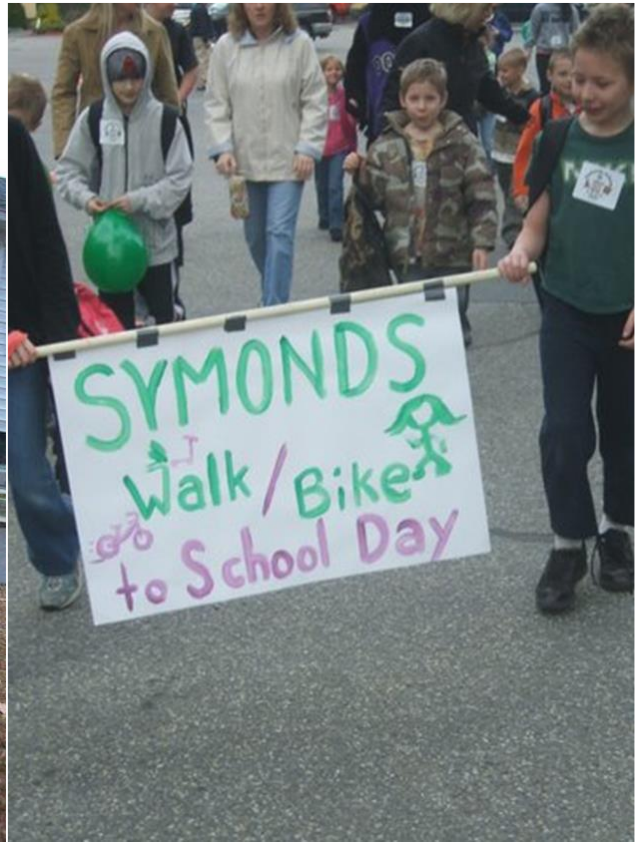
SYMONDS ELEMENTARY SCHOOL

SAFE ROUTES TO SCHOOL ACTION PLAN



SafeRoutes

September 2015 • Keene, NH

SYMONDS ELEMENTARY SCHOOL

SAFE ROUTES TO SCHOOL ACTION PLAN

Acknowledgements

In 2015, Symonds Elementary School (SES) worked with the Southwest Region Planning Commission (SWRPC) to develop a Safe Routes to School Action Plan. Beth Corwin, the Physical Education teacher and coordinator for the Symonds School Walk, Roll, & Ride program, helped to provide SWRPC staff with locally relevant guidance and input for this Action Plan. SWRPC and SES are grateful for Beth's contributions to this plan.

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Southwest Region Planning Commission

Healthy MONADNOCK 2020

Table of Contents

INTRODUCTION

The Symonds Elementary School Safe Routes to School Action Plan was created to identify measures that will improve conditions for walking and biking to school. It includes an evaluation of existing travel conditions, strategies to improve education, encouragement, and enforcement activities, and recommendations for physical improvements, educational programs and community efforts that will encourage walking and biking within a two-mile radius of the school. This document was prepared with input and guidance from Michele Tiani, the Physical Education teacher at Symonds.

Project Overview

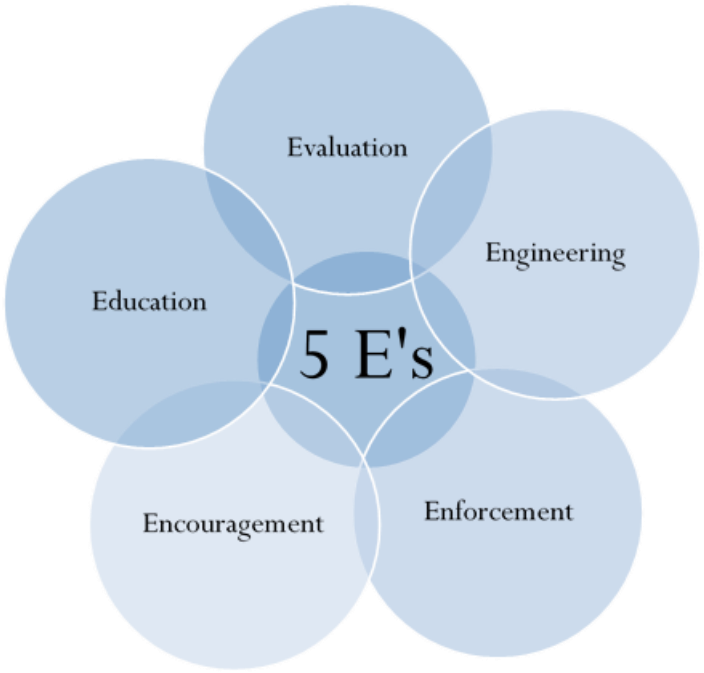
Safe Routes to Schools (SRTS) is a national program focused on improving the health and wellbeing of children by creating safe opportunities to walk and bike to school. SRTS programs examine the conditions around schools and conduct activities to improve safety and accessibility, traffic and air pollution in the vicinity of schools. Communities conducting these programs are encouraged to employ a combination of evaluation, education, encouragement, enforcement and engineering strategies to address the specific needs of their school(s).

This comprehensive approach, called the five (5) E's, is centered on an understanding that the barriers to safe walking and bicycling are both behavioral and physical. Although the focus of this Action Plan is evaluation, each of the 5 E's (described below) is addressed.

- Evaluation involves monitoring and documenting outcomes, attitudes and trends through the collection of data before and after program activities or projects. These activities help track which strategies would be most or least successful and which should be modified for better results.

- Education programs include teaching pedestrian/bicyclist/traffic safety and creating awareness of the benefits and goals of SRTS. Education programs can also incorporate health and environmental considerations associated with walking and bicycling.

Figure 1. The Safe Routes to School 5 E's



- Encouragement activities generate excitement and interest in walking and bicycling. Special events, mileage clubs, contests and ongoing activities all provide ways for parents, caregivers and children to discover or re-discover that walking and bicycling are do-able and fun.

- Enforcement programs are focused on deterring unsafe behaviors of drivers, pedestrians and bicyclists, and encouraging all road users to obey traffic laws and share the road safely.

- Engineering is a broad concept used to describe the design, implementation, and maintenance of traffic control devices or physical measures. These strategies create safer environments for walking and bicycling through improvements to the infrastructure surrounding the schools.

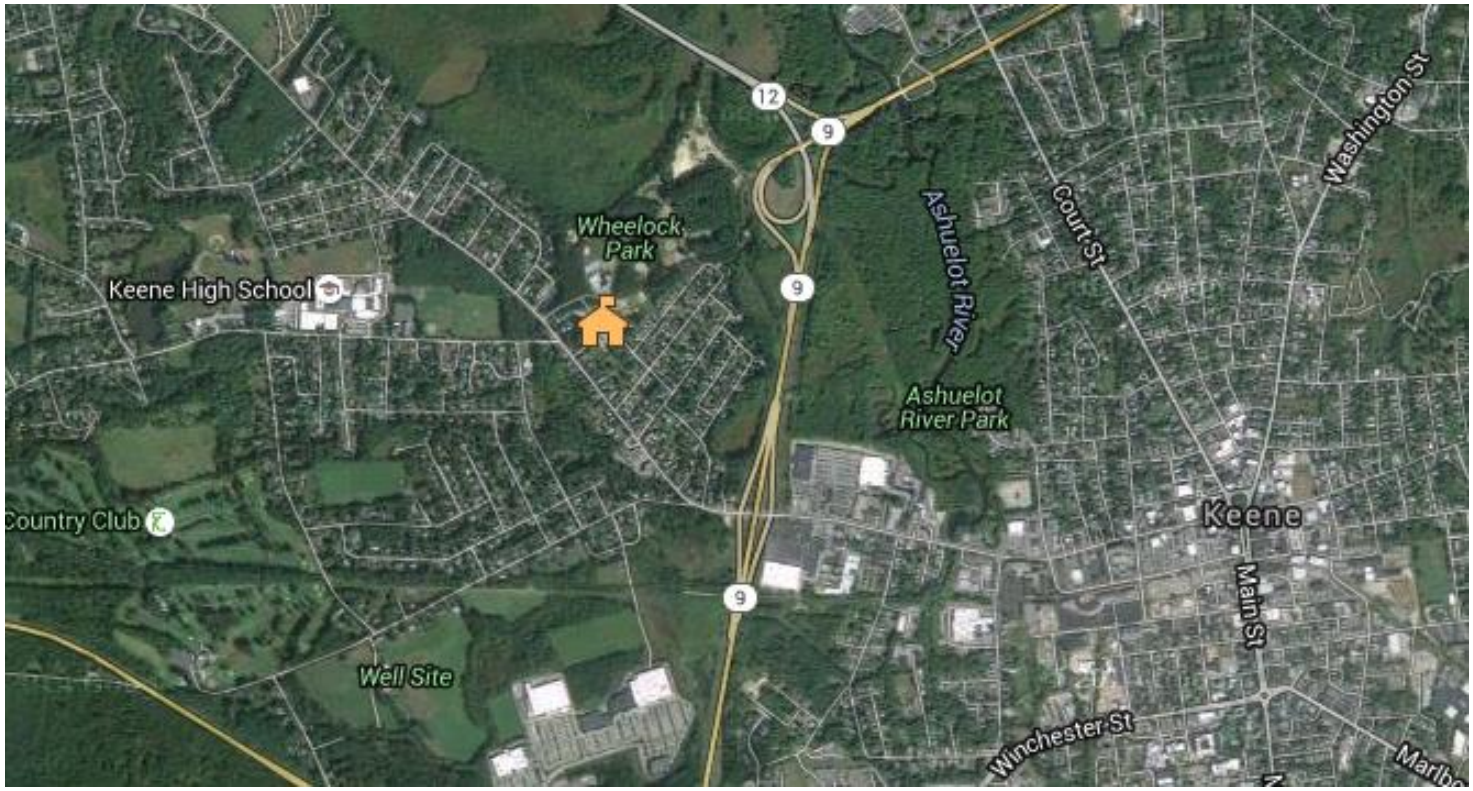
Benefits of Safe Routes to School

Safe Routes to School (SRTS) programs create a safer travel environment near schools and serve to reduce motor vehicle congestion at school drop-off and pick-up areas. Students that choose to walk or bike to school are rewarded with the benefits of a more active lifestyle, as well as the responsibility and independence that comes from being in charge of the way they travel. SRTS programs offer additional benefits to neighborhoods by helping to reduce school-related traffic and provide infrastructure improvements that facilitate walking and bicycling for everyone. Identifying and improving routes for students to safely walk and bicycle to school can also help reduce traffic speeds in neighborhoods, reduce traffic congestion on weekday mornings and afternoons at schools, and decrease auto-related pollution around school environments.

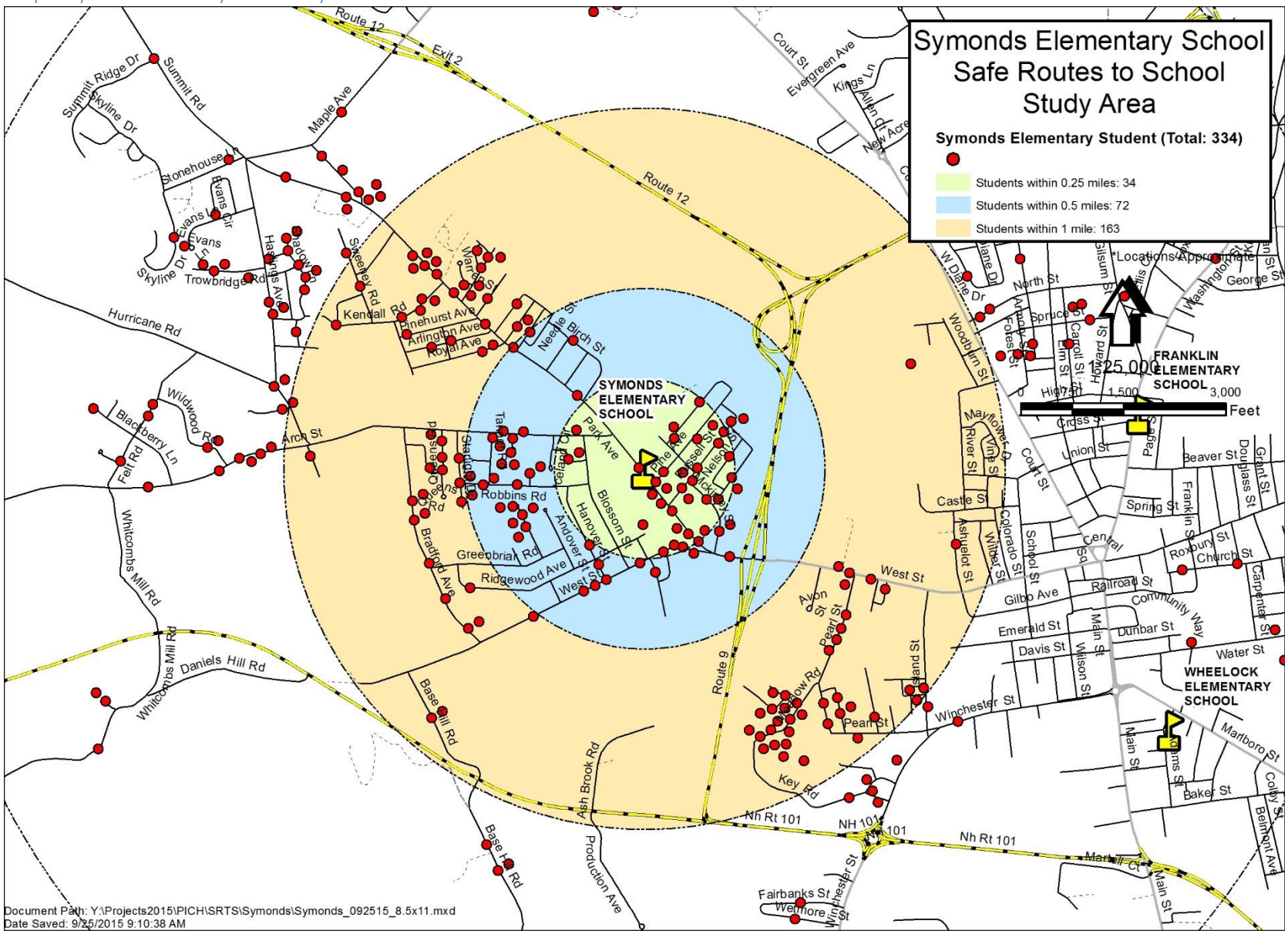
STUDY AREA

Symonds Elementary School (SES) is located next to Wheelock Park in West Keene, approximately 1.3 miles from Central Square and less than a half mile from Keene High School. Figure 2 shows an aerial view of the school in relation to surrounding neighborhoods. The school includes grades Kindergarten through fifth and enrolled 334 students in the 2014-2015 academic school year. Approximately 49% of the student population, or 163 students, lived within a one-mile radius of the school in 2014. Primary access to the school is through the main entrance to Wheelock Park off of Park Avenue. The school can also be accessed via the back entrance to Wheelock Park, which is off of Newman Street. Map 1 on the next page displays the extent of the SES study area and shows the approximate locations of SES students.

Figure 2. Aerial view of Symonds Elementary School in Keene.



Map 1. Symonds Elementary School Study Area.



EVALUATION OF EXISTING TRAVEL CONDITIONS

To better understand existing travel conditions within the study area (see Map 1), SWRPC staff conducted a morning field observation to review the behaviors and travel patterns of students, buses, and motorists at SES during drop-off hours, collected and analyzed traffic volume data near the school entrance, and distributed and analyzed data from an in-class student tally related to student travel modes. SWRPC staff also worked with Keene State College to collect Air Quality data. A review of these observations and analysis is included in the sections below.

School Arrivals and Departures

School begins at 8:25 a.m. and lets out at 3:00 p.m. In the morning, parents start dropping off their children at 8:10 a.m. Parents enter via the main entrance to Wheelock Park, go left as they enter the school parking lot, and drop off students in front of the playground before looping back around to exit onto Park Avenue. Students are directed by school staff to go play in the playground until the bell rings at 8:20 a.m. In general, parents seem to know and follow the drop-off route and traffic seemed to flow smoothly. According to school staff, traffic has backed up onto Park Avenue in the past when weather conditions were not favorable for walking and biking.

The bus drop-off route is similar to the parent drop-off route, however buses go to the left as they enter the school and drop off students in front of the main entrance of the school, and then exit the same way as the parents. Students exited the buses and walked around the side of the school to play in the playground before school starts.

