Project Overview:

NC 54 is a primary corridor to access Chapel Hill, NC from I-40. The 6 intersections of interest span from E Barbee Chapel Rd on the East to Hamilton Rd on the West just before the Fordham Blvd Interchange. The corridor carries regular event traffic as the University of North Carolina resides just over a mile west of the Fordham Blvd interchange. Additionally the corridor has multiple multi-family residences that generates large commuter volumes(40k-50k ADT) and heavy pedestrian foot traffic.

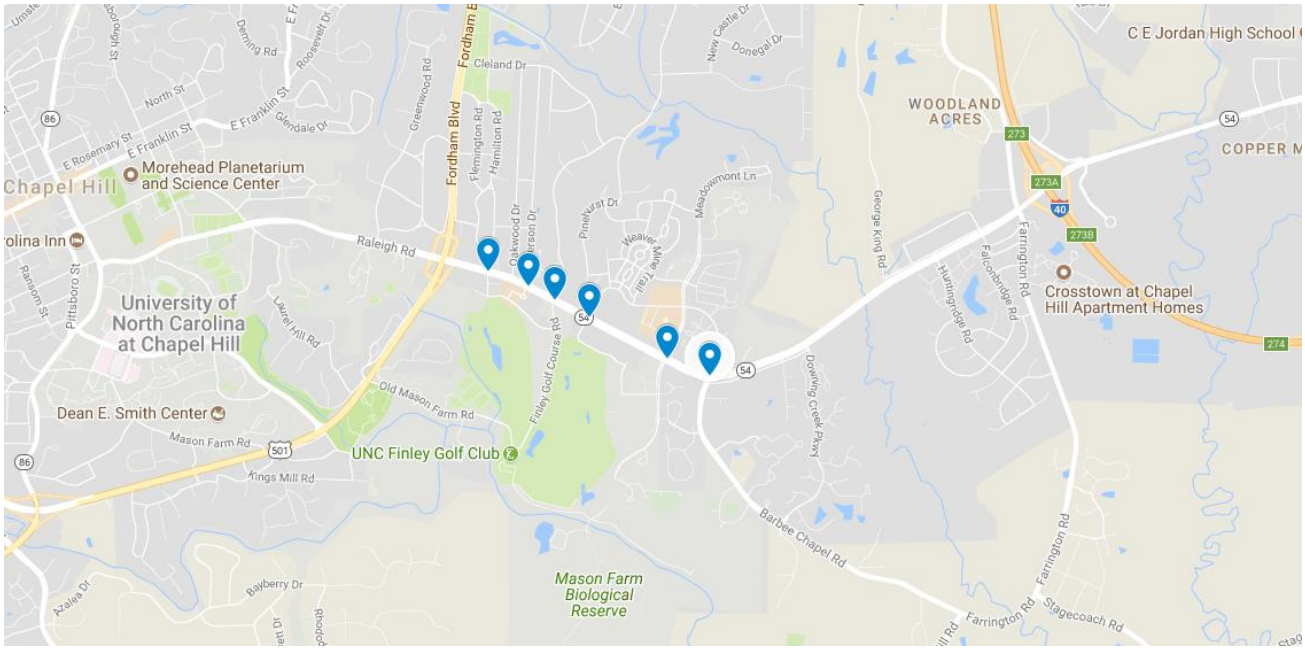

Figure 1: NC 54 in Chapel Hill, NC

Corridor concerns:

The primary issues consist of congestion during the peaks and event traffic. Major traffic generators exist along the corridor from the University, Elemetary schools, residences, golf courses and parks, and shopping and dining. Additionally the corridor is very multi-modal consisting of passenger vehicles, trucks, busses, bycyclists and pedestrians. Another point of interest is the lane drop that occurs at E Barbee Chapel Rd heading East towards I-40.

Corridor resolutions:

Currently the corridor is broken up into multiple sections during the AM and PM peak periods. The western section consisting of the following intersections:

1. NC 54 & Hamilton Rd
2. NC 54 & Rogerson Dr
3. NC 54 & Burning Tree Dr
4. NC 54 & W Barbee Chapel Rd

While the Eastern section consists of the following intersections:

1. NC 54 & Meadowmont Ln
2. NC 54 & E Barbee Chapel Rd

During the AM Peak period the western section runs a cycle length of 140 seconds while Meadowmont Ln runs a 115 second cycle length and E Barbee Chapel Rd runs a 145 second cycle length. Similarly, in the PM Peak period the western section again runs a 140 second cycle length while the eastern section runs a 120 second cycle length.

