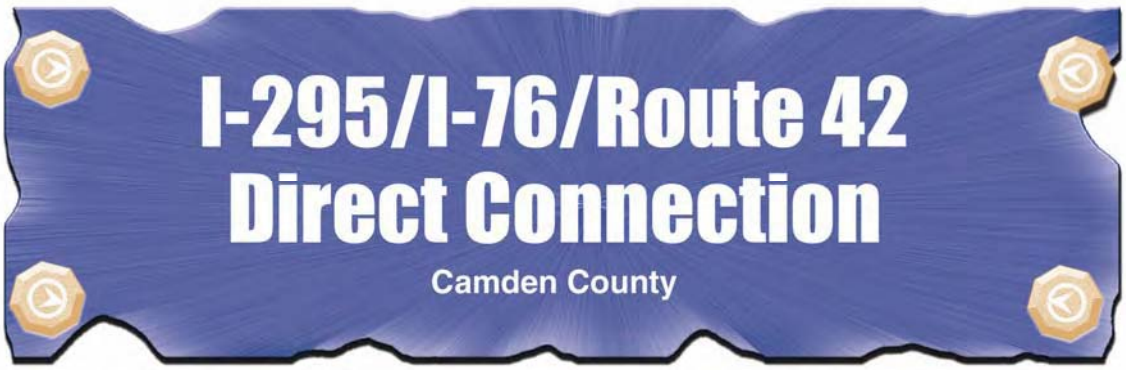

Natural Ecosystems
Technical Environmental Study

October 2007

US Department of Transportation
Federal Highway Administration
New Jersey Department of Transportation

I-295/I-76/ROUTE 42 DIRECT CONNECTION
NATURAL ECOSYSTEMS TECHNICAL ENVIRONMENTAL STUDY
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EXECUTIVE SUMMARY

The I-295/I-76/Route 42 Direct Connection project involves the reconstruction of Interstate 295 (I-295), Interstate 76 (I-76), and New Jersey State Route 42 (Route 42) and affected roadway segments traversing the Boroughs of Bellmawr, Mount Ephraim, and Gloucester City, Camden County. The natural ecosystem study area is comprised of portions of the drainage areas of Little Timber Creek (LTC) and Big Timber Creek (BTC). These waterways are tidally influenced up to the head-of-tide. The study area for the I-295/I-76/Route 42 Direct Connection project is described approximately as follows:

Along the Route 42/I-76 corridor, the study area extends from the southerly limit of Route 42 at Leaf Avenue Mile Post (M.P.) 13.82 north to where Route 42 ends and becomes I-76 at M.P. 14.28. The study area continues north along I-76 from M.P. 0.00 to the northerly limit just south of Crescent Blvd (Route 130) over I-76 at M.P. 1.15. Along I-295, the study area extends from the southerly limit of Creek Road (CR 753) over I-295 at M.P. 26.03 north to Black Horse Pike (Route 168) over I-295 at M.P. 28.16. Included in the study area are several residential, commercial, industrial, and public/recreational areas in Bellmawr, Mount Ephraim, and Gloucester City.

No significant impacts are identified for geology, soil, groundwater, and aquatic ecology. Below is a summary of impacts related to surface water, floodplain, wetlands and upland vegetation.

Surface Water

Potential impacts to surface water quality relate mainly to non-point source stormwater runoff impacts. The greatest potential for long-term impacts to surface water quality associated with this project would be increased highway-derived contaminants in stormwater runoff reaching LTC and BTC and surrounding wetlands. However, all of the proposed Build Alternatives incorporate stormwater pretreatment facilities in their design.

The proposed stormwater drainage system, including the upgraded piping system pump stations and new pretreatment facilities, would be a significant improvement over the existing umbrella drainage system. The proposed drainage system provides for pretreatment of runoff from the water quality storm through the use of bioretention facilities. Storms of greater rainfall, such as the 2-, 10- and 100-year storms, would have excess runoff volume pass through an outlet control structure to the receiving watercourse. See Section 5.3.1 for a description of the bioretention system.

The drainage and stormwater management plan for each alternative meet NJDEP stormwater management planning requirements and would provide for treatment of contaminants in stormwater runoff from both the net additional pavement and the rebuilt pavement proposed for this project. Non-structural measures would be incorporated to the greatest extent practicable in later design stages.

In conjunction with the roadway drainage systems, stormwater pumping stations would be required for each alternative for areas where gravity flow is insufficient. Alternatives D, G2 and K would include one stormwater pumping station in the vicinity of Browning Road, within the

Annunciation B.V.M. Church property. Alternatives D1 and H1 would utilize 2 pumping stations along Ramps D and F, on opposite sides of Little Timber Creek, each discharging into a bioretention basin. The proposed stormwater pumping stations for each Build Alternative would provide additional water quality treatment measures through screening of runoff and deposition of solids within the wet well areas of each facility. Alternative H1 would require the relocation of 250 feet of the Little Timber Creek channel. A soil erosion and sediment control plan would be prepared and implemented to address temporary surface water impacts during construction.

Floodplain

All alternatives would result in some impacts within the 100-year floodplain zone. Alternative D1 would have the greatest impact at 4.449 acres and Alternative G2 would have the least impact with 0.900 acres affected. There would be minimal or insignificant fills in the floodway which would be offset by removal of existing fills for all five Build Alternatives.

The FHWA has developed guidelines for encroachment into the floodplain (23 CFR 650 Subpart A). The purpose of this regulation is to prescribe "FHWA policies and procedures for the location and hydraulic design of highway encroachment on floodplains."

There are no practicable Build Alternatives that would avoid impacts to floodplains. The NJDOT evaluated twenty-six possible alternatives in an extensive screening process that included representatives from the United States Army Corps of Engineers (USACOE), the United States Environmental Protection Agency (USEPA) and the New Jersey Department of Environmental Protection (NJDEP). All of the alternatives evaluated would have resulted in floodplain impacts. The five Build Alternatives studied in this TES were selected as having the least potential adverse impacts, including those related to floodplain, while still meeting the project purpose and need.

To comply with Executive Order 11988, entitled "Floodplain Management," the project will be designed to avoid floodplain impacts where practicable, minimize impacts to the greatest extent possible and to adequately mitigate unavoidable impacts. None of the Build Alternatives would completely avoid floodplain impacts. Each Build Alternative would include measures (floodwalls and/or berms), which would isolate the roadways from flooding from Little Timber Creek for the 100-year tidal flood event. Roadway storm sewers and stormwater pumping stations would be designed in accordance with NJDOT drainage design criteria to provide adequate drainage within the study limits.

Wetlands

Alternative D1 represents the greatest permanent wetland impact with 3.732 acres affected. Alternative G2 represents the lowest permanent impact with 0.952 acres affected. Since all of the Build Alternatives would have wetland impacts, mitigation would be required. All of the impacted wetlands were classified by NJDEP as having ordinary or intermediate resource values. None were classified as having exceptional resource values.

Alternative G2 would have the least freshwater wetland buffer impact with 2.479 acres affected while Alternative H1 would have the greatest amount of wetland buffer affected (4.674 acres). The buffer area is located within the upland vegetation area discussed in Section 4.8.

There are no feasible Build Alternatives that would avoid impacts to wetlands. The NJDOT evaluated twenty-six possible alternatives in an extensive screening process that included representatives from the USACOE, USEPA and NJDEP. All of the alternatives evaluated would have resulted in wetland impacts. The five Build Alternatives studied in this TES were selected as having the least potential adverse impacts, including those related to wetlands, while still meeting the project purpose and need.

For Alternatives D, G2 and K, Al Jo's Curve would be removed. This would allow the wetlands divided by the existing roadway (Wetlands TB, TD, TE and TF) to be reconnected and provide improved and additional habitat for the wild rice as well as other vegetation and wildlife species.

Alternatives D, G2 and K would also provide enhancement to the community in the form of public access to LTC. Alternatives D1 and H1 would have the viewing areas for LTC, but no access, since Al Jo's Curve would remain in place.

If the loss of wetlands is compensated by the creation of new wetlands, the NJDEP requires wetland mitigation in the ratio of two acres created for each acre impacted. Three preferred onsite potential wetland mitigation areas have been identified for the alternatives that do not re-use Al Jo's Curve (Alternative D, G2 and K). These three preferred mitigation areas total approximately 5.35 acres and are, therefore, sufficient compensation for Alternatives D and G2 and partly sufficient for Alternative K. The wetlands impacted by Alternatives D1 and H1 would require offsite mitigation. However, one potential offsite area has been identified for these two alternatives and for the partial off-site mitigation required for Alternative K. The existing functions and values of the impacted wetlands would be replaced by the mitigated wetlands provided as compensation.

Upland Vegetation

Upland vegetation impacts would result for all the Build Alternatives. The greatest upland vegetation impact would result from Alternative H1 at 21.951 acres and the least upland vegetation impact would result from Alternative D at 19.039 acres. Figures 18 to 22 show the areas where upland vegetation would be impacted for each alternative. Most of the upland vegetation area impacted is classified by NJDEP as woodland. More than half of the total upland vegetation impacted, with the exception of Alternative H1, would be located within the interchange. According to NJDEP, this area is identified as deciduous woodland.

All of the upland impacts would be in isolated areas within the interchange or along the fringe of larger contiguous areas. Since only typical urban/suburban plant and animal species were observed in these areas, this loss of upland vegetation does not constitute a significant impact.

According to the New Jersey No Net Loss Reforestation Act, any loss of more than one-half acre of forested area would need to be replaced. Therefore, a reforestation plan will be developed by the NJDOT Landscape Unit once a preferred alternative is selected. With the removal of Al Jo's Curve for Alternatives D, G2 and K, the areas not designated as wetland mitigation areas may be utilized as upland vegetation mitigation. The amount that would be available for upland vegetation mitigation is approximately 1.652 acres.

1.0 INTRODUCTION

A Natural Ecosystems Technical Environmental Study (TES) was conducted to identify and assess potential impacts on natural resources and the ecosystems associated with the alternatives under consideration for construction of the I-295/I-76/Route 42 Direct Connection project. This technical environmental study was prepared pursuant to the requirements set forth in the Federal Highway Administration (FHWA) in Title 23, Code of Federal Regulations (CFR), Part 771, and FHWA Technical Advisory T-6640.8A and the New Jersey Department of Transportation (NJDOT) scope of work for a TES for ecology.

This document serves as the basis for findings and conclusions regarding ecological impacts presented in the National Environmental Policy Act (NEPA) compliance document for the proposed project.

The Natural Ecosystems TES was prepared by Dresdner Robin in association with Dewberry-Goodkind on behalf of the NJDOT.

2.0 PROJECT DESCRIPTION/SUMMARY OF IMPACTS

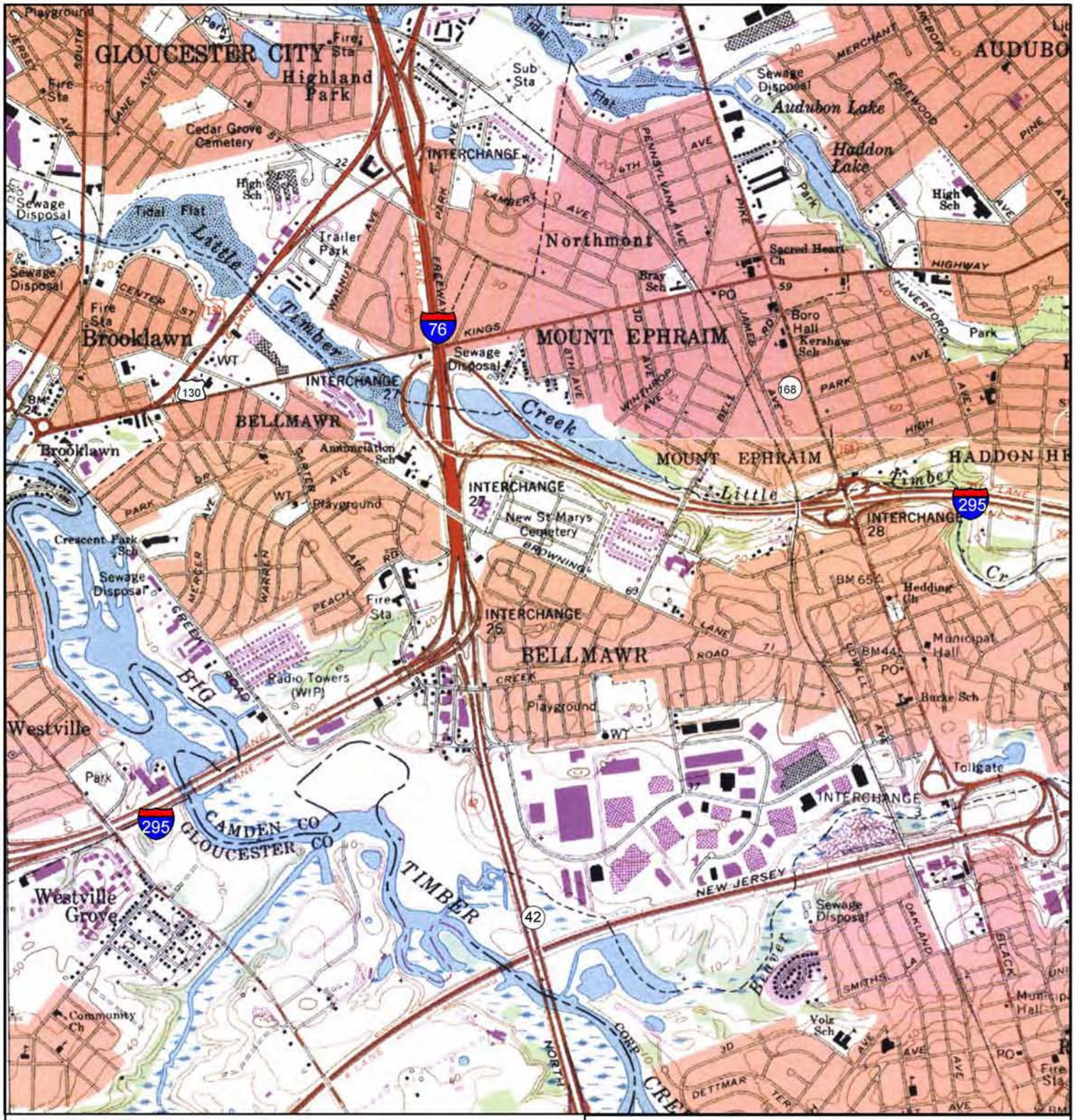
2.1 Project Area Overview

The I-295/I-76/Route 42 Direct Connection project involves the reconstruction of Interstate 295 (I-295), Interstate 76 (I-76), and New Jersey State Route 42 (Route 42) and affected roadway segments traversing the Boroughs of Bellmawr and Mount Ephraim, and Gloucester City, Camden County. The existing interchange, which was constructed between 1958 and 1961, is insufficient to accommodate current traffic volumes and travel speeds safely, resulting in an accident rate that is more than seven times the statewide average. Additionally, failing levels of service on the interchange ramps, combined with the congestion of local streets, adversely affects the quality of life in the surrounding communities.