A Crossing Guard is present at the intersection of Arch Street and Park Avenue between 8:15 and 8:30 a.m. and 3:00 to 3:15 p.m. Students who walked or biked to school arrived from various different directions, including the neighborhoods to the southeast, the neighborhoods to the southwest (across Park Avenue from the school), and the neighborhoods to the northwest. Many of these children were observed walking or biking with an adult present.

Above: Parents drop off their children.

Above: A Symonds student locks her bike before school starts.

In-Classroom Survey

SWRPC staff worked with Symonds Elementary School faculty and administration to conduct the National SRTS In-Classroom Survey during the second half of the 2014-2015 school year. This survey helped generate an understanding of the number of students currently biking and walking to school. Copies of the survey are included in Appendix A of this document. The In-Classroom survey was administered by all classrooms at SES in late May 2015. Teachers surveyed students each morning and afternoon for three consecutive days (Tuesday – Thursday) on their mode of arrival to and departure from the school. On average, 276 students shared their arrival modes over the course of three days and 241 shared their departure modes.

Table 1. Student travel modes to and from school based on student in-class tally.

Mode of Travel	Morning/Arrival		Afternoon/Departure	
	Average # of Students	% of Total Respondents	Average # of Students	% of Total Respondents
Walking	71	26%	33	14%
Biking	20	7%	20	8%
Family Vehicle	100	36%	95	39%
Bus	80	29%	88	37%
Carpool	5	2%	7	3%
Transit	0	0%	0	0%
Other	0	0%	0	0%

The results of the survey, detailed in Table 1, show that an average of 52 students arrive to school via walking and depart school on foot, which is roughly 20% of total respondents. An average of 20 students (7.5% of survey respondents) arrive to and depart from school via bicycle. On average, 84 students rode the bus to and from school (33% of survey respondents). However, more students rode the bus in the afternoon than in the morning; in the morning, 80 students (29% of survey respondents) arrived by bus, whereas in the afternoon 88 students (37% of survey respondents) departed by bus. The opposite trend was recorded for students traveling to and from school in a family vehicle; 100 students arrived in a family vehicle whereas 95 departed in a family vehicle (36% and 39% of survey respondents, respectively). An average of 6 students arrived and departed in a carpool over the three days of the survey (about 2.5% of survey respondents). Survey results indicate that students did not arrive via transit or other mode of transportation.

Traffic Volume and Speeds

To better understand vehicular travel conditions near SES, SWRPC staff conducted traffic volume counts on Wheelock Parkway and at the entrance to the school. Figure 3 identifies the location of the traffic counters. Figure 4, which corresponds with Figure 3, displays the average weekday traffic at each traffic counter site, measured in vehicles per day. Table 2 displays the traffic volume at the three traffic counter sites during peak morning and afternoon times, when vehicle traffic generated by the school is likely to be at its peak. Morning traffic volumes are likely higher at Site 1 because parents can drop off their children in the morning, whereas in the afternoon they must park and walk into the school to pick up their child. Table 3 shows the average traffic volume at site 1 during peak morning and afternoon times on Symonds Walk, Roll, and Ride days (Tuesdays and Thursdays) in comparison to the other days of the week. The morning traffic volume decreases by about 29% on Walk, Roll, and Ride days, which indicates that the program is successful in reducing traffic volume at the parent drop-off location.

Figure 3. Locations of traffic counters near SES.

Figure 4. Average weekday traffic volumes in vehicles per day at the traffic counter sites.

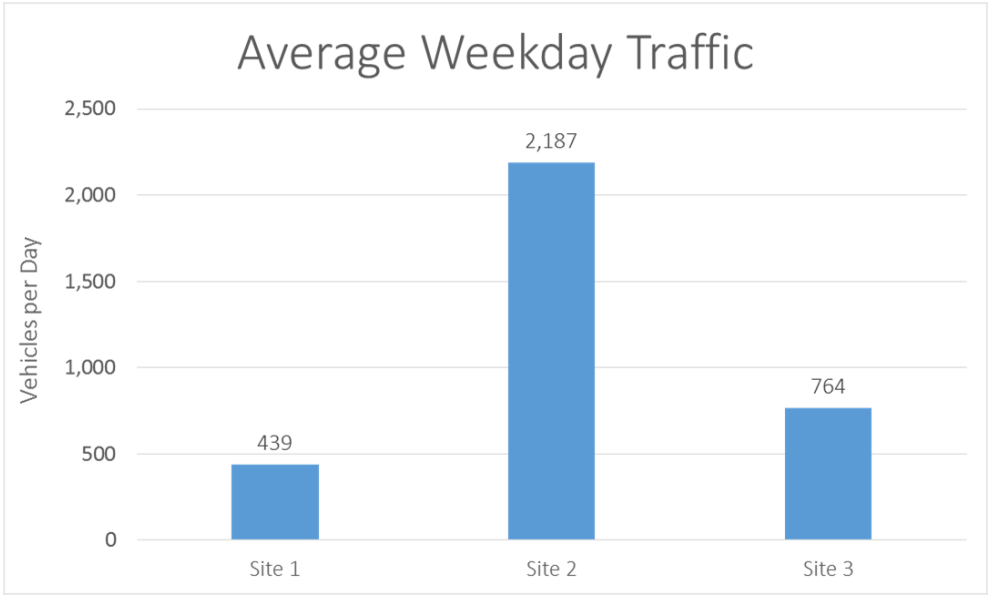


Table 2. Weekday traffic volume during peak morning and afternoon times.

Traffic Counter Location	Morning* (8 – 9 AM)	Afternoon* (3 – 4 PM)
Site 1	146	44
Site 2	221	195
Site 3	32	38

** Average traffic volume in vehicles per hour.*

Table 3. Weekday traffic volume during peak morning and afternoon times.

Site 1	M/W/F	T/TH
Morning (8 – 9 AM)	171	122
Afternoon (3 – 4 PM)	44	50

Accident/Crash Data

Between 2004 and 2013, there were 402 reported accidents within a 1-mile radius of Symonds Elementary School (excluding limited access highways such as NH 9/10/12). Of these, 402 occurred on the east side of the NH 9/10/12 bypass. There were 17 reported pedestrian crashes during this timeframe, most of which occurred on West Street. There were no pedestrian crashes within a ¼-mile radius of the school. There were a total of 7 bicyclist crashes, with only 1 occurring within a ¼-mile of the school. Table 4 shows the number of crashes that were reported for selected roads within the 1-mile radius, and Table 5 shows the number of reported crashes that occurred within a 1-mile radius of the school by year.

Table 4. Reported crashes within a 1-mile radius of Symonds School by road.

# Reported Crashes	Park Ave.	West St.	Arch St.	Wheelock Park Driveway
Total	60	14	14	2
Bicyclist	0	0	0	1
Pedestrian	3	0	0	0

Table 5. Reported crashes within a 1-mile radius of Symonds School by year.

Year	# Reported Crashes
2004	47
2005	28
2006	25
2007	27
2008	34
2009	54
2010	55
2011	28
2012	58
2013	46

Air Quality Pilot Study

For four days in May of 2015, a team from Keene State College conducted an air quality pilot study to compare air quality on "Walk, Roll, and Ride" days versus non-walk days. This report, which is included in Appendix E, concludes that there was no significant different in measured particle number concentration or particle mass concentration between the "walk" and "non-walk" days. However, the authors note that weather conditions and background air quality may have affected the results, and that further data collection should be done in order to get reliable results. Figure 4 displays the time series analysis of the particle concentration, in particles per cubic centimeter, over time. Figure 5 shows the time series analysis of particle mass concentration (in micrograms per cubic meter) emitted over time. Table 6 shows the meteorological conditions for each day that data were collected. Percent RH (%RH) stands for relative humidity.

Table 6. Summary of meteorological conditions during the study.

	May 20	May 21	May 26	May 27
% RH	37	73	70	75
Wind Speed	17	1	9	6
Temp (F)	58	43	73	68

Figure 5. Time series analysis of the particle concentration emitted over time.

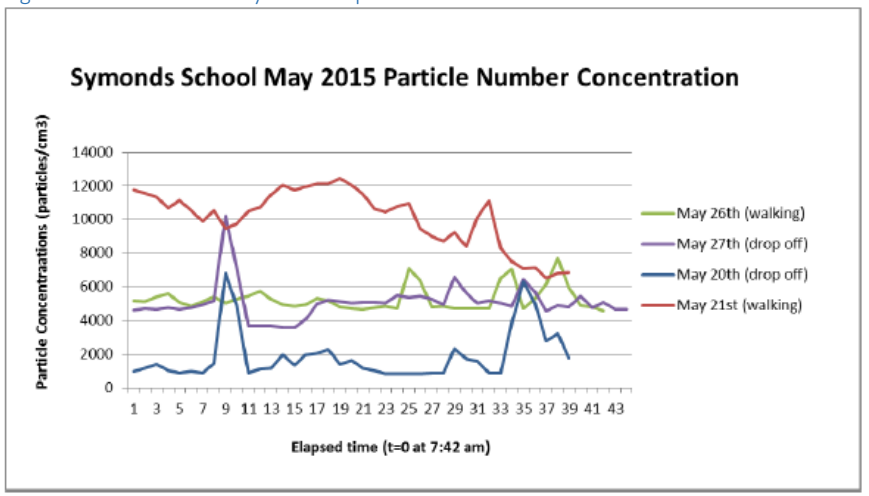
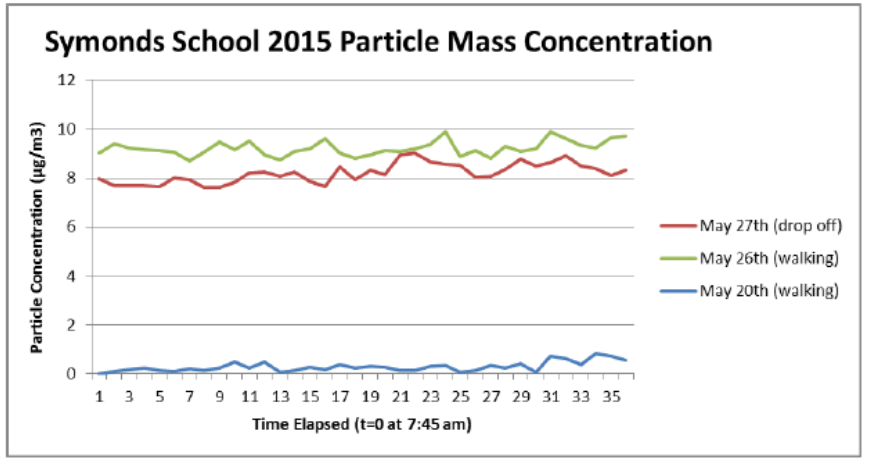


Figure 6. Time series analysis of mass concentration of particles emitted over time.



RECOMMENDATIONS

Education Recommendations

Education is an essential component of improving safe walking and biking conditions. SES should consider using this Action Plan as an opportunity to educate the school community about the benefits of walking and biking to school and on safe travel behavior for students and parents. Recommendations for enhancing education and awareness of the importance of and need for safe walking and bicycling routes to school are described below.

- Share this Action Plan with Faculty, Staff, Parents, and Students of Symonds Elementary School, as appropriate.
- Continue to share information on student bicycle and pedestrian safety with the SES school community via the school's website, newsletter, and/or other information outlets.
- Offer lessons on pedestrian and bicyclist safety as part of the school curriculum. For resources on safety education, see the National Safe Routes to School Curricula page: http://www.walkbiketoschool.org/keep-going/ongoing-activities/classroom-curricula
- Work with the local police department and/or fire department to hold an annual event for students on bicycle safety and the rules for bicyclists in New Hampshire (i.e. bike rodeo).
- Develop and distribute an easy-to-read map for students and families to use to identify routes in a one-mile radius of the school that are safe for walking and bicycling.

Above: A bike rodeo organized by the Bicycle Coalition of Maine in 2012.

Encouragement Recommendations

Encouragement activities help to generate excitement and interest in walking and bicycling. Special events, mileage clubs, contests and ongoing activities all provide ways for parents and children to discover, or re-discover, the benefits of walking and bicycling to school. Several recommended encouragement activities are listed below.

- **Organize a School-wide Walk to School Day and/or Bike to School Day event to promote walking and bicycling to school.** National Walk to School Day occurs the first week of October, and National Bike to School day occurs the first week of May. SES may want to consider using these days as an opportunity to encourage all students at SES, not just those within walking distance, to walk or bike to school by organizing a remote drop-off for school buses and parents who drive their children to school.

- **Continue and/or expand the successful "Walk, Roll, and Ride" program.** The Symonds School Walk, Roll, and Ride program has developed over the past 5 years into a successful program with large support from the school community. SES should ensure that this program continues by seeking funding to help support the program, and by continuing to reach out to parents and community members for volunteering and other program support. If possible, SES should consider expanding the program to include all weekdays in the fall and spring, if volunteer support is available.

- Utilize the National Safe Routes to School website (www.saferoutesinfo.org) and the NH DOT SRTS program (www.nh.gov/dot/org/projectdevelopment/planning/srts) as resources to identify ideas and opportunities for additional encouragement activities.

Symonds Elementary School students get their cards punched for the Symonds "Walk, Roll, and Ride" program.

Enforcement Recommendations

The goal of enforcement is to deter unsafe driver behavior as well as unsafe pedestrian and bicyclist behavior. Enforcement strategies encourage all users of the roadway to obey traffic laws and share the road. Enforcement strategies should be implemented in combination with education, encouragement, and engineering strategies to have a maximum impact. Used on its own, enforcement does not usually result in long-term, lasting changes in driver behavior. Recommended enforcement strategies are listed below.

- **Work with the City to ensure the continued presence of crossing guards at key intersections.** Adult crossing guards remind drivers that pedestrians are present and help children develop the skills needed to safely cross the street at all times. The school should continue to advocate for the crossing guard at Park Avenue and Arch Street.
- **Strictly enforce proper drop-off and pick-up process**. The school should inform and remind parents of the proper drop-off and pick-up process on a regular basis.

- **Create larger and more visible signs to direct parents to proper drop-off and pick-up locations.** The school may want to consider creating larger and more visible signs that tell parents where they can and cannot drop off their children. Currently, many of the signs are small and difficult to read more than a few feet away.

Engineering Recommendations

Engineering is a broad concept used to describe the design, implementation, operation and maintenance of traffic control devices or physical measures, including low-cost as well as high-cost capital measures. Infrastructure such as sidewalks, visible crosswalks, trails/paths, and connectivity between sidewalks and trails/paths creates conditions that improve safety for walking and bicycling in the area surrounding the school. Recommended engineering strategies for Symonds Elementary School are listed below.

- **Work with the City to install a curb ramp for the crosswalk at the intersection of Park Avenue and Arch Street.** Curb ramps are important, not only for bicyclists but also for people with disabilities to easily cross the street. The lack of curb ramps can be a deterrent for anyone with wheels, including strollers, bicycles, wheelchairs, etc. As the designated school crossing on Park Avenue, this crosswalk should be ADA-compliant.
- **Consider creating a path between the bus drop-off location and the school playground.** Currently, students exiting the bus are directed to walk around the back of the school to get to the playground. To do so, they must walk across grass. The school may want to consider building a gravel or paved path for students to use.

Above: The crosswalk on Park Avenue does not have a curb ramp.

Evaluation Recommendations

Evaluation involves monitoring and documenting outcomes, attitudes and trends through the collection of data before and after program activities or projects. These activities help track which strategies would be most or least successful and which should be modified for better results. As of the time of this writing, Symonds Elementary School had already collected baseline data on student travel modes to and from school. Moving forward, the school should consider the evaluation recommendations listed below.

- Conduct walkability audits of walking routes with members of the school community. The National Safe Routes to School Partnership has created a walkability checklist that parents and students can use to evaluate their walk to school and identify areas that need improvement. This assessment can help alert school and town officials to areas within the community that need attention. The walkability checklist can be found in Appendix F.
- Administer the "Safe Routes to School Arrival and Departures Tally Sheet" on an annual basis to track trends over time. The Student arrival and departure tally sheet is simple to administer, and it provides useful data on student travel modes to and from school. By collecting this data on an annual basis, the school will be able to track trends in travel modes over time and adjust education, encouragement, enforcement, and engineering strategies accordingly. A copy of this survey can be found in Appendix C.
- Administer the "Parent Survey about Walking and Biking to School" on a bi-annual (every two years) basis. The parent take-home survey provides useful information about parents' safety concerns related to their children walking and biking to school, and it helps to uncover the reasons behind travel behaviors. In order to stay current with the school population, this survey should be administered once every two to three years. A copy of this survey can be found in Appendix C.
- Update the Safe Routes to School Action Plan every five years. The data and recommendations outlined in this Action Plan are intended to be used as a starting point for launching a comprehensive Safe Routes to School program. As the program progresses, the Action Plan will need to be updated to include current data and recommendations that fit the needs of the school and community at that time. The school may want to consider forming a "Safe Routes to School" task force consisting of parents, teachers, and school administration to take this task on.

