

2020 Bike/ Ped Pool Project Prioritization in New Castle County

SUMMARY OF RESULTS

PAUL MOSER, DELDOT PLANNING

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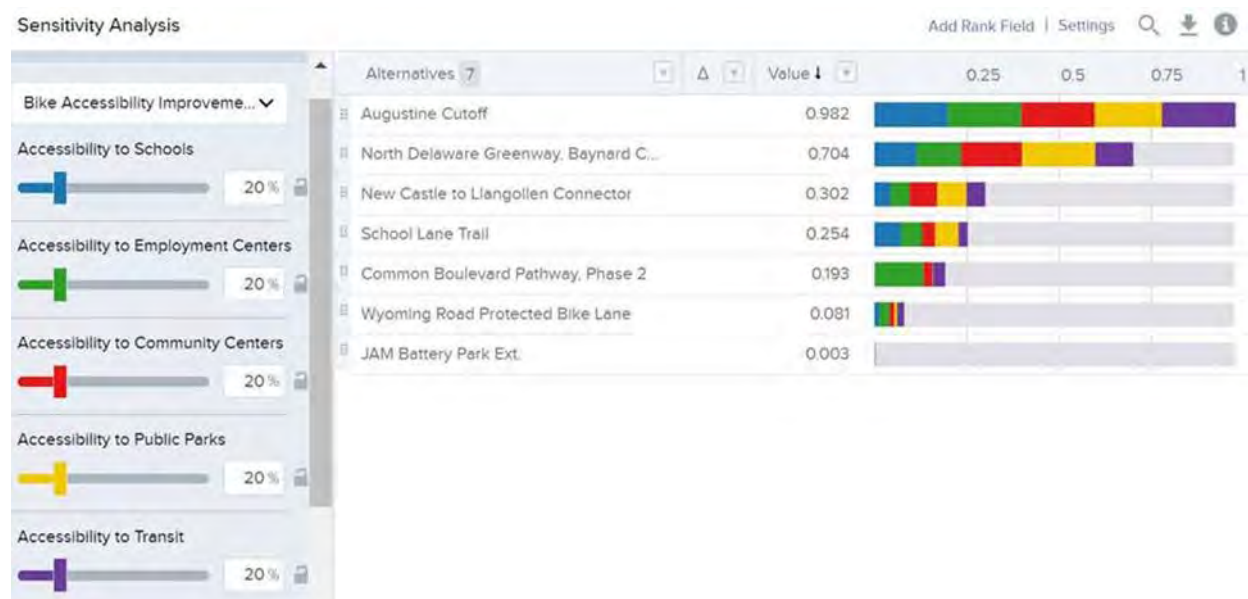
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Overview

Per the [2018 Blueprint for a Bicycle Friendly Delaware Statewide Bike Plan](#), DelDOT has developed the capacity to manage the project selection process for the Bike/ Pedestrian Program with a clear, transparent, publicly accessible, and fair process. The cornerstone of this process is responsiveness to local planning, coordinated at the Metropolitan Planning Organization (MPO) level. The Wilmington Area Planning Council (WILMAPCO) completed their [New Castle County Bicycle Plan](#) in May of 2020. From this plan, WILMAPCO submitted several Priority Projects (pg 78) to DelDOT Local Systems Improvement Section. From this list, the Local Systems Team selected seven project proposals, which were a good match for the Bike/ Ped Program, to be evaluated and prioritized at the county level. This document contains an overview of the methods used for DelDOT prioritization, a narrative of each Priority Project, and a presentation of the results, and project selection for New Castle County.

Executive Summary

With insight garnered from bicycle mobility modeling as well as a more in-depth programmatic review of the seven Priority Projects, Local Systems Improvement plans to move forward two projects in 2021: Augustine Cutoff and School Lane Trail. These projects ranked 1st and 4th, respectively, in mobility modeling prioritization. The North Delaware Greenway, Baynard Extension and New Castle to Llangollen Connector (ranked 2nd and 3rd, respectively), were found to have significant project challenges and action items which should be undertaken before the project will be considered for funding and project development through the DelDOT Bike/ Ped Program.



Methods

Level of Traffic Stress

The Delaware Bicycle Mobility Tool was developed in 2015 in conjunction with Dr. Peter Furth from North Eastern University, as part of a State Planning and Research, Part 1 project to develop the capacity at DelDOT to implement a new metric of suitability for roadways for bicycling called '[Level of Traffic Stress](#)' (LTS). This metric ranks roads as Level 1 through Level 4, depending on the intensity of automobile traffic and provisions made for bicycle traffic. A base assumption of this method is that people are only willing to bicycle on roads which are within their tolerance for Traffic Stress. Some people are not comfortable leaving their subdivision roads (usually considered LTS1 roads), while others will tolerate country roads with shoulders (typically LTS3) but refuse to ride on a high speed rural roads with no shoulders (LTS4 in many cases).

To make things simple, we associate each Level of Traffic Stress with a class of cyclists. For example, an LTS1 rider will only tolerate LTS1 roads. An LTS2 rider will tolerate both LTS1 and LTS2 roads but will shy away from LTS3 and LTS4 roads. An LTS3 rider will tolerate LTS1-3 conditions, and an LTS4 rider will ride just about anywhere except limited access highways.

This assumption leads us to the conclusion that people will only travel to destinations on a bicycle *if* there is a connected route of roadways, pathways, and intersections that is within their comfort level. If the most direct route requires them to use a roadway or intersection they are not comfortable with (eg, a higher level of traffic stress), then they will either detour to find another, lower-stress route, or view the trip as infeasible and just drive or not make the trip.

By this logic, the way to improve cycling mobility is to

- A). Create new, low-stress connections to places that people want to go; building pathways, shortcuts, or cut throughs that didn't previously exist.
- B). Improve intersections and roadways that provide more direct access from people's houses to places they want to go; reducing detour required to get somewhere under low-stress cycling conditions

Bicycle Mobility Modeling

With these two criteria of success, we have used our statewide Level of Traffic Stress model to develop travel models which compare how proposed bike/ ped projects can improve cycling mobility, at the household level. Per the State Bike Plan, we are interested in five categories of 'destinations': Schools, Community Centers, Employment Centers, Transit, and Parks. We have developed Statewide datasets of these Points of Interest (POIs). We have also developed a county-wide model of housing unit distribution, aggregated to the nearest intersection using 'Theja Tiles' – a unique method of Euclidean tiling and address matching. This aggregation allows us to run our model at a county-level with minimal loss in resolution and error compared to tax-parcel based modeling, and still push the results back to tax parcels for visualization and mapping.

Using an aggregated surrogate for housing units as our 'Origins' and each set of POIs as our 'Destinations', we look at how each origin is connected to each destination.

We start from the perspective of the LTS4 rider: what is the shortest route to the nearest state park (for example). This gives us the most direct route, currently available, regardless of the level of traffic stress.

Then we consider the LTS1 rider: what is the shortest route to get there on only pathways, LTS1 roads and through LTS1 intersections? Is it even possible to get there under LTS1 conditions? If it is, we look at the distance, and compare it to the shortest LTS4 route. This gives us the *detour* associated with this route. If there is no viable route, this Origin-Destination (OD) pair is considered disconnected and is given a “Propensity Score” of 0. If it is a direct route within the critical cycling distance of 3 miles, the Propensity Score will be 1, meaning fully connected. As direct distance increases above 3 miles and/ or the detour increases, the Propensity Score decreases, between 1 and 0.

We then move on to the LTS2 and LTS3 networks, to compare connectivity, distance, and detour to the state park in question. In general, people with a higher tolerance for traffic stress have greater mobility around the State of Delaware.

Our model does this path building and propensity scoring routine for every origin and destination pair in the study area, giving us an estimate of how well each household is connected to our Points of Interest. We then sum the propensity scores for each household to arrive at the Global Connectivity Score of the entire study area, by POI category. This gives us the ‘No Build’ connectivity score for the study area, and gives us a point of reference, for which we can compare different scenarios. We can model the construction of a new pathway, the reduction of the LTS of a roadway section, the reduction of LTS at an intersection, or any combination of bicycle network improvements we’d like to understand. When we re-run the model with improvements to the network, the path building and scoring will reflect the new travel conditions of that project scenario. If this project creates new connectivity or reduces detour between OD pairs at LTS1, LTS2, or LTS3, the scenario connectivity score will reflect these improvements, this Raw Improvement Score can be found in **table 3**. We then weight improvements to each LTS Level ($LTS1*1$, $LTS2*0.75$, $LTS3*0.5$) for each destination category, and arrive at a Weighted LTS Improvement Score. These values are shown, per destination category, in **table 1**.