A Project Location Map is provided in Figure 1. The study area for the I-295/I-76/Route 42 Direct Connection project includes several residential, commercial, industrial, and public/recreational areas in Bellmawr, Mount Ephraim, and Gloucester City. The project limits for the I-295/I-76/Route 42 Direct Connection are as follows:

Along the Route 42/I-76 corridor, the study area extends from the southerly limit of Route 42 at Leaf Avenue, Mile Post (M.P.) 13.82, north to where Route 42 ends at M.P. 14.28 and merges with I-295 at M.P. 26.79. The I-295 corridor includes only a short section of I-295 roadway from M.P. 26.79 to M.P. 26.96 before I-295 continues north following Ramp A. Additionally, the I-76 section of the project begins at M.P. 0.00 and continues to the northerly limit just south of Crescent Boulevard (Route 130) over I-76 at M.P. 1.15. Along I-295, the study area extends from the southerly limit of Creek Road (CR 753) over I-295 (M.P. 26.03), to the merge with Route 42 (M.P. 26.79), and continues north to M.P. 28.16, where Black Horse Pike (Route 168) crosses over I-295.

The natural ecosystem study area is comprised of portions of the drainage areas of Little Timber and Big Timber Creeks. These waterways are tidally influenced up to the head-of-tide. The project area, as well as the locations of Little Timber and Big Timber Creeks, is shown on Figure 1.



SOURCE:

- Camden, NJ-PA
  USGS 7.5 Minute Quadrangle
  1967, Revised 1994
- Runnemede, NJ
  USGS 7.5 Minute Quadrangle
  1964, Revised 1994

0 1,000 2,000 4,000 Feet

N

Q:\2652\technical\GIS\Alternatives-2005\PROJECT LOCATION MAP

NEW JERSEY DEPARTMENT OF TRANSPORTATION

I-295 / I-76/ ROUTE 42
Direct Connection
Camden County

Figure 1

Project Location Map

2.2 Description of Existing Facilities

The following is a description of the existing roadways. Figure 2 is an excerpt from the NJDOT Straight Line Diagram that provides an overview of the interchange configuration.

2.2.1 Ramps

Ramp A
Ramp A connects northbound Route 42 with northbound I-295.

Ramp B
Ramp B connects southbound I-295 with northbound I-76.

Ramp C
Ramp C connects southbound I-295 with southbound Route 42.

Ramp D
Ramp D connects southbound I-76 with northbound I-295.

Ramp E
Ramp E connects northbound I-295 with northbound I-76.

Ramp F
Ramp F connects northbound I-295 with the I-76 northbound express lanes.

Ramp G
Ramp G connects the I-76 southbound express traffic with southbound I-295.

Ramp H
Ramp H connects southbound I-76 with southbound I-295.

2.2.2 I-295, I-76, Route 42 from the Southern Project Limit

I-295 northbound consists of three 12' lanes with a 12' right shoulder. There is a 50' wide grass median separating the northbound and southbound lanes. The three lane section terminates in the vicinity of the bridge over Essex Avenue in Bellmawr, and forms Ramps E and F, which lead traffic to I-76 northbound local and express lanes, respectively. Ramp E becomes Ramp A, which is considered a continuation of I-295 northbound, and carries I-295 through-traffic northbound. Ramp A merges with Ramp D, carrying I-76 northbound traffic onto I-295, and together re-form the three lane section of I-295 northbound.

Route 42 northbound consists of four 12' lanes with a 12' right shoulder and a concrete median barrier curb. Route 42 ends at the merge of Ramp E carrying traffic from I-295 northbound. At this point, Route 42 becomes I-295 northbound, which continues to the Ramp A gore. At the gore, I-76 northbound begins for through-traffic while traffic heading to I-295 must exit onto

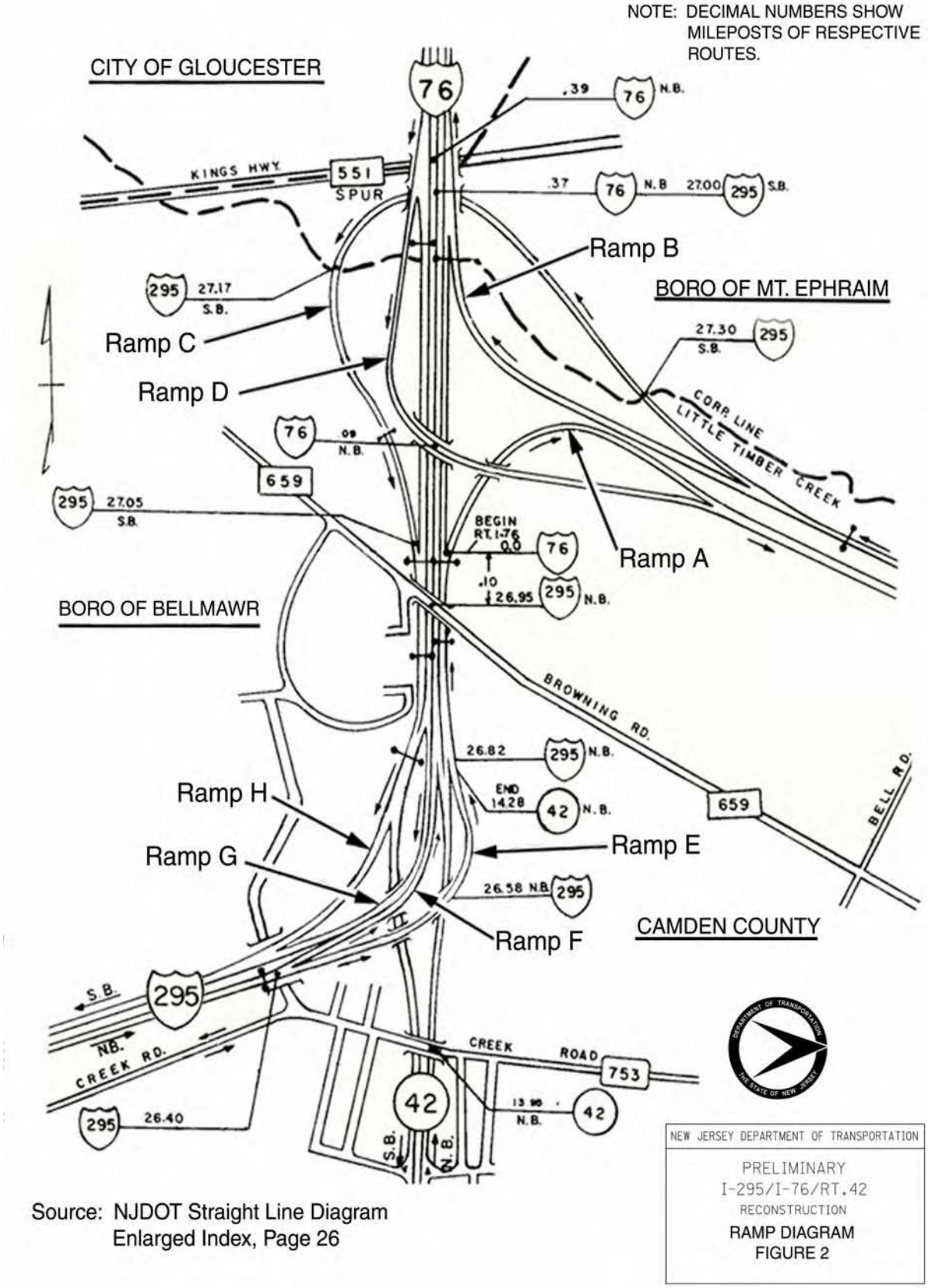
Ramp A. Traffic traveling from Route 42 northbound to I-295 northbound must merge across the lanes created by Ramp E to exit onto Ramp A to continue onto I-295, as the lanes of Ramp E form part of the express and local lanes of I-76 northbound.

2.2.3 I-295, I-76, Route 42 from the Northern Project Limit

I-295 southbound consists of three 12' lanes with a 12' right shoulder. Approximately 1,000' south of the Bell Road overpass in Mt. Ephraim, the travel lanes diverge into Ramps B and C. Ramp B carries traffic to I-76 northbound lanes. Ramp C, also known as "Al-Jo's Curve," carries I-295 southbound through-traffic via Ramp H, while traffic to Route 42 exits from the left lane. Ramp G, carrying I-76 and Route 42 southbound traffic merges with Ramp H, re-forming the 3-lane southbound section of I-295.

I-76 southbound consists of four 12' lanes with a 12' shoulder. Ramp D carries traffic from I-76 to I-295 northbound. At the Ramp C merge, I-76 ends, becoming I-295 southbound. Traffic continuing on I-295 southbound exits at Ramp G, while through-traffic continues onto Route 42 southbound past the Ramp G exit. Traffic traveling on I-76 to Route 42 must stay in the right lane after the Ramp C merge, then move to the left lane across merging traffic from I-295 southbound to continue onto Route 42. Traffic continuing to I-295 southbound exits right onto Ramp H.

Figure 2. Overview of Intersection Configuration



Source: NJDOT Straight Line Diagram
Enlarged Index, Page 26

2.3 Purpose and Need

2.3.1 Purpose

The purpose of this project is to improve traffic safety, reduce traffic congestion and meet driver's expectations by improving the direct connection of the I-295 mainline and the interchange of I-295/I-76/Route 42.

2.3.2 Need

There is a significant accident history at the interchange. The interchange's existing roadways include a number of geometric deficiencies that can be considered contributing factors to the high number of accidents. The deficiencies were identified from NJDOT record construction drawings and Structural Inventory and Appraisal (SI&A) Sheets.

Improve Safety
Accident data for the years 1995 through 2000 were reviewed. Since statewide accident rates were available for 1995, 1996, and 1999, a comparison of the accident rates on I-295, I-76 and Route 42 for these years was made with the statewide average.

During the 1995 to 1999 period, the I-295 roadway segments from M.P. 26.4 to M.P. 28.2 had accident rates over seven times the statewide average. Of these segments, M.P. 26.4 and 27.6 and M.P. 28 to 28.2, lengths that encompass the area of the interchange with Route 42 and I-76, had a substantially higher number of accidents than sections of I-295 immediately north and south of the interchange. For example, in 1995, M.P. 26.4 to 27.0 had almost seven times more accidents than the statewide average, while M.P. 26.8 to M.P 27.1 had the most accidents in each of the analyzed years.

All six segments of Route 42 (from M.P. 13.2 to M.P. 14.28) had accident rates in excess of the statewide average. In 1996, four segments (from M.P. 13.45 to M.P. 14.28) had accident rates, per million vehicle miles, greater than the statewide average. In 1999, four segments (from M.P. 13.44 to M.P. 14.28) had accident rates, per million vehicle miles, greater than the statewide average. In the years 1995, 1996 and 1999, one segment had an accident rate four times the statewide average.

I-76 accident rates were similar to those of I-295 and Route 42 in the 1995-1999 time frame. For 1995, four segments (from M.P. 0.0 to M.P. 0.8) had accident rates that exceeded the statewide average. One segment had an accident rate twice the statewide average. In 1996 five segments (from M.P. 0.0 to M.P. 0.8) had accident rates greater than the statewide average, with one segment being three times the statewide average. On I-76 in 1999, three segments (from M.P. 0.0 to M.P. 0.53) had accident rates in excess of the statewide average. In 1999, one segment had an accident history four times greater than the statewide average. Segments that were over-represented, in all three years that were compared with statewide averages, were M.P. 0.0 to 0.3 and 0.3 to 0.5. These segments mainly encompass the area in which I-76 is combined with I-295.

Geometric and Structural Deficiencies
The existing interchange has numerous substandard geometric design elements. These include horizontal curvature, stopping sight distance, superelevation, shoulder widths and acceleration and deceleration lane lengths. These are present along I-295, I-76, Route 42 and ramps at various locations. Since a majority of the improvements will be on new alignments, these substandard features will be addressed as part of the project.

In addition to the geometric deficiencies noted above, several bridges within the interchange have been identified as structurally deficient or functionally obsolete due to substandard vertical and horizontal clearances. Once again, since a majority of the improvements will be on new alignments, these structures will be replaced as part of the project.

Driver Expectations
While there is a definite need to correct the geometric deficiencies in existing ramps and structures, driver expectations also play a large role in the high accident rates at the interchange and necessitate improved safety. The posted speed limits on the existing ramps that serve the through-traffic on I-295 are inconsistent with typical operating speeds on an interstate highway. The posted speed limit on all of the highway approaches to the interchange is 55 miles per hour (MPH). The 20 MPH discrepancy between the posted speed limits (and higher operating speeds) on the approach highways and the 35 MPH speed on the ramps can be considered as a contributing factor in the interchange's overall poor accident record.

