Truck Count Emission Estimation Method

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Center for Neighborhood Technology

Author Note

This truck data portal is a project between Little Village Environmental Justice Organization, Fish Transportation Group, Inc., and CNT.

Acknowledgements

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Abstract

In 2023 and 2025 CNT consulted Fish Transportation Group, Inc. to count traffic at 47 different locations in Chicago and Cicero, Illinois using proprietary software and hardware called Miovision. CNT developed a web tool that allows users to determine the number of trucks and buses passing through each location (classes 4 – 13 as defined by the Federal Highway Association). CNT also estimated vehicle emissions created by these vehicles using US-EPS's MOVES5: the Latest Version of Motor Vehicle Emission Simulator. **We estimated three types of vehicle emissions: NO_x (nitrogen oxide), PM_{10} (particulate matter ten micrometers in diameter or smaller) and $PM_{2.5}$(particulate matter 2.5 micrometers in diameter or smaller).** The particulate matter emissions account for tailpipe exhaust, brake ware, and tire ware pollution. Each location's emissions were estimated by the hour for a 24-hour period and summed up to calculate total daily emissions. The results vary widely; the emissions in the highest location are approximately 30 times that of the lowest location.

Truck Count Emission Estimation Method

In 2023 and 2025 CNT engaged Fish Transportation Group, Inc. to count traffic at 47 different locations in Chicago and Cicero IL and then communicate these findings in a web tool, allowing users to examine the number of trucks and buses passing through each location. CNT has now developed estimates of vehicle emissions created by these vehicles. Three types of vehicle emission were estimated: NO_x, PM_{10} and $PM_{2.5}$. Each location's emissions were modeled by the hour for a 24-hour period and summed up to calculate total daily emissions.

Counting Locations

Data was collected in 21 Chicago community areas and one in Cicero, representing a snapshot in time from April 2023 to September 2023 and June 2025 to July 2025. The data show exactly how many trucks passed through each intersection, mid-block, or driveway location over 24 hours on a typical non-holiday weekday (mostly on Tuesdays and some Wednesdays See Appendix A: List of Locations).

Location Selection

The choice of each of the 47 locations was established in consultation with local community-based organizations that were concerned about the location in their neighborhoods on the southwest, south, and southeast sides of Chicago. The counts also included a few locations on the north side for comparison. The locations vary by three types: critical intersections & mid-blocks, truck-generating driveways, and four northside locations. Figure 1 below maps these locations.

