# IV. ENVIRONMENTAL RESOURCES, IMPACTS AND MITIGATION

This chapter details the environmental features of the Christina River Bridge project study area that would be potentially affected by the implementation of the Preferred Alternative. The overall project study area limits are bound by Norfolk-Southern railroad and the I-495/US13 interchange to the south, I-95 and the Amtrak Northeast Corridor rail line to the west, Martin Luther King Jr. Boulevard to the north, and SR 9 and freight railroad tracks to the east (refer to Figure 1). Environmental impacts were calculated using limits of disturbance (LOD), which were set based on the preliminary roadway profile and cross-sections and to account for impacts related to construction activities. The LOD in the River was set to account for barge construction, including barge set-up and movements on the north side of the bridge. (Refer to **Figure 8** to see the relationship between the Preferred Alternative alignment and the LOD.)

**Table 5** below highlights a comparison of some of the environmental resources impacts between the No-Build Alternative and the Preferred Alternative.

**Table 5: Summary of Environmental Resource Impacts**

| Resource | No Build Alternative | Preferred Alternative |
|---|---|---|
| Riverwalk | No change from existing location | Relocated |
| Environmental Justice Communities | No change | No disproportionate adverse effect |
| Waters of the US | 0 acres | 0.5 acres |
| Wetlands – USACE tidal and non-tidal | 0 acres | 0.05 acres |
| Wetlands - DNREC | 0 acres | 0.1 acres[1] |
| Subaqueous Lands - DNREC | 0 acres | 0.4 acres[1] |
| Floodplain | 0 acres | 33.4 acres |
| Rare, threatened and endangered species | None | None |

Notes: [1]Acreage based on mapping from the 1988 DNREC Tidal Wetland Maps – field delineations indicate there may be fewer therefore a map revision may be requested from DNREC

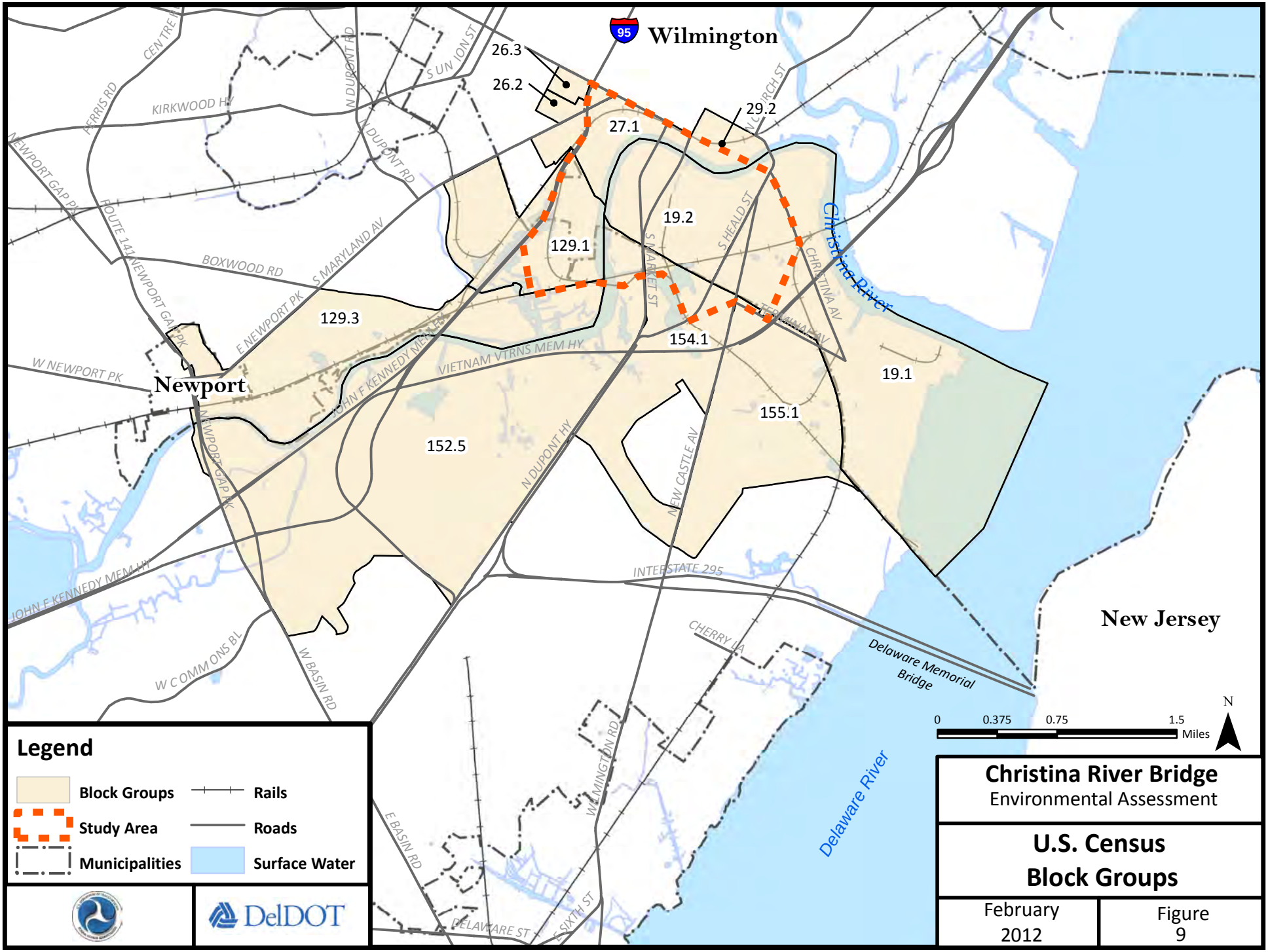
## A. Socioeconomic Resources

### 1. Demographics

#### a. Existing Conditions

For the purpose of this socioeconomic evaluation, data was gathered from the ten US Census Block Groups that intersect the project study area (refer to **Figure 9**). At the time of publication of this document only some of the 2010 Census data had been released from the US Census Bureau; this includes total population, race, and ethnicity data. The 2010 income and employment data was not available.

The majority of the study area is located within the City of Wilmington municipal boundary and the remainder in New Castle County. The population of Delaware, New Castle County and the


Wilmington
Newport
New Jersey
Christina River
Delaware River
Delaware Memorial Bridge
26.3
26.2
29.2
27.1
19.2
129.1
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154.1
19.1
155.1
152.5
INTERSTATE 295
VIETNAM VTRNS MEM HY
JOHN F KENNEDY MEM HY
N DUPONT HY
W NEWPORT PK
E NEWPORT PK
BOXWOOD RD
S MARYLAND AV
KIRKWOOD HY
N DUPONT RD
S UNION ST
S HEALD ST
S MARKET ST
CHRISTINA AV
NEW CASTLE AV
CHERRY LN
W BASIN RD
E BASIN RD
W COMMONS BL
DELAWARE ST
SIXTH ST
WILMINGTON RD
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Miles
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Legend
Block Groups
Study Area
Municipalities
Rails
Roads
Surface Water
DelDOT
Christina River Bridge
Environmental Assessment
U.S. Census
Block Groups
February
2012
Figure
9

demographic study area is summarized in **Table 6.** The populations in the Census Block Groups range between 656 and 2,157. The total population of the Demographic Study Area in 2010 was 14,145; an increase in 1,401 people than the 2000 Census.

**Table 6: Population in the Demographic Study Area in 2010**

| Geographic Area/ Block Group | Total Population | Percent in Study Area |
|---|---|---|
| Delaware | 897,934 | N/A |
| New Castle County | 538,479 | N/A |
| Block Group 19.21 | 656 | 4.6% |
| Block Group 19.22 | 1,262 | 8.9% |
| Block Group 26.2 | 1,114 | 7.9% |
| Block Group 26.3 | 1,144 | 8.1% |
| Block Group 27.1 | 832 | 6.0% |
| Block Group 29.2 | 784 | 5.6% |
| Block Group 129.1 | 2,157 | 15.2 % |
| Block Group 129.3 | 1,362 | 9.6% |
| Block Group 152.5 | 1,546 | 10.9% |
| Block Group 154.1 | 1,237 | 8.7% |
| Block Group 155.21 | 2,051 | 14.5% |
| **Study Area Total** | **14,145** | **100.0%** |

Source: US Census, 2010 Decennial Census

### b. Population Projections

According to the Delaware Population Consortium's Annual Population Projections from 2010, the population of Delaware is projected to grow 25 percent between 2010 and 2040. During that time, New Castle County is projected to grow approximately 13 percent to reach just over 606,000 people in 2040.