Operational Deficiencies
The lack of a direct connection for through movement on I-295, significant weaving problems, deficient connecting ramps, and high volumes of traffic all result in operational deficiencies (or congestion) within and near the interchange. The operational deficiencies on I-295, I-76 and Route 42, particularly the queuing of traffic and poor Levels of Service (LOS) that cause excessive delays, impact not only regional traffic and commuters using the highways, but local arterials and neighborhood streets as well. Excessive delays at the interchange result in highway traffic exiting onto surrounding local arterials, thereby further adding to congestion in the region. The diverted traffic, in turn, causes congestion on local roads, compromises traffic and pedestrian safety, increases noise levels, and lowers air quality in the community, which disproportionately tax the capacity and life of local roadways.

The effective operation of any roadway network, be it highway, local arterial or street intersection, is measured by the LOS categories ranging from A to F. LOS A represents the most favorable operating conditions with little or no delay. LOS F is the worst operating condition occurring when demand volume exceeds the capacity of the roadway resulting in severe congestion. Specific sections of the interchange that experience a poor LOS (LOS E or F) are highlighted in Table 1A. Of the eight ramps studied in detail, five operate at a LOS E or worse for at least one of the two peak hours (AM and PM).

In addition, a weaving condition exists on I-76/Route 42 between Ramp E and Ramp A. Traffic on Ramp E wishing to proceed north on I-76 must weave with traffic from northbound Route 42 proceeding north on I-295. Due to the volumes of traffic involved in this section of the interchange (specifically the high volume of traffic from Ramp E proceeding to Ramp A) this section of the roadway experiences failure. It should be noted that the traffic exiting Ramp E and proceeding on Ramp A is "through" traffic that could be expected to stay on mainline I-295 if a mainline section of the highway were available.

Table 1A – Level of Service

Roadway/Ramp	Peak Hour Level of Service	
	AM	PM
I-295 - Northbound		
South of Interchange	D	C
North of Interchange	D	**E**
I-295 - Southbound		
South of Interchange	**E**	**E**
North of Interchange	C	C
I-76 - Northbound		
South of Interchange	n/a[1]	n/a[1]
North of Interchange	**E**	C
Express Lanes	D	B
I-76 - Southbound		
South of Interchange	n/a[1]	n/a[1]
North of Interchange	C	**E**
Route. 42 - Northbound		
South of Interchange	D	C
North of Interchange	n/a[1]	n/a[1]
Route. 42 - Southbound		
South of Interchange	B	D
North of Interchange	n/a[1]	n/a[1]
Ramp A	**F**	**F**
Ramp B	**E**	B
Ramp C	**F**	**F**
Ramp D	B	C
Ramp E	**E**	**E**
Ramp F	**E**	**E**
Ramp G	B	C
Ramp H	C	B

[1]Section of roadway does not exist (see Figure 1).

2.3.3 Goals and Objectives

A set of project goals and objectives has been developed based on the project's purpose and needs described above, findings from previous studies, and goals developed during the partnering meetings on December 11-12, 2001. The goals and objectives are a compendium of statements made by the NJDOT, Federal Highway Administration (FHWA), agencies, local elected officials, residents, and other stakeholders in the project. As such, the goals and objectives are wide-ranging and represent different levels of priority for each stakeholder.

While the project may not be able to satisfy all goals and objectives listed herein, the preferred alternative seeks to address as many as possible. The project's goals and objectives are as follows:

- Improve safety by constructing a roadway system that meets interstate standards for geometric design.
- Provide a direct connection for through-traffic on I-295 with a design speed consistent with that of the interchange's approach roadways.
- Reduce congestion on local arterials such as Route 168 and US 130 and decrease commuter traffic on neighborhood streets, thereby improving local traffic mobility, pedestrian safety, and the level of service on I-295. In addition, noise levels would decrease and air quality would improve.
- Enhance regional economic development by increasing overall mobility. In addition, the improved roadway network conforms to State and local development plans.
- Reduce the financial burden on State and local police and emergency services by decreasing the number of vehicle accidents.
- Avoid, minimize or mitigate environmental and cultural resource impacts.
- Preserve the quality of life of communities by minimizing relocations and acquisitions of private and public property.
- Enhance opportunities for other modes of transportation, including bicycle and pedestrian, within the project area.
- Provide opportunities for intermodal use within the project area.

2.4 Description of Alternatives

The following section provides a description of the alternatives selected for further study. The alternatives were developed through a collaborative effort between stakeholder groups and were based on the objectives set forth in the project Purpose and Need statement. Graphics illustrating each alternative follow the narrative.

2.4.1 Alternative D

Alternative D, shown in Figure 3, begins in the vicinity of the Grenloch Secondary Railroad Bridge over I-295. Mainline I-295 shifts slightly south and elevates to a third level viaduct over Browning Road and Route 42 and a second level viaduct over Ramp C. The roadway meets existing I-295 pavement north of the Creek Road overpass. The I-295 Alternative D alignment crosses I-76/Route 42 at a skew through an unused area of New St. Mary's Cemetery.

Vehicles on northbound Route 42, whose destination is I-295 northbound, exit on Ramp A. This ramp configuration, in conjunction with the new I-295 mainline alignment, eliminates the current substandard weaving condition with Ramp E at this location. Ramp A crosses under Ramp E and then crosses over Route 42 northbound before joining the elevated I-295 northbound alignment just north of Browning Road.

Ramp B provides the movement from southbound I-295 to northbound I-76. Ramp C provides the movement from southbound I-295 to southbound I-76/Route 42. Ramp B and Ramp C exit I-295 from the right. Ramp B follows a similar alignment to its existing one to meet I-76 northbound. Ramp C splits from Ramp B and crosses under Ramp D, I-76, Browning Road, and I-295 to connect with Route 42 north of the Creek Road Bridge.

Ramp D is the move from I-76 southbound to I-295 northbound. Ramp D exits I-76 in much the same way that it does now. The Ramp D alignment crosses over I-76, over Ramp C, and under I-295 before merging with I-295 northbound south of Bell Road.

Northbound I-295 traffic heading north to I-76 utilizes Ramp E which follows essentially the same alignment as it does now.

Southbound I-76 traffic heading to I-295 southbound utilizes Ramp F. Ramp F diverts from I-76 from the right (existing exit is from the left), and then passes under Browning Road. Ramp F first runs parallel to Ramp C and then runs adjacent to I-295 southbound. Ramp F rises from a depressed section at Browning Road to an elevated section as it ties into I-295 southbound prior to Essex Avenue.

A summary of design features of this alternative are:

- Northbound and Southbound I-295 are side-by-side
- I-295 crosses over Route 42/I-76 on a viaduct on a skew
- I-295 on viaduct over Ramp C and Browning Road
- Ramp D on viaduct over I-76/Route 42, Ramp C and under I-295
- Two lane ramps except for Ramp F

- Removes express/local lanes on I-76 Westbound
- I-295 Posted Speed Limit: 55 mph (Design Speed: 60 mph)
- Ramp Speed Limits: 40 mph (Design Speed: 45 mph)

2.4.2 Alternative D1

Alternative D1, shown in Figure 4, is almost identical to Alternative D. The primary difference is the configuration of Ramps B and C. Ramp C exits I-295 southbound from the tangent section of I-295 southbound. Ramp B exits from the right approximately 1,000' later. Ramp B is on a new alignment south of its present location, but ties into I-76 at a similar location. Ramp C generally follows (within 150'±) the existing Ramp C alignment (Al Jo's curve) and passes under I-76 and Ramp F before merging with Route 42 southbound. The substandard radius on the existing Ramp C is replaced with a larger radius. Ramp D follows the same alignment as in Alternative D.

A summary of design features of this alternative are:

- Northbound and Southbound I-295 are side-by-side
- I-295 crosses over Route 42/I-76 on a viaduct on a skew
- I-295 on viaduct over Ramp C and Browning Road
- Ramp D on viaduct over I-76/Route 42 and under I-295
- Two lane ramps except for Ramp F
- Removes express/local lanes on I-76 Westbound
- I-295 Posted Speed Limit: 55 mph (Design Speed: 60 mph)
- Ramp Speed Limits: 40 mph (Design Speed: 45 mph)

2.4.3 Alternative G2

Alternative G2, shown in Figure 5, also begins in the vicinity of the Grenloch Secondary Railroad Bridge over I-295. The southbound and northbound lanes of I-295 align over top of each other as an over–and-under viaduct and shift south. The I-295 viaduct alignment is elevated to cross over all of the ramps as well as I-76 and Browning Road. I-295 crosses over I-76 on a skewed alignment and then diverges and lowers in elevation to meet the existing I-295 pavement following the same alignment as in Alternative D to a point just north of the Creek Road Bridge. I-295 southbound is a fourth level viaduct and northbound is a third level viaduct at the Route 42 and Browning Road crossings. I-295 southbound passes over Bell Road, whereas, I-295 northbound passes under Bell Road.

Vehicles on Route 42 whose destination is I-295 northbound, exit on Ramp A. Ramp A crosses under Ramp E and then crosses over Route 42 northbound before joining the elevated I-295 northbound alignment just north of Browning Road, similar to Alternative D.

Ramp B provides the movement from southbound I-295 to northbound I-76. Ramp C provides the movement from southbound I-295 to southbound Route 42. Ramps B and C exit I-295 from the right. Ramp B follows a similar alignment to its existing alignment to meet I-76 northbound. Ramp C crosses under Ramp D, I-76, Browning Road, and I-295 to connect with Route 42 north of the Creek Road Bridge.

Ramp D is the move from I-76 southbound to I-295 northbound. Ramp D exits I-76 in much the same way that it does now. The Ramp D alignment crosses over I-76, over Ramp C, and under I-295 before merging with I-295 northbound south of Bell Road.

Northbound I-295 traffic heading north on I-76 utilizes Ramp E which follows essentially the same alignment as it does now.

Southbound I-76 traffic heading to I-295 southbound utilizes Ramp F. Ramp F diverts from I-76 from the right (existing exit is from the left), and then passes under Browning Road. Ramp F first runs parallel to Ramp C and then runs adjacent to I-295 southbound. Ramp F rises from a depressed section at Browning Road to an elevated structure as it ties into I-295 southbound prior to Essex Avenue.

A summary of design features of this alternative are:

- Southbound I-295 placed above Northbound I-295 using a double-decker configuration
- I-295 crosses over Route 42/I-76 on a viaduct on a skew
- I-295 on viaduct over Ramp C and Browning Road
- I-295 on viaduct over Ramp D
- Ramp D on viaduct over I-76/Route 42 and Ramp C
- Two lane ramps except for Ramp F
- Removes express/local lanes on I-76 Westbound
- I-295 Posted Speed Limit: 55 mph (Design Speed: 60 mph)
- Ramp Speed Limits: 40 mph (Design Speed: 45 mph)

2.4.4 Alternative H1

Alternative H1, shown in Figure 6, is almost identical to Alternative G2. The primary difference is the configuration of Ramps B and C. Ramps B and C exit from I-295 from the right. Ramp C generally follows (within 150'±) the existing Ramp C alignment (Al Jo's curve) and passes under I-76 and Ramp F before merging with Route 42 southbound. The substandard radius on the existing Ramp C is replaced with a larger radius. Ramp B splits from Ramp C to meet I-76 northbound.

A summary of design features of this alternative are:

- Southbound I-295 placed above Northbound I-295 using a double-decker configuration
- I-295 crosses over Route 42/I-76 on a viaduct on a skew
- I-295 on viaduct over Ramp C and Browning Road
- I -295 on viaduct over Ramp D
- Ramp D on viaduct over I-76/Route 42
- Two lane ramps except for Ramp F
- Removes express/local lanes on I-76 Westbound
- I-295 Posted Speed Limit: 55 mph (Design Speed: 60 mph)
- Ramp Speed Limits: 40 mph (Design Speed: 45 mph)

2.4.5 Alternative K

Alternative K makes I-295 a continuous direct-through alignment in the form of a tunnel beneath I-76/Route 42, as shown in Figure 7. Alternative K begins in the vicinity of the Grenloch Secondary Railroad Bridge over I-295. Mainline I-295 shifts slightly south and begins to descend at a 3.5%± grade close to New St. Mary's Cemetery. The road reaches a depth of 60' in the northwestern corner of New St. Mary's Cemetery, and a depth of 35' below the I-76/Route 42 pavement. The roadway begins to ascend at a 4% grade beside the baseball fields and is at grade to meet the I-295 pavement north of the Creek Road overpass.

Vehicles on northbound Route 42 whose destination is I-295 northbound, exit on Ramp A, which would be separated from, but parallel with, Route 42. This ramp configuration, in conjunction with the new I-295 mainline alignment, eliminates the current substandard weaving condition with Ramp E at this location. Ramp A then crosses under Ramp E before joining the depressed I-295 alignment north of Browning Road.

Ramp B provides the movement from southbound I-295 to northbound I-76. Ramp C provides the movement from southbound I-295 to southbound Route 42. Ramp C exits I-295 from the right and Ramp B exits from the right approximately 1,000' further. Ramp B follows a similar path but to the south of its existing location to meet I-76 northbound. Ramp C crosses over Ramps B and D, and I-76. Then Ramp C passes over Browning Road and I-295 to connect with Route 42 north of the Creek Road Bridge.

Ramp D is the move from I-76 southbound to I-295 northbound. Ramp D exits I-76 in much the same way that it does now. The Ramp D alignment crosses over I-76, under Ramp C, and over I-295 before merging with I-295 northbound south of Bell Road.

Northbound I-295 traffic heading north on I-76 utilizes Ramp E which follows essentially the same alignment as it does now.

Southbound I-76 traffic heading to I-295 southbound utilizes Ramp F. Ramp F diverts from I-76 from the right (existing exit is from the left) and then passes under Browning Road. Ramp F first runs parallel to Ramp C and then runs adjacent to I-295 southbound. Ramp F rises from a depressed section at Browning Road to tie into I-295 southbound prior to Essex Avenue.