FUNDING FOR SAFE ROUTES TO SCHOOLS

Transportation Alternatives Program (TAP)

The Federal Transportation bill, Moving Ahead for Progress in the 21st Century (MAP-21), authorizes the Transportation Alternatives Program (TAP) to provide funding for programs and projects defined as *transportation alternatives*, including safe routes to school projects. The Transportation Alternatives Program is administered in New Hampshire by the State DOT. For information about this program, or to find the TAP application, see the NH DOT website: http://www.nh.gov/dot/org/projectdevelopment/planning/tap/index.htm.

Safe, Accountable, Flexible, Efficient Transportation Equity Act – A Legacy for Users (SAFETEA-LU)

While the NHDOT has awarded all of the funds available for infrastructure grants under this old federal transportation law, limited funds are still available for non-infrastructure awards, which include:

- *Startup grants:* awards of up to $5,000 per school that provide seed money to reimburse local sponsors for initial efforts.
- *Travel Plan grants:* awards of up to $15,000 per school to develop a walking and bicycling plan tailored to a specific location.
- *General Non-infrastructure grants:* awards of up to $10,000 for communities that have already initiated SRTS programs or may need more funds than are available under the startup awards.

For more information about SRTS funding through SAFETEA-LU, see the NHDOT Safe Routes to School website: http://www.nh.gov/dot/org/projectdevelopment/planning/srts/index.htm

Healthy Eating Active Living New Hampshire (HEAL NH) Active Transportation Grant

The overall goal of the HEAL Active Transportation Grant Program is to encourage widespread, safe, and responsible use of walking and bicycling as forms of transportation in the Granite State. To learn more about this program, go to www.healnh.org or contact Nik Coates, the Active Living Coordinator for HEAL NH, at ncoates@healthynh.com.

Advocates for Healthy Youth Mini Grant

Advocates for Healthy Youth (AFHY) is a coalition of community partners working to create family, school and community environments where children make healthy food and activity choices. AFHY provides small grants ($200-$1,000) to create or enhance youth programs in Cheshire County that promote healthy activity and nutrition choices. AFHY accepts applications throughout the school year until funds are depleted. Applications are reviewed three times during the year – December 1st, February 1st, and May 1st. For more information or to apply, contact Lauren Bressett at 603-399-4442 or email at llb@unh.edu.

APPENDICES

Field Review

On May 21, 2015 SWRPC staff visited Symonds Elementary School during the morning arrival period to observe travel patterns of students, vehicles, and buses as well as site characteristics and conditions. The day the site was observed was an organized "Walk, Ride and Roll" day, which is part of a program to encourage students to walk, bike, or take the bus to school. The key observations and findings from this field visit are documented below.

PARENT DROP OFF

- In general, parents seem to know the route for drop-off. As parents enter the school parking lot, they are directed to the left to drop off their students in front of the school playground. They exit the school by looping back around to the entrance to Wheelock Park.
- On the day the site was observed, traffic seemed to flow smoothly and there was no significant traffic congestion or back-up onto the street. However, according to school staff, traffic has backed up onto the street in the winter.
- Several parents parked in the Wheelock Park pool parking lot and walked with their children over to the school playground.
- There is a pedestrian/vehicle conflict area at the point where parents exit the school parking lot and pedestrians cross from the Wheelock Park pool parking lot to the school playground (see area circled in red in Figure 1 below).
- There is one staff person present at the parent drop-off location.

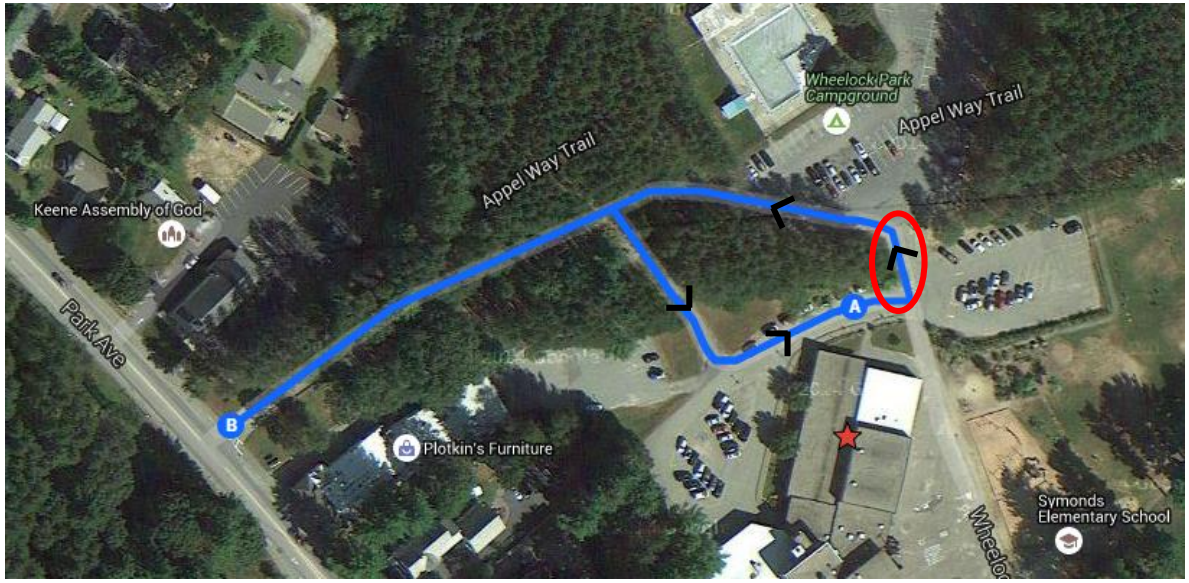


Figure 1. The figure to the left shows the main parent drop-off route in blue. Point A shows the drop-off location for children, point B shows the entrance/exit to Wheelock Park, and the red circled area is the observed pedestrian/vehicle conflict zone.

A = Parent drop-off location

B =Entrance/Exit to Wheelock Park

= Pedestrian/vehicle conflict area

=Symonds Elementary School

Safe Routes to School Students Arrival and Departure Tally Sheet

CAPITAL LETTERS ONLY – BLUE OR BLACK INK ONLY

School Name:

Teacher's First Name:

Teacher's Last Name:

Grade: (PK,K,1,2,3...) 0 2

Monday's Date (Week count was conducted) M M D D Y Y Y Y

Number of Students Enrolled in Class: 1 5

- Please conduct these counts **on two of the following three days Tuesday, Wednesday, or Thursday. (Three days would provide better data if counted)**
- **Please do not conduct these counts on Mondays or Fridays.**
- Before asking your students to raise their hands, please read through all possible answer choices so they will know their choices. Each Student may only answer once.
- Ask your students as a group the question "**How did you arrive at school today?**"
- Then, reread each answer choice and record the number of students that raised their hands for each. **Place just one character or number in each box.**
- Follow the same procedure for the question **"How do you plan to leave for home after school?"**
- You can conduct the counts once per day but during the count please ask students both the school arrival and departure questions.
- Please conduct this count regardless of weather conditions (i.e., ask these questions on rainy days, too).

Step 1.
Fill in the weather conditions and number of students in each class

Step 2.
AM – "**How did you arrive at school today?**" Record the number of hands for each answer.
PM – "**How do you plan to leave for home after school?**" Record the number of hands for each answer.

Key	**Weather** S= sunny R= rainy O=overcast SN=snow	**Student Tally** Number in class when count made	**Walk** -	**Bike** -	**School Bus** -	**Family Vehicle** Only with Children from your family	**Carpool** Riding with children from other families	**Transit** City bus, subway, etc.	**Other** Skate-board, scooter, etc.
Sample AM	S N	2 0	2	3	8	3		3	1
Sample PM	R	1 9	3	3	8	1	2	2	
Tues. AM									
Tues. PM									
Wed. AM									
Wed. PM									
Thurs. AM									
Thurs. PM									

Please list any disruptions to these counts or any unusual travel conditions to/from the school on the days of the tally.

BUSES

- The bus drop-off route differs from the parent drop-off route in that buses are directed to the right instead of the left when they enter the school parking lot. Buses drop off children directly in front of the school and then exit the same way as the parent vehicles.
- Children who are dropped off by the bus walk around back of the school to get to the playground.
- Symonds Elementary School has a total of 8 buses in the morning: 3 normal-size school buses, 2 "short" buses, and 3 bus vans. There is also the YMCA bus that drops off children at school.
- There were no major pedestrian/vehicle conflict areas identified in the bus drop-off zone.
- One staff person was present at the bus drop-off area.

A bus exits the Symonds School parking lot after dropping off children.

SPEED

- Speed along Park Avenue is 20 mph when the school zone signs are flashing and 30 mph when school zone sings are not flashing.
- In general, parents appeared to proceed cautiously down Wheelock Street and through the school drop-off route.
- Some speeding was observed after the school bell rang when a few late comers arrived.

This sign, posted at a blocked off entrance to the school playground, directs parents not to drop off their children at this location.

WAYFARING

- While there are several wayfaring signs directing parents where to go and where not to go, many of these signs are small and difficult to read from the car; larger signs may be helpful in increasing compliance from parents and other motorists.
- There are white painted arrows on the pavement to direct flow of traffic in the staff parking lot.

BIKE USE / FACILITIES

- There are four bike racks, one near the front entrance and three near the Park Avenue entrance. Each bike rack can hold ~29 bicycles.

- On the day the site was observed, there were 23 student bikes locked to the school bike racks, and 26 children were observed riding their bikes to school (one rode tandem with a parent and two had their bikes taken home by their parent).
- Six parents were observed riding their bikes to school with their children.
- There are no bike lanes on Park Avenue or any of the surrounding neighborhood streets, however there are "Sharrow" makings on Wheelock Street indicating that motorists should share the road with bicyclists. These sharrows are faded and should be repainted to increase visibility.
- Park Avenue does not have adequate bicycle infrastructure for children; the shoulders are too narrow and traffic is too fast/heavy for children to feel safe riding their bikes on the road. There are sidewalks that children could use to ride their bikes.

Left: A student walks her bike to one of Symond's four bike racks.

Middle: A parent rides to school with his child.

Right: View of the bike racks full of students' bicycles.

SIDEWALKS

- There are asphalt sidewalks on the streets surrounding the school and concrete & asphalt sidewalks on Park Avenue.
- On school grounds, sidewalks are made of asphalt and are in good condition.
- There is no sidewalk that connects the front entrance of the school where children are dropped off by the bus to the Park Avenue entrance. This is the walking route that children use when they are dropped off by the bus. A paved sidewalk should be considered for this location.

The picture above shows the sidewalk in front of the main entrance to the school and bus drop-off area.

TRAILS

- There are trails in Wheelock Park and there is a trail that goes around the edge of the athletic field. No students were observed walking on these trails on the day the site was observed.

CROSSINGS

- There is one school crossing guard posted at the intersection of Park Avenue and Arch Street. This crossing guard wears a safety vest and holds a hand-held stop sign to stop traffic.
- Crossings on Park Avenue near the school are marked with white ladder-style painted crosswalks, white painted pedestrian yield markings in the travel lane, and yellow pedestrian crossing signs.
- The crosswalk from the Wheelock Park pool parking lot to the school has a "pedestrian crossing" sign posted in the middle of the crosswalk. Several parents and children were observed walking through this intersection on the opposite side of the crosswalk, creating a conflict area with motorists.

The picture above shows the crosswalk from the Wheelock Park pool parking lot to the school playground.

ENVIRONMENTAL CONDITIONS

- Walking and biking routes to and from the school are pleasant and the infrastructure seems to be in good condition.
- Traffic on Park Avenue would be scary for a younger child walking or biking without a parent or other adult.
- Parents in the drop-off line idle their cars, however the line moves too fast for parents to turn off their cars in the morning. Anti-idling signs for afternoon pick-up could be helpful for reducing exhaust fumes.


A parent walks with her children from the Wheelock Park pool parking lot to drop them off at the entrance to the school playground.

DRIVER BEHAVIOR

- In general, parents behaved cautiously in the school zone, however they did not always obey the wayfaring signs.
- One parent made a U-turn on Wheelock Street during drop-off.

POLICIES

- Children are not allowed outside when the temperature is 15 degrees or below. For this reason, the “Walk, Ride, and Roll” program only runs in the spring and fall.

OTHER NOTES

- Parking is somewhat limited for staff.

Parent Survey About Walking and Biking to School

Dear Parent or Caregiver,

Your child's school wants to learn your thoughts about children walking and biking to school. This survey will take about 5 - 10 minutes to complete. We ask that each family complete only one survey per school your children attend. If more than one child from a school brings a survey home, please fill out the survey for the child with the next birthday from today's date.

After you have completed this survey, send it back to the school with your child or give it to the teacher. Your responses will be kept confidential and neither your name nor your child's name will be associated with any results.

Thank you for participating in this survey!

+ CAPITAL LETTERS ONLY – BLUE OR BLACK INK ONLY +

School Name:

1. What is the grade of the child who brought home this survey? ☐☐ Grade (PK,K,1,2,3…)

2. Is the child who brought home this survey male or female? ☐ Male ☐ Female

3. How many children do you have in Kindergarten through 8th grade? ☐☐

4. What is the street intersection nearest your home? (Provide the names of two intersecting streets)

and

Place a clear 'X' inside box. If you make a mistake, fill the entire box, and then mark the correct box.

5. How far does your child live from school?

- ☐ Less than ¼ mile
- ☐ ¼ mile up to ½ mile
- ☐ ½ mile up to 1 mile
- ☐ 1 mile up to 2 miles
- ☐ More than 2 miles
- ☐ Don't know

Place a clear 'X' inside box. If you make a mistake, fill the entire box, and then mark the correct box. +

6. On most days, how does your child arrive and leave for school? (Select one choice per column, mark box with X)

Arrive at school	Leave from school
☐ Walk	☐ Walk
☐ Bike	☐ Bike
☐ School Bus	☐ School Bus
☐ Family vehicle (only children in your family)	☐ Family vehicle (only children in your family)
☐ Carpool (Children from other families)	☐ Carpool (Children from other families)
☐ Transit (city bus, subway, etc.)	☐ Transit (city bus, subway, etc.)
☐ Other (skateboard, scooter, inline skates, etc.)	☐ Other (skateboard, scooter, inline skates, etc.)