## 2. Neighborhoods and Community Facilities

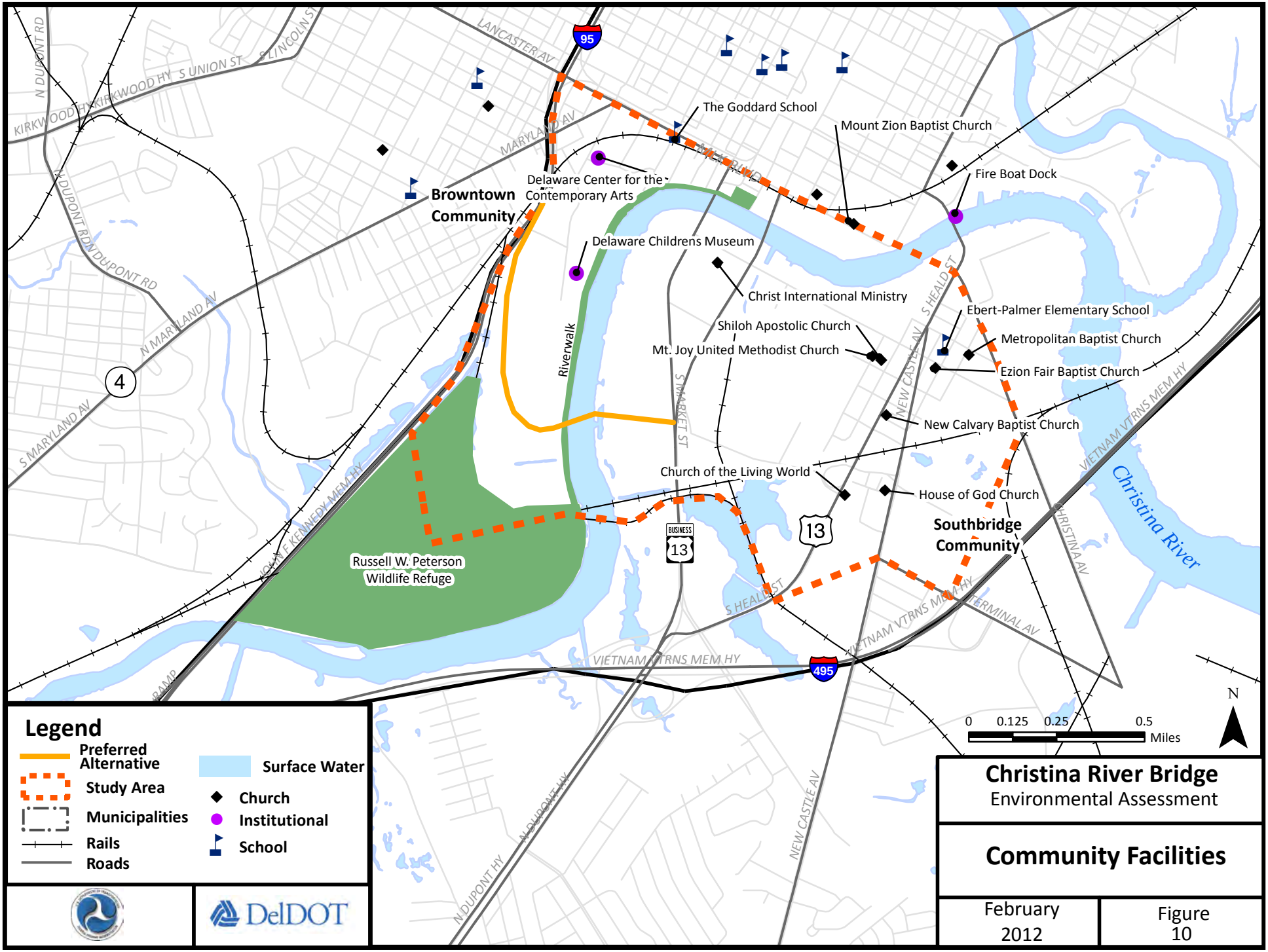
Neighborhoods and community facilities within and adjacent to the project study area are described in the sections below and are shown on **Figure 10**.

### a. Existing Conditions

***Neighborhoods***

The majority of the project study area is industrial and commercial. Residential areas are located primarily northwest and east of the project and these neighborhoods will be served by the proposed Christina River Bridge and would benefit from the improved access provided by the project.

The neighborhood of Southbridge is approximately 1.2 square miles in area and is located south of downtown Wilmington, east of the Riverfront, and north of I-495. The population density in Southbridge is approximately 1,800 people per square mile, compared to 6,700 people per square mile in downtown Wilmington. Southbridge is a low-income neighborhood with a large minority population. Detailed income and racial demographic information on the Southbridge community is provided in Section 3 of this Chapter.


The Goddard School
Mount Zion Baptist Church
Fire Boat Dock
Delaware Center for the Contemporary Arts
Browntown Community
Delaware Childrens Museum
Christ International Ministry
Ebert-Palmer Elementary School
Shiloh Apostolic Church
Metropolitan Baptist Church
Mt. Joy United Methodist Church
Ezion Fair Baptist Church
New Calvary Baptist Church
Church of the Living World
House of God Church
Southbridge Community
Russell W. Peterson Wildlife Refuge
Riverwalk
Christina River
N DUPONT RD
KIRKWOOD HY
S UNION ST
S LINCOLN ST
LANCASTER AV
MARYLAND AV
N MARYLAND AV
S MARYLAND AV
S DUPONT RD
JOHN F KENNEDY MEM HY
S MARKET ST
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NEW CASTLE AV
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Preferred Alternative
Study Area
Municipalities
Rails
Roads
Surface Water
Church
Institutional
School
DelDOT
Christina River Bridge
Environmental Assessment
Community Facilities
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Figure 10

Also located near the project study area are the neighborhoods of Hedgeville, Browntown and the South Wilmington Redevelopment. Hedgeville and Browntown are minority neighborhoods located west of the I-95 corridor.

The Browntown neighborhood is located west of I-95 and is approximately 0.25 square miles in area. The population density in Browntown is approximately 10,900 people per square mile, compared to 6,700 people per square mile in downtown Wilmington. Detailed income and racial demographic information on the Browntown community is provided in Section 3 of this Chapter.

***Housing***

Development trends in New Castle County show a high degree of concentration, particularly in and around municipalities and urban areas. In 2008 and 2009, a total of 14,760 residential units were approved by local governments in Delaware (with a total of 7,121 residential permits issued). Data from the US Census Bureau indicates that nearly 94 percent of the 218,000 available housing units in New Castle County are occupied.

There are currently two residential areas on the Wilmington Riverfront within the project study area: the Residences at Justison Landing and the Residences at Christina Landing. The Residences at Justison Landing were constructed in 2010 along South Justison Street on the west bank of the Christina River. The 330 units range from 700 to 1,800 square feet and include a combination of townhomes, condominiums, and apartments. The Residences at Christina Landing were constructed in 2005 along Christina Landing Drive directly along the Riverfront. Christina Landing offers condominiums, 63 townhouses and 173 rental apartments.

***Recreation Areas***

There are two public park and recreation areas located within the project study area (refer to **Figure 10**). The 1.3-mile Riverwalk, located on the west and north banks of the Christina River, was developed between 1997 and 2005. The Riverwalk is owned by the RDC and provides pedestrian access between the Tubman-Garrett Riverfront Park, Riverfront Market, Hare Pavilion, Delaware Children's museum, the Shipyards Shops, and the Russell W. Peterson Wildlife Refuge. The Riverwalk is also part of the East Coast Greenway, an interstate trail network. The Riverwalk is not a Section 4(f) resource.

The Tubman-Garret Riverfront Park is located along the Riverwalk at Water Street on the north side of the Christina River. The park hosts seasonal music events and festivals and includes open space, gardens and benches.

In 2011, there were 93 outdoor events along the Riverfront, including 52 walk/run events which use the Riverwalk. This resulted in approximately 25,000-30,000 visitors to the Riverfront according to the RDC. An additional 20,000 visitors, visited the DuPont Environmental Education Center in 2011.

***Wildlife Refuges***

The Russell W. Peterson Wildlife Refuge is an urban wildlife refuge along Wilmington's Riverfront south of the proposed project (refer to **Figure 10**). The refuge consists of 212 acres of protected tidal wetland west of the Christina River. The Refuge includes the DuPont Environmental Education Center which contains interactive exhibits, maps and information on the refuge and an extensive boardwalk through the marshes.

***Religious Institutions***

There are nine churches is located in the project study area. DelDOT is also aware of a church, Higher Ground Ministries, which is leasing a property on South Market Street. However, this church is not in active ministry at this time.

***Schools***

There are four districts that serve the public schools in Wilmington: Colonial, Red Clay, Brandywine, and Christina School Districts. There is one school located within the project study area. The Elbert-Palmer Intermediate School, a public elementary school, is located in the Southbridge Neighborhood.

***Emergency Services***

The Wilmington Fire Department and Police Department serve the project study area. The only emergency service facility in the vicinity of the project is the fire boat dock for Fireboat #7, which docks downstream of the Third Street Bridge, has a vertical height of over 20 feet and a draft of 5.5 feet. The channel depth upstream of Market Street is also 5.5 feet, precluding the Fireboat from operating upstream of the Market Street Bridge.

A meeting was held with the Wilmington City Fire and Police Departments on December 9, 2011. The Wilmington Police Department raised no objection to a new bridge crossing. While the proposed bridge will limit the movement of the fire boat, the Wilmington Fire Department indicated that in the event of a fire upstream of the bridge, the few parcels blocked by the bridge are easily accessed from land. The primary need for the fire boat upstream of the bridge would be to augment the city water supply in the event of a fire on either side of the river upstream of the bridge. The Fire Department reported that the installation of a standpipe system on the downstream side of the bridge with connections at the east and west banks would fulfill this need. A fender and dolphin system would also need to be added to the bridge to ensure that the fire boat could safely dock while connecting to the standpipe. DelDOT agreed to the installation of a standpipe system and a fender and dolphin system at the bridge.

A meeting was held with the Holloway Terrace Fire Chief, Sage Logan, on December 10, 2011 to discuss the location, type and vertical clearance of the proposed bridge. Chief Logan responded that their emergency rescue boat requires eight feet of clearance and the emergency services provided by the company would not be affected.

A meeting was held with Minquas Fire Chief, Joe Dierolf, on December 15, 2011 to discuss the location, type and vertical clearance of the proposed bridge. The Minquas Fire Department takes no exceptions to the bridge, as their emergency rescue boat only requires 8’ of vertical clearance.

DNREC Fish and Wildlife (FWS) Enforcement was contacted on November 10, 2011. David Blaasch reported that DNREC FWS uses boats that require clearance of eight feet or less, thus DNREC FWS has no concern with the 12 foot clearance on the proposed bridge.

***Cemeteries***

There are no cemeteries located within the project study area.

**b. Impacts**

The No-Build Alternative would ultimately affect the mobility in the project study area by failing to address the traffic capacity concerns, and the resulting traffic delays would make travel

within the project study area increasingly difficult and time consuming. In addition, the quality of life for project study area residents would also decrease under the No-Build scenario.

No residential or business displacements are anticipated with the Preferred Alternative.

The Preferred Alternative would require 10 acres of permanent right-of-way and 22 acres of temporary easement for the project. The permanent right-of-way impacts would be required on the west side of the River from the parking areas for the Shipyard Shops and Stadium and undeveloped land just south of the Shipyard Shops. On the east side of the River, permanent right-of-way would be required from one business and the conversion of the state-owned parcel into transportation right-of-way. All property owners with right-of-way acquisition or easements obtained would be compensated according to the *Uniform Relocation Assistance and Real Property Acquisition Polices Act of 1970* and paid fair market value for the affected property.

The Riverwalk will be relocated with the Preferred Alternative (refer to **Figure 11**). Upon completion of the project, users of the Riverwalk will have two options for continuing on the path. The first option would be on a 440- linear foot boardwalk over the Christina River under the proposed bridge. The second option is for an at-grade pedestrian/cyclist crossing location, approximately 300 linear feet west of the existing Riverwalk, which would coincide with the T-intersection of a new access road to the Russell W. Peterson Wildlife Refuge. On the south side of the bridge, approximately 930 linear feet of shared use pathways would connect back to the existing Riverwalk from either the at-grade crossing or the boardwalk, providing continued use of the Riverwalk to access the Wildlife Refuge. During construction of the project, access to the Riverwalk could be limited, but temporary.