A summary of design features of this alternative are:

- Northbound and Southbound I-295 are side-by-side
- Mainline I-295 is a tunnel under I-76/Route 42 on a skew
- Ramp C on viaduct over Ramps B and D and I-76/Route 42
- Two lane ramps except for Ramp F
- Removes express/local lanes on I-76 Westbound
- I-295 Posted Speed Limit: 55 mph, (Design Speed: 60 mph)
- Ramp Speed Limits: 40 mph, (Design Speed: 45 mph)

Three local bridges are impacted by each of the alternatives. The Bell Road, Browning Road, and Creek Road bridges will be raised to provide proper vertical clearance and lengthened to accommodate the wider typical section of I-295 or I-76/Route 42. In addition, King's Highway will be lowered by approximately one foot under each alternative and Alternative K may require Essex Avenue to be lowered by approximately two feet.

2.4.6 No Build Alternative

This alternative proposes no changes to the existing interchange. Impacts to the project area will be evaluated in the same way as the other proposed alternatives, with the assessment of current conditions projected to the design year serving as the impact assessment for the no-build alternative. The no-build alternative serves as the benchmark to measure the costs and benefits of each build alternative evaluated.

A - Ramp Designation

- Roadway
- Bridge
- Ramps for Missing Moves
- Roadway to be Removed

N

0 750 1,500 3,000 Feet

Q:\2652\technical\GIS\Alternatives-2005\1-06Maps\AlternativeD

NEW JERSEY DEPARTMENT OF TRANSPORTATION

I-295 / I-76/ ROUTE 42
Direct Connection
Camden County

Figure 3
Alternative D

A - Ramp Designation

- Roadway
- Bridge
- Ramps for Missing Moves
- Roadway to be Removed

N

0 750 1,500 3,000 Feet

Q:\2652\technical\GIS\Alternatives-2005\1-06Maps\AlternativeD1

NEW JERSEY DEPARTMENT OF TRANSPORTATION

I-295 / I-76/ ROUTE 42
Direct Connection
Camden County

Figure 4
Alternative D1

A - Ramp Designation

- Roadway
- Bridge
- Ramps for Missing Moves
- Roadway to be Removed

N

0 750 1,500 3,000 Feet

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NEW JERSEY DEPARTMENT OF TRANSPORTATION

I-295 / I-76/ ROUTE 42
Direct Connection
Camden County

Figure 5
Alternative G2

A - Ramp Designation

- Roadway
- Bridge
- Ramps for Missing Moves
- Roadway to be Removed

N

0 750 1,500 3,000 Feet

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NEW JERSEY DEPARTMENT OF TRANSPORTATION

I-295 / I-76/ ROUTE 42
Direct Connection
Camden County

Figure 6
Alternative H1

A - Ramp Designation

- Roadway
- Bridge
- Ramps for Missing Moves
- Roadway to be Removed

N

0 750 1,500 3,000 Feet

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NEW JERSEY DEPARTMENT OF TRANSPORTATION

I-295 / I-76/ ROUTE 42
Direct Connection
Camden County

Figure 7
Alternative K

2.5 Summary of Impacts

The principal ecological impacts by alternative are summarized in Table 1.

TABLE 1
I-295/I-76/Route 42 Direct Connection
SUMMARY OF IMPACTS

Discipline	Impacts				
	Alternative D	**Alternative D1**	**Alternative G2**	**Alternative H1**	**Alternative K**
Geology	Minimal Impact	Minimal Impact	Minimal Impact	Minimal Impact	Minimal Impact
Soil	Minimal Impact	Minimal Impact	Minimal Impact	Minimal Impact	Minimal Impact
Groundwater	Minimal Impact	Minimal Impact	Minimal Impact	Minimal Impact	Minimal Impact
Surface Water Quality	Improved treatment of contaminated stormwater runoff from new and rebuilt pavement through bioretention basins and pumping stations	Improved treatment of contaminated stormwater runoff from new and rebuilt pavement through bioretention basins and pumping stations	Improved treatment of contaminated stormwater runoff from new and rebuilt pavement through bioretention basins and pumping stations	Improved treatment of contaminated stormwater runoff from new and rebuilt pavement through bioretention basins and pumping stations	Improved treatment of contaminated stormwater runoff from new and rebuilt pavement through bioretention basins and pumping stations
Aquatic Ecology	Minimal Impact	Minimal Impact	Minimal Impact	Minimal Impact	Minimal Impact
Permanent Floodplain Impacts	2.275 acres	4.449 acres	0.900 acres	4.263 acres	3.036 acres
Permanent Wetland and SOW Impacts	1.971 acres	3.732 acres	0.952 acres	3.151 acres	2.900 acres
Permanent Freshwater Wetland Buffer Impacts	3.586 acres	4.199 acres	2.479 acres	4.674 acres	3.351 acres
Permanent Upland Vegetation Impacts	19.039 acres	20.923 acres	20.569 acres	21.951 acres	21.427 acres

3.0 METHODOLOGY

The methodology for the TES involved three major tasks: inventory/data collection, field reconnaissance, and assessment of potential impacts. Available information regarding existing conditions was assembled and reviewed to describe the study area relative to geology and soils/hydrogeology, water quality, wetlands and floodplains, aquatic ecology, and terrestrial habitats.

The floodway/floodplain delineation was prepared in accordance with hydrologic and hydraulic analysis requirements set forth in the Flood Hazard Area Rules (N.J.A.C. 7:13). Hydrologic calculations to determine peak flows are based upon full watershed development with analysis utilizing the methodology of the US Department of Agriculture, Natural Resources Conservation Service, as outlined in Technical Release 55 (TR-55). Water surface elevations were determined based upon the standard step backwater method with computations prepared utilizing the US Army Corps of Engineers HEC-RAS (River Analysis System) computer model. Floodplain limits were established by comparative analysis of fluvial versus tidal flooding for the 100-year storm to determine the controlling (higher) elevation and corresponding limit of tidal backwater. The delineation of floodway limits, as required for fluvial and tidally influenced waterways, is in accordance with NJDEP requirements. Floodway limits were established utilizing equal conveyance methodology with allowance for a 0.2 foot maximum water level increase above the base flood elevation.

A field investigation was conducted to evaluate wetland areas and terrestrial and aquatic communities (Fall 2003 and Spring 2004). Wetland boundaries within the study area adjacent to the existing I-295/I-76/Route 42 interchange were delineated. In June 2004, the Essex Avenue portion of the study area was surveyed for the potential presence of threatened and endangered bird species and bog turtles.

Surface water bodies, channels and stormwater outfalls within the study area were identified by reviewing aerial photographs, as-built plans, and by on-site inspection during the field investigation. Available existing water quality data for Bellmawr was obtained. The New Jersey Department of Environmental Protection (NJDEP) files were reviewed, and public databases were reviewed for water supply wells in the study area. A review of available information on shellfisheries and fisheries was also performed. Requests for information also were made to the U.S. Fish and Wildlife Service and the National Marine Fisheries Service.

4.0 EXISTING CONDITIONS

4.1 Geology

The overall study area can be described as within the New Jersey Coastal Plain portion of the Coastal Plain physiographic province. The coastal plain consists of a thick wedge of gently, southeast sloping unconsolidated deposits that were deposited on top of Pre-Cambrian crystalline bedrock. In the study area, the coastal plain formations are of Upper Cretaceous Age and, from youngest to oldest, consist of the following:

1. Marshalltown Formation (Kmt)
2. Englishtown Formation (Ket)
3. Woodbury Formation (Kwb)
4. Merchantville Formation (Kmv)

The descriptions of the formations as obtained from the "Bedrock Geologic Map of Central and Southern, NJ" (USGS, 1998, Investigations Series Map I-2540-B) are summarized below. See Figure 8, Study Area Geology, which represents the NJDEP Bureau of Geographic Information and Analysis data layer, at the end of Section 4.0.

Woodbury Formation (Kwb)

The Woodbury Formation (Kwb) makes up the majority of the study area. The formation extends from the southwestern portion northward and then to the eastern edge of the study area. This formation is generally made up of a dark gray clay-silt, that turns brown and orange-pink when weathered. Iron oxides fill fractures or form layers in the moist weather beds. The unit is massive, except at the base where thin quartz sand layers occur. Locally thin strings of pale greenish-brown, smooth-surface glauconite may occur near the top. The unit is conspicuously micaceous throughout and contains finely dispersed pyrite, carbonaceous matter, and small pieces of carbonized wood. Small siderite concretions are abundant. The unit is thought to be 50 feet thick throughout.

Englishtown Formation (Ket)

Englishtown Formation (Ket) makes up the second largest portion of the study area. This formation covers a large majority of the southern and part of the eastern portion of the study area. This formation is generally made up of fine to coarse-grained gravelly quartz sand. The formation is massive and bioturbated with a medium to dark gray color that weathers to light brown-yellow or reddish-brown. The formation is locally interbedded with thin to thick beds of dark clay. Abundant carbonaceous matter with large lignitized logs occurs locally, especially in clay strata. Feldspar, glauconite, and muscovite are minor sand constituents. Sand is extensively cross-bedded. The unit is pyritic, especially in the carbonaceous rich beds where pyrite is finely disseminated grains or pyritic masses. The lowest part of the unit is a massive sand formation that contains small to large, soft, light gray siderite concretions. The unit is thought to be 50 feet thick throughout this portion of the formation.

Merchantville Formation (Kmv)

The Merchantville Formation (Kmv) makes up a portion of the northwestern section of the subject area. This formation is generally made up of sand and glauconite. It locally has high quartz content which includes the following characteristics; very clayey, silty, massive to thick bedded, grayish-olive-green to dark greenish-gray that turns moderate brown or moderate yellow-brown when weathered. Mica, feldspar, and pyrite are minor sand constituents within this formation. This formation is very micaceous at its base, and locally has extensive iron incrustations in near-surface weathered beds. This formation is presumably 40 to 50 feet thick in the study area.

Marshalltown Formation (Kmt)

The Marshalltown Formation (Kmt) makes up a very small portion of the southeastern section of the study area. This formation is generally made up of sand, quartz, and glauconite. These constituents are characterized as: fine to medium-grained silty and clayey, massive, dark gray; weathers light brown or pale red; and is extensively bioturbated. It is very glauconitic in basal few meters; glauconitic concretion decreases upward so that in the upper portions of the unit, quartz and glauconite are nearly equal. Feldspar, mica, pyrite, and phosphatic fragments are minor sand constituents. Locally, it may be very micaceous (mostly green chlorite) with sparse carbonized wood fragments. Fine-grained pyrite is abundant throughout the formation, and local thin, pebbly zones may occur. Contact with the underlying Englishtown Formation is sharp and unconformable. The basal few centimeters of the Marshalltown Formation contain siderite concentrations, clay balls, and wood fragments reworked by the underlying Englishtown Formation. Burrows, many filled with glauconite, extend about three feet down into the Englishtown Formation.

The NJDEP well search records in Appendix A provide drilling logs for shallow monitoring wells within the study area.

4.2 Soils

Soil types presented on the Geographic Information System (GIS) from the NJ Bureau of Geographic Information and Analysis utilized sources from the Natural Resources Conservation Service (NRCS 2002) for the soil classifications which are overlain on the USGS (2002) site aerial photography (see Figure 9 at the end of Section 4.0). The NRCS (2002) soil classification mapping was used because this information is more recent than the Camden County Soil Classification Survey dated 1957. The soil classification descriptions were taken from the 1957 survey.

The largest contiguous soil type mapped is Urban Land, which is found to the north of the Little Timber Creek corridor in the northern portion of the study area. Freehold soils are mapped both in the southeastern portion and west central portion of the study area. Howell soils are mapped in the western portion of the study area. The abundance of Made Land and Urban Land shows the extent of disturbance to the native soil types that formerly were found within the study area.

Psamments (Ps) soils are mapped within the highway corridor. The main component of these soils is Made Land.

Two (2) tidal marsh areas are shown on the map. One area is west of Al Jo's Curve and the second is within the tidally influenced region of the unnamed tributary to Big Timber Creek in the southwest portion of the study area.

The soil classifications in the study area are described below:

Urban Land

In areas where buildings have been constructed, the soils have been disturbed. As a result, the original soil layers have been mixed, borrow material from other sources has been added, and some soils may have been moved to other places. Urban land soils have been developed or disturbed by human activity in such a way that the natural arrangement of the particles and the soil horizons has been destroyed. These soils cannot be classified on the basis of form and properties, including acidity of the original or natural layers. Areas within the study area mapped as urban soils were found to be consistent with the NRCS mapping as shown on Figure 9, Study Area Soils.

Freehold Series

The Freehold series consists of dark grayish-brown, well-drained, sandy soils that are low in glauconite. They occur in high positions in the western part of the county. Their subsoil is dark yellowish-brown or brown. The substratum is stratified material that is mostly loamy sand, but also contains thin layers of sandy loam and clayey material. The finer material generally has a reddish color derived from iron coatings. Generally, the soils contain little quartzose gravel.

A typical profile of Freehold soil has a dark grayish-brown, fine sandy loam plow layer 9 inches thick; a yellowish-brown, fine sandy loam subsurface layer 6 inches thick; a dark yellowish-brown, sandy clay loam subsoil 20 inches thick; and underlying layers of mostly stratified loamy sand and sandy loam. The underlying layers range in color from light olive-brown to strong brown in places where the sand grains are coated with iron. There are thin ironstone sheets in some lower layers. The subsoil ranges from fine sandy loam to sandy clay loam in texture. In high positions where oxidation takes place readily, the colors of the subsoil are somewhat redder than those in the typical Freehold soil. The thickness of the solum ranges from 30 to 42 inches. As a rule, Freehold soils contain little gravel. The soils are moderately fertile, moderately permeable, and have a moderate to good water-holding capacity. The pH value ranges from 3.6 to 5.5 and these soils are designated as being extremely acidic to strongly acidic.