+ Place a clear 'X' inside box. If you make a mistake, fill the entire box, and then mark the correct box +

7. How long does it normally take your child to get to/from school? (Select one choice per column, mark box with X)

Travel time to school	Travel time from school
☐ Less than 5 minutes	☐ Less than 5 minutes
☐ 5 – 10 minutes	☐ 5 – 10 minutes
☐ 11 – 20 minutes	☐ 11 – 20 minutes
☐ More than 20 minutes	☐ More than 20 minutes
☐ Don't know / Not sure	☐ Don't know / Not sure

+ +

8. Has your child asked you for permission to walk or bike to/from school in the last year? ☐ Yes ☐ No

9. At what grade would you allow your child to walk or bike to/from school without an adult?

(Select a grade between PK,K,1,2,3…) ☐☐ grade **(or)** ☐ I would not feel comfortable at any grade

Place a clear 'X' inside box. If you make a mistake, fill the entire box, and then mark the correct box

10. What of the following issues affected your decision to allow, or not allow, your child to walk or bike to/from school? (Select ALL that apply)

11. Would you probably let your child walk or bike to/from school if this problem were changed or improved? (Select one choice per line, mark box with X)

	My child already walks or bikes to/from school		
☐ Distance	☐ Yes	☐ No	☐ Not Sure
☐ Convenience of driving	☐ Yes	☐ No	☐ Not Sure
☐ Time	☐ Yes	☐ No	☐ Not Sure
☐ Child's before or after-school activities	☐ Yes	☐ No	☐ Not Sure
☐ Speed of traffic along route	☐ Yes	☐ No	☐ Not Sure
☐ Amount of traffic along route	☐ Yes	☐ No	☐ Not Sure
☐ Adults to walk or bike with	☐ Yes	☐ No	☐ Not Sure
☐ Sidewalks or pathways	☐ Yes	☐ No	☐ Not Sure
☐ Safety of intersections and crossings	☐ Yes	☐ No	☐ Not Sure
☐ Crossing guards	☐ Yes	☐ No	☐ Not Sure
☐ Violence or crime	☐ Yes	☐ No	☐ Not Sure
☐ Weather or climate	☐ Yes	☐ No	☐ Not Sure

Place a clear 'X' inside box. If you make a mistake, fill the entire box, and then mark the correct box

12. In your opinion, how much does your child's school encourage or discourage walking and biking to/from school?

☐ Strongly Encourages ☐ Encourages ☐ Neither ☐ Discourages ☐ Strongly Discourages

13. How much fun is walking or biking to/from school for your child?

☐ Very Fun ☐ Fun ☐ Neutral ☐ Boring ☐ Very Boring

14. How healthy is walking or biking to/from school for your child?

☐ Very Healthy ☐ Healthy ☐ Neutral ☐ Unhealthy ☐ Very Unhealthy

Place a clear 'X' inside box. If you make a mistake, fill the entire box, and then mark the correct box

15. What is the highest grade or year of school you completed?

☐ Grades 1 through 8 (Elementary)
☐ Grades 9 through 11 (Some high school)
☐ Grade 12 or GED (High school graduate)
☐ College 1 to 3 years (Some college or technical school)
☐ College 4 years or more (College graduate)
☐ Prefer not to answer

16. Please provide any additional comments below.

Symonds Elementary School

Traffic Studies

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Contents

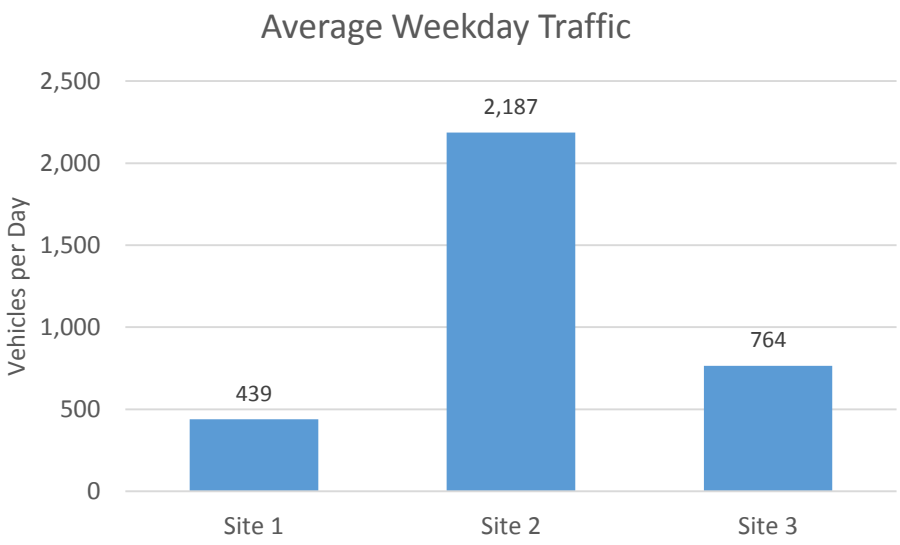
List of Figures

Site Map

Figure 1 – Site Map

Summary

Figure 2 – Average traffic volume (vehicles per day)



Traffic Counts

Site 1: Symonds School One-Way Entrance

Figure 3 - Site 1 (facing east)

60-Minute Drops

Peak hour **bold**

	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Averages	
	11 May	12 May	13 May	14 May	15 May	16 May	17 May	1 - 5	1 - 7
Hour									
0000-0100	*	0	0	0	0	2	0	0.0	0.3
0100-0200	*	0	0	0	0	0	3	0.0	0.3
0200-0300	*	0	0	0	0	0	0	0.0	0.0
0300-0400	*	0	0	0	0	0	0	0.0	0.0
0400-0500	*	0	0	0	0	0	0	0.0	0.0
0500-0600	*	1	1	2	3	0	0	1.3	0.8
0600-0700	*	1	0	5	4	0	0	2.3	1.5
0700-0800	*	53	70	59	47	0	0	56.8	37.8
0800-0900	*	**121**	**169**	**144**	**223**	7	0	**163.8**	**110.3**
0900-1000	*	5	6	10	13	7	3	8.0	7.0
1000-1100	*	14	15	1	7	27	**17**	9.3	13.3
1100-1200	*	2	5	8	4	**39**	5	4.5	10.3
1200-1300	14	25	21	13	24	33	6	18.6	18.9
1300-1400	10	8	13	10	4	**41**	**13**	8.4	13.7
1400-1500	38	30	42	48	39	37	1	38.6	32.9
1500-1600	47	40	47	57	**45**	30	1	47.0	**37.9**
1600-1700	32	32	18	**58**	28	22	6	33.2	27.7
1700-1800	**51**	**42**	**68**	53	27	16	5	**47.8**	37.0
1800-1900	17	13	51	16	13	13	4	21.2	17.6
1900-2000	14	19	15	9	6	13	2	12.0	10.6
2000-2100	0	3	18	5	1	11	0	5.0	5.1
2100-2200	0	2	0	2	2	0	6	1.0	1.6
2200-2300	2	1	4	2	0	0	0	1.2	0.9
2300-2400	0	0	0	0	3	1	1	0.4	0.6
Totals									
0700-1900	*	383	521	475	471	271	60	457.1	364.4
0600-2200	*	407	554	495	483	295	68	477.3	383.2
0600-0000	*	408	558	496	486	296	69	478.9	384.6
0000-0000	*	409	559	498	488	298	71	480.1	386.1
AM Peak	*	0800	0800	0800	0800	1100	1000		
	*	121	169	144	223	39	17		
PM Peak	1700	1700	1700	1600	1500	1300	1300		
	51	42	68	58	45	41	13		

*** - No data.**

	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Averages	
	18 May	19 May	20 May	21 May	22 May	23 May	24 May	1 - 5	1 - 7
Hour									
0000-0100	0	0	0	0	0	2	2	0.0	0.3
0100-0200	0	0	0	0	0	0	0	0.0	0.0
0200-0300	0	0	0	0	0	0	0	0.0	0.0
0300-0400	0	0	0	0	0	0	0	0.0	0.0
0400-0500	0	0	0	0	0	0	0	0.0	0.0
0500-0600	4	1	1	1	2	0	0	1.4	1.0
0600-0700	0	1	1	0	1	0	0	0.6	0.4
0700-0800	44	49	67	44	51	0	0	50.4	36.0
0800-0900	**152**	**165**	**167**	**144**	**176**	6	2	**160.4**	**115.6**
0900-1000	10	3	4	11	6	5	1	6.2	5.3
1000-1100	6	7	8	12	7	16	0	7.4	7.4
1100-1200	10	16	10	7	11	**18**	**3**	10.2	10.3
1200-1300	13	12	11	22	**62**	17	5	23.6	20.0
1300-1400	14	5	8	10	28	**33**	2	12.6	13.9
1400-1500	32	25	42	31	24	5	5	30.2	23.0
1500-1600	**44**	43	**61**	**44**	26	14	4	**43.2**	**33.3**
1600-1700	22	23	19	19	4	6	**6**	17.0	13.9
1700-1800	37	**49**	14	43	25	7	4	33.0	24.9
1800-1900	6	25	14	12	11	4	5	13.4	10.9
1900-2000	3	13	9	13	9	2	5	9.0	7.3
2000-2100	1	17	9	0	2	0	0	5.6	4.0
2100-2200	2	0	6	3	0	0	0	1.6	1.1
2200-2300	0	0	2	0	0	0	0	0.2	0.1
2300-2400	0	0	0	1	0	0	0	0.2	0.1
Totals									
0700-1900	388	420	423	396	427	129	37	407.6	314.3
0600-2200	393	451	447	411	439	131	41	424.4	327.1
0600-0000	393	451	449	412	439	131	41	424.8	327.4
0000-0000	397	452	450	413	440	132	43	426.2	328.7
AM Peak	0800	0800	0800	0800	0800	1100	1100		
	152	165	167	144	176	18	3		
PM Peak	1500	1700	1500	1500	1200	1300	1600		
	44	49	61	44	62	33	6		

*** - No data.**

Hour	Mon 25 May	Tue 26 May	Wed 27 May	Thu 28 May	Fri 29 May	Sat 30 May	Sun 31 May	Averages 1 - 5	1 - 7
0000-0100	0	0	2	1	0	1	0	0.6	0.6
0100-0200	0	0	0	0	0	0	1	0.0	0.1
0200-0300	0	0	0	0	0	0	0	0.0	0.0
0300-0400	0	0	0	0	0	0	0	0.0	0.0
0400-0500	0	0	0	0	0	0	0	0.0	0.0
0500-0600	0	1	1	1	1	1	0	0.8	0.7
0600-0700	0	2	0	0	1	7	0	0.6	1.4
0700-0800	1	49	52	70	40	**50**	0	42.0	37.0
0800-0900	1	**130**	**150**	**127**	**156**	43	0	**112.4**	**86.4**
0900-1000	3	14	11	4	1	16	0	6.4	6.7
1000-1100	3	6	13	6	0	6	0	5.4	4.6
1100-1200	**3**	10	5	10	15	8	**3**	8.2	7.4
1200-1300	0	13	7	13	14	4	**3**	9.0	7.3
1300-1400	3	6	3	7	8	4	2	5.0	4.1
1400-1500	**5**	25	37	44	33	3	2	28.4	21.0
1500-1600	2	**53**	**41**	**64**	44	**9**	0	**40.6**	**30.3**
1600-1700	3	29	15	17	26	6	0	17.8	13.4
1700-1800	3	38	39	20	**85**	2	0	36.2	26.1
1800-1900	2	36	25	12	47	1	3	23.8	17.4
1900-2000	2	9	9	11	5	2	1	7.2	5.6
2000-2100	0	19	12	0	9	1	0	7.6	5.6
2100-2200	3	5	0	2	5	0	0	2.6	1.9
2200-2300	0	0	0	0	2	0	0	0.4	0.3
2300-2400	0	0	0	0	0	0	0	0.0	0.0
Totals									
0700-1900	28	405	396	392	467	149	12	335.2	261.9
0600-2200	33	440	416	405	486	159	13	353.2	276.3
0600-0000	33	440	416	405	488	159	13	353.6	276.6
0000-0000	33	441	419	407	489	161	14	355.0	278.0
AM Peak	1100	0800	0800	0800	0800	0700	1100		
	3	130	150	127	156	50	3		
PM Peak	1400	1500	1500	1500	1700	1500	1200		
	5	53	41	64	85	9	3		

*** - No data.**

15-Minute Drops

Peak hour red

* Monday, May 11, 2015=223 (Incomplete) , 15 minute drops

0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	
-	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**14**	**10**	**38**	**47**	**32**	**51**	**17**	**14**	**0**	**0**	**2**	**0**	
-	-	-	-	-	-	-	-	-	-	-	-	2	7	0	**28**	12	14	12	5	0	0	2	0	0
-	-	-	-	-	-	-	-	-	-	-	-	5	2	0	**5**	6	19	1	6	0	0	0	0	0
-	-	-	-	-	-	-	-	-	-	-	-	3	2	**14**	11	6	10	2	2	0	0	0	0	0
-	-	-	-	-	-	-	-	-	-	-	-	4	0	**24**	4	8	9	2	1	0	0	0	0	0

PM Peak 1430 - 1530 (70), PM PHF=0.64

* Tuesday, May 12, 2015=409, 15 minute drops

0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	
0	**0**	**0**	**0**	**0**	**1**	**1**	**53**	**121**	**5**	**14**	**2**	**25**	**8**	**30**	**40**	**32**	**42**	**13**	**19**	**3**	**2**	**1**	**0**	
0	0	0	0	0	0	0	1	**56**	0	10	1	6	4	0	**25**	7	13	7	11	0	0	0	0	0
0	0	0	0	0	0	0	9	**56**	0	0	0	8	3	0	**8**	0	14	5	2	0	0	0	0	0
0	0	0	0	0	1	0	**23**	7	5	1	0	4	0	4	**7**	18	6	0	6	1	2	0	0	0
0	0	0	0	0	0	1	**21**	2	0	3	1	8	1	**26**	1	8	10	1	0	2	0	1	0	0

AM Peak 0730 - 0830 (156), AM PHF=0.69 PM Peak 1445 - 1545 (65), PM PHF=0.63

* Wednesday, May 13, 2015=559, 15 minute drops

0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	
0	**0**	**0**	**0**	**0**	**1**	**0**	**70**	**169**	**6**	**15**	**5**	**21**	**13**	**42**	**47**	**18**	**68**	**51**	**15**	**18**	**0**	**4**	**0**	
0	0	0	0	0	0	0	2	**83**	0	6	0	5	2	2	23	2	9	**17**	3	0	0	0	0	0
0	0	0	0	0	0	0	17	**71**	1	5	3	8	4	2	8	3	**25**	18	4	1	0	4	0	0
0	0	0	0	0	1	0	**29**	14	4	2	0	5	5	6	9	8	**11**	4	4	2	0	0	0	0
0	0	0	0	0	0	0	**22**	1	2	3	2	3	3	32	7	6	**24**	13	5	15	0	0	0	0

AM Peak 0730 - 0830 (204), AM PHF=0.61 PM Peak 1715 - 1815 (76), PM PHF=0.78

* Thursday, May 14, 2015=498, 15 minute drops

0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	
0	**0**	**0**	**0**	**0**	**2**	**5**	**59**	**144**	**10**	**1**	**8**	**13**	**10**	**48**	**57**	**58**	**53**	**16**	**9**	**5**	**2**	**2**	**0**	
0	0	0	0	0	0	0	0	**63**	4	0	3	7	3	2	**27**	10	13	8	4	4	2	0	0	0
0	0	0	0	0	0	0	10	**70**	3	0	4	2	0	6	**7**	21	23	5	1	0	0	0	0	0
0	0	0	0	0	2	5	**24**	7	3	0	0	2	5	**13**	3	8	10	2	2	0	0	0	0	0
0	0	0	0	0	0	0	**25**	5	2	1	2	2	3	**27**	21	20	7	2	2	1	0	2	0	0

AM Peak 0730 - 0830 (181), AM PHF=0.65 PM Peak 1430 - 1530 (73), PM PHF=0.68

* Friday, May 15, 2015=488, 15 minute drops

0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	
0	**0**	**0**	**0**	**0**	**3**	**4**	**47**	**223**	**13**	**7**	**4**	**24**	**4**	**39**	**45**	**28**	**27**	**13**	**6**	**1**	**2**	**0**	**3**	
0	0	0	0	0	0	0	3	**77**	7	1	1	7	0	5	**26**	12	9	6	2	1	0	0	0	0
0	0	0	0	0	2	0	11	**137**	2	2	1	4	0	2	**9**	8	7	4	0	0	2	0	0	0
0	0	0	0	0	1	0	**21**	5	1	3	0	5	3	**8**	5	3	5	1	3	0	0	0	0	0
0	0	0	0	0	0	4	**13**	5	3	2	2	8	2	**24**	5	6	7	2	1	0	0	0	3	2

AM Peak 0730 - 0830 (247), AM PHF=0.45 PM Peak 1430 - 1530 (66), PM PHF=0.63

* Saturday, May 16, 2015=298, 15 minute drops

0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	
2	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**7**	**7**	**27**	**39**	**33**	**41**	**37**	**30**	**22**	**16**	**13**	**13**	**11**	**0**	**0**	**1**	
0	0	0	0	0	0	0	0	0	3	9	5	**10**	**15**	5	10	4	7	4	5	6	0	0	0	0
0	0	0	0	0	0	0	0	0	3	6	4	**7**	**4**	9	6	0	2	2	2	3	0	0	1	0
0	0	0	0	0	0	0	0	4	0	4	**11**	4	**14**	13	7	7	4	4	4	3	0	0	0	0
2	0	0	0	0	0	0	0	3	2	9	**20**	**13**	9	11	7	11	4	3	3	0	0	0	0	0

AM Peak 1130 - 1230 (48), AM PHF=0.59 PM Peak 1245 - 1345 (45), PM PHF=0.75

* Sunday, May 17, 2015=71, 15 minute drops

0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	
0	**3**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**3**	**17**	**5**	**6**	**13**	**1**	**1**	**6**	**5**	**4**	**2**	**0**	**6**	**0**	**1**	
0	0	0	0	0	0	0	0	0	0	3	**4**	0	**5**	0	0	2	0	0	0	0	1	0	0	0
0	3	0	0	0	0	0	0	0	2	**3**	0	4	**0**	0	1	1	0	0	0	0	3	0	1	0
0	0	0	0	0	0	0	0	0	2	**5**	0	3	**5**	0	0	1	3	2	2	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	**6**	1	0	**4**	1	0	3	3	2	0	0	3	0	0	0

