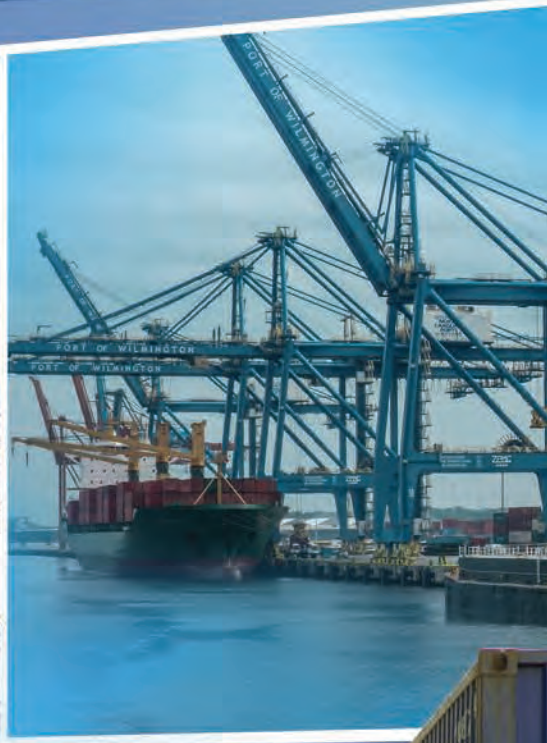
CITY OF WILMINGTON
NORTH CAROLINA

Wilmington Rail Realignment and Right of Way Use Alternatives Feasibility Study

June 2017



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Feasibility Report

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Introduction

The City of Wilmington (the "City"), the Wilmington Urban Area Metropolitan Planning Organization (WMPO), and the NC Department of Transportation (NCDOT) directed that a study be performed to investigate the feasibility of realigning the existing CSXT railroad line that traverses in a "V" shape through the City. Moving this line will provide a new location for rail access to the Port, and offer the potential of repurposing the existing CSXT railroad corridor for transit use. Note that this is a high level planning document and does not reflect or state otherwise the policies or positions of NCDOT regarding use of a specific approach or modal alternative.

This study approaches these initiatives as two separate but linked projects:

1) The development of a new freight rail corridor and realignment of the freight traffic to this corridor to provide a more direct route to Navassa

2) The reconfiguration of the existing tracks to provide a path for a heritage trolley or similar light transit within the City.

This feasibility report covers many aspects of the project across a wide spectrum of detailed areas of investigation. Project success will depend on successful negotiations of rights, agreements and control. Therefore, at a very high level, the four primary prominent aspects for project success are:

1) Developing agreements between the key players such as City, the State of North Carolina (NCDOT/NCSPA)/North Carolina Department of Commerce), CSXT, regulatory agencies and the Surface Transportation Board (STB).
2) Obtaining STB concurrence that CSXT will retain control and ownership of the realigned freight rail corridor.
3) Retaining a single rail access controlled by CSXT to the Port.
4) Allowing CSXT to retain control of the northern leg of existing Beltline corridor and negotiating an agreement for transit service to operate within the CSXT corridor along the south side.

Other significant aspects for consideration include:

- Derive and present data and cost-benefit analyses to drive state and federal funding, compete for grant funding and assure return on public and private investment.
- Infrastructure investors will be interested in transit redevelopment potential along the repurposed or dual use rail corridor.
- The return-on-investment for the freight rail realignment indicates that private investment may take a wait-and-see position for this initial phase. The City will need to establish zoning and other

regulations, which are favorable for the development of the trolley system to show the City's resolve to move forward.

- Environmental benefits of transit use on the rail line are a minor factor due to the replacement of longer delays a few times per day for freight trains with shorter delays multiple times per day for a trolley system. Shorter delays is a positive result offsetting the impacts of a new corridor.
- Interim alternatives will have a level of impact, and despite efforts to mitigate, they are not desired as an optimal solution long term.
- Phases of the project planning process can be undertaken sequentially in manageable components to minimize risks in project investment and development thus reducing the risk to the City.
- The CCX Intermodal hub is currently in development near Rocky Mount NC on the CSXT A-Line. The proximity to Wilmington will likely increase intermodal freight moves from the Port once completed. How CSXT chooses to modify their network once CCX is in operation has not yet been determined. It is anticipated that CSXT intermodal traffic from the Port of Wilmington will be sent to both Charlotte and CCX for classification.

There are other benefits to the project including an improved quality of life, reduced risks which are accounted for in the benefit cost analyses using generalized data. The list of benefits may grow once the final design is developed and the benefits can be measured quantitatively.

The following is a list of potential benefits associated with the development of the freight and transit projects:

Freight

- Improved freight rail access to business properties on the west side of the Cape Fear River.
- Shorter freight rail transit time between CSXT's Davis Yard and NCSPA's Port of Wilmington, as well as customers near the NCSPA such as Colonial Oil and Vopak.
- No increased congestion in the City due to rising volumes of trains serving the NCSPA per day.
- Slightly lower freight rail fuel usage and emissions due to shorter length of track.
- Greatly reduced number of crossing conflicts with freight trains on the Beltline in Wilmington.
- Reducing the impacts of cars idling for significant periods due to long freight trains could also help improve runoff water quality, air quality and fuel savings.
- Lower highway maintenance, fuel usage and emissions as more containers are converted to freight rail, lessening the number of container trucks on the highways.
- CSXT will have a shorter, newer track requiring less short-term maintenance than current track and less crossings to maintain.
- Reductions in risks from derailments to the City proper.
- Curtail noise due to freight trains being realigned across the Cape Fear River to a less populous area.
- Potential benefits to the NCSPA from more direct rail routes. This may translate to less residential opposition to Port growth that then furthers industrial recruitment.
- Reduced diversion and or blockage of emergency vehicles.

Transit

- Expands the City's streetcar history.
- Likely increase in redevelopment and land values in proximity to transit stops.
- Possible increase in City's population density around transit stops.
- Offer other mobility options for citizen in the study area.
- Reduces demand for surface parking lots and parking decks, particularly in downtown Wilmington and near UNCW.
- Promotes walking and biking as other mobility options in the City.
- Decreased automobile dependency.
- Repurposed use of existing/vacant/underutilized infrastructure along trolley corridor
- Reduction of vehicle ownership due to transit options.
- Ability to deliver students and university employees to UNCW from within the City limits.
- Leverage existing surface parking near the trolley corridor during major events to bring large volumes of people downtown to the Northern Riverfront Park, Pier 33, Thalian Hall, Cape Fear Community College, or specific events such as the Azalea Festival, Riverfest, Independence Day Fireworks, etc.

Technical Reports

The summaries below reflect the information presented in the 14 technical reports:

Technical Report A - Socioeconomic Conditions

The demographic and socio-economic characteristics of New Hanover and Brunswick Counties, the City and the study area are indicated in Table 1 through Table 5, inclusive. Realignment of the freight rail corridor and reuse of the existing railroad corridor along the Beltline are considered together as the "actions being considered" for the purpose of this study.

The Wilmington region is experiencing brisk growth, rebounding strongly since the 2008-2009 recession. The total population in New Hanover, Brunswick, and Pender Counties in July 2015 was 401,700, and by 2036, another 150,000 people are anticipated to make the region their home.

Table 1: POPULATION CHANGE

Geographic Location	Population 2000	Population 2010	Population Increase	Percentage Increase	Annualized Growth Rate
Study Area	40,461	43,223	2,762	6.8%	0.7%
Brunswick County	73,143	107,431	34,288	46.9%	3.9%
New Hanover County	160,307	202,667	42,360	26.4%	2.4%
North Carolina	8,049,313	9,535,483	1,486,170	18.5%	1.7%

Source: U.S. Census Bureau, Census 2010, and Census 2000, Summary File 1 100% Data, Table P1 and P001 "Total Population."

Places of regional importance include downtown Wilmington, the Port, the Wilmington International Airport (ILM), the University of North Carolina at Wilmington (UNCW), Cape Fear Community College (CFCC), New Hanover Regional Medical Center (NHRMC), and the NHRMC Orthopedic Hospital.

Table 2: POPULATION BY RACE

Geographic Area	White	Black or African American	American Indian and Alaska Native	Asian	Other Race
Study Area	59%	37%	1%	0%	1%
Brunswick County	84%	11%	0%	1%	2%
New Hanover County	81%	15%	0%	1%	1%

Source: U.S. Census Bureau, American Community Survey 5-year Estimates (2009-2013), Table B02001, "Race." Data averaged over a five-year period from 2009 to 2013.

Currently, residents across the region rely mostly on automobiles for travel, and meeting the residents' needs to connect to their jobs will become more challenging as traffic congestion worsens with population growth. Wilmington adopted a comprehensive plan to help the City meet future challenges, with a defining focus on urban growth (The *Create Wilmington Comprehensive Plan*, adopted in 2016).

Table 3: POPULATION BY POVERTY STATUS

Geographic Area	Percentage of Population Below the Federal Poverty Level
Study Area	30.6%
New Hanover County	16.9%
Brunswick County	16.6%

Source: Five-year estimates, U.S. Census American Community Survey. Data averaged over five-year period from 2008 to 2013.

Land Use

The City's downtown core is one of the most important areas in the region. It is a vibrant mix of new and old residential developments and neighborhoods, entertainment, retail and restaurants, hotels, office and service oriented business centers. Portions of the study area along the CSXT Beltline may be appropriate for redevelopment; that is, transit-oriented redevelopment.

Table 4: POPULATION DENSITY

Southeastern Cities in the U.S.	Population Per Square Mile
Wilmington, North Carolina	2,070
Charlotte, North Carolina	2,460
Virginia Beach, Virginia	1,760
Savannah, Georgia	1,320

Source: QuickFacts data are derived from: Population Estimates, American Community Survey, Census of Population and Housing, Current Population Survey.

Mobility

A robust multimodal transportation network supports Wilmington, including river traffic, airline travel, freight rail lines, major streets and highways, local streets, public transit, bikeways, trails and greenways and sidewalks. The interstate system supporting Wilmington is I-40 and the soon to be completed I-140 bypass. Other major routes supporting Wilmington are US Highways 17, 74, 76 and 421. The Cape Fear Public Transportation Authority or Wave Transit provides public transportation in Wilmington (bus,

shuttle and trolley). Average travel times to work in the study area are around 18 minutes, versus an average of 23 minutes for the state North Carolina and 26 minutes for the entire U.S.

Table 5: TRANSPORTATION MODES, COMMUTE, CITY OF WILMINGTON

Modes of Transportation	Percentage
Car, truck, or van	86.2%
Public transportation	1.3%
Walked	3.2%
Worked at home	6.2%
Other modes	2.9%

Source: Five-year estimates from surveys in 2010 to 2015, U.S. Census American Community Survey. Does not total 100 percent due to rounding.

Economic Trends

There has been an increase in the labor force in both Brunswick and Hanover Counties over the past decade. As of May of 2016, Wilmington reported 59,966 individuals in the labor force. Brunswick County experienced a higher percentage of growth in the labor force between 2001 and 2013; however, New Hanover County realized a greater increase in workers. The City represents a prominent employment node in the Southeast Prosperity Zone (SPZ), which consists of a twelve county area, and within the project study area. In 2011, more than 22 percent of workers that reside in the SPZ work in New Hanover County and Wilmington. According to the U.S. Bureau of Labor Statistics, over the span of five years the City's unemployment rate has been consistently below the national unemployment rate. In 2016, the City's unemployment rate was 4.4 percent. .

Tourism

In 2013, tourism spending in the SPZ was just shy of $2 billion and employed some 19,000 people. In New Hanover County, the economic benefit of tourism was estimated at $507.9 million in 2014. This represented a 6.3 percent increase over 2013 thus ranking New Hanover County as eighth largest among North Carolina's 100 counties in tourism expenditures. It is estimated that travel and tourism provide more than 5,680 jobs in New Hanover County and supports a payroll of $113 million.

Technical Report B - Existing Physical Conditions

The City was for many years a "railroad town." The remnant of this is a legacy of railroad tracks (and former railroad rights-of-way) that provide challenges to motorists in the communities that grew up around these tracks. The "Beltline" is the only remaining active track through the City. The "Beltline" forms a "V" from the Hilton Bridge on the Cape Fear River, to Kerr Avenue to the east, and back west to the Port. The Port, is the main producer of rail traffic in the area; though, there are other customers who use and require rail service.

Numerous railroads merged over many years resulting in the current CSXT corridor and track through and around Wilmington. The Wilmington Terminal Railway (WTRY) short-line exchanges traffic with CSXT on port.

The existing corridor runs from Davis Yard in Navassa (Brunswick County), across two movable bridges, through Wilmington to the Port (10.7 railroad miles total). CSXT trains cross the study area's 30 public and 6 private crossings two times per day (in/out). In addition, CSXT also provides manifest trains 5 to 7 days per week depending upon customer needs. A new intermodal train, the Queen City Express operating on Saturdays (inbound) and Mondays (outbound) also just started. CSXT serves NCSPA and five other customers on this line.

The Beltline crosses major roadways including US 74/Martin Luther King Jr. Parkway (grade separated), 23rd Street, Princess Place Drive, Market Street, Covil Avenue/ Independence Boulevard Extension, Wrightsville Avenue, Oleander Drive, South 16th Street, South 17th Street, South 3rd Street, and South Front Street. The track is composed of various weights from 85 to 132 pounds. Right-of-way widths of 125-feet to 130-feet dominate the corridor, though it is as narrow as 40-feet for a short segment. Track speed is 10 mph due to the movable bridges, curvature at the "V", and general track conditions.

This study investigates moving these tracks across the Cape Fear River into Brunswick County, thereby eliminating interactions and inconvenience in the City proper. The study area for the rail realignment lies mainly in an area of land between the Cape Fear and Northeast Cape Fear Rivers and Eagles Island. The area between these rivers consists of partially developed riverfront and partially pristine tracts of wetlands, some of which have conservation easements. Eagles Island is part dredge spoil and part pristine tracts of wetlands. The Cape Fear Memorial Bridge (and associated US17/74/76/421 interchange) and the Battleship NORTH CAROLINA Memorial are notable features with which the proposed rail corridor will interact. Crossings of the navigable Cape Fear River and its branches are anticipated.

The Port is served by a 42-foot deep navigational channel, and is 26 miles from the mouth of the Cape Fear River. The Port has warehousing facilities, state-of-the-art container cranes and the latest in cargo management technology. It is aggressively working to expand its throughput, and recently completed an expansion of the turning basin to accommodate larger ships.

The Cape Fear Public Transportation Authority, operating as Wave Transit, serves the City and the surrounding areas. Services provided include bus, trolley, rideshare, shuttles, paratransit, and bikes-on-bus. There are two major bus transfer centers operated by Wave Transit. The Downtown Station is located on 2nd Street between Market Street and Princess Street, and the Forden Station (2011) is located on Cando Street near the intersection of Market Street and North College Road. There is also a planned Wilmington Multi-Modal Transportation Center (WMMTC) on Campbell Street, comprising a bus station and a railroad station.

Technical Report C - Public Outreach

Two public open house and forum meetings were held by the City of Wilmington. The first meeting was held Monday, February 20, 2017 at Leland Town Hall (22 attendees). The second meeting was held Wednesday, March 22, 2017 at Wilmington City Hall (26 attendees).

Three comments were received, and the items noted were: 1) potential commuter rail connection, 2) river crossing and the structure impacts to navigation on the Cape Fear River and, 3) potential impacts to an existing business.

Technical Report D - Project Funding Conditions

The discussion on funding is separated into two major sections to align with the two projects developed by the City—freight rail realignment and transit service. Within each section, funding sources are examined with pertinent information and restrictions being discussed. Much of this information was obtained directly from the various administering organizations rather than the federal and state transportation organizations.

The best potential sources of project funding are listed in Table 1 (Freight) and Table 2 (Transit). Each table defines potential limitations, the fund's applicability to the project and presents the likelihood (high, medium, low) of funds being available. Potential limitations include how certain features of the project can be used, funding, competitive applications and time restrictions.

Based on the above review, and in support of the City's previous determinations, splitting the freight rail line realignment and the transit service projects into separate, but overlapping, delivery plans is recommended given the timing and development of each project and the different yet available funding streams. This recommendation allows separate funding strategies and resources to be dedicated to each project with individual timeframes.

The freight operations would need to be realigned before any transit operation would be practical. The freight rail realignment is predominately a rail project in an open area on a new alignment with potentially significant bridges, environmental issues and structures. The transit reuse project will involve building stations, rail interface and will provide social and economic opportunities to the communities it will serve. Those opportunities will need to be compared to the impact of urban construction constraints.

The funding sources, project justifications, timelines and delivery vehicles for the freight rail realignment versus creating a multi-modal transit corridor will likely differ significantly in each case. There are varieties of available funds for either project and obtaining the right mix of funding sources will be critical to success. Also, some funding strategies, such as, selling "air rights" for transit-oriented development is applicable to the transit reuse project, but not the rail realignment project.

A single source of funds for both project is unlikely given the different uses of the two facilities, i.e. a freight rail controlled by a private Class I RR and the other (transit) being a form of public transportation. Besides the NCDOT STIP funds and a rail grant (loan), the most likely single source of funds is a multi-year arrangement through the North Carolina General Assembly (NCGA) and the City. Phasing the rail realignment project to match funding to smaller subprojects may mean some portions of the realignment are built before others. However, this piecemeal approach would not generate any benefits until he freight traffic is moved to the new corridor and off of the Beltline. The planning, NEPA documentation and engineering could be one subproject funded by local monies. A combination of local, state and federal sources should fund the construction of the rail line and major structures. Local matches for the construction can be accomplished by either creating a special tax or by assessing a fee on each container

passing through the Port. While this is plausible, the assessment would probably require some subsidy from the state or local government to offset the charge for the Port and railroad to maintain a competitive position.

Table 6: SUMMARY OF POTENTIAL FUNDING SOURCES – FREIGHT RAIL REALIGNMENT

Fund	Source	Limitations	Applicability
Freight Intermodal Distribution Pilot Grant Program	USDOT FHWA	All funds are allocated to specific projects. Funding levels range from $5 million to $30 million per project.	Development and construction of intermodal freight distribution and transfer facilities at inland ports.
NCIIP	US DOT FHWA	No maximum up to apportioned amount, generally 80% federal.	Ancillary highway construction associated with reducing freight truck delays.
PNRS	USDOT FHWA	A minimum of the lesser of $500 million or 50% of NC's annual apportionment.	Freight railroad for national economic and transportation needs to facilitate international trade.
FASTLANE Grant	USDOT FHWA	$100 million	Freight-related construction improvements.
STBG and Airport Improvement Program	USDOT FAA	Generally, 75% to 95%, limits not known.	Providing transit service to Wilmington International Airport.
RSIG Grant	USDOT FRA	$25 million	Safety improvements to railroad infrastructure.
RLR	USDOT FRA	Typical funding ranges from $500k to $2.5 million per project.	Relocation to improve vehicle traffic flow, quality of life, or economic development.
TIGER	USDOT Secretary	$10 million maximum for a project per NCDOT.	Discretionary grant for critical projects. Innovative multi-modal, multi-jurisdictional with regional economic and environmental benefits.
RRIF	US DOT FRA	Fund 100% of project with up to a 35-year repayment period.	Loans and loan guarantees for intermodal or rail equipment, track, buildings, and yards.
Reassignment of Funds Planned for Transportation Improvements on Portion of CSXT Rail in Wilmington	NCDOT from current STIP Projects	Potential amount could vary based on savings from current STIP projects.	Planned funds for improving CSXT crossings in Wilmington.
Contingency Funds	NCDOT Rail Division	50% maximum up to $200K per project.	Constructing rail to new or expanding businesses.
Container Fees	NCSPA Port of Wilmington	Unknown	Per container fee or fee per ton.
Legislative Action	NCGA	Unknown	Study of existing rail line to Charlotte.
NCDOT STIP	NCDOT	Maximum $100 million limit on rail projects.	STIP

Fund	Source	Limitations	Applicability
		Based on the Benefit-Cost Ratio.	
Statewide Contingency Funds	NCDOT	$10 million annual fund	Request funds from NC's Secretary of Transportation.
Small Urban Funds	NCDOT	$250Klimit per year.	Request funds from division engineer and board member.
Economic Development Funds	NCDOT	$400k limit per project	Awards $2500 per job created.
P3	State, Local, Private	No limits.	All aspects of project with particular emphasis on transit operations, stations, major bridges and rail line.
Private Corporation/Joint Venture	Private	Limited by amount of return to investors.	All aspects of project with particular emphasis on major bridges and rail line.
Golden LEAF Foundation	Golden LEAF Foundation	Unknown	General economic development

Ownership for Freight Rail Realignment

There are opportunities for a proposed freight rail realignment ownership structure. Entities and representatives of a "Joint Powers Authority" could include, but not be limited to: NCDOT, the City of Wilmington, New Hanover and Brunswick Counties, the NCSPA, and CSXT. Although the NCGA would need to approve this type of ownership structure, this type of joint powers authority has inherent benefits. One is the ability to condemn property for the proposed improvements if negotiations with property owners fail. An additional benefit is that an authority would unify the areas entities that could potentially compete for the same funds for different projects. Another benefit is that this ownership structure would last longer than the current champions of the project for each separate entity. In other words, by the formation of an authority, the various member agencies would continue to work into the future to make this a successful venture. When the realignment project is complete, this ownership would transition to CSXT to meet the railroads requirement for sole access to the Port and to conform to STB regulations.

Best Potential Funding for Transit Service

The freight rail conversion to transit project may require multiple levels of funding from various sources given the wide variety of tasks and the nature of the work. The most likely and largest funding source may be Federal Transit Administration (FTA) funds for Small and New Starts. The City will likely find the scope of work triggers a "domino effect" resulting in other funding opportunities.

Table 7: SUMMARY OF POTENTIAL FUNDING SOURCES – TRANSIT FACILITIES AND SERVICE

Fund	Source	Limitations	Applicability
100% Federal Share for Safety	US DOT FHWA	100% funding, state limited to 10% of total federal aid apportionment.	Priority control system for transit vehicles at signalized intersections.
CMAQ	US DOT FHWA & FTA	Generally 80% up to state's apportionment.	Intermodal equipment and facility projects, real time transit information systems, transit vehicle acquisition, and construction of new transit and pedestrian facilities. Projects to improve air quality and improve surface transportation.
Elimination of Hazards at Railway-Highway Crossings	US DOT FHWA	90% federal up to state's apportionment.	Installation of protective devices at crossings, elimination of hazards, grade separation.
HSIP	US DOT FHWA	90% federal up to state's apportionment.	Safety improvements on public roads, trail, or pedestrian pathway.
NHPP	US DOT FHWA	Generally 80% up to state's apportionment.	Highway, transit, pedestrian portion of US 17 or SR 1140 affected by project plus bus terminals serving these routes.
NHS	US DOT FHWA	No maximum up to apportioned amount, generally 80% federal.	Highway, transit, pedestrian portion of US 17 or SR 1140 affected by project plus bus terminals serving these routes.
National Scenic Byways Program	US DOT FHWA	80% federal if program is authorized by Congress.	The Cape Fear Scenic Byway intersects the proposed transit line at the 5th St. & Martin St. intersection.
STBG	US DOT FHWA & FTA	No maximum up to apportioned and sub-apportioned amounts, generally 80% federal.	Transit capital projects, transit safety improvements, and pedestrian projects. Improve transit, pedestrian, and vehicular flow.
Capital Investment Grant	US DOT FTA	Discretionary without selection process.	Major transit capital investments in heavy rail, commuter rail, light rail, and streetcars.
Expedited Project Delivery for Capital Investment Grants	US DOT FTA	Funds may have been allocated	P3 required.
TIGER	US DOT Secretary	Does not apply to planning or design. Competitive grant application. $5M minimum, $100M maximum.	Discretionary grant for critical projects. Innovative multi-modal, multi-jurisdictional with economic and environmental benefits to region.

Fund	Source	Limitations	Applicability
Buses and Bus Facilities Grants Program Low- or No-Emission Vehicle	US DOT FTA	Competitive grants up to 85% of bus cost. 90% for facilities and related equipment.	Purchase of transit vehicles
STBG and Airport Improvement Program	US DOT FAA	Generally, 75% to 95%, limits not known.	Provide transit service to ILM.
Federal Small and New Starts	US DOT FTA	New Starts funding is more than $100 million. Small Starts funding is less than $100 million.	Construction of new transit lines
Legislative Action	NCGA	Unknown	Study of existing rail line to Charlotte.
State Transportation Grants	NCDOT Public Transportation	Formula based requiring local match. Limit unknown.	Operation of the transit service
Department of Commerce Tourism Development Program	NCDOC	Unknown	As a partner to NC DENR and NCDOT, assistance to local government for economic development and downtown revitalization.
Leasing Airspace	New Transit Operator	Unknown	Income can be used to offset the cost of operation of the station. Provide local match to federal funds.
TOD-based TIF	Local Government	Unknown	Future increase in tax value can be used to offset the cost of operation of the station. Provide local match to federal funds.
Bonding	Transit Operator	Unknown	All operations and construction. Provide local match to federal funds.
P3	Local, State, Private	No limits.	All aspects of project with particular emphasis on transit operations and stations.
Private Corporation/Joint Venture	Private	Limited by the return on investment.	All aspects of project with particular emphasis on transit operations and stations.
Golden LEAF Foundation	Golden LEAF Foundation	Unknown	General economic development

By pursuing multiple funding sources for the subprojects, funds can be requested and obtained on an ongoing basis using the latest information and experience from other subprojects. The subprojects will need to be prioritized in a logical fashion to provide an income stream, show functionality and to demonstrate progress. By pursuing multiple sources, the City would be wise to allocate sufficient resources to the task of coordinating and maintaining a vision of the completed system.

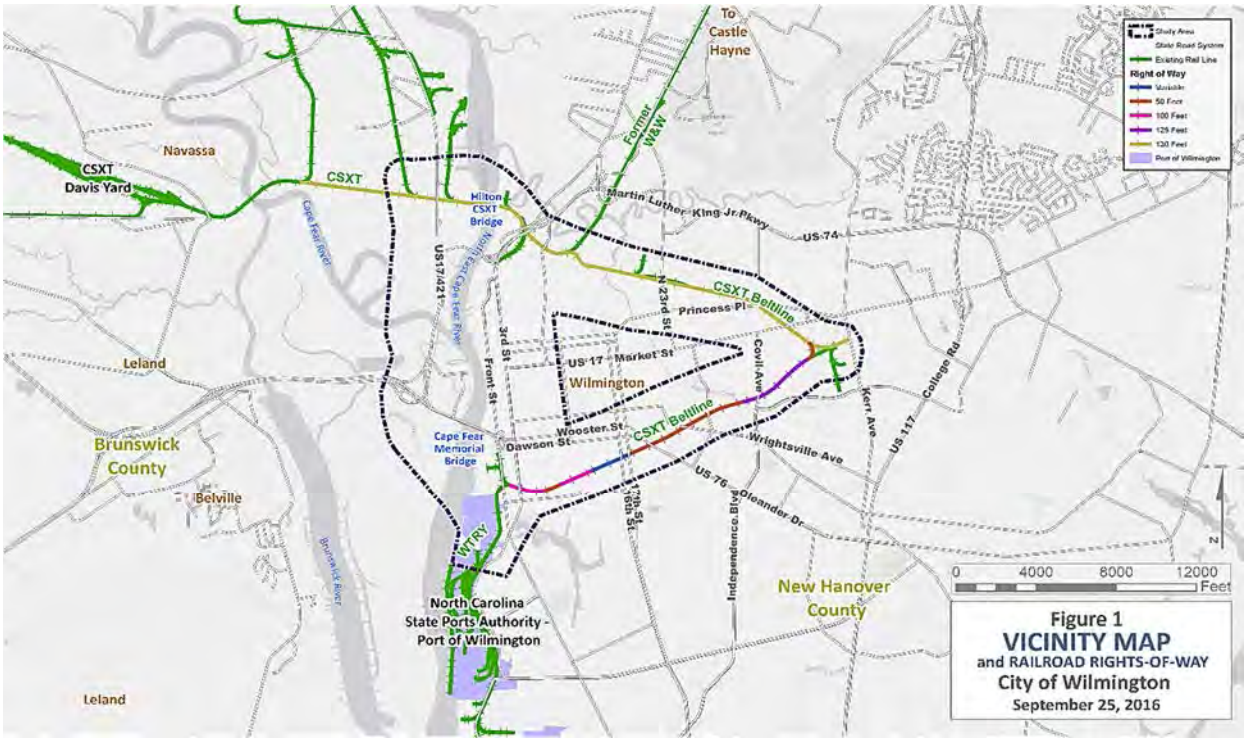
The transit service may be phased in one of several ways: by length of track converted, number of rolling stock obtained, by stations/stops and by crossings improved. Extension to the downtown area to form a complete loop, connection to the MMTC and extension to ILM are expansions that may come later, but the developed sections should be conceived in a manner that generates momentum, excitement and interest.

Ownership for Transit Service

Transit systems in other metropolitan areas are a mix of ownership models. Many are operated by a transit authority that exists to provide public transportation within a region. Typically, they have the power of government including taxing, eminent domain and policing.

After investigating the various types of potential ownership structures from sole ownership, P3s and the creation of an authority, the recommended structure is the establishment of an authority. Including this transit system as a service of the Cape Fear Public Transportation Authority is recommended.

Figure 1: VICINITY MAP



Technical Report E - Legal Conditions

As the realignment project develops and moves forward, CSXT will continue to own, maintain and operate the areas of rail right-of-way and infrastructure. They affirmed that the service to their existing customers along the northern section of the Beltline will remain active. The realignment (out of Wilmington for the

southern leg) of the Beltline service must allow continuous service to CSXT's current customers and the Port.

Since the new realignment introduces two movable span structures, the ownership, operations and maintenance of the rail realignment will have to be negotiated and is beyond the scope of this study. Additionally, U.S. Army Corps of Engineers and Coast Guard approvals will be required. The dual use of the northern leg (freight and transit) and the removal of freight rail service along the southern leg portion of the Beltline for subsequent use for transit will be a part of the final negotiations between CSXT and the City.

The STB regulates the acquisitions of rail lines as rail restructuring activities. Application to the STB is the first step to discontinuing freight service on the line for repurposing the corridor. An attorney familiar with STB regulations or experienced in railroad transactions is recommended.

Ownership of the transit service is not defined at this time but will be influenced by right-of-way transfer agreements, memoranda of understanding and agreements with CSXT, funding agreements, and other legal documents prepared to convey rights-of-way and service requirements along the new rail and transit corridors. Prior to any transit service development or further efforts to realign the Beltline, a complete legal abstract should be prepared to describe the existing right-of-way of the Beltline and the legal encumbrances on properties being considered for the rail realignment corridor.

Once the conveyance legalities have been determined, the City should be in position to determine ownership, maintenance and operations of the transit service. These items should be done in conjunction with the rail realignment project so the City knows if the conveyance and subsequent transit operation can be accomplished in a manner suitable to them or operator.

The main item of the legal ramifications affecting the project is that the realignment is feasible under the conditions and stipulations noted but will require further discussions and legal analysis as the project progresses.

Technical Report F - Environmental Conditions

Rail Realignment Environmental

The proposed environmental study area (see Figure 1), is approximately 8,831 acres in size, and encompasses downtown Wilmington, the Port, the Cape Fear River, the Northeast Cape Fear River and Eagles Island. Emphasis was placed on Eagles Island, considering a significant portion of the island is being returned to its natural state. As this is currently a feasibility study, environmental consequences, cumulative effects or federal/state permitting options were not evaluated.

Affected Biological Resources

Wetlands

The majority of the natural habitats present within the proposed study area on Eagles Island are wetlands including marshes, forests and transitional successional areas between. Tidal marshes are the dominant habitat across Eagles Island. The tidal freshwater marshes on Eagles Island are

part of the Brunswick River/Cape Fear River Marshes Significant Natural Heritage Area and include a number of rare plant species endemic to the area.

Fish and Fisheries

The Cape Fear River is a passageway for the larvae of many species of commercially or ecologically important fish. Located within the proposed study area are 50-plus estuarine and freshwater species, identified by the NC Division of Marine Fisheries.

Rare, Threatened and Endangered Species

Species occurrences of rare, threatened and endangered plants and animals documented by the Natural Heritage Program were considered. For the upper Wilmington Harbor portion of the Cape Fear River, the only federally listed species that may occur in the project area are two endangered sturgeon species: the Shortnose and the Atlantic.

Proposed Critical Habitat Designation

The Cape Fear and Northeast Cape Fear Rivers were identified as spawning rivers for Atlantic sturgeon based on the capture of juveniles, the capture of adults in spawning condition, the tracking location of adults and information indicating the historical use by Atlantic sturgeon.

Historical and Cultural Resources

The following historical and cultural resources have been identified by the Eagles Island Coalition Conservation Management Plan (2016): Maritime Archaeological Resources (shipwrecks along Eagles Island), Wilmington and Manchester (W&M) Railroad (remnants on Eagles Island) and the USS North Carolina Battleship (a National Historical Landmark).

Alternative Corridors Analysis

A GIS-based suitability model was used to evaluate the environmental feasibility of each preliminary alternative corridor. By examining the spatial relationships between the environmental resources and the alignment alternatives, attributes could be evaluated that may support freight rail realignment, and determine which scenarios would likely trigger federal and state resource agency concerns.

Air Quality

New Hanover and Brunswick Counties are currently listed as "attainment" status for all Criteria pollutants that have a National Ambient Air Quality Standard (NAAQS) published with the exception of Sulfur Dioxide (SO_2). Both counties are currently listed as "unclassifiable" for SO_2 by the EPA like most of the rest of the country (with the exception of some areas which have a SO_2 monitor, which clearly shows a violation - these are listed as "nonattainment").

Summary of Parcel Constraints

Several parcels on Eagles Island contain environmental constraints that may result in future consideration of alternative corridor suitability. The following highlights the relative importance of these parcels and constraints:

- USS North Carolina Battleship –the Battleship NORTH CAROLINA exhibit consists of parcels combining for a total of 54.72 acres*. The Battleship and these parcels are designated as a National Historic Landmark.
- NCDOT McIntyre Tract – this 131.12-acre* site was transferred fee simple to NCDOT from the Ecosystems Land Mitigation Bank Corporation. There is no conservation easement on the property, however, the site is tied to the USACE issued 404 permits for the Wilmington Bypass. Relevant special condition related to the McIntyre Tract indicate it would be a violation of the permit for NCDOT to allow any type of encroachment/development.
- Terminal Road Property LLC – this 25.64-acre* site is included in a conservation district with an easement for an underwater pipeline.
- Cape Fear Royal Tract – this 291.3-acre site*contains a conservation easement held by the North Carolina Coastal Land Trust. The site is also designated as a Primary Nursery Area. Avoidance and minimization of this tract by bridging the rail will be key.

*All acreage numbers given above are approximate.

Transit Environmental

The proposed environmental study area (see Figure 1), approximately 8,831 acres in size, encompasses downtown Wilmington, the Port the Cape Fear River, the Northeast Cape Fear River and Eagles Island. This report section addresses the transit reuse of the existing CSXT "Beltline" tracks. As this is currently a feasibility study, environmental consequences, cumulative effects or federal/state permitting options were not evaluated.

Environmental Constraints

Wetlands and Streams

Wetlands adjacent to the existing rail corridor that are being considered for reuse include palustrine wetlands. Within the study area, these natural habitats exist primarily along Burnt Mill Creek, which drains an extensively urbanized watershed. GIS analysis indicated possible wetland encroachment on the existing rail corridor in these locations, thus any new construction would likely be subject to permit requirements under Section 404 of the Clean Water Act (33 USC § 1344).

Active Hazardous Waste Sites

GIS analysis showed no active hazardous waste sites regulated by the hazardous waste portions of the Resource Conservation and Recovery Act (RCRA) within or immediately adjacent to the existing rail corridor being considered for reuse as a transit system.

National Pollution Discharge Elimination System Sites (NPDES)

The National Pollution Discharge Elimination System permit program addresses water pollution by regulating point sources that discharge pollutants to waters of the United States. No NPDES sites are located within or near the proposed transit corridor.

Historic Preservation Sites

The National Register of Historic Places (NRHP) is the nation's official list of buildings, structures, objects, sites and districts worthy of preservation for their significance in American history, architecture,

archaeology and culture. Several sites listed on the NRHP were found within or adjacent to the existing rail corridor, particularly within Wilmington's Historic District along 3rd Street. These sites are primarily houses and churches of historic significance. Any reuse of the existing rail infrastructure in this location would not affect these properties; however, new construction could trigger a Section 106 review by the State Historic Preservation Office (SHPO).

Avoidance, Minimization, and Mitigation of Potential Environmental Effects

Repurposing the out-of-service freight rail infrastructure for transit service and/or a greenway would require minor, if any, avoidance or mitigation measures because these factors were considered in the original planning and permitting process of the existing freight rail. However, any new construction would require consideration of practical alternatives for avoiding and minimizing impacts in collaboration with federal and state regulatory agencies. For unavoidable impacts to wetlands, mitigation would be required.

Technical Report G - Freight Rail Realignment Environmental Analysis

As the project moves into the phase of design and permitting, all practical alternatives for avoiding and minimizing impacts should be explored in collaboration with federal and state regulatory agencies. For any unavoidable impacts to wetland areas, mitigation plans will be required and will require negotiations with the federal and state resource agencies.

Options for compensatory mitigation include:

- Mitigation banks: Applicant satisfies the mitigation requirement by purchasing mitigation credits from an approved mitigation bank.
- In-lieu fee mitigation: Applicant satisfies the mitigation requirement by purchasing mitigation credits through the NC Division of Mitigation Services (DMS).Project-specific mitigation: Applicant satisfies the mitigation requirement themselves, either at the project site or an off-site location. For this study, mitigation costs associated with unavoidable wetland impacts were estimated assuming purchasing credits through the state's mitigation program or by enhancing existing wetlands on Eagles Island. The current DMS cost per acre credit for each type of wetland potentially impacted puts the mitigation cost in the range of approximately $550,000 to $3.1 million for the alternatives assessed. Other mitigation may be required for the bridge crossing over the Cape Fear River but it cannot be quantified until further coordination is conducted with state and federal agencies.

Realigning the freight rail line and repurposing the existing corridor through the City for public transit use will provide a number benefits; many of which are discussed in the Executive Summary. Other benefits, all of which can be qualified and quantified as the project moves forward, are presented in the various Technical Reports. A few of the primary benefits may be:

- Reduction of traffic congestion at intersections due to unit train crossings.
- Betterment of City air quality due to reductions in length of time of idling vehicles.
- Betterment of water quality from standing vehicles and associated oil drippings
- Reduction in demand and need for additional parking areas and associated storm water impacts.

Technical Report H - Freight Rail Realignment Engineering Analysis

The feasibility of realigning the existing active CSXT freight rail line leading from the CSXT Davis Yard in Brunswick County to the Port is being considered and is the subject of this engineering analysis. The feasibility of repurposing the potential remnant freight rail infrastructure in Wilmington into a trolley transit service is also a subject of this feasibility study. Both proposed actions, realignment of freight rail and out-of-service rail reuse, are combined as the "actions being considered".

Corridor Definition

Engineering constraints identified within the study area (see *Figure 1*) include:

- Terminus at the existing CSXT mainline that avoids affecting the US 17 overpass.
- Conservation easement encompassing former rail corridor.
- Wetlands, salt marshes, impoundments, dredge material disposal areas and other known natural or man-made environmental areas.
- Existing infrastructure and business operations.

Study area limits established the outer boundaries for the corridors. Constraints identified areas within the outer boundaries that should be avoided. Remaining areas within the outer boundaries, though potentially appearing illogical or disjointed, provided the most advantageous locations for corridors or corridor segments.

Corridor Alignment Alternatives

The remaining areas between constraints provide a minimum of three potentially viable corridors. All three corridors begin at the CSXT mainline west of US 17. Connectors between these corridors are possible, but are excluded from the descriptions and figures to focus on the following three potentially feasible corridors:

1) Corridor A (See Figure 2) – The corridor furthest West.
2) Corridor B (See Figure 3) – Central corridor that uses the most of the former railway embankment.
3) Corridor C (See Figure 4) – This corridor closely follows the US17/74 highway corridor.

Figure 2: CORRIDOR A

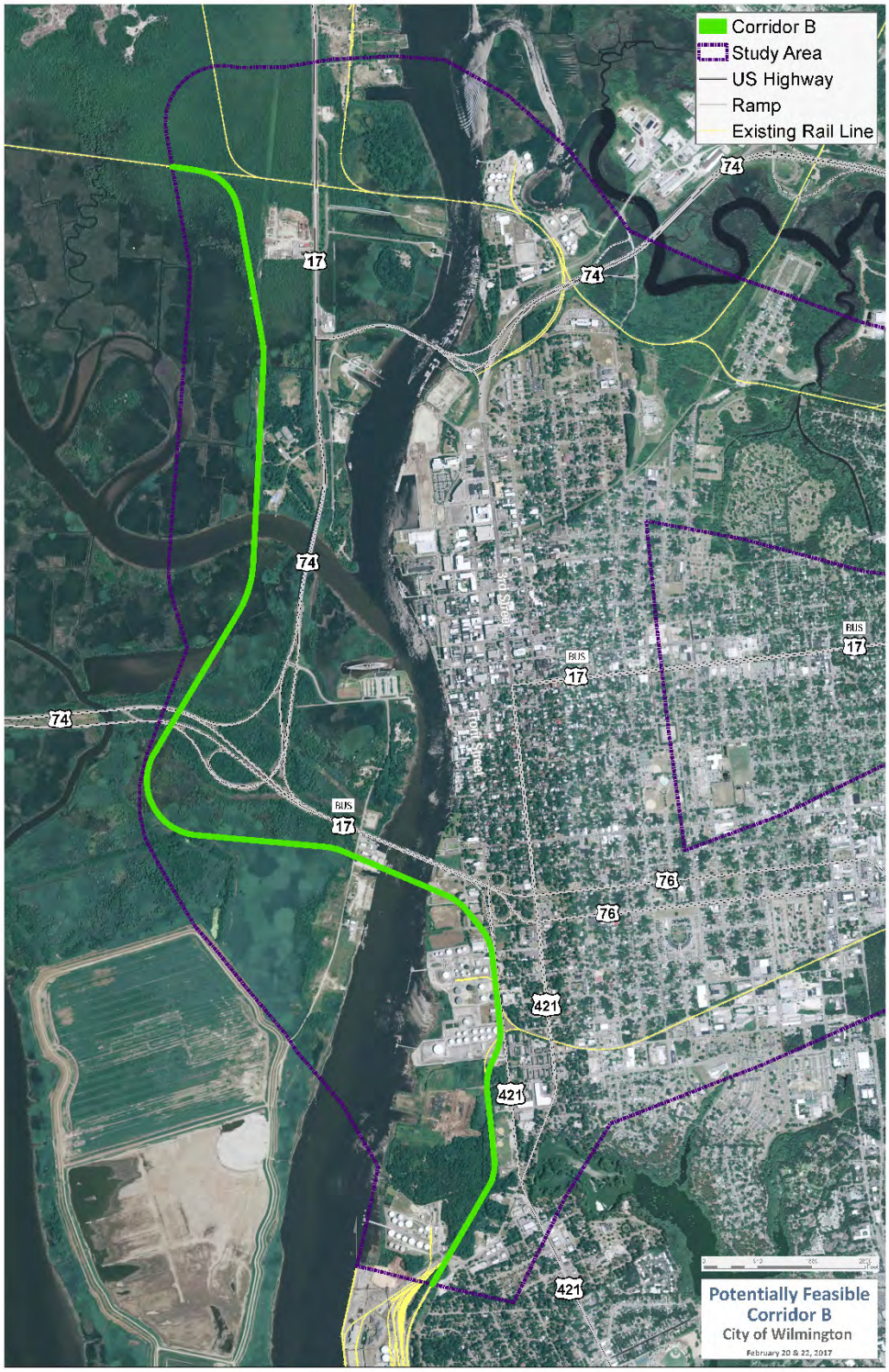


Figure 3: CORRIDOR B

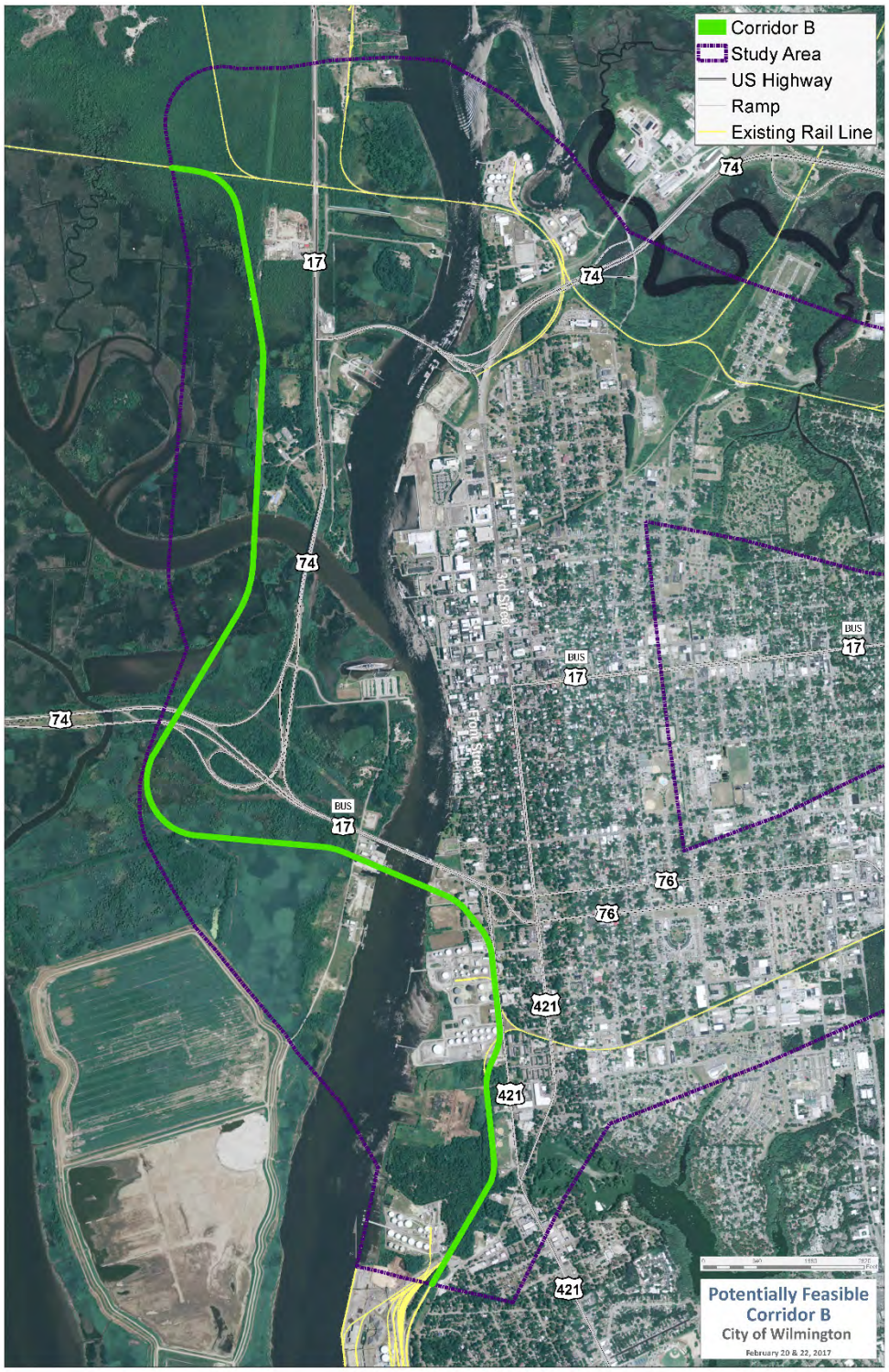
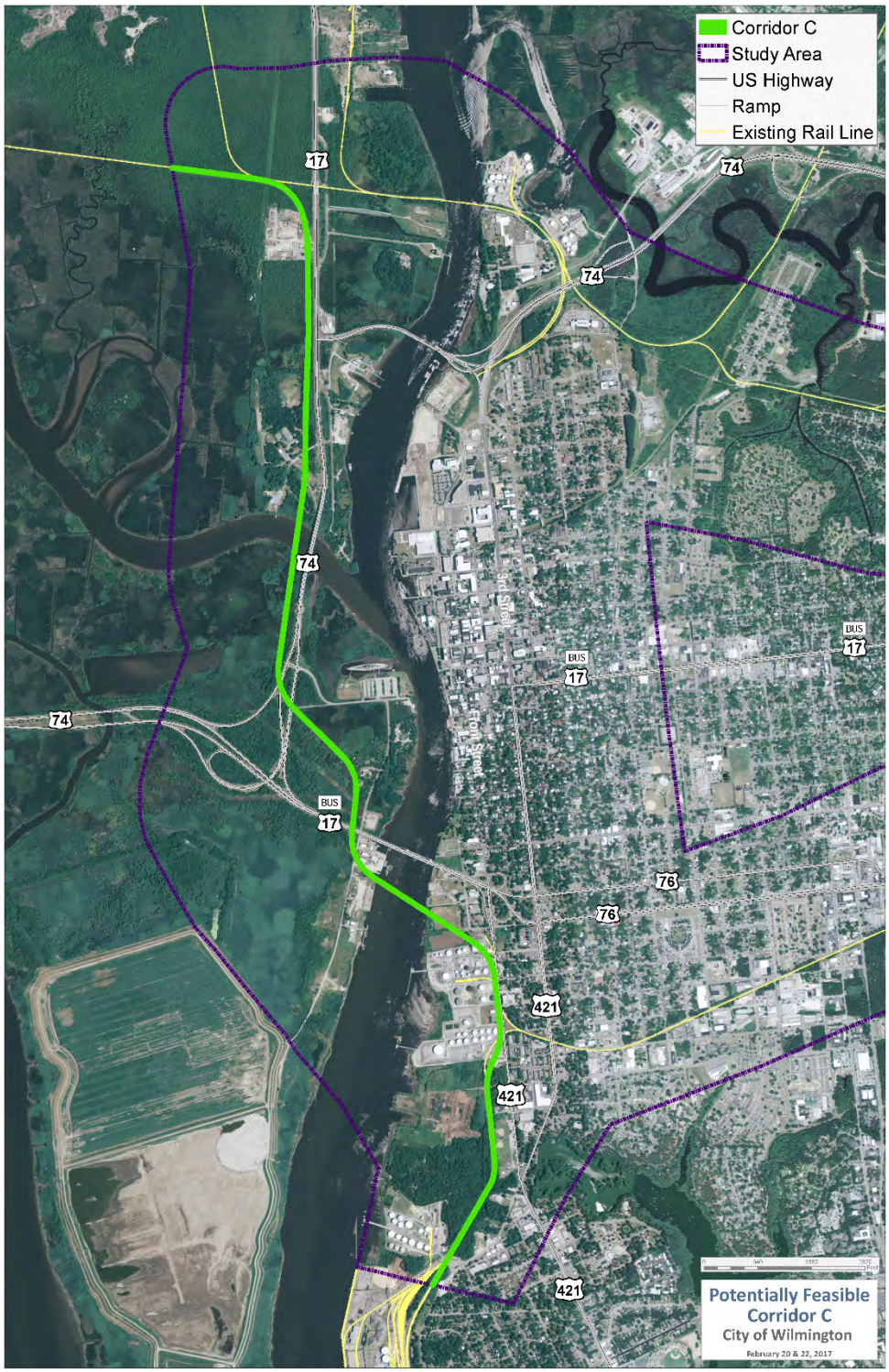


Figure 4: CORRIDOR C



Assumptions

- Single track operation on embankment or elevated structure.
- Existing distance between Davis Yard and the Port 10.7 miles
- Proposed distance between Davis Yard and the Port 7 miles
- Existing round trip travel time 4 hours
- Proposed round trip travel time 2 hours
- Existing rail service to/from the Port 2 trains/day (1 in, 1 out)
- Existing manifest trains 5-7 days/week (as needed)
- Existing intermodal trains to/from the Port 1 trains/week (Queen City Express)
- Proposed rail service to/from the Port 4 trains/shift (12 trains/day max.)
- Proposed maximum allowable operating speed 10 mph (due to movable bridges)
- Existing highways crossed by the proposed track would be grade separated.
- Protection at access drives could range from crossbucks with stop signs to gates and flashers.

Table 8: POTENTIAL IMPACTS TO ENVIRONMENTAL CONSTRAINTS

CORRIDOR RESOURCE CONSTRAINT	Corridor A	Corridor B	Corridor C
Estuarine and Marine Deepwater	Med	Med	Med
Freshwater Emergent Wetland	High	High	Med
Freshwater Forested/Shrub Wetland	Med	Low	Low
Businesses	Low	Low	Med
Residences	Low	Low	Low
Conservation Easement	High	Med	Low
Battleship NORTH CAROLINA Attraction	Low	Low	Med
Highway Infrastructure	Med	Med	High

Table 9: OPINION OF PROBABLE ORDER OF MAGNITUDE CONSTRUCTION COSTS

COSTS *(in millions)*									Cost *(2016 $ in millions)*	Cost *(2025 $ in millions)*
CORRIDOR	Track		Structures		Sitework		Roadway			
	2016	2025	2016	2025	2016	2025	2016	2025		
Rail A	$ 15	$ 20	$ 557	$ 745	$ 29	$ 38	$ 30	$ 46	$ 631	$ 849
Rail B	$ 15	$ 20	$ 557	$ 745	$ 29	$ 38	$ 30	$ 46	$ 631	$ 849
Rail C	$ 17	$ 23	$ 597	$ 798	$ 44	$ 58	$ 28	$ 42	$ 686	$ 921

Note: Costs shown as $ -0- indicate that sitework is incidental to the other cost categories for that corridor.

Technical Report J - Transit Environmental Analysis

Repurposing the vacated freight rail infrastructure for transit service and/or a greenway would require little, if any, additional avoidance or mitigation measures because these factors would be included in the original planning and permitting process for the freight rail realignment to save time and to ensure the transit project would proceed unimpeded. However, any new construction would require consideration of practical alternatives for avoiding and minimizing impacts in collaboration with federal and state regulatory agencies and will still require mitigation for any unavoidable impacts to wetland on the transit project and therefore the need for a negotiated mitigation plan meeting federal and state resource agencies.

The options for compensatory mitigation of the transit project impacts are the same as the freight rail project and include:

- Mitigation banks: Applicant satisfies the mitigation requirement by purchasing mitigation credits from an approved mitigation bank.
- In-lieu fee mitigation: Applicant satisfies the mitigation requirement by purchasing mitigation credits through the NCDMS.
- Project-specific mitigation: Applicant satisfies the mitigation requirement themselves, either at the project site or at an off-site location.

Since the transit corridor and the subsequent stations needed to support the transit system will be located within the City, the project will also need to evaluate impacts related to NRHP and SHPO historic properties/sites.

Realigning the freight rail line and repurposing the existing corridor through the City for public transit use will provide a number benefits; many of which are discussed in the Executive Summary. Other benefits, all of which can be qualified and quantified as the project moves forward, are presented in the various Technical Reports.

A few of the primary benefits may be:

- Greater transition to walking and biking as a mobility option.
- Provision of “greenway” trail connecting to other “greenway” trails throughout the City.
- Increased use of public transit system by area residents—also benefitting air and water quality.
- Repurposing of existing but vacant building infrastructure and resources invested in their construction, particularly along the southern segment.

Technical Report K - Transit Engineering Analysis

Transit Technologies Considered

Commuter Rail

Fixed guideway, long haul, and passenger rail services operating between large metropolitan and suburban areas. This option was considered and discarded due to not meeting the needs of the City.

Light Rail Transit (LRT)

Operates on fixed rails as a commuter service driven by an on-board operator.

Streetcar Systems

Serve as urban circulators operating on rails embedded in existing streets, with overhead wires providing electric power. Streetcars may operate either as modern streetcars using new vehicles that resemble light rail vehicles or as heritage streetcars/trolleys using replica or refurbished vehicles.

Proposed Design Assumptions

Northern Portion of the Existing Freight Right-of-Way

It is assumed that CSXT will remain in its current location and the proposed transit system would operate on a newly built separate track (40-foot separation) within the same right-of-way.

WMMTC site to King Street

The existing freight corridor is not utilized, and a future inter-city and/or commuter rail is planned to be located here. In this portion of the corridor, the proposed transit system tracks are also located 40 feet away from the planned passenger rail.

Southern Portion of the CSXT current freight right-of-way from the Port East to the Existing Turning Wye

CSXT access to the Port is assumed to be realigned to a new freight alignment on the west side of the Cape Fear River, and the proposed transit system would operate on the existing freight tracks as the tracks would be not be serviced by CSXT. A parallel multi-use trail is planned in the corridor.

For locations where the proposed rail transit system enters an existing roadway such as 3rd Street or Randall Parkway, it is assumed the system will operate on tracks embedded in concrete. Two tracks are required to allow transit vehicles to travel in the same direction as roadway traffic. Station spacing would be approximately every three to five blocks with stations located in a widened median between the tracks. Pedestrian access to the in-street stations would be provided at the existing intersections through the crosswalks.

Technology and Operations

Commuter rail was eliminated as a practical option for the proposed Wilmington rail transit system. The stop frequency proposed would not allow the commuter rail vehicle to get up to a significant cruising speed before it would need to decelerate for the next stop. Additionally, the constrained right-of-way widths and the system lengths are not well-suited for this technology. Commuter rail is generally not compatible with the overall system characteristics of the proposed alternatives.

For the application in Wilmington, there would be almost no difference between light rail and streetcar operation in the freight right-of-way. Within City streets, however, there is a choice on how to integrate rail transit. There are generally three ways to address this situation:

1) Add Lanes – An exclusive lane in each direction could be added in the center of the existing street while preserving the number of existing travel lanes in both directions on either side of the transit lanes.

2) Take Lanes – The inside lanes of the existing street could be converted to exclusive lanes for the rail transit and the remaining width of the street would be allocated to vehicular travel lanes, parking, turn lanes, etc.

3) Share Lanes – The tracks would be installed in the existing center lanes in an embedded guideway where transit vehicles and vehicular traffic would share the lanes using the same line-of-sight precautions and obeying traffic signals.

A cursory cross sectional analysis of 3rd Street revealed that adding exclusive light rail l or transit lanes while preserving existing travel ones is not practical. It is assumed that removing two travel lanes (one in each direction) on 3rd Street would not be feasible either, which effectively sets aside light rail operations. Therefore, streetcar technology has been selected using shared lanes operations for the in-street segments.

Alignment Alternatives

Alternative #1: The Loop

Uses the south side of CSXT existing freight line along the north leg of the Beltline, using the existing track along the south leg, shared lanes along 3rd Street, and the upper level of the "trench" or "gulch" between 3rd Street and King Street.

Alternative #2: Downtown to Wye on Southside

Begins in the existing freight wye right-of-way west of Kerr Avenue, extends west using the existing track along the south leg to downtown Wilmington, shared lanes along 3rd Street, and terminates near Campbell Street and the proposed WMMTC site.

Alternative #3: Downtown to UNCW on Southside

Begins at UNCW, just east of South College Road and Randall Parkway. The alignment operates in shared lanes along Randall Parkway and enters the existing freight corridor near Marlboro Street. It then continues west using the existing track along the south leg to downtown Wilmington, shared lanes along 3rd Street, and terminates near Campbell Street and the proposed WMMTC site.

Alternative #4: Downtown to UNCW on Northside

Begins near Campbell Street and the proposed WTMC site in the upper level of the "trench" or "gulch" between 3rd Street and King Street, continues east using the south side of CSXT existing freight line along the north leg of the Beltline to the existing wye (operating on the south side of the wye). It then turns south near Marlboro Street, turns east onto Randall Parkway and ends at UNCW just east of South College Road.

Alternative #5: North to UNCW and Downtown to Wye on Southside

This alternative is a combination of Alternative #2 and Alternative #4, these two lines would operate independently and would share a station near the Progress 910 apartment complex where passengers could transfer between the two systems.

The recommended alternative is provided at the conclusion of Table 13.

Table 10: TRANSIT ALTERNATIVES SCREENING 1 RESULTS TABLE

SCREENING 1		Loop		Downtown to Wye on Southside		Downtown to UNCW on Southside		Downtown to UNCW on Northside		Northside to UNCW and Downtown to Wye Southside	
CATEGORY	CRITERIA	ALTERNATIVE 1		ALTERNATIVE 2		ALTERNATIVE 3		ALTERNATIVE 4		ALTERNATIVE 5	
Mobility	Population Density	Low	1	Med	2	High	3	High	3	Med	2
	Employment Density	Med	2	High	3	High	3	Low	1	Med	2
	Transit Dependency (Vehicle Access)	Med	2	Med	2	Med	2	Low	1	Med	2
	Low Income Households	Low	1	High	3	High	3	Low	1	Med	2
	Proximity to Employment Anchors	Med	2	Low	1	Med	2	High	3	High	3
	Integration with Alternative Transit	High	3	Low	1	High	3	Low	1	High	3
MOBILITY SUBTOTAL		11		12		16		10		14	
Development Opportunities	Opportunity Areas	Med	2	Low	1	Med	2	Low	1	High	3
	Future Mixed Use Centers/Neighborhood Nodes	High	3	Low	1	Low	1	Low	1	High	3
	Underutilized Land	Med	2	Low	1	Med	2	Low	1	High	3
	Vacant Land	High	3	Low	1	Low	1	Low	1	High	3
DEVELOPMENT SUBTOTAL		10		4		6		4		12	
SCREENING 1 TOTAL		21		16		22		14		26	

Table 11: TRANSIT ALTERNATIVES SCREENING 2 RESULTS TABLE

SCREENING 2		Loop		Downtown to UNCW on Southside		Northside to UNCW and Downtown to Wye Southside	
CATEGORY	CRITERIA	ALTERNATIVE 1		ALTERNATIVE 3		ALTERNATIVE 5	
Project Readiness	Overall Likelihood of Implementing the Project in a Shorter Timeframe	Low	1	Med	2	Low	1
Affordability	Overall Affordability of Order of Magnitude Total Capital Cost	Med	2	Low	3	High	1
SCREENING 2 TOTAL		3		5		2	

Table 12: TRANSIT ALTERNATIVES EVALUATION RESULTS TABLE

SCREENINGS 1 & 2	Loop	Downtown to UNCW on Southside	Northside to UNCW and Downtown to Wye Southside
	ALTERNATIVE 1	ALTERNATIVE 3	ALTERNATIVE 5
SCREENING 1 MOBILITY SUBTOTAL	2	3	3
SCREENING 1 DEVELOPMENT SUBTOTAL	3	2	3
SCREENING 2 TOTALS	3	5	2
EVALUATION TOTALS	8	10	8

Table 13: ORDER OF MAGNITUDE CAPITAL COST ESTIMATES SUMMARY

CAPITAL COST ESTIMATES SUMMARY			
ALTERNATIVE	ORDER OF MAGNITUDE CAPITAL COST (MILLIONS)	COST PER MILE (MILLIONS)	TOTAL ROUTE (MILES)
Alt 1: The Loop	$148M	$17.6M	8.44
Alt. 3: Downtown to UNCW on Southside	$134M	$20.2M	6.66
Alt. 5: Northside to UNCW & Downtown to Wye Southside	$188M	$18.8M	10.04

Recommended Alternative

Based on the evaluation of alternatives the alignment that is recommended for further study is Alignment Alternative #3 – Downtown to UNCW on the Southside. This alterative maximizes the benefits of development and mobility while minimizing impacts regarding contractibility and project readiness. This alternative provides a vital linkage between downtown and the UNCW campus.

At Grade Crossings

Due to the large number of significant variables to be considered, no single standard system of traffic control devices is universally applicable for all roadway-rail at-grade crossings. The appropriate traffic control system to be used at each roadway-rail grade crossing should be determined as specified in the Manual on Uniform Traffic Control Devices (MUTCD) and by an engineering study involving NCDOT, the City, and Wave Transit.

Technical Report L - Transit Benefit Analysis

The Transit Economic Benefits Assessment presents relevant data points that aid in selecting a preferred route for a future streetcar system.

While four overarching considerations were utilized to select a preferred alternative, data in this analysis was focused on the following two:

1. Mobility

   The project's potential to enhance access between neighborhoods, colleges, employment centers and major destinations. Also, project would likely promote walkability, bicycle usage, usage of alternate non-motorized transportation modes and provide opportunities for transit dependent households.

2. Development Opportunities

   The project's potential ability to attract real estate development within the corridor. This is measured by the number of opportunities for new development or redevelopment and potential support of TOD.

Project readiness and affordability are the other two considerations.

The main economic driver for Wilmington is tourism, generating 5,800 jobs and a payroll of $121.5 million.

Activity centers in the study area include Downtown, industrial sites (north), the Market Street Corridor, the Port. Other activity centers that may be considered in future studies include Wrightsville Beach, Independence Mall, Mayfaire Town Center, NHRMC, and UNCW

The study area approximately 23,550 residents in 2016, an increase of 11.2 percent from 21,181 in 2000. While the number of residents in the study area showed only modest growth between 2000 and 2010, likely impacted by the economic downturn during the 2007-2009 recession, the growth in the last six years equates to an annual average increase of 1.2 percent.

When compared to the two-county Wilmington MSA, the study area has higher shares of younger residents. Many of these residents are students or young professionals seeking to live in or near an urban core.

The median household income in the study area was estimated at $28,138 annually. This is notably lower than $48,482 per year reported for the larger Wilmington MSA. The significant concentration of students in and near the Study Area impacts the median for the Study Area. Additionally, the area also hosts many of the City's public and tax credit housing developments. The urban location of affordable housing properties offers the highest level of connection between households needing assistance and jobs and services nearby.

Annual net new job growth in the Wilmington MSA peaked in 2006 and 2007, adding nearly 10,000 new jobs to the economy in a two-year period. Wilmington economy has added more than 3,000 jobs per year in the last three years. Although growth has been consistent, it has yet to exceed pre-recession levels.

There are approximately 12,700 housing units in the study area, representing a variety of product types and tenures. Nearly 54 percent of all the housing units in the study area are classified as renter-occupied, followed by 30.4 percent owner-occupied, and 15.6 percent are vacant.

Development and Redevelopment Opportunities

In order to assess the potential for development and redevelopment along the proposed transit corridor, two data points were investigated. One data point was the acreage of vacant and underutilized properties with proximity to the rail corridor. It was calculated to identify low-hanging development opportunities. The second data point was the development opportunity nodes and mixed-use centers identified as part of the *Create Wilmington Comprehensive Plan* (adopted in 2016) s.

Vacant and Underutilized Properties

For this analysis, vacant properties are defined as any parcel that had no building value in New Hanover County's tax parcel data set. Underutilized properties are defined as those properties where the building value is less than the land value. It should be noted that some properties that met the criteria of underutilized were excluded upon review of the results given their special nature.

Potential Mixed-Use/Transit Oriented Development Centers

Through the Create Wilmington planning process, the City combined qualitative data points with public input in order to identify key mixed-use nodes for future development. In fact, the City identifies a focus on mixed-use centers as the most important strategy to accommodate future growth within its jurisdictional boundaries. The identified centers should have a focus on walkability, urban vitality, place making, higher-density land use patterns, and transit.

Future Opportunity Areas

The *Create Wilmington Comprehensive Plan* identified areas largely through redevelopment of existing land use patterns. Infill and redevelopment will be a critical component of growth accommodation for the future of Wilmington as much of New Hanover County is built-out. As defined by the City of Wilmington, the Study Area is targeted for high-density transitions, neighborhood scale infill, post-industrial revitalization, and live/work innovation zones. *These areas offer the highest levels of potential for future redevelopment. The consideration of the preferred transit/streetcar alternative considers proximity to these areas to evaluate potential for catalyzing future growth.*

Coupled with existing transit routes provided by WAVE, the future streetcar corridor could be a key catalyst for growth and development.

Technical Report M - Financial Analysis

The Wilmington Rail Realignment Project (Project) will generate $291 million of undiscounted benefits under a no expansion scenario and $395 million of undiscounted benefits under an expansion scenario over a 30-year benefit-cost analysis horizon. These benefits would lead to an economic rate of return of +0.22 percent and +0.67 percent, respectively. The economic rate of return was calculated under the assumptions that all elements of the realignment project are designed for a 100-year lifespan and will continue to generate value at the same rate though the end of their design life.

The benefits associated with the Project are attributed to both the removal of freight rail traffic from the City of Wilmington (City) and the implementation of a transit system. The Project will result in the removal of freight rail traffic and reconfiguration of tracks for use by a streetcar system. The potential benefits generated from the implementation of a streetcar through the City total $230M of undiscounted benefits.

The remaining benefits generated by the Project are associated with freight rail traffic. No expansion and expansion scenarios generate a total of $61 million and $165 million of undiscounted benefits, respectively. These benefits are realized in terms of avoided costs to the public caused by a transfer of train traffic from the CSXT Beltline to outside the City. Two base scenarios were considered for future rail volumes and Project benefits. The first scenario assumes no container operation expansions ("no-expansion") at the Port of Wilmington (Port). Here, container volumes will be capped by current annual capacity of 600,000 TEU (Strategic Plan, Table 14). The second scenario assumes the Port will expand its container operations ("expansion"). North Carolina State Port Authority (NCSPA) will expand the Port to enable handling all of the state's container volume demand (Maritime Strategy, Table 75). Here, container volumes through the Port will reach 1.32 million TEU (twenty-foot equivalent unit) by 2050.

Both no expansion and expansion freight scenarios would generate benefits in many areas which have been separated into five long-term categories including:

- Benefits associated with increased **Quality of Life** including reduction in traffic congestion, increase in property values, and reduction in noise pollution.

- Benefits resulting from travel times savings and operating cost savings, or **Economic Competitiveness**.
- Benefits associated with the prevention of highway and highway-rail crashes, or **Safety Costs**.
- Benefits associated with the reduction of highway maintenance costs, or **State of Good Repair**.
- Benefits associated with the reduction of fuel emissions, or **Environmental Sustainability**.

The Present Value of all social benefits realized as a result of the rail realignment project are summarized in Figure 6. The present value of these potential social cost savings are then compared to potential transit benefits and the cost of the Project in Figure 7. The most recent Benefit-Cost Analysis (BCA) Resource Guide was published in November 2016 using 2015 USD values. Therefore, all benefits and costs of the realignment project were calculated using 2015 USD.

Figure 6: PRESENT VALUE OF SOCIAL BENEFITS – 2015 USD @ 3% DISCOUNT RATE

	NO EXPANSION	EXPANSION
QUALITY OF LIFE	$3,925,643	$11,299,329
ECONOMIC COMPETITIVENESS	$18,948,932	$41,346,794
SAFETY COSTS	$16,327,137	$18,073,235
STATE OF GOOD REPAIR	-	$11,766,542
ENVIRONMENTAL SUSTAINABILITY	$182,633	$2,250,333
TOTAL TRANSIT BENEFITS	$137,404,137	$137,404,137
TOTAL SOCIAL BENEFITS	**$176,788,482**	**$222,140,370**

Source: Moffatt & Nichol

Figure 7: PROJECT NET PRESENT VALUE – 2015 USD @ 3% DISCOUNT RATE

	NO EXPANSION	EXPANSION
TOTAL FREIGHT BENEFITS	$39,384,345	$84,736,233
TOTAL TRANSIT BENEFITS	$137,404,137	$137,404,137
PROJECT RESIDUAL VALUE	$207,291,227	$207,291,227
PROJECT COST	($751,783,152)	($751,783,152)
NET PRESENT VALUE	**($367,703,443)**	**($322,351,555)**

Source: Moffatt & Nichol

Technical Report N - Project Implementation Schedule

Implementation is defined as the process of completing a goal, reflects a proactive approach and has a process and a goal as components.

Processes develop a path between known or desired locations. Combining the steps along the path creates the process.

A clearly defined goal establishes the end of the process. For the Project's goal is to operate trains from a location near Yadkin Junction to the Port along a new, shorter rail alignment in a less urbanized area. Reaching this goal will open the process toward the next goal, which is repurposing the existing Beltline rail corridor for transit operations.

Process

Major steps in the process between Feasibility Study and Operating Rail Corridor are shown below.

Components of the development plan depend on identifying a funding source or sources. Table 14 further defines potential components of the Development Plan:

Table 14: IMPLEMENTATION SCHEDULE

IMPLEMENTATION SCHEDULE		
RAILROAD REALIGNMENT		
PROCESS STEPS	STEP COMPONENTS	RANGE OF TIME
Obtain Regulatory Clearance	STB Clearance	1 – 2 years
	Environmental Clearance, Stakeholder Collaboration and Agreements	5 – 9 years
Execute Development Plan	Preliminary Engineering	2 – 4 years
	Permitting/Right-of-Way	2 – 3 years
	Design-Build	4 – 6 years
	Design-Bid-Build	5 – 8 years
Operating Rail Corridor	Commissioning	1 year
TRANSIT SERVICE		
PROCESS STEPS	STEP COMPONENTS	RANGE OF TIME
Obtain Regulatory Clearance	Environmental Clearance	4 – 6 years
Execute Development Plan	Preliminary Engineering	2 – 6 years
	Permitting/Right-of-Way	2 – 6 years
	Design-Build	4 – 8 years
	Design-Bid-Build	5 – 10 years
Operating Transit Service	Commissioning	1 – 3 years

Components

Potential components in Table 1 identify the major steps in similar projects listed in a general order of occurrence. Design-Build and Design-Bid-Build are provided for time comparison only. Overlap was excluded from the summation of the ranges of time. Component descriptions include:

STB Clearance

Process of obtaining STB's approval of a new track location to be used by an operating railroad.

Environmental Clearance

Process of obtaining governmental approval/permits to move forward with design and construction. If any state or federal funds are contributed to the project, this will trigger the need for an environmental document. River crossings and wetland impacts will require permits from various state and federal agencies. The triggering of a federal permit from the USACE or US Coast Guard will federalize the environmental process regardless of the funding source, and will allow the agencies to request an environmental document at their discretion.

Preliminary Engineering

Process of collecting sufficient surveys, geotechnical data and other base data to prepare engineering designs to a 30 percent plan level.

Permitting/Right-of-Way

Process of obtaining construction permits and obtaining right-of-way for the construction, operation, and maintenance of the railroad.

Design-Build

Process of concurrently designing and building the railroad infrastructure as a collaborative effort between the engineer and the contractor.

Design-Bid-Build

Process of an engineer designing the project, the owner/financier bidding the project and a contractor constructing the railroad infrastructure in a series of sequential efforts.

Commissioning

Process of inspecting, testing, troubleshooting, and initiating operations on the constructed infrastructure.

Range of Time

Ranges of time are estimates. Actual time required for each component will vary depending on the number and complexity of subcomponents as well as the regulations governing the development during the execution of the component. The minimum time for Design-Build was used for the lower range of the total number of years. The maximum time for Design-Bid-Build was used for the upper range of the total number of years.

Railroad realignment component time ranges are estimated basing the dependencies between the components on the completion of the previous component. For example, Environmental Clearances will not be required if the STB denies the operations which the Project would create.

Transit service time ranges are estimated basing the lower range on the time to covert the “southern leg” of the Beltline to transit use. Upper ranges of time are based on the time estimated to sequentially implement the three “legs” of the transit loop.

A: Socioeconomic Conditions

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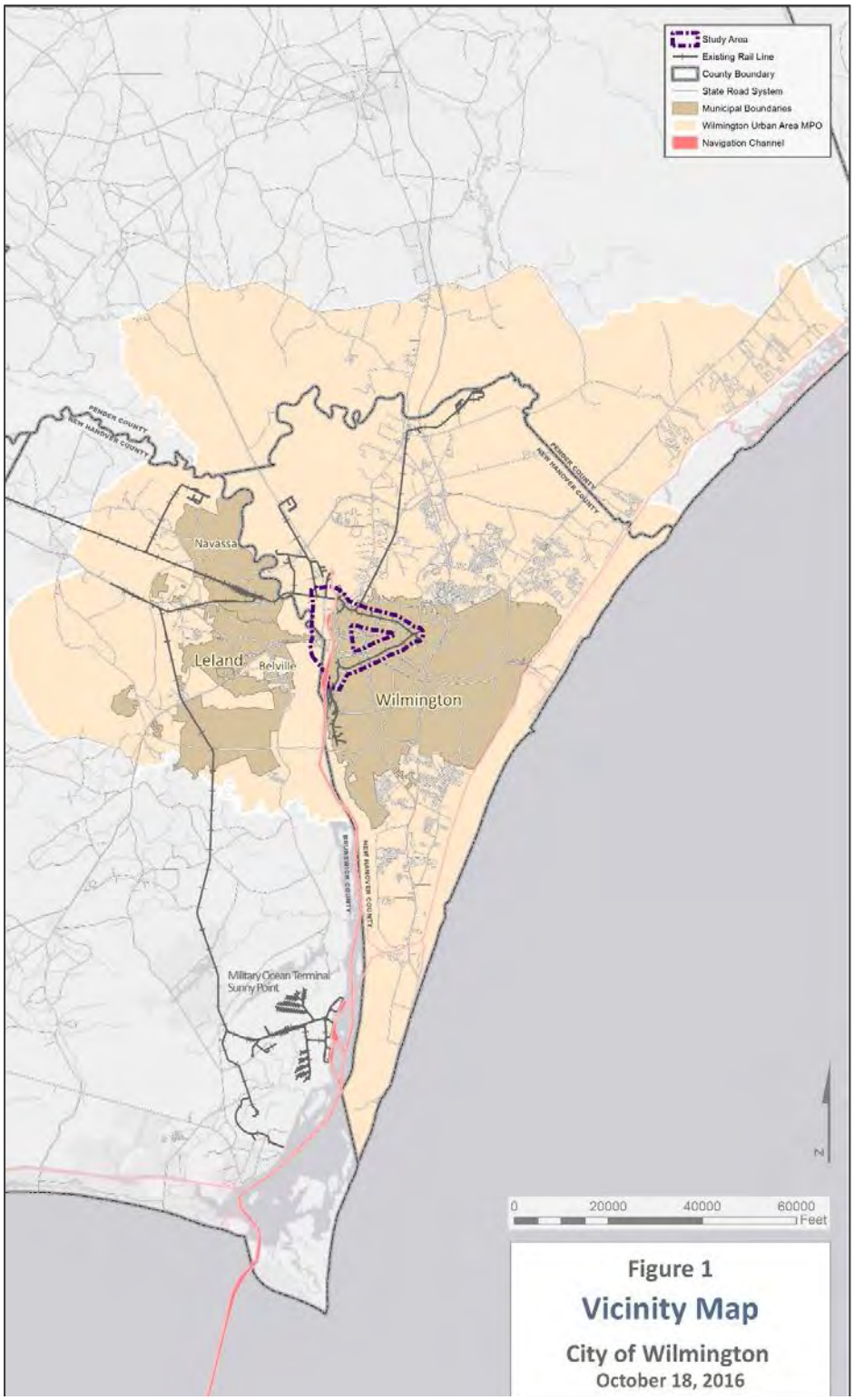
1. Introduction

Technical Report A describes the socioeconomic and demographic characteristics of New Hanover and Brunswick Counties, the City of Wilmington (the "City), and the study area (see Figure 1). The feasibility of relocating the existing CSXT freight rail line leading to the Port of Wilmington (Port), which is currently routed through a portion of the City's urban core, to a new location is being considered by the City of Wilmington and is the subject of this feasibility study (Study). In a separate proposed action, which would follow the freight rail line relocation, the City is considering the possibility of repurposing the remaining freight infrastructure into a multi-use trail and transit service (i.e. freight rail reuse). Both proposed actions, relocation of freight rail and implementation of transit service, are considered together as the "actions being considered" for the purpose of this report.

The basis of socioeconomic characteristics and trends that decision makers should consider when evaluating the Project's feasibility is provided herein. Technical Report A also provides a framework in which to build a more detailed assessment of socioeconomic impacts when the actions being considered move beyond the conceptual stage of development.

The steps in assessing socioeconomic characteristics and trends includes research of demographic data, land use policies, population change, employment activity, commerce and distribution, and commuting patterns.

Figure 1: VICINITY MAP



Credits: Connect NCDOT GIS Resources (MPO/RPO, Road Data, Rail Division Data, TIP Data), New Hanover GIS Parcel Data, NCDOT ValMaps, Esri, HERE, DeLorme, MapmyIndia, © OpenStreetMap contributors, and the GIS user community.

1.1. The "Port City's" History of Growth

Wilmington was established in the mid 1700's as a port city. The City's river access and its location along the Eastern Seaboard of the U.S. contributed to its commercial success and expansion. The City was located near key commodities (pine tar, rice, and tobacco) that were the basis for thriving businesses at the time. The availability of skilled workers also contributed to the economic prosperity, which helped make Wilmington the most populous city in North Carolina until the early 1900's.

The Port of Wilmington (the Port) was created in the early 1950's on the site of former shipyards. Looking back, the Port offered employment opportunities, which consequently fueled the development of areas south of the City's downtown core, now known as Wilmington's "Greater Downtown area". Sunset Park, and other neighborhoods near the Port were established, in part, to house Port workers. The Port continues to serve as an impetus for community and economic development. The Port fosters growth in the industrial, trade, and transportation sectors of the local and state economy.

Today, the Port hosts vessels from around the world, allowing Wilmington and North Carolina to import from and export to global trade markets. The Port is located on the eastern bank of the Cape Fear River's 42-foot deep navigational channel, 26-miles from the Atlantic Ocean. Port operations encompass approximately 200-acres along with another 100 developable acres owned by the North Carolina State Port Authority (NCSPA) located north of the Port at the west end of Greenfield Street. The Port handles a mix of commodity types including containers, bulk and breakbulk, also known as general cargo. Major highways leading to Wilmington, and hence the Port, include U.S. Highways 421, 17, 74, 76, and Interstate Highways 40 and 140.

Another contributing component to Wilmington's transportation network came by way of rail service. Completed in 1840, the Wilmington and Weldon Railroad (or W&W) served Wilmington, the State's largest port city at the time, providing a rail connection that supported statewide commerce. The W&W was the longest freight rail line in the world in the 1840's (see Figure 2), spanning 161 miles northwest to Weldon, North Carolina on the banks of the Roanoke River near the Virginia border. The W&W connected trade centers from Wilmington to Goldsboro, Wilson, Rocky Mount and Weldon. Late in the 1800's the W&W became part of the Atlantic Coast Line Railroad (ACLRR), along with lines heading out of Wilmington west towards Florence, South Carolina. Along with service from the Seaboard Air Line Railroad (SAL), this made Wilmington a major transportation hub.

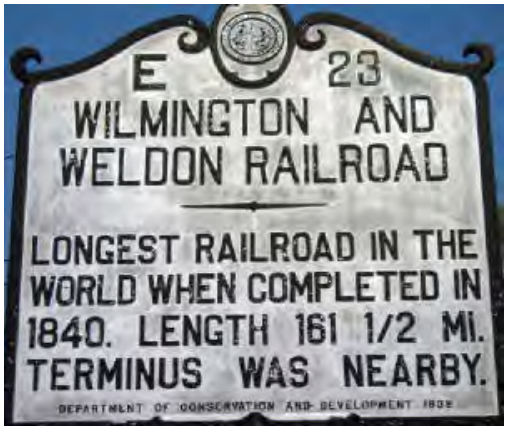


Figure 2: HISTORIC RAILROAD

As the City's economy expanded outward from its more urbanized core, so did the demand for better forms of transportation. By the early 1900's, Wilmington developed a mass transit system and streetcar-era suburbs emerged (see Figure 3). In 1925, there were 22 miles of streetcar lines serving the Wilmington area, including service between downtown and Wrightsville Beach, a distance of ten miles.

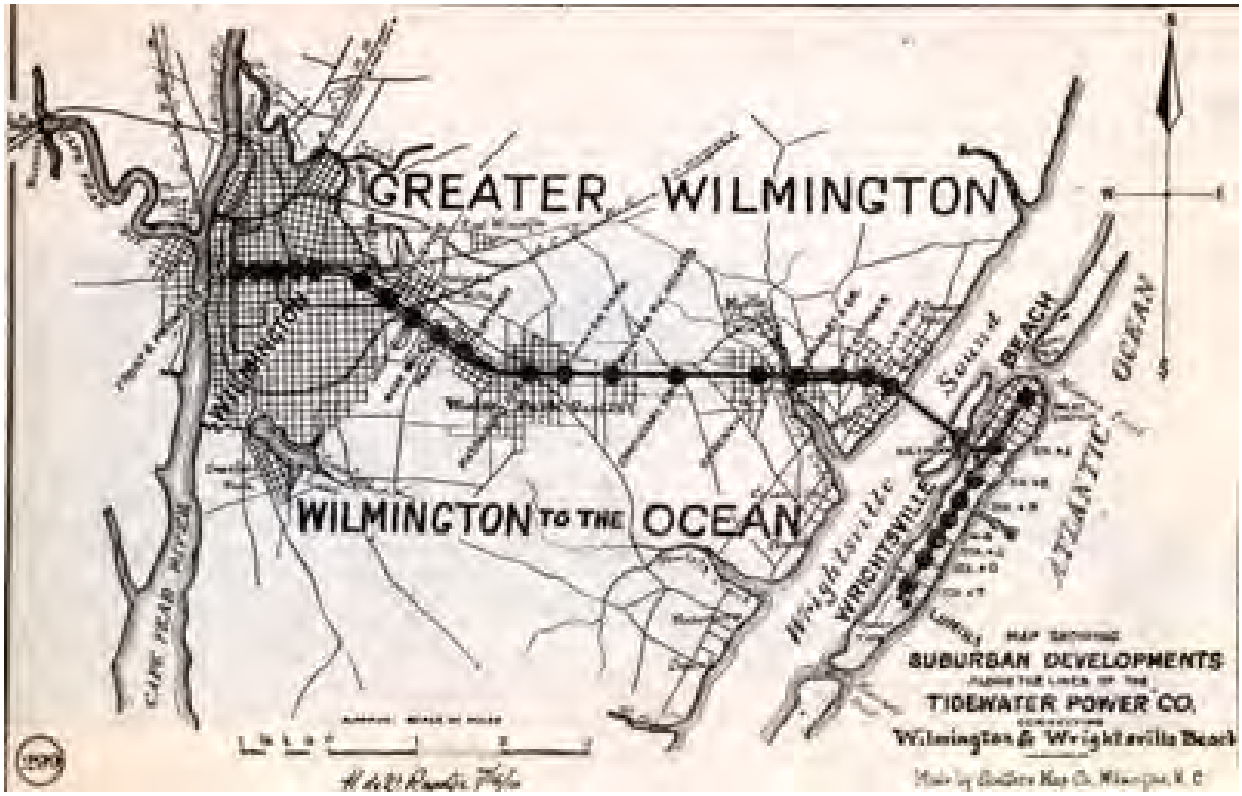


Figure 3: SUBURBAN DEVELOPMENT ALONG THE WILMINGTON & WRIGHTSVILLE BEACH STREETCAR LINE, prior to 1940.

2. Regional Context

People are drawn to Wilmington for many reasons including its character, cultural resources and attractions, educational institutions, job opportunities and retirement. Places of regional importance include downtown Wilmington, the Port, the Wilmington International Airport (ILM), UNCW, Cape Fear Community College (CFCC), New Hanover Regional Medical Center (NHRMC), and the NHRMC Orthopedic Hospital. In addition, many places of worship, recreational facilities, parks, community centers, and neighborhoods contribute to the area's quality of life. Regional growth is likely to increase the popularity and use of all of these places.

The Wilmington region is experiencing brisk growth, rebounding strongly since the global economic recession of 2008-2009. The labor market in Wilmington continues to grow and income levels continue to rise. U.S. Census Bureau data show the Wilmington Metropolitan Statistical Area (MSA) was the second fastest growing MSA in North Carolina in 2013. The total population in New Hanover, Brunswick, and Pender Counties in July 2015 was 401,700, according to the Office of State Budget and Management, and the projection is for annualized growth in this three-county region of approximately 1.5 percent per year. By 2036, another 150,000 people are anticipated to make the Wilmington region their home.

Wilmington's downtown historic district draws tens of thousands of local residents and tourists each year frequenting a wide array of restaurants, stores, entertainment, festivals, and other cultural events and locations. The readers of *USA Today* voted Wilmington the best al fresco dining in the country in 2015 and the best riverfront in 2014. Significant educational institutions located in Wilmington include the University of North Carolina at Wilmington (UNCW) and the Cape Fear Community College (CFCC). Attracting 45,000 students each year, these institutions offer a variety of learning opportunities from two-year degrees to graduate programs, as well as lifelong learning opportunities. The NHRMC and NHRMC Orthopedic Hospital provide vital health care services to residents of the City and southeastern North Carolina. Hospitals and supporting medical facilities employ over 6,000 people, including 500 physicians and 700 volunteers.

Currently, residents across the region rely mainly on automobiles for travel. Although current average regional commuting times are lower than in Atlanta or Charlotte, a post-recession surge in multi-family development is escalating traffic congestion in the City. This situation is anticipated to worsen if automobile dependence continues to grow disproportionately with the population, thus detracting from the quality of life in Wilmington. The present trajectory of traffic volume increasing relative to population growth is not sustainable and argues for alternative transportation systems.

Wilmington adopted a comprehensive plan to help the City meet future challenges, with a defining focus on facilitating changes in urban growth patterns. The *Create Wilmington Comprehensive Plan*, adopted in 2015, is a forward-looking plan that shapes a collective vision of the City's future with emphasis on mixed-use and transit-oriented development.

3. Community Context

For the purpose of this report, community context is described in various ways, such as in terms of:

- community assets
- demographic factors
- description of the populous residing and working within the study area
- ways in which individuals interact with one another, and
- quality of life.

The demographic data presented in this section provides a "big picture" look at the population characteristics within the study area. Detailed demographic information is presented in Appendix A.

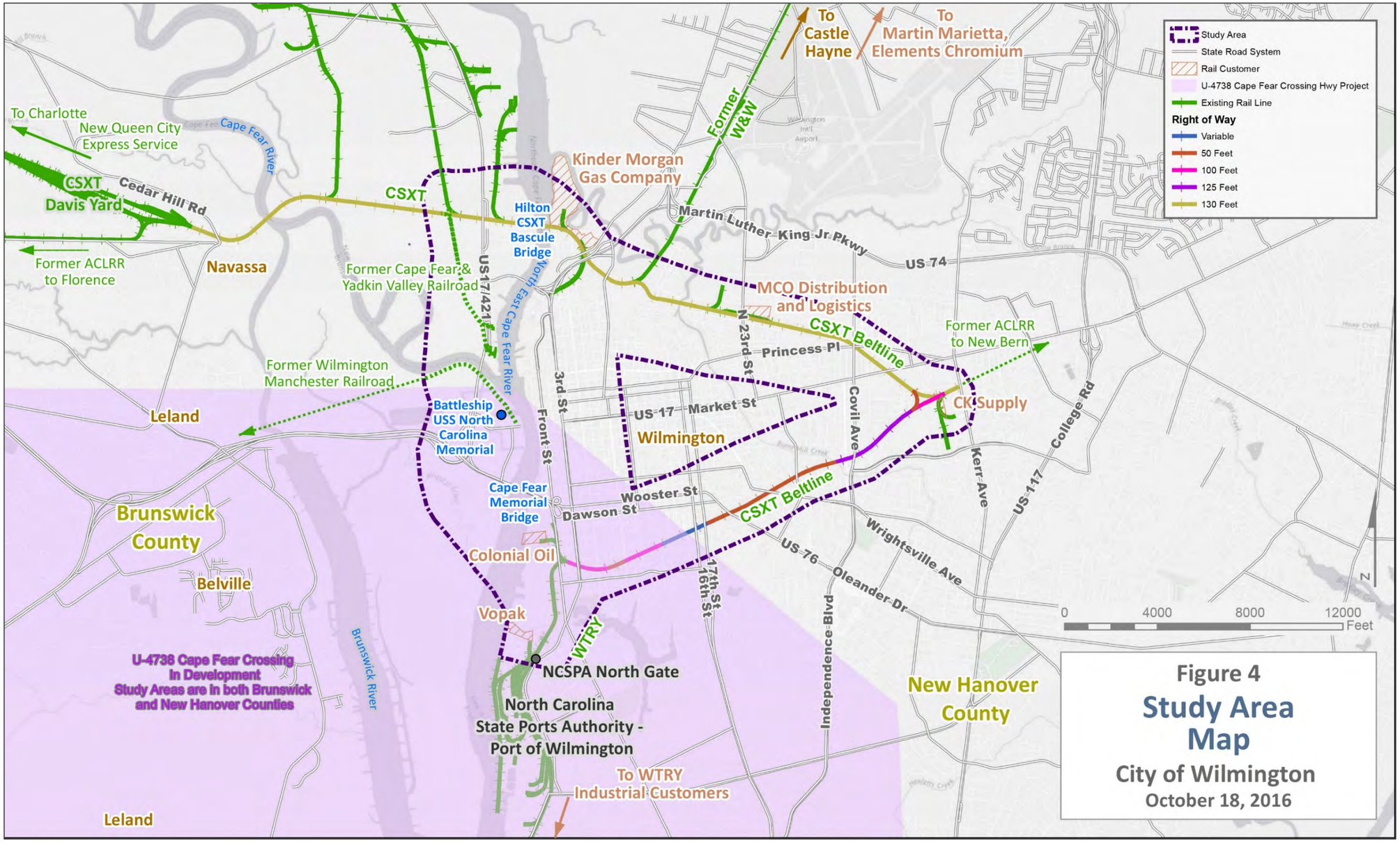
3.1. Study Area

The study area is comprised of a wide range of land use types, from the densely developed downtown urban core to uninhabited areas of Eagles Island that contain saltwater and freshwater marshes. The study area boundary (see Figure 4):

1. includes that portion of Eagles Island being considered to site a new freight rail corridor connecting the Port with the CSXT mainline east of Davis Yard in Navassa,
2. excludes portions of Eagles Island considered to be protected, e.g. land used by the U.S. Army Corps of Engineers to deposit spoils from river dredging operations, and
3. minimizes the number of river crossings as corridors are evaluated for a new freight rail line.

Within the City limits, the study area boundary meets the north gate of the Port surrounding both sides of the existing CSXT Beltline railroad. This boundary is drawn for the evaluation of a new trail and transit service on the Beltline corridor if CSXT freight service can be relocated to Eagles Island. A one-half mile study area lies on the urban side of the Beltline to include cycling as a means of transportation and a one-quarter mile study area falls on the suburban side. Along the south leg of the CSXT Beltline, there is a one-half mile study area extending north of the rail line (the urban side) and a one-quarter mile study area extending to the south (the suburban side). One-quarter mile represents the typical walking distance to a transit stop and therefore the area of most interest in evaluating a transit system. The study area includes north-south corridors in downtown Wilmington that currently do not have rails. The intent of including these corridors in the study area is to connect the north and south legs of the CSXT Beltline with trail and/or transit service. The resulting "hole in the donut" represents the portion of Wilmington that is too far from the possible transit line to reasonably study new transit-ready development.

Figure 4: STUDY AREA MAP



Credits: Connect NCDOT GIS Resources (Road Data, Rail Division Data, TIP Data), New Hanover GIS Parcel Data, NCDOT ValMaps, Esri, HERE, DeLorme, MapmyIndia, © OpenStreetMap contributors, and the GIS user community.

3.2. Community Assets

Within the community context, assets can take on various forms, including typically the built environment and its natural resources.

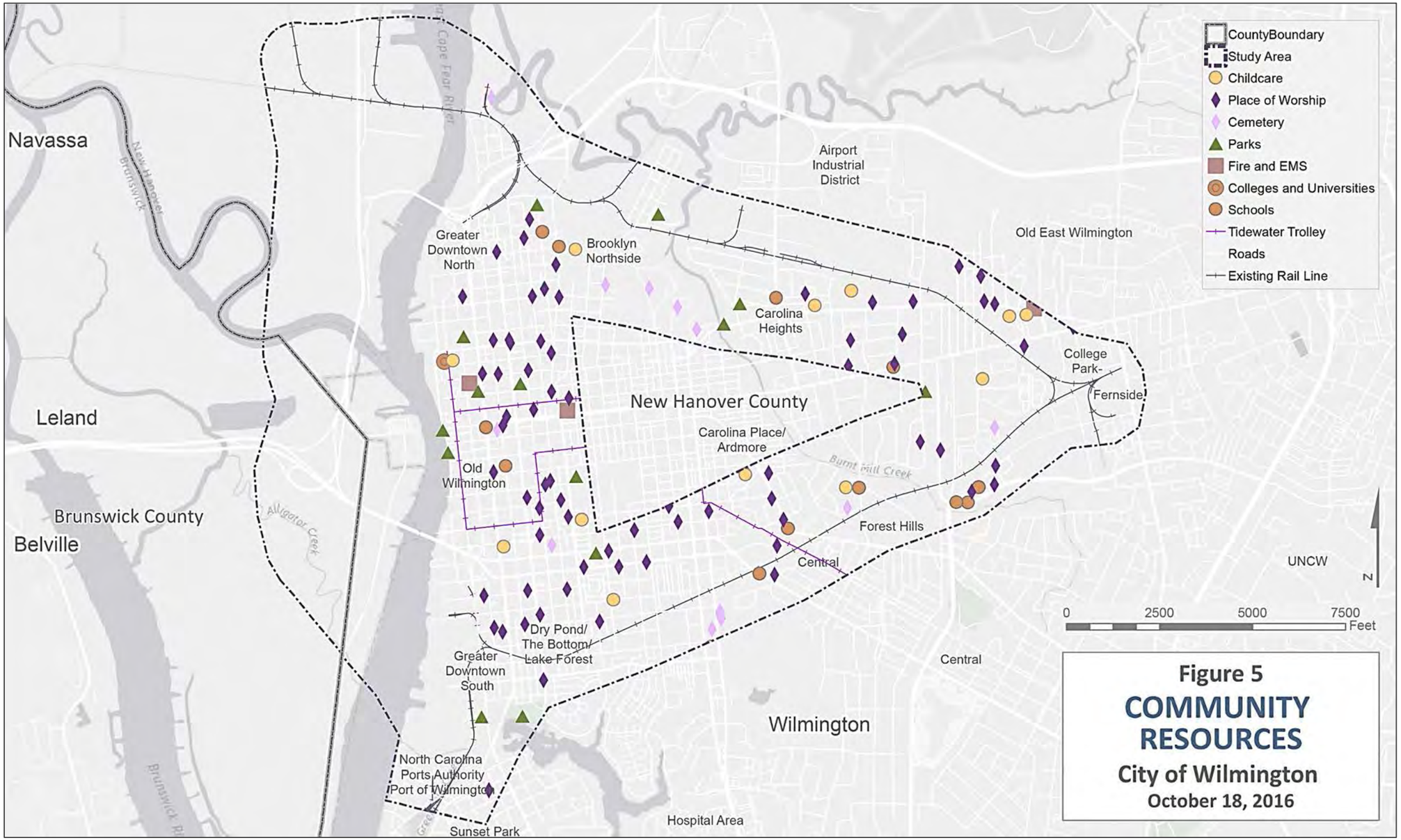
3.2.1. Built Environment

The built environment includes infrastructure that encompasses regional and local community resources, such as businesses, residential development, transportation networks, services and utilities, parks and recreational resources, cultural and religious resources, and other community gathering places. In the most general terms, the built environment represents the physical capital that sustains those residing and working within the City.

There are numerous community resources within the study area (see Figure 5). Some of these resources are in close proximity to the CSXT Beltline rail corridor. It is worth nothing that when it was built, the CSXT Beltline railroad skirted the City. Since then, as shown on Figures 1 and 4, the City and region have grown well beyond the rail line.

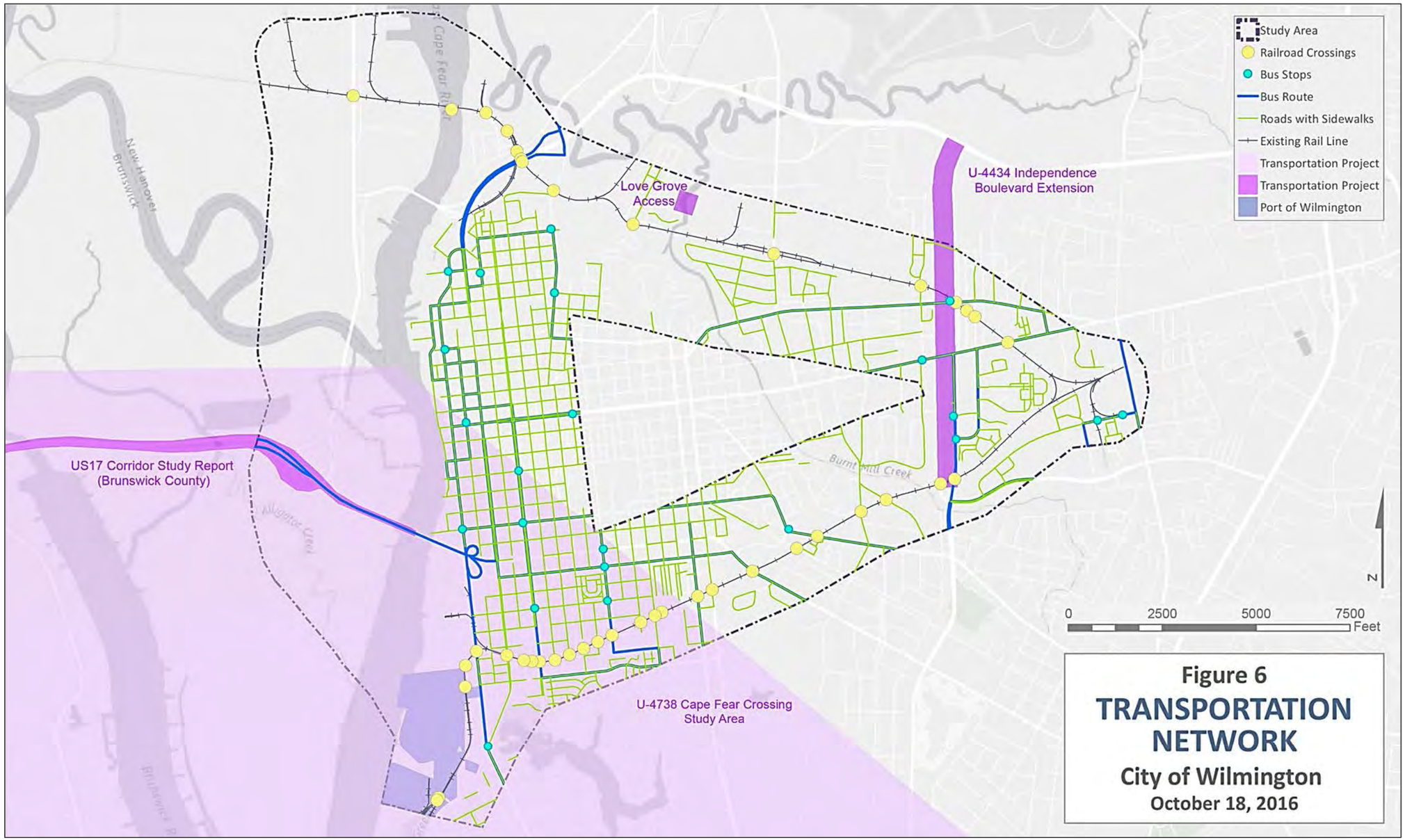
The transportation network consists of public streets and highways in addition to the CSXT Beltline (see Figure 6). The riverfront area is distinguishable as the prominent transportation node in the area. Wilmington's riverfront area has a well-developed network of sidewalks, accommodating greater access to downtown business, retail stores, and other places of employment, entertainment, and tourism. Figure 6 also highlights the existing Cape Fear Public Transportation Authority (Wave Transit) bus routes and bus stop locations.

Figure 5: COMMUNITY RESOURCES



Credits: New Hanover County GIS (Parcels), NCDOT (Roads, Rail), NCOneMap (Hospital, EMS, Fire Stations, Public Schools, Private Schools, Colleges and Universities) Esri (Background, Institutions Layer), HERE, DeLorme, MapmyIndia, Copywrite OpenStreenMap contributors, and the GIS user community.

Figure 6: TRANSPORTATION NETWORK



Credits: Esri, HERE, DeLorme, MapmyIndia, © OpenStreetMap contributors, and the GIS user community, NCDOT (rail, roads, TIP projects), New Hanover County (parcels, roads), Wave Transit.

3.2.2. Natural Environment

Natural resources, including the Cape Fear River, influence the development of Wilmington and contribute notably to the City's sense of place (see Figure 7). Resources integral to the functionality of the ecosystem in the study area include wetlands, tidal creeks, marshes, estuaries, and other wildlife and aquatic habitat. The area's natural resources also serve as prominent landmarks of Wilmington's beauty and heritage. Areas managed for natural resource conservation include the Cape Fear Royal Tract along the Cape Fear River in the northwest corner of the study area. It is a land trust conservation property valued for its wetlands, riparian habitat, primary fish nursery area and aesthetics.

Eagles Island, a 3,110-acre island situated between the Brunswick and Cape Fear Rivers, across from downtown Wilmington, has a fascinating history. As early as 1997, the *Cape Fear River Plan* recognized that Eagles Island is a wedge of open space in the midst of a rapidly urbanizing area. The uniqueness of the island spurred a coalition effort in 2010 that continues to function today to protect existing natural areas and to cultivate traditional cultural uses of the land deeply rooted in maritime, agriculture, and industrial applications. Some development has occurred in areas of the island suitable for infrastructure improvement. The eastern portion of Eagles Island is in New Hanover County, the remainder is in Brunswick County.

Eagles Island has been shaped by erosion during low tide and flooding during storms. The soils are a mixture of silt, clay and sand along with organic material from decomposing vegetation. Wetland plants filter sediment and help build wet flats. The surface has a thick black soft mud layer deeper than five feet. Peat deposits measure four to eight feet in depth. Marshes act as a sink for fine sediments and broken down plant debris, which assist in building up the land mass.