Howell Series

The Howell Series consists of thick, yellowish-brown, silty clay soils that are well-drained to moderately well-drained and contain a small amount of glauconite. They are nearly level to strongly sloping and are found on divides, lower slopes, and stream bluffs in the western part of the county. They developed in beds of thick, marine silty clay. The pH value ranges from 3.6 to 5.0 and these soils are designated as being extremely acidic to very strongly acidic.

Made Land

This mapping unit consists of areas where the soil material has been so thoroughly mixed by excavation, filling, or other disturbances that the original soil horizons have been destroyed.

In most places in Camden County, the soil material near the surface of Made Land is predominantly sand and gravel, but in a few places there is much fine material, especially in the Howell-Urban land soil association. In some places, clayey layers underlie this land type. Along the Delaware River and other major streams, the material making up Made Land came from pumping/dredging operations conducted to deepen stream channels. These areas contain boulders in addition to sand and gravel. Many recent residential and commercial building sites are in this mapping unit. The pH value ranges from 3.6 to 5.0 and these soils are designated as being extremely acidic to very strongly acidic.

4.3 Groundwater

Groundwater quality within the study area has been reviewed from database records and public documents. No site-specific water quality analyses were performed for this project.

4.3.1 Public Water Supply

The three (3) municipalities within the study area are serviced by public water supplies. The source of public water is primarily supply wells, some of which are located within the study area boundaries. The water quality data for these wells is discussed within this section of the report Raw groundwater data collected by these facilities is generally limited to the analysis of groundwater parameters that affect water hardness and clarity as well as chlorides analysis, which is used to evaluate the potential draw of the salt line from the Delaware River within the aquifer. The following parameters were reported for 2003 from the Bellmawr Water Department for Wells #3, 4, 5, and 6.

Well ID	Date	Turbidity	Fe	Mn	Alkalinity	Hardness	Ph	Chlorides
Well # 3	9/8/03	7.5	1.258	0.107	112.0	126.0	7.40	27.0
Well # 4	9/8/03	0.15	0.016	0.014	86.0	90.0	7.65	13.5
Well # 5	9/8/03	0.98	0.424	0.042	92.0	168.0	7.53	32.0
Well # 6	9/8/03	3.11	1.562	0.121	82.0	204.0	7.40	62.0

Data is reported in mg/L units

Wells #4 and #5 are located at Leaf Avenue and Bell Road, south of Creek Road, on the east side of Route 42, near the southwest corner of the Bellmawr Recreation Center. Their depth is 560 feet below ground surface (bgs). Wells #3 and # 6 are located in the southwest corner of Warren Avenue near Carter Avenue. Their depth is 359 feet bgs (Bellmawr Water Department Year 2003 Annual Drinking Water Report). None of these wells are located near the proposed improvements.

Since raw groundwater data was limited to the parameters shown above, additional groundwater data for the study area was obtained from publicly accessible databases for drinking water, which

are discussed below. The annual water quality data published by the municipalities is reported for the point of entry, i.e., the deliverable water to the consumer.

Figure 10 at the end of Section 4.0 presents the location of wells within the study area identified through an NJDEP well search. Wells numbered 28 through 32 are located on the northeast corner of the study area at 101 West Kings Highway in Mount Ephraim. The wells are classified as monitoring wells and all have a depth 17 feet. Wells numbered 55 and 56 are located on the southern side of the study area at Creek and Harding Roads. The depth of each of these monitoring wells is 70 feet.

Based on the NJDEP well search no potable wells were identified within the study area. All drinking water is from the Potomac-Raritan-Magothy (PRM) aquifer (2004 Annual Reports for Bellmawr and Gloucester City). This aquifer is a sole source confined aquifer and discussed further in Section 4.3.8.

4.3.2 Bellmawr Drinking Water Data

The Annual Drinking Water Quality Report, Bellmawr Water Department Year 2004 (Public Water System Identification [PWSID] #0404001) reported the concentrations for copper, lead, barium, turbidity, fluoride, sodium, and radioactive contaminants for both of the public water production and treatment facilities (Point of Entry [POE] Leaf and Bell Treatment Plant #01 and POE Warren Avenue Treatment Plant #2). In addition, drinking water from Plant #2 was sampled and analyzed for 1,2-Dichloroethane, a volatile organic compound (VOC) utilized in some industries. All laboratory analytical results for the analytes sampled for deliverable water were reported below the maximum concentration level (MCL) i.e., the level allowed in drinking water.

The Bellmawr water is drawn from four (4) wells in the PRM aquifer. Plant #1 wells are drilled to a depth of 557 feet below ground surface (bgs). The Plant #2 wells are drilled to depths of 359 feet bgs. Both treatment facilities utilize manganese greensand filtration systems and chlorinate the water, prior to delivery to consumers. The Bellmawr Water Department draws approximately 353 million gallons of water each year from the aquifer.

4.3.3 Mount Ephraim Drinking Water Data

According to the 2004 New Jersey Annual Water Quality Report, Mount Ephraim purchases its water from New Jersey American Water Company. All contaminants tested were below the MCL. The contaminants tested include barium, various VOC's, copper, lead and radioactive material.

4.3.4 Gloucester City Water Data

The 2004 Consumer Confidence Report, Gloucester City Environmental Utilities Department (Public Water System Identification [PWSID] #0414001) reported the concentrations for copper,

barium, sodium, asbestos, total haloacetic acids five, and radioactive contaminants for the four wells located at the Johnson Boulevard Water Treatment Plant. In addition, drinking water was sampled and analyzed for 1,2-Dichloroethane, cis-1,2-Dichloroethene, specific VOCs utilized in some industries, and Methyl Tertiary Butyl Ether (MTBE), a gasoline additive. All laboratory analytical results for the analytes sampled for deliverable water were reported below the MCL.

The Gloucester City water is drawn from four (4) wells in the PRM aquifer. Both treatment facilities utilize manganese greensand filtration systems and chlorinate the water, prior to delivery to consumers. Neither the four wells, nor the treatment facilities, are located in the study area.

4.3.5 USGS NWIS Groundwater Data

The United States Geologic Survey (USGS) National Water Information System (NWIS) database indicates the four (4) wells mentioned above are the only four (4) public water supply wells in Bellmawr Borough. The database also indicates that Gloucester City has 17 public water supply wells, four (4) of which are utilized by the Gloucester City Water Department. There are no public supply wells listed in Mount Ephraim Borough.

The NWIS database lists two (2) groundwater withdrawal sources with existing groundwater data within or adjacent to the study area and within the same aquifer. Both wells are public water supply wells for Bellmawr Borough. Below is a summary of the September 1985 analytical results provided from the NWIS database (Note: 1985 was the most recent data available as of August 2005):

Field Parameters	**Range**
Temperature	14.5º to 15º Celsius
Specific Conductance	188 to 350
pH	7.3 to 7.9
Laboratory Sample Results	
Calcium (filtered)	16 to 37 mg/L
Magnesium (filtered)	3.80 to 8.80 mg/L
Sodium (filtered)	13.0 to 18.0 mg/L
Potassium (filtered)	6.80 to 9.60 mg/L
Chloride (filtered)	3.1 to 12.0 mg/L
Sulfate (filtered)	21 to 34 mg/L
Fluoride (filtered)	0.3 to 0.5 mg/L
Iron (filtered)	120 to 380 mg/L
Manganese (filtered)	20.0 to 45.0 mg/L

4.3.6 Fazzio Landfill Effects on Groundwater

According to the NJDEP Site Remediation Program (SRP) Status Report 2000, the Fazzio Landfill, located in Bellmawr adjacent to the study area, has resulted in groundwater impacts

from Volatile Organic Compounds (VOCs), semi-VOCs, pesticides, Polychlorinated Biphenyls (PCBs), and metals at levels exceeding the New Jersey Ground Water Quality Standards. A clay layer underlies the landfill (Missing Moves Hazardous Waste Evaluation Report, NJDOT 2003), reducing the potential for downward migration of the contaminants. Groundwater contamination from the landfill is localized and does not impact public water supply because the borough public supply wells draw water from a geologic stratum that is deeper than the clay layer.

4.3.7 Other Sites of Concern

The 2001 edition of the NJDEP SRP Known Contaminated Site List (KCSL) indicates six (6) sites within the vicinity of the study area in Bellmawr Borough, one (1) site within the study area boundary in Mount Ephraim and no sites within or adjacent to the study area in Gloucester City. Listed sites have on-site sources of contamination. Groundwater contaminants are not reported within the KCSL; however, the potential for groundwater contamination may exist at the listed sites. Refer to Appendix B for the KCSL sites.

4.3.8 NJDEP Private Well Testing Act

The NJDEP Private Well Testing Act (PWTA) Program reported results for September 2002 to March 2003 (Note: this was the most recent data available as of August 2005). This program requires the seller of a residential home with a private well to analyze for fecal coliform/E.coli, nitrates, mercury, and any VOC over the MCL. The PWTA report presents results by county and municipality. No private well testing data was available for the municipalities in Camden County within the study area.

4.3.9 Sole Source Aquifer

According to the NJDEP New Jersey Geologic Survey Sole Source Aquifer GIS data layer, the study area is within the New Jersey Coastal Plain Sole Source Aquifer. The recharge zone is defined as the New Jersey Coastal Plain physiographic province. Its stream-flow source zone includes all upstream parts of the Delaware River watershed in New Jersey, Delaware, Pennsylvania and New York. The United States Environmental Protection Agency's (USEPA's) project review areas include the recharge zone and that part of the streamflow-source zone that lies within two miles of the mainstem of the Delaware River. The study area is within two miles of the Delaware River.

The PRM, the water supply source for Bellmawr and Gloucester City, is part of the Coastal Plain Aquifer. According to the USGS, the PRM is a confined aquifer with alternating layers of sand, gravel, silt, and clay. Its 1980 aquifer withdrawals were 243 million gallons per day. The common yield is 500 to 1,000 gallons per minute. The aquifer is characterized as highly productive and it is the most used confined aquifer in the Coastal Plain. The aquifer system extends throughout the Coastal Plain and attains maximum thickness of 4,100 feet at the southeast portion of New Jersey. The water is described as excellent in quality, but large iron concentrations exist in some areas.

Figure 11, at the end of Section 4.0, represents the groundwater recharge in inches per year within the study area (NJGS, 2004). Information pertaining to groundwater recharge was available only within Bellmawr. Along the west side of I-295/Route 42, the area is generally characterized as having a groundwater recharge of 1 to 8 inches a year. The majority of the east side of I-295/ Route 42 and the south side of I-295 parallel to Little Timber Creek has a groundwater recharge of 9 to 12 inches a year.

The outcrop recharge zone of the PRM aquifer is along the Delaware River located approximately 2 miles to the northwest of the study area. Since the study area is outside the aquifer recharge outcrop area, the study area does not represent a significant source of recharge to the PRM aquifer.

4.4 Surface Water Quality

4.4.1 New Jersey Surface Water Quality Classification

The study area is comprised of portions of the drainage areas of Little Timber Creek (LTC) and Big Timber Creek (BTC). A large section of LTC passes through the study area, while only a tributary of Big Timber Creek is contained within the study area. These waterways are tidally influenced. Both creeks flow to the west into the Delaware River. BTC has a drainage basin consisting of approximately 63 square miles, with 25 total stream miles. LTC drains approximately 4 square miles of land surface. The LTC watershed extends upstream beyond the boundary of the study area, to the headwaters located west of Tavistock, New Jersey, a distance of approximately 3 miles.

The highest quality waters (i.e., "waters of exceptional recreational or ecological significance") in New Jersey are designated as "Outstanding National Resource Waters" (ONRW). Waters designated as ONRW include: Fresh Water One (FW1) and Pinelands waters (PL). All remaining waters are categorized as Fresh Water Two (FW2). There are three (3) sub-categories within the FW2 designation:

- FW2-TP - Trout production waters for trout spawning or nursery during their first summer;
- FW2-TM - Trout maintenance water for the support of trout throughout the year;
- FW2-NT – Non-trout waters – these are not considered suitable for trout, but may be suitable for many other fish species.

Both the BTC and LTC have been designated as FW2-NT waters in the Lower Delaware Watershed Management Area (Area 18). Neither LTC nor BTC are classified as Scenic Rivers, according to the National Park Service National Wild and Scenic Rivers system.

4.4.2 Surface Water Chemistry

According to the New Jersey 1996 State Water Quality Inventory Report [305(b) Report] for BTC, “Water quality is fair to good, with nutrients mildly elevated and bacteria elevated. Lead may be a problem with regard to aquatic life support.” The report also states: “Fazzio Landfill

also has been suspected of contaminating BTC with organic chemicals." This landfill site is just upstream of the study area. The NJDEP SRP Status Report 2000 indicates that surface water is adversely impacted by semi-VOCs and metals from the landfill. As noted above, there are six (6) KCSL sites in the vicinity of the study area. However, the KCSL does not specifically identify whether surface water has been impacted by these sites.

In 1996, there were fourteen (14) NJPDES permitted dischargers, ten (10) of which were municipal facilities. The Camden County Municipal Utilities Authority (MUA) regionalized sewer treatment systems to comply with the Federal Clean Air and Water Act. The development of the MUA eliminated five (5) treatment plants and resulted in improved water quality. Runoff from non-point sources is currently a primary concern since it results in elevated levels of nutrients and bacteria at numerous points within the BTC watershed.

The Delaware Riverkeeper Network (DRKN) has a volunteer monitoring site on BTC at Chews Landing. This monitoring site is approximately 4.5 miles south of the study area. The following field parameters were recorded at this site:

Parameter	**Results**
pH	5.5 to 7.5
Nitrates	0.88 to 4.4 mg/L
Phosphate	0.2 to 0.5 mg/L
Dissolved Oxygen	4.6 to 11.9 mg/L
Dissolved Oxygen Saturation	52.6 to 112.9%.