AM Peak 1015 - 1115 (18), AM PHF=0.80 PM Peak 1300 - 1400 (13), PM PHF=0.65

* Monday, May 18, 2015=397, 15 minute drops

0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	
0	**0**	**0**	**0**	**0**	**4**	**0**	**44**	**152**	**10**	**6**	**10**	**13**	**14**	**32**	**44**	**22**	**37**	**6**	**3**	**1**	**2**	**0**	**0**	
0	0	0	0	0	1	0	2	**70**	1	2	3	6	7	1	**27**	7	7	3	2	0	0	0	0	0
0	0	0	0	0	0	0	3	**72**	4	1	4	4	3	0	**9**	7	13	0	0	0	2	0	0	0
0	0	0	0	0	1	0	**15**	11	3	2	3	0	1	5	**5**	1	6	2	1	1	0	0	0	0
0	0	0	0	0	2	0	**25**	0	3	2	0	4	4	**26**	4	7	11	1	0	0	0	0	0	0

AM Peak 0730 - 0830 (180), AM PHF=0.63 PM Peak 1445 - 1545 (66), PM PHF=0.62

* Tuesday, May 19, 2015=452, 15 minute drops

0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	
0	**0**	**0**	**0**	**0**	**1**	**1**	**49**	**165**	**3**	**7**	**16**	**12**	**5**	**25**	**43**	**23**	**49**	**25**	**13**	**17**	**0**	**0**	**0**	
0	0	0	0	0	0	0	4	**64**	0	3	5	5	2	5	**32**	1	14	6	3	2	0	0	0	0
0	0	0	0	0	0	0	10	**83**	0	0	2	3	0	2	**7**	4	12	5	2	3	0	0	0	0
0	0	0	0	0	1	0	**15**	12	0	2	4	1	1	**6**	2	14	10	3	5	11	0	0	0	0
0	0	0	0	0	0	1	**21**	7	3	2	6	3	2	**13**	3	4	13	12	4	2	0	0	0	0

AM Peak 0730 - 0830 (182), AM PHF=0.55 PM Peak 1430 - 1530 (57), PM PHF=0.45

* Wednesday, May 20, 2015=450, 15 minute drops

0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	
0	**0**	**0**	**0**	**0**	**1**	**1**	**67**	**167**	**4**	**8**	**10**	**11**	**8**	**42**	**61**	**19**	**14**	**14**	**9**	**9**	**6**	**2**	**0**	
0	0	0	0	0	0	0	2	**66**	2	0	4	4	3	2	**33**	6	8	1	1	0	4	2	0	0
0	0	0	0	0	0	0	8	**84**	0	2	0	3	3	4	**13**	10	2	0	5	0	0	0	0	0
0	0	0	0	0	1	0	**31**	11	2	3	4	1	0	**9**	8	0	2	4	0	0	0	0	0	0
0	0	0	0	0	0	1	**27**	7	0	3	3	3	3	**27**	9	4	2	9	3	9	2	0	0	0

AM Peak 0730 - 0830 (207), AM PHF=0.62 PM Peak 1430 - 1530 (81), PM PHF=0.62

* Thursday, May 21, 2015=413, 15 minute drops

0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	
0	**0**	**0**	**0**	**0**	**1**	**0**	**44**	**144**	**11**	**12**	**7**	**22**	**10**	**31**	**44**	**19**	**43**	**12**	**13**	**0**	**3**	**0**	**1**	
0	0	0	0	0	0	0	2	**64**	6	1	1	4	2	2	**30**	6	10	1	5	0	0	0	0	0
0	0	0	0	0	0	0	8	**66**	2	5	2	8	3	2	**8**	4	18	10	4	0	0	0	0	0
0	0	0	0	0	1	0	**18**	9	0	3	4	6	0	**8**	5	3	11	0	3	0	3	0	0	0
0	0	0	0	0	0	0	**16**	6	3	3	0	5	5	**20**	1	6	5	1	1	0	0	0	1	0

AM Peak 0730 - 0830 (164), AM PHF=0.62 PM Peak 1430 - 1530 (65), PM PHF=0.55

* Friday, May 22, 2015=440, 15 minute drops

0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	
0	**0**	**0**	**0**	**0**	**2**	**1**	**51**	**176**	**6**	**7**	**11**	**62**	**28**	**24**	**26**	**4**	**25**	**11**	**9**	**2**	**0**	**0**	**0**	
0	0	0	0	0	0	0	4	**82**	1	0	2	4	**18**	1	16	0	3	6	4	0	0	0	0	0
0	0	0	0	0	0	1	6	**82**	0	1	3	**25**	8	1	7	2	13	3	2	2	0	0	0	0
0	0	0	0	0	2	0	**26**	10	2	1	0	**21**	0	3	0	2	4	0	3	0	0	0	0	2
0	0	0	0	0	0	0	**16**	3	3	5	6	**13**	3	19	4	1	6	2	1	0	0	0	0	0

AM Peak 0730 - 0830 (205), AM PHF=0.63 PM Peak 1215 - 1315 (76), PM PHF=0.78

* Saturday, May 23, 2015=132, 15 minute drops

0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	
2	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**6**	**5**	**16**	**18**	**17**	**33**	**5**	**14**	**6**	**7**	**4**	**2**	**0**	**0**	**0**	**0**	
0	0	0	0	0	0	0	0	0	1	2	3	**10**	**9**	0	0	0	3	0	1	0	0	0	0	0
0	0	0	0	0	0	0	0	0	1	9	**2**	2	**8**	1	6	2	0	3	0	0	0	0	0	0
2	0	0	0	0	0	0	0	2	1	5	**2**	0	**11**	4	0	4	1	1	0	0	0	0	0	0
0	0	0	0	0	0	0	0	4	2	0	**11**	**5**	5	0	8	0	3	0	1	0	0	0	0	2

AM Peak 1115 - 1215 (25), AM PHF=0.57 PM Peak 1245 - 1345 (33), PM PHF=0.74

* Sunday, May 24, 2015=43, 15 minute drops

0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	
2	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**2**	**1**	**0**	**3**	**5**	**2**	**5**	**4**	**6**	**4**	**5**	**5**	**0**	**0**	**0**	**0**	
0	0	0	0	0	0	0	0	0	0	0	**2**	0	2	1	0	1	0	0	**3**	0	0	0	0	0
0	0	0	0	0	0	0	0	1	1	0	**1**	0	0	2	2	0	0	**0**	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	**0**	0	2	0	0	0	3	4	**4**	2	0	0	0	0	0
2	0	0	0	0	0	0	0	1	0	**0**	0	3	0	2	2	2	0	**1**	0	0	0	0	0	0

AM Peak 1030 - 1130 (3), AM PHF=0.38 PM Peak 1815 - 1915 (8), PM PHF=0.50

* Monday, May 25, 2015=33, 15 minute drops

0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	
0	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**1**	**3**	**3**	**3**	**0**	**3**	**5**	**2**	**3**	**3**	**2**	**2**	**0**	**3**	**0**	**0**	
0	0	0	0	0	0	0	0	0	0	**1**	0	0	0	0	**1**	2	1	0	0	0	3	0	0	0
0	0	0	0	0	0	0	0	0	0	**2**	1	0	3	**3**	1	0	2	0	1	0	0	0	0	0
0	0	0	0	0	0	0	1	0	**3**	0	1	0	0	**1**	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	1	**0**	0	1	0	0	**1**	0	1	0	2	1	0	0	0	0	0

AM Peak 0930 - 1030 (6), AM PHF=0.55 PM Peak 1415 - 1515 (6), PM PHF=0.50

* Tuesday, May 26, 2015=441, 15 minute drops

0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	
0	**0**	**0**	**0**	**0**	**1**	**2**	**49**	**130**	**14**	**6**	**10**	**13**	**6**	**25**	**53**	**29**	**38**	**36**	**9**	**19**	**5**	**0**	**0**	
0	0	0	0	0	0	1	2	**53**	7	3	0	4	3	0	**38**	4	9	7	5	2	0	0	0	0
0	0	0	0	0	1	1	10	**62**	5	3	5	6	0	0	**9**	5	12	10	2	11	5	0	0	2
0	0	0	0	0	0	0	**18**	10	1	0	2	2	1	**6**	2	9	10	6	1	6	0	0	0	0
0	0	0	0	0	0	0	**20**	6	2	1	3	1	2	**19**	5	11	8	14	1	0	0	0	0	0

AM Peak 0730 - 0830 (151), AM PHF=0.61 PM Peak 1430 - 1530 (71), PM PHF=0.47

* Wednesday, May 27, 2015=419, 15 minute drops

0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	
2	**0**	**0**	**0**	**0**	**1**	**0**	**52**	**150**	**11**	**13**	**5**	**7**	**3**	**37**	**41**	**15**	**39**	**25**	**9**	**12**	**0**	**0**	**0**	
0	0	0	0	0	0	0	2	**70**	4	7	0	3	2	2	**26**	8	5	3	5	0	0	0	0	1
2	0	0	0	0	0	0	8	**71**	1	2	2	3	0	**5**	2	2	12	1	5	0	0	0	0	0
0	0	0	0	0	1	0	**20**	4	2	3	2	2	0	**7**	9	3	15	3	0	12	0	0	0	0
0	0	0	0	0	0	0	**23**	5	4	1	1	0	1	**24**	5	3	7	18	0	0	0	0	0	0

AM Peak 0730 - 0830 (183), AM PHF=0.65 PM Peak 1415 - 1515 (61), PM PHF=0.59

* Thursday, May 28, 2015=407, 15 minute drops

0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	
1	**0**	**0**	**0**	**0**	**1**	**0**	**70**	**127**	**4**	**6**	**10**	**13**	**7**	**44**	**64**	**17**	**20**	**12**	**11**	**0**	**2**	**0**	**0**	
1	0	0	0	0	0	0	5	**68**	1	0	0	5	2	1	**39**	3	11	1	2	0	0	0	0	0
0	0	0	0	0	0	0	8	**49**	1	3	6	3	3	0	**18**	2	8	5	3	0	0	0	0	0
0	0	0	0	0	1	0	**25**	4	0	3	1	4	0	**11**	4	9	1	3	2	0	2	0	0	0
0	0	0	0	0	0	0	**33**	7	2	0	4	1	2	**32**	3	3	0	4	4	0	0	0	0	0

AM Peak 0730 - 0830 (175), AM PHF=0.64 PM Peak 1430 - 1530 (100), PM PHF=0.64

* Friday, May 29, 2015=489, 15 minute drops

0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	
0	**0**	**0**	**0**	**0**	**1**	**1**	**40**	**156**	**1**	**0**	**15**	**14**	**8**	**33**	**44**	**26**	**85**	**47**	**5**	**9**	**5**	**2**	**0**	
0	0	0	0	0	0	0	3	**73**	1	0	6	5	1	7	25	13	10	**29**	0	5	2	1	0	0
0	0	0	0	0	1	0	3	**69**	0	0	3	2	3	3	4	6	**17**	3	4	1	1	1	0	0
0	0	0	0	0	0	0	**20**	13	0	0	3	6	1	5	9	1	**17**	11	1	3	2	0	0	0
0	0	0	0	0	0	1	**15**	2	0	0	4	2	3	19	7	6	**41**	4	0	0	0	0	0	1

AM Peak 0730 - 0830 (175), AM PHF=0.60 PM Peak 1715 - 1815 (104), PM PHF=0.63

* Saturday, May 30, 2015=161, 15 minute drops

0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	
1	**0**	**0**	**0**	**0**	**1**	**7**	**50**	**43**	**16**	**6**	**8**	**4**	**4**	**3**	**9**	**6**	**2**	**1**	**2**	**1**	**0**	**0**	**0**	
0	0	0	0	0	0	2	10	**22**	3	5	5	1	1	1	**4**	3	0	1	2	1	0	0	0	0
0	0	0	0	0	0	3	0	**17**	4	0	2	0	0	0	**3**	3	0	0	0	0	0	0	0	0
0	0	0	0	0	0	1	**16**	3	3	1	1	0	3	0	**2**	0	0	0	0	0	0	0	0	0
1	0	0	0	0	1	1	**25**	2	7	0	1	3	0	**2**	0	0	2	0	0	0	0	0	0	0

AM Peak 0730 - 0830 (79), AM PHF=0.80 PM Peak 1445 - 1545 (11), PM PHF=0.69

* Sunday, May 31, 2015=14, 15 minute drops

0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	
0	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**3**	**3**	**2**	**2**	**0**	**0**	**0**	**3**	**1**	**0**	**0**	**0**	**0**	
0	0	0	0	0	0	0	0	0	0	0	0	**2**	2	2	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	**2**	**0**	0	0	0	0	0	0	0	0	0	0	0	0
0	1	0	0	0	0	0	0	0	0	0	**1**	**0**	0	0	0	0	0	3	1	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	**0**	**1**	0	0	0	0	0	0	0	0	0	0	0	0

AM Peak 1115 - 1215 (5), AM PHF=0.63 PM Peak 1200 - 1300 (3), PM PHF=0.38

* Monday, June 01, 2015=332 (Incomplete) , 15 minute drops

0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	
0	**0**	**0**	**0**	**0**	**1**	**2**	**51**	**279**	**–**	**–**	**–**	**–**	**–**	**–**	**–**	**–**	**–**	**–**	**–**	**–**	**–**	**–**	**–**	
0	0	0	0	0	0	0	4	94	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
0	0	0	0	0	0	2	12	173	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
0	0	0	0	0	1	0	13	8	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
0	0	0	0	0	0	0	24	4	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–

Site 2: Wheelock Park Driveway North of Symonds School One-Way Entrance

Figure 4 - Site 2 (facing south, towards Park Avenue)

60-Minute Drops

Peak hour **bold**

	Mon 18 May	Tue 19 May	Wed 20 May	Thu 21 May	Fri 22 May	Sat 23 May	Sun 24 May	Averages 1 - 5	Averages 1 - 7
Hour									
0000-0100	*	*	*	*	*	4	4	*	3.0
0100-0200	*	*	*	*	*	0	0	*	0.0
0200-0300	*	*	*	*	*	2	3	*	2.5
0300-0400	*	*	*	*	*	0	0	*	0.0
0400-0500	*	*	*	*	*	0	3	*	1.0
0500-0600	*	*	*	*	*	0	4	*	1.5
0600-0700	*	*	*	*	*	10	5	*	6.5
0700-0800	*	*	*	*	*	0	6	*	3.0
0800-0900	*	*	*	*	*	40	11	*	25.5
0900-1000	*	*	*	*	*	68	18	*	42.0
1000-1100	*	*	*	*	42	117	17	42.0	58.3
1100-1200	*	*	*	*	35	**129**	**42**	34.0	**68.0**
1200-1300	*	*	*	*	**267**	67	44	**266.0**	**125.3**
1300-1400	*	*	*	*	110	**163**	**75**	109.0	115.7
1400-1500	*	*	*	*	81	84	54	80.0	72.3
1500-1600	*	*	*	*	172	140	54	172.0	121.7
1600-1700	*	*	*	*	67	39	51	67.0	52.0
1700-1800	*	*	*	*	152	57	43	151.0	83.0
1800-1900	*	*	*	*	121	45	49	121.0	71.3
1900-2000	*	*	*	*	232	16	40	231.0	95.3
2000-2100	*	*	*	*	105	28	16	105.0	49.3
2100-2200	*	*	*	*	87	12	2	86.0	32.7
2200-2300	*	*	*	*	16	4	1	16.0	7.0
2300-2400	*	*	*	*	5	5	3	5.0	4.0
Totals									
0700-1900	*	*	*	*	*	945	463	*	838.2
0600-2200	*	*	*	*	*	1010	524	*	1022.0
0600-0000	*	*	*	*	*	1018	528	*	1033.0
0000-0000	*	*	*	*	*	1024	541	*	1041.0
AM Peak	*	*	*	*	*	1100	1100		
	*	*	*	*	*	129	42		
PM Peak	*	*	*	*	1200	1300	1300		
	*	*	*	*	267	163	75		

