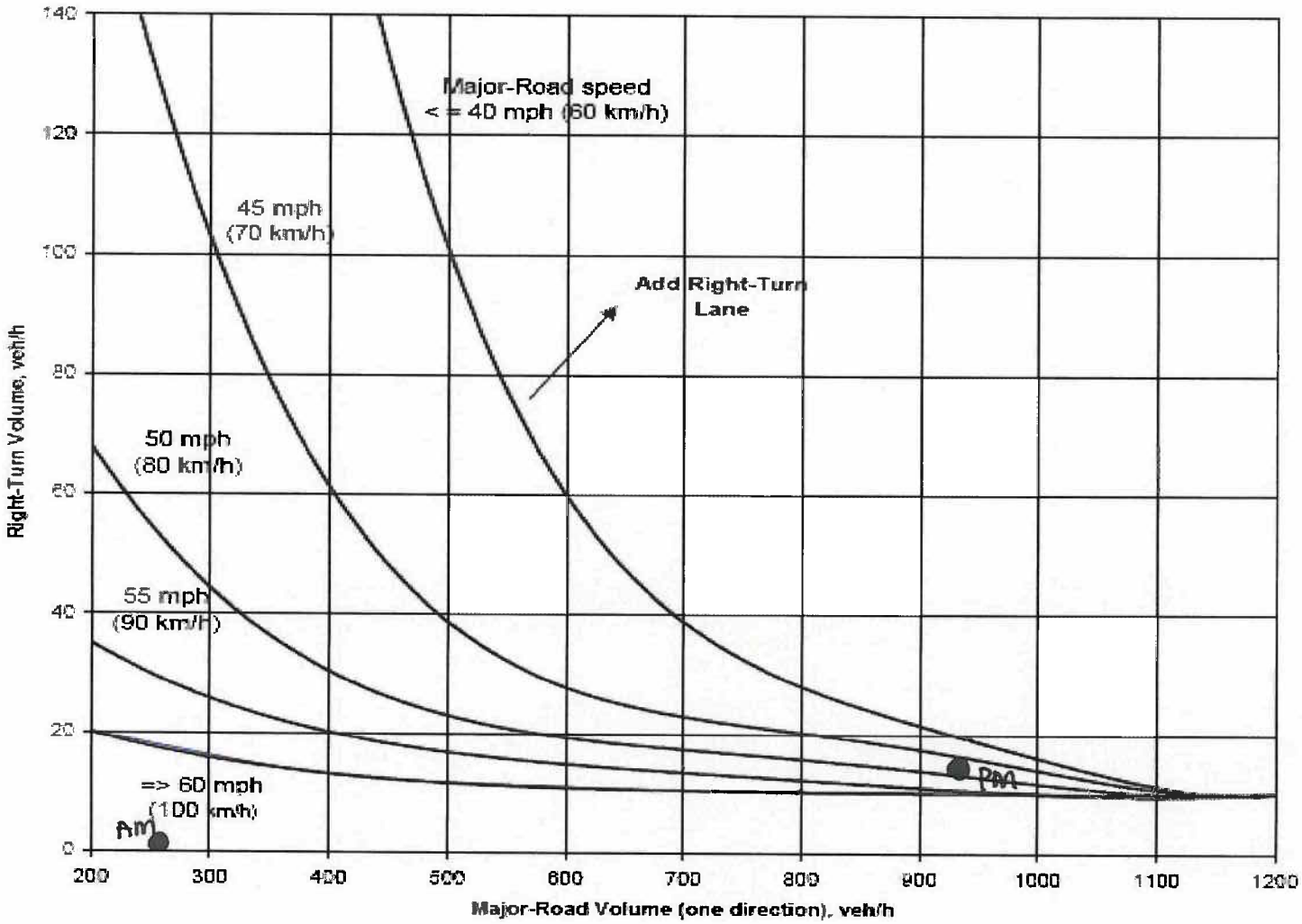
Time Period	Right Turn Volume	Through Volume	Major Road Speed	Major Road Volume
AM	67	687	35	754
PM	121	442	35	563



