Sidewalk and Bike Lane recommendations for the use of non-motorized vehicles and pedestrians, in and around the town of Bethel

By

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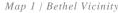
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Introduction

The town of Bethel, located in the northern most part of Pitt County, is a small town with a population of 1,987 residents, according to the Census 2020 5-year estimate. The town formally known as the town of Brandon, gains a small amount of traffic due to old US highway 64 running through the heart of the town





In this report, it will cover two different sets of

recommendations to achieve the goal of making the Town of Bethel more pedestrian and bicycle friendly and to connect the town to the university City of Greenville.

For the first portion of the report, the focus will be about what is within the town of Bethel. Focusing on areas of interest of the youth, the report will go into detail on how to connect the town to the Field of Dreams Park located just on the edge of the city limits within the Extra Territorial Jurisdiction (ETJ) and on connecting the Neighborhood to the Bethel School (K-8 grade).

The next half of the report is to find ways to connect Bethel to Greenville for the use of non-motorized vehicles, more specifically bicycles. Using data provided by the popular fitness app, Strava, and through talks with other cyclists, three alternative routes have been created to help with commuting for work, recreation, and any other reasons.

The report will go over all the recommendations into further detail and explain why these recommendations are needed for multimodal transportation in Bethel.

Executive Summary

While being a small town, Bethel has several facilities yet has little to no access to them. Additionally, the town has no designated alternative connections to the larger City of Greenville. The goal of this report is to identify ways to improve the overall connectivity of Bethel to its needed facilities.

The report has 5 goals:

- 1. Identify possible connections to the Field of Dreams Park from the Town Center
- 2. Identify needed connections from the neighborhoods to the school
- 3. Sidewalk improvement recommendations
- 4. Identify potential routes to connect Bethel to Greenville
- 5. Express the need for bike and pedestrian facilities on NC 13

The first two goals of this report is connecting the Field of Dreams Park and the Bethel School to the surrounding neighborhoods. Identifying these possible improvements to be added to the town will allow for safe walking and cycling throughout the city. Also included in the goals of this report is the recommendations for alternative connections for the town of Bethel to the city of Greenville for commuting and recreational purposes.

Using existing structures and the idea of complete streets, multiple recommendations were developed. The recommendation is to turn Railroad Street into a complete street by extending the five-foot lanes or adding bike signage and by extending the sidewalk down to Washington street. To aid in connecting the neighborhoods to the park, it is recommended to have the sidewalk on Washington Street get extended west to the park. Adding these recommendations would create a walkable alternative to getting to the park. The need for crosswalks within Bethel is greatly expressed when looking at how to connect the school to the surrounding neighborhoods within the town in the safest and most effective manner. The addition of crosswalks at larger intersections, as well as adding a crosswalk in front of the school, would allow for safe passage across Washington Street, Old Hwy 64. As mentioned, the town has pre-existing 5-foot lanes and turning them into bike lanes for the use of students to go to school is the preferred usage for the otherwise unmarked lanes.

In addition to the improvements recommended for the neighborhood, finding routes to connect Bethel and Greenville is the other task of this report. With the recommendation of three alternative routes of varying length, these routes offer safe connections if the proper signage or bike lanes are implemented.

To find an even more direct route between Bethel and Greenville the idea of using NC 13 is explored in this report. Providing possible bike facilities and the bike destinations along the route shows that the need for bike accommodation should be explored.

Definition of Vehicle

To better understand the terminology mentioned in the recommendations, the definition of a vehicle as defined by the North Carolina General Statute 20-4.01 section 49 is provided below.

