

---

# **C**MS Transportation Common Stop Placement Project

---

Prepared by  
UNC Charlotte Urban Institute

August 2009



9201 University City Boulevard / Charlotte, NC 28223 / 704-687-4224 / [www.ui.uncc.edu](http://www.ui.uncc.edu)



# UNC Charlotte Urban Institute

## CMS Transportation Review of Stop Placement

### August 2009

#### **Background**

The UNC Charlotte Urban Institute (the Institute) began work with Charlotte Mecklenburg Schools (CMS) on an exploratory study in 2007. This exploratory work examined the complex CMS transportation system for potential operational efficiencies. The framework and strategy for this initiative were outlined and recommended in the CMS Transportation Board Oversight Report presented in November 2007, as well as the annual Transportation Continuous Improvement Plan.

In the Institute's preliminary analysis, it was clear that the number and locations of CMS bus stops was a major contributor to stress in the system's operation as well as increasing the length of time students were riding on buses. The Institute recommended a review of the ways and the degree to which the very large number of stops could be consolidated.

Based on the work done in the exploratory study, the Institute began work with the CMS Transportation staff in July 2008 on a year-long project to review current bus stop placement. It was important that work of this type be done fairly and systematically with emphasis on safety. The Institute suggested an approach that used the Charlotte Neighborhood Quality of Life Study (QoL) defined neighborhoods to organize and inform this process. These neighborhoods are manageable in size and have accompanying demographic data that would be useful in the project.

The recent economic downturn has expedited the need for review and approval to put many of these initiatives in place effective this school year.

#### **Goals of Study:**

- Reduce student ride time
- Reduce the number of stops in neighborhoods
- Create identifiable and constant community stops for pick up and drop off, if feasible, regardless of the school of attendance
- Improve operational efficiency
  - ◊ Reduce overall fleet costs
  - ◊ Improve fuel efficiency
  - ◊ Streamline driver routes and directions

#### **Understanding CMS Transportation**

CMS is the largest pupil transportation operation in North Carolina supporting more than 1600 vehicles with a team of more than 1,400 employees. Safety is the primary goal for all maintenance and services while supporting the safest method of transportation for students to and from school. During the 2008-2009 school year, CMS transported more than 85,000 of the 112,000 students eligible for transportation.

To transport this large number of students the district uses tiered bell times for the opening of school. This strategy is very effective and is needed for the system to function with the number of vehicles available. In areas with a relatively large number of students, this strategy would result in three stops in many locations just to accommodate the separate High School, Middle School and Elementary School pickups. With the district's other policy and program initiatives, federal requirements and district allowances for individual students' transportation outside of normal parameters the number of pickup and drop off locations can quickly multiply.

Below are the major influences that challenge transportation resources and quality of services:

- Significant numbers of county-wide and zoned magnet programs with smaller populations
- Five Pre-K centers serving students in larger than normal attendance zones
- Federally mandated transportation for NCLB and McKinney Vento students
- County-wide transportation offered for CMS specialized academic, special needs, and alternative programs such as Midwood High , Performance Learning Center, Morgan, Hawthorne, Metro and Turning Point Academy Schools. These schools generally serve small populations of students distributed throughout the county.

The map displayed in Exhibit 1 summarizes the size of zones and distance CMS is transporting students throughout Mecklenburg County. Continuing growth in traffic congestion throughout the county has made coverage of these zones progressively more challenging in recent years. These deteriorating traffic situations result in the need for more vehicles with lower loads for the set of routes that must cover these larger geographic areas.

Taken together, these factors create additional bus stops and number of buses serving any given neighborhood, creating a very complex operation with separate buses picking up and discharging students to and from school each day.

### Exhibit 1 Factors Contributing to the Number of Bus Stops

#### **Methodology**

QoL neighborhood definitions of the 2008 Charlotte Mecklenburg Quality of Life Neighborhood study were used as the organizing geography for the study. A complete set of maps covering the entire district were created for review which contained all stop locations for every school that served the neighborhood.

A series of meetings were held with CMS transportation staff to bring everyone in the organization together that was involved with routing decisions. Consultants from the Institute worked with staff at CMS Transportation and Charlotte-Mecklenburg Police Dept. (CMPD) to review the issues of safety, efficiency, and operational implementation involved. Teams of staff were developed to work with Institute staff systematically to review all neighborhoods in the district.