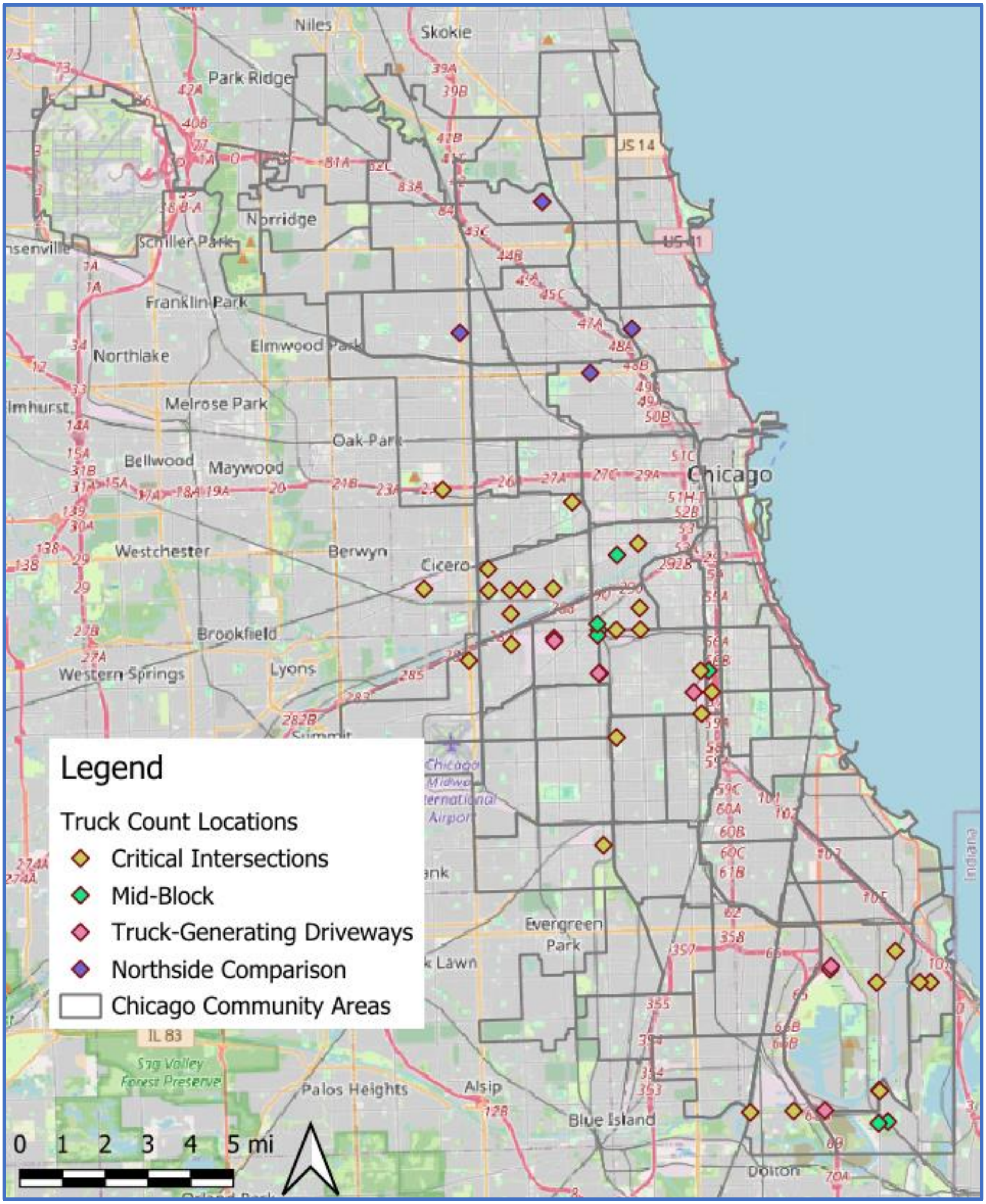


Figure 1: Map of Truck Count Locations

MOVES5 Inputs

MOVES5 can be run at three different scales: default scale (usually uses a regional – multi-county scale), county scale, and project scale. For this project we ran MOVES5 on the project scale, since each count location has a finite geographical extent. One limitation of the project scale is that it can only be run for one hour. This required us to run 24 runs for each location – one for each hour and then sum the emissions at the end. However, this has the benefit of being able to examine modeled emissions profile throughout the day.

The inputs required to run MOVES5 each hour are:

- The length of each possible route a truck will take within the geographical extent – known as the **links**,
- Counts of vehicles by type (buses, smaller trucks and semi-trucks) on each link,
- The amount of breaking, accelerating and idling on each link,
- Meteorological data – temperature and relative humidity for that location, day and hour,
- The inspection and maintenance plan for the region – in this case the Chicago Metropolitan Area
- Age distribution of vehicles
- The type of fuels (gasoline, diesel, EV, CNG, etc.) their formulation, the usage fraction, and the fraction of vehicles using alternative fuels

CNT developed a set of R scripts to read information from Miovision output data and develop the input for each hour at each location.

Defining Links

MOVES5 needs to know the length of street where the trucks are driving – called links. To define the links at each location and to make the locations comparable, we used one eighth mile (1/8) before and after the camera location. To determine the impact of stopping, starting, turning, and idling, we considered different assumptions for travel on the links depending on the location. As an example, consider the location at “S Cicero Ave and W 44th St” – this is a critical intersection with these two streets forming a 4-way intersection. Figure 2 below shows a map of this intersection with the red dot at the camera position and the light grey square approximately one eighth of a mile from the camera.

Figure 2: Intersection of S Cicero Ave (IL 50) and W. 44th St with the twelve links defined to the right.

Southbound on Cicero

1. going straight or U-turn,
2. turning left,
3. turning right

Northbound on Cicero

4. going straight or U-turn,
5. turning left,
6. turning right

Eastbound on 44^{th}

7. going straight or U-turn,
8. turning left,
9. turning right

Westbound on 44^{th}

10. going straight or U-turn,
11. turning left,
12. turning right

Each of these links therefore is one quarter of a mile long (we assume a U-turn happens at the intersection – and this is very rare). Each location gets a set of links like above, depending on the configuration of the streets and/or driveways considered, but every link is still defined to be one quarter of a mile. The exact set of directions and link type are read, using a R script, from the raw data (see Table 1 below).

Counts of vehicles by type on each link

The R script reads raw truck count data to determine the type of vehicle and the number of those vehicles on each link, see example data in Table 1 below. This is then written for a comma separated file (CSV) on CNT's SharePoint server.

Table 1: Sample of raw data from various time of the day at S Cicero Ave and W 44th St.