Vehicle: Every device in, upon, or by which any person or property is or may be transported or drawn upon a highway, excepting devices moved by human power or used exclusively upon fixed rails or tracks; provided, that for the purposes of this Chapter bicycles and electric assisted bicycles shall be deemed vehicles and every rider of a bicycle or an electric assisted bicycle upon a highway shall be subject to the provisions of this Chapter applicable to the driver of a vehicle except those which by their nature can have no application. This term shall not include a device which is designed for and intended to be used as a means of transportation for a person with a mobility impairment, or who uses the device for mobility enhancement, is suitable for use both inside and outside a building, including on sidewalks, and is limited by design to 15 miles per hour when the device is being operated by a person with a mobility impairment, or who uses the device for mobility enhancement. This term shall not include (i) an electric personal assistive mobility device as defined in subdivision (7b) of this section or (ii) a personal delivery device as defined by this section. Unless the context requires otherwise, and except as provided under G.S. 20-109.2, 47-20.6, or 47-20.7, a manufactured home shall be deemed a vehicle.

Bethel - Park Recommendations

When looking at the population of Bethel, there is a noticeable gap between the elderly and younger population. Roughly 20% of the current population is of the grades K-12 and that makes them the target population of this portion of the project and recommendations. Located in the Eastern section of the towns City limits is the Bethel School hosting grades k-8th.

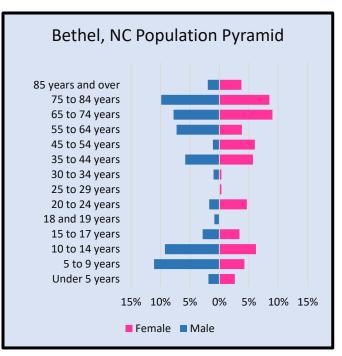


Table 1 | 2020: ACS 5-Year Estimates Subject Tables S0101 | Age and Sex

However, located in the far west of the city limits and partially within the Extra-territorial



Map 2 | Bethel Amenities

jurisdiction is the Field of Dreams Park. Containing different facilities such as a playground and open fields, this park is cut off from the center of the city due to the lack of sidewalks and bike facilities. As seen in map 2 on page 6, the sidewalks on Washington Street do not extend all the way to the park. Most homes in the town are located more than a half-mile radius of the park making it unsafe to attempt to go to the park. One thing to also note, is that Washington Street is also Highway 64 making the need for safe pedestrian access even more necessary. Another issue present is the lack of sidewalks within the center of the town to safely cross the streets to access the local stores, restaurants, and the school. The aim of these recommendations is to give the neighborhood families better and sage access to the school. The railroad that runs through the center of the town is an area of concern due to its lack of designated areas for pedestrians to safely cross the railroad. While the rail is not highly used, the lack of designated crossing does pose a threat to the pedestrians because they need to cross two streets with no stopping place and



Map 3 | Bethel Recommendations

that increases that chances of an accident happening. Map 3 shows the recommendations that have been made to help solve the issues that have been previously addressed.



Image 1 | Facing west on Railroad Street

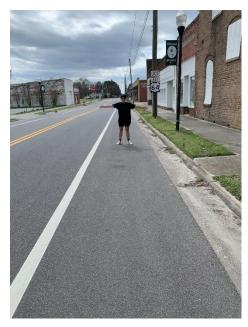


Image 2 | Facing South on S. Main Street

In order to understand the desires of the recommendations, knowing and being able to define what a complete street is, is curial. According to the NCDOT complete streets have four goals "reduce pedestrian crashes and unsafe conditions, improve access and mobility for those without a vehicle, enhance quality of life by providing transportation choice, and ensure NCDOT has an equitable transportation system that works for everyone." In this report, the overall goal is to start the process of complete streets within the town of Bethel.

To start, the connection from the town center and the fields of dreams park takes place using two different roads, Washington street and Railroad Street. The goal of using these roads is to divert foot traffic from Washington Street, Old Hwy 64, by using Railroad Street that runs parallel to Washington then feeds into it right before the park. Referencing image 1 and 2 to the left, the unmarked lanes off to the side of the road are shown. Due to its width of roughly 5 feet, as demonstrated in image 2 by showing

one's arms span, it makes it a desirable area for a bike lane due to the pre-existing lanes. Currently, there is no indication of these lanes being for bikes or for parking. In a meeting with the Mayor Brown she discussed that the lines were created to attempt to slow down traffic by decreasing the width of the road and now these lanes are used for parking by the businesses even though it is not marked for parking.