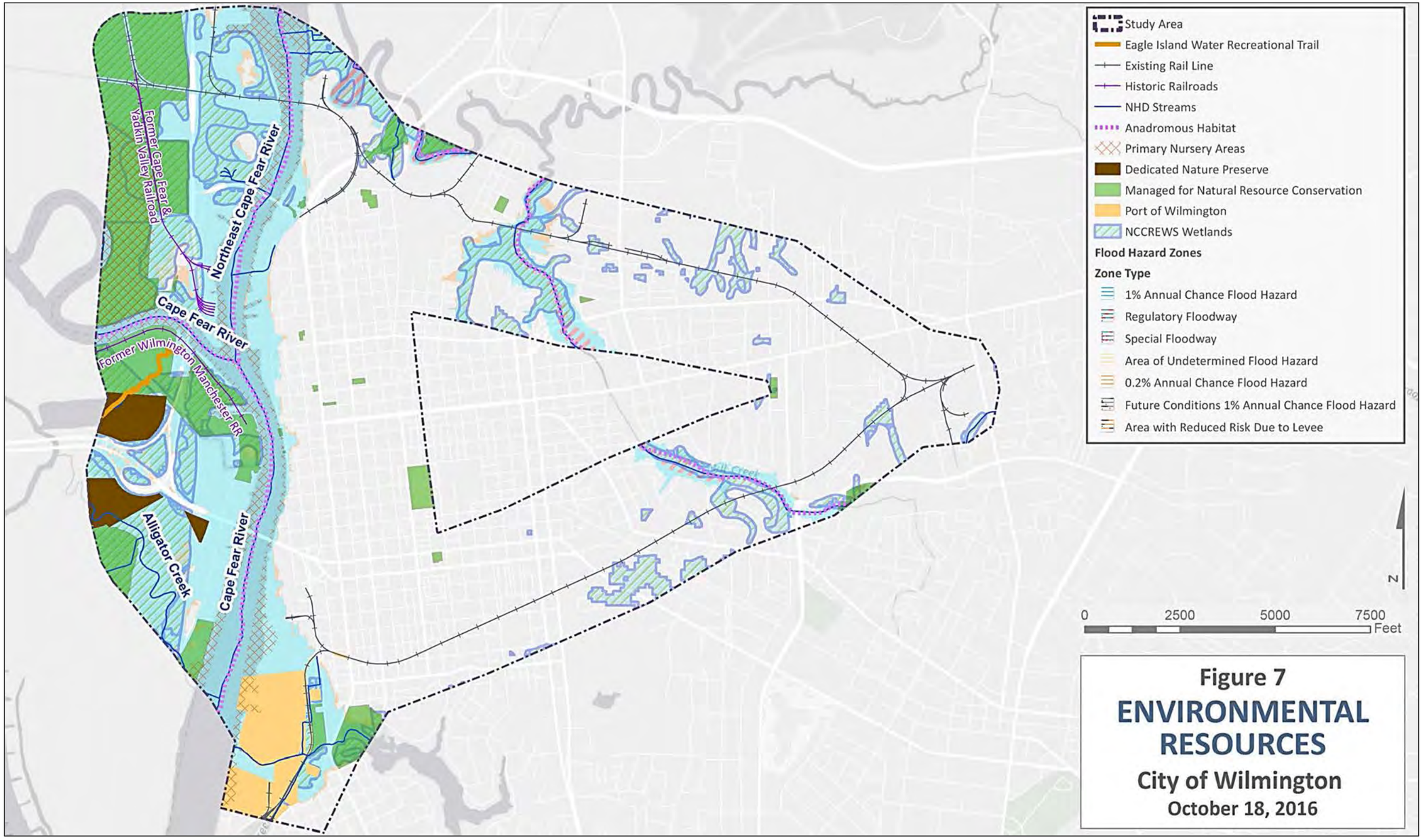
The extent of the community's effort aimed at enhancing, conserving, or maintaining the sustainability of Eagles Island is an indicator of community cohesion and contributes to the quality of life. The Eagles Island Coalition was formed with a Memorandum of Understanding in 2010 that seeks to bring private organizations together with federal, state, and municipal government agencies to coordinate actions that will protect, manage, and interpret the natural and cultural resources of Eagles Island in the public interest. In Wilmington, local advocacy groups and government work together to preserve and protect natural resources, which in many cases involve Wilmington's plentiful rivers, wetlands, and streams.

The Brunswick County *CAMA Land Use Plan* shows most of Eagles Island to continue to be held for conservation use in the future. The *Create Wilmington Comprehensive Plan* reflects a broad goal of environmental sustainability and stewardship at the core of the City's future; however, it is not a stated

goal for Eagles Island. The plan states "Wilmington's natural resources are a major factor in attracting residents and visitors to the area."

The successful management of natural resources are vital to the City's future environmental sustainability. Typically, the management of natural resources stems primarily from federal and state regulatory oversight. The City has taken the conservation of important natural resources a step further by framing conservation of natural resources as a core objective to be considered when making land use decisions.

Figure 7: ENVIRONMENTAL RESOURCES



Service Layer Credits: Esri, HERE, DeLorme, MapmyIndia, © OpenStreetMap contributors, and the GIS user community, NCOneMap (Primary Nursery Areas, Dedicated Nature Preserve, Managed Areas), NCDEQ Data (NCCREWS Wetlands), USGS Geospatial Data Gateway (NHD Streams), Eagle's Island Coalition (Wilmington and Manchester RR), SEACAP (Anadromous Habitat), New Hanover County GIS (parcels), NCDOT Rail Division Valmaps (Cape Fear and Yadkin Valley RR).

4. Community Cohesion

When assessing which indicators best represent a cohesive community, contributing factors to its social functionality must be considered. The natural and built environments as well as land use policies, cultural opportunities and opportunities for community engagement, often influence the magnitude of cohesiveness in communities. Signs of a strong sense of place are often evident through the investment of community resources including places of worship, parks, schools and the preservation of natural and cultural resources.

Community resources shown in Figure 5 serve Wilmington at-large and support a sense of belonging (or community cohesion). Another characteristic of a cohesive community are the wide variety of civic engagement initiatives aimed at improving the quality of life. Wilmington's municipal planning efforts are sustaining the ongoing revitalization of the downtown core area while preserving its historic legacy. Revitalization efforts have focused on strategies for enhancing neighborhood identity and for strengthening the downtown economy. Community engagement over a sustained period is a strong indicator of a cohesive community.

The *Create Wilmington Comprehensive Plan* identifies seven key themes that prioritize a heightened sense of community cohesion for the entire City. Those key themes are:

1. Creating a Place for Everyone
2. Getting Around
3. Regional Collaboration
4. Challenging Places, Revitalized Spaces
5. Unique Places, Captivating Spaces
6. Nurturing Our Community
7. Opportunity and Prosperity

Theme number two "Getting Around" aligns well with the actions being considered. Relocating the freight rail line would temper ongoing discussions about closing public streets at the rail crossings, therefore maintaining connectivity between neighborhoods, parks and other community places. It would also simplify the Independence Boulevard extension planned north of Market Street; changing it from an elevated highway to an at-grade street, which would greatly reduce the costs and impacts. Reusing the rail right--of-way as a path for non-motorized travel and as a transit travel corridor would increase transportation options, which may lead to the creation of unique places and captivating spaces.

Riverfront and downtown venues for community engagement and support of local commerce include shopping, the Farmers Market, and nightlife and cultural venues including the arts, dining, seasonal festivals, such as the Azalea Festival and Riverfest. The walkability of downtown Wilmington is an asset to those who reside, work and patronize downtown businesses and cultural venues.

5. Demographics

The demographic statistics in Tables 1 through 5 compare data for the study area with comparable information for Brunswick and New Hanover counties, the State of North Carolina and the United States. Detailed information is presented in Appendix A. New Hanover County reported slightly more than double the population of Brunswick County. The percent increase in population in New Hanover and Brunswick Counties between 2000 and 2010 is 26 percent and 47 percent, respectively.

As stated in the *Transit Needs Study for the Wilmington Multi-Modal Transportation Center*, the future location of employment and population density will be key factors in estimating the area's long-term transit needs. The most recent population data for the census block groups that comprise the study area represent year 2010 data (see Table 1). New Hanover and Brunswick Counties reported substantial population increases at growth rates that outpaced those of the State and the U.S. as a whole. Local government officials anticipate this trend continuing. They are implementing proactive measures to plan for future growth. It is noteworthy that leading up to 2010, areas within the study area grew at a much slower annualized growth rate than either county. However, since 2010, a surge in higher density multi-family housing, particularly near UNCW and in the downtown area, has dramatically changed the growth curves for the study area. Future transit-supportive redevelopment would likely occur at these higher density locations.

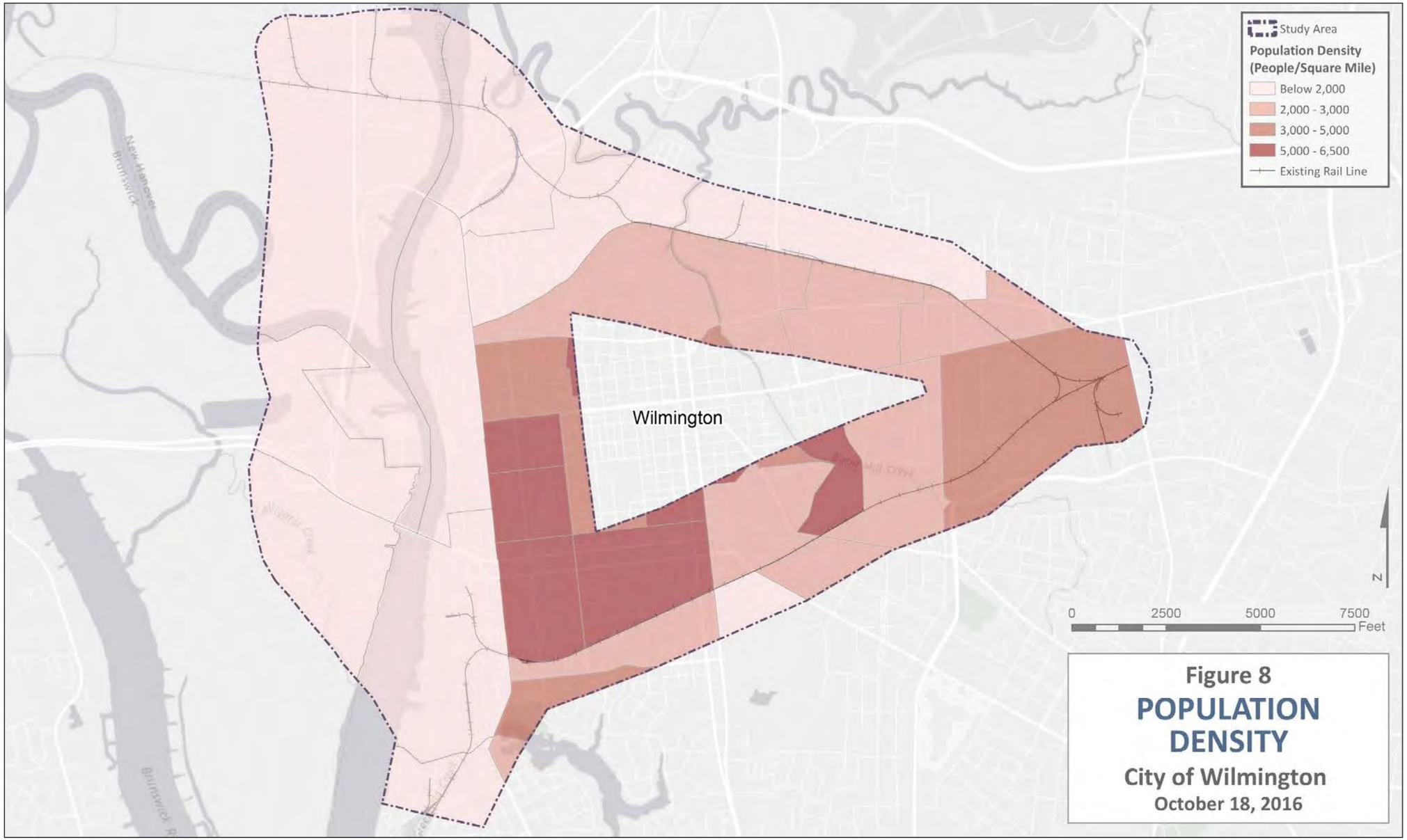
Table 1: POPULATION CHANGE

Geographic Location	Population 2000	Population 2010	Population Increase	Percentage Increase	Annualized Growth Rate
Study Area	40,461	43,223	2,762	6.8%	0.7%
Brunswick County	73,143	107,431	34,288	46.9%	3.9%
New Hanover County	160,307	202,667	42,360	26.4%	2.4%
North Carolina	8,049,313	9,535,483	1,486,170	18.5%	1.7%

Source: U.S. Census Bureau, Census 2010, and Census 2000, Summary File 1 100% Data, Table P1 and P001 "Total Population."

Figure 8 displays population density by census block.

Figure 8: POPULATION DENSITY



Service Layer Credits: US Census (2010 Census Blocks, Population), NCDOT (Rail) Esri, HERE, DeLorme, MapmyIndia, © OpenStreetMap contributors, and the GIS user community.

The percentage of the Black or African American population in the Brunswick County portion of the study area is greater than in New Hanover County (see Table 2). The majority of census blocks within the study area have populations with more than the statewide average of the non-white population (see Figure 9).

Table 2: POPULATION BY RACE

Geographic Area	White	Black or African American	American Indian and Alaska Native	Asian	Other Race
Study Area	59%	37%	1%	0%	1%
Brunswick County	84%	11%	0%	1%	2%
New Hanover County	81%	15%	0%	1%	1%

Source: U.S. Census Bureau, American Community Survey 5-year Estimates (2009-2013), Table B02001, "Race." Data averaged over a five-year period from 2009 to 2013.

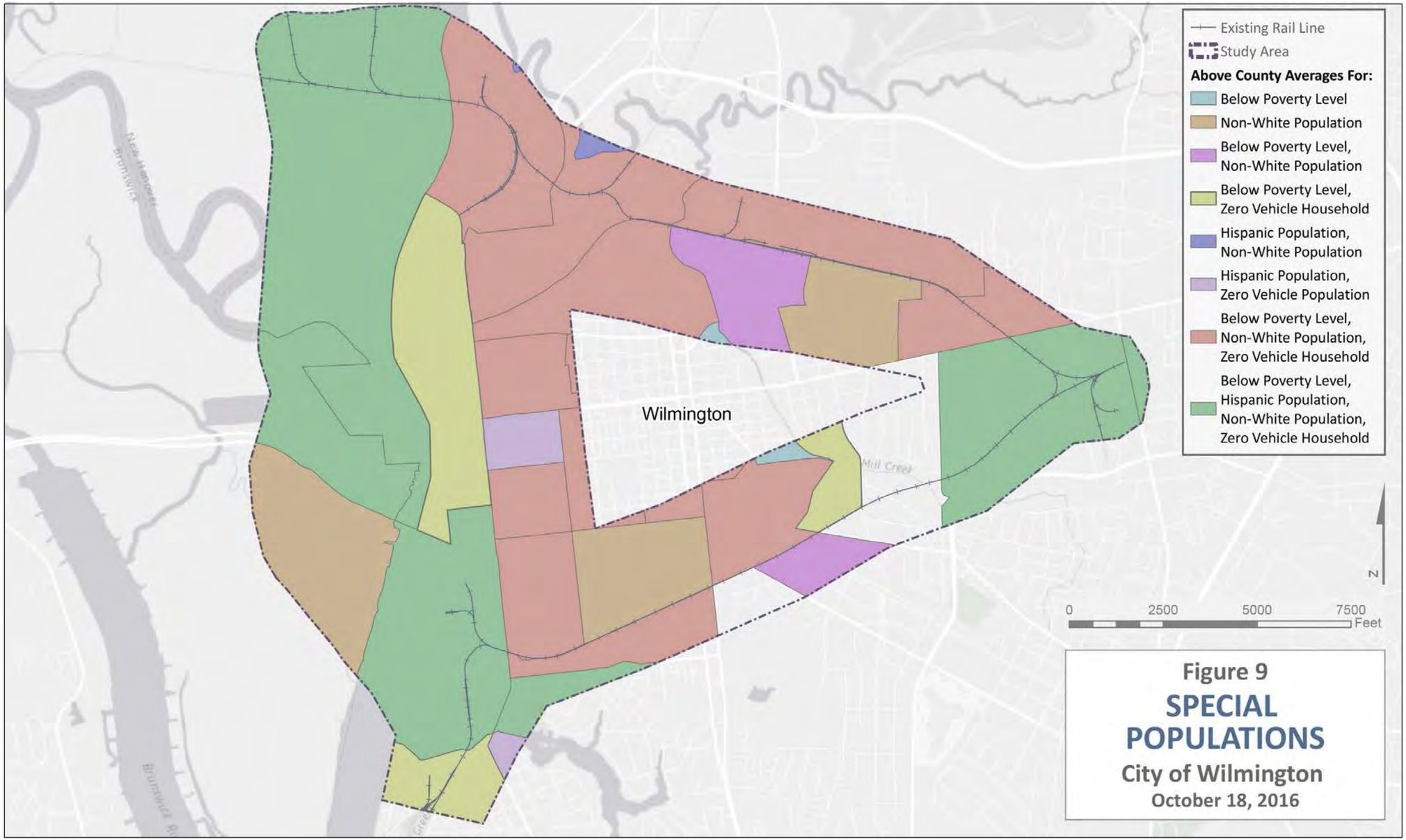
Poverty affects 13,075 people in the study area (see Table 3). In 2014, the national poverty rate was 14.8 percent. Only 13.5 percent of the total households (2,587) in the study area reported having no available vehicle. These statistics support the need for enhanced public transit to serve these households, providing better access to jobs and allowing for reduced transportation costs.

Table 3: POPULATION BY POVERTY STATUS

Geographic Area	Percentage of Population Below the Federal Poverty Level
Study Area	30.6%
New Hanover County	16.9%
Brunswick County	16.6%

Source: Five-year estimates, U.S. Census American Community Survey. Data averaged over five-year period from 2008 to 2013.

Figure 9: SPECIAL POPULATIONS



Service Layer Credits: US Census, American Community Survey, Esri, HERE, DeLorme, MapmyIndia, © OpenStreetMap contributors, and the GIS user community.

6. Land Use and Mobility

The movement of freight in and out of Wilmington is a lifeline for the distribution of goods throughout North Carolina and the mid-Atlantic region. The transportation routes used to move goods to and from the Port are essential to its commercial success. The Port's commercial success and the region's growth have led to increased economic prosperity, but with that benefit comes an increase in traffic congestion. Safety concerns have led to studies of strategies to enhance public safety at rail-highway at-grade crossings. The *Cape Fear Transportation 2040* plan identifies fourteen freight rail improvements in Wilmington, some of which would reduce car-train conflicts at crossings. The City's Traffic Engineering Division estimates that there are no fewer than 180,000 daily vehicles crossing CSXT in the City.

7. Land Use Now and In the Future

Within the study area, land use ranges from rural to urban core (see Figure 10). As identified in the *Brunswick County CAMA Land Use Plan* more than 50 percent of Eagles Island is designated as natural conservation area.

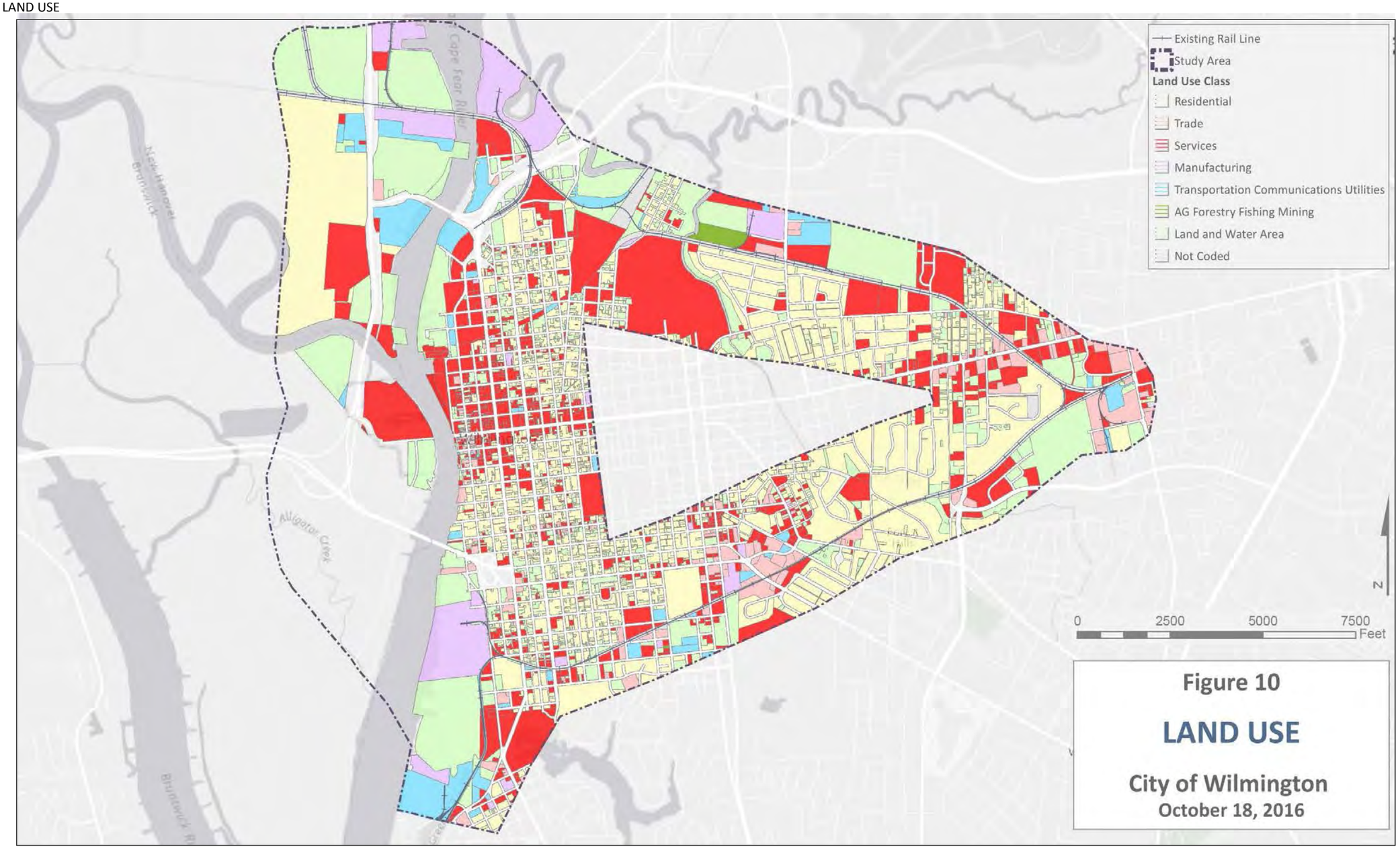
Relocation of the freight rail corridor from the City's urban core to Eagles Island would change the land use within the new rail corridor to a transportation use if the rail relocation were implemented. The use of land adjacent to such a rail corridor may be subject to change if sites suitable to rail-served industrial development are identified by developers and are available for sale and redevelopment. Many of the parcels on Eagles Island designated as conservation areas on the *Brunswick County Future Land Use Map* are protected by conservation easement. More research is underway and will be described in detail in the forthcoming Environmental Conditions Report.

The City's downtown urban core is one of the most important areas in the region. It is a vibrant mix of new and old residential developments and neighborhoods, entertainment, retail and restaurants, hotels, office and service oriented business centers. Portions of the study area along the CSXT Beltline may be appropriate for transit-oriented redevelopment. Commercial buildings particularly on the south side of the City that are currently vacant or underutilized, should be considered.

Land development is best supported by multi-modal travel when municipalities develop land use policies that plan for higher density development. Building on the concept and strategies of *Create Wilmington Comprehensive Plan*'s Growth Strategies Report, a framework for future growth based on urban mixed-use principles is provided. Future development within the study area, assuming implementation of the mixed-use trail and transit system, would likely consist of redevelopment of parcels to higher densities and mixed-use infill development. Recent implementations of this strategy include numerous mid-rise residential towers, the approval of a new hotel next to the City's convention center, and consideration of a proposal to redevelop the Water Street parking deck with a mixed-use high-rise. With the opportunity

for infill development and redevelopment within the study area comes the need to minimize increases in vehicular traffic. Strategies to limit additional parking associated with new development will be an important next step when a mixed-use trail and transit system are implemented.

Figure 10: LAND USE



Service Layer Credits: ESRI, HERE, DeLorme, MapmyIndia, © OpenStreetMap contributors, and the GIS user community, New Hanover County GIS (Land Use), NCDOT (Rail).

Many of the objectives of the *Create Wilmington Comprehensive Plan* resonate with previous Wilmington land use studies, including the *Wilmington's Choices - Future Land Use Plan*, *2004-2015*, and the *Wilmington's Visions 2020: A Waterfront Downtown p*lan.

The *Create Wilmington Comprehensive Plan* defines key points that include:

> ***"Wilmington should focus on growing inward and upward, integrating land uses to reduce traffic congestion and improve housing, working, and shopping options. A more densely developed, walkable city can be achieved while maintaining the integrity and desired character of the city's neighborhoods."***

The Wilmington Vision 2020: A Waterfront Downtown plan balances the preservation of community character and natural resources with economic development. Some of the main points include the promotion of more efficient development patterns, an increased emphasis on economic development, and infrastructure development that connects the businesses and communities in the downtown area.

An identified growth strategy in the *Create Wilmington Comprehensive Plan* supports strategic connections to residential and employment areas so as not to increase traffic congestion. The City's existing grid-type street pattern aligns with this strategy. This pattern allows for the designation of parallel streets to primarily serve one or another travel mode. For example, Front Street could continue to be pedestrian-oriented while 2nd Street might be a bicycle boulevard, 3rd Street could continue to function as the spine in the skeletal street network for moving motor vehicle traffic, and 4th Street might become a transit-first corridor with new transit service.

Research suggests that property within walking distance of a transit stop generally holds its value or realizes significant increases in value because of the enhanced benefits of transportation service and choices. Businesses typically benefit from transit investment because of enhanced accessibility and easier access to a larger labor pool.

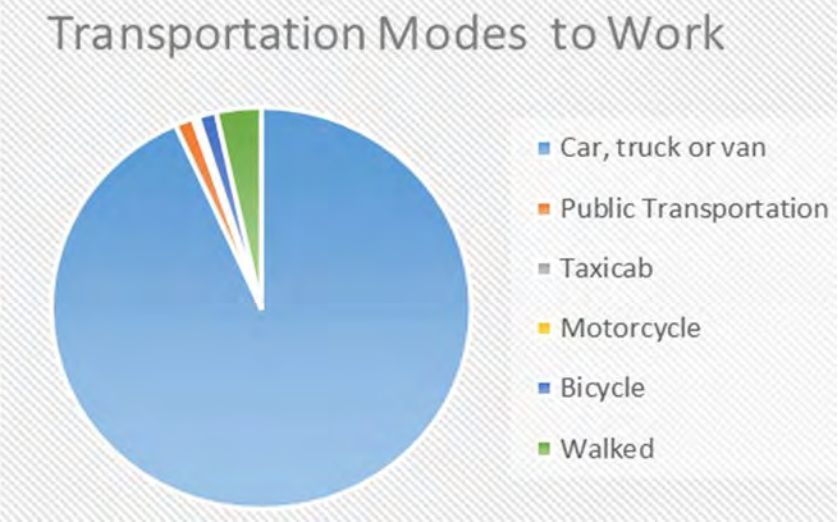
8. Mobility

Wilmington is supported by a robust multi-modal transportation network making it accessible to residents, business travelers and tourists. This network includes river traffic, airline travel, freight rail lines, major streets and highways, local streets, public transit, bikeways, trails and greenways, and sidewalks. The Wilmington International Airport (ILM) is located north of downtown and is operated by the New Hanover County Airport Authority. Railway transportation is solely freight movement and is provided by CSXT, a Class 1 railroad in corridors that are wholly owned by the private railroad. The Wilmington Terminal railroad handles the interchange of freight cars between the Port and CSXT. The interstate system supporting Wilmington is I-40 and I-140. Other major routes supporting the City are US Highways 17, 74, 76 and US 421. (See Figure 6). Public transportation in Wilmington is provided by the Cape Fear Public

Transportation Authority or Wave Transit. Fixed-route and on-demand bus and van service is ADA-accessible and serves the region. Wave Transit also offers shuttle and a rubber-tire trolley service in the downtown area.

Figure 11 illustrates the various modes of transportation used by people who work within the study area. Wilmington's well established downtown area serves as a transportation hub, with transportation service provided by Wave Transit bus line, taxis, cars, trucks and vans. Most downtown streets have sidewalks to accommodate pedestrians.

Figure 11: MODES TO WORK



Source: U.S. Census

When compared with other southeastern U.S. cities that either have rail transit or are in the development stages, Wilmington's population density per square mile is comparable to Charlotte, North Carolina and greater than Virginia Beach, Virginia and Savannah, Georgia (see **Error! Reference source not found.**).

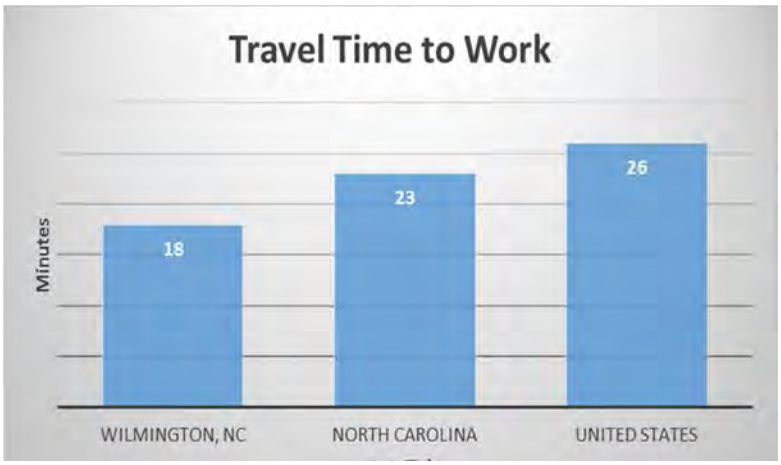
Table 4: POPULATION DENSITY

Southeastern Cities in the U.S.	Population Per Square Mile
Wilmington, North Carolina	2,070
Charlotte, North Carolina	2,460
Virginia Beach, Virginia	1,760
Savannah, Georgia	1,320

Source: QuickFacts data are derived from: Population Estimates, American Community Survey, Census of Population and Housing, Current Population Survey.

The 2014 U.S. Census reported that the median travel time to work for those residing in Wilmington was 18 minutes (see Figure 12). Residents of who travel to work do so in less time than the rest of the state's commuters and the nation, on average. The average commute time reported in North Carolina and the nation was 23 minutes and 26 minutes, respectively.

Figure 12: TIMES TO WORK



Source: U.S. Census, QuickFacts data.

The *Create Wilmington Comprehensive Plan* adopted in 2016 included a stated objective to increase the use and effectiveness of alternative transportation modes including transit. The plan objectives supported land use strategies that support the reintroduction of passenger rail service to the region. The land use plan also stated that alternative modes of transportation including walking, bicycling, and public transportation, currently only comprise a small share of commute trips. This statement is supported by census data from 2010 to 2015 estimating that approximately 1.3 percent of the City's residents used public transit as a means of transportation to work (see Table 5).

Table 5: TRANSPORTATION MODES, COMMUTE, CITY OF WILMINGTON

Modes of Transportation	Percentage
Car, truck, or van	86.2%
Public transportation	1.3%
Walked	3.2%
Worked at home	6.2%
Other modes	2.9%

Source: Five-year estimates from surveys in 2010 to 2015, U.S. Census American Community Survey. Does not total 100 percent due to rounding.

Policies in the *Create Wilmington Comprehensive Plan* call for the enhanced connectivity between people, businesses and communities. This call includes a focus on regional connectivity as well as local initiatives to improve connection between neighborhoods and parks via the City's network of trails, greenways, and multi-use paths. The proposed transit system, if implemented, would be expected to provide more connectivity to local parks, work places, and the community at large.

The City has prioritized transportation projects to enhance Wilmington's network as part of a $44 million transportation bond referendum supported by voters in November 2015. Proposed infrastructure improvements on a state and federal level include the study of the Independence Boulevard Extension that is located in the study area (see Figure 5). The purpose of the proposed extension is to improve north-south connectivity between major routes and shift some motor vehicle traffic away from residential streets. NCDOT asserts that the Independence Boulevard would improve connectivity between the Port, ILM, UNCW, and I-40. As conditions are today, the design of the proposed extension includes an interchange at Market Street and two raised crossings over CSXT tracts. These rail crossings substantially increase construction costs. Funding for the project's construction is anticipated to be included in the 2018 – 2027 State Transportation Improvement Program, however, the Wilmington City Council is on record as being opposed to an elevated Independence Boulevard Extension. Recent federal policy initiatives are in direct opposition to the creation of new separated grade expressways through neighborhoods in favor of at-grade facilities.

9. Current Economic Trends

This section assesses economic trends and how the movement of people and goods shaped the study area and its local economy.

10. Regional Employment Growth and Labor Statistics

Business and government officials have taken a coordinated approach in preparing North Carolina for the demands of an increasingly competitive globalized economy. This drives growth across all sectors, and enhances the State's abilities to attract and retain business and industry. As part of this approach, New Hanover and Brunswick Counties have been designated to be a part of the Southeast Prosperity Zone. Other southeastern North Carolina counties in this zone include Carteret, Craven, Duplin, Greene, Jones, Lenoir, Onslow, Pamlico, Pender, and Wayne. Though its demographics mirror those of the state as a whole, the Southeast zone is distinguished by its faster-growing economy, according to the North Carolina Department of Commerce (N.C. Commerce). Furthermore, a Foreign Trade Zone is established at the Port of Wilmington to foster business growth that involves imports and exports through the Port.

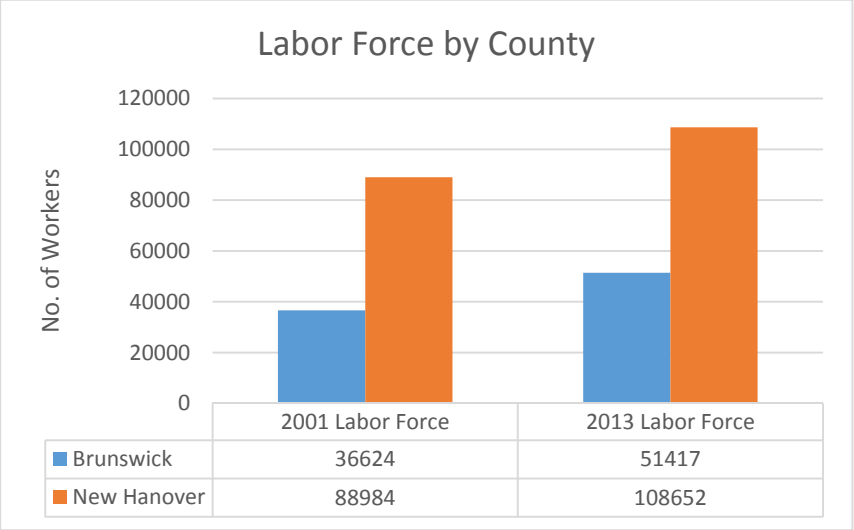
Table 6 and Figure 13 illustrate the increase in the labor force in both Brunswick and Hanover Counties over the past decade. In May of 2016, Wilmington reported 59,966 individuals in the labor force.

Table 6: CHANGE IN NUMBER OF WORKERS

Geographic Location	Percentage Change from 2001 to 2013
Brunswick County	40.40%
New Hanover County	22.10%
Southeast Prosperity Zone	17.30%
North Carolina	12.70%

Source: Local Area Unemployment Statistics (LAUS), LEAD, N.C. Department of Commerce; N.C. Office of State Budget and Management.

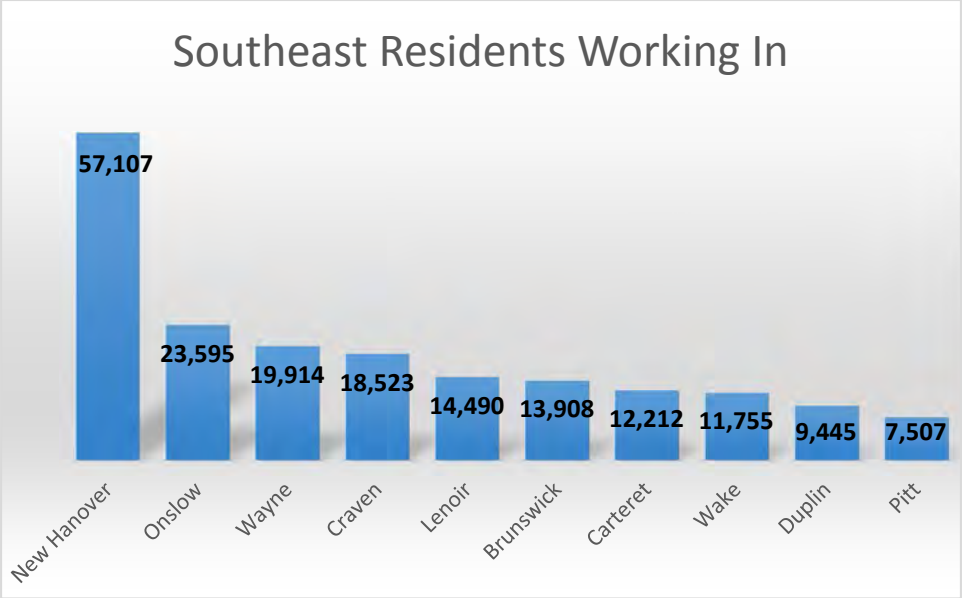
Figure 13: LABOR FORCE, 2001-2013



Source: LAUS, LEAD, N.C. Department of Commerce; N.C. Office of State Budget and Management.

Brunswick County has experienced a greater percentage of growth in the labor force between 2001 and 2013, while New Hanover County has realized a larger increase in the number of workers. The City represents a prominent employment node in the Southeast Prosperity Zone and within the project study area. In 2011, more than 22 percent of workers that reside in the Southeastern Prosperity Zone, which consists of a twelve county area, work in New Hanover County, and Wilmington at large (see Figure 144).

Figure 14: EMPLOYEE COMMUTE



Source: OnTheMap, Longitudinal Employer-Household Dynamics (LEHD), U.S. Census Bureau.

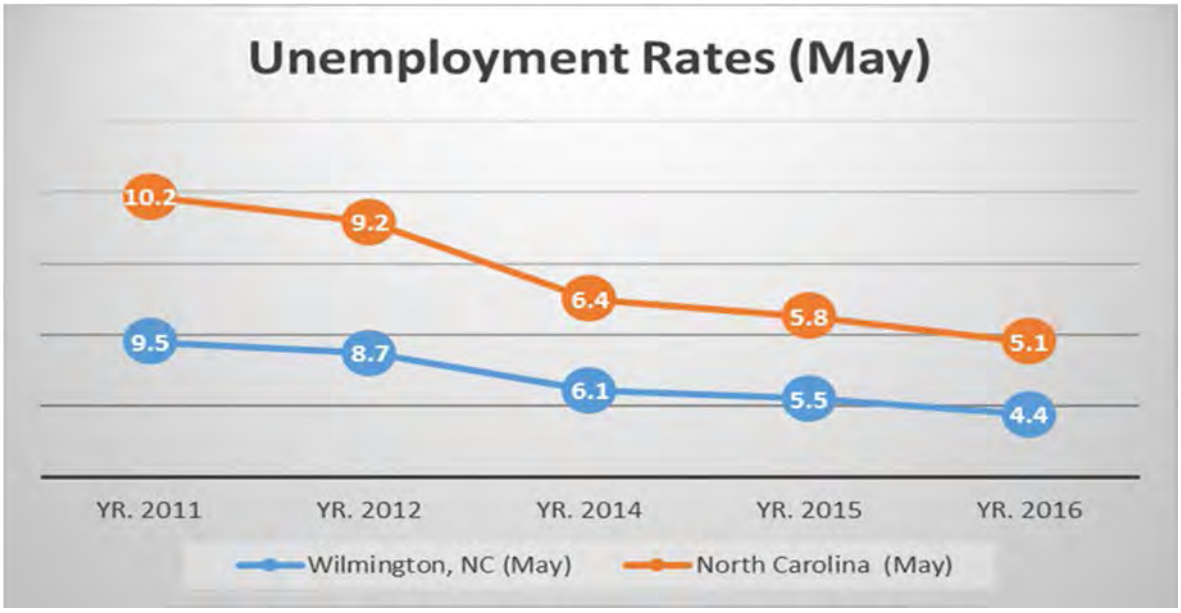
According to the Bureau of Labor Statistics, Wilmington's rate of unemployment in the month of May, over the span of five years, has consistently been below the national unemployment rate (see Table 7 and Figure 15).

Table 7: UNEMPLOYMENT PERCENTAGES (2006-2016)

Geographic Location	May 2011	May 2012	May 2014	May 2015	May 2016
Wilmington	9.5%	8.7%	6.1%	5.5%	4.4%
North Carolina	10.2%	9.2%	6.4%	5.8%	5.1%

Source: U.S. Department of Labor, Bureau of Labor Statistics.

Figure 15: UNEMPLOYMENT RATES



Source: U.S. Department of Labor, Bureau of Labor Statistics.

The City has a diverse economy. The Wilmington Chamber of Commerce notes that economic mainstays include: tourism, contract research organizations, finance, retail, service, construction, education government, arts, and manufacturing. According to the Wilmington Business Development website, Wilmington's largest employers include the City itself, NHRMC, New Hanover County School System, UNCW, PPD, Cellco Partnership, Wal-Mart, CFCC, New Hanover County, General Electric-Hitachi Nuclear Energy, and Corning.

11. The Port of Wilmington

The U.S. Southeast region is highly competitive in terms of port facility services and is served by five ports: the Port of Virginia, the Port of Charleston, the Port of Savannah, the Ports of Morehead City and Wilmington in North Carolina. Further south are the Florida ports including Jacksonville, Tampa and Miami. These facilities compete for cargo regionally. Essential to the ports' ability to compete on a regional scale is the efficiency of freight movement by rail. Most of the competing ports in the southeast region have access to two Class 1 railroads, while NC ports do not. Due to other Southeast region port facilities having the benefit of stronger rail connectivity, the Port of Wilmington's markets have historically been primarily within the state. Until recently, the neighboring-state ports have served as primary gateways for container freight into the southeast region. To remedy this situation, recent negotiations with CSXT and recent infrastructure improvements have been completed with the purpose of improving the container throughput at the Port. The upgrades allow greater capacity to handle larger volumes of containers used for shipping commodities. These improvements benefit the Wilmington area and the State of North

Carolina in marketing products globally. The Port of Wilmington can now handle very large container vessels as demonstrated by its hosting ships in 2016 that measure approximately 1,100 feet in length and 150 feet in width.

The NCDOT recognized the potential benefits of improving the supply chain and distribution network between market and State ports in its *Seven Portals Study* (2011). It will be important for the region's economic competitiveness to consider measures that may increase the accessibility of freight traffic to the Port, such as the proposed realignment of rail outside the more urbanized areas of Wilmington. The proposed relocation of a critical freight line that supports the Port would be expected to improve the efficiency of egress and ingress, by providing more direct rail access to the Port. When considered together as a network of trade, the North Carolina ports of Wilmington and Morehead City, plus inland terminals in Charlotte and Greensboro, linked to these ports by freight rail, provide a vital connection between the State's consumers, businesses, industry and the world market. According to the NCDOT, this network contributes statewide to 76,000 jobs and $700 million each year in state and local tax revenue.

The CSXT freight rail line enters New Hanover County across the Cape Fear River from Brunswick County before winding its way more than 10 miles through the City before entering the Port of Wilmington. The current freight rail line runs through the urbanized area of Wilmington includes approximately 36 at-grade rail crossings on local roads within Wilmington communities (see Figure 5), and many of these are at a skew angle. Angled railroad crossings create sight restrictions because motorists must turn their heads more than 90 degrees to see oncoming trains. Due to the safety concerns associated with vehicle or pedestrian/train contact at at-grade crossings, federal-aid funds have been authorized by Congress to assist NCDOT in assessing the possibility of crossing-safety improvements, including in some cases the closure of public and private streets to eliminate such crossings. Currently, the NCDOT is evaluating the railroad crossings in Wilmington to assess the need for improvements at select crossings. The City, NCDOT, the WMPO, and CSXT are collaborating on the *Wilmington Traffic Separation Study* to evaluate all roadway/rail crossings in the City.

12.Tourism

According to North Carolina Department of Commerce, tourism spending in the Southeast Prosperity Zone was just shy of $2B and employed some 19,000 people in 2013. Illustrating just how important tourism is to Wilmington, the retail trade, accommodation, and food service industries are responsible for one out of every three private sector jobs in the region.

In New Hanover County, the economic impact of tourism in 2014 (using the most recent data available) was estimated at $507.9M, a 6.3 percent increase over the prior year. New Hanover County ranks as the eighth largest among North Carolina's 100 counties in tourism expenditures. It is estimated that travel and tourism provide more than 5,680 jobs in New Hanover County and supports a payroll of $113.27M.

Between 2008 and 2013, taxable retail sales increased by 11 percent in the Southeast zone, which is twice the statewide rate.

13.Sources and References Cited

2010 United States Census.

American Public Transportation Association: *A Profile of Public Transportation Passenger Demographics and Travel Characteristics Reported in On-Board Surveys*, Washington, D.C. May, 2007.

Booz Allen & Hamilton Inc., *Impacts of Rail Transit on Property Value*, Roderick B. Diaz. http://reconnectingamerica.org/assets/Uploads/bestpractice083.pdf, accessed on 8/31/2016.

Brunswick County, *CAMA Land Use Plan*, adopted 10/15/2007.

City-data.com, Wilmington, North Carolina, http://www.city-data.com/city/Wilmington-North-Carolina.html, last accessed 8/31/2016.

City of Wilmington, *Create Wilmington Comprehensive Plan*, adopted May 1, 2016

City of Wilmington, *The Economic and Community Development Opportunities of Rail Realignment in Wilmington, NC, Federal State and Regional Interests*, Glenn R. Harbeck, AICP, Director of Planning, Development and Transportation, City of Wilmington, April 28, 2015, Updated through December 22, 2015.

City of Wilmington, *Wilmington Vision 2020: A Waterfront Downtown*, adopted December 14, 2014.

City of Wilmington, *Choices – The Wilmington Future Land Use Plan 2004-2025*, adopted September 7, 2004.

City of Wilmington, Wilmington Multi-Modal Transportation Center, May, 2009.

Eagles Island Coalition, Memorandum of Understanding, Approved 11/03/2010, http://eaglesisland.org/EIC%20MOU%20with%20Sig%20Pages%2008.05.15.pdf, accessed on 09/09/2016.

New Hanover Soil and Water Conservation District and Cape Fear Resource Conservation & Development, Inc., *Eagles Island: A History of a Landscape*, July 2011.

New Hanover County Commission/City of Wilmington Economic Development Strategy Steering Committee, *Pathways to Prosperity: New Hanover County's Plan for Jobs and Investment*, March 27, 2014.

North Carolina Department of Commerce, Southeast Prosperity Zone, https://www.nccommerce.com/about-our-department/north-carolina-prosperity-zones, accessed on 8/31/2016.

North Carolina Department of Commerce, Labor and Economics Analysis Division, *2014 Data Book, Prosperity Zone Regional Snapshots, Southeast Region,* PowerPoint, https://www.nccommerce.com/lead/research-publications/regional-economic-labor-market-information/prosperity-zone-data-books/southeast-region, accessed on 8/31/2016.

North Carolina Department of Cultural Resources/Office of Archives and History, http://www.learnnc.org/lp/editions/nchist-antebellum/4885, accessed on 8/29/2016.

North Carolina Department of Transportation, Independence Boulevard Extension project description, https://www.ncdot.gov/projects/independenceblvd/, accessed on 8/31/2016.

North Carolina Department of Transportation (2), North Carolina Ports Welcome Largest Ever Container Ship to Port of Wilmington, https://apps.ncdot.gov/newsreleases/details.aspx?r=12709, accessed on 8/31/2016.

North Carolina Department of Transportation and Governor's Logistics Task Force, *Seven Portals Study, An Investigation of How Economic Development Can Be Encouraged in North Carolina Through Infrastructure Investment*, George F. List, Ph. D,,P.E., Department of Civil Construction and Environmental Engineering, North Carolina State University, December 31, 2011.

North Carolina State Ports Authority, *Economic Contribution of the North Carolina Ports*, Institute for Transportation Research and Education, North Carolina State University, Swain Center for Business and Economic Services, Cameron School of Business, University of North Carolina Wilmington, November 17, 2014.

Environmental Engineering, North Carolina State University, December 31, 2011.

North Carolina State Ports Authority, http://www.ncports.com/port-of-wilmington/.

Environmental Engineering, North Carolina State University, December 31, 2011.

North Carolina State Ports Authority, *Draft Port of Wilmington and Morehead City Feasibility Study*, October, 2012.

Star News Online, http://www.starnewsonline.com/news/20150209/wilmington-mayor-outlines-state-of-the-city-and-looks-to-the-future, accessed on 8/31/2016.

U.S. Chamber of Commerce, Tracing the Origins of Wilmington, North Carolina's Revamped Economy, https://www.freeenterprise.com/tracing-the-origins-of-wilmington-north-carolinas-revamped-economy/, accessed on 8/31/2016.

U.S. Department of the Interior, National Park Service, National Register of Historic Places.

Wilmington and Weldon Rail Road History, http://thomaslegion.net/wilmington_and_weldon_railroad_history.html, accessed on 8/29/2016.

Wilmington Urban Area Metropolitan Planning Organization, *Cape Fear Transportation 2040, A Metropolitan Transportation Plan*, November 18, 2012.

14. Appendix A: Demographic Data

Table A.1: POPULATION CHANGE 2000 to 2010

Geography 2000 CT= census tract BG= block group	Geography 2010	2000	2010	Difference	Percent Change	Annualized Growth Rate
CT 101, BG 1	CT 101, BG 1	896	995	99	11.0%	1.1%
CT 101, BG 2	CT 101, BG 2	717	790	73	10.2%	1.0%
CT 101, BG 3	CT 101, BG 3	1,105	727	(378)	-34.2%	-4.1%
CT 102, BG 1	CT 102, BG 1	630	1,085	455	72.2%	5.6%
CT 102, BG 2 and CT 102, BG 4 and CT 102, BG 5	CT 102, BG 2	2,167	1,535	(632)	-29.2%	-3.4%
CT 102, BG 3	CT 102, BG 3	546	758	212	38.8%	3.3%
CT 103, BG 1	CT 103, BG 1	1,439	2,401	962	66.9%	5.3%
CT 103, BG 2	CT 103, BG 2	1,517	846	(671)	-44.2%	-5.7%
CT 103, BG 3	CT 103, BG 3	814	732	(82)	-10.1%	-1.1%
CT 103, BG 4	CT 103, BG 4	766	1,386	620	80.9%	6.1%
CT 104, BG 1	CT 104, BG 1	1,586	1,017	(569)	-35.9%	-4.3%
CT 104, BG 2	CT 104, BG 2	1,105	902	(203)	-18.4%	-2.0%
CT 105.01, BG 1	CT 105.01, BG 1 and CT 105.01, BG 2	1,948	2,623	675	34.7%	3.0%
CT 105.02, BG 1	CT 105.02, BG 1	2,298	3,431	1,133	49.3%	4.1%
CT 106, BG 3	CT 106, BG 1	1,107	1,245	138	12.5%	1.2%
CT 109, BG 1	CT 109, BG 1	1,223	1,018	(205)	-16.8%	-1.8%
CT 109, BG 2	CT 109, BG 2	1,055	1,232	177	16.8%	1.6%
CT 110, BG 1	CT 110, BG 1	651	758	107	16.4%	1.5%
CT 110, BG 2	CT 110, BG 2	1,623	1,490	(133)	-8.2%	-0.9%
CT 111, BG 1 and CT 111, BG 2	CT 111, BG 2	1,226	1,233	7	0.6%	0.1%
CT 111, BG 3	CT 111, BG 1	1,194	1,649	455	38.1%	3.3%
CT 112, BG 1	CT 112, BG 1	665	615	(50)	-7.5%	-0.8%
CT 112, BG 2	CT 112, BG 2	750	827	77	10.3%	1.0%
CT 112, BG 3	CT 112, BG 3	991	870	(121)	-12.2%	-1.3%
CT 113, BG 1	CT 113, BG 1	1,007	885	(122)	-12.1%	-1.3%
CT 113, BG 2	CT 113, BG 2	771	514	(257)	-33.3%	-4.0%
CT 114, BG 1	CT 114, BG 1	922	341	(581)	-63.0%	-9.5%
CT 114, BG 2	CT 114, BG 2	677	1,079	402	59.4%	4.8%
CT 115, BG 3 and CT 115, BG 4	CT 115, BG 4	1,469	2,132	663	45.1%	3.8%
CT 115, BG 5	CT 115, BG 2	1,985	2,001	16	0.8%	0.1%
CT 201, BG 3	CT 201.04, BG 2	2,239	2,338	99	4.4%	0.4%
CT 202, BG 1 and CT 202, BG 2	CT 202.02, BG 1	3,372	3,768	396	11.7%	1.1%
DSA Aggregate		**40,461**	**43,223**	**2,762**	**6.8%**	**0.7%**
Brunswick County		**73,143**	**107,431**	**34,288**	**46.9%**	**3.9%**
New Hanover County		**160,307**	**202,667**	**42,360**	**26.4%**	**2.4%**
North Carolina		**8,049,313**	**9,535,483**	**1,486,170**	**18.5%**	**1.7%**

Source: U.S. Census Bureau, Census 2010 and Census 2000, Summary File 1 100% Data, Table P1 and P001 "Total Population."

Table A.2: RACIAL COMPOSITION

Geography	Total Pop-ulation	White		Black or African American		American Indian and Alaska Native Alone		Asian		Native Hawaiian/ Pacific Islander		Some Other Race		Two or More Races		Total Non-White	
		#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%
CT 111, BG 2	1,471	12	0.8%	1,438	97.8%	-	0.0%	-	0.0%	-	0.0%	-	0.0%	21	1.4%	1,459	99.2%
CT 101, BG 1	1,155	169	14.6%	977	84.6%	-	0.0%	-	0.0%	-	0.0%	-	0.0%	9	0.8%	986	85.4%
CT 102, BG 1	1,169	1,009	86.3%	146	12.5%	-	0.0%	5	0.4%	-	0.0%	-	0.0%	9	0.8%	160	13.7%
CT 103, BG 1	2,396	780	32.6%	1,591	66.4%	-	0.0%	17	0.7%	-	0.0%	8	0.3%	-	0.0%	1,616	67.4%
CT 104, BG 1	842	718	85.3%	117	13.9%	-	0.0%	-	0.0%	-	0.0%	-	0.0%	7	0.8%	124	14.7%
CT 105.01, BG 1	1,144	811	70.9%	293	25.6%	37	3.2%	-	0.0%	-	0.0%	-	0.0%	3	0.3%	333	29.1%
CT 105.02, BG 1	3,815	2,658	69.7%	905	23.7%	-	0.0%	45	1.2%	-	0.0%	11	0.3%	196	5.1%	1,157	30.3%
CT 106, BG 1	1,045	978	93.6%	53	5.1%	14	1.3%	-	0.0%	-	0.0%	-	0.0%	-	0.0%	67	6.4%
CT 109, BG 1	968	837	86.5%	62	6.4%	-	0.0%	23	2.4%	-	0.0%	12	1.2%	34	3.5%	131	13.5%
CT 110, BG 1	313	61	19.5%	240	76.7%	-	0.0%	-	0.0%	-	0.0%	-	0.0%	12	3.8%	252	80.5%
CT 111, BG 1	1,129	158	14.0%	921	81.6%	12	1.1%	-	0.0%	-	0.0%	38	3.4%	-	0.0%	971	86.0%
CT 112, BG 1	629	594	94.4%	24	3.8%	-	0.0%	-	0.0%	-	0.0%	-	0.0%	11	1.7%	35	5.6%
CT 113, BG 1	1,013	822	81.1%	137	13.5%	-	0.0%	54	5.3%	-	0.0%	-	0.0%	-	0.0%	191	18.9%
CT 114, BG 1	269	24	8.9%	243	90.3%	-	0.0%	-	0.0%	-	0.0%	-	0.0%	2	0.7%	245	91.1%
CT 202.02, BG 1	5,121	4,184	81.7%	535	10.4%	33	0.6%	51	1.0%	-	0.0%	23	0.4%	295	5.8%	937	18.3%
CT 101, BG 2	798	288	36.1%	497	62.3%	-	0.0%	-	0.0%	-	0.0%	1	0.1%	12	1.5%	510	63.9%
CT 102, BG 2	1,372	270	19.7%	1,093	79.7%	-	0.0%	-	0.0%	-	0.0%	-	0.0%	9	0.7%	1,102	80.3%
CT 103, BG 2	1,210	929	76.8%	260	21.5%	-	0.0%	-	0.0%	-	0.0%	21	1.7%	-	0.0%	281	23.2%
CT 104, BG 2	871	794	91.2%	39	4.5%	-	0.0%	-	0.0%	-	0.0%	-	0.0%	38	4.4%	77	8.8%
CT 109, BG 2	1,384	1,300	93.9%	56	4.0%	-	0.0%	-	0.0%	-	0.0%	10	0.7%	18	1.3%	84	6.1%
CT 110, BG 2	1,884	1,152	61.1%	620	32.9%	103	5.5%	-	0.0%	-	0.0%	-	0.0%	9	0.5%	732	38.9%

Geography	Total Pop-ulation	White		Black or African American		American Indian and Alaska Native Alone		Asian		Native Hawaiian/ Pacific Islander		Some Other Race		Two or More Races		Total Non-White	
		#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%
CT 112, BG 2	657	440	67.0%	217	33.0%	-	0.0%	-	0.0%	-	0.0%	-	0.0%	-	0.0%	217	33.0%
CT 113, BG 2	620	348	56.1%	132	21.3%	-	0.0%	-	0.0%	20	3.2%	104	16.8%	16	2.6%	272	43.9%
CT 114, BG 2	1,364	490	35.9%	868	63.6%	-	0.0%	-	0.0%	-	0.0%	-	0.0%	6	0.4%	874	64.1%
CT 115, BG 2	2,609	1,142	43.8%	1,281	49.1%	86	3.3%	-	0.0%	-	0.0%	-	0.0%	100	3.8%	1,467	56.2%
CT 201.04, BG 2	2,366	1,609	68.0%	588	24.9%	2	0.1%	-	0.0%	-	0.0%	130	5.5%	37	1.6%	757	32.0%
CT 101, BG 3	509	179	35.2%	321	63.1%	-	0.0%	-	0.0%	-	0.0%	-	0.0%	9	1.8%	330	64.8%
CT 102, BG 3	1,046	311	29.7%	729	69.7%	-	0.0%	-	0.0%	-	0.0%	6	0.6%	-	0.0%	735	70.3%
CT 103, BG 3	583	479	82.2%	68	11.7%	-	0.0%	-	0.0%	-	0.0%	-	0.0%	36	6.2%	104	17.8%
CT 104, BG 3	1,320	1,290	97.7%	20	1.5%	-	0.0%	-	0.0%	-	0.0%	-	0.0%	10	0.8%	30	2.3%
CT 112, BG 3	894	178	19.9%	704	78.7%	-	0.0%	-	0.0%	-	0.0%	-	0.0%	12	1.3%	716	80.1%
CT 103, BG 4	1,230	16	1.3%	1,131	92.0%	-	0.0%	-	0.0%	-	0.0%	70	5.7%	13	1.1%	1,214	98.7%
CT 115, BG 4	2,153	1,800	83.6%	282	13.1%	-	0.0%	25	1.2%	-	0.0%	-	0.0%	46	2.1%	353	16.4%
DSA	**45,349**	**26,830**	**59.2%**	**16,588**	**36.6%**	**287**	**0.6%**	**220**	**0.5%**	**20**	**0.0%**	**434**	**1.0%**	**970**	**2.1%**	**18,519**	**40.8%**
Brunswick County	**110,324**	**92,642**	**84.0%**	**12,069**	**10.9%**	**326**	**0.3%**	**625**	**0.6%**	**325**	**0.3%**	**1,831**	**1.7%**	**2,506**	**2.3%**	**17,682**	**16.0%**
New Hanover County	**206,403**	**166,336**	**80.6%**	**30,155**	**14.6%**	**867**	**0.4%**	**2,875**	**1.4%**	**118**	**0.1%**	**2,868**	**1.4%**	**3,184**	**1.5%**	**40,067**	**19.4%**

Source: US Census Bureau, American Community Survey 5-year Estimates (2009-2013), Table B02001, "Race."

Table A.3: HISPANIC POPULATION

Geography	Total Population	Hispanic		Not Hispanic	
		#	%	#	%
CT 111, BG 2	1,471	-	0.0%	1,471	100.0%
CT 101, BG 1	1,155	-	0.0%	1,155	100.0%
CT 102, BG 1	1,169	35	3.0%	1,134	97.0%
CT 103, BG 1	2,396	86	3.6%	2,310	96.4%
CT 104, BG 1	842	36	4.3%	806	95.7%
CT 105.01, BG 1	1,144	365	31.9%	779	68.1%
CT 105.02, BG 1	3,815	213	5.6%	3,602	94.4%
CT 106, BG 1	1,045	17	1.6%	1,028	98.4%
CT 109, BG 1	968	-	0.0%	968	100.0%
CT 110, BG 1	313	12	3.8%	301	96.2%
CT 111, BG 1	1,129	9	0.8%	1,120	99.2%
CT 112, BG 1	629	35	5.6%	594	94.4%
CT 113, BG 1	1,013	7	0.7%	1,006	99.3%
CT 114, BG 1	269	2	0.7%	267	99.3%
CT 202.02, BG 1	5,121	128	2.5%	4,993	97.5%
CT 101, BG 2	798	2	0.3%	796	99.7%
CT 102, BG 2	1,372	20	1.5%	1,352	98.5%
CT 103, BG 2	1,210	23	1.9%	1,187	98.1%
CT 104, BG 2	871	39	4.5%	832	95.5%
CT 109, BG 2	1,384	137	9.9%	1,247	90.1%
CT 110, BG 2	1,884	102	5.4%	1,782	94.6%
CT 112, BG 2	657	-	0.0%	657	100.0%
CT 113, BG 2	620	115	18.5%	505	81.5%
CT 114, BG 2	1,364	19	1.4%	1,345	98.6%
CT 115, BG 2	2,609	330	12.6%	2,279	87.4%
CT 201.04, BG 2	2,366	215	9.1%	2,151	90.9%
CT 101, BG 3	509	-	0.0%	509	100.0%
CT 102, BG 3	1,046	6	0.6%	1,040	99.4%
CT 103, BG 3	583	-	0.0%	583	100.0%
CT 104, BG 3	1,320	-	0.0%	1,320	100.0%
CT 112, BG 3	894	31	3.5%	863	96.5%
CT 103, BG 4	1,230	-	0.0%	1,230	100.0%
CT 115, BG 4	2,153	209	9.7%	1,944	90.3%
DSA	**45,349**	**2,193**	**4.8%**	**43,156**	**95.2%**
Brunswick County	**110,324**	**5,497**	**5.0%**	**104,827**	**95.0%**
New Hanover County	**206,403**	**10,944**	**5.3%**	**195,459**	**94.7%**

Source: U.S. Census Bureau, American Community Survey 5-year Estimates (2009-2013), Table B03002, "Hispanic or Latino Origin by Race."

Table A.4: MINORITY POPULATION

Geography	Total Population	White, Non-Hispanic		Minority Population*	
		#	%	#	%
CT 111, BG 2	1,471	12	0.8%	1,459	99.2%
CT 101, BG 1	1,155	169	14.6%	986	85.4%
CT 102, BG 1	1,169	974	83.3%	195	16.7%
CT 103, BG 1	2,396	763	31.8%	1,633	68.2%
CT 104, BG 1	842	682	81.0%	160	19.0%
CT 105.01, BG 1	1,144	446	39.0%	698	61.0%
CT 105.02, BG 1	3,815	2,456	64.4%	1,359	35.6%
CT 106, BG 1	1,045	961	92.0%	84	8.0%
CT 109, BG 1	968	837	86.5%	131	13.5%
CT 110, BG 1	313	61	19.5%	252	80.5%
CT 111, BG 1	1,129	158	14.0%	971	86.0%
CT 112, BG 1	629	559	88.9%	70	11.1%
CT 113, BG 1	1,013	815	80.5%	198	19.5%
CT 114, BG 1	269	24	8.9%	245	91.1%
CT 202.02, BG 1	5,121	4,079	79.7%	1,042	20.3%
CT 101, BG 2	798	287	36.0%	511	64.0%
CT 102, BG 2	1,372	250	18.2%	1,122	81.8%
CT 103, BG 2	1,210	917	75.8%	293	24.2%
CT 104, BG 2	871	755	86.7%	116	13.3%
CT 109, BG 2	1,384	1,163	84.0%	221	16.0%
CT 110, BG 2	1,884	1,059	56.2%	825	43.8%
CT 112, BG 2	657	440	67.0%	217	33.0%
CT 113, BG 2	620	337	54.4%	283	45.6%
CT 114, BG 2	1,364	471	34.5%	893	65.5%
CT 115, BG 2	2,609	812	31.1%	1,797	68.9%
CT 201.04, BG 2	2,366	1,524	64.4%	842	35.6%
CT 101, BG 3	509	179	35.2%	330	64.8%
CT 102, BG 3	1,046	311	29.7%	735	70.3%
CT 103, BG 3	583	479	82.2%	104	17.8%
CT 104, BG 3	1,320	1,290	97.7%	30	2.3%
CT 112, BG 3	894	147	16.4%	747	83.6%
CT 103, BG 4	1,230	16	1.3%	1,214	98.7%
CT 115, BG 4	2,153	1,594	74.0%	559	26.0%
DSA	**45,349**	**25,027**	**55.2%**	**20,322**	**44.8%**
Brunswick County	**110,324**	**89,422**	**81.1%**	**20,902**	**18.9%**
New Hanover County	**206,403**	**158,358**	**76.7%**	**48,045**	**23.3%**

** Minority population includes all races that are non-white and Hispanic populations that are also White.*

Source: U.S. Census Bureau, American Community Survey 5-year Estimates (2009-2013), Table B03002, "Hispanic or Latino Origin by Race."

Table A.5: POVERTY LEVELS

Geography	Total Population for whom Poverty Status is Determined	Below Poverty Level		Very Poor: Under 50% of Poverty Level		Near Poor: Between 100% and 149% of Poverty Level	
		#	%	#	%	#	%
CT 111, BG 2	1,573	741	47.1%	501	31.8%	331	21.0%
CT 101, BG 1	1,155	605	52.4%	96	8.3%	261	22.6%
CT 102, BG 1	1,169	263	22.5%	111	9.5%	67	5.7%
CT 103, BG 1	2,396	748	31.2%	321	13.4%	512	21.4%
CT 104, BG 1	842	147	17.5%	77	9.1%	59	7.0%
CT 105.01, BG 1	1,144	416	36.4%	95	8.3%	190	16.6%
CT 105.02, BG 1	3,787	2,445	64.6%	1,562	41.2%	459	12.1%
CT 106, BG 1	1,045	93	8.9%	34	3.3%	31	3.0%
CT 109, BG 1	968	183	18.9%	122	12.6%	75	7.7%
CT 110, BG 1	313	234	74.8%	108	34.5%	45	14.4%
CT 111, BG 1	1,129	461	40.8%	252	22.3%	114	10.1%
CT 112, BG 1	615	42	6.8%	26	4.2%	80	13.0%
CT 113, BG 1	1,005	182	18.1%	92	9.2%	44	4.4%
CT 114, BG 1	269	139	51.7%	24	8.9%	74	27.5%
CT 202.02, BG 1	4,954	542	10.9%	102	2.1%	16	0.3%
CT 101, BG 2	775	437	56.4%	336	43.4%	44	5.7%
CT 102, BG 2	1,372	252	18.4%	80	5.8%	196	14.3%
CT 103, BG 2	1,210	220	18.2%	29	2.4%	147	12.1%
CT 104, BG 2	871	122	14.0%	94	10.8%	102	11.7%
CT 109, BG 2	1,384	178	12.9%	45	3.3%	235	17.0%
CT 110, BG 2	1,884	861	45.7%	481	25.5%	356	18.9%
CT 112, BG 2	657	237	36.1%	108	16.4%	64	9.7%
CT 113, BG 2	620	296	47.7%	26	4.2%	57	9.2%
CT 114, BG 2	1,364	571	41.9%	338	24.8%	191	14.0%
CT 115, BG 2	2,606	790	30.3%	649	24.9%	588	22.6%
CT 201.04, BG 2	2,366	407	17.2%	166	7.0%	325	13.7%
CT 101, BG 3	509	181	35.6%	7	1.4%	53	10.4%
CT 102, BG 3	1,046	626	59.8%	351	33.6%	118	11.3%
CT 103, BG 3	583	71	12.2%	-	0.0%	33	5.7%
CT 104, BG 3	1,320	336	25.5%	228	17.3%	58	4.4%
CT 112, BG 3	894	234	26.2%	181	20.2%	72	8.1%
CT 103, BG 4	1,230	451	36.7%	323	26.3%	271	22.0%
CT 115, BG 4	1,726	194	11.2%	132	7.6%	83	4.8%
DSA	**44,781**	**13,705**	**30.6%**	**7,097**	**15.8%**	**5,351**	**11.9%**
Brunswick County	**109,534**	**18,191**	**16.6%**	**6,965**	**6.4%**	**10,806**	**9.9%**
New Hanover County	**201,530**	**34,053**	**16.9%**	**17,073**	**8.5%**	**17,443**	**8.7%**

Source: U.S. Census Bureau, American Community Survey 5-year Estimates (2009-2013), Table C17002, "Ratio of Income to Poverty Level in the Past 12 Months."

Table A.6: LIMITED ENGLISH PROFICIENCY LEVELS

Geography	Total Adult Population, 18 years and older	Primary Language Group of Persons Who Speak English Less than Very Well							
		Spanish		Other Indo-Euro		Asian/Pacific		Other	
		#	%	#	%	#	%	#	%
CT 101, BG 1	1,125	-	0.0%	-	0.0%	-	0.0%	-	0.0%
CT 102, BG 1	860	-	0.0%	-	0.0%	-	0.0%	-	0.0%
CT 103, BG 1	1,033	-	0.0%	-	0.0%	-	0.0%	-	0.0%
CT 104, BG 1	1,907	22	1.2%	-	0.0%	-	0.0%	-	0.0%
CT 105.01, BG 1	708	-	0.0%	-	0.0%	-	0.0%	-	0.0%
CT 105.02, BG 1	916	178	19.4%	-	0.0%	-	0.0%	3	0.3%
CT 106, BG 1	2,935	32	1.1%	-	0.0%	45	1.5%	-	0.0%
CT 109, BG 1	891	-	0.0%	-	0.0%	-	0.0%	-	0.0%
CT 110, BG 1	905	-	0.0%	37	4.1%	23	2.5%	-	0.0%
CT 111, BG 1	248	-	0.0%	-	0.0%	-	0.0%	-	0.0%
CT 112, BG 1	855	-	0.0%	-	0.0%	-	0.0%	-	0.0%
CT 113, BG 1	521	6	1.2%	-	0.0%	-	0.0%	-	0.0%
CT 114, BG 1	861	-	0.0%	-	0.0%	-	0.0%	-	0.0%
CT 202.02, BG 1	215	-	0.0%	-	0.0%	-	0.0%	-	0.0%
CT 101, BG 2	4,022	13	0.3%	12	0.3%	15	0.4%	-	0.0%
CT 102, BG 2	528	1	0.2%	-	0.0%	-	0.0%	-	0.0%
CT 103, BG 2	1,266	-	0.0%	-	0.0%	-	0.0%	-	0.0%
CT 104, BG 2	847	-	0.0%	-	0.0%	-	0.0%	-	0.0%
CT 109, BG 2	674	-	0.0%	18	2.7%	-	0.0%	-	0.0%
CT 110, BG 2	1,230	110	8.9%	-	0.0%	-	0.0%	-	0.0%
CT 112, BG 2	1,325	14	1.1%	-	0.0%	-	0.0%	-	0.0%
CT 113, BG 2	629	-	0.0%	-	0.0%	-	0.0%	-	0.0%
CT 114, BG 2	518	36	6.9%	-	0.0%	-	0.0%	-	0.0%
CT 115, BG 2	1,106	8	0.7%	-	0.0%	-	0.0%	-	0.0%
CT 201.04, BG 2	1,856	-	0.0%	-	0.0%	-	0.0%	-	0.0%
CT 101, BG 3	1,769	62	3.5%	-	0.0%	-	0.0%	-	0.0%
CT 102, BG 3	397	-	0.0%	-	0.0%	-	0.0%	-	0.0%
CT 103, BG 3	658	-	0.0%	-	0.0%	-	0.0%	-	0.0%
CT 104, BG 3	561	-	0.0%	-	0.0%	-	0.0%	-	0.0%
CT 112, BG 3	949	-	0.0%	7	0.7%	-	0.0%	-	0.0%
CT 103, BG 4	711	-	0.0%	-	0.0%	-	0.0%	-	0.0%
CT 115, BG 4	829	-	0.0%	-	0.0%	-	0.0%	-	0.0%
DSA Aggregate	**33,855**	**482**	**1.4%**	**74**	**0.2%**	**83**	**0.2%**	**3**	**0.0%**

Source: U.S. Census Bureau, American Community Survey 5-year Estimates (2009-2013), Table B16004, "Age by Language Spoken at Home by Ability to Speak English for the Population 5 Years and Over."

Table A.7: VEHICLE AVAILABILITY LEVELS

Geography	Total Households	No Vehicle Available		One Vehicle Available		Two or More Vehicles Available	
		#	%	#	%	#	%
CT 111, BG 2	704	307	43.6%	306	43.5%	91	12.9%
CT 101, BG 1	473	126		195	41.2%	152	32.1%
CT 102, BG 1	571	-		277	48.5%	294	51.5%
CT 103, BG 1	951	123		441	46.4%	387	40.7%
CT 104, BG 1	500	40		266	53.2%	194	38.8%
CT 105.01, BG 1	478	85		152	31.8%	241	50.4%
CT 105.02, BG 1	1,561	151		662	42.4%	748	47.9%
CT 106, BG 1	583	14		334	57.3%	235	40.3%
CT 109, BG 1	479	57		216	45.1%	206	43.0%
CT 110, BG 1	169	84		57	33.7%	28	16.6%
CT 111, BG 1	615	154		403	65.5%	58	9.4%
CT 112, BG 1	228	18		76	33.3%	134	58.8%
CT 113, BG 1	513	65		251	48.9%	197	38.4%
CT 114, BG 1	119	28		63	52.9%	28	23.5%
CT 202.02, BG 1	1,906	-		395	20.7%	1,511	79.3%
CT 101, BG 2	344	69		159	46.2%	116	33.7%
CT 102, BG 2	538	65		222	41.3%	251	46.7%
CT 103, BG 2	436	15		170	39.0%	251	57.6%
CT 104, BG 2	369	15		146	39.6%	208	56.4%
CT 109, BG 2	641	78		211	32.9%	352	54.9%
CT 110, BG 2	924	256		434	47.0%	234	25.3%
CT 112, BG 2	403	62		231	57.3%	110	27.3%
CT 113, BG 2	375	88		171	45.6%	116	30.9%
CT 114, BG 2	556	140		149	26.8%	267	48.0%
CT 115, BG 2	930	95		341	36.7%	494	53.1%
CT 201.04, BG 2	886	57		239	27.0%	590	66.6%
CT 101, BG 3	234	35		161	68.8%	38	16.2%
CT 102, BG 3	314	51		177	56.4%	86	27.4%
CT 103, BG 3	372	13		167	44.9%	192	51.6%
CT 104, BG 3	513	9		165	32.2%	339	66.1%
CT 112, BG 3	405	72		202	49.9%	131	32.3%
CT 103, BG 4	408	215		79	19.4%	114	27.9%
CT 115, BG 4	654	-	0.0%	203	31.0%	451	69.0%
DSA	**19,152**	**2,587**	**13.5%**	**7,721**	**40.3%**	**8,844**	**46.2%**
Brunswick County	**47,600**	**2,247**	**4.7%**	**15,288**	**32.1%**	**30,065**	**63.2%**
New Hanover County	**86,010**	**5,599**	**6.5%**	**31,472**	**36.6%**	**48,939**	**56.9%**

Source: U.S. Census Bureau, American Community Survey 5-year Estimates (2009-2013), Table B25044, "Household Size by Vehicles Available."

B: Existing Physical Conditions

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1. Existing Physical Conditions

Technical Report B describes the existing physical conditions within the study area in New Hanover and Brunswick Counties, including the City of Wilmington (City) and the Cape Fear River system (see Figure 1). The feasibility of relocating the existing active CSXT freight rail line in Wilmington that leads from the CSXT Davis Yard in Brunswick County (Navassa) to the Port of Wilmington (Port) is being considered and is the subject of this report. In a separate proposed action, which would follow the freight rail line realignment, the City is considering whether repurposing the remaining freight infrastructure into a multi-use trail and transit service (i.e. freight rail reuse) is achievable. Both proposed actions, realignment of freight rail and freight rail reuse, are considered together as the "actions being considered" for the purpose of this report.

1.1. Rail Conditions

1.1.1. History

To understand the rail conditions in Wilmington and the surrounding area, it helps to examine some related rail history. Wilmington was long considered a "railroad town" for hosting the Atlantic Coast Line Railroad (ACLRR) headquarters, which was also the area's main employer for many years. The railroad relocated its headquarters to Jacksonville, Florida in 1960, which understandably hurt the City's economy for several years and forced many families to relocate. The former ACLRR headquarters site is now the location of Cape Fear Community College (CFCC).

In 1835, the Wilmington & Raleigh Railroad was chartered to construct a railroad between Wilmington and Raleigh. Due to lackluster investment interest by Raleigh's citizens, the ultimate northern destination was shifted to Weldon near the Virginia state line. At the time of completion in 1840, the newly renamed W&W line was the longest railroad in the US at 161 miles. The W&W soon became an important link in a continuous north-south rail route along the Atlantic coast, especially during the Civil War. This link later became part of the ACLRR system near the turn of the 20th Century. In 1986, the route's connection to Wilmington was severed by removing the track and structures between Wallace and Castle Hayne (27 miles).

The Wilmington & Manchester Railroad (W&M), chartered in 1846-47 was a route from Wilmington into the interior of South Carolina at Florence, intending to help Wilmington compete with Charleston. This link also later became part of the ACLRR system. Note that the original route of the W&M began at the current site of the Battleship North Carolina Memorial, and arched northwest across the north end of Eagles Island before heading westward, including a Brunswick River crossing. The railroad later relocated to the north in the early 1890's (with a crossing of the Northeast Cape Fear and the Cape Fear Rivers) and abandoned the original route. Portions of the original alignment embankment still exist on Eagles Island (see Figure 1).

The Cape Fear & Yadkin Valley Railroad (CF&YV) was chartered to connect Wilmington with cities in the Yadkin Valley region in the interior of North Carolina. Construction started inland entering Wilmington in 1890. In 1899, the W&W acquired the CF&YV line from Wilmington through Fayetteville and into Sanford, later becoming part of the ACLRR system.

Another leg of the Wilmington rail system was the ACLRR line to New Bern, North Carolina that also served the military at Marine Corps Base Camp Lejeune. In New Bern, connections were made with the Norfolk Southern Railway and the Atlantic & East Carolina Railroad.

Chartered in 1855, the Wilmington, Charlotte and Rutherford Railroad was built to connect Wilmington with Charlotte. Following a financial failure in 1872, the Carolina Central Railroad acquired the line and extended it to Shelby, North Carolina. The 237 total miles were completed in 1874. This line later became part of the Seaboard Air Line Railroad (SALRR). Compared with the ACLRR, Seaboard's presence was relatively minor in Wilmington. The company maintained a small yard in Wilmington and a separate passenger depot while passenger rail service was offered by SALRR.

At its rail peak, Wilmington was served by five rail lines (four ACLRR and one SALRR), radiating outward like spokes of a wheel from the west to the northeast. All lines except the ACLRR New Bern line entered Wilmington on its northwest corner. The New Bern line entered at the location of the current CSXT Beltline wye west of Kerr Avenue. The ACLRR itself reached 5,500 total system miles by 1950, and served the entire southeastern US, either directly or through associated railroads. Wilmington had the distinction of being the headquarters of one of the nation's leading railroad companies.

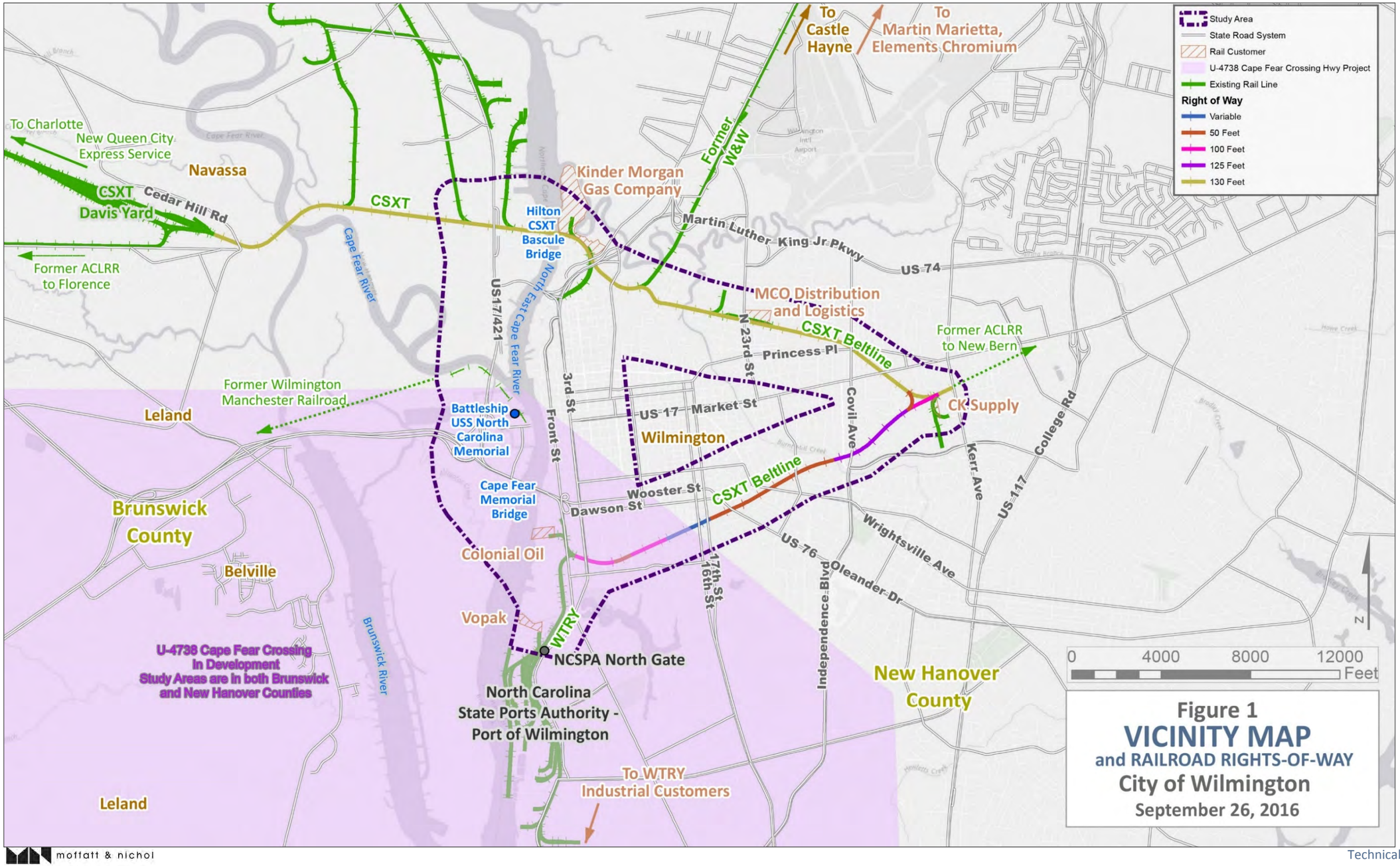
Wilmington Railway Bridge Company was formed in 1866 to provide rail access across the Cape Fear River into Wilmington proper. One purpose of this report is to evaluate a realignment and/or reuse of this long serving rail crossing of the Cape Fear River. The current CSXT Hilton Bridge (a moveable bascule span constructed in 1971) is located approximately ½ mile north of the current Isabel Holmes US 74/NC 133 highway bridge.

In 1967, the ACLRR and SALRR merged to form the Seaboard Coast Line Railroad (SCL). With this merger, rail competition in the city ceased. The SCL removed two outdated yards in Wilmington (called the Hilton and Smith Creek Yards), and constructed the new Davis Yard (named for former ACLRR President Champ Davis) at Navassa along the former Seaboard line. Between 1967 and 1986, the four ACLRR rail access points to Wilmington were cut, leaving only the former SALRR line to Charlotte remaining. In 1986 the SCL was merged into the current carrier CSXT.

Historically, there was passenger rail service to Wilmington from the origins of the W&W Railroad. At one point, in the early 1900's, most north-south ACLRR passenger trains for "snowbirds" passed through Wilmington. All passenger rail service to Wilmington ended in March of 1968 under the SCL's ownership.

Wilmington has a long and distinguished association with railroads, and railroads continue to help the City's economy thrive in the 21st Century. Ensuring that both the City and the railroads continue to prosper is one of the main topics investigated by this Study.

Figure 1: STUDY AREA MAP



1.1.2. Rail Overview

CSXT provides the only Class 1 rail service to the Wilmington area. There is no connection to the Norfolk Southern Railroad (NS). This places the Port at somewhat of a disadvantage, as most competing east coast ports are served by both Class 1 railroads.

The CSXT interchanges traffic with a separate, shortline railroad (the Wilmington Terminal Railroad or WTRY) between 2nd and 3rd Streets north of the Port. The WTRY has 17 total track miles, and can accommodate heavy 286,000 pound GVW (gross vehicle weight) car loads. The WTRY also serves industrial customers south of the Port along River Road.

As noted earlier, there is no current passenger rail service to Wilmington.

Freight rail service to the study area originates at CSXT's Davis Yard off Cedar Hill Road near Navassa in Brunswick County on the west side of the Cape Fear River. The east end of Davis Yard is near Railroad Milepost SE359.5. The line running eastward towards Wilmington crosses both the Cape Fear River and the Northeast Cape Fear River (both with moveable bascule bridge spans) before entering Wilmington and New Hanover County at the Hilton community on the north side of the City.

The track from Hilton to the WTRY is known as the "CSXT Beltline". The total track mileage from CSXT Davis Yard to the North Gate of the Port is approximately 10.7 miles.

There is a turning wye (a remnant of the ACLRR line connection to New Bern) existing at the easternmost point of the CSXT Beltline near Kerr Avenue.

1.1.3. Operational Impacts to the Community

Current rail traffic in the study area results in congestion, safety and noise impacts to the surrounding communities and businesses. Staff at the Port reports that, on average, two trains traverse the CSXT Beltline per day to interchange with WTRY; one inbound train and one outbound train. Each trip involves crossing 36 roadways and the sounding of a train whistle four times for each roadway crossing. Each roadway crossing by a train causes delays for motorists, whose idling vehicles use more fuel per trip contributing to air quality concerns. The 36 crossings also present the opportunity for highway/rail vehicular collisions. Table 1 on page 17 notes the accidents that have happened at crossings in the study area in the last five years. CSXT reports that up to six trains per day operate on the Beltline. This number includes the two trains per day reported by the Port.

1.1.4. Realignment Study Corridor Conditions

The majority of the realignment study corridor lies in Brunswick County across the Cape Fear River from Wilmington on Eagles Island. The Eagles Island Coalition describes the island as follows: "Eagles Island lies in the confluence of the Cape Fear and Brunswick Rivers in southeastern NC in the Lower Cape Fear River Basin. Eagles Island consists of approximately 3,100 acres situated between the Brunswick and Cape Fear

Rivers. The island is directly across the Cape Fear River from Wilmington in New Hanover County, but is located mostly in Brunswick County. The town of Bellville lies just to the west of the Island on the west bank of the Brunswick River, and the nearby towns of Leland and Navassa are located to the northwest, adjacent to Mill Creek and Sturgeon Creek, which flows into the Brunswick River. The land of Eagles Island is currently owned by private individuals and corporations, the State of North Carolina (through the NC Division of Soil and Water Conservation, the NC Department of Transportation [NCDOT], and NC State Ports Authority), the U.S. Army Corps of Engineers (USACE), New Hanover Soil and Water Conservation District, and the Town of Leland. Currently the majority of the island is undeveloped and is home to the USS North Carolina Battleship.

The southern end of Eagles Island is dominated by spoil fill from dredging. The remainder is natural area with vast tracts of marshlands.

Near the Cape Fear Memorial Bridge, on the west side of the river, are boat works and tugboat facilities. Eagle Island is crossed by the highways US 17 Business/US 74 east-west and US 17/US 74/US 421 to the north-south.

The USS North Carolina was berthed at Eagles Island Oct. 2, 1961, and was formally dedicated on April 29, 1962, as a permanent memorial to North Carolina veterans of the Second World War. The memorial now occupies a 61-acre tract on the island, much of it set aside as a nature preserve. It is listed on the National Register of Historic Places and North Carolina Historic Sites. It is a National Historic Landmark.

1.1.5. Track Condition

The track in the study area is steel rail on timber ties. Rail weight is a mixture of 85, 100, and 132 pound rail, with predominantly 100 pound rail. CSXT indicates that the existing track condition is good and is appropriate for the movement of freight trains at 10 mph, however, faster speeds and/or transit service would require track improvements.

The track speed and train operating speed is 10 mph, chiefly limited by horizontal curvature at each end of the CSXT Beltline, as well as the wye and by the movable Hilton Bridge.

1.1.6. Crossing Inventory

There are 36 at-grade highway/rail crossings being considered in the study area, with 30 public-jurisdiction crossings and 6 private crossings. There are no rail crossing diamonds. The crossing protection varies from simple crossbuck signs to gates/flashers/cantilever protection. See the Existing Conditions column in Table 1 on page 17.

Wilmington has a number of these crossings at unfavorable angles, which along with the frequency of at grade crossings, creates potentially hazardous rail/highway interactions (See the Crashes column in Table 1 on page 17). The City of Wilmington, NCDOT, and CSXT have entered into an agreement to complete a

Traffic Separation Study (TSS), which was completed in 2016. This TSS will make recommendations for safety improvements within the City. These typically fall into short-, mid- and long-term recommendations. These recommendations may include signal improvement and intersection redesigns or improvements. Any work that could improve the safety of the rail/highway intersections in Wilmington would be of benefit to transit service on the CSXT Beltline.

See Figure 2 on page 9 for the location of the crossings, and Table 1 on page 17 for information about each crossing.

1.1.7. Right-of-Way

The right-of-way widths for the rail lines in the corridor were estimated from valuation mapping. The right-of-way varies between 40-feet (for a short distance) and 130-feet (for a long distance). Predominant right-of-way widths are 125-feet and 130-feet. See Figure 2 on page 9 for the rail rights-of-way in each area.

1.1.8. Current Rail Service

The North Carolina State Port Authority (NCSPA) Port of Wilmington (Port) has rail service up to seven days per week. Manifest mixed-freight trains serve the Port five to seven days per week depending upon volumes. The new Queen City Express intermodal service train will operate on Mondays and Saturdays. A cold storage facility opened at the Port in 2016 with 100,000 square feet of freezer space to store products prior to shipping. When the Enviva wood pellet manufacturing facilities throughout North Carolina are operational, a unit train will serve the facility once every three days. The Port is a designated Foreign Trade Zone, which provides economic advantages to businesses involved in international trade by permitting foreign or domestic merchandise to enter the zone without a formal customs entry or payment of customs duties or government excise taxes, and without a thorough examination. If the final product is exported from the US, no custom duty is levied. If the final product is imported into the US, duty and excise taxes are due at the time of transfer from the foreign trade zone.

1.1.9. Other Customers Served

There are a number of sites with rail access along the CSXT Beltline that this proposed project will need to consider. Rail service to these sites are based on customer demand and do not have a fixed schedule. They include:

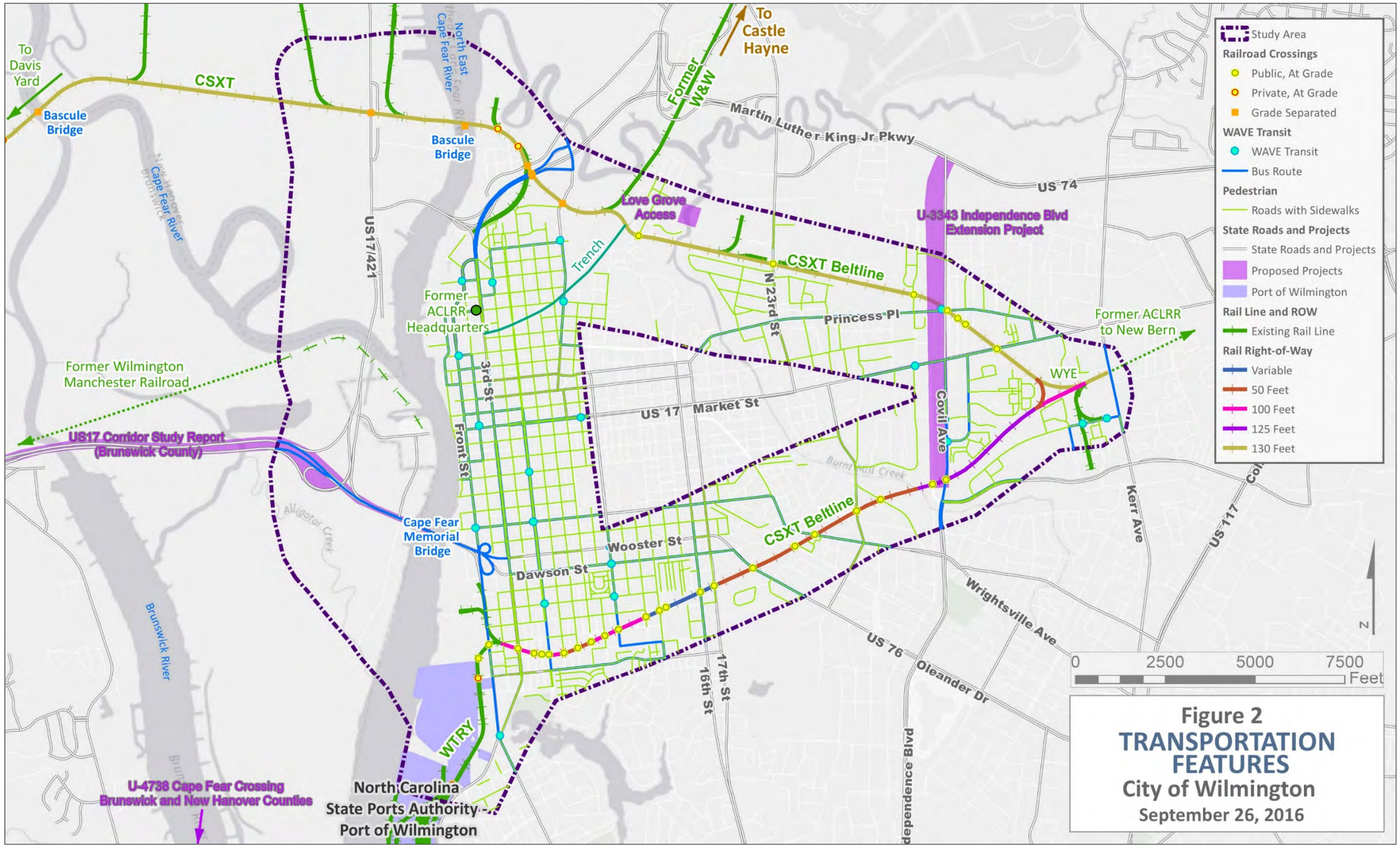
- Kinder-Morgan Gas Company (near N. 6th Street).
- Martin Marietta Aggregates and Elements Chromium on the former W&W line north of Wilmington on the Northeast Cape Fear River.
- MCO Distribution & Logistics at 23rd Street.
- CK Supply and Pro Build off the wye near Kerr Avenue.
- Oil and chemical industrial locations on the WTRY (including Colonial Oil and Vopak north of the Port).

Evaluation of continued access and recommendations for rail access for these firms will be addressed later.

1.1.10. Current Rail Operations (Maintenance & Liability)

The tracks from Davis Yard to the WTRY exchange between 2nd and 3rd Streets in Wilmington are owned and maintained by CSXT. CSXT is responsible for the right-of-way and the track infrastructure within that right-of-way, as well as railroad signals and crossing surfaces.

Figure 2: TRANSPORTATION FEATURES



1.2. Major Streets and Highways Serving the Study Area

1.2.1. Existing Streets and Highways

The study area encompasses a variety of street and highway types that serve both counties and the City. Functional classifications of these roadways include Interstate; Other Freeways and Expressways; Other Principal Arterial; Minor Arterial, Major Collector, and Minor Collector. It should be noted that I-40 and I-140 serve the Wilmington area and ultimately handles vehicular volumes from the study area, but these interstate highways do not enter the study area directly. The volume of traffic on public streets near the rail crossings is provided in Table 1 on page 17. In addition to the crossings listed below, the tracks cross roads that serve industrial sites, including North 6th Street, Hilton Street, Greenfield Street, and Myers Street.

The northern leg of the CSXT Beltline (City of Wilmington, New Hanover County) crosses the following streets; those shown in bold cross the CSXT Beltline at grade and carry the highest traffic volume:

- Cornelius Harnett Drive – grade-separated crossing
- Martin Luther King Jr. Parkway (US 74) – grade-separated crossing
- McRae Street
- King Street
- **North 23rd Street**
- **North 30th Street**
- **Princess Place Drive**
- Clay Street
- Henry Street
- **Market Street (Business Highway 17)**

The southern leg of the CSXT Beltline (City of Wilmington, New Hanover County) angles across the grid-pattern street section of the City and crosses the following streets; those shown in bold carry the highest traffic volume:

- **Covil Avenue**
- Mercer Avenue
- Forest Hills Drive
- **Colonial Drive**
- **Wrightsville Avenue**
- **Oleander Drive (US 76)**
- **South 17th Street**
- **South 16th Street**
- Marstellar Street
- **South 13th Street**
- South 12th Street
- South 10th Street
- South 9th Street
- South 8th Street
- South 7th Street
- Martin Street
- South 6th Street
- South 5th Avenue
- Lakeshore Drive
- Martin Street
- Hooper Street
- South 4th Street

- **South 3rd Street (US 421)**
- South 2nd Street
- **South Front Street**
- Greenfield Street
- Myers Street

Other substantial roads carrying traffic into and out of the study area in New Hanover County are US 17 Business (Wooster and Dawson Streets), US 117 (Shipyard Blvd.), and US 421 (Carolina Beach Road). Brunswick County has fewer major roadways entering the study area. The major thoroughfare west across Eagles Island and into Brunswick County (including Leland and Bellville) are US 17/US 74/US 76/US421 with a major interchange west of the Cape Fear Memorial Bridge. Major public utility extensions are planned along the US 421 corridor on Eagles Island.

1.2.2. Proposed or Studied Highways

Market Street Access Management Improvements

The City plans to build a median along Market Street between Colonial Drive and Porters Neck Road in 2020-2021 according to NCDOT. The City of Wilmington's Market Street Corridor Study, approved in 2011, indicates the improvements are intended to reduce traffic congestion and increase safety. Specific improvements include right-sizing Market Street to provide only enough pavement as necessary, completing secondary street connections, limiting traffic conflicts, providing sufficient lanes for left-turn vehicles to move out of through lanes, promoting access management techniques with existing businesses, planting street trees and building sidewalks, bikeways, and bus shelters with a transit center nearby.

South Front Street Improvements

According to NCDCOT, the City plans to widen South Front Street to a multi-lane roadway between Cape Fear Memorial Bridge and Burnett Boulevard (Project U-5734) in 2023. There is an existing at-grade crossing with the Wilmington Terminal Railway Company, which will be improved with rail signalization and gates.

US 421 Interchange Improvements

The intent of NCDOT Project U-5731 is to build a flyover ramp and a free-flow ramp at the US 17/US 421 intersection in 2024, according to NCDOT. The project's location is immediately west of the Isabel Holmes Bridge over the Cape Fear River.

Cape Fear Crossing Study

A new Cape Fear River Crossing study is under way that considers transportation alternatives over the Cape Fear River. These alternatives would help improve traffic and enhance freight movement to and from the Port in southern New Hanover County to US 17 and I-140 in Brunswick County. US 17 serves as one of the primary entry points into the City from the west, and the WMPO determined that an additional crossing is needed to alleviate congestion on the Cape Fear Memorial Bridge (US 76/US 421/US 17 Business). The Cape Fear Crossing Study is also evaluating multiple alternatives for residents and visitors to evacuate in the event of a hurricane or other emergency. NCDOT is evaluating 12 alternatives and a Draft Environmental Impact Statement is anticipated in 2017.

Independence Boulevard Extension

NCDOT is proposing to extend existing Independence Boulevard near the Covil Avenue/Randall Parkway intersection with Martin Luther King Jr. Parkway (US 74). The purpose of this project is to help increase mobility for motorists traveling north and south in central Wilmington as an alternative to using College Road, which is currently the only north-south road that connects all of the main east-west routes east of downtown Wilmington (See Figure 2 on page 9). The NCDOT is considering grade separations (including two over the CSXT Beltline), intersection improvements and interchanges at several locations along the Independence Boulevard Extension project. The City of Wilmington's City Council does not support NCDOT's elevated highway alternative.

Love Grove Second Access

An additional access into the Love Grove neighborhood was included in the Transportation Bond approved by Wilmington voters in 2014. The Love Grove neighborhood currently has one entrance, which train traffic on the CSXT Beltline can block. Another entrance will ensure access to this neighborhood, regardless of train schedules or derailments. A derailment in 2012 led the City to seek funding for construction of a secondary access to the neighborhood. Construction is planned for late 2016 (See Figure 2 on page 9).

1.3. River/Marine Transportation Conditions

1.3.1. Cape Fear River System

The Cape Fear River is formed by the combination of the Deep and Haw Rivers, with the Black River joining approximately 10 miles north of the City. At Wilmington, it also adds the Northeast Cape Fear and Brunswick Rivers. The river is navigable as far as Fayetteville through a series of locks and dams. The estuary of the river furnishes a segment of the Intracoastal Waterway route. See Figure 3.

The Cape Fear region is home to two important ports: the Port of Wilmington (NC's busiest port) and the Military Ocean Terminal Sunny Point in Brunswick County, the largest munitions port in the US and the US Department of Defense's primary east coast port.

The Port offers terminal facilities serving container, bulk and breakbulk operations. It currently has available berths and storage areas for containers and cargo.

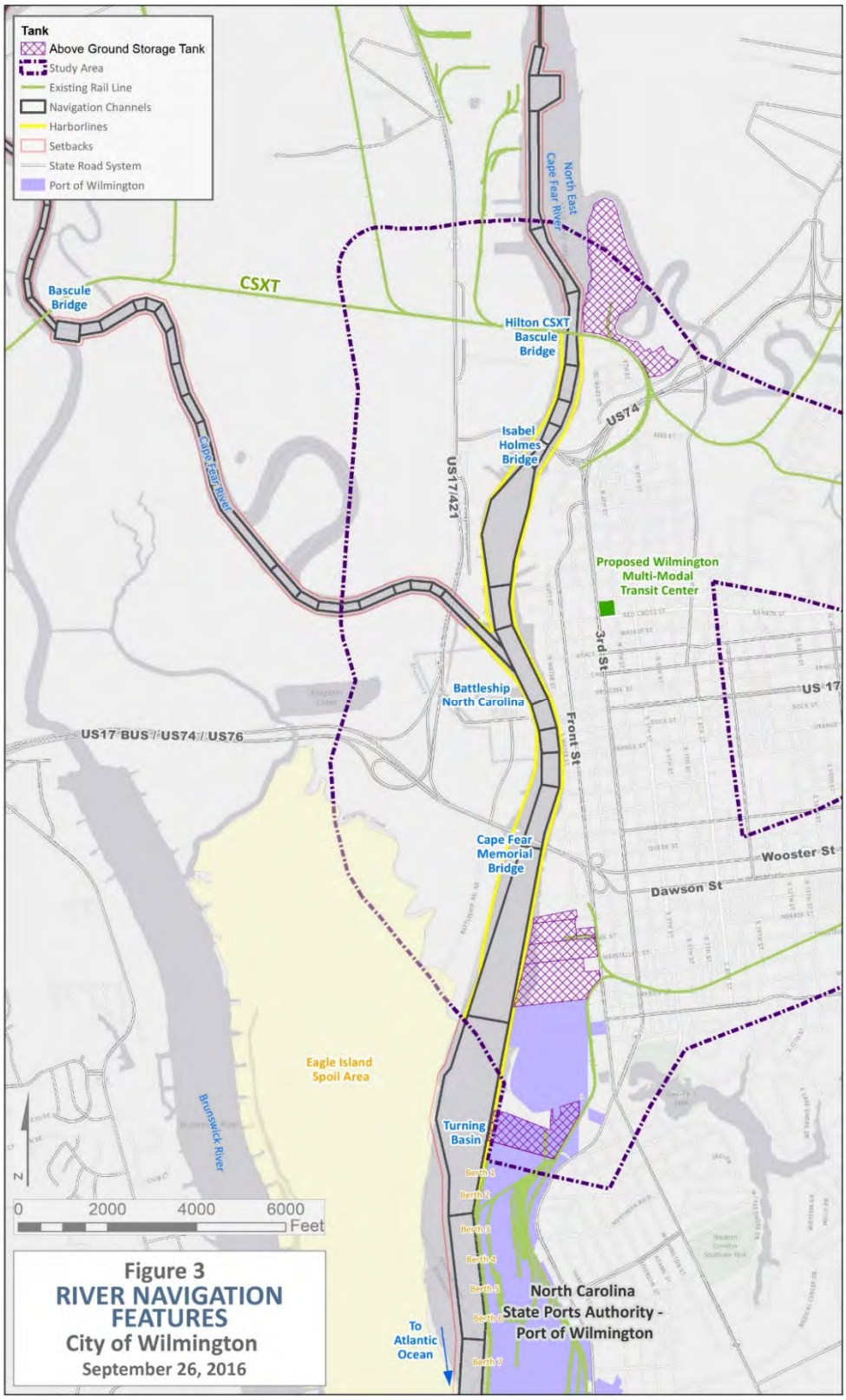
The Port is served by a 42-foot deep navigational channel, and is 26 miles from the mouth of the Cape Fear River. The Port has warehousing facilities, state-of-the-art container cranes and the latest in cargo management technology. CSXT provides daily merchandise rail service to and from the Port for boxcar, tanker and general cargo services, and now offers the Queen City Express container train connecting to Charlotte, North Carolina. This service brings a non-stop, double stacked train with overnight service to CSXT's intermodal terminal in Charlotte.