Right Turn Lane Analysis for Northbound MO 9 & Clark Avenue (Future Conditions)

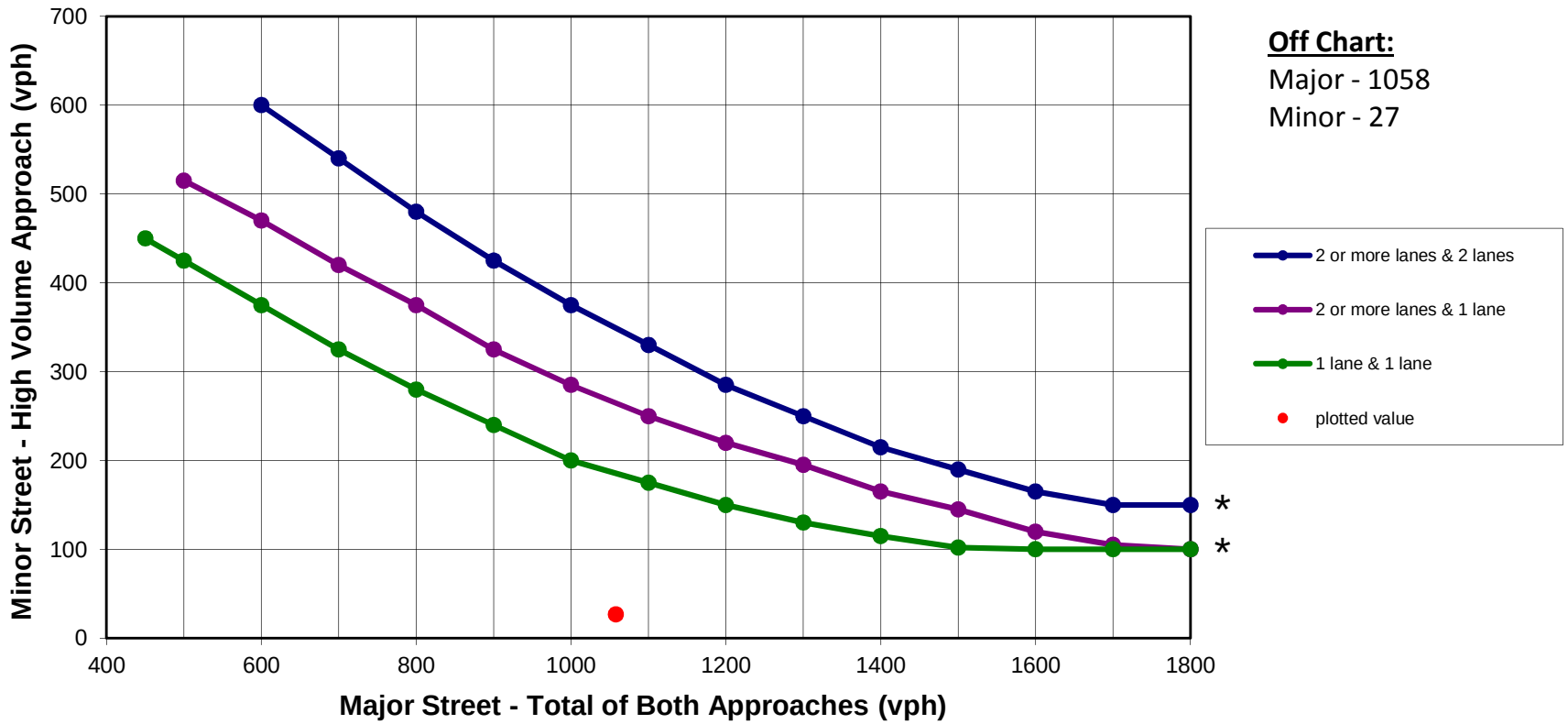
	x	y
AM Point	253	3
PM Point	927	14

Time Period	Right Turn Volume	Through Volume	Major Road Speed	Major Road Volume
AM	3	250	35	253
PM	14	913	35	927