Defined by the U.S. Department of Transportation "Complete Streets are streets designed and operated to enable safe use and support mobility for all users. Those include people of all ages and abilities, regardless of whether they are travelling as drivers, pedestrians, bicyclists, or

public transportation riders. The concept of Complete Streets encompasses many approaches to planning, designing, and operating roadways and rights of way with all users in mind to make the transportation network safer and more efficient." The proposed recommendations for the connection of the town center and the field of dreams park will consist of making Railroad Street a complete street by turning the existing lanes into bike lanes and either extending them down to the intersection of Washington Street or by adding bike signage. The more commonly found sign of share the road, image 4, does indicate that cyclists may use the road, but the use of the May Use Full Lane sign, figure 3, indicates the rights of the cyclists to use the full lane. If the lanes were to get

MAY USE FULL LANE

Image 3 /May Use Full Lane Bike Sign



Image 4 | Share the Road Bike Sign

extended then the recommended extension of the bike lanes on Railroad Street would total about a mile thus making a total of 1.9 miles of bike lanes on Railroad Street However, if there is an inability to add extend the lane then either a "Share The Lane" or "May Use Full Lane" sign would be recommended as an alternative. In addition to the bike lanes on Railroad Street, extending the sidewalk an extra 0.7 miles west down to Washington Street would finish and make Railroad Street a complete street. As for Washington Street, the goal is to start at the sidewalk from the existing location near the intersection of Jenkins Street and Washington Street extend to the park. The extension would be about 0.75 miles long on the southern side of the street straight to the entrance of the field of dream park. On the north side of the street, the sidewalk extension would be 0.6 miles long running to the intersection and adding .18 miles of sidewalk on the northern side from the intersection to across the entrance of the park. As for not including bike lanes, the goal is to divert as much traffic as possible from the larger road to the less used Railroad Street. This will help to decrease the chances of vehicle-pedestrian accidents on the major road running through the town. Lastly, is the need for crosswalks at the intersection of Railroad Street and Washington Street As expressed in Map 3 on page 7, there are three recommended cross walks at the intersection one running east-west at the end of Railroad Street and two running north-south across Washington Street. Lastly, is the recommendation to place a crosswalk north-should on Washington Street in front of the park to allow for safe access. These recommendations were made to make the park more accessible for the general public and to allow for greater pedestrian movement within the city limits.

<u>Neighborhood – school connection</u>

In addition to the need to connect the neighborhoods to the Field of Dreams park, there is a need to connect the surrounding neighborhoods to the school using sidewalks, bike lanes and crosswalks.

Currently, most of the major roadways within the city have sidewalks running adjacent to the side the roads with two crossswalks crossing at the intersection of Washington Street and Main Street and the other crossing Washington Street across from the school. As mentioned, at the intersection of Washington Street and Main Street there are two crosswalks, but there are no crosswalk going across Washington Street, which is needed to get to the school on the south side of Washington Street. There is one other crosswalk running across Main Street at the Main and Jefferson intersection located south of the school. Stating this, it is seen that there is a clear connection of the southern neighborhood to the school, but no safe connection of the north neighborhood to the school.

One of the defining features of the town of Bethel is the railroad that bisects the town. Currently, there is no pedestrian designated crossing of the rail. It is recommended to add crosswalks across West Andrews Street and West Railroad Street at the intersections of James Street and Main Street. This would allow for designated crossing sections of the railroad. Per the recommendations it is also suggested to add concrete standings at the edge of the grass



Image 5 | Curb Corner

running next to the railway so that pedestrians crossing will have a safe and designated place to stand when attempting to cross the street

Lastly, there is a need to add sidewalks along the eastern side of the neighborhood block in front of the school. At the edge of the block is a gas station that gains a lot of foot traffic, yet no sidewalks to it. Directly to the east of the gas station is the ramp on and off NC 13 making it a high-volume area for traffic and increasing the risks to pedestrians. Running northeast of the block is E. Railroad and southeast is Washinton. It is recommended to add a sidewalk on the south side of Railroad and on the north side of Washington to make a full connection around the block. Implementing these sidewalks would allow for safe commuting to the station as well as increasing the number of ways to access the school.