NCSPA recently completed the expansion project of the turning basin at the Port, which now accommodates vessels with a length of 1,150 feet and a beam of 158 feet. See Figure 3 on page 14. The

turning basin project included the removal of an existing bulk pier and dredging along the port side of the river to expand the turning basin from 1,200 feet to 1,400 feet. This expansion will typically accommodate vessels in the 8,000 to 10,000 twenty-foot equivalent unit (TEU) range, depending on the vessel's profile.

On August 7, 2016, the Yang Ming Unity became the largest vessel to utilize the expanded turning basin and call on the Port. The Unity carries around 8,200 TEUs and measures 1,101 feet in length and 140 feet in beam. On September 10, 2016, a larger ship, the Evergreen Ever Laden, called on the Port with 8,500 TEUs, measuring 1,099 feet in length and 150 feet in beam width. The voyage originated in Asia and navigated the newly widened Panama Canal.

Figure 3: RIVER NAVIGATION FEATURES



1.4. Public Transportation

1.4.1. Cape Fear Public Transportation Authority (Wave Transit)

The Cape Fear Public Transportation Authority, operating as Wave Transit, serves the City and the surrounding areas. The Authority's mission is to develop and maintain an effective, efficient and responsive transportation service to the mobility needs of the community. Wave Transit provides a variety of transportation options to the citizens of Wilmington and the surrounding areas. Services provided include bus, trolley, rideshare, shuttles, paratransit and bikes-on-bus. These options include Dial-a-Ride (paratransit) for the region's disabled and elderly citizens, and the UNCW Teal shuttle for the college students. In the month of August 2016, Wave Transit had a total ridership of 128,592 passengers. This includes the fixed routes, the UNC Teal shuttle and paratransit.

Currently, 16 routes serve the City and the surrounding areas. See Figure 6 in Technical Report A, Socioeconomic Report for the location of these routes within the study area. Thirteen routes directly serve the study area. These routes include:

1. 101 Princes Place- DC Virgo Middle School, Walmart (Sigmon Rd.), and the Downtown Station.
2. 103 Oleander East- College Rd, Hospital, Kmart, and New Hanover County (NHC) Government Center.
3. 104 Northeast- Mayfaire Town Center, Colonial Park Apartments, and Food Lion (Military Cutoff Road).
4. 105 Medical Center- YMCA, NHRMC and Independence Mall.
5. 106 Shipyard Blvd- Independence Mall and Miller-Motte College.
6. 108 Market Street- Food Lion (Kerr Ave), Hew Hanover High School, Downtown Station, and the Cape Fear Museum.
7. 201 Carolina Beach Road- Downtown, Monkey Junction, and Halyburton Park.
8. 202 Oleander West- Independence Mall, Roland-Grise Middle School, and Brightmore Retirement Community.
9. 203 Free Downtown Trolley - Downtown Station, Hilton Wilmington Riverside, Wilmington Convention Center, CFCC and NHC Public Library
10. 204 Brunswick Connector- Downtown, North Brunswick High School and Walmart (Leland)
11. 205 Long Leaf Park- Downtown Station, Social Services and NHRMC.
12. 207 North- CFCC (Downtown), NHC Jail, Laney High School, PPD and the VA Clinic.
13. 209 Independence – Jervay Housing, Housing Authority, and NHC's Department of Social Services.

1.4.2. Existing Transportation Centers

There are two major bus transfer centers operated by Wave Transit. The Downtown Station is located on 2nd Street between Market Street and Princess Street. A new downtown station is discussed in Section 1.4.3.

Forden Station is a major bus transfer center for the Wave Transit system. It opened in 2011 and is the region's first bus transfer facility with indoor facilities for passengers and employees. The station is located at 505 Cando Street in Wilmington near the intersection of Market Street and North College Road. The station has customer service representatives and amenities including real time bus arrival and departure information inside the terminal and at the bus loading area. Greyhound intercity bus service is provided at Forden Station. There are six daily Greyhound routes serving Forden Station as well as two thruway bus service routes that connect Goldsboro, Kinston, Jacksonville, and Wilmington to the Amtrak Palmetto route in Wilson, North Carolina.

1.4.3. Planned Downtown Transportation Center

The proposed Wilmington Multi-Modal Transportation Center (WMTC) comprises a bus station and a railroad station. The transit station section of the overall center will be developed ahead of the future railroad station (transit construction to start in 2017), but the planning work considers both facilities. The proposed location borders both sides of Campbell Street between North 3rd and North 4th Streets. The Southeastern North Carolina Passenger Rail Study (2005) confirmed a demand for passenger rail service between Raleigh and Wilmington. The study identified the existing grade separated former passenger train ACLRR corridor (also known as the "Trench" or "Gulch") through downtown Wilmington as the ideal location for the station. The station will provide connections between Greyhound intercity bus, Wave Transit and Amtrak.

Table 1: WILMINGTON RAIL STUDY CROSSING INVENTORY

Crossing Number	Primary Operating Railroad	County	City	Road Name	Route No.	RR Milepost	Crossing Type	Total Trains per day	Train Speed (mph)	Existing Condition	Road Speed (mph)	AADT	Year for AADT	Estimate Percent Trucks	Avg. No of Daily School Buses	Crashes (5 Years)	CRASH NARRATIVE
629178R	CSXT	BRUNSWICK	NEAR NAVASSA	CEDAR HILL ROAD	SR 1430	360.05	PUBLIC	4	10	FLASHERS (ONLY)	45	1,500	2015	1	7		
629175V	CSXT	BRUNSWICK	NEAR NAVASSA	PRIVATE ROAD NEAR QUALITY DR.	PRIVATE	360.37	PRIVATE	12	10	SIGNS (ONLY)	N/A	N/A	N/A	N/A	UNK		
628739Y	CSXT	NEW HANOVER	WILMINGTON	N. 6TH STREET	PRIVATE	323.32	PRIVATE	7	10	SIGNS (ONLY)	35	N/A	N/A	N/A	0		
628741A	CSXT	NH	WILMINGTON	HILTON STREET	PRIVATE	363.46	PRIVATE	7	10	SIGNS (ONLY)	35	N/A	N/A	N/A	0		
629284Y	CSXT	NEW HANOVER	WILMINGTON	KING STREET	LS	244.48	PUBLIC	2	10	SIGNS (ONLY)	25	1,100	2014	1	40	1 IN 2016	1 CRASH – VEHICLE STALLED ON RR
629286M	CSXT	NEW HANOVER	WILMINGTON	N 23RD STREET	SR 1302	244.97	PUBLIC	2	10	FLASHERS AND GATES	35	16,000	2014	1	47		
629287U	CSXT	NEW HANOVER	WILMINGTON	N. 30TH STREET	SR 1302	245.72	PUBLIC	2	10	FLASHERS (ONLY)	25	3,700	2014	1	76		
629288B	CSXT	NEW HANOVER	WILMINGTON	PRINCESS PLACE DRIVE	SR 1301	245.91	PUBLIC	2	10	FLASHERS AND GATES	35	9,200	2014	1	97		
642724T	CSXT	NEW HANOVER	WILMINGTON	CLAY STREET	LS	245.98	PUBLIC	2	10	SIGNS (ONLY)	25	300	2014	1	2	1 IN 2013	VEHICLE STRUCK
629289H	CSXT	NEW HANOVER	WILMINGTON	HENRY STREET	LS	246.04	PUBLIC	2	10	FLASHERS AND GATES	25	400	2014	0	2		
629290C	CSXT	NEW HANOVER	WILMINGTON	MARKET STREET	US 17	246.24	PUBLIC	2	10	FLASHERS AND GATES	40	36,000	2014	8	24		
629426M	CSXT	NEW HANOVER	WILMINGTON	COVIL AVENUE	LS	247.28	PUBLIC	2	10	FLASHERS AND GATES	35	17,300	2014	4	47		
629427U	CSXT	NEW HANOVER	WILMINGTON	MERCER AVENUE	LS	247.37	PUBLIC	2	10	FLASHERS (ONLY)	25	1,000	2014	1	23		
629428B	CSXT	NEW HANOVER	WILMINGTON	FOREST HILLS DRIVE	LS	247.65	PUBLIC	2	10	FLASHERS (ONLY)	25	800	2014	1	2		
629429H	CSXT	NEW HANOVER	WILMINGTON	COLONIAL DRIVE	LS	247.79	PUBLIC	2	10	FLASHERS (ONLY)	25	3,800	2014	1	37		
629430C	CSXT	NEW HANOVER	WILMINGTON	WRIGHTSVILLE AVENUE	SR 1411	248.04	PUBLIC	2	10	FLASHERS AND GATES	35	18,400	2014	5	45		
937501V	CSXT	NEW HANOVER	WILMINGTON	RIVER TO SEA BIKEWAY	NON	248.15	PUBLIC	2	10	None		BIKES, PEDS					
629431J	CSXT	NEW HANOVER	WILMINGTON	OLEANDER DRIVE	US 76	248.41	PUBLIC	2	10	FLASHERS AND GATES	40	27,000	2014	9	21		
629432R	CSXT	NEW HANOVER	WILMINGTON	S. 17TH STREET	SR 1219	248.64	PUBLIC	2	10	FLASHERS AND GATES	35	17,400	2014	7	37		
629433X	CSXT	NEW HANOVER	WILMINGTON	S. 16TH STREET	SR 1218	248.72	PUBLIC	2	10	FLASHERS AND GATES	45	17,200	2014	8	29		
629434E	CSXT	NEW HANOVER	WILMINGTON	MARSTELLER STREET	LS	248.92	PUBLIC	2	10	FLASHERS AND GATES	35	1,400	2014	1	0		

629435L	CSXT	NEW HANOVER	WILMINGTON	S. 13TH STREET	LS	248.95	PUBLIC	2	10	FLASHERS (ONLY)	35	2,800	2014	1	29		
629436T	CSXT	NEW HANOVER	WILMINGTON	S. 12TH STREET	LS	249.03	PUBLIC	2	10	SIGNS (ONLY)	35	200	2014	1	8		
629437A	CSXT	NEW HANOVER	WILMINGTON	S. 10TH STREET	LS	249.19	PUBLIC	2	10	FLASHERS (ONLY)	35	500	2014	1	2		
629438G	CSXT	NEW HANOVER	WILMINGTON	S. 9TH STREET	LS	249.27	PUBLIC	2	10	SIGNS (ONLY)	35	600	2014	1	14		
629439N	CSXT	NEW HANOVER	WILMINGTON	S. 8TH STREET	LS	249.35	PUBLIC	2	10	SIGNS (ONLY)	35	800	2014	1	4		
629440H	CSXT	NEW HANOVER	WILMINGTON	S. 7TH STREET	LS	249.42	PUBLIC	2	10	SIGNS (ONLY)	35	600	2014	0	3		
629441P	CSXT	NEW HANOVER	WILMINGTON	S. 6TH STREET / MARTIN STREET	LS	249.5	PUBLIC	2	10	SIGNS (ONLY)	35	600	2014	1	0		
629442W	CSXT	NEW HANOVER	WILMINGTON	S. 5TH STREET	LS	249.58	PUBLIC	2	10	FLASHERS (ONLY)	35	2,200	2014	1	0		
629443D	CSXT	NEW HANOVER	WILMINGTON	MARTIN STREET AT HOOPER STREET	LS	246.48	PUBLIC	2	10	SIGNS (ONLY)	35	400	2014	1	0		
629445S	CSXT	NEW HANOVER	WILMINGTON	S. 4TH STREET	LS	249.66	PUBLIC	2	10	FLASHERS (ONLY)	35	300	2014	1	0		
629446Y	WTRY	NEW HANOVER	WILMINGTON	S. 3RD STREET	US 421	249.75	PUBLIC	2	10	FLASHERS AND GATES	35	18,600	2011	2	37		
629448M	WTRY	NEW HANOVER	WILMINGTON	S. FRONT STREET	SR 1140	249.93	PUBLIC	2	10	FLASHERS AND GATES	35	16,000	2011	8	8		
902753X	WTRY	NEW HANOVER	WILMINGTON	GREENFIELD STREET	PRIVATE	250.14	PRIVATE	2	10	SIGNS (ONLY)	35	N/A	N/A	N/A	0		
629453J	WTRY	NEW HANOVER	WILMINGTON	MYERS STREET AT THE NORTH GATE	PRIVATE	250.73	PRIVATE	2	10	SIGNS (ONLY)	35	N/A	N/A	N/A	0		
629459A	WTRY	NEW HANOVER	WILMINGTON	MYERS STREET AT THE NORTH GATE	PRIVATE	250.75	PRIVATE	4	10	SIGNS (ONLY)	35	N/A	N/A	N/A	0	1 IN 2015	UNOCCUPIED PORT VEHICLE ROLLED BACKWARDS INTO TRAIN

C: Public Outreach Data

Public Outreach

The City of Wilmington (City), along with the Wilmington Urban Area MPO (WMPO), and the NCDOT Rail Division, held meetings with various groups throughout the community for the realignment of the rail corridor that currently runs through the City to a safer, more direct route into and out of the Port of Wilmington. The City utilized a multi-pronged approach to informing the public, and soliciting and integrating public comment.

This project effort began in earnest in August of 2015 and has included presentations to the following organizations:

- CSX Rail, August 6, 2015 (Raleigh)
- Wilmington City Council – presentation at work session and regular Council meeting in August of 2015 with Updates in February, 2016, August 2016, planned for June , 2017
- New Hanover County Commissioners presentation in August 2015
- Group of Brunswick County elected officials in August 2015
- Wilmington Transportation Advisory Committee, August 26, 2015
- Eagles Island Coalition September 9, 2015
- Elected NC State Delegates individually September 2015 through March 2016
- Government affairs committee of WRAR October 7, 2015
- NC DEQ, USACOE, CAMA, US Fish and Wildlife, November 12, 2015
- Central Rotary Club, February 4, 2016
- Wilmington Chamber of Commerce, February 10, 2016
- NCGS Legislative Committee Meeting March 7, 2016 (Raleigh)
- Southside Wilmington community meeting, March 10, 2016
- Railway Association of North Carolina, March 16, 2016
- Local chapter of ASCE member meeting March 8, 2016
- Lower Cape Fear River Program Advisory Board, May 24, 2016
- ACL Railroad Museum members annual meeting, May 25, 2016
- Leland Rotary Club, Summer 2016
- WAVE Board of Directors, June 2016
- Eagle's Island Coalition, September 7, 2016
- Colonial Oil, September 29, 2016
- Wilmington West Rotary
- Local chapter of Sierra Club, October 17, 2016
- Osher Lifelong Learning Cntr, Adult Scholars Program UNCW, October 27, 2016
- Wilmington Chapter of Naval Aviators Group, November 17, 2016
- Leland Town Council, January 19, 2017
- East Wilmington Rotary Club, January 23, 2017
- Task Force Chair's Update to the Wilmington MPO TAC, January 25, 2017
- General public meeting for citizens of Brunswick County January 30, 2017
- Wilmington Downtown Rotary, March 14, 2017
- Pender County Commissioners, March 20, 2017
- Town of Belville Town Board, March 27, 2017
- Cape Fear River Pilots, April 18, 2017

- Various private companies who may be affected by the project or interested in it
- Meetings with individuals from NC RR Co, Coastal Federation, NC Coastal Land Trust, UNCW Marine Biology Dept., NC Railway Association, NC DOT, State Ports
- Region 3 Board Member

Outreach efforts include public access on the City's website (www.wilmingtonnc.gov/rail), the WMPO's website, websites of WMPO member jurisdictions and other local government websites that provide general information about the potential project, followed by posting of the Consulting Engineer's draft report. There were directions to a survey for public comments and reaction. That survey was advertised through standard media press releases in order to reach a broad array of citizens in the greater Wilmington area.

Ongoing public outreach efforts include the following:

a. Creation of an eleven-person Task Force, representing the City of Wilmington Council, New Hanover County commissioners, Brunswick County commissioners, the Port of Wilmington, NCDOT Rail Division, the Wilmington Urban Area MPO, a private shipper using the current rail, CSXT, the City of Wilmington Planning Director, a railroad consultant (volunteer) who works with the railroad companies, and a Chair.

b. Creation of an email list for updates on progress of the study. The list will consist of area elected officials, elected officials at the State and Federal level representing the local communities, community leaders, organization leaders, businesses and property owners that use the rail or will be affected by the project, and others who have met with members of the Task Force leadership and are aware of the basic components of the project. The list has in excess of 100 contacts. There should be 3 updates during the time until the Task Force makes its recommendations to the City of Wilmington.

c. Two Public Open Houses will be conducted by the City and include the presence of the Consulting Engineer team members for questions. There will be information on the draft report from the Consultant and public input. The dates for the two Open Houses are February 20 and 22, one on each side of the Cape Fear River.

d. Ongoing public outreach efforts will continue to solicit opportunities for organizations such as civic clubs, service organizations, groups of community leaders and elected boards, to hear a PowerPoint Presentation and ask questions, present concerns.

Additional Outreach Efforts

Two Public Open Houses were conducted by the City and included the presence of the consulting engineer team members for questions. The dates for the two Open Houses were February 20 and March 22, one on each side of the Cape Fear River. These two meetings generated 22 and 26 attendees respectively.

Continuing outreach efforts include public access on the City's website (www.wilmingtonnc.gov/rail), the WMPO's website, websites of WMPO member jurisdictions and other local government websites to general information about the potential project. The project is also being assisted by:

a. An eleven-person Task Force, representing the City of Wilmington Council, New Hanover County commissioners, Brunswick County commissioners, the Port of Wilmington, NCDOT Rail Division, the Wilmington Urban Area MPO, a private shipper using the current rail, CSXT, the City of Wilmington Planning Director, a railroad consultant (volunteer) who works with the railroad companies, and a Chair.

b. An email list for updates on progress of the study. The list consists of area elected officials, elected officials at the State and Federal level representing the local communities, community leaders, organization leaders, businesses and property owners that use the rail or will be affected by the project, and others who have met with members of the Task Force leadership and are aware of the basic components of the project. The list has in excess of 100 contacts with on-going updates until the Task Force makes its recommendations to the City of Wilmington.

c. Ongoing public outreach efforts to solicit opportunities for organizations such as civic clubs, service organizations, groups of community leaders and elected boards, to hear a PowerPoint Presentation and ask questions, present concerns.

Presentations of Final Report Findings to Key Stakeholders Groups will be arranged to present the report findings to key stakeholder groups. All meetings will be publicized and open to the general public as well as other interested stakeholders. Key stakeholder groups will include but not be limited to:

- Wilmington City Council
- Wilmington MPO Board
- North Carolina Department of Transportation Rail
- New Hanover County Board of Commissioners
- Other local and state government agencies as may be appropriate.

Public Access Final Report

Upon completion, the Final Report of the Feasibility Study will be on the website of the City of Wilmington, WMPO, member websites, and NCDOT. As well, hard copies will be in the City's public libraries and City Manager's office of the City of Wilmington.

D: Project Funding Conditions

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1. Introduction

The following discussion is separated into two major sections to align with the two projects developed by the City Wilmington (City) — realignment of freight rail and abandoned rail reuse. Within each section, funding sources are examined with pertinent information and restrictions discussed. Much of this information was obtained directly from the various administering organizations rather than the federal and state transportation organizations. Transportation often represents only a small portion of a fund's potential uses. For instance, economic development funds may be used for advertising and promotion and not for the construction or operation of a transit service.

For the purposes of matching funding sources to needs, the proposed projects' scopes are categorized as follows:

1. Major Project: Realignment of Freight Rail
   Potential Subprojects:
   a. Planning
   b. NEPA Documentation
   c. Engineering
   d. Rail Line
   e. Structure crossing of Cape Fear River (northwest)
   f. Structure crossing(s) of Business US 17
   g. Structure crossing of Cape Fear River

2. Major Project: Transit Service (OR Abandoned Rail Reuse)
   Potential Subprojects:
   a. Planning
   b. NEPA Documentation
   c. Engineering
   d. Platforms
   e. Line Conversion
   f. Crossing Improvements
   g. Airport Line
   h. Service Yard Facilities
   i. Pedestrian Facilities
   j. Rolling Stock
   k. Ridership (Fare, Promotion and Ticketing) Systems
   l. Real-Time Passenger Information System

Table 1 (Freight) and Table 2 (Transit) list potential funding sources for the projects with potential limitations, and applicability to the project of those funds. Limitations include use for certain aspects of

the project, funding limits, competitive applications, and time restrictions. Recommendations are made in regards to proceeding with funding including which funds to pursue and how to bundle or package the project(s).

1.1. Interviews

Moffatt & Nichol and Zapata interviewed individuals who could have influence in the decision making process for funding, owning, operating and maintaining the Project. These individuals represented the City, the NCDOT's Division 3 Office, the NCDOT Rail Division, two former NCDOT Deputy Secretaries of Transit, NCDOT's current Public Transportation Director, Golden Leaf, North Carolina Railroad Company (NCRR), NCSPA, local North Carolina General Assembly House and Senate Representatives, private rail operators, and private equity firms. Throughout the interview process, two major items resonated with each interviewee. The first was the project being split into two individual projects; one for freight and one for transit rail. The second was that there will be a need for multiple financial sources to fund these projects.

Each interview included a question that pertained specifically to insights on potential funding sources. Interviewees consistently stated that multiple sources would necessary to fund the freight rail and multimodal projects independently. This opinion was based on their perception of the projects' total cost, the need for engagement from multiple parties to build support and the anticipated lack of desire from any one organization to bear the full projects' delivery and operational costs. Various federal and state funding programs were discussed that could be sources of financing. In most instances, interviewees suggested the projects' champions entertain programs that included some level of "debt equity" be obtained given the lack of available grant or government funding. It was determined that the current federal TIGER grant program is limited to ten million dollars per project. NCDOT STIP funding would be based on the benefit-cost ratio would be limited to one hundred million dollars per individual rail project. Interviewees also suggested there could possibly be a special local tax, similar to what Horry County, South Carolina did for their roadway improvements or what Wake County, North Carolina has done for their transit improvements.

Throughout the interview process, there was agreement that the freight rail realignment would provide direct rail access to the NCSPA facility for freight rail. Direct rail access to Davis Yard in Navassa could be a significant catalyst to the Port of Wilmington (Port) that is seeing growth in container throughput approaching one million TEU's per year.

Some interviewees advocated for investigating the cost and benefits of extending the proposed freight rail line to connect with other rail providers that serve destinations throughout the state of North Carolina, musing about opportunities to secure financing by demonstrating greater benefit to the state's economy by supporting important job-producers, e.g. U.S. Army. Some interviewees expressed an interest in knowing and understanding the total project parameters, impacts and estimated costs. In conversations

outside of local jurisdictions, several interviewees mentioned requesting additional funding to support a more detailed study of the feasibility, design, environmental impacts and cost-benefits.

A concern was echoed during several interviews regarding the ability of the rail transit project being able to secure financing due to expectations that ridership would be low, at least in the early years of operation.

Discussions included opinions on the projected ownership structure. Two types of ownership concepts discussed the most were the Public Private Partnerships (P3) and the creation of an authority. Between the two ownership structures, the creation of an authority with significant local representation seemed to garner the most support. Certainly, North Carolina has potential advantages in addressing freight rail activities in that the state is an owner of railroad right-of-way and infrastructure leased to a private railroad company, NCRR, who is becoming more engaged in economic development. State ownership and investment in a significant network of freight rail facilities provides an important foundation for eventual connections between that network and the Port.

Additional interviews were held with a private equity firm and former high-level state DOT officials. Mr. Tom Bradshaw, who has experience in P3, and Mr. Ron Marino of Citigroup Global Markets, Inc., both indicated funding of the rail portion is more likely through loans from the Railroad Rehabilitation and Improvement Financing (RRIF) Program that makes loans available for short line railroads with little credit. Loans may be used to move the freight rail line to a better location, but there needs to be a revenue stream to pay back these loans. Since CSXT would benefit from the realignment, it is reasonable to ask them to share in the costs due to improved economy of rail operations. A separate privately-held company owning a short line could also build the line and recover costs from fees on the rail traffic on the more economic line. This money could be used to secure a RRIF loan. It makes sense for a rail company to build the line as a private company's involvement could accelerate the realignment and acquisition process.

As to transit project funding, there is a need for up-front capital investment however, there is not enough revenue coming from fare boxes to attract private companies alone. Some transit systems in the country require subsidies up to 90 percent from public sources. Nearly all transit systems have sales and or property taxes enacted by transit districts to make the system feasible. TIF districts based on increased value of Transit Oriented Development (TOD) around the stations could pay back investments. Making the TOD approach successful will require the local community to develop and promote a vision of the transit system that attracts many individual investors.

2. Potential Funding Sources

2.1. Freight Rail Realignment

2.1.1. Sources

USDOT Federal Highway Administration (FHWA) - Federal

The FHWA administers nearly 100 funding programs and projects as authorized by Congress. These include specialized areas such as bicycles, interstates and railroads. Because the scope of rail realignment affects many aspects of transportation, funding programs may exist that may be useful in funding subprojects. The following programs may be of use, however, many will focus on portions of subprojects, some are unfunded by Congress and others will require a demonstration of political will. All of the following funding programs are more likely to apply to the two proposed projects.

- Freight Intermodal Distribution Pilot Grant Program
- National Corridor Infrastructure Improvement Program
- Projects of National and Regional Significance
- Surface Transportation Block Grant Program
- Fostering Advancements in Shipping and Transportation for the Long-term Achievement of National Efficiencies grants.

Freight Intermodal Distribution Pilot Grant Program

This USDOT FHWA Program funds projects that help relieve congestion, improve transportation safety, facilitate international trade and encourage public private partnerships. Projects may include the development and construction of intermodal freight distribution and transfer facilities at inland ports. However, all authorized funds are directed to six projects identified in the authorizing legislation. Congress may reauthorize funding in the future.

A purpose of the program is to make grants to states to facilitate and support intermodal freight transportation initiatives at the State and local levels to relieve congestion and improve safety. The program provides capital funding to address infrastructure and freight distribution needs at inland ports and intermodal freight facilities. If discretionary funding becomes available, funding for projects will be awarded through a selection process conducted by the Secretary of Transportation. Priority will be given to projects that reduce congestion into and out of international ports and expand intermodal facilities that encourage the development of inland freight distribution centers.

National Corridor Infrastructure Improvement Program (NCIIP)

The NCIIP is a USDOT program intended for highway construction projects in corridors of national significance. Projects are selected with consideration of the extent to which:

- The project facilitates major multi-state or regional mobility, economic growth and development in areas underserved by highway infrastructure.
- International truck-borne commodities move through the corridor.
- The project will reduce congestion on an existing segment of the interstate.
- The project will reduce commercial and other travel time through a major freight corridor.

- Federal funds will be leveraged including use of innovative funding, and other sources of federal, state, local or private funding.
- The value of the cargo carried by commercial vehicle traffic in the corridor and the economic benefits arising from congestion in the corridor exceed the cost of the project.

Projects of National and Regional Significance (PNRS)

This USDOT program funds any surface transportation project eligible for assistance, including a freight railroad project, that has a total eligible cost greater than or equal to the lesser of (1) 500 million dollars or (2) 50 percent of the amount of federal highway funds apportioned to the state in which the project is located for the most recently completed federal fiscal year.

The PNRS Program also provides funding beyond the state apportionment levels for high cost transportation infrastructure facilities for critical national economic and transportation needs not adequately funded within existing surface transportation program categories. The program seeks to improve economic productivity, facilitate international trade, relieve congestion and enhance movement of passengers and freight.

Applications for funding will be solicited by the U.S. Secretary of Transportation (Secretary) and funding will be awarded competitively through an evaluation based on preliminary engineering. In the context of a multi-modal approach, the use of PNRS funds on non-highway facilities is permitted.

The Secretary may designate a project as one of national and regional significance if the project meets all of these requirements:

- Increases access to jobs, labor and other critical economic inputs.
- Cannot be realized without federal support and participation.
- Has support for non-federal financial commitments and has stable and dependable financing sources to construct, maintain and operate the infrastructure facility, including P3.
- Improves transportation safety, including reducing transportation accidents, injuries, and fatalities.
- Significantly improves the performance of the federal-aid highway system, nationally, or regionally, the project increases speed, reliability and accessibility of the movement of people or freight.
- Addresses major bottlenecks, chokepoints, gateways, hubs, and surface transportation system corridors.

Development phase activities are eligible costs. Examples of development activities include planning, feasibility analysis, revenue forecasting, environmental review, preliminary engineering and design work and other preconstruction activities. Other eligible costs include the costs of construction, reconstruction, and rehabilitation as well as the costs associated with the acquisition of real property and equipment, environmental mitigation, construction contingencies, and operational improvements.

Surface Transportation Block Grant (STBG) Program

This USDOT STBG Program funds the following eligible activities:

- Construction of highways, bridges and transit capital projects.
- Operational improvements and capital and operating costs for transit monitoring, management and control facilities and programs.
- Transit safety infrastructure improvements and programs, including railway-highway grade crossings.
- Pedestrian projects.
- Surface transportation infrastructure modifications to facilitate direct intermodal interchange, transfer and access into and out of a port terminal.

Fostering Advancements in Shipping and Transportation for the Long-term Achievement of National Efficiencies (FASTLANE)

The USDOT FASTLANE is a grant program focused on the need for continual infrastructure investment across the country. Programs goals include:

- Improving safety and efficiency of moving freight and people.
- Generating national or regional economic growth.
- Reducing roadway congestion and delays.
- Improving freight connectivity.
- Addressing the effects of freight movement in communities.

It should be noted that the USDOT received 13 times more requests than what was available in funding, which shows the need for infrastructure investments across the nation. Currently, this program is funded through 2020 with annual funding ranging from 850 million dollars a year and increasing to 1 billion dollars a year.

USDOT/Federal Railroad Administration (FRA) -Federal

The FRA supports passenger and freight railroad programs through a variety of competitive grant, dedicated grant and loan programs to develop safety improvements, relieve congestion and encourage the expansion and upgrade of passenger and freight rail infrastructure and services. Applicable programs include the Railroad Safety Infrastructure Improvement Grant, Rail Line Relocation and Improvement Capital Grant Program, Transportation Investment Generating Economic Recovery, and the Railroad Rehabilitation and Improvement Financing Program.

Railroad Safety Infrastructure Improvement Grant (RSIG)

RSIG is a new program that provides discretionary funding up to 25 million dollars, to projects that make safety improvements to railroad infrastructure. Eligible projects include the acquisition, improvement or rehabilitation of intermodal or rail equipment, such as rolling stock, locomotives and passenger cars; or rail facilities, including track, bridges, tunnels, yards, buildings, passenger stations and maintenance and repair shops

Rail Line Relocation and Improvement Capital Grant Program (RLR)

RLR provides financial assistance for local rail line realignment and improvement projects that involve a lateral or vertical line realignment and mitigate the adverse effects of rail traffic on safety, motor vehicle

traffic flow, community quality of life or economic development. This program requires a ten percent contribution from the project sponsor.

Transportation Investment Generating Economic Recovery (TIGER)

TIGER is a nationwide discretionary grant program investing in critical road, rail, transit, and port projects. The USDOT's Office of the Secretary manages program funds.

Railroad Rehabilitation and Improvement Financing (RRIF)

RRIF provides direct loans and loan guarantees to acquire, improve or rehabilitate intermodal or rail equipment or facilities, including track, bridges, yards, buildings and shops; refinance outstanding debt incurred for the purposes listed above; and develop or establish new intermodal or railroad facilities.

Reassignment of Funds Planned for Transportation Improvements on Portion of CSXT Rail in Wilmington - State and Federal

Funds already planned for improving the existing CSXT crossings in Wilmington may be diverted to relocating the freight rail traffic outside of the city. This would improve the delay and safety at the crossings even if the line is converted to transit use. Transit vehicles may be more frequent but should be shorter and quicker translating into more frequent but shorter interruptions to roadway traffic flow. Shorter interruptions may be more bearable reducing the need for grade separations.

NCDOT Rail Division / Contingency Funds- State

The NCDOT Rail Division may help fund the cost of constructing rail tracks required to serve a new or expanding business as part of a statewide effort to attract new industry to the state. The purpose of the program is to provide an incentive for companies to locate or expand in North Carolina rather than another state. Funding applications should be made prior to making a location decision.

This funding stream is for a maximum of 50 percent of total project costs up to approximately $200,000. While this maximum is subject to change, the low maximum may require applications for separate rail subprojects to accumulate adequate funding for the rail aspects of the major projects.

Ports – Container Fees- State

The NCSPA maintains the Marine Terminal Operator Schedule #1 (Terminal Tariff) that governs fees for the dockage, wharfage, handling and storage of containers. Three ports in South Carolina (Port of Charleston, Port of Georgetown, and Inland Port Greer) also maintain this tariff. There may be an opportunity to discuss allocation of a portion of these fees toward a new freight rail line.

The North Carolina General Assembly (NCGA) - State

The City could ask the NCGA to fund a study to investigate competitive rail service to the Port from western North Carolina. This study would review all rail options and limitations between Charlotte and Wilmington. CSXT currently operates the most direct line that extends from Wilmington through Lumberton, Pembroke, Hamlet, Wadesboro and Monroe before reaching Charlotte. Each of those locations has connections to branches to other rail lines. Because the CSXT-operated line also serves the

US Department of Defense facility Military Ocean Terminal at Sunny Point, study of upgrades may also take on national importance.
New Hanover and Brunswick Counties have State House Districts 17, 18, 19 and 20. The State Senate Districts are Districts 8 and 9.

NCDOT State Transportation Improvement Program (STIP) - State

The NCDOT STIP program is the approved project ranking and transportation funding program for the state. There is a 100 million dollar cap on the rail program. The projects are ranked based on the Strategic Mobility Formula. There are three evaluation categories and multiple factors considered; these are listed below:

Statewide Mobility Category (receives 40 percent of the available revenue)

Projects are scored using these weighted criteria:

- Congestion (30 percent)
- Benefit/Cost (30 percent)
- Economic Competitiveness (10 percent)
- Safety (10 percent)
- Multimodal, Freight, and Military (20 percent)

Regional Impact Category (receives 30 percent of available revenue shared over 7 regions)

- Funding is distributed based on populations
- Projects are scored on the following weighted criteria:
    - Congestion (25 percent)
    - Benefit/Cost (25 percent)
    - Safety (10 percent)
    - Accessibility/Connectivity (10 percent)
    - Local Rankings (30 percent)

Division Needs Category (receives 30 percent of the available revenue)

- Funding is distributed equally over NCDOT's 14 Divisions.
- Projects are scored using these weighted criteria:
    - Congestion (20 percent)
    - Benefit/Cost (20 percent)
    - Safety (10 percent)
    - Local Rankings (50 percent)

Statewide Contingency Funds - State

The Statewide Contingency Fund is a 10 million dollar fund administered by the State's Secretary of Transportation. The Secretary of Transportation along with the President Pro Tempore of the Senate and the Speaker of the House sponsor project requests for this fund.

As part of the approval process, requests are sent to the NCDOT Chief Engineer-Operations for review and recommendations. This review includes a cost estimate, written comments and a recommendation regarding project feasibility. The request then moves to the Contingency and Small Urban Funds

Committee who will make recommendations for the Secretary of Transportation for consideration. If approved by the Secretary, the project will be placed on the Board of Transportation's agenda for final action.

NCDOT Small Urban Funds- State

The NCDOT Small Urban fund is a program in which each NCDOT Division is appropriated 2 million dollars annually to aid in funding local projects. These funds are to be used for projects located in or near (within two miles of the city's limits) of a municipality. The funds for this program cannot be used for right-of-way acquisition or utility relocations. The funding maximum for a project is $250,000 per year.

NCDOT Economic Development Funds- State

The NCDOT Economic Development funds are used for projects that fit the following criteria:

- Project should contribute to economic growth and development by attracting new businesses/industries or expanding existing business/industries that increase employment opportunities.
- Funds may be used for highway projects, aviation projects at publicly owned airports and for rail or marine public access projects that contribute to economic growth and development by attracting new businesses/industries or expanding existing business/industries.

Funding is up to $2,500 per new job with a maximum of $400,000 per project unless this is waived by the NCDOT Secretary and NC Department of Commerce Secretary.

Private-Public Partnership (P3)

P3s are government services as business ventures funded and operated through a partnership of government and one or more private companies. They are long-term contracts between a private party and a government entity for providing a public asset or service. Typically, the private party bears significant risk and responsibility and the financial remuneration is tied to performance and the level of risk.

There are three models of P3 currently being used. They differ as to how the facility is constructed, operated and maintained. In the first P3 model, the public agency takes on the debt and the task of constructing the facility in cooperation with a public/private operator. In the second P3 model, the public agency also finances the construction but the ongoing operation is part of the construction contract. In the third P3 model, the financing is a combination of public debt and private equity with a public subsidy or guarantee to the concessionaire who constructs and operates the facility. These models differ on the amount of public debt and involvement in the construction and operation aspects of the project.

P3 agreements have significant benefits for constructing a project including a cost savings and shortened project delivery. The overall project delivery mechanism is structured to manage risk, accelerate delivery and reduce overall life-cycle cost with more flexible private sector delivery models. In many ways, the P3 concepts provide for efficiencies that the governmental agencies cannot provide.

The NCDOT's policy on P3 agreements (dated January 2014) that permits private entities to have a financial interest in the project after completion. It has applicability to a wide array of transportation projects throughout the state. P3 systems may be utilized if it is determined that there is "a critical need for a capital improvement project."

In addition to the rail realignment project several subprojects such the rail line and structures over the Brunswick and Cape Fear Rivers could be candidates for P3 agreements. Breaking the freight rail line realignment into individual revenue streams may complicate the return and construction. Based on interviews with private equity leaders, it may be best for CSXT to construct the entire line and provide some revenue sharing through a P3 agreement. The public portion of the P3 partnership could then use those revenues to pay back Federal loans.

Private Corporation/Joint Venture - Private

Private corporations could be formed or attracted to operate the short line. Like the P3 model, a private corporation could have significant benefits for constructing a project including a cost savings and shortened project delivery. Without the public involvement, the entire rail realignment project would have to be financed without public funds.

While breaking the rail realignment project into several subprojects may complicate the return and construction, it may lower the upfront capital costs for individual investors making them more feasible. Since the return is based on each element's successful construction, there must be an agreement between the investors of the individual subprojects. This is why many of these arrangements are joint ventures between different contractors, equity firms and operators. Based on interviews with private equity leaders, it is possible to attract a private investment group or a joint venture to build the short line railroad.

North Carolina Golden LEAF Foundation - Private

The Golden LEAF Foundation was formed under a charter established by the NCGA. According to the charter, the Golden LEAF Foundation *"shall promote the social welfare and lessen the burdens of government [by using its funds] to provide economic impact assistance to economically affected or tobacco-dependent regions of North Carolina in accordance with the Consent Decree [between the state of North Carolina and cigarette manufacturers]."*

Besides education, job training and employment assistance, activities also include public works for upgrading transportation, and other public service infrastructure for general economic development purposes. Specifically, the benefits of this project would have to extend to rural regions of North Carolina and rural benefits must be a significant aspect of the grant application.

Duke Energy Coal Ash as Fill Material - Private

Coal ash is a waste byproduct of energy production and represents a solid waste disposal concern for energy companies. The use of coal ash in construction has been documented over the decades and the use of coal ash is supported by the U.S. Environmental Protection Agency (EPA). The use can be as either encapsulated or unencapsulated forms. Encapsulated coal ash would be used as a filler in concrete, bricks or other construction materials. The EPA has concerns with unencapsulated or loose coal ash, particularly when proper engineering standards are not met. The EPA considers coal ash used to fill in sand and gravel

pits and other large scale fill operations and is soliciting comments as to whether it should be regulated. In the railroad realignment major project, the material could serve as in "structural fills or embankments" or as a replacement for soils with poor geotechnical engineering characteristics. With this potential use, and with Duke Energy's Sutton Plant only three miles away, this concept could conceivably reduce the overall construction cost of the new freight rail line. Securing permits and approval from the US Army Corps of Engineers (USACE), the EPA the USDOT Federal Railroad Administration, and NCDOT approval for the use of coal ash in the construction of these projects would be a significant undertaking.

User Fees for Rail Car Access to New Rail- Private

The rail line operator may assess user fees for access to the rail line. This could be a fee per rail car or per container used to offset the cost of construction and operation. The concept also has the potential to open up access to multiple rail carriers.

Table 1: SUMMARY OF POTENTIAL FUNDING SOURCES – FREIGHT RAIL REALIGNMENT

Fund	Source	Limitations	Applicability
Freight Intermodal Distribution Pilot Grant Program	USDOT FHWA	All funds are allocated to specific projects. Funding levels range from $5 million to $30 million per project.	Development and construction of intermodal freight distribution and transfer facilities at inland ports.
NCIIP	US DOT FHWA	No maximum up to apportioned amount, generally 80% federal.	Ancillary highway construction associated with reducing freight truck delays.
PNRS	USDOT FHWA	A minimum of the lesser of $500 million or 50% of NC's annual apportionment.	Freight railroad for national economic and transportation needs to facilitate international trade.
FASTLANE Grant	USDOT FHWA	$100 million	Freight-related construction improvements.
State Block Grant Program and Airport Improvement Program	USDOT FAA	Generally, 75% to 95%, limits not known.	Providing transit service to Wilmington International Airport.
RSIG Grant	USDOT FRA	$25 million	Safety improvements to railroad infrastructure.
RLR	USDOT FRA	Typical funding ranges from $500k to $2.5 million per project.	Relocation to improve vehicle traffic flow, quality of life, or economic development.
TIGER	USDOT Secretary	$10 million maximum for a project per NCDOT.	Discretionary grant for critical projects. Innovative multi-modal, multi-jurisdictional with regional economic and environmental benefits.
RRIF	US DOT FRA	Fund 100% of project with up to a 35-year repayment period.	Loans and loan guarantees for intermodal or rail equipment, track, buildings, and yards.

Fund	Source	Limitations	Applicability
Reassignment of Funds Planned for Transportation Improvements on Portion of CSXT Rail in Wilmington	NCDOT from current STIP Projects	Potential amount could vary based on savings from current STIP projects.	Planned funds for improving CSXT crossings in Wilmington.
Contingency Funds	NCDOT Rail Division	50% maximum up to $200K per project.	Constructing rail to new or expanding businesses.
Container Fees	NCSPA Port of Wilmington	Unknown	Per container fee or fee per ton.
Legislative Action	NCGA	Unknown	Study of existing rail line to Charlotte.
NCDOT STIP	NCDOT	Maximum $100 million limit on rail projects. Based on the Benefit-Cost Ratio.	STIP
Statewide Contingency Funds	NCDOT	$10 million sannual fund	Request funds from NC's Secretary of Transportation.
Small Urban Funds	NCDOT	$250Klimit per year.	Request funds from division engineer and board member.
Economic Development Funds	NCDOT	$400k limit per project	Awards $2500 per job created.
P3	State, Local, Private	No limits.	All aspects of project with particular emphasis on transit operations, stations, major bridges and rail line.
Private Corporation/Joint Venture	Private	Limited by amount of return to investors.	All aspects of project with particular emphasis on major bridges and rail line.
Golden LEAF Foundation	Golden LEAF Foundation	Unknown	General economic development
Coal Ash as Fill Material	Duke Energy	Potential savings based on amount of fill that coal ash could replace.	Use as fill material for rail realignment.

Funding from a Single Source or Multiple Sources

A single source of funds seems highly unlikely. Besides the NCDOT STIP funds and a rail grant (loan) the most likely single source of funds is a multi-year arrangement through the NCGA. Phasing the rail realignment project to match funding to smaller subprojects may mean some portions of the realignment are built before others. Having only part of the rail line built would mean the existing rail line would have to remain in service and no additional revenue would be realized to begin paying any incurred debt. Funding that does not need to be repaid is advantageous given the lack of early revenue stream.

Because of the length of time before benefits are realized, different funds may be used for pre-construction. Local funding may be necessary for planning, engineering and environmental work while the larger construction costs may need funding from private, state, and federal government sources.

The rail realignment project has significant bridges, environmental issues and geotechnical challenges. Subprojects could be individual bridges, roadway or railway realignments, grade separations, etc. that may be phased as funding becomes available. The monetary benefits, increased tonnage, better delivery times of goods and lower operating costs and safer operations associated with improving rail access to the port should be accessed for funding. This would require positive negotiations with the users and operators to gain agreement for the use of any revenue realized through cost savings from business growth or operating efficiencies.

2.1.2. Recommendation for Best Mix of Funding Sources— Rail Realignment

Funding for the rail realignment project should be broken out by subproject. The planning, NEPA documentation and engineering could be one subproject funded by local monies. The construction of the rail line and major structures should be funded by a combination of state and federal sources. Local matches for the construction would be best accomplished by either creating a special tax or assessing a fee on each container passing through the Port. Additional cost saving measures such as using coal ash in fill sections of the project may be used to reduce the anticipated construction costs.

There are numerous sources of funding available. With the anticipated project costs and funding limitations of each individual program shown in the previous sections, one can conclude that there will be a mix of grant funding and low interest loans needed to meet the funding requirements. The best sources of grant funding would be from the Golden Leaf Foundation, TIGER grants, NCDOT STIP and from USDOT FASTLANE program. The remaining fund balance of would be obtained from the RRIF program, which is a low interest loan program.

2.1.3 Ownership and Management Structure – Examples

The following examples demonstrate a range of examples for ownership and management structure.

Carolina Southern

R.J. Corman Railroad Group worked with local and state officials in North Carolina and South Carolina to reestablish train service on the 80-mile abandoned Carolina Southern rail line. The $13.9 million deal was a mix of private and county funding negotiated through the efforts of a locally organized interstate railroad committee. The stakeholder group worked for three years after the closure of the line in 2011.

Commonwealth Railway

Commonwealth Railway, Inc. is owned by Genessee & Wyoming Inc., which is a short line holding company with 120 railroads in five countries. This rail line recently had a $60 million project to relocate the line to the median of I-664 and State Route 164 in Portsmouth, Virginia. As part of this work, greater vertical clearances were provided for double-stack container rail service. Construction of the median-rail line was included in a larger project to build the freeway.

P3s in North Carolina

P3s have been used for North Carolina State University's Centennial Campus and expansions of the campus at the University of North Carolina at Chapel Hill. In 2015, NCDOT used a P3 agreement for the I-77 Express Lanes Project. This project will add 26 miles of tolled, express lanes with an approximate cost of $591 million with $248 million in private equity funding, $189 million TIFIA loan, $100 million of private activity bonds and $95 million in public funds. NCDOT also guaranteed debt service payment obligations due to insufficient revenues. This project is currently under design and construction by the P3 entity.

P3s for Freight Rail Projects

P3 agreements have been used in various states to fund freight rail projects including the Norfolk and Southern Heartland Corridor Route from Chicago, Illinois to Norfolk, Virginia's marine terminals and CSXT's National Gateway project, which is predominately along the I-95 corridor but also includes the line from Charlotte to Wilmington in North Carolina. The Heartland Corridor Route included five states to modify rail lines to accommodate double stack containers using both private funding and PNSR program funds from the federal DOT. The National Gateway project provided for intermodal terminals as well as increasing clearances for double stack containers.

Ownership Structure and Revenue Arrangement Analysis

The relocated freight rail line and associated structures may be owned by CSXT (or one of their wholly-owned subsidiaries), or a short line railroad company such as Genessee & Wyoming Inc. Ongoing revenue would be obtained by assessing a fee on each container or railcar. Lease payments between the owner and operator may be used to pay debts incurred.

Recommendation for Ownership Structure and Revenue Arrangement

The formation of an authority is recommended as the ownership structure for the proposed realignment of the freight rail. The ownership structure for the authority should include various local entities that will benefit from the proposed improvements. It is envisioned that the ownership structure would include the City of Wilmington, New Hanover County, Brunswick County, Navassa, Leland, Belville, NCSPA and members of the Wilmington Area MPO. Although the NCGA would need to approve this type of ownership structure, this type of entity has inherent benefits. One being the ability to condemn property for the proposed improvements if negotiations with property owners fail. An additional benefit of this ownership structure is its ability to unify the areas entities that could potentially compete for the same funds for different projects. Another benefit is that this structure would last longer than the current champions of the project for each separate entity would. In other words, by the formation of this authority, the various member agencies would continue to work to make this a successful venture long after the current champions have retired or are no longer holding public office.

Several potential revenue streams exist that can be realistically considered for this entity.

The first avenue of income would be to lease the relocated freight line either to a short line railroad operator or to a large national railroad company. There are two options to consider for structuring the lease. The first is to have an annual flat lease of the rail line, which would possibly include some annual increase in rent due to historic annual increases in cost. The second is to have a lease based on the number

of containers transported along this track. With this type of lease structure, income increases as the number of containers transferred along this rail line increases. However, if the number of containers decreases income will do the same.

The second source of potential income would be from a unique sales tax created to help fund the debt service of the relocated rail line and/or the proposed multi-modal transportation of the current CSXT rail bed after the freight rail realignment. This new tax would stay in effect until the debt service for the project was paid and certainly would require some levels of local referendum and legislative concurrence.

2.2. Transit Facilities and Service

2.2.1. Sources

US Department of Transportation/Federal Transit Administration (FTA) - Federal

FTA is funded through the current federal aid legislation "Fixing America's Surface Transportation (FAST) Act". This law was signed in December 2015 and provides transit funding through fiscal year 2020. There are 28 different programs, which are both competitive, and formula based. Some competitive programs, which may be applicable to these projects, include: Capital Investment Grants, Expedited Project Delivery for Capital Investment Grants, and the Transportation Investment Generating Economic Recovery (TIGER) grants. Formula based programs, which may be applicable, include the STBG Surface Program.

Capital Investment Grant is FTA's primary grant program for funding major transit capital investments, including heavy rail, commuter rail, light rail, streetcars, and bus rapid transit, this discretionary grant program is unlike most others in government. Instead of an annual call for applications and selection of awardees, the law requires that projects seeking CIG funding complete a series of steps over several years to be eligible for funding.

Expedited Project Delivery for Capital Investment Grants Program allows up to eight projects over the life of the pilot program to be selected for expedited grant awards. Projects must be supported through a public-private partnership and demonstrate local financial commitment, technical capacity, and a certification that the existing transit system is in a state of good repair.

TIGER grants provide funding for innovative, multi-modal and multi-jurisdictional transportation projects that promise significant economic and environmental benefits to an entire metropolitan area, a region, or the nation.

STBG Program provides funding that may be used by states and localities for a wide range of projects to preserve and improve the conditions and performance of surface transportation, including highway, transit, intercity bus, bicycle, and pedestrian projects.

Buses and Bus Facilities Grants Program's Low- or No-Emission Vehicle Sub Program makes federal funds available to states and transit operators to obtain low and no-emission vehicles.

USDOT FHWA — Federal

The FHWA administers nearly 100 funding programs and projects as authorized by Congress. These include many specialized areas such as bicycles, interstates and tribal areas. Because the scope of the rail realignment affects many aspects of transportation, funding programs may exist that may be useful in funding subprojects. The following programs may be of use for these projects, however, many will focus on portions of subprojects, some of which are unfunded by Congress and others that would require a demonstration of political will.

100% Federal Share for Safety ("G" Matching Ratio)

- Bicycle Transportation and Pedestrian Walkways
- Congestion Mitigation and Air Quality (CMAQ) Improvement Program
- Elimination of Hazards at Railway-Highway Crossings
- Highway Safety Improvement Program (HSIP)
- National Highway Performance Program
- National Highway System (NHS)
- National Scenic Byways Program
- Real-Time System Management Information Program
- STBG Program

100% Federal Share for Safety

"G" Matching Ratio states may use up to 10 percent of their total federal-aid apportionments at a 100 percent federal share for priority control systems for transit vehicles at signalized intersections.

Bicycle Transportation and Pedestrian Walkways

Bicycle and pedestrian projects are broadly eligible throughout the federal-aid and federal lands programs. STP funds are available they could be used for the construction of pedestrian walkways and bicycle transportation facilities and for carrying out non-construction projects related to safe bicycle use.

CMAQ Program

CMAQ projects must demonstrate the three primary elements of eligibility: 1) transportation identity, 2) emissions reduction and 3) location in or benefitting a nonattainment or maintenance area. Wilmington is ineligible for CMAQ funds. Projects must be included in a metropolitan planning organization (MPO) transportation plan and transportation improvement program (TIP). Eligible activities include:

- Intermodal equipment and facility projects that target diesel freight emissions.
- Projects that improve traffic flow, including efforts to mitigate congestion and improve air quality, improve mobility, such as through real time traffic, **transit,** and multimodal traveler information.
- Transit investments, including transit vehicle acquisitions and construction of new facilities or improvements to facilities that increase transit capacity.

Elimination of Hazards at Railway-Highway Crossings Program

This program funds at-grade public crossing safety improvement projects meeting the eligibility requirements including but not limited to, the installation of protective devices, the elimination of hazards and grade crossing separation.

Highway Safety Improvement Program

HSIP funds may be obligated to carry out any highway safety improvement project on any public road or publicly owned bicycle or pedestrian pathway or trail without regard to whether the project is included in an applicable state strategic highway safety plan.

National Highway Performance Program (NHPP)

NHPP funds may be obligated for a project involving an "eligible facility," that is a project supporting progress toward the achievement of national performance goals for improving infrastructure condition, safety, congestion reduction, system reliability or freight movement on the NHS. Projects must be identified in the STIP/TIP and be consistent with the state's long-range statewide transportation plan and the metropolitan transportation plan(s). Projects incorporating innovative project delivery may be increased by up to 5 percent of the total project cost not to exceed a 100 percent federal share. The federal share for NHPP projects and activities is reduced to 65 percent for states that have not developed and implemented an asset management plan in the required time periods. The following activities are eligible:

- Construction, reconstruction, resurfacing, restoration, rehabilitation, preservation of, and operational improvements for, a federal-aid highway not on the NHS, and construction of a transit project eligible for assistance. If the transit project is in the same corridor as a fully access-controlled highway on the NHS, the construction or improvements will reduce delays or produce travel time savings on the fully access-controlled highway; and the construction or improvements are more cost-effective than an improvement to the fully access-controlled highway on the NHS.
- Bicycle transportation and pedestrian walkways associated with an NHS facility.
- Highway safety improvements on the NHS.
- Construction of publicly owned intra-city or intercity bus terminals servicing the NHS.

National Highway System (NHS)

State appropriations t for the NHS may be obligated for

- construction, reconstruction, resurfacing, restoration, and rehabilitation of segments of the NHS;
- construction of a federal-aid highway not on the NHS and construction of a transit project if such highway or transit project is in the same corridor as a fully access-controlled NHS highway;
- level of service improvements on the fully access-controlled NHS highway;
- improvements to regional travel; and
- if the construction is more cost-effective than improvements on the fully access-controlled NHS highway would be to provide the same benefits. This includes pedestrian walkway and publically owned intra-city or intercity bus terminals.

National Scenic Byways Program

This program funds improvements to the Cape Fear Scenic Byway (Byway), which extends seven miles through the heart of Wilmington. The existing rail line crosses the Byway near the intersection of Fifth Street and Martin Street. Any special provisions or cultural elements required by the Byway may be eligible for this funding.

Real-Time System Management Information Program

This program funds activities relating to the planning and deployment of real-time monitoring elements including capital and operating costs for transit information monitoring, management and control facilities and programs.

STBG Program

The STBG program funds the following eligible activities:

- Construction of highways, bridges, and transit capital projects.
- Operational improvements and capital and operating costs for transit monitoring, management and control facilities and programs.
- Transit safety infrastructure improvements and programs, including railway-highway grade crossings.
- Pedestrian projects.

US DOT FAA—STBG Program and Airport Improvement Program

The Wilmington International Airport (ILM) is a publicly owned airport owned by New Hanover County with international service capabilities. The airport terminal is located north of the downtown area of Wilmington and is within two miles of the CSX rail line. ILM is planning expansion of the terminal and gates but not the parking facilities. Currently the airport has non-stop flights to Atlanta, Charlotte, New York City, Philadelphia, and Washington DC. Growth emphasis is on tourism travel with a focus on increasing flights to Dallas and Chicago. Given that City representatives consider the potential downtown trolley system a tourism growth generator, ILM may want to consider updates to its Master Plan to include multimodal transportation alternatives for its arriving and departing passengers.

The FAA operates a STBG Program for airports that includes up to 10 states. North Carolina was one of the original three states included in 1989. The Airport & Airway Trust Fund provides grants for construction and safety projects at airports through the Airport Improvement Program (AIP). The amount of a project that is funded is dependent on the size of the airport and may range between 75-to-95 percent of the project total.

US DOT FTA Federal Small Starts and New Starts - Federal

The New Starts and Small Starts programs are FTA funding programs for establishing new fixed guideway systems or extending existing guideway systems. The New Starts funding is for projects that have an overall cost greater than $300 million and total funding being requested is more than $100 million. The Small Starts funding is for projects that have an overall cost of less than $300 million and total funding being requested is less than $100 million. This program has an annual appropriation of $2.3 billion. Projects must complete the environmental review process including reviewing alternatives and selecting a locally preferred alternative and demonstrate that an acceptable commitment of stable and dependable

local funding is available before funding will be approved. Projects are evaluated based on mobility, environmental benefits, congestion relief, and economic development among other aspects.

NCGA - State

The NCGA could be asked to fund a study to investigate transit service in Wilmington. This study would review all transit options and perform economic analysis of the viability of the service. Because a transit service is able to replace commuter traffic, analysis of the entire region may be in order including New Hanover and Brunswick counties. New Hanover and Brunswick Counties have State House Districts 17, 18, 19 and 20. While the Senate Districts are Districts 8 and 9.

NCDOT Public Transportation Division (PTD) - State

The NCDOT Public Transportation Division administers federal and state transportation grant programs. These programs totaled more than $130 million in 2015.

North Carolina Department of Commerce (DOC) Tourism Development Program - State

North Carolina DOC operates the Tourism Development Program to increase tourism in the state. The program seeks to develop partnerships with federal, state, and local agencies including the Department of Transportation and the Department of Environment and Natural Resources. The DOC also has a Division of Community Assistance, which assists local governments with community development, economic development, smart growth management, and downtown revitalization.

Leasing Airspace of Property along Proposed Transit R/W - Local

Buildings may be built adjacent to and over the proposed transit line. The portion of the transit right of way used by such buildings could be leased for a fee. This would be particularly true where stations occur and more intensive TOD occurs. The advantage of leasing airspace over the transit line is the improved accessibility to both sides of the transit line. Travelers can visit the retail, restaurants, and specialty shops and still access both directions of travel.

TOD and Tax Increment Financing (TIF) - Local

With the establishment of public transportation development comes a concentration of people. That concentration of people makes the surrounding area more appealing for developers and retailers who wish to capitalize on that facility. Transit Oriented Development, or as known in North Carolina as “Project Development Financing,” is development that includes a mix of retail, housing, business and other facilities within a short walk (half-mile) of good public transportation. The community surrounding the stations can become more compact, walkable and mixed-used reflecting those who desire to live without, or with reduced, dependence on vehicular travel.

With the increased development comes increased property tax value. The future increase in tax value is applied to the cause of the increased value. That increased tax value can be leveraged to pay for the transit station itself through the use of Tax Increment Financing or TIF.

Bonding - Local

The transit operator may be able to sell their own bonds against future revenue. This would enable the system to be constructed and would help cover startup costs. Strict financial management will be required to ensure the repayment of the bonds however, the funds will not have restrictions on their use.

Private-Public Partnership (P3)—State, Private, and Local

Private-Public Partnerships (P3) are government services or business venture that is funded and operated through a partnership of government and one or more private companies. They are long term contracts between a private party and a government entity for providing a public asset or service. Typically the private party bears significant risk and responsibility and the financial remuneration is tied to performance and the level of risk.

There are several models of P3 being used. They differ as to how the facility is constructed and operated/maintained. In some P3 models, the public agency takes on the debt and the task of constructing the facility in cooperation with a public/private operator. In a second P3 model, the public agency also finances the construction but the ongoing operation is part of the construction contract. In another P3 model, the financing is a combination of public debt and private equity with a public subsidy or guarantee to the concessionaire who constructs and operates the facility. These models differ on the amount of public debt and involvement in the construction and operation aspects of the project.

P3 agreements have significant benefits for constructing a project including a cost savings and shortened project delivery. After construction, the management of the facility is positioned to manage risk and to implement long term cost controls based on life-cycle principles.

The NCDOT has a policy on P3 agreements dated January 2014 that permits private entities to have a financial interest in the project after completion. It has wide applicability to all manner of transportation projects throughout the state. Prior to Governor McCrory signing the legislation in 2013, non-traditional delivery methods had to be approved by the State Building Commission. P3 systems may be utilized if it is determined that there is “a critical need for a capital improvement project”.

There are numerous companies and joint ventures that are potential P3 partners. P3 teams are typically made up of 20 or 30 partners including developers, engineers, investment bankers, and constructors. Often these companies have multiple subsidiaries present in several countries operating under various names. Joint ventures between companies in this list are common. The list includes:

- Cintra, Concesiones de Infraestructuras de Transporte, S.A.
- Obayashi Corporation Japanese construction and engineering firm.
- Balfour-Beatty-U.K.
- Bouygues-France
- BRISA-Portugal
- Figg Bridge Developers-U.S.
- Hochtief-German
- Laing-U.K.
- Meridiam-U.S./France

- Arcadis G&M – U.S. arm of Netherlands company that performs risk assessments, financial management.
- Babcock & Brown – Australian company that manages infrastructure assets.
- Balfour Beatty – U.K. company specializing in rail, roads and infrastructure.
- Cintra – Toll-road developer and operator based in Madrid, Spain.
- DBAH Capital – Affiliate of Deutsche Bank.
- Dexia – Top player in retail banking in Belgium and Luxembourg.
- Dragados – Spanish construction company.
- Ferrovial Agroman – Unit of Grupo Ferrovial, which is parent company of Cintra.
- Granite – California company that makes construction materials and oversees large projects.
- Kiewit – U.S. company specializing in infrastructure, transportation, and mining.
- Macquarie – Australian investment bank.
- OHL Concesiones – Manages toll roads and concessions
- Skanska – Multinational based in Sweden that builds roads, ports, hospitals.
- Transurban – Australian toll road developer and investor.

The transit project could be divided into several individual sub-projects that can also be candidates for P3 agreements. These could potentially include transit terminals, individual transit stations, the operation of the transit service, and sections of the track network.

Interviews with private equity leaders indicate a P3 approach may not be the best for transit as there is a significant need for public subsidies to augment the revenue from the fare box. With a lack of revenue stream, a P3 approach has little attraction for private equity. The lack of revenue stream is also not attractive for private corporations alone without the public subsidy

Private Corporation/Joint Venture - Private

Private corporations could be formed or attracted to operate the transit line. Like the P3 model, a private corporation could have significant benefits for constructing a project including a cost savings and shortened project delivery. Without the public involvement in the form of subsidies, the transit line would likely not be financially feasible. Throughout the US, fare box revenue streams are insufficient to pay for the operation of transit lines. Based on interviews with private equity leaders, it is unlikely to attract a private investment group or a joint venture to build the short line.

Golden LEAF Foundation - Private

The Golden LEAF Foundation was formed under a charter established by the NCGA. According to the charter, the Golden LEAF Foundation *"shall promote the social welfare and lessen the burdens of government [by using its funds] to provide economic impact assistance to economically affected or tobacco-dependent regions of North Carolina in accordance with the Consent Decree [between the state of North Carolina and cigarette manufacturers]."*

Besides education, job training, and employment assistance, activities also include public works for upgrading transportation and other public service infrastructure for general economic development purposes. The focus of the program is to show a positive economic benefit to rural North Carolina.

Table 2: SUMMARY OF POTENTIAL FUNDING SOURCES – TRANSIT FACILITIES AND SERVICE

Fund	Source	Limitations	Applicability
100% Federal Share for Safety	US DOT FHWA	100% funding, state limited to 10% of total federal aid apportionment.	Priority control system for transit vehicles at signalized intersections.
Elimination of Hazards at Railway-Highway Crossings	US DOT FHWA	90% federal up to state's apportionment.	Installation of protective devices at crossings, elimination of hazards, grade separation.
HSIP	US DOT FHWA	90% federal up to state's apportionment.	Safety improvements on public roads, trail, or pedestrian pathway.
NHPP	US DOT FHWA	Generally 80% up to state's apportionment.	Highway, transit, pedestrian portion of US 17 or SR 1140 affected by project plus bus terminals serving these routes.
NHS	US DOT FHWA	No maximum up to apportioned amount, generally 80% federal.	Highway, transit, pedestrian portion of US 17 or SR 1140 affected by project plus bus terminals serving these routes.
National Scenic Byways Program	US DOT FHWA	80% federal if program is authorized by Congress.	The Cape Fear Scenic Byway intersects the proposed transit line at the 5th St. & Martin St. intersection.
STBG	US DOT FHWA & FTA	No maximum up to apportioned and sub-apportioned amounts, generally 80% federal.	Transit capital projects, transit safety improvements, and pedestrian projects. Improve transit, pedestrian, and vehicular flow.
Capital Investment Grant	US DOT FTA	Discretionary without selection process.	Major transit capital investments in heavy rail, commuter rail, light rail, and streetcars.
Expedited Project Delivery for Capital Investment Grants	US DOT FTA	Funds may have been allocated	P3 required.
TIGER	US DOT Secretary	Does not apply to planning or design. Competitive grant application. $5M minimum, $100M maximum.	Discretionary grant for critical projects. Innovative multi-modal, multi-jurisdictional with economic and environmental benefits to region.
Buses and Bus Facilities Grants Program Low- or No-Emission Vehicle	US DOT FTA	Competitive grants up to 85% of bus cost. 90% for facilities and related equipment.	Purchase of transit vehicles
STBG and Airport Improvement Program	US DOT FAA	Generally, 75% to 95%, limits not known.	Provide transit service to ILM.

Fund	Source	Limitations	Applicability
Federal Small and New Starts	US DOT FTA	New Starts funding is more than $100 million. Small Starts funding is less than $100 million.	Construction of new transit lines
Legislative Action	NCGA	Unknown	Study of existing rail line to Charlotte.
State Transportation Grants	NCDOT Public Transportation	Formula based requiring local match. Limit unknown.	Operation of the transit service
Department of Commerce Tourism Development Program	NCDOC	Unknown	As a partner to NC DENR and NCDOT, assistance to local government for economic development and downtown revitalization.
Leasing Airspace	New Transit Operator	Unknown	Income can be used to offset the cost of operation of the station. Provide local match to federal funds.
TOD-based TIF	Local Government	Unknown	Future increase in tax value can be used to offset the cost of operation of the station. Provide local match to federal funds.
Bonding	Transit Operator	Unknown	All operations and construction. Provide local match to federal funds.
P3	Local, State, Private	No limits.	All aspects of project with particular emphasis on transit operations and stations.
Private Corporation/Joint Venture	Private	Limited by the return on investment.	All aspects of project with particular emphasis on transit operations and stations.
Golden LEAF Foundation	Golden LEAF Foundation	Unknown	General economic development

2.2.2. Funding from Single Source or Multiple Sources

Because of the wide variety of tasks and the nature of the work to convert the heavy rail line to transit, this project is difficult to finance with a single source funding. The closest to this would be the FTA funds for Small and New Starts. Even so, the City is likely to find numerous spin off effects that will ripple through the scope of work(s). These will likely have the added effect of growing the scope and cost of the project as a whole.

By going after multiple sources of funding for the subprojects, funds can be requested and obtained on an ongoing basis using the latest information and experience from other subprojects. The subprojects will need to be prioritized in a logical fashion to provide an income stream, functionality and positive growth.

The City would be wise to allocate sufficient resources to the task of coordinating and maintaining a vision of the completed system.

As in the rail realignment, the planning, NEPA documentation and engineering may be done early as a single step. Public input and perception will be key and this portion of the NEPA process should be elevated to a level that it becomes a long-term subproject of its own.

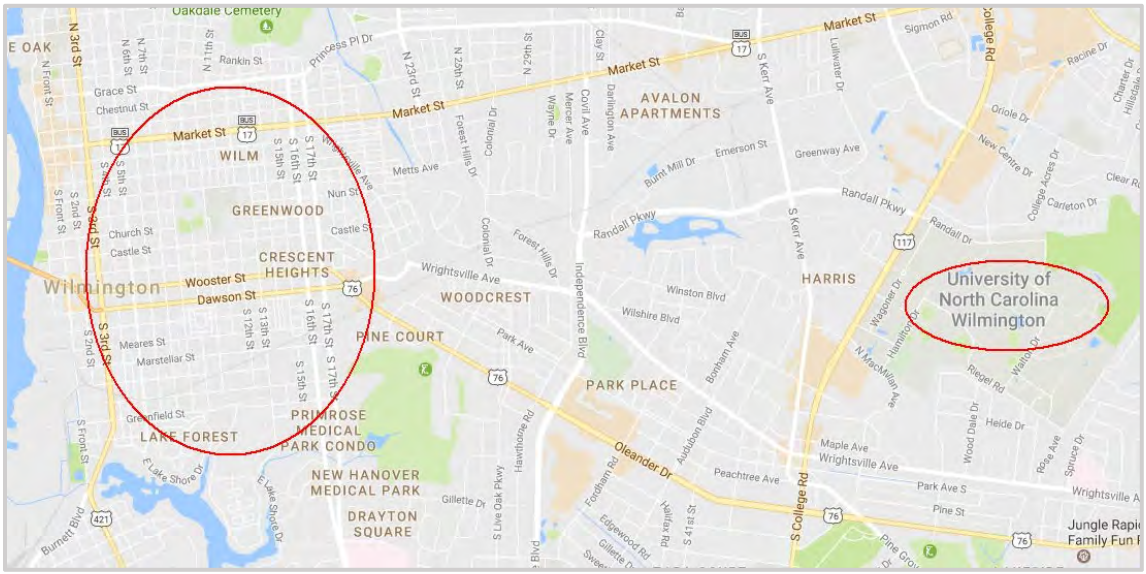
The transit service may be phased in several ways: by length of track converted, number of rolling stock obtained, by stations/stops and by crossings improved. Service may be created between on a part of the entire route with the route extended later. Conversion to a passenger system from a freight system may be both functional and aesthetic. The aesthetic treatments may need to be done early to avoid initial negative impressions. Additional cars and rolling stock may be obtained as ridership and schedules require. Stations may be prioritized based on likely ridership with new stations being inserted between older stations at a later time. Certain crossings may be improved with crossing devices or rebuilt as financial and traffic conditions warrant. Some functions do not lend themselves to phased construction, however such as maintenance yards, ridership systems, administration and passenger information systems. These functions may be critical to a successful start. Station locations and placement would be the result of a separate and subsequent study.

Extension to the downtown area to form a complete loop, connection to the Multi-Modal Transportation Center and extension to the airport are expansions that may form later phases but could be vital to generating excitement and interest necessary for a successful launch

2.2.3. Recommendation for Best Mix of Sources for Funding

It is recommended the conversion to a transit system be approached in two stages. The initial phase would connect two points of higher ridership likely to start a positive image. For instance, this may be between the Historic District (downtown) area of Wilmington and UNCW/University Centre. This section includes the wye area, which may be necessary if there are to be future plans for growth of the system north up the coast or to access maintenance yards.

Figure 1: POTENTIAL HIGH DENSITY RIDERSHIP AREAS



Transit service for the City could include a multi-modal feeder service to and from the ILM Airport, which could increase the attractiveness of the overall multi-modal aspects of the project and potentially have the positive side effect of opening more ridership (and revenue) to the effort. Providing service to the ILM Airport would increase the attractiveness of TOD of a station at the Airport, as this is a primary point of entry for tourists coming to the City.

Transit service could include another multi-modal feeder service in the form of Wave Transit bus routes. Locating stations on existing bus routes or adjusting bus routes to the stations would also increase the attractiveness of TOD.

This initial startup could be funded by the New Starts program of the FTA. Individual crossings may be eligible for Elimination of Hazards at Railway-Highway Crossings funds while the vehicles may be obtained through Buses and Bus Facilities Grants Program (Low- or No-Emission Vehicles). There are specific funds indicated above for the information systems, pedestrian facilities, Scenic Byway crossing as well. Individual stations may be a development effort by the City based on TIF funds and development districts.

2.2.4. Research Examples of Ownership and Management Structure in other Locations

Transit systems in other metropolitan areas are a mix of ownership models. Many are operated by a transit authority created for the purpose of providing public transportation within a region. Typically, they have the power of government including taxing, eminent domain and policing. The Cape Fear Public Transportation Authority (Wave Transit) is well suited to operate the transit in concert with the established bus system.

In Denver, Colorado, the Regional Transit District of Denver (RTD) formed a Public Private Partnership (P3) with Denver Transit Partnership (DTP) to construct, operate and maintain 40.4 miles of transit rail and a

rail maintenance facility. The DTP's members include Fluor Enterprises, Inc., Denver Rail (Eagle) Holdings, Inc., a unit of John Laing plc; and Aberdeen Infrastructure Investments (No 4) USA LLC, a unit of Aberdeen Global Infrastructure Partners LP. The RTD entered into a 34-year agreement with DTP in which it will pay DTP to operate and maintain the transit system. At this time, one of the three proposed transit lines is under still construction. The two operational lines opened in 2016.

2.2.5. Ownership Structure and Revenue Arrangement Analysis

Ownership may be by the Cape Fear Public Transportation Authority Wave Transit) or a separate new authority entity that may include the City, one or more counties and the Wilmington Urban Area Metropolitan Planning Organization (WMPO) as members. A larger regional ownership model would be a strong step toward ensuring a wider ridership base for the transit system. Wave Transit is an example of such a regional system.

2.2.6. Recommendation for Ownership Structure and Revenue Arrangement

After investigating the various types of potential ownership structures from sole ownership, P3s, and the creation of an authority, the recommendation for ownership structure for the proposed transit rail is an authority structure. Furthermore, it is recommended that this transit system be included in the services of the Cape Fear Public Transportation Authority.

There are several reasons for utilizing the existing Cape Fear Public Transportation Authority. The first is that Wave Transit is currently an operational public transit entity serving the City and New Hanover County. Secondly, there will need to be coordination between all modes of public transportation servicing the area and having one entity overseeing this will reduce potential conflicts. Another reason is that Wave Transit has the local expertise and staff in place to operate and maintain a public transportation network.

There are several streams of potential revenue that can be realistically considered for this entity. The first avenue of income would be from fares paid by the commuters utilizing the transit system. A second potential source of income would be from parking fees collected at the commuter stations. Another stream of revenue would be from local businesses paying to advertise on the transit cars and at the individual stations. An additional source of income could come from leasing store space at the individual transit stations if space was available. Another source of income would be from a sales tax that is created to help fund the debt service of the transit line. This new tax would stay in effect until the debt service for the project was paid for.

3. Closing Thoughts on Funding Opportunities

Based on the review of potential funding sources, and in support of the City of Wilmington's previous determinations, separating the freight line realignment and the transit service projects into separate delivery plans is recommended. This allows for separate funding strategies and resources to be dedicated to each in individual time streams. The two projects are different in nature and the freight operations would need to be relocated before some type of transit utilization would be practical. The freight rail

realignment is predominately a rail project in an open area on a new alignment with potentially significant bridges, environmental issues and geotechnical structures. The transit reuse project will involve building stations, rail interface, social and economic impacts to the communities it will serve, and significant urban construction constraints. The funding sources, project justifications, project timelines and delivery vehicles for rail freight realignment versus creating a multimodal transit corridor will more than likely be significantly different in each case. There are varieties of funds available for either of these projects and obtaining the right mix of funding sources will be critical for their success. Also, some funding strategies, such as, selling "air rights" for transit oriented development might work in one scenario, but not in the other. Tables 3 and 4 present a mix of potential funding sources that have a higher probability for use to fund the two projects. The following description expands on the potential overall vision of project delivery.

3.1.1. Phased Project Delivery

There is a logical sequence of construction necessary to achieve the City's goal of relocating the freight line outside the city and converting the existing track to transit. If the transit line were to reuse the existing freight corridor, the freight line realignment would need to precede conversion to transit so as to not interrupt the flow of freight to the port. Because conversion to a transit line involves more than just reusing the track, construction of the associated stations and terminals will be necessary and may take significant time to perform. The two major projects will ideally overlap with the transit work progressing as far as possible without impacting freight operations. The transit system cannot be completed, however, until the freight line is relocated. Prior to getting too specific on funding strategies, it would be helpful to develop a cost estimate, identify contract vehicles for delivery and negotiate formal agreements with all the "players," etc. As presented earlier, some of the respondents during interviews were supportive of a detailed feasibility study.

The need for logical termini of the various project features would need to be addressed to show justification for various sources of funding. For example, just building the freight rail bridge across the river, but not connecting the rail to Davis Yard or the Port would not garner support from the potential funding entities. However, breaking the freight rail project from the transit project would make sense operationally and financially.

3.1.2. NC Golden Leaf Funding

This source of funding may lend itself more towards the freight rail concepts. Golden Leaf will participate in future discussions at the appropriate time; it will be important to discuss how the effort supports job growth, the rural counties of NC, economic development and existing industries, etc. Even the actual project construction might assist in supporting job and industry benefits. There should be the opportunity to show how this project would help the Port, North Carolina agriculture, the US military, and others. With tourism being one of the three largest industries in North Carolina, there may be a way to show job growth and opportunity with the transit operation.

3.1.3. Growth in Port Operations

The anticipated expansion of container, bulk and breakbulk operations at the Port s another major driving force for relocating the freight rail. Improving the efficiency and capacity of the rail service to the Port will aid the North Carolina State Ports Authority's (NCSPA) expansion efforts while contributing to the economic growth of the region and state. In 2012, the NCDOT commissioned the "North Carolina Maritime Strategy Economic Impact and Benefit Cost Assessment" to review the potential impacts on the economy for expanding the Port's capacity to 1.3 million TEUs annually. A TEU (twenty foot equivalent unit) is the common measurement used to describe a single cargo container. Along with assessing the potential benefit cost ratios for growing the container market, the study also investigated other opportunities including wood pellets, the military, frozen bulk food products, the auto industry, other bulk and break bulk options. Benefits may include increased tonnage, better delivery times, lower operating costs, new job creation and safer operations. Certainly, the benefits of more efficient rail access from the Port to the rest of the state and the East Coast of the U.S. would support a discussion on the use of container fees as a funding mechanism.

3.1.4. Creation of a Local Project-specific Authority

An authority may be the most suitable approach to champion and manage the overall project goals. This could include the proposed freight rail line as well as the multi-modal use of the CSXT rail line. There are two significant examples of authorities to manage specific state infrastructure in existence in North Carolina today. They are the NCSPA and the North Carolina Global TransPark Authority. Both entities have legislated powers t allowing them to operate in a blend of private and government oriented roles. A new local authority could be created, with legislated powers that allowed for the planning design, construction, operation and maintenance of the new infrastructure. A modification to the existing authority model could be to create the authority to manage, construct and operate the new freight rail line, while the existing transit operator, Wave Transit, would own the multi-modal transit effort. The two entities could then work together to champion their parts and help accelerate delivery by more specific focus on their diverse resources.

Table 3: BEST OPPORTUNITIES – FREIGHT RAIL REALIGNMENT

Fund	Source	Limitations	Applicability
Golden LEAF Foundation	Golden LEAF Foundation	Unknown	General economic development.
Contingency Funds	NCDOT Rail Division	50% maximum up to $200,000 per project.	Constructing rail to new or expanding business.
Rail Line Relocation	US DOT FRA	Not accepting applications.	Relocation to improve vehicle traffic flow, community quality of life or economic development.
RRIF	USDOT FRA	Accepting applications.	Loans and loan guarantees for intermodal or rail equipment, track, buildings, yards.

Fund	Source	Limitations	Applicability
P3	Multiple	If the project is profitable for a private entity to invest in. May have to be subsidized by the proposed Authority	All aspects of project with particular emphasis on transit operations, stations, major bridges, and rail line.

Table 4: BEST OPPORTUNITIES – TRANSIT FACILITIES AND SERVICE

Fund	Source	Limitations	Applicability
Golden LEAF Foundation	Golden LEAF Foundation	Unknown	General economic development
STBG	USDOT FHWA & FTA	No maximum up to apportioned and sub-apportioned amounts, generally 80% federal.	Transit capital projects, transit safety improvements, and pedestrian projects. Improve transit, pedestrian, and vehicular flow.
Capital Investment Grant	USDOT FTA	Discretionary without selection process.	Major transit capital investments in heavy rail, commuter rail, light rail and streetcars.
Buses and Bus Facilities Grants Program Low- or No-Emission Vehicle	USDOT FTA	Competitive grants up to 85% of bus cost. 90% for facilities and related equipment.	Purchase of transit vehicles.
P3	Multiple	If the project is profitable for a private entity to invest in. Proposed authority may have to subsidize.	All aspects of project with particular emphasis on transit operations and stations.
Leasing Airspace	New Transit Operator	Unknown	Income can be used to offset the cost of operation of the station. Provide local match to federal funds.
TOD based TIF	Local Government	Unknown	Future increase in tax value can be used to offset the cost of operation of the station. Provide local match to federal funds.
Bonds	Transit Operator	Unknown	All operations and construction. Provide local match to federal funds.

E: Legal Conditions

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Figure 1: VICINITY MAP 2

1. Legal Conditions

Technical Report E describes the legal conditions applicable to the study area in New Hanover and Brunswick Counties, including the City of Wilmington (City) and the Cape Fear River system (see Figure 1). This chapter is not a legal opinion. The City should retain legal counsel to evaluate the topics herein further.

The feasibility of relocating the existing CSXT freight rail line leading to the Port, which is currently routed through a portion of the City's urban core, to a new location is being considered and is the subject of this Study. In a separate proposed action, which would follow the freight rail line realignment, the City is considering whether repurposing the remaining freight infrastructure into a multi-use trail and trolley service (i.e. abandoned rail reuse) is achievable. Both proposed actions, realignment of freight rail and abandoned rail reuse, are considered together as the "actions being considered" for the purpose of this report.

1.1. Rail Realignment

1.1.1. Ownership of the Rail/Bridge

Ownership of Rail Infrastructure

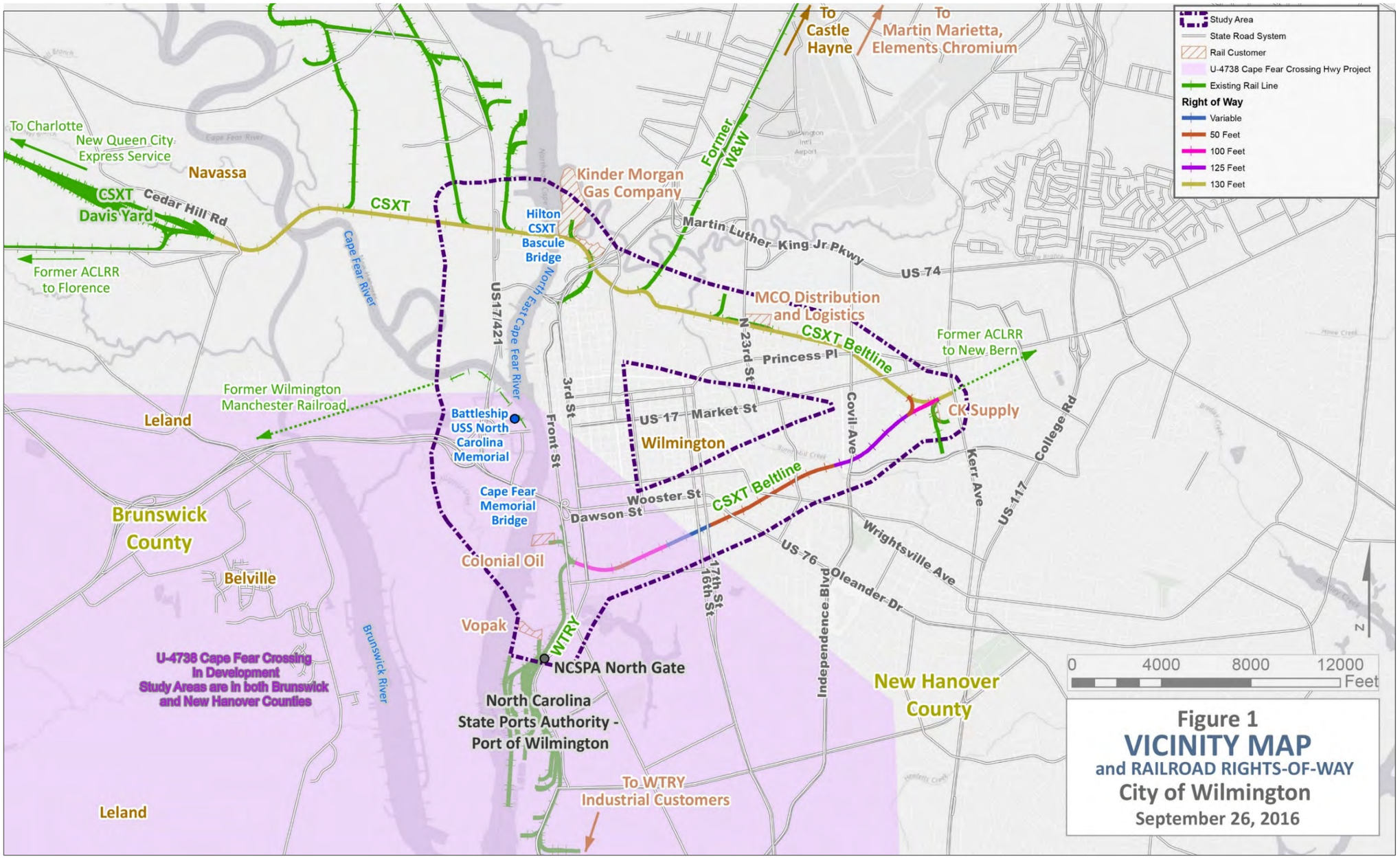
Ownership of the right-of-way and Hilton Bridge by CSXT will affect the operational and financial feasibility of any project to realign the existing tracks and reuse the existing corridor. Additional research will be required to establish the legal interest CSXT holds in the right-of-way and the Hilton Bridge. CSXT obtained ownership of the infrastructure and property through the following actions:

1. Wilmington & Raleigh Railroad Company – chartered in 1834
2. Wilmington & Weldon Railroad Company – merger/consolidation in 1855
3. Atlantic Coast Line Railroad Company – merger/consolidation in 1900
4. Seaboard Coast Line Railroad Company – merger/consolidation in 1967
5. Seaboard System Railroad, Inc. – merger/consolidation in 1982
6. CSXT– merger/consolidation in 1986

CSXT owns, maintains, and operates the infrastructure and bridges within the right-of-way from Davis Yard along the Beltline to the Port. In interviews with CSXT, they have stated that they will continue to own, maintain and operate the infrastructure between Davis Yard and the Port (see Figure 1 – Vicinity Map). While this statement does not preclude a realignment of the Beltline, the following alternatives would require negotiations with CSXT, which are beyond the scope of this Study:

- Ownership, maintenance and operations by a third party.
- Ownership and maintenance by a third party granting CSXT operating rights.
- Ownership and maintenance by CSXT granting operating rights to a third party.
- Ownership by CSXT with maintenance and operations by a third party.

Figure 1: VICINITY MAP



Credits: Connect NCDOT GIS Resources (Road Data, Rail Division Data), New Hanover GIS Parcel Data, NCDOT ValMaps, Esri, HERE, DeLorme, MapmyIndia, © OpenStreetMap contributors, and the GIS user community.

Access to existing freight customers along the Beltline is also critical. CSXT stated that they would maintain current freight service to existing customers. While this statement also does not preclude a realignment of the Beltline, it does affect the approach to sequencing the realignment. Existing freight customers are located along the Beltline between the Hilton Bridge and the wye at the eastern apex of the Beltline. Customers south and west of the wye include the Port, Colonial Oil, and Vopak. The realignment of the Beltline could be phased as follows:

1. Construct the railroad realignment along a new corridor west of the City.
2. Obtain the right-of-way from CSXT for the portion of the Beltline between South 3rd Street and the Port.
3. Construct the transit service from the Multimodal Transit Center, at the intersection of Campbell Street and 3rd Street, along 3rd Street south to the Beltline and along the Beltline to terminate the wye or to extend the transit service to terminate at UNCW.
4. Negotiate to obtain the right-of-way from CSXT for the remainder of the Beltline when the existing freight service contracts expire or are renegotiated.
5. Construct the northern third of the transit loop once the right-of-way is obtained.

Conveyance of ownership may have taken several forms due to the number of charters, mergers and consolidations. Two methods of conveyance discussed herein are fee simple and easement. In basic terms, fee simple is the conveyance of the **title** to real property between two parties. It is defined as the "absolute title to land, free of any other claims against the title"[1]. Whereas, easement is the conveyance of the **use** of real property between two parties. It is defined as "the right to use the real property of another for a specific purpose."[2] A significant difference between fee simple and easement conveyances is the ability to change the use of the real property.

The first method, a fee simple conveyance allows a new owner to use the property, within certain legal and regulatory limits, in a manner that **best serves his/her interests**. The new owner may continue using the property as it is currently used or they may demolish part or all of the improvements to best serve their purpose. A fee simple conveyance is also important for repurposing the right-of-way without any encumbrances on its use other than those legally established.

The second method, an easement conveyance, allows a new owner to use the property, within certain legal and regulatory limits, for the **purpose specified in the creation of the easement**. The new owner may improve the property to serve the function for which the easement was created. Improvements or functions other than those for which the easement was created will "extinguish" the easement, or cause

[1] "Fee-simple." Copyright © 1981-2005 by Gerald N. Hill and Kathleen T. Hill. October 31, 2016 http://legal-dictionary.thefreedictionary.com/Fee-simple

[2] "Easement." Copyright © 1981-2005 by Gerald N. Hill and Kathleen T. Hill. October 31, 2016 http://legal-dictionary.thefreedictionary.com/Easement

it to revert to the original owner(s). An easement conveyance is important for the right-of-way to continue to be used as it was originally purposed.

A cursory review of public documents indicates that some, if not all, of the CSXT right-of-way along the Beltline is a fee simple conveyance. Fee simple ownership, established by obtaining a right-of-way abstract, will allow CSXT to convey the right-of-way to be used for its best purpose as established by the City. Other forms of ownership may prohibit conveyance by CSXT for purposes other than railroad use and/or result in the right-of-way reverting to the adjoining property owners.

Based on the information provided to date, CSXT will maintain the ownership, maintenance and operations for freight service to the Port and existing customers. Right-of-way to and from the Port will be owned by CSXT, either continuing the existing right-of-way ownership or through an exchange of ownership that does not diminish CSXT access to the Port and existing freight customers.

1.1.2. Operation on/of Rail Infrastructure

Operation on the existing rail infrastructure and of the Hilton Bridge by CSXT will continue for the near future. CSXT stated that existing customers would continue to be served. This requires continued use of the Hilton Bridge and the Beltline. CSXT also stated that they will continue to serve the Port and that they will interchange at the Port with the Port rail operator. This allows a realignment of the Port access while requiring negotiations with CSXT to consider alternatives that allow any third party operations between Davis Yard and the Port.

A "party of record", typically the rail operator, will need to file an application with the Surface Transportation Board (STB) for the rail realignment. The STB "is an independent adjudicatory and economic-regulatory agency charged by Congress with resolving railroad rate and service disputes and reviewing proposed railroad mergers."[3] This agency has jurisdiction over rail restructuring transactions among other duties. The STB regulates rail realignments, sales, construction and abandonments as rail restructuring activities. An application to the STB is the first step to building a new rail line or extending an existing line. The STB's Office of Environmental Analysis usually requires an Environmental Impact Statement (EIS) or an Environmental Assessment (EA) as the next step if the STB grants authority.

1.1.3. Construction of Rail Infrastructure

CSXT typically manages their own construction of rail infrastructure. They may allow development of a 30% preliminary engineering set of plans by the city or state. Recent CSXT projects that are or will be on a CSXT-owned right-of-way have been designed, bid and constructed (design-bid-build method) by CSXT with oversight by the funding agency. CSXT has indicated a preference for this method of project delivery

[3] Source: https://www.stb.gov/stb/about/overview.html

to ensure adherence to CSXT standards and specifications. Memoranda of understanding (MOU) and engineering agreements will be required to clearly define the design, construction management/oversight and funding responsibilities.

1.1.4. Maintenance of Rail Infrastructure

CSTX usually performs maintenance of their own rail infrastructure. They maintain the roadbed, tracks, bridges and other critical infrastructure related to CSXT rail operations. FRA track safety standards, the penalties for non-compliance with these standards and the potential damage caused by faulty maintenance create risks that are best managed by both operating and maintaining the infrastructure. The City or the state will maintain highway overpasses depending on the existing maintenance responsibility of the highway. MOUs and maintenance agreements may be required to clearly define the limits and division of maintenance responsibilities.

1.2. Transit Service

1.2.1. Ownership of the Transit Service

Ownership of the transit service will be determined by the City. This decision may be influenced by right-of-way transfer agreements, memoranda of understanding with CSXT, funding agreements, or a combination of these and other legal documents. Prior to any transit service development or any further efforts to realign the Beltline, a complete legal abstract should be prepared describing the existing right-of-way of the Beltline and the legal encumbrances on properties being considered for the rail corridor realignment.

Ownership, maintenance, and operations of the transit service on the Beltline should be studied once the use of the Beltline right-of-way is established by a legal abstract.

Transit service on the Beltline may be limited to some form of rail service if the right-of-way was conveyed by easement. Another option, if the right-of-way is an easement, would be to obtain the right-of-way from the current owner of the underlying fee simple property. Obtaining the easement in fee simple would allow the right-of-way to be used for other transit systems, modes of transportation and/or utilities.

The STB regulates acquisitions of rail lines as rail restructuring activities. Application to the STB is the first step to “abandoning” the line for repurposing the corridor. An attorney familiar with STB regulations or experienced in railroad transactions is recommended for this process.

1.3. Summary

CSXT owns, maintains and operates the existing rail right-of-way and infrastructure. CSXT affirmed that they would continue to serve their existing customers and the Port using the Beltline. Any realignment of the Beltline service must continue CSXT’s service to their existing customers and the Port. CSXT has stated a preference to own, maintain and operate any realignment of the Beltline rail right-of-way and infrastructure. Negotiations of ownership, operations and maintenance of the rail realignment are beyond

the scope of this study. Reuse of the unused portion of the Beltline and/or obtaining right-of-way from CSXT for any or all of the Beltline will be determined by future considerations and/or negotiations.

A Beltline realignment is feasible under the conditions and stipulations noted in this report and subject to the findings in the other conditions and analyses reports.

F: Environmental Conditions

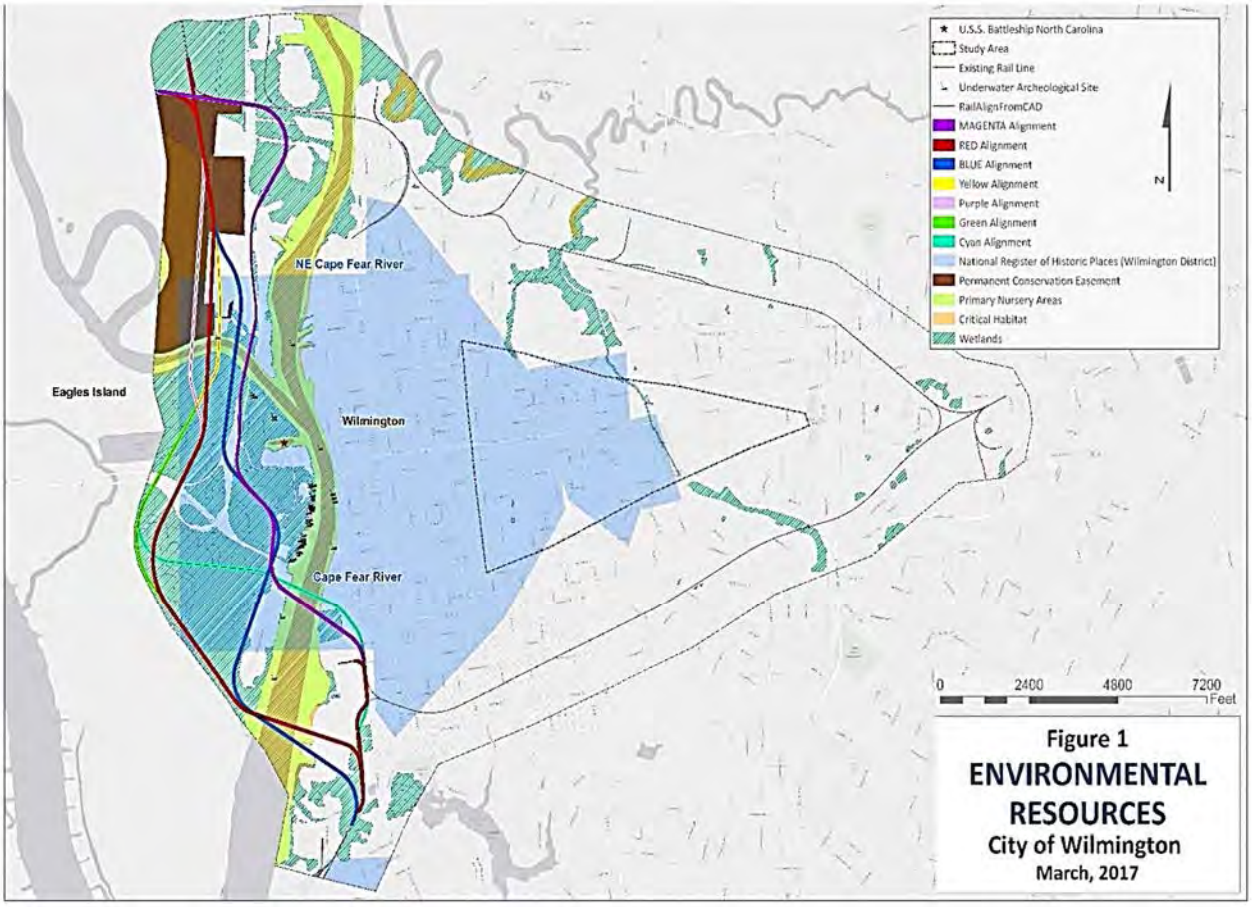
Executive Summary

A preliminary environmental analysis was conducted by Dial Cordy and Associates (DC&A) in response to the City of Wilmington's (City) request to evaluate the feasibility of realigning the existing CSX-Transportation (CSXT) freight rail line from its current location to a new location across the Cape Fear River. Repurposing the remaining freight infrastructure into a trolley service and/or a multi-use path (greenway) is also under consideration but is not the subject of this report. Furthermore, this report does not serve as a basis for determining a Least Environmentally Damaging Alternative (LEDPA) or provide a comprehensive effects analysis.

The proposed study area, approximately 8,831 acres, encompasses downtown Wilmington, Port of Wilmington (Port), Cape Fear River, Northeast Cape Fear River and Eagles Island. An early assessment of potential corridors between the Port and the Department of Defense Military Ocean Terminal at Sunny Point (MOTSU) found excessive impacts and river crossings among the major factors that shaped the western limits of the study area. Considering the unique environmental setting of the study area, several resources, existing documents and studies were utilized to summarize the environmental feasibility of the proposed rail alignment. Relevant geospatial datasets representing the affected resources were utilized along with a Geographical Information System (GIS) to assess each proposed alignment alternative corridor. The analysis identified Wetlands, Primary Nursery Areas (PNAs), proposed Atlantic Sturgeon Critical Habitat, Underwater Archeological sites, and a Permanent Conservation Easement (Cape Fear Royal Tract) as the primary environmental resources of concern (Figure 1). Potential resource impacts related to each alternative corridor were quantified and an estimate of cost to mitigate unavoidable impacts was calculated.

As the proposed project moves into the design and permitting phase, all practical alternatives for avoiding and minimizing impacts will be explored in collaboration with federal and state regulatory agencies. Unavoidable impacts to wetland will require mitigation, and a mitigation plan will be prepared and negotiated with the federal and state resource agencies. Options for compensatory mitigation include: mitigation banks, In-Lieu fee mitigation, and Project-specific mitigation. Based on preliminary assessment of wetland impacts within the study boundary across all alternatives, mitigation will be required. However, impacts to PNAs, proposed Atlantic Sturgeon Critical Habitat, and Underwater Archeological sites can likely be minimized or avoided using sound engineering practices and elevated river crossings. Preliminary results indicate the MAGENTA alignment avoids the Permanent Conservation Easement.

Figure 1: ENVIRONMENTAL RESOURCES



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1. Freight Rail Realignment on New Location

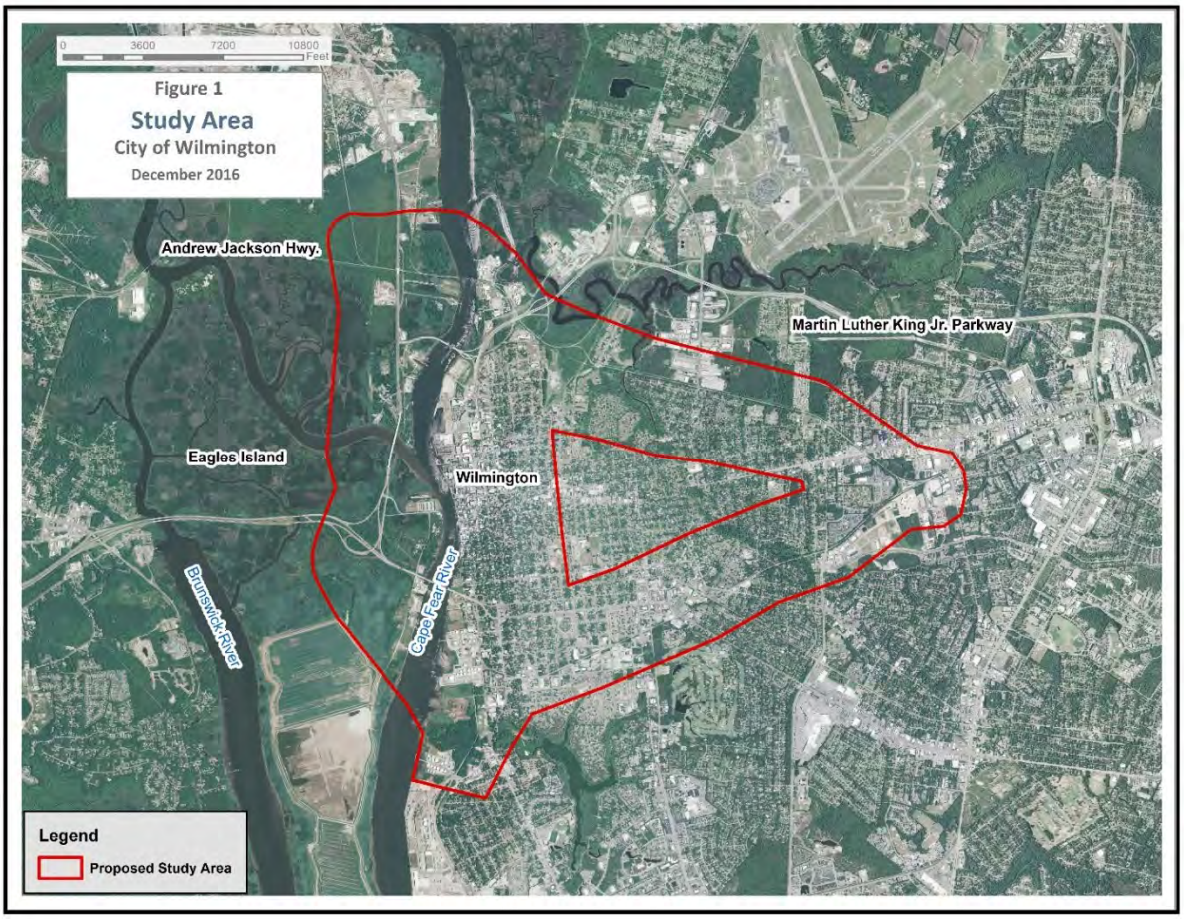
1.1. Environmental Setting

1.1.1. Introduction

The environmental feasibility of realigning the existing CSXT freight rail line leading to the Port, which currently runs through the center of the City, to a new location across the Cape Fear River is the subject of this analysis developed by DC&A.

The feasibility of realigning the existing active CSXT freight rail line leading from the CSXT Davis Yard in Brunswick County (Navassa) to the Port is being considered and is the subject of this report. In a separate proposed action, which would follow the freight rail line realignment, the City is considering whether repurposing the remaining freight infrastructure into a multi-use trail and trolley service (i.e. abandoned rail reuse) is achievable. Although both proposed actions, realignment of freight rail and abandoned rail reuse, are considered together as the "actions being considered," only the rail realignment over the Cape Fear River and Eagles Island were analyzed for the purpose of this environmental feasibility report. This report does not serve as a basis for determining a LEDPA or provide an analysis of comprehensive effects. The proposed study area, approximately 8,831 acres in size, encompasses downtown Wilmington, the Port, the Cape Fear River, the Northeast Cape Fear River, and Eagles Island (Figure 1 – Proposed Study Area).