Ranking

Improvements in accessibility are ranked relative to the other projects being evaluated. Weighted improvement scores within each of the five destination categories (transit, schools, employment center, community centers, parks) are scaled from 0-0.20. The largest improvement for each category is given a score of 0.2, and the lowest, zero. Since each destination category is weighted equally, per the bike plan, and each project is given a scaled value between 0-0.2 for each category, the maximum total score a project can achieve is 1 (if it ranks first in each category). Then these Scaled Ranking Scores are summed, we arrive at the value we use to compare projects, as seen in **table 2** and **chart 1**.

Programmatic Review

In addition to the Bicycle Mobility Modeling, DelDOT Local Systems Improvement Section conducted a cursory review of each project evaluated. This review considered project feasibility (engineering environmental, right-of-way), programmatic feasibility (implementing agency, project concept maturity, integration with other plans and projects), and other less tangible factors that play into project value or challenge. These findings are summarized for each project in this report.

Results

Results are shown in several different ways. Enjoy.

Scenarios	School	CommCenter	EMPCenter	Transit	Park	Total
Existing	16,567	14,894	12,242	47,437	15,716	106,855
JAM Battery Park Ext.	16,567	14,895	12,242	47,441	15,717	106,863
Llangollen to New Castle Pathway	16,643	14,996	12,325	47,609	15,847	107,420
School Lane Trail	16,695	14,942	12,333	47,521	15,820	107,311
NDG Talley Road Connector	16,769	15,119	12,432	47,786	16,043	108,150
Commons Boulevard Pathway, Ph	16,569	14,927	12,452	47,549	15,718	107,214
Augustine Cutoff	16,919	15,166	12,558	48,111	16,015	108,769
Wyoming Road Protected Bike Lane	16,590	14,911	12,287	47,500	15,728	107,017

Table 1: Weighted Accessibility Improvement Scores for the 7 project scenarios, values represent improvement / 1,000

Scenarios	School	CommCenter	EMPCenter	Transit	Park	Total
JAM Battery Park Ext.	0.0001	0.0009	0.0001	0.0013	0.001	0.0034
Llangollen to New Castle Pathway	0.0433	0.0746	0.0526	0.0511	0.0801	0.3017
School Lane Trail	0.073	0.0349	0.0574	0.0251	0.0636	0.254
NDG Talley Road Connector	0.115	0.1654	0.1205	0.1035	0.2	0.7044
Commons Boulevard Pathway, Ph	0.001	0.0242	0.1326	0.0333	0.0016	0.1927
Augustine Cutoff	0.2	0.2	0.2	0.2	0.1825	0.9825
Wyoming Road Protected Bike Lane	0.0132	0.0126	0.0284	0.0188	0.0077	0.0807

Table 2: Scaled Ranking Scores for the 7 project scenarios, as shown in Chart 1

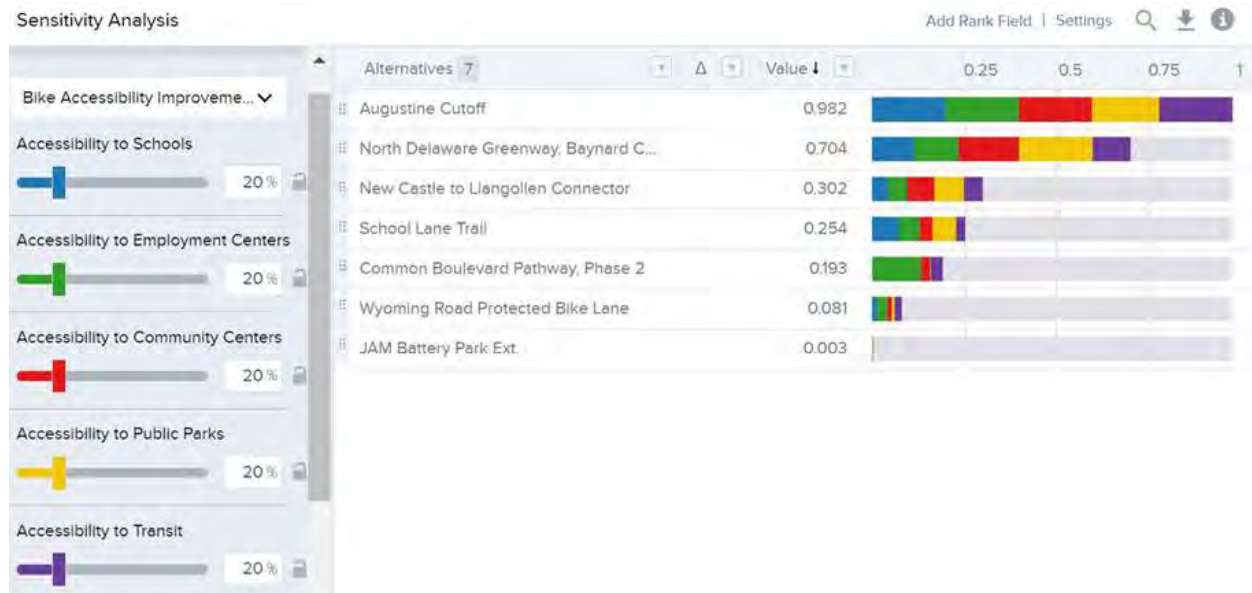
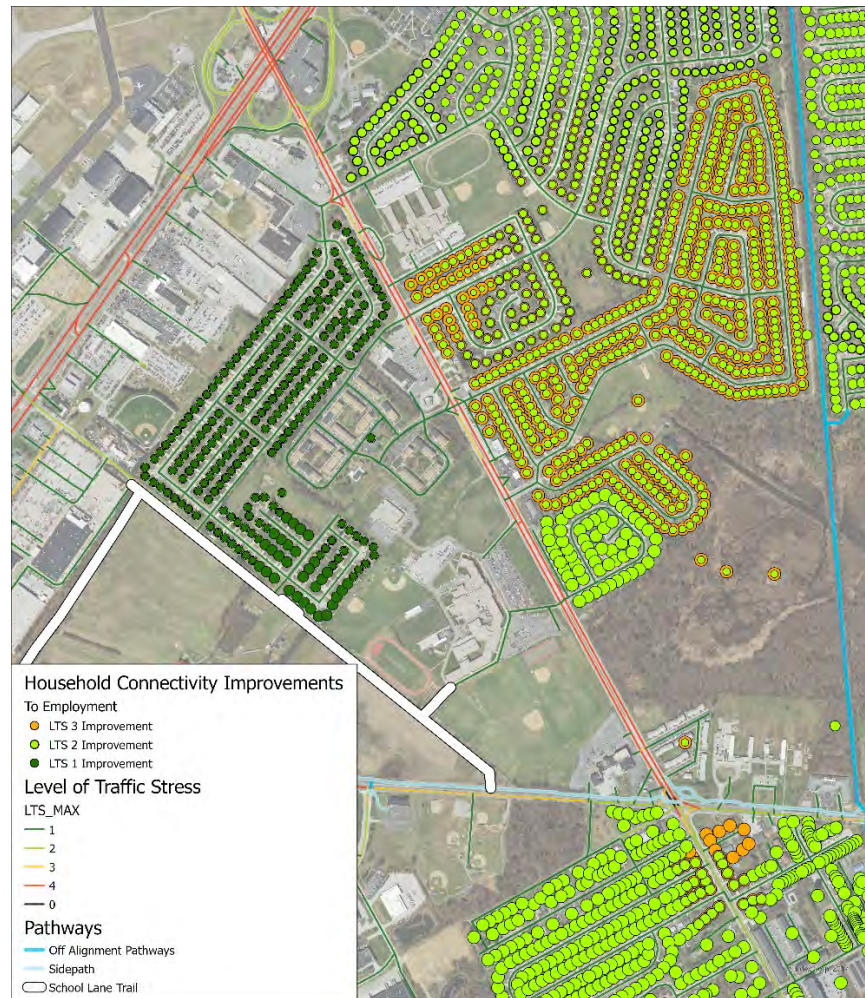