Sidewalk improvements

While these sidewalk improvements don't directly impact the overall goal of this report, it is important to note these sidewalk conditions when assessing the accessibility of town.

Shown in images 6, 7 and 8, are sections of the sidewalks located on either side of James Street. These sidewalks have cracks with vegetation growing over the sections of the sidewalks and large sections of concrete missing making them a hazard.

Image 6 is located on the West side of the street. This picture was taken to show how there is a skip in the concrete as well as the grass growing in between the concrete slabs.

Images 7 and 8 are both on the eastern side of James Street, but they are focusing on two different areas of concern. Image seven is taken at the end of the sidewalk that goes down into a ramp. While the ramp is likely only used for the church it is connected to, this is also a sidewalk entry point for cyclists and any



Image 6 / James Street West side



Image 7 | James Street East Side

other type of pedestrian. The poorly maintained ramp poses a tripping hazard as well as unsafe conditions for any type of sidewalk vehicle, including but not limited to bikes and scooters.

Image 8 was taken on a different segment of the same sidewalk shown in image 7. This image shows the side of the parking lot and while there is not a current sidewalk, there is potential for one, due to the pre-existing sidewalks on either side. However, when looking closer at the image, there is a tire stop located on the grass. This also poses as a hazard to pedestrians because it is not immediately visible and could flip a bike or trip someone walking.

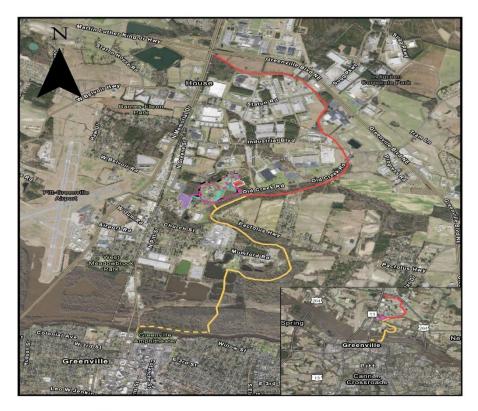


Image 8 | James Street East Side pt. 2

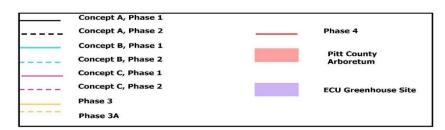
While these are not recommendations, it is important to bring these issues to attention as there could be a possibility that these conditions are not within ADA compliance. Addressing these issues will also improve the overall quality of the neighborhood by adding a safe entrance to it.

Bethel-Greenville Bike Path Recommendations

For this portion of the report, it will be focusing on the recommended alternative routes that connects Bethel to the Pitt County Arboretum in Greenville. The Pitt County Arboretum was designated as the start/stop location due to its proximity to the existing greenway system. In Fall 2021, ECU Planning Studio students created the Parker's Creek Greenway Plan that connected