Figure 1: PROPOSED STUDY AREA



Considering the unique environmental setting of the proposed study area and interest of landowners and stakeholders; several resources, existing documents and studies were utilized to summarize the environmental feasibility of the proposed rail realignment alternative corridors. A list of sources includes, but is not limited to, the following:

- Eagles Island: A History of a Landscape (Soil and Water Conservation District);
- Eagles Island Conservation Management Plan (2015-2025) (Eagles Island Coalition);
- Cape Fear River Basin Action Plan for Migratory Fish (Cape Fear River Partnership);
- Cape Fear Arch Conservation Plan;
- Wilmington/New Hanover County Comprehensive Greenway Plan
- NC Wildlife Action Plan – Cape Fear River Basin (NC Wildlife Resources Commission);
- Draft Environmental Assessment – Eagle Island Improvements [U.S. Army Corps of Engineers (USACE)]; and,
- Port of Wilmington Turning Basin Biological Assessment and Essential Fish Habitat Assessment (DC&A);

- Cape Fear River Basin Fish and Wildlife Habitat Assessment and Prospective Resiliency Project List (DC&A and National Fish and Wildlife Foundation); and
- Stakeholder communication and dialogue with: State Historic Preservation Office (SHPO), Underwater Cultural Resource staff, Eagles Island Coalition, USS Battleship North Carolina (Captain Terry Bragg), Soil and Water Conservation District, Division of Soil and Water Conservation, City of Wilmington – Planning Department, Town of Leland, NC Natural Heritage Program, Cape Fear River Watch, USACE – Wilmington District, Regulatory Division, National Marine Fisheries Service (NMFS), Kerr McGee Trustees, Coastal Land Trust and scientists from UNCW.

1.1.2. Background

The Cape Fear River is North Carolina's largest river basin that is completely contained within the state's borders, with its headwaters stretching from northwest of Greensboro to its mouth in the Atlantic Ocean at Bald Head Island. The basin covers an area of more than 9,000 square miles, larger than the state of New Jersey. There are more than 6,000 miles of tributaries including four major ones: the Deep River, Haw River, Black River, and Northeast Cape Fear River. Over one third of North Carolina's population lives within the basin. The Cape Fear is also the state's most ecologically diverse river basin, with some of the highest biodiversity on the eastern seaboard of the U.S. (Hall et al. 1999, Stein et al. 2000).

The Cape Fear basin is the only major river basin in North Carolina to empty directly into the Atlantic Ocean. This direct connection to the Atlantic was important for early settlers who used the Cape Fear as a way to move the natural resources found in the basin down-river, where they were loaded onto oceangoing vessels for shipment overseas. These goods included naval stores derived from the longleaf pine forests that blanketed the basin, rice from the plantations of the lower Cape Fear and timber. The Port was a major blockade-running port during the Civil War, and later, steamboats plied the waterways of the Cape Fear River connecting the many towns along its banks. As trade on the river increased, so did efforts to make navigation r easier. Over time, the river was dredged and channelized, and locks and dams were constructed to facilitate navigation.

Eagles Island, located in Brunswick and New Hanover Counties, consists of approximately 2,100 acres situated between the Brunswick and Cape Fear Rivers. The land of the island is presently owned by private and corporate individuals, the State of North Carolina (NC Division of Soil and Water Conservation, NCDOT and the NCSPA), the New Hanover Soil and Water Conservation District, the Town of Leland and the U.S. Government.

Eagles Island is part of a number of Significant Natural Heritage Areas (SNHA), which are natural areas identified by the North Carolina Department of Natural and Cultural Resources (NCDNCR) Natural Heritage Program (NHP) as an area of biological interest due to its exemplary natural communities and clustering of rare species.

Eagles Island is at the upstream most extent of the nationally significant Cape Fear River Megasite and the nationally significant Lower Cape Fear River Macrosite. Eagles Island is cataloged as nationally significant because it is considered by the NHP to contain examples of natural communities, rare plant or animal populations or other significant ecological features that are among the top five or six best examples of their kind in the nation. Eagles Island is also within two standalone standard SNHAs: The Lower Cape Fear River Aquatic Habitat SNHA and the Brunswick River/Cape Fear River Marshes SNHA. Both of these sites are of state significance. In addition to SNHAs, Eagles Island contains large Managed Areas – the USACE dredge spoil disposal cells that occupy the lower half of the island as well as state nature preserves of conservation interest.

Section 1.2 – Affected Resources provides a more detailed description of the environmentally-sensitive resources currently present within the proposed study area. An emphasis was placed on Eagles Island, considering a majority of the island is in its natural state. As this is currently a feasibility study, environmental consequences, cumulative effects or federal/state permitting options were not evaluated.

1.2. Affected Resources

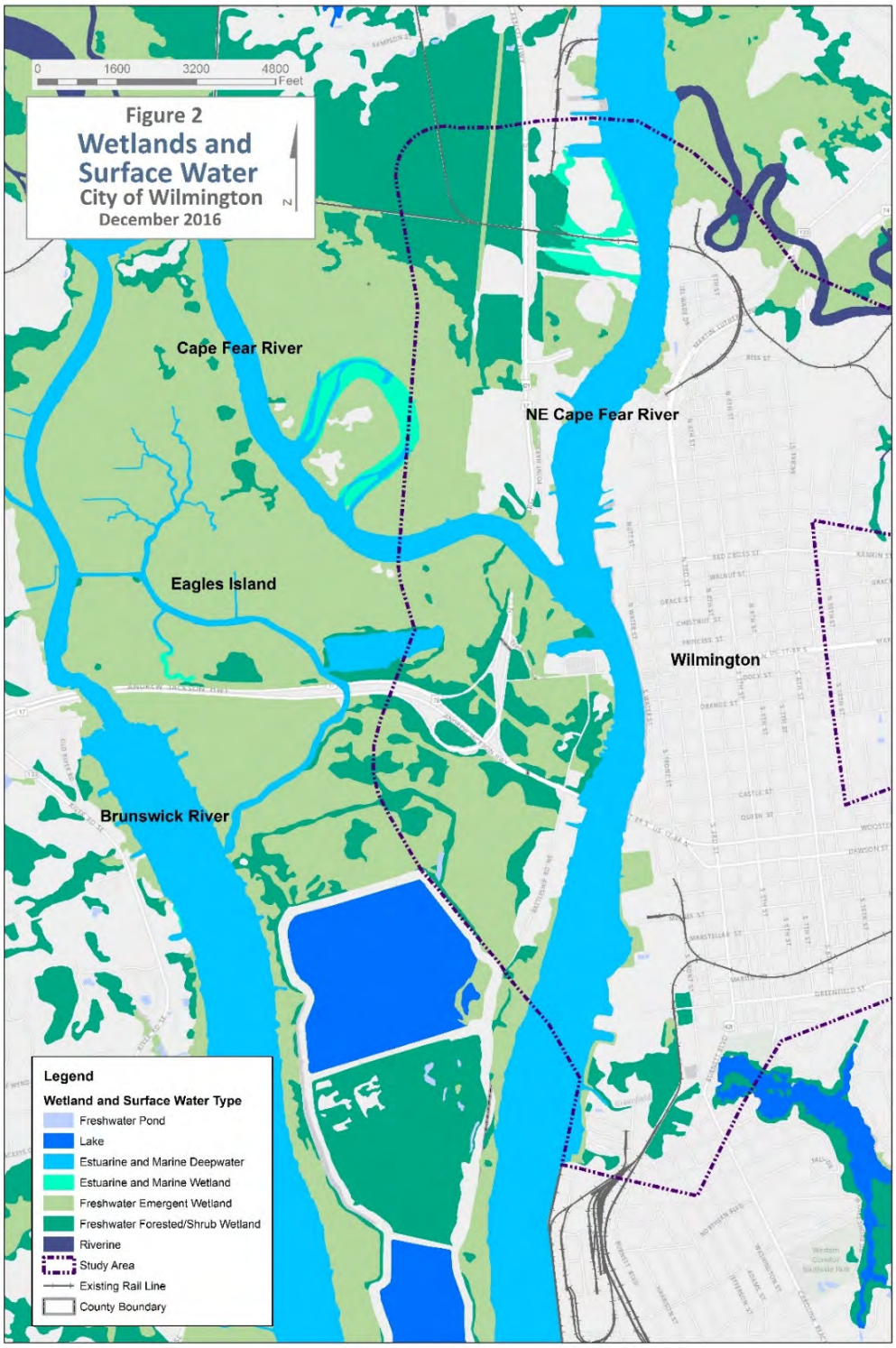
1.2.1. Biological Resources

Wetlands

The majority of the natural habitats present within the proposed study area on Eagles Island are wetlands including marshes, forests and transitional successional areas between. The majority of the non-wetland areas present on the island occur along the eastern side adjacent to roadways and spoil areas. Upland areas represent disturbed habitats dominated by a variety of early successional species that readily colonize disturbed areas. These areas are densely vegetated with woody shrub and tree species and generally include little diversity of herbaceous plants. These areas also include a number of non-native species that disperse along roadways and other habitats.

The cypress-gum forested wetlands on Eagles Island occur as scattered pockets primarily adjacent to upland areas and on slightly higher elevations that occur on the interior and along the eastern side of the island, which is dominated by a canopy of bald cypress (*Taxodium distichum*), swamp tupelo (*Nyssa biflora*), and water tupelo (*N. aquatica*). Bald cypress is not tolerant of increased levels of salinity. Evidence of recent mortality of bald cypress can be observed along the fringes of this community where the trees have been stressed. This stress could be attributed to increased levels of salinity in the water. Forested wetlands were more common on Eagles Island historically than seen today, however, evidence suggests that cypress-gum forest has always been a minor component of Eagles Island.
The tidal marshes of Eagles Island are the dominant habitat across the island (Figure 2 – Wetlands and Surface Waters). The tidal marshes include areas of diverse tidal freshwater marsh and dense stands of cattails (*Typha angustifolia* and *T. latifolia*) and giant reed (*Phragmites australis*). The tidal freshwater marshes on Eagles Island are part of the Brunswick River/Cape Fear River Marshes SNHA and include a number of rare plant species endemic to the area.

Figure 2: WETLANDS AND SURFACE WATER



Credits: U.S. Fish and Wildlife Service National Wetlands Inventory,
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This area is unique in that the tidal freshwater marsh is influenced primarily by lunar tides as opposed to wind driven tides that are more common in freshwater marshes in other parts of North Carolina. In recent years, brackish and estuarine marsh species have been observed on Eagles Island at scattered localities due to changes in salinity. A number of non-native species have been documented on Eagles Island, the most important of which is the invasive giant reed, which displaces and outcompetes native marsh vegetation to form dense stands. Eagle Island is fringed by marsh/wetlands suited to brackish water. Giant reed predominates, while cattails (*T. latifolia, T angustifolia, and T domingensis*) are interspersed with *Spartina alterniflora*, *S. patens*, *T. latifolia*, *Scirpu*s spp, *Juncus roermerianus*, and various other species of reeds, rushes, and sedges. Areas dominated by *Phragmites* are of lower quality and provide less habitat for native species; however, they are still useful for flood protection, erosion control, and improving water quality.

Fish and Fisheries

The Cape Fear River is a passageway for the larvae of many species of commercially or ecologically important fish. Spawning grounds for many marine fishes are believed to occur on the continental shelf with immigration to estuaries, such as the lower Cape Fear River, during the juvenile stage. The shelter provided by the marshes and shallow water habitats within the project area's estuarine waters serves as nursery habitat where young fish undergo rapid growth before returning to the offshore environment. Many estuaries and freshwater species are located within the proposed study area such as those identified by the NC Division of Marine Fisheries (NCDMF) long-term trawling study (Personal communication, Chris Stewart, NCDMF Fisheries Biologist, August 2016; Table 1).

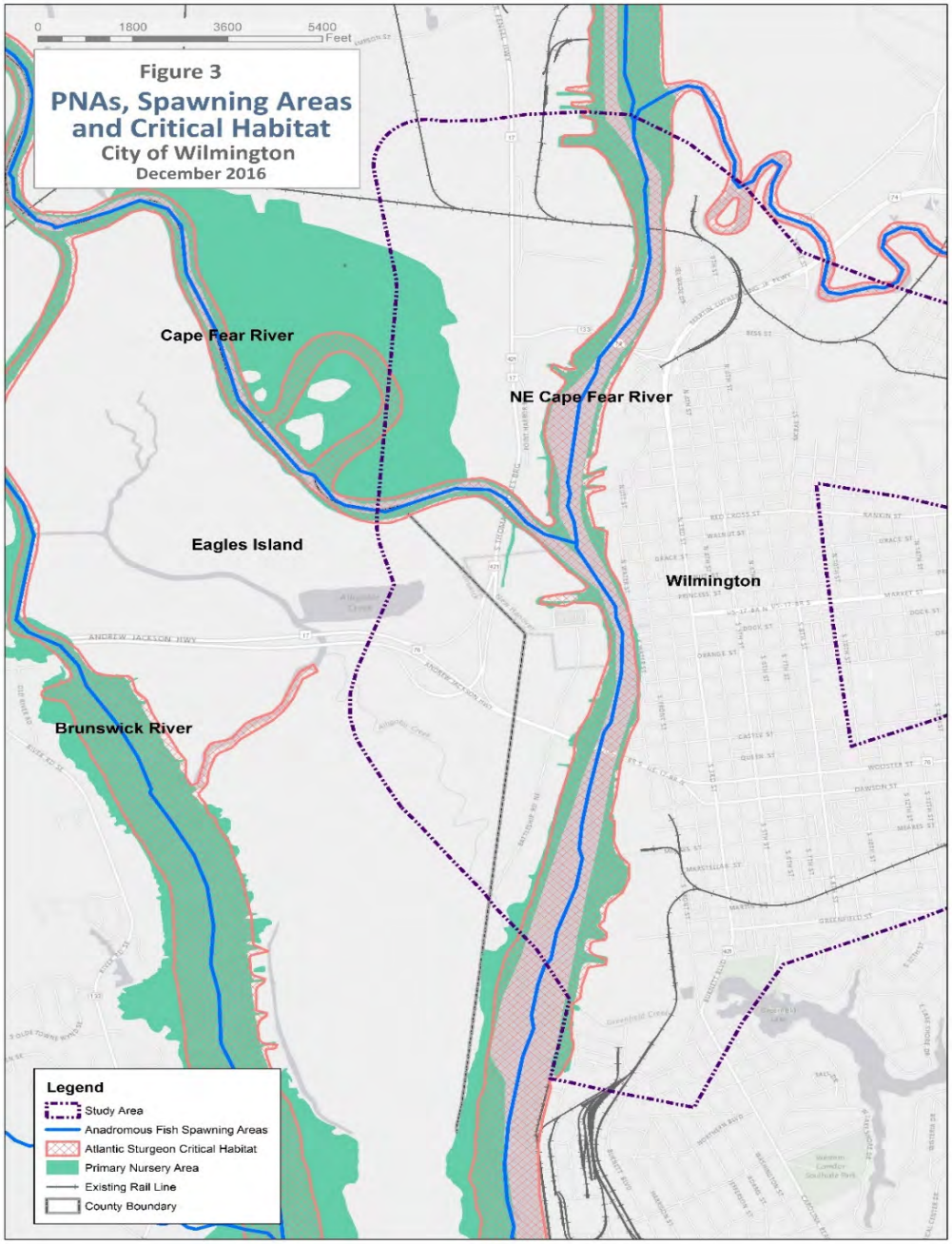
The State of North Carolina defines Primary Nursery Areas (PNAs) as tidal saltwater, which provide essential habitat for the early development of commercially important fish and shellfish (15 NCAC 3B .1405). It is in these estuarine areas that many fish species undergo initial post-larval development. PNAs are designated by the North Carolina Marine Fisheries Commission. The Cape Fear River PNAs shown in Figure 3 are defined as follows: "all waters north of a line beginning on the west shore at a point 34° 10.4410' N - 77° 57.7400' W; running easterly through Beacon "59" to the east shore to a point 34° 10.4050' N - 77° 57.1310' W; with the exception of the maintained channel, and all waters north of a line beginning on the west shore at a point 34° 04.6040' N - 77° 56.4780' W; running easterly through Beacon "41" to the east shore to a point 34° 04.7920' N - 77°55.4740' W; with the exception of 300 yards east and west of the main shipping channel up to Beacon "59" (mouth of Brunswick River)." Map #27 from the NCDMF's website, (http://portal.ncdenr.org/web/mf/primary-nursery-areas), depicts the PNAs within the project area (see Figure 3 – PNAs, Spawning Areas and Critical Habitat). Secondary Nursery Areas (SNAs) are defined by rule 15 NCAC 3N .0102(c) as: "…. those areas in the estuarine system where later juvenile development takes place. Populations are usually composed of developing sub–adults of similar size which have migrated from an upstream primary nursery area to the secondary nursery area located in the

Table 1: LIST OF LARVAL FISH COLLECTED BY NCDMF WITHIN THE VICINITY OF THE PROPOSED STUDY AREA

Species	Common Name
Peracarida mysidacea mysidae	Mysid Shrimp
Farfantepenaeus aztecus	Brown Shrimp
Farfantepenaeus duorarum	Pink Shrimp
Litopenaeus setiferus	White Shrimp
Palaemonetes spp.	Grass Shrimps

Species	Common Name
Portunidae	Swimming Crabs
Callinectes sapidus	Blue Crab
Callinectes similis	Lesser Blue Crab
Ovalipes stephensoni(=guadulpensis)	Coarsehand Lady Crab
Xanthidae	Mud Crabs
Rhithropanopeus harrisii	Harris Mud Crab
Alosa sapidissima	American Shad
Alosa aestivalis	Blueback Herring
Brevoortia tyrannus	Atlantic Menhaden
Dorosoma petenense	Threadfin Shad
Opisthonema oglinum	Atlantic Thread Herring
Anchoa mitchilli	Bay Anchovy
Synodus foetens	Inshore Lizardfish
Ameiurus catus	White Catfish
Ictalurus furcatus	Blue Catfish
Ictalurus punctatus	Channel Catfish
Menidia beryllina	Inland Silverside
Syngnathus fuscus	Northern Pipefish
Prionotus tribulus	Bighead Searobin
Morone saxatilis	Striped Bass
Pomatomus saltatrix	Bluefish
Eucinostomus argenteus	Spotfin Mojarra
Lagodon rhomboides	Pinfish
Cynoscion regalis	Weakfish
Bairdiella chrysoura	Silver Perch
Leiostomus xanthurus	Spot
Menticirrhus americanus	Southern Kingfish
Micropogonias undulatus	Atlantic Croaker
Sciaenops ocellatus	Red Drum
Chaetodipterus faber	Atlantic Spadefish
Ctenogobius shufeldti	Freshwater Goby
Gobiosoma bosc	Naked Goby
Trichiurus lepturus	Atlantic Cutlassfish
Citharichthys spilopterus	Bay Whiff
Paralichthys spp.	Paralicthid Flounders
Paralichthys dentatus	Summer Flounder
Paralichthys lethostigma	Southern Flounder
Trinectes maculatus	Hogchoker
Symphurus plagiusa	Blackcheek Tonguefish

Figure 3: PRIMARY NURSERY AREAS, SPAWNING AREAS, AND PROPOSED CRITICAL HABITAT



middle portion of the estuarine system." These areas are located adjacent to PNAs, are generally deeper and contain mixed populations of large juveniles, subadults, and adults.

Rare, Threatened and Endangered Species

Species occurrences of rare, threatened, and endangered plants and animals documented by the NHP were considered as part of the GIS analysis, yet the results were difficult to evaluate. Locations of documented occurrences only confirm the presence of the species for the observation date, and there are no indications that those same species exist within the study area today. While many of these species likely still inhabit the area where last observed, their presence cannot be confirmed through GIS analysis alone. While many of these species have been observed in the study area as recently as 2012, others have not been seen in the area since the early 1900s. Nevertheless, a list displaying the common and scientific name of each species; as well as, the last known observation is provided in Table 2.

The Endangered Species Act (ESA) of 1973, as amended (16 U.S.C. 1531–1543), provides a program for the conservation of threatened and endangered (T&E) plants and animals and the habitats in which they are found. In accordance with section 7 (a)(2) of the ESA, the applicant, in coordination with the USACE, will initiate consultation with the US Fish and Wildlife Service (USFWS) and the National Marine Fisheries Service (NMFS) to ensure that effects of the proposed project would not jeopardize the continued existence of listed species or result in the destruction or adverse modification of designated critical habitat of such species.

Updated lists of endangered and threatened species for the project area were obtained from NMFS (Southeast Regional Office, St. Petersburg, FL) and the USFWS (Field Office, Raleigh, NC). The actual occurrence of a species in the area depends upon the availability of suitable habitat, the season of the year relative to a species' temperature tolerance, migratory habits, and other factors. For the upper Wilmington Harbor portion of the Cape Fear River, the only species that may occur in the project area are two endangered sturgeon species: shortnose (*Acipenser brevirostrum*) and Atlantic (*A. oxyrinchus oxyrinchus*). Whale, manatee, and sea turtle species are not likely to occur in the project area or be affected by the proposed project. The proposed study area does not provide habitat for any of the listed bird species in the area: piping plovers and red knots prefer oceanfront beaches; red cockaded woodpeckers are accustomed to long leaf forests; and the wood stork favors cypress trees and mangrove swamps.

Table 2: LIST OF SPECIES KNOWN TO HAVE OCCURRED OR POTENTIALLY OCCURRED IN THE PROPOSED STUDY AREA

Scientific Name	Common Name	Last Observation	Listing Designation
Federally Listed			
Acipenser brevirostrum	Shortnose Sturgeon	1993	Endangered (FS)
Acipenser oxyrinchus	Atlantic Sturgeon	2012	Endangered (F)
Trichechus manatus	West Indian Manatee	2012	Endangered (FS)
State Listed			
Somatochlora georgiana	Coppery Emerald	2004	Rare (S)
Myotis septentrionalis	Northern Long-eared Bat	1994	Rare (S)

Scientific Name	Common Name	Last Observation	Listing Designation
Corynorhinus rafinesquii macrotis	Rafinesque's Big-eared Bat - Coastal Plain subspecies	2006	Special Concern (S)
Baccharis glomeruliflora	Silverling	1904	Special Concern (S)
Dichanthelium cryptanthum	Hidden-flowered Witchgrass	1906	Rare (S)
Ophisaurus mimicus	Mimic Glass Lizard	2006	Special Concern (S)
Aristida condensata	Big Three-awn Grass	1931	Threatened (S)
Ambystoma mabeei	Mabee's Salamander	1971	Rare (S)
Alligator mississippiensis	American Alligator	2005	Threatened (FS)
Farancia erytrogramma	Rainbow Snake	2002	Rare (S)
Asclepias pedicellata	Savanna Milkweed	2007	Special Concern (S)
Micrurus fulvius	Eastern Coralsnake	1979	Endangered (S)
Ludwigia suffruticosa	Shrubby Seedbox	1978	Threatened (S)
Masticophis flagellum	Coachwhip	1968	Rare (S)
Himantopus mexicanus	Black-necked Stilt	1987	Rare (S)
Ptilimnium ahlesii	Carolina Bishop-weed	1963	Rare (S)
Malaclemys terrapin	Diamondback Terrapin	1912	Special Concern (FS)
Carex decomposita	Cypress Knee Sedge	1938	Special Concern (S)
Crocanthemum carolinianum	Carolina Sunrose	1958	Endangered (S)
Ptilimnium costatum	Ribbed Bishop-weed	1940	Threatened (S)
Crinum americanum var. americanum	Swamp-lily	1975	Special Concern (S)
Problema bulenta	Rare Skipper	1997	Rare (S)
Boltonia asteroides var. glastifolia	White Doll's-daisy	1965	Rare (S)
Helisoma eucosmium	Greenfield Rams-horn	1908	Endangered (S)
Planorbella magnifica	Magnificent Rams-horn	1908	Endangered (S)
Anodonta couperiana	Barrel Floater	1990	Endangered (S)
Gomphus australis	Clearlake Clubtail	1960	Rare (S)
Heterandria formosa	Least Killifish	1968	Special Concern (S)
Quercus elliottii	Running Oak	1958	Rare (S)
Peltandra sagittifolia	Spoonflower	1986	Rare (S)
Regina rigida	Glossy Crayfish Snake	1962	Rare (S)
Lilaeopsis carolinensis	Carolina Grasswort	1991	Rare (S)
Schinia septentrionalis	Northern Flower Moth	-	Rare (S)
Euphyes dukesi	Dukes' Skipper	2003	Rare (S)
Oenothera riparia	Riverbank Evening-primrose	2005	Rare (S)
Haliaeetus leucocephalus	Bald Eagle	2010	Threatened (FS)

Note: (F) = Federally listed, (S) = State Listed, (FS) = Federally and State Listed

Benthic Community

Aquatic organisms that live in close association with the bottom, or substrate, of a body of water, are collectively called benthos. Common benthic organisms in the sediments within the proposed study area would likely include polychaetes, amphipods, decapods, and mollusks. Given the susceptibility of the river bottom within the proposed study area to currents, water movement, water depths, and the amount of suspended sediment, large benthic communities and large numbers of organisms are not expected. The primary factors affecting the estuarine benthic community species occurrence, distribution and abundance includes sediment grain-size and organic content, sediment depositional rates, dissolved oxygen and salinity. Sediment characteristics within the proposed study area near the Port are shown in Table 3. The primary sediment type in the Cape Fear River within the vicinity of the proposed study area is silt and clay. Mallin et.al. (2000) described the infaunal benthic diversity and richness as constant, as sampled over a four-year period downstream of downtown Wilmington and the Port, within the proposed study area boundary. These samples were dominated by a variety of taxa, including oligochaetes and amphipods (*Gammarus*, *Lembos*, and *Monoculodes* spp.) and by polychaetes (*Maranzellaria*, *Mediomastus*, and *Streblospio* spp.).

These taxa were considered relatively opportunistic species typical of oligohaline to mesohaline areas. These species are considered proficient at recovering from bottom disturbances. Epibenthic species living on the sediment generally include gastropods, amphipods, and some insect larvae. Other more motile epibenthic such as juvenile fish, crabs and shrimp vertically migrate within the water column on a daily basis. The general condition of an area is reflected in the benthic community's health; whereas, the epibenthic community present provides insight on the movement and timing of post-larvae and juvenile fish species important both commercially and recreationally (Mallin et.al. 2000).

Future construction of the rail realignment project may consider the direct, indirect, and cumulative effects on benthic communities within the proposed study area.

Table 3: SEDIMENT CHARACTERIZATION WITHIN THE VICINITY OF THE PORT OF WILMINGTON

Sediment Type	Sediment Gradation (millimeters)	POW Sediment (%)
Gravel	Particles ≥ 4.75	0.0
Sand	Particles ≥ 0.075 but ≤ 4.75	4.3
Silt	Particles ≤ 0.075	54.7
Clay	Particles ≤ 0.075	41.0

Shortnose Sturgeon

The most recent population estimate of shortnose sturgeons in the Cape Fear River is less than 50 individuals, based on analysis of tag/re-capture data by the Shortnose Sturgeon Recovery Team in 1995. The shortnose sturgeon was listed as endangered throughout its range in 1967 under the Endangered Species Preservation Act of 1966 (a predecessor to the ESA). The National Oceanic and Atmospheric Administration's (NOAA) NMFS later assumed jurisdiction for shortnose sturgeon under a 1974 government reorganization plan (38 FR 41370). No harvest or bycatch of shortnose sturgeon is allowed in state or federal waters. A fishing moratorium has been in place in state waters since 1991 for shortnose sturgeon.

The shortnose sturgeon inhabits large Atlantic coast rivers from the St. Johns River in northeastern Florida to the Saint John River in New Brunswick, Canada. Shortnose sturgeons occur primarily in slower moving rivers or nearshore estuaries associated with large river systems. Adults in southern rivers are estuarine anadromous, foraging at the freshwater-saltwater interface and moving upstream to spawn in the early spring. Shortnose sturgeons spend most of their life in their natal river systems and rarely migrate to marine environments. Spawning habitats include river channels with gravel, gravel/boulder, rubble/boulder, and gravel/sand/log substrates. Spawning in southern rivers begins in later winter or early spring and lasts from a few days to several weeks. Juveniles occupy the freshwater-saltwater interface, moving back and forth with the low salinity portion of the salt wedge during summer. Juveniles typically move upstream during the spring and summer and move downstream during the winter, with movements occurring above the freshwater-saltwater interface. In southern rivers, both adults and juveniles are known to congregate in cool, deep thermal refugia during the summer. Shortnose sturgeons are benthic omnivores, feeding on crustaceans, insect larvae, worms, and mollusks. Juveniles randomly vacuum the bottom and consume mostly insect larvae and small crustaceans. Adults are more selective feeders, feeding primarily on small mollusks (NMFS 1998).

Atlantic Sturgeon

The Atlantic sturgeon population in the Cape Fear River is suspected to be less than 300 spawning adults [Atlantic Sturgeon Status Review Team (ASSRT) 2007]. The harvest of Atlantic sturgeons has been banned in state and federal waters since 1991. However, the Atlantic States Marine Fisheries Commission (ASMFC) has recognized that fishery management measures alone cannot sustain stocks of migratory fish species if sufficient quantity and quality of habitat is not available (ASMFC 1999).

On 6 February 2012, the NOAA's NMFS listed the Carolina distinct population segment of Atlantic sturgeons as endangered under the ESA, an action that triggers several additional conservation measures by federal and state agencies, private groups, and individuals (77 FR 5914). The historic range of the Atlantic sturgeons included estuarine and riverine systems from Labrador, Canada to the St. John's River in Florida. The historical distribution in the U.S. included approximately 38 rivers from Saint Croix River in Maine to the St. John's River in Florida, including spawning populations in at least 35 rivers. The current distribution in the U.S. includes 35 rivers, with spawning known to occur in at least 20 rivers.

Atlantic sturgeons spawn in freshwater, but spend most of their adult life in the marine environment. Spawning adults generally migrate upriver in the spring/early summer. A fall spawning migration may also occur in some southern rivers. Spawning is believed to occur in flowing water between the salt front and fall line of large rivers. Post-larval juvenile sturgeons move downstream into brackish waters, and eventually move to estuarine waters where they reside for a period of months or years. Subadult and adult Atlantic sturgeons emigrate from rivers into coastal waters, where they may undertake long-range migrations. Migratory subadult and adult sturgeons are typically found in shallow (33-164 feet) nearshore waters with gravel and sand substrates. Although extensive mixing occurs in coastal waters, Atlantic sturgeons return to their natal river to spawn (ASSRT 2007).

Proposed Critical Habitat Designation

The Cape Fear and Northeast Cape Fear Rivers were identified as spawning rivers for Atlantic sturgeon based on the capture of juveniles, the capture of adults in spawning condition, the tracking location of adults, and information indicating the historical use by Atlantic sturgeon. In the late 1800s, the Cape Fear

River had the largest landings of sturgeon in the southeastern United States (Moser and Ross 1995). While species identification (i.e., shortnose or Atlantic sturgeon) is not possible, these landings suggest large populations of both species. The Cape Fear River is tidally influenced by diurnal tides up to at least rkm 96. The River is also dredged extensively to maintain a depth of 12 meters (m) up to rkm 49 and then a depth of four meters up to Lock and Dam #1. There are numerous deep holes (>10 m) throughout this extent.

A gill net survey for adult shortnose and juvenile Atlantic sturgeon was conducted in the Cape Fear River drainage from 1990 to 1992, and replicated from 1997 to 2005. Each sampling period included two overnight sets. The 1990-1992 survey captured 100 Atlantic sturgeons below Lock and Dam #1 (rkm 95). In 1997, 16 Atlantic sturgeons were captured below Lock and Dam #1, an additional 60 Atlantic sturgeons were caught in the Brunswick (a tributary of the Cape Fear River), and 12 were caught in the Northeast Cape River (Moser et al. 1998). Additionally, Ross et al. (1988 in Moser and Ross 1995) reported the capture of a gravid female in the Cape Fear River.

Recent telemetry work conducted in the Cape Fear and Northeast Cape Fear River showed that subadult Atlantic sturgeon movement and distribution followed seasonal patterns (Loeffler and Collier in Post et al., 2014). During summer months, Atlantic sturgeon distribution was shifted upriver with limited large-scale movements; during the coldest time of year, subadult fish were absent from the rivers and had migrated to the estuary or ocean (Loeffler and Collier in Post et al., 2014). The high inter-annual return rates of tagged fish to the system demonstrate that Atlantic sturgeon have fidelity to these rivers; this implies that the Cape Fear River system may be the natal system for these fish (Loeffler and Collier in Post et al. 2014).

Further evidence of the importance of this system is demonstrated by the movement patterns of one of five adult Atlantic sturgeons tagged during the study that has shown site fidelity. his individual fish was in ripe and running condition at the time of tagging. This fish subsequently returned to the Cape Fear system each of the following years (2013 and 2014) and has been detected farther upstream in both the Cape Fear (rkm 95) and Northeast Cape Fear (rkm 132) rivers than any tagged subadult fish during this study. This fish did not use the fish passage rock arch ramp at Lock and Dam #1; however, at the time when it was present at the base of the dam, the rock arch ramp structure was only partially complete. In all years of the study, this fish had movement patterns that are consistent with spawning behavior and demonstrate that both the Northeast Cape Fear and Cape Fear Rivers may be important spawning areas. While telemetry data have not indicated Atlantic sturgeon presence above Lock and Dam #1, we believe the fish passage present at the dam is successful or that fish pass through the lock. We base this determination on reports of Atlantic sturgeon above Lock and Dam #1 (Personal communication J. Hightower, NCSU to J. Rueter, NMFS, July 21, 2015).

Most recently, NOAA NMFS released a proposed critical habitat designation for the Atlantic sturgeon Carolina Distinct Population Segment (DPS C4) from the mouth of the Cape Fear River to Lock and Dam #3 (Federal Register 2016). It was noted that the area from Huske Lock and Dam (Lock and Dam #3) downstream to Lock and Dam #2 as unoccupied critical habitat on the Cape Fear River was included because Atlantic sturgeon behavior indicates they are attempting to move upstream to spawning habitat located beyond this barrier, and NOAA NMFS consider this historical spawning habitat essential to the conservation of the DPS.

Essential Fish Habitat

The Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act) defines essential fish habitat (EFH) as "all waters and substrates necessary to fish for spawning, breeding, feeding, or growth to maturity" and includes habitat for individual species or an assemblage of species designated by the regional fishery management councils. Pursuant to the Magnuson-Stevens Act, the South Atlantic Fisheries Management Council (SAFMC) designates EFH within the rail realignment study area (8,832 acres) to encompass palustrine areas with tidal freshwater and tidal forests as well as estuarine areas with emergent wetlands, shallow bottom habitat, intertidal flats, and the water column.

The SAFMC identifies waters within the project area as EFH for brown shrimp, pink shrimp, white shrimp, and for estuarine species within the snapper/grouper complex (e.g., gray snapper and gag). As described above, the ecological function of the Cape Fear River and its tributaries is widely recognized for contributions to spawning, egg and larval dispersal, and juvenile recruitment; and as foraging habitat for anadromous fishes including American shad, Atlantic sturgeon, shortnose sturgeon, blueback herring, and striped bass. The project area clearly functions as nursery habitat for federally managed species as well as other species of commercial or recreational importance including red drum, Atlantic croaker, spot, Atlantic menhaden, bay anchovy, striped mullet, weakfish, and blue crab. Many of these species serve as prey for fish that are managed by the SAFMC (e.g., king mackerel, Spanish mackerel, and cobia) or for highly migratory fish managed by the NMFS (e.g., billfishes and sharks).

The NMFS, SAFMC, Mid-Atlantic Fishery Management Council, and ASMFC are responsible for managing specific species/life stages that may occur within the Cape Fear River and/or near the proposed study area. Table 4 identifies those species and their life stage(s) potentially occurring in the vicinity of the study area. The EFH species data was provided by the NMFS Habitat Conservation Division, Beaufort, NC (NOAA 2012).

Table 4: ESSENTIAL FISH HABITAT MANAGED SPECIES

Species Common Name	Scientific Name	Life Stages Cape Fear River to US 421
INVERTEBRATES		
Brown shrimp	*Farfantepenaeus aztecus*	L, J, A
White shrimp	*Litopenaeus setiferus*	L, J, A
Pink shrimp	*Farfantepenaeus duorarum*	L, J, A
COASTAL DEMERSALS		
Red drum	*Sciaenops ocellatus*	E, L, J, A
Bluefish	*Pomatomus saltatrix*	J, A
Summer flounder	*Paralichthys dentatus*	L, J, A
COASTAL PELAGICS		
Spanish mackerel	*Scomberomorus maculatus*	J, A
King mackerel	*Scomberomorus cavalla*	J, A
Cobia	*Rachycentron canadum*	J, A
SNAPPERS/GROUPERS		
Black sea bass	*Centropristis striata*	J
Rock sea bass	*Centropristis philadelphica*	J

Species Common Name	Scientific Name	Life Stages Cape Fear River to US 421
Gag grouper	*Mycteroperca microlepis*	J
Red grouper	*Epinephelus morio*	J
Black grouper	*Mycteroperca bonaci*	J
Lane snapper	*Lutjanus synagris*	J
Mutton snapper	*Lutjanus analis*	J
Gray snapper	*Lutjanus griseus*	J
Yellow jack	*Carangoides bartholomaei*	J
Blue runner	*Caranx crysos*	J
Crevalle jack	*Caranx hippos*	J
Bar jack	*Caranx ruber*	J
Atlantic spadefish	*Chaetodipterus faber*	J
Sheepshead	*Archosargus probatocephalus*	J, A
SHARKS		
Smooth dogfish	*Mustelus canis*	J
SMALL COASTAL SHARKS		
Atlantic sharpnose shark	*Rhizoprionodon terraenovae*	J, A
Finetooth shark	*Carcharhinus isodon*	J, A
Blacknose shark	*Carcharhinus acronotus*	J, A
Bonnethead shark	*Sphyrna tiburo*	J, A
LARGE COASTAL SHARKS		
Silky shark	*Carcharhinus falciformis*	J, A
Tiger shark	*Galeocerdo cuvieri*	J, A
Blacktip shark	*Carcharhinus limbatus*	J, A
Spinner shark	*Carcharhinus brevipinna*	J, A
Bull shark	*Carcharhinus leucas*	J, A
Lemon shark	*Negaprion brevirostris*	J, A
Nurse shark	*Ginglymostoma cirratum*	J, A
Scalloped hammerhead	*Sphyrna lewini*	J, A
Great hammerhead	*Sphyrna mokarran*	J, A
Smooth hammerhead	*Sphyrna zygaena*	J, A

Legend: E=Egg; L=Larval; J=Juvenile; A=Adult
Source: Habitat Protection Division, Pivers Island, NC

Water Resources

The Cape Fear River naturally carries a large amount of sediment from inland to the Atlantic Ocean and drains broad areas of coastal plains. The relatively slow moving water allows higher concentrations of tannins, essentially making the river a blackwater system. This, combined with the relatively heavy marine industrial traffic and urban development along both sides of the river and its tributaries, can affect the river's water quality, including clarity. During times of poorer water quality due to high-suspended sediment loads, pollution and runoff, submerged aquatic vegetation and associated fauna, marshes, and nektonic communities (fish, shellfish, and marine reptiles and mammals) may be adversely impacted.

The EPA developed a system to identify drainage areas by assigning a Hydrologic Unit Code (HUC) to watersheds. The Cape Fear River's HUC is 03030005. The NC Division of Water Resources (DWR) designates classifications for surface water bodies in the state. These classifications define the best uses to be protected within each water body. The Cape Fear River from Snows Point to Federal Point to the Atlantic Ocean is designated as SA; High Quality Waters (HQW) and Brunswick River is designated as SC. The classification definitions are: Class SA are tidal salt waters used for commercial shellfishing or marketing purposes. All SA waters are also HQW by supplemental classification. Class SC are all tidal salt waters protected for secondary recreation such as fishing, boating and other activities involving minimal skin contact; fish and non-commercial shellfish consumption; aquatic life propagation and survival; and wildlife. HQW are a supplemental classification intended to protect waters, which are rated excellent based on biological and physical/chemical characteristics through the NC DWR monitoring or special studies, primary and other functional nursery areas designated by the MFC.

Hydrology

Tides in the project area are semidiurnal and the mean tidal range (difference between mean high water and mean low water) at Downtown Wilmington is approximately 4.3 feet. The mean tidal range in the Atlantic Ocean near its confluence with the Cape Fear River is between five and six feet. The river's salinity is approximately 35 parts per thousand (ppt) at its confluence with the Atlantic Ocean. The salinity of the waters surrounding Eagles Island is increasing [UNCW Aquatic Ecology Laboratory (AEL) 2007]. The rise in salinity is the result of a number of different factors including changes in sea level and changes to the depth and shape of the Cape Fear River channel that affect how far up river salt water can flow. Salinity upstream and near Downtown Wilmington fluctuates within the brackish (0.5 – 30 ppt) range.

The amount of rainfall in the upper portions of the Cape Fear River Basin affects the amount of freshwater coming down the river to mix with the salt water being pushed up the river during incoming tides. In years of heavier rainfall, lower salinity can be expected in the waters within and surrounding Eagles Island than in years of drought (UNCW AEL 2007). The relationship between the salinity and the various factors affecting it is part of an ongoing study by UNCW AEL. Various other indicators of water quality are being measured in the water surrounding Eagles Island by the State of North Carolina and the UNCW AEL to better understand the effect of upstream land use activities on the Lower Cape Fear River Estuary.

Historical and Cultural Resources

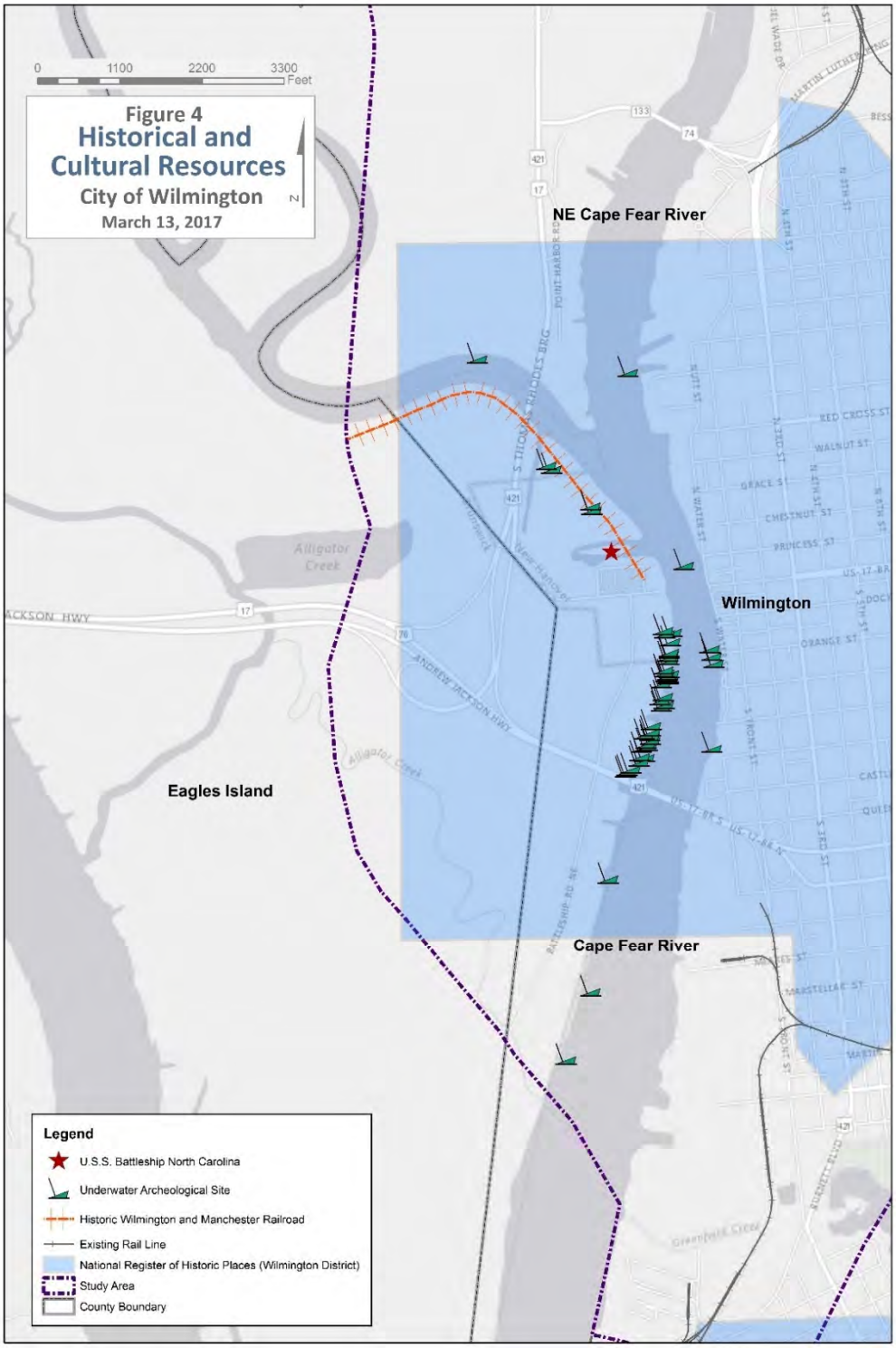
Wilmington and its surrounding areas have a rich military and maritime history. During the nineteenth century, Eagles Island was thriving as an industrial center with turpentine distilleries, naval stores, and shipyards. The following historical and cultural resources have been identified by the Eagles Island Coalition and summarized in the Conservation Management Plan and below (Figure 4).

Maritime Archaeological Resources

- Shipwrecks – dozens of recorded shipwrecks and likely many other unknown shipwrecks can be found along the shores of Eagles Island, especially along the Cape Fear River; the largest concentration of these wrecks and remains are between the USS NORTH CAROLINA and the Cape Fear Memorial Bridge. Thirty-seven sites have been inventoried near the study area by the North Carolina Office of State Archeology and an environmental review is necessary for any future development in this area (Figure 4 – Historical and Cultural Resources). These wrecks include barges, tugboats and wooden sailing ships. These abandoned vessels and the marine facilities are physical reminders of Eagles Island's historically important role in the commerce along the lower Cape Fear River.

- Shipyard remnants – in addition to port facilities, Eagles Island was host to a number of shipyards. The hay day of shipbuilding in the Wilmington area was during the nineteenth century.
- Historical dockyard remnants – remains of historical dockyards, where ships were repaired, line the shore of Eagles Island. These remnants are another reminder and connection to Eagles Island as part of the working riverfront that drove Wilmington's economy for centuries.

Figure 4: HISTORICAL AND CULTURAL RESOURCES



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Maritime Industrial Artifacts

- Naval stores industry – the term "naval stores" is used to describe the products produced for the marine and shipbuilding industries from the gum of coniferous trees. The production of naval stores was a major industry through the coastal plain during the colonial era. At its height, the naval stores industry in the lower Cape Fear region produced nearly one-third of all the turpentine in the world. Naval stores activities were conducted on the island, which most likely would have been related to the processing of gum (resin), turpentine production, and the shipping of naval stores products. The Geechee were West African slaves, brought from coastal Georgia to work in the naval stores industry. Eagles Island is the northern extent of the Gullah-Geechee Corridor, as designated by the National Park Service.
- Carpentry shop - remains of the Stone Towing Company carpentry shop exist on Eagles Island; the Stone Towing Company was formed in 1895 as a towing business and grocer. Remnants of the carpentry shop help to piece together the history and use of Eagles Island, and connect it to the history of the area.
- Cultural resource sites – to date, no formal terrestrial cultural resource survey has been conducted on Eagles Island. It is possible there are significant cultural resource sites across Eagles Island that are yet to be discovered - especially given the documented maritime history, and previous rice cultivation on the island.

Wilmington and Manchester (W&M) Railroad

- Eagles Island was the starting point for the W&M Railroad, which was officially noted as abandoned in 1888 (USCG Survey Chart 150 of 1898). The remains of the W&M railroad are among the cultural resources of interest to the Eagles Island Coalition (EIC) and were identified and documented by the EIC using historical nautical charts, high resolution aerial photos, GIS, and site visits. The preservation of these remains is part of the EIC Mission, which seeks to preserve cultural resources in need of conservation on Eagles Island.

Historical Attraction

- Battleship NORTH CAROLINA – was the lead ship of North Carolina – class battleships and the fourth warship in the US Navy to be named in honor of the state of North Carolina. She was the first newly constructed American battleship to enter service during World War II, and she took part in every major naval offensive in the Pacific Theater of Operations to become the most highly decorated American battleship of World War II, accumulating 15 battle stars. The USS North Carolina is now a museum ship and memorial, kept on the shores of Eagles Island. The USS North Carolina and adjoining property is designated as a National Historical Landmark and is managed and maintained by NC DNCR. Environmental regulatory review seeks to protect historic shipwrecks and other submerged sites from water-related construction projects. This review is backed by federal legislation and performed by the Underwater Archeological Branch pursuant to Section 106 of the National Historic Preservation Act of 1966. Furthermore, these sites are protected by North Carolina legislation (G.S. 121-122 to 128, Article 3: salvage of abandoned shipwrecks and other underwater archaeological materials on all bottoms from low water to one marine league seaward, and bottoms of other navigable waters), which is supported by the Federal Abandoned Shipwreck Act of 1987 (P.L. 100-298).

Air Quality

New Hanover and Brunswick Counties are currently listed as in "attainment" status for all Criteria pollutants that have a National Ambient Air Quality Standard (NAAQS) published with the exception of

Sulfur Dioxide (SO_2). Both counties are currently listed as "unclassifiable" for SO_2 by the EPA like most of the rest of the country (with the exception of some areas which have a SO_2 monitor, which clearly shows a violation - these are listed as "nonattainment").

More than two years ago, this pollutant received a revised (lowered) NAAQS value. The EPA has yet to publish clear regulatory guidance directing states how to satisfactorily demonstrate attainment status for counties in the nation, thus the newly made up attainment status term "unclassifiable." The proposed study area in New Hanover and Brunswick Counties is considered as having a status of "attainment/unclassifiable." The EPA indicates the largest source of SO_2 in the atmosphere is the burning of fossil fuels by power plants and other industrial facilities. Smaller sources of SO_2 emissions include: industrial processes such as extracting metal from ore; natural sources; and locomotives, ships and other vehicles and heavy equipment that burn fuel with a high sulfur content.

Eagles Island Recreational Assets

Eagles Island is a wedge of open space in the midst of rapidly urbanizing areas on both banks of the Cape Fear River. This fact was recognized in the Cape Fear River Corridor Plan adopted by the City and the Counties of Brunswick and New Hanover in October 1997. The plan calls for the island to remain in its natural state. More recently, The *Parks, Recreation and Open Space Master Plan* (City of Wilmington, 2010) calls for the protection of Eagles Island as well as to work with other interested parties and agencies to ensure the continued preservation of and recreational access to the island. The plan states that the City is interested in expanding partnerships to acquire Eagles Island, and to develop a conservation management plan for Eagles Island. In addition, *Wilmington's Vision 2020: A Waterfront Downtown* plan recognizes the value of the undeveloped island and calls for enhancing the green edge along the west side of the river to enhance pedestrian and bicycle activity.

1.3. Screening and Analysis of Affected Resources

1.3.1. Data Acquisition

In response to the City's request to evaluate the feasibility of realigning the freight rail to accommodate future development and population growth, M&N contracted DC&A to conduct an environmental analysis of proposed corridor alignments. DC&A compiled a list of current and relevant datasets that represent possible environmental constraints and submitted the list to M&N and the Task Force for preliminary review. After determining that many of the requested datasets were not readily available from the City's geodatabase, DC&A was granted permission to obtain the data from outside sources. Although DC&A's geospatial database already contained many of the requested datasets, which allowed for immediate upload into a GIS, others required third party engagement and individual data requests. Therefore, several organizations were contacted to acquire the additional data. Once procured, all data was uploaded into a file geodatabase and archived. A full summary of the datasets can be found below in Table 5.

Table 5: LIST OF DATA REQUESTED FOR THE ENVIRONMENTAL ANALYSIS.

Data Requested	Data Source
Study Area Boundary	Moffat and Nichol
Alternative Corridors	Moffat and Nichol
Wetlands	U.S. Fish and Wildlife Service

Data Requested	Data Source
Endangered and Threatened Species Occurrences	North Carolina Natural Heritage Program
Critical Habitat	National Oceanic and Atmospheric Admin.
Important Bird Areas	Audubon Society
Historical Gullah-Geeche Corridor	National Parks Service
Conservation and Managed Lands	North Carolina Natural Heritage Program
Proposed Restoration Projects	Kerr McGee Trustees
Stormwater BMP Areas	City of Wilmington
Floodplains/Sea Level Rise Maps	Federal Emergency Management Agency
Water Quality Data	Lower Cape Fear River Program
Underwater Archeological/Historical Sites	NC State Historic Preservation Office
Anadromous Fish Spawning Areas	North Carolina Division of Marine Fisheries
Primary Nursery Areas	North Carolina Division of Marine Fisheries
Historical Rice Fields and Canals	Eagles Island Coalition, Jim Kapetsky
USACE Navigational Boundary	United States Army Corps of Engineers
Eagles Island CDF	United States Army Corps of Engineers
Recreational Water Trails	Eagles Island Coalition
Abandoned M&W Railroad	Eagles Island Coalition
New Hanover and Brunswick County Parcels	Brunswick and New Hanover County Registry

1.3.2. Data Screening

DC&A sought to obtain and include all data from the original data request; however, some datasets were not available in a geospatial format and/or did not contain the necessary metadata records to ensure the integrity of the study. Accessible datasets with proper metadata were vetted for quality assurance and content relevance. In addition to scrutinizing the data to confirm its value and importance, alternate datasets were considered to determine if they were more appropriate for the analysis. For instance, data representing underwater archeological sites were available from two reputable sources, the USN and the SHPO. After determining that the state-level data was more current and comprehensive, it was selected for the final analysis. In summary, the environmental analysis was carried out using 14 datasets that represent the best possible data available at the time of the analysis (August – December 2016; Table 6).

Table 6: SUBSET OF VETTED DATA ACQUIRED FOR THE ENVIRONMENTAL ANALYSIS OF FREIGHT RAIL REALIGNMENT

Dataset Acquired for Environmental Analysis
Proposed Study Area Boundary
Rail Realignment Alternative Corridors
Endangered and Threatened Species Occurrences
Wetlands
Critical Habitat for Atlantic sturgeon
Conservation Easements and Managed Lands
Proposed Restoration Projects
Underwater Archeological/Historical Sites

Dataset Acquired for Environmental Analysis
Anadromous Fish Spawning Areas
Primary Nursery Areas
Recreational Water Trails
Historic M&W Railroad
New Hanover County Parcels
Brunswick County Parcels

General Processing

A subset of 14 individual shapefiles (13 constraints layers and the study boundary), were added to a blank map document in ArcGIS 10.5 and all datum conversions and transformations were completed to ensure proper alignment. All data layers were built using the North American Datum 1983 State Plane North Carolina FIPS 3200 projected coordinate system. The properties of each shapefile were carefully examined to better understand the data and realize the best course of action for geoprocessing.

Identifying Environmental Constraints

To determine the most "suitable" alignment and development of potential alternatives for the City's freight rail realignment, environmental constraints were identified with a specific focus on Eagles Island. The New Hanover and Brunswick County parcel layers were unionized. Parcels from the union were clipped to the study area boundary and evaluated using the register of deeds. Each parcel was carefully reviewed to identify ownership, land use/land cover (LULC), size, and the existence of any conservation easements (Table 7). Next, the remaining constraints shapefiles were examined for "fatal flaws" and findings provided to M&N to facilitate the development of the rail alignment alternatives and their corridors (Figure 5 – Land Ownership). Ultimately, the discovery of a perpetual conservation easement within the Cape Fear Royal Tract (CPFRT) was the only "fatal flaw" identified during our investigation (Figure 5 – Land Ownership). This property is held by the NC Coastal Land Trust. This initial step directed attention away from unfeasible locations and towards areas more likely to support the construction of a freight rail corridor.

1.3.3. Alternative Corridors Analysis

GIS-based suitability models examine the various characteristics of a set of locations to determine their feasibility for a particular use, thus this approach was applied to evaluate the environmental feasibility of each alternative corridor. By examining the spatial relationships between the resources and the alignment alternatives, locations for attributes could be evaluated that may support freight rail realignment, and determine which scenarios would likely trigger federal and state resource agency concerns. Furthermore, this approach allowed for the preliminary quantification of potential environmental impacts.

Any corridor that avoids environmental constraints identified in this analysis will generate less regulatory restrictions from an environmental perspective; therefore, making it more "suitable." Moreover, avoidance of these constraints will likely result in lower costs associated with potential mitigation. It is worth mentioning, however, this analysis evaluated the "suitability" of each corridor only from an environmental position and did not consider other attributes that may affect the overall "suitability", such as cost or engineering feasibility.

Table 7: LIST OF EVALUATED PARCELS WITHIN THE STUDY AREA BOUNDARY

Map ID	Owner	Acreage	Conservation Lands (Y/N)	Ownership Type	Contact Information	Potential Constraints/Notes
1	Alan E. Rusher	2.7	N	Private	P.O. Box 947 Wrightsville Beach, NC 28480	Currently developed/river front/boat construction
2	Arundel Corp	9.8	N	Private	FIXED ASSET SERV 1401-843 1200 Urban Center Drive Birmingham, AL 35242	Undeveloped. The Arundel Corporation produces and markets construction materials such as concrete, sand, and gravel. It also acquires, develops, and markets real estate. The company was incorporated in 1919 and is based in Sparks, Maryland.
3a-e	USS NC Battleship Commission	48.9	N	State	Captain Terry Bragg, Executive Director (910-251-5797); P.O. Box 480 Wilmington, NC 28402	National Historic Landmark of National Significance; requires North Carolina Historical Commission Review.
4	Carolina Christian Radio Inc.	2.04	N	Private	P.O. Box 957 Wilmington, NC 28402	Undeveloped
5a-5b	Duke Energy Progress Inc.	2.9/61.8	N	Private	410 S Wilmington Street Raleigh, NC 27601-1748	Developed/contains upland property; Larger tract is wetland and is adjacent to an underwater cultural resource.
6	318 Battleship Road LLC	7.3	N	Private	3330 River Road Wilmington, NC 28412; David Brinkley (910) 763-7671	Developed/contains upland property.
7	Floyd M. Hufham	4.9	N	Private	c/o Vance Moore CPA 1210 Essex Drive Wilmington, NC 28403	Undeveloped/contains upland property.
8a-b	John D. Bellamy	17.15/39.6	N	Private	Jim Smith, Oleander Company (jim@oleandercompany.com)	Owner deceased. Oleander Company has taken over management of property. Larger tract is wetland.

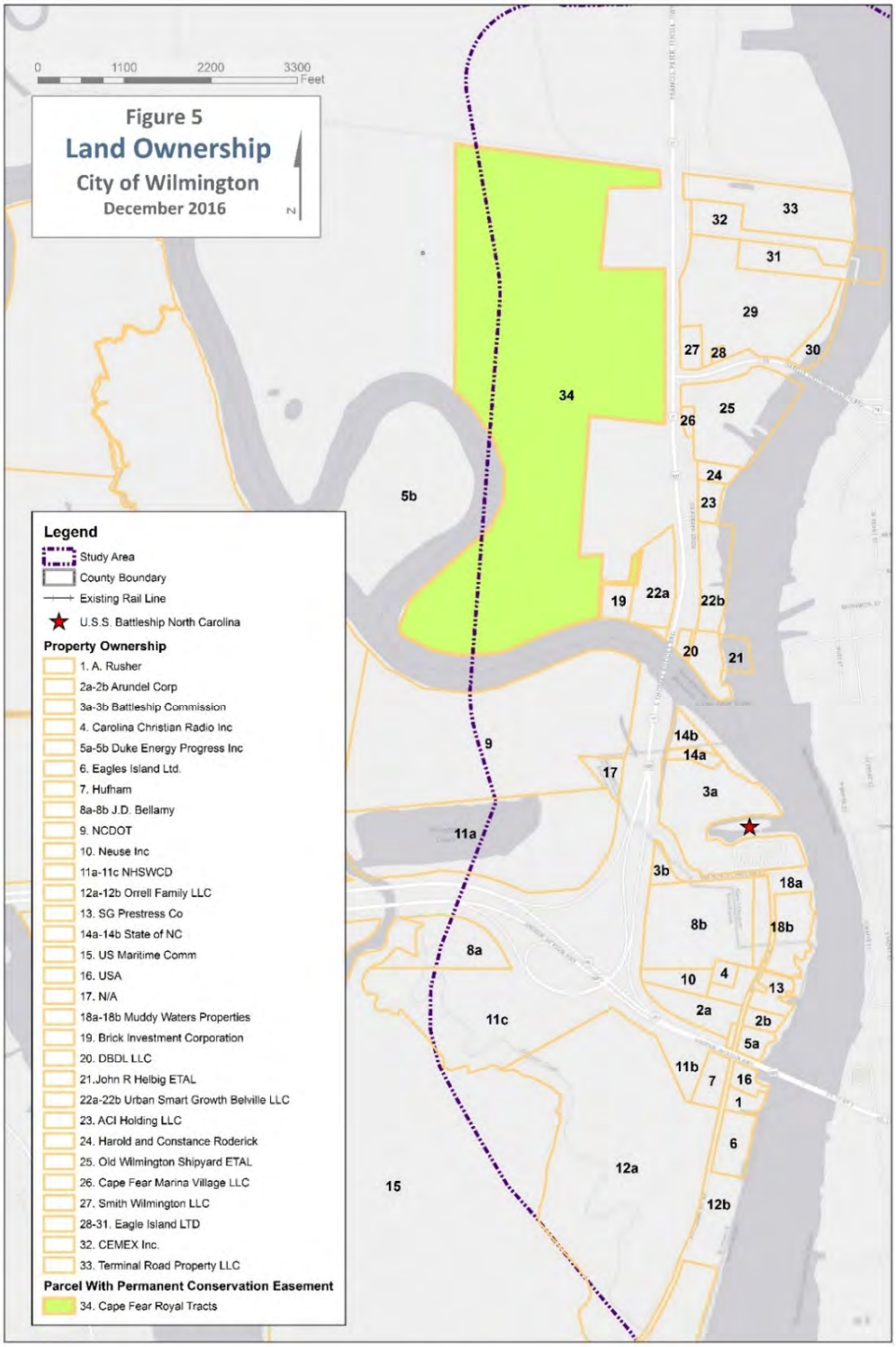
Map ID	Owner	Acreage	Conservation Lands (Y/N)	Ownership Type	Contact Information	Potential Constraints/Notes
9	NCDOT	131.12	N	State	Marissa Rodman Cox, Environmental Supervisor PDEA (919) 707-6153/ mrcox@ncdot.gov	Known as the McIntyre Tract; permitted mitigation bank with restrictions. Property is to be transferred to a third party, conservation easement to be completed; Interagency Review Team to discuss impacting mitigation bank.
10	Neuse Inc	5.3	N	Private	100 E Tryon Road Raleigh, NC 27603	Undeveloped/contains wetland and upland property.
11a	NHSWCD/Town of Leland	53	N	Local/State	Dru Harrison (910) 798-7135/Niel Brooks (910) 332-4818	Town Council and Board need to be engaged.
11b-c	NHSWCD	54.34	N	State	Dru Harrison (910) 798-7135	Board needs to be engaged. Sole purpose of land is for conservation.
12a-b	Orrell Family LLC	139.9/10.1	N	Private	Sylvia Orrell Stoudenmire (sstouden1@aol.com)	In process of selling parcels to a developer (river front property is upland).
13	SG Prestress Co	12.7	N	Private	FIXED ASSET SERV 1401-843 1200 Urban Center Drive Birmingham, AL 35242	Undeveloped/contains wetland and upland property.
14a-b	State of NC	5.82	N	State	1321 Mail Service Center, Raleigh, NC 27699	Wetland property/associated with USS Battleship NC.
15	US Maritime Commission	1,414	N	Federal	Jenny Owens, Chief of Environmental (910) 251-4757	Road access/CDF Future Expansion
16	USA	2.4	N	Federal	1849 C Street NW, Washington DC 20240	Federal use/DoD use

Map ID	Owner	Acreage	Conservation Lands (Y/N)	Ownership Type	Contact Information	Potential Constraints/Notes
17	Seaboard Coast Line R/R	1.58	N	Private	Richmond, VA 23230	Ownership of parcel unknown/Land Use Code is utilities.
18a-b	Diamondback Properties	15.87/2.89	N	Private	Jay Shott with Diamondback Development, LLC at (704) 309-9880 (Mooresville, NC)	New owner is Holdings of TCM, Inc.; Proposed brownfield agreement in place; In process of requesting land use change through NHC Planning Department (Riverfront Mixed Use District); Site of proposed natural interpretative center.
19	Brick Investment Corporation	4.15	N	Private	Fee Simple: P.O. Box 3660 Hollywood, CA 90778	Possible CAMA concern/Land Use Code listed as other services; Zoning = Industrial.
20	DBDL LLC	8.34	N	Private	Fee Simple: Donald and Donna Bordeaux 1120 Village Road B-9 Leland, NC 28451	Undeveloped/contains wetland and upland property
21	John R Etal Helbig	3.64	N	Private	John R Etal Helbig 18129 Fjord Dr. Suite B Poulsbo, WA 98370	Industrial Use/Timber Pen Pt Peter/ Contains water and upland.
22a-b	Urban Smart Growth-Belville LLC	11.42	N	Private	Fee Simple: P O Box 2109, Hollywood, CA 90778	Undeveloped/Land Use Code Listed as Unused Land.
23	ACI Holdings LLC	3.46	N	Private/Local	1402 Front Street Wilmington, NC 28401	Industrial/Land Use Code Listed as Construction Contracting.
24	Harold and Constance Roderick	2.67	N	Local	Harold and Constance Roderick 2056 Kerr Ave N. Wilmington, NC 28405	Industrial Class/Land Use Code Listed as Vacant/Dilapidated. The parcel contains right-of-way for electric 30-foot wide granted to Duke Energy Progress.

Map ID	Owner	Acreage	Conservation Lands (Y/N)	Ownership Type	Contact Information	Potential Constraints/Notes
25	Old Wilmington Shipyard Etal	29.11	N	Private/Local	Fee Simple: Old Wilmington Shipyard Etal P O Box 15209 Wilmington, NC 28408	Contains easement for water and sewer granted to Cape Fear Public Utility Authority/ Land Use Code listed as Marina-Marine Craft Dock.
26	Cape Fear Marina Village LLCC ETAL	1.22	N	Private/Local	P.O. Box 15209 Wilmington, NC 28408	Land Use Code listed as Auto Parking/Zoning=Industrial.
27	Smith Wilmington LLC	3.46	N	Private	Fee Simple: William and Carolyne Smith 115 Linden Drive Danville, VA 24541	Private business/Truck stop (Shell station)/Land Use Code listed as Convenience/Grocery.
28	Eagle Island LTD	0.61	N	Private/Local	3330 River Road Wilmington, NC 28412	Undeveloped/Land Use Code listed as brackish marsh.
29	Eagle Island LTD	48.12	N	Private/Local	3330 River Road Wilmington, NC 28412	Undeveloped/Land Use Code listed as unused land. Parcel contains brackish marsh.
30	Eagle Island LTD	5.54	N	Private/Local	3330 River Road Wilmington, NC 28412	Brackish Marsh/Possible CAMA concern/Zoning = Industrial/Parcel contains water and upland and water is part of a PNA/
31	Eagle Island LTD	14.25	N	Private/Local	3330 River Road Wilmington, NC 28412	Land Use Code listed as unused land/ Zoning = Industrial. Parcel contains brackish marsh and is listed as a possible CAMA concern
32	CEMEX Inc.	12.67	N	Private	CEMEX INC 1501 Belvedere Rd. West Palm Beach, FL 33406	Land Use Code listed as Other/Trans/Com/Util and there is a Possible CAMA concern.

Map ID	Owner	Acreage	Conservation Lands (Y/N)	Ownership Type	Contact Information	Potential Constraints/Notes
33	Terminal Road Property LLC	25.64	N	Private	234 Seagull Lane Wilmington, NC 28409	Conservation district = Swamp Forest; Possible CAMA area of concern; Contains an easement for a subaqueous pipeline granted to Cape Fear Public Utility Authority.
34	NC Coastal Land Trust	291.3	Y	Local	Fee Simple: Robert and Ann Stapleton, 515 N 5th St Wilmington, NC 28401 Conservation Easement: Jessica Blake, Development Director (jessicag@nccoast.org)	Conservation easement restricting development; known Bald Eagle nest; Coastal Land Trust conveyed concerns over project; rail easement exists running east to west along northern boundary of parcel.

Figure 4: LAND OWNERSHIP



Credits: Connect NCDOT GIS Resources (Rail Division Data),Brunswick GIS Parcel Data, New Hanover GIS Parcel Data, Esri, HERE, DeLorme, MapmyIndia, © OpenStreetMap contributors, and the GIS user community

1.4. Quantification of Potential Environmental Constraints

1.4.1. Wetlands

Wetlands provide numerous beneficial services for people, fish and wildlife; for example, they protect and improve water quality, provide habitat, store floodwaters, and maintain surface water flow during droughts. According to the EPA, these systems are among the most productive ecosystems in the world, and are often compared to rainforests and coral reefs. Impacts to wetlands are regulated and may be subject to permit requirements under Section 404 of the Clean Water Act (33 USC § 1344). The environmental analysis utilized the most recent National Wetlands Inventory map for the proposed study area, which includes the following types of wetlands: estuarine deep water (river/creek), estuarine wetland (salt marsh), freshwater emergent (freshwater marsh), freshwater forested/scrub, and freshwater pond.

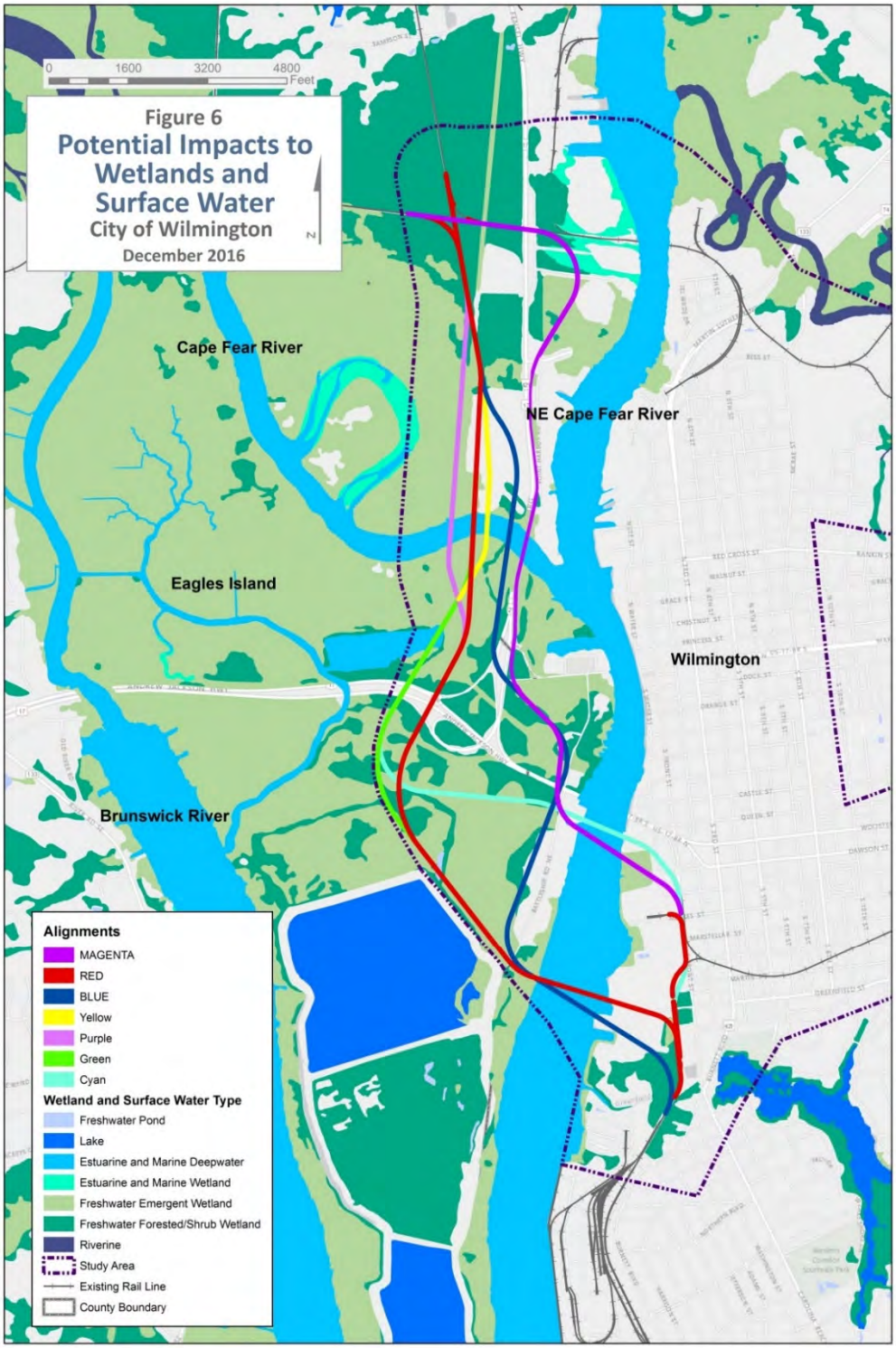
The analysis indicated the Blue alignment as the least disturbing to wetlands (25.52 acres); whereas, the Magenta and Red options would result in higher impacts (25.83 and 31.89 respectively). Yellow had the least impact of the remaining alternatives (5.86 acres), but when merged with a primary alignment, the cumulative disturbance would be greater than the Blue option alone. Purple, Green, and Cyan options would likely impact 17.41, 14.50, and 13.97 acres respectively (Table 8 and Figure 6). Finally, construction costs vary with land cover type; therefore, it is important to consider not only the total acreage of wetland impacts but also the acreage of each wetland type to gain more insight into pros and cons associated with each option.

Table 8: WETLAND IMPACTS BASED ON PROPOSED ALTERNATIVE CORRIDORS.

Corridor	Estuarine Deepwater	Estuarine Wetland	Freshwater Emergent Wetland	Freshwater Forested/Shrub Wetland	Freshwater Pond	Total Acreage
R	4.43	0.00	21.50	5.75	0.33	32.01
B	4.32	0.00	11.00	10.50	0.00	25.82
M	3.73	1.00	12.50	9.00	0.00	26.23
P	1.17	0.00	13.25	3.25	0.00	17.67
Y	1.00	0.00	4.00	1.25	0.00	6.25
G	1.19	0.00	9.00	4.50	0.00	14.69
C	2.00	0.00	8.50	3.75	0.00	14.25

Note: R=red, B=blue, M= magenta, P= purple, Y=yellow, G=green, C=cyan

Figure 5: POTENTIAL IMPACTS TO WETLANDS AND SURFACE WATER



Credits: U.S. Fish and Wildlife Service National Wetlands Inventory,
Esri, HERE, DeLorme, MapmyIndia, © OpenStreetMap contributors, and the GIS user community

1.4.2. Primary Nursery Areas

The soft bottom estuarine creeks of the southeastern US are home to juveniles of offshore winter-spawned fishes, and are designated as PNAs (Ross 2002) within North Carolina coastal waters and the proposed study area (Figure 3). As such, these locations are given extra protection by the NCDMF. Of the three primary corridors (Red, Blue, and Magenta), Magenta was identified as having the least impacts to PNAs (Figure 7, 1.77 acres). Estimated acreage impacts for the Red and Blue corridors, on the other hand, were 3.86 and 2.13 acres respectively. The Purple, Cyan, Yellow and Green corridors are short, alternative alignments that depend upon a primary corridor to cover the project's range, yet the Purple alternative had the highest impact on primary nursery areas (8.71 acres). Although impacts of less than one acre are anticipated from the Cyan and Yellow options, and the Green option avoids all PNAs; these alternatives cannot standalone and impact more area than the Magenta alternative when connected to any of the primary alignments (Figure 8). Bridging or elevating sections of the rail will avoid and/or minimize impacts to these areas.

1.4.3. Proposed Critical Habitat for Atlantic Sturgeon

Atlantic sturgeons are long-lived, estuarine dependent, anadromous fish that can reach lengths of 14 feet. They spawn in freshwater in the spring and early summer and migrate into estuarine and marine waters where they spend most of their lives. In 2009, the Natural Resources Defense Council (NRDC) petitioned to list this species under the ESA, and critical habitat has been designated to protect the existing populations. Critical habitat is described by NOAA as the geographical area occupied by the species at the time of listing. Of the primary alignments, Magenta was identified as having the least impact to proposed Atlantic sturgeon critical habitat (3.27 acres), followed by the Red (4.28 acres) and the Blue corridors (4.33 acres). Due primarily to their shorter length, the Cyan, Purple, and Yellow options would affect less acreage (2.20, 1.04, 0.90 acres respectively), and the Green option would not impact any proposed Atlantic sturgeon critical habitat (Figure 9 and Figure 8). As the train trestle will be a bridge crossing the Cape Fear River, impacts to proposed critical habitat will be related to pile driving during construction.

Figure 6: IMPACTS TO PNAs PER ALTERNATIVE ALIGNMENT

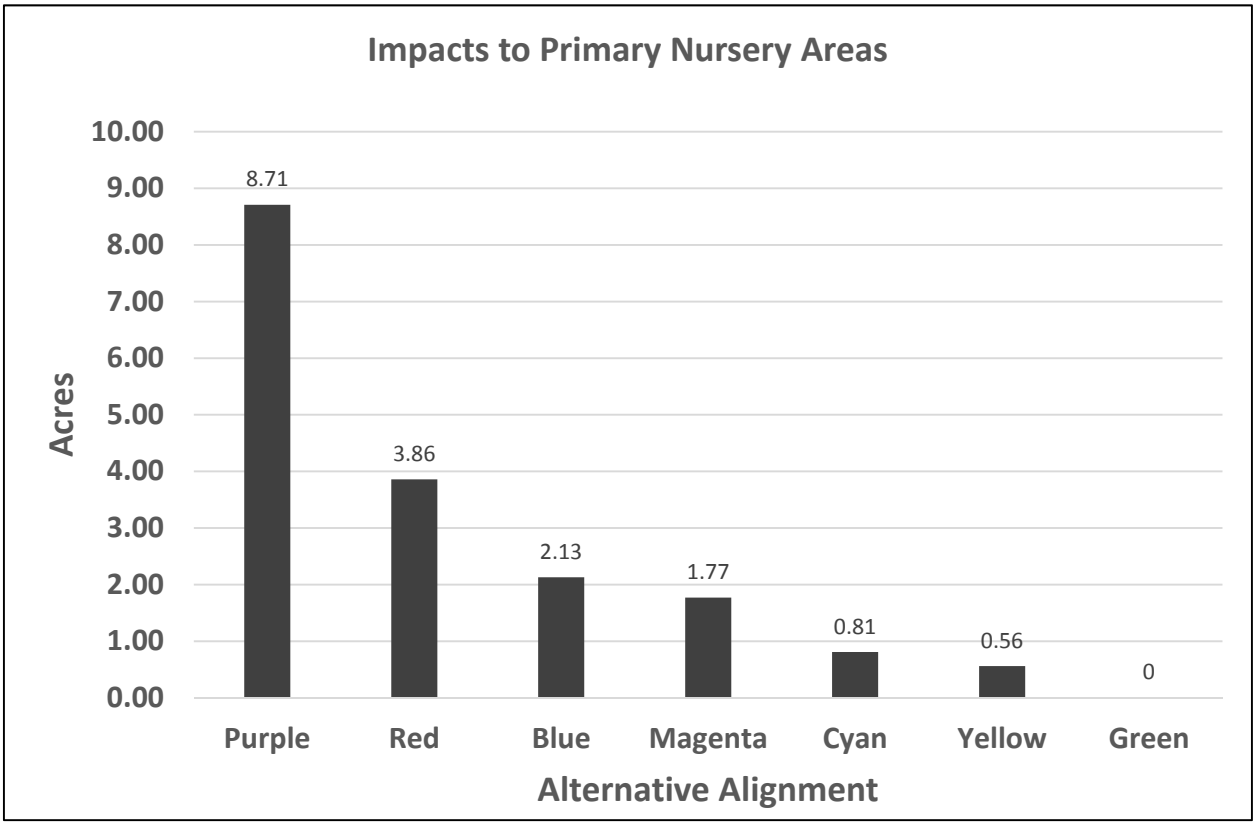


Figure 7: POTENTIAL IMPACTS TO PNAs, SPAWNING AREAS, AND PROPOSED CRITICAL HABITAT

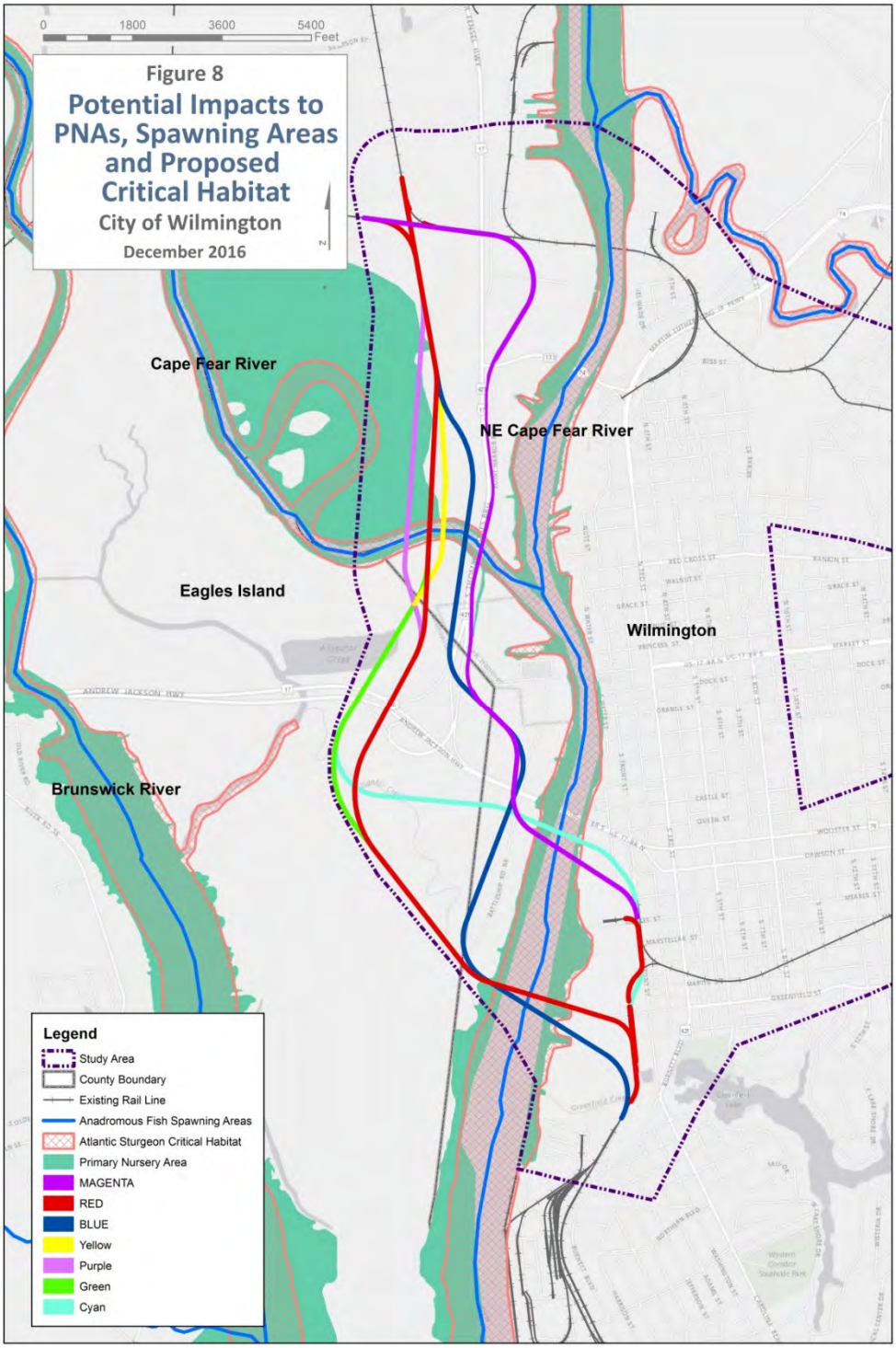
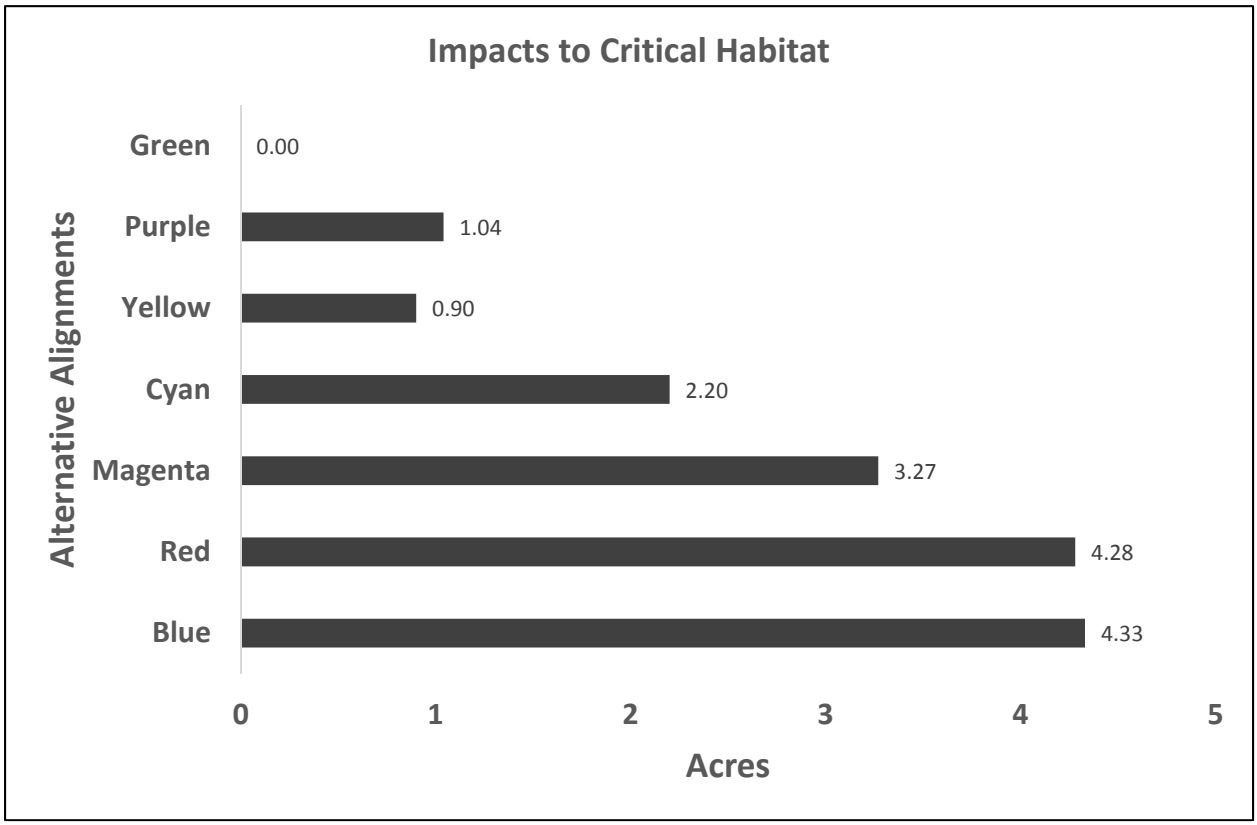


Figure 8: POTENTIAL IMPACTS TO PROPOSED ATLANTIC STURGEON CRITICAL HABITAT



1.4.4. Cultural and Historical Constraints

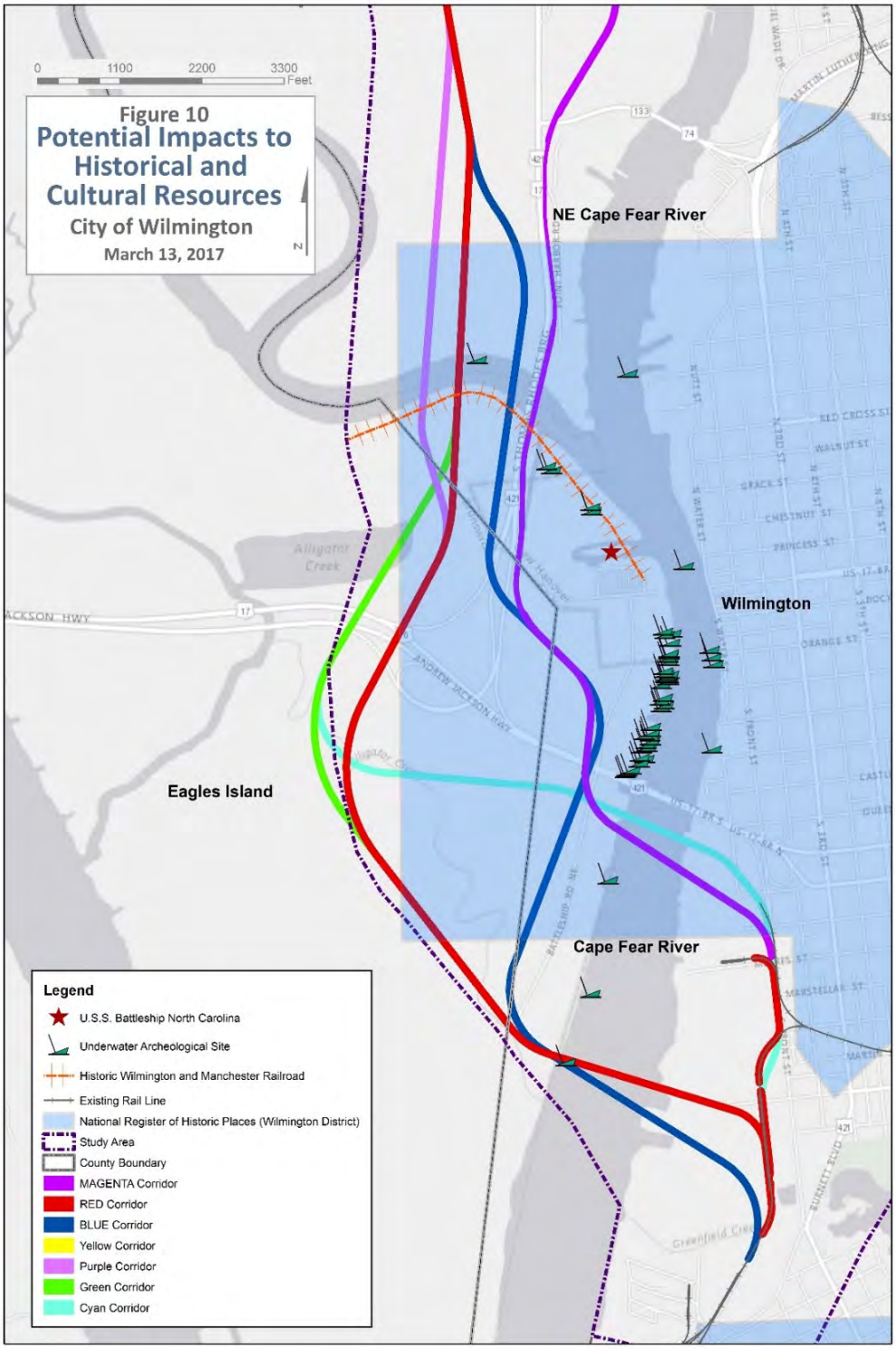
Marine Archaeological Sites

The results of the GIS analysis indicated that the Red corridor might affect a site at 34.218056 N, -77.956389 W, while the Blue and Magenta corridors showed no impacts. An investigation of the remaining alternatives indicated only the Yellow corridor as possibly affecting a site at 34.243889 N, -77.96 W (Figure 10). The proposed rail is likely to be elevated on structure, which would avoid and minimize impacts to marine archaeological sites. Further coordination would be required following preliminary design to determine the full nature of marine archaeological sites.

Historic W&M Railroad

The results of the GIS analysis indicate that all the primary corridor alignments (Red, Blue and Magenta); as well as the Yellow and Purple corridor alignments, will cross over the historic W&M railroad (Figure 10). The Cyan and Green options do not affect the historic railroad, however they are not standalone alignments. The proposed rail is likely to be elevated on structure, which would avoid and minimize impacts to the Historic W&M Railroad.

Figure 9: POTENTIAL IMPACTS TO HISTORICAL AND CULTURAL RESOURCES.



Credits: U.S. Fish and Wildlife Service National Wetlands Inventory,
Esri, HERE, DeLorme, MapmyIndia, © OpenStreetMap contributors, and the GIS user community

Battleship NORTH CAROLINA

The only corridor alignment that potentially impacts the Battleship NORTH CAROLINA property is the Magenta corridor, which overlaps Parcel 3b by 0.2 acres (Figure 11). The USS North Carolina Battleship is designated as a National Historic Landmark. A formal SHPO request has not been initiated at this stage of the study. Dialogue with the Executive Director of the Battleship NORTH CAROLINA has been initiated to ensure the feasibility study and alternative corridors are communicated. Avoidance and minimization of impacts to traffic patterns to and from the Battleship NORTH CAROLINA is critical.

1.4.5. Summary of Parcel Constraints

As depicted in Figure 12, several parcels on Eagles Island contain environmental constraints that may result in future consideration of alternative corridor suitability. The following summary highlights the relative importance of these parcels and constraints:

USS North Carolina Battleship

As noted above, the Battleship NORTH CAROLINA consists of parcels 3a, 3b, 14a, and 14b for a total of approximately 54.72 acres. These parcels plus the Battleship are designated as a National Historic Landmarks. The Magenta corridor is the only alternative to have a potential affect on these properties, however, M&N is preparing conceptual plans to elevate the USS North Carolina Battleship entrance road and a portion of US 17/421 to avoid traffic and access impacts.

NCDOT McIntyre Tract

This site, approximately 131.12 acres, was transferred fee simple to NCDOT from the Ecosystems Land Mitigation Bank Corporation. There is no conservation easement on the property, however, the site is tied to the USACE issued 404 permits for the Wilmington Bypass. Relevant special condition related to the McIntyre Tract indicate it would be a violation of the permit for NCDOT to allow any type of encroachment/development on the site. The deed is provided in in this report. All preliminary alternative corridors pass through the McIntyre Tract. Bridging the rail would avoid and minimize impacts to this site.

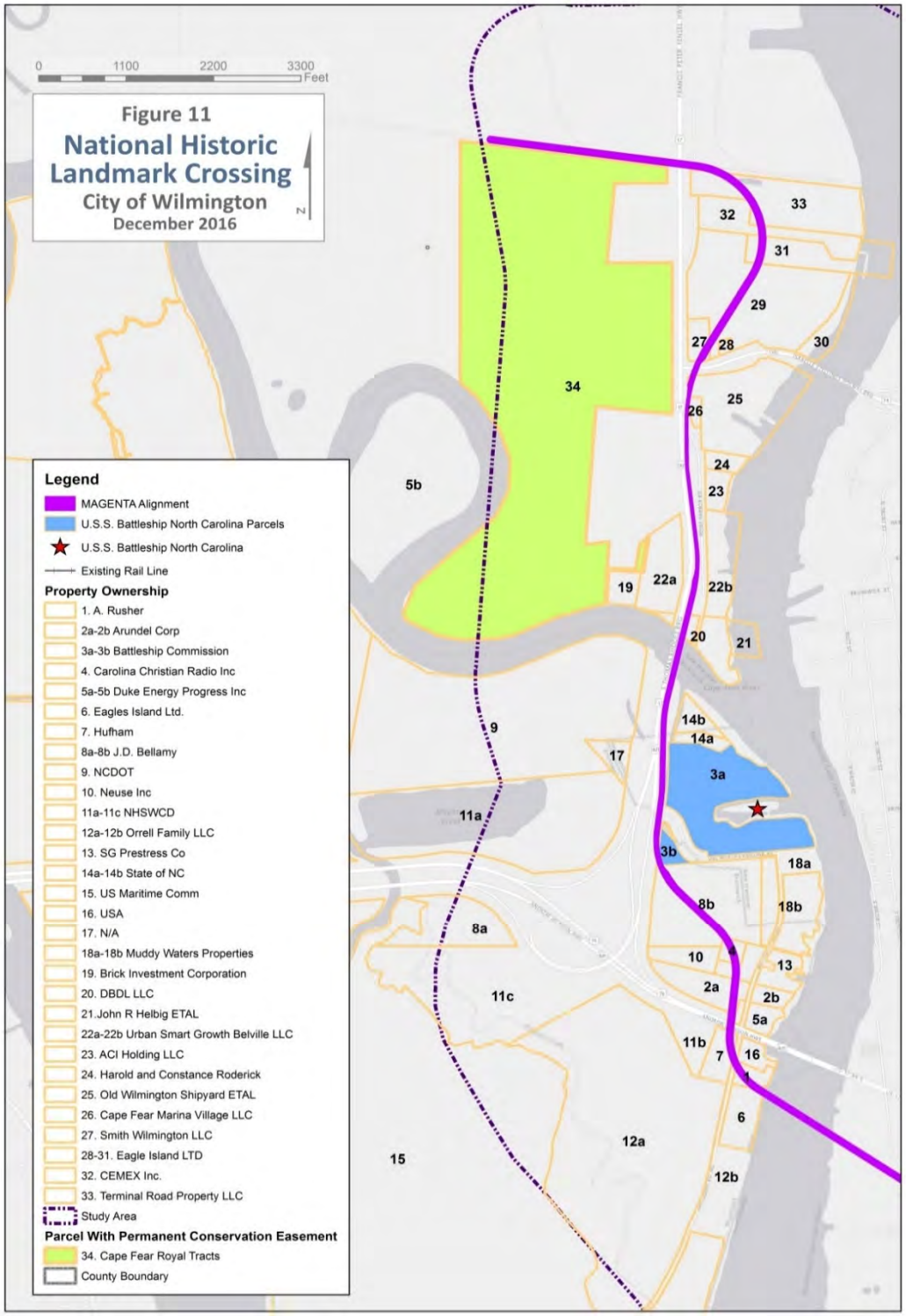
Parcel 33 (Terminal Road Property LLC)

This site, approximately 25.64 acres, is included in a conservation district with an easement for an underwater pipeline. The Magenta corridor is the only corridor to pass through this site, affecting a total of 2.0 acres consisting of approximately 0.85 acres of estuarine wetlands, 0.96 of forested wetlands and the remaining 0.19 acres of uplands.

Cape Fear Royal Tract (CFRT)

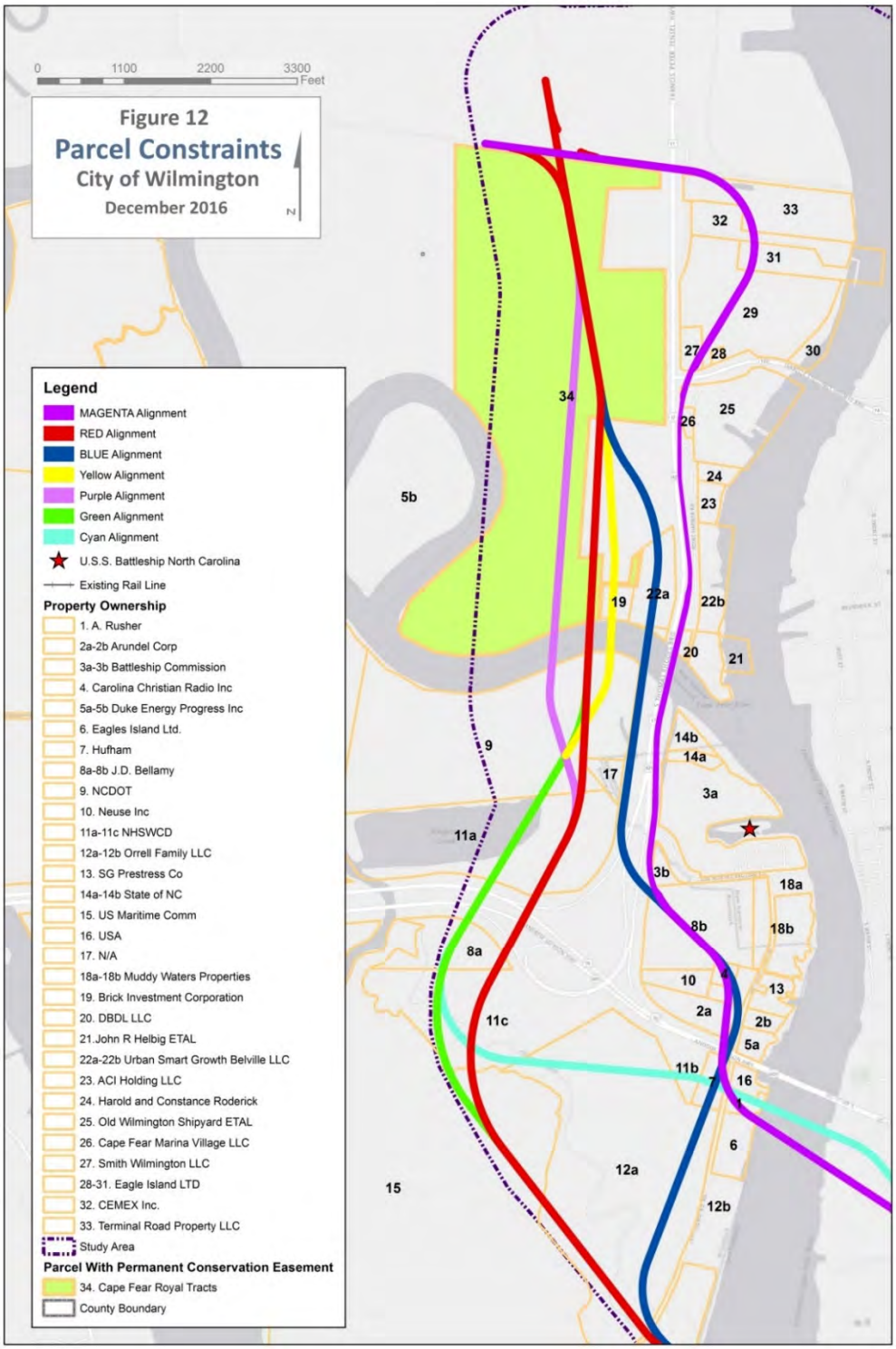
The CFRT, approximately 291.3 acres, contains a conservation easement held by the North Carolina Coastal Land Trust (Appendix B). The site is also designated as a PNA. All alternative corridors, except for the Magenta corridor, pass through the CFRT. Avoidance and minimization of this tract by bridging the rail will be key.

Figure 11: NATIONAL HISTORIC LANDMARK CROSSING



Credits: Connect NCDOT GIS Resources (Rail Division Data),Brunswick GIS Parcel Data, New Hanover GIS Parcel Data, Esri, HERE, DeLorme, MapmyIndia, © OpenStreetMap contributors, and the GIS user community

Figure 10: PARCEL CONSTRAINTS



Credits: Connect NCDOT GIS Resources (Rail Division Data),Brunswick GIS Parcel Data, New Hanover GIS Parcel Data, Esri, HERE, DeLorme, MapmyIndia, © OpenStreetMap contributors, and the GIS user community

1.4.6. Eagles Island Recreational Assets

The Yellow Water Trail (34.24104 N, -77.95803 W), also known as the Bridge to Borrow Pit Trail, is a short, less than one mile route used for recreational purposes. It is listed on the map of Eagles Island water trails and boat launches (Figure 13). The trail entrance is located under the Rhodes Bridge, and the lake portion of the trail can be navigated at any tide level along the south shore. However, the creek portion of the trail is only navigable at high tide. The GIS analysis of this resource identifies the Magenta alignment as the only primary alignment to avoid the Yellow Water Trail. Apart from the Cyan and Green alternatives, which terminate further south, the remaining options will all need to cross the Yellow Water Trail to connect to the existing rail line north of the CFRT. Avoidance of impacts to creeks and waters of the U.S. can be done through bridging of the rail. Vertical clearance would be based on the height of the vessels navigating the channel, which in the case of the recreational water trail would include kayaks, canoes and small boats such as a jon boat.

1.4.7. Proposed Restoration Lands

Cape Fear River Watch has proposed to restore approximately 10,000 linear feet of Alligator Creek (Figure 14). The proposed restoration project location is within the rail realignment study area boundary on Eagles Island. Prior to the development of the southern half of Eagles Island by the USACE as a confined disposal facility (CDF) for dredged material, several tidal creeks traversed the site. Many of these creeks are now covered by the CDF, but the portion of Alligator Creek that runs northwest to southeast is outside of the dike alignment that surrounds the CDF. This creek has closed up over the decades since the access road to Eagles Island blocked tidal flow in the creek in the early 1940s. The proposed Alligator Creek restoration project will likely be completed before any rail realignment construction begins, as funding is forthcoming in spring 2017; and therefore, has been included in this environmental analysis. Two of the three primary alignments (Blue and Magenta) avoid the location of the proposed Alligator Creek site, and the Yellow and Purple corridors were located northeast of the proposed restoration site (Figure 11). The remaining corridors (Red, Green, and Cyan) would likely need to cross over restored Alligator Creek, and the Cyan option would consist of multiple crossings. Table 9 provides a summary of environmental constraints for all alternative corridors.

1.5. Summary of Potential Benefits

Realigning the freight rail line and repurposing the existing corridor through the City for public transit use and/or a “greenway” may also provide benefits to local and regional air quality, water quality and traffic patterns. Examples of potential benefits that should be quantified as the proposed project moves forward are listed below.

- Elimination of stalled traffic at intersections due to train crossings.
- Reduction in air quality related to idling vehicles.
- Reduction in water quality from standing vehicles and associated oil drippings.
- Reduction in impervious surface and consequently stormwater impacts from reduced demand for parking lots and parking decks.
- Greater transition to walking and biking as a mobility option.
- Provision of “greenway” trail connecting to other “greenway” trails throughout the City.

- Increased use of public transit system by area residents—also benefitting air and water quality.
- Repurposing of existing but vacant building infrastructure and resources invested in their construction, particularly along the southern segment.
- A shift in freight tonnage from trucks to rail, resulting in less carbon emissions.

