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Date: March 22, 2023

To: Dave Gula, WILMAPCO

From: Mark Tudor, RK&K

RE: Update of Key Elements of the Delmarva Intercity Rail Feasibility Study, 2013

1. Introduction

The states of Delaware and Maryland are eager to investigate the potential of re-establishing passenger rail service on the Delmarva Peninsula from Wilmington or Newark Delaware to Sussex County and Maryland's Eastern Shore in Salisbury or Ocean Pines/Berlin. The passenger rail service we have called the Diamond State Line could operate along the existing freight lines owned by Norfolk Southern Corporation (NS) and the Maryland and Delaware Railroad, but also could be located along nearby, parallel high-need travel corridors that do not currently have a rail line.

In December 2013, the states of Delaware and Maryland prepared the Delmarva Intercity Rail Feasibility Study. The study focused on the feasibility of service between Newark, Delaware and Berlin, Maryland. It looked at aspects including the purpose and need of passenger rail service on the Delmarva Peninsula; alternatives, ridership, and revenue projections; an operation analysis; station profiles; and infrastructure requirements including cost estimates.

After the completion of the 2013 study no further action was taken; however, the trends and conditions have continued as projected in the original study. The restoration of passenger rail is once again being considered to address the needs anticipated by the trends and conditions. This memo provides an update to key elements of the original study and will also support efforts to seek funding such as the FRA's Corridor ID grant application to study the Diamond State Line's potential in more detail.

The Diamond State Line project alignment has not been identified for the purpose of this memo; however, two general corridor and travel sheds have been identified, based on the presence of existing railroad rights-of-way (Fig. 1). Both corridors would operate along the main spine service extending from Amtrak's Wilmington Station or Newark Station and continuing to Middletown, Dover, and Harrington DE, with the first service corridor extending towards the potential terminus at Seaford, DE with continued service to Salisbury, MD. The second service corridor would branch at Harrington and run east to Milford, and then Georgetown, DE with continued service to Berlin, MD. Station stops in between Wilmington and Salisbury are tentatively envisioned in Delaware, but those and other specific station locations will be identified after further investigation to determine which towns or activity centers warrant a station.

Figure 1: Existing Delmarva Peninsula Rail Corridors



2. Purpose and Need

The population in the Delmarva region continues to grow, particularly in Sussex County, with a 21% increase since 2010. Growth within the region is expected to continue. Once a seasonal destination, Sussex County's growth is supported by year-round residents. The increasing population has led to an increase in traffic congestion. Compounded with seasonal resort traffic, congestion is only getting worse.

The State of Delaware's 2021 *Climate Action Plan* reported that transportation is the source of 61% of the state's greenhouse gas emissions (GHG). The *Climate Action Plan* set a strategic plan for cleaner, greener transportation options to protect and preserve the environment. **Rail service would offer an alternative mode of transportation to the automobile, supporting Delaware's climate goals.** It would also connect rural and underserved communities along the Delmarva Peninsula by providing enhanced access and mobility to activity centers such as housing, educational institutions, medical facilities, and retail and commercial services.

3. Existing Conditions Update

One of the key components of this technical memorandum is updating the demographic and operational data reported in the 2013 Feasibility Study.

3.1.1. Demographics

The 2013 Feasibility Study discussed the population and economic growth of the region and projected continued growth. The following data reveals that the trends have continued as projected. The population in the study area has continued to grow steadily between 2010 and 2020. The rate of growth from 2010 and 2020 increases north to south, from 6%, to 12%, and to 21%. By contrast, the rate of growth across Delaware was 12% for this period.

Table 1: Population by County, 2010 and 2020

	Actual Population			Projections			
	2010	2020	% Change 2010-2020	2030	2040	2050	% Change 2010-2050
New Castle County	538,753	570,888	6%	590,820	594,231	586,107	9%
Kent County	162,736	181,858	12%	194,499	202,464	207,616	28%
Sussex County	197,865	239,762	21%	268,241	285,142	288,549	49%
State of Delaware	889,381	992,508	12%	1,053,560	1,081,837	1,082,272	20%

Source: Delaware Population Consortium

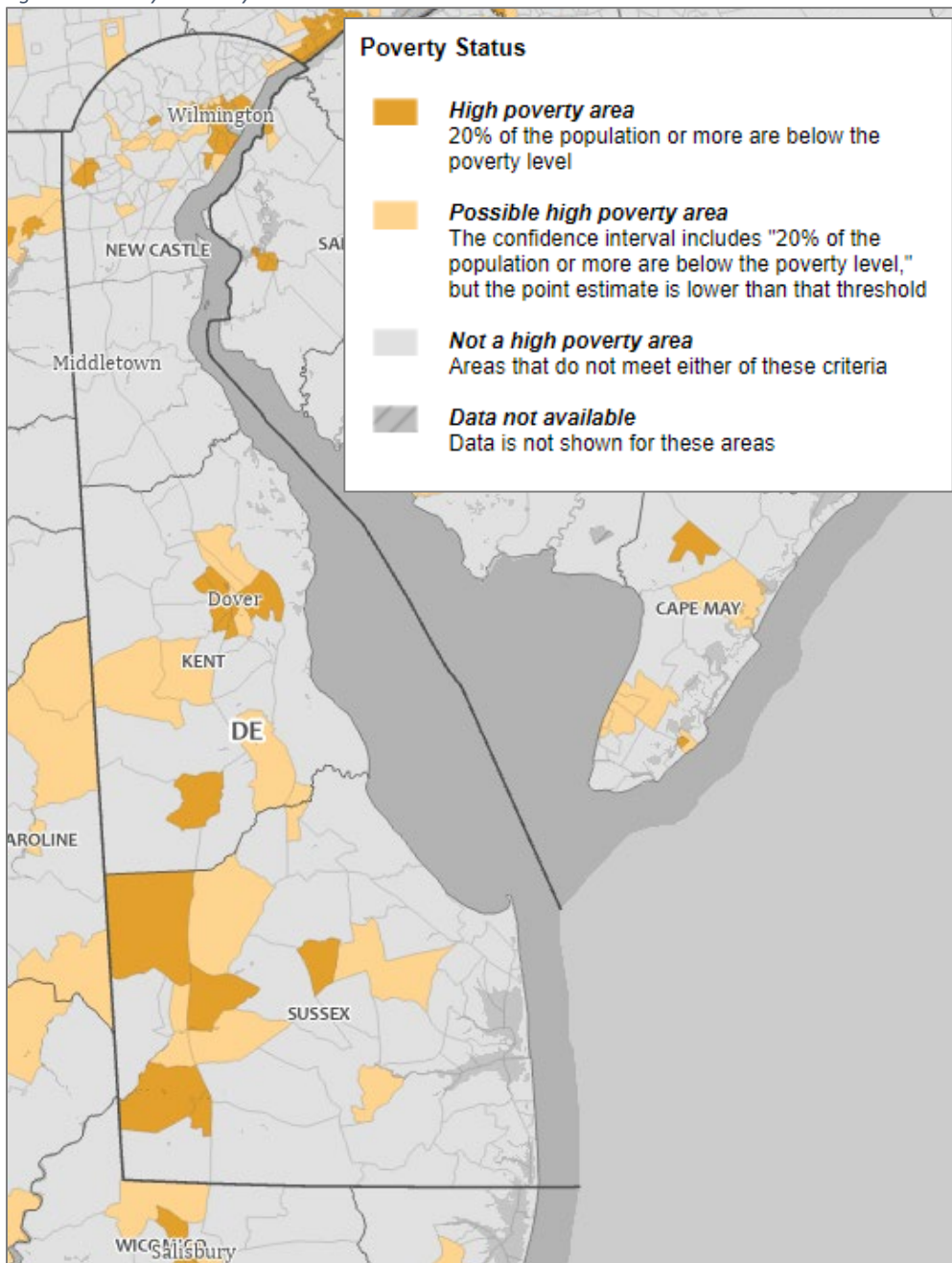
Although the counties do not have particularly high levels of poverty compared to the average U.S. rates, the individual census tracts reveal a different story, particularly in the western portion of Sussex County and near Salisbury (Table 2 and Figure 2)