Chart 1: Scaled Ranking Scores summed and plotted

Scenario	LTS Level	SCH	COM	EMP	BUS	Park
JAM Battery Park Ext.	LTS1	0	430	50	2970	590
	LTS2	140	1010	240	2030	1320
	LTS3	0	0	0	50	10
Scenario	LTS Level	SCH	COM	EMP	BUS	Park
Llangollen to New Castle Pathway	LTS1	7670	24000	7190	32050	26470
	LTS2	50490	53420	46420	99700	70840
	LTS3	61260	74440	81820	131290	103540
Scenario	LTS Level	SCH	COM	EMP	BUS	Park
School Lane Trail	LTS1	4510	0	700	0	0
	LTS2	103500	46040	98890	98320	92340
	LTS3	92610	27310	31440	22520	70970
Scenario	LTS Level	SCH	COM	EMP	BUS	Park
NDG Talley Road Connector	LTS1	0	0	0	0	0
	LTS2	226890	284800	224200	370020	380430
	LTS3	66100	22220	44810	152930	86110
Scenario	LTS Level	SCH	COM	EMP	BUS	Park
JAM Commons Boulevard Pathway	LTS1	0	0	0	0	0
	LTS2	1390	24430	155850	88980	2030
	LTS3	1450	28980	184770	90990	2330
Scenario	LTS Level	SCH	COM	EMP	BUS	Park
Augustine Cutoff	LTS1	23280	10580	45910	73720	18970
	LTS2	112610	99260	113360	247740	128550
	LTS3	488710	372990	369220	830560	367580
Scenario	LTS Level	SCH	COM	EMP	BUS	Park
Wyoming Road Protected Bike	LTS1	2940	3720	8280	18960	1200
	LTS2	23090	16330	46700	57500	13530
	LTS3	5810	2310	3150	2870	2610

Table 3: Raw LTS Improvement scores on each LTS, by category, for each project. Red-to-Green color ramp compares improvements per destination category and per LTS across projects (eg, colors represent rank for LTS2 improvements to employment).

Visualizing Connectivity Improvements

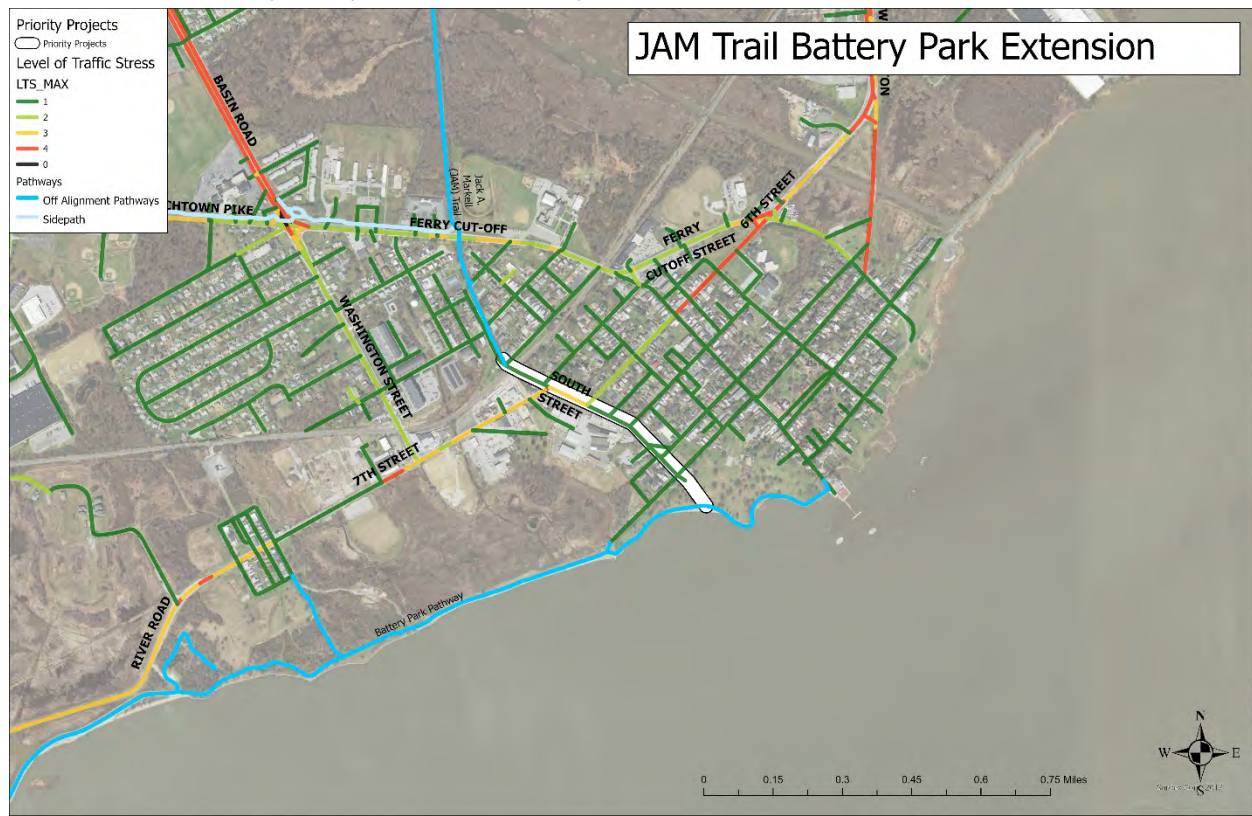


The image above is the visualization we will be using to communicate the geography of bicycle network connectivity improvements. Each colored point represents a housing-unit which had an *improvement to LTS1, LTS2, or LTS3 connectivity from the project in question*. Households which do not benefit from the project are not shown in this visualization.

The color of the point represents the LTS level which had an improvement, and the size of the point represents the raw improvement score for that household, on that LTS level. It is evident that only some households will experience LTS1 connectivity improvements, while others will only experience LTS2 or LTS3 improvements. Because of the unique connectivity opportunities of every house, there will usually be improvements across multiple LTS values, as new connections are made, or detour is reduced. Each point has a number of housing units associated with it – therefore, if a point represents a multifamily dwelling or an apartment, the number of units is accounted for in the raw scoring. The size of the points is the *per housing unit* value.

The size of the dots is symbolized discretely by quantiles, not continuously. Therefore, a jump from a small dot to a larger one will look abrupt, while the actual data will show a more continuous transition, as the household garners less accessibility gains from the project – usually from distance away from the project or increased detour. This visualization shows improvements to Employment Centers for School Lane Trail. **Visualizations throughout this document will show improvements to employment centers.** If you want to see improvements to other destinations, contact DelDOT and we will set you up with a better means to exploring the results.

Jack A. Markel (JAM) Trail, Battery Park Extension



Project Scope: Protected Bike lane or Sidepath on South Street, from the Southern terminus of the JAM Trail to Battery Park.

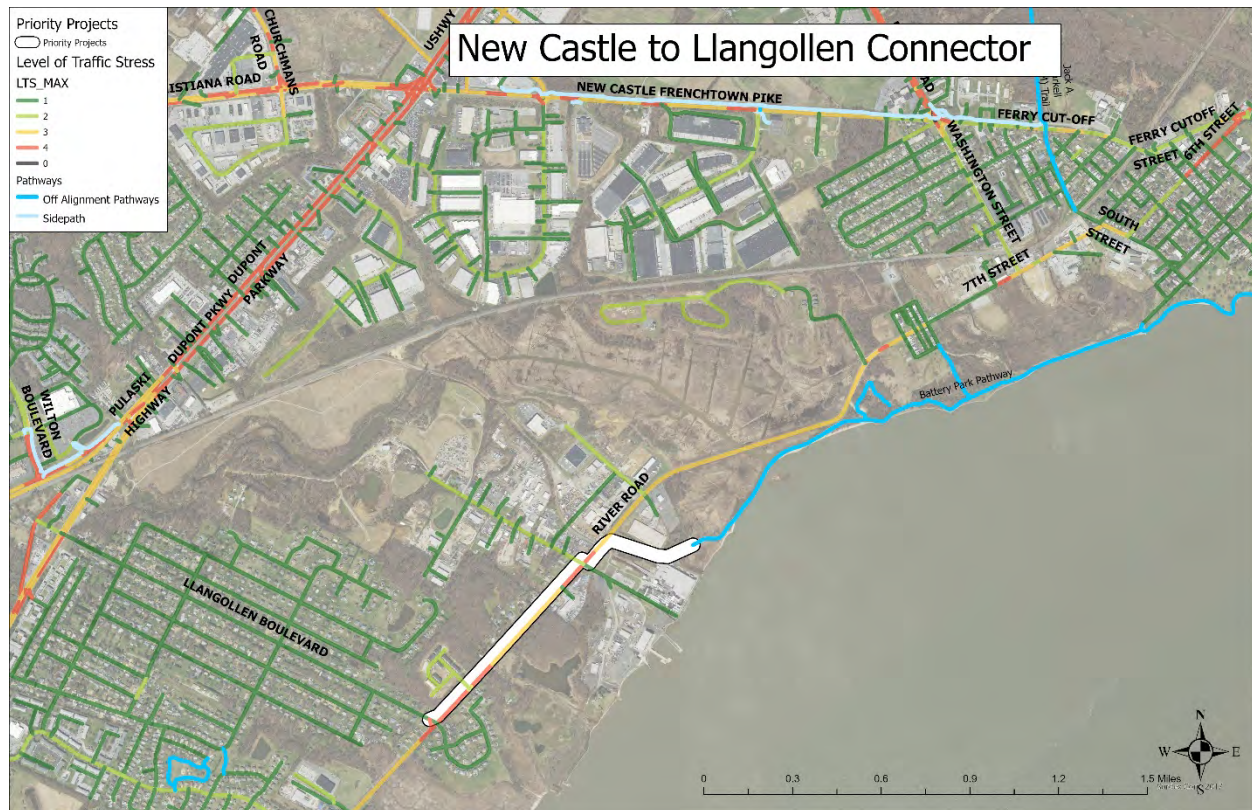
Project Challenges: Potential conflict with on-road parking. Potential conflict with aerial utilities. Developing pathway over a Norfolk Southern at-grade rail crossing. Crossing entrances of Goodwill Fire Station. Potential right-of-way constraints.