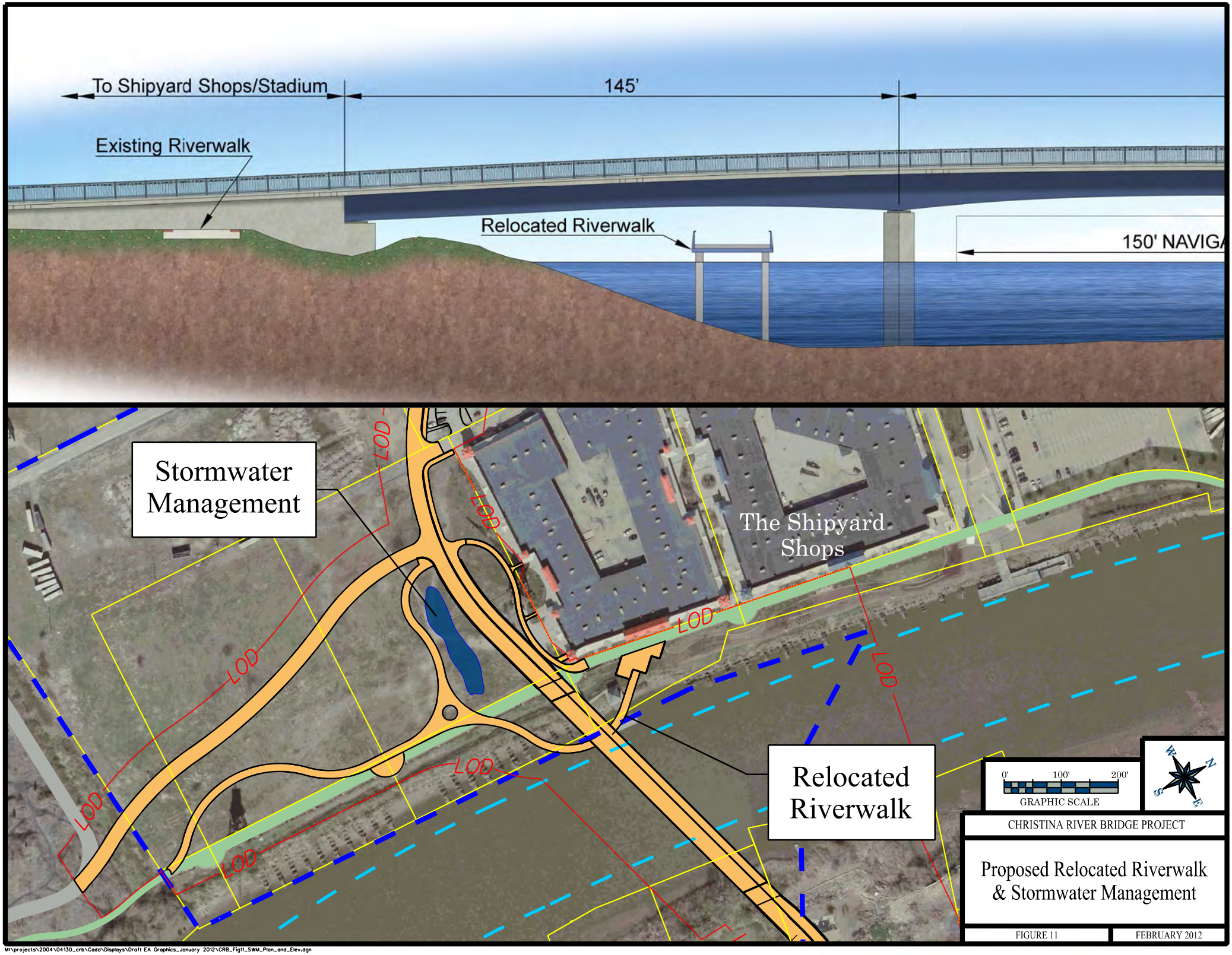
### 3. Minority and Low-Income Populations

According to Executive Order 12898, *Federal Actions to Address the Environmental Justice in Minority and Low-Income Populations*, issued on February 11, 1994, environmental justice must be evaluated: "… to identify and address as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies and activities on minority populations and low income populations …". The US EPA's Environmental Justice guidelines further define environmental justice as "The fair treatment and meaningful involvement of all people regardless of race, color, national origin or income with respect to the development, implementation and enforcement of environmental laws, regulations, and policies. Fair treatment means that no group of people, including racial, ethnic or socioeconomic groups should bear a disproportionate share of the negative environmental consequences…".

#### a. Existing Conditions

Environmental justice includes the evaluation of impacts to both low income and minority populations. The socio-economic profile of the affected area was analyzed using the most recent available information from the 2000 US Census. There are ten US Census Block Groups located in the Christina River Bridge project study area.

The US Department of Health and Human Services (HHS) identifies families and persons as living in poverty if their total family income or unrelated individual income is less than the poverty threshold specified for the family size, age of householder, and the number of related children under 18 present. In 1999, the year from which the most recent US Census income


To Shipyard Shops/Stadium
145'
Existing Riverwalk
Relocated Riverwalk
150' NAVIGA
Stormwater Management
LOD
The Shipyard Shops
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CHRISTINA RIVER BRIDGE PROJECT
Proposed Relocated Riverwalk & Stormwater Management
FIGURE 11
FEBRUARY 2012
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data is based, the poverty level was $8,240 for the first person and $2,820 for each additional person.

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**Table 7** shows the median income and percentage of the population in poverty for Delaware, New Castle County, and the study area in 1999. The median household income in Delaware is $47,381 per year. Household income in New Castle County is slightly higher than the statewide average at $52,419. The average median household income in the study area is $34,738, with the lowest in block group 19.2 ($22,656) and the highest in block group 152.5 ($49,286). **Figure 12** shows the percent of the population in poverty in the project study area by Census Block Group.

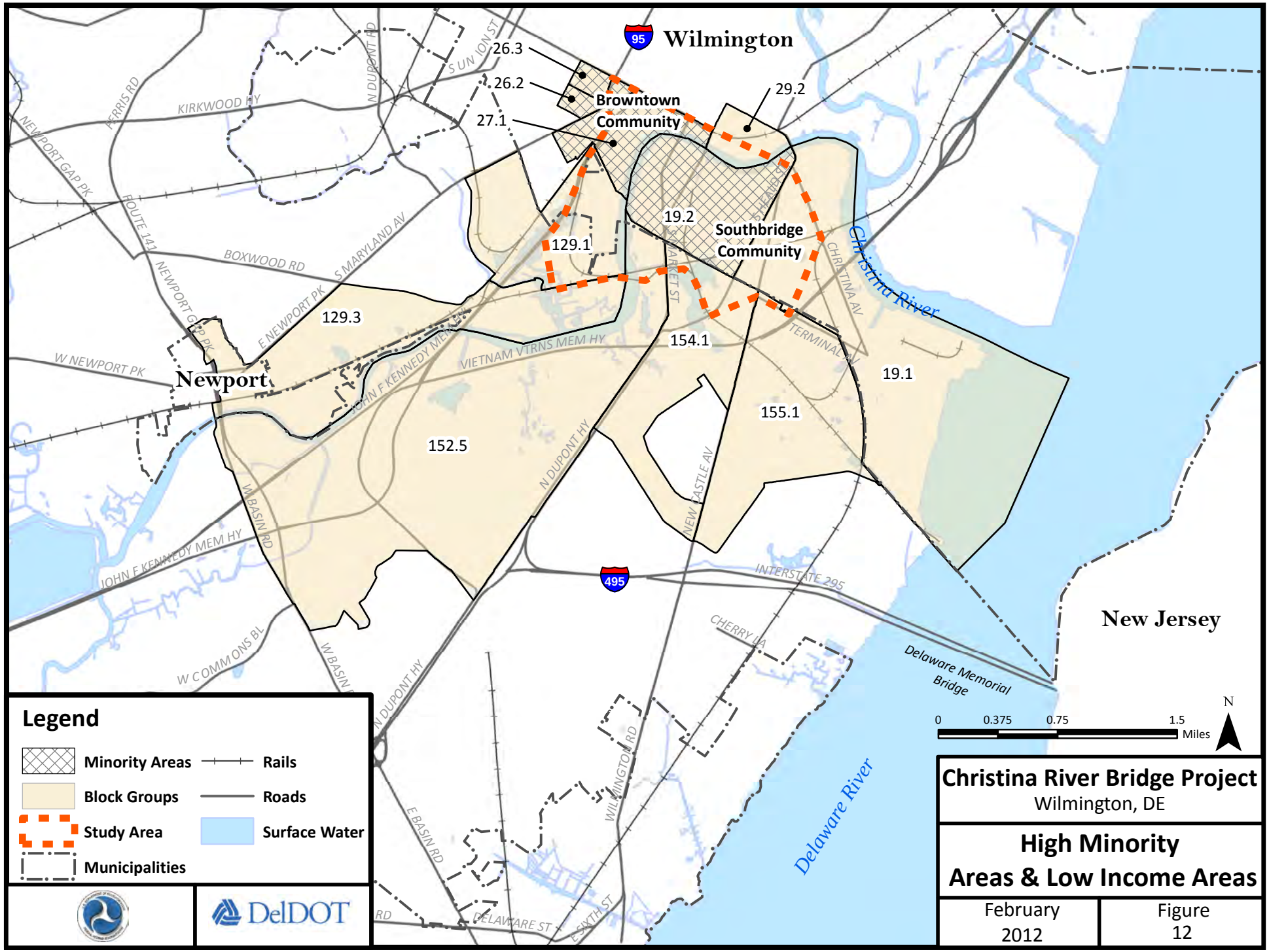
**Table 7: Median Income and Percentage in Poverty in 1999**

| Geographic Area/ Block Group | Median Household Income (in dollars) | Population in Poverty (in percent) |
|---|---|---|
| Delaware | $47,381 | 8.9% |
| New Castle County | $52,419 | 8.4% |
| Block Group 19.1 | $24,167 | 37.4% |
| Block Group 19.2 | $22,656 | 43.2% |
| Block Group 20.1 | $28,672 | 37.8% |
| Block Group 26.2 | $34,250 | 4.6% |
| Block Group 26.5 | $34,219 | 19.4% |
| Block Group 27.1 | $29,286 | 24.5% |
| Block Group 129.2 | $45,906 | 1.4% |
| Block Group 152.5 | $49,286 | 17.8% |
| Block Group 154.3 | $39,595 | 10.4% |
| Block Group 155.2 | $39,338 | 14.2% |
| **Study Area Average** | **$34,738** | **21.1%** |

*Source: US Census, 2000*

*Note: Shaded areas contain populations with a lower household income and higher population in poverty than the study area averages.*

Of the ten block groups that encompass the project study area, six have a lower median household income than the project study area average of $34,738. Four block groups contain a greater percentage of the population in poverty than the study area average of 21.1 percent.