Staff involvement was considered critical to the success of the project from the beginning. CMS Transportation staff visited the neighborhoods they normally serve during the school day. It was quickly recognized that each neighborhood had its own unique characteristics that were very

important when making bus stop placement decisions. Careful consideration for bus stop locations were made individually for each neighborhood's situation rather than applying rigid rules globally to all neighborhoods. Within this approach, however, there were goals and agreed-upon strategies that guided decisions. A key was to set goals of walking distances. The goal for elementary stops was to be within .2 miles from students. For secondary students the goal was to be within .4 miles of students. These parameters fall below the state requirements for student distances, and would not be held as strict guidelines if the situation in any of the neighborhoods made that distance difficult and/or would greatly increase student ride times or present safety issues (i.e. dangerous or difficult bus turns or turnarounds).

### Exhibit 2 Quality of Life Study Area

- Red lines represent specific neighborhoods and their "Quality of Life" features; dimensions on social well being, physical characteristics , crime and economic vitality are measured and compared
- Neighborhoods are defined as "stable, transitioning or challenged" according to data collected from each neighborhood for the Quality of Life report

### Exhibit 3: Sample Neighborhood Map

Using the QOL maps gave a systematic way to look at the county that also included useful information to be used in consideration of the stop location process.

### Establishing Stop "Landmarks"

Staff was able to use the Transportation Information Management System (TIMS) to review neighborhood zones, stop locations, and current bus stop locations. Neighborhood stop location decisions were recorded on the QoL maps of existing conditions. Those locations were used by Institute staff to create a template of "landmark" locations in TIMS to be used as a universal resource for all staff in CMS for future creation of bus stop records in TIMS.

Two "layers" of stop landmarks were created to address the difference in walking distance goals for elementary and secondary students. In the following exhibits, these layers are shown on maps with two different symbols. Locations shown as stop signs are more numerous and represent the elementary stop locations needed to meet shorter walking distance goals. Other locations have a school bus symbol on top of the stop sign or in a separate location. Those represent the secondary stops that meet the longer walking distance for older students. Note that many elementary and secondary stop locations occur at the same locations in the Hidden Valley neighborhood. In the exhibits for Carmel, there are some stops for secondary students that are not at the same location as elementary stops. This situation could occur in any area of the county. As a result, it will be important for transportation staff to review and update common stop locations as neighborhoods are developed and student populations change.

### Exhibit 4: Hidden Valley Area Neighborhood Stops

Using TIMS "landmarks", a consistent set of stop locations using the established parameters were created for each neighborhood to be used by any school serving the neighborhood.

Exhibit 5: Hidden Valley Before / After—1.18 mile saving; 6 minutes saved on run

Areas across the county were reviewed in a similar fashion. Below are samples of other areas and some routing changes that resulted from the realignment of bus stop locations.

Exhibit 6: Carmel Area Neighborhood Stops

Exhibit 7: Carmel Area: Before / After

Exhibit 8: South Mecklenburg: Before / After

**Summary of Changes as Related to Common Bus Stops**

Below are bus stop changes that resulted from the project.

**1) Common stops in neighborhoods**

- a) Walk distances for *some* may increase
  - i) Elementary – up to .2 mile or slightly above
  - ii) Secondary – up to .4 mile or slightly above
  
- b) Avg. assigned distance to stop for students is projected to be .12 tenths of a mile – this equates to a little less a half lap around an athletic track (avg. last year was .07 hundredths of a mile)
  
- c) Likely more students per stop - those students can walk and stand together, and provide CMPD with fewer locations to monitor

This strategy has contributed significantly to a total reduction in stops, buses, miles and projected cost to operate buses.