Programmatic Factors: The final section of the mainline JAM Trail; has significant value in completing a regional bicycle route. Awarded Delaware Bike Council (DBC) 2020 Innovation Grant for a feasibility study, supplementing a WILMAPCO UPWP funded City Transportation Study.

Ranking: 7th out of 7. Very little global connectivity improvements, besides LTS1 improvement to Battery Park, and bus lines on SR273.

DeIDOT Path forward: Coordinate with the City of New Castle at the conclusion of their Transportation Plan and DBC Innovation Grant Study and determine best path forward for funding.

New Castle to Llangollen Connector



Project Scope: Pathway from the Southern Terminus of Battery Park Trail to SR9 (River Road), and a Sidepath along SR 9, south to Llangollen Boulevard.

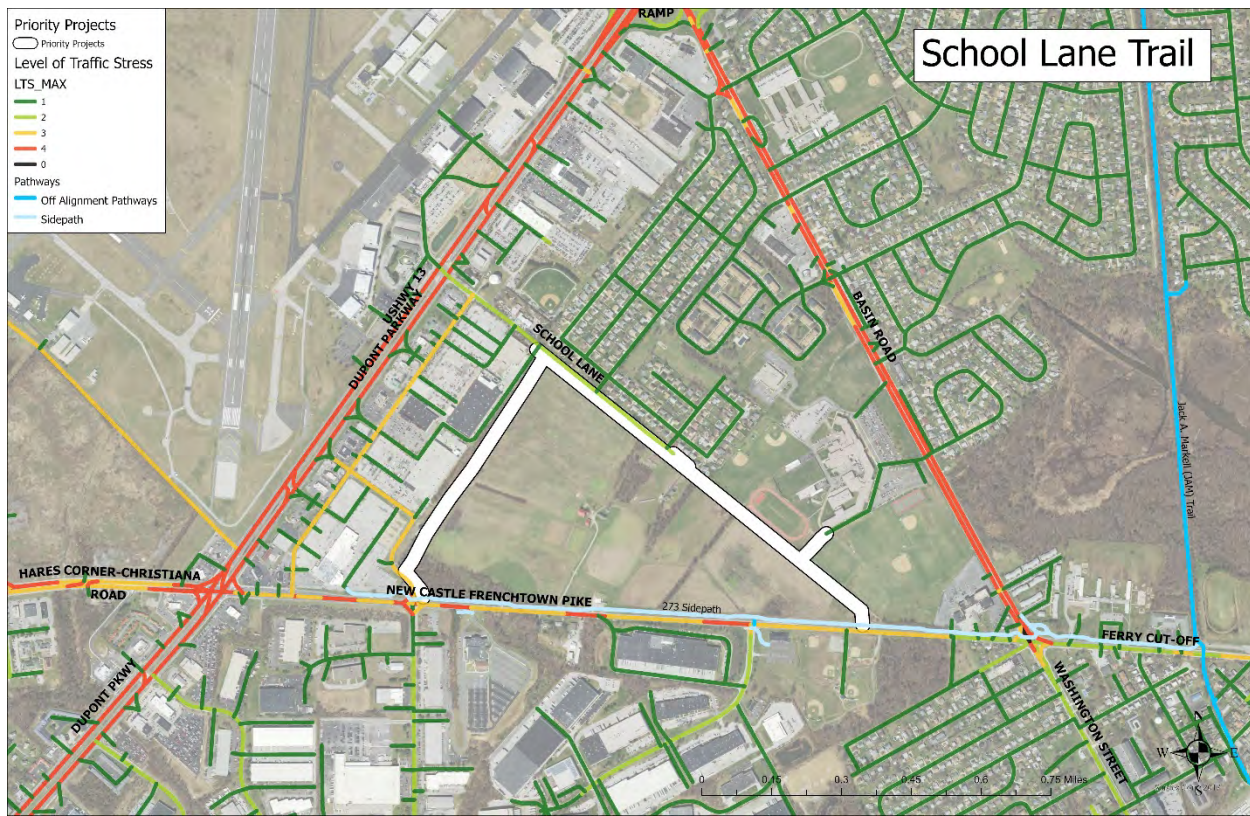
Project Challenges: Significant environmental impacts from the end of the Battery Park Pathway (along a dike recently improved by DNREC/ New Castle Conservation District) to SR9. Easement needed on private industrial land between existing path and SR9. Potential impacts to high voltage transmission lines. Impacts to drainage ditches on SR9. Rail crossing. Unsignalized crossing of SR9.

Programmatic Factors: Significant permitting and maintenance ramifications for DeIDOT to get involved in the construction of a pathway along this dike.

Ranking: 3rd out of 7. Good overall connectivity improvements, but mostly for longer-trips lengths (2.5-4 miles). Large LTS1 connectivity gains to Parks and Community Centers.

DeIDOT Path forward: WILMAPCO coordinate with City of New Castle, New Castle County, and DNREC to determine if interest exists to continue a Pathway/ Dike to SR9 – have one of those agencies manage design and construction. DeIDOT would be able to construct remaining sidepath along SR9 once the connection has been made to SR9.

School Lane Trail



Project Scope: Pathway from the terminus of School Lane, southeast along a State Owned, unimproved roadway corridor, connecting to the SR273 Sidepath. Another section of pathway would connect School Lane to the SR 273 Pathway, near Traders Lane signalized intersection, behind the Hares Corner shopping center.