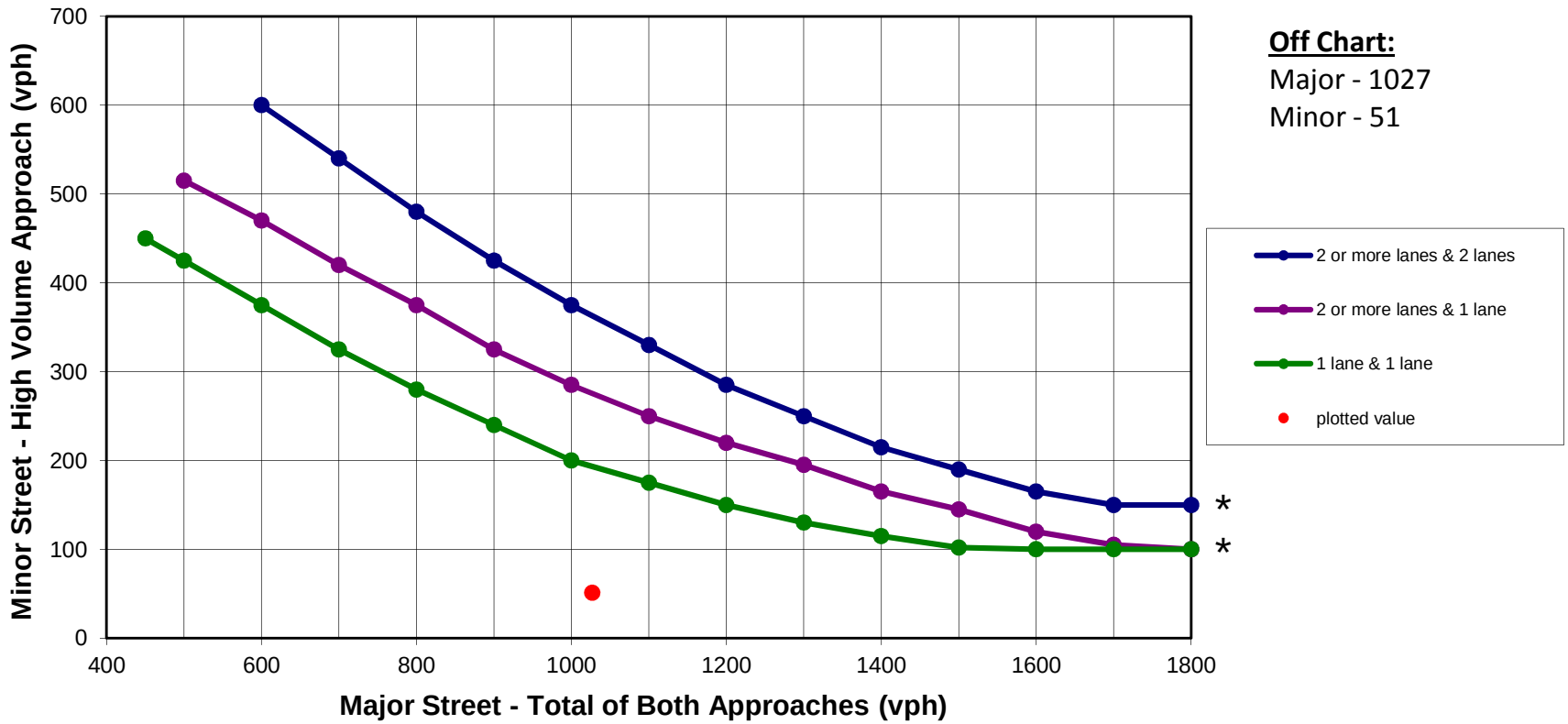
Signal Warrant Analysis

Future AM Peak Hour Volume Warrant
Missouri Route 9 & NW 62nd Street