Time	Entry	Entry Direction	Movement	Class	Volume
2025-06-25 08:00:00	Cicero Avenue	North	Thru	Single-Unit Trucks	63
2025-06-24 12:00:00	Cicero Avenue	North	Right	Single-Unit Trucks	1
2025-06-25 08:00:00	Cicero Avenue	North	Left	Buses	1
2025-06-25 08:00:00	Cicero Avenue	South	Thru	Articulated Trucks	71
2025-06-25 09:00:00	Cicero Avenue	South	Right	Articulated Trucks	1
2025-06-25 09:00:00	Cicero Avenue	South	Left	Articulated Trucks	0
2025-06-25 10:00:00	44th Street	East	Thru	Single-Unit Trucks	0
2025-06-25 09:00:00	44th Street	East	Right	Articulated Trucks	1
2025-06-25 10:00:00	44th Street	East	Left	Single-Unit Trucks	1
2025-06-25 10:00:00	44th Street	West	Thru	Single-Unit Trucks	0
2025-06-25 08:00:00	44th Street	West	Right	Single-Unit Trucks	1
2025-06-24 12:00:00	44th Street	West	Left	Single-Unit Trucks	1

Estimating cruising, breaking, accelerating and idling on each link

Each location has a unique configuration of its stop light, stop sign, turn signal or through traffic. CNT staff used Google Street View to determine this configuration for each location (see example in Figure 3). CNT obtained from the Chicago Department of Transportation the stop light timing tables for each location with a stop light.

Figure 3: Google Street View of S Ashland & W 35th

These tables were given to CNT as .pdf files which were very specific for each location with a stop light and complicated, each having different timing for peak and non-peak traffic times (see Appendix B: Example Stop Light Timing Table). Rather than create a scenario for each location CNT created 9 types of locations, or signal types, shown in Appendix C: List of Signal Types, with a short description of each and the fraction of time spent cruising, breaking, accelerating and idling.

The fractions were calculated, using the equations of motion[1], assuming a speed of 25 mph cruising into the location and breaking at a deacceleration rate of 4.5 meter/second^2 (m/s^2), then idling for a fraction (adjusted for the various scenarios) of a red light, and then accelerating at a rate of 1.125 m/s^2 back up to 25 mph and cruising the rest of the way out of the ¼ mile link. The following figure shows these different operation segments.

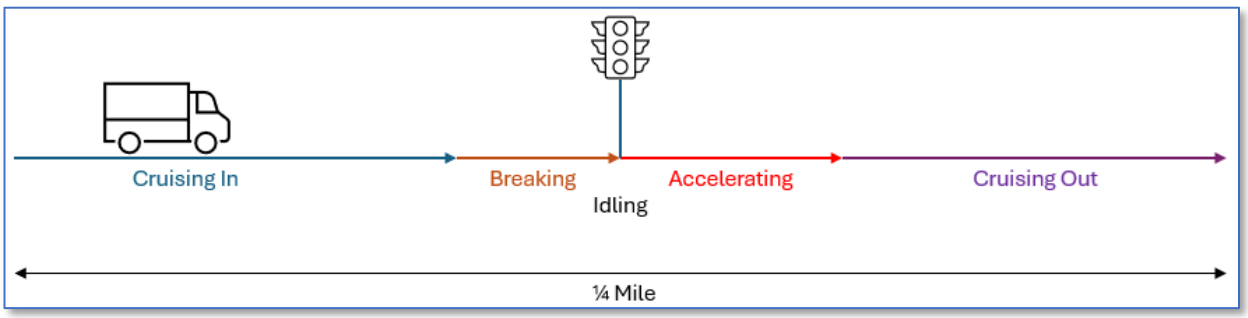


Figure 4: Schematic Diagram of Typical Link and Operation Segments

First, we calculate the time it takes to slow down to a stop from the initial cruising speed:

$$T_b = \frac{V_c}{A_b}$$

Where:

- T_b is the time it takes to stop
- V_c is the initial velocity of the truck
- A_b is the deacceleration from hitting the breaks

Then we calculate the cruise in distance before breaking:

$$D_i = \left(\frac{D_t}{2}\right) - D_b = \left(\frac{D_t}{2}\right) - \left(1/2 \times A_b \times T_b^2\right)$$

[1] To remind yourself of these simple equations of motion see for example https://en.wikipedia.org/wiki/Equations_of_motion#Uniform_acceleration

Where:

- D_i is cruise in distance
- D_t is the total distance of the link (1/4 Mile)
- D_b is the distance it takes to stop, which is $1/2 \times A_b \times T_b^2$