*** - No data.**

Hour	Mon 25 May	Tue 26 May	Wed 27 May	Thu 28 May	Fri 29 May	Sat 30 May	Sun 31 May	Averages 1 - 5	Averages 1 - 7
0000-0100	3	0	2	0	4	16	2	1.4	3.6
0100-0200	0	0	1	0	0	1	3	0.2	0.7
0200-0300	0	0	4	0	1	0	0	1.0	0.7
0300-0400	0	0	0	0	4	3	0	0.8	0.9
0400-0500	0	0	6	0	0	0	0	1.2	0.9
0500-0600	0	1	1	9	6	1	2	3.2	2.7
0600-0700	3	12	8	20	8	25	4	9.6	10.7
0700-0800	6	39	57	77	41	104	9	43.0	46.7
0800-0900	11	**241**	**291**	**302**	**264**	144	10	**220.8**	**179.7**
0900-1000	16	33	52	63	41	**281**	20	40.8	72.0
1000-1100	22	50	69	50	47	198	**31**	47.4	66.4
1100-1200	**29**	62	93	80	80	126	26	68.6	70.7
1200-1300	30	58	53	58	56	**134**	20	50.8	58.1
1300-1400	50	68	38	88	65	81	41	61.4	61.1
1400-1500	45	62	97	115	77	94	45	78.8	76.0
1500-1600	**61**	242	270	**284**	235	124	**55**	217.8	181.1
1600-1700	47	101	85	93	116	46	43	88.2	75.6
1700-1800	43	256	222	234	229	120	4	196.2	157.9
1800-1900	46	160	166	154	278	125	18	160.2	134.7
1900-2000	24	**263**	**413**	249	**285**	36	15	**246.4**	**183.3**
2000-2100	9	208	21	221	232	47	8	137.6	106.0
2100-2200	7	152	6	132	162	20	0	91.4	68.0
2200-2300	5	85	4	76	135	18	0	60.6	45.9
2300-2400	3	10	0	4	29	12	0	8.8	7.9
Totals									
0700-1900	403	1371	1490	1594	1527	1575	321	1274.0	1180.1
0600-2200	446	2005	1937	2215	2212	1702	347	1759.0	1548.1
0600-0000	453	2100	1941	2295	2375	1731	347	1828.4	1601.9
0000-0000	455	2101	1955	2304	2390	1752	354	1836.2	1611.3
AM Peak	1100	0800	0800	0800	0800	0900	1000		
	29	241	291	302	264	281	31		
PM Peak	1500	1900	1900	1500	1900	1200	1500		
	61	263	413	284	285	134	55		

*** - No data.**

15-Minute Drops

Peak hour red

* Friday, May 22, 2015=1489 (Incomplete) , 15 minute drops

0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	
-	-	-	-	-	-	-	-	-	-	**42**	**35**	**267**	**110**	**81**	**172**	**67**	**152**	**121**	**232**	**105**	**87**	**16**	**5**	
-	-	-	-	-	-	-	-	-	-	15	15	29	**27**	16	76	27	26	49	34	43	11	14	2	4
-	-	-	-	-	-	-	-	-	-	6	7	35	**46**	17	52	14	55	19	40	20	12	0	2	0
-	-	-	-	-	-	-	-	-	-	11	5	**131**	24	16	22	12	26	28	71	23	2	2	0	0
-	-	-	-	-	-	-	-	-	-	11	8	**72**	14	32	23	15	46	26	88	20	62	0	2	0

PM Peak 1230 - 1330 (275), PM PHF=0.52

* Saturday, May 23, 2015=1024, 15 minute drops

0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	
4	**0**	**2**	**0**	**0**	**0**	**10**	**0**	**40**	**68**	**117**	**129**	**67**	**163**	**84**	**140**	**39**	**57**	**45**	**16**	**28**	**12**	**4**	**5**	
4	0	0	0	0	0	0	0	4	15	33	**22**	10	**33**	22	37	11	16	9	7	11	10	0	4	0
0	0	0	0	0	0	8	0	6	25	43	**25**	29	**45**	24	69	5	12	14	0	8	2	1	1	1
0	0	2	0	0	0	0	0	16	14	17	**29**	14	**65**	18	30	10	16	7	9	6	0	3	0	0
0	0	0	0	0	0	2	0	15	15	24	**54**	15	**21**	21	5	14	14	15	0	4	0	0	0	3

AM Peak 1100 - 1200 (129), AM PHF=0.60 PM Peak 1300 - 1400 (163), PM PHF=0.63

* Sunday, May 24, 2015=541, 15 minute drops

0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	
4	**0**	**3**	**0**	**3**	**4**	**5**	**6**	**11**	**18**	**17**	**42**	**44**	**75**	**54**	**54**	**51**	**43**	**49**	**40**	**16**	**2**	**1**	**3**	
0	0	3	0	0	0	0	0	3	7	5	8	**7**	**25**	19	8	6	22	21	10	4	0	1	0	3
1	0	0	0	0	0	0	0	0	5	4	2	**6**	**29**	16	14	12	16	8	18	7	2	0	0	0
0	0	0	0	0	4	3	3	0	4	8	**25**	**18**	10	7	19	18	3	7	7	1	0	0	1	0
3	0	0	0	3	0	2	3	9	3	1	**8**	**14**	12	12	14	16	2	14	5	5	0	0	2	0

AM Peak 1130 - 1230 (45), AM PHF=0.45 PM Peak 1230 - 1330 (85), PM PHF=0.74

* Monday, May 25, 2015=455, 15 minute drops

0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	
3	**0**	**0**	**0**	**0**	**0**	**3**	**6**	**11**	**16**	**22**	**29**	**30**	**50**	**45**	**61**	**47**	**43**	**46**	**24**	**9**	**7**	**5**	**3**	
3	0	0	0	0	0	0	0	4	4	4	6	**12**	11	6	14	**16**	19	15	13	1	5	5	0	0
0	0	0	0	0	0	0	1	1	9	4	6	**12**	8	13	13	**18**	14	9	6	1	2	0	0	0
0	0	0	0	0	0	0	1	2	4	8	**6**	0	12	14	**17**	7	8	7	5	3	0	0	0	0
0	0	0	0	0	0	3	4	4	0	6	**12**	6	19	13	**18**	7	3	15	0	5	0	0	3	0

AM Peak 1130 - 1230 (42), AM PHF=0.86 PM Peak 1530 - 1630 (67), PM PHF=0.96

* Tuesday, May 26, 2015=2101, 15 minute drops

0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	
0	**0**	**0**	**0**	**0**	**1**	**12**	**39**	**241**	**33**	**50**	**62**	**58**	**68**	**62**	**242**	**101**	**256**	**160**	**263**	**208**	**152**	**85**	**10**	
0	0	0	0	0	0	1	5	**86**	12	17	18	16	12	5	137	22	57	47	52	**64**	48	16	7	2
0	0	0	0	0	1	4	8	**108**	7	11	12	11	18	7	61	20	68	28	**69**	47	64	37	3	0
0	0	0	0	0	0	7	13	**35**	7	5	17	18	14	13	30	23	66	25	**63**	38	25	33	0	0
0	0	0	0	0	0	1	**14**	12	7	17	16	14	26	39	15	36	66	61	**80**	59	16	0	0	0

AM Peak 0745 - 0845 (242), AM PHF=0.56 PM Peak 1915 - 2015 (275), PM PHF=0.86

* Wednesday, May 27, 2015=1955, 15 minute drops

0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	
2	**1**	**4**	**0**	**6**	**1**	**8**	**57**	**291**	**52**	**69**	**93**	**53**	**38**	**97**	**270**	**85**	**222**	**166**	**413**	**21**	**6**	**4**	**0**	
2	0	0	0	0	0	0	5	**92**	17	20	17	21	10	15	147	25	39	33	**75**	10	2	4	0	0
0	1	0	0	0	1	0	18	**172**	18	16	27	14	9	22	69	27	44	19	**239**	3	1	0	0	0
0	0	4	0	0	0	5	**18**	15	15	16	28	12	15	14	30	21	72	43	**97**	8	2	0	0	0
0	0	0	0	6	1	3	**17**	12	3	18	23	7	5	47	25	12	68	**72**	4	0	1	0	0	0

AM Peak 0730 - 0830 (298), AM PHF=0.43 PM Peak 1845 - 1945 (482), PM PHF=0.50

* Thursday, May 28, 2015=2304, 15 minute drops

0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	
0	**0**	**0**	**0**	**0**	**9**	**20**	**77**	**302**	**63**	**50**	**80**	**58**	**88**	**115**	**284**	**93**	**234**	**154**	**249**	**221**	**132**	**76**	**4**	
0	0	0	0	0	0	2	14	**122**	10	15	16	11	18	24	**165**	17	50	49	46	72	28	6	2	0
0	0	0	0	0	0	1	6	**125**	17	12	22	20	17	15	**55**	16	64	31	49	56	38	44	2	4
0	0	0	0	0	0	11	16	**25**	8	12	28	9	26	28	**44**	32	73	21	111	54	56	11	0	0
0	0	0	0	0	9	7	**41**	30	30	11	15	19	29	**49**	21	28	48	53	43	40	11	16	0	0

AM Peak 0745 - 0845 (312), AM PHF=0.62 PM Peak 1445 - 1545 (312), PM PHF=0.47

* Friday, May 29, 2015=2390, 15 minute drops

0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	
4	**0**	**1**	**4**	**0**	**6**	**8**	**41**	**264**	**41**	**47**	**80**	**56**	**65**	**77**	**235**	**116**	**229**	**278**	**285**	**232**	**162**	**135**	**29**	
0	0	1	0	0	0	0	10	**101**	11	18	12	12	25	20	122	24	35	51	43	**86**	52	35	9	4
4	0	0	0	0	0	5	9	**120**	7	6	22	13	17	12	52	34	63	135	**61**	50	18	19	6	0
0	0	0	2	0	1	1	10	**35**	15	13	32	23	5	17	42	24	67	46	**56**	52	25	75	2	9
0	0	0	2	0	5	2	**12**	8	8	10	15	10	19	29	20	35	64	47	**125**	45	67	7	12	3

AM Peak 0745 - 0845 (268), AM PHF=0.56 PM Peak 1915 - 2015 (328), PM PHF=0.66

* Saturday, May 30, 2015=1752, 15 minute drops

0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	
16	**1**	**0**	**3**	**0**	**1**	**25**	**104**	**144**	**281**	**198**	**126**	**134**	**81**	**94**	**124**	**46**	**120**	**125**	**36**	**47**	**20**	**18**	**12**	
4	1	0	3	0	0	3	9	63	52	**87**	36	25	19	20	64	13	21	**61**	9	11	2	5	6	0
0	0	0	0	0	0	4	9	47	**74**	38	26	29	17	27	21	13	**32**	30	12	22	2	2	6	0
9	0	0	0	0	0	5	37	17	**62**	45	24	49	18	20	26	5	**26**	11	9	10	11	5	0	2
3	0	0	0	0	1	13	49	19	**94**	29	41	31	28	27	14	16	**42**	23	7	5	5	7	0	0

AM Peak 0915 - 1015 (316), AM PHF=0.84 PM Peak 1715 - 1815 (161), PM PHF=0.66

* Sunday, May 31, 2015=354, 15 minute drops

0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	
2	**3**	**0**	**0**	**0**	**2**	**4**	**9**	**10**	**20**	**31**	**26**	**20**	**41**	**45**	**55**	**43**	**4**	**18**	**15**	**8**	**0**	**0**	**0**	
0	0	0	0	0	0	2	2	0	3	**4**	0	7	8	18	18	**17**	0	0	5	5	0	0	0	0
0	0	0	0	0	0	0	4	4	4	**9**	10	4	11	9	19	**10**	0	5	0	0	0	0	0	2
2	3	0	0	0	0	2	3	2	3	**11**	9	8	10	5	1	**11**	2	9	5	0	0	0	0	0
0	0	0	0	0	2	0	0	5	**10**	8	8	2	13	14	**18**	5	3	5	5	3	0	0	0	0

AM Peak 0945 - 1045 (33), AM PHF=0.77 PM Peak 1545 - 1645 (56), PM PHF=0.79

* Monday, June 01, 2015=364 (Incomplete) , 15 minute drops

0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	
2	**0**	**0**	**0**	**0**	**0**	**4**	**35**	**324**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	
0	0	0	0	0	0	0	6	108	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2	0	0	0	0	0	0	13	175	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
0	0	0	0	0	0	1	4	35	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
0	0	0	0	0	0	3	12	7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Site 3: Wheelock Park Driveway North of Symonds School One-Way Exit

Figure 5 - Site 3 (facing south, towards Park Avenue)

60-Minute Drops

Peak hour **bold**

	Mon 18 May	Tue 19 May	Wed 20 May	Thu 21 May	Fri 22 May	Sat 23 May	Sun 24 May	Averages 1 - 5	Averages 1 - 7
Hour									
0000-0100	*	*	*	*	*	0	3	*	1.5
0100-0200	*	*	*	*	*	0	1	*	0.5
0200-0300	*	*	*	*	*	2	2	*	2.0
0300-0400	*	*	*	*	*	0	0	*	0.0
0400-0500	*	*	*	*	*	0	1	*	0.5
0500-0600	*	*	*	*	*	0	3	*	1.5
0600-0700	*	*	*	*	*	5	4	*	4.0
0700-0800	*	*	*	*	*	0	3	*	1.5
0800-0900	*	*	*	*	*	15	2	*	8.0
0900-1000	*	*	*	*	*	27	14	*	20.5
1000-1100	*	*	*	*	32	24	7	32.0	20.7
1100-1200	*	*	*	*	28	**41**	**37**	28.0	**35.3**
1200-1300	*	*	*	*	55	45	34	54.0	43.7
1300-1400	*	*	*	*	48	**69**	**47**	48.0	**54.7**
1400-1500	*	*	*	*	38	47	32	37.0	38.7
1500-1600	*	*	*	*	59	41	40	59.0	46.0
1600-1700	*	*	*	*	40	27	19	39.0	27.7
1700-1800	*	*	*	*	97	35	27	96.0	52.3
1800-1900	*	*	*	*	65	14	31	65.0	36.3
1900-2000	*	*	*	*	**97**	21	37	**96.0**	51.3
2000-2100	*	*	*	*	25	20	10	24.0	18.0
2100-2200	*	*	*	*	9	14	2	8.0	7.7
2200-2300	*	*	*	*	7	2	2	6.0	3.3
2300-2400	*	*	*	*	2	4	0	2.0	2.0
Totals									
0700-1900	*	*	*	*	*	382	291	*	385.3
0600-2200	*	*	*	*	*	442	344	*	466.3
0600-0000	*	*	*	*	*	448	346	*	471.7
0000-0000	*	*	*	*	*	450	356	*	477.7
AM Peak	*	*	*	*	*	1100	1100		
	*	*	*	*	*	41	37		
PM Peak	*	*	*	*	1900	1300	1300		
	*	*	*	*	97	69	47		

*** - No data.**

Hour	Mon 25 May	Tue 26 May	Wed 27 May	Thu 28 May	Fri 29 May	Sat 30 May	Sun 31 May	Averages 1 - 5	Averages 1 - 7
0000-0100	3	0	1	2	0	3	0	1.0	1.1
0100-0200	0	0	1	0	0	3	3	0.2	0.7
0200-0300	0	0	0	0	0	0	0	0.0	0.0
0300-0400	0	0	0	0	0	4	0	0.0	0.4
0400-0500	0	0	1	0	0	0	0	0.2	0.1
0500-0600	0	1	1	1	1	1	1	0.4	0.6
0600-0700	1	3	5	10	4	14	4	4.2	5.4
0700-0800	2	20	25	26	18	30	3	17.4	17.0
0800-0900	9	**44**	53	35	20	51	4	31.6	30.3
0900-1000	11	24	26	33	20	68	13	22.2	27.3
1000-1100	9	35	50	39	28	85	21	32.0	37.9
1100-1200	**31**	36	**58**	**57**	**43**	**89**	**23**	**44.8**	**47.9**
1200-1300	20	37	42	44	30	**104**	15	34.2	41.4
1300-1400	36	36	19	60	35	71	30	36.8	40.6
1400-1500	21	23	44	47	23	68	38	30.8	36.9
1500-1600	34	46	23	67	23	102	**44**	38.2	47.9
1600-1700	31	39	34	46	35	38	32	36.4	35.7
1700-1800	14	**123**	112	**132**	112	84	0	**98.2**	**82.0**
1800-1900	**36**	64	68	82	112	86	10	72.2	65.1
1900-2000	9	74	**134**	67	**126**	25	7	81.4	62.6
2000-2100	12	85	12	92	63	27	3	52.0	41.3
2100-2200	3	20	7	23	41	15	0	18.4	15.1
2200-2300	0	8	0	9	25	8	0	8.4	7.1
2300-2400	2	0	0	0	9	9	0	2.0	2.6
Totals									
0700-1900	253	525	551	665	496	872	231	494.8	509.9
0600-2200	277	705	709	856	729	952	244	650.8	634.3
0600-0000	279	713	709	865	762	968	244	661.2	644.0
0000-0000	281	713	712	868	763	978	247	663.0	647.0
AM Peak	1100	0800	1100	1100	1100	1100	1100		
	31	44	58	57	43	89	23		
PM Peak	1800	1700	1900	1700	1900	1200	1500		
	36	123	134	132	126	104	44		