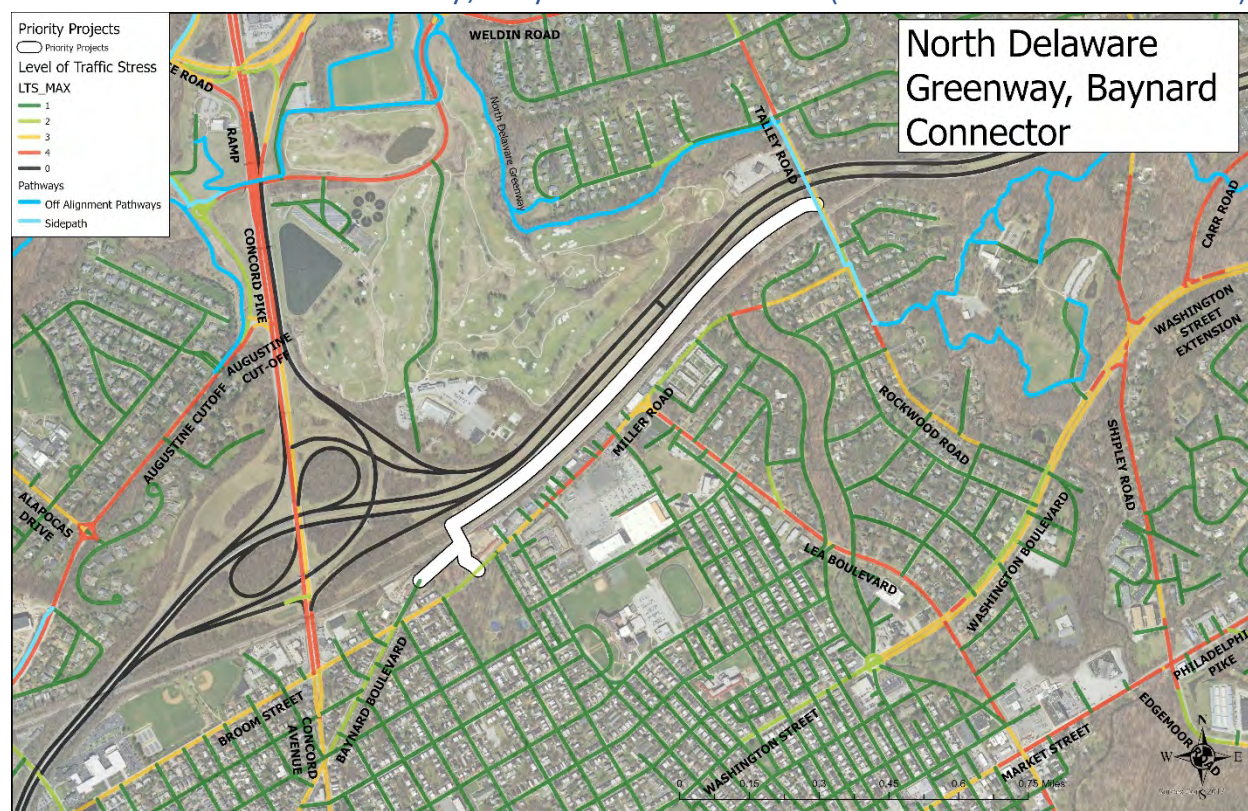
Project Challenges: Potential wetland impacts.

Programmatic Factors: A relatively straight forward project with a mature concept. Feasibility study conducted from Delaware Bicycle Council Innovation Grant.

Ranking: 4th out of 7. Modest connectivity improvements, localized around the Penn Acres, Penn Acres South, and Wilmington Manner Gardens neighborhoods. Creates significant LTS2 connections to employment at Hares Corner and the Airport Industrial Park as well as William Penn High School. This area is separated from New Castle by LTS2 or greater intersections, so aside from the directly adjacent neighborhoods, most connectivity gain is in the LTS2 and LTS3 network.

Recommended DeIDOT Path Forward: Initiate wetland delineation study to further explore feasibility.

North Delaware Greenway, Baynard Connector (Brew Works Connector)



Project Scope: This project consists of a paved multi-use pathway beginning at the stub end of Baynard Boulevard, near Wilmington Brew Works. A pathway would be constructed through an existing culvert, underneath the CSX rail line, to access an existing unimproved roadway corridor on State Land, between CSX and I-95. The pathway would continue north along this corridor, and then cut through Talley Yard to access the North Delaware Greenway, along Talley Road.

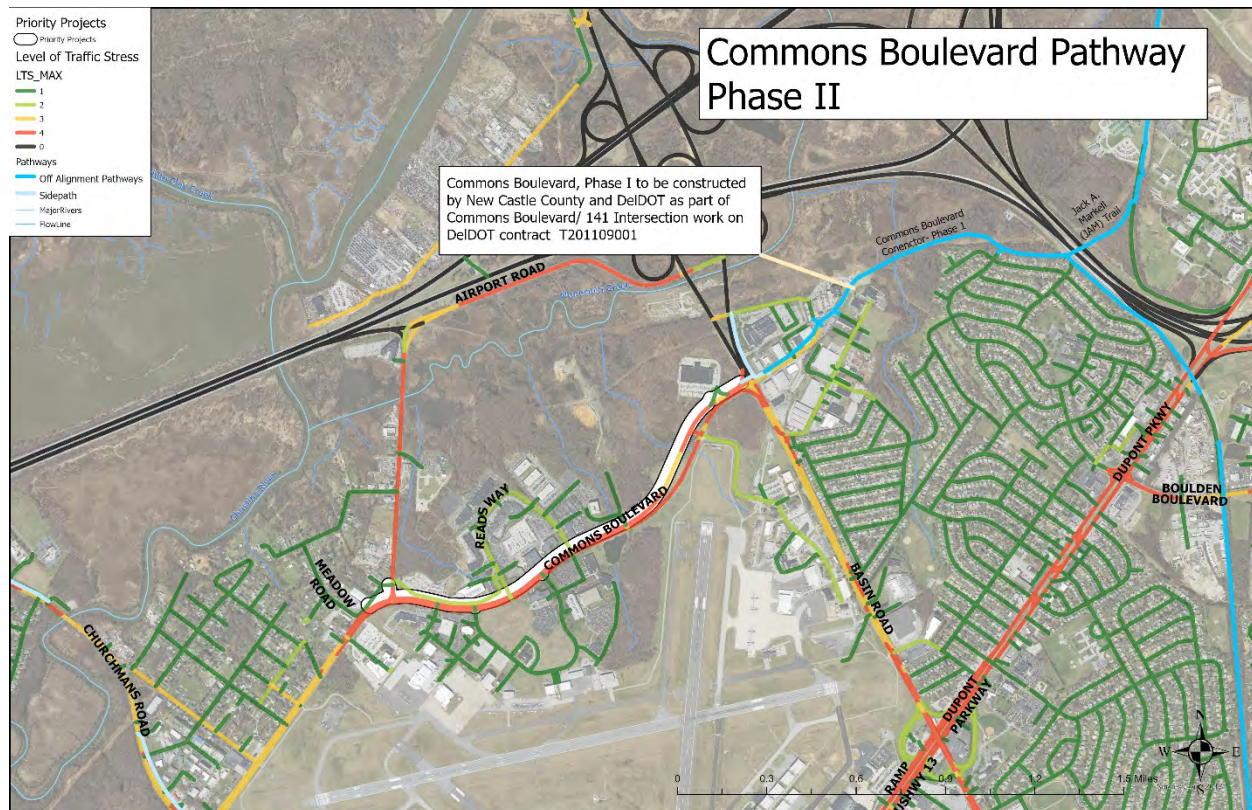
Project Challenges: Potential wetland impacts and grading challenges to connect southern terminus to unimproved roadway corridor. Elevation change between Talley Road and Talley Yard is significant.

Programmatic Factors: DelDOT Facilities Management is unlikely to approve public access through Talley Yard, currently, a restricted area. City of Wilmington Bike Plan recommends bicycle network improvements to Baynard Boulevard and Washington Street. This project would be very synergistic with these projects.

Ranking: 2nd out of 7. Provides a new LTS2 connection from the North Delaware Greenway at Talley Road to North-East Wilmington via the traffic signal at Baynard Boulevard and Miller Road. On its own, this project provides a new network connection, but it lacks directness or continuity with other bicycle infrastructure. It is in an isolated area and without direct continuity to other bike infrastructure on the southern terminus, it may be overlooked or underutilized.

Recommended DelDOT Path Forward: WILMAPCO coordinate with the City of Wilmington to begin development of Washington St/ Baynard Blvd bicycle improvements, prior to initiating development of this project. Revisit this pathway alignment once supporting projects have been constructed.

Commons Boulevard Pathway, Phase II



Project Scope: A sidepath along the western side of Commons Boulevard – connecting the proposed Commons Boulevard Phase 1 pathway to Airport Road.

Project Challenges: Potential wetland impacts and significant grading challenges south of Fedex Distribution Center. Underground utilities.

Programmatic Factors: Phase I is being designed by New Castle County, with DelDOT implementing frontage paths and intersection crossing of SR141 with a project, currently under construction. New Castle County has contracted a feasibility study for this entire alignment (SR141 to SR58) and is managing in-house design of Phase 1.

Ranking: 5th out of 7. This project excels at expanding LTS2 connectivity to employment. The Corporate Commons Industrial Park, Corporate Commons East, New Castle County Government Building and the New Castle Airport (one of the largest job clusters in the state) are made accessible to the JAM Trail. Phase III and future connections to Duross Heights and the Lewden Green Trail will compound the value of this important regional corridor.

Recommended DelDOT Path Forward: Coordinate with New Castle County for anticipated design and construction schedule and re-evaluate this alignment in future years.