Figure 11: RECREATIONAL ASSETS

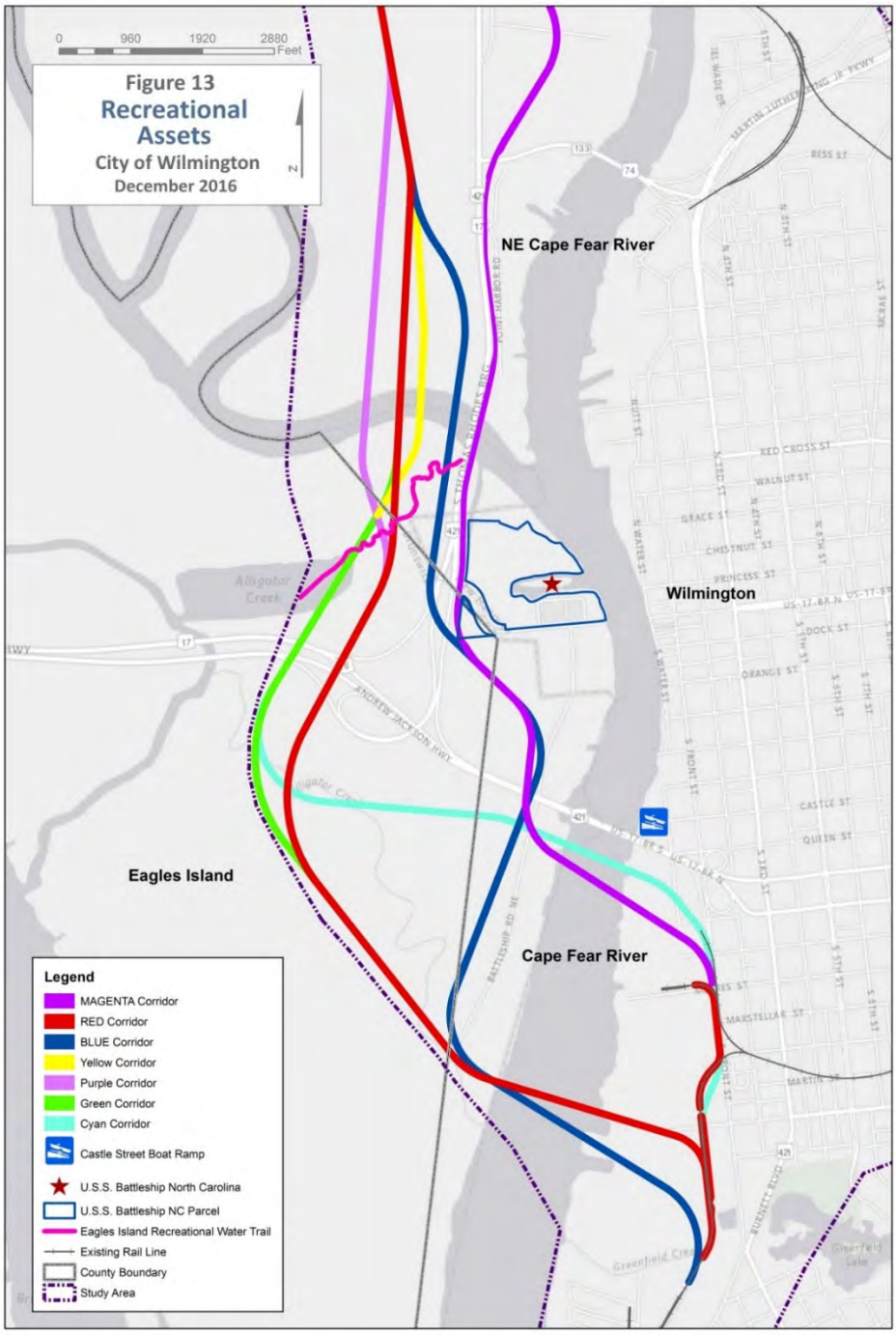


Figure 12: ALLIGATOR CREEK PROPOSED RESTORATION SITE

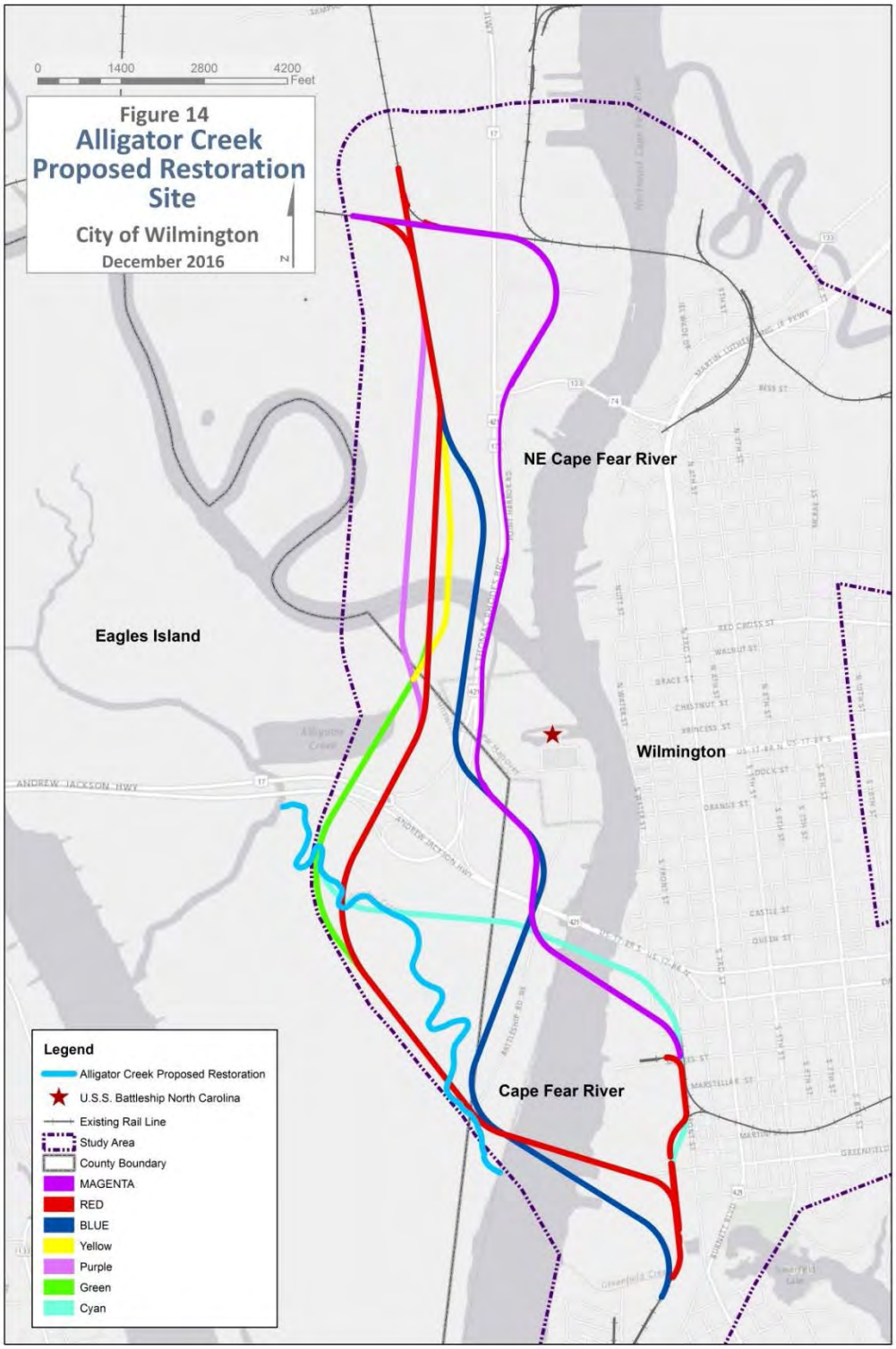


Table 9: MATRIX OF ENVIRONMENTAL CONSTRAINTS ASSOCIATED WITH THE ALTERNATIVE CORRIDORS

	[1]Conservation Easement	Wetlands (Acres)	[2] PNA (Acres)	[3] Crit. Hab. (acres)	[4]Underwater Arch.	[5]Historic RR	[6]Water Trail	[7]Alligator Creek
R	Yes	Yes (32.01)	Yes (3.86)	Yes (4.28)	Yes	Yes	Yes	Yes
B	Yes	Yes (25.82)	Yes (2.13)	Yes (4.33)	No	Yes	Yes	No
M	No	Yes (26.23)	Yes (1.77)	Yes (3.27)	No	Yes	No	No
Y	Yes	Yes (6.25)	Yes (0.56)	Yes (0.90)	Yes	No	No	No
G	No	Yes (14.69)	No (0.00)	No (0.00)	No	No	Yes	Yes
P	Yes	Yes (17.67)	Yes (8.71)	Yes (1.04)	No	Yes	Yes	No
C	No	Yes (14.25)	Yes (0.81)	Yes (2.20)	No	No	No	Yes

Note: [1] Conservation Easement references corridor crossing the Cape Fear Royal Tract
[2] Primary Nursery Area
[3] Proposed Critical Habitat for Atlantic Sturgeon
[4] Underwater Archaeological Resources
[5] Wilmington and Manchester Railroad
[6] Eagles Island Recreational Water Trail
[7] Proposed Alligator Creek Restoration Project

1.6. Avoidance, Minimization, and Mitigation of Potential Environmental Effects

As the proposed project moves into the design and permitting phases, all practical alternatives for avoiding and minimizing impacts will be explored in collaboration with federal and state regulatory agencies. For any unavoidable impacts to wetlands, mitigation will be required. As part of the permitting process, a mitigation plan will be prepared and negotiated with the federal and state resource agencies. Mitigation acceptable to the agencies must be implemented and/or constructed before or concurrent with project construction. In the case of a public or private transportation project, mitigation must be implemented before the transportation is in use. Proof of payment into a mitigation bank or in-lieu fee program or completion of an approved permit-specific mitigation project must be provided to the NC DWR to satisfy this requirement.

Options for compensatory mitigation include:

- Mitigation banks: Applicant satisfies the mitigation requirement by purchasing mitigation credits from an approved mitigation bank.
- In-lieu fee mitigation: Applicant satisfies the mitigation requirement by purchasing mitigation credits through the NC DMS.

- Project-specific mitigation: Applicant satisfies the mitigation requirement themselves, either at the project site or at an off-site location.

In accordance with 15A NCAC 02H .0506(h) and 15A NCAC 02H .1305(g), the DWR requires compensatory mitigation for losses of streams and wetlands (404 jurisdictional wetlands as well as isolated and other non-404 jurisdictional wetlands) as follows:

- For all non-linear public transportation projects, mitigation shall be required for impacts equal to or exceeding 150 linear feet of perennial and intermittent streams or impacts equal to or exceeding one acre of wetlands.
- For linear public transportation projects, mitigation shall be required for impacts equal to or exceeding 150 linear feet per stream or one acre of wetlands.

Based on preliminary assessment of wetland impacts within the study area boundary across all alternatives, mitigation will be required. Due to the preliminary nature of the alternative corridors, discussion with the USACE and other state and federal resource agencies, regarding mitigation was not been initiated during the feasibility study. A table of available mitigation banks within the Cape Fear River Basin has been summarized below (Table 10).

Table 10: APPROVED MITIGATION BANKS IN THE CAPE FEAR RIVER BASIN

Name	County	Credit Types	Contact Info
Neville Farms PHASES I & II Mitigation Bank	Orange	Riparian buffer, Nutrient Offset	Watershed Investments NC, LLC Mike Hermann 1630 Weatherford Circle Raleigh, NC 27604 (919) 559-6264 mhermann@watershedinvestmentnc.net
Cape Fear Umbrella Bank-Ivey Ferguson	Orange	Nutrient offset	EBX-EM, LLC (RES) (Bank Sponsor) Cara S. Conder, RES (Bank POC) 302 Jefferson St., Suite 110 Raleigh, NC 27605 (919) 209-1052 (office) (843) 446-2312 (cell)
Cripple Creek Stream and Wetland Bank	Alamance	Warm stream, wetlands (riparian and non-riparian)	Restoration Systems, LLC (Bank Sponsor & POC) Tiffany Bylow (POC) 1101 Haynes Street, Suite 211 Raleigh, NC 27604 (919) 334-9123 tbylow@restorationsystems.com
Bass Mountain Bank	Alamance	Stream, riparian buffer, nutrient offset	Restoration Systems, LLC (Bank Sponsor & POC) George Howard 1101 Haynes Street, Suite 211 Raleigh, NC 27604 (919) 755-9490 george@restorationsystems.com

Name	County	Credit Types	Contact Info
Barra Farms PHASE II Wetland Mitigation Bank	Cumberland	Wetlands (non-riparian)	Southern Produce Distributors (Bank Sponsor) Tiffani Bylow, Restoration Systems, LLC 1101 Haynes Street, Suite 211 Raleigh, NC 27604 (919) 334-9123 tbylow@restorationsystems.com
Lower Cape Fear Mitigation Bank	Brunswick	Stream, wetlands (riparian riverine, riparian non-riverine, & non-riparian	Jon Vincent, LCFUMB, LLC (Bank Sponsor and POC) Lower Cape Fear Mitigation Bank 1508 Military Cutoff Road, Suite 302 Wilmington, NC 28403 (910) 256-0101 jontvincent@gmail.com
Town Creek Headwaters Mitigation Bank	Brunswick	Warm stream, wetlands (riparian & non-riparian)	Jimmy Bullock, Springwood Timberlands, LLC Bill Schoeder, Mitigation Development Services 9995 Gate Parkway North, Ste. 330 Jacksonville, FL 32246 (904) 421-3265 bill@mitigation.dev.com
NE Cape Fear Mitigation Bank (Holly Shelter)	Pender	Stream, wetlands (riparian non-riverine & non-riparian)	Cal Miller NE Cape Fear Mitigation Bank (Holly Shelter) Shaw Highway Properties, LLC c/o 3970 Bowen Rd Canal Winchester, OH 43110 (614) 834-5244 wetlandsresource@aol.com

1.7. Opinion of Probable Cost to Mitigate Environmental Effects

Current mitigation fees for 2016 to 2017, as provided by the NC DMS, is provided in Table 11 below. Considering detailed design and engineering has not been completed for each alternative corridor, it is difficult to assess the mitigation credits required for the implementation of the project or preferred alternative. A range of mitigation options are available, including wetland mitigation banks, wetland enhancement, creation and/or stream mitigation/restoration.

Table 11: CURRENT FEES FOR MITIGATION CREDITS

Fee Category	Credit Unit	Fee per Unit Click below for (Higher Fee HUs)	Fee per Unit Click below for (Standard Fee HUs)
Riparian Buffer	Sq. ft.	$1.11	$1.11
Stream	Linear ft.	$391	$297
Riparian Wetland	Acre	$71,273	$40,297
Non-Riparian Wetland	Acre	$51,422	$26,445
Coastal Wetland	Acre	$175,323	$175,323

Mitigation options for unavoidable wetland impacts could include purchasing credits through the state's mitigation program or enhancing existing wetlands on Eagles Island. For conceptual planning and cost estimating, using the DMS cost per acre credit for each type of wetland potentially impacted is the most practicable choice for this assessment (as listed in Table 12). Table 12 summarizes the wetland type, assumed ratio (acre credit/acre impacted), cost per wetland type, and total estimated cost for each corridor alternative. Mitigation cost ranges from $552,365 to $3.1 million for the alternatives assessed. Other mitigation that may be required for the bridge crossing over the Cape Fear River cannot be quantified until further coordination is conducted with state and federal agencies.

Table 12: TOTAL ESTIMATED COST FOR WETLAND MITIGATION FOR EACH ALTERNATIVE CORRIDOR

Alternative	Total Wetland Impact (ac)	Total Mitigation Cost ($)
R	31.89	2,761,828.75
B	25.52	3,029,102.50
M	25.83	3,165,929.50
P	17.41	1,639,279.00
Y	5.86	552,365.75
G	14.50	1,603,642.50
C	13.97	1,407,641.75

Note:
1:1 Ratio for Freshwater Emergent Wetland at $71,273 per acre (acres are rounded up to nearest ¼ acre)
2:1 Ratio for Estuarine Wetland at $175,323 per acre (acres are rounded up to nearest ¼ acre)
3:1 Ratio for Forested Wetland at $71,273 per acre (acres are rounded up to nearest ¼ acre)

APPENDIX A: McINTYRE TRACT DEED

Prepared By: Fred C. Lanier
NC Department of Transportation
Attorney Owner's Office
1505 Mail Service Center
Raleigh, N.C. 27699-1505

TAX PARCEL #03900001
01000084
03800008

Brunswick County—Register of Deeds
Robert J. Robinson
Inst #65177 Book 1428 Page 1259
01/16/2001 04:37:28pm Rec# 62741

STATE OF NORTH CAROLINA

COUNTY OF BRUNSWICK

THIS DEED OF GIFT, made and entered into this the 22nd day of December, 2000, by and between ECOSYSTEMS LAND MITIGATION BANK CORPORATION, a Florida corporation, party of the first part; and NORTH CAROLINA DEPARTMENT OF TRANSPORTATION, an agency of the State of North Carolina, having an address of One South Wilmington Street, P. O. Box 2520, Raleigh, NC 27611, party of the second part;

W I T N E S S E T H :

That the party of the first part for and in consideration of a donative intent and by way of gift to the party of the second part, does convey as a gift unto the party of the second part, said party's successors and assigns, subject to the matter hereinafter specified, the following described property, to wit:

All those certain tracts or parcels of land and easements lying and being situate in Brunswick County, North Carolina and being more particularly described as follows:

(1) Neal - Eagle Brunswick

All of the property described by the deed dated July 16, 1999 recorded in Book 1318, Page 1424 in the office of the Register of Deeds of Brunswick County from Caroline H. Neal and husband, Charles R. Neal to Ecosystems Land Mitigation Bank Corporation, said deed being incorporated herein by reference for a more perfect description of said property.

(2) Dale -

All of the property described by the deed from Ezra G. Dale and wife, Elizabeth H. Dale to Ecosystems Land Mitigation Bank Corporation dated October 21, 1999 and recorded in Book 1337, Page 882 in the office of the Register of Deeds of Brunswick County, said deed being incorporated herein by reference for a more perfect description of said property.

RECORD OF POOR QUALITY DUE TO CONDITION OF ORIGINAL

BY Samantha/DOT
TOTAL 18 — REV ___ TC# ___
REC# ___ CK AMT 18 CK# ___
CASH ___ - REF ___ BY ___

Inst # 65177 Book 1428 Page 1260

(3) McIntyre -

All of the property described by the deed from Kyle McIntyre to Ecosystems Land Mitigation Bank Corporation dated August 31, 1999 and recorded in Book 1328, Page 4 in the office of the Register of Deeds of Brunswick County together with all right, title and interest of the party of the first part in the property described by deed from Kyle McIntyre to Ecosystems Land Mitigation Bank Corporation dated August 31, 1999 recorded in Book 1328, Page 14 in the office of the Register of Deeds of Brunswick County, said deeds being incorporated herein by reference for a more perfect description of said property.

(4) Rowell's Branch

All that certain easement and rights described by deed from Ezra G. Dale and wife, Eleanor H. Dale and D&H Investors, Inc. to Ecosystems Land Mitigation Bank Corporation dated October 21, 1999 and recorded in Book 1337, Page 888 in the office of the Register of Deeds of Brunswick County, said deed being incorporated herein by reference for a more perfect description of said easement.

This conveyance is made together with all easements, appurtenances and rights conveyed to the party of the first part in each of the aforesaid instruments. This conveyance is made subject to easements, reservations and restrictions of record affecting the aforesaid property, if any, and subject to any agreements between the parties regarding the above property.

TO HAVE AND TO HOLD said property and all privileges and appurtenances thereunto belonging to the party of the second part, said party's successors and assigns forever.

And the party of the first part does covenant that said party is seized of said property in fee and has the right to convey same in fee simple; that the same is free from encumbrances except any encumbrances, restrictions, reservations and rights of entry mentioned above and that said party will warrant and defend the title to the same against the lawful claims of all persons whomsoever.

RECORD OF POOR QUALITY
DUE TO CONDITION OF ORIGINAL

Inst # 65177 Book 1428Page: 1261

IN TESTIMONY WHEREOF, the party of the first part has caused this instrument to be executed under seal and in such form as to be binding, all by authority of its Board of Directors first duly given, this the day and year first above written.

ECOSYSTEMS LAND MITIGATION BANK CORPORATION

By: _____
Vice President

Attest: _____
Secretary

Accepted this 28TH day of DECEMBER 2006.

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION, an agency of the State of North Carolina

By: _____ (SEAL)
Title: Manager of Right-of-Way Branch

ATTEST:

_____
SECRETARY TO THE BOARD OF TRANSPORTATION AND CUSTODIAN OF THE SEAL OF THE DEPARTMENT OF TRANSPORTATION

NORTH CAROLINA 1973

3

REPORT OF POOR QUALITY DUE TO CONDITION OF ORIGINAL

Inst # 65177 Book 1428 Page: 1262

RECORD OF POOR QUALITY
DUE TO CONDITION OF ORIGINAL.

STATE OF Florida
COUNTY OF Orange

I, A. Dean Murdock, a Notary Public in and for said County and State, do hereby certify that on the 21 day of December, 2000, before me personally appeared William G. Gerber with whom I am personally acquainted, who, being by me duly sworn, says that he is Vice President and that Alan G. Dickett is _____ Secretary of ECOSYSTEMS LAND MITIGATION BANK CORPORATION, the corporation described in and which executed the foregoing instrument; that he knows the common seal of said corporation; that the seal affixed to the foregoing instrument is said corporate seal; that the name of the corporation was subscribed thereto by the said Vice President; that the said Vice President and _____ Secretary subscribed their names thereto and the said common seal was affixed, all by authority of the Board of Directors of said corporation; and that the said instrument is the act and deed of said corporation.

WITNESS my hand and notarial seal, this the 21 day of December 2000.

A. Dean Murdock
Notary Public

My Commission Expires:

A. DEAN MURDOCK
MY COMMISSION # CC 701895
EXPIRES: March 25, 2002
Bonded Thru Notary Public Underwriters

STATE OF NORTH CAROLINA Inst # 65177 Book 1428Page: 1263

COUNTY OF WAKE

This the 28TH day of DECEMBER, 2000, personally appeared before me, JOE G. CREECH JR, a Notary Public for said County and State, Tammy Denning, who being by me duly sworn, says that she knows the Seal of the Department of Transportation and is acquainted with A. D. Allison, II, who is Assistant Manager of Right-of-Way of the Division of Highways of said Department, and that she, the said Tammy Denning, is the Secretary to the Board of Transportation and Custodian of the Seal of the Department of Transportation, and saw said Assistant Manager of Right-of-Way sign the foregoing instrument, and that she, the said Secretary to the Board of Transportation and Custodian of the Seal of the Department of Transportation, affixed said seal instrument and signed her name in attestation of the execution thereof in the presence of said Assistant Manager of Right-of-Way.

WITNESS my hand and Notary Seal, this the 28TH day of DECEMBER 2000.

NOTARY PUBLIC

[NOTARIAL SEAL]

My Commission expires: SEPTEMBER 8, 2002

4

Inst # 65177 Book 1428Page: 1264

STATE OF NORTH CAROLINA

COUNTY OF _____

The foregoing Certificate(s) of

_____

Is/ are certified to be correct. This instrument and this certificate are duly registered at the date

STATE OF NORTH CAROLINA
COUNTY OF BRUNSWICK
The Foregoing (or annexed) Certificate(s) of A. DEAN PURDOCK, JOE G. CREECH JR

Notary(ies) Public is (are) Certified to be Correct.
This Instrument was filed for Registration on this 16th Day of January 2001
in the Book and Page shown on the First Page hereof.

ROBERT J. ROBINSON, Register of Deeds

APPENDIX B: CAPE FEAR ROYAL TRACT CONSERVATION EASEMENT

3
45
120.00 R/S

2003074332

FOR REGISTRATION REGISTER OF DEEDS
REBECCA T. CHRISTIAN
NEW HANOVER COUNTY NC
2003 NOV 18 02:49:01 PM
BK:4099 PG:153-171 FEE:$65.00
NC REV STAMP:$120.00
INSTRUMENT # 2003074332

COPY

NORTH CAROLINA GENERAL WARRANTY DEED
WITH RESERVED CONSERVATION EASEMENT

Tax Parcel ID#: Part of R04100-001-001-000

STATE OF NORTH CAROLINA
COUNTY OF NEW HANOVER

This Deed made this 17th day of November, 2003, by and between the **NORTH CAROLINA COASTAL LAND TRUST**, a North Carolina nonprofit corporation with its address at 3806-B Park Avenue, Wilmington, North Carolina ("Grantor"), and **ROBERT L. BRYDEN AND WIFE ANN E. STAPLETON**, with an address at 4501 Mt. Misery Road, Leland NC 28451 ("Grantee").

The designation Grantor and Grantee as used herein shall include said parties, their heirs, successors and assigns, and shall include singular, plural, masculine, feminine or neuter as required by context.

Return To: David C. Barefoot

WITNESSETH

RECITALS

A. Grantor owns in fee simple certain real property situate, lying and being in New Hanover County, North Carolina comprised of 287.8 acres, more or less, as more particularly described in **EXHIBIT A** attached hereto and by this reference incorporated herein (hereinafter "Property").

B. Grantor is a non-profit corporation established for the purpose of promoting the preservation of environmentally valuable and sensitive lands and lands with significant natural and open space values in the coastal plain of North Carolina for charitable, scientific, educational and aesthetic purposes.

C. Grantor and Grantee recognize that the Property in its present state has conservation value as a significant natural area that has not been subject to significant development and that provides a "relatively natural habitat for fish, wildlife, or plants or similar ecosystem" as that phrase is used in Section 170(h)(4)(A)(ii) of the Internal Revenue Code, including mixed pine-hardwoods, cypress-gum swamp and bottomland hardwood forest that provides significant habitat for migratory and resident waterfowl, neotropical songbirds, game birds such as wild turkey, mourning dove and bobwhite quail, colonial waterbirds, American alligator, black bear, otter, and other wildlife, plants and natural communities and various wetland habitats.

D. Grantor and Grantee further recognize that the Property has additional conservation value as scenic open space, the preservation of which is pursuant to federal, state and local government policy and will yield significant public benefit as evidenced by:

(1) the requirement by the State of North Carolina of a basinwide management plan for the Cape Fear River and its tributaries for the purpose of protecting water quality, public water supply, significant wetlands and natural areas along the corridor; and
(2) the Clean Water Management Trust Fund, N.C.G.S. 113-145.1 et seq., which recognizes the importance of protecting riparian buffers for conserving clean surface water.

E. The biological, scenic, open space, natural and other characteristics of the Property and its current use are described in the Easement Documentation Report, dated September 2003 prepared by the Grantor, and acknowledged by the Grantor and Grantee to be complete and accurate as of the date hereof. Both the Grantor and the Grantee have copies of this report. It will be used by the parties to assure that any future changes in the use of the Property will be consistent with the terms of this Deed. However, this report is not intended

to preclude the use of other evidence to establish the present condition of the Property if there is a controversy over its use.

F The Uniform Conservation and Historic Preservation Agreements Act, N.C.G.S. 121-34 et seq., provides for the enforceability of restrictions, easements, covenants or conditions appropriate to retaining land or water areas predominantly in their natural, scenic or open condition or in agricultural, horticultural, farming or forest use.

NOW, THEREFORE, in consideration of the premises and the mutual benefits recited herein, together with Ten Dollars ($10.00) and other good and valuable consideration, the receipt and sufficiency of which is hereby acknowledged, the Grantor hereby unconditionally and irrevocably grants and conveys forever and in perpetuity to the Grantee, its successors and assigns in fee simple, all that certain lot or parcel of land situated in New Hanover County, North Carolina and more particularly described in **EXHIBIT A** attached hereto and incorporated herein by reference

TO HAVE AND TO HOLD the aforesaid lot or parcel of land and all privileges and appurtenances thereto belonging to the Grantee, its heirs, successor and assigns in fee simple forever.

AND THE GRANTOR COVENANTS with the Grantee, that Grantor is seized of the premises in fee simple, has the right to convey the same in fee, simple, that title is marketable and free and clear of all encumbrances, and that Grantor will warrant and defend the title against the lawful claims of all persons, except for the exceptions hereinafter stated.

SUBJECT, however, to the perpetual restriction, pursuant to the Uniform Conservation and Historic Preservation Agreements Act, N.C. G. S. 121-34 et seq., that the primary purpose of this conveyance is to preserve and protect the conservation values of the Property described in the foregoing Recitals, to maintain permanently the natural, scenic, biological and open character of the Property, including land, water and wildlife resources or forest use, and to prevent any use of the Property that would significantly impair or interfere with the conservation values of the Property as set forth in Paragraphs C and D of the Recitals hereinabove. The Grantor and Grantee agree that the purpose of this conveyance is also to assure that the premises encumbered as set forth herein will be used only in conformity with the terms and conditions of this conveyance.

Grantor reserves, for itself, its successors and assigns, a conservation easement, of the nature and character and to the extent hereinafter set forth, over the Property, together with the right to preserve and protect the conservation values of the Property.

To achieve these purposes, the following Articles I through V, consisting of the conditions and restrictions of this conservation easement are set forth:

ARTICLE I. DURATION OF EASEMENT

This Conservation Easement shall be perpetual. It is an easement in gross, runs with the land and is enforceable by Grantor against Grantee, Grantee's personal representatives, heirs, successors and assigns, lessees, agents and licensees.

ARTICLE II. PROHIBITED AND RESTRICTED ACTIVITIES

The Property shall be maintained in its natural, scenic, and open condition and restricted from any development or use that would impair or interfere with the conservation values of the Property as set forth in Paragraphs C and D of the Recitals hereinabove.

Any activity on or use of the Property inconsistent with the purposes of this Conservation Easement is prohibited; provided, however, that all rights allowed to Grantee hereunder are considered to be consistent with the conservation purposes of this Conservation Easement and require no prior notification to or approval by Grantor unless expressly provided hereunder. Notwithstanding the foregoing, the Grantor and Grantee have no right to agree to any activity that would result in the termination of this Conservation Easement or would cause it to fail to qualify as a qualified interest in real property as described in section 2055(f) of the Internal Revenue Code (the estate tax rule regarding conservation easements), or any regulations promulgated thereunder.

Without limiting the generality of the foregoing, the following activities and uses are expressly prohibited, restricted, or reserved as the case may be.

A. Industrial and Commercial Use. Industrial and commercial use of the Property, including agriculture and timber harvesting and access therefore is prohibited.

B. Disturbance of Natural Features, Plants and Animals. There shall be no cutting or removal of trees, or the disturbance of other natural features within the Property except for the following: (1) as incidental to boundary marking, fencing, signage, (2) selective cutting and prescribed burning or clearing of vegetation and the application of mutually approved pesticides for fire containment and protection, disease control, restoration of hydrology, wetlands enhancement and/or control of non-native plants and for purposes of salvaging timber damaged by ice, fire, storm, wind, insects, infectious organisms, or other natural disasters, (3) as incidental to the improvements allowed in Paragraph J below; (4) hunting and fishing pursuant to applicable rules and

regulations; and (5) ecological and biological research for monitoring and conservation management purposes.

C. Signage. Display to the public of billboards, signs or advertisements is prohibited on or over the Property, except the posting of no trespassing signs, for sale signs, signs identifying the conservation values of the Property and/or identifying the Grantee as owner of the Property and Grantor as holder of the Conservation Easement.

D. Dumping. Dumping of nonbiodegradable substances such as chemicals and other hazardous substances, trash, garbage, wastes, abandoned vehicles, appliances, machinery, or other nonbiodegradable material on the Property is prohibited. Composting of biodegradable material or use of such materials to improve fields, pastures, etc. is allowed. Manure, natural bedding and other grown materials may be spread on the Property.

E. Mineral Use, Excavation, Dredging. There shall be no filling, excavation, dredging, mining or drilling; no removal of topsoil, sand, gravel, rock, peat, minerals or other materials, and no change in the topography of the land in any manner on the Property except (a) for the purpose of combating erosion or flooding and (b) for construction and maintenance of existing and permitted structures, ponds, roads and activities permitted hereunder; provided there will be no such excavation for archaeological or historic purposes if such excavation may significantly impair or interfere with the conservation values of the Property as set forth in Paragraphs C and D of the Recitals hereinabove.

G. Hunting and Fishing and Other Recreational Activities. Grantee has the right to lawfully hunt, shoot and fish on the Property; provided all such activities in conducted in compliance with federal, state and local rules and regulations.

H. Conveyance and Subdivision. The Property may not be divided, partitioned, or subdivided, nor conveyed except in its current configuration as an entity.

I. Water Quality, Wetlands and Drainage. Except as provided under paragraph J below and as required for the continued maintenance of the existing ditches, there shall be no other alteration of natural drainage patterns, no draining, filling, dredging or diking of wetlands, no withdrawal of subsurface waters, no discharging or releasing into waters or wetlands nor any activities that result in impairment to water quality or wetlands; provided, however that Grantee may construct, maintain and replace one well for residential use. Notwithstanding any other provision in this Deed, all such activities shall be conducted in compliance with federal, state and local rules and regulations.

J. Improvements, New Construction and Access Thereto. No building, facility, mobile home, structure, or means of access shall be constructed or placed on the Property after the date of this Conservation Easement except that Grantee may:

1. Construct, maintain and utilize walking trails and reasonable means of access to and utilities for all permitted uses of the Property, provided, however that (a) no road, driveway nor right of way may be wider than twenty (20) feet, (b) construction of roads and driveways shall be limited to permeable materials, and (c) all new utilities shall, unless prohibited by the appropriate utility, be installed underground except for antennas, satellite dishes and other similar utility structures required by their nature to be located above ground; (d) all necessary permits are secured and complied with; and,
2. Construct and maintain one single family dwelling, provided, however, that a) construction must meet all local and state building codes; and b) construction must meet the Special Use Permit Order and the associated Site Plan, issued for this Property by New Hanover County (the "Permit"), a copy of which is attached hereto as **EXHIBIT B** and by this reference incorporated herein, or must be otherwise agreed to in writing by Grantor; c) the footprint of the enclosed area of the dwelling shall not be larger than one thousand (1000) square feet, exclusive of exterior porches or decks, which shall not be larger than an additional four hundred (400) square feet; and d) Grantee shall provide written notice to Grantor of construction plans for the said single family dwelling.
3. Construct, establish, maintain, use, and replace accessory structures designed, constructed and used for the purpose of serving the permitted uses consistent with the conservation purposes of this Deed and of a size and scale consistent with permitted structures (including for example, storage sheds, garden, carport, boat dock, canoe/kayak landing, camping platform, deer stands and hunting blinds, but not including swimming pools, tennis courts, or other similar large or impervious improvements), provided however, that, with the exception of the boat dock and canoe/kayak landing, deer stands and hunting blinds, such structures and improvements shall be located within four hundred feet (400') of the single family dwelling.

Should have included camping platform as exception

K. Residential Use. The Property may be used for residential purposes; provided, however that all such use must be in compliance with the Permit, or as otherwise agreed to in writing by Grantor.

L. Development Rights. No development rights that have been encumbered or extinguished by this Conservation Easement shall be

transferred to any other lands pursuant to a transferable development rights scheme or cluster development arrangement or otherwise.

M. Quiet Enjoyment. The conservation easement reserved by Grantor here shall not interfere with all other rights accruing from its ownership of the Property, including (i) the right to engage in or permit or invite others to engage in all uses of the Property as exist on the date of this grant (including but not limited to hunting, fishing, game management) that are not expressly prohibited or restricted herein and do not significantly impair or interfere with the conservation values of the Property as set forth in Paragraphs C and D of the Recitals hereinabove and (ii) the right to sell, give or otherwise convey the Property. Without limiting the generality of the foregoing, Grantor expressly conveys to Grantee for itself, its successors and assigns, invitees and licensees the right of quiet enjoyment of the Property.

ARTICLE III. ENFORCEMENT, REMEDIES & CASUALTY LOSS

A. Upon any breach of the terms of this Conservation Easement by Grantee or by a third party that comes to the attention of the Grantor, the Grantor shall notify the Grantee in writing of such breach. The Grantee shall have ninety (90) days after receipt of such notice to begin undertaking actions that are reasonably calculated to correct promptly the conditions constituting such breach. If the breach remains uncured after ninety (90) days, the Grantor may enforce this Conservation Easement by appropriate legal proceedings including damages, injunctive and other relief including the right to require that the land be restored promptly to the condition required by this Conservation Easement.

Grantee acknowledges that its failure to abide by the provisions of this Conservation Easement will result in irreparable harm to Grantor and that Grantor's remedy at law for damages will be inadequate. Accordingly, Grantee shall be entitled upon any breach by Grantee to injunctive relief and to specific performance, in addition to any other available remedies. Any controversy or claim arising out of or relating to this Conservation Easement, or the breach of the Conservation Easement shall be litigated in the General Court of Justice of the state of North Carolina for New Hanover County and the parities consent to the exclusive jurisdiction of, and service of process by, that Court for the purpose of resolving any disputes and the propriety of venue in that Court.

If Grantor determines that circumstances require immediate legal action to prevent or mitigate significant damage to the conservation values of the Property, the Grantor may pursue its remedies without prior notice to Grantee, but shall exercise reasonable efforts to notify Grantee.

B. Any cost incurred by Grantor in enforcing the terms of this Conservation Easement against Grantee, including, without limitations, costs of suits and attorney's fees, and any costs of restoration necessitated by Grantee's acts or omissions in violation of the terms of this Conservation Easement, shall be borne by Grantee.

C. No failure on the part of Grantor to enforce any covenant or provision hereof shall discharge or invalidate such covenant or any other covenant, condition, or provision hereof or affect the right to Grantor to enforce the same in the event of a subsequent breach or default.

D. Grantor, its employees and agents and its successors and assigns, has the right, with reasonable prior notice, to enter the Property at reasonable times for the purpose of inspecting the Property to determine whether the Grantee, Grantee's representatives, heirs, successors or assigns are complying with the terms, conditions and restrictions of this Conservation Easement.

E. Nothing contained in this Conservation Easement shall be construed to entitle Grantor to bring any action against Grantee for any injury or change in the Property resulting from causes beyond the Grantee's control, including, without limitation, fire, flood, storm, and earth movement, or from any prudent action taken in good faith by the Grantor under emergency conditions to prevent, abate, or mitigate significant injury to life, damage to property or harm to the Property resulting from such causes.

ARTICLE IV. ACCESS

The granting of this Conservation Easement does not convey to the public the right to enter the Property for any purpose whatsoever.

ARTICLE V. MISCELLANEOUS

A. Subsequent Transfers. Grantee agrees for itself, its successors and assigns, to notify Grantor in writing of the names and addresses of any party to whom the Property or any part thereof, is to be transferred at or prior to the time said transfer is consummated. Grantee, for itself, its successors and assigns, further agrees to make specific reference to this Conservation Easement in a separate paragraph of any subsequent lease, deed or other legal instrument by which any interest in the Property is conveyed.

B. Conservation Purpose.

(1) Grantor, for itself, its successors and assigns, agrees that this Conservation Easement shall be held exclusively for conservation purposes, as defined in Section 170(h)(4)(A) of the Internal Revenue Code.

(2) Grantor and Grantee agree that the reservation of this Conservation Easement is rise to a property right, immediately vested in Grantor, with a fair market value equal to the proportionate value that the reserved fee title to the Property bears to the value to the Property as a whole.

That proportionate value of the Grantor's property rights shall remain constant. If a change in conditions which makes impossible or impractical any continued protection of the Property for conservation purposes, the restrictions contained herein may only be extinguished by judicial proceeding. Upon such proceeding, the Grantor, upon a subsequent sale, exchange or involuntary conversion of the Property, shall be entitled to a portion of the proceeds at least equal to that proportionate value of the fee title. The Grantor shall use its share of the proceeds in a manner consistent with the conservation purposes set forth in the Recitals herein.

(3) Whenever all or part of the Property is taken in exercise of eminent domain by public, corporate, or other authority so as to abrogate the restrictions imposed by this Conservation Easement, the Grantor and the Grantee shall join in appropriate actions at the time of such taking to recover the full value of the taking and all incidental or direct damages resulting from the taking, which proceeds shall be divided in accordance with the proportionate value of the Grantee's and Grantor's interests as specified above; all expenses including attorneys fees incurred by the Grantor and the Grantee in this action shall be paid out of the recovered proceeds to the extent not paid by the condemning authority.

(4) The Grantor and Grantee agree that the terms of this Conservation Easement shall survive any merger of the fee and easement interests in the Property.

(5) The parties hereto recognize and agree that the benefits of this Conservation Easement are in gross and assignable, provided, however that the Grantor hereby covenants and agrees, that in the event it transfers or assigns this Conservation Easement it holds, the organization receiving the interest will be a qualified organization as that term is defined in Section 170(h)(3) of the Internal Revenue Code of 1986 (or any successor section) and the regulations promulgated thereunder, which is organized or operated primarily for one of the conservation purposes specified in Section 170 (h)(4)(A) of the Internal Revenue Code, and Grantee further covenants and agrees that the terms of the transfer or assignment will be such that the transferee or assignee will be bound by the terms of this Conservation Easement.

(6) The Grantee agrees to pay any real estate taxes or other assessments levied on the Property.

C. Construction of Terms. This Conservation Easement shall be construed to promote the purposes of the North Carolina enabling statute set forth in N.C.G.S. 121-34, which authorizes the creation of Conservation Easements for purposes including those set forth in the recitals herein, and the conservation purposes of this Conservation Easement, including such purposes as are defined in Section 170(h)(4)(A) of the Internal Revenue Code and shall be governed by and construed under the laws of the State of North Carolina, United States of America.

D. Entire Agreement. This instrument sets forth the entire agreement of the parties with respect to the Conservation Easement and supersedes all prior discussions, negotiations, understandings or agreements relating to the Conservation Easement. If any provision is found to be invalid, the remainder of the provisions of this Conservation Easement, and the application of such provision to persons or circumstances other than those as to which it is found to be invalid, shall not be affected thereby.

E. Recording. Grantee shall record this instrument and any amendment hereto in timely fashion in the official records of New Hanover County, North Carolina, and may re-record it at any time as may be required to preserve their rights under this Conservation Easement.

F. Notices. Any notices shall be sent by registered or certified mail, return receipt requested, addressed to the parties as set forth above or to such other address(es) as either party may establish in writing to the other.

In any case where the terms of this Conservation Easement require the consent of any party, such consent shall be requested by written notice. Such consent shall be deemed to have been given unless, within thirty (30) days after receipt of notice, a written notice of disapproval and the reason therefore has been mailed to the party requesting consent.

G. Amendments. Grantors and Grantee are free to jointly amend this Conservation Easement to meet changing conditions, provided that no amendment will be allowed that (1) will affect the qualification of this easement under N.C.G.S. 121-34 et seq., or under Sections 170(h) of the Internal Revenue Code; (2) is inconsistent with the purposes of this Conservation Easement; or (3) affects the perpetual duration of this conservation Easement. Such amendment(s) shall be effective upon recording in the public records of New Hanover County, North Carolina.

The burden of these restrictions created hereby shall run with the property and shall be enforceable against all future owners and tenants in perpetuity; the benefits of these restrictions shall not be appurtenant to any particular parcel of land, but shall be in gross and assignable or transferable as set forth above. Any such assignee or transferee shall have the like power of assignment or transfer.

SUBJECT, also to those matters set forth in **EXHIBIT C** hereto.

IN WITNESS WHEREOF, Grantor, by authority duly given, has caused these presents to be executed by its President and its corporate seal affixed, and Grantees have set their hands and seals all to be effective as of the date first above written.

[SIGNATURES ON FOLLOWING PAGE]

GRANTOR

NORTH CAROLINA COASTAL LAND TRUST

By: _____
Hannah Holt, President

ATTEST:

By: _____
Camilla M. Herlevich, Ass't Secretary

GRANTEE

_____ (Seal)
Robert L. Bryden

_____ (Seal)
Ann E. Stapleton

STATE OF NORTH CAROLINA
COUNTY OF NEW HANOVER

I, Catherine G. Gorum, a Notary Public of New Hanover County, North Carolina do hereby certify that Camilla M. Herlevich personally appeared before me this day and acknowledged that she is the Assistant Secretary of **NORTH CAROLINA COASTAL LAND TRUST**, a non-profit corporation, and that by authority duly given and as act of the corporation the foregoing instrument was signed in its name by Hannah Holt, its President, sealed with its corporate seal and attested by herself as its assistant secretary.

Witness my hand and notarial seal this the 17 day of Nov, 2003.

_____
Notary Public

My commission expires: January 24, 2007

CATHERINE G. GORUM
NOTARY PUBLIC
NEW HANOVER COUNTY, N.C.

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EXHIBIT A
Legal Description

Beginning in the western boundary line of the U.S. Highway 421 variable right of way and the northeastern most corner of the subject tract at a point labeled "24" on that certain map entitled "Map for Steven D. Royal et al" by Sherwin D. Cribb dated August 29, 2000, and recorded in Map Book 40, Page 78, of the New Hanover County Registry (the "Map") and being the POINT AND PLACE OF BEGINNING, thence along the following numbered points as shown on the Map, the following calls and distances:

Thence South 05° 29' 01" East for 220.73 feet to a point numbered 25.

Thence South 89° 43' 48" West for 664.82 feet to a point numbered 26.

Thence South 05° 10' 48" West for 1042.65 feet to a point numbered 27.

Thence North 89° 38' 19" East for 49.61 feet to a point numbered 28.

Thence North 89° 38' 19" East for 201.28 feet to a point numbered 29.

Thence North 89° 33' 22" East for 567.97 feet to a point numbered 30.

Thence North 89° 44' 08" East for 25.00 feet to a point numbered 77.

Thence South 00° 14' 40" East for 1693.61 feet to a point numbered 31.

Thence South 08° 39' 45" West for 284.19 feet to a point numbered 32.

Thence North 84° 07' 34" West for 980.60 feet to a point numbered 33.

Thence South 04° 20' 26" West for 1796.37 feet to a point numbered 34.

Thence North 83° 25' 26" East for 300.00 feet to a point numbered 35.

Thence South 04° 04' 46" West for 350.00 feet to a point numbered 36.

Thence South 88° 22' 34" East for 360.17 feet to a point numbered 37.

Thence North 08° 43' 56" East for 336.8 feet to a point numbered 38.

Thence North 53° 43' 55" East for 36.28 feet to a point numbered 39.

Thence North 53° 43' 56" East for 109.30 feet to a point numbered 40.

Thence South 08° 48' 19" West for 460.55 feet to a point numbered 41.

Thence North 86° 59' 41" West for 60.16 feet to a point numbered 42.

Thence North 86° 56' 12" West for 379.82 feet to a point numbered 43.

Thence South 03° 14' 05" West for 436.49 feet to a point numbered 44.

Thence west along the northern bank of the Cape Fear River as shown on the Map to a point numbered 57 on the Map, the following calls and distances:

Points 44 – 45	South 84° 10' 48" West	56.22'
Points 45 – 46	South 74° 37' 03" West	193.56'
Points 46 – 47	South 76° 13' 58" West	216.18'
Points 47 – 48	South 70° 35' 03" West	126.06'
Points 48 – 49	South 68° 37' 49" West	369.17'
Points 49 – 50	South 64° 25' 58" West	283.12'
Points 50 – 51	South 77° 01' 04" West	170.51'
Points 51 – 52	South 85° 42' 55" West	363.92'
Points 52 – 53	North 86° 07' 03" West	201.77'
Points 53 – 54	North 78° 32' 35" West	215.20'
Points 54 – 55	North 74° 28' 21" West	230.47'
Points 55 – 56	North 57° 53' 29" West	196.20'
Points 56 – 57	North 26° 52' 13" West	144.69'

Thence in a northerly direction along the eastern bank of the Cape Fear River labeled as Horse Shoe Bend on the Map to a point numbered 69 on the Map, the following calls and distances:

Points 57 – 58	North 08° 50' 28" East	190.51'
Points 58 – 59	North 34° 44' 06" East	209.28'
Points 59 – 60	North 45° 44' 59" East	304.06'
Points 60 – 61	North 49° 34' 16" East	325.92'
Points 61 – 62	North 56° 38' 53" East	411.04'
Points 62 – 63	North 40° 16' 09" East	376.71'
Points 63 – 64	North 23° 43' 08" East	337.34'
Points 64 – 65	North 02° 33' 03" East	391.37'
Points 65 – 66	North 18° 55' 46" West	405.03'
Points 66 – 67	North 27° 37' 28" West	273.79'
Points 67 – 68	North 39° 40' 30" West	253.00'
Points 68 – 69	North 47° 37' 38" West	283.63'

Thence North 00° 17' 56" East approximately 3141.35 feet to the southernmost boundary of the Seaboard Coast Line Railroad 130 foot right of way as shown on the Map.

Thence South 82° 39' 37" East for 2618.08 feet to the POINT AND PLACE OF BEGINNING at point numbered 24.

EXHIBIT B

Permit

COUNTY OF NEW HANOVER
STATE OF NORTH CAROLINA
ORDER GRANTING A SPECIAL USE PERMIT
For a Dwelling Unit incidental to the principle Use
S-501, 05/03

The County Commissioners for New Hanover County having held a public hearing on June 2, 2003 to consider application number S-501 submitted by The North Carolina Coastal Land Trust for a special use permit to locate a dwelling unit incidental to the principle use in an I-2 Heavy Industrial Zoning District located on 477 acres of property on the west side of US Highway 421 between the Northeast Cape Fear River Bridge and the Railroad Bridge and having heard all of the evidence and arguments presented at the hearing, make the following FINDINGS OF FACT and draw the following CONCLUSIONS:

1. The County Commissioners FIND AS A FACT that all of the specific requirements set forth in Section 72-27 of the County Zoning Ordinance WILL be satisfied if the property is developed in accordance with the plans submitted to the County Commissioners.

2. It is the County Commissioners' CONCLUSION that the proposed use DOES satisfy the first general requirement listed in the Ordinance; namely that the use will not materially endanger the public health or safety if located where proposed and developed according to the plan as submitted and approved. In support of this conclusion, the Commissioners make the following FINDINGS OF FACT:

   A. The subject property is located within the 421 North Fire District.
   B. Proposed access to the site is from US 421
   C. The site is served by private water and sewer.

3. It is the County Commissioners' CONCLUSION that the proposed use DOES satisfy the second general requirement listed in the Ordinance; namely that the use meets all required conditions and specifications. In support of this conclusion, the Commissioners make the following FINDINGS OF FACT:

   A. One dwelling unit is proposed on the 477 acre site
   B. The proposed location meets all setback requirements
   C. The dwelling shall be occupied solely by the person engaged in the maintenance of the conservation land, an employee of the organization holding the conservation easement, or their family members residing with them.
   D. The petitioner has stated that a dwelling unit is permitted within the Conservation Easement.

4. It is the County Commissioners' CONCLUSION that the proposed use DOES satisfy the third general requirement listed in the Ordinance; namely that the use will not substantially injure the value of adjoining or abutting property, or that the use is a public necessity. In support of this conclusion, the Commissioners make the following FINDINGS OF FACT

   A. The subject property is located in an I-2 Heavy Industrial District.
   B. The subject property is more than 400 acres.
   C. Nearby properties are used for industrial purposes. There is also an outdoor shooting range approximately 3,000 feet south of the subject property.

5. It is the County Commissioners' CONCLUSION that the proposed use DOES satisfy the fourth general requirement listed in the Ordinance; namely that the location and character of the use if developed according to the plan as submitted and approved will be in harmony with the area in which it is to be located and in general conformity with the plan of development for New Hanover County. In support of this conclusion, the Commissioners make the following FINDINGS OF FACT:

   A. The site is classified Conservation by the New Hanover County Comprehensive Plan. The purpose of the conservation class is to provide for effective long-term management and protection of significant, limited or irreplaceable natural resources while protecting the rights of the property owner.

   B. The proposed dwelling unit is for a caretaker who will help protect the conservation easement from illegal dumping, hunting, and other illicit activities.

6. Therefore, because the County Commissioners conclude that all of the general and specific conditions precedent to the issuance of a SPECIAL USE PERMIT HAVE been satisfied, IT IS ORDERED that the application for the issuance of a SPECIAL USE PERMIT BE GRANTED subject to the following conditions:

   A. That the applicant shall fully comply with all of the specific requirements stated in the Ordinance for the proposed use, as well as any additional conditions hereinafter stated.

   B. If any of the conditions imposed by this special use permit shall be held invalid beyond the authority of this Board of Commissioners by a court of competent jurisdiction, then this permit shall become void and of no effect.

   C. Other:

      1. All other applicable federal, state and local laws.

Ordered this 2nd day of June 2003.

Ted Davis, Jr., Chairman

Clerk to the Board

EXHIBIT C
Title Exceptions

1. Easement(s) to Southern Bell Telephone and Telegraph Company recorded in Book 303, Page 600, New Hanover County Registry.
2. Easement(s) to Tidewater Power Company, recorded in Book 243, Page 375; Book 258, Page 222; and Book 311, Page 364, New Hanover County Registry.
3. Rights-of-way in favor of Carolina Power and Light Company.
4. Rights-of-way in favor of North Carolina State Highway Commission.
5. Easement(s) to North Carolina Department of Transportation recorded in Book 1177, Page 1106, New Hanover County Registry.
6. Right(s)-of-way to North Carolina Natural Gas Company, recorded in Book 633, Page 131, New Hanover County Registry.
7. Right(s)-of-way of Seaboard Coast Line Railroad.
8. Easements and any other facts as shown on map recorded in Map Book/Cabinet 40, Page 78, New Hanover County Registry.
9. Existing easements for public roads and utilities now in use.
10. Such state of facts as would be disclosed by an accurate survey and inspection of the land.
11. Riparian rights or title to that portion of the land lying below the highwater mark of the Cape Fear River and Old Horse Shoe Bend.
12. Rights, if any, of Signature Outdoor Advertising, Inc., under that certain Unrecorded Real Estate Lease Agreement dated August 1998 for the term of five years between Fleming-Royal Property and Signature OutdoorAdvertising Company, Inc.

G: Freight Rail Relocation Environmental Analysis

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1. Freight Rail Realignment on New Location

1.1. Introduction

The environmental feasibility of realigning the existing CSX Transportation (CSXT) freight rail line leading to the Port of Wilmington (Port), via an eight-mile corridor through the City of Wilmington (City), to a new location across the Cape Fear River is the subject of this analysis developed by DC&A. In a separate proposed action, following the freight rail realignment, the feasibility of repurposing the remaining freight infrastructure into a trolley service and/or a multi-use path (greenway) is also under consideration. Although both proposed actions, realignment of freight rail and abandoned rail reuse, are together defined as the "actions being considered," the rail realignment over the Cape Fear River and Eagles Island will only be analyzed for the purpose of this environmental feasibility report. This report does not serve as a basis for determining a Least Environmentally Damaging Practicable Alternative (LEDPA) or provide a comprehensive effects analysis. The proposed study area, approximately 8,831 acres in size, encompasses downtown Wilmington, the Port, the Cape Fear River, the Northeast Cape Fear River, and Eagles Island. An emphasis was placed on Eagles Island, considering a majority of the island is in its natural state. As this is currently a feasibility study, environmental consequences, cumulative effects or federal/state permitting options were not evaluated.

1.2. Affected Resources

1.2.1. Biological Resources

Wetlands

The majority of the natural habitats present within the proposed study area on Eagles Island are wetlands including marshes, forests, and transitional successional areas between. The cypress-gum forested wetlands on Eagles Island occur as scattered pockets primarily adjacent to upland areas and on slightly higher elevations that occur on the interior and along the eastern side of the island dominated by a canopy of bald cypress (Taxodium distichum), swamp tupelo (Nyssa biflora), and water tupelo (N. aquatica). Bald cypress is not tolerant of increased levels of salinity. Evidence of recent mortality of bald cypress can be observed along the fringes of this community where the trees have been stressed.

The tidal marshes of Eagles Island are the dominant habitat across the island. The tidal marshes include areas of diverse tidal freshwater marsh and dense stands of cattails (Typha angustifolia and T. latifolia) and giant reed (Phragmites australis). The tidal freshwater marshes on Eagles Island are part of the Brunswick River/Cape Fear River Marshes Significant Natural Heritage Area (SNHA) and include a number of rare plant species that are endemic to the area. In recent years, brackish and estuarine marsh species have been observed on Eagles Island at scattered localities due to changes in salinity.

Fish and Fisheries

The Cape Fear River is a passageway for the larvae of many species of commercially or ecologically important fish. The shelter provided by the marshes and shallow water habitats within the project area's estuarine waters serves as Primary Nursery Areas where young fish undergo rapid growth before returning to the offshore environment. Located within the proposed study area are 50-plus estuarine and

freshwater species, identified by the NC Division of Marine Fisheries (NCDMF) long-term trawling study (Personal communication, Chris Stewart, NCDMF Fisheries Biologist, August 2016).

Rare, Threatened, and Endangered Species

Species occurrences of rare, threatened and endangered plants and animals documented by the Natural Heritage Program were considered. Updated lists of endangered and threatened species for the project area were obtained and evaluated. The actual occurrence of a species in the area depends upon the availability of suitable habitat, the season of the year relative to a species' temperature tolerance, migratory habits, and other factors. For the upper Wilmington Harbor portion of the Cape Fear River, the only federally-listed species that may occur in the project area are two endangered sturgeon species: shortnose (*Acipenser brevirostrum*) and Atlantic (*A. oxyrinchus oxyrinchus*). Whale, manatee, and sea turtle species are not likely to occur in the project area or be affected by the proposed project.

Proposed Critical Habitat Designation

The Cape Fear and Northeast Cape Fear Rivers were identified as spawning rivers for Atlantic sturgeon based on the capture of juveniles, the capture of adults in spawning condition, and the tracking location of adults, and information indicating the historical use by Atlantic sturgeon. Most recently, the National Marine Fisheries Service released a proposed critical habitat designation for the Atlantic sturgeon Carolina Distinct Population Segment (DPS C4) from the mouth of the Cape Fear River to Lock and Dam #3 (Federal Register 2016).

1.2.2. Historical and Cultural Resources

Wilmington and its surrounding areas have a rich military and maritime history. The following historical and cultural resources have been identified by the Eagles Island Coalition Conservation Management Plan (2016):

Maritime Archaeological Resources

Shipwrecks – dozens of recorded shipwrecks and likely many other unknown shipwrecks can be found along the shores of Eagles Island, especially along the Cape Fear River; the largest concentration of these wrecks and remains are between the Battleship NORTH CAROLINA exhibit and the Cape Fear Memorial Bridge. Thirty-seven sites have been inventoried near the study area by the North Carolina Office of State Archeology. These sites are also listed as part of the NRHP (Wilmington Archeological District).

Wilmington and Manchester (W&M) Railroad

Eagles Island was the starting point for the W&M Railroad, which was officially noted as abandoned in 1888 (USCG Chart 150 of 1898). The remains of the W&M railroad are among the cultural resources of interest to the Eagles Island Coalition (EIC) and were identified and documented by the EIC using historical nautical charts, high resolution aerial photos, GIS, and site visits. The preservation of these remains is part of the EIC Mission, which seeks to preserve cultural resources in need of conservation on Eagles Island.

Historical Attraction – Battleship NORTH CAROLINA

The USS North Carolina Battleship was the lead ship of North Carolina – class battleships and the fourth warship in the USN to be named in honor of the state of North Carolina. The USS North Carolina Battleship is now a museum ship and memorial, kept on the shores of Eagles Island. The USS North Carolina

Battleship and the adjoining property are designated as a National Historical Landmark and is managed and maintained by NC DNCR.

1.3. Screening and Analysis of Affected Resources

1.3.1 Identifying Environmental Constraints

To determine the most "suitable" alignment, environmental constraints were identified with a specific focus on Eagles Island. Each parcel was carefully reviewed to identify ownership, land use/land cover, and the existence of conservation easements. Initial discussions were conducted with several landowners. A perpetual conservation easement within the Cape Fear Royal Tract (CFRT) was the only serious issue identified.

1.3.2. Alternative Corridors Analysis

A GIS-based suitability model was used to evaluate the environmental feasibility of each preliminary alternative corridor. By examining the spatial relationships between the environmental resources and the alignment alternatives, attributes could be evaluated that may support freight rail realignment, and determine which scenarios would likely trigger federal and state resource agency concerns. Furthermore, this approach allowed for the preliminary quantification of potential environmental impacts as further summarized below.

1.4. Quantification of Potential Environmental Constraints

1.4.1. Wetlands

Impacts to wetlands are regulated and may be subject to permit requirements under Section 404 of the Clean Water Act (33 USC § 1344). The environmental analysis utilized the most recent National Wetlands Inventory map for the proposed study area, which includes the following types of wetlands: estuarine deepwater (river/creek), estuarine wetland (salt marsh), freshwater emergent (freshwater marsh), freshwater forested/scrub, and freshwater pond.

The analysis indicated the Blue alignment as the least disturbing to wetlands (25.52 acres); whereas, the Magenta and Red options would result in higher impacts (25.83 and 31.89 respectively). Yellow had the least impact of the remaining alternatives (5.86 acres), but when merged with a primary alignment, the cumulative disturbance would be greater than the Blue option alone. Purple, Green, and Cyan options would likely impact 17.41, 14.50, and 13.97 acres respectively. Finally, construction costs vary with land cover type; therefore, it is important to consider not only the total acreage of wetland impacts but the acreage of each wetland type to gain more insight into pros and cons associated with each option.

1.4.2. Primary Nursery Areas (PNAs)

Of the three primary corridors (Red, Blue, and Magenta), Magenta was identified as having the least impacts to PNAs (1.77 acres). Estimated acreage impacts for the Red and Blue corridors, on the other hand, were 3.86 and 2.13 acres respectively. The Purple, Cyan, Yellow, and Green corridors are short, alternative alignments that depend upon a primary corridor to cover the project's range, yet the Purple alternative

was identified as having the highest impact on PNAs (8.71 acres). Although impacts of less than one acre are anticipated from the Cyan and Yellow options, and the Green option avoids all PNAs; these alternatives cannot stand-alone and affect more area than the Magenta alternative when connected to any of the primary alignments. Bridging or elevating sections of the rail will avoid and/or minimize impacts to these areas.

1.4.3. Proposed Critical Habitat for Atlantic sturgeon

Of the primary alignments, Magenta was identified as having the least impact to proposed Atlantic sturgeon critical habitat (3.27 acres), followed by the Red (4.28 acres) and the Blue corridors (4.33 acres). Due primarily to their shorter length, the Cyan, Purple, and Yellow options would impact less acreage (2.20, 1.04, 0.90 acres respectively), and the Green option would not impact any proposed Atlantic sturgeon critical habitat. As the train trestle will be a bridge crossing over the Cape Fear River, temporary impacts to proposed critical habitat will be related to pile driving during construction.

1.5. Cultural and Historical Constraints

1.5.1. Marine Archaeological Sites

The results of the GIS analysis indicate that the Red corridor may impact a site at 34.218056 N, -77.956389 W, while the Blue and Magenta corridors showed no impacts. An investigation of the remaining alternatives indicated only the Yellow corridor as possibly impacting a site at 34.243889 N, -77.96 W. The proposed rail is likely to be elevated on structure which would avoid and minimize impacts to marine archaeological sites.

1.5.2. Historic W&M Railroad

The results of the GIS analysis indicate that all the primary corridor alignments (Red, Blue, and Magenta); as well as the Yellow and Purple corridor alignments, will cross over the historic W&M Railroad. The proposed rail is likely to be elevated on structure which would avoid and minimize impacts to the Historic W&M Railroad.

1.6. Summary of Parcel Constraints

Several parcels on Eagles Island contain environmental constraints that may result in future consideration of alternative corridor suitability. The following summary highlights the relative importance of these parcels and constraints:

1.6.1. USS North Carolina Battleship

The Battleship NORTH CAROLINA exhibit consists of approximately 54.72 acres to include the memorial USS North Carolina Battleship. These parcels and the Battleship are designated as a National Historic Landmarks. The Magenta corridor is the only alternative to have potential direct impact on these properties, however, M&N is preparing conceptual plans to elevate the entrance road to the Battleship NORTH CAROLIA exhibit and a portion of US 17/421 to avoid traffic and access impacts.

1.6.2. NCDOT McIntyre Tract

This site, approximately 131.12 acres, was transferred fee simple to NCDOT from the Ecosystems Land Mitigation Bank Corporation. The site is tied to the USACE issued 404 permit for the Wilmington Bypass. Relevant special conditions related to the McIntyre Tract indicate it would be a violation of the permit to allow any type of encroachment/development on the site. All preliminary alternative corridors except for the Magenta corridor pass through the McIntyre Tract. Bridging the rail would avoid and minimize impacts to this site.

1.6.3. Parcel 33 (Terminal Road Property LLC)

This site, approximately 25.64 acres, is included in a conservation district with an easement for an underwater pipeline. The Magenta corridor is the only corridor to pass through this site, impacting a total of 2.0 acres.

1.6.4. Cape Fear Royal Tract

This site, approximately 291.3 acres, contains a conservation easement held by the North Carolina Coastal Land Trust. The site is also designated as a PNA. All alternative corridors, except for the Magenta corridor, pass through the CFRT. Avoidance and minimization of this tract by bridging the rail will be key.

Table 1 and Figure 1 summarize the environmental constraints for all alternative corridors.

Table 1: MATRIX OF ENVIRONMENTAL CONSTRAINTS ASSOCIATED WITH THE ALTERNATIVE CORRIDORS

	[1]Conservation Easement	Wetlands (Acres)	[2] PNA (Acres)	[3] Crit. Hab. (acres)	[4]Underwater Arch.	[5]Historic RR
R	Yes	Yes (32.01)	Yes (3.86)	Yes (4.28)	Yes	Yes
B	Yes	Yes (25.82)	Yes (2.13)	Yes (4.33)	No	Yes
M	No	Yes (26.23)	Yes (1.77)	Yes (3.27)	No	Yes
Y	Yes	Yes (6.25)	Yes (0.56)	Yes (0.90)	Yes	No
G	No	Yes (14.69)	No (0.00)	No (0.00)	No	No
P	Yes	Yes (17.67)	Yes (8.71)	Yes (1.04)	No	Yes
C	No	Yes (14.25)	Yes (0.81)	Yes (2.20)	No	No

Note: [1] Conservation Easement references corridor crossing the Cape Fear Royal Tract
[2] Primary Nursery Area
[3] Proposed Critical Habitat for Atlantic Sturgeon
[4] Underwater Archaeological Resources
[5]Wilmington and Manchester Railroad

Figure 1: SUMMARY OF ENVIRONMENTAL RESOURCES AND ALTERNATIVE CORRIDORS

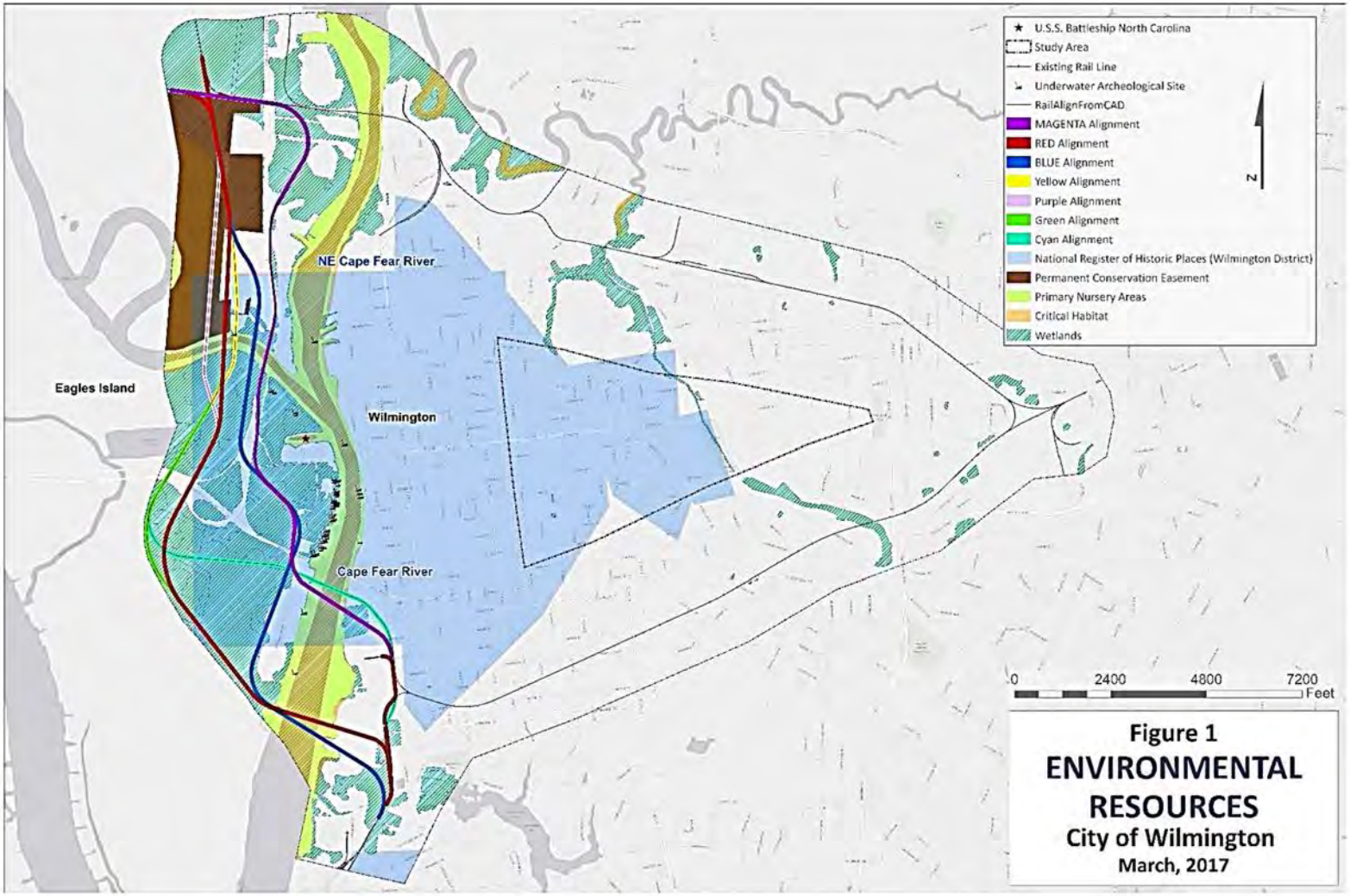
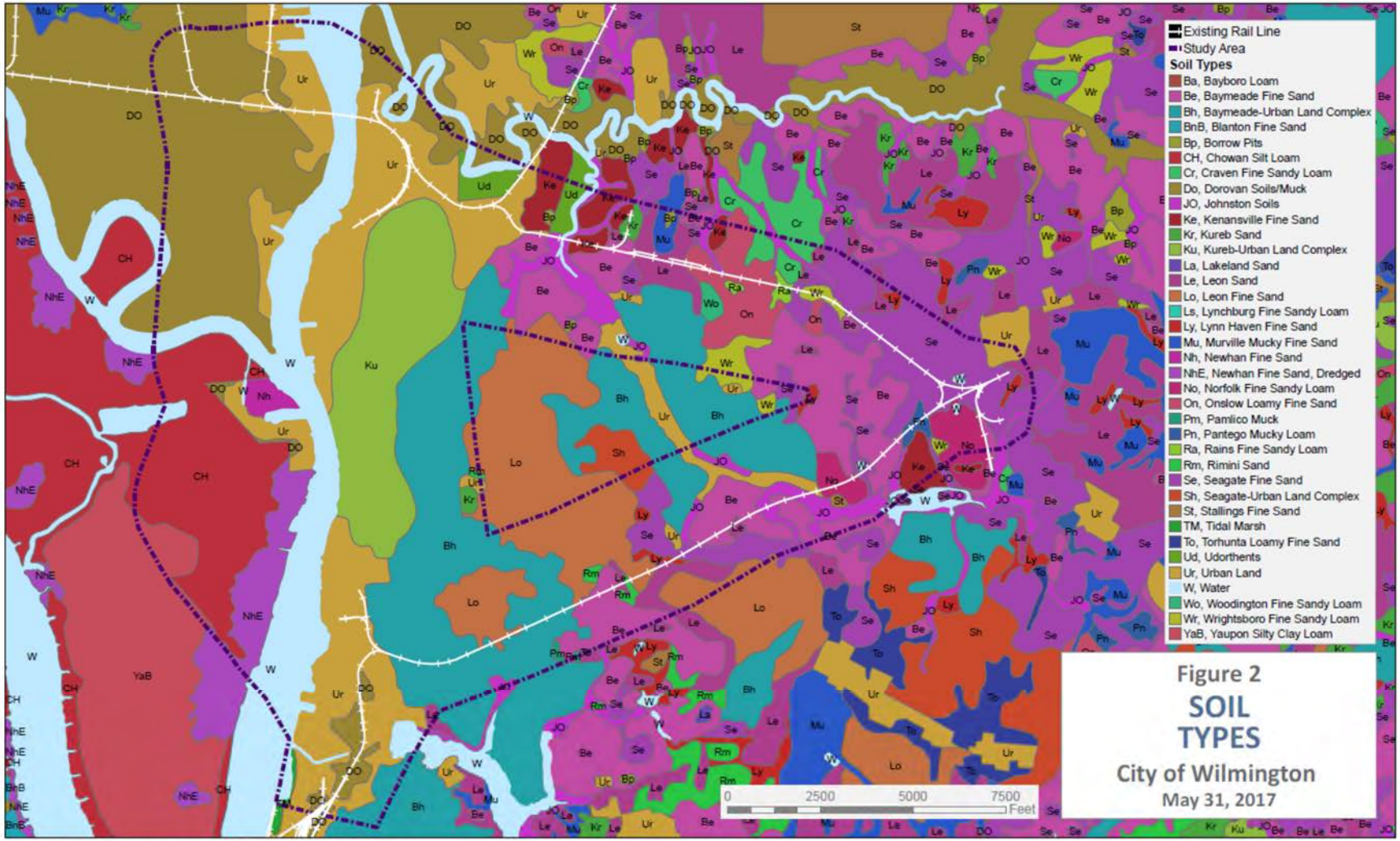


Figure 2: STUDY AREA SOILS MAP



Credits: USDA Web Soil Survey, NCDOT Rail Layer, Country Boundaries.

1.7. Summary of Potential Benefits

Relocating the freight rail line and repurposing the existing corridor through the city for public transit use and/or a "greenway" may also provide benefits to local and regional air quality, water quality, and traffic patterns. Examples of potential benefits that should be quantified as the proposed project moves forward are listed below.

- Elimination of stalled traffic at intersections due to train crossings.
- Reduction in air quality related to idling vehicles.
- Reduction in water quality from standing vehicles and associated oil drippings.
- Reduction in impervious surface and consequently stormwater impacts from reduced demand for parking lots and parking decks.
- Greater transition to walking and biking as a mobility option.
- Provision of "greenway" trail connecting to other "greenway" trails throughout the City
- Increased use of public transit system by area residents—also benefitting air and water quality.
- Repurposing of existing but vacant building infrastructure and resources invested in their construction, particularly along the southern segment.
- A shift in freight tonnage from trucks to rail, resulting in less carbon emissions.

1.8. Avoidance, Minimization, and Mitigation of Potential Environmental Effects

As the proposed project moves into the design and permitting phases, all practical alternatives for avoiding and minimizing impacts will be explored in collaboration with federal and state regulatory agencies. For any unavoidable impacts to wetland, mitigation will be required. As part of the permitting process, a mitigation plan will be prepared and negotiated with the federal and state resource agencies.

Options for compensatory mitigation include:

- Mitigation banks: Applicant satisfies the mitigation requirement by purchasing mitigation credits from an approved mitigation bank.
- In-lieu fee mitigation: Applicant satisfies the mitigation requirement by purchasing mitigation credits through the NC Division of Mitigation Services (DMS).
- Project-specific mitigation: Applicant satisfies the mitigation requirement themselves, either at the project site or at an off-site location.

1.9. Opinion of Probable Cost to Mitigate Environmental Effects

Mitigation options for unavoidable wetland impacts could include purchasing credits through the state's mitigation program or enhancing existing wetlands on Eagles Island. For conceptual planning and cost estimating, using the DMS cost per acre credit for each type of wetland potentially impacted is the most practicable choice for this assessment. Mitigation cost ranges from $552,365 to $3.1 million for the alternatives assessed. Other mitigation that may be required for the bridge crossing over the Cape Fear River that cannot be quantified at this time until further coordination is conducted with state and federal agencies.

H: Freight Rail Relocation Engineering Analysis

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1. Engineering Analysis

Technical Report H describes the engineering analysis of the study area in New Hanover and Brunswick Counties, including the City of Wilmington (City) and the Cape Fear River system (see Figure 1). The feasibility of realigning the existing active CSX-Transportation (CSXT) freight rail line leading from the CSXT Davis Yard in Brunswick County to the Port is being considered and is the subject of this study. In a separate proposed/studied action, the feasibility of repurposing the potential remnant freight rail infrastructure in Wilmington into a trolley transit service is also a subject of this feasibility study. Both proposed actions, realignment of freight rail and out-of-service rail reuse, are combined as the "actions being considered".

1.1. Rail Realignment

1.1.1. Basis of Design – Project Scope

Basis of Design (BOD)

CSXT conducts existing railroad operations. Mainline track design standards for CSXT are unavailable to the public. The FRA provides the following data for minimum standards for the lowest six classes of track:

Table 1: FRA TRACK STANDARDS BY CLASS OF TRACK

FRA Class of Track	Maximum Allowable Operating Speed for Freight	Minimum Gage	Maximum Gage	Min. No. of Crossties per 39'
Excepted track	10	N/A	4' 10-1/4"	N/A
Class 1 track	10	4' 8"	4' 10"	5
Class 2 track	25	4' 8"	4' 9-3/4"	8
Class 3 track	40	4' 8"	4' 9-3/4"	8
Class 4 track	60	4' 8"	4' 9-1/2"	12
Class 5 track	80	4' 8"	4' 9-1/2"	12

For the purposes of this study and the proposed rail service, the study used the "CSX Standard Specifications for the Design and Construction of Private Sidetracks" (available at the following link): https://www.csx.com/index.cfm/library/files/customers/industrial-development/site-design-guidelines-and-specifications/

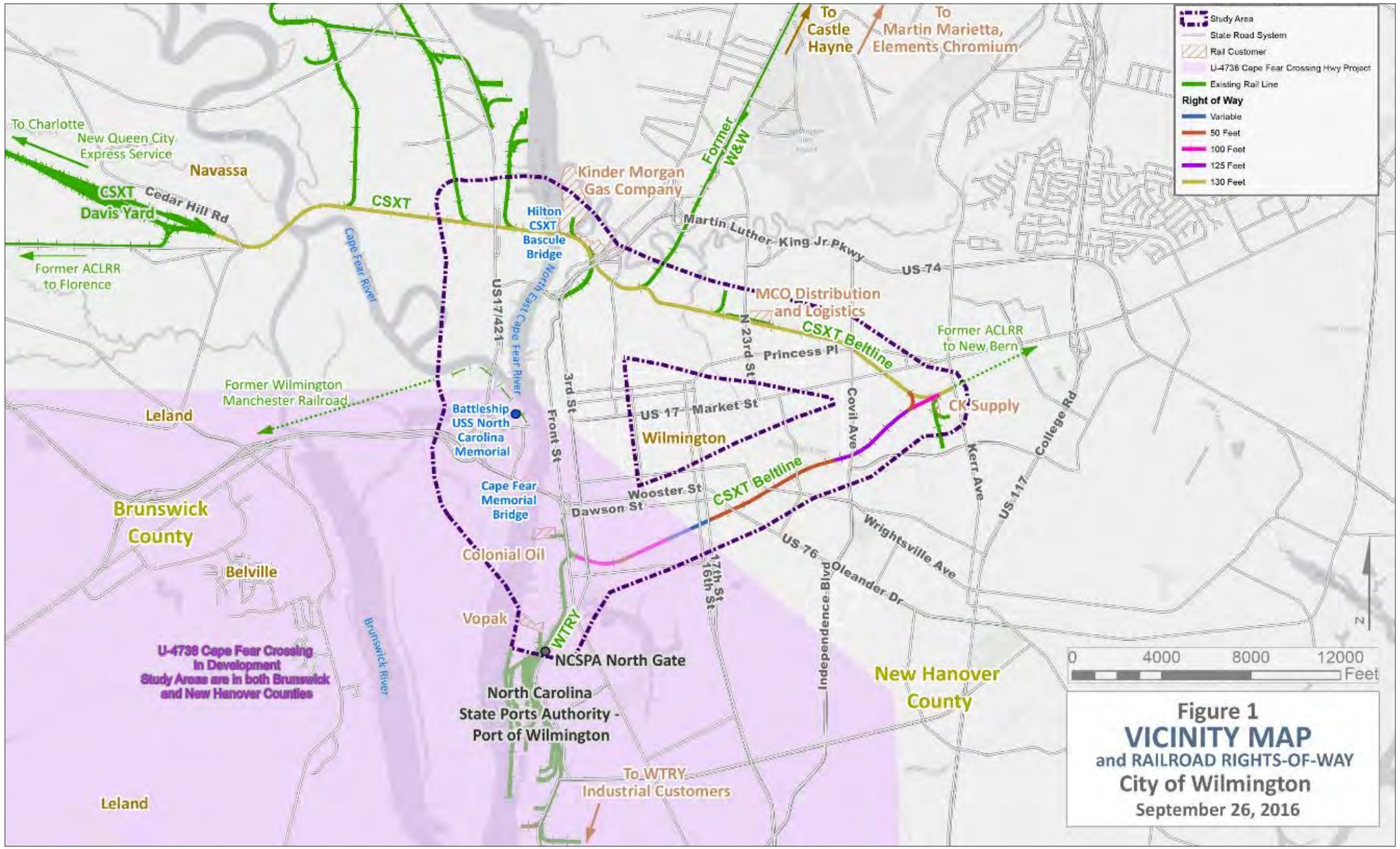
For mainline track concepts, the study used the guidelines published by the American Railway Engineering and Maintenance-of-Way Association in their "Manual for Railway Engineering." These guidelines include sufficient information for embankments and fixed and movable structures, in addition to the other rail system infrastructure that will be constructed.

Feasibility analysis of conceptualized corridors analyzes the overall rail system rather than individual components of the system. This level of analysis allowed the study to use the BOD documents as published without modification. A detailed BOD and subsequent modifications should be developed in support of future studies.

Project Scope

Feasibility analysis of the potential to relocate the existing Beltline tracks to a new corridor required defining the scope of the project. Defining the scope included identifying the termini of the project, discovering constraints to the location of potential corridors, and applying the BOD to establish potential corridors between the termini while avoiding the constraints to the maximum extent possible.

Figure 1: VICINITY MAP



Credits: Connect NCDOT GIS Resources (Road Data, Rail Division Data), New Hanover GIS Parcel Data, NCDOT ValMaps, Esri, HERE, DeLorme, MapmyIndia, © OpenStreetMap contributors and the GIS user community.

Proposed Corridor Definition

The engineering scope and existing conditions report established the general area within which corridors could be developed. Constraints identified within this area include:

- Terminus at the existing CSXT mainline that avoids affects to the US 17 overpass.
- Conservation easement encompassing former rail corridor.
- Wetlands, salt marshes, impoundments, dredge material disposal areas and other known natural or man-made environmental areas.
- Existing infrastructure and business operations

Study area limits established the outer boundaries for the corridors. Constraints identified areas within the outer boundaries that should be avoided. Remaining areas within the outer boundaries, though potentially appearing illogical or disjointed, provided the most advantageous locations for corridors or corridor segments.

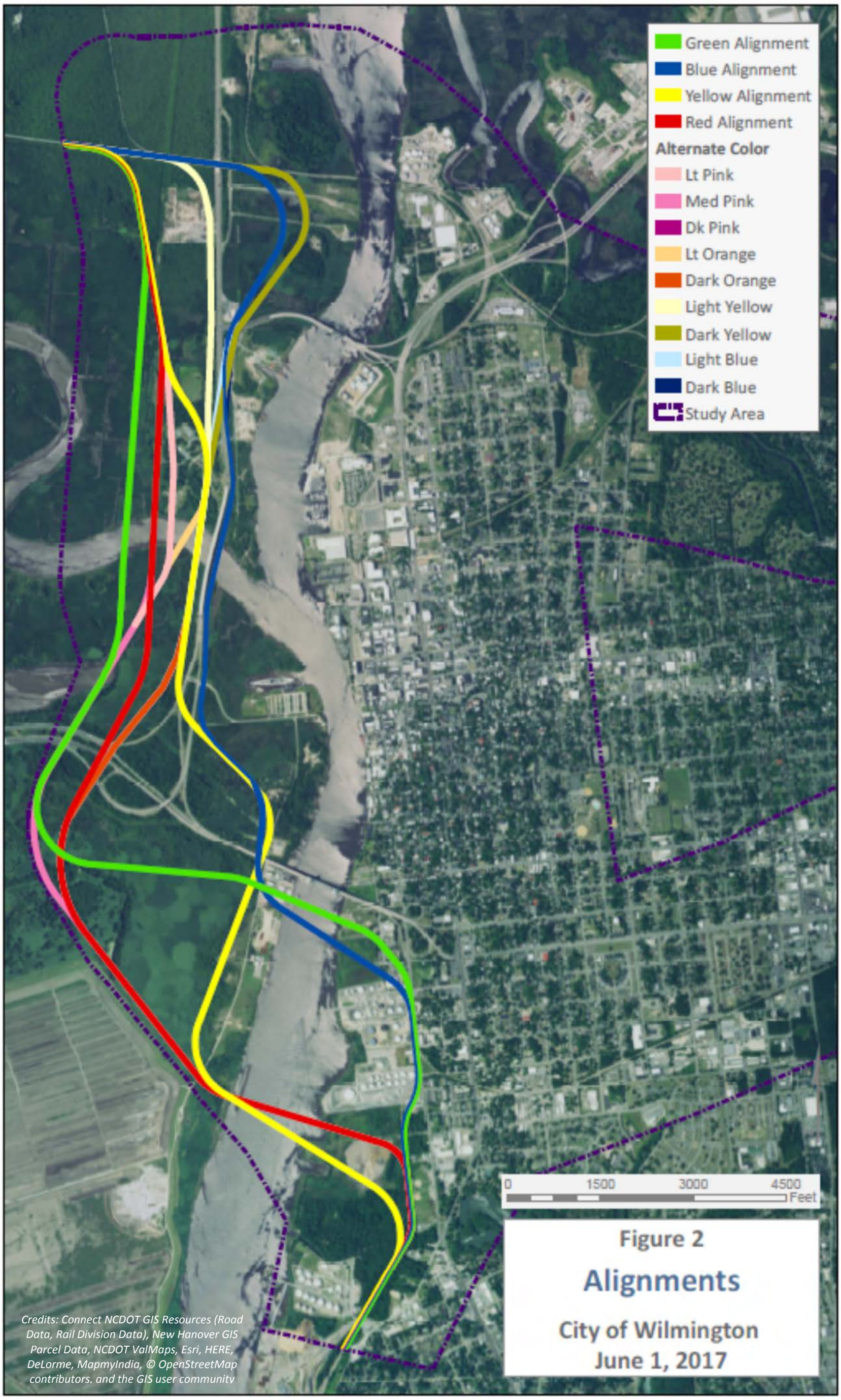
1.1.2. Corridor Alignment Alternatives

Development of corridor alignments used the BOD to apply track geometry across and between the advantageous areas. Figure 2 below shows many of the possible corridors that could be considered.

The due diligence phase of the Study resulted in the elimination of some possible corridors.

- A conservation easement west of US 17 provides for the negotiation of uses other than conservation.
    - Allows corridors west of US 17 to remain in consideration.
- River access, wetland impacts, impacts to the US 17/US 74 intersection and grade separated crossings of US 17 and US 74 increases infrastructure costs.
    - Reduces the probability that corridors east of US 17 are reasonable and prudent.
- Any obstruction to the Battleship NORTH CAROLINA attraction will be met with opposition.
    - Eliminates corridors east of US 17 near the Battleship NORTH CAROLINA property.
    - The USS North Carolina Battleship and its parcels area historic sites listed on the National Register of Historic Places.
- Existing and proposed highway infrastructure at the US 17/US 74/US 76 interchange must consider highway geometry.
    - Pushes corridors east or west of the existing highway bridges far enough to accommodate highway grades to get over the railroad corridor.
- Any corridors upstream of the Cape Fear Memorial Bridge must consider highway geometry at the Bus 17/S. Front Street and US 17/US 421 interchanges.
    - Impacts to port access, residential neighborhoods, and local businesses combined with increased highway infrastructure costs eliminates corridors upstream of the Cape Fear Memorial Bridge.
- Any corridors near the turning basin, or corridors that separate the Port from the tank farms will be met with opposition.
    - Eliminates corridors south of the tank farms.

Figure 2: POSSIBLE ALIGNMENTS



The remaining areas provide a minimum of three potential corridors. All three of these corridors begin at the CSXT mainline west of US 17. Connectors between these corridors are possible, but are excluded from the descriptions and figures to focus on the three potentially feasible corridors:

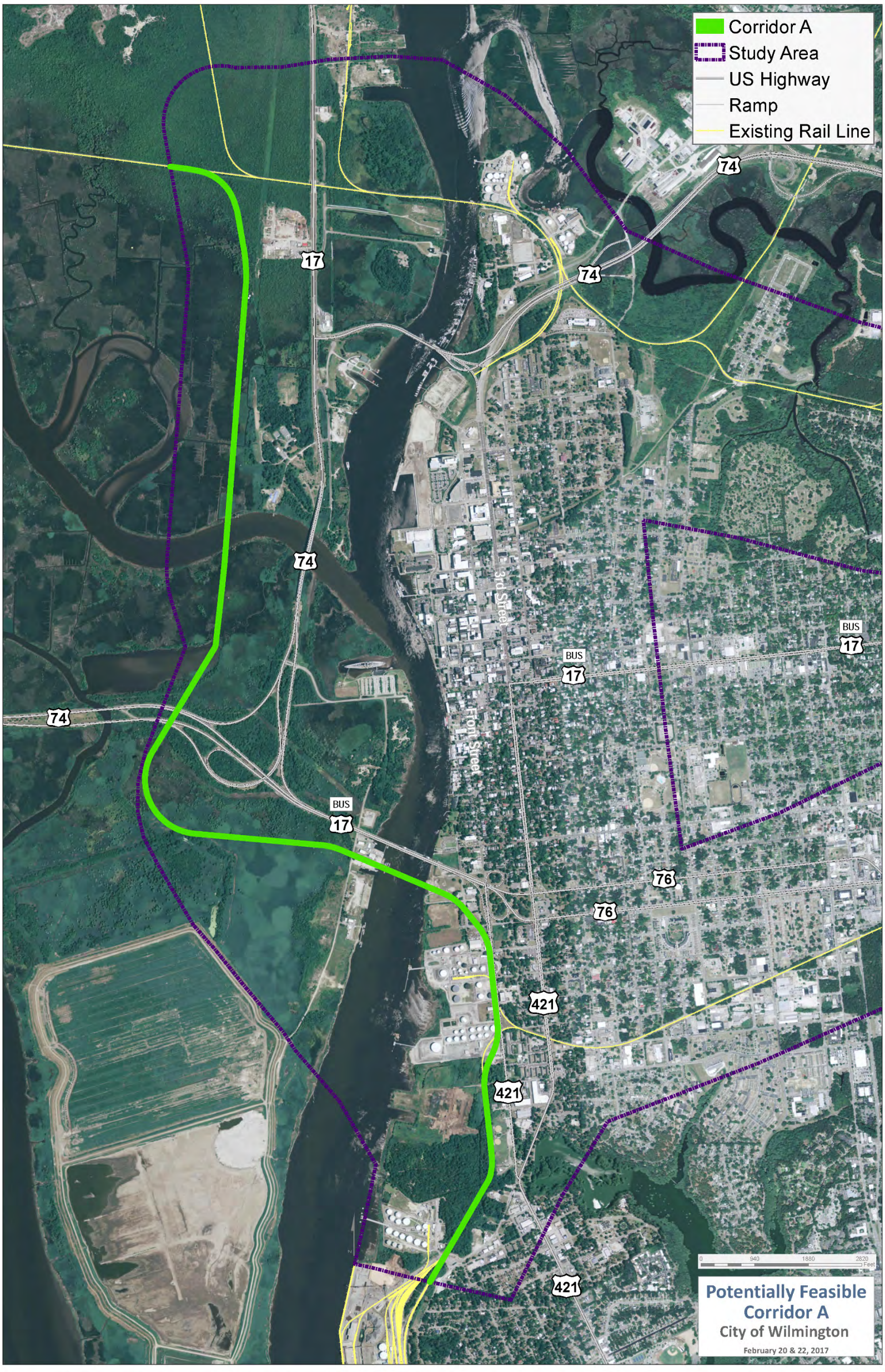
1) Corridor A (See Figure 3)
2) Corridor B (See Figure 4)
3) Corridor C (See Figure 5)

Descriptions of each of the above corridors begin below with Corridor A. A representative visualization (figure) of the corridor follows its description.

Corridor A

(See Figure 3) – An approximately four-mile long corridor that diverges from the CSXT mainline west of a former railroad corridor curving onto the former railroad alignment. The A Corridor then curves south to avoid a utility corridor by remaining west of and parallel to the utility corridor. Corridor A then crosses the Cape Fear River with a movable bridge and enters Brunswick County. Following a curve to the southwest, it crosses a pond before requiring a grade separated overpass for US 17/US 76/US 421 near the west end of the interchange. A curve back to the east brings Corridor A back to the Cape Fear Memorial Bridge where it crosses the Cape Fear River with a movable bridge downstream of and parallel to the Cape Fear Memorial Bridge and into New Hanover County. Once east of the river, the Corridor A follows former industrial spur tracks to a lead track that parallels South Front Street. Approaching the existing south leg of the beltline, the Corridor A curves into the CSXT mainline to provide access to the Port.

Figure 3: CORRIDOR A

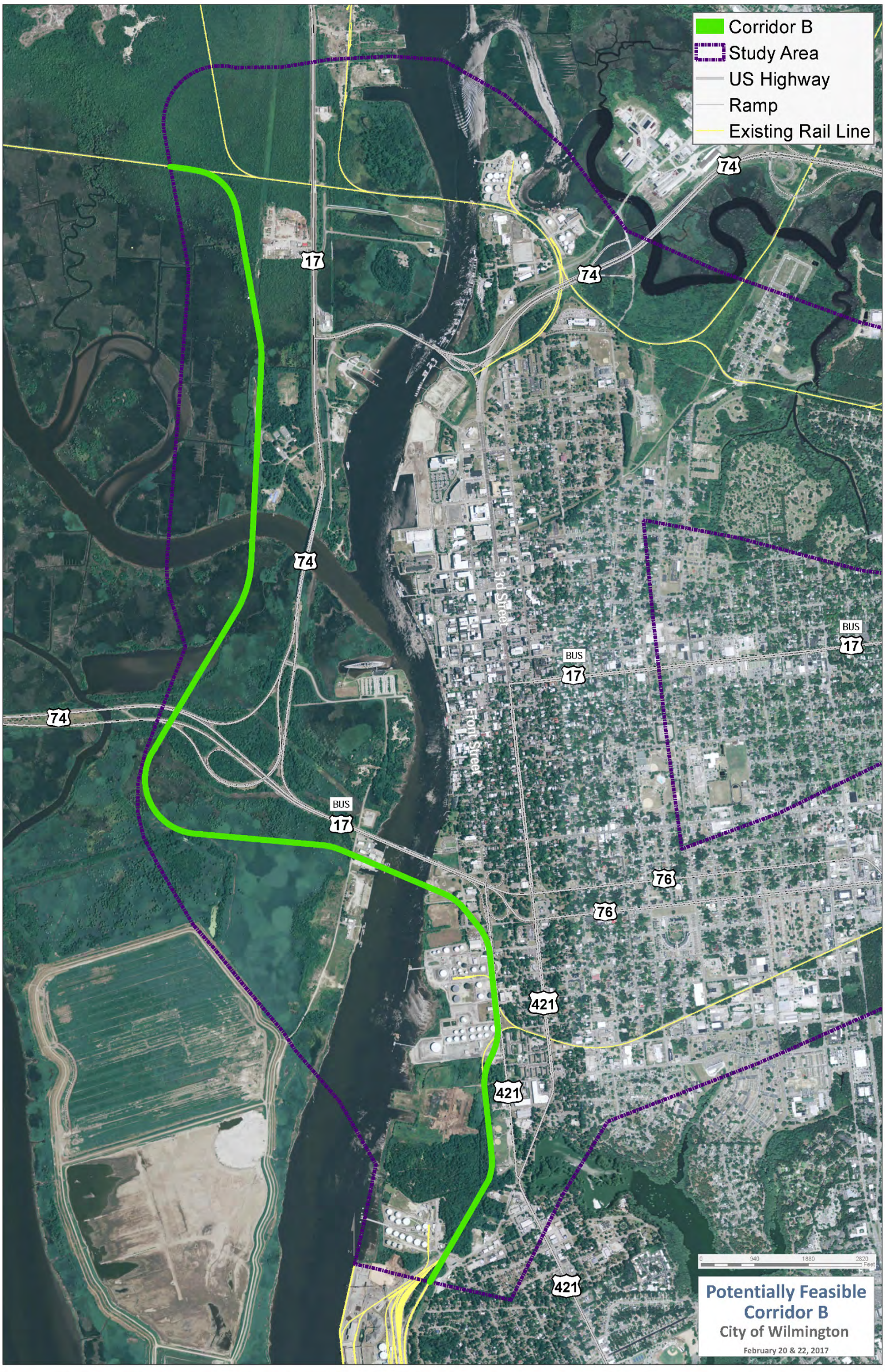


Credits: Connect NCDOT GIS Resources (Rail Division Data, Road Arcs), Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN and the GIS User Community.

Corridor B

(See Figure 4) – An approximately four-mile long corridor that diverges from the CSXT mainline west of a former railroad corridor to then curve onto the former railroad alignment. The B Corridor then curves south on the east side of a utility corridor and parallels the utility corridor. It then crosses the Cape Fear River with a movable bridge and enters Brunswick County. Following a curve to the southwest, Corridor B crosses a pond before requiring a grade separated overpass for US 17/US 76/US 421 near the west end of the interchange. A curve back to the east brings the corridor back to the Cape Fear Memorial Bridge. The corridor crosses the Cape Fear River with a movable bridge downstream of and parallel to the Cape Fear Memorial Bridge and into New Hanover County. Once east of the river, the Corridor B follows former industrial spur tracks to a lead track that parallels South Front Street. Approaching the existing south leg of the beltline, the corridor curves into the CSXT mainline to provide access to the Port.

Figure 4: CORRIDOR B

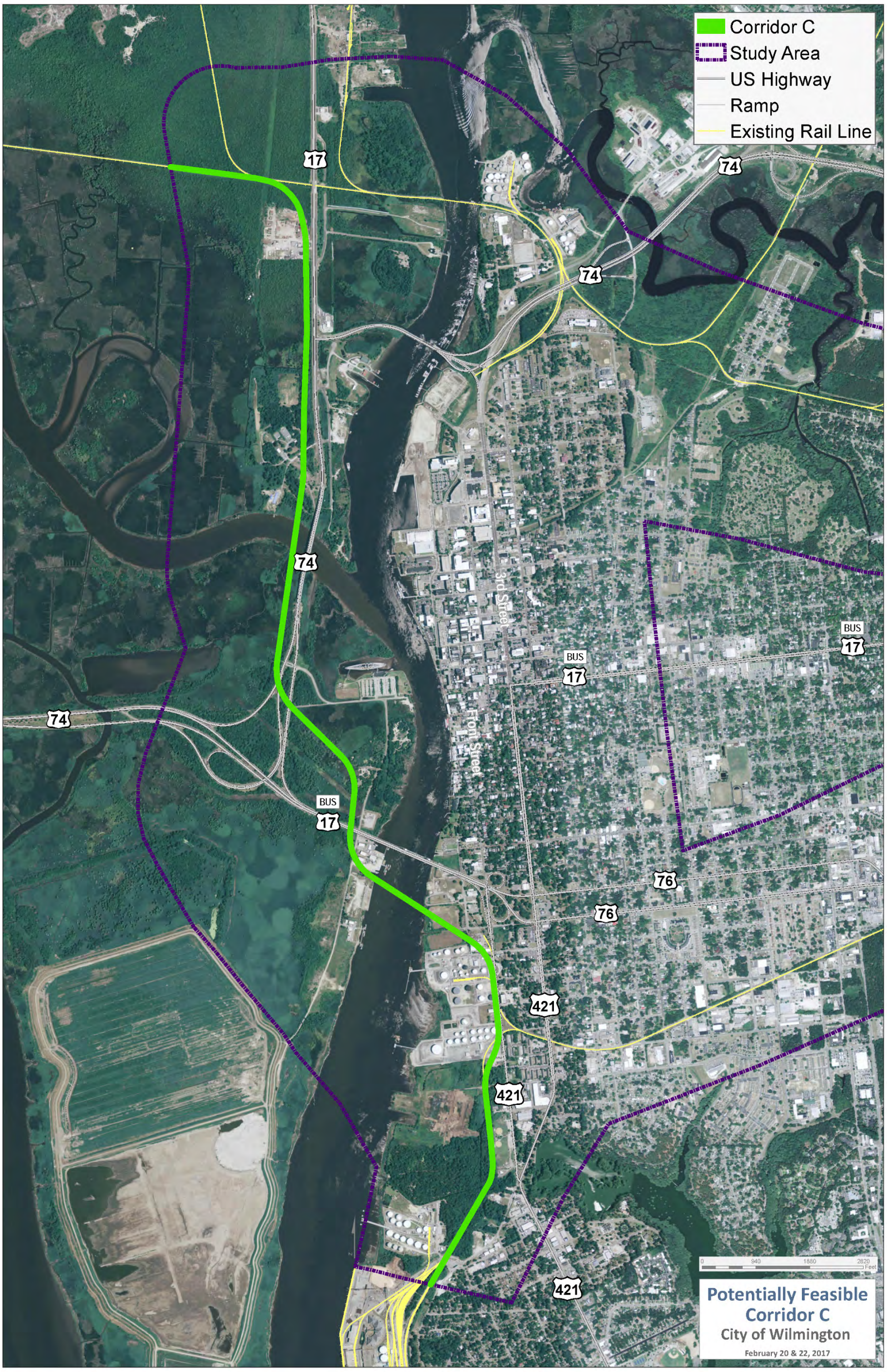


Credits: Connect NCDOT GIS Resources (Rail Division Data, Road Arcs), Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Corridor C

(See Figure 5) An approximately four-mile long corridor that diverges from the CSXT mainline west of US 17 to then curve to the south and parallel US 17. The C Corridor then crosses the Cape Fear River with a movable bridge and enters Brunswick County. Following a curve to the southeast, it requires a grade separated overpass for US 17/US 74 near the north end of the interchange with US 76/US 421. US 76/US 421 will also require an overpass as the corridor curves to the south to cross to the south of US 76/US 421. A curve back to the east brings the corridor across the Cape Fear River with a movable bridge downstream of Cape Fear Memorial Bridge and into New Hanover County. Once east of the river, the corridor follows a new alignment to a lead track that parallels South Front Street. Approaching the existing south leg of the beltline, the corridor curves into the CSXT mainline to provide access to the port.

Figure 5: CORRIDOR C



Credits: Connect NCDOT GIS Resources (Rail Division Data, Road Arcs), Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN and the GIS User Community.

Infrastructure within these three potential corridors would be a single-track operation on embankment or elevated structure. This is determined using the following data:

- Existing distance between Davis Yard and the Port — 11 miles
- Proposed distance between Davis Yard and the Port — 7 miles
- Existing round trip travel time — 4 hours
- Proposed round trip travel time — 2 hours
- Existing rail service to/from the Port — 2 trains per day
- Existing intermodal trains to/from the Port — 0 trains per day
- Proposed rail service to/from the Port — 4 trains per shift (12 trains per day max.)
- Proposed maximum allowable operating speed — 10 mph (due to movable bridges)

Intermodal capacity at the Port is currently at 600,000 twenty feet equivalent units (TEU's) per year. An 8,000-foot long intermodal train carrying single-stack TEU's can carry approximately 5 percent (30,000 TEU's) of this per year capacity making one round trip per day. Each additional train or each additional round trip would increase the capacity delivered by rail by approximately 5 percent per train or per round trip, e.g. four trains would carry approximately 20 percent (120,000 TEU's). Double-stack rail service would double the percentage to 40 percent (240,000 TEU's). Typical rail/truck splits for ports fall into a range of 20 percent or less for rail. The remaining percentage is carried by truck. Specialized facilities can increase this split beyond 20 percent, but there is usually a special circumstance causing the need for specialized facilities.

With two trains per day for existing rail service and no existing intermodal rail service, a balance will need to be found between the expansion of existing rail service and proposed intermodal rail service. Additionally, the Port will need to work with CSXT to ensure smooth and efficient turn-arounds of all trains to meet capacity goals. A single track operated during multiple shifts provides the rail service currently proposed.

Benefits of realigning this rail corridor include reduced service time and increased throughput capacity. Reduced service time increases productivity rates allowing more TEU's to be moved during a work shift. Labor and equipment costs would be unchanged during the work shift resulting in a lower cost per TEU for this seven-mile portion of the total travel distance. Increased throughput capacity potentially reduces the dwell time of TEU's at the Port as well as the amount of backland storage area for TEU's. Future port planning and detailed studies will assess the extent of these potential benefits.

Existing highways that are crossed by the proposed track would be grade separated. Business or residential access drives crossed by the proposed track would intersect at-grade with some form of crossing protection. Protection at access drives could range from crossbucks with stop signs to gates and flashers.

Corridors will cross the Cape Fear River at two locations between Yadkin Junction and the Port. One crossing will be near the US 74 bridge. The navigable channel at this location appears to be approximately 150 feet wide. Railroad geometry and vertical constraints indicate that a movable bridge will be required at this crossing. A second crossing will be near the Cape Fear Memorial Bridge. The navigable channel at this location appears to be approximately 400 feet wide. A movable bridge (e.g. bascule or lift) will also be required at this crossing. More detailed, future studies will examine the types of movable bridges.

Table 2 summarizes the environmental constraints found for the Corridors A, B, and C and scores their respective impact qualitatively as low, medium, or high. Low impacts range from "none" to "some potential for impacts may be present." Medium impacts range from "some potential for impacts" to "a moderate level of impacts." High impacts range from "moderate" to "severe" levels of impacts.