This will allow us to calculate the time of cruising in:

$$T_i = \frac{D_i}{V_c}$$

Where:

- T_i is the time of cruising in

Likewise for the second half of the link, we calculate the time it takes to accelerate back up to cruising speed:

$$T_a = \frac{V_c}{A_a}$$

Where:

- T_a is the time it takes to accelerate back up to speed
- A_a is the acceleration back up to speed

Then we calculate the cruise out distance after getting up to speed:

$$D_o = \left(\frac{D_t}{2}\right) - D_a = \left(\frac{D_t}{2}\right) - (1/2 \times A_a \times T_a^2)$$

Where:

- D_o is cruise out distance
- D_a is the distance it takes to accelerate back up to speed, which is $1/2 \times A_a \times T_a^2$

This will allow us to calculate the time of cruising out:

$$T_o = \frac{D_o}{V_c}$$

Where:

- T_o is the time of cruising out

The idling time is estimated to be the time the truck stops at the red light we use a fraction of the red-light time:

$$T_s = F \times T_l$$

Where:

- T_s is the time of stop time
- F is the fraction of time spent stopped at the light

The total time to traverse the link is:

$$T_{tot} = T_i + T_b + T_s + T_a + T_o$$

Thus, the fraction of time spent in each mode is:

$$F_c = \frac{(T_i + T_o)}{T_{tot}}; F_b = \frac{T_b}{T_{tot}};\ F_s = \frac{T_s}{T_{tot}}; F_a = \frac{T_a}{T_{tot}}$$

Where:

- F_c is the fraction of time spent cruising speed
- F_b is the fraction of time spent breaking
- F_s is the fraction of time spent stopped at the red light
- F_a is the fraction of time spent accelerating back up to cruising speed

These fractions were then calculated for each of the 9 different signal type scenarios for on peak (rush hours) and off peak time of the day (see Appendix C: List of Signal Types below).

Meteorological Data

Using the VisualCrossing Application Programming Interface (API) CNT obtained meteorological data for the specific day and time of day for each location and hour.

Inspection and maintenance Plan for the Chicago Region

CNT used the data in the MOVES5 database ‘movesdb20241112' in table 'imcoverage' and selected for Cook County, and the appropriate year, either 2023 or 2025 depending on the year the data was taken for a given location.

Age distribution of vehicles

CNT used the data in the MOVES5 database ‘movesdb20241112' in table ‘sourceTypeAgeDistribution' and selected the appropriate year, either 2023 or 2025 depending on the year the data was taken for a given location.

Fuels, usage fraction, formulation, and fraction of vehicles using alternative fuels

CNT used the data in the MOVES5 database ‘movesdb20241112' and following tables for:

- Type of fuels used table 'fuelsupply' and selected the appropriate year, either 2023 or 2025 depending on the year the data was taken for a given location.
- Usage fraction used table 'fuelusagefraction' and selected Cook County and the appropriate year, either 2023 or 2025 depending on the year the data was taken for a given location.
- Fuel formulation used table ‘fuelformulation' and selected the fuel formulation index from the given year from the data in the Usage Fraction.

Fraction of vehicles using alternative fuels was calculated using the AVFT (Alternate Vehicle Fuel and Technology) tool in MOVES5 for Cook County and the appropriate year.

Running MOVES5 for all 47 Locations over 24 Hours

Running MOVES5 in project mode is restricted to running one hour at a time. This feature is useful for this project since it allows us to display a series of emissions by time of day, allowing users to observe when the emissions peak and when they are less concentrated. Running MOVES5 interactively using the GUI interface was not an option since there were 47 locations and each had 24 hours of measurements, totaling 1,128 runs. Therefore, CNT developed an R script to loop over each hour for each location by using MOVES5 in command line mode. The MOVES5 documentation online did not describe how to accomplish this correctly. We assumed the documentation was for an older version of MOVES, so after trial and error we succeeded. Each location took about an hour to run through all 24 hours, so it took almost a day and a half to run through the entire data set. The code to run this along with the code that reads in the raw data and converts it into MOVES5 inputs is now available on GitHub at this repository.

References

"Various location listed in Appendix A." *Google Maps*, Accessed March 15, 2026, [Example Google Street View of the intersection at S Ashland Ave. and W 35th St.].

“Weather data provided by Visual Crossing" Visual Crossing, accessed in March and April 2026.