0 1 2 4 Miles

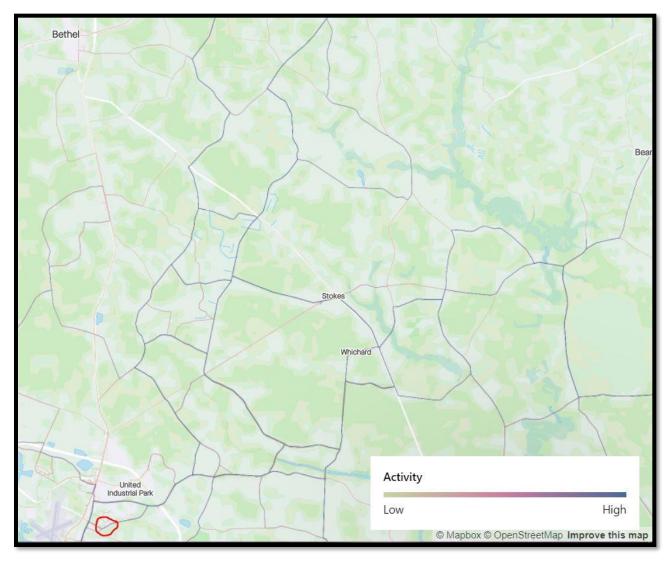


Map 4 | Parker's Creek Greenway Plan | Uptown Connection

the campus Greenhouse site, located next to the Pitt County Arboretum, to community assets and existing greenways. Located to the left, Map 4, is the recommended route created by the Planning Studio group. The recommended routes from this report can continue into uptown Greenville via the phase 3 route shown in Map 4.

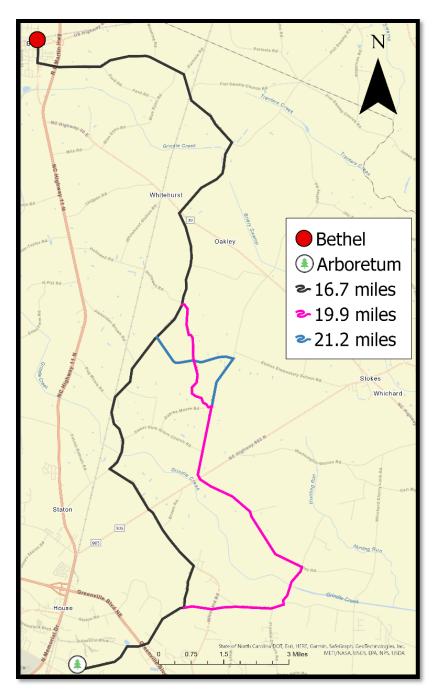
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While cycling is not a commonly used form of transportation in larger areas, the NC Department of Transportation Bicycle and Pedestrian Safety Survey conducted in 2011is mentioned in the 2013 North Carolina Statewide Pedestrian and Bicycle Plan found that if given the proper facilities about 70% of North Carolina residents would cycle more. With that idea in mind, the report will focus on finding a way to connect these two cities to provide a route that will hopefully promote the use of cycling more in the populations. The goal when finding routes roads for the recommended routes is low traffic volume, good with fair road conditions, minimal



Map 5 | Strava Bike April 2021 - March 2022 Frequency Heatmap

intersections and low speed limits. When researching the possible routes, the use of the app Strava. Strava was very beneficial to the creation of these alternative routes. Within the Strava data available, the app has a heat map of the frequently used routes as seen in Map 5. While the Strava data does provide frequency use based off of the users of the app, the primary users on this app use it for recreational and fitness purposes, not commuter purposes.



In map 6, is the

Map 6 | Bethel – Greenville Connection, Recommended Bike Paths

recommended route provided. Varying in length and different road types, these routes provide safe alternative routes for any type of cyclists. Starting and stopping at the same location, all three of these routes share a similar path but vary to allow for either more scenic or more direct routes.

16.7 miles	Miles	Volume	Speed (MPH)
Old Creek	2.45	<4,999	45/55
Lewis Dudley	0.8	<1,999	55
Whichard	2.43	<4,999	45/55
Staton Mill	7.17	<1,999	55
Big Oak	4.11	<499	55
Package-Craft	0.34	<499	40/35
South Main	0.45	<1,999	40/35/20

Starting with the black route,

this is the shortest totaling around 16.7 miles and is the most direct route of the three using seven different roads. As seen in table 3 and in Map 6 the rider

would stay on Staton Mill Road for

Table 3 | GUAMPO NCDOT AADT

7.17 miles out of the 16.7 miles of the route. However, while this route is the shortest and most direct route, it also has a road with one of the highest traffic volumes of up to 4,999 vehicles, as seen in table 3. As stated prior, the goal is to use routes with low traffic volume and low speed limits. Looking in table 3 at the speed limits, most of the roads stay at a consistent speed of around 40-55 mph, so the deciding factor of the safest route is more dependent on the traffic volume. While Whichard Road does have high volume, most of it is closer to the intersection of Greenville Boulevard and Old Creek making the road safer the closer the rider gets to Bethel.