Table 2: Rates of Poverty by County, 2010 and 2020

Poverty		
	2010	2020
New Castle County	11%	11%
Kent County	11%	13%
Sussex County	14%	12%
State of Delaware	12%	11%
United States	15%	13%

Source: US Census, American Community Survey

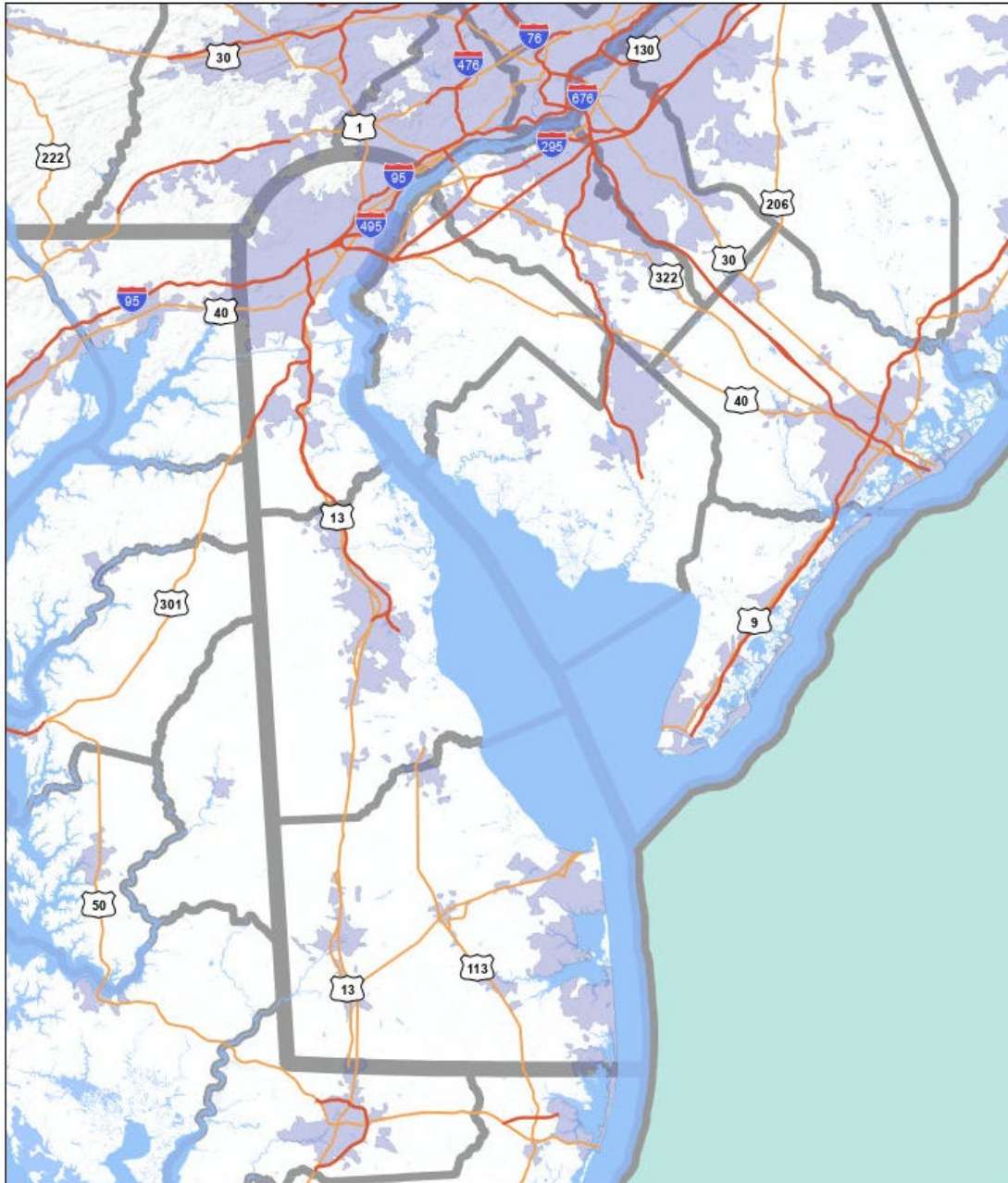
Figure 2: Poverty Status by Census Tract



Source: [Census Poverty Status Viewer \(ACS19\)](#)

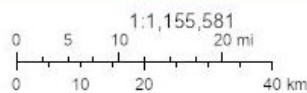
Much of the study area is a mix of small towns and rural and suburban developments where mobility requires the use of a car (Figure 3). The Census data also reveals Areas of Persistent Poverty, Historically Disadvantaged Communities, and rural populations. The western Sussex County census tracts that have rates of poverty over 20% correspond to the Areas of Persistent Poverty and the Historically Disadvantaged Communities (Figure 4).