Appendix A: List of Locations

Table 2: List of all Truck Counting Locations

Location	Observation Start Date	Truck Count Location Type	Community Area	Stop Light	Stop Sign	Turn Signal	Signal Type
E 103rd St & S Doty Ave (driveway)	Tues April 18th 2023	Truck-Generating Driveways	SOUTH DEERING	no	yes (1 on Doty turning into 103rd)	no	4
N Ashland Ave & W Fullerton Ave	Tues Sep 12th 2023	Northside Comparison	LINCOLN PARK	yes	no	yes	1
N Cicero Ave & W Fullerton Ave	Tues Sep 12th 2023	Northside Comparison	BELMONT CRAGIN	yes	no	yes	1
N Kedzie Ave & W Lawrence Ave	Tues Sep 12th 2023	Northside Comparison	ALBANY PARK	yes	no	yes	1
Norfolk Southern Railyard, north of E 103rd St (driveway)	Tues April 18th 2023	Truck-Generating Driveways	SOUTH DEERING	no	no	no	8
S Ashland Ave & W 35th St	Tues June 6th 2023	Critical Intersections	MCKINLEY PARK	yes	no	yes	1
S Ashland Ave & W Cermak Rd	Tues June 10th 2025	Critical Intersections	LOWER WEST SIDE	Yes (5-way)	no		6
S Ashland Ave & W Pershing Rd	Tues June 24th 2025	Critical Intersections	MCKINLEY PARK	yes	no	yes	1
S Avenue O & E 106th St	Tues June 10th 2025	Critical Intersections	EAST SIDE	yes	no	yes	1
S Brainard Ave, south of S Torrence Ave (mid-block)	Tues Aug 1st 2023	Mid-Block	HEGEWISCH	no	no	no	3
S California Ave & W Roosevelt Rd	Tues June 10th 2025	Critical Intersections	NORTH LAWNDALE	yes	no		4
S Cicero Ave & W 44th St	Tues June 24th 2025	Critical Intersections	GARFIELD RIDGE	no	1 way (on 44th)	no	5
S Commercial Ave & W 100th St	Tues June 10th 2025	Critical Intersections	SOUTH DEERING	yes	no	no	4

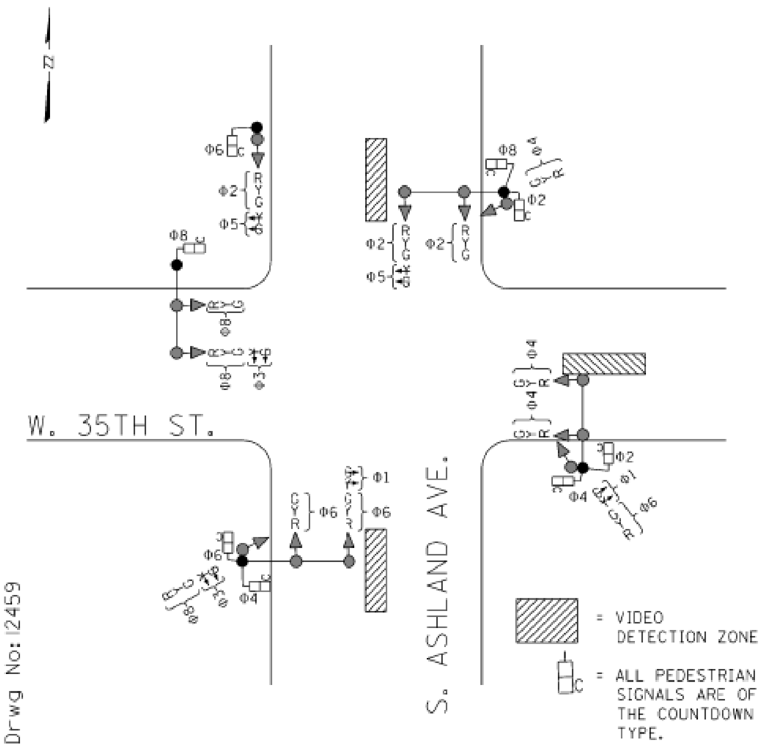
Location	Observation Start Date	Truck Count Location Type	Community Area	Stop Light	Stop Sign	Turn Signal	Signal Type
S Damen Ave & S Blue Island Ave (intersection)	Tues June 6th 2023	Mid-Block	LOWER WEST SIDE	yes	no	yes	1
S Damen Ave & W Pershing Rd	Tues June 24th 2025	Critical Intersections	MCKINLEY PARK	no	1 way	no	2
S Doty Ave & E 130th St	Tues June 10th 2025	Truck-Generating Driveways	SOUTH DEERING	no	no	no	9
S Ellis St & E 130th St	Wed Aug 9th 2023	Critical Intersections	RIVERDALE	yes	no	yes (on 130th)	1
S Ewing Ave & E 106th St	Tues Aug 1st 2023	Critical Intersections	EAST SIDE	yes	no	yes	1
S Hoyne Ave & W 59th St	Tues June 10th 2025	Critical Intersections	WEST ENGLEWOOD	no	yes (1 way; going south on Hoyne)	no	5
S Indiana Ave & E 130th St	Tues June 24th 2025	Critical Intersections	RIVERDALE	no	no	no	7
S Kedzie Ave & Corwith Intermodal Facility b/w W 40th Pl & W 41st St	Tues May 16th 2023	Truck-Generating Driveways	BRIGHTON PARK	yes	no	yes	1
S Kedzie Ave & Corwith Intermodal Facility, b/w W 40th St & W 40th Pl (driveway)	Tues May 16th 2023	Truck-Generating Driveways	BRIGHTON PARK	no	1 way	no	2
S Kedzie Ave & W 31st St	Tues June 6th 2023	Critical Intersections	SOUTH LAWNDALE	yes	no	yes	1
S Kostner Ave & W 26th St	Tues Oct 3rd 2023	Critical Intersections	SOUTH LAWNDALE	yes	no	no	4
S Kostner Ave & W 31st St	Tues June 6th 2023	Critical Intersections	SOUTH LAWNDALE	yes	no	yes	1
S Laramie Ave & W Lexington St	Weds July 23rd 2025	Critical Intersections	AUSTIN	yes	no	yes	1
S Lawndale Ave & W 31st St	Tues Sep 19th 2023	Critical Intersections	SOUTH LAWNDALE	yes	no	no	4