The DRKN monitoring results indicate that pH, nitrates, and phosphate are at concentrations considered acceptable to support wildlife; however, dissolved oxygen (DO) and DO saturation results are some of the lowest ranges observed in the region. These two parameters are very important in maintaining a diverse aquatic habitat and appear to be impacted by continuing land development stresses on this ecosystem.

Six (6) water quality monitoring stations were identified within the BTC and its major tributaries; however, none are within the study area (See Figure 12 at the end of Section 4.0). The six locations are:

- South Branch of Big Timber Creek at Grenloch, New Jersey
- South Branch of Big Timber Creek at Blackwood, New Jersey
- North Branch of Big Timber Creek at Clementon, New Jersey
- North Branch of Big Timber Creek at Glendora, New Jersey
- Two at North Branch of Big Timber Creek at Laurel Springs, New Jersey

All six (6) of the monitoring stations are located upstream of the study area. Only one (1) station within the North Branch of BTC at Glendora (Station #01467359) has conducted water quality sampling up to 2003. This station is over two (2) miles upstream of the study area. The following are the results for sampling events conducted June through September 2003:

Field Parameters	**Results**

Water Temperature	19.0º Celsius
Discharge	81 cubic feet per second (cfs)
Gage Height	3.51 feet
Specific Conductance	173
Dissolved Oxygen (DO)	6.3 mg/L
Biochemical Oxygen Demand	1.3 mg/L
PH (field)	6.5
Turbidity (field)	11

Laboratory Sample Results	
Total Nitrogen	0.95 mg/L
Ammonia (unfiltered as N)	0.120 mg/L
Nitrite (filtered as N)	0.011 mg/L
Phosphorus (unfiltered)	0.21 mg/L
Calcium (filtered)	13.3 mg/L
Magnesium (filtered)	2.90 mg/L
Sodium (filtered)	11.2 mg/L
Potassium (filtered)	3.23 mg/L
Chloride (filtered)	19.0 mg/L
Sulfate (filtered)	17.6 mg/L
Boron (filtered)	179 mg/L

Biological Parameters	
Chlorophyll a	3.30 mg/L
Fecal Coliform	2,400 cfu
Escherichia coli	900 cfu
Enterococci	1,200 cfu

Comparing these surface water sample results with data from earlier events at this site, it appears that the general water quality has improved at this station within the BTC. However, as noted in the results, biological impacts still remain a concern. No comparable surface water quality is available for LTC. However, based on aquatic ecology data discussed in section 4.5, and field reconnaissance, the surface water quality of LTC is expected to be similar to BTC. Based on field observations, it is apparent that the water quality of LTC is degraded by stormwater runoff from existing development.

4.4.3 Stream Morphology

Historical mapping shows that, prior to the I-295 highway construction (1950s), the LTC stream bed meandered throughout what is now the highway corridor. The stream was relocated to the north to allow for construction of the highway. This is apparently the reason that the existing stream channel is relatively straight and its width relatively consistent from the head-of-tide upstream within the study area. However, there are areas located downstream where LTC meanders within the floodplain. Sections of this portion of the stream contain culverts and the banks are relatively stable.

In the upstream portions of the stream (east of Bell Road to the railroad and identified as non-tidal), the channel had bank erosion and severely incised channels. Downstream of Bell Road to the edge of the tree line within Wetland TF (tidal), there was bank erosion and severely incised channels. The channel bed was covered with soft clay sediments. Clay was present in the stream channel from Bell Road upstream to the railroad.

The width of the stream is relatively consistent upstream of the treeline in Wetland TF. Downstream of the treeline in Wetland TF, the stream width varies and the stream has dendritic characteristics. No significant pooling, ponding or riffles were observed throughout the entire stretch of LTC within the study area. Additionally, debris dams were observed in several locations between Bell Road and the railroad.

The southern portion of the project area is within the BTC watershed. Within the study area it consists of a freshwater tributary which flows into a tidally influenced mudflat wetland which continues to the main stem of the BTC. The tidal influence is affected by the blockage of sediment and silt which has been deposited within the conveyance pipe beneath Creek Road.

The headwaters of the unnamed tributary appear to be the result of small seeps and surface drainage from areas east of I-295/ Route 42. It is conveyed via a box culvert underneath this portion of the I-295/I-76/ Route 42 Interchange near the Bellmawr Ball Fields, where it is once again conveyed via a series of pipes to west of Essex Avenue where it discharges to the tributary. The unnamed tributary has bank erosion and severely incised channels. The channel bed consists of sand and gravel. The unnamed tributary is relatively straight until just prior to the mudflat tidal wetland. At this point, the unnamed tributary becomes dendritic.

The USGS does not monitor any flow data within the study area.

4.5 Aquatic Ecology

4.5.1 Macro Invertebrate Studies

The 2000-2001 Ambient Biomonitoring Network (AMNET) benthic macroinvertebrate sampling conducted in BTC by the NJDEP reveals significant portions of BTC watershed are moderately impaired. The sample locations were on Clements Bridge Road in Runnemede Borough, approximately 1.7 miles southeast of the study area and on Route 168 in Gloucester Township, approximately 2.4 miles southeast of the study area. Moderately impaired means that macroinvertebrate richness is reduced, in particular the Ephemeroptera, Plecoptera, and Trichoptera (EPT) species, and that there is a reduction in the community balance and number of pollutant intolerant species present. The lack of or low number of EPT species observed suggest that physiochemical impacts, as well as habitat degradation, are contributing to biological impairment.

The AMNET results for the LTC sample location on Devon Road in Bellmawr, approximately 3,400 feet east of the study area, reveal a positive change in the New Jersey impairment score from the 1995/1996 survey (score 9) to the 2000/2001 survey (score 12); however, the LTC is still considered moderately impaired and exhibits the same characteristics as those described

above for BTC. The habitat analysis results were reported as 118 (sub optimal). The deficiencies noted within the report indicate that there is significant organic pollution and a paucity of clean water organisms within the LTC. This likely results from degraded water quality caused by urban stormwater runoff.

4.5.2 Freshwater Fish Species

The NJDEP Freshwater Fisheries *Freshwater Fish Management Database Reports* for both LTC and BTC presented in Appendix C were reviewed. According to the NJDEP, these reports are considered the most accurate record of fish species present within these water bodies. The locations of these survey points for BTC were Clementon Borough (greater than 6 miles southeast of the study area), Brooklawn Borough (approximately 4,500 feet west of the study area) and Runnemede (approximately 4,200 feet southeast of the study area). For LTC, the survey point was within Bellmawr Borough, approximately 4,000 feet east of the study area.

The Magnuson-Stevens Fishery Conservation and Management Act (the Act), as amended in 1996, strengthened the ability of the National Marine Fisheries Service (NMFS) and the eight regional fishery management councils to protect and conserve the habitat of marine, estuarine, and anadromous finfish, mollusks, and crustaceans. This habitat is known as the essential fish habitat (EFH) and is defined by the Act as "those waters and substrate necessary for fish for spawning, breeding, feeding, or growth to maturity." The Act requires the regional fishery management council to identify EFH for all managed species, to specify actions to conserve and enhance EFH, and to minimize adverse effects upon EFH. The NMFS evaluates marine resources for the purpose of establishing regional conditions to be implemented within nationwide permits for the state of New Jersey. The NMFS EFH review also takes into consideration the fact that fish may change habitats with changes in life history stage, seasonal and geographic distributions, abundance, and interactions with other species. According to the NMFS correspondence dated July 18, 2005 (Appendix D), the study area is not classified as EFH.

An initial determination was made by NMFS regarding LTC and BTC dated May 27, 2005. In this correspondence, NMFS requested that the *NJDEP Freshwater Fisheries Fish Management Database Report* be reviewed. Upon review of the NJDEP report, the fish species identified on NMFS correspondence were not identified. This database information and a letter outlining the proposed construction activities were provided to NMFS on July 15, 2005. After review of this information, a second determination was made by NMFS (See Appendix D). According to this second correspondence, LTC contains no fishery resources of concern and no construction restrictions are necessary. BTC was identified as containing numerous fish species such as striped Bass, American Shad, blueback Herring and Alewife. In-water work within BTC would be restricted from March 15 to June 30.

Based on these findings, typical disturbed fresh water fisheries are present in both LTC and BTC.

In 2002, a statewide health advisory for eating fish from New Jersey freshwaters was issued. This advisory was implemented due to the elevated levels of mercury found in edible fish tissue throughout many portions of the state. In addition, Camden County has issued a Fish Consumption Advisory for BTC. There are no county restrictions within the LTC watershed.

According to correspondence dated October 9, 2003 from the United States Department of Interior-Fish and Wildlife Service, no federally listed or proposed to be listed freshwater fish are known to occur within the vicinity of the study area (See Appendix D).

4.6 Floodplains

The LTC is not a State Studied or Federal Emergency Management Agency (FEMA) Studied Stream in regard to flooding and consequently, a floodway and floodplain have not been established upstream of Little Timber Creek beyond Kings Highway. However, the September 1996 FEMA Flood Insurance Rate Map (FIRM) GIS mapping for the study area was reviewed (See Figure 13 at the end of Section 4.0).

As shown on the FEMA mapping, the 500-year tidal flood plain extends into a small portion of the LTC corridor in the northwestern portion of the study area. The FEMA study for the 500-year tidal flood plain ends at Kings Highway, and no limits are shown beyond this point. Upstream of Kings Highway, the FEMA maps show the area as Zone A. This indicates that the flood plain in this area has not been established. Assuming the same relative elevations for the 100-year and 500-year tidal floods upstream of Kings Highway, as shown on Figure 11, the 100-year tidal flood plain extends to the north of LTC into residential areas.

In conjunction with the I-295/I-76/Route 42 Direct Connection Project, the respective 100-year floodplain and floodway limits were established for the LTC channel reach beginning upstream of Bell Road, 6,000 feet east of the I-295/I-76/Route 42 interchange, and continuing 7,000 feet west of the interchange to a point downstream of Route 551. The floodway is presented on the impact figures at the end of Section 5.0.

LTC is a tidally influenced tributary to Big Timber Creek and the Delaware River. The waterway is subject to both tidal backwater inundation and fluvial flooding within the project study area. Based upon the analysis investigations, the LTC 100-year flood plain limits are controlled by tidal backwater from Big Timber Creek and the Delaware River for the reach extending downstream from Bell Road. The 100-year tide flood stage El. 9.4 feet (NAVD 1988) exceeds the 100-year fluvial flood stages along this portion of LTC. Upstream of Bell Road, the 100-year flood limits are controlled by fluvial flooding from the 1.6 square mile drainage area to the roadway culvert, with water elevations exceeding the 100-year tidal flood stage.

The LTC drainage area to Bell Road is 1.6 square miles and increases to 2.2 square miles at the I-295/I-76/Route 42 Interchange. No published or studied information on “average” annual flows and velocities has been gathered and no USGS information is published for LTC. However, calculations for peak annual flow ranges from 160 cubic feet per second (cfs) at Bell Road to 240 cfs at the Interchange with corresponding flow velocities ranging up to approximately 2 feet per second.

The BTC is a State Studied Stream upstream of I-295, but the detailed study does not include the unnamed tributary that is part of this project. However, the FEMA flood mapping indicates that the 500-year flood plain extends up to or slightly beyond Essex Avenue within the unnamed tributary to BTC. Some residential dwellings may be subject to flooding in extreme storm

events, especially when coupled with tidal influences. The 100-year flood plain appears to extend approximately to the field established head-of-tide within this area. According to the data provided in the State Study, the 100-year flood elevations may reach a maximum of approximately 9.0 feet above sea level (NAVD 88) on the waterways within the study area.

Placement of fill materials downstream of the study area and along or within these two (2) creek corridors may have altered the flood plain shown on the FEMA mapping.

4.7 Wetlands

4.7.1 NJDEP Wetlands Mapping

The State of New Jersey has completed mapping of wetland areas using high-resolution aerial photography in combination with field studies to classify wetlands within the state. Through this effort, New Jersey has determined that freshwater tidal marshes, deciduous wooded, deciduous scrub/shrub, mixed scrub/shrub, and herbaceous wetlands are present within the study area. In addition, wetland right-of-way (modified) wetlands are mapped within the LTC corridor north of I-295. Wetland right-of-way is defined as a former wetland area which still exhibits evidence of soil saturation on the photography. Because of alterations associated with creating the rights-of-way, these areas may not support the typical natural wetland vegetation found in adjacent unaltered natural areas. The NJDEP wetland mapping has been overlain on the site aerial photograph and is presented as Figure 14, NJDEP Wetlands Map, at the end of Section 4.0.

NJDEP determined that tidal areas are present along the LTC and within the unnamed tributary to the BTC located in the western portion of the study area. Tidal areas are under the jurisdiction of the NJ State Coastal Development Authority and under the authority of the United States Army Corps of Engineers (USACOE). The two (2) head-of-tide locations are found: 1) in the eastern portion of the study area within the LTC corridor east of Bell Road and west of the railroad bridge and 2) in the western portion of the study area to the east of Creek Road within the BTC tidally influenced tributary, west of the forested wetland area. The head-of-tide for LTC was provided by the NJDEP. The head-of-tide for the unnamed tributary to BTC was field observed during the delineation effort. Figure 14 shows the head-of-tide locations.

The following discussion describes areas identified and delineated as wetlands during the field investigation, as compared to the NJDEP wetland mapping. The boundaries of some areas delineated were different from those shown on the NJDEP wetlands maps. The fieldwork was used to refine and/or verify the NJDEP wetland mapping designations. The field delineation results differ from the NJDEP mapped wetlands based on observations of actual site wetland characteristics.

4.7.2 NJDEP Wetland Map Comparisons

The wetlands in the study area are highly modified, due to developmental pressures. The comparisons between the NJDEP wetland mapping and actual field observations are presented below. Site photographs are provided in Appendix E.