Wilmington
Browntown Community
Southbridge Community
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Christina River
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S MARYLAND AV
KIRKWOOD HY
FERRIS RD
ROUTE 141
N DUPONT RD
S UNION ST
S MARKET ST
NEW CASTLE AV
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Minority Areas
Block Groups
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Municipalities
Rails
Roads
Surface Water
DelDOT
Christina River Bridge Project
Wilmington, DE
High Minority Areas & Low Income Areas
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Figure 12

The US Census evaluates race and ethnicity individually with Hispanic or Latino origin listed as a separate category from race. As indicated in **Table 8**, six of the eleven block groups within the project study area contain a racial minority population greater than the project study area average of 55.3 percent, with three block groups containing a minority population of over 84 percent. The percentage of the population that was minority decreased between the 2010 and 2000, from 63 percent to 55 percent. However, the percentage of the population that was Hispanic or Latino increased between 2000 and 2010, from 9 percent to 21 percent. Four block groups contain populations of Hispanic or Latino populations greater than the study area average of 21.1 percent. Block Group 129.1 had nearly a 50 percent minority population according to the 2010 Census. **Figure 12** shows the areas of high minority populations and low income populations.

**Table 8: Race and Ethnicity by US Census Block Group in 2010**

| Geographic Area/ Block Group | Total Population | White | Non-White or More than One Race | Percent Minority | Hispanic or Latino | Percent Hispanic or Latino Minority |
|---|---|---|---|---|---|---|
| Delaware | 897,934 | 618,617 | 289,483 | 32.2% | 31,865 | 3.5% |
| New Castle County | 538,479 | 331,836 | 159,722 | 29.7% | 46,921 | 8.7% |
| Block Group 19.21 | 656 | 25 | 610 | 93.0% | 21 | 3.2% |
| Block Group 19.22 | 1,262 | 341 | 820 | 65.0% | 101 | 8.0% |
| Block Group 26.2 | 1,114 | 226 | 558 | 50.1% | 330 | 29.6% |
| Block Group 26.3 | 1,144 | 128 | 627 | 54.8% | 389 | 34.0% |
| Block Group 27.1 | 832 | 175 | 482 | 57.9% | 175 | 21.0% |
| Block Group 29.2 | 784 | 66 | 662 | 84.4% | 56 | 7.1% |
| Block Group 129.1 | 2,157 | 318 | 792 | 36.7% | 1,047 | 48.5% |
| Block Group 129.3 | 1,362 | 886 | 247 | 18.1% | 229 | 16.8% |
| Block Group 152.5 | 1,546 | 824 | 500 | 32.3% | 222 | 14.4% |
| Block Group 154.1 | 1,237 | 57 | 1,059 | 85.6% | 121 | 9.8% |
| Block Group 155.21 | 2,051 | 332 | 1,472 | 71.8% | 247 | 12.0% |
| **Study Area Total** | **14,145** | **3,378** | **7,829** | **AVG- 55.3%** | **2,983** | **AVG- 21.1%** |

*Source: US Census, 2010*

*Notes: The US Census allowed people to claim more than one racial or ethnic group. Shaded areas indicate higher minority percentages than the study area average.*

### *Southbridge*

Southbridge is a historically disadvantaged community where there has been extensive planning in the last decade to reduce through truck traffic and increase access to jobs. The neighborhood of Southbridge (refer to **Figure 10**) is located south of downtown Wilmington and east of the Riverfront. Southbridge is comprised of about 2,200 people of which 88 percent are minority residents and 37.8 percent of residents live below the poverty line. Southbridge is surrounded by a highly industrial area and suffers from low employment, high through- and truck- traffic, chronic flooding, high asthma rates, and insufficient infrastructure.

The South Wilmington Neighborhood Plan (June 2006), Walkable Community Report (September 2006), Southbridge Circulation Study (September 2008), and South Wilmington Signage Study (May 2009) all focused on redeveloping the Southbridge neighborhood. These plans are available at: www.wilmapco.org/southbridge. The South Wilmington Planning Network (Network), a partnership of over thirty agencies, community groups, non-profit and private businesses led by WILMAPCO, Nemours Health and Prevention Services, the HOPE Commission and the Southbridge Civic Association, is working to implement these plans while also fostering youth and economic development and access to better healthcare. Specific to transportation, Safe Routes to School and Transportation Enhancements Programs have been established in Southbridge to slow vehicle speeds, beautify the neighborhood, and improve walkability. A diesel retrofit program has also been established to cut emissions from neighboring truck fleets. Beyond these efforts, the Network has identified poor access to the redeveloping Riverfront from Southbridge as a chief concern. The proposed project would address this concern by enhancing multimodal connectivity between the Riverfront and Southbridge, supporting prior and ongoing efforts.

***Browntown***

The community of Browntown is located just west of I-95, across from the Frawley Stadium on the Riverfront (refer to **Figure 10**). This area was founded in the 19th Century as a Polish-American immigrant neighborhood. Over the past decade, the Latino and Hispanic, as well as the African-American populations have grown considerably. The 2000 U.S. Census shows that the Browntown community has 16.4 percent of the population below poverty level.

### b. Potential Effects on Environmental Justice

Based on information provided by the US Census data, New Castle County, field reviews conducted by DelDOT, the minimal community impacts, and anticipated community benefits from the project, the Preferred Alternative is not expected to result in a disproportionately high and adverse effect on environmental justice populations. The proposed project will improve the livability of the area by improving traffic congestion, encouraging continued redevelopment of the area, improving air quality, and community connectivity.

## 4. Economic Activity

### a. Existing Conditions

The 2000 US Census is the most recent source for employment data and was used to gather information on employment and industries in the study area. **Table 9** shows how employment industries are divided in the State of Delaware, New Castle County, and the project study area.

The greatest employment sectors in the project study area are educational services, health care, and social assistance; finance, insurance and real estate; and retail trade.

The James Court Industrial Park is located in the southern portion of the study area along the east bank of the Christina River. The Industrial Park includes nine businesses, one landscaping contractor and eight industrial businesses. The Shipyard Shops Retail and Entertainment District are located on the west bank of the Christina River.

**Table 9: Employment in 2000 (percent)**

| Industry | Delaware | New Castle County | Study Area |
|---|---|---|---|
| Educational services, health care, and social assistance | 21.5% | 19.7% | 17.1% |
| Manufacturing | 10.8% | 13.2% | 8.8% |
| Retail trade | 11.2% | 10.3% | 11.9% |
| Construction | 8.1% | 6.1% | 6.0% |
| Arts, entertainment, recreation, accommodation, and food services | 7.0% | 7.3% | 9.8% |
| Public administration | 5.2% | 3.9% | 6.9% |
| Finance, insurance, and real estate | 10.6% | 14.4% | 14.9% |
| Professional, scientific, management, administrative, and waste management services | 9.9% | 10.9% | 7.9% |
| Other services (except public administration) | 4.7% | 4.2% | 5.1% |
| Wholesale trade | 3.3% | 2.7% | 3.0% |
| Transportation, warehousing, and utilities | 4.7% | 4.8% | 7.4% |
| Agriculture, forestry, fishing and hunting, and mining | 1.4% | 0.5% | <0.1% |
| Information | 1.6% | 2.0% | 1.2% |
| **Total Employees** | **405,078** | **249,320** | **4,961** |

Source: US Census, 2000

### b. Impacts

The No-Build Alternative would have a negative effect on local and regional business activities as increased congestion would lead to longer travel times for individuals throughout the Riverfront and Wilmington. Travel demands in this area are expected to exceed the current capacity, which would result in longer peak travel periods due to a lack of east-west options crossing the Christina River. The decreased mobility on the regional roadway network would not support planned economic growth in the region, and as a result, a decrease in the rate of new business development may occur. The No-Build Alternative would also affect existing businesses as increased traffic and congestion could limit the geographic base of a particular business, and customers could look to other, more convenient options.

The Preferred Alternative would benefit local and regional business activity by reducing traffic delays and improving mobility throughout the region. The improved mobility would support economic growth by providing a new east-west connection across the Christina River to support local businesses and make the area more desirable for future business ventures.

The Preferred Alternative avoids the business displacements on James Court that would have occurred under the Orange A Alternative. However, a sliver of right-of-way adjacent to the River would be required from the parcel (26-056.00-002), but the Preferred Alternative would not impact the building on this property.

On the western side of the River, the permanent business impacts involve loss of parking for the Shipyard Shops and Frawley Stadium. Approximately 94 parking spaces will be taken from the Stadium and 155 parking spaces from the Shipyard Shops. Since these two destinations share aggregate, available parking facilities, the loss of this parking would not affect the long-term viability of these attractions.

Temporary impacts to businesses could include reduced vehicle and pedestrian access, reduced parking, as well as noise and dust during construction. There will also be construction equipment and truck traffic on the local roadway network during construction.

## B. Physical Resources

### 1. Land Use and Zoning

#### a. Existing Conditions

Current (2010) land use is shown on **Figure 13**. The primary land use in the project study area is industrial (55 percent). Urban areas are the next largest land use (20 percent). Wetlands and Water occupy 9 percent and 8 percent of the project study area, respectively. Land use has changed significantly in recent years, shifting to more residential and commercial uses with the construction of the Shipyard Shops and Christina Landing.

Future land use is assessed using zoning maps for the project study area. The most recent zoning data is from 2005 for New Castle County and 2011 for the City of Wilmington. Current zoning is shown on **Figure 14**. The majority of the project area is zoned Waterfront District (55 percent). Waterfront is a unique zoning category that includes several different uses: manufacturing, low-intensity manufacturing, commercial, recreation and residential. Approximately 30 percent of the project study area is zoned for industrial use only, 10 percent is residential only, and the remaining five percent is either commercial or recreational.

#### b. Impacts

Land use and zoning will not be affected by the No-Build Alternative. The Preferred Alternative would support recent redevelopment and planned future redevelopment in the area and would not significantly alter existing land use in the project area. The Preferred Alternative meets the project purpose and need to support economic development and encourage livability and sustainable communities.