Location	Observation Start Date	Truck Count Location Type	Community Area	Stop Light	Stop Sign	Turn Signal	Signal Type
S Normal Ave & W 47th St	Tues May 16th 2023	Critical Intersections	NEW CITY	no	yes (1 way on Normal Ave)	no	2
S Normal Blvd & W Garfield Blvd (west-bound)	Tues May 16th 2023	Critical Intersections	NEW CITY	yes	no	yes (left turn only)	1
S Princeton Ave & W 51st St	Tues May 16th 2023	Critical Intersections	FULLER PARK	yes	no	no	4
S Pulaski Rd & W 31st St	Tues April 11th 2023	Critical Intersections	SOUTH LAWNDALE	yes	no	yes (turn on Pulaski)	1
S Pulaski Rd & W 36th St	Tues April 11th 2023	Critical Intersections	SOUTH LAWNDALE	yes	no	yes	1
S Pulaski Rd & W 41st St	Tues May 16th 2023	Critical Intersections	ARCHER HEIGHTS	yes	no	yes	1
S Shields Ave & W 47th St (mid-block)	Tues May 16th 2023	Mid-Block	FULLER PARK	no	yes (two for N and S bound, sandwiched between 47th)	yes	2
S Torrence Ave & E 106th St	Tues Aug 1st 2023	Critical Intersections	SOUTH DEERING	yes (3-way)	no	yes (turn on Torrence)	1
S Torrence Ave & E 126th Pl	Tues Aug 1st 2023	Critical Intersections	HEGEWISCH	yes	no	no	4
S Torrence Ave & E 126th Pl (right turn lane)	Tues Aug 1st 2023	Critical Intersections	HEGEWISCH	yes	no	yes	1
S Torrence Ave, south of E 130th St (mid-block)	Tues Aug 1st 2023	Mid-Block	HEGEWISCH	no	no	no	3
S Western Ave & W 47th St (driveway)	Tues June 6th 2023	Truck-Generating Driveways	BRIGHTON PARK	yes	no	yes	1

Location	Observation Start Date	Truck Count Location Type	Community Area	Stop Light	Stop Sign	Turn Signal	Signal Type
S Western Ave & W 79th St	Weds July 30th 2025	Critical Intersections	ASHBURN	yes	no	yes	1
S Western Ave, north of W Pershing Rd (mid-block)	Tues April 11th 2023	Mid-Block	MCKINLEY PARK	no	no	no	3
S Western Ave, south of W Pershing Rd (mid-block)	Tues April 11th 2023	Mid-Block	BRIGHTON PARK	no	no	no	3
S Western Blvd & W 47th St	Tues June 6th 2023	Critical Intersections	NEW CITY	yes	no		4
S Western Blvd & W Pershing Rd (intersection)	Tues April 11th 2023	Mid-Block	MCKINLEY PARK	yes	no		4
W 51st St, east of S Lowe Ave (driveway)	Tues May 16th 2023	Truck-Generating Driveways	NEW CITY	no	no	no	2
W North Ave & N Western Ave	Tues Sep 12th 2023	Northside Comparison	WEST TOWN	yes	no	yes	1
W Ogden Ave & S Central Park Ave	Tues Oct 3rd 2023	Critical Intersections	CICERO	yes	no	yes	1