**Service Improvement**

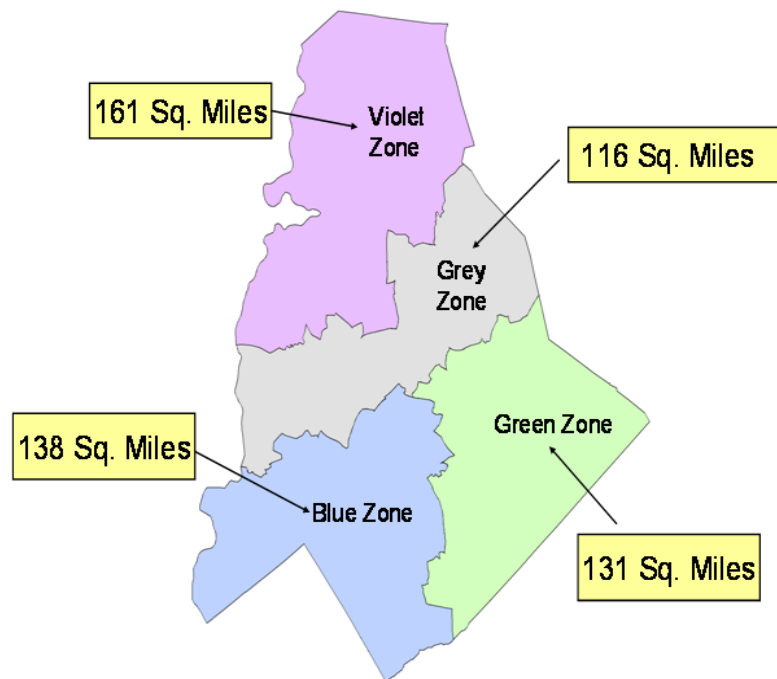
These changes, while they may require a slightly longer walking distance (.05 miles or 264 feet on average) may likely decrease the time each child is actually riding the bus.

<b>Comparison of Opening Day of School Assigned TIMS Data</b>			
	<b>2008-09</b>	<b>2009-10*</b>	<b>Estimated Change</b>
# Students Assigned to a Bus	112,000	111,000	(1,000)
# Total Bus Stops	37,000	26,000	(11,000)
# Total Bus Runs	5,652	5,292	(360)
# Total Routes or Buses	1,255	1,155	(100)
# Daily Miles	140,000	129,000	(11,000)
Average Walk Distance to Bus Stop (miles)	0.07	0.12	0.05
*2009-10 Data are projections and subject to change as the year progresses Numbers in ( ) are projected reductions; without ( ) represents an increase			

# Exhibit 1: Factors Contributing to the Number of Bus Stops

- Tiered School Opening Times
- McKinney Vento Act Requirements
- NCLB Requirements
- County Wide Magnet Programs
- Large Magnet Zones and Transportation Zones
- Pre-K Transportation
- E.C. Transportation
- Alternative Schools