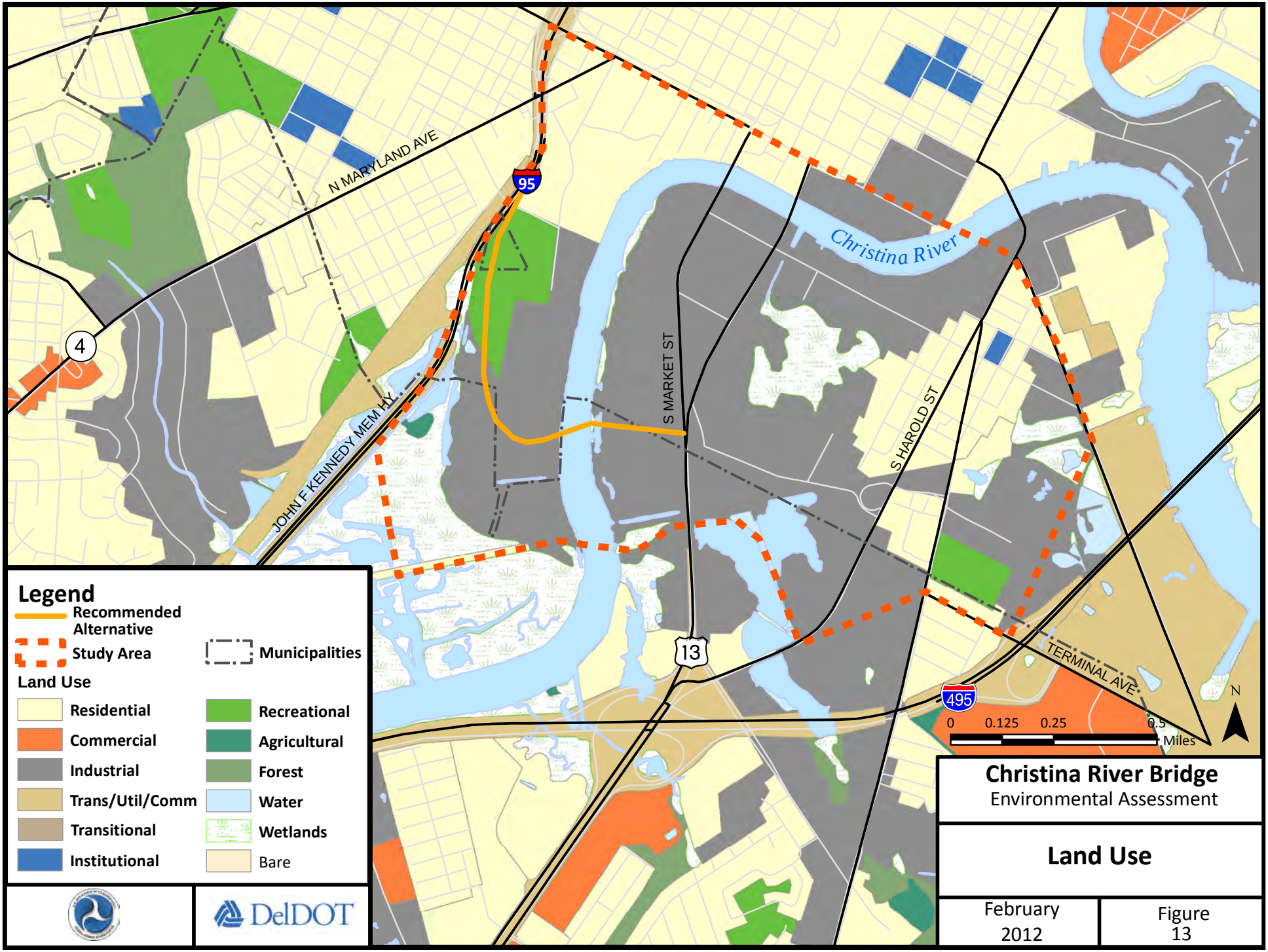
### 2. Hazardous Materials and Solid Waste

A Site Specific Assessment (SSA) was conducted in the project study area in 2009 at the request of the DNREC Site Investigation and Restoration Branch (SIRB). The Area of Investigation for the SSA is depicted on **Figure 15**. All work completed for the SSA was conducted under DNREC's Brownfield Program and included documentation of existing environmental conditions determined through the collection of soil, groundwater, and sediment samples. Samples were collected to identify the impact of historic property uses within the project area. When appropriate, the source(s) of contaminants were identified.

Hazardous materials are defined in 7 Del. C., Chapter 63, Section 261.2 of the Delaware Hazardous Waste Regulations as a solid waste that is defined as any material that will no longer be used for its original intended purpose, or a material that must be reclaimed before reuse.

#### a. Existing Conditions

Research indicates that the project study area was historically maintained as undeveloped marsh land and industrial properties. Currently, the properties west of the Christina River are used for retail (Shipyard Shops) and parkland/open space (Riverwalk).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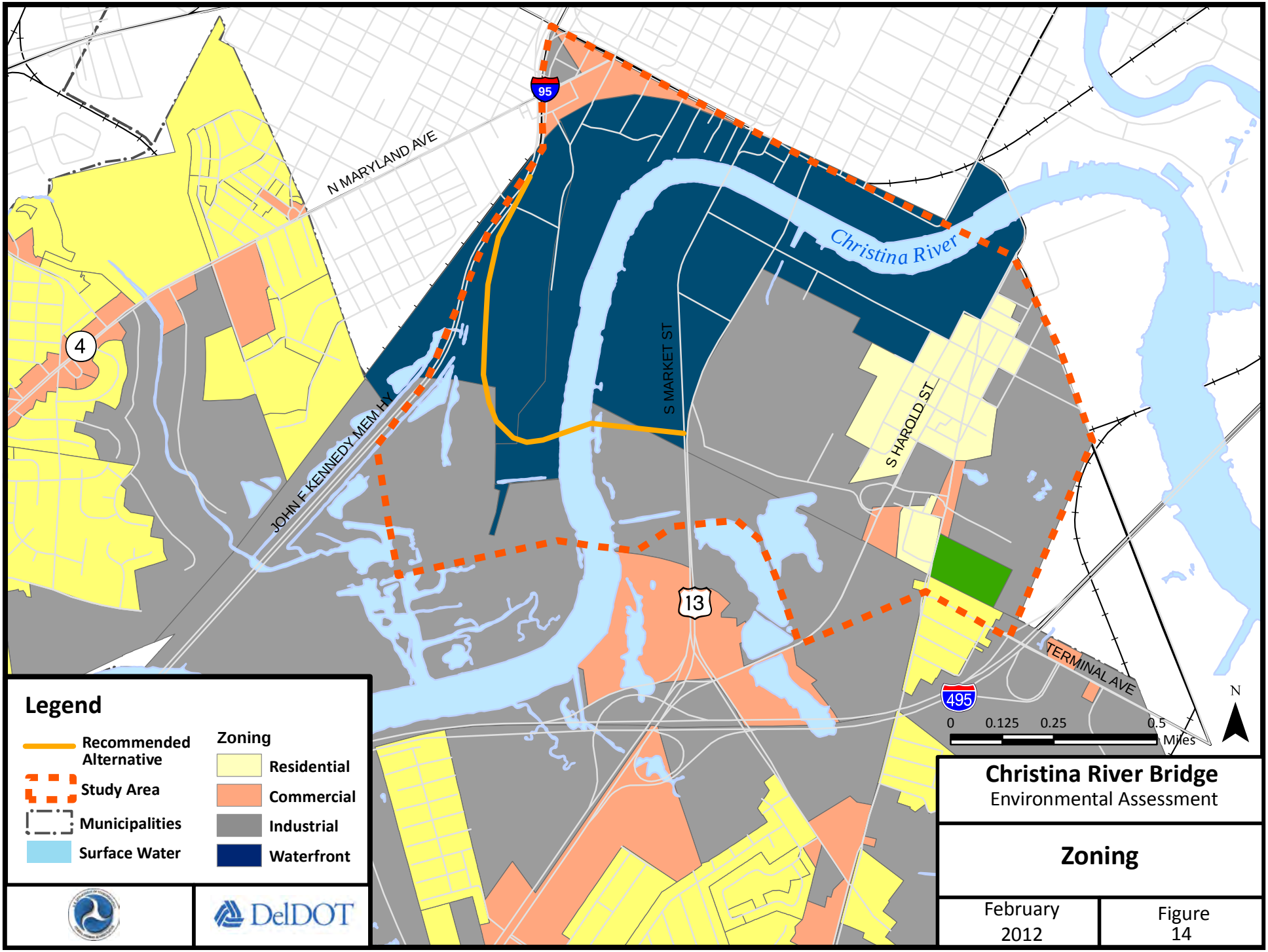
Legend
Recommended Alternative
Study Area
Municipalities
Land Use
Residential
Commercial
Industrial
Trans/Util/Comm
Transitional
Institutional
Recreational
Agricultural
Forest
Water
Wetlands
Bare
DelDOT
Christina River Bridge
Environmental Assessment
Land Use
February 2012
Figure 13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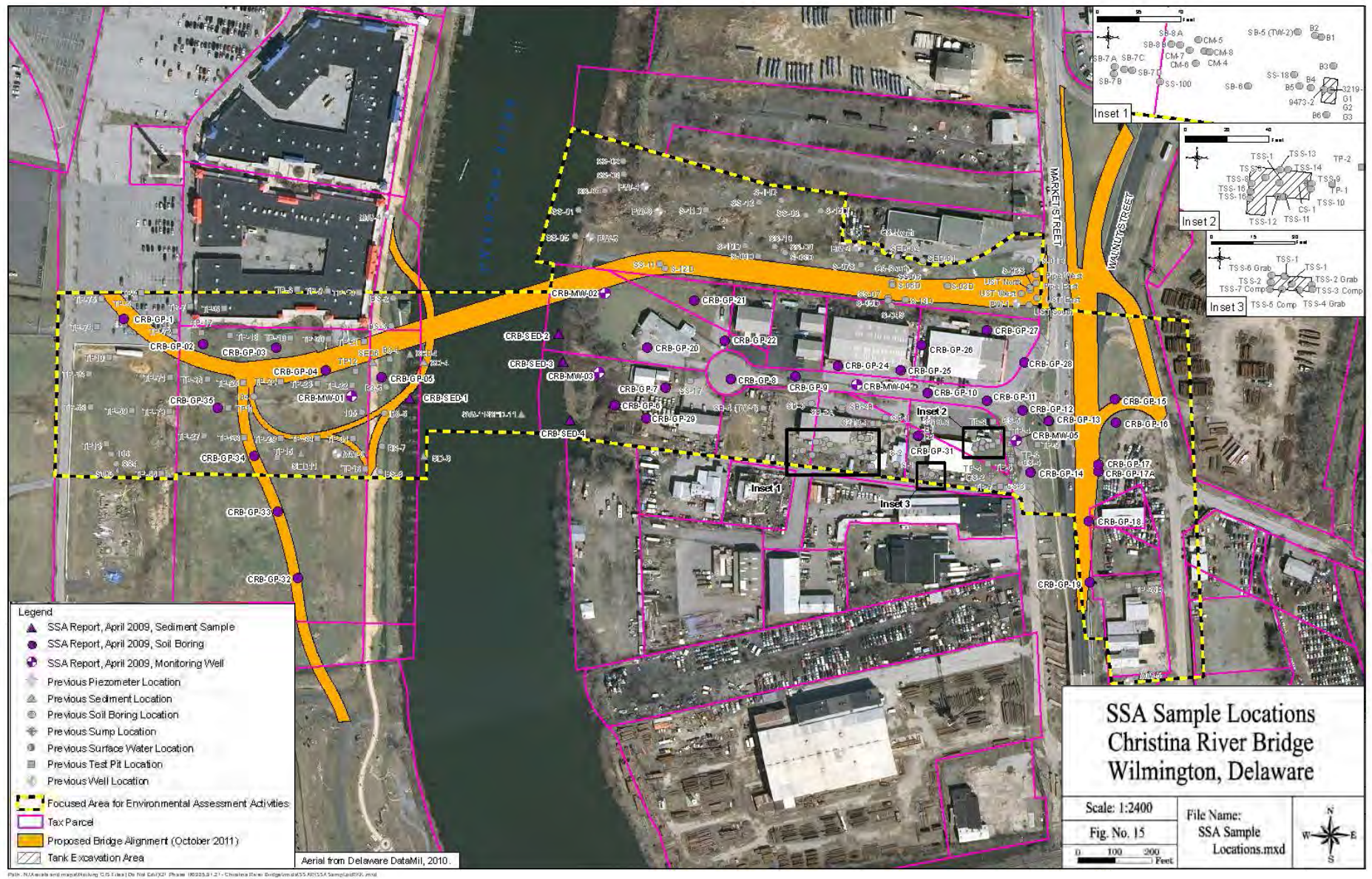
Recommended Alternative
Study Area
Municipalities
Surface Water
Zoning
Residential
Commercial
Industrial
Waterfront
DelDOT
Christina River Bridge
Environmental Assessment
Zoning
February 2012
Figure 14