Appendix B: Example Stop Light Timing Table

DIAL	CYCLE LENGTH	OFFSET	TIMES OF OPERATION	FLASH OPERATION
1	110''	50''	ALL OTHER TIMES	RΦ2, RΦ4, RΦ6, RΦ8,
2	110''	50''	6:00 AM TO 10:00 AM MONDAY - FRIDAY	ALL ARROWS AND WALK/DON'T WALK OFF
3	110''	49''	3:00 PM TO 7:00 PM MONDAY - FRIDAY	
4				



S. ASHLAND AVE. & W. 35TH ST

CEO Drwg No: 12459

DIAL 1

	PHASE							
PHASE NUMBER	1	2	3	4	5	6	7	8
DIRECTION	SBLT	NB	WBLT	EB	NBLT	SB	EBLT	WB
MIN GREEN	7		5		7			
VEHICLE EXT.	0		0		0			
MAX GREEN	7	55	5	28	7	55		36
TRAILING GREEN								
YELLOW CHANGE	3	3	3	3	3	3		3
RED CLEARANCE		1		2		1		2
WALK		42		7		42		15
PED CLEARANCE		13		2.		13		21
SPLITS	10	59	8	33	10	59		41
SEQUENCE	LEAD		LEAD		LEAD			
ADVANCE PED(LPI)								
HOLDING PED(LAG PED)								
RECALL		COORD		MAX		COORD		PED
FORCE MODE	FLOATING							

DIAL 2

	PHASE							
PHASE NUMBER	1	2	3	4	5	6	7	8
DIRECTION	SBLT	NB	WBLT	EB	NBLT	SB	EBLT	WB
MIN GREEN	7		5		7			
VEHICLE EXT.	5		0		5			
MAX GREEN	12	50	5	28	12	50		36
TRAILING GREEN								
YELLOW CHANGE	3	3	3	3	3	3		3
RED CLEARANCE		1		2		1		2
WALK		37		7		37		15
PED CLEARANCE		13		2.		13		21
SPLITS	15	54	8	33	15	54		41
SEQUENCE	LEAD		LEAD		LEAD			
ADVANCE PED(LPI)								
HOLDING PED(LAG PED)								
RECALL		COORD		MAX		COORD		PED
FORCE MODE	FLOATING							

DIAL 3

	PHASE							
PHASE NUMBER	1	2	3	4	5	6	7	8
DIRECTION	SBLT	NB	WBLT	EB	NBLT	SB	EBLT	WB
MIN GREEN	7		7		7			
VEHICLE EXT.	0		0		0			
MAX GREEN	7	53	7	28	7	53		38
TRAILING GREEN								
YELLOW CHANGE	3	3	3	3	3	3		3
RED CLEARANCE		1		2		1		2
WALK		40		7		40		17
PED CLEARANCE		13		2.		13		21
SPLITS	10	57	10	33	10	57		43
SEQUENCE	LEAD		LEAD		LEAD			
ADVANCE PED(LPI)								
HOLDING PED(LAG PED)								
RECALL		COORD		MAX		COORD		PED
FORCE MODE	FLOATING							

NOTE:
EXTENDED GREEN TSP OF 10 SEC FOR NORTHBOUND/SOUTHBOUND ASHLAND AVE AT ALL TIMES.