Augustine Cut-off

Priority Projects
 ○ Priority Projects

Level of Traffic Stress
 LTS_MAX
 1
 2
 3
 4
 0

Pathways
 — Off Alignment Pathways
 — Sidepath

Map labels include: North Delaware Greenway, ALAPOCAS DRIVE, AUGUSTINE CUT-OFF, CONCORD PIKE, MILLER ROAD, KENTMERE DRIVE, LOWERING AVENUE, DELAWARE AVENUE, UNION STREET, SCOTT STREET, BROOM STREET, BAYVIEW BOULEVARD, CONCORD AVENUE, WASHINGTON STREET, and 18TH STREET.

Scale: 0 0.15 0.3 0.45 0.75 Miles

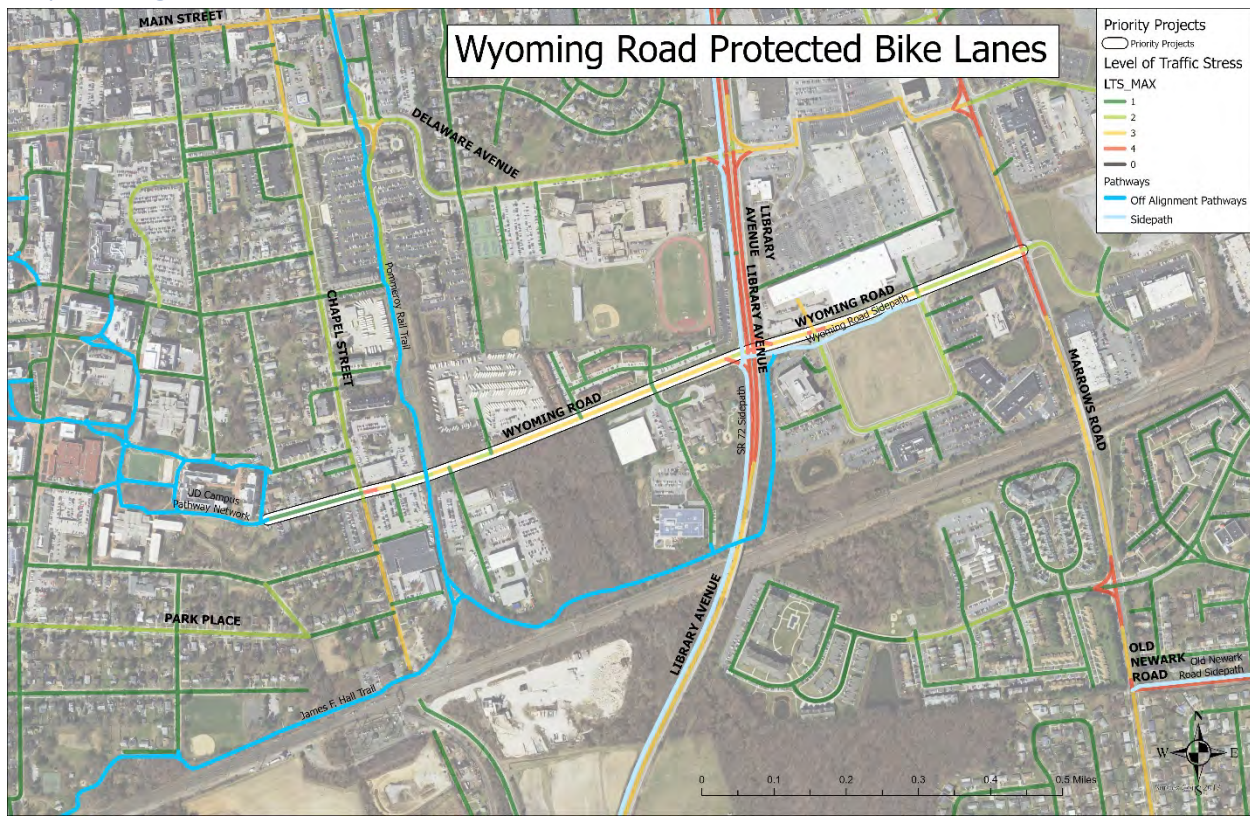
North Arrow

Project Challenges: Grading challenges at intersection approaches. ROW needs to be verified near intersections. Potential impacts to private property situated in the ROW. Potential impacts to the typical section of Augustine Cutoff.

Ranking: 1st out of 7. This project creates a significant direct connection between the North Delaware Greenway/ Blue Ball Properties Pathway Network, Alapocas, and the Forty Acres Neighborhood. Reduces the stressful elevation changes of riding the North Delaware Greenway along the Brandywine. A major connection to two densely populated areas with expansive bicycle networks.

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Wyoming Road Protected Bike Lanes



Project Scope: A pathway or protected bike lane along Wyoming Road, from Marrows Road to Chapel Street. Potential realignment of Library Avenue and Chapel Street intersections.

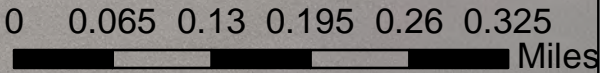
Project Challenges: Potential ROW constraints, Library Ave and Chapel Street are large and busy intersections.

Programmatic Factors: Awarded a 2020 Delaware Bicycle Council Innovation Grant. Scope may expand beyond the capacity of the Bike/ Ped Pool. Significant redevelopment of the College Square Shopping Center will add 300 unit apartment complex + significant intersection improvements in the area.

Ranking: 6th out of 7. This project alleviates significant detour and creates new connections between Newark, College Square Shopping Center, and Brookside. Low-stress connections are needed on Marrows Road south to Brookside.

Recommended DeIDOT Path Forward: Coordinate with Newark and DeIDOT Development coordination to assist DBC Innovation Grant, and depending on the outcome of the feasibility study, WILMAPCO determine if this warrants inclusion in the TIP.

JAM Trail, Battery Park Extension



Households with increased access to employment centers (300+ jobs in 200 m area):

Increased LTS1 Connectivity: 48 households
Increased LTS2 Connectivity: 150 households
Increased LTS3 Connectivity: 22 households

Weighted Accessibility Improvement Score = 7620.00

Large points refer to large improvement in household accessibility, smaller dots refer to smaller improvement.

Legend

Proposed Project
Markell Trail to Battery Park Extension

Household Accessibility Improvement To Employment Centers
 LTS1 Improvement
 LTS2 Improvement
 LTS3 Improvement

Level of Traffic Stress LTS_MAX
 0
 1
 2
 3
 4

Pathways
 Pathways
 Pathways_Sidepath

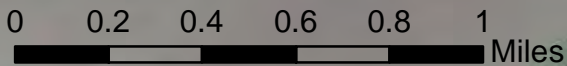
Llangollen to New Castle Pathway

Households with increased access to employment centers (300+ jobs in 200 m area):

Increased LTS1 Connectivity: 877 households
Increased LTS2 Connectivity: 5187 households
Increased LTS3 Connectivity: 6900 households

Weighted Accessibility Improvement Score = 82911.11

Large points refer to large improvement in household accessibility, small dots refer to smaller improvement.



Legend

Proposed Project

New Castle to Llangollen Pathway

Household Accessibility Improvement To Employment Centers

- LTS1 Improvement
- LTS2 Improvement
- LTS3 Improvement

Level of Traffic Stress

LTS_MAX

- 0
- 1
- 2
- 3
- 4

Pathways

- Pathways
- Pathways_Sidepath



School Lane Trail



Households with increased access to employment centers (300+ jobs in 200 m area):

Increased LTS1 Connectivity: 0 households
Increased LTS2 Connectivity: 3744 households
Increased LTS3 Connectivity: 4782 households

Weighted Accessibility Improvement Score = 396452.50

Large points refer to large improvement in household accessibility, smaller dots refer to smaller improvement.