19.9 miles	Miles	Volume	Speed (MPH)
Old Creek	4.31	<4,999	45/55
Mason School	0.8	N/A	55
Oakley	3.98	<1,999	55
Dupree-Moore	0.06	N/A	55
Hollowell	2.21	N/A	55
Staton Mill	3.4	<1,999	55
Big Oak	4.11	<499	55
Package-Craft	0.34	<499	55
South Main	0.45	<499	40/35/20

Consisting of nine roads at a total of around 19.9 miles, this route uses the most roadways of the three. Other than the use of Old Creek Road, most of the roads have a small road volume or are not a NCDOT road so they have no data available about them.

Table 2 | GUAMPO NCDOT AADT

Looking at map 6 page 17, the pink route is almost identical to the blue route. The main

difference is the use of Hollowell Road to cut out about 1.3 miles.

As stated prior, the blue route is almost identical to the pink. When looking at the Strava heatmap, note that Hollowell is not a popular route and is often skipped on most rides. While unsure as to why most Strava riders avoid this road, it is believed

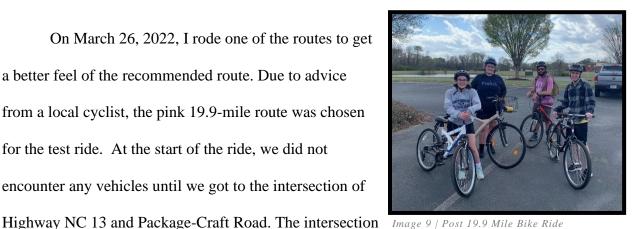
21.2 miles	Miles	Volume	Speed (MPH)
Old Creek	4.31	<4,999	45/55
Mason School	0.8	N/A	55
Oakley	5	<1,999	55
David Nobels	1.7	N/A	55
Staton Mill	4.29	<1,999	55
Big Oak	4.11	<499	55
Package-Craft	0.34	<499	40/35
South Main	0.45	<1,999	40/35/20

Table 4 | GUAMPO NCDOT AADT

that it is due to Hollowell being a more residential road. However, due to this uncertainty about the road, the alternate route blue was created to avoid said road. Overall, while the route is the longest and not very direct, it is recommended due to the uncertainty of the use of Hollowell Road.

19.9 personal report

On March 26, 2022, I rode one of the routes to get a better feel of the recommended route. Due to advice from a local cyclist, the pink 19.9-mile route was chosen for the test ride. At the start of the ride, we did not encounter any vehicles until we got to the intersection of



has a two-way stop sign giving NC 13 having the right-of-way and Package-Craft Road needing to stop. Other than the initial apprehension of crossing a major road, it was rather empty making the crossing relatively simple. Throughout the entire route we encountered seven stop signs where we did not have the right of way. However, all of the roads that needed to be crossed had low traffic volume and did not pose an issue. The only intersection that caused worry was crossing 264. The intersection is a stoplight with what we initially thought had a pressure sensor for light changes. However, during a later discussion with Mr. Steven Hardy-Braz it was discovered that the intersection already has a visual sensor aimed at picking up cyclists and motorcycles.



Table 5 | 19.9 Mile Path Elevation

Overall, the route was fairly flat with minimal issues. In table 5 above, the elevation of the route is shown. The entire route had low traffic volume with only 16 cars needing to by-pass us on the left side. The ideal purpose of the route is to provide residents of Bethel with an alternate non-motorized way to Greenville. By riding the route, it is obvious that 20 miles is a long ride for an intermediate rider. As shown in the image to the left, the route took just under two hours of riding, this excludes the time that was taken for the two breaks.