## CMS TRANSPORTATION ZONES

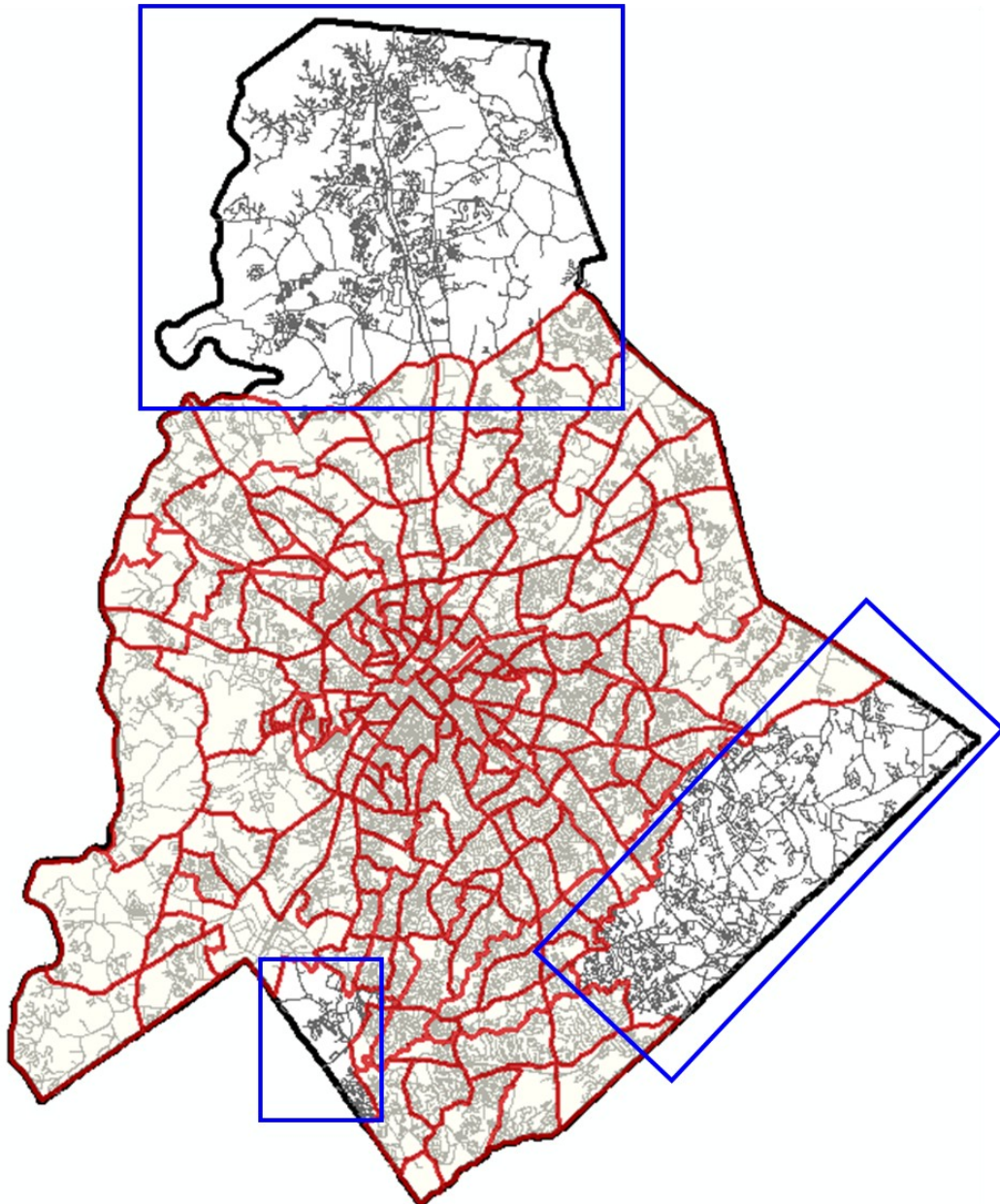


**Mecklenburg County – 546 Total Square Miles**



## Exhibit 2: Quality of Life Study Area

- Red lines represent specific neighborhoods and their “Quality of Life” (QoL) features; dimensions on social well being, physical characteristics, crime and economic vitality are measured and compared
- Neighborhoods are defined as “stable, transitioning or challenged” according to data collected from each neighborhood
- Areas shown in blue boxes have not been part of the QoL continuing study, however maps of these neighborhood zones were created using census tracks and the same methodology used by staff to cover those areas.