Global Optimization:

In|Sync's global optimizer creates bi-directional coordination. Global tunnels are established with various tunnel durations throughout the day to provide the necessary corridination. Each configuration is unique and dynamic period lengths allow for the entire corridor to adjust seamlessly with varying traffic conditions.

Configuration Development:

A separate configuration will be developed for each major peak period throughout the day to allow the engineer to prioritize directions, have differenet dynamic period ranges, provide various coordination plans and much more. Generally on an In|Sync designed corridor configuations are designed to run during the following:

1. AM Peak
2. PM Peak
3. Midday/Lunch Peak
4. Offpeak
5. Tunnel-less (Free operation)

Special Event Configuration:

In addition to the aforementioned configurations, Rhythm Engineers can also design even more detailed configurations specific to special events such as:

1. UNC Game Day Arrival
2. UNC Game Day Departure
3. Elementary school configurations
4. Church/Worship configurations
5. Weekend configurations
6. Any other required configurations.

With a multitude of configurations available the engineer can easily schedule special event configurations by time of day with very little effort.

Dynamic Period Length:

In order to improve overall corridor progression, Rhythm Engineering is proposing that all 6 intersections be coordinated together utilizing In|Sync's Dynamic Period Length. A dynamic period length is a variable period length(similar to a cycle length) that allows the engineer or user to set the boundries of the adjustable period length. For example, this particular corridor could have a range with a minimum of 120 seconds and a maximum of 150 seconds. This range allows In|Sync to adjust the period length based off of real-time traffic condtions either up or

down. Having a variable period length also helps by adjusting to sudden influxes in traffic (i.e. event traffic, highway accident, etc.) that were not planned, which is something that can not be done with a standard timing plan.

Local Optimization:

In|Syncs local optimizer provides adaptive operation locally at each intersection. In|Sync evaluates traffic in real-time to more efficiently schedule dynamic sequences and green splits.

Dynamic Sequences and Splits:

In|Sync has the ability to dynamically select sequences and adjust green splits second by second. In|Sync is evaluating every intersection at every moment throughout the day be counting the queue for each approach and making sequence and green split decisions based off of what is happening at that very moment. Sequences can vary from period to period and can even be reserviced when time permits prior to the next scheduled coordinated movement.

Green splits are scheduled based off the number of cars that are visibly seen in the queue and can adjust as cars leave and approach the queue. This operation allows In|Sync to be extremely efficient with its green split allocation and helps limit overall delay by not wasting any time.

Other In|Sync Functions:

Emergency Vehicle Preemption (EVP):

In|Sync can seamlessly integrate with EVP. Whenever an intersection receives a preemption signal, In|Sync drops into detector mode (non-adaptive) to allow the EVP exit sequences to occur within the controller. Upon completion of the programed exit sequences, In|Sync will resume adaptive operation.

Transit Signal Priority (TSP):

In|Sync has the ability to provide priority for transit vehicles using its TSP functionality. TSP can be programmed to varying levels of priority by intersection, by configuration and by time of day. The priority settings are as such:

- OFF
  - Default setting. No special treatment for TSP.
- LOW
  - Minimally prioritize TSP. When a TSP signal is received, the phase(s) with TSP signals will extend if currently being served and time exists in the configuration.
- MEDIUM
  - Moderately prioritize TSP. When a TSP signal is received, the phase(s) with TSP signals will extend if currently being served and time exists in the configuration. Phases without TSP actuation will not have freedom to extend. If the signal is received while the approach is red, In|Sync will complete its current schedule and return to green for the prioritized approach.

- HIGH
    - Significantly prioritize TSP. When a TSP signal is received, the phase(s) with TSP signals will extend if currently being served and time exists in the configuration. Phases without TSP actuation will not have freedom to extend and will be gapped out after minimum green service

This functionality will help with the current bus route that runs along NC 54 once necessary equipment is installed and configured.

Previous Success on Similar Projects:

Each corridor is unique and provides its own challenges but results are evident in many of Rhythm Engineering Projects. One project in particular that shows similarities to the NC 54 corridor is Stadium Blvd or MO 740 in Columbia, MO. Stadium Blvd has an AADT of just over 35,000. Stadium Blvd, like NC 54 has 3 lanes in each direction with dedicated left turn bays. The corridor consists of 7 intersections on the main arterial from N outer Rd to Broadway as visible in the map below.