Based on environmental constraints mapping of the rail realignment, minimal impacts are anticipated on the following resources:

- Historic preservation sites (excluding the battleship NORTH CAROLINA attraction)
- Active hazardous waste sites
- National Pollution Discharge Elimination System sites
- Estuarine and marine wetlands
- Lakes

Table 2: POTENTIAL IMPACTS TO ENVIRONMENTAL CONSTRAINTS

CORRIDOR RESOURCE CONSTRAINT	Corridor A	Corridor B	Corridor C
Estuarine and Marine Deepwater	Med	Med	Med
Freshwater Emergent Wetland	High	High	Med
Freshwater Forested/Shrub Wetland	Med	Low	Low
Businesses	Low	Low	Med
Residences	Low	Low	Low
Conservation Easement	High	Med	Low
Battleship NORTH CAROLINA Attraction	Low	Low	Med
Highway Infrastructure	Med	Med	High

Corridor A has low impacts to three resources, medium impacts to three resources and high impacts to two resources. Corridor B has low impacts to four resources, medium impacts to three resources and high impacts to one resource. Corridor C has low impacts to three resources, medium impacts to four resources and high impacts to one resource. Qualitatively, an alignment in or near Corridor B should have fewer impacts than Corridors A or C.

Ancillary Design Elements

Any corridor identified in the study area will have some impact on non-railroad infrastructure. Most of these impacts will be to some form of access, e.g. highways, driveways, maintenance easements, and/or

utilities. None of the three corridors identified in this study require the realignment of access. However, federal, state, and railroad policies will require grade separations at new railroad/highway intersections. Corridors A and B will require grade separations at US 76/US 421 in both directions. Corridor C will require grade separations at US 17/US 74 and at US 76/US 421.

Corridors A, B and C impact property access to approximately 12, 15 and 16 driveways, respectively. All of these driveways would require additional analysis to determine the type of protection required.

A utility corridor is visible on aerial mapping in the northwestern section of the study area. Corridor A avoids this utility corridor whereas Corridors B and C cross it. The level of impacts and required mitigation will be part of a future study which should consider the proximity of above ground infrastructure and both horizontal and vertical clearances.

Alignments within all three corridors may be adjusted to minimize or mitigate both river crossings (Cape Fear and Northeast Cape Fear). Impacts to river access is not a deciding factor for the corridors evaluated in this study.

1.1.3. Opinion of Probable Order of Magnitude Construction Costs

Estimating costs at the level of a feasibility study used system quantities and costs. A feasibility study desktop analysis lacks the comprehensive information required to develop a more detailed cost opinion. This results in a range of costs, which include a contingency of 40 percent and excludes the following costs: right-of-way, rolling stock, utility realignment/construction, and signaling and communications. Table 3 provides an opinion of probable order of magnitude construction costs.

Table 3: OPINION OF PROBABLE ORDER OF MAGNITUDE CONSTRUCTION COSTS

COSTS *(in millions)*									Cost *(2016 $ in millions)*	Cost *(2025 $ in millions)*
CORRIDOR	**Track**		**Structures**		**Sitework**		**Roadway**			
	2016	2025	2016	2025	2016	2025	2016	2025		
Rail A	$ 15	$ 20	$ 557	$ 745	$ 29	$ 38	$ 30	$ 46	$ 631	$ 849
Rail B	$ 15	$ 20	$ 557	$ 745	$ 29	$ 38	$ 30	$ 46	$ 631	$ 849
Rail C	$ 17	$ 23	$ 597	$ 798	$ 44	$ 58	$ 28	$ 42	$ 686	$ 921

J: Transit Environmental Analysis Summary

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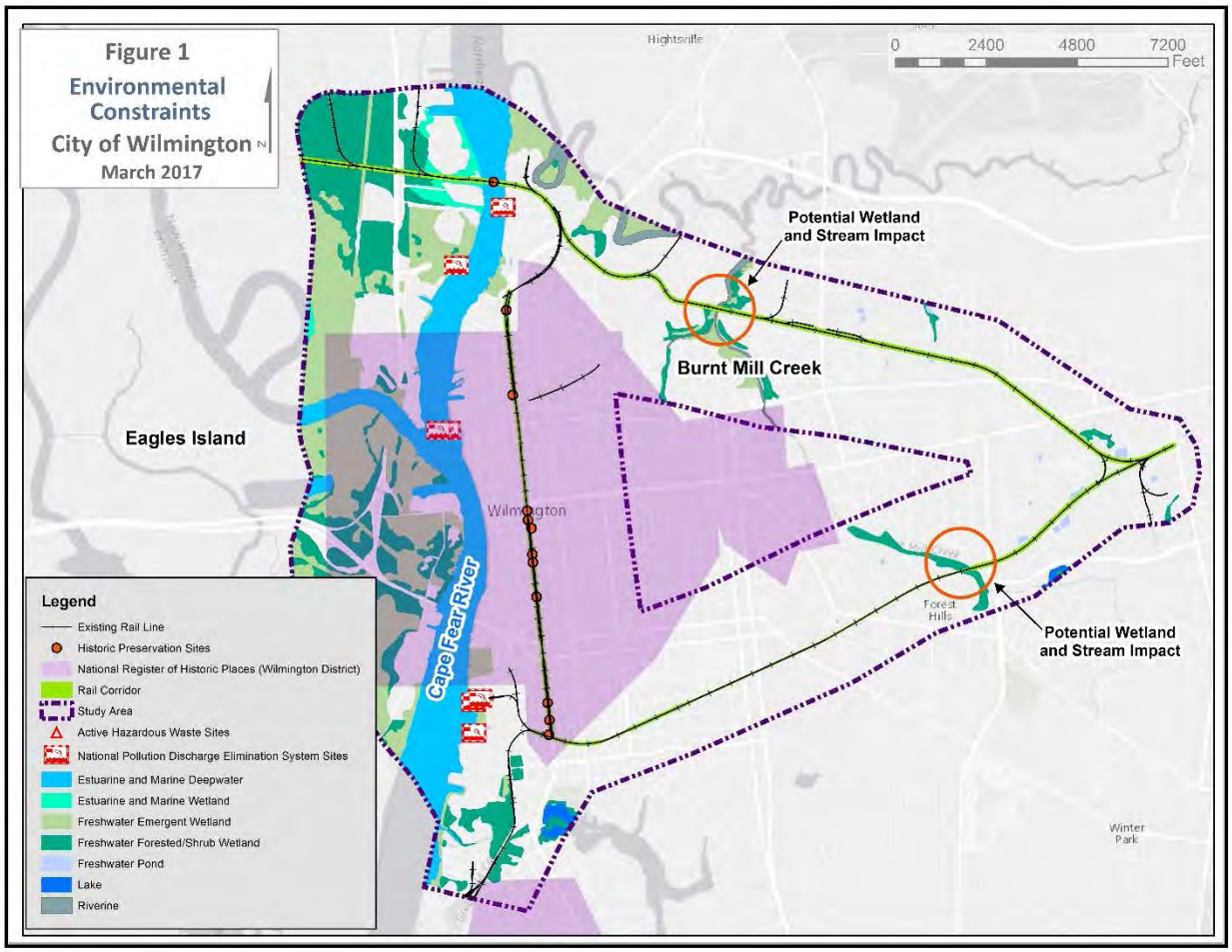
1. Freight Rail Reuse for Transit Service

1.1 Introduction

The environmental feasibility of repurposing the remaining freight rail infrastructure into a trolley service and/or a multi-use path (greenway) after freight rail realignment occurs has occurred, is the subject of this analysis developed by Dial Cordy and Associates Inc. (DC&A). Although both proposed actions, realignment of freight rail and abandoned rail reuse, are considered together as the "actions being considered," only the reuse of the abandoned rail was analyzed for this report, which does not provide a comprehensive effects analysis. Since this is a feasibility study, environmental consequences, cumulative effects or federal/state permitting options were not evaluated. Environmental constraints with respect to the rail transit were identified through GIS analysis and are summarized in Figure 1.

Figure 1. ENVIRONMENTAL CONSTRAINTS WITHIN AND ADJACENT TO THE PROPOSED TRANSIT CORRIDOR



1.2 Environmental Constraints

1.2.1. Wetlands and Streams

Wetlands adjacent to the existing rail corridor being considered for reuse include palustrine wetlands. Palustrine wetlands include all non-tidal wetlands dominated by trees, shrubs, persistent emergent mosses or lichens, and all such wetlands that occur in tidal areas where salinity due to ocean-derived salts is below 0.5 percent. Within the study area, these natural habitats exist primarily along Burnt Mill Creek. Burnt Mill Creek drains an extensively urbanized watershed, which leads to poor water quality, frequent algal blooms caused by inputs of nitrogen and phosphorus from non-point source runoff, and high fecal coliform counts that often exceed human contact standards. Burnt Mill Creek's water quality samples exceed water quality standards for one or more specific parameters; and therefore, it is designated as "impaired" by the North Carolina Division of Environmental Quality (NCDEQ). Two locations within the existing rail corridor cross Burnt Mill Creek and/or its adjacent wetlands (Figure 1). GIS analysis indicated possible wetland encroachment on the existing rail corridor in these locations, thus any new construction would likely be subject to permit requirements under Section 404 of the Clean Water Act (33 USC § 1344).

1.2.2. Active Hazardous Waste Sites

Site locations regulated by the hazardous waste portions of the Resource Conservation and Recovery Act (RCRA) were evaluated. These include large quantity generators; small quantity generators; transporters of hazardous waste; permitted treatment, storage or disposal (TSD) facilities; and TSD facilities that are under an order or a consent agreement. This data was extracted from the EPA RCRA Info database. The State of North Carolina, Division of Waste Management, Hazardous Waste Section is the implementer of record for this data. GIS analysis showed no active hazardous waste sites within or immediately adjacent to the existing rail corridor being considered. (Figure 1).

1.2.3. National Pollution Discharge Elimination System (NPDES) Sites

The NPDES permit program addresses water pollution by regulating point sources that discharge pollutants to waters of the US. The permits contain limits on what can be discharged; as well as, monitoring and reporting requirements and other provisions to ensure that the discharge does not hurt water quality or pose a threat to public health. Sites with NPDES permits for wastewater discharges to surface waters within or near the study area were included in this analysis. Several NPDES sites release into the Cape Fear and Northeast Cape Fear Rivers; however, none is located within or near the proposed transit corridor (Figure 1).

1.3 Historic Preservation Sites

The National Register of Historic Places (NRHP) is the nation's official list of buildings, structures, objects, sites and districts worthy of preservation for their significance in American history, architecture, archaeology and culture. The NRHP was established by the National Historic Preservation Act of 1966. The purpose of the Act is to ensure that as a matter of public policy, properties significant in national, state, and local history are considered in the planning of federal undertakings, and to encourage historic preservation initiatives by state and local governments and the private sector. An NHRP listing does not

provide absolute protection from federal actions that may affect the property. If a federal undertaking conflicts with the preservation of a NRHP property, the North Carolina State Historic Preservation Office (SHPO) will negotiate with the responsible federal agency to eliminate or minimize the effect on the historic property. This review procedure applies to properties that are determined eligible for the NRHP in the day-to-day environmental review process and those listed in the NRHP. Several sites listed on the NRHP were found within or adjacent to the existing rail corridor, particularly within Wilmington's Historic District along 3rd Street (Figure 1). These sites are primarily houses and churches of historic significance. Any reuse of the existing rail infrastructure in this location would not affect these properties; however, new construction could trigger a Section 106 review by the SHPO.

1.3.1 Summary of Potential Benefits

Repurposing the existing corridor for public transit use and/or a "greenway" may also benefit local and regional air quality, water quality and traffic patterns. Examples of potential benefits that should be quantified as the proposed project moves forward are listed below.

- Elimination of stalled traffic at intersections due to train crossings.
- Reduction in air quality related to idling vehicles.
- Drop in water quality from standing vehicles and associated oil drippings.
- Decrease in impervious surface areas and, consequently, stormwater impacts from reduced demand for parking lots and parking decks.
- Greater transition to walking and biking as a mobility option.
- Provision of "greenway" trail connecting to other "greenway" trails throughout the City.
- Increased use of public transit system by area residents—also benefitting air and water quality.
- Repurposing of existing but vacant building infrastructure and resources invested in their construction, particularly along the southern segment.
- A shift in freight tonnage from trucks to rail, resulting in less carbon emissions.

1.4 Avoidance, Minimization, and Mitigation of Potential Environmental Effects

Existing freight track is a single track within a variable width right-of-way. An approximately 0.2 mile siding parallels the existing single track near South Front Street. Repurposing the abandoned freight rail infrastructure for transit service and/or a greenway would require little, if any avoidance or mitigation measures because these factors were considered in the original planning and permitting process of the existing freight rail. However, any new construction would require consideration of practical alternatives for avoiding and minimizing impacts in collaboration with federal and state regulatory agencies. For unavoidable impacts to wetland, mitigation would be required. As part of the permitting process, a mitigation plan would be prepared and negotiated with the federal and state resource agencies. Options for compensatory mitigation include:

- Mitigation banks: Applicant satisfies the mitigation requirement by purchasing mitigation credits from an approved mitigation bank.
- In-lieu fee mitigation: Applicant satisfies the mitigation requirement by purchasing mitigation credits through the NC Division of Mitigation Services.

- Project-specific mitigation: Applicant satisfies the mitigation requirement themselves, either at the project site or at an off-site location.

Moreover, for any unavoidable impacts to sites listed in the NRHP, a SHPO review would be implemented to eliminate or minimize the effect on any historic resources.

K: Transit Engineering Analysis

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1. Goals and Objectives

The following goals and objectives have been established for the Wilmington rail transit project:

1) Provide a reliable and attractive transportation alternative to support mobility and provide access to existing and future jobs and activity centers.

2) Enhance non-automobile travel options—reduce reliance on private automobile travel, decrease future parking infrastructure needs in downtown Wilmington.

3) Slow the growth of automobile congestion in the downtown area.

4) Promote walkability, use of bicycles and alternative modes of non-motorized transportation mode.

5) Support economic growth in the downtown core and surrounding neighborhoods.

6) Connect activity centers with underutilized areas to promote economic growth and transit oriented development.

2. Transit Technologies Considered

Several high-capacity transit technologies could be applied to the proposed rail transit alternatives. Below are the characteristics for each of the technologies evaluated.

2.1. Commuter Rail

Commuter rail is fixed guideway, long-haul, passenger rail services operating between large metropolitan and suburban areas. Trains are typically either an electric, diesel-electric or dual-mode locomotive pulling one or more passenger coaches. Commuter rail can operate on or adjacent to existing freight tracks if the vehicles are Federal Railroad Administration (FRA) compliant. These systems are typically about 20 to 50 miles long with stations approximately every 5 to 10 miles and operate around 50 miles per hour (mph) but can reach speeds up to 80 mph. Commuter rails serve high volumes of passengers during peak periods and typically incorporate park-and-ride lots, bus access and large stations for passengers. The typical vehicle capacity ranges from 100 – 250 passengers per rail car.

Figure 1: NORTHSTAR COMMUTER RAIL (TWIN CITIES, MN)

Photo Credit: https://commons.wikimedia.org

2.2. Light Rail

Light Rail Transit (LRT) operates on fixed rails in exclusive right-of-way, utilizes an electric overhead catenary system (OCS) to power the vehicles and is driven by an on-board operator. LRT systems are often used as a commuter service by connecting suburban areas with central business districts, resulting in high ridership volumes during weekday peak periods. These systems are characteristically about 10 to 15 miles

long, operating between 30 – 60 mph, and require gated crossings for at-grade road crossings in dedicated right-of-ways. These systems can also operate in street with signal control at intersections. Stations are spaced approximately one mile apart and typically are highly developed with large covered platforms with seating, lighting, signage, communications and ticket vending. Station areas often include park-and-ride lots, parking structures, kiss-and-ride zones, and/or and bus transfer facilities for feeder transit service. The typical vehicle capacity varies from 150 – 250 passengers per vehicle.

Figure 2: THE TIDE LIGHT RAIL (NORFOLK, VA)

Photo Credit: http://www.railfanguides.us/va/tide

2.3. Streetcar

Streetcars systems are typically designed to serve as urban circulators operating on rails embedded in existing streets, with overhead wires providing electric power to vehicles. Streetcars traditionally operate in mixed traffic conditions, sharing lanes with vehicular traffic, but can operate in dedicated guideways as well. These systems operate on short headways providing frequent service with stations located every few blocks in urban settings or around every ¼ – ½ mile. The total length of a streetcar system ranges from 2 to 10 miles.

There are two classifications of streetcars: heritage and modern. The primary difference being the vehicle design as described in the following sections.

2.3.1. Modern Streetcar

Modern streetcar systems are simply streetcar systems that operate new vehicles (often resembling light rail vehicles or operating actual light rail vehicles) and utilize modern technology and equipment. The typical vehicle capacity for modern streetcars range from 100 – 200 passengers. The average operating speed is approximately 10 mph with a maximum speed of 45 mph.

Figure 3: MODERN STREETCAR – ATLANTA STREETCAR (ATLANTA, GA)

Photo Credit: https://commons.wikimedia.org/wiki

2.3.2. Heritage Streetcar/Trolley

Heritage streetcar systems, sometimes referred to as heritage trolleys, are systems that operate either replica or refurbished vehicles from the late 19th and early 20th century. These types of vehicles are often an attraction for tourists and visitors. For heritage streetcar systems, the average vehicle capacity ranges from 40 – 90 passengers with the average operating speed being approximately 10 mph; the maximum speed is typically 25 mph.

Figure 4: HERITAGE STREETCAR – CITY LYNX GOLD LINE (CHARLOTTE, NC)

Photo Credit: https://fineartamerica.com/featured/charlotte-streetcar-line-1-joseph-c-hinson-photography.html

3. Proposed Design Assumptions

3.1. Freight Rail Corridor

For the northern portion of the existing freight right-of-way, it is assumed that CSXT will remain in its current location and the proposed transit system would operate on a newly built separate track in the same right-of-way. The proposed tracks would be located with a separation of 40 feet from the proposed track centerline to the existing freight track centerline. This assumption is based on other systems throughout the US where rail transit shares right-of-way with freight rail service. One example where transit shares right-of-way with CSXT is the Hudson-Bergen Light Rail in New Jersey, indicated in Figure 5 below.

Figure 5: HUDSON-BERGEN LIGHT RAIL TRACKS ADJACENT TO CSX (NJ)

Photo Credit: http://oldtrails.com/LightRail/HudsonBergen/raillnjt13.htm

From the proposed Wilmington Multi-Modal Transportation Center (WMTC) site to near Railroad Street and King Street, the existing freight corridor is abandoned and future inter-city and/or commuter rail is planned for this location. In this portion of the corridor, the proposed transit system tracks could be located 40 feet away from the planned passenger rail.

It is also assumed that CSXT will abandon the southern portion of the current freight right-of-way from the Port east to the existing turning wye (a remnant of the ACLRR line connection to New Bern) near Kerr Avenue. CSXT access to the Port is assumed to be relocated to a new freight alignment on the west side

of the Cape Fear River, bypassing downtown Wilmington. The proposed transit system would operate on the existing freight tracks as they would be abandoned by CSXT. See Appendix Figures A.3.1 and A.3.2.

3.1.1. Passing Sidings

Throughout the existing freight corridor, the proposed transit system alternatives would operate on a single track used by transit vehicles operating in both directions. This would be made possible by periodic passing sidings where a vehicle traveling in one direction waits while one going in the opposite direction passes. This allows the system to operate in both directions on a single track saving the cost of building an additional track. Single-track construction is considerably cheaper to build but has lower capacity as the number of cars operating in each direction is limited by the spacing of passing sidings. The passing sidings should be located at the proposed station locations and other strategic sites throughout the corridor to maintain the anticipated service frequencies and travel times. Figure 6 below shows an example of passing siding.

Figure 6: PASSING SIDING WITH EMBEDDED TRACK AT STATION – TECO STREETCAR (TAMPA, FL)

Photo Credit: http://www.heritagetrolley.org/images/Tampa111.jpg

Additionally, a new multi-use trail is proposed adjacent to the transit system in the freight corridor that could connect to the City's existing and planned greenway system. The multi-use trail is shown on the section views in the Appendix. Utilizing the existing CSXT right-of way in any manner will require extensive negotiations between CSXT, the City and other stakeholders. The rights to a portion or all the existing right-of-way will need to be acquired from CSXT to build a new transit system. As part of the negotiation, the City would need to include the right to build a multi-use path adjacent to the transit system.

3.2. In-Street Corridor

For locations where the proposed rail transit system enters an existing roadway such as 3rd Street or Randall Parkway, the system is assumed to operate on double tracks embedded in concrete. In the proposed design the tracks would be center running in the existing roadway, separated by a median where the OCS poles would be located. See Appendix Figures A.4.1 – A.6.2.

Station spacing would be approximately every three to five blocks with stations located in a widened median between the tracks (see Appendix Figure A.7 for schematic layout). Pedestrian access to in-street stations would be provided at the existing intersections through the crosswalks as shown in Figure 7.

Figure 7: IN-STREET MEDIAN STOP AT INTERSECTION (CITY LYNX GOLD LINE, CHARLOTTE, NC)

Photo Credit: Kimley-Horn

3.3. Technology and Operations

The types of rail transit technology being considered must be compatible with operating on standard gauge ballasted track when in exclusive right-of-way locations as well as operating within an existing city streets in other locations. Other considerations include system length, vehicle speed, vehicle capacity, preferred operating frequency and many others.

Commuter rail was eliminated as a practical option for several reasons. One, the stop frequency proposed would not allow the commuter rail vehicle to get up to a significant cruising speed before it would need to decelerate for the next stop. Additionally, the constrained right-of-way widths and the system lengths are not well-suited for this technology. Commuter rail is generally not compatible with the overall system characteristics of the proposed alternatives.

Figure 8: EXCLUSIVE CENTER RUNNING TRANSIT LANES—GREEN LINE LRT (TWIN CITIES, MN)

Photo Credit: © Steve Uzzell, All Rights Reserved

Although light rail and streetcar systems are fundamentally very similar, the primary difference is how they are applied. Light rail is typically used as a higher capacity trunk line of a transit system than streetcar. Light rail also generally operates in an exclusive guideway with less frequent stops than streetcar. Streetcar is typically used in a shared guideway with frequent stop spacing that encourages walk-up type trips. F In Wilmington, there would be almost no difference between light rail and streetcar operation in the freight right-of-way. Within city streets, however, there is a choice on how rail transit can be integrated. There are generally three ways to address this situation: add lanes, take lanes and/or share lanes.

1) Add Lanes – An exclusive lane in each direction could be added in the center of the existing street while preserving the number of existing travel lanes in both directions on either side of the transit lanes. This

rail transit application is typically considered light rail, as the exclusive lanes give an operational advantage to the rail transit system. This application is utilized in in highly congested corridors where the number of existing travel lanes cannot be reduced and where additional right-of-way width is available as it would require a wider cross section for the entire roadway.

2) Take Lanes – The inside lanes of the existing street could be converted to exclusive lanes for the rail transit allocating the remaining width of the street to vehicular travel lanes, parking, turn lanes, etc. as shown in Figure 8. This rail transit application is typically considered light rail due to the exclusive transit lane, and this is typically applied in locations where there is excess capacity for auto lanes. This option would require a detailed examination of impacts to traffic flow and capacity. This option would not have significant right-of-way impacts or significantly add to the capital costs.

3) Share Lanes – The tracks would be installed in the existing center lanes in an embedded guideway where transit vehicles and vehicular traffic would share the lanes. No operational advantage would be given to the transit vehicles and no significant impact on roadway congestion would be experienced. This is how streetcars have operated historically.

A cursory cross sectional analysis of 3rd Street revealed that adding exclusive light rail lanes would have significant right-of-way impacts and necessitate full reconstruction of the street. Due to anticipated property impacts and high capital cost associated with this option, it was determined that adding exclusive transit lanes while preserving existing travel lanes is not practical. It is assumed that removing two travel lanes (one in each direction) on 3rd Street would not be feasible either, which effectively sets aside light rail operations.

Therefore, for this study and the development of capital cost, streetcar technology has been selected using shared lanes operations for the in-street segments. Shared lane operation requires the trolley vehicle to follow the same rules as the passenger vehicles using line-of-sight precautions and obeying traffic signals. Therefore, no additional traffic signal control is necessary, however, specific traffic signal phasing may be required to accommodate trolley exclusive movements. Additionally, to reduce capital cost, a heritage streetcar/trolley vehicle has been assumed. These can cost up to half as much as modern streetcar vehicles, are consistent with Wilmington's heritage and the system can be converted to modern vehicles in the future, if chosen.

4. Alignment Alternatives

4.1. Alternative #1: The Loop

This alternative begins in the existing 130-foot-wide freight right-of-way located near Campbell Street and North 3rd Street. From 3rd Street to 7th Street, the existing terrain creates a trench, referred to as the gulch, where at one time freight and passenger tracks shared the right-of-way. From 3rd Street to King Street the proposed condition includes the trolley system and a multi-use trail as shown in Figure A.1.2 of the Appendix. This is consistent with the Gulch Greenway Master Plan currently underway which proposes a greenway in the existing freight rail right-of-way from 3rd Street to McRae Street. East from King Street, the trolley would share the corridor with the existing freight track and a proposed greenway as shown in Figure A.2.2. This proposed arrangement would be used for the remainder of the northern portion of the proposed alternative.

The easternmost point of the alignment is the existing freight turning wye near Kerr Avenue, where the rail transit system would turn west and continue towards the southern portion of downtown. This southern portion of the corridor from the wye to downtown is physically constrained with only 50 – 60 feet of right-of-way width, therefore, both the freight track and a rail transit cannot be accommodated. From the turning wye back to downtown, the proposed rail transit operates on the existing freight tracks and shares the right-of-way with a greenway. It is assumed that the existing tracks would be rehabilitated to provide better ride quality and service life for the transit system.

Once the corridor reaches downtown the rail transit would enter the existing roadway network and proceed to run in-street in shared travel lanes with traffic. The alignment could enter the in-street segment by turning north onto 5th Street with both tracks running down the center of 5th Street, then turning down Dawson Street and Wooster Street before turning to run north on 3rd Street. This alignment alternative would avoid truck traffic on 3rd Street between the Cape Fear Memorial Bridge and the Port. Another alternative is the alignment could continue through the freight corridor towards the Port until it reaches 3rd Street and heads north onto 3rd Street. These alternatives should be studied in more detail in future phases of design.

Once the alignment enters 3rd Street, it proceeds north to Campbell Street to the proposed site for the WMTC. The design of the WMTC would need to be modified to incorporate the connection between 3rd Street and the existing trench to complete the loop proposed in Alternative 1. The grade required to connect the trolley alignment from the surface of 3rd Street to the elevation of the freight corridor in the trench is approximately 5 percent per GIS elevations, which is within operating parameters for typical streetcar or trolley vehicles. This alignment alternative is shown in Figure A.9 of the Appendix.

For this study, the planned commuter rail and inter-city rail services were contemplated to be developed beyond the potential implementation date of the trolley system. If this alignment alternative is selected, a strategy for integration of all these services into the Gulch and WMTC will require further coordination.

4.2. Alternative #2: Downtown to Wye on Southside

This alternative begins in the existing freight right-of-way west of Kerr Avenue, near the Progress 910 apartment complex. It extends west to downtown Wilmington, enters 3rd Street and continues north on 3rd Street, terminating near Campbell Street and the proposed WMTC site. A map showing this alternative is presented in Figure A.10 of the Appendix.

4.3. Alternative #3: Downtown to UNCW on Southside

This alternative begins at University of North Carolina Wilmington (UNCW), just east of South College Road and Randall Parkway. The alignment operates in-street on Randall Parkway in the median and enters to the existing freight corridor near Marlboro Street. It then continues west to downtown Wilmington, runs in-street on 3rd Street in the median and terminates near Campbell Street and the proposed WMTC site. A map showing this alternative is presented in Figure A.11 of the Appendix.

4.4. Alternative #4: Downtown to UNCW on Northside

This alternative begins near Campbell Street proceeds through the proposed WTMC site into the existing freight right-of-way (trench), continues east to the existing wye (operating on the south side of the wye), turns south near Marlboro Street, turns east onto Randall Parkway and ends at UNCW just east of South College Road. A map showing this alternative is presented in Figure A.12 of the Appendix.

4.5. Alternative #5: North to UNCW and Downtown to Wye on Southside

This alternative is a combination of Alternative #2 and Alternative #4, these two lines would operate independently and would share a station near the Progress 910 apartment complex where passengers could transfer between the two systems. A map showing this alternative is presented in Figure A.13 of the Appendix.

5. Evaluation of Rail Transit Alternatives

The five proposed alternatives have been evaluated based on the following screening categories: mobility, development opportunities, project readiness and affordability. Screening 1 determined which alternatives provided the most benefit in terms of development opportunities and mobility. The top three ranking alternatives from Screening 1 were then further evaluated through Screening 2 to determine which alternative is has the least impacts with respect to affordability and project readiness.

Specific technical criteria were identified for each category and then measured with applicable data points. Data was collected from various sources including New Hanover County and City of Wilmington GIS data, 2010-2015 US Census American Community Survey, Environmental Systems Research Institute (ESRI), and Longitudinal Employer-Household Dynamics (LEHD). Detailed descriptions of each criteria are described below.

This comparison exercise utilized ¼-mile radius from the proposed station locations. It should be noted that this only incorporates a portion of the UNCW campus. Results for each criteria were then ranked from 1 to 3 (1 – low, 2 – medium, and 3 – high). These scores were then totaled to compare each alternative.

5.1. Screening 1

The evaluation criteria for Screening 1 is described below along with the opportunities that could be achieved by a rail transit system for each. For more information on the data analyzed and associated maps refer to the *Rail Alignment & Right-of-Way Alternatives Feasibility Study: Transit Benefit Analysis-Technical Report L*.

5.1.1 Mobility

Population Density

- **Measures**: Population density within a ¼-mile of radius of proposed stations.
- **Metric**: People/acre
- **Why it is important**: Measures opportunities to connect areas with population densities supportive of transit ridership.
- **Source**: U.S. Census 2010–2015 American Community Survey.

Employment Density

- **Measures:** Employment density within ¼-mile radius of proposed stations.
- **Metric:** Jobs/acre
- **Why it is important:** Measures opportunities to connect areas with employment densities supportive of transit ridership.
- **Source:** U.S. Census 2014 LEHD Origin-Destination Employment Statistics (LODES).

Transit Dependency (Vehicle Access)

- **Measures**: Households that do not own a vehicle within ¼ mile of proposed stations.
- **Metric**: Percent of total households.
- **Why it is important**: Measures opportunities to connect potential users who would benefit from transit due to limited vehicle access.
- **Source**: U.S. Census 2010–2015 American Community Survey.
- **Special note**: Since students living in a dorm are captured under group quarters, the percent of households without a vehicle does not reflect need by UNCW student. Logically, any alternative that connects to UNCW would have enhanced connection for students, some of who do not have a car on campus.

Low Income Households

- **Measures**: Households below poverty line within ¼ mile of proposed stations.
- **Metric**: Percent of total households.
- **Why it is important**: Measures opportunities to connect low-income households who would benefit from transit access due to enhanced transportation options.
- **Source**: U.S. Census 2010–2015 American Community Survey.

Proximity to Employment Anchors

- **Measures**: Employment centers within ¼ mile of proposed stations.
- **Metric**: Number of centers.
- **Why it is important**: Measures opportunities to connect major employment concentrations, potentially reducing personal vehicle usage for commuting.
- **Source**: U.S. Census 2014 LEHD Origin-Destination Employment Statistics (LODES).

Integration with Transit

- **Measures**: Connections with exiting bus systems and number of bike routes or greenways within ¼ mile of proposed stations.
- **Metric**: Number of bus routes and greenways/bike trails.
- **Why it is important**: Measures opportunities to connect with existing transit lines and alternative transportation modes, resulting in increased accessibility and a more efficient system.
- **Sources**: City of Wilmington; Wave Transit.

5.1.2 Development Opportunities

This category focuses on the transit project's potential to attract or catalyze real estate investment within the corridor. This is measured through opportunities for new development or redevelopment within a ¼-mile radius of proposed stations and potential support of transit-oriented development (TOD).

Opportunity Areas

- **Measures:** Areas defined by the City, through the Create Wilmington Comprehensive Plan, as key opportunity areas for development or redevelopment within ¼ mile of proposed stations.
- **Metric:** Acres
- **Why it is important:** Measures opportunities to connect areas identified through a publicly vetted process as having potential beyond what currently exists.

- **Source**: City of Wilmington

Future Mixed-use Centers/Neighborhood Nodes

- **Measures:** Mixed-use Centers and Neighborhood Nodes defined by the City of Wilmington within ¼ mile of proposed stations.
- **Metric:** Number of centers and nodes.
- **Why it is important:** Measures opportunities to connect centers/nodes that would support TOD patterns.
- **Source:** City of Wilmington.

Vacant Land

- **Measures**: Vacant properties within ¼ mile of proposed stations.
- **Metric**: Acres.
- **Why it is important**: Measures opportunities to leverage a new transit alignment to catalyze greenfield or infill development
- **Source**: New Hanover County tax parcel data.
- **Special Note**: Properties were identified as vacant if they had a building value of zero. A secondary review also removed properties that had no building value, but are not developable, such as cemeteries, parks, or areas with environmental constraints.

Underutilized Land

- **Measures**: Underutilized properties within ¼ mile of the proposed stations.
- **Metric**: Acres
- **Why it is important**: Measures opportunities to leverage a new transit alignment to catalyze infill development or redevelopment.
- **Source**: New Hanover County tax parcel data.
- **Special Note**: Properties were identified as underutilized when the building value is less than, or equal to, the land value. This analysis recognizes that there are opportunities beyond this simple equation. The criteria highlighting Opportunity Areas was included to further identify properties that offer additional potential.

Table 1: SCREENING 1 RESULTS TABLE

SCREENING 1		Loop		Downtown to Wye on Southside		Downtown to UNCW on Southside		Downtown to UNCW on Northside		Northside to UNCW and Downtown to Wye Southside	
CATEGORY	CRITERIA	ALTERNATIVE 1		ALTERNATIVE 2		ALTERNATIVE 3		ALTERNATIVE 4		ALTERNATIVE 5	
Mobility	Population Density	Low	1	Med	2	High	3	High	3	Med	2
	Employment Density	Med	2	High	3	High	3	Low	1	Med	2
	Transit Dependency (Vehicle Access)	Med	2	Med	2	Med	2	Low	1	Med	2
	Low Income Households	Low	1	High	3	High	3	Low	1	Med	2
	Proximity to Employment Anchors	Med	2	Low	1	Med	2	High	3	High	3
	Integration with Alternative Transit	High	3	Low	1	High	3	Low	1	High	3
MOBILITY SUBTOTAL		11		12		16		10		14	
Development Opportunities	Opportunity Areas	Med	2	Low	1	Med	2	Low	1	High	3
	Future Mixed Use Centers/Neighborhood Nodes	High	3	Low	1	Low	1	Low	1	High	3
	Underutilized Land	Med	2	Low	1	Med	2	Low	1	High	3
	Vacant Land	High	3	Low	1	Low	1	Low	1	High	3
DEVELOPMENT SUBTOTAL		10		4		6		4		12	
SCREENING 1 TOTAL		21		16		22		14		26	

5.2. Screening 2

Alternatives #1, #3, and #5 were the top ranked alternatives, and subsequently moved on to Screening 2 for further comparison. The results for Screening 2 are shown in Table 2.

5.2.1 Project Readiness

The overall likelihood of implementing the project in a short to mid-timeframe. This includes construction complexity, amount of time needed for agency coordination and stakeholder support and the implementation schedule.

One factor that contributes to readiness is coordination with CSXT as negotiations and agreements with freight railroads for use of right-of-way can be an extended and expensive process. Another issue affecting project readiness is interaction with proposed WMTC site. Any alternative that crosses the current recommended WMTC site will need to be revised to incorporate the proposed rail transit tracks while still accommodating the objectives of the current design. The grade difference between 3rd Street and the trench also contributes to construction complexity. Additionally, coordination with the NCDOT Rail Division regarding the planned passenger rail is a factor for these alternatives as well.

5.2.2 Affordability

This category measured the order of magnitude capital cost of construction. Since this measure is based on affordability, the higher the score the more affordable the alternative is (high score = low capital cost). This section details information on how the capital costs were estimated for each alternative.

The next step was to compare how well Alternatives #1, #3, and #5 scored on overall mobility and development from Screening #1 in relation to each other. Therefore, since Alternatives #3 and #5 scored the highest in the mobility category a score of three was given to each and a score of two was given to Alternative #1. The same logic was used for the development opportunities category, the overall results for both screenings are shown in Table 3.

Table 2: SCREENING 2 RESULTS TABLE

SCREENING 2		Loop		Downtown to UNCW on Southside		Northside to UNCW and Downtown to Wye Southside	
CATEGORY	CRITERIA	ALTERNATIVE 1		ALTERNATIVE 3		ALTERNATIVE 5	
Project Readiness	Overall Likelihood of Implementing the Project in a Shorter Timeframe	Low	1	Med	2	Low	1
Affordability	Overall Affordability of Order of Magnitude Total Capital Cost	Med	2	Low	3	High	1
SCREENING 2 TOTAL		3		5		2	

Table 3: ALTERNATIVES EVALUATION RESULTS TABLE

SCREENINGS 1 & 2	Loop	Downtown to UNCW on Southside	Northside to UNCW and Downtown to Wye Southside
	ALTERNATIVE 1	ALTERNATIVE 3	ALTERNATIVE 5
SCREENING 1 MOBILITY SUBTOTAL	2	3	3
SCREENING 1 DEVELOPMENT SUBTOTAL	3	2	3
SCREENING 2 TOTALS	3	5	2
EVALUATION TOTALS	8	10	8

6. Order of Magnitude Capital Cost Analysis

A high-level estimation of capital cost was performed to compare order of magnitude differences between alignment alternative #1, #3, and #5 for the affordability category in Screening 2. The major project elements examined are listed below. Each element was roughly quantified based on the assumptions for each alternative. The approximate unit costs were developed based on industry averages and experience on similar systems.

Major project elements examined included:

- **Guideway and Track**
  - New ballasted single track and guideway preparation
  - Embedded double track
  - Refurbish existing ballast freight track
  - Passing sidings
- **Stations**
  - In-street stations
  - Freight right-of-way stations
- **Maintenance Facility**
- **Site work and Special Conditions**
  - Roadway restoration (in-street)
  - Utility relocation (in-street)
  - Multi-use path (in-freight right-of-way)
- **Systems**
  - Traction power substations
  - Overhead wire (OCS)
  - Signal modifications
  - At-grade crossings
- **Vehicles**
- **Professional Services**
- **Contingency**

Guideway and track types vary throughout each alternative and individual costs were developed for each situation. In the northern portion of the freight corridor, a cost for new ballasted single track was applied. For the southern portion of the freight corridor, it is assumed that the existing ballasted freight track will need some repairs and improvements (tie or ballast replacement, tamping, etc.) therefore, a cost to refurbish the existing tracks was applied. The passing siding unit cost developed includes two turnouts (one at each end), 250 feet of ballasted track and an allowance for additional OCS infrastructure. It was assumed that two passing sidings will be required for the northern portion of the freight corridor and two for the southern portion as well to maintain the assumed 15-minute headways. For the in-street portions of the alignments, a cost was developed for double track embedded in a concrete guideway.

Two different station costs were used for either the in-street stations or the stations in the freight corridor. It was assumed that the stations in the freight corridor may require additional grading, drainage, and other civil improvements to provide access to these locations. The in-street stations are assumed to be at-grade, in the median between the tracks, and utilize the existing crosswalks at intersections for access. Both stations types include a 10-foot-wide by 40-foot-long concrete platform, with loading provided on both sides (dual loading) and a simple shelter for passengers.

All alternatives include an approximate cost for the construction of a new trolley maintenance building, yard and storage tracks. This maintenance facility includes storage tracks where the trolley vehicles would be stored during non-operational hours as well as a wash facility and track bays for trolley repairs, maintenance and inspection. It also includes office space, meeting rooms, locker rooms and parking for the transit operations personnel.

The site work costs include roadway reconstruction and utility relocation for the in-street portions of the alignments. These costs are based on similar in-street embedded transit systems in urban downtown environments. Also included is a 10-foot-wide, asphalt multi-use path that is proposed adjacent to the transit system in the freight corridor.

The elements of the electric power supply for the trolley include traction power substations, which convert the alternating (AC) electric power to direct current (DC) power. The DC power is then distributed by the overhead wires and collected by the trolley pole attached to the roof of the trolley vehicle. The overhead wire is supported by OCS poles that are located adjacent to the tracks.

The vehicle cost provided for the proposed systems is for a refurbished heritage trolley car. This assumes that a historic trolley car would be purchased and a vehicle manufacturer would make the modifications necessary for it to operate using modern technology and include modern amenities such as air conditioning and ADA accessibility. A calculation was performed to determine the number of vehicles that would be required in each fleet for Alternatives #1, #3 and #5. The calculation is based on high-level estimated system run times, assuming15-minute headways and a maximum vehicle speed of 25 miles per hour. The total number of vehicles for each alternative also includes a 20% increase to account for spare vehicles. It is estimated that Alternatives #1 and #3 would require 8 vehicles and Alternative #5 would require a fleet of 10 vehicles.

Professional services were added to account for the cost of items such as engineering, project and construction management, insurance, permitting, surveys, testing and inspections. Professional services were estimated at 30 percent of the total construction cost. Contingency costs were estimated at 35 percent of the professional services and construction costs combined. Contingency costs account for unforeseen conditions that arise during design and construction.

All the costs presented in the opinion of capital cost estimate are in current year (2017) dollars and should be escalated to the mid-year of construction date once identified. Cost for real estate, railroad right-of-way and track usage are not included in this estimate.

Table 4: ALTERNATIVE 1 ORDER OF MAGNITUDE CAPITAL COST ESTIMATE

ALTERNATIVE 1—LOOP					
Total Route Length: 8.44 Miles Total Track Length: 10.54 Miles Total Stops: 26					
ITEM #	ITEM	QUANTITY	UNIT	UNIT COST	SUBTOTAL
1	Ballasted Single Track & New Guideway Preparation	18,164	TF	$750	$13,623,000
2	Embedded Double Track	11,096	RF	$1,500	$16,644,000
3	Refurbish Existing Ballast Track	15,318	TF	$100	$1,531,800
4	Passing Sidings	4	Each	$437,500	$1,750,000
5	Signal Modifications (In-Street)	11	Each	$75,000	$825,000
6	At-Grade Crossings	25	Each	$50,000	$1,250,000
7	Stations (In-Street)	10	Each	$75,000	$750,000
8	Stations (Freight ROW)	16	Each	$100,000	$1,600,000
9	Maintenance Facility	1	Each	$4,000,000	$4,000,000
10	Roadway Restoration (In Street)	11,093	RF	$250	$2,773,250
11	Utility Relocation (In Street)	11,093	RF	$300	$3,327,900
12	Multi-use Path	33,480	LF	$100	$3,348,000
13	Systems (Traction Power, OCS, Fare Collection)	8.44	MI	$2,000,000	$16,885,606
14	Vehicles	8	Each	$2,000,000	$16,000,000
15	Professional Services	30% of Items 1-14			$25,292,567
16	Contingency	35% of Items 1-15			$38,360,393
ALTERNATIVE 1 TOTAL:					$148,000,000
CAPITAL COST PER ROUTE MILE:					$17,600,000

Table 5: ALTERNATIVE 3 ORDER OF MAGNITUDE CAPITAL COST ESTIMATE

ALTERNATIVE 3—DOWNTOWN TO UNCW ON SOUTHSIDE					
Total Route Length: 6.66 Miles Total Track Length: 9.73 Miles Total Stops: 25					
ITEM #	ITEM	QUANTITY	UNIT	UNIT COST	SUB-TOTAL
1	Ballasted Single Track & New Guideway Preparation	0	TF	$750	$0
2	Embedded Double Track	16,222	RF	$1,500	$24,333,000
3	Refurbish Existing Ballast Track	18,918	TF	$100	$1,891,800
4	Passing Sidings	2	Each	$437,500	$875,000
5	Signal Modifications (In-Street)	14	Each	$75,000	$1,050,000
6	At-Grade Crossings	17	Each	$50,000	$850,000
7	Stations (In-Street)	14	Each	$75,000	$1,050,000
8	Stations (Freight ROW)	11	Each	$100,000	$1,100,000
9	Maintenance Facility	1	Each	$4,000,000	$4,000,000
10	Roadway Restoration (In Street)	19,821	RF	$250	$4,955,250
11	Utility Relocation (In Street)	19,821	RF	$300	$5,946,300
12	Multi-use Path	11,040	LF	$100	$1,104,000
13	Systems (Traction Power, OCS, Fare Collection)	6.66	MI	$2,000,000	$13,310,606
14	Vehicles	8	Each	$2,000,000	$16,000,000
15	Professional Services	30% of Items 1 – 14			$22,939,787
16	Contingency	35% of Items 1 – 15			$34,792,010
		ALTERNATIVE 3 TOTAL:			**$134,200,000**
	CAPITAL COST PER ROUTE MILE:				**$20,200,000**

Table 6: ALTERNATIVE 5 ORDER OF MAGNITUDE CAPITAL COST ESTIMATE

ALTERNATIVE 5—NORTHSIDE TO UNCW & DOWNTOWN TO WYE SOUTHSIDE					
Total Route Length: 10.04 Miles Total Track Length: 13.11 Miles Total Stops: 33					
ITEM #	ITEM	QUANTITY	UNIT	UNIT COST	SUB-TOTAL
1	Ballasted Single Track & New Guideway Preparation	21,050	TF	$750	$15,787,500
2	Embedded Double Track	16,222	RF	$1,500	$24,333,000
3	Refurbish Existing Ballast Track	15,729	TF	$100	$1,572,900
4	Passing Sidings	4	Each	$437,500	$1,750,000
5	Signal Modifications (In-Street)	14	Each	$75,000	$1,050,000
6	At-Grade Crossings	25	Each	$50,000	$1,250,000
7	Stations (In-Street)	14	Each	$75,000	$1,050,000
8	Stations (Freight ROW)	19	Each	$100,000	$1,900,000
9	Maintenance Facility	1	Each	$4,000,000	$4,000,000
10	Roadway Restoration (In Street)	19,821	RF	$250	$4,955,250
11	Utility Relocation (In Street)	19,821	RF	$300	$5,946,300
12	Multi-use Path	36,779	LF	$100	$3,677,900
13	Systems (Traction Power, OCS, Fare Collection)	10.04	MI	$2,000,000	$20,076,136
14	Vehicles	10	Each	$2,000,000	$20,000,000
15	Professional Services	30% of Items 1 – 14			$32,204,696
16	Contingency	35% of Items 1 – 15			$48,843,789
		ALTERNATIVE 5 TOTAL:			$188,400,000
	CAPITAL COST PER ROUTE MILE:				$18,800,000

Table 7: ORDER OF MAGNITUDE CAPITAL COST ESTIMATES SUMMARY

CAPITAL COST ESTIMATES SUMMARY			
ALTERNATIVE	ORDER OF MAGNITUDE CAPITAL COST (MILLIONS)	COST PER MILE (MILLIONS)	TOTAL ROUTE (MILES)
Alt 1: The Loop	$148M	$17.6M	8.44
Alt. 3: Downtown to UNCW on Southside	$134M	$20.2M	6.66
Alt. 5: Northside to UNCW & Downtown to Wye Southside	$188M	$18.8M	10.04

7. Recommended Alternative

Based on the evaluation of alternatives, the alignment recommended for further study is Alignment Alternative #3 – Downtown to UNCW on the Southside. This alterative maximizes the benefits of development and mobility while minimizing impacts regarding costs and project readiness. This alternative provides a vital link between downtown and the UNCW campus.

8. Transit System Considerations

8.1. Maintenance Facility

A maintenance facility will be required to service and store the vehicles. The facility is typically located adjacent to the alignment and, ideally, in an industrially zoned area. A facility building with two or three service bays where routine and light maintenance can be performed will be needed. An administration building and an operation center are usually co-located at the site. Employee parking and transit vehicle storage are usually provided outside.

A site location for a vehicle maintenance facility was not identified as part of the scope of this study. However, there appear to be several feasible sites in the industrial areas adjacent to the alignment. For development of the opinion of probable cost, a maintenance facility was assumed on a two-acre site that can accommodate six trolley vehicles.

8.2. At-Grade Crossings

Due to the large number of significant variables to be considered, no single standard system of traffic control devices is universally applicable for all roadway-rail grade crossings. The appropriate traffic control system used at a roadway-rail grade crossing should be determined by an engineering study involving NCDOT, the City, the Wilmington Urban Area Metropolitan Planning Organization (WMPO) and Wave Transit.

Per the *Manual on Uniform Traffic Control Devices* (MUTCD), an active grade crossing warning system is one which includes flashing-light signals, with or without warning gates, together with the necessary control equipment used to inform road users of the approach or presence of rail traffic at grade crossings. A passive grade crossing is one at which the traffic control devises consists entirely of signs and/or marking and none of the automatic traffic control devices associated with active grade crossing warning systems. For existing at-grade crossing locations see Figure A.8 of the Appendix.

For recommended Alternative #3 there are currently 22 existing at-grade roadway crossings and an additional 4 proposed for the extension to UNCW. For this study, the existing at-grade crossings along the route for Alterative #3 were examined and a strategy was determined based on the USDOT Grade Crossing Handbook and APTA Grade Crossing Standards. Based on the preliminary examination, it was assumed all at-grade crossings would utilize some form of active warning devices as defined by MUTCD. A full

diagnostic team review involving State Safety Oversight will ultimately be required to confirm the approach for each at-grade crossing as the project proceeds through design and into implementation. The assumed design stated here represents a reasonable approach that is consistent with other projects in the US. The proposed improvements included in the adopted *Wilmington Traffic Separation Study (February 2017)* would need to be coordinated with the proposed design as well.

At-grade crossings that currently have crossing gates should be preserved and brought to current standards, these locations are listed below. Timings and detection must be adjusted to allow for the anticipated trolley vehicle frequency and operating speeds. Provisions for bicycles and pedestrians at each crossing should be confirmed with MUTCD and TCRP 17, 69, and 175 guidance and standards.

Existing gated crossing locations:

- 3rd Street
- Marstellar Street
- 16th Street
- 17th Street
- Oleander Drive
- Wrightsville Avenue
- Covil Avenue

At 15-minute headways, with trolley vehicles traveling in both directions, there would be 8 trains per hour (4 in each direction). This means that gates would be dropped or traffic would be stopped using other warning devices/signals roughly every 7 ½ minutes for 30 – 45 seconds based on operating speed. Detailed traffic impact analysis will be required to determine the impacts as part of future phases of design.

When transit speeds are below 35 mph, at-grade crossings may utilize flashers, signs and markings, and not require gates depending on results from the diagnostic team review. The maximum operating speed envisioned for the recommended Alternative #3 is 25 mph, so this would need to be studied in greater detail to determine which locations may use other active warning devices without gates.

Locations with existing flasher devices only are assumed to be preserved, brought to current standards and adjusted to accommodate the anticipated trolley vehicle frequency and operating speeds.

Existing at-grade crossings with flashers only:

- 4th Street
- 5th Street
- 10th Street
- 13th Street
- Colonial Drive
- Forest Hills Drive
- Mercer Avenue

Passive at-grade crossings are assumed to be modified to active at-grade crossings with or without gates depending on the results of the diagnostic review.

Existing passive at-grade crossings with signs and markings only:

- Colwell Avenue
- 12th Street
- 9th Street
- 8th Street
- 7th Street
- 6th Street
- Martin Street and Hooper Street
- Martin Street and 6th Street

Proposed new at-grade crossing for Alternative #3:

- Emerson Street
- Randall Parkway
- S. Kerr Avenue
- S. College Road

The location where the proposed trolley system enters Randall Parkway would require a signalized intersection due to the exclusive transit movement required. Additionally, the movement required for the trolley to enter the in-street segment at 5th Street or 3rd Street will likely require signal modifications in order to give the trolley an exclusive signal phase. For normal in-street operation, the trolley will operate under the same requirements as normal vehicular traffic, obeying traffic signals or four-way stops at intersections.

8.3. Off-Wire Technology Considerations

Although OCS is the most common and reliable method of power distribution, developing technology offers new options. Technology advances driven by the need for energy savings, combined with the desire to eliminate the visual impact of overhead wires in certain areas, have led to the development of "off-wire capable" vehicles. This term refers to a vehicle that can operate from traditional OCS as well as utilize an internal power supply periodically. The segments of off-wire operation are accomplished through some form of on-board energy storage inside the vehicle itself. Currently, on-board batteries and/or super-capacitors are the most common energy storage devices. The size and requirements of the on-board energy storage vary depending on the needs of the vehicle.

Off-wire technology could be a consideration in areas such as downtown Wilmington where the visual impact of overhead wires may be undesirable. However, the cost implications for adding this capability to the vehicles would need to be further analyzed. While there is a cost savings from eliminating the OCS poles and wire, there is also a cost increase for modifying the vehicle to operate using the on-board energy as well as creating a space to store the on-board energy supply.

8.4. Passenger Rail Interface

All project alignment alternatives leave open the option for future passenger rail service. . According to the Transit Needs Study for the Wilmington Multi-Modal Transportation Center Final Report (May 2009) both inter-city and commuter rail service are accommodated in the proposed WMTC design. Coordination with NCDOT Rail Division will be important as the City and Cape Fear Transit Authority work to utilize the WMTC site to its greatest potential. Access between the WMTC site and the trolley system proposed in the recommended Alternative #3 would be accommodated via the in-street stop proposed on 3rd Street near Campbell Street.

8.5. Greenway Interface

The proposed multi-use path adjacent to the transit system throughout the freight right-of-way logically could interface with the existing and proposed greenway system and extend access to the transit system. The *2013 Wilmington/New Hanover County Comprehensive Greenway Plan* shows several locations where the proposed multi-use path and the proposed greenway could intersect and connections provided. One connection to the existing system could be where the River to Sea Bikeway intersects the CSXT right-of-way on the south side between Oleander Drive and Wrightsville Avenue. A trail connection is also proposed at the proposed WMTC site which could be incorporated into the design with the trolley system as well.

9. Transit System Implementation

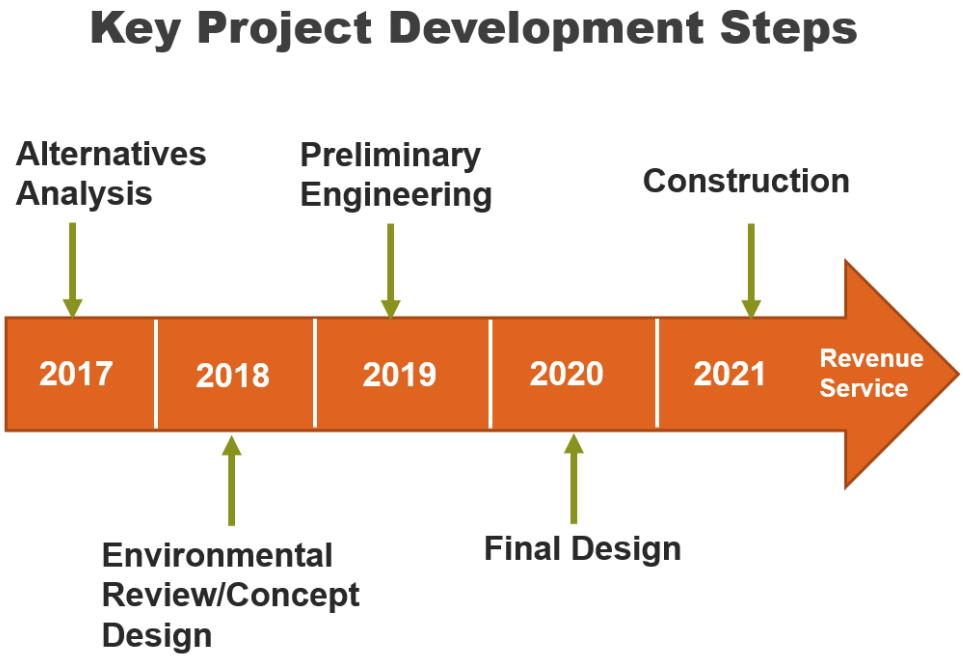
9.1. Implementation Schedule

The next steps needed to pursue implementing a rail transit system in Wilmington include:

1. Develop a funding plan
2. Complete an alternatives analysis
3. Complete preliminary design
4. Execute agreements for transfer of right-of-way with CSXT
5. Complete final design and obtain property
6. Procure vehicles
7. Begin construction

A feasible timeline for these steps is shown in Figure 9. The following timeline is predicated on the freight realignment occurring prior to 2021. Changes to the freight realignment schedule will require similar changes to this timeline. Construction of the trolley system can begin once freight rail service is relocated. Advance project development and design can occur in anticipation of the freight realignment service date.

Figure 9: KEY PROJECT DEVELOPMENT TIMELINE FOR TRANSIT



Appendix

Appendix Figures

Figure A.1.1: EXISTING CONDITION FOR TRENCH FROM 3RD STREET TO KING STREET SECTION

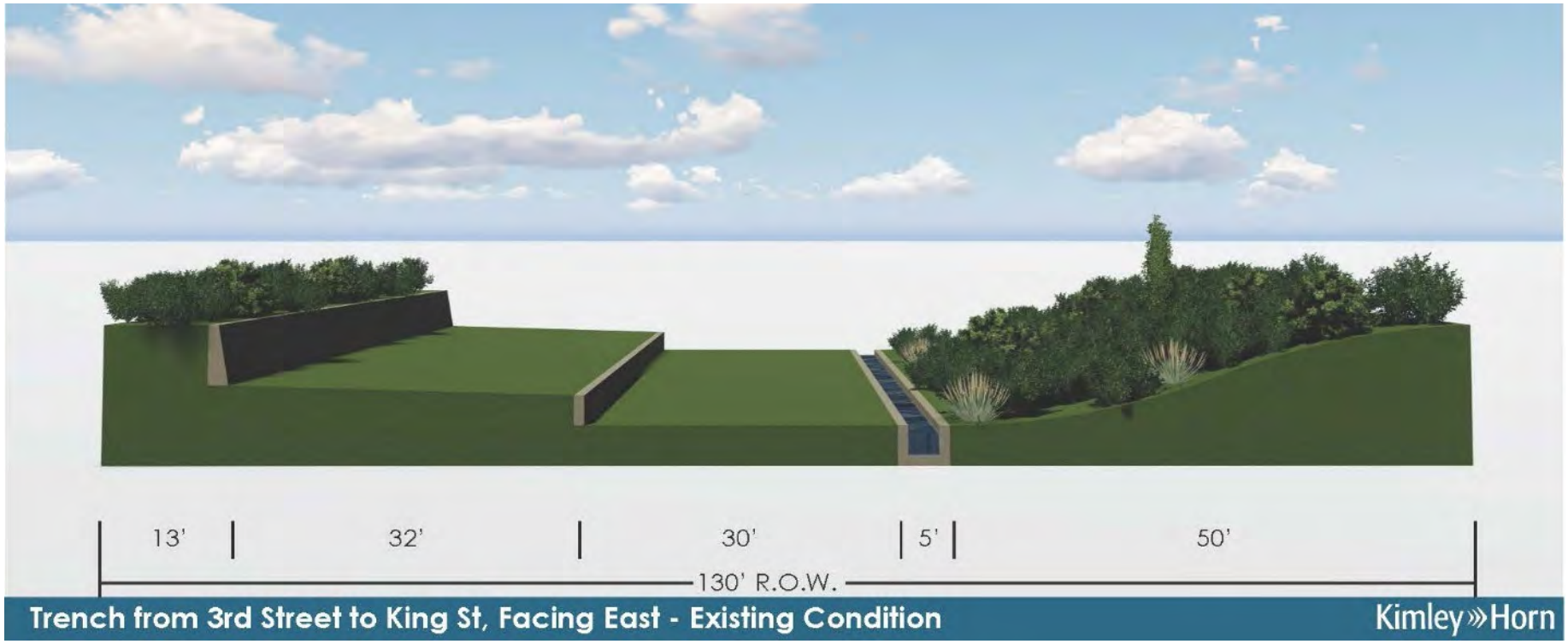


Figure A.1.2: PROPOSED CONDITION FOR TRENCH FROM 3RD STREET TO KING STREET SECTION

Figure A.2.1: EXISTING CONDITION FOR NORTHERN SECTION OF FREIGHT CORRIDOR, FACING EAST

Figure A.2.2: PROPOSED CONDITION FOR NORTHERN SECTION OF FREIGHT CORRIDOR, FACING EAST

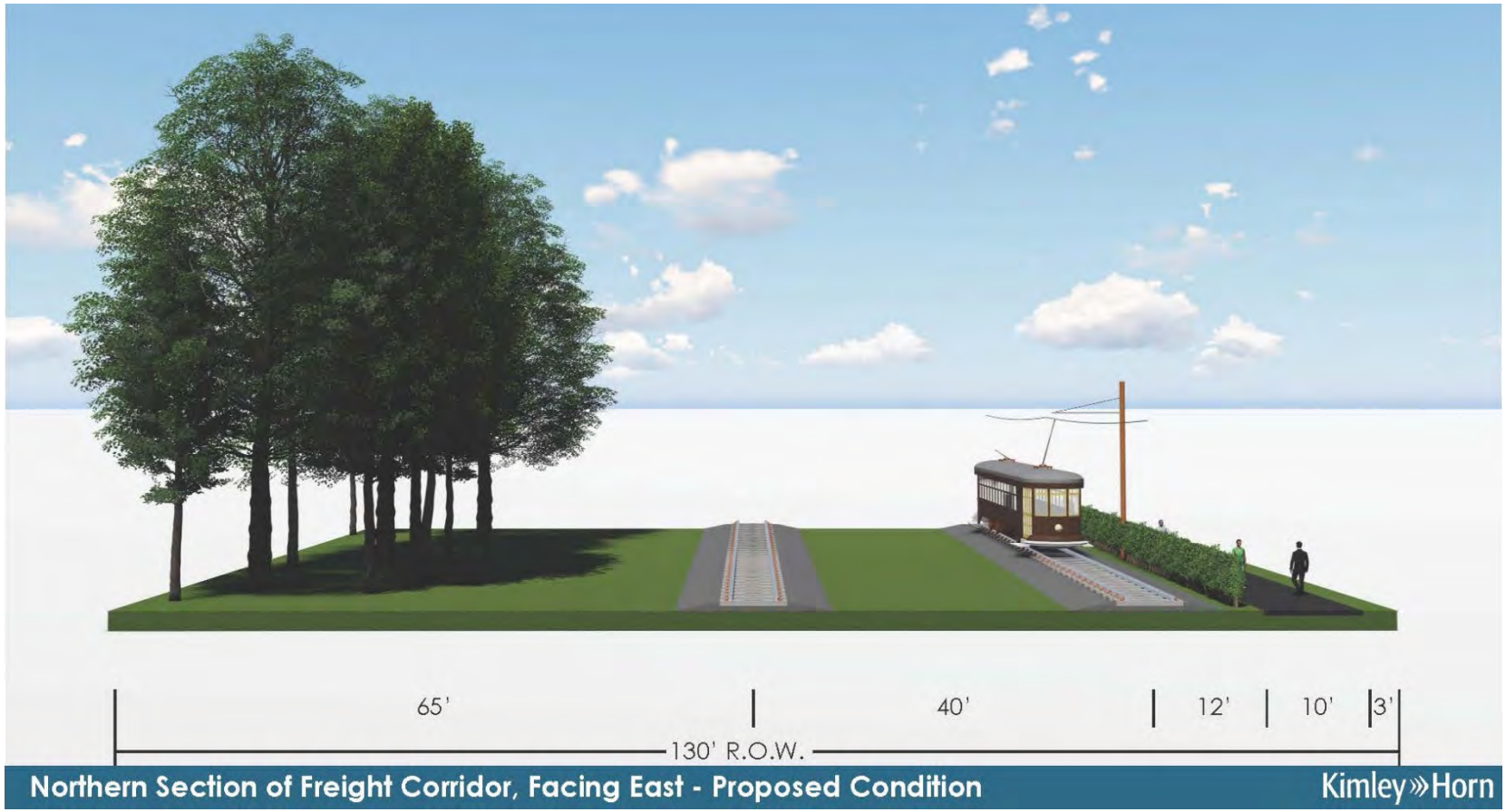


Figure A.3.1: EXISTING CONDITION FOR SOUTHERN SECTION OF FREIGHT CORRIDOR SECTION

Figure A.3.2: PROPOSED CONDITION FOR SOUTHERN SECTION OF FREIGHT CORRIDOR SECTION

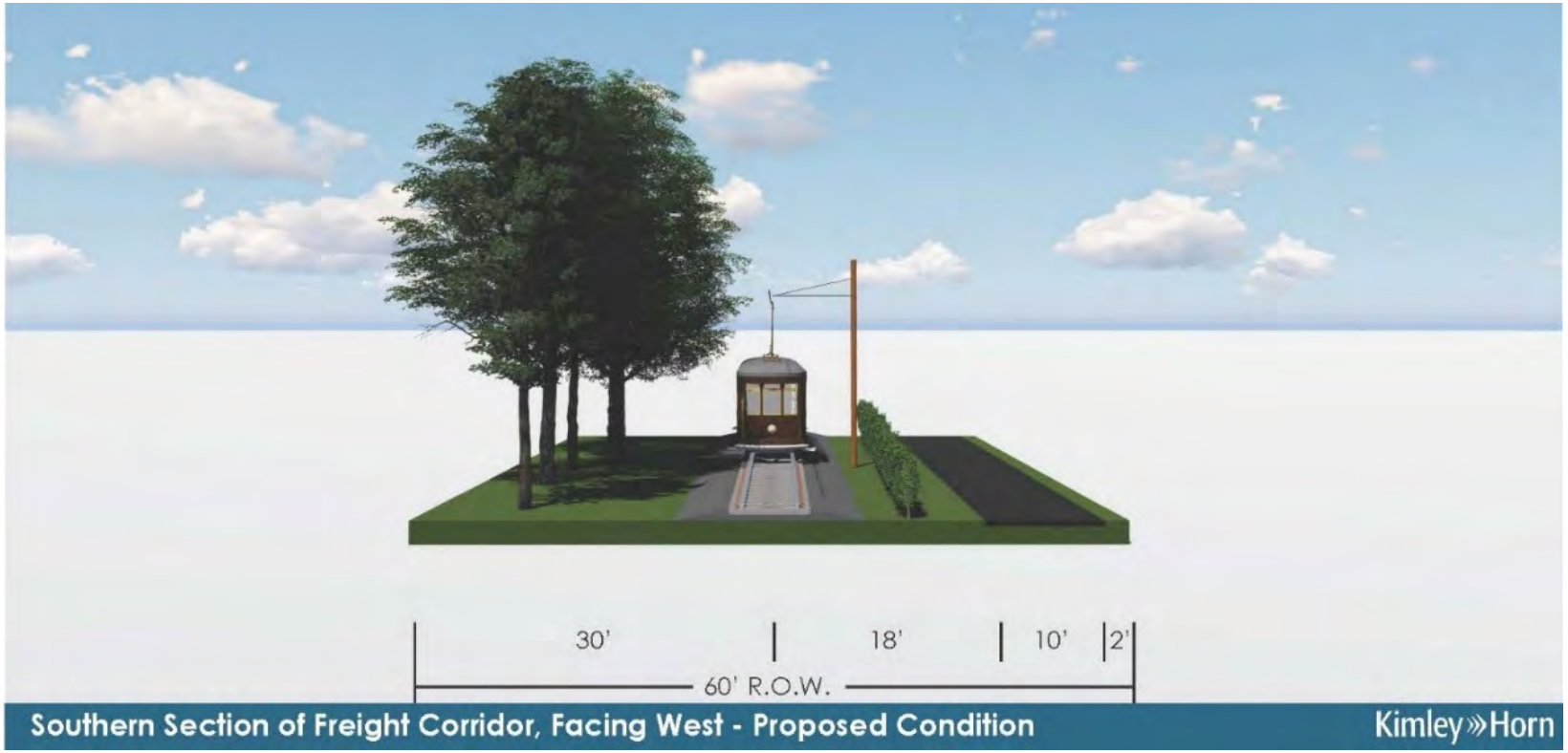


Figure A.4.1: EXISTING CONDITION FOR 3RD STREET BETWEEN MARKET AND CAMPBELL, FACING NORTH

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Figure A.5.1: EXISTING CONDITION FOR 3RD STREET SOUTH OF MARKET STREET SECTION

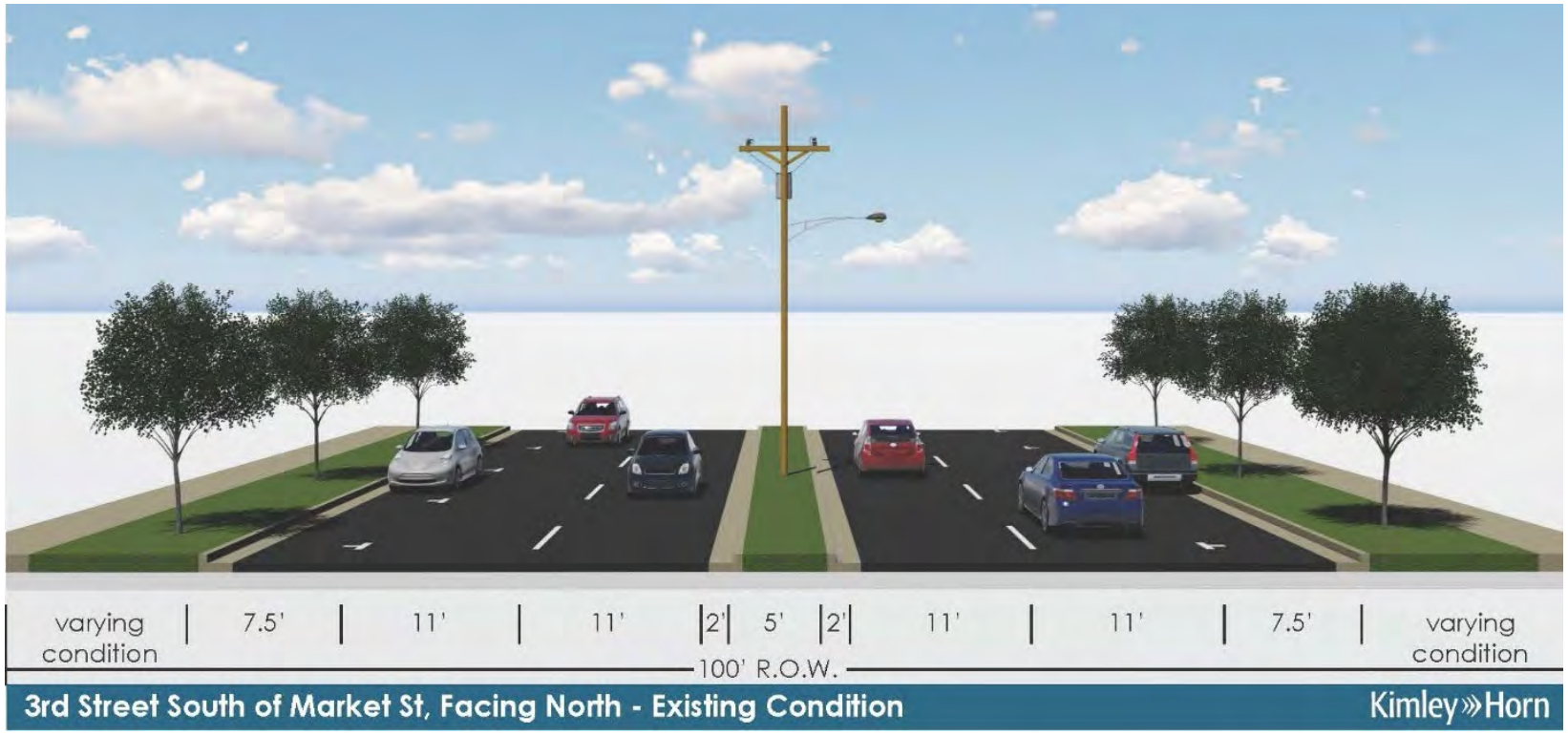


Figure A.5.2: PROPOSED CONDITION FOR 3RD STREET SOUTH OF MARKET STREET SECTION

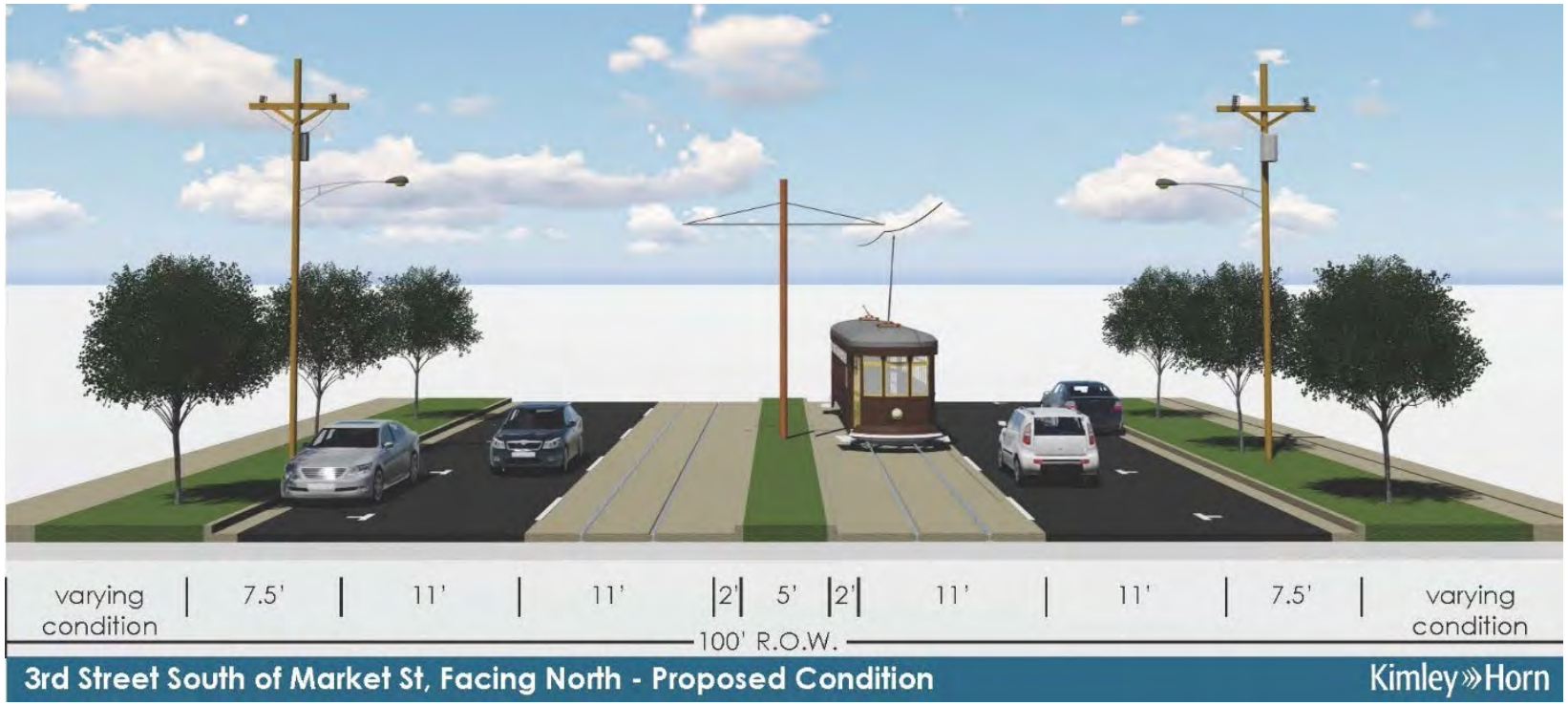


Figure A.6.1: EXISTING CONDITION FOR RANDALL PARKWAY EXTENSION TO UNCW SECTION

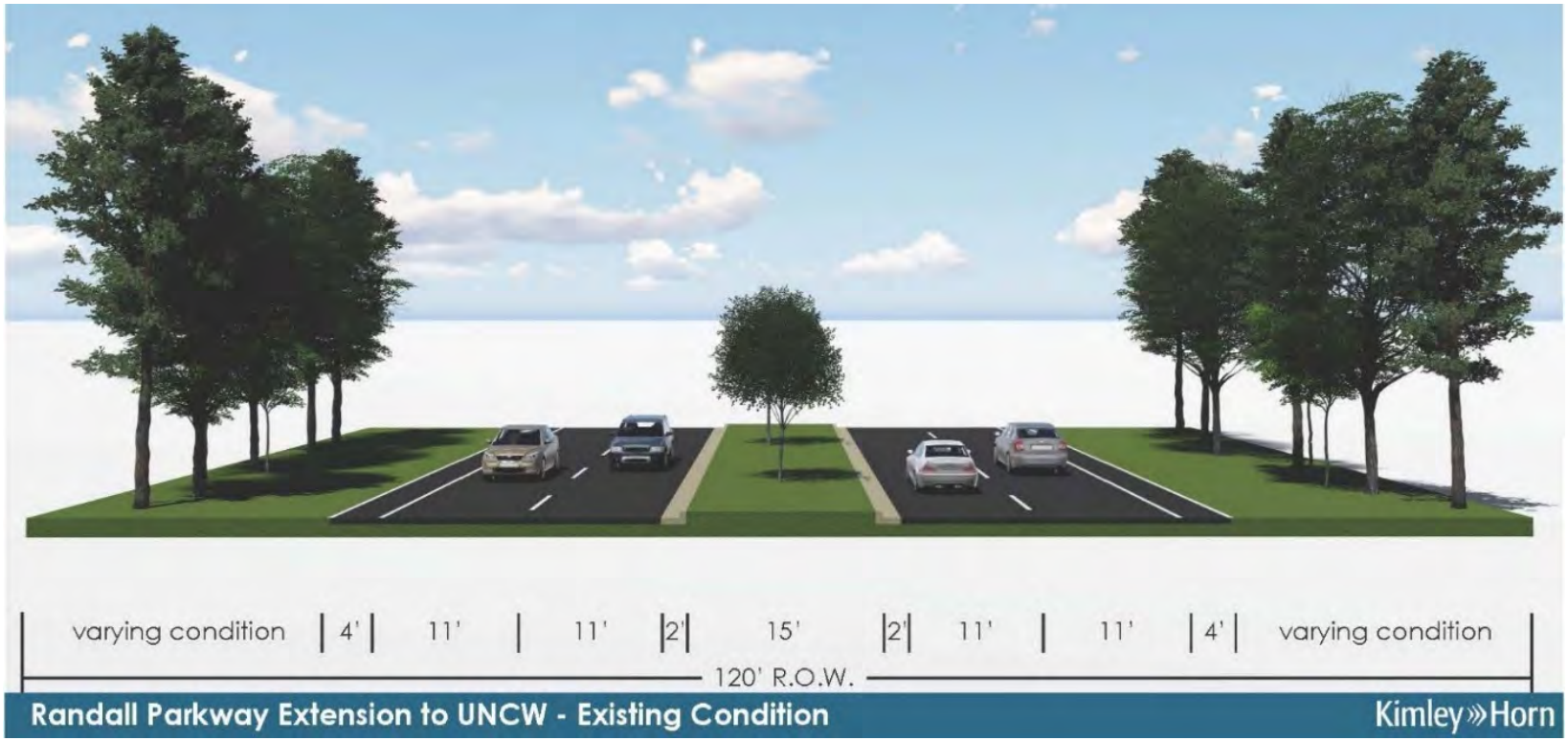


Figure A.6.2: PROPOSED CONDITION FOR RANDALL PARKWAY EXTENSION TO UNCW SECTION

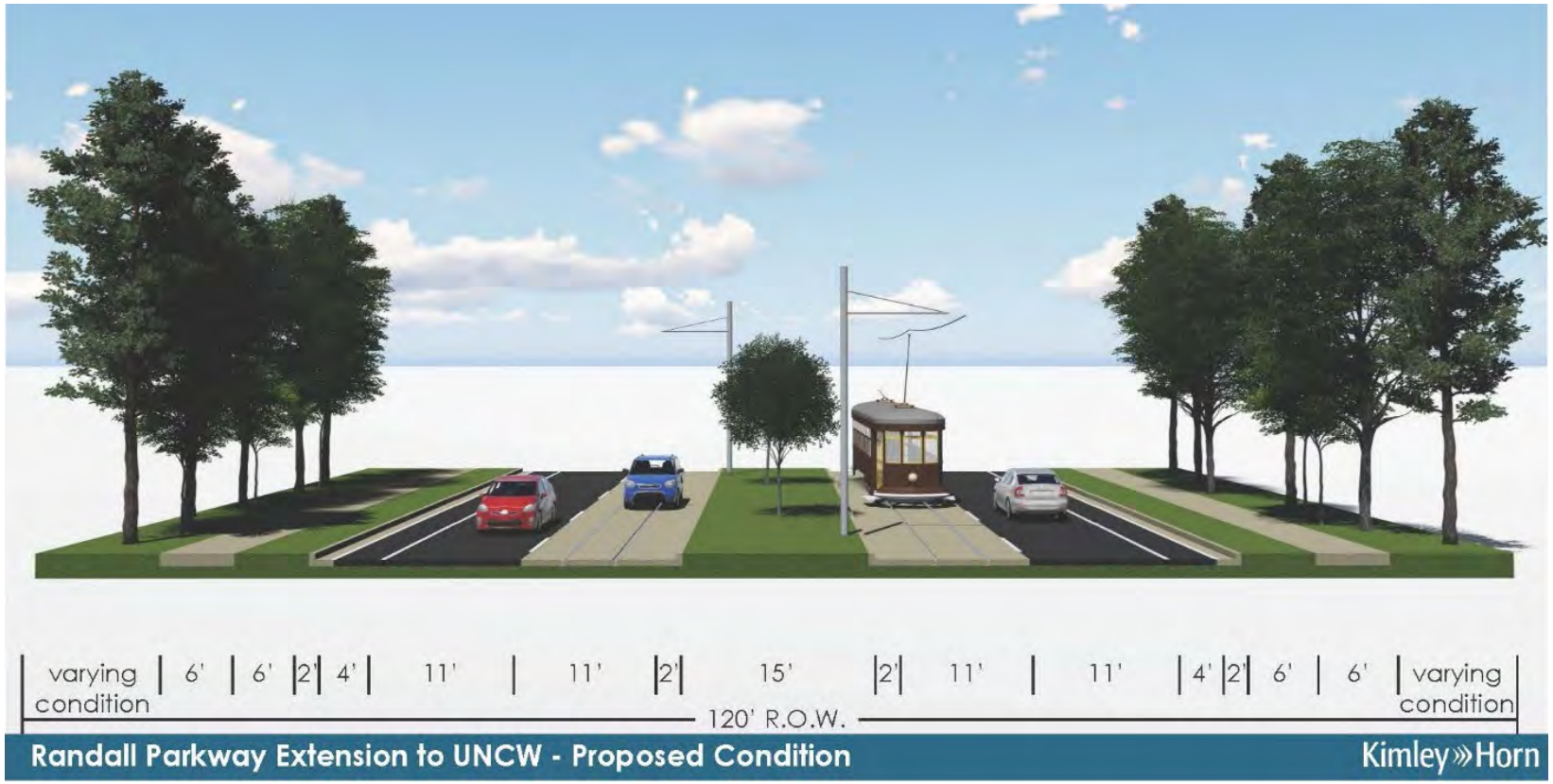


Figure A.7: PROPOSED IN-STREET STATION LAYOUT

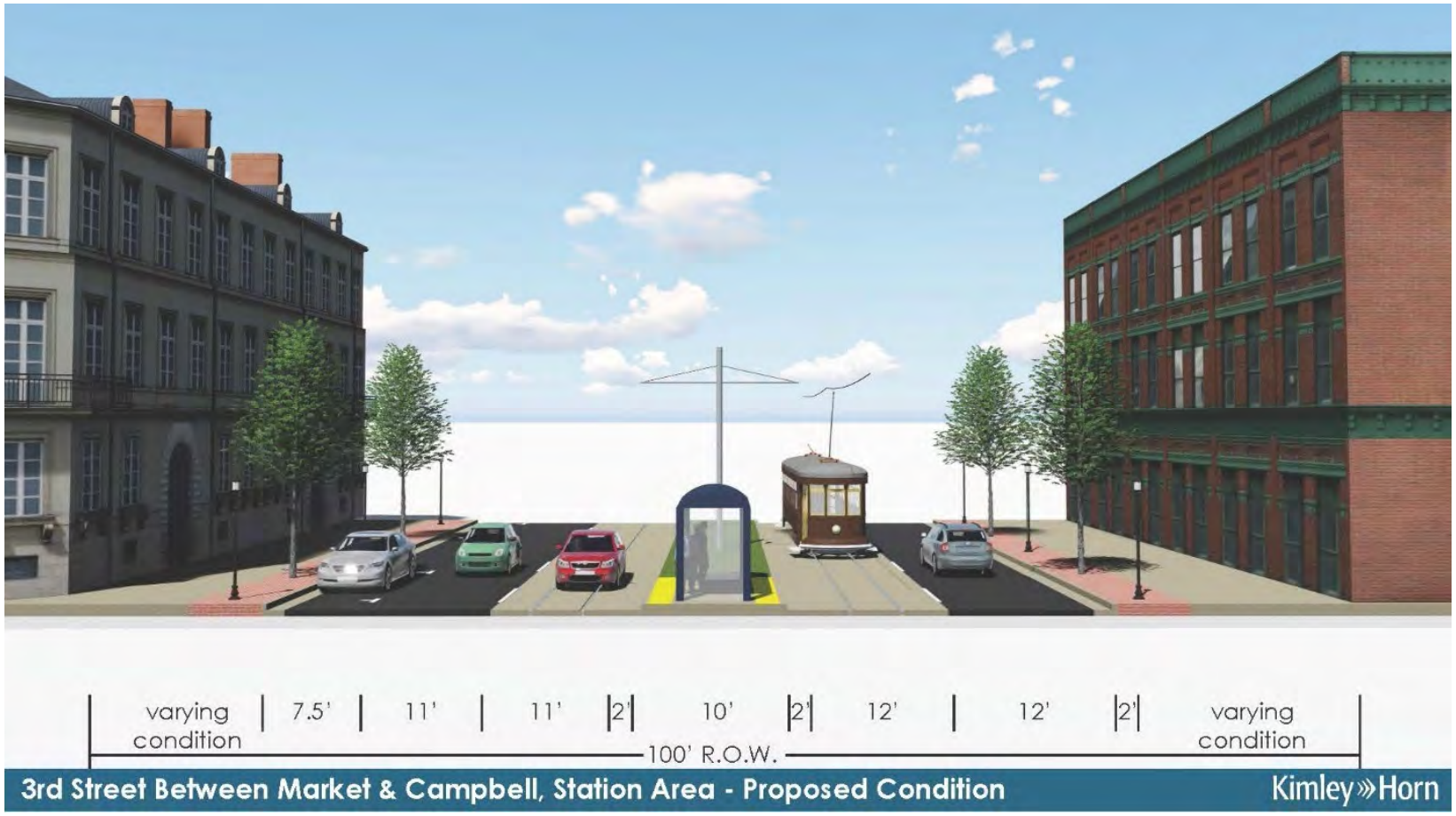


Figure A.8: EXISTING CONDITIONS MAP

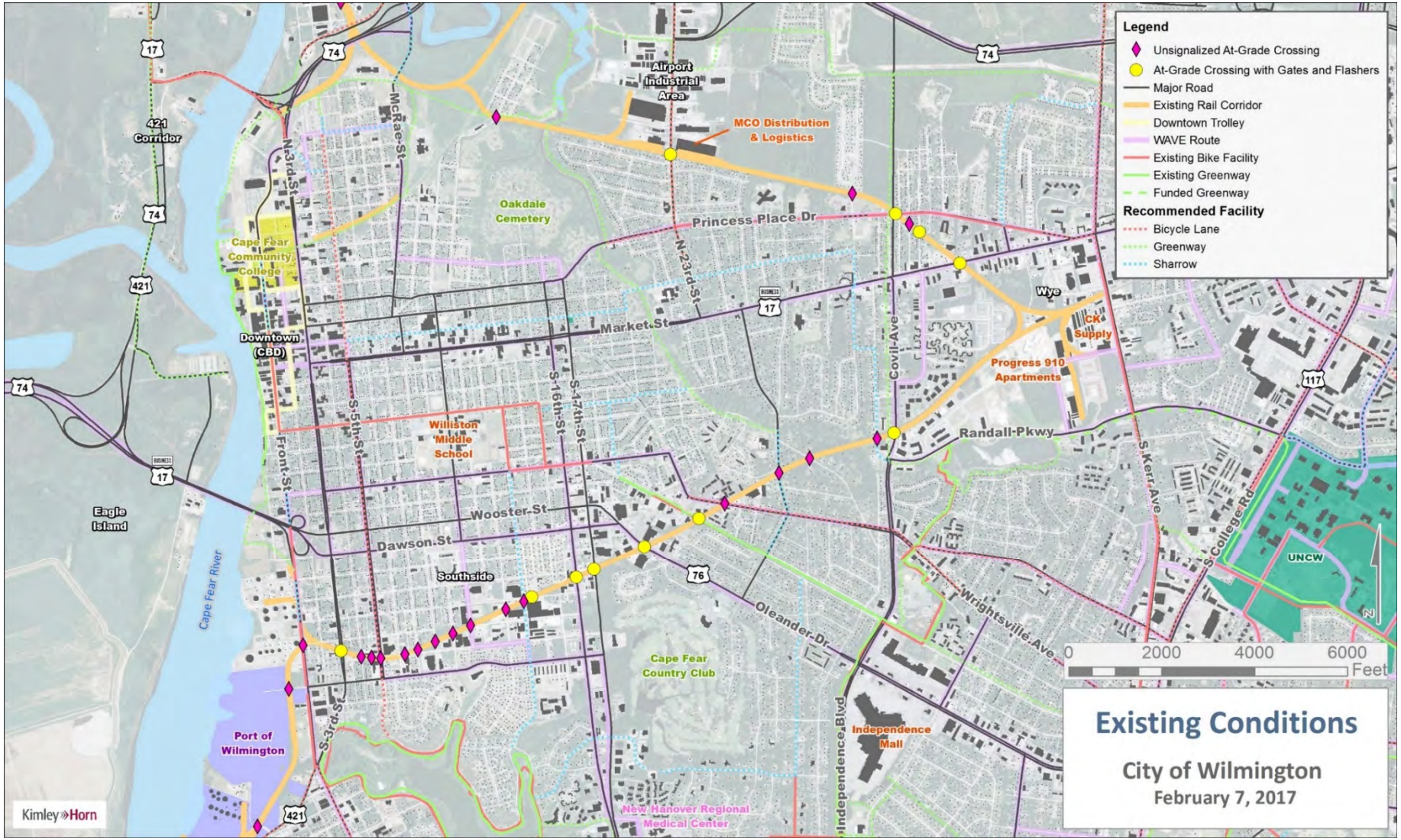


Figure A.9: ALTERNATIVE 1 ALIGNMENT MAP

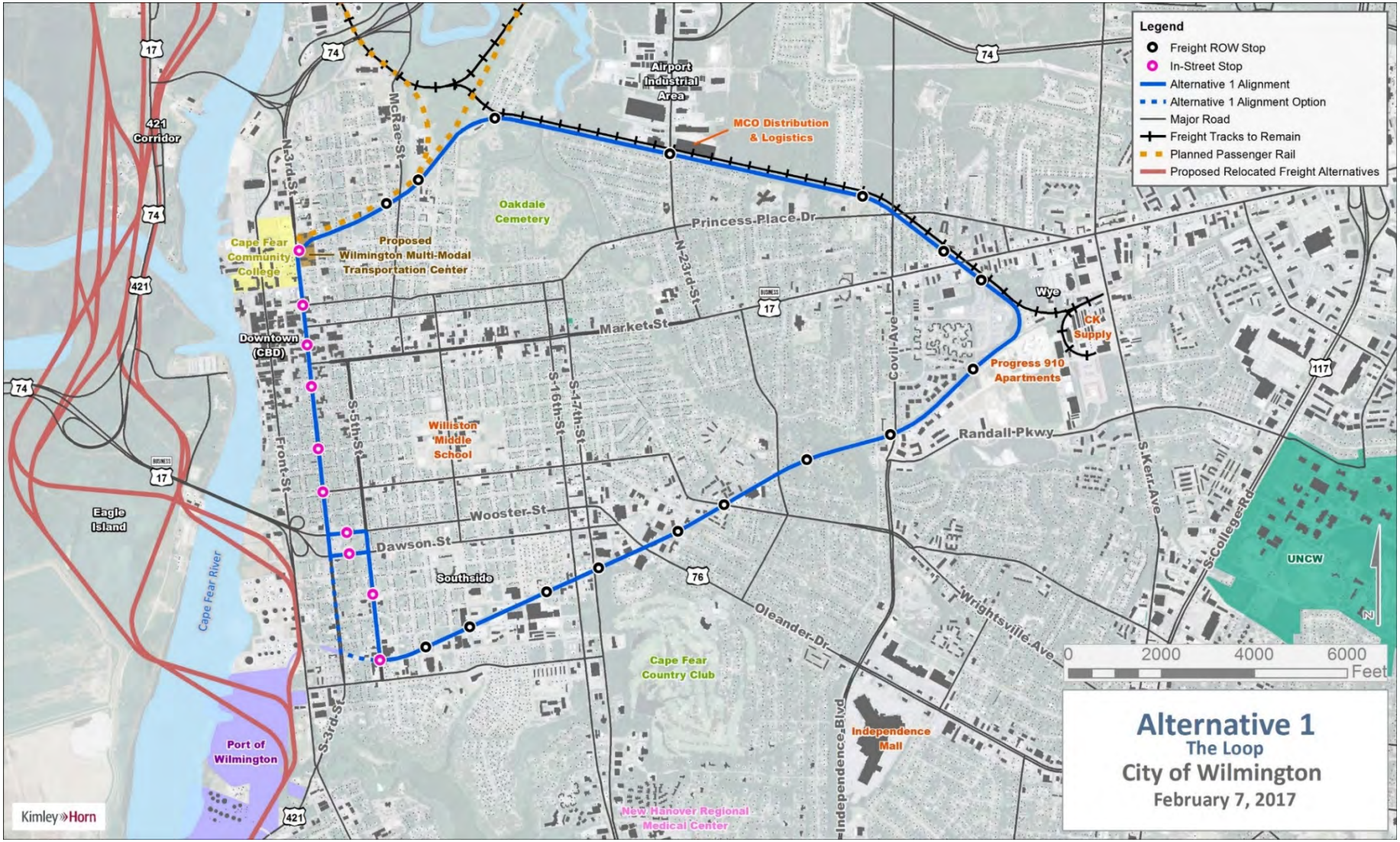


Figure A.10: ALTERNATIVE 2 ALIGNMENT MAP

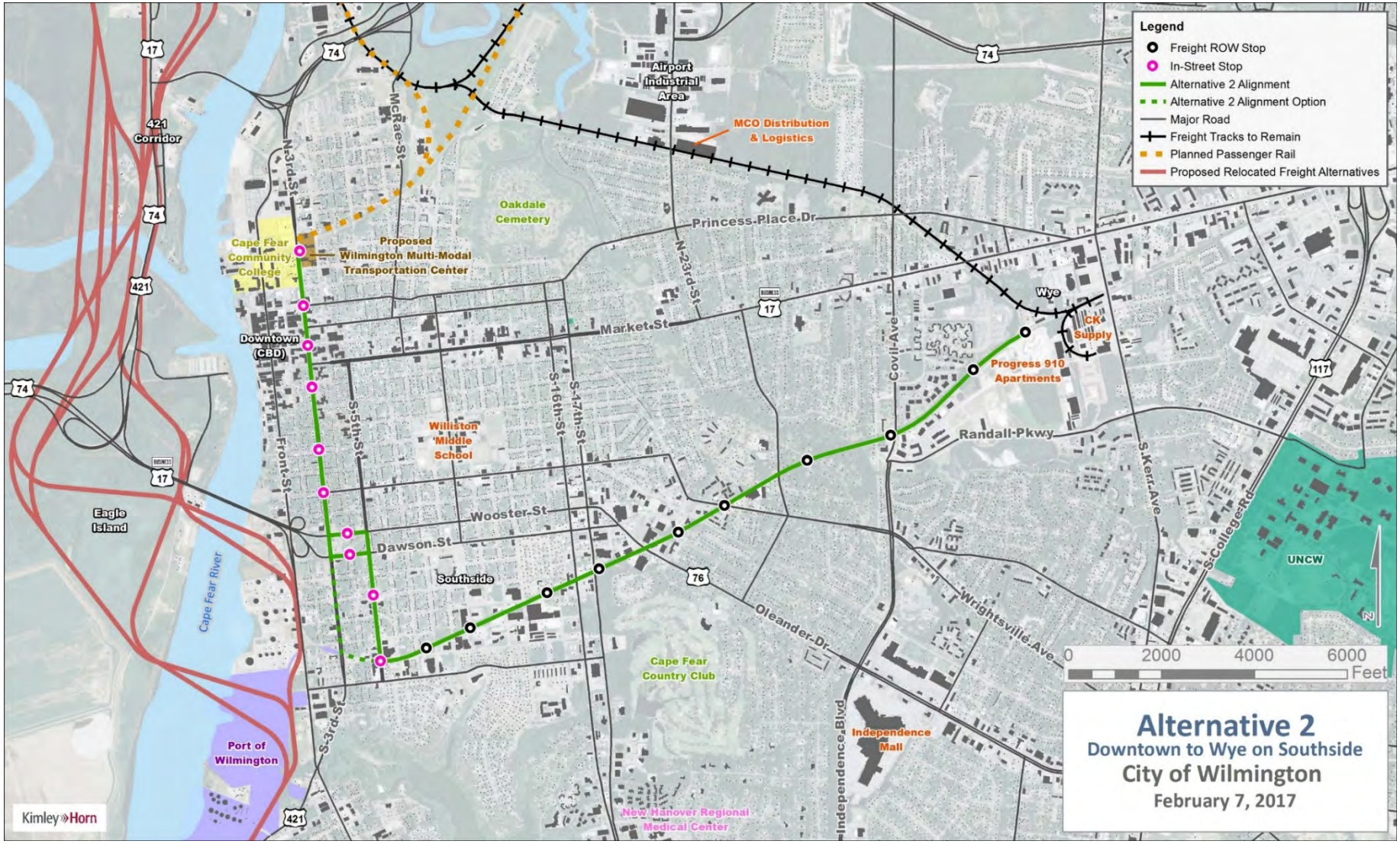


Figure A.11: ALTERNATIVE 3 ALIGNMENT MAP

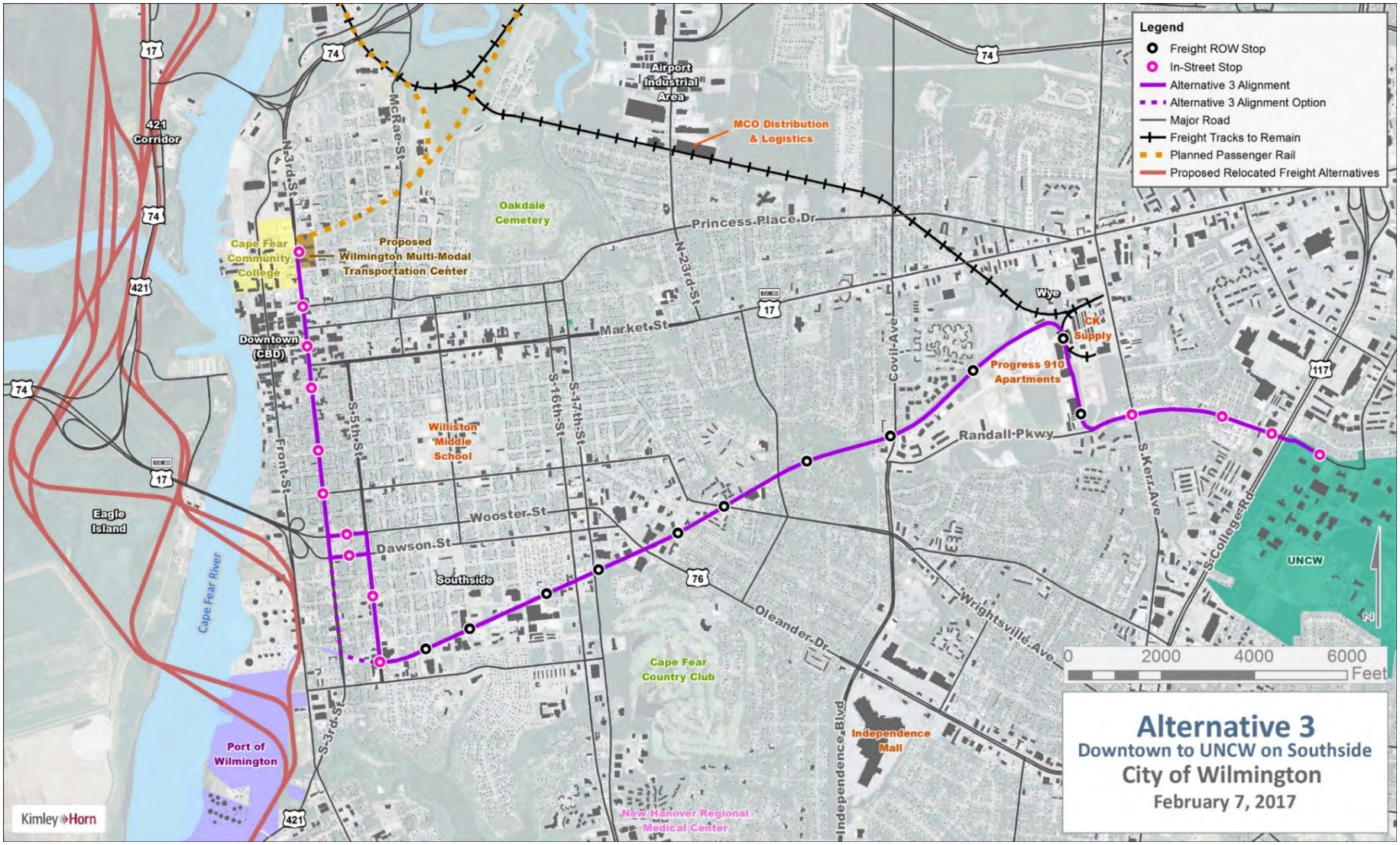


Figure A.12: ALTERNATIVE 4 ALIGNMENT MAP

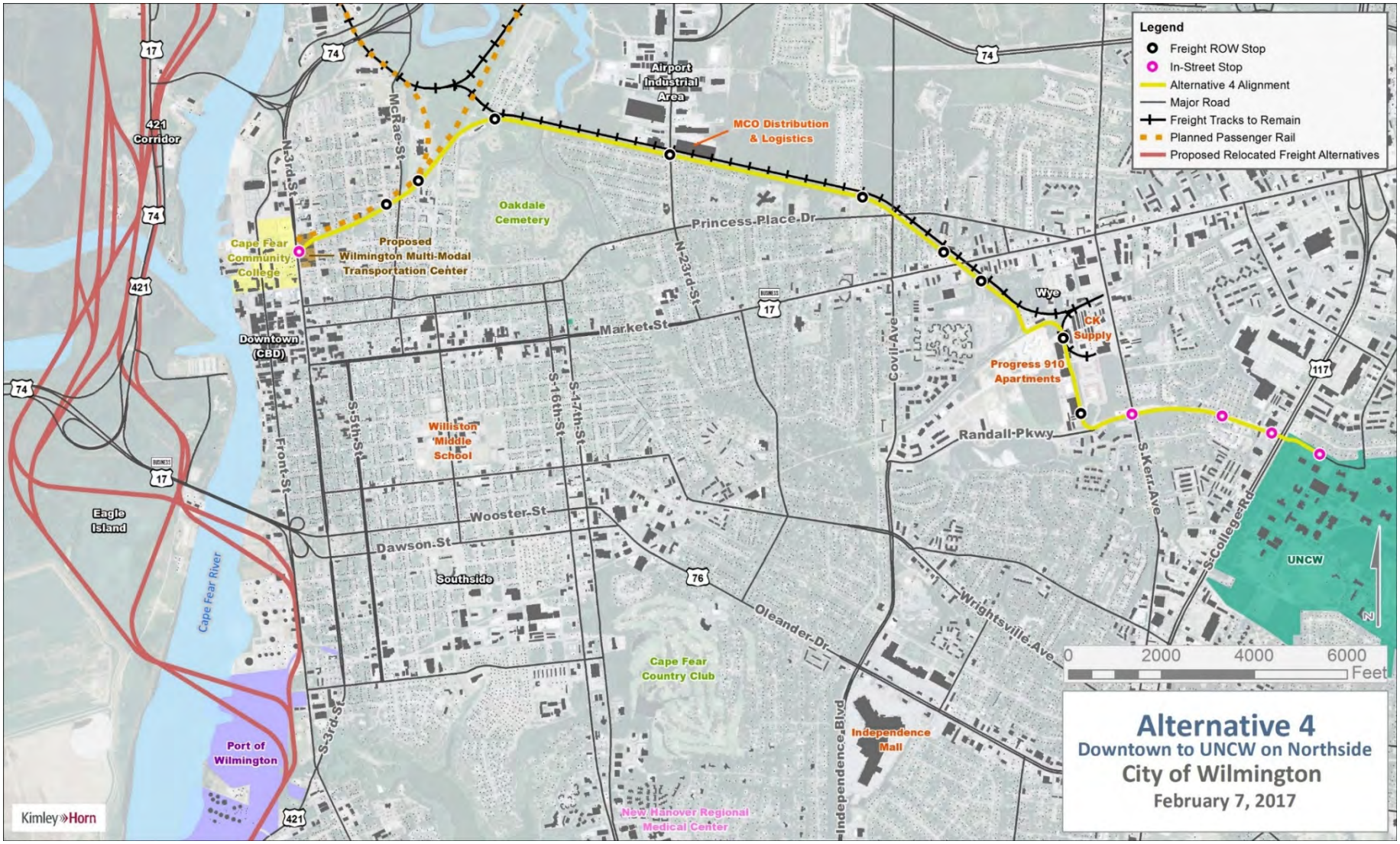
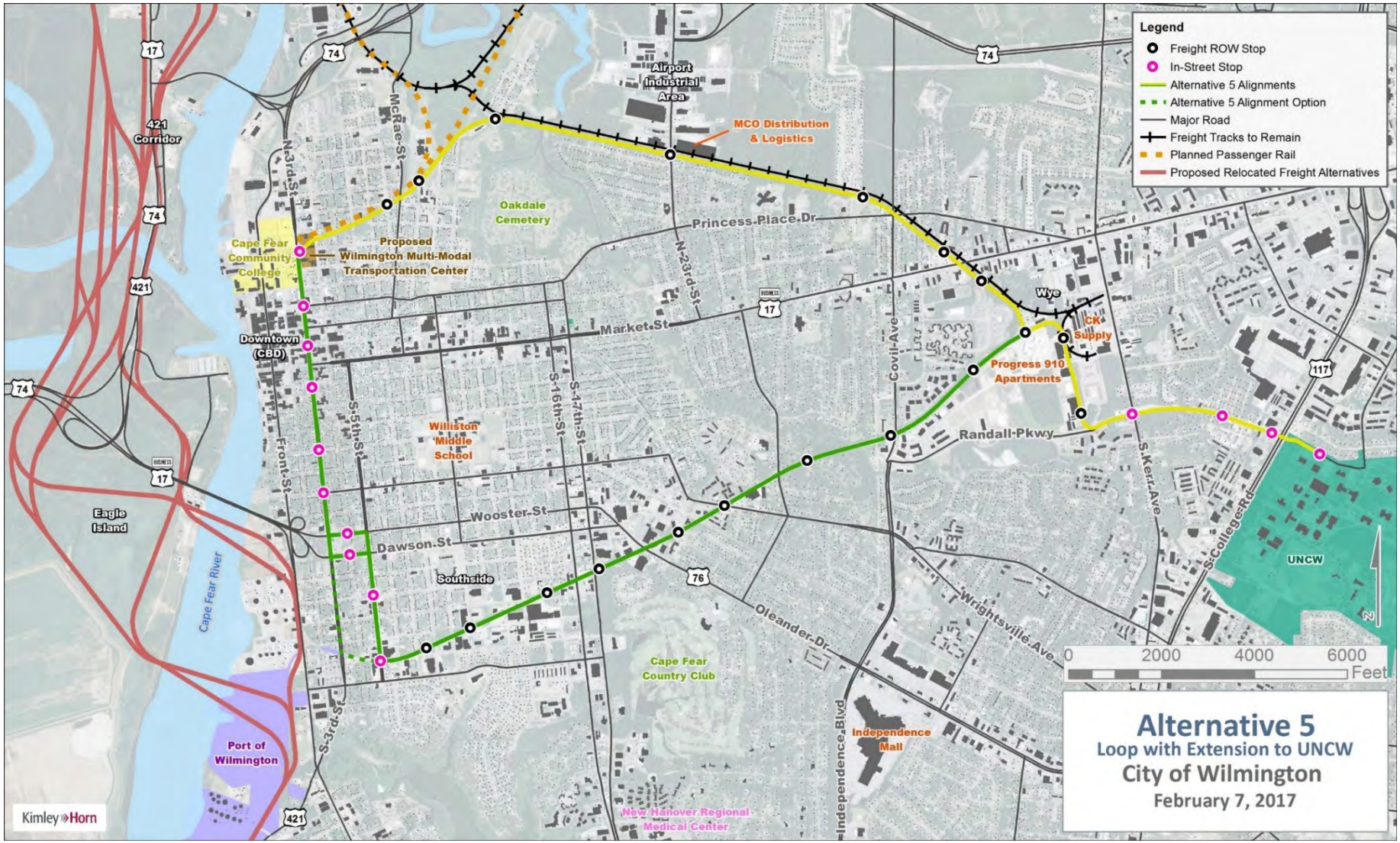


Figure A.13: ALTERNATIVE 5 ALIGNMENT MAP



L: Transit Socioeconomic Benefit Analysis

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1. Introduction

The Transit Socioeconomic Benefits Assessment presents relevant data points that aid in selecting a preferred route for a future streetcar system. Research and data highlighted herein have been incorporated into an alternative ranking matrix that weighs the expected benefits and perceived costs of five potential routes along the corridor. The five alternatives, described in detail in the Transit Engineering Analysis Report, Technical Report K, consider routes that represent a variety of construction impacts, including new in-street rail construction, new in rail right-of-way corridor construction and freight rail re-use. While four overarching considerations were utilized to select a preferred alternative, data in this analysis was particularly focused on the following four:

1. **Mobility:** The project's potential for enhancing access between neighborhoods, colleges, employment centers, and major destinations. In addition, the likelihood that the project could promote walkability, use of bicycles, use of alternate non-motorized modes of transportation, and provide opportunities for transit-dependent households.
2. **Development Opportunities:** The project's potential ability to attract real estate development within the corridor. This is measured by the number of opportunities for new development or redevelopment and potential support of transit-oriented development (TOD).
3. **Project Readiness:** The overall likelihood of implementing the project in a short timeframe. This includes construction complexity, amount of time needed for agency coordination and stakeholder support, and implementation schedule.
4. **Affordability:** This category is used to measure the order of magnitude capital cost of construction for each transit investment. See Section 5 for the methodology behind this measure.