20.08 mi Distance	1:49:00 Moving Time	72 ft Elevation
	Avg	Max
Speed	11.1mi/h	20.6mi/h
Elapsed Time	2:17:49	

To summarize the findings of the ride, the route was biker friendly and the cars that were encountered respected us on the road by giving us the full lane when they had by-passed us. Most of the riders on this were intermedient

Table 6 | Trip Summary

cyclists in terms of skill level and based off of our condition post-trip, this route is believed feasible for the average rider.

Recommended route

Distance (Miles)	Difficulty
0-5	Easy
6-10	Moderate
11-15	Hard
16-20	Definitely Sweaty
20-25	Impressive!
25-30	Dedicated
30+	Olympian Commuter

Looking at the collected data and the needs for residents, the shorter the route the better.

These recommendations are being made to help with commuting between Greenville and Bethel. The image to the left was taken from bicycle2work and matches data found from many other cycling websites. It shows the difficulty of a ride

Table 7 | Milage Difficulty

depending on distance. The pink and black route falls into "Hard" and blue is categorized as "Definitely Sweaty." Based off the image, if the blue 21.1-mile path was implemented, it would likely not be used due to the distance of the path. While riders do enjoy the scenery, finding the shorts and most direct possible is the goal. With that being said, the black 16.7-mile route is the main one to be recommended for implementation for this report.

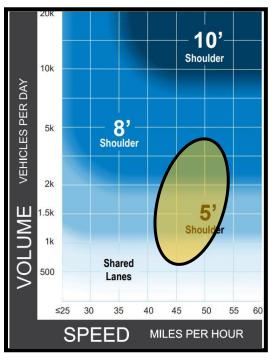
Recommended Signage/Lanes

While it is recommended to add bike lanes on the shoulders of the roads, there are areas that may not be able to accommodate the extra road with. For that reason, using the sign located to the left is the best viable alternative. While there are Share the Road signs, this one indicates to drivers



Image 10 | May Use Full Lane Bike Sign

not experienced with cyclists that they have the right to the full lane. While it is not a full proof way to prevent motor-vehicle operators from being aggressive toward cyclists, it is a better warning than stating to share the road with the cyclists. There are many types of bike accommodations that can be implemented to help a cyclist navigate the roads. These accommodations include the use of signs (shown in the Bethel bike path recommendations), lanes on the road, separate lanes, bike boulevards and much more. For the use of the Bethel-



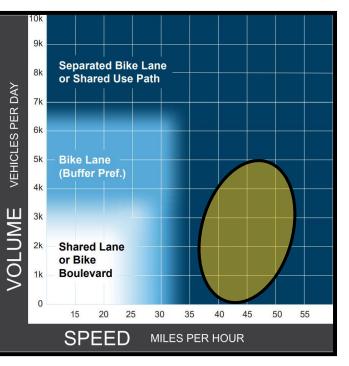


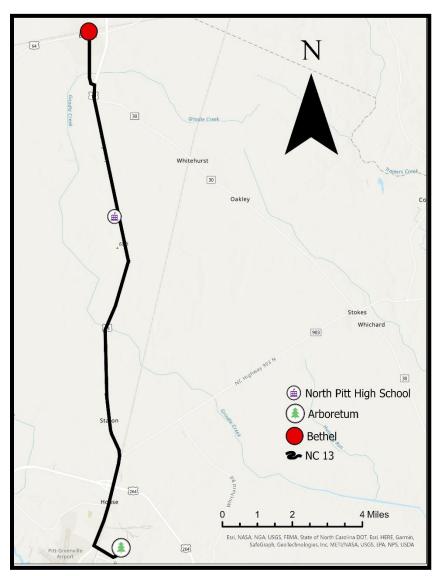
Table 8 / DOT Bikeway Selection Guide, Preferred Bikeway Type for Urban, Urban Core, Suburban and Rural Town Contexts