Figure 3: Urban areas in Delaware, 2020



February 23, 2023

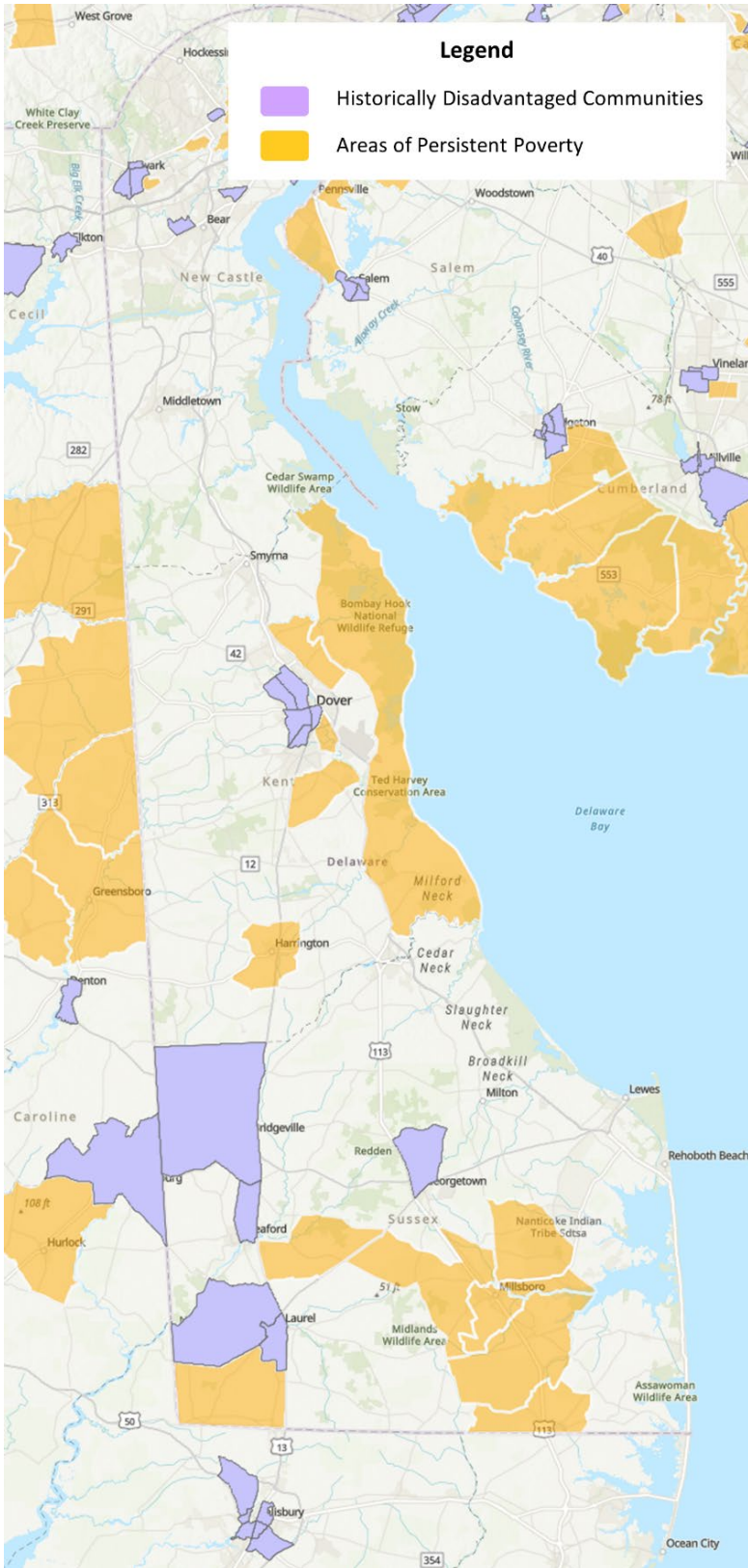
- 2020 Urban Areas
- Counties
- States



Source: U.S. Census Bureau, Sources: Esri, USGS, NOAA

Source: US Census, TIGERweb Geo census

Figure 4: Census Tracts of Areas of Persistent Poverty, and Historically Disadvantaged Communities



Source: [AoPP and HDC Census Tracts \(arcgis.com\)](https://arcgis.com)

Recent Census data paints a picture of a growing, popular region that might be ready to support and embrace strategically located passenger rail service. The number of jobs reflect activity centers – educational institutions, medical services, entertainment, retail – a myriad of destinations – many of which now are difficult to access without a car.

While New Castle County with its hustle and bustle of Delaware's largest cities has the largest number of jobs, Sussex County downstate, has experienced the fastest growth of the employment market statewide in the past decade - a 14% increase. Kent County is not far behind. As employment continues to expand downstate (see Figure 5) the concentration of the available workforce is statewide (see Figure 6) as shown on the following page.

Table 3: Number of Jobs, by County, 2010 and 2020

	2010	2020	% Change
New Castle County	261,981	276,059	+5%
Kent County	60,027	64,924	+8%
Sussex County	69,131	78,948	+14%
State of Delaware	399,078	426,661	+7%