4.7.2.1 Big Timber Creek Watershed

Wetland delineation work confirmed the presence of freshwater tidal marsh wetlands up to the head-of-tide within the unnamed tributary to BTC (See Figure 15 at end of section 4.0). The NJDEP wetland mapping shows the presence of herbaceous wetlands along the southern edge of the freshwater tidal marsh wetlands; however, this area is deciduous wooded and scrub/shrub vegetation atop and along a steep slope descending to the tidal wetland. Areas to the west of Essex Avenue are mapped as deciduous wooded wetlands. The delineation revealed the presence of stream corridor and forested wetlands within depressions and drainage channels; however, the entire area is not a wetland. A mixed scrub/shrub wetlands (deciduous Dominant [Dom]) is shown on the NJDEP mapping just east of the radio towers. This area appeared to have been used as a borrow area and may have the potential for wetland characteristics, especially within depressions or low-lying areas; however, no wetlands were observed. A follow-up investigation by the NJDEP (personal communication, May 7, 2004) confirmed that there are no wetlands in this area. Several deciduous scrub/shrub wetlands are shown adjacent to the I-295/I-76/Route 42 highway corridor. Site investigation revealed no wetlands within these areas.

4.7.2.2 Little Timber Creek Watershed

The NJDEP wetland mapping shows the presence of deciduous scrub/shrub wetlands within the tidal flats of LTC to the west of I-76. The results of the jurisdictional wetland delineation effort show that these areas are all freshwater tidal marshes. In fact, the majority of these areas are steep-sloped right to the edge of the wetland. Deciduous wooded wetlands are mapped along the outer edges of portions of the tidal marsh; however, forested wetlands were only observed upstream (east) of Shining Star Park. One isolated deciduous scrub/shrub wetland area is shown to the north of Kings Highway and east of I-76. Soil borings and data point information collected in this area indicate that this area is an upland and not a wetland. A wetland right-of-way (modified) area is mapped to the east of Shining Star Park, west of Bell Road, and to the south of Lowell Avenue. This area shows signs of disturbance immediately behind the homes along Lowell Avenue, as well as along Emerson Avenue. A herbaceous wetland is mapped by the NJDEP along the highway corridor. Wetlands within this area are primarily forested wetlands within the creek corridor, based on the field delineation efforts.

4.7.3 National Wetland Inventory Mapping

Study area wetlands are primarily classified as Palustrine with limited Riverine systems on the National Wetlands Inventory (NWI) maps (See Figure 16 at the end of Section 4.0). Wetland classifications within the study area were described according to: "*A Classification of Wetlands and Deepwater Habitats of the United States*" by L. Cowardin.

One wetland type, Palustrine, emergent, tidal, seasonally flooded (PEMR) is shown below the head-of-tide for the unnamed tributary to BTC. This area is regularly flooded (i.e., daily) and therefore, the designation PEMV (regularly flooded) may better describe this area. Palustrine forested broad-leaved deciduous (PFO1) and emergent (PEM) wetlands are mapped in the area

east of the PEMR mapped wetlands. This area consisted primarily of forested and scrub/shrub (PSS) wetlands.

Palustrine emergent wetland (PEM) regimes are mapped throughout the LTC to the west of Bell Road. This area is tidally influenced with daily flooding (V) and would therefore be more appropriately designated as PEMV. The area south of Kings Highway in the western portion of the study area is designated a Palustrine emergent (PEM) and Palustrine, flat, seasonal tidal (PFLR). This area consists of emergent species and is flooded daily and, therefore, would be better described as PEMV. One area north of King's Highway and beyond the study area is mapped as Riverine, flat (RFL). This area is sparsely vegetated and flooded daily; therefore, the designation RFLN may be better suited. There are also several areas mapped as Palustrine, forested, broad-leaved deciduous (PFO1) wetlands. The area within the infield portion of Al Jo's Curve mapped as PFO1 is actually a wooded upland at an elevation above normal flooding. The PFO1 area located west of Bell Road is consistent with the delineation for this area. The PFO1 area to the east of Bell Road is floodplain area, but no wetlands were observed during the field delineation efforts.

Wetland areas were field verified during the jurisdictional wetland delineation. Keys to the descriptions of the classification of wetlands are presented as Table 2. Table 3 presents the classifications for each of the areas investigated within the study area.

TABLE 2
I-295/I-76/Route 42 Direct Connection
PALUSTRINE WETLAND LEGEND
P = PALUSTRINE

CLASS	SUBCLASSES
RB = Rock Bottom	1 = Bedrock 2 = Boulder
UB = Unconsolidated Bottom	1 = Cobble/Gravel 2 = Sand 3 = Mud 4 = Organic
AB = Aquatic Bed	1 = Submergent Algal 2 = Submergent Vascular 3 = Submergent Moss 4 = Floating – Leaved 5 = Floating 6 = Unknown Submergent 7 = Unknown Surface
FL = Flat	1 = Cobble/Gravel 2 = Sand 3 = Mud 4 = Organic 5 = Vegetated Pioneer 6 = Vegetated Non-Pioneer
ML = Moss/Lichen	1 = Moss 2 = Lichen
EM = Emergent	1 = Persistent 2 = Nonpersistent 3 = Narrow-leaved Nonpersistent 4 = Broad-leaved Evergreen 5 = Narrow-leaved Persistent 6 = Broad-leaved Persistent
SS = Scrub/Shrub FO = Forested	1 = Broad-leaved Deciduous 2 = Needle-leaved Deciduous 3 = Broad-leaved Evergreen 4 = Needle-leaved Evergreen 5 = Dead 6 = Deciduous 7 = Evergreen
OW = Open Water.	Unknown Bottom

NON TIDAL WATER REGIME

A = Temporary	F = Semipermanent	U = Unknown
B = Saturated	G = Intermittently Exposed	W = intermittently Flooded/Temporary
C = Seasonal	H = Permanent	Y = Saturated/Semipermanent/Seasonal
D = Seasonal Well-drained	J = Intermittently Flooded	Z = Intermittently Exposed/Permanent
E = Seasonal Saturated	K = Artificial	

TIDAL MODIFIERS FOR PALUSTRINE WETLANDS

S = Temporary	R= Seasonal	T= Semi-Permanent	V= Permanent

SPECIAL MODIFIERS

b = Beaver	f = Farmed	r = Artificial	
x = Excavated	d = Partially drained/ditched	h = Diked	S = Soil

TABLE 3
I-295/I-76/Route 42 Direct Connection
WETLANDS CLASSIFICATION SUMMARY

Area ID	Wetland Location	Wetland Classification	Comments	NJDEP Resource Value
Wetland A	Near Creek Rd.	PEM1A	Saturation from storm water runoff trapped @ edge of pavement	Ordinary Isolated Wetland
Wetland B	Near ballfield @ Essex Rd.	PFO1W	Storm water and high water event flooding and/or saturation	Ordinary
Wetland C	At I-295 SB ramp from I-76 EB	PEM1Z	Storm water is poorly drained from this infield area of I-295	Intermediate
Wetland D	West of Shining Star Park	PEM1B	Storm water and sheet flow from upland areas to tidal areas	Intermediate
Wetland E	At the end of Jefferson Street	PFO1W	Storm water and sheet flow from upland areas to tidal areas	Intermediate
Area F	Prior to Creek Rd. overpass	Upland	Infield area of highway, SOW to north, Phragmites stand	N/A
Area G	Opposite Wetland C, I-76 WB side	Upland	Infield area of highway, Phragmites stand	N/A
Wetland H	At corner of Colonial and Dewey	PSS1B	Seep and drainage from upland areas to channel	Ordinary
Wetland I	Near Bell Rd. north of Kennedy	PEM2B	Seep and drainage from upland areas to exposed pipe	Intermediate
Wetland J	Small wetland behind noise barrier	PEM2B	Storm water runoff poorly drained from this area	Intermediate
Wetland K	South of St. Mary's Cemetery	PFO1H	Seep/spring flow to drop inlet	Intermediate
Area L	Behind homes on Sartori St.	Upland	NJDEP mapped deciduous wooded wetland	N/A
Wetland M	Along I-295 NB	PEM1B/PFO1B	Seeps along similar elevation of the slope	Ordinary
Wetland N	Along I-295 NB	PEM1B	Seeps along similar elevation of the slope	Ordinary
Wetland P	I-295 NB @ on ramp from NB 42	PEM1B/PSS1B	Seeps along similar elevation of the slope	Ordinary
Wetland Q	Along I-295 NB	PEM1B	Seeps along similar elevation of the slope	Intermediate
Wetland R	Along I-295 NB	PEM1B	Seeps along similar elevation of the slope	Ordinary
Wetland S	Along I-295 NB East of Bell Road	PEM2B	Seeps along similar elevation of the slope	Ordinary
Wetland T	Along I-295 NB East of Bell Road	PEM1B	Seeps along similar elevation of the slope	Ordinary
Wetland U	Along I-295 SB West of Bell Road	PFO1H/PSS1H	From flow conveyed under I-295	Intermediate
Wetland V	Behind noise barrier by Bell Road	PEM2B	Wet area shaded by the noise barrier	Intermediate
Wetland W	East of Bell Rd. W. of RR bridge	PFO1B	Stream corridor wetland along mainstem Little Timber Creek	Intermediate
Wetland X	East of Bell Rd. W. of RR bridge	PFO1B	Stream corridor wetland along mainstem Little Timber Creek	Intermediate
Wetland Y	East of Bell Rd. W. of RR bridge	PFO1B	Stream corridor wetland along mainstem Little Timber Creek	Intermediate
Wetland Z	Beyond Rudderrow St.	PFO1W/PSS1W	SW portion of freshwater wetland near RR	Intermediate
Wetland AA	Beyond Rudderrow St.	PFO1W	NW portion of freshwater wetland near RR	Intermediate
Wetland AB	Beyond Rudderrow St.	PFO1W	NE portion of freshwater wetland near RR	Intermediate

TABLE 3
I-295/I-76/Route 42 Direct Connection
WETLANDS CLASSIFICATION SUMMARY (continued)

Wetland AC	Beyond Rudderrow St.	PFO1W	SE portion of freshwater wetland near RR	Intermediate
Wetland AD	Beyond Rudderrow St.	PFO1W	SE portion of freshwater wetland near RR	Intermediate
Wetland AE	East of Bell Rd. W. of RR bridge	PEM1H	N. side of channel	Intermediate
Wetland AF	East of Bell Rd. W. of RR bridge	PEM1H/PFO1H	S. side of channel	Intermediate
Area AG	Beyond Linfield St. W. of ballfields	Upland	Two data points in phragmites stands	N/A
Area Wetland AH	Behind noise barrier NW of Wetland TF	Upland	Three data points in Phragmites stand, Landfilled area	N/A
Wetland AI	E of TC tidal wetland	PFO1B	Low lying wooded area red and silver maple dom.	Intermediate
Wetland AJ	Along I-295 NB	PEM1B/PSS1B	Seeps along similar elevation of the slope	Ordinary
Area AK	W. of Emerson St.	Upland	Delineated by NJDEP	N/A
Wetland AAA	Beyond Rudderrow St.	PFO1W/PSS1W	SW portion of freshwater wetland along RR	Intermediate
TA 1	Big Timber Creek tidal mud flat	PEM2V	Tidally influenced	Intermediate
TB 1	Near bridge at W. Kings Highway	PEM2V	Tidally influenced	Intermediate
TB 2	SW corner of Wetland TB	PSS1V	Tidally influenced	Intermediate
TB 3	SE corner of Wetland TB	PEM2V/PSS1V	Tidally influenced	Intermediate
TB 4	NE corner of Wetland TB	PEM1V	Tidally influenced	Intermediate
TC 1	N. of W. Kings Highway	PEM2V	Tidally influenced	Intermediate
TC 2	N. of W. Kings Highway	PEM2V	Tidally influenced	Intermediate
TD 1	E. side of Wetland TD	PEM2V	Tidally influenced	Intermediate
TD 2	N. portion of Wetland TD	PFO1V	Tidally influenced	Intermediate
TD 3	SW Corner of Wetland TD	PFO1V	Tidally influenced	Intermediate
TE 1	SW corner of Wetland TE	PSS1V/PFO1V	Tidally influenced	Intermediate
TE 2	SE corner of Wetland TE	PSS1V	Tidally influenced	Intermediate
TE 3	NE corner of Wetland TE	PFO1V	Tidally influenced	Intermediate
TE 4	NW edge of Wetland TE	PEM1V	Tidally influenced	Intermediate
TF 1	At Shining Star Park	PEM2V	Tidally influenced	Intermediate
TF 2	NW portion of Wetland TF	PEM1V	Tidally influenced	Intermediate
TF 3	W of Bell Rd. near Emerson	PFO1V	Tidally influenced, wooded area,	Intermediate
TF 4	Behind home on Lowell Ave.	PEM2V	Tidally influenced	Intermediate
OW	Behind home on Lowell Ave.	OW	Open Water reportedly from spring flow	State Open Water
S-1 Stream Corridor: Including S-1A1, S-1A2 "B", "C" and "D" Line	Stream located W of Essex Avenue	PFO1H	Freshwater Stream Corridor and associated wetlands	Ordinary

4.7.4 Jurisdictional Wetland Delineation Effort Results

In the summer of 2004, NJDEP Letter of Interpretation (LOI) and USACOE Jurisdictional Determination (JD) applications were submitted. These submissions were based on field delineations and field meetings with the NJDEP, USACOE and USEPA. The NJDEP and USACOE provided considerable technical assistance in the field delineation effort. Within the submission package, notes were provided on the wetland delineation sheets outlining the agencies comments and recommendations. The LOI/JD submissions were approved by the agencies in early 2005. Copies of the LOI and JD letters are provided in Appendix D).