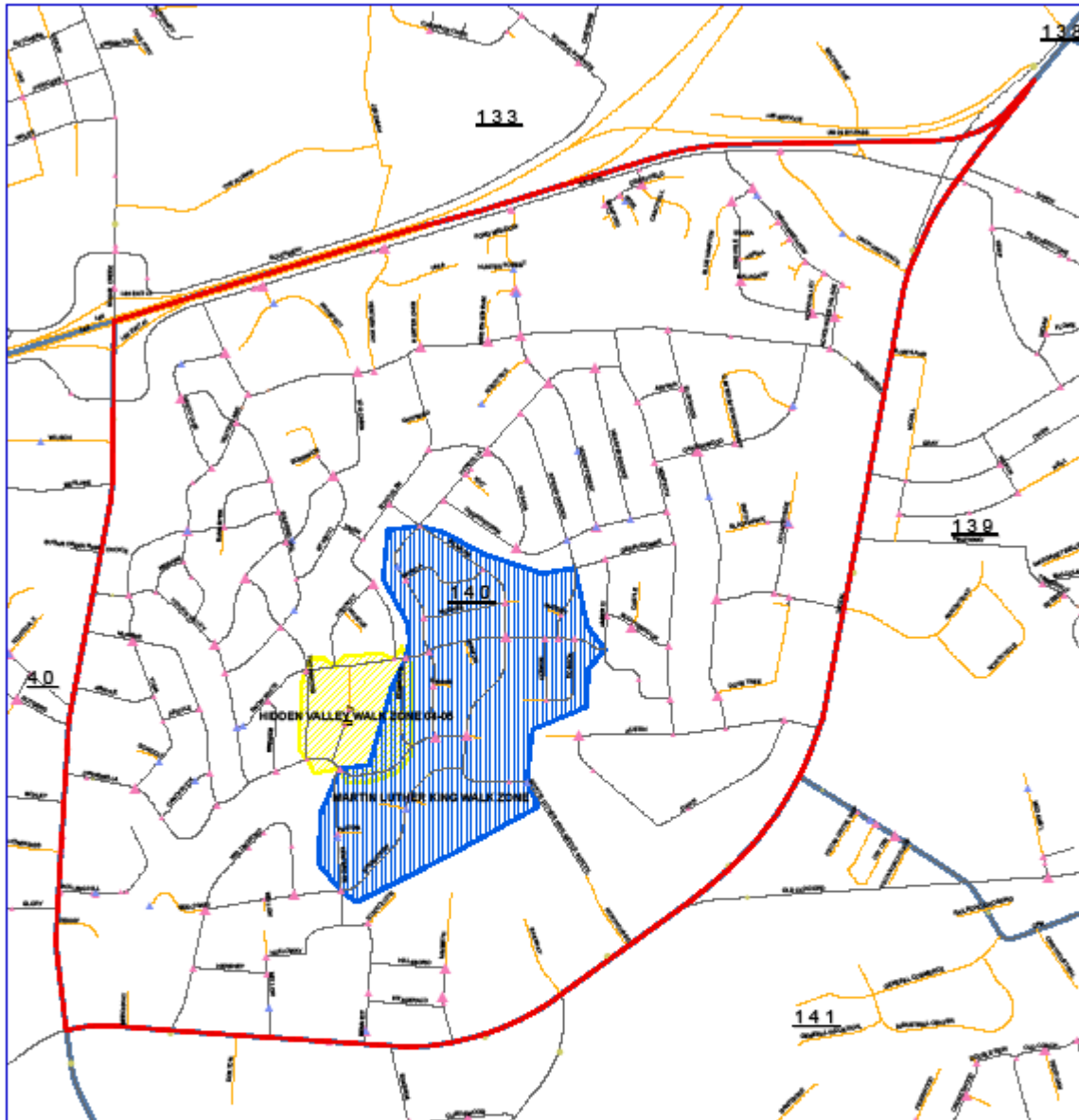


# Exhibit 3: Sample Neighborhood Map

CHARLOTTE MECKLENBURG SCHOOLS

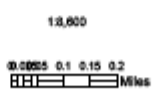
QOL# 140

NEIGHBORHOOD STOP LOCATION



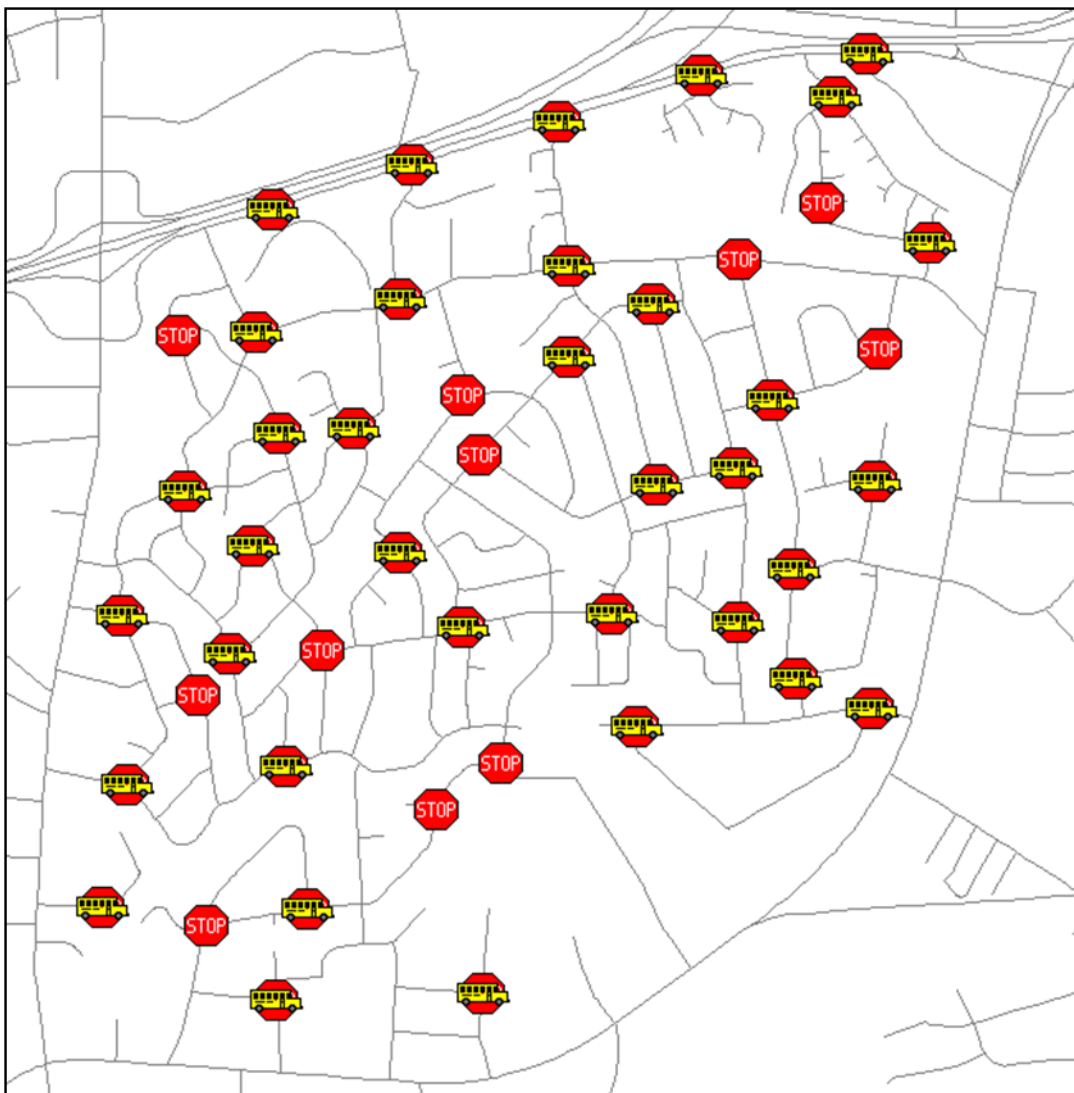
NOTE: QOL Neighborhoods based on the 2008 Charlotte Mecklenburg Quality of Life Study. 2008 Boundaries. Map data source TM20 Mecklenburg County August 2008.