Inset 1
Inset 2
Inset 3
MARKET STREET
WALNUT STREET
CRB-GP-1
CRB-GP-2
CRB-GP-3
CRB-GP-4
CRB-GP-5
CRB-GP-6
CRB-GP-7
CRB-GP-8
CRB-GP-9
CRB-GP-10
CRB-GP-11
CRB-GP-12
CRB-GP-13
CRB-GP-14
CRB-GP-15
CRB-GP-16
CRB-GP-17
CRB-GP-17A
CRB-GP-18
CRB-GP-19
CRB-GP-20
CRB-GP-21
CRB-GP-22
CRB-GP-24
CRB-GP-25
CRB-GP-26
CRB-GP-27
CRB-GP-28
CRB-GP-29
CRB-GP-31
CRB-GP-32
CRB-GP-33
CRB-GP-34
CRB-GP-35
CRB-MW-01
CRB-MW-02
CRB-MW-03
CRB-MW-04
CRB-MW-05
CRB-SED-1
CRB-SED-2
CRB-SED-3
CRB-SED-4
Legend
SSA Report, April 2009, Sediment Sample
SSA Report, April 2009, Soil Boring
SSA Report, April 2009, Monitoring Well
Previous Piezometer Location
Previous Sediment Location
Previous Soil Boring Location
Previous Sump Location
Previous Surface Water Location
Previous Test Pit Location
Previous Well Location
Focused Area for Environmental Assessment Activities
Tax Parcel
Proposed Bridge Alignment (October 2011)
Tank Excavation Area
Aerial from Delaware DataMil, 2010.
SSA Sample Locations
Christina River Bridge
Wilmington, Delaware
Scale: 1:2400
Fig. No. 15
File Name:
SSA Sample
Locations.mxd
0 100 200
Feet
N
W
E
S

Because most of the land within the project study area is currently industrial/commercial use, it falls under DNREC's definition of a "Restricted Use" or a property which typically includes any setting on which commercial, industrial, manufacturing, agriculture or any other activity is done to further either the development, manufacturing, or distribution of goods and services, intermediate and final products, including but not limited to: administration of business activities, research and development, warehousing, shipping, transport, remanufacturing, stockpiling of raw materials, storage, repair and maintenance of commercial machinery and equipment, and solid waste management (DNREC, 1999).

***Database Search***

A Freedom of Information Act (FOIA) request was submitted to all branches of the DNREC Division of Air and Waste to view any files or previous investigations pertaining to the properties within the project study area. Several files pertaining to Solid and Hazardous Waste, Enforcement, Environmental Response, Site Investigation and Restoration, and Tank Management were reviewed for the Dravo Shipyard, Jablow Property, Wilmington Glass and Aluminum and Dunrite Tires, Cobra Machine, Bentley Truck Services, Inc., and Industraplate. Historic aerials, historic topographic maps, historic atlases, Sandborne mapping and Polk's City Directories were also reviewed to identify past land use and areas of potential land disturbances throughout years of record.

***Physical Site Sampling***

Geoprobe soil borings, Christina River sediment samples, and surface and subsurface soil samples were conducted throughout the project study area. Boring logs from site investigations indicate that a majority of the project study area is filled with imported fill on the west side of the Christina River and industrial fill on the east side of the Christina River, and is underlain by marsh deposits. The locations of soil and sediment samples and borings are depicted in **Figure 15**.

Five monitoring wells were installed within the project area and groundwater samples were collected and analyzed for various contaminants including: target compound list, volatile organic compound, semi volatile organic compounds, pesticides, polychlorinated biphenyls, target analyte lists metals, and cyanide using HSCA protocols. Monitoring well locations are depicted in **Figure 15.**

**b. Impacts**

The No-Build Alternative would not impact or come in contact with any hazardous materials in the project study area. The Preferred Alternative would involve areas of potentially hazardous materials. Several contaminants were identified in soil samples within the project study area, including metals (arsenic and lead), PAHs (benz(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, and dibenz(a,h)anthracene, and PCBs in two areas. The sediment sample analysis indicated that antimony, barium, cadmium, chromium, copper, lead, mercury, nickel, silver and zinc were detected in levels that exceeded the sediment URS in the DNREC screening data.

Groundwater samples taken from monitoring wells were screened for dissolved metals, cyanide, TCL VOCs, TCL SVOCs, and TCL Pesticides/PCBs. Elevated levels of aluminum, barium, manganese, and arsenic were detected. Only arsenic is considered a contaminant of concern,

and was detected at a concentration above the URS criteria and the City of Wilmington Industrial Pretreatment Regulations limit of 90 ug/L in four of the five sample locations.

Petroleum compounds are potential contaminants of concern under a "restricted use" scenario for the project. Two samples were analyzed for Toxicity Characteristic Leaching Procedure (TCLP) lead to determine whether soil in the project study area could be classified as hazardous for disposal purposes during construction. The TCLP lead levels were detected at levels below the hazardous waste soil criteria of 5 mg/L for lead, classifying the soil as non-hazardous for disposal purposes.

**c. Minimization and Mitigation**

Localized areas of the project study area, primarily on the east side of the Christina River, have been impacted by metals (arsenic and lead), low level VOCs, petroleum hydrocarbons, and PCBs from contaminant sources ranging from leaking underground storage tanks (USTs) and past filling activities to current and past site operations. Recommendations to remediate potential contamination in these areas include the following:

- Proper management of soil, sediment and groundwater during project construction
- Capping in conjunction with construction, where applicable
- Environmental covenant put in place to restrict digging and installation of wells
- Sampling soils to be excavated for project construction to evaluate disposal or treatment options; possibly in conjunction with geotechnical drilling activities
- Preparation of a Contaminated Materials and Water Management Work Plan (CMWMWP); including a construction worker risk assessment and site specific Health and Safety Plan (HASP)
- Proper abandonment of existing monitoring wells according to DNREC regulations
- Fully characterize the Cobra Machine Property located on the east side of the Christina River to assess the nature and extend of arsenic impact
- Any groundwater encountered in excavations occurring on the east side of the Christina River that require dewatering for construction purposes will require pre-treatment to remove arsenic to allowable concentrations for discharge to the sanitary sewer. Because the project area is located within a Groundwater Management Zone, this water will not be used for drinking purposes and is, therefore, not a risk to the public.

If any hazardous material is encountered during project construction, DelDOT would coordinate with DNREC regarding the appropriate treatment and disposal options, consistent with 7 Del. C., Chapter 63, Part 266- Standards for the Management of Specific Hazardous Wastes and Specific Types of Hazardous Waste Management Facilities. In addition, proper precautions would be taken during construction to ensure that construction workers are not exposed to hazardous materials.

Refer to **Appendix B** for a copy of the letter from DNREC, Division of Air and Water Management accepting the report and findings of the Site Specific Assessment Report for the project.

## 3. Noise

An evaluation of potential noise effects was completed in the context of the Delaware Department of Transportation's 2011 Highway Transportation Noise Policy for the proposed Christina River Bridge crossing.

A review of the existing land uses adjacent to the proposed improvements indicates that the west side of the river consists of retail facilities known as the Shipyard Shops. The east side of the River, adjacent to the proposed project within the James Court area, contains a mix of industrial and manufacturing uses. Per the FHWA Noise Abatement Criteria, this type of land use constitutes Activity Category F, for which there is no defined noise impact metric.

The 2011 *State of Delaware Highway Transportation Noise Policy* states that Category F is deemed to have no need for a noise analysis. As defined in the Code of Federal Regulations 23 CFR 772, for which the State Policy is based on, *Category F Land Uses are defined as: Agriculture, airports, bus yards, emergency services, industrial, logging, maintenance facilities, manufacturing, mining, rail yards, retail facilities, shipyards, utilities (water resources, water treatment, electrical), and warehousing*. Section 772.11(c)(2)(vi) states Activity Category F includes: *developed lands that are not sensitive to highway traffic noise. There is no impact criteria for the land use facilities in this activity category and no analysis of noise impacts is required.*

Additionally, a review of potential proposed development indicates that there are currently no planned developments near the proposed project that would be classified as an activity category that would require a noise analysis.