*** - No data.**

15-Minute Drops

Peak hour red

* Friday, May 22, 2015=598 (Incomplete) , 15 minute drops

0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	
-	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**32**	**28**	**55**	**48**	**38**	**59**	**40**	**97**	**65**	**97**	**25**	**9**	**7**	**2**	
-	-	-	-	-	-	-	-	-	-	5	10	17	8	6	19	14	22	**23**	15	2	2	7	0	0
-	-	-	-	-	-	-	-	-	-	10	9	12	21	18	18	11	**29**	16	10	8	3	0	0	0
-	-	-	-	-	-	-	-	-	-	5	5	17	12	6	8	7	**15**	13	27	4	0	0	0	0
-	-	-	-	-	-	-	-	-	-	13	5	9	8	9	15	9	**32**	14	46	11	4	0	2	0

PM Peak 1715 - 1815 (98), PM PHF=0.77

* Saturday, May 23, 2015=450, 15 minute drops

0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	
0	**0**	**2**	**0**	**0**	**0**	**5**	**0**	**15**	**27**	**24**	**41**	**45**	**69**	**47**	**41**	**27**	**35**	**14**	**21**	**20**	**14**	**2**	**4**	
0	0	0	0	0	0	0	0	4	10	2	**12**	10	**25**	15	15	7	12	0	9	3	12	0	2	0
0	0	0	0	0	0	5	0	2	7	13	**10**	11	**19**	17	22	8	12	4	3	8	2	2	0	0
0	0	2	0	0	0	0	0	4	3	1	**10**	11	**20**	6	2	6	7	4	9	2	0	0	2	0
0	0	0	0	0	0	0	0	5	8	9	**9**	**14**	6	10	2	7	5	6	0	7	0	0	0	3

AM Peak 1100 - 1200 (41), AM PHF=0.85 PM Peak 1245 - 1345 (77), PM PHF=0.77

* Sunday, May 24, 2015=356, 15 minute drops

0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	
3	**1**	**2**	**0**	**1**	**3**	**4**	**3**	**2**	**14**	**7**	**37**	**34**	**47**	**32**	**40**	**19**	**27**	**31**	**37**	**10**	**2**	**2**	**0**	
0	1	2	0	0	0	0	0	0	4	2	6	**14**	**22**	11	7	4	14	12	6	2	0	2	0	3
0	0	0	0	0	0	0	0	0	4	1	**7**	6	**9**	13	9	7	7	5	25	3	2	0	0	0
0	0	0	0	0	3	2	0	0	6	2	**18**	9	**14**	3	14	4	1	7	3	2	0	0	0	0
3	0	0	0	1	0	2	3	2	0	2	**7**	**6**	3	5	11	5	5	7	4	4	0	0	0	0

AM Peak 1115 - 1215 (45), AM PHF=0.64 PM Peak 1245 - 1345 (50), PM PHF=0.58

* Monday, May 25, 2015=281, 15 minute drops

0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	
3	**0**	**0**	**0**	**0**	**0**	**1**	**2**	**9**	**11**	**9**	**31**	**20**	**36**	**21**	**34**	**31**	**14**	**36**	**9**	**12**	**3**	**0**	**2**	
3	0	0	0	0	0	0	0	3	2	2	**9**	7	6	6	4	**6**	6	5	7	4	3	0	0	0
0	0	0	0	0	0	0	0	2	7	1	**12**	7	8	8	9	**13**	5	12	2	2	0	0	0	0
0	0	0	0	0	0	0	0	2	3	3	**2**	0	9	7	**11**	5	4	8	0	1	0	0	0	0
0	0	0	0	0	0	1	2	3	0	3	**10**	6	14	1	**10**	7	0	11	0	5	0	0	2	0

AM Peak 1100 - 1200 (31), AM PHF=0.67 PM Peak 1530 - 1630 (40), PM PHF=0.77

* Tuesday, May 26, 2015=713, 15 minute drops

0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	
0	**0**	**0**	**0**	**0**	**1**	**3**	**20**	**44**	**24**	**35**	**36**	**37**	**36**	**23**	**46**	**39**	**123**	**64**	**74**	**85**	**20**	**8**	**0**	
0	0	0	0	0	0	0	5	**20**	14	7	9	4	12	6	23	6	**26**	22	13	36	4	1	0	1
0	0	0	0	0	1	0	3	**8**	2	11	6	10	9	2	5	7	**20**	9	20	9	8	4	0	0
0	0	0	0	0	0	2	5	**5**	6	4	15	17	6	3	14	14	**34**	10	15	10	3	3	0	0
0	0	0	0	0	0	1	8	**11**	3	14	8	7	10	12	6	13	**44**	24	27	30	5	0	0	0

AM Peak 0800 - 0900 (44), AM PHF=0.54 PM Peak 1700 - 1800 (123), PM PHF=0.70

* Wednesday, May 27, 2015=712, 15 minute drops

0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	
1	**1**	**0**	**0**	**1**	**1**	**5**	**25**	**53**	**26**	**50**	**58**	**42**	**19**	**44**	**23**	**34**	**112**	**68**	**134**	**12**	**7**	**0**	**0**	
1	0	0	0	0	0	0	7	14	9	12	10	**19**	2	6	11	7	23	15	**19**	2	0	0	0	0
0	1	0	0	0	0	0	9	30	11	6	**17**	10	7	21	3	17	18	13	**89**	4	4	0	0	0
0	0	0	0	0	0	1	5	6	3	13	**12**	8	6	12	6	4	43	20	**25**	6	2	0	0	0
0	0	0	0	1	1	4	4	4	3	20	**19**	7	5	6	4	6	30	**21**	2	0	2	0	0	2

AM Peak 1115 - 1215 (67), AM PHF=0.88 PM Peak 1845 - 1945 (153), PM PHF=0.43

* Thursday, May 28, 2015=868, 15 minute drops

0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	
2	**0**	**0**	**0**	**0**	**1**	**10**	**26**	**35**	**33**	**39**	**57**	**44**	**60**	**47**	**67**	**46**	**132**	**82**	**67**	**92**	**23**	**9**	**0**	
0	0	0	0	0	0	0	10	10	5	10	**17**	10	21	21	29	7	31	**38**	20	42	9	2	0	0
0	0	0	0	0	0	0	2	11	7	8	**9**	11	4	12	20	7	**39**	16	18	21	8	6	0	0
0	0	0	0	0	0	2	7	14	0	12	**21**	10	20	8	9	15	**36**	13	18	16	6	0	0	0
2	0	0	0	0	1	8	7	0	21	10	**12**	13	16	7	10	17	**26**	16	11	14	1	1	0	0

AM Peak 1100 - 1200 (57), AM PHF=0.70 PM Peak 1715 - 1815 (138), PM PHF=0.88

* Friday, May 29, 2015=763, 15 minute drops

0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	
0	**0**	**0**	**0**	**0**	**1**	**4**	**18**	**20**	**20**	**28**	**43**	**30**	**35**	**23**	**23**	**35**	**112**	**112**	**126**	**63**	**41**	**25**	**9**	
0	0	0	0	0	0	0	4	11	5	12	6	**12**	15	11	6	7	15	**41**	20	29	13	12	0	0
0	0	0	0	0	0	0	5	6	2	6	**9**	4	8	5	6	7	**27**	21	34	15	9	2	1	0
0	0	0	0	0	1	2	2	1	6	10	**13**	7	6	5	7	11	**40**	19	31	10	10	10	0	3
0	0	0	0	0	0	2	7	2	7	2	**16**	8	6	3	5	11	**31**	32	41	10	9	2	8	0

AM Peak 1115 - 1215 (48), AM PHF=0.77 PM Peak 1715 - 1815 (138), PM PHF=0.84

* Saturday, May 30, 2015=978, 15 minute drops

0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	
3	**3**	**0**	**4**	**0**	**1**	**14**	**30**	**51**	**68**	**85**	**89**	**104**	**71**	**68**	**102**	**38**	**84**	**86**	**25**	**27**	**15**	**8**	**9**	
0	3	0	4	0	0	2	0	12	5	23	23	**20**	21	18	45	11	15	**43**	3	9	1	2	6	0
0	0	0	0	0	0	2	3	25	23	25	18	**19**	13	14	18	7	**25**	15	11	12	2	2	3	0
3	0	0	0	0	0	2	13	8	25	23	13	**41**	15	20	30	4	**13**	13	8	1	8	3	0	0
0	0	0	0	0	1	9	14	6	15	15	**36**	25	23	17	9	16	**32**	16	4	6	4	1	0	0

AM Peak 1145 - 1245 (115), AM PHF=0.70 PM Peak 1715 - 1815 (112), PM PHF=0.65

* Sunday, May 31, 2015=247, 15 minute drops

0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	
0	**3**	**0**	**0**	**0**	**1**	**4**	**3**	**4**	**13**	**21**	**23**	**15**	**30**	**38**	**44**	**32**	**0**	**10**	**7**	**3**	**0**	**0**	**0**	
0	0	0	0	0	0	2	1	0	0	2	1	**5**	4	13	**12**	11	0	0	3	1	0	0	0	0
0	0	0	0	0	0	2	1	2	3	7	**7**	2	5	4	**14**	4	0	3	0	2	0	0	0	1
0	3	0	0	0	0	0	1	0	4	10	**6**	6	8	**5**	4	12	0	2	0	0	0	0	0	0
0	0	0	0	0	1	0	0	2	7	3	**10**	3	13	**17**	15	5	0	5	4	0	0	0	0	0

AM Peak 1115 - 1215 (27), AM PHF=0.70 PM Peak 1430 - 1530 (47), PM PHF=0.71

* Monday, June 01, 2015=63 (Incomplete) , 15 minute drops

0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	
1	**0**	**0**	**0**	**0**	**0**	**2**	**20**	**40**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	
0	0	0	0	0	0	0	5	12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1	0	0	0	0	0	0	9	27	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
0	0	0	0	0	0	0	3	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
0	0	0	0	0	0	2	4	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

"Walk, Ride, Roll" Program Air Quality Report

Rachel Klaski, Audrey Boraski, Nora Traviss

Introduction

This project report details an evaluation of air quality performed by Keene State College students at Symonds Elementary School in Keene, NH throughout 4 days in May 2015. Symonds School has implemented a program called Walk Roll Ride on Tuesdays and Thursdays in the fall and spring. This program encourages students to use alternative modes of transportation on these designated days, such as walking, biking and riding the bus to school. The goal of this project is to minimize the amount of car traffic and air pollution caused by students getting dropped off by parents. We were asked by the Southwest Region Planning Commission and Symonds School to collect air quality data to help evaluate their Walk Roll Ride program. We monitored the number concentration and mass concentrations of particulate matter (PM) emitted by the vehicles on walking days and drop off days to evaluate if the Walk Roll Ride program is improving the air quality at the school. PM is the general term used to describe solid particles and liquid droplets found in the air after combustion of fuel (EPA, 2015). The scientific literature has shown that PM has been linked to adverse health effects, especially in young children. High levels of exposure to PM over a period of time have been known to cause aggravation of respiratory and cardiovascular disease, aggravated asthma, acute respiratory symptoms, chronic bronchitis, decreased lung function, and increased risk of myocardial infarction (EPA, 2015). The Walk Ride Roll Program is in place to reduce the amount of PM emitted, further reducing the negative health effects on the children attending the school and improving their physical fitness. Our hypothesis is that the particle number and mass concentrations will be significantly less on walking days than normal drop off days. Real time instrumentation to monitor air quality was used, and results and conclusions are reported below.

Methods

Two instruments were used to collect data on the particulate matter emitted by the cars: a Condensation Particle Counter (Model 3007, TSI Incorporated) also known as the "CPC", and the MIE pDR-1500 Active Personal Particulate Monitor (Model pDR-1500, Thermo Fisher Scientific) also known as the "Thermo PDR". The CPC measures real-time number concentration of particles less than 1.0 micrometer (μm) in diameter. Data was collected every second for the CPC and results are reported in units of particles/cm^3. PM was sampled every 10 seconds by the PDR, and reported in units of micrograms/cubic meter or $\mu g/m^3$.

Passenger cars do not have diesel engines and tend to emit less particulate matter mass than a diesel engine. The PM emitted is usually smaller in size and contains less mass; therefore, the CPC is the preferred instrument to measure the impact of car traffic on air quality. It is preferred because it counts tiny particles down to 10 nanometer in size. The Thermo PDR measures the mass of the particles emitted, and is preferred for measuring larger particles with more mass. Air pollution in general, and heavy traffic pollution from combined diesel and car sources, can contain PM with a diameter of 2.5 μm or less, which can have substantial mass. The instruments were positioned near the parent drop off location, where the car line begins, to be as close to the traffic source as possible. The Southwest Region Planning Commission also set up traffic counters, with tubes laid across the entrance of the school driveway, which counted the number of cars arriving in the drop off. Also, the same organization had members who counted the individuals that parked at Wheelock Park pool area (bypassing the school driveway) and the individuals who walked the students to the entrance.

Data Analysis

The CPC and Thermo PDR, collect PM in 1 and 10 second intervals, respectively. When downloaded, we converted the data to 60 second average intervals using Microsoft Excel. IBM SPSS statistical analysis software was used to perform a t-test to analyze statistical significance between PM between the "walking" and "drop off days". Amount of cars entering the school yard was counted every day and data was obtained from Southwest Region Planning Committee. The data was only analyzed only from the second week, because the first week had inconsistent wind speeds to make for comparable data.

Results

Figure 1 below shows the number concentration of particles measured on walk vs non walk days for the two week period of this study. In general, May 21st (walking) had much higher background levels of particles than any other day, which suggests the influence of meteorology (low wind speed); therefore we only analyzed the second week of data. On the second week between the two days, the number concentration ranged from a low of 359 particles/cm^3 on May 27th (drop off) to a high of 10232 particles/cm^3, also on May, 27th (drop off). The average number of particles on May 26th (walking) was 5224 particles/cm^3 compared to the average number of particles on May 27th, which was 5115 particles/cm^3. A t-test was performed and there was no statistically significant difference between May 26th (walking) and May 27th (drop off).

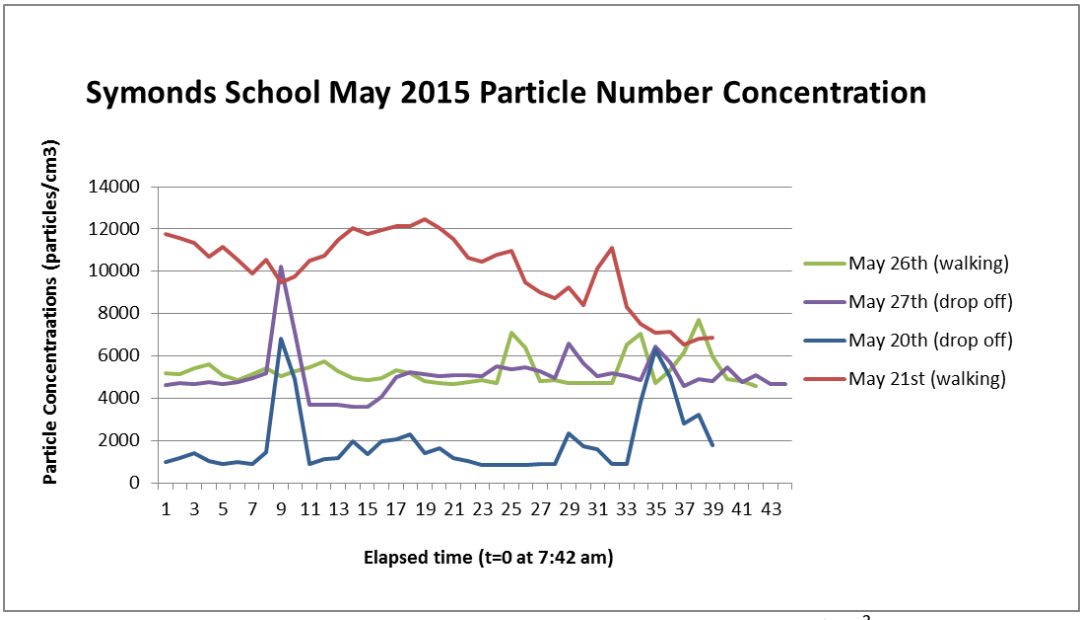


Figure 1: Time series analysis of the particle concentration (particles/cm^3) emitted over time. Displayed are the two "walking days" (May 21st & 26th) as well as the two "drop off days" (May 20th & May 27th).