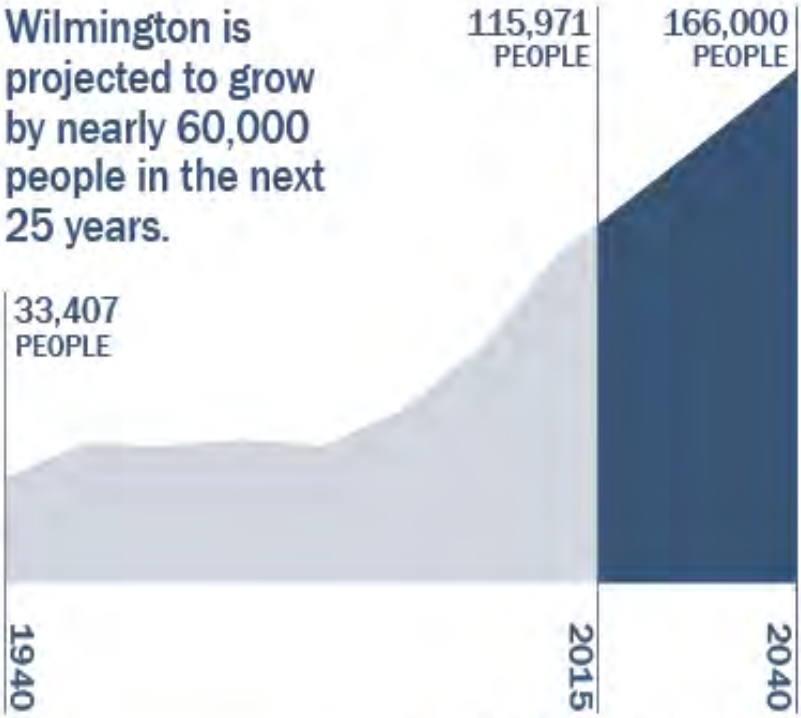
Communities across the country are turning to transit routes, including streetcar lines, to enhance mobility, promote place-making and economic development and support tourism. The urban location of the proposed line in Wilmington would align with these benefits, largely by encouraging better connections between downtown, which represents the largest job center in the region, surrounding residential, retail and service nodes, and a concentrated student base at UNCW.

Data presented in this analysis relies on numerous data sources, and considers goals and opportunities clearly defined in the *Create Wilmington Comprehensive Plan*. Adopted in 2016, the comprehensive plan includes a public vision for where and how the City will evolve in the future.

Wilmington must grow inward and upward, not outward and far apart.

This plan focuses on urban development in key growth areas and on creating vibrant places. Infill, redevelopment and revitalization are critical to Wilmington's future.

"Bicycle and pedestrian infrastructure is one of our highest priorities."
-Citizens of Wilmington



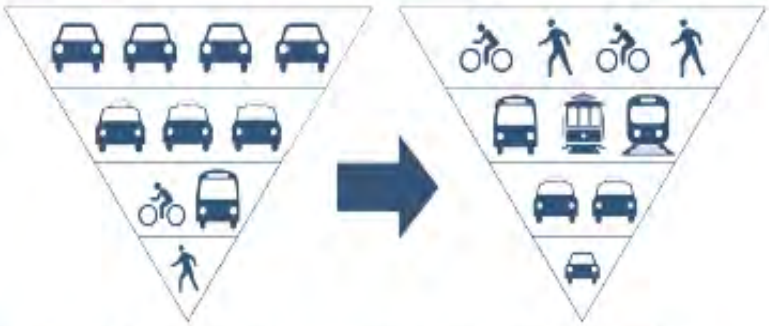
(Growth Factors Report, Chapter 1)

The plan uses a *framework* map, not a *parcel-specific* land use map. Mixed-use centers are a key element.
(Growth Strategies Maps and Report)

This document does not stand alone. Collaboration with regional public and private partners is absolutely necessary.

PERSEVERE

The city's motto remains relevant in dealing with critical planning issues.



Move toward a more balanced transportation system (Polices, Chapter 2)

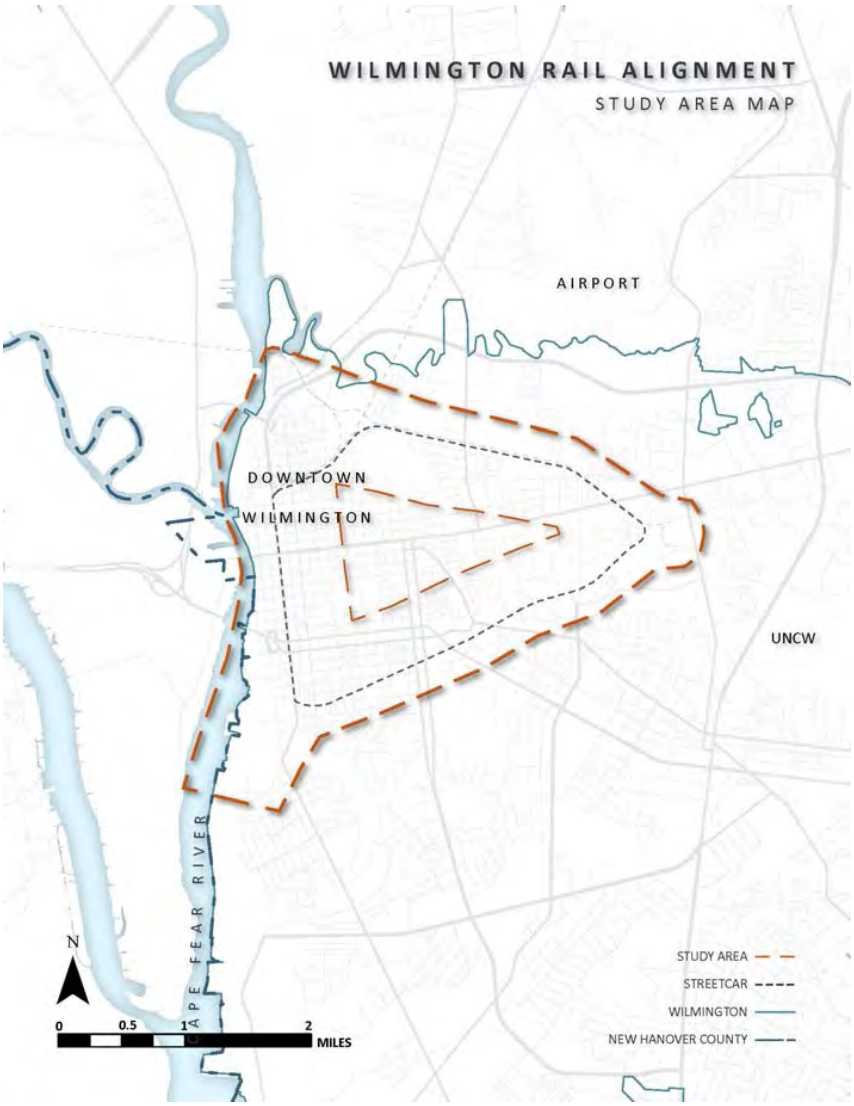
2. Study Area

The Study Area utilized in the Socio-Economic Benefits Assessment (for Transit) (see Figure 1) is designed to measure demographic and economic indicators that will support selection of a preferred transit route alternative.

The Study Area typically follows a one-quarter mile radius outside and one-half mile inside of the existing rail corridor. While one-quarter mile is a distance often quoted as having reasonable walkability for the average person, the one-half mile distance on the interior extends into more of the established neighborhoods that could benefit from a new transit corridor.

To show analysis that best and most accurately utilizes U.S. Census block group data, the entire area within the identified outer boundary is incorporated and analyzed for this analysis.

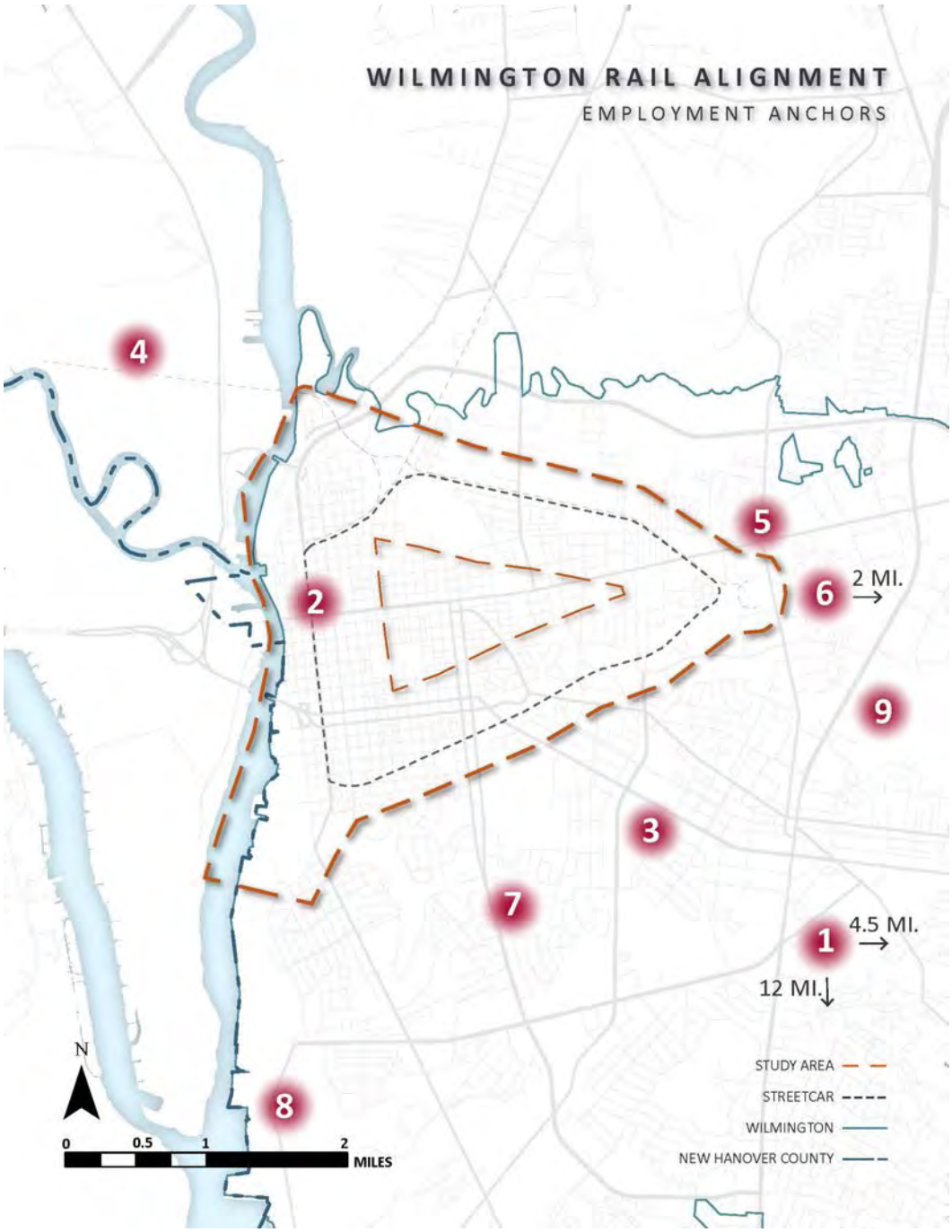
Figure 1: MAP OF STUDY AREA



3. Economic Anchors

Figure 2 shows the key activity centers in and near the Study Area that could potentially influence ridership levels and development opportunities related to a fixed transit system. Economic activity node descriptions in this section coordinate with the map key below.

Figure 2: ECONOMIC ANCHORS, WILMINGTON, 2016



3.1. Beaches and Coastal Activity

The closest beach to the City is Wrightsville Beach. Wrightsville is a popular and important tourist attraction for the region. Much of the employment in the area is centered around tourism-supportive uses, including a wide variety of hospitality, restaurants, nightlife and entertainment. Further from the core of Wilmington, Carolina Beach, and Kure Beach are in the southern portion of New Hanover County. Coastal areas in New Hanover host significant concentrations of seasonal housing, including large single-family detached houses and higher-density condominiums.

3.2. Downtown Wilmington

Fronting the Cape Fear River, Downtown Wilmington represents the single, largest concentration of employment in eastern North Carolina. Similar to other urban cores, Downtown Wilmington has experienced a resurgence of activity with nearly $350 million in new investments over the past five years. Recent developments include a mixture of retail, restaurants, office, residential and hospitality uses, all seeking to capitalized on the walkability, and the unique atmosphere of downtown.

Downtown Wilmington hosts approximately 10,000 jobs, anchored by PPD, Inc., a pharmaceutical clinical research organization, that employs over 1,000 people. According to Wilmington Downtown, Inc., the central core of the community has over 880 businesses, including 275 shops, restaurants, salons, pubs, and museums. Downtown also represents a key center for entertainment and culture supported by the 1,500-seat Wilson Center, the 880-seat Thalian Hall, and a 107,000-square-foot meeting and convention center.

With approximately 28,000 students, Cape Fear Community College (CFCC) is the sixth largest in the state. The downtown campus, which has recently experienced a surge in investment through a bond referendum approved in 2008, hosts 7,500 students daily. An economic impact study completed in 2015 by Economic Modeling Specialists International found that CFCC generated $584.3 million to the local economy.

Development momentum has been exhibited along the northern riverfront in downtown Wilmington, recently attracting multi-family residential and hospitality construction. In 2013, the City of Wilmington purchased 6.6 acres for a park that will offer proximity to new, adjacent private investments, the Wilmington Convention Center, PPD, Inc., and CFCC, while connecting to the core of downtown via the Riverwalk. The passive park is planned to include a great lawn, a variety of play areas, and an outdoor concert venue that could bring up to 8,000 people to downtown for shows. City residents approved $20 million in funds for the design and construction of the North Riverfront Park in 2016.

3.3. Independence Mall/Oleander Drive/Independence Boulevard

Located on Oleander Drive, Independence Mall contains almost 1,000,000 square feet of retail space, anchored by Belk, Sears, JC Penny, and Dillards. Similar to other enclosed shopping centers across the US, Independence Mall has struggled to maintain the same levels of occupancy they achieved since opening in 1979. A $110 million loan that was collateralized by most of the property went into default in 2014. Since that time, a new buyer has surfaced with a closing expected in the first-party of this year. As of September 1, 2016, less than 85 percent of the mall was occupied.

One of the strongest assets for reinvestment or a potential redevelopment of the mall in the future is its location at the intersection of Oleander Drive and Independence Boulevard. The location is surrounded by additional retail concentrations containing various smaller shopping centers, with one of the key anchors outside the mall property being Hanover Center, directly across the Oleander Drive to the north. Oleander Drive has attracted redevelopment interest, with announcements made on older, obsolete structures. In late-2016, a six-acre former Carmike Cinema property sold and is likely to be developed with a focus on high-quality, sustainable development.

Further south from the potential transit corridor a large mixed-use development is underway at the intersection of Independence Boulevard and South 17th Street. The first phase includes a 14-screen theater and two retail buildings, and was completed earlier this year. The Point at Barclay, a 402-unit multi-family development, is also nearly completed. At full build-out, this development could offer a mixture of retail, office, restaurants, community-scaled businesses, and multi-family residential.

3.4. Industrial Sites (Northwest New Hanover)

There is a large collection of industrial sites in the northwest corner of New Hanover County, along the US 421 corridor. These range from medium to large sites and contain a variety of manufacturing, warehousing and transportation/logistics businesses.

Located in the northwest quadrant of I-140 and Castle Hayne Road, the GE Aviation facility is a significant employment node outside of the urban core of the City. With approximately 600 employees in 2013, the company announced a $63 million expansion plan and the creation of an additional 35 high-paying jobs.

3.5. Market Street Corridor

Market Street is designated as US 17 Business within the City of Wilmington from N. and S. 3rd Streets to the Wilmington Bypass. Today, Market Street serves as one of the major arterials for the City and New Hanover County. Given its location and size, Market Street carries much of the traffic between downtown and suburban communities such as Ogden and Porters Neck—even extending to areas in Pender County. Martin Luther King Parkway provides relief to traffic congestion on Market Street.

As one of the most recognizable and traveled corridors in the city, Market Street serves as a gateway into downtown and a major commercial connection for local citizens and regional travelers. The corridor is not without challenges, as traffic congestion, delay and unsafe travel conditions have impacted mobility. Traffic counts along Market Street range from 30,000 to 55,000 vehicles per day.

3.6. Mayfaire Town Center

Mayfaire is one of the largest commercial nodes in the region, located in a fast-growing area between downtown Wilmington and the coastline. The development offers a live, work, and play environment with a mix of for-sale and rental residential, retail, dining and entertainment, hospitality and employment uses. The area surrounding Mayfaire has expanded as well offering several key retail anchors, including Michael's, HHGregg, Barnes & Nobles, Belk, Marshalls, Dick's Sporting Goods, Harris Teeter, Dollar Tree, and Food Lion. Expansion plans for the shopping center have been announced, adding as many as seven buildings to the development.

The Mayfaire area has a significant, and growing, concentration of employment uses with small- to medium-sized offices throughout. The corporate headquarters for Castle Branch, a nationwide employment screening company, is located on Sir Tyler Drive. The company hosts approximately 700 employees with an average annual salary nearing $40,000.

3.7. New Hanover Regional Medical Center (NHRMC)

Located on South 17th Street, New Hanover Regional Medical Center (NHRMC), is the largest employer in Wilmington with approximately 6,000 employees, including 560 physicians on staff. In 2005, a large building expansion and renovation project was approved making way for the opening of a new Surgical Pavilion and the Betty H. Cameron Women's and Children's Hospital in 2008. Renovations to the main patient tower were completed in late-2010. According to the facility, the medical center today has an estimated local economic impact of $1 billion.

3.8. Port of Wilmington

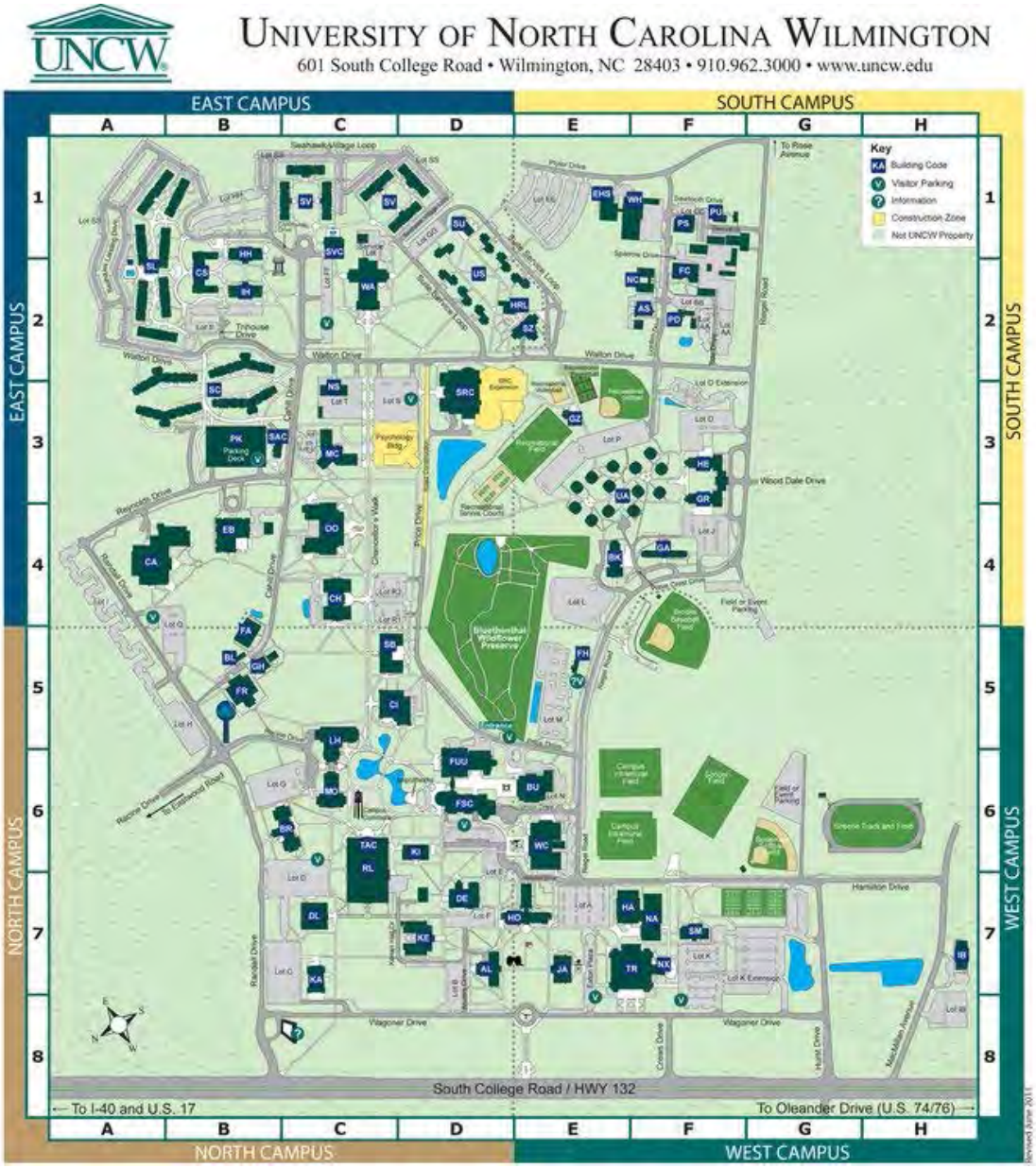
Located in the southwest corner of the City, the Port of Wilmington (Port) represents a significant concentration of industrial land uses, focusing primarily on shipping and intermodal freight movement. The Port offers a 42-foot navigational channel, nine berths with over 6,700 feet of wharf frontage and four post-Panamax container cranes. The CSXT rail line connects to the Port, allowing for multi-modal accessibility. The facility has a container capacity of 600,000 twenty-foot equivalent units (TEU), and nearly 1.0 million square feet of covered storage.

3.9. University of North Carolina at Wilmington

University of North Carolina at Wilmington (UNCW) is the largest university in the region with a total enrollment of over 15,700 undergraduate, graduate and doctoral students. The campus is located just

east of College Street, in the central part of the City. UNCW offers 52 undergraduate, 36 master's degree, and four doctoral programs. More 13 percent of all students are from southeastern North Carolina. The campus hosts 1,092 faculty members and 1,302 staff.

An estimated 40 percent of the student body lives on campus. New full-time freshmen are required to live on campus their first year. In order to balance parking demands between those who live, attend class, and work on campus, any student that resides within one mile of campus is not granted a parking permit.

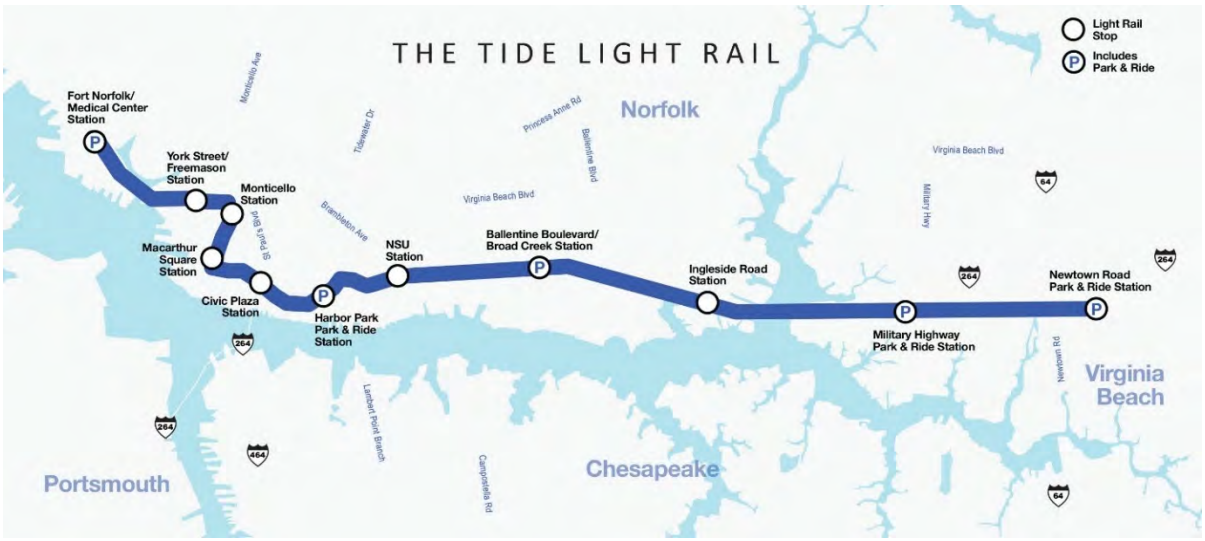


4. Comparable Streetcar Developments

The purpose of this section is to highlight five active streetcar systems comparable to represent what is proposed for the City. The research prepared focused on the measured economic benefits related to the transit service.

4.1. Norfolk – Tide Light Rail

The Tide Light Rail line is a transit-focused light rail/streetcar line connecting the Fort Norfolk/Medical Center area northwest of downtown Norfolk to the western border of Virginia Beach. The service runs parallel to the southern border of Norfolk connecting riders to Downtown Norfolk, a local sports stadium, shopping areas, and Norfolk State University. The Tide Light Rail opened in 2011.



Notable Design Features

- Linear
- 7.4 miles in length
- 11 stations
- Modern cars
- Primarily runs off street, except for downtown area where it runs with traffic.
- Overhead electrical system
- About $318.5 million in total cost

Operations

- $1.75 fare
- Runs 7 days a week
- 10 – 15 minute wait during peak times
- 3,700 people ride daily

Economic/Development Impacts

According to Hampton Roads Transit (HRT), which runs the service, $532 million in economic development in downtown Norfolk has been completed since the light rail service initiated. In addition, the downtown area has seen a 25 percent increase in young people (20-34) living downtown and a 72 percent increase in housing overall. HRT believes that the introduction of the Tide Light Rail contributes to these figures. HRT also reports that ADP, a human resources company that recently moved to downtown Norfolk bringing 1,800 jobs, was swayed to that location because of access to the light rail.

4.2. Charlotte – CityLYNX Gold Line

The Gold Line streetcar provides a direct link between the Time Warner Cable Arena and Transportation Center in the core of urban Charlotte and Central Piedmont Community College and Novant Health's Presbyterian Hospital in the historic Elizabeth neighborhood to the east. The first 1.5-mile phase of the system provides access for daily commuters, residents and tourists seeking to access downtown's nightlife and entertainment districts,. CityLYNX opened the streetcar for service in 2015.

Notable Design Features

- Linear
- 1.5 miles in length
- 6 stations
- Replica heritage cars
- Runs on street with traffic
- Overhead electrical system
- +/- $37 million in total cost

Operations

- Free to ride (until completion of Phase 2)
- Runs 7 days a week
- 15 minute wait during peak times
- 1,500 people ride daily

Economic/Development Impacts

The City of Charlotte anticipates that the Gold Line and its subsequent expansions will help to encourage housing and commercial development in areas previously lacking momentum. The completed phase exists in an area that was previously experiencing development pressures, so allocating impact directly attributable to the streetcar is challenging.

Phase 2 will serve as a catalyst for economic growth by providing effective and efficient transit operations, connecting key neighborhoods and maximizing development opportunities. It will extend an additional 2.5 miles to the east and west: from Presbyterian Hospital to Sunnyside Avenue and from the center city transportation center, west to Johnson C. Smith University. A $94 million construction contract was awarded by the City Council in November 2016 to complete the second phase of the system. Construction is scheduled to begin in 2017. Based on this timing, the second phase could open in 2020.

The third and final phase between Hawthorne Land and the former Eastland Mall, and from Johnson C. Smith University to Rosa Parks Place on Beatties Ford Road, is scheduled for completion by 2023 at an estimated cost of $231 million. As currently planned, at full build-out the system would extend ten miles with 34 station stops.

4.3. Tucson – Sun Link

The Sun Link streetcar is a transit/neighborhood connectivity focused system that runs Southwest to Northeast throughout Tucson. The line connects The University of Arizona to the Mercado District in Southwest Tucson, with major commercial centers (business districts, shopping, entertainment) along the way. The system began service in 2014.

Notable Design Features

- Linear
- 3.9 miles in length
- 21 stations
- Modern cars
- Runs on street with traffic
- Overhead electrical system
- About $196 million in total cost

Operations

- $1.50 fare
- Runs 7 days a week
- 10 – 15 minute wait during peak times
- 4,000 people ride daily

Economic/Development Impacts

According to the website for the Sun Link system,

> "The Sun Link project has already triggered transit oriented development - new retail, office and residential development and redevelopment along the streetcar corridor. To date, more than $800 million has been invested by the private sector. Fifty new restaurants, bars and cafes, approximately 1,500 new student housing apartments plus 58 new retail businesses have popped up along the route over the past two years, and there are mixed-use housing developments in the works. Additionally, there has been significant corporate business expansion within the Sun Link route: a new headquarters for UniSource Energy, with +400 plus employees, and Providence Service Corporation, both publicly traded companies. The City of Tucson estimates that 1,200 new jobs were created as a direct result of Sun Link construction and that an additional 1,650 related jobs in over 19 industries

will be created because of construction activities. Research projects an estimated 1,500 long-term regional jobs were driven by the streetcar."

4.4. Atlanta – Atlanta Streetcar

The Atlanta Streetcar is a transit/tourism focused system that links the historic Edgewood Neighborhood to downtown. Along the way, the system connects riders to Georgia State University, commercial areas and other transit modes.

The streetcar opened in late 2014 and is the first of several phases.

Notable Design Features

- Looped
- 2.7 miles in length
- 12 stations
- Modern cars
- Runs on street with traffic
- Overhead electrical system
- About $99 million in total cost

Operations

- $1.00 fare
- Runs 7 days a week
- 10 – 15 minute wait during peak times
- 700 people ride daily

Economic/Development Impacts

According to the Atlanta Streetcar website,

> "The increased mobility and convenience spurred by the Atlanta Streetcar is anticipated to generate investment opportunities on the over 80 acres of underutilized land and in the 30 vacant buildings within a few blocks of the route....By 2030, it is projected that Downtown Atlanta will experience 5.1 million square feet of retail absorption and an increase of approximately 4.4 million square feet of new office space thanks to the presence of the Atlanta Streetcar."

The system began service as being free to ride. Since a $1.00 fare was instituted on January 1st, 2016, ridership has declined.

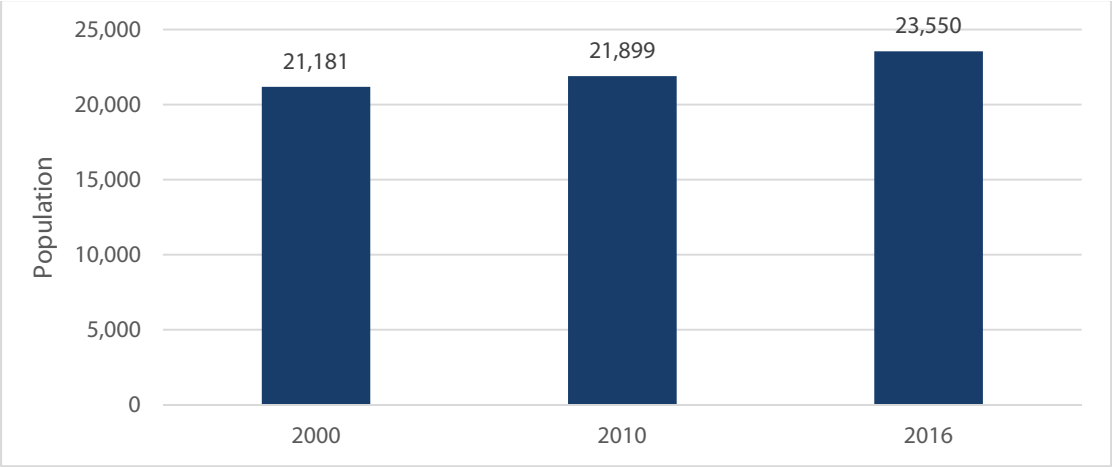
5. Resident and Employment Profiles

This section profiles key population and employment features for the Study Area and the surrounding region. Metrics presented in this section, including population and employment densities, age, and income, will ultimately be used to inform the assessment of possible transit route alternatives. As stated in Chapter 2, the analysis takes into account all data within the outer boundary of the Study Area in order to more accurately present the current conditions. This capitalizes on data from more full U.S. Census Block Groups, which increases accuracy.

5.1. Resident Profile

Based on estimates provided from Environmental Systems Research Institute (ESRI), the Study Area had approximately 23,550 residents in 2016, an 11.2 percent increase from 21,181 in 2000. While the number of residents in the Study Area demonstrated only modest growth between 2000 and 2010, likely impacted by the economic downturn during the 2007-2009 Recession, the growth in the last six years equates to an annual average increase of 1.2 percent. Much of the recent growth has been driven by the completion of new multi-family residential projects, concentrated in the downtown core of Wilmington and in private, off-campus apartment communities located near UNCW.

Graph 1: POPULATION IN STUDY AREA, 2016



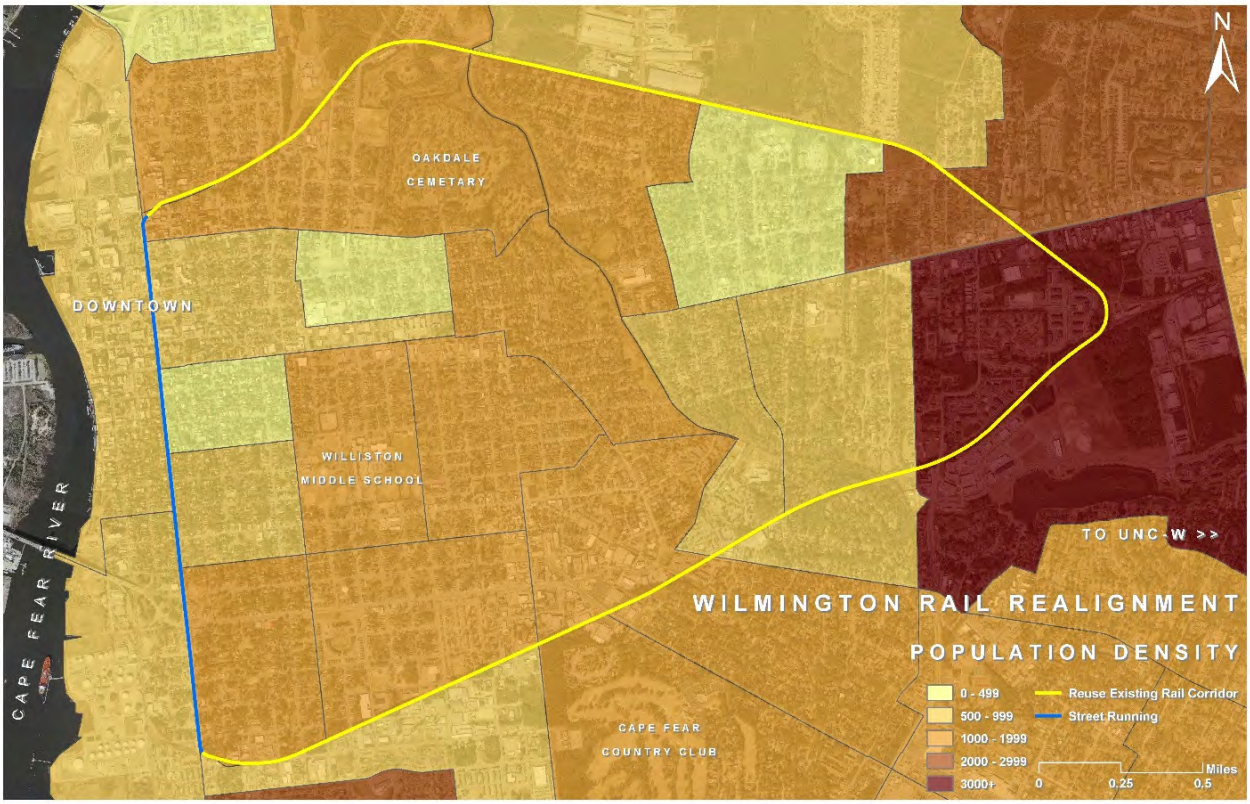
Source: U.S. Census, ESRI BAO, Kimley-Horn

The 23,550 residents in the Study Area account for 8.4 percent of the total 279,912 residents living in the Wilmington Metropolitan Statistical Area (MSA). As defined by the U.S. Census, the Wilmington MSA includes New Hanover and Pender counties. The 1,650 net new residents added to the Study Area between 2010 and 2016 equated to 6.6 percent of the region's total growth. Although the new Study Area growth indicates a resurgence in urban development, more suburban areas of New Hanover and Pender counties grew at a faster rate, largely attributable to the availability of developable land.

5.1.1. Population Concentrations

In the immediate vicinity of the proposed streetcar corridor, the highest concentration of population is located to the east, close to the UNCW campus, as seen in **Error! Reference source not found.** 3. This area features a concentration of commercial uses along College Road, as well as higher-density multifamily housing in the surrounding area. Many of the multi-family communities target students attending UNCW.

Figure 3: ESTIMATE OF POPULATION DENSITY IN STUDY AREA, 2015

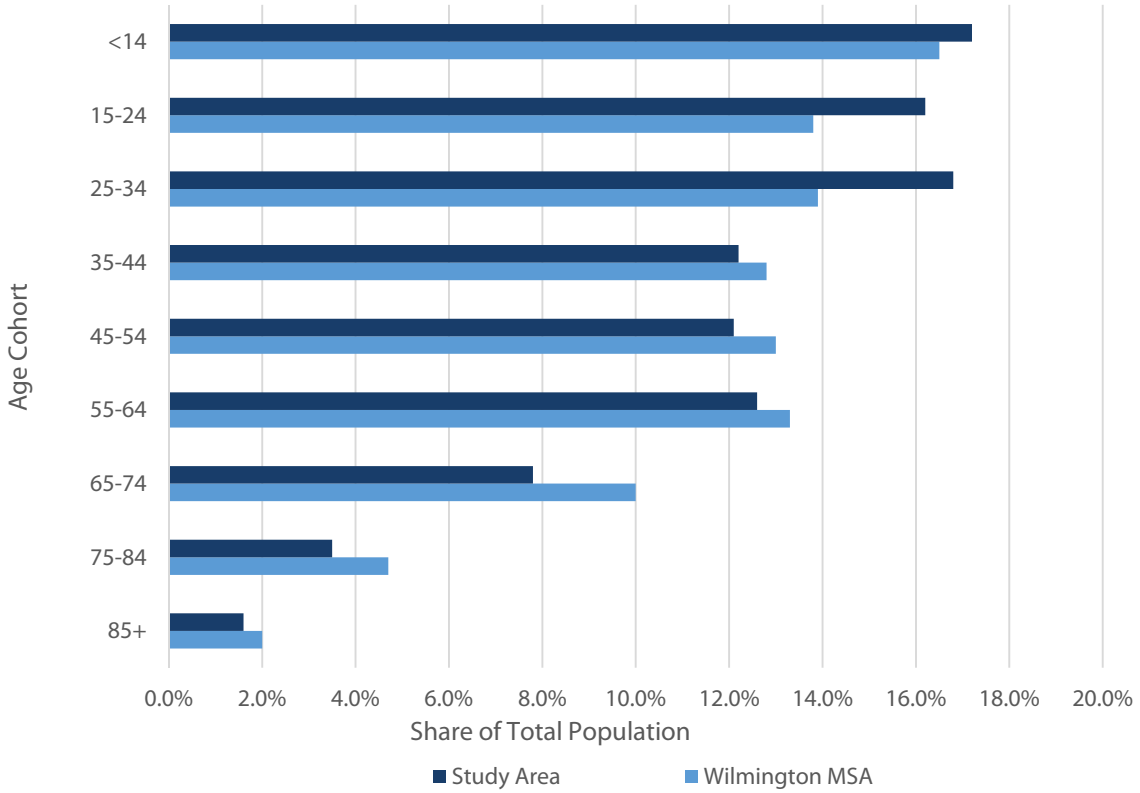


Source: U.S. Census ACS 5-year Estimates, ESRI BAO, Kimley-Horn

5.1.2. Age

When compared to the two-county Wilmington MSA, the Study Area has higher shares of younger residents. Many of these residents are students attending UNCW or CFCC, or young professionals seeking to live in or near an urban core. Conversely, the MSA has higher shares of all age cohorts over age 35. Often seeking single-family neighborhoods in good school districts, families historically have gravitated to areas in more suburban locations. With its access to coastal amenities, the Wilmington MSA has been an attractive place for retirees, with a focus on locations near the beaches.

Graph 2: COMPARISON OF AGE COHORTS BY SHARE, 2016

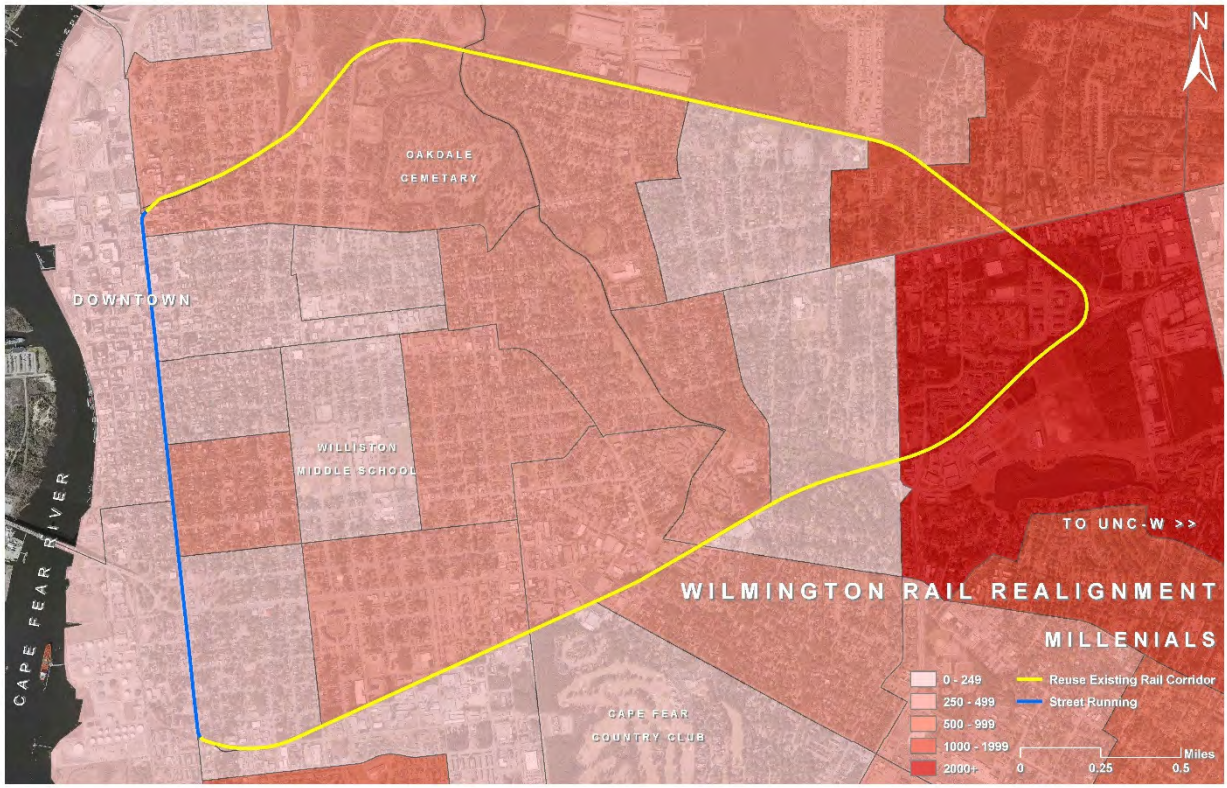


Source: U.S. Census, ESRI BAO, Kimley-Horn

Nationally, Millennials and Baby Boomers represent the two largest age groups and their preferences in residential and commercial real estate development has directly impacted the built environment. As of the 2010 U.S. Census, Millennials outnumbered the Baby Boomers and are more ethnically diverse than the generations that preceded them. Although nationally, Millennials, typically aged 15 to 34, make up approximately one-quarter of the population, the Study Area's share is higher at one-third of the total. The elevated capture for this generation is largely driven by the presence of two large higher-education facilities on either end of the Study Area.

Millennials are more highly concentrated on the eastern portion of the Study Area, as seen in Figure 4. This area contains larger concentrations of multi-family housing with a focus on capturing students attending UNCW. Although downtown is home to CFCC, many of the students there commute to the facility daily. However, new multi-family development in downtown is likely to convert commuting students to residents in the short term.

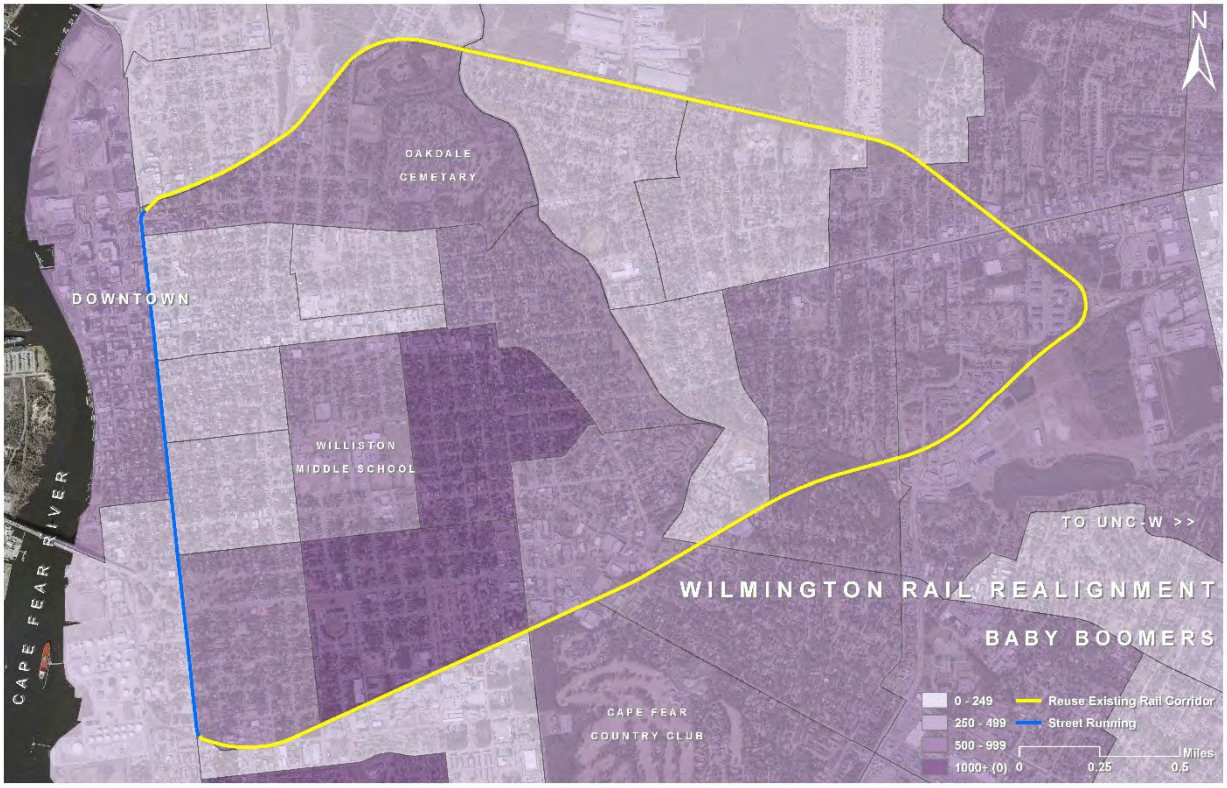
Figure 4: MILLENNIAL DISTRIBUTION IN STUDY AREA, 2015



Source: U.S. Census ACS 5-year Estimates, ESRI BAO, Kimley-Horn

Baby Boomers (55-74) residing in the Study Area are more commonly concentrated in established neighborhoods that developed to the east of downtown Figure 4. As their children move out of the family households, Baby Boomers are increasingly gravitating towards a maintenance-free lifestyle close to friends, family, shopping, dining, and cultural or recreational amenities.

Figure 5: BABY BOOMER DISTRIBUTION IN STUDY AREA, 2015



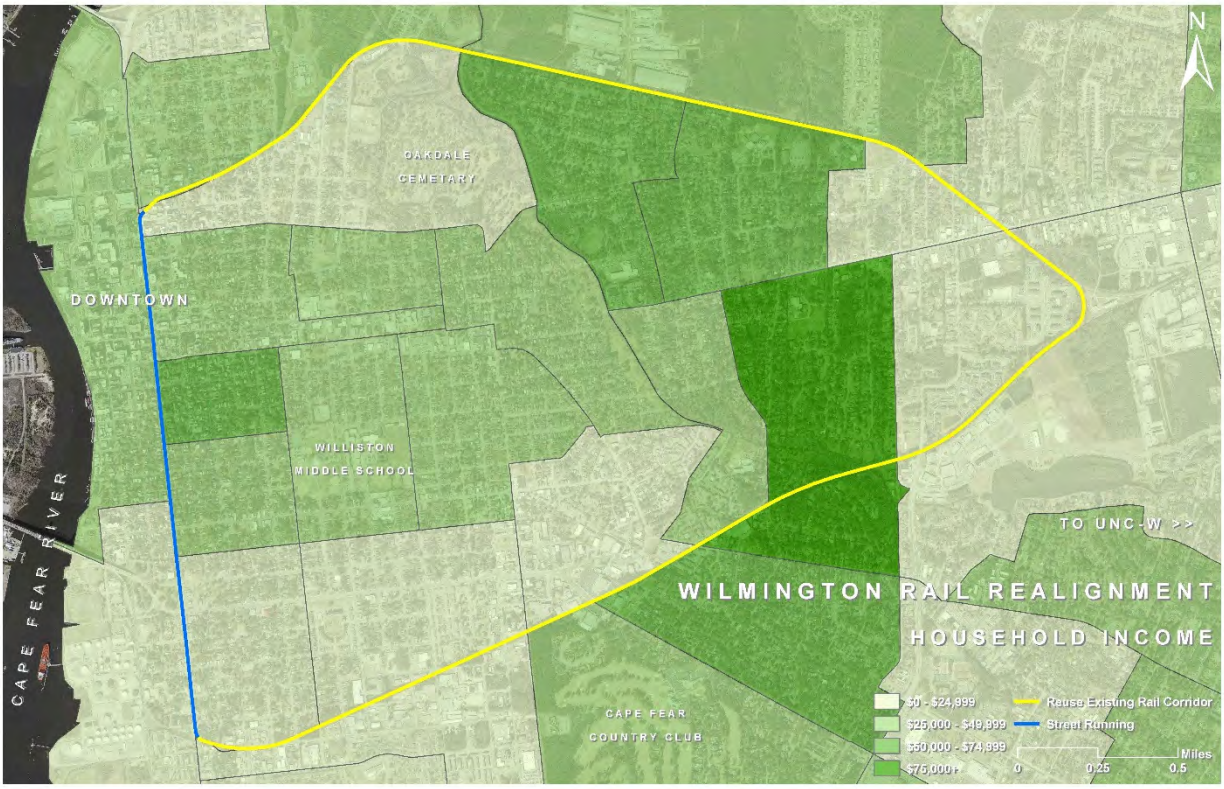
Source: US Census ACS 5-year Estimates, ESRI BAO, Kimley-Horn

Household Income

The median household income in the Study Area is currently estimated at $28,138 annually. This is notably lower than $48,482 per year reported for the larger Wilmington MSA. The significant concentration of students in and near the Study Area, many of whom have very low incomes impacts the median for the Study Area. Additionally, the area also hosts many of the City's public and tax credit housing developments. The urban location of affordable housing properties offers the highest level of connection between households needing assistance and jobs and services nearby.

As shown in Figure 6, the highest household income concentrations in the Study Area are located in near the Beaumont, Forest Hills and Glen Arden neighborhoods, comprised established single-family detached housing. Lower income concentrations are identified for Block Groups covering transitioning neighborhoods adjacent to downtown (Northside to the north and Jervay Place and Village at Greenfield to the south), as well as areas near UNCW with significant student population.

Figure 6: MEDIAN HOUSEHOLD INCOME CONCENTRATIONS IN STUDY AREA, 2015

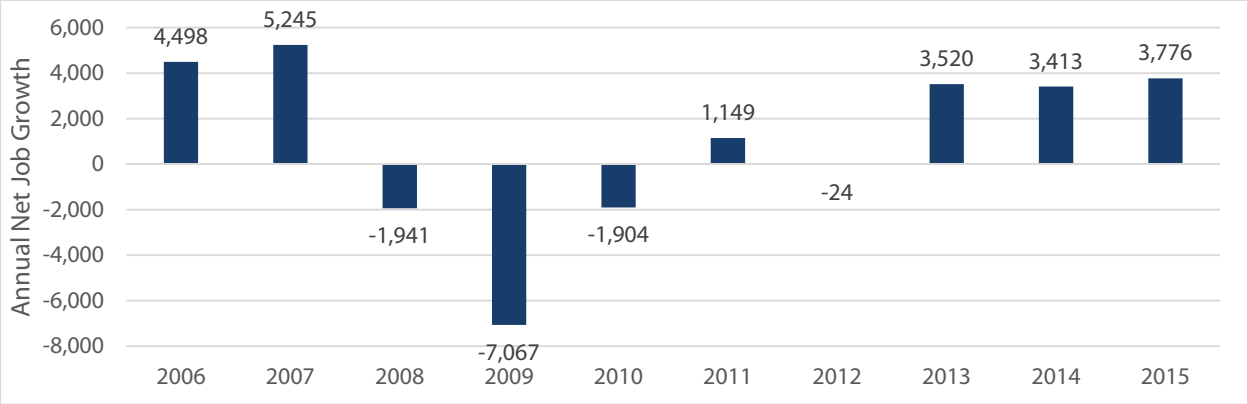


Source: US Census ACS 5-year Estimates, ESRI BAO, Kimley-Horn

5.2. Employment Profile

Annual net new job growth in the Wilmington MSA peaked in 2006 and 2007, adding nearly 10,000 new jobs to the economy in a two-year period. Given the strong base in tourism, common for many coastal communities, the region experienced significant job loss during the 2007-2009 Recession, and slower recovery as people prioritized spending to essentials. As shown in Graph 3, the Wilmington economy has added more than 3,000 jobs per year in the last three years. Although growth has been consistent, it has yet to exceed pre-Recession levels.

Graph 3: ANNUALIZED JOB GROWTH, WILMINGTON MSA, 2006-2015
Source: NC Department of Commerce, Kimley-Horn



Employment in the two-county Wilmington MSA increased by 11,894 jobs, or 11.3 percent, between 2010 and 2015. Total annual employment in 2015 was nearly 117,000, representing the largest economic base in the last decade. Driven by the presence of NHRMC, Healthcare and Social Assistance represents the largest employment sector in the region, followed by Retail Trade and Accommodation and Food Services. Together, these three sectors comprise 44.2 percent of the total regional employment.

The net increase in jobs since 2010 was attributable to strong growth in Accommodation and Food Services, Retail Trade, and Health Care and Social Assistance (Table 1). The sustained increase in Accommodation and Food Services employment is largely attributable to the strong tourism economy in Wilmington. The only net losses were experienced in the Construction, Manufacturing, and Mining sectors, consistent with national trends.

Table 1: ANNUALIZED EMPLOYMENT TRENDS, WILMINGTON MSA, 2010-2015

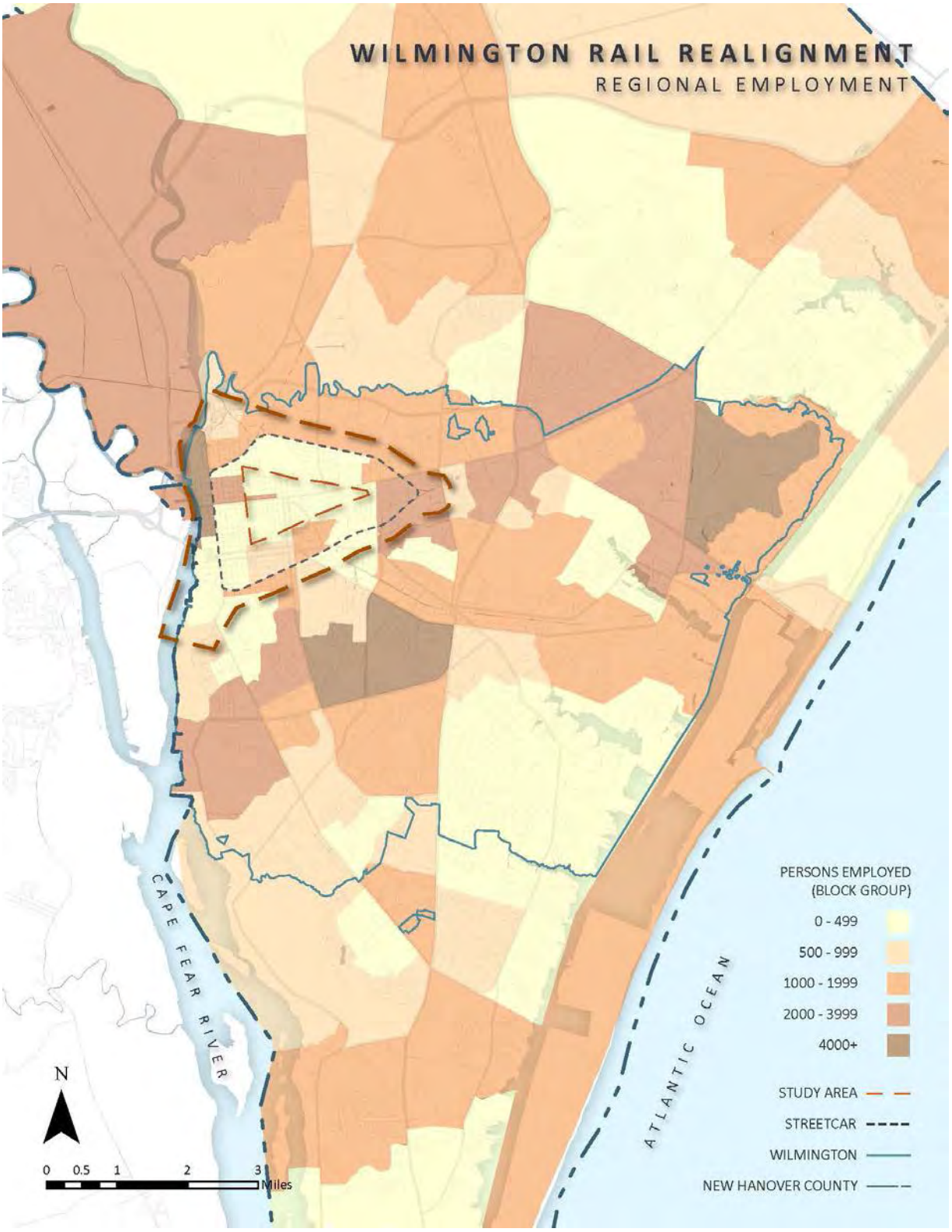
					2010-2015 Δ	
Industry Classification	2010	% of Total	2015	% of Total	#	%
Accommodation and Food Services	13,453	12.81%	16,055	13.73%	2,602	19.3%
Retail Trade	14,349	13.66%	16,664	14.25%	2,315	16.1%
Administrative and Waste Services	5,280	5.03%	7,331	6.27%	2,051	38.8%
Health Care and Social Assistance	16,904	16.09%	18,929	16.19%	2,025	12.0%
Professional and Technical Services	6,411	6.10%	7,388	6.32%	977	15.2%
Educational Services	8,831	8.40%	9,426	8.06%	595	6.7%
Other Services, Ex. Public Admin	2,844	2.71%	3,436	2.94%	592	20.8%
Transportation and Warehousing	2,553	2.43%	3,038	2.60%	485	19.0%
Management of Companies and Enterprises	482	0.46%	881	0.75%	399	82.8%
Wholesale Trade	3,758	3.58%	4,136	3.54%	378	10.1%
Arts, Entertainment, and Recreation	1,646	1.57%	1,998	1.71%	352	21.4%

Industry Classification	2010	% of Total	2015	% of Total	2010-2015 Δ #	2010-2015 Δ %
Real Estate and Rental and Leasing	1,922	1.83%	2,258	1.93%	336	17.5%
Information	2,725	2.59%	3,026	2.59%	301	11.0%
Public Administration	6,087	5.79%	6,168	5.27%	81	1.3%
Agriculture, Forestry, Fishing & Hunting	636	0.61%	657	0.56%	21	3.3%
Finance and Insurance	2,833	2.70%	2,848	2.44%	15	0.5%
Utilities	320	0.30%	323	0.28%	3	0.9%
Mining	85	0.08%	31	0.03%	-54	-63.5%
Manufacturing	6,509	6.20%	5,911	5.05%	-598	-9.2%
Construction	7,426	7.07%	6,444	5.51%	-982	-13.2%
Total	**105,054**		**116,948**		**11,894**	**11.3%**

Source: NC Department of Commerce, Labor and Economic Analysis Division

Understanding what types of employment anchors in the region, and where they are located, will help to paint a clearer picture as to the types of users and need for connectivity that a future streetcar system can provide. The distribution in block groups of total employment throughout Wilmington and the surrounding region of New Hanover County can be seen in Figure 7.

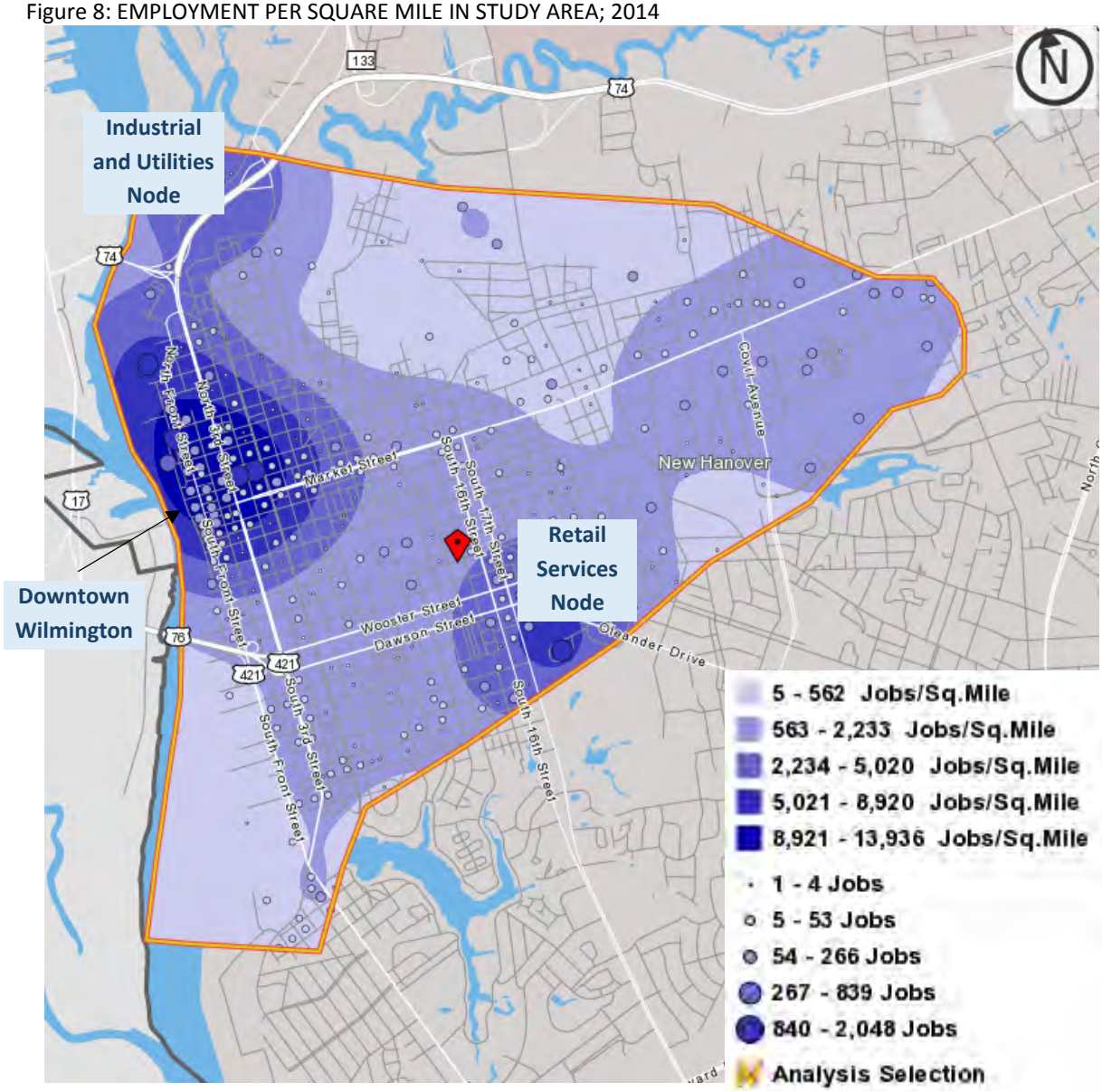
Figure 7: EMPLOYMENT DISTRIBUTION BY BLOCK GROUP; 2015
Source: ESRI, Kimley-Horn



Based on data from the U.S Census' Longitudinal Employer-Household Dynamics data set, as of 2014, the Study Area had approximately 17,900 jobs, equating to 17.6% of the regional total at the time. Downtown Wilmington captures more than one half of the jobs in the Study Area, further reiterating its prominence as a job center in Wilmington and the larger region (Figure 8). Just outside and east of the Study Area shown below, is a heavy concentration of jobs at UNCW and within the extensive commercial areas along North College Road.

By type, Professional and Technical Services jobs make up the largest share of Study Area employment at 17.0%, followed by Public Administration (16.8%) and Accommodation and Food Services (10.1%). Many of these positions gravitate towards public government buildings and office space in and near downtown.

Figure 8: EMPLOYMENT PER SQUARE MILE IN STUDY AREA; 2014



Source: US Census LEHD On the Map; Kimley-Horn

5.3. Summary of Potential Socio-Economic Benefits

This section highlights the potential socio-economic benefits that could accrue in Wilmington with the addition of a fixed-rail public transit service. These benefits highlight factors that could impact residents and jobs with proximity to the planned corridor.

Enhanced Mobility for Residents. Introducing a fixed-rail transit system into a community offers new alternative modes of transportation to move Wilmington residents between home, work, and services beyond what is currently offered by existing Wave routes. As currently planned, the corridor passes through a diverse group of neighborhoods representing a variety of ages, incomes and ethnicities. The proximity of UNCW to the planned corridor represents an opportunity to connect students and faculty more directly with nearby retail services along Market Street, Oleander Drive, and Independence Boulevard, as well as nightlife, entertainment and cultural amenities throughout the community. In particular, the Millennial generation has demonstrated a steady decline in persons obtaining drivers licenses, often seeking to live in places where they do not need to use a car very often.

Reduced Reliance on Personal Vehicles. Fixed-rail transit offers a highly reliable transportation alternative to connect residents with jobs, services and entertainment. A reduction in vehicle miles traveled, particularly via personal automobile, could allow households to reduce ownership levels thus saving capital outputs, gas expenditures, maintenance and annual tax burdens, estimated at $8,000-$10,000 per year, per vehicle. This is particularly relevant for portions of the track that could also offer greenway and trail connections, enhancing bike usage. Savings by a shift to transit could be leveraged to offset housing affordability or increase spending potential of households.

Support Job Creation. Downtown Wilmington represents the largest concentration of jobs in eastern North Carolina. The operation of a fixed-rail transit system could promote short-term construction jobs, as well as long-term operation positions. As companies are becoming more competitive for top talent, many firms are seeking locations that are close to cafes, restaurants, retail shops, personal and business services, hospitality, and civic uses. Many of the locations now being sought are compact, walkable places near housing and public transit. A fixed-rail system could be a contributing factor in positioning Wilmington for increased job growth in the future.

Increased Community Cohesion. A fixed-rail transit system, complemented by a robust greenway system, could reduce barriers (real and perceived) between neighborhoods in the urban core of Wilmington. Increasing connectivity between residents offers enhanced opportunities for collaboration, attraction of new households and jobs, community engagement and sharing of civic amenities.

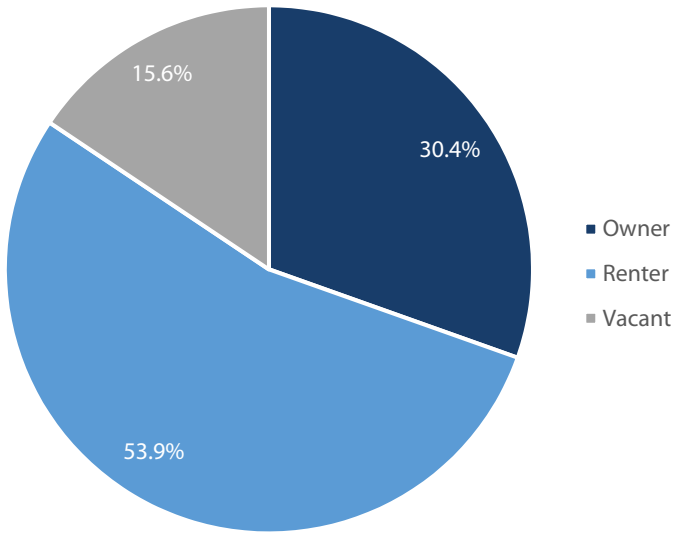
6. Real Estate Profiles

This section provides summary real estate performance information for the Study Area. Information displayed within will be used to inform the evaluation of transit alternatives, particularly as it relates to development and redevelopment opportunities.

6.1. Housing

There are approximately 12,700 housing units in the Study Area, representing a variety of product types and tenures. As shown in Graph 4, nearly 54 percent of all the housing units in the Study Area are classified as renter-occupied, followed by 30.4 percent owner-occupied, and 15.6 percent vacant. The elevated renter occupancy is indicative of the student population base seeking off-campus options that offer proximity.

Graph 4: HOUSING UNIT TENURE IN STUDY AREA, 2016



Source: US Census; ESRI BAO; Kimley-Horn

Nearly 58 percent of the housing stock in the Study Area represents single-family detached product. The remaining units are a blend of attached product with 15.4% representing structures with two units and 32.4 percent contained in larger developments (three or more units per structure). Nearly one-half of all housing units in the Study Area were built before 1960.

6.1.1. For-Sale Residential

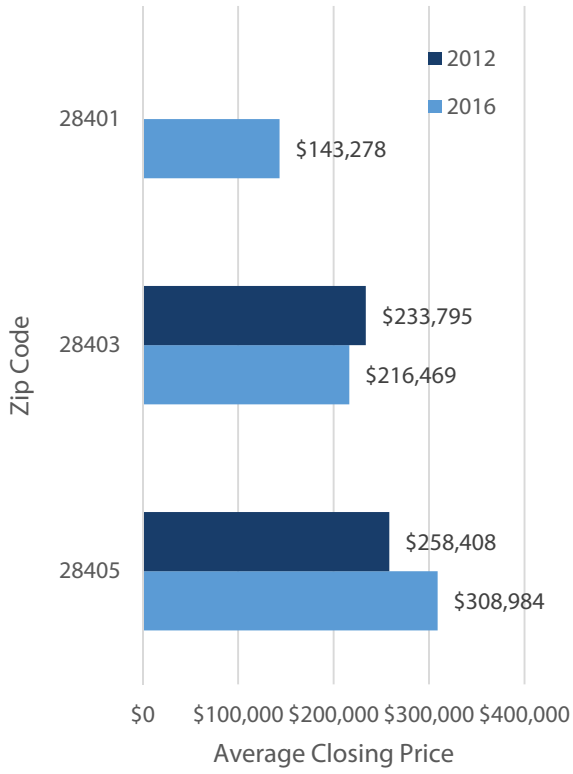
The Study Area hosts several long-established neighborhoods at a variety of price points. Single-family closing data is provided from the Wilmington Board of Realtors based on zip code. The Study Area contains properties in the 28401, 28403, and 28405 zip codes. For-sale performance in the three zip codes varies widely, and is described in more detail below:

Zip Code 28401. This zip code includes all of downtown and the surrounding neighborhoods, some of which have national and local historic designations. It should be noted that it also includes the US 421 corridor, however, residential product in this area is very limited. Overall, 28401 covers all of the Study Area east of 17th Street. Single-family closings had an average price point of $143,278 in third-quarter 2016. There is no trend data for 28401 before 2014, however since that time the average price point has increased 4.1 percent. The number of closings in zip code 28401 has remained relatively stable in recent years, largely due to the limited amount of new for-sale construction activity in the urbanized area.

Zip Code 28403. Zip code 28403 captures all of the Study Area east of 17th Street and south of Market Street. Overall, it includes mainland to the Atlantic Intracoastal Waterway between Market Street and Oleander Drive. Single-family detached units in this zip code are generally newer than 28401 with comparably larger lot sizes. The average closing price for single-family detached units in this zip code is $216,469, a slight decline from the recorded measure in 2012. The number of residential units sold in third-quarter 2016 represented a 31.9 percent increase in one year, the largest increase of any zip code in the region.

Zip Code 28405. This zip code includes all residential activity in the Study Area east of 17th Street and north of Market Street. However, it is important to note that it extends north to I-140 and east to the Atlantic Intracoastal Water way, an area of New Hanover County that has received an influx of new residential growth in larger master-planned developments. As such, the average single-family detached closing price in this area was over $308,000 in third-quarter 2016, a 19.6 percent increase over 2012.

Graph 5: AVERAGE CLOSING PRICE TRENDS, 2012-2016



Source: Wilmington Board of Realtors

6.1.2. Rental Residential

The majority of new residential activity in the Study Area is due to the momentum of rental properties. Nationally, rental product has been a leading real estate sector, largely bolstered by a shift in residential preferences as Millennials move out of their family houses, Baby Boomers seeking to downsize and simplify and challenges receiving mortgages following the 2007-2009 Recession.

Apartment demand in the Wilmington market outpaced supply between 2012 and 2016. Inventory increased by an average of 555 units annually, ranging from 284 new units in 2014 to over 1,100 units in 2015. The market averaged 592 units of net absorption annually over the five-year period, peaking at 977 units in 2015. The consistently strong demand over the last five years was representative of national trends toward rental housing following the 2007-2009 Recession.

Table 1: APARTMENT PERFORMANCE TRENDS, WILMINGTON, 2012-2016

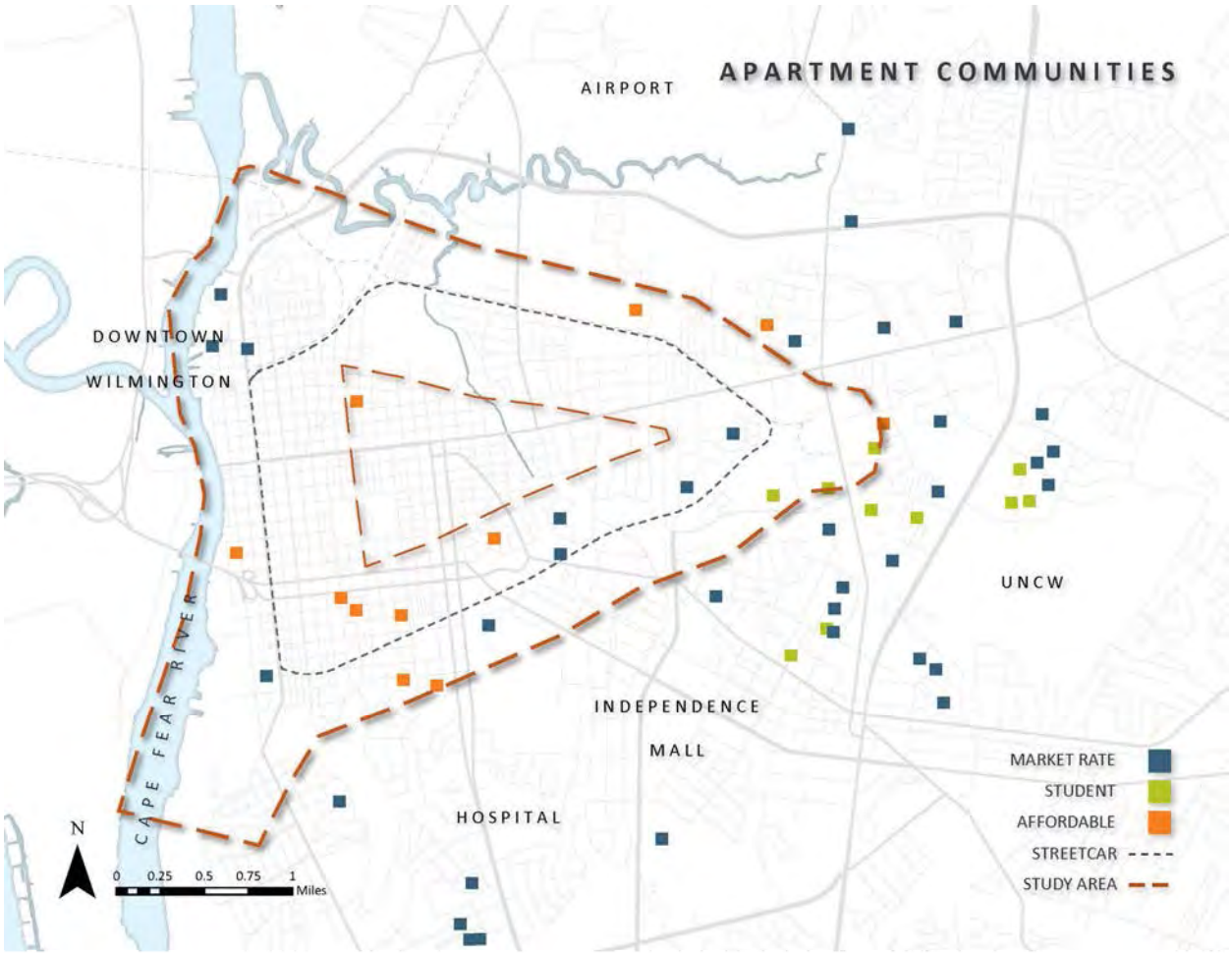
Year	Net Change in Inventory	Net Absorption	(Over)/ Under Supply
2012	308	318	10
2013	658	327	(331)
2014	284	695	411
2015	1,112	977	(135)
2016	413	643	230
Total	**2,775**	**2,960**	**185**
Annual Average	**555**	**592**	**37**

Source: Real Data; Kimley-Horn

The vacancy rate in the Wilmington market peaked in June 2013 at 8.3 percent. Robust net absorption in the following year allowed the vacancy rate to improve to 5.5 percent by June 2014. The vacancy rate increased to 6.1 percent in June 2015, following the delivery of over 1,100 new units, only to fall to 4.6 percent in 2016. It should be noted that over the last five years the Wilmington apartment market has remained at or below the industry standard 7.0 percent equilibrium rate in every reporting period except 2013.

The Study Area offers a variety of rental opportunities, including market rate, student, and affordable targeted communities. Of the tracked communities in and near the Study Area, approximately 77.4 percent are market rate, 13.9 percent are professionally managed off-campus communities and 8.7 percent are tax credit or public housing. Driven by proximity to UNCW, 40 percent of all new inventory completed since 2010 in or near the Study Area has targeted the student population. Rents per square foot range significantly for market-rate product, generally ranging from $0.80 to $1.50, with the highest price points located downtown or near Mayfaire.

Figure 9: RENTAL COMMUNITIES IN STUDY AREA; 2016



Source: Real Data; Wilmington Housing Authority; Kimley-Horn

6.2. Commercial

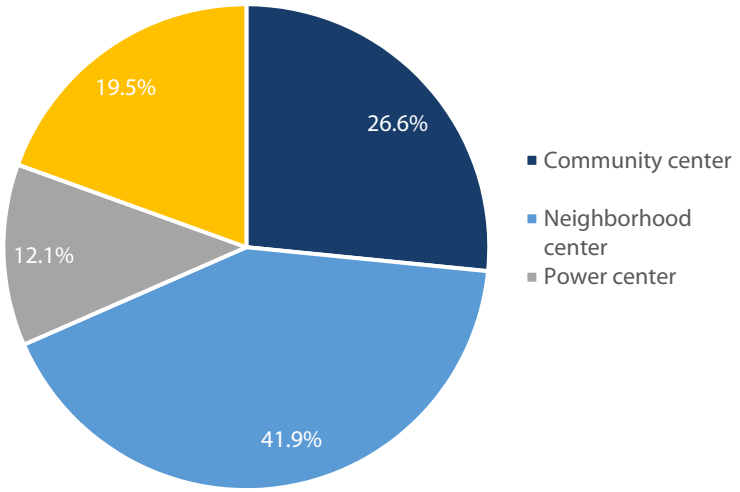
The Study Area incorporates a wide range of commercial uses, including retail, office, light industrial and heavier manufacturing. Downtown Wilmington represents the largest commercial concentration in the region, hosting a wide array of professional office spaces, as well as retail, hospitality, dining and nightlife and entertainment. However, several commercial nodes, most notably the Mayfaire neighborhood, have emerged and offer an alternative to a traditional downtown setting.

As a comparably smaller market, third-party real estate data for Wilmington is relatively limited. The statistics presented in this section represent trends for New Hanover County; however, it should be noted that the Study Area captures a significant portion of the total inventory in most commercial real estate sectors.

6.2.1. Retail

As shown in Graph 6, multi-tenant retail inventory in New Hanover County is most commonly represented by neighborhood centers, which are typically anchored by a grocery store or pharmacy, at 41.9 percent of the total. Community centers, larger centers with more than one anchor and inline retail spaces, comprise another 26.6 percent of the inventory.

Graph 6: SHARE OF RETAIL INVENTORY BY TYPE, NEW HANOVER COUNTY, 2016



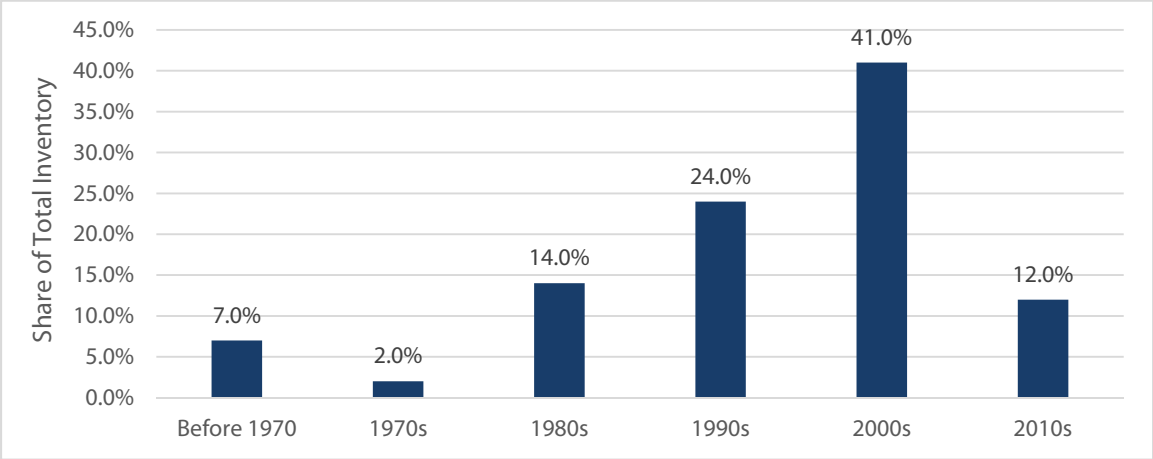
Source: REIS; Kimley-Horn

The average vacancy rate of multi-tenant retail space in Wilmington is currently estimated at 17.1 percent. Vacancy has been on the rise since 2011, increasing by 230 basis points in five years. Asking rents average $15.90 per square foot, a measure that has remained relatively unchanged since 2011. The newest space in Wilmington, typically completed post-2009, generates premium lease rates at an average of $22.51 per square foot.

Outside of small-shop retail and dining spaces in downtown Wilmington, the Study Area offers additional concentrations along Market Street, at the intersection of Oleander Drive and Dawson Street, and on S. Kerr Avenue. Most of the multi-tenant retail product in the Study Area represents older, community and neighborhood centers, with newer product generally gravitating towards the Mayfaire area following new residential development. Downtown Wilmington and Mayfaire generate the highest rent per square foot lease rates in the market.

6.2.2. Office

As shown in Graph 7, approximately 41.0 percent of the office inventory in Wilmington was competed between 2000 and 2009, making it the most active decade of development. Based on data provided by REIS, a third-party data source that tracks commercial real estate performance, the average multi-tenant office building contains approximately 25,000 square feet.



Graph 7: SHARE OF RETAIL INVENTORY BY DECADE COMPLETED, NEW HANOVER COUNTY, 2016
Source: REIS; Kimley-Horn

The aggregate vacancy rate for multi-tenant office in New Hanover County is estimated at 16.4 percent, representing a gradual decline from 18.9 percent in 2011. Asking rents average $17.48/SF. Similar to retail, office space in downtown and near Mayfaire Town Center typically achieves premiums over the market-wide average. The average lease rate for office properties in downtown Wilmington is $19.27, 10.2 percent higher than what is reported for New Hanover County.

6.2.3. Industrial

Industrial space in the Study Area is concentrated in four key nodes:

Node #1: Cornelius Harnett Drive. Anchored by the Wilmington Water Treatment Plant, this area is located immediately north of US 74 and includes a mixture of utilities, transportation/logistics, and warehousing uses.

Node #2: Smith's Creek Industrial Park. Is located immediately north of the CSX rail corridor at N 23rd Street. This industrial park offers a mix of users with the most notable being Alcami Corporation, MCO Distribution and Logistics, Mead Westvaco Corporation, and a number of movie studios.

Node #3: S. Kerr Avenue. CSXT currently serves one user, CK Supply, one time per week located off Kerr Avenue. Other key users, largely warehousing in nature, include ProBuild, United Refrigeration, and Hubbard Pipe and Supply.

Node #4: Martin Street Corridor. The area along Martin Street, immediately south of the rail corridor, represents a concentration of light industrial users. Many of the buildings are outdated and approaching or exceeding their useful life.

6.3. Summary of Potential Socio-Economic Benefits

This section highlights the potential socio-economic benefits that could accrue in Wilmington with the addition of a fixed-rail public transit service. These benefits highlight factors that could impact real estate development and redevelopment with proximity to the planned corridor.

Increased Residential Tax Value. Most studies show a direct correlation between fixed-rail transit systems and increased residential value within a reasonable walking distance, typically quoted at one-quarter mile. A similar correlation is demonstrated for greenways, although premiums are typically lower. The exact increase in property value varies significantly based on community type and transit mode

A review of white paper studies demonstrated the following value increases for communities with existing systems:

- Residential property values in Portland, Oregon increased by $75 for every 100 feet closer a home is to a transit station.
- The average home value in New York declined by about $2,300 for every 100 feet farther it is from a station.
- Apartments near transit stops in Washington DC brought in between $1.13 and $2.29 per year in government revenue for every $1.00 spent on public services, 70 percent higher than those located further away.

Promote Commercial Value Enhancements. Although not quoted as regularly, there is also a correlation between proximity to fixed-rail transit stations and commercial development values. Heightened commercial property values reflect the added benefits from increased accessibility to transportation options. These benefits are likely to be particularly exhibited in downtown, as well as along the major commercial corridors like Market Street, Oleander Drive, and Independence Boulevard.

Attract Residential Development. A variety of real estate sectors have been quoted as being particularly attracted to locations near fixed-rail transit. Higher-density residential development has shown propensity to be located within a walkable distance from a transit station. The planned corridor's proximity to UNCW and surrounding student housing could capitalize on future investment to support the fast-growing school. Additionally, downtown Wilmington has a strong pipeline of residential projects that are expected to be completed over the next five years that would benefit from access to a fixed-rail line through the urban core.

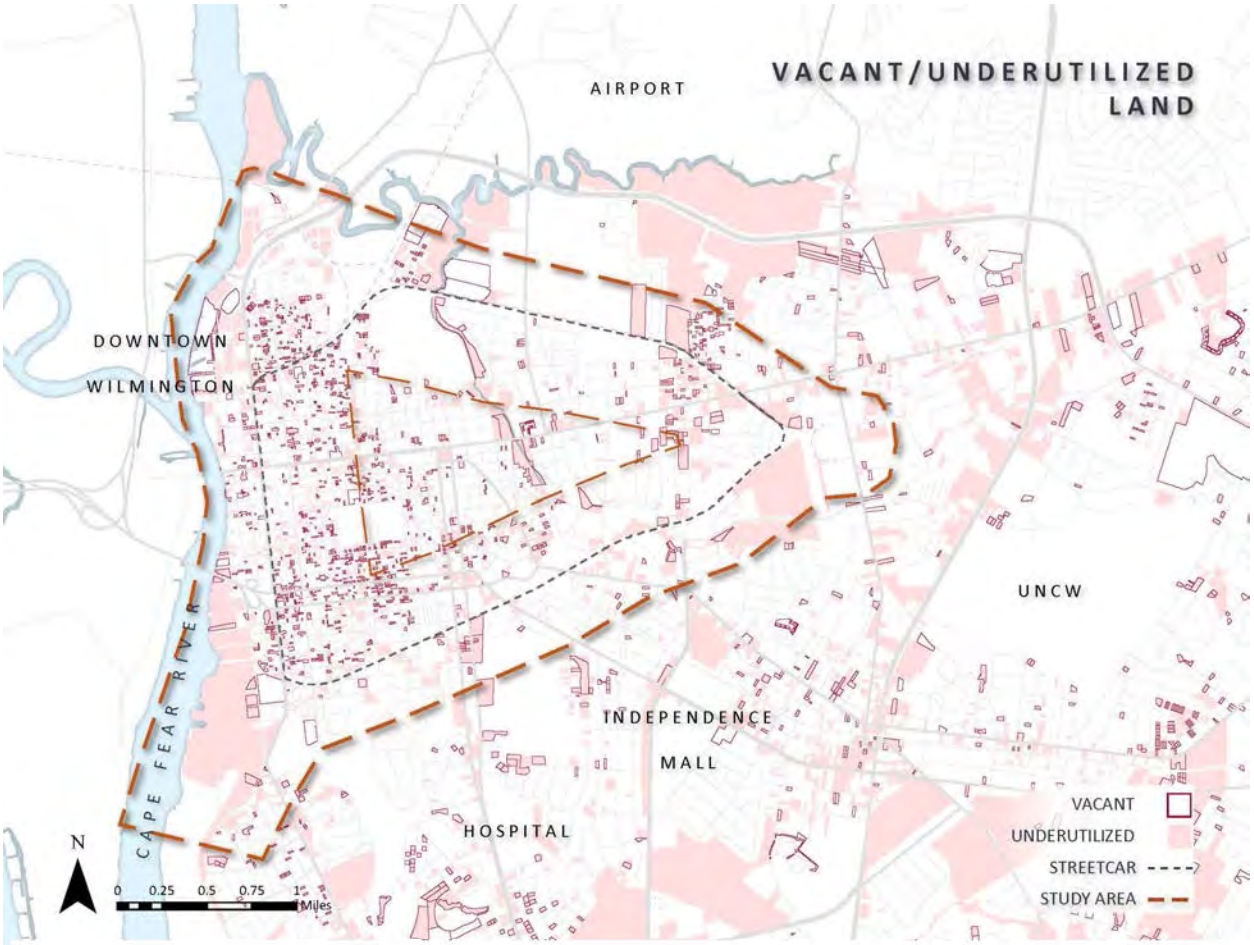
7. Development and Redevelopment Opportunities

In order to assess potential for development and redevelopment along the proposed transit corridor, three data points were investigated. First, the acreage of vacant and underutilized properties with proximity to the rail corridor was calculated to identify low-hanging development opportunities. Second, development opportunity nodes and mixed-use centers identified as part of the *Create Wilmington* comprehensive planning process were highlighted.

7.1. Vacant and Underutilized Properties

For this analysis, vacant properties are defined as any parcel that had no building value in New Hanover County's tax parcel data set. Underutilized properties are defined as those properties where the building value is less than the land value. It should be noted that some properties that met the criteria of underutilized were excluded upon review of the results given their special nature. The largest correction was Oakdale Cemetery.

Figure 10: VACANT AND UNDERUTILIZED ACREAGE IN STUDY AREA; 2016



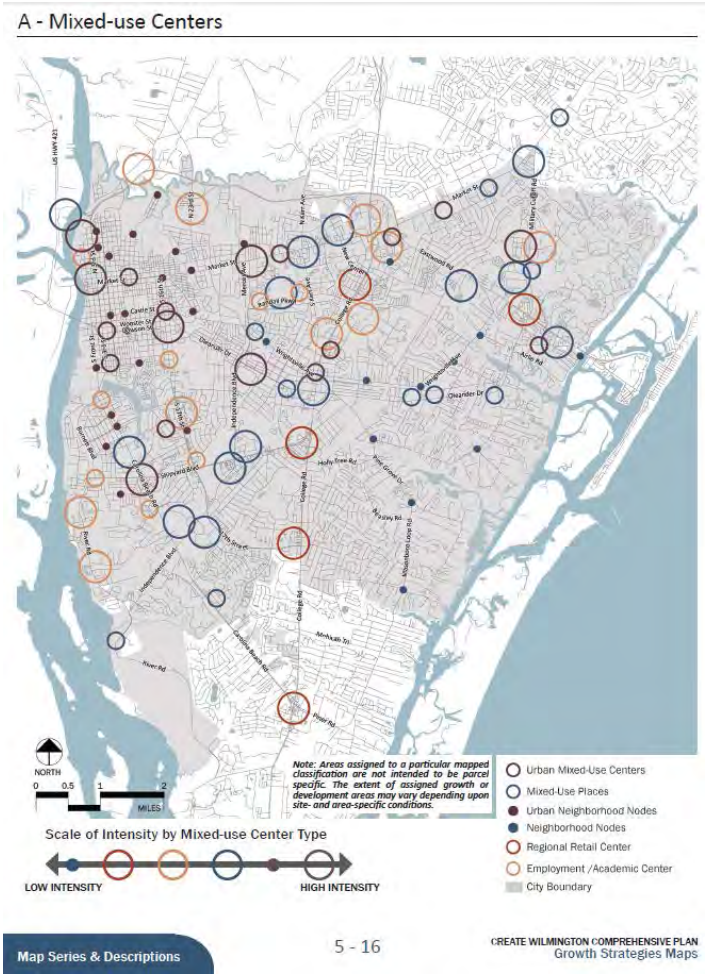
Source: New Hanover County; Kimley-Horn

7.2. Potential Mixed-Use/Transit Oriented Development Centers

Through the *Create Wilmington* planning process, the City combined qualitative data points with public input in order to identify key mixed-use nodes for future development. In fact, the City identifies a focus on mixed-use centers as the most important strategy to accommodate future growth within its jurisdictional boundaries.

The identified centers should have a focus on walkability, urban vitality, place-making, higher-density land use patterns, and transit. Coupled with existing transit routes provided by Wave Transit, the future streetcar corridor could be a key catalyst for growth and development in the identified nodes. The plan differentiates between mixed-use centers and neighborhood centers in order to demonstrate the intended size and scale of the opportunity sites. Neighborhood centers would serve the surrounding population, where larger mixed-use centers would likely draw from a larger customer base.

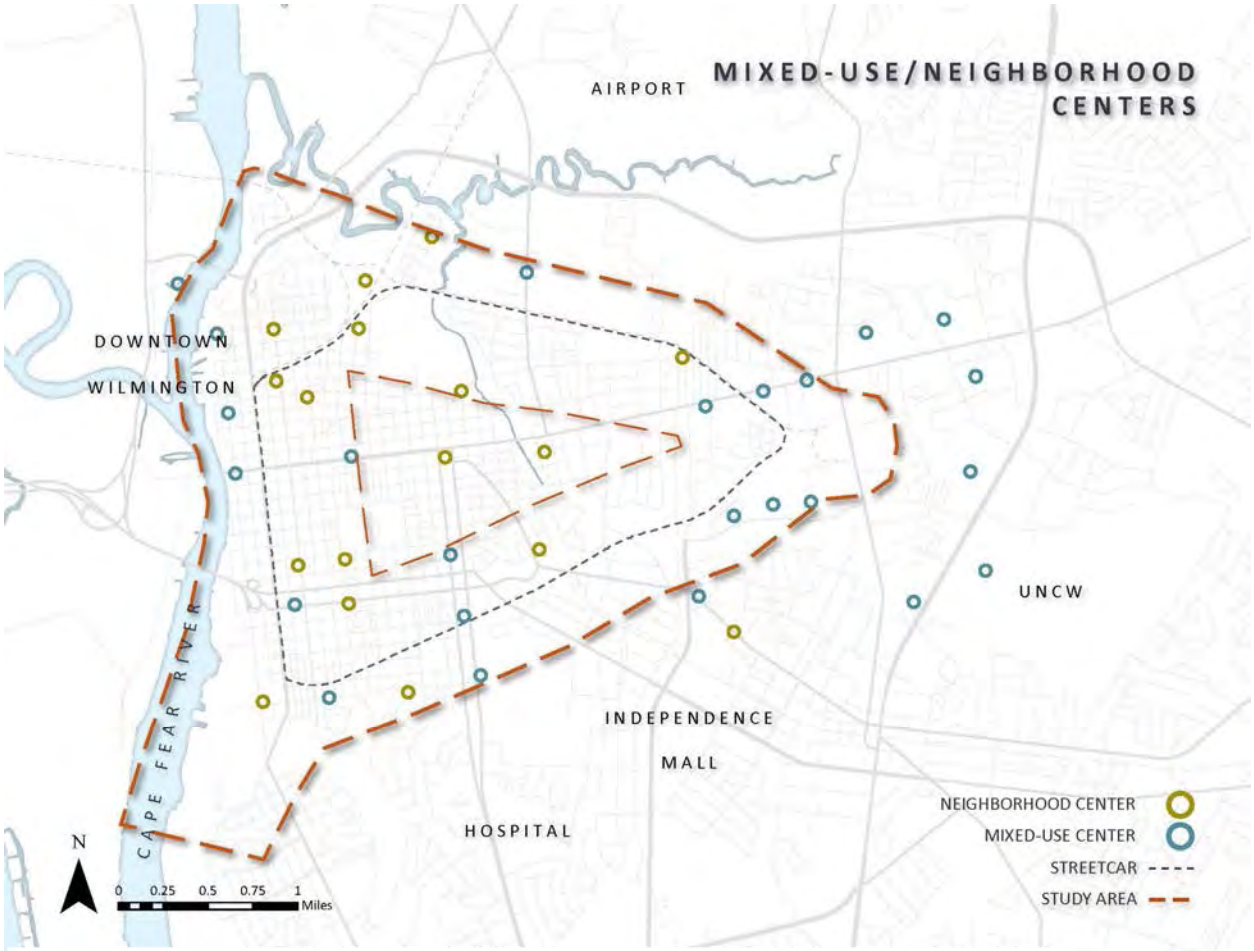
FIGURE 11: POTENTIAL MIXED-USE/TOD CENTERS; 2016



Source: Create Wilmington Comprehensive Plan, City of Wilmington

As shown in Figure 12, the Study Area has a significant number of potential mixed-use nodes, largely driven by proximity services and attractions in the urban core and the potential for future transit accessibility. Alternatives for future streetcar routes considered the identified mixed-use/neighborhood centers as a benefit for development.

FIGURE 12: POTENTIAL MIXED-USE/TOD CENTERS IN STUDY AREA; 2016



Source: Create Wilmington Comprehensive Plan, City of Wilmington

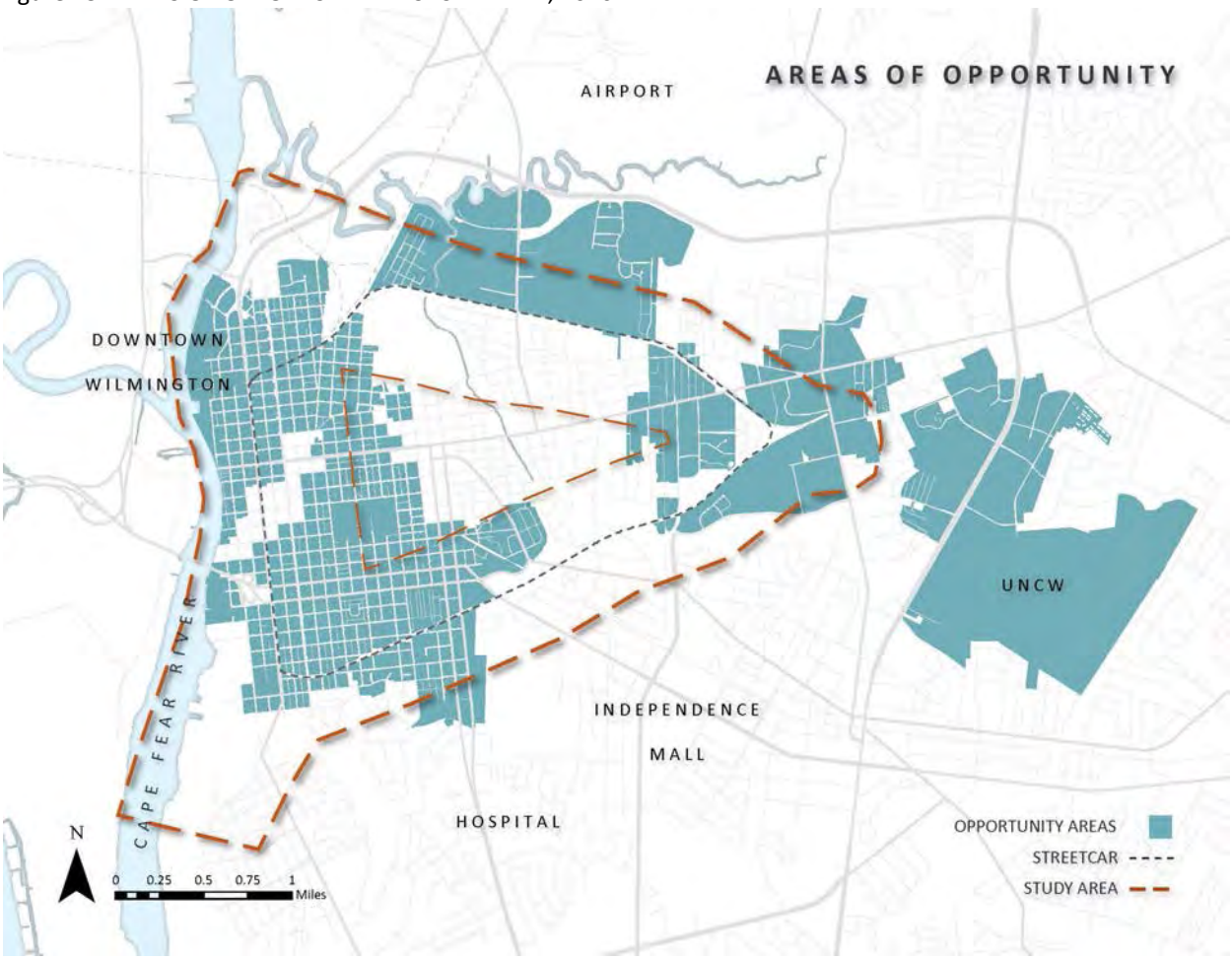
7.3. Future Opportunity Areas

The *Create Wilmington* planning process identified areas, outside of the specific Mixed-Use/Neighborhood Centers, which had the attributes to attract and accommodate future growth, largely through redevelopment of existing land use patterns. Infill and redevelopment will be a critical component of growth accommodation for the future of Wilmington as much of New Hanover County is built-out. Opportunity areas should be unique to the surrounding neighborhoods, and fit the size and scale of surrounding land use. As defined by the City, the Study Area is targeted for high-density transitions, neighborhood scale infill, post-industrial revitalization and live/work innovation zones.