Legend

Proposed Project
School Lane Trail

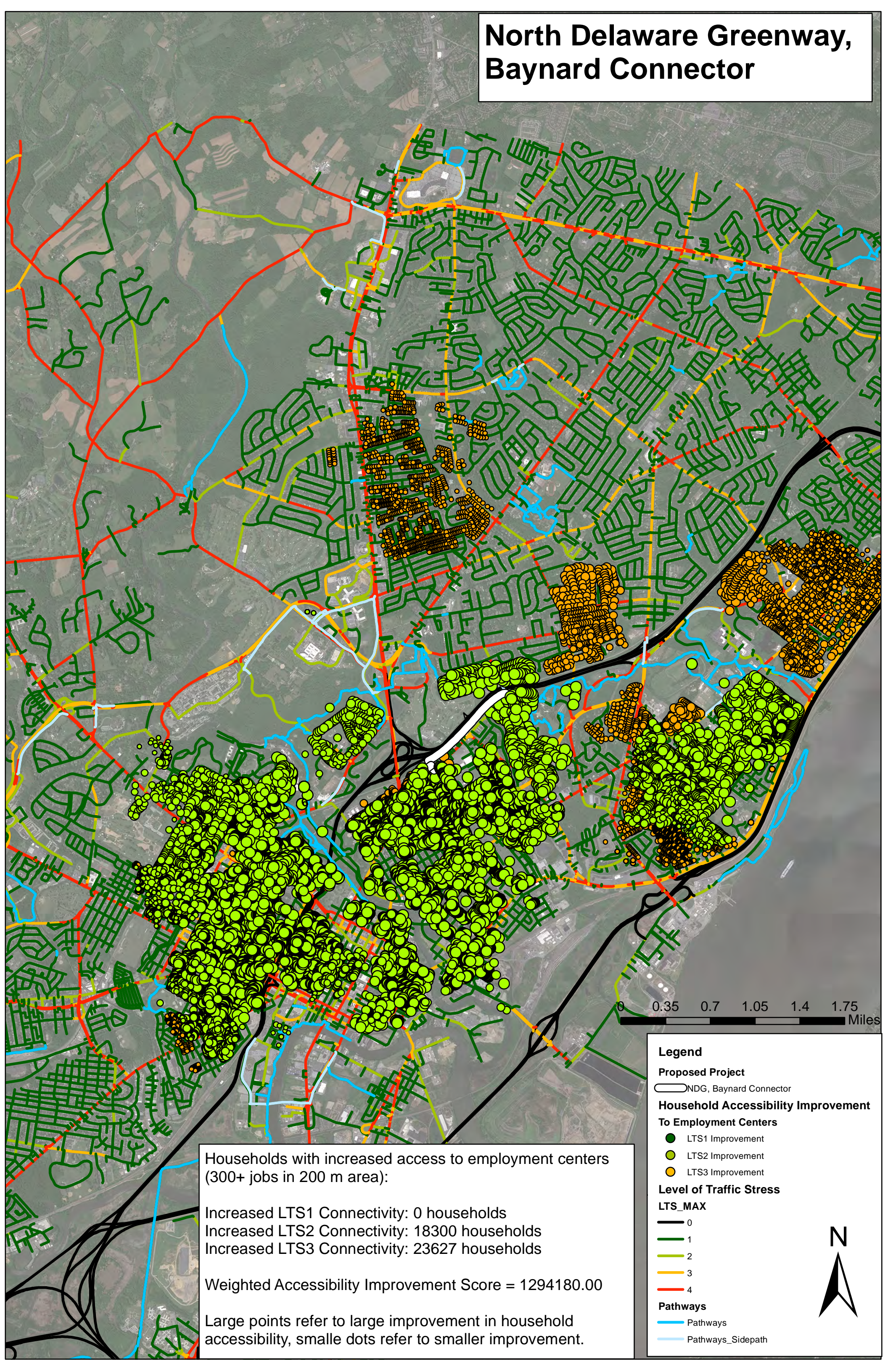
Household Accessibility Improvement To Employment Centers
LTS1 Improvement
LTS2 Improvement
LTS3 Improvement