Source: Delaware Population Consortium

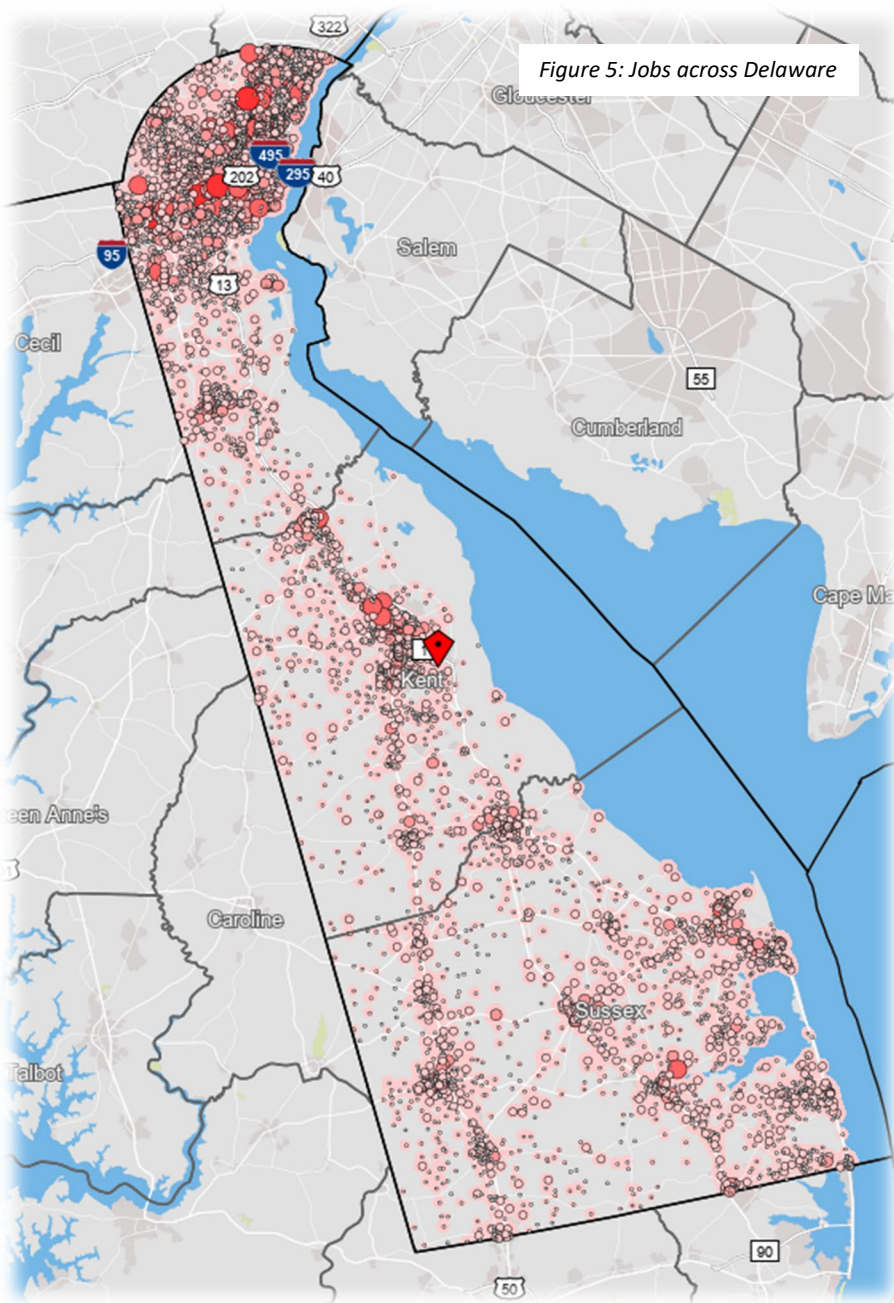


Figure 5: Jobs across Delaware

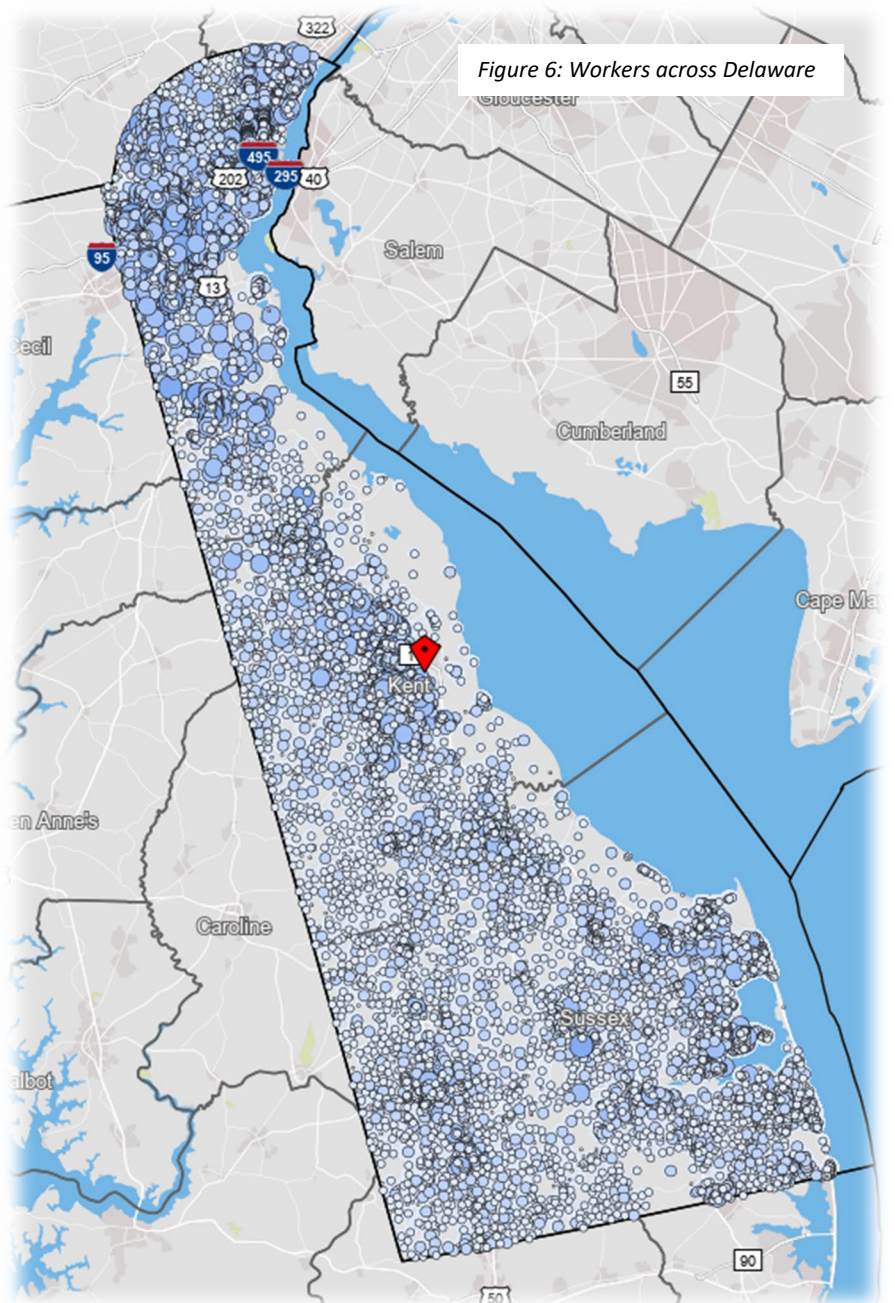


Figure 6: Workers across Delaware

Source: US Census, American Community Survey 2019

3.2. Traffic Volumes

Growing population, jobs, industry, and tourism impacts traffic volumes across Delaware. Using DeIDOT’s interactive GIS portal (The DeIDOT “Gateway”), we created a map showing the latest annual available traffic counts across the state (Figure 7). The map shows elevated traffic along all three key roadways leading to/from downstate Delaware: US 13, US 113, and SR 1. Annualized average daily traffic data shows volumes exceeding build capacity all throughout, resulting in inadequate LOS, delays, and lost opportunity costs. Beaches, dining, shopping, jobs, and housing options will continue to drive traffic growth across Delaware. This trend is expected to continue, with Vehicle Miles Traveled statewide projected to increase 22% by 2040 (DeIDOT Planning).

To evaluate traffic growth trends since 2012 in the travel shed that could be served by passenger rail, we focused on US 13, US 113, and SR 1 traffic conditions.

Key observations on the historic AADT data include:

- Traffic volumes have increased the most along SR 1 (a 16% cumulative increase vs. 2012) and US 113 (10% increase).
- Relatively high level of annual traffic growth, with average growth rates of 2.4% on SR 1 and 1.8% on US 113.
- These trends are despite a pronounced COVID-related travel demand decrease in 2020.