Figure 2 below shows the mass concentration of particles measured on walk vs non walk days for the two week period of this study. Week 1 also was not analyzed for the mass concentration, because the thermo PDR shut down on May 21st (walking) and did not record any data. Looking at the concentrations during the second week between the two days, the mass concentration ranged from 7.6 µg/cm^3 on May 27th (drop off) to a high mass of 10.3 µg/cm^3 on May 26th (walking). The average mass concentration on May 26th (walking) was 9.2 µg/cm^3 and on May 27th (drop off) the average mass concentration was 8.2 µg/cm^3. A t-test was performed to determine if the sampling days were significantly different. There was no statistically significant difference between the 26th (walking) and the 27th (drop off).

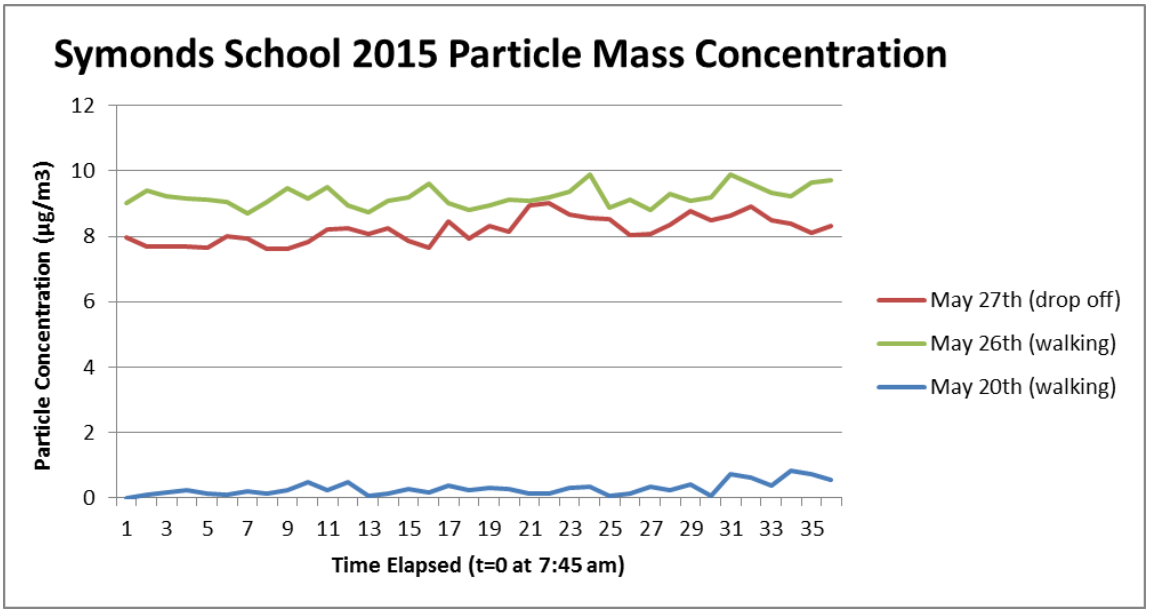


Figure 2: Time series analysis of mass concentration of particles (µg/m^3) emitted over time. Displayed are the two "walking days" (May 21st & 26th) as well as the one "drop off day" (May 27th).

Key metereological factors that could influence the results are presented below. Note that May 20th, the wind speed was much higher compared to the other days. Again this is why we did not include this day in the analysis. May 26th and May 27th had similar weather patterns. All weather reports were attained from the Dillant Hopkins airport.

	20-May-15	21-May-15	26-May-15	27-May-15
%RH	37	73	70	75
Wind Speed	17	1	9	6
Temperature ˚F	58	43	73	68

Table 1: Summary of %RH, Wind Speed, and Temperature (˚F) for the dates of: May 20th, 21st, 26th, and 27th.

Finally, we contacted SWRPC to review the traffic data. Between 8:00 a.m. and 9:00 a.m. on May 26th 130 cars were recorded, and on May 27th 150 cars were recorded driving to Symonds school, a decrease of 20 cars on the "walk" day.

Discussion

We observed that May 26th (walk day) had higher particle mass concentrations; however, particle number concentrations were similar between May 26th and May 27th. Even though the mass concentration on the walk day was higher, it was not significantly higher. Evaluation of these two days seems to suggest there is no difference in air pollution (whether measured by number or mass concentration) between walk and ride days. However, we note that it is difficult to draw any conclusions with just two days of data. Also interesting is that, per Fig. 1, particle number concentration seems to peak at the same time (between 8:10 and 8:20 am) each of the four days, regardless of whether they were a "walking day" or "drop off day". The highest traffic density is likely occurring during this time.

On May 27th 20 more cars were recorded entering the school then on May 26th. Although there were more cars on the "drop off" day, it did not significantly affect the number concentration or mass concentration of particles the cars emitted in the air. One possible explanation for the lack of difference between the two days could be the heavy congestion of cars at the same time span (between 8:10 and 8:20 am) every day. Since the cars arrive in a line at the same time, 20 less cars over a one hour period may not make enough difference in the amount and mass of particulate matter emitted. As previously mentioned, passanger vehicles emit less mass and more small particles than a diesel engine. Since the particles are so small and do not contribute to total mass, 20 fewer cars, while an important metric for the program evaluation, may not impact air quality to the desired effect. In other words, additional decreases in traffic may be needed to "see" a decrease in air pollution. Another reason why there may have been higher levels of PM mass on May 26th could be due to possibly higher regional background air pollution on that day; we did not examine the background level of air quality in this study. We would also point out that the highest mass concentration of 10.3 $\mu g/cm^3$ on May 26th (walking) is still very low

compared to the National Ambient Air Quality Standard of 35 μg/cm^3 (over a 24 hour period), which is the level considered to be harmful to human health.

While our results display no significant difference in air quality between "walking" and "drop off " days, this was a pilot study. To better assess the impact on air quality, we would recommend collecting a larger data set for comparative analysis (3-5 more sampling pairs of days) to compare results. We would also recommend analyzing the meteorological, background air pollution and traffic data in more detail in order to more fully evaluate the impact of the program.

Works Cited

National Ambient Air Quality Standards (NAAQS). (2012, December 14). Retrieved from http://www.epa.gov/air/criteria.html

Particulate Matter. (2015, February 18). Retrieved from http://www.epa.gov/ncer/science/pm

Walkability Checklist

How walkable is your community?

Take a walk with a child and decide for yourselves.

Everyone benefits from walking. These benefits include: improved fitness, cleaner air, reduced risks of certain health problems, and a greater sense of community. But walking needs to be safe and easy. Take a walk with your child and use this checklist to decide if your neighborhood is a friendly place to walk. Take heart if you find problems, there are ways you can make things better.

Getting started:

First, you'll need to pick a place to walk, like the route to school, a friend's house or just somewhere fun to go.

The second step involves the checklist. Read over the checklist before you go, and as you walk, note the locations of things you would like to change. At the end of your walk, give each question a rating. Then add up the numbers to see how you rated your walk overall.

After you've rated your walk and identified any problem areas, the next step is to figure out what you can do to improve your community's score. You'll find both immediate answers and long-term solutions under "Improving Your Community's Score..." on the third page.

SafeRoutes
National Center for Safe Routes to School

Pedestrian and Bicycle Information Center

U.S. Department of Transportation

Take a walk and use this checklist to rate your neighborhood's walkability.

How walkable is your community?

Location of walk _____

_____

Rating Scale:

1	2	3	4	5	6
awful	many problems	some problems	good	very good	excellent

1. Did you have room to walk?

☐ Yes ☐ Some problems:

- ☐ Sidewalks or paths started and stopped
- ☐ Sidewalks were broken or cracked
- ☐ Sidewalks were blocked with poles, signs, shrubbery, dumpsters, etc.
- ☐ No sidewalks, paths, or shoulders
- ☐ Too much traffic
- ☐ Something else _____

Locations of problems: _____

Rating: (circle one)
1 2 3 4 5 6

_____

_____

2. Was it easy to cross streets?

☐ Yes ☐ Some problems:

- ☐ Road was too wide
- ☐ Traffic signals made us wait too long or did not give us enough time to cross
- ☐ Needed striped crosswalks or traffic signals
- ☐ Parked cars blocked our view of traffic
- ☐ Trees or plants blocked our view of traffic
- ☐ Needed curb ramps or ramps needed repair
- ☐ Something else _____

Locations of problems: _____

Rating: (circle one)
1 2 3 4 5 6

_____

_____

3. Did drivers behave well?

☐ Yes ☐ Some problems: Drivers...

- ☐ Backed out of driveways without looking
- ☐ Did not yield to people crossing the street
- ☐ Turned into people crossing the street
- ☐ Drove too fast
- ☐ Sped up to make it through traffic lights or drove through traffic lights?
- ☐ Something else _____

Locations of problems: _____

Rating: (circle one)
1 2 3 4 5 6

_____

_____

4. Was it easy to follow safety rules? Could you and your child...

☐ Yes	☐ No	Cross at crosswalks or where you could see and be seen by drivers?
☐ Yes	☐ No	Stop and look left, right and then left again before crossing streets?
☐ Yes	☐ No	Walk on sidewalks or shoulders facing traffic where there were no sidewalks?
☐ Yes	☐ No	Cross with the light?

Locations of problems: _____

Rating: (circle one)
1 2 3 4 5 6

_____

_____

5. Was your walk pleasant?

☐ Yes ☐ Some unpleasant things:

- ☐ Needed more grass, flowers, or trees
- ☐ Scary dogs
- ☐ Scary people
- ☐ Not well lighted
- ☐ Dirty, lots of litter or trash
- ☐ Dirty air due to automobile exhaust
- ☐ Something else _____

Locations of problems: _____

Rating: (circle one)
1 2 3 4 5 6

_____

_____

How does your neighborhood stack up? Add up your ratings and decide.

1. _____
2. _____
3. _____
4. _____
5. _____

Total _____

26–30	Celebrate! You have a great neighborhood for walking.
21–25	Celebrate a little. Your neighborhood is pretty good.
16–20	Okay, but it needs work.
11–15	It needs lots of work. You deserve better than that.
5–10	It's a disaster for walking!

Now that you've identified the problems, go to the next page to find out how to fix them.

Now that you know the problems,
you can find the answers.

Improving your community's score...

	What you and your child can do immediately	What you and your community can do with more time
1. Did you have room to walk?		
Sidewalks or paths started and stopped Sidewalks broken or cracked Sidewalks blocked No sidewalks, paths or shoulders Too much traffic	• pick another route for now • tell local traffic engineering or public works department about specific problems and provide a copy of the checklist	• speak up at board meetings • write or petition city for walkways and gather neighborhood signatures • make media aware of problem • work with a local transportation engineer to develop a plan for a safe walking route
2. Was it easy to cross streets?		
Road too wide Traffic signals made us wait too long or did not give us enough time to cross Crosswalks/traffic signals needed View of traffic blocked by parked cars, trees, or plants Needed curb ramps or ramps needed repair	• pick another route for now • share problems and checklist with local traffic engineering or public works department • trim your trees or bushes that block the street and ask your neighbors to do the same • leave nice notes on problem cars asking owners not to park there	• push for crosswalks/signals/ parking changes/curb ramps at city meetings • report to traffic engineer where parked cars are safety hazards • report illegally parked cars to the police • request that the public works department trim trees or plants • make media aware of problem
3. Did drivers behave well?		
Backed without looking Did not yield Turned into walkers Drove too fast Sped up to make traffic lights or drove through red lights	• pick another route for now • set an example: slow down and be considerate of others • encourage your neighbors to do the same • report unsafe driving to the police	• petition for more enforcement • request protected turns • ask city planners and traffic engineers for traffic calming ideas • ask schools about getting crossing guards at key locations • organize a neighborhood speed watch program
4. Could you follow safety rules?		
Cross at crosswalks or where you could see and be seen Stop and look left, right, left before crossing Walk on sidewalks or shoulders facing traffic Cross with the light	• educate yourself and your child about safe walking • organize parents in your neighborhood to walk children to school	• encourage schools to teach walking safely • help schools start safe walking programs • encourage corporate support for flex schedules so parents can walk children to school
5. Was your walk pleasant?		
Needs grass, flowers, trees Scary dogs Scary people Not well lit Dirty, litter Lots of traffic	• point out areas to avoid to your child; agree on safe routes • ask neighbors to keep dogs leashed or fenced • report scary dogs to the animal control department • report scary people to the police • report lighting needs to the police or appropriate public works department • take a walk wih a trash bag • plant trees, flowers in your yard • select alternative route with less traffic	• request increased police enforcement • start a crime watch program in your neighborhood • organize a community clean-up day • sponsor a neighborhood beautification or tree-planting day • begin an adopt-a-street program • initiate support to provide routes with less traffic to schools in your community (reduced traffic during am and pm school commute times)
A Quick Health Check		
Could not go as far or as fast as we wanted Were tired, short of breath or had sore feet or muscles Was the sun really hot? Was it hot and hazy?	• start with short walks and work up to 30 minutes of walking most days • invite a friend or child along • walk along shaded routes where possible • use sunscreen of SPF 15 or higher, wear a hat and sunglasses • try not to walk during the hottest time of day	• get media to do a story about the health benefits of walking • call parks and recreation department about community walks • encourage corporate support for employee walking programs • plant shade trees along routes • have a sun safety seminar for kids • have kids learn about unhealthy ozone days and the Air Quality Index (AQI)

Need some guidance?
These resources might help...

Great Resources

WALKING INFORMATION

Pedestrian and Bicycle Information Center (PBIC)
UNC Highway Safety Research Center
730 Airport Road , Suite 300
Campus Box 3430
Chapel Hill, NC
27599-3430
Phone: (919) 962-2202
www.pedbikeinfo.org
www.walkinginfo.org

National Center for
Safe Routes to School
730 Martin Luther
King, Jr. Blvd., Suite 300
Campus Box 3430
Chapel Hill, NC 27599-3430
Toll-free 1-866-610-SRTS
www.saferoutesinfo.org

National Center for Bicycling and Walking
Campaign to Make America Walkable
1506 21st Street, NW
Suite 200
Washington, DC 20036
Phone: (800) 760-NBPC
www.bikefed.org

WALK TO SCHOOL DAY WEB SITES

USA event: www.walktoschool-usa.org
International: www.iwalktoschool.org

STREET DESIGN AND TRAFFIC CALMING

Federal Highway Administration
Pedestrian and Bicycle Safety Research Program
HSR - 20
6300 Georgetown Pike
McLean,VA 22101
www.fhwa.dot.gov/environment/bikeped/index.htm

Institute of Transportation Engineers
www.ite.org

Surface Transportation Policy Project
www.transact.org

Transportation for Livable Communities
www.tlcnetwork.org

WALKING COALITIONS

America Walks
P.O. Box 29103
Portland, Oregon 97210
Phone: (503) 222-1077
www.americawalks.org

PEDESTRIAN SAFETY

National Highway Traffic Safety Administration
Traffic Safety Programs
400 Seventh Street, SW
Washington, DC 20590
Phone: (202) 662-0600
www.nhtsa.dot.gov/people/injury/pedbimot/ped

SAFE KIDS Worldwide
1301 Pennsylvania Ave. NW
Suite 1000
Washington, DC 20004
Phone: (202) 662-0600
Fax: (202) 393-2072
www.safekids.org

WALKING AND HEALTH

US Environmental Protection Agency
Office of Children's Health Protection (MC 1107A)
Washington, DC 20460
Phone: 202-564-2188
Fax: 202-564-2733
www.epa.gov/children/
www.epa.gov/airnow/
www.epa.gov/air/urbanair/ozone/what.html
www.epa.gov/sunwise/uvindex.html
www.epa.gov/otaq/transp/comchoic/ccweb.htm

President's Task Force on Environmental Health Risks and
Safety Risks to Children
www.childrenshealth.gov

Centers for Disease Control and Prevention
Division of Nutrition and Physical Activity
Phone: (888) 232-4674
www.cdc.gov/nccdphp/dnpa/readyset
www.cdc.gov/nccdphp/dnpa/kidswalk/index.htm

Prevention Magazine
33 East Minor Street
Emmaus, PA 18098
www.itsallaboutprevention.com

Shape Up America!
6707 Democracy Boulevard
Suite 306
Bethesda, MD 20817
www.shapeup.org

ACCESSIBLE SIDEWALKS

US Access Board
1331 F Street, NW
Suite 1000
Washington, DC 20004-1111
Phone: (800) 872-2253;
(800) 993-2822 (TTY)
www.access-board.gov