As shown on Figure 13, the Study Area has many identified opportunity areas. These areas offer the highest levels of potential for future redevelopment. The consideration of the preferred transit/streetcar

alternative considers proximity to these areas to evaluate potential for catalyzing future growth. Areas of opportunity have been identified throughout the Study Area.

Figure 13: AREAS OF OPPORTUNITY IN STUDY AREA; 2016



Source: Create Wilmington Comprehensive Plan, City of Wilmington

7.4. Summary of Potential Socio-Economic Benefits

This section highlights the potential socio-economic benefits that could accrue in Wilmington with the addition of a fixed-rail public transit service. These benefits highlight factors that could impact potential for transit-oriented development and redevelopment with proximity to the planned corridor.

Enhanced Opportunities for TOD. Fixed-rail transit stations provide enhanced opportunities for concentrated, mixed-use development, far beyond the impacts of other transit modes (bus, bus rapid transit, etc.). TOD has become increasingly popular to promote smart and sustainable growth and provide a wider array of lifestyle choices within a community. This mixed-use development style is particularly attractive to a variety of resident types, including young professionals and Baby Boomers. Higher-density development concentrated near station nodes offers a strong opportunity to leverage public investment with private development dollars.

Promote Downtown Infill Development. The section of the planned corridor that traverses through downtown could offer an unparalleled opportunity to promote redevelopment and infill around downtown Wilmington, the largest job concentration in eastern North Carolina. Parking in downtown is a mixture of public parking decks, surface lots, and on-street parking. Public parking garages are largely single use, taking up entire blocks with no supporting uses. The extension of fixed-rail public transit could offer incentive to increase the value of public parking garages via private development. New Hanover County is currently investigating the potential to 'wrap' a publicly owned parking deck on 3rd Street with private development to increase the tax base. Additionally, there are plans to tear down the Water Street deck and redevelop into Riverplace, a mixed-use development that will include more integrated parking on site.

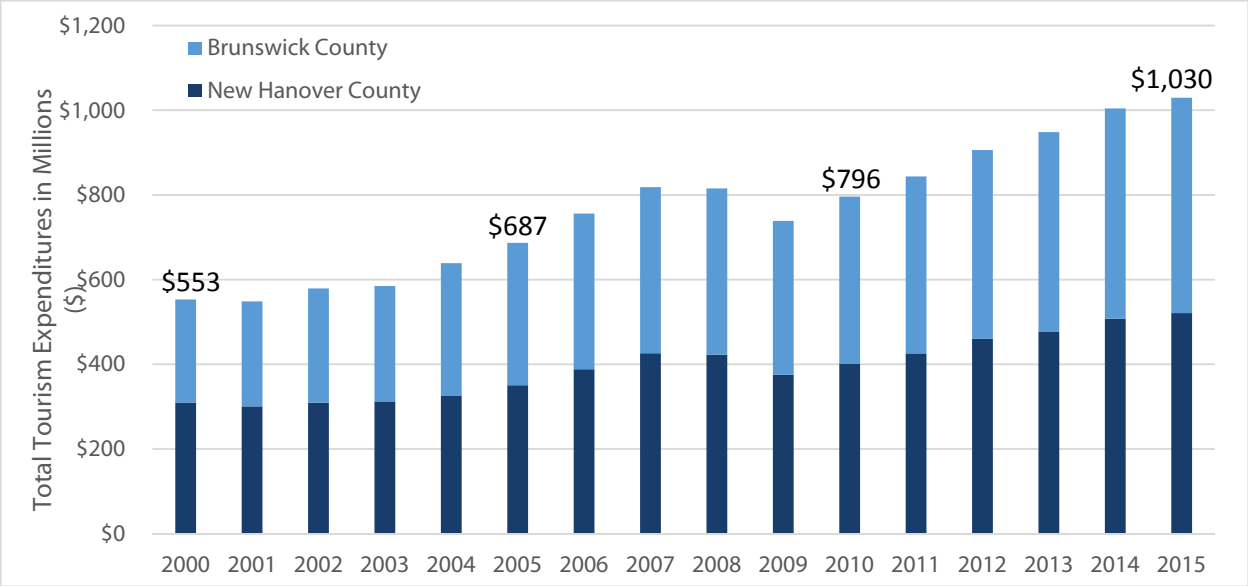
Reinvigorate Neighborhoods. Public investment in fixed-rail transit has often been leveraged to reinvigorate declining neighborhoods and areas that offer challenges to conventional development pro-formas (brownfields, structure dilapidation, etc.). Potential value premiums for proximity to station nodes can be used to help offset development unknowns in areas in need of revitalization. This could be leveraged in the southwest area of the planned corridor, which is characterized by outdated light-industrial buildings that are no longer competitive in today's market.

8. Tourism

8.1. Tourism Expenditures

The impact of tourism is a critical economic feature for Wilmington and surrounding New Hanover and Brunswick Counties. Driven by the surrounding beaches, coastal amenities and the historic downtown, New Hanover County experiences a significant influx of tourists, especially during the warmer seasons. In 2015, total tourism expenditures in New Hanover County were estimated at over $520 million. The most recently reported annual expenditure measure ranked New Hanover as #8 in the state for tourism. As shown in *Graph 8*, annual expenditures in New Hanover County has increased 68.1 percent since 2000. Except for a reset during the 2007-2009 Economic Recession, which slowed tourism nationally, annual expenditures in New Hanover County have increased gradually year-over-year.

Graph 8: ANNUAL TOURISM EXPENDITURES, NEW HANOVER COUNTY, 2000-2015
Source: North Carolina Department of Commerce



Tourism expenditures in Brunswick County closely mimic those of New Hanover, with strong growth exhibited over the last 15 years. With total tourism expenditures of nearly $509 million, Brunswick County ranked #9 in the state, following closely behind New Hanover. Brunswick County benefits from similar tourism factors, largely a significant influx of visitors during summer months, but also benefits from proximity to historic downtown Wilmington.

In addition to the generation of revenue, tourism supports a mixture of full- and part-time jobs in the local economy. In 2015, tourism accounted for more than 5,800 jobs within New Hanover County with a combined payroll of $121.5 million. Tourism-supported employment has increased by 3.7 percent since 2000.

8.2. Summary of Potential Socio-Economic Benefits

This section highlights the potential socio-economic benefits that could accrue in Wilmington with the addition of a fixed-rail public transit service. These benefits highlight factors that could impact tourism activities with proximity to the planned corridor.

Increase Connection to Amenities. Downtown Wilmington's historic setting with unique retail and restaurant offerings makes it a popular location for tourism. During peak months, typically June through August, hotel occupancy in downtown Wilmington ranges from 80% to 90%, higher than average for the market. With a strong pipeline of new hotel development under construction or proposed, opportunity to visit downtown (both for recreation and for business) will be enhanced. A fixed-rail transit system could be leveraged to support a strong tourism market, including major festivals, parades, and theatrical performances. Two new planned amphitheaters in the northern Riverfront area would also be an attractive draw to residents and tourists alike. Visitors would be less reliant on personal vehicles to get around, and have an easy way to get from one end of downtown to the other.

Promote Tourism as a Component of Strategy. A review of streetcar lines across the United States indicates a strong relationship between this mode of transportation and the promotion of tourism. In fact, a study completed in 2015 indicates that the promotion of tourism is the second most commonly quoted purpose of local streetcar systems, after the creation of new development opportunities (Brown, Nixon, & Ramos, 2015). Streetcars offer an efficient way to move visitors from one location to another without a personal vehicle, reducing the need for parking in attractive locations. However, it should be noted that the incorporation of other fundamental purposes like development opportunities and mobility enhancements will help mitigate operation impacts in times of reduced seasonal tourism or economic downturns.

M: Financial Analysis

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1. Financial Analysis

1.1. Summary Wilmington Rail Realignment Project

The Wilmington Rail Realignment Project (Project) will generate **$291M** of (combined $61M freight and $230M transit) undiscounted benefits if the Port does not expand ("no Port expansion"), and **$395M** of (combined $165M freight and $230M transit) undiscounted benefits if the Port does expand ("Port expansion") over a 30-year benefit cost analysis horizon. An undiscounted benefit represents the full value of a benefit. These benefits would lead to an economic rate of return of +0.29% and +0.76%, respectively. Depending on the project type, federal guidelines require a rate of return of 3% or 7%. The 3% rate is used when the requested funding is used for public expenditures and the 7% rate is used when the requested funding is combined with private investment[1].

The benefits associated with the Wilmington Rail Realignment Project are attributed to a combination of the removal of freight rail traffic from the City and the implementation of a transit system. The Project will result in the removal of freight rail traffic allowing the tracks to be repurposed for a streetcar system. The potential benefits generated from the implementation of transit through the City of Wilmington total **$230M of undiscounted <u>transit</u> benefits.**

The remaining benefits generated by the Project are associated with freight rail traffic. No Port expansion and Port expansion scenarios generate a total of **$61M and $165M of undiscounted <u>freight</u> benefits**, respectively. These benefits are realized in terms of avoided costs to the public caused by a transfer of train traffic from the CSXT Beltline to outside the City of Wilmington. Two base scenarios were considered for future rail volumes and project benefits. The first scenario assumes no container operation expansions ("no Port expansion") at the Port of Wilmington (Port). Here, container volumes will be capped by current annual capacity of 600,000 TEU (twenty foot equivalent unit) [Strategic Plan[2], Table 14]. The second scenario assumes the Port of Wilmington will expand its container operations ("Port expansion"). North Carolina State Port Authority (NCSPA) will expand the Port of Wilmington to accommodate all of the State's container volume demand (Maritime Strategy[3], Table 75). In this scenario, the Port projects container volumes through the port will reach 1.32M TEU by 2050.

Both no Port expansion and Port expansion freight scenarios would generate benefits in many areas which have been separated into five long-term categories including:

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[1] https://www.transportation.gov/policy-initiatives/tiger/2016-tiger-benefit-cost-analysis-guidance
[2] *2015 Strategic Plan of the North Carolina State Ports Authority, February 26, 2015*
[3] *The North Carolina Maritime Strategy, June 26, 2012*

- Benefits associated with increased **Quality of Life** including reduction in traffic congestion, increase in property values, and reduction in noise pollution.
- Benefits resulting from travel times savings and operating cost savings, or **Economic Competitiveness**.
- Benefits associated with the prevention of highway and highway-rail crashes, or **Safety Costs**.
- Benefits associated with the decrease of highway maintenance costs, or **State of Good Repair**.
- Benefits associated with the reduction of fuel emissions, or **Environmental Sustainability**.
- This project could also provide additional benefits for the City of Wilmington such as increased employment, personal income, and business impacts for travel and tourism industries as well as potential for new residential and commercial developments. These benefits are outside of Benefit Costs Analysis guidelines and are not evaluated in this report.

The Present Value of all social benefits realized as a result of the freight rail realignment and transit projects are summarized in Table 1. The present value of these potential social cost savings are then compared to potential transit benefits and the cost of the Project in Table 2. The most recent ***Benefit-Cost Analysis (BCA) Resource Guide***[4] was published in November 2016 using 2015 USD values. Therefore, all benefits and costs of the realignment project were calculated using 2015 USD.

Table 1: PRESENT VALUE OF SOCIAL BENEFITS – 2015 USD @ 3% DISCOUNT RATE

	NO PORT EXPANSION	PORT EXPANSION
TOTAL RAIL BENEFITS	$39,384,345	$84,736,233
QUALITY OF LIFE	*$3,925,643*	*$11,299,329*
ECONOMIC COMPETITIVENESS	*$18,948,932*	*$41,346,794*
SAFETY COSTS	*$16,327,137*	*$18,073,235*
STATE OF GOOD REPAIR	-	*$11,766,542*
ENVIRONMENTAL SUSTAINABILITY	*$182,633*	*$2,250,333*
TOTAL TRANSIT BENEFITS	$137,404,137	$137,404,137
TOTAL SOCIAL BENEFITS	**$176,788,482**	**$222,140,370**

Source: Moffatt & Nichol

Table 2: PROJECT NET PRESENT VALUE – 2015 USD @ 3% DISCOUNT RATE

	NO PORT EXPANSION	PORT EXPANSION
TOTAL FREIGHT BENEFITS	$39,384,345	$84,736,233
TOTAL TRANSIT BENEFITS	$137,404,137	$137,404,137
PROJECT RESIDUAL VALUE	$196,990,723	$196,990,723
PROJECT COST	($714,426,313)	($714,426,313)
NET PRESENT VALUE	**($340,647,108)**	**($295,295,220)**

Source: Moffatt & Nichol

[4] *Benefit-Cost Analysis (BCA) Resource Guide, November 2016*

1.2. Future Rail Volume

The Port of Wilmington and adjacent industries are the main origin and destination for trains moving through the City of Wilmington. References to rail growth and to rail demand in this analysis refer to a combination of rail service for Port expansion and for projected growth of nearby and adjacent industries. It is estimated that rail demand generated by the port would reach 102,229 TEU (1.8 daily trains) by 2020 and, in the Port expansion scenario, 243,924 TEU (4.2 daily trains) by 2050. For the no Port expansion scenario, both container and non-container rail volumes will reach capacity by 2024 and container rail volumes will peak at 114,000 TEU (2.0 daily trains) which is approximately 19 percent of total container volume. Rail volumes of 19% match the most efficient rail diversion from trucks and rail throughput efficiency for an east coast port in operation today.

Moffatt & Nichol interviewed the Port and evaluated the Port's Business Plan to estimate its future rail demand. The latest business plan for the Port of Wilmington, ***2015 Strategic Plan of the North Carolina State Ports Authority, February 26, 2015*** (Strategic Plan), pre-dates the Queen City Express service and does not have any forecasts for rail volumes. Port staff estimated that at full capacity the Port would be able to turn around one intermodal train per day. This train would provide a portion of the container traffic needed to support operations at both the Queen City Express and CCX. Additional study is required to determine the volume of rail traffic between Wilmington and these services.

Bulk and break-bulk commodities shipped through the Port and to industries along the Beltline use rail for some of their shipments. The majority of these shipments are made by truck to locations that make trucking a more economical method of shipping. "Low historical volumes to (Wilmington) have resulted in high per unit rail costs, making rail transport less competitive as compared to truck transport within the state." Increases in bulk and break-bulk rail shipments will be accomplished by increasing the number of railcars per train, i.e. making the train longer, until the trains reach a maximum length determined by the track lengths at Davis Yard and at the Port yard. **Bulk and break-bulk volumes shipped by rail to/from all shipping sources in the Wilmington area may reach three trains per day based on current projections.** These three trains per day will have a mix of railcars destined for the multiple recipients along the Beltline and at or near the Port.

Freight rail volumes developed along the Beltline or the realigned track will depend on the combined marketing efforts of the railroad and the economic development community in and around Wilmington. Markets must be developed for shipping between Wilmington and inland locations at a sufficient distance to make rail shipping economically feasible. While the possibility for such economic development exists, quantifying the benefits of this economic development requires information beyond the scope of this feasibility study. Moffatt & Nichol performed an independent evaluation of rail volumes to estimate project benefits, as follows.

The Strategic Plan indicates a 14.6 percent market capture rate for the Port addressable market. An addressable market represents the revenue opportunity or potential opportunity available to the Port. The Port's addressable intermodal market is mapped in Figure 1. This market capture rate would lead to a total demand of 538,048 TEU.

Since the Strategic Plan pre-dates the Queen City Express service, it has no indication of the share of the market that would be served by rail. To estimate the future traffic on the CSXT Beltline, Wilmington's expected volume is broken down into rail and truck markets based on their relative cost competitiveness. Figure 4**Error! Reference source not found.** shows the competitiveness of truck versus rail in Wilmington's addressable market. Rail cost components are sourced from USRail Desktop [5], Table 3 (b), while American Transportation Research Institute [6] (ATRI) costs, Table 3 (a), adjusted for changes in fuel costs, are used for calculating truck costs.

Figure 1: PORT OF WILMINGTON ADDRESSABLE MARKET

Source: 2015 Strategic Plan of the North Carolina State Ports Authority

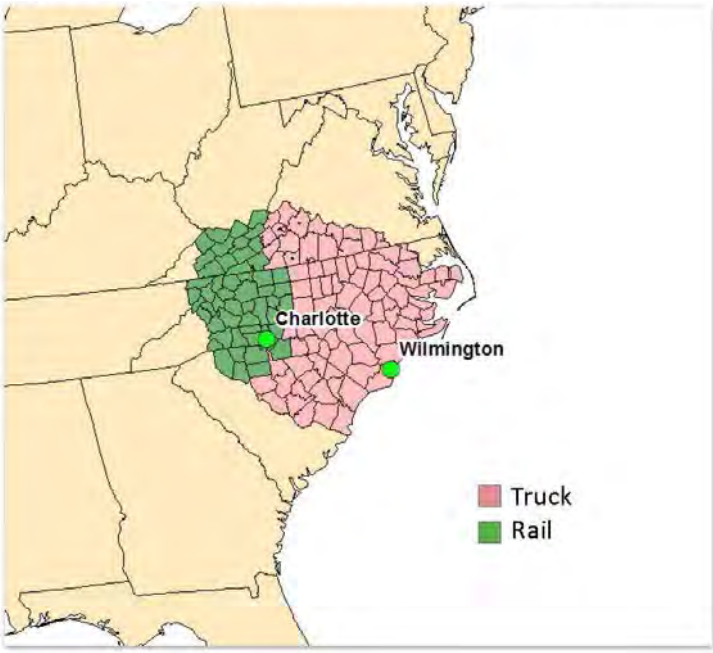
[5] http://www.usraildesktop.com/
[6] http://atri-online.org/wp-content/uploads/2015/09/ATRI-Operational-Costs-of-Trucking-2015-FINAL-09-2015.pdf/

Table 3: ATRI TRUCK COSTS

(a) Truck Cost Elements		(b) Rail Cost Elements	
Cost Element	**$/mile**	**Cost Element**	**$**
Fuel Costs (adjusted for change in fuel cost)	0.3725	Fixed Cost per Move	153.1000
Trailer Lease	0.2110	Fuel Cost per Mile	0.0417
Repair & Maintenance	0.1630	Other Variable Costs per Mile	0.2412
Insurance	0.0610		
Permits & Licenses	0.0130		
Tires	0.0440		
Tolls	0.0190		
Driver Wages	0.4980		
Driver Benefits	0.1370		
Total	**1.5185**		

The light red shaded area indicates the market that is more cost competitive when served by truck, while the dark green shaded area indicates the market that is more competitive when served by rail.

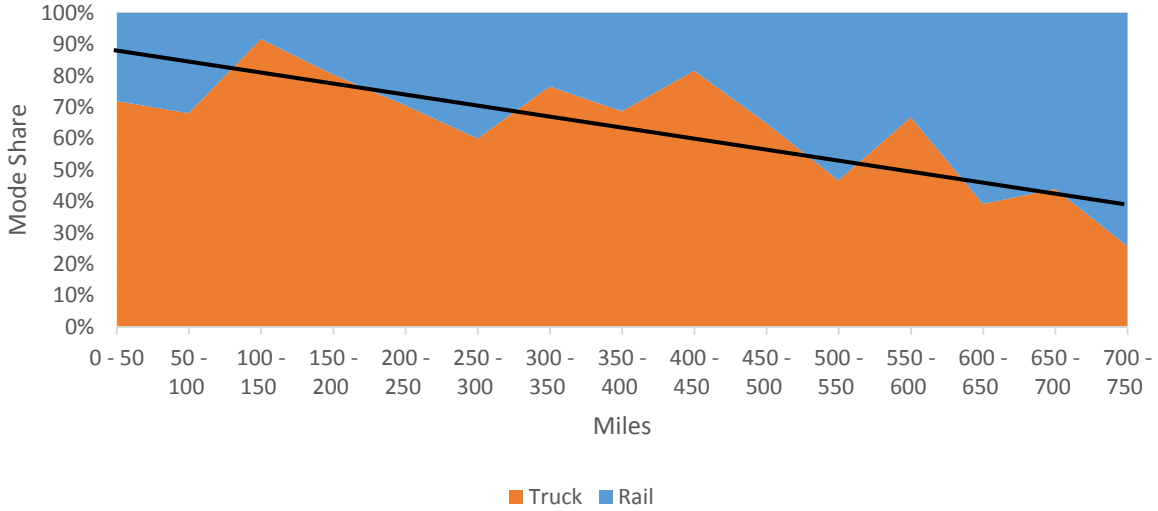
Figure 2: TRUCK VS. RAIL WITHIN ADDRESSABLE MARKET



Source: Moffatt & Nichol

The rail competitive area is home to 39 percent of the addressable market's population, an indicator of the maximum potential for rail volumes. To refine potential volumes for the rail market further, Moffatt & Nichol investigated the national rail market capture rate for waterborne commerce based on data from the USDOT's Freight Analysis Framework (FAF), as presented in Figure 3. US Census's waterborne commerce data was used to identify Port throughput at the commodity level. FAF was used to identify origin and destination of Port volumes. FAF is produced through a partnership between Bureau of Transportation Statistics (BTS) and Federal Highway Administration (FHWA), integrates data from a variety of sources to create a comprehensive picture of freight movement among states and major metropolitan areas by all modes of transportation. Figure 3 illustrates inland rail and truck market shares of international waterborne volume at different distances from ports. The x-axis indicates the distance from the Port while the y-axis shows the truck-rail breakdown.

Figure 3: NATIONAL RAIL MARKET CAPTURE RATE



Source: Moffatt & Nichol, FAF

By applying the national average market capture rate to Wilmington's addressable market, the potential rail market was further refined to 24.8 percent of total addressable volumes. This estimate was further refined based on industry benchmarks to an expected capture rate of 19 percent. At the target throughput of 538,048 TEU, the intermodal rail service will be cost competitive for 39 percent (209,082 TEU) of the market and will have an expected capture rate of 19 percent (102,229 TEU). A 19 percent capture rate would lead to roughly one round trip intermodal train per day, as shown in Table 4, assuming 70 car double stacked unit trains at 80 percent utilization.

Table 4: CONTAINER AND TRAIN VOLUME FORECAST - 2020

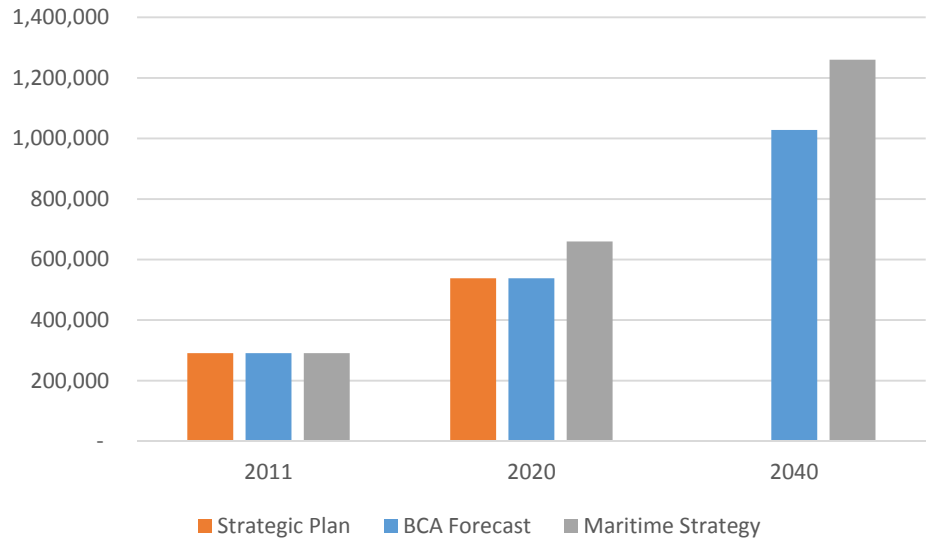
	POPULATION SHARE	TEU (2020)	NUMBER OF DAILY TRAINS (MAX.)	BENCHMARK SHARE	TEU (2020)	NUMBER OF DAILY TRAINS (BENCHMARK)
TRUCK MARKET AREA	61%	328,966	-	81 %	435,819	-
RAIL MARKET AREA	39%	209,082	1.8	19 %	102,229	0.9
TOTAL	**100%**	**538,048**	**1.8**	**100 %**	**538,048**	**0.9**

Source: Moffatt & Nichol, FAF

The North Carolina Maritime Strategy, June 26, 2012 (Maritime Strategy) was used to forecast the rail volumes at the Port beyond 2020. The Strategic Plan forecast for 2020 was used in favor of Maritime's Strategy, as shown in Figure 4, because it was published more recently and, therefore, considered more recent trade trends. The Strategic Plans forecast of 538,048 TEU in 2020 was extended forward to 2040 using the Maritime Strategy assumption of 3.29 percent annual growth. Therefore, referencing the Maritime Strategy, North Carolina's container volume is forecasted to grow to 1.03M TEU by 2040.

Figure 4 graphs the difference between the Strategic Plan and the Maritime Strategy forecasts and the forecast used in this study. Moffatt & Nichol then assumed a 2.5 percent CAGR up until 2050 to develop the final part of the 30-year planning period. The Maritime Strategy assumes a 3.29 percent CAGR for its 2040 forecast. Moffatt & Nichol believes that growth at 2.5 percent for the following 10 years is a relatively conservative approach.

Figure 4: BCA STUDY FORECAST VS. NORTH CAROLINA STUDY FORECASTS



The Maritime Strategy also lays down multiple scenarios for how NCSPA would handle expected container demand for North Carolina. Moffatt & Nichol breaks down these scenarios into two distinct categories. Those projects, which involve the development of container terminals outside the Port and those, which involve the expansion of the Port. The first group of projects satisfy North Carolina's container demand by developing container terminals in other locations including Radio Island, River Road, and Southport. Consequently, the Port's rail volume will remain near 2020 levels. In the case of Port of Wilmington expansions, the Port's volume will continue to grow beyond current annual capacity of 600,000 TEU and realize 1.03M TEU in 2040 and 1.32M TEU in 2050. This increase in container trade at the Port would lead to an increase of daily intermodal trains from 0.9 round trips to 1.7 round trips, or 3.4 daily trains in 2040, as shown in Table 5, and 4.2 daily trains in 2050.

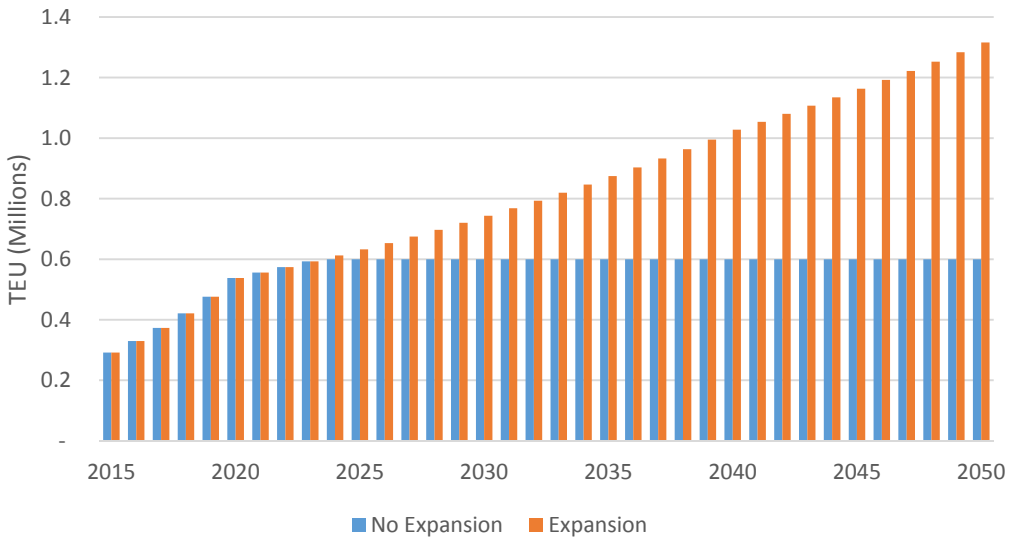
Figure 5 summarizes the volume forecasts for both the no Port expansion and Port expansion scenarios.

Table 5: CONTAINER AND TRAIN VOLUME FORECAST - 2040

	POPULATION SHARE	TEU (2040)	NUMBER OF DAILY TRAINS (MAX.)	BENCHMARK SHARE	TEU (2040)	NUMBER OF DAILY TRAINS (BENCHMARK)
TRUCK MARKET AREA	61%	628,517	-	81%	832,667	-
RAIL MARKET AREA	39%	399,468	6.9	19%	195,317	3.4
TOTAL	**100%**	**1,027,985**	**6.9**	**100%**	**1,027,985**	**3.4**

Source: Moffatt & Nichol, FAF

Figure 5: NO PORT EXPANSION VS. PORT EXPANSION VOLUME FORECASTS



Source: Strategic Plan, Maritime Strategy, Moffatt & Nichol

1.3. Benefit Calculations

Re-routing rail traffic out of the City because of the Project will lead to public benefits in five categories including Quality of Life, Economic Competiveness, Safety, State of Good Repair, and Environmental Sustainability. These benefits are estimated for both no Port expansion and Port expansion scenarios at the Port and are used to calculate the Economic Rate of Return of the Project. Refer to Appendix A for detailed information on the method for estimating these benefits.

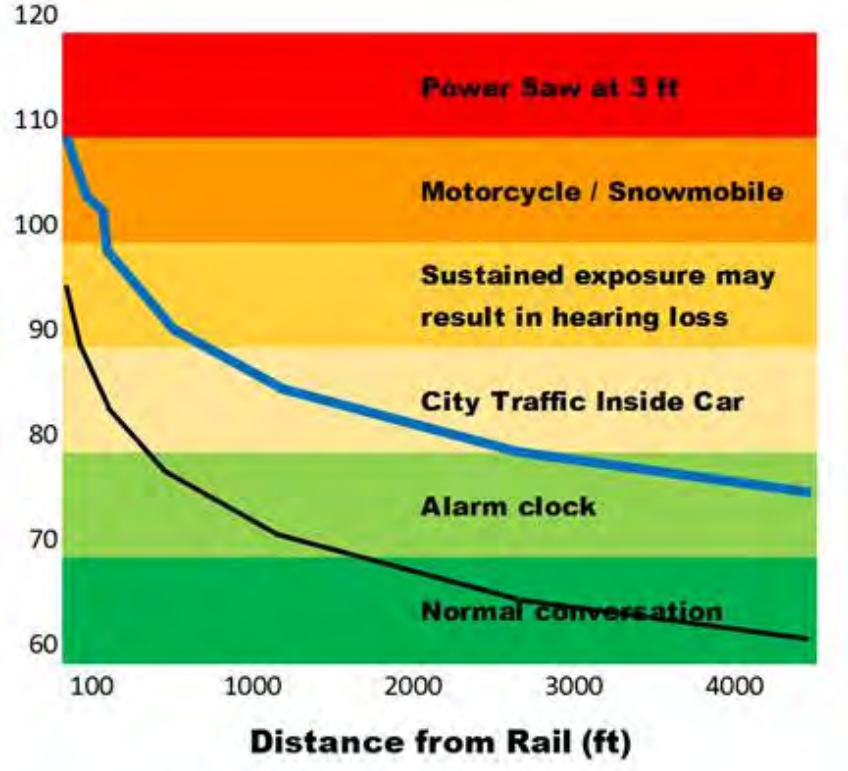
Evaluations based on total distance traveled, switching operations at both ends, maximum operating speeds, and operating efficiencies indicate that the CSXT Beltline can functionally handle up to six daily (round trip) trains, though this would have traffic congestion impacts on the City unless other accommodations are made for traffic flow. In the no Port expansion scenario, Wilmington's rail volume

will remain within the track capacity of six daily trains. However, in the Port expansion scenario, rail volumes will exceed the six daily trains. With CSXT's Beltline already expected to be supporting three daily bulk and breakbulk trains by 2020, there will be enough capacity for just three daily intermodal trains. Continuing with the same assumption of 70 car double stacked unit trains at 80 percent utilization, each daily intermodal train has an annual capacity of 58,240 TEU. Rail demand in 2040 is projected to be 195,317 TEU. Therefore, rail demand in excess of 174,720 TEU ("excess rail demand") is approximately 20,600 TEU in 2040, will move by truck to an intermodal facility in Charlotte, NC or near Rocky Mount, NC, increasing costs. As a result, the Port expansion scenario has a set of social costs associated with the trucking created by excess rail demand that the no Port expansion scenario does not.

1.3.1. Quality of Life

The realignment of train traffic out of the City will have a positive impact on the quality of life in areas surrounding crossings and rail track. Trains are required to sound their horns while travelling through at-grade crossings. Train signals are required to be heard between 110 and 96 dB from a distance of 100 feet, with four horn blasts per crossing. This high noise intensity affects the quality of life and, consequently, the property values in areas exposed to these sounds. Figure 6 helps depict the intensity of train signals by distance.

Figure 6: TRAIN SIGNAL INTENSITY (dB)



Source: Examining the Spatial Distribution of Externalities: Freight Rail Traffic and Home Values in Los Angeles

In addition to noise pollution, studies have shown that train traffic emissions also have a negative impact on property values. The impact of noise and air emissions were calculated based on the ***Examining the Spatial Distribution of Externalities: Freight Rail Traffic and Home Values in Los Angeles***[7] research for both Port expansion and no Port expansion scenarios. Undiscounted property value (quality of life) benefits of the realignment project equals $4.4 million for the no Port expansion case and $5.0 million for the Port expansion case.

The rail realignment Project will also lead to additional quality of life benefits by preventing congestion and noise pollution caused by the diversion of traffic from truck to rail in the Port expansion scenario. Undiscounted congestion and noise pollution cost savings of the realignment project would be equal to $16.5 million as a result of excess rail demand in the Port expansion scenario.

Total undiscounted Quality of Life benefits would be equal to $4.4 and $21.5 million for no-expansion and expansion scenarios. At 3% discount rate the present value of these benefits would equate to $3.9 and $11.3 million respectively.

1.3.2. Economic Competiveness

Economic competitiveness benefits are defined as operating and travel-time savings resulting from rerouting train traffic through the City. Train movement through at-grade crossings in the City leads to loss of time and additional vehicle and truck operating costs for road users. The Project can save up to 1,286,307 hours of vehicle time and 68,349 hours of truck time over 30 years by eliminating traffic delays caused by train traffic through the City, based on TIGER guidelines [4].

Travel time-savings include both the value of time for truck drivers and vehicle passengers. Passenger and truck driver time is valued at $14.10 per hour and $27.20 per hour, respectively, based on TIGER guidelines [4]. The undiscounted travel time-savings of the Project would be equal to $21.4 million and $30.9 million for Port expansion and no Port expansion scenarios. Operating cost savings include savings from both trucks and passenger vehicles. The undiscounted operating cost savings of the Project would be equal to $2.0 million and $2.9 million for Port expansion and no Port expansion scenarios.

As previously mentioned in Section 1.3, rail demand will exceed rail capacity by approximately 20,600 TEU in 2040 and will increase transportation costs as a result in the Port expansion scenario. As the Port's container, and therefore rail volumes, continue to grow past 2020, boxes that are more cost competitive as a rail move will have to be put onto a truck. These boxes, originally destined for further inland locations by rail, were being moved by rail to an intermodal facility in Charlotte, NC or near Rocky Mount, NC. Therefore, rail costs to the intermodal facility will be compared to truck costs to the same location for

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[7] Futch, Micael, *Examining the Spatial Distribution of Externalities: Freight Rail Traffic and Home Values in Los Angeles, November 11, 2011*

calculating transportation costs in this section. The undiscounted transportation cost savings of the Project would be equal to $40.5 million as a result of excess rail demand in the Port expansion scenario.

Also included in this section is the reduction in the project cost of Independence Boulevard. Current cost projections for this unfunded project are at approximately $76.6 million based on a preliminary estimate developed by NCDOT on April 20, 2014. In a recent traffic separation study, the City eliminated the possibility of using grade separations (bridges) as a way to replace at-grade highway railroad intersections. Planning for Independence Boulevard includes two grade separations in conformance with Federal requirements for no new at-grade crossings. If the City were to follow through with the Independence Boulevard Extension Project after implementing the rail realignment, an estimated $5.6 million will be saved from the Independence Boulevard Extension project budget by eliminating both of the grade separations. This savings is based on the cost of the structures as indicated in the preliminary estimate plus the savings in the reduction of the 15% E. & C. cost.

Total undiscounted Economic Competitiveness benefits would be equal to $29 and $79.5 million for no-expansion and expansion scenarios. At three percent discount rate the present value of these benefits would equate to $19 and $41 million respectively.

1.3.3. Safety

Crossing Crashes

Realignment of the CSXT Beltline to outside the City will eliminate the chance of having highway-freight rail crashes at any of the at-grade crossings. Crash costs were calculated in accordance with FRA and National Cooperative Highway Research Program (NCHRP) NCHRP-755 report[8] guidelines and include primary and secondary costs.

Primary effect costs involve all direct, indirect, and intangible costs associated with property damage, injury, and fatal crashes. This would include all costs visible at the time of the crash, making them relatively straightforward to calculate. Fatal crash costs are determined using the Value of Statistical Life (VSL) as published by USDOT at a value of $9.6 million per fatality. Also based on VSL, injury crashes are assumed to carry an average cost of $216,008 in the case of accident injuries. In the case of a highway-rail crash, there are also costs associated with property damage. In addition, fatal crashes have higher property damage costs than injury or property damage only crashes. Secondary effect costs involve all costs accrued because of delayed travelers and cargo, and to parties beyond the immediate road and rail travelers. Although secondary effect costs can sometimes represent the majority of costs associated with highway-rail crashes, because they are not as visible, they can be harder to calculate.

These undiscounted safety cost savings of the realignment project would be equal to $12.8 and $13.2 million for no Port expansion and Port expansion scenarios.

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[8] *Transportation Research Board, NCHRP Report 755, Comprehensive Costs of Highway-Rail Grade Crossing Crashes*

Highway Crashes

In the Port expansion scenario where excess rail demand will be moved by truck, there will be safety costs associated with additional trucks travelling on the state's highways. Generally, higher truck volumes lead to more highway crashes. The undiscounted safety cost savings of the realignment project would be equal to $1.4 million as a result of excess rail demand in the Port expansion scenario.

Derailments

Derailments are an operating risk for all railroads. However, the cost of that risk is only determined when a derailment actually occurs. Derailment costs vary based on the severity of the derailment, the commodities in the derailed cars, the location of the derailment, and the impact to the surrounding environment and/or communities near the derailment. Estimating the cost of derailment or the cost savings of reducing the potential for derailments is an actuarial exercise beyond the scope of this Feasibility Study.

The following tables show the national relationship between planes, trucks, trains, and ships for hazmat incidents, fatalities, and injuries from 2007 through 2016, inclusive.

Incidents By Mode and Incident Year

Mode Of Transportation	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	Grand Total
FAA-AIR	1,556	1,278	1,356	1,295	1,401	1,460	1,441	1,327	1,129	1,199	13,442
FMCSA-HIGHWAY	16,932	14,803	12,730	12,651	12,812	13,254	13,886	15,312	15,120	16,491	143,991
FRA-RAILWAY	753	748	642	747	745	661	667	718	581	543	6,805
USCG-WATER	61	100	90	105	71	70	63	47	24	11	642
Grand Total	19,302	16,929	14,818	14,798	15,029	15,445	16,057	17,404	16,854	18,244	164,880

Fatalities By Mode and Incident Year

Mode Of Transportation	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	Grand Total
FAA-AIR	0	0	0	0	0	0	0	0	0	0	0
FMCSA-HIGHWAY	9	6	12	8	12	13	11	11	12	8	102
FRA-RAILWAY	0	0	1	0	1	0	0	0	0	0	2
USCG-WATER	0	3	0	0	0	0	0	0	0	0	3
Grand Total	9	9	13	8	13	13	11	11	12	8	107

Injuries By Mode and Incident Year

Mode Of Transportation	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	Grand Total
FAA-AIR	8	7	10	2	7	20	12	15	20	7	108
FMCSA-HIGHWAY	160	153	153	152	130	147	142	134	157	144	1,472
FRA-RAILWAY	57	63	38	13	20	18	15	14	213	17	468
USCG-WATER	3	0	0	2	8	0	2	0	0	8	23
Grand Total	228	223	201	169	165	185	171	163	390	176	2,071

Source: https://hip.phmsa.dot.gov/analyticsSOAP/saw.dll?Dashboard

The following chart shows the national relationship between planes, trucks, trains, and ships for hazmat damage costs from 2007 through 2016, inclusive.

Damages By Mode and Incident Year

Mode Of Transportation	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	Grand Total
FAA-AIR	$88,030	$191,434	$707,939	$20,267	$171,467	$41,089	$143,105	$129,417	$46,971	$1,929,865	**$3,469,584**
FMCSA-HIGHWAY	$47,279,979	$42,889,714	$50,628,781	$63,672,251	$113,102,635	$60,189,859	$49,517,136	$59,602,170	$62,214,706	$45,667,139	**$594,764,370**
FRA-RAILWAY	$27,305,219	$7,941,838	$17,557,034	$7,342,259	$12,309,566	$17,838,609	$37,780,045	$22,656,840	$46,086,006	$27,385,862	**$224,203,278**
USCG-WATER	$19,097	$138,350	$100,887	$574,103	$205,000	$806,168	$18,713	$117,350	$3,427	$53,211	**$2,036,306**
Grand Total	**$74,692,325**	**$51,161,336**	**$68,994,641**	**$71,608,880**	**$125,788,668**	**$78,875,725**	**$87,458,999**	**$82,505,777**	**$108,351,110**	**$75,036,077**	**$824,473,538**

Source: https://hip.phmsa.dot.gov/analyticsSOAP/saw.dll?Dashboard

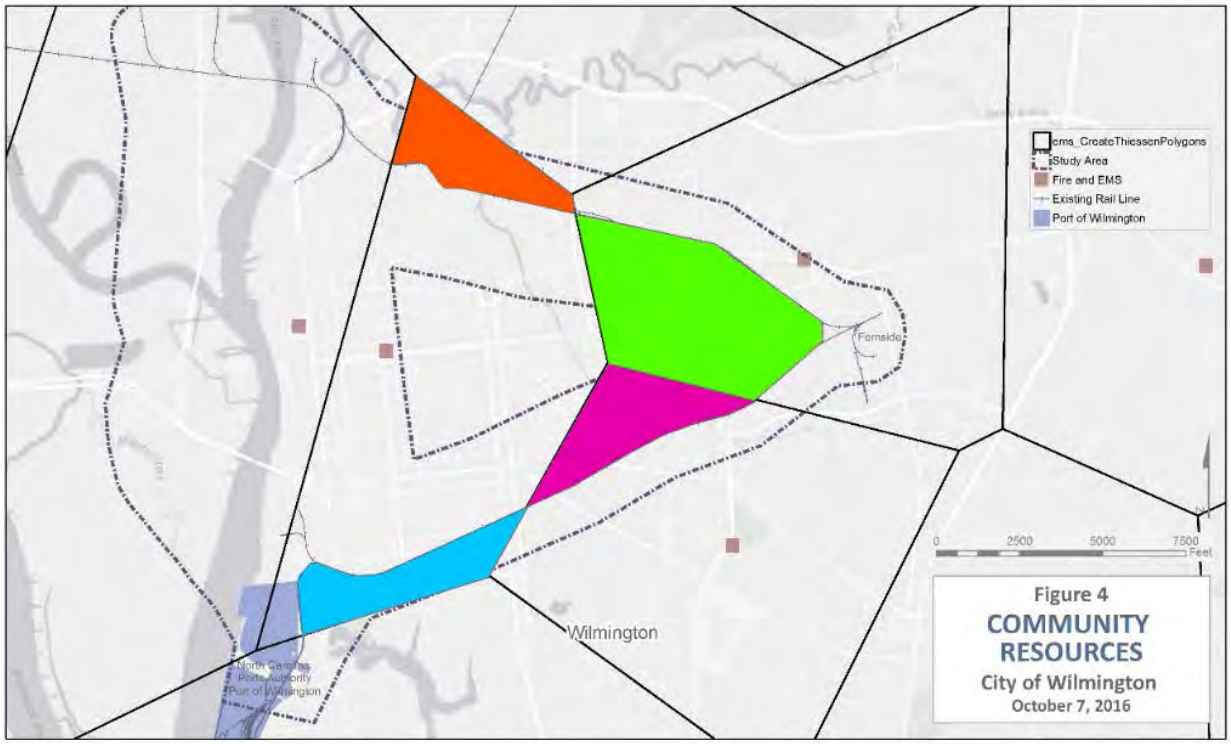
Fire and EMS

High train volumes through the City can also pose a major issue for emergency situation response times. A 70-car train moving through the City can delay fire trucks and ambulances trying to reach citizens in times of an emergency. The study area within the City has five fire and EMS stations. The four colored regions in Map 1 represent areas that could be disrupted by closed crossings in the event of a fire or medical emergency.

Moffatt & Nichol calculated the cost associated with delayed response times as a result of crossing closures. These costs were calculated in accordance with ***FEMA's BCAR: Development of Standard Economic Values***[9], which assumes that in the case of an emergency and the temporary shutdown of a fire station, the next closest station will serve the affected area.

[9] *FEMA Benefit-Cost Analysis Re-engineering (BCAR), Development of Standard Economic Values, December 2011*

Map 1: STUDY AREA FIRE AND EMS STATIONS



Credits: New Hanover County GIS (Parcels), NCDOT (Roads, Rail), NCOneMap (Hospital, EMS, Fire Stations, Public Schools, Private Schools, Colleges and Universities) Esri (Background, Institutions Layer), HERE, DeLorme, MapmyIndia, Copywrite OpenStreetMap contributors, and the GIS user community.

Source: Moffatt & Nichol

The undiscounted fire and EMS cost savings of the Project would be equal to $14.5 million and $16.4 million for no Port expansion and Port expansion scenarios. In the case of a fire, the dollar amount reflects the additional dollar value loss per year because of delayed response time. While in the case of a loss of EMS, the dollar amount reflects the value of additional lives loss per year as a result of delayed response time.

Total undiscounted Safety benefits would be equal to $27.3 and $40.0 million for no-expansion and expansion scenarios. At 3% discount rate the present value of these benefits would equate to $16.3 and $18.1 million respectively.

1.3.4. State of Good Repair

In the Port expansion scenario, starting in 2037, excess rail demand leading to increased truck moves will also introduce State of Good Repair costs to the state's highway system. These costs include the additional highway maintenance costs that come with higher truck volumes. The undiscounted state of good repair cost savings of the realignment project would be equal to $27.7 million for the Port expansion scenario. At 3% discount rate the present value of these benefits would equate to $11.8 million.

1.3.5. Environmental Sustainability

Crossing closures caused by train traffic going through the City imposes an environmental sustainability cost of fuel emissions generated by idling vehicles. In the Port expansion scenario, starting in 2037, increased highway congestion from the diversion of traffic from rail to truck will lead to additional environmental costs and fuel emissions.

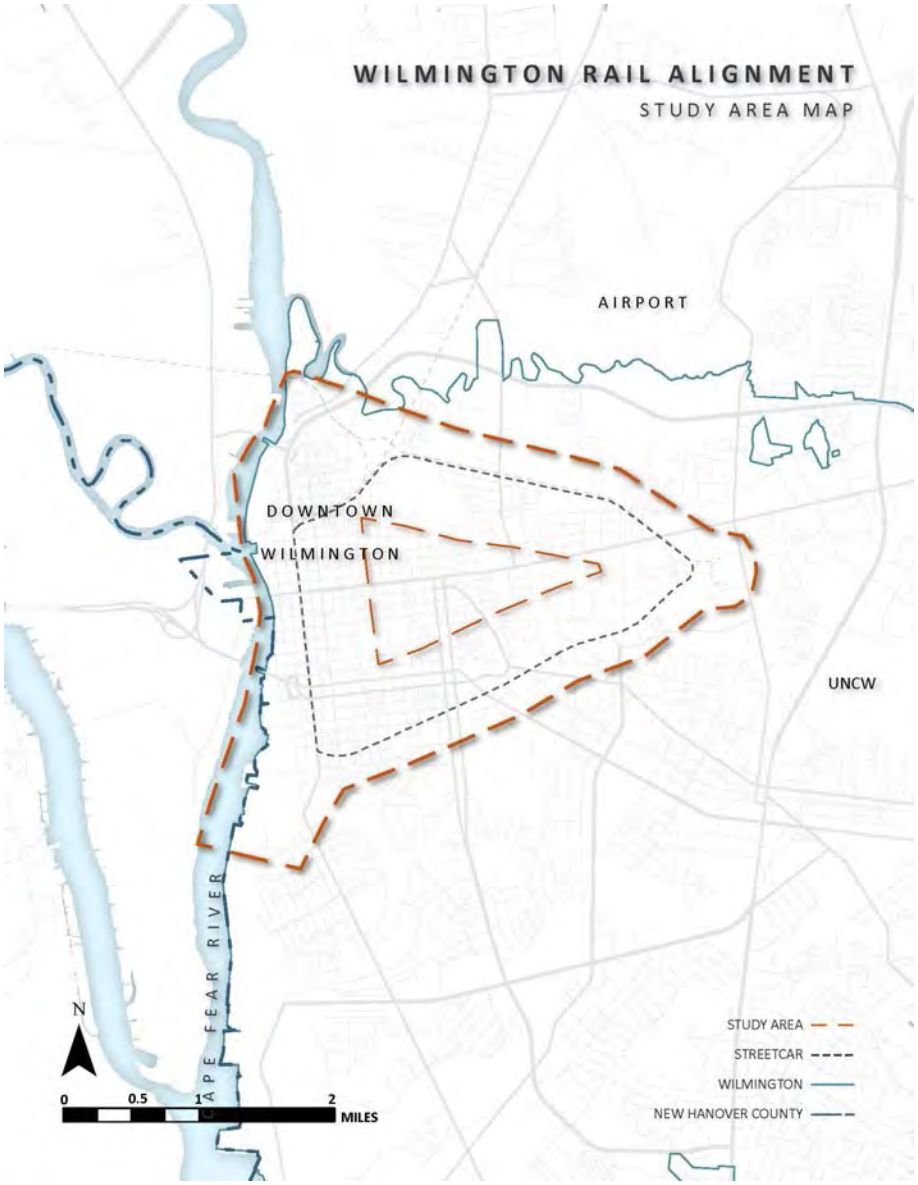
Moffatt & Nichol calculated the social costs of carbon, SOx, NOx, and particle matter emissions introduced by both vehicles waiting at crossing closures and excess rail demand. The undiscounted environmental sustainability cost savings of the Project would be equal to $289,101 and $398,936 for no Port expansion and Port expansion scenarios resulting from crossing closures. The undiscounted environmental sustainability cost savings of the Project would be equal to $4.8 million for the Port expansion scenario resulting from excess rail demand.

Total undiscounted Environmental Sustainability benefits would be equal to $0.3 and $5.1 million for no-expansion and expansion scenarios. At 3% discount rate the present value of these benefits would equate to $0.2 and $2.3 million respectively.

1.3.6. Transit Benefits

As part of the feasibility study, Moffatt & Nichol has generated a high-level estimate of the potential benefits realized from a streetcar transit system in the City. It is assumed that a streetcar will make use of the existing tracks in the City currently being used by freight rail, as shown in Figure 7. At this point in the study, and in the absence of detailed travel demand and transit studies, the method for estimating the potential benefits generated from a streetcar transit system in Wilmington is calculated by benchmarking it to similar existing operations.

Figure 7: WILMINGTON RAIL ALIGNMENT: TRANSIT STUDY AREA MAP



Source: Kimley Horn

In developing this benchmark, various light rail and streetcar systems, which have similar qualities to what one in Wilmington may look like, have been reviewed. These transit systems include Norfolk's Tide Light Rail, Charlotte's CityLynx Gold Line, Tucson's Sun Link, Atlanta's Streetcar, and New Orleans' UPT/French Quarter Streetcar. Of the five, three had TIGER Grant applications that calculated the expected benefits for those systems – Atlanta, Tucson, and New Orleans. Atlanta, Tucson, and New Orleans have the population densities of 3,572, 2,648, and 2,519 person per square mile, respectively, compared to Wilmington's 2,329 person per square mile within the study area.

New Orleans has the closest population density to Wilmington, which makes New Orleans UPT/French Quarter Streetcar[10] the best representative benchmark for evaluating Wilmington's transit benefits.

The UPT/French Quarter Streetcar analysis involved a transit line of 3.27 route miles primarily through New Orleans' French Quarter. The idea was to provide transit options to both residents living in the area as well as tourists. The local population that was expected to be directly affected by the new streetcar system was more than 70,000 people. At the time of the study, the new transit line was forecasted to transport approximately 2,500 daily users and, in doing so, remove more than 130 vehicles off the roads daily. In addition to benefits associated with the removal of vehicle traffic, the presence of a number of tourist attractions in the area were also expected to increase social benefits. Since the reviewed benefit cost analysis was in the form of a TIGER Grant application, the document categorized the total benefits in accordance with TIGER Grant guidelines – Quality of Life, Economic Competiveness, Safety, State of Good Repair, and Environmental Sustainability.

In addition to the factors considered in a benefit-cost analysis, other transit-related benefits are studied in the Transit Economic Benefits Assessment, Technical Report L.

As previously mentioned, the benefit-cost analysis was conducted for a study area of approximately 70,000 people. The study area for the Project includes a one-quarter mile radius from the transit line. It is estimated that the study area population equals 23,500, which includes the area within a one-quarter mile radius outside of the existing rail corridor (see Figure 7). The New Orleans study estimated total benefits of the Streetcar at $342 million over a 20-year period at 3 percent discount rate. Therefore, assuming that such transit benefits are evenly distributed over the study period, Moffatt & Nichol benchmarked total undiscounted benefits per person per year at $325. As a result, the undiscounted transit benefits of the realignment project over the 30-year BCA horizon would be equal to $230 million. At 3% discount rate the present value of these benefits would equate to $137 million.

1.3.7. Project Residual Value

Project residual value is based on the undiscounted benefits converted to a discounted net present value using a discount rate over a certain time period. TIGER program guidelines establish the discount rate at 3%. Increasing the discount rate above these guidelines (to greater than 3 percent) would reduce the net present value of the investment by further decreasing the value of the discounted benefits. Moffatt & Nichol calculated the present value of all social benefits for 30 years in 2015 USD at a 3 percent discount rate in accordance with the TIGER program guidelines. Furthermore, the Project's residual value was calculated assuming a 100-year lifespan. This created a greater residual value at the 30 years evaluation

period by retaining the value of the capital for the estimated service life of the investment rather than assuming the value to be zero at the end of 30 years.

At three percent discount rate the present value of the residual value would equate to $197 million.

The total net present value of the Project is summarized below in Table 6: PROJECT NET PRESENT VALUE – 2015 USD @ 3% DISCOUNT RATE.

Table 6: PROJECT NET PRESENT VALUE – 2015 USD @ 3% DISCOUNT RATE

	NO PORT EXPANSION	PORT EXPANSION
TOTAL FREIGHT BENEFITS	$39,384,345	$84,736,233
TOTAL TRANSIT BENEFITS	$137,404,137	$137,404,137
PROJECT RESIDUAL VALUE	$196,990,723	$196,990,723
PROJECT COST	($714,426,313)	($714,426,313)
NET PRESENT VALUE	**($340,647,108)**	**($295,295,220)**

Source: Moffatt & Nichol

Appendix A – Table of Undiscounted Costs and Benefits

				30-yr NPV @ 3%	Undiscounted	2016	2017	2018	2019	2020	2021	2022	2023
No Expansion	Safety	Expected crash costs of 36 crossings - Total	USD	7,632,829	12,765,935	-	-	-	-	425,531	425,531	425,531	425,531
		Total dollar loss due to fire station shutdown - 2015 USD	USD	228,291	381,818	-	-	-	-	12,727	12,727	12,727	12,727
		Cost of lives lost due to increased EMS respond time - 2015 USD	USD	8,466,017	14,159,445	-	-	-	-	471,981	471,981	471,981	471,981
		Total change in safety costs from rail overflow to truck - 2015 USD	USD	-	-	-	-	-	-	-	-	-	-
	Economic Competitiveness	Passenger time cost as a result of train delay - Total - 2015 USD	USD	12,771,532	21,360,434	-	-	-	-	712,014	712,014	712,014	712,014
		Vehicle operating cost as a result of train delay - Total - 2015 USD	USD	1,201,746	2,009,924	-	-	-	-	66,997	66,997	66,997	66,997
		Independence Boulevard cost reduction - 2015 USD	USD	4,975,655	5,600,144	-	-	-	-	5,600,144	-	-	-
		Total change in transportation costs from rail overflow to truck - 2015 USD	USD	-	-	-	-	-	-	-	-	-	-
	Environmental Sustainability	Additional social cost of emissions as a result of vehicle delay - Total - 2015 USD	USD	182,633	289,101	-	-	-	-	14,686	14,184	13,589	13,160
		Total change in environmental costs from rail overflow to truck - 2015 USD	USD	-	-	-	-	-	-	-	-	-	-
	Quality of Life	Total change in real estate values as a result of removed train traffic - 2015 USD	USD	3,925,643	4,418,346	-	-	-	-	4,418,346	-	-	-
		Total change in quality of life costs from rail overflow to truck - 2015 USD	USD	-	-	-	-	-	-	-	-	-	-
	State of Good Repair	Total change in state of good repair costs from rail overflow to truck - 2015 USD	USD	-	-	-	-	-	-	-	-	-	-
	Transit	Total expected benefits of transit system	USD	137,404,137	229,808,923	-	-	-	-	7,660,297	7,660,297	7,660,297	7,660,297
		Residual Value - 2015 USD - TS	USD	207,291,227	566,300,000	-	-	-	-	-	-	-	-
		Total project cost - 2015 USD - TS	USD	(751,783,152)	(809,000,000)	-	(202,250,000)	(202,250,000)	(202,250,000)	(202,250,000)	-	-	-
		Net Present Value - 30yr @ 3%		(367,703,443)	48,094,067								

				30-yr NPV @ 3%	Undiscounted								
Expansion	Safety	Expected crash costs of 36 crossings - Total	USD	7,863,804	13,223,268	-	-	-	-	425,531	425,531	425,531	425,531
		Total dollar loss due to fire station shutdown - 2015 USD	USD	252,344	429,609	-	-	-	-	12,727	12,727	12,727	12,727
		Cost of lives lost due to increased EMS respond time - 2015 USD	USD	9,357,987	15,931,753	-	-	-	-	471,981	471,981	471,981	471,981
		Total change in safety costs from rail overflow to truck - 2015 USD	USD	599,099	1,411,236	-	-	-	-	-	-	-	-
	Economic Competitiveness	Passenger time cost as a result of train delay - Total - 2015 USD	USD	17,532,863	30,878,185	-	-	-	-	712,014	712,014	712,014	712,014
		Vehicle operating cost as a result of train delay - Total - 2015 USD	USD	1,649,736	2,905,444	-	-	-	-	66,997	66,997	66,997	66,997
		Independence Boulevard cost reduction - 2015 USD	USD	4,975,655	5,600,144	-	-	-	-	5,600,144	-	-	-
		Total change in transportation costs from rail overflow to truck - 2015 USD	USD	17,188,540	40,489,268	-	-	-	-	-	-	-	-
	Environmental Sustainability	Additional social cost of emissions as a result of vehicle delay - Total - 2015 USD	USD	238,553	398,936	-	-	-	-	14,686	14,184	13,589	13,160
		Total change in environmental costs from rail overflow to truck - 2015 USD	USD	2,011,780	4,735,785	-	-	-	-	-	-	-	-
	Quality of Life	Total change in real estate values as a result of removed train traffic - 2015 USD	USD	4,278,625	4,968,793	-	-	-	-	4,418,346	-	-	-
		Total change in quality of life costs from rail overflow to truck - 2015 USD	USD	7,020,704	16,537,947	-	-	-	-	-	-	-	-
	State of Good Repair	Total change in state of good repair costs from rail overflow to truck - 2015 USD	USD	11,766,542	27,717,226	-	-	-	-	-	-	-	-
	Transit	Total expected benefits of transit system	USD	137,404,137	229,808,923	-	-	-	-	7,660,297	7,660,297	7,660,297	7,660,297
		Residual Value - 2015 USD - TS	USD	207,291,227	566,300,000	-	-	-	-	-	-	-	-
		Total project cost - 2015 USD - TS	USD	(751,783,152)	(809,000,000)	-	(202,250,000)	(202,250,000)	(202,250,000)	(202,250,000)	-	-	-
		Net Present Value - 30yr @ 3%		(322,351,555)	152,336,516								

			2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037
No Expansion	Safety	Expected crash costs of 36 crossings - Total	425,531	425,531	425,531	425,531	425,531	425,531	425,531	425,531	425,531	425,531	425,531	425,531	425,531	425,531
		Total dollar loss due to fire station shutdown - 2015 USD	12,727	12,727	12,727	12,727	12,727	12,727	12,727	12,727	12,727	12,727	12,727	12,727	12,727	12,727
		Cost of lives lost due to increased EMS respond time - 2015 USD	471,981	471,981	471,981	471,981	471,981	471,981	471,981	471,981	471,981	471,981	471,981	471,981	471,981	471,981
		Total change in safety costs from rail overflow to truck - 2015 USD	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Economic Competitiveness	Passenger time cost as a result of train delay - Total - 2015 USD	712,014	712,014	712,014	712,014	712,014	712,014	712,014	712,014	712,014	712,014	712,014	712,014	712,014	712,014
		Vehicle operating cost as a result of train delay - Total - 2015 USD	66,997	66,997	66,997	66,997	66,997	66,997	66,997	66,997	66,997	66,997	66,997	66,997	66,997	66,997
		Independence Boulevard cost reduction - 2015 USD	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Total change in transportation costs from rail overflow to truck - 2015 USD	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Environmental Sustainability	Additional social cost of emissions as a result of vehicle delay - Total - 2015 USD	12,492	12,063	11,634	11,258	10,881	10,193	9,889	9,752	9,428	9,104	8,780	8,695	8,423	8,391
		Total change in environmental costs from rail overflow to truck - 2015 USD	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Quality of Life	Total change in real estate values as a result of removed train traffic - 2015 USD	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Total change in quality of life costs from rail overflow to truck - 2015 USD	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	State of Good Repair	Total change in state of good repair costs from rail overflow to truck - 2015 USD	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Transit	Total expected benefits of transit system	7,660,297	7,660,297	7,660,297	7,660,297	7,660,297	7,660,297	7,660,297	7,660,297	7,660,297	7,660,297	7,660,297	7,660,297	7,660,297	7,660,297
		Residual Value - 2015 USD - TS	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Total project cost - 2015 USD - TS	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Net Present Value - 30yr @ 3%														

Expansion	Safety	Expected crash costs of 36 crossings - Total	425,531	427,342	429,160	430,986	432,819	434,661	436,510	438,367	440,232	442,105	443,986	445,875	447,772	449,677
		Total dollar loss due to fire station shutdown - 2015 USD	12,727	12,889	13,062	13,241	13,425	13,616	13,812	14,015	14,225	14,442	14,666	14,897	15,136	15,273
		Cost of lives lost due to increased EMS respond time - 2015 USD	471,981	477,994	484,403	491,023	497,860	504,923	512,218	519,753	527,536	535,575	543,879	552,456	561,314	566,378
		Total change in safety costs from rail overflow to truck - 2015 USD	-	-	-	-	-	-	-	-	-	-	-	-	-	7,632
	Economic Competitiveness	Passenger time cost as a result of train delay - Total - 2015 USD	712,014	739,523	769,619	801,550	835,447	871,448	909,705	950,379	993,646	1,039,694	1,088,729	1,140,971	1,196,660	1,229,288
		Vehicle operating cost as a result of train delay - Total - 2015 USD	66,997	69,586	72,417	75,422	78,611	81,998	85,598	89,425	93,496	97,829	102,442	107,358	112,597	115,667
		Independence Boulevard cost reduction - 2015 USD	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Total change in transportation costs from rail overflow to truck - 2015 USD	-	-	-	-	-	-	-	-	-	-	-	-	-	218,965
	Environmental Sustainability	Additional social cost of emissions as a result of vehicle delay - Total - 2015 USD	12,492	12,529	12,575	12,673	12,767	12,475	12,634	13,016	13,157	13,293	13,425	13,934	14,157	14,487
		Total change in environmental costs from rail overflow to truck - 2015 USD	-	-	-	-	-	-	-	-	-	-	-	-	-	28,120
	Quality of Life	Total change in real estate values as a result of removed train traffic - 2015 USD	-	35,059	37,373	38,602	39,872	41,184	42,539	43,939	45,384	46,878	48,420	50,013	51,658	29,526
		Total change in quality of life costs from rail overflow to truck - 2015 USD	-	-	-	-	-	-	-	-	-	-	-	-	-	89,437
	State of Good Repair	Total change in state of good repair costs from rail overflow to truck - 2015 USD	-	-	-	-	-	-	-	-	-	-	-	-	-	149,894
	Transit	Total expected benefits of transit system	7,660,297	7,660,297	7,660,297	7,660,297	7,660,297	7,660,297	7,660,297	7,660,297	7,660,297	7,660,297	7,660,297	7,660,297	7,660,297	7,660,297
		Residual Value - 2015 USD - TS	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Total project cost - 2015 USD - TS	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Net Present Value - 30yr @ 3%														

			2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050
No Expansion	Safety	Expected crash costs of 36 crossings - Total	425,531	425,531	425,531	425,531	425,531	425,531	425,531	425,531	425,531	425,531	425,531	425,531	-
		Total dollar loss due to fire station shutdown - 2015 USD	12,727	12,727	12,727	12,727	12,727	12,727	12,727	12,727	12,727	12,727	12,727	12,727	-
		Cost of lives lost due to increased EMS respond time - 2015 USD	471,981	471,981	471,981	471,981	471,981	471,981	471,981	471,981	471,981	471,981	471,981	471,981	-
		Total change in safety costs from rail overflow to truck - 2015 USD	-	-	-	-	-	-	-	-	-	-	-	-	-
	Economic Competitiveness	Passenger time cost as a result of train delay - Total - 2015 USD	712,014	712,014	712,014	712,014	712,014	712,014	712,014	712,014	712,014	712,014	712,014	712,014	-
		Vehicle operating cost as a result of train delay - Total - 2015 USD	66,997	66,997	66,997	66,997	66,997	66,997	66,997	66,997	66,997	66,997	66,997	66,997	-
		Independence Boulevard cost reduction - 2015 USD	-	-	-	-	-	-	-	-	-	-	-	-	-
		Total change in transportation costs from rail overflow to truck - 2015 USD	-	-	-	-	-	-	-	-	-	-	-	-	-
	Environmental Sustainability	Additional social cost of emissions as a result of vehicle delay - Total - 2015 USD	8,192	8,160	7,941	7,700	7,461	7,465	7,470	7,516	7,546	7,650	7,683	7,718	-
		Total change in environmental costs from rail overflow to truck - 2015 USD	-	-	-	-	-	-	-	-	-	-	-	-	-
	Quality of Life	Total change in real estate values as a result of removed train traffic - 2015 USD	-	-	-	-	-	-	-	-	-	-	-	-	-
		Total change in quality of life costs from rail overflow to truck - 2015 USD	-	-	-	-	-	-	-	-	-	-	-	-	-
	State of Good Repair	Total change in state of good repair costs from rail overflow to truck - 2015 USD	-	-	-	-	-	-	-	-	-	-	-	-	-
	Transit	Total expected benefits of transit system	7,660,297	7,660,297	7,660,297	7,660,297	7,660,297	7,660,297	7,660,297	7,660,297	7,660,297	7,660,297	7,660,297	7,660,297	-
		Residual Value - 2015 USD - TS	-	-	-	-	-	-	-	-	-	-	-	-	566,300,000
		Total project cost - 2015 USD - TS	-	-	-	-	-	-	-	-	-	-	-	-	-
		Net Present Value - 30yr @ 3%													
Expansion	Safety	Expected crash costs of 36 crossings - Total	449,677	449,677	449,677	449,677	449,677	449,677	449,677	449,677	449,677	449,677	449,677	449,677	-
		Total dollar loss due to fire station shutdown - 2015 USD	15,273	15,273	15,273	15,273	15,273	15,273	15,273	15,273	15,273	15,273	15,273	15,273	-
		Cost of lives lost due to increased EMS respond time - 2015 USD	566,378	566,378	566,378	566,378	566,378	566,378	566,378	566,378	566,378	566,378	566,378	566,378	-
		Total change in safety costs from rail overflow to truck - 2015 USD	25,281	43,511	62,341	77,120	92,269	107,796	123,712	140,025	156,747	173,886	191,454	209,461	-
	Economic Competitiveness	Passenger time cost as a result of train delay - Total - 2015 USD	1,229,288	1,229,288	1,229,288	1,229,288	1,229,288	1,229,288	1,229,288	1,229,288	1,229,288	1,229,288	1,229,288	1,229,288	-
		Vehicle operating cost as a result of train delay - Total - 2015 USD	115,667	115,667	115,667	115,667	115,667	115,667	115,667	115,667	115,667	115,667	115,667	115,667	-
		Independence Boulevard cost reduction - 2015 USD	-	-	-	-	-	-	-	-	-	-	-	-	-
		Total change in transportation costs from rail overflow to truck - 2015 USD	725,339	1,248,372	1,788,613	2,212,636	2,647,259	3,092,749	3,549,375	4,017,417	4,497,161	4,988,897	5,492,928	6,009,559	-
	Environmental Sustainability	Additional social cost of emissions as a result of vehicle delay - Total - 2015 USD	14,144	14,088	13,709	13,294	12,882	12,888	12,897	12,976	13,028	13,208	13,265	13,324	-
		Total change in environmental costs from rail overflow to truck - 2015 USD	90,941	155,902	217,366	260,744	302,298	353,321	405,777	462,112	519,370	584,114	645,903	709,816	-
	Quality of Life	Total change in real estate values as a result of removed train traffic - 2015 USD	-	-	-	-	-	-	-	-	-	-	-	-	-
		Total change in quality of life costs from rail overflow to truck - 2015 USD	296,266	509,901	730,563	903,757	1,081,280	1,263,241	1,449,752	1,640,925	1,836,877	2,037,728	2,243,601	2,454,620	-
	State of Good Repair	Total change in state of good repair costs from rail overflow to truck - 2015 USD	496,536	854,582	1,224,408	1,514,676	1,812,201	2,117,164	2,429,751	2,750,153	3,078,564	3,415,186	3,760,224	4,113,887	-
	Transit	Total expected benefits of transit system	7,660,297	7,660,297	7,660,297	7,660,297	7,660,297	7,660,297	7,660,297	7,660,297	7,660,297	7,660,297	7,660,297	7,660,297	-
		Residual Value - 2015 USD - TS	-	-	-	-	-	-	-	-	-	-	-	-	566,300,000
		Total project cost - 2015 USD - TS	-	-	-	-	-	-	-	-	-	-	-	-	-
		Net Present Value - 30yr @ 3%													

Appendix B – Table of Costs and Benefits over 20 Year Period

No Expansion

			30-yr NPV @ 3%	Undiscounted	2016	2017	2018	2019	2020	2021	2022	2023
Safety	Expected crash costs of 36 crossings - Total	USD	5,793,605	8,510,623	-	-	-	-	425,531	425,531	425,531	425,531
	Total dollar loss due to fire station shutdown - 2015 USD	USD	173,282	254,545	-	-	-	-	12,727	12,727	12,727	12,727
	Cost of lives lost due to increased EMS respond time - 2015 USD	USD	6,426,027	9,439,630	-	-	-	-	471,981	471,981	471,981	471,981
	Total change in safety costs from rail overflow to truck - 2015 USD	USD	-	-	-	-	-	-	-	-	-	-
Economic Competitiveness	Passenger time cost as a result of train delay - Total - 2015 USD	USD	9,694,075	14,240,289	-	-	-	-	712,014	712,014	712,014	712,014
	Vehicle operating cost as a result of train delay - Total - 2015 USD	USD	912,170	1,339,949	-	-	-	-	66,997	66,997	66,997	66,997
	Independence Boulevard cost reduction - 2015 USD	USD	4,975,655	5,600,144	-	-	-	-	5,600,144	-	-	-
	Total change in transportation costs from rail overflow to truck - 2015 USD	USD	-	-	-	-	-	-	-	-	-	-
Environmental Sustainability	Additional social cost of emissions as a result of vehicle delay - Total - 2015 USD	USD	149,712	212,952	-	-	-	-	14,686	14,184	13,589	13,160
	Total change in environmental costs from rail overflow to truck - 2015 USD	USD	-	-	-	-	-	-	-	-	-	-
Quality of Life	Total change in real estate values as a result of removed train traffic - 2015 USD	USD	3,925,643	4,418,346	-	-	-	-	4,418,346	-	-	-
	Total change in quality of life costs from rail overflow to truck - 2015 USD	USD	-	-	-	-	-	-	-	-	-	-
State of Good Repair	Total change in state of good repair costs from rail overflow to truck - 2015 USD	USD	-	-	-	-	-	-		-	-	-
Transit	Total expected benefits of transit system	USD	104,294,927	153,205,948	-	-	-	-	7,660,297	7,660,297	7,660,297	7,660,297
	Residual Value - 2015 USD - TS	USD	318,379,514	647,200,000	-	-	-	-	-	-	-	-
	Total project cost - 2015 USD - TS	USD	(751,783,152)	(809,000,000)	-	(202,250,000)	(202,250,000)	(202,250,000)	(202,250,000)	-	-	-
	Net Present Value - 30yr @ 3%		(297,058,543)	35,422,425								

Expansion

			30-yr NPV @ 3%	Undiscounted								
Safety	Expected crash costs of 36 crossings - Total	USD	5,920,219	8,726,499	-	-	-	-	425,531	425,531	425,531	425,531
	Total dollar loss due to fire station shutdown - 2015 USD	USD	186,332	276,882	-	-	-	-	12,727	12,727	12,727	12,727
	Cost of lives lost due to increased EMS respond time - 2015 USD	USD	6,909,999	10,267,975	-	-		-	471,981	471,981	471,981	471,981
	Total change in safety costs from rail overflow to truck - 2015 USD	USD	39,344	76,425	-	-	-	-	-	-	-	-
Economic Competitiveness	Passenger time cost as a result of train delay Total - 2015 USD	USD	12,219,655	18,585,306	-	-		-	712,014	712,014	712,014	712,014
	Vehicle operating cost as a result of train delay - Total - 2015 USD	USD	1,149,801	1,748,769	-	-	-	-	66,997	66,997	66,997	66,997
	Independence Boulevard cost reduction - 2015 USD	USD	4,975,655	5,600,144	-	-	-	-	5,600,144	-	-	-
	Total change in transportation costs from rail overflow to truck - 2015 USD	USD	1,128,793	2,192,675				-		-		-
Environmental Sustainability	Additional social cost of emissions as a result of vehicle delay - Total - 2015 USD	USD	181,716	267,465	-	-	-	-	14,686	14,184	13,589	13,160
	Total change in environmental costs from rail overflow to truck - 2015 USD	USD	141,572	274,964	-	-	-	-		-	-	-
Quality of Life	Total change in real estate values as a result of removed train traffic - 2015 USD	USD	4,278,625	4,968,793	-	-	-	-	4,418,346	-	-	-
	Total change in quality of life costs from rail overflow to truck - 2015 USD	USD	461,058	895,604	-	-	-	-	-	-	-	-
State of Good Repair	Total change in state of good repair costs from rail overflow to truck - 2015 USD	USD	772,723	1,501,012	-	-		-		-		-
Transit	Total expected benefits of transit system	USD	104,294,927	153,205,948	-	-	-	-	7,660,297	7,660,297	7,660,297	7,660,297
	Residual Value - 2015 USD - TS	USD	318,379,514	647,200,000	-	-	-	-	-	-	-	-
	Total project cost - 2015 USD - TS	USD	(751,783,152)	(809,000,000)	-	(202,250,000)	(202,250,000)	(202,250,000)	(202,250,000)	-	-	-
	Net Present Value - 30yr @ 3%		(290,743,220)	46,788,461								

			2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037
No Expansion	Safety	Expected crash costs of 36 crossings - Total	425,531	425,531	425,531	425,531	425,531	425,531	425,531	425,531	425,531	425,531	425,531	425,531	425,531	425,531
		Total dollar loss due to fire station shutdown - 2015 USD	12,727	12,727	12,727	12,727	12,727	12,727	12,727	12,727	12,727	12,727	12,727	12,727	12,727	12,727
		Cost of lives lost due to increased EMS respond time - 2015 USD	471,981	471,981	471,981	471,981	471,981	471,981	471,981	471,981	471,981	471,981	471,981	471,981	471,981	471,981
		Total change in safety costs from rail overflow to truck - 2015 USD	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Economic Competitiveness	Passenger time cost as a result of train delay - Total - 2015 USD	712,014	712,014	712,014	712,014	712,014	712,014	712,014	712,014	712,014	712,014	712,014	712,014	712,014	712,014
		Vehicle operating cost as a result of train delay - Total - 2015 USD	66,997	66,997	66,997	66,997	66,997	66,997	66,997	66,997	66,997	66,997	66,997	66,997	66,997	66,997
		Independence Boulevard cost reduction - 2015 USD	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Total change in transportation costs from rail overflow to truck - 2015 USD	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Environmental Sustainability	Additional social cost of emissions as a result of vehicle delay - Total - 2015 USD	12,492	12,063	11,634	11,258	10,881	10,193	9,889	9,752	9,428	9,104	8,780	8,695	8,423	8,391
		Total change in environmental costs from rail overflow to truck - 2015 USD	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Quality of Life	Total change in real estate values as a result of removed train traffic - 2015 USD	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Total change in quality of life costs from rail overflow to truck - 2015 USD	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	State of Good Repair	Total change in state of good repair costs from rail overflow to truck - 2015 USD	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Transit	Total expected benefits of transit system	7,660,297	7,660,297	7,660,297	7,660,297	7,660,297	7,660,297	7,660,297	7,660,297	7,660,297	7,660,297	7,660,297	7,660,297	7,660,297	7,660,297
		Residual Value - 2015 USD - TS	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Total project cost - 2015 USD - TS	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Net Present Value - 30yr @ 3%														
Expansion	Safety	Expected crash costs of 36 crossings - Total	425,531	427,342	429,160	430,986	432,819	434,661	436,510	438,367	440,232	442,105	443,986	445,875	447,772	449,677
		Total dollar loss due to fire station shutdown - 2015 USD	12,727	12,889	13,062	13,241	13,425	13,616	13,812	14,015	14,225	14,442	14,666	14,897	15,136	15,273
		Cost of lives lost due to increased EMS respond time - 2015 USD	471,981	477,994	484,403	491,023	497,860	504,923	512,218	519,753	527,536	535,575	543,879	552,456	561,314	566,378
		Total change in safety costs from rail overflow to truck - 2015 USD	-	-	-	-	-	-	-	-	-	-	-	-	-	7,632
	Economic Competitiveness	Passenger time cost as a result of train delay - Total - 2015 USD	712,014	739,523	769,619	801,550	835,447	871,448	909,705	950,379	993,646	1,039,694	1,088,729	1,140,971	1,196,660	1,229,288
		Vehicle operating cost as a result of train delay - Total - 2015 USD	66,997	69,586	72,417	75,422	78,611	81,998	85,598	89,425	93,496	97,829	102,442	107,358	112,597	115,667
		Independence Boulevard cost reduction - 2015 USD	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Total change in transportation costs from rail overflow to truck - 2015 USD	-	-	-	-	-	-	-	-	-	-	-	-	-	218,965
	Environmental Sustainability	Additional social cost of emissions as a result of vehicle delay - Total - 2015 USD	12,492	12,529	12,575	12,673	12,767	12,475	12,634	13,016	13,157	13,293	13,425	13,934	14,157	14,487
		Total change in environmental costs from rail overflow to truck - 2015 USD	-	-	-	-	-	-	-	-	-	-	-	-	-	28,120
	Quality of Life	Total change in real estate values as a result of removed train traffic - 2015 USD	-	35,059	37,373	38,602	39,872	41,184	42,539	43,939	45,384	46,878	48,420	50,013	51,658	29,526
		Total change in quality of life costs from rail overflow to truck - 2015 USD	-	-	-	-	-	-	-	-	-	-	-	-	-	89,437
	State of Good Repair	Total change in state of good repair costs from rail overflow to truck - 2015 USD	-	-	-	-	-	-	-	-	-	-	-	-	-	149,894
	Transit	Total expected benefits of transit system	7,660,297	7,660,297	7,660,297	7,660,297	7,660,297	7,660,297	7,660,297	7,660,297	7,660,297	7,660,297	7,660,297	7,660,297	7,660,297	7,660,297
		Residual Value - 2015 USD - TS	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Total project cost - 2015 USD - TS	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Net Present Value - 30yr @ 3%														

			2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050
No Expansion	Safety	Expected crash costs of 36 crossings - Total	425,531	425,531	-	-	-	-	-	-	-	-	-	-	-
		Total dollar loss due to fire station shutdown - 2015 USD	12,727	12,727	-	-	-	-	-	-	-	-	-	-	-
		Cost of lives lost due to increased EMS respond time - 2015 USD	471,981	471,981	-	-	-	-	-	-	-	-	-	-	-
		Total change in safety costs from rail overflow to truck - 2015 USD	-	-	-	-	-	-	-	-	-	-	-	-	-
	Economic Competitiveness	Passenger time cost as a result of train delay - Total - 2015 USD	712,014	712,014	-	-	-	-	-	-	-	-	-	-	-
		Vehicle operating cost as a result of train delay - Total - 2015 USD	66,997	66,997	-	-	-	-	-	-	-	-	-	-	-
		Independence Boulevard cost reduction - 2015 USD	-	-	-	-	-	-	-	-	-	-	-	-	-
		Total change in transportation costs from rail overflow to truck - 2015 USD	-	-	-	-	-	-	-	-	-	-	-	-	-
	Environmental Sustainability	Additional social cost of emissions as a result of vehicle delay - Total - 2015 USD	8,192	8,160	-	-	-	-	-	-	-	-	-	-	-
		Total change in environmental costs from rail overflow to truck - 2015 USD	-	-	-	-	-	-	-	-	-	-	-	-	-
	Quality of Life	Total change in real estate values as a result of removed train traffic - 2015 USD	-	-	-	-	-	-	-	-	-	-	-	-	-
		Total change in quality of life costs from rail overflow to truck - 2015 USD	-	-	-	-	-	-	-	-	-	-	-	-	-
	State of Good Repair	Total change in state of good repair costs from rail overflow to truck - 2015 USD	-	-	-	-	-	-	-	-	-	-	-	-	-
	Transit	Total expected benefits of transit system	7,660,297	7,660,297	-	-	-	-	-	-	-	-	-	-	-
		Residual Value - 2015 USD - TS	-	-	647,200,000	-	-	-	-	-	-	-	-	-	-
		Total project cost - 2015 USD - TS	-	-	-	-	-	-	-	-	-	-	-	-	-
		Net Present Value - 30yr @ 3%													
Expansion	Safety	Expected crash costs of 36 crossings - Total	449,677	449,677	-	-	-	-	-	-	-	-	-	-	-
		Total dollar loss due to fire station shutdown - 2015 USD	15,273	15,273	-	-	-	-	-	-	-	-	-	-	-
		Cost of lives lost due to increased EMS respond time - 2015 USD	566,378	566,378	-	-	-	-	-	-	-	-	-	-	-
		Total change in safety costs from rail overflow to truck - 2015 USD	25,281	43,511	-	-	-	-	-	-	-	-	-	-	-
	Economic Competitiveness	Passenger time cost as a result of train delay - Total - 2015 USD	1,229,288	1,229,288	-	-	-	-	-	-	-	-	-	-	-
		Vehicle operating cost as a result of train delay - Total - 2015 USD	115,667	115,667	-	-	-	-	-	-	-	-	-	-	-
		Independence Boulevard cost reduction - 2015 USD	-	-	-	-	-	-	-	-	-	-	-	-	-
		Total change in transportation costs from rail overflow to truck - 2015 USD	725,339	1,248,372	-	-	-	-	-	-	-	-	-	-	-
	Environmental Sustainability	Additional social cost of emissions as a result of vehicle delay - Total - 2015 USD	14,144	14,088	-	-	-	-	-	-	-	-	-	-	-
		Total change in environmental costs from rail overflow to truck - 2015 USD	90,941	155,902	-	-	-	-	-	-	-	-	-	-	-
	Quality of Life	Total change in real estate values as a result of removed train traffic - 2015 USD	-	-	-	-	-	-	-	-	-	-	-	-	-
		Total change in quality of life costs from rail overflow to truck - 2015 USD	296,266	509,901	-	-	-	-	-	-	-	-	-	-	-
	State of Good Repair	Total change in state of good repair costs from rail overflow to truck - 2015 USD	496,536	854,582	-	-	-	-	-	-	-	-	-	-	-
	Transit	Total expected benefits of transit system	7,660,297	7,660,297	-	-	-	-	-	-	-	-	-	-	-
		Residual Value - 2015 USD - TS	-	-	647,200,000	-	-	-	-	-	-	-	-	-	-
		Total project cost - 2015 USD - TS	-	-	-	-	-	-	-	-	-	-	-	-	-
		Net Present Value - 30yr @ 3%													

Appendix C – List of Crossings from FRA Database

Crossing ID	Last Updated	Railroad	State CD	State Name	County Name	City Name	Street	Highway	DayThru (FRA-2015)	DayThru (Mn-2020)	Night Thru	Gates	Bells	Wd Code
628739Y	08 Mar 15	CSX	37	NC	NEW HANOVER	WILMINGTON	PRIVATE		7	7	-	-	-	3
628741A	08 Mar 15	CSX	37	NC	NEW HANOVER	WILMINGTON	PRIVATE RD.		7	7	-	-	-	1
629175V	08 Mar 15	CSX	37	NC	BRUNSWICK	WILMINGTON	PRIVATE ROAD		12	12	-	-	-	1
629178R	08 Mar 16	CSX	37	NC	BRUNSWICK	LELAND	CEDAR HILL ROAD	SR 1430	4	5	-	-	1	7
629284Y	25 Mar 16	CSX	37	NC	NEW HANOVER	WILMINGTON	KING STREET	LS	2	5	-	-	-	3
629286M	08 Mar 16	CSX	37	NC	NEW HANOVER	WILMINGTON	TWENTY0THIRD STREET	SR 1302	2	5	-	2	2	8
629287U	08 Mar 16	CSX	37	NC	NEW HANOVER	WILMINGTON	THIRTIETH STREET	LS	2	5	-	-	2	7
629288B	08 Mar 16	CSX	37	NC	NEW HANOVER	WILMINGTON	PRINCESS PLACE DRIVE	SR 1301	2	5	-	2	1	8
629289H	08 Mar 16	CSX	37	NC	NEW HANOVER	WILMINGTON	HENRY STREET	LS	2	5	-	2	1	8
629290C	08 Mar 16	CSX	37	NC	NEW HANOVER	WILMINGTON	MARKET STREET	US 17	2	5	-	2	2	8
629426M	09 Mar 16	CSX	37	NC	NEW HANOVER	WILMINGTON	COVIL AVENUE	LS	2	5	-	2	1	8
629427U	09 Mar 16	CSX	37	NC	NEW HANOVER	WILMINGTON	MERCER AVENUE	LS	2	5	-	-	2	7
629428B	09 Mar 16	CSX	37	NC	NEW HANOVER	WILMINGTON	FOREST HILLS DRIVE	LS	2	5	-	-	2	7
629429H	09 Mar 16	CSX	37	NC	NEW HANOVER	WILMINGTON	COLONIAL DRIVE	LS	2	5	-	-	1	7
629430C	09 Mar 16	CSX	37	NC	NEW HANOVER	WILMINGTON	WRIGHTSVILLE AVENUE	SR 1411	2	5	-	2	2	8
629431J	09 Mar 16	CSX	37	NC	NEW HANOVER	WILMINGTON	OLEANDER DRIVE	US 76	2	5	-	2	2	8
629432R	09 Mar 16	CSX	37	NC	NEW HANOVER	WILMINGTON	SEVENTEENTH STREET	SR 1219	2	5	-	2	1	8
629433X	09 Mar 16	CSX	37	NC	NEW HANOVER	WILMINGTON	SIXTEENTH STREET	SR 1218	2	5	-	2	1	8
629434E	08 Mar 16	CSX	37	NC	NEW HANOVER	WILMINGTON	MARSTELLER STREET	LS	2	5	-	2	2	8
629435L	08 Mar 16	CSX	37	NC	NEW HANOVER	WILMINGTON	THIRTEENTH STREET	LS	2	5	-	-	2	7
629436T	08 Mar 16	CSX	37	NC	NEW HANOVER	WILMINGTON	TWELFTH STREET	LS	2	5	-	-	-	3
629437A	08 Mar 16	CSX	37	NC	NEW HANOVER	WILMINGTON	TENTH STREET	LS	2	5	-	-	1	7
629438G	08 Mar 16	CSX	37	NC	NEW HANOVER	WILMINGTON	NINTH STREET	LS	2	5	-	-	-	3
629439N	09 Mar 16	CSX	37	NC	NEW HANOVER	WILMINGTON	EIGHTH STREET	LS	2	5	-	-	-	3
629440H	09 Mar 16	CSX	37	NC	NEW HANOVER	WILMINGTON	SEVENTH STREET	LS	2	5	-	-	-	3
629441P	09 Mar 16	CSX	37	NC	NEW HANOVER	WILMINGTON	SIXTH STREET / MARTIN STREET	LS	2	5	-	-	-	3
629442W	09 Mar 16	CSX	37	NC	NEW HANOVER	WILMINGTON	FITTH STREET	LS	2	5	-	-	2	7
629443D	09 Mar 16	CSX	37	NC	NEW HANOVER	WILMINGTON	MARTIN STREET	LS	2	5	-	-	-	3
629445S	09 Mar 16	CSX	37	NC	NEW HANOVER	WILMINGTON	FOURTH STREET	LS	2	5	-	-	1	7
629446Y	09 Mar 16	WTRY	37	NC	NEW HANOVER	WILMINGTON	THIRD STREET	US 421	-	5	-	2	2	8
629448M	09 Mar 16	WTRY	37	NC	NEW HANOVER	WILMINGTON	FRONT STREET	SR 1140	-	5	-	2	1	8
629453J	08 Mar 15	WTRY	37	NC	NEW HANOVER	WILMINGTON	MYERS	SR 1112	-	5	-	-	-	3
629459A	08 Mar 15	WTRY	37	NC	NEW HANOVER	WILMINGTON	WOODBINE ST		2	5	-	-	-	3
642724T	09 Mar 16	CSX	37	NC	NEW HANOVER	WILMINGTON	CLAY STREET	LS	2	5	-	-	-	3
902753X	08 Mar 15	WTRY	37	NC	NEW HANOVER	WILMINGTON	GREENFIELD ST/CIT		2	5	-	-	-	1
937501V	-		-		NEW HANOVER	WILMINGTON	RIVER TO SEA BIKEWAY		2	5	-	-	-	1

WDCode	Description
1	No sign or signal
2	Other signs or signal
3	Stop signs
4	Crossbucks
5	Non-train activated special protection
6	Highway traffic signals, wigwags, or bells
7	Flashing lights
8	Gates

Crossing ID	Last Updated	Railroad	State CD	State Name	County Name	City Name	Street	WD Code Desc	Hwy Speed	AADT	AADT Year	Pct Truck
628739Y	08 Mar 15	CSX	37	NC	NEW HANOVER	WILMINGTON	PRIVATE	Stop signs	-	2,000	1978	3
628741A	08 Mar 15	CSX	37	NC	NEW HANOVER	WILMINGTON	PRIVATE RD.	No sign or signal	-	-	1970	-
629175V	08 Mar 15	CSX	37	NC	BRUNSWICK	WILMINGTON	PRIVATE ROAD	No sign or signal	-	-	1970	-
629178R	08 Mar 16	CSX	37	NC	BRUNSWICK	LELAND	CEDAR HILL ROAD	Flashing lights	45	1,545	2015	1
629284Y	25 Mar 16	CSX	37	NC	NEW HANOVER	WILMINGTON	KING STREET	Stop signs	25	1,120	2014	1
629286M	08 Mar 16	CSX	37	NC	NEW HANOVER	WILMINGTON	TWENTY0THIRD STREET	Gates	35	15,875	2014	1
629287U	08 Mar 16	CSX	37	NC	NEW HANOVER	WILMINGTON	THIRTIETH STREET	Flashing lights	25	3,664	2014	1
629288B	08 Mar 16	CSX	37	NC	NEW HANOVER	WILMINGTON	PRINCESS PLACE DRIVE	Gates	35	9,155	2014	1
629289H	08 Mar 16	CSX	37	NC	NEW HANOVER	WILMINGTON	HENRY STREET	Gates	25	429	2014	-
629290C	08 Mar 16	CSX	37	NC	NEW HANOVER	WILMINGTON	MARKET STREET	Gates	40	35,920	2014	8
629426M	09 Mar 16	CSX	37	NC	NEW HANOVER	WILMINGTON	COVIL AVENUE	Gates	35	17,294	2014	4
629427U	09 Mar 16	CSX	37	NC	NEW HANOVER	WILMINGTON	MERCER AVENUE	Flashing lights	25	997	2014	1
629428B	09 Mar 16	CSX	37	NC	NEW HANOVER	WILMINGTON	FOREST HILLS DRIVE	Flashing lights	25	821	2014	1
629429H	09 Mar 16	CSX	37	NC	NEW HANOVER	WILMINGTON	COLONIAL DRIVE	Flashing lights	25	3,837	2014	1
629430C	09 Mar 16	CSX	37	NC	NEW HANOVER	WILMINGTON	WRIGHTSVILLE AVENUE	Gates	35	18,343	2014	5
629431J	09 Mar 16	CSX	37	NC	NEW HANOVER	WILMINGTON	OLEANDER DRIVE	Gates	35	26,998	2014	9
629432R	09 Mar 16	CSX	37	NC	NEW HANOVER	WILMINGTON	SEVENTEENTH STREET	Gates	35	17,398	2014	7
629433X	09 Mar 16	CSX	37	NC	NEW HANOVER	WILMINGTON	SIXTEENTH STREET	Gates	45	17,194	2014	8
629434E	08 Mar 16	CSX	37	NC	NEW HANOVER	WILMINGTON	MARSTELLER STREET	Gates	35	1,360	2014	1
629435L	08 Mar 16	CSX	37	NC	NEW HANOVER	WILMINGTON	THIRTEENTH STREET	Flashing lights	35	2,797	2014	1
629436T	08 Mar 16	CSX	37	NC	NEW HANOVER	WILMINGTON	TWELFTH STREET	Stop signs	35	201	2014	1
629437A	08 Mar 16	CSX	37	NC	NEW HANOVER	WILMINGTON	TENTH STREET	Flashing lights	35	523	2014	1
629438G	08 Mar 16	CSX	37	NC	NEW HANOVER	WILMINGTON	NINTH STREET	Stop signs	35	570	2014	1
629439N	09 Mar 16	CSX	37	NC	NEW HANOVER	WILMINGTON	EIGHTH STREET	Stop signs	35	763	2014	1
629440H	09 Mar 16	CSX	37	NC	NEW HANOVER	WILMINGTON	SEVENTH STREET	Stop signs	35	574	2014	-
629441P	09 Mar 16	CSX	37	NC	NEW HANOVER	WILMINGTON	SIXTH STREET / MARTIN STREET	Stop signs	35	576	2014	1
629442W	09 Mar 16	CSX	37	NC	NEW HANOVER	WILMINGTON	FITTH STREET	Flashing lights	35	2,214	2014	1
629443D	09 Mar 16	CSX	37	NC	NEW HANOVER	WILMINGTON	MARTIN STREET	Stop signs	35	393	2014	1
629445S	09 Mar 16	CSX	37	NC	NEW HANOVER	WILMINGTON	FOURTH STREET	Flashing lights	35	256	2014	1
629446Y	09 Mar 16	WTRY	37	NC	NEW HANOVER	WILMINGTON	THIRD STREET	Gates	35	18,631	2011	2
629448M	09 Mar 16	WTRY	37	NC	NEW HANOVER	WILMINGTON	FRONT STREET	Gates	35	15,930	2011	8
629453J	08 Mar 15	WTRY	37	NC	NEW HANOVER	WILMINGTON	MYERS	Stop signs	-	400	1988	10
629459A	08 Mar 15	WTRY	37	NC	NEW HANOVER	WILMINGTON	WOODBINE ST	Stop signs	-	3,360	1995	4
642724T	09 Mar 16	CSX	37	NC	NEW HANOVER	WILMINGTON	CLAY STREET	Stop signs	35	307	2014	1
902753X	08 Mar 15	WTRY	37	NC	NEW HANOVER	WILMINGTON	GREENFIELD ST/CIT	No sign or signal	-	-	-	-
937501V	-		-		NEW HANOVER	WILMINGTON	RIVER TO SEA BIKEWAY	No sign or signal	-	-	-	-

WDCode	Description
1	No sign or signal
2	Other signs or signal
3	Stop signs
4	Crossbucks
5	Non-train activated special protection
6	Highway traffic signals, wigwags, or bells
7	Flashing lights
8	Gates

Appendix D – Table of Truck Trips

	Additional trucks in non-expansion scenario	Additional trucks in expansion scenario
2016	-	-
2017	-	-
2018	-	-
2019	-	-
2020	-	-
2021	-	-
2022	-	-
2023	-	-
2024	-	-
2025	-	-
2026	-	-
2027	-	-
2028	-	-
2029	-	-
2030	-	-
2031	-	-
2032	-	-
2033	-	-
2034	-	-
2035	-	-
2036	-	-
2037	-	1,417
2038	-	4,693
2039	-	8,076
2040	-	11,571
2041	-	14,315
2042	-	17,126
2043	-	20,009
2044	-	22,963
2045	-	25,991
2046	-	29,094
2047	-	32,276
2048	-	35,537
2049	-	38,879

N: Implementation Schedule

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1. Implementation Schedule

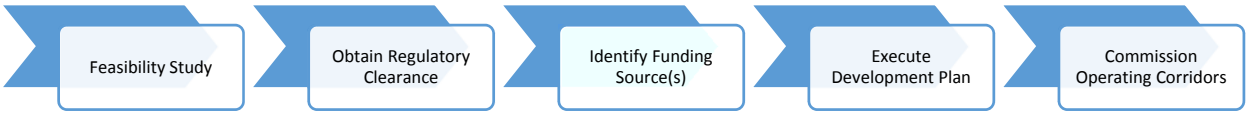
An implementation schedule lists the steps that move a process from its current status to the goal. Implementation of the Wilmington Rail Realignment and Right of Way Use Alternatives Feasibility Study (the "Project") formally began with the creation of the Mayor's Task Force. This Feasibility Study is the documentation developed by the Task Force to establish the current status for the goal of the Project. The goal of the Project is to realign the railroad tracks from within the City limits to a corridor west of the Cape Fear River and to repurpose the existing railroad corridor as a transit corridor.

Steps in the process from Feasibility Study to realigned tracks and repurposed corridor are based on current conditions in regulatory and financial processes. This report addresses the major steps in the process, the major components of these steps and the range of time current transportation projects experience on similar projects.

1.1.1. Process Steps

Transportation projects follow a similar process from inception to functioning corridor. Major steps in the process are shown in Figure 1.

Figure 1: PROJECT PROCESS – MAJOR STEPS



These steps may overlap or be performed simultaneously to accelerate the schedule. An example of overlapping steps is pursuing funding sources while obtaining regulatory clearances. A reward/risk analysis should be performed to evaluate overlapping or performing steps simultaneously. A reward/risk analysis would compare the potential savings in time, and therefore money, with the potential expenses associated with overlapping actions.

Regulatory clearance will be required without respect to the funding source(s). The Surface Transportation Board (STB) governs railroad transactions and will require a NEPA clearance if one has not been obtained prior to the STB action. Refer to the Technical Report E: Legal Conditions Report for further information about the STB action. Any federal agency providing a permit for the Project may also require a NEPA clearance. This places public and private funding for the Project on the same schedule.

Development plans have some overlap with the regulatory clearance and funding source steps. equipment procurement are needed for funding programs. This engineering and estimating is generally

10 percent or less of the total effort for the development plan step. Time savings associated with this overlap is included in the time ranges for these steps.

Operating corridors are the last step, and goal, of the Project. Commissioning of the mechanical infrastructure and equipment is a key component. This step may overlap the end of the design-build or design-bid-build component of the development plan step. Time savings for this overlap are excluded from the range of times. This overlap will require contractual obligations beyond the ability of this study to predict. Table 1 further defines potential components for the major steps of the Project Process.

Table 1 - IMPLEMENTATION SCHEDULE

IMPLEMENTATION SCHEDULE		
RAILROAD REALIGNMENT		
PROCESS STEPS	STEP COMPONENTS	RANGE OF TIME
Obtain Regulatory Clearance	STB Clearance	1 – 2 years
	Environmental Clearance	5 – 9 years
Execute Development Plan	Preliminary Engineering	2 – 4 years
	Permitting/Right-of-Way	2 – 3 years
	Design-Build	4 – 6 years
	Design-Bid-Build	5 – 8 years
Operating Rail Corridor	Commissioning	1 year
TRANSIT SERVICE		
PROCESS STEPS	STEP COMPONENTS	RANGE OF TIME
Obtain Regulatory Clearance	Environmental Clearance	4 – 6 years
Execute Development Plan	Preliminary Engineering	2 – 6 years
	Permitting/Right-of-Way	2 – 6 years
	Design-Build	4 – 8 years
	Design-Bid-Build	5 – 10 years
Operating Transit Service	Commissioning	1 – 3 years

1.1.2. Step Components

Potential components for each step in the process are shown above in Table 1. These step components are typical of transportation projects. Components specific to this Project will change and expand with the introduction of additional information from future studies.

Step components in Table 1 are listed in the order in which they typically occur and are described below. This order may change as the Project moves forward.

STB Clearance

The process of obtaining approval from the STB for a new track location to be used by an operating railroad.

Environmental Clearance

The process of obtaining governmental approvals and/or permits to move forward with design and construction. If the project receives any state or federal funds, or if any federal permits are required for any operation within the corridor, the funds and/or permits will trigger the need for an environmental document. Any action that requires federal involvement will federalize the Project. Federalization will trigger an environmental process regardless of the funding source, and will allow the agency to request an environmental document at their discretion.

Preliminary Engineering

The process of collecting sufficient surveys, geotechnical data, and other base data to prepare engineering designs to a 30% plan level.

Permitting/Right-of-Way

The process of obtaining construction permits and obtaining right-of-way for the construction, operation and maintenance of the railroad.

Design-Build

The process of concurrently designing and building the railroad infrastructure as a collaborative effort between the engineer and the contractor.

Design-Bid-Build

The process of an engineer designing the Project, the owner/financier bidding the Project, and a contractor constructing the railroad infrastructure in a series of sequential efforts.

Commissioning

The process of inspecting, testing, troubleshooting, and initiating operations on the constructed infrastructure.

1.1.3. Range of Time

Ranges of time are estimates based on recent experience on transportation projects. The actual time frame for each component will vary depending on the number and complexity of subcomponents

identified in future studies. Time frames will also increase or decrease as the regulations governing transportation projects change over time.

Overlap or simultaneous performance may be used between components to reduce the range of time for the step or between steps. Overlap and simultaneous performance was excluded from the summation of the ranges of time. Excluding overlap and simultaneous performance provides a realistic estimation of the time required to complete the Project. Using overlap and simultaneous performance to estimate an optimistic schedule creates expectations that current transportation projects do not meet.

Railroad Realignment Component time ranges are estimated basing the dependencies between the components on the completion of the previous component. Lower ranges estimate the amount of time on recent transportation projects. The upper ranges are based on the Project experiencing unforeseen conditions.

Transit Service time ranges are estimated basing the dependencies between the components on the completion of the previous component. The lower range estimates the time to covert the “southern leg” of the Beltline to transit use. Upper ranges of time are based on the time estimated to sequentially implement the three “legs” of the transit loop.

Implementation Years is the total estimated time to full implementation of both systems if all components are completed sequentially. The minimum time for Design-Build was used for the lower range of the implementation years. The maximum time for Design-Bid-Build was used for the upper range of the implementation years.

This schedule is an estimate based on the documents available for the study and on recent transportation projects. Actual ranges of time may vary widely from this estimate.

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