AUGUST 14, 2008



## Exhibit 4: Hidden Valley Area Neighborhood Stops—A “Transitioning” Neighborhood

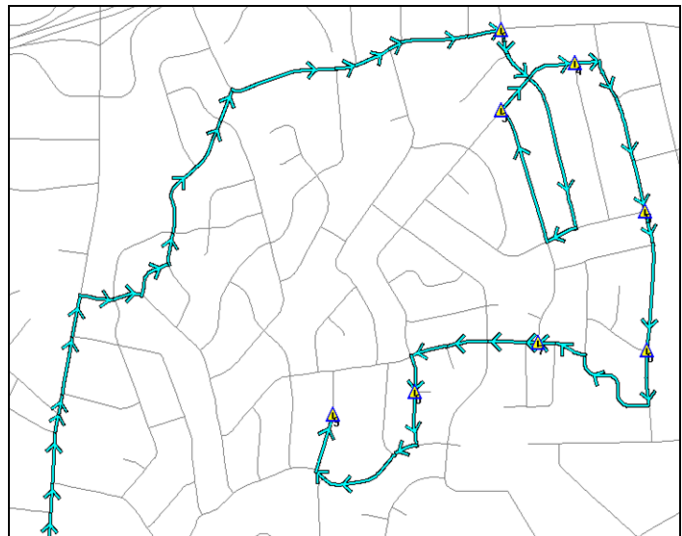
- Area visited and checked for where to locate neighborhood stops
- Stop Sign = Elementary Only
- Bus = Middle/High Only
- Before = 536 am stops, 545 pm stops
- After = 52 stops