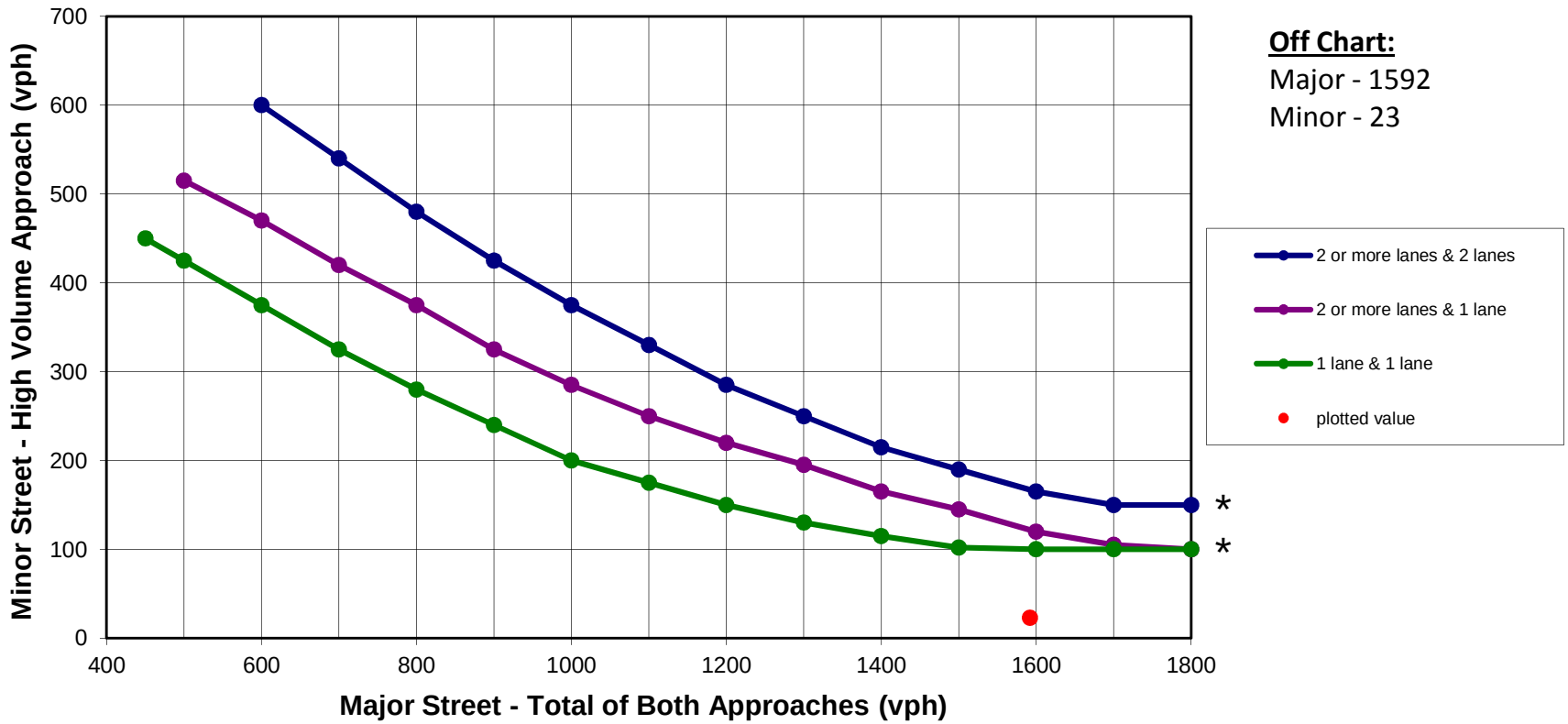
*Note: 150 vph applies as the lower threshold volume for a minor street approach with two or more lanes