Approximately 5.851 acres of non-tidal freshwater wetlands and approximately 49.835 acres of tidal freshwater wetlands were delineated (See Figure 15 at the end of Section 4.0). Upland plant communities within the study area consist primarily of successional, old-field communities. No specimen trees or unique plant communities, other than wild rice, as described below, were observed during the wetland delineation effort.

Wild rice (*Zizania aquatica)* is found in stands throughout the Little Timber Creek tidal area. It is in association throughout the study area with pickerel weed (*Pontederia cordata*) and common smartweed (*Polygonum hydropiper*) or marshpepper smartweed (*Polygonum hydropiperoides*) (See Figure 15 at the end of Section 4.0).

An aggressive invasive species, common reed (*Phragmites australis - FACW*), is opportunistic and found throughout the study area from areas of high topography or xeric conditions down to low lying wet areas or hydric conditions. Japanese knotweed (*Polygonum cuspidatum - FACU-*), another aggressively invasive species, is also found throughout the study area, sometimes in thick stands, generally in the outer perimeter of the wetlands.

The functions and values of the wetlands within the study area are based upon field observations and the professional judgment of the wetland scientists who performed the jurisdictional wetland delineation effort. Table 3 presents the wetland classification and NJDEP approved wetland resource value for each of the wetlands within the study area. All delineated wetlands were classified by NJDEP as having Ordinary or Intermediate Resource Values. Ordinary Resource Value wetlands do not require a wetland transition area and Intermediate Resource Value wetlands require a fifty foot transition area.

The two major types of wetlands that would be impacted during proposed construction activities are:

1) Isolated wetlands generally along the south side of I-295, and

2) Generally tidal fringe wetlands primarily within the LTC floodplain.

The isolated wetlands receive moisture from precipitation, storm water run-off, seeps or springs, and groundwater. The fringe wetlands are typically inundated with water during regular daily tidal influences, as well as from flooding resulting from heavy storm events.

Both wetland types provide short-term storm water and runoff storage capacity. In addition, the wetland areas offer sediment and nutrient filtration. Both wetland regimes also provide habitat for a variety of common plant and animal species.

4.7.4.1 Tributary to Big Timber Creek

The unnamed tributary to the BTC is divided into two different sections. One is tidal, designated as Tidal area (TA) (approximately 4.372 acres) and one is non-tidal, designated as Stream 1 (S-1) (approximately 2.096 acres). S-1 wetlands include: "B" Line wetland, "C" Line wetland, "D" Line wetland, wetland S-1 A1 and wetland S-1 A2 and the stream corridor. The total acreage for the unnamed tributary to the BTC is 6.468 acres. Refer to Figure 15, Field Delineated Study Area Wetlands Map.

Stream 1 (S-1) is an unnamed tributary to BTC and is the only watercourse/wetlands area within the BTC watershed included within the study area. Its source is believed to be unidentified seeps that may be within the I-295 highway corridor or areas further to the east. Headwaters flow through a large culvert under I-295, then flow a short span in the open, before again being piped under the Bellmawr Baseball fields, to their discharge point on the west side of Essex Avenue. A headwall is present to the south of the Bellmawr Volunteer Fire Station at Essex Avenue.

The stream's confluence with BTC is about 1/2 mile to the southwest of the headwall. The stream traverses a narrow, steep-sided, gully-like channel that gradually broadens as it reaches the tidal area. The tidal area extends about 1/4 mile westward to the confluence with BTC.

The stream corridor was delineated, as well as ephemeral channels and small wetlands associated with seeps, drainage patterns, or areas where sufficient water was observed to sustain wetland vegetation.

NJDEP wetland mapping (Figure 14) includes virtually this entire unnamed tributary and the adjacent woodland as forested, scrub/shrub, or freshwater tidal marsh wetland; however, this was not observed during the delineation effort. The delineation effort identified wetlands throughout the stream corridor and within the drainage patterns of the area, but not in the entire area, as is shown on the NJDEP wetland maps.

The area to the south of the wetlands appears to have been altered from soil excavation activities and the construction of two (2) radio towers. The northern limits of the wetlands consist of residential development. The I-295 right-of-way (ROW) beyond the Bellmawr Baseball fields is located to the east of this wetland area.

Vegetation in the upper portions of this BTC sub-watershed is a mixture of upland deciduous hardwoods, such as oaks (*Quercus spp*.), beech (*Fagaceae*), and maple (*Aceraceae*) with under story shrubs such as spicebush (*Lindera benzoin*) and sweet pepperbush (C*lethra alnifolia*). Herbaceous species include: jewelweed (*Balsaminaceae*), goldenrod (*Compositae*), and asters (*Asteraceae*). Even though impacts to the surrounding areas appear to have been significant, this area seems to have been relatively undisturbed. Mature hardwood species in the eastern portion and species typically found within tidally influenced areas were observed in the western portion of this wetland area.

Soils in the wetland are mapped (Figure 9) primarily as Urban Land and Made Land soils. Howell series soils are mapped along the I-295 corridor to the south and a Tidal Marsh area is shown in the far western edge of the wetland. The soils within the stream corridor appear to be highly eroded, with scouring from storm and high water events cutting steep slopes in many areas. Residential and other development may have changed or altered soil conditions from the original soil types that may have previously existed within this area.

Wetland hydrology in this area is complex, due to a number of factors, including the configuration of the stream channel, impacts from tides, the presence of seeps and intermittent storm events. However, in the upstream portion of this tributary to BTC, flooding from tidal influence is negligible.

4.7.4.2 Little Timber Creek Watershed

The LTC flows from the east to the west toward the Delaware River. In the study area, almost the entire length of the LTC, except the far eastern portion of the watershed, is tidally influenced. The I-295 ROW corridor generally parallels the LTC. Embankments placed to build the I-76 and I-295 highways, residential development, disturbances for construction of the noise barrier wall, and numerous other encroachments have altered the natural habitat and nature of this watershed.

LTC is a plentiful, perennial source of fresh water that flows through broad marshy areas in portions of the watershed. This source of water is supplemented by the daily tidal cycle in the tidal marshes. A large number of wetland areas within the watershed are supported by seeps. Collectively, these seeps amount to a considerable contribution of flow to the LTC. Photographs of the study area are presented in Appendix E.

Proposed improvements would primarily be located within the LTC watershed, except for two freshwater wetland (Wetlands B and H) areas in the tributary to BTC watershed. The NJDEP approved wetland resource values are provided in Table 3.

NJDEP wetland mapping (Figure 14) classified the LTC wetlands in the study area as freshwater tidal marshes, deciduous scrub wetlands, deciduous wooded wetlands, herbaceous wetlands and wetlands ROW. The wetland delineation effort identified 45.462 acres of tidal freshwater wetlands (Wetlands TB, TC, TD, TE, and TF on Figure 15) in the LTC portion of the study area. These wetlands are located in the northern portion of the study area in the vicinity of Al Jo's Curve and Kings Highway. They contain a diverse community of deciduous hardwoods, shrubs and herbaceous species. Wild rice stands were found to be especially prevalent in Wetland TF and Wetland TB. The wild rice stands provide food for migrating birds.

LTC provides freshwater to these wetlands, which are also influenced significantly by tidal fluctuations. The tidal wetlands provide long-term storage of surface water and habitat for diverse vegetation and common types of wildlife. Given the degraded water quality, LTC does not provide important aquatic ecology habitat.

The remaining wetlands in the LTC portion of the study area are non-tidal freshwater wetlands totaling 3.257 acres. Twenty eight separate non-tidal freshwater wetlands were identified, the largest of which is Wetland AE/AF (0.939 acres). Stormwater and seeps are the predominant

source of water for these wetlands. Vegetation includes mixed hardwoods and common reeds. Most of these wetlands are isolated. Their primary function is short-term storage of stormwater, although the largest of these wetlands also provides habitat for common forms of wildlife. Wetlands anticipated to be within the proposed improvements are discussed in more detail in Section 5.7.

4.7.4.3 Wetland Vegetation

Vegetation observed during the delineation effort is presented in Table 4A. The USFWS National List of Plant Species that occur in Wetlands 1988 National Summary (Reed, 1988) and the USFWS National List of Plant Species that occur in Wetlands: Northeast (Region I) (Reed, 1988) were referenced to determine acceptable common names, scientific names, and wetland indicator categories for the vegetation observed at the site.

Plants identified were classified and placed in one of the following five categories according to The Wetland Indicator Categories (Reed, 1988):

- Obligate (OBL). Occur almost always (estimated probability >99%) under natural conditions in wetlands.

- Facultative Wetland (FACW). Usually occur in wetlands (estimated probability 67% to 99%) but occasionally found in non-wetlands.

- Facultative (FAC). Equally likely to occur in wetlands and non-wetland areas (estimated probability 34% to 66%).

- Facultative Upland (FACU). Usually occur in uplands but occasionally are found in wetlands (estimated probability 1% to 33%).

- Obligate Upland (UPL). Occurs almost always in upland areas (estimated probability <1%).

- Modifiers (+) (-).
  (+) Found at the wetter end of frequency spectrum within the category.
  (-) Found at the drier end of frequency spectrum within the category.

The percentages refer to the chance that a specific plant in a category will be found growing under wetland conditions. In cases where more than 50 percent of the species identified at a location fall into the first three categories, then the area can be classified as a wetland as long as the soils and hydrology criteria are met.

TABLE 4A
I-295/I-76/Route 42 Direct Connection
LIST OF VEGETATION FOUND IN WETLAND AND UPLAND AREAS

Trees

Scientific Name	Common Name	Indicator Status
Acer rubrum	Red maple	FACW+ thru FAC
Acer negundo	Boxelder	FAC+
Acer platanoides	Norway maple	UPL
Acer saccharinum	Silver maple	FACW
Albizia julibrissin	Silktree ("Mimosa")	UPL
Ailanthus altissima	Tree-of-heaven	FACU-
Betula lenta	Sweet birch	FACU
Catalpa speciosa	Northern catalpa	FAC
Celtis occidentalis	Common hackberry	FACU
Cercis Canadensis	Redbud	FACU-
Cornus florida	Flowering dogwood	FACU-
Diospyros virginiana	Common persimmon	FAC-
Fraxinus americana	White ash	FACU
Fraxinus pennsylvanica	Green ash	FACW
Fagus grandifolia	American beech	FACU
Juglans nigra	Black walnut	FACU
Juniperus virginiana	Eastern red cedar	FACU
Liquidambar styraciflua	Sweet gum	FAC
Liriodendron tulipifera	Tulip-tree, yellow poplar	FACU
Morus rubra	Red mulberry	FACU
Nyssa sylvatica	Black gum	FAC
Pinus strobus	Eastern white pine	FACU
Pinus virginiana	Scrub pine	FACU
Plantanus occidentalis	American sycamore	FACW-
Prunus serotina	Black cherry	FACU
Quercus alba	White oak	FACU
Quercus marilandica	Black-jack oak	NE
Quercus muehlenbergii	Chinquapin (yellow) oak	NI
Quercus palustris	Pin oak	FACW
Quercus phellos	Willow oak	FAC+
Quercus prinus	Chestnut oak	UPL
Quercus rubra	Northern red oak	FACU-
Quercus nigra	Water oak	FAC
Rhododendron spp	Rhododendron spp.	UPL - FACW+
Rhus typhina	Staghorn sumac	UPL
Robinia pseudoacacia	Black locust	FACU-
Salix nigra	Black willow	FACW+
Sassafras albidum	Sassafras	FACU-
Tilia americana	American basswood	FACU
Ulmus americana	American elm	FACW-
Ulmus parvifolia	Chinese elm	UPL

TABLE 4A
I-295/I-76/Route 42 Direct Connection
LIST OF VEGETATION FOUND IN WETLAND AND UPLAND AREAS (Cont.)

Shrubs

Scientific Name	Common Name	Indicator Status
Aralia spinosa	Devil's Club	NE
Berberis spp.	Barberry species (2 spp.)	FACU
Cephalanthus occidentalis	Common buttonbush	OBL
Clethra alnifolia	Sweet pepperbush	FAC+
Cornus amomum	Silky dogwood	FACW
Cornus stolonifera	Red-osier dogwood	FACW+
Hamamelis virginiana	American witch-hazel	FAC-
Lindera benzoin	Northern spicebush	FACW-
Lonicera canadensis	American fly-honeysuckle	FACU
Lonicera tatarica	Tartarian honeysuckle	FACU
Rosa multiflora	Multiflora rose	FACU
Salix interior	Sandbar willow	OBL
Sambucus canadensis	Common elder	FACW-
Viburnum acerifolium	Maple-leaf arrow-wood	UPL
Viburnum dentatum	Southern arrow-wood	FAC
Viburnum prunifolium	Smooth black haw	FACU
Viburnum recognitum	Northern arrow-wood	FACW-

Vines

Scientific Name	Common Name	Indicator Status
Humulus lupulus	Common hop	FACU
Ipomoea purpurea	Common morning-glory	UPL
Lonicera dioica	Limber honeysuckle	FACU
Lonicera japonica	Japanese honeysuckle	FAC-
Parthenocissus quinquefolia	Virginia creeper	FACU
Smilax rotundifolia	Common greenbrier	FAC
Toxicodendron radicans	Poison ivy	FAC
Vitis aestivalis	Summer grape	FACU
*Vitis labrusc*a	Fox grape	FACU
Wisteria frutescens	American wisteria	FACW

TABLE 4A
I-295/I-76/Route 42 Direct Connection
LIST OF VEGETATION FOUND IN WETLAND AND UPLAND AREAS (Cont.)

Herbs

Scientific Name	Common Name	Indicator Status
Achillea millefolium	Common yarrow	FACU
Ageratina altissima	White snakeroot	FACU-
Agrostis gigantea	Redtop	FACW
Alliaria petiolata	Garlic mustard	FACU-
Allium vineale	Wild garlic	FACU-
Ambrosia trifida	Giant ragweed	FAC
Ambrosia artemisifolia	Common ragweed	FAC
Arctium minus	Common burdock	NE
Arisaema quintatum	Jack-in-the-