**Exhibit 5: Hidden Valley Before / After:  
1.18 mile savings;  
6 minutes saved on run**



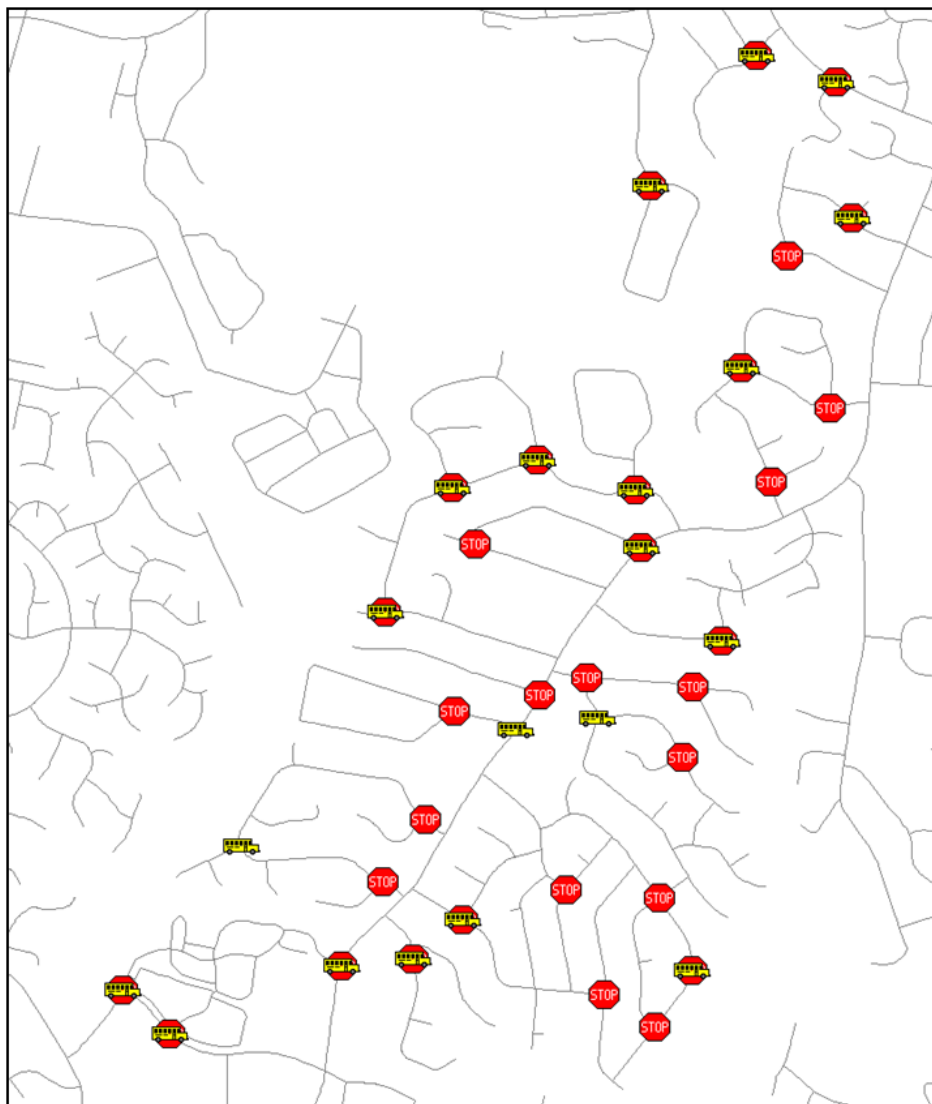
**Before**



**After**

## Exhibit 6: Carmel Area Neighborhood Stops

- Before—141 am stops, 166 pm stops
- Created 35 neighborhood stop locations
- Average distance to am stop before: 0.095
- Average distance to am stop after 0.163
- Average distance to pm stop before: 0.107
- Average distance to pm stop after 0.156
- Stop Sign = elementary stop
- Bus = Middle / High School stop



## Exhibit 7: Quality of Life Study Area

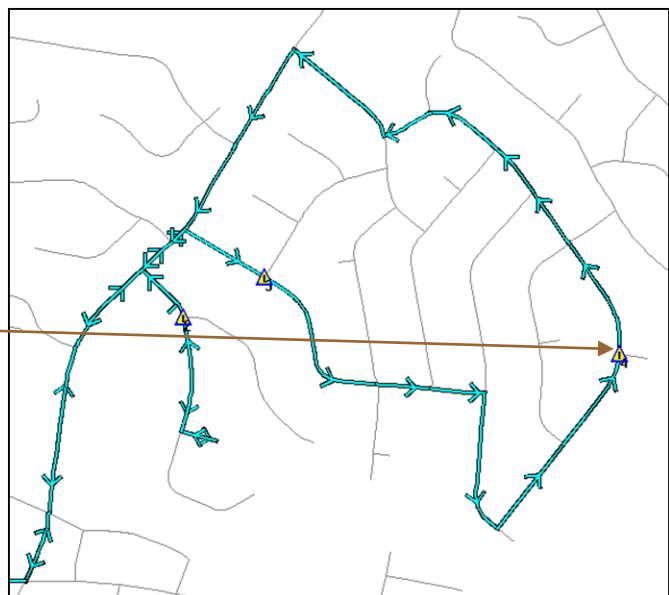
- South Mecklenburg High School Run in Carmel Neighborhood



**Before**

Actually increased based on HS stop added. Further review indicates that this stop can be moved

**After**











9201 University City Boulevard / Charlotte, NC 28223 / 704-687-4224 / [www.ui.uncc.edu](http://www.ui.uncc.edu)