All presented data is annualized and shows average daily traffic, irrespective of seasonal variations. Daily volumes are subject to peaking for the summer months, as expected. According to DeIDOT, peak season traffic variation along SR 1, for instance, consistently exceed the AADT by 50%, and reach nearly triple of the lowest recorded AADT, typically in January. Today, more so than in 2013, the ever-growing waves of ocean-bound vehicles routinely transform segments of SR 1 and other key roads leading towards the beach communities into hot, sitting parking lots. As the number of jobs and people residing in the Delmarva Peninsula continues to rise, traffic pains are bound to accelerate.

Figure 5: 2021 Statewide Traffic Volumes (DeIDOT)

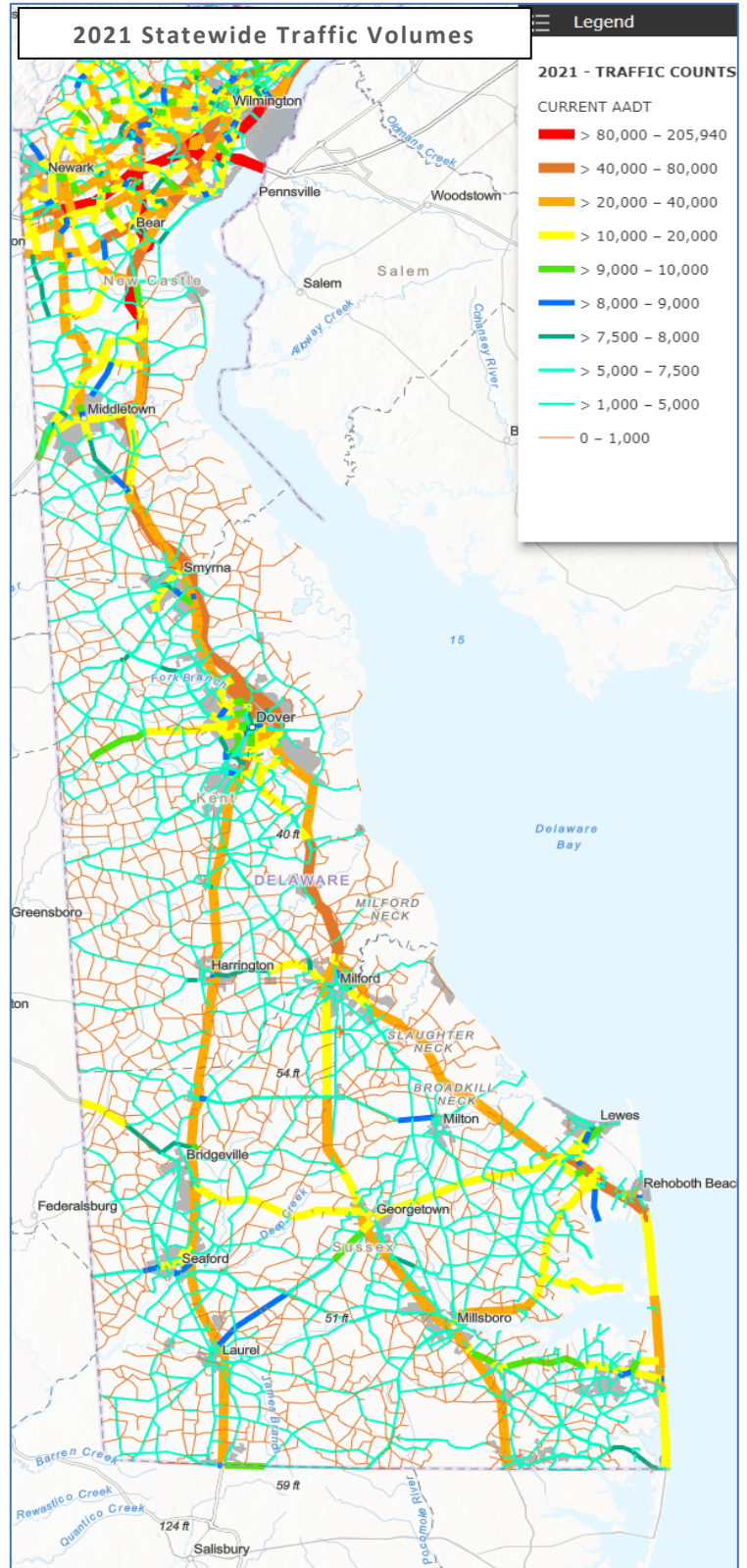


Figure 6: Cumulative Traffic Volume % Change [2012 vs, 2021]