Level of Traffic Stress LTS_MAX
0
1
2
3
4

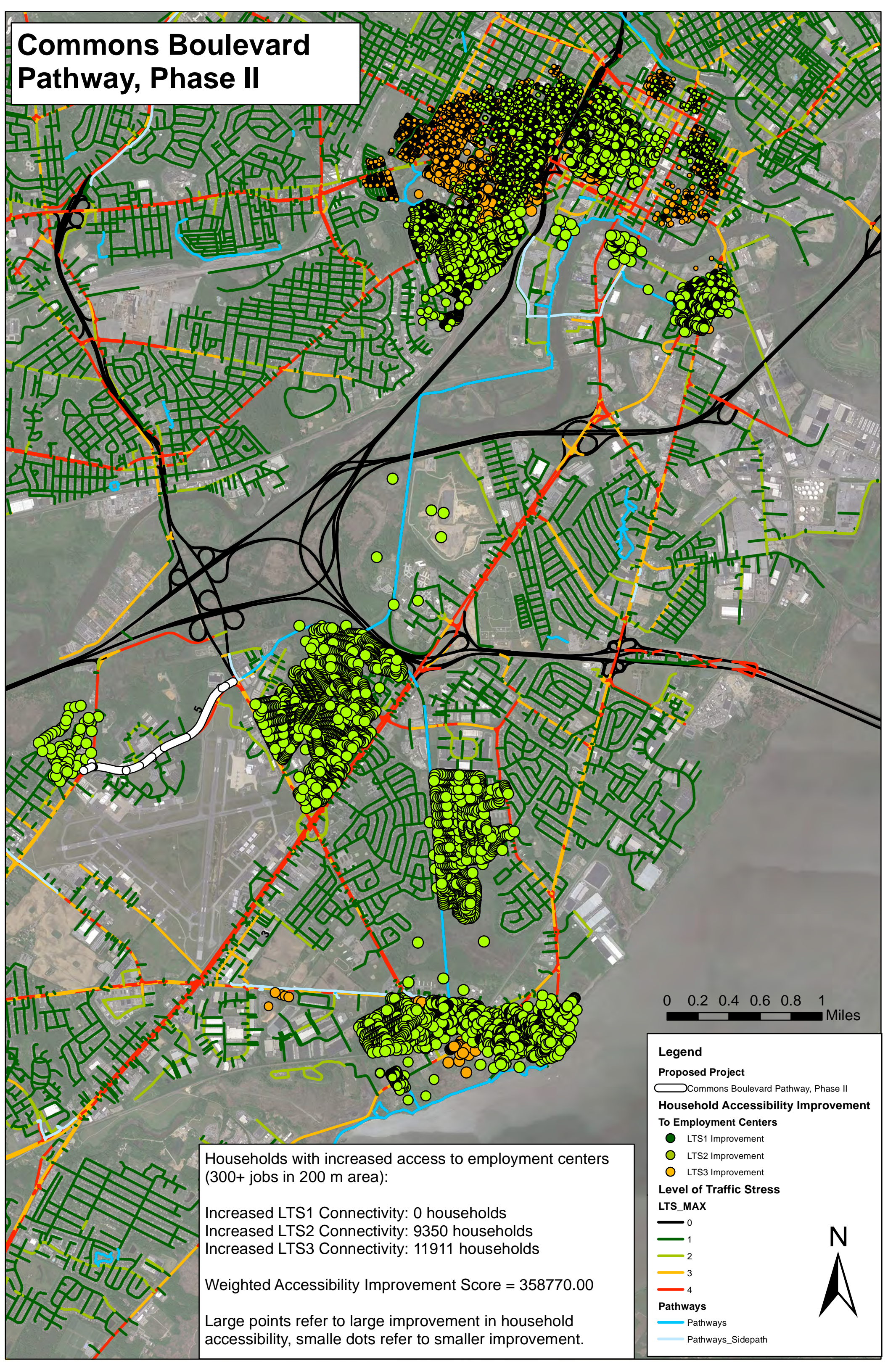
Pathways
Pathways
Pathways_Sidepath



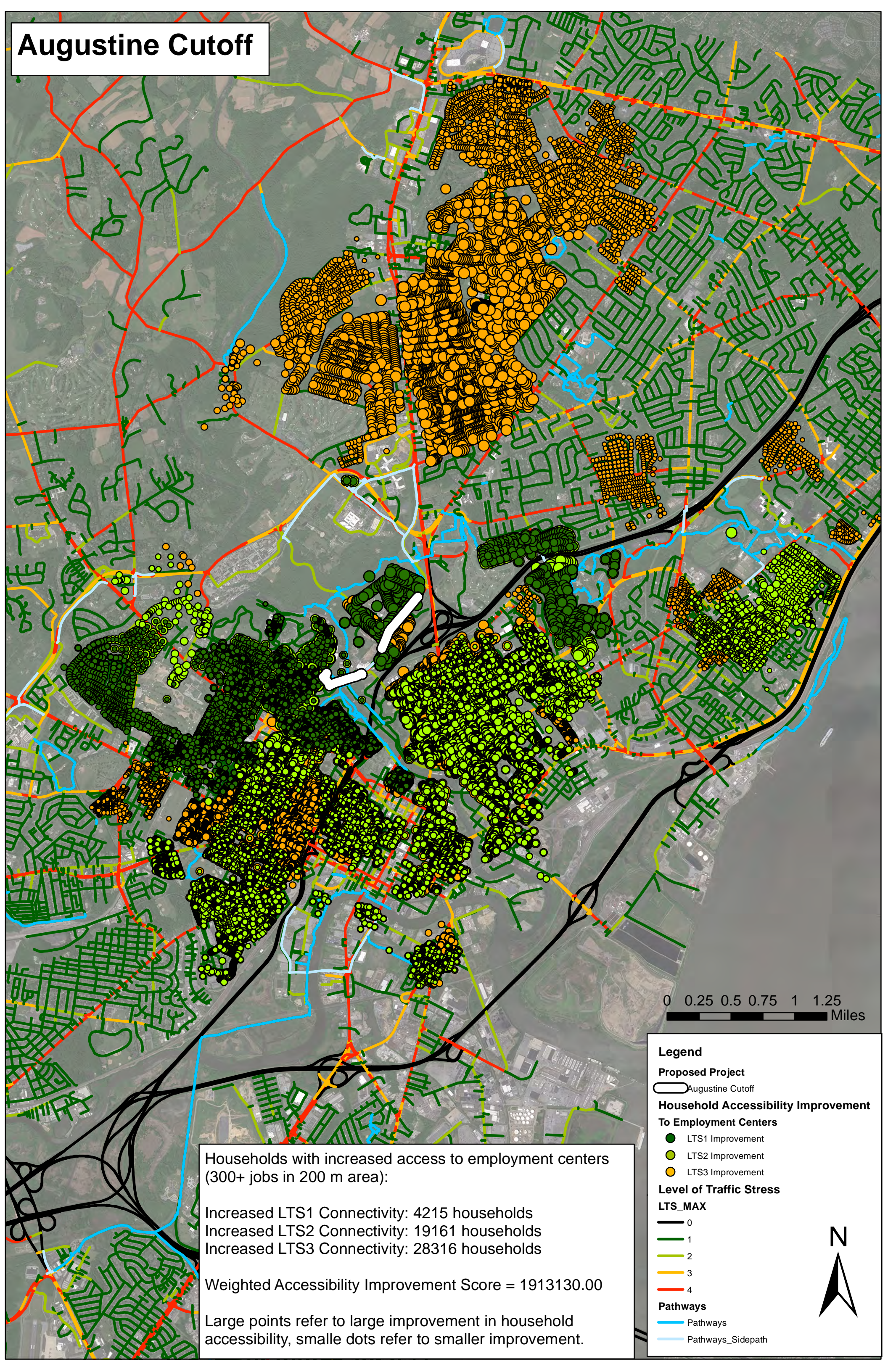
North Delaware Greenway, Baynard Connector



Commons Boulevard Pathway, Phase II



Augustine Cutoff



Households with increased access to employment centers (300+ jobs in 200 m area):

Increased LTS1 Connectivity: 4215 households
Increased LTS2 Connectivity: 19161 households
Increased LTS3 Connectivity: 28316 households

Weighted Accessibility Improvement Score = 1913130.00

Large points refer to large improvement in household accessibility, smaller dots refer to smaller improvement.

0 0.25 0.5 0.75 1 1.25 Miles

Legend

Proposed Project

Augustine Cutoff

Household Accessibility Improvement To Employment Centers

- LTS1 Improvement
- LTS2 Improvement
- LTS3 Improvement

Level of Traffic Stress

LTS_MAX

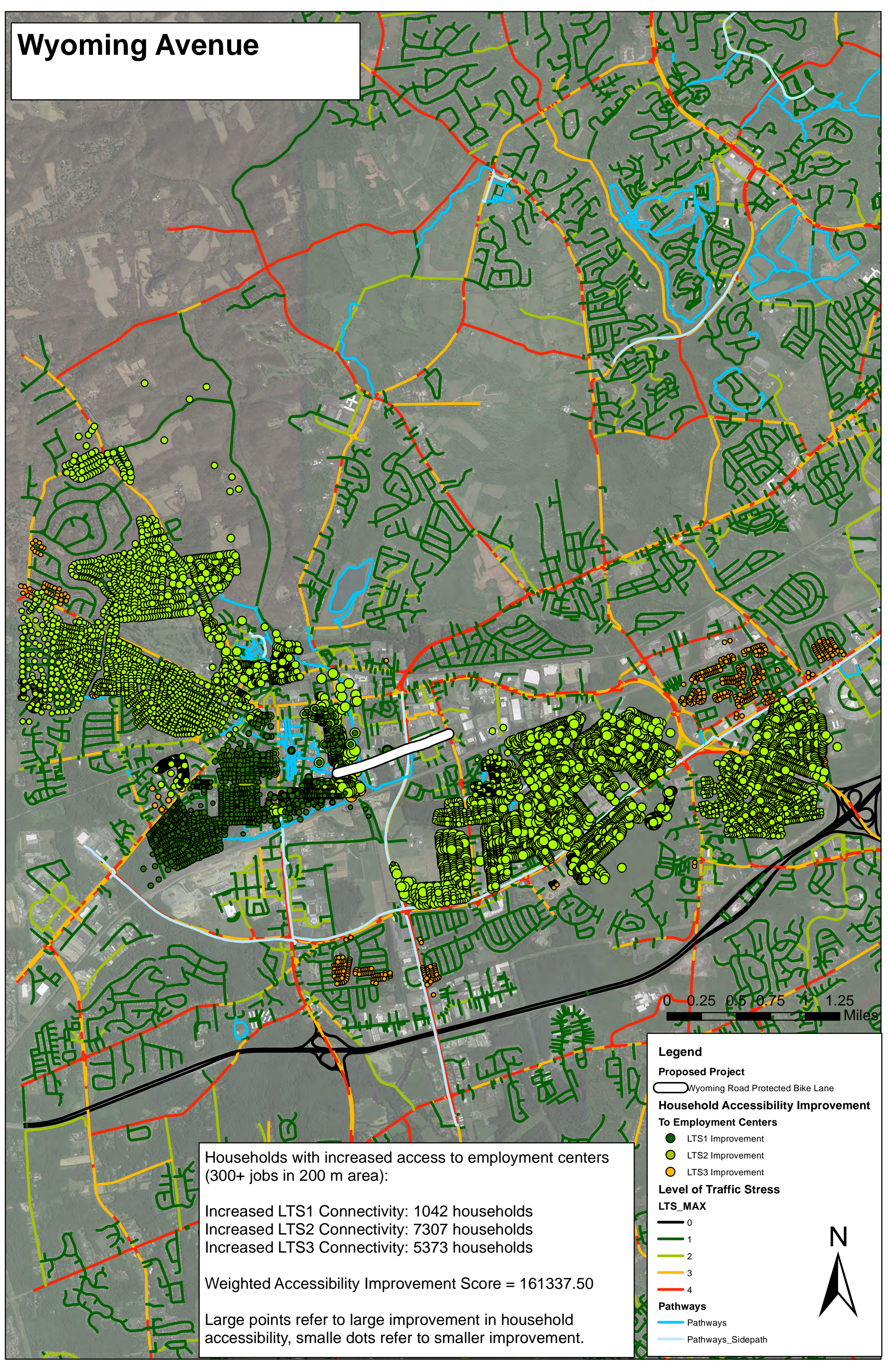
- 0
- 1
- 2
- 3
- 4

Pathways

- Pathways
- Pathways_Sidepath



Wyoming Avenue



Households with increased access to employment centers (300+ jobs in 200 m area):

Increased LTS1 Connectivity: 1042 households
Increased LTS2 Connectivity: 7307 households
Increased LTS3 Connectivity: 5373 households

Weighted Accessibility Improvement Score = 161337.50

Large points refer to large improvement in household accessibility, smaller dots refer to smaller improvement.

Legend

Proposed Project

Wyoming Road Protected Bike Lane

Household Accessibility Improvement To Employment Centers

- LTS1 Improvement
- LTS2 Improvement
- LTS3 Improvement

Level of Traffic Stress LTS_MAX

- 0
- 1
- 2
- 3
- 4

Pathways

- Pathways
- Pathways_Sidepath