DelDOT is aware of the industrial property being leased to the Higher Ground Ministries on South Market Street. This is not an active worship institution at this time. Due to the location on South Market Street, the property already experiences some roadway noise. The project is does not anticipate increasing traffic in this area nor result in an increase in noise.

## 4. Air Quality

The project study area encompasses both Wilmington and New Castle County, and therefore is within the US Environmental Protection Agency (EPA) designated attainment area for carbon monoxide (CO), nonattainment areas for particulate matter ($PM_{2.5}$), and moderate nonattainment area for Ozone ($O_3$). In compliance with the Clean Air Act (CAA) Amendments of 1990 and the Final Transportation Conformity Rule (40 CFR Parts 51 and 93), DelDOT conducted an air quality analysis for the project.

The results of the air quality analysis are summarized herein; refer to **Appendix C** for the complete Air Quality Technical Report. The Preferred Alternative is not predicted to cause or exacerbate a violation of the National Ambient Air Quality Standards (NAAQS). The project is not expected to measurably increase regional emission burdens or Mobile Source Air Toxics (MSAT) levels. The project is also not expected to cause a violation of the $PM_{2.5}$ standard. There will not be significant increases in Greenhouse Gases. Construction-related effects of the project would be limited to short-term increased fugitive dust and mobile-source emissions during construction. State and local regulations regarding dust control and other air quality emission reduction controls should be followed.

## C. Cultural Resources

### 1. Historic Structures

Historic structures identification and evaluation efforts concluded that the following known resources or properties were within or just outside the area of potential effect (APE) and shown on **Figure 16**:

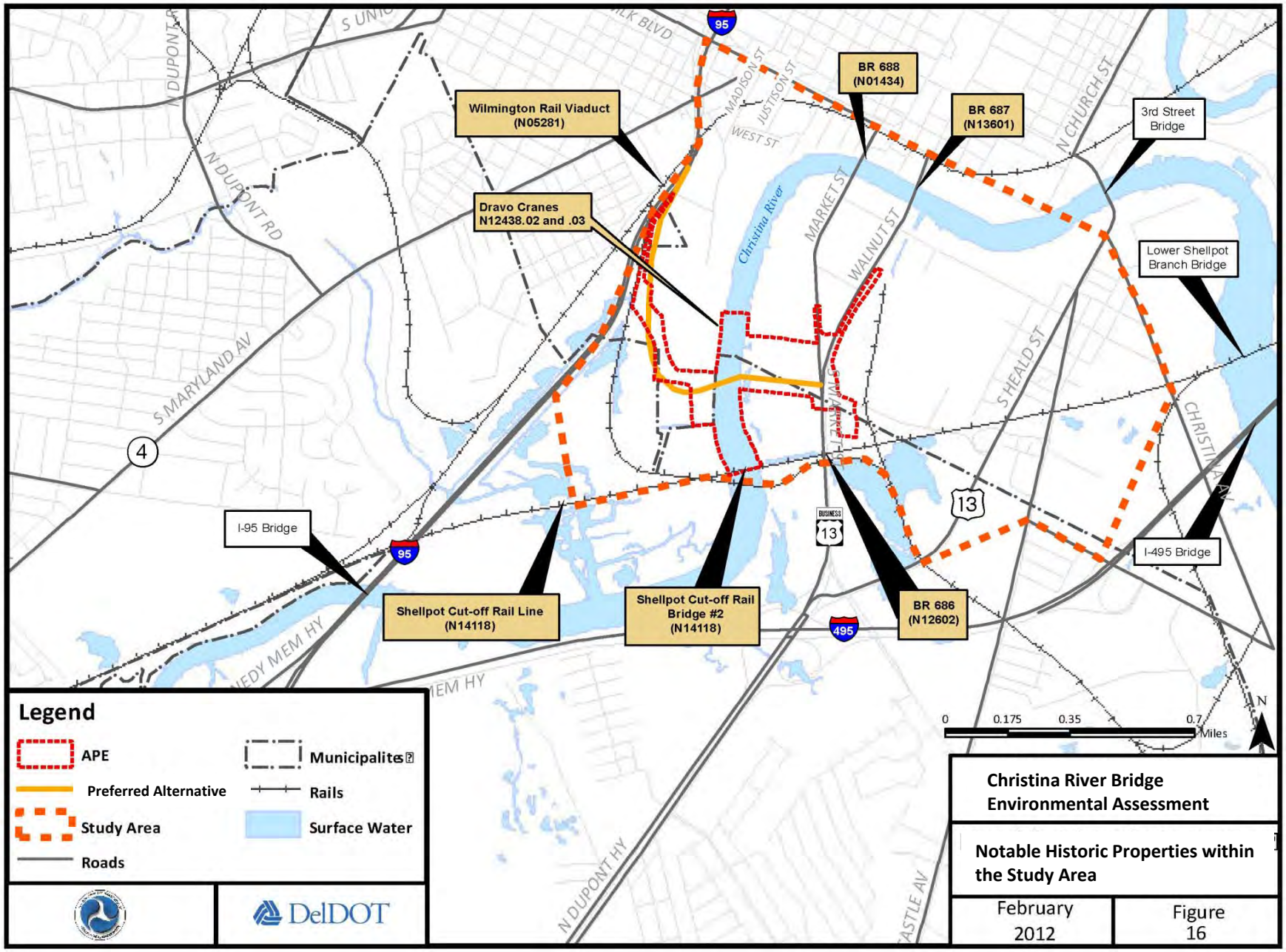
- Wilmington Rail Viaduct (National Register (NR) listed as N05281);
- Shellpot Bridge No. 2 over Christiana River (NR eligible as N04318);
- Shellpot Cutoff Rail Line (NR not eligible as N14118);
- State Bridge 1-686 (NR eligible as N12602)
- State Bridge 1-688 (NR eligible as N01434),
- State Bridge 1-687 (NR eligible as N13601), and
- Dravo Cranes (treated eligible as N12438.02 and .03).

The Shellpot Bridge No. 2 over the Christiana River and the Dravo Cranes along the Christina Riverwalk are the known cultural resources within the project's APE. The circa 1880's swing bridge is eligible for listing on the National Register of Historic Places (NRHP) for its engineering and functional design. This bridge rail crossing will be situated approximately 1,500 feet south and within visual sight distances of the new Christina River Bridge crossing. Both properties could experience visual impacts, but the impact is considered to be adverse.

Studies were also conducted to identify any unknown or un-surveyed historic standing structures within the project's APE. Four (4) individual properties were newly identified and investigated for their potential inclusion into the National Register of Historic Places. Results concluded that none of the properties were recommended eligible. Each property's assessment will be amended to the South Market Street Safety Improvement Project a concurrent DelDOT undertaking as a draft and ultimate final report. As a result, no new standing structures are affected and/or involved by the Christiana River Bridge Project. These conclusions and recommendations were concurred upon by the State Historic Preservation Office in an email dated October 21, 2011. It was determined, and documents in a letter dated January 31, 2011, that a Finding of No Adverse Effect is the appropriate finding and that none of the defining characteristics on the historic property would be adversely affected (Refer to **Appendix D** for a copy of the October 21, 2011 email, January 31, 2012 No Adverse Effect Letter, and February 22, 2012 email from the Deputy State Historic Preservation Officer.)

### 2. Archaeological Resources

DelDOT conducted a Phase IA Archeological Investigation for the project to assess the likelihood that important archeological sites might be present in the project study area. After review of archival research, cartographic analysis, and field investigations, the study concluded that there is little, if any, likelihood that significant archeological resources are present in the project study area. Some features associated with nineteenth- and twentieth-century industries may be present, particularly on the western bank of the Christina River, but these resources would not be expected to retain sufficient integrity or information potential to warrant archeological documentation. No further archeological investigations are recommended for the project. (The Phase IA Archeological Investigation Report is currently being reviewed by the State Historic Preservation Office.)


Wilmington Rail Viaduct (N05281)
Dravo Cranes N12438.02 and .03
BR 688 (N01434)
BR 687 (N13601)
3rd Street Bridge
Lower Shellpot Branch Bridge
I-95 Bridge
I-495 Bridge
Shellpot Cut-off Rail Line (N14118)
Shellpot Cut-off Rail Bridge #2 (N14118)
BR 686 (N12602)
Christina River
N DUPONT RD
S MARYLAND AV
MARKET ST
WALNUT ST
S HEALD ST
N CHURCH ST
MADISON ST
JUSTISON ST
WEST ST
N DUPONT HY
Legend
APE
Preferred Alternative
Study Area
Roads
Municipalities
Rails
Surface Water
DelDOT
0 0.175 0.35 0.7 Miles
N
Christina River Bridge Environmental Assessment
Notable Historic Properties within the Study Area
February 2012
Figure 16

# D. Natural Resources

## 1. Wetlands and Waters of the US

Detailed wetland identification and delineation was conducted along the Preferred Alternative. US Geological Survey Quadrangles, National Wetland Inventory Maps, 1988 Delaware Tidal Wetland Maps, and Natural Resource Conservation Service Soil Survey Maps were utilized to conduct a background investigation. A delineation and survey of wetland boundaries was completed in early spring 2011 and updated in summer 2011.

### a. Existing Conditions

The following three areas were delineated as jurisdictional wetlands and/or waters of the United States and are shown on **Figure 17**. The US Army Corps of Engineers (USACE) Section 404 regulatory jurisdiction extends from the furthest landward extent of jurisdictional wetlands or High Tide Line channelward and Section 10 regulatory jurisdiction extends from High Tide Line channelward. DNREC jurisdiction extends from Mean High Water (MHW) channel ward and includes all features included on the 1988 DNREC Tidal Wetland Maps and are shown on **Figure 18**.

***Christina River***

Originating in southeastern Pennsylvania, the Christina River is approximately 35 miles long and drains 565 square miles. According to the NWI, the river is classified as estuarine, subtidal, unconsolidated bottom, oligohaline (E1UBL6). The maximum channel depth of the Christina River in the project study area ranges from 5.5 to 11 feet. The width of the river ranges from 275 to 475 feet in the project study area. The USACE has recorded a 200-foot wide federal navigation channel within this segment of the Christina River. This federal right-of-way extends 100 feet in each direction (east and west) from centerline of the river at mean low water (MLW). No permanent structure may encroach on this channel without approval from the USACE navigation section and the US Coast Guard.