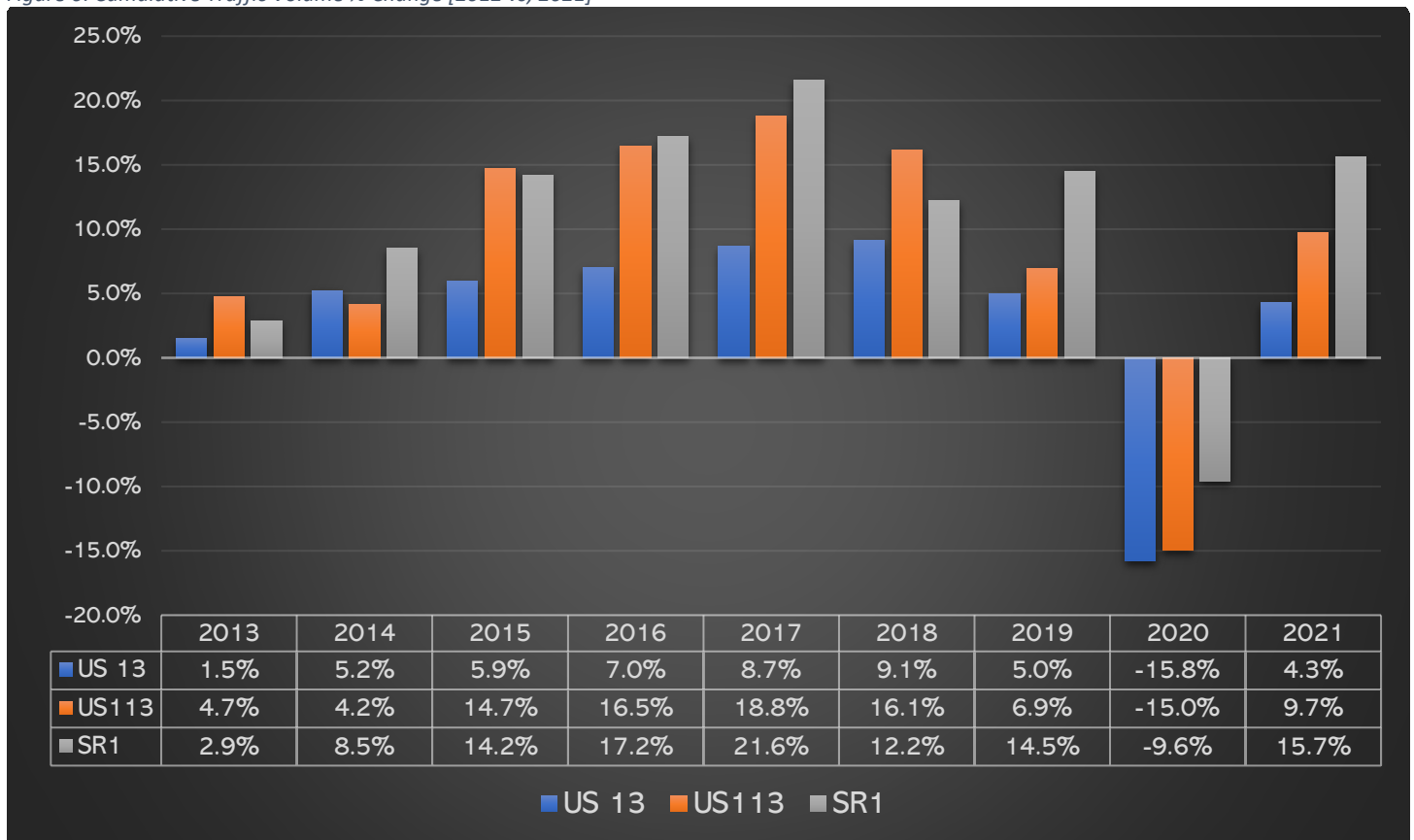
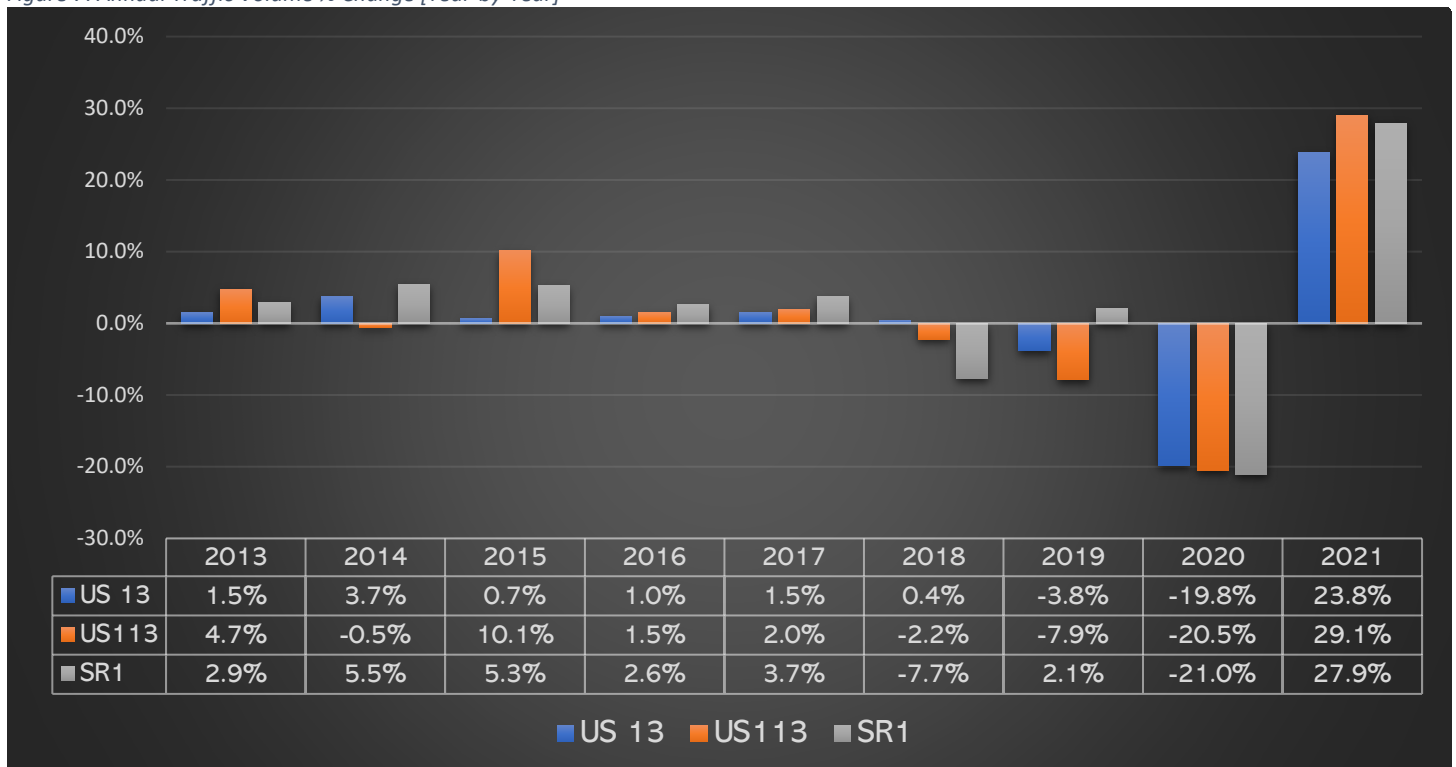


Figure 7: Annual Traffic Volume % Change [Year-by-Year]



Source for Figures: DeIDOT

3.2.1. Local Bus Transit Services

Local bus transit services in the region could provide access to future intercity rail, expanding its benefits and ridership catchment area. This is an important consideration in serving the environmental justice and historically disadvantaged communities in the Delmarva Peninsula and providing better access and improving connectivity throughout the region.

DART

Statewide public transit service is provided by Delaware Transit Corporation under the operating name of “DART”. DART provides daily fixed-route bus service operating over 60 bus routes daily in New Castle, Kent and Sussex counties connecting to employment, educational, recreational, health care and residential locations. DART’s 300 series route offers inter-county connections with service from Wilmington/Newark to Dover and routes from Dover to Georgetown and Lewes. DART’s Beach Bus operates seasonal resort service between Wilmington and Lewes at DART’s new Lewes Transit Center, providing connections to DART’s resort area services. Due to the increase in annual residents in the resort area, DART now operates year-round bus services operating in the eastern and western portions of Sussex County.

DART is currently initiating a study to review and revise its transit services to better serve the community and address areas of need in underserved communities. The study known as *DART Reimagined* is developing innovative methods such as microtransit in areas such as Seaford and Dover to provide more accessible access to transit and the communities.