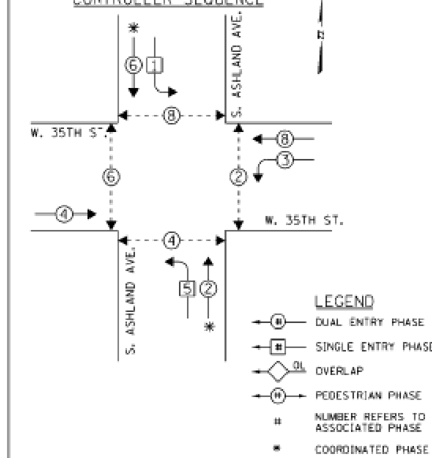
CITY OF CHICAGO
DEPARTMENT OF TRANSPORTATION
DIVISION OF TRAFFIC SAFETY

TRAFFIC SIGNAL TIMING SCHEDULE

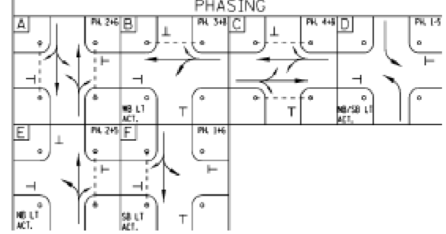
S. ASHLAND AVENUE AT W. 35TH STREET

CONSULTANT FIRM NAME/ ADDRESS Sam Schwartz 223 W. JACKSON BLVD SUITE 1101 CHICAGO, IL 60606 TEL: (773) 305-0800	3500 S./1600 W. DESIGNED BY: TRAFFIC ENGINEER
DESIGNED BY: ERICA SALUTZ, PE	REVIEWED BY: TRAFFIC ENGINEER
APPROVED BY: Peter A. Wojtkiewicz PETER WOJTKIEWICZ, PE	APPROVED BY: Y. Montazery TRAFFIC ENGINEER
DATE: 04-05-2021	DATE: 04-09-2021
SHEET: 1 OF 1	SENT: 04-09-2021 INSTALLED: 05-21-21

CONTROLLER SEQUENCE



PHASING



Appendix C: List of Signal Types

Signal TYPE	ACTION	ON/OFF PEAK	CRUISING	BRAKING	IDLING	ACCELERATING
Signal Type 1 - Standard 4-way stop light with left turn arrow on all four stop lights						
1	LT	ON	0.385	0.031	0.46	0.123
1	RT	ON	0.652	0.052	0.118	0.282
1	THRU	ON	0.477	0.038	0.332	0.152
1	LT	OFF	0.38	0.3	0.468	0.122
1	RT	OFF	0.714	0.057	0	0.229
1	THRU	OFF	0.486	0.039	0.32	0.155
Signal Type 2 – 3-way intersection with the third way being a driveway						
2	LT	ON	0.652	0.052	0.118	0.282
2	RT	ON	0.714	0.057	0	0.229
2	THRU	ON	1	0	0	0
2	LT	OFF	0.714	0.057	0	0.229
2	RT	OFF	0.714	0.057	0	0.229
2	THRU	OFF	1	0	0	0
Signal Type 3 – Midway in a block with no requirement to stop						
3	THRU	ON	1	0	0	0
3	THRU	OFF	1	0	0	0
Signal Type 4 – 4-way intersection with stop lights but no turning arrow						
4	LT	ON	0.478	0.038	0.33	0.153
4	RT	ON	0.652	0.052	0.118	0.282
4	THRU	ON	0.611	0.049	0.145	0.195
4	LT	OFF	0.478	0.038	0.33	0.153
4	RT	OFF	0.714	0.057	0	0.229
4	THRU	OFF	0.579	0.046	0.19	0.185

Signal TYPE	ACTION	ON/OFF PEAK	CRUISING	BRAKING	IDLING	ACCELERATING
Signal Type 5 – 4-way intersection with a turn arrow only on one street						
5	LT	ON	0.517	0.041	0.276	0.166
5	RT	ON	0.714	0.057	0	0.229
5	THRU	ON	1	0	0	0
5	LT	OFF	0.652	0.052	0.118	0.282
5	RT	OFF	0.714	0.057	0	0.229
5	THRU	OFF	1	0	0	0
Signal Type 6 – 5-way intersections						
6	LT	ON	0.3	0.06	0.5	0.14
6	RT	ON	0.55	0.06	0.25	0.14
6	THRU	ON	0.4	0.038	0.4	0.152
6	LT	OFF	0.35	0.05	0.5	0.1
6	RT	OFF	0.6	0.06	0.1	0.24
6	THRU	OFF	0.45	0.042	0.35	0.158
Signal Type 7 – Right angle turn with no stop sign/light						
7	THRU	ON	0.76470588	0.04705882	0	0.18823529
7	THRU	OFF	0.76470588	0.04705882	0	0.18823529
Signal Type 8 – Midway in a block with an intersection						
8	ALL	ALL	0.652	0.052	0.118	0.282
Signal Type 9 – 4-way intersection with one of streets being a truck entrance and the other being a street with stop sign						
9	LT	ON	0.517	0.041	0.276	0.166
9	RT	ON	0.714	0.057	0	0.229
9	THRU	ON	1	0	0	0
9	LT	OFF	0.714	0.057	0	0.229
9	RT	OFF	0.714	0.057	0	0.229
9	THRU	OFF	1	0	0	0