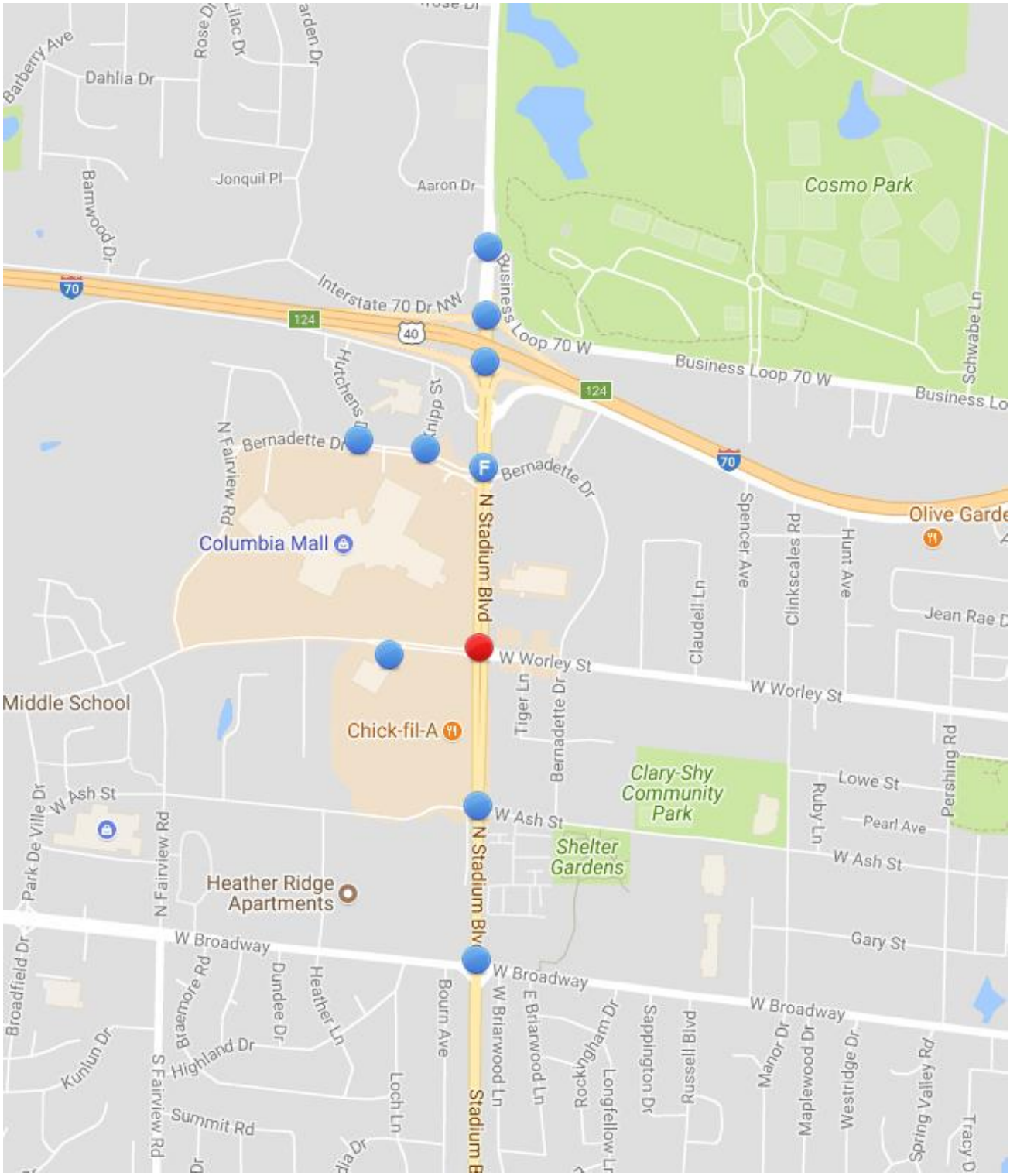

Figure 2: Stadium Blvd in Columbia, MO

In addition to the similar capacity, the corridor acts as a major arterial for traffic to access the University of Missouri, Columbia. Other similarities consist of shopping, parks and residential attractions. Results consisted of up to 30% reduction in travel time, 62% reduction in stops and 62% reduction in total delay. Travel Time results are shown in the table below. Additional case studies and 3rd party reports can be found here.
http://rhythmtraffic.com/resources/library/

Stadium Blvd			Travel Time	# of Stops	Avg Speed	Total Delay
PM	NB	Before	203.7	2.8	20.3	99.1
		After	141.7	1.2	29.1	37.5
		Change	-62	-1.6	8.8	-61.6
		% Change	**-30.4%**	**-57.1%**	**43.3%**	**-62.2%**
	SB	Before	214.9	2.9	19.2	111.2
		After	158.4	1.1	26	56.6
		Change	-56.5	-1.8	6.8	-54.6
		% Change	**-26.3%**	**-62.1%**	**35.4%**	**-49.1%**

Figure 3: Before and After comparison for Stadium Blvd in the PM Peak Period.