Shore Transit

The Shore Transit bus company provides service in Wicomico and Worcester counties in Maryland serving Delmar, Salisbury, Ocean City, Berlin, the US Route 50 corridor, and points south to Crisfield, MD. The service operates nine routes on weekdays including Saturdays on select routes.

3.2.2. Rail Corridor Operations Today

The study corridor’s northern terminus could be in Wilmington at the Amtrak Station or Newark at the new Newark Regional Transportation Center, both located along Amtrak’s Northeast Corridor (NEC). Freight rail traffic continues to be the only rail mode operating from Newark south along the Delmarva Secondary. Freight rail traffic connects to the Delmarva Secondary from the NEC at Davis interlocking. Travel south along the Delmarva Secondary in the study area has changed since the completion of the 2013 study. While there are no new rail segments in the study area there have been changes to rail corridor operations and availability of rail corridors.

- Norfolk Southern (NS) Chrysler rail yard located adjacent to the Newark rail station was a major freight yard serving the Chrysler auto assembly plant and the MOPAR parts distribution center. Freight rail activity at the yard has significantly decreased since both facilities closed.
- Norfolk Southern had previously operated along the entire Delmarva Secondary spine through Delaware continuing into Maryland. Connections from Harrington, DE to points east towards eastern Sussex County was also operated by NS and connected with the Maryland & Delaware Line (MDDE) at Frankford, DE. As of 2016, NS only operates from the Northeast Corridor to Porter, DE approximately 8 miles south of Newark.
- From Porter, DE south rail operations are now provided by Delmarva Central Railroad (DCR) that operates along the Delmarva Secondary, to Pocomoke City, MD. DCR also operates from Harrington, DE along the Indian River Secondary with connections to MDDE at Frankford, DE, continuing south to Berlin, MD.

- The Lewes branch is no longer available for consideration as a possible passenger rail corridor. Only a small portion of the branch is in operation for freight activities. Most of the former rail corridor has been redeveloped as a Rails-to-Trails multi-use trail.

3.2.3. Stations

Station locations will be identified based on key criteria developed with the agency partners. These criteria will address the project goals:

1. Increases mobility in underserved communities by providing access to jobs, education, and healthcare.
2. Reduced congestion
3. Multi-modal connectivity
4. A cleaner and greener option that is accessible without the need for auto use
5. Supports growth at the station and surrounding community.

Areas of consideration for station locations include Wilmington, Newark, Middletown, Dover, Harrington, Seaford, Milford, and Georgetown, Delaware and Salisbury, and Berlin/Ocean Pines, Maryland.

The new Newark commuter rail station at the University of Delaware's STAR Campus is served by multiple DART and Newark Ucity transit routes, as well as Amtrak's Northeast Corridor service and SEPTA, providing more connectivity for the future Diamond State line.

Existing rail stations in Newark and Wilmington serving Amtrak and SEPTA rail services along the Northeast Corridor are enclosed passenger stations and would serve as station locations for the Diamond State Line. New stations would be constructed for the other station locations and would be basic intercity rail passenger stations with high level ADA-compliant platforms with canopies or shelters providing protection from the elements for waiting passengers. The identification of specific station locations would consider access to local transit services, bike trails and pedestrian access.

4. Infrastructure Requirements/Costs Update

High-level infrastructure costs were updated for the potential Delmarva intercity rail corridor, with a caveat that a set of assumptions about the corridor's alignment, stations, and other project needs had to be made to arrive at the estimates. These assumptions and cost estimates are preliminary and subject to change pending future analysis and additional coordination and input by rail operators. The northern endpoint of the proposed Delmarva corridor is the Davis Interlocking (MP PW 38.4) in Newark on Amtrak's Northeast Corridor New York - Washington Main Line. Davis is the connection between the Northeast Corridor and the Delmarva Secondary owned by NS. From there, the study corridor follows the Delmarva Secondary to one of three possible end points to the south: (1) West Ocean City, MD, (2) Berlin, (nearest point on existing rail lines to Ocean City), and (3) Frankford (southernmost point in Delaware).

Infrastructure improvements will principally be made on the Delmarva lines; however, other improvements may be beneficial along the NEC. The costs of other improvements along the NEC are not included in the capital program for the Delmarva passenger service, but consideration should be made to evaluate better connections for efficient rail operations between both directions on the NEC and the Delmarva Secondary. No other new infrastructure or modifications to operations on the NEC are anticipated, as the proposed service will have a minimal impact on the NEC's operating capacity.

All costs shown in the following narrative are for the Wilmington to Berlin/Ocean Pines option. In the final summary table, estimates are shown for the Wilmington to Salisbury option. It is assumed that the Salisbury corridor is similar in nature to Berlin corridor, therefore costs are estimated in a similar fashion.

The following estimates are in base year 2023 dollars without contingency. Contingency used in the total construction cost is shown in a section to follow.

Stations

Two types of stations will be constructed. A terminal station would feature an enclosed waiting room with ticketing capability and at least 50 parking spaces. The second type of station would serve the intermediate locations. These stations would have high-level platforms with canopies and a basic shelter. Each would also have parking capacity of 50 vehicles. A terminal station is estimated to cost \$7.2 million, while the intermediate stations are estimated to cost \$2.6 million. The total cost of stations would be \$14.8 million.

The estimates of needed parking capacity were based on the 2013 Feasibility Study and may be low and should be reassessed in any future study.

Station Tracks

ADA compliant high-level passenger station platforms along the line will need sufficient clearance not to hinder freight operations. In addition, the Delmarva Secondary do not have any passing tracks that permit two trains to meet or overtake one another. Opportunities exist to effectively time-separate the trains to avoid train conflicts, siding tracks will be required to accommodate future growth in either passenger or freight services, or both. To permit the operations of freight trains through the stations with ADA compliant platforms and to provide for train meets, a separate platform track will be built at each station. These tracks will also serve as passing sidings required for the shared passenger-freight train operations. Four passing tracks would need to be constructed at \$4.9 million for a total cost of \$19.6 million.

Train Control-Signal system

FRA has issued proposed regulations in response to the US Rail Safety Improvement Act of 2008 that require Positive Train Control (PTC) by 2015 on virtually all rail lines over which scheduled passenger trains operate. Because the Delmarva lines are to be used for regularly scheduled passenger trains, implementation of PTC is mandated. The cost of any PTC installation required for passenger operations would need to be borne by the sponsor of the passenger operation, as the line does not require PTC for the current freight operations.

Currently, the route has no signal system. This limits train speed and would adversely affect passenger train safety. The position of NS is that signaling is not necessary for freight operations on this line, but a signal system is important to ensure safe operation overall for passenger operations and prevent interference with freight train operations. To implement the Delmarva service, train control would be provided by an Automatic Block System (ABS) energized by track voltage that can thus detect broken rails and similar aberrations. NS policy generally calls for at least an ABS system for territory with regularly scheduled passenger trains.