Table 9 | DOT Bikeway Selection Guide, Preferred Shoulder Widths for Rural Roadways

Greenville lanes, the use of shoulders and signage are the likely candidates. As shown in Table 8 and 9 on page 22, provided from the Bike Way Selection Guide by the Department of Transportation, the DOT recommended bike facilities should be a 5–8-foot shoulder and a separate bike lane or shared use path. The creation of a separate lane would be the preferred bike facility due to it being the safest of the options. However, with the current road conditions, extending the shoulders would also be a safe alternative. Most sections of the road have a large soft shoulder that could be easily converted to a hard shoulder that cyclists may use. However, using bike signage is also an option. While it is not the preferred outcome, it still makes the motor-vehicles aware that bikes use the route and they have rights to use the full lane, just like any other vehicle.

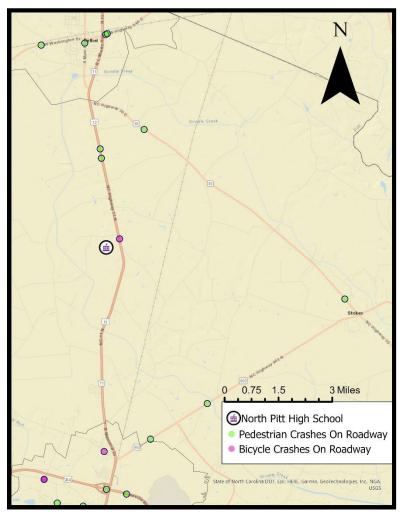
NC 13 bike accomadation recommendations

As an alternative to the three recommended routes provided prior in the report, it is necessary to explore the idea of using NC 13 for non-motorized vehicles. While the road is a highway, the speed limit is the same as most of the other alternative routes at 55mph. The biggest difference in terms of safety when looking at using NC 13 over the alternative routes is the volume of the cars on the road. Having an average



Map 7 / NC 13

volume of up to 19,999 vehicles, this increases danger to roads cyclists danger lever jumps exponentially. Referencing the tables on page 22, the road is recommended to have a 10-foot shoulder, larger than the average bike lane, and the volume is not even covered in terms of what type of bike facility should be used on a road this size. While the use of this road is dangerous for any pedestrian, exploring the idea of a safe way to navigate this road would be best due to the location of North Pitt Highschool in reference to Highway 13, as shown in map 7 and 8. The high school is located to the west side of the



Map 8 / NCDOT Bicyclist and Pedestrian Crash Map

highway, and students living in homes nearby may walk or ride their bike to school currently without a designated path or signage. There is one report of a bike accident located on NC 13 across the school. Referencing Map 8 to the left, there have also been two pedestrian crashes along NC 13. Adding a separate facility would be a probable option to this issue. Creating a shared use path for both walking pedestrians and cyclists would prevent these issues in the future.

The 12-mile route using NC 13 is the most direct route that can be created for commuters between Greenville and Bethel. In the difficulty table on page 22, a 12-mile ride would be considered hard but not impossible to make, especially if it is twice a day. While this report provides no real solutions to the NC 13 bike issues, it brings focus to issues that some may not know of. Creating a safe route to education facilities requires more attention than it currently has.

<u>Summary</u>

Overall, the goal of this is to focus on the safety of pedestrians and anyone that uses a non-motorized vehicle. The safety of the pedestrian is so important to consider when making these kinds of changes. It was discovered that on roads going 40mph only 1 out of 10 pedestrians are likely to survive the crash. Thinking about that, most of the recommended routes are 55mph but that doesn't mean that the vehicles are going that speed, likely over. Implementing these changes can and likely will result in fewer crashes and an increase of the use of facilities within and around Bethel.

When speaking with locals, they were excited to see some changes in the increase of safety for pedestrians and the hopeful improvements of the sidewalks that they currently have. The health and well-being of the locals of a small town like this is important. Let's make it better by making it friendlier.

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