***Feature W***

Feature W (refer to **Figure 17**) is a series of estuarine emergent wetlands (vegetated and non-vegetated mudflats) along the east bank of the Christina River. Common reed (*Phragmites australis*) dominates the shore and tidal mudflats; however, dense patches of pickerelweed (*Pontedaria cordata*) can be observed on the tidal mudflats in the growing season. Wetland functions and values include floodflow alteration, groundwater recharge, wildlife habitat, water quality improvement, and shoreline erosion protection.

***Feature WA***

Feature WA (refer to **Figure 17**) is a palustrine emergent and palustrine scrub-shrub wetland located along the I-95 corridor in the northwestern portion of the project study area. The dominant vegetation observed within the emergent portion of this wetland is common reed (*Phragmites australis, FACW*). Black willow (*Salix nigra, FACW+*), bush honeysuckle (*diervilla lonicera, NI*), and riverbank grape (*Vitis riparia*, FACW) are dominant within the scrub-shrub portion of Feature WA. The wetland is linear, extending along a ditch within the I-95 right-of-way adjacent to Frawley Stadium, then widens around an unmaintained stormwater management pond. The primary function of this wetland is sediment and toxicant removal/transformation of sediment and toxicant laden runoff from I-95.


Feature W
0' 100' 200'
GRAPHIC SCALE
Feature WA
Feature W
Northeast Corridor
Amtrak Training Facility
AMTRAK
Jackson Street
INTERSTATE 95
Parking Lot for Public Transportation Buses
Lower Linden Street
Maryland Ave
Madison Street
Delmarva Power Company
DPL Gas Regulator Station
Judy Johnson Field at Daniel S. Frawley Stadium
S. Madison Street
CSO Access
DCCA
Star Building
Justison Street
Christina Crescent
Chase Center
Justison St
Delaware Children's Museum
Justison Landing
Poole Pl
AAA
West Street
BP Gas Station
Martin Luther King Jr. Boulevard
Parking Lot
Barclay's
Crafts Publishing Company
Tatnall Street
Avenue of the Arts
South Orange Street
ING Direct
South Shipley Street
The Shipyard Shops
Russell W. Peterson Wildlife Refuge
South Market Street
A Street
Christina Landing
ShopRite
Wilmington Train Station
ING Direct
Walnut Street
Buccini/ Pollin Offices
200' Federal Navigation Channel
BUS 13
Cherry Lane
0' 200' 400'
GRAPHIC SCALE
LEGEND
Tidal Wetland Line
Non-Tidal Wetland Line
High Tide Line
Mean High Water Line
Mean High Water/Tidal Wetland Line
Mean Low Water Line
Approximate Wetland Investigation Area
Surveyed Wetland Boundaries
LOD Limit of Disturbance
DelDOT
CHRISTINA RIVER BRIDGE PROJECT
USACE Wetlands and Waters of the U.S.
FIGURE 17
FEBRUARY 2012


CHRISTINA RIVER BRIDGE PROJECT

# DNREC Tidal Wetlands and Subaqueous Lands

FIGURE 18 | FEBRUARY 2012

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### b. Impacts

The No-Build Alternative would not impact any wetlands, hydric soils or waters of the US. The Preferred Alternative would have permanent and temporary impacts on both USACE and DNREC jurisdictional wetlands and waters of the US.

The Preferred Alternative would permanently impact 0.05 acres of non-tidal and tidal USACE jurisdictional wetlands. In addition, the Preferred Alternative would permanently impact 0.5 acres of waters of the US, primarily through shading from the new bridge. The Preferred Alternative would also permanently impact 0.1 acres of DNREC jurisdictional wetlands mapped as Tidal Mudflats/Sandbars and Marsh as shown on the 1988 DNREC Tidal Wetland Maps, and would permanently impact 0.4 acres of DNREC subaqueous lands resulting from shading by the new bridge. Recent field delineations indicate that there are fewer DNREC tidal wetlands and impacts in the project area and a map revision could be requested from DNREC. USACE impacts will require a Nationwide Permit. DNREC impacts will require a Subaqueous Lands Permit and a Tidal Wetland Permit. Depending on the Nationwide authorization and the designation of state critical waters, the project may require Delaware Coastal Zone Management consistency certification.

### c. Minimization and Mitigation

Avoidance and minimization of impacts to wetlands and waters of the US will continue as final design plans are developed. It is expected that the actual acres of impact to wetlands and linear feet of waters of the US will decrease through both avoidance and minimization measures. This project will not require the relocation, stabilization or channelization of any streams.

Mitigation of impacts to wetlands and waters of the US may include preservation, enhancement or restoration designed to replicate functions and values provided by impacted resources, in accordance with the federal and state regulations and in coordination with the USACE and the DNREC. The installation of effective stormwater management (SWM) facilities and erosion and sedimentation controls would preclude most indirect stream impacts. For example the area on the west bank south of the bridge where the Riverwalk is located could be used for stormwater treatment for the project. The SWM facilities could incorporate environmental site design techniques, such as bio-swales and landscape infiltration. By utilizing these techniques in this area the project would not only meet the stormwater requirements, but the landscaped area would provide a natural transition from the Riverfront development and the bridge to the wildlife refuge. Refer to **Figure 11** for the location of a proposed SWM facility.

## 2. Ground Water

### a. Existing Conditions

There are no Recharge Resource Protection Areas or Wellhead Resource Protection Areas located within or near the project study area. There are no drinking water wells located within the project study area.

### b. Impacts

The No Build Alternative would not impact ground water resources in the project study area. The Preferred Alternative would not impact drinking water wells or groundwater recharge areas.

## 3. Floodplains

### a. Existing Conditions

According to the Federal Emergency Management Agency's (FEMA) National Flood Insurance Rate Maps (FIRM) for New Castle County, most of the project is located within the 100-year flood zone (Zone AE), with small pockets in the 500 to 500+ year flood zone (Shaded Zone X and Zone X).

### b. Impacts

The significance of floodplain encroachment was evaluated with respect to the criteria in Executive Order 11988 (Floodplain Management) and US DOT Order 5650.2. Floodplain encroachments were also analyzed according to the Federal Aid Highway Program Manual, which recommends that longitudinal encroachment (encroachment that parallels the stream channel) be avoided whenever possible.

The No-Build Alternative would have no effect on the 100-year flood zone or the 500-year flood zone in the project study area. The Preferred Alternative is not configured in such a manner that major longitudinal floodplain encroachments would occur. Floodplain impacts for the Preferred Alternative would be 33.4 acres and were estimated based on the LOD. However, impacts to the natural and beneficial values of the floodplain in the project study area would be minimal since the floodplain on both sides of the Christina River is currently commercially and industrially developed. The final floodplain impacts will be determined based on hydrologic and hydraulic modeling during the design phase for the project.

### c. Minimization and Mitigation

Efforts to minimize impacts to floodplains will continue throughout the design phase. Any construction within the floodplain would require New Castle County and City of Wilmington Floodplain Approval.

## 4. Wildlife and Habitat

### a. Existing Conditions

Letters of inquiry were sent in December 2010 to the Delaware Department of Natural Resources and Environmental Control (DNREC), Natural Heritage and Endangered Species Division and the United States Fish and Wildlife Service Chesapeake Bay Field Office to conduct a full search of records (**Appendix E**). The results of the inquiry were:

> *A review of our database indicates that there are currently no records of state-rare or federally listed plants, animals or natural communities at this project site. As a result, at present, this project does not lie within a State Natural Heritage Site, nor does it lie within a Delaware National Estuarine Research Reserve which are two criteria used to identify "Designated Critical Resource Waters" in the Army Corps of Engineers (ACOE) Nationwide Permit General Condition No. 19.*

### b. Impacts

The No-Build Alternative would not impact wildlife or wildlife habitat in the project study area. The Preferred Alternative will not impact federally or state listed endangered or threatened species. In-stream construction, time of year restrictions will minimize impacts to anadromous fish.

The Preferred Alternative will not directly impact the Peterson Wildlife Refuge, the associated nature center, or the Christina River Marsh State Resource Area. The Preferred Alternative would be 1,628 feet from the nature center at its closest point to the proposed sidewalk on the bridge, at least 680 feet from the Peterson Wildlife Refuge boundary.

## 5. Sea Level Rise

### a. Existing Conditions

Sea level rise is an expected result of climate change. According to the International Panel on Climate Change (IPCC), global average sea level has risen 10-25 cm in the past century, and is projected to rise 20-86 cm by 2100 (IPCC, 2001). In Delaware, sea level rise over the past 100 years has been measured at 33 cm, greater than the global average, according to the DNREC, 2011 *Climate Change, Delaware and Sea Level Rise* report (DNREC, 2011). This accelerated rate is attributable to various factors, including geomorphologic, anthropogenic and biologic processes. In Delaware, geomorphologic processes are comprised of thermal expansion and land subsidence (DNREC, 2011). Anthropogenic processes are comprised mainly of the burning of fossil fuels, including the burning of gasoline by motor vehicles. As a riverside community near the Atlantic Ocean, Wilmington is particularly sensitive to sea level rise, the consequences of which may include river bank erosion, increased salinity of estuaries, increased flooding during storm surges and extreme rainfall, and inundation of coastal and low-elevation river bank areas (NOAA, 2007). If the current trend of increasing sea level rise continues, Delaware coastal resources and communities may be at risk (DNREC, 2011).

### b. Impacts

Under the No-Build Alternative, existing traffic patterns would continue to increase. As traffic volume increases without an increase in capacity, congestion and vehicle idling time likewise would increase. As a result, it is expected that the vehicular emissions of greenhouse gases would rise from increases in traffic volumes and travel times.

The Preferred Alternative would not result in an increase in traffic volume above the increases already projected independently, and thus would not result in elevated emission of the greenhouse gases that contribute to sea level rise. Instead, by increasing capacity, the Preferred Alternative would be expected to decrease congestion and vehicle idling time, so that the vehicular emission of greenhouse gases per vehicle may decrease. Any rise in the emission of greenhouse gases and associated sea level rise would not be attributable to the Preferred Alternative.

During implementation of the Preferred Alternative, construction vehicles and machinery would operate and emit greenhouse gases. Because construction activities would be of limited scope and duration, it is expected that these activities would not appreciably contribute to sea level rise.

### c. Minimization and Mitigation

The design of the Preferred Alternative includes an additional two feet of vertical clearance to account for the potential sea level rise factor. During construction, heavy equipment and other construction equipment and vehicles will be turned off when not in use in order to reduce idling time and thereby minimize the amount of greenhouse gas emitted.