The investment in combined PTC, ABS and signals is \$770,000 per mile. The total cost of the train control system would be \$82.8 million with Berlin as the Delmarva terminus.

Road Crossings

Currently 171 public and private road crossings are located along the corridor with one private and 22 public crossings having gates; gates are required for passenger operation. Timing circuits on signalized road crossings would also need to be upgraded and retimed for passenger train operation. The 124 public roads would be equipped with four quadrant gates at a cost of \$32.7 million and dual gates with flashing signals would be installed at the 47 private crossings at a cost of \$10.6 million. The crossings would be outfitted with constant warning time technology.

Additionally, each road crossing will be reconstructed to include bolt down concrete panels for easy access to tracks for maintenance. The total cost to replace these crossings is estimated at \$6.4million.

Rail, Ties, and Ballast

Rail, tie, and ballast condition on both the Delmarva Secondary and Indian River Secondary will need to be improved to accommodate passenger trains operating at higher speeds, FRA Class 4. Currently, the Delmarva Secondary from Davis to Harrington is FRA Class 3. Most While the rail on the entire route is welded, some have been in place almost 30 years, and all rail was re-laid from other, higher-tonnage locations. Norfolk Southern maintains the line to transport current traffic levels, and often timetable speeds are not reflective of existing conditions with trains operating well below the posted speed limit. Currently, nine specific slow orders are in place on the Delmarva Secondary north of Harrington, affecting approximately 15 miles of the line. Included in those slow orders are twelve miles of 25 MPH restriction and one mile of 10 MPH restriction. On the Indian River Secondary, there are three 10 MPH restrictions. The line between Frankford and Berlin operated by the MDDE will also require upgrading to accommodate passenger trains. Additional maintenance or capital costs to upgrade or maintain track conditions beyond that required to operate freight trains would be the obligation of the passenger train's sponsor.

All existing rail and ties are assumed to be rehabbed or replaced in order to alleviate the need for immediate maintenance along the corridor upon passenger service implementation. Ballast is assumed to be in adequate condition and will only be replaced from the bottom of the tie up. All existing ballast to be removed will be lost on site as the probability of hazardous material being present is high.

Improvements on the 107-mile Norfolk Southern segment between Newark and Berlin, to rehab the track, are estimated to cost \$1.9 million per mile, for a total of \$204.3 million.

Existing turnouts are located along the corridor to connect to industry tracks. While those turnouts are presumed to remain in place, the probability is high that some turnouts will need to be replaced due to degradation or damage during construction. It is assumed that 1 in 10 existing turnouts will be replaced and upgraded to a No. 15 turnout.

Additionally, 12 new turnouts will be needed from the mainline to the passing sidings. The cost per turnout (16 total) is estimated at \$280,000, for a total of \$4.5 million.

Finally, a cost for reconstruction of bridge/culvert decks is added to this section. Upon field investigations of similar corridor within the region, many decks were found to be in poor condition and needed to be replaced. It is assumed that some of the bridges may need to be rehabbed, therefore, a 5% allocation of the total cost of track rehab is added as an allowance. The total cost is estimated at \$9.1 million.

Bridges

Bridges along the Delmarva Secondary would need to be improved to accommodate passenger rail service. DCR is currently updating the control system of the Chesapeake and Delaware Canal lift bridge and expects additional needs over the next 7-12 years to replace the bridge lift cables.

The Seaford swing bridge is also undergoing control system upgrades by DCR but operates at a “walking speed” for rail travel which would require the bridge to be replaced to meet passenger rail standards. Additional, bridge assessments would need to be performed before an estimated bridge infrastructure improvement cost could be identified. Accordingly, bridge repair costs are included in the 40% cost contingency.

Design and Contract Management

Design and contract management is allocated as a percentage of the overall construction cost (minus exclusions listed in the section to follow). This percentage is recommended by Transit Cooperative Research Program (TCRP) Report 138: Estimating Soft Costs for Major Public Transportation Fixed Guideway Projects. The data published was established by analyses based on detailed cost and project data from rail transit capital projects (29 light rail and 30 heavy rail). The report provides a range for Standard Cost Category (SCC) 80.01-80.08. The following table is a summary of percentages from the report and the percentage of each category applied to the cost estimate:

Table 4: TCRP Report 138 Recommendations

SCC Category	Low	High	Applied
Project Development	2%	6%	4%
Engineering	8%	11%	9%
Project Management for Design and Construction	7%	10%	9%
Construction Administration & Management	5%	8%	7%
Professional Liability and Other Non-Construction Insurance	0%	2%	1%
Legal; Permits; Review Fees by Other Agencies, Cities, Etc.	1%	3%	2%
Surveys, Testing, Investigation, Inspection	1%	3%	2%
Start Up	0%	6%	3%
TOTAL	24%	49%	37%

The applied percentages were chosen based on professional judgement and experience producing cost estimates for federally funded projects.

Contingency

An overall contingency of 40% is added to the total base cost of the project. Per FRA Capital Cost Estimating Guidance for Project Sponsors (August 30, 2016), allocated contingency for completion of planning/concept design (15%) should range from 25%-35%. Unallocated contingency for the same design phase should range from 10%-20% (total contingency of 35%-55%). Due to the unknown risks of an existing freight corridor and several towns in which it passes through, 40% is a reasonable contingency at this point of the design.

Cost Summary

Below is a cost summary table for capital improvements. The following are excluded from the cost of the project:

- Maintenance of traffic – both vehicular and rail
- Right-of-Way
- Restroom facilities at intermediate stations
- Safety upgrades through towns: i.e., safety fence near tracks - if needed.

Table 5: Cost Summary

Category	Wilmington to Berlin Base Cost (\$'s x1,000)
Stations, Platforms and Parking	\$14.8
Passing Sidings and Track Improvements	\$237.5
Train Control and Signals	\$82.8
Grade Crossing Protection and Improvements	\$49.8
Maintenance Facility	\$20.8
Design/Contract Management (37%)	\$150.1
Contingency (40%)	\$162.2
TOTAL CAPITAL INVESTMENT	\$717.9

Added to this capital cost estimate of \$717.9 million would be the \$37.4 million per train set (increasing from \$27.8 million in 2013). Assuming the existing Wilmington to Salisbury corridor is similar in nature to Wilmington to Berlin, the cost is estimated at \$6.7 million/track mile, including design, management, and contingency. This corridor is approximately 97 miles in length with a total capital investment of \$648 million. The same exclusions above shown for Wilmington to Berlin apply to this Wilmington to Salisbury scenario.