Future AM Peak Hour Volume Warrant
Missouri Route 9 & Clark Avenue



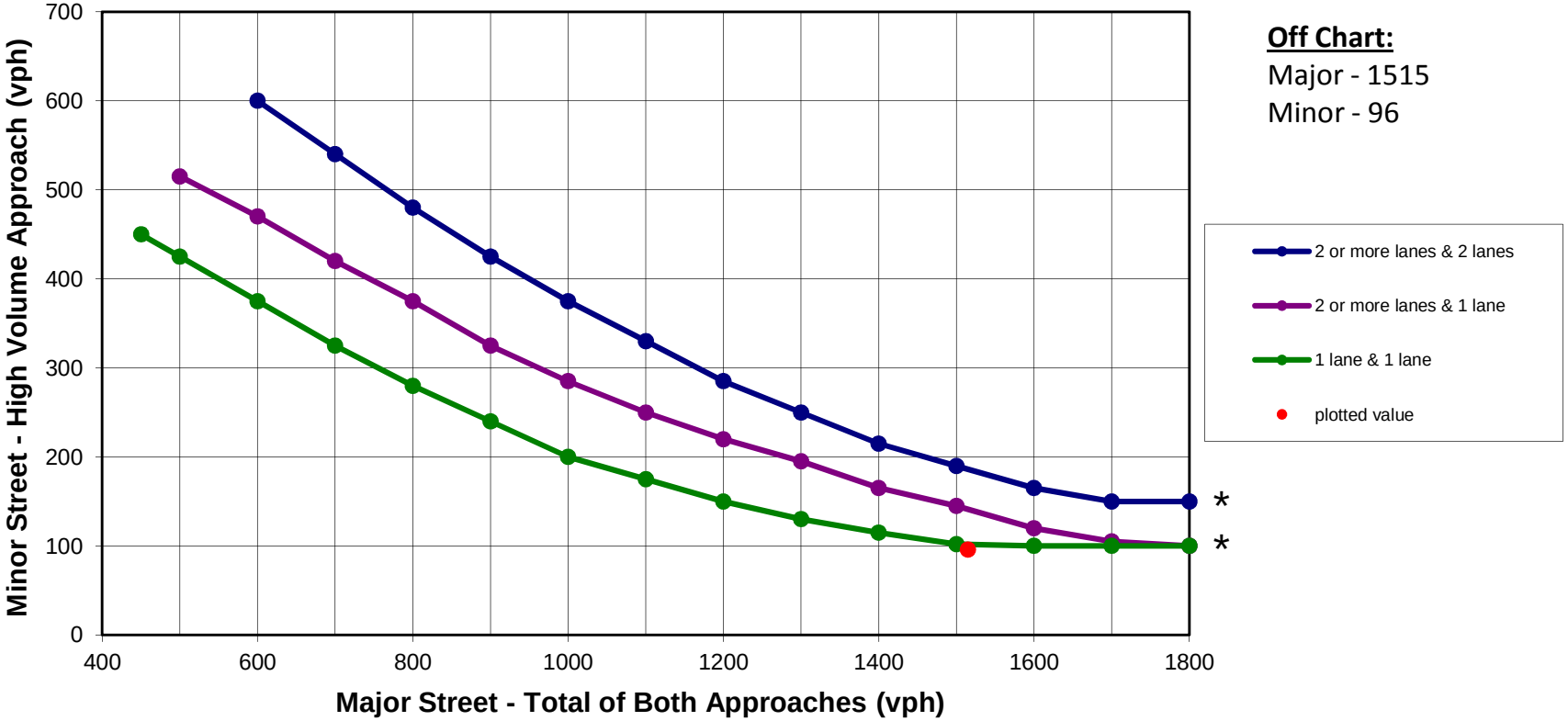
*Note: 150 vph applies as the lower threshold volume for a minor street approach with two or more lanes

Future PM Peak Hour Volume Warrant
Missouri Route 9 & NW 62nd Street



*Note: 150 vph applies as the lower threshold volume for a minor street approach with two or more lanes

Future PM Peak Hour Volume Warrant
Missouri Route 9 & Clark Avenue



Off Chart:
Major - 1515
Minor - 96

*Note: 150 vph applies as the lower threshold volume for a minor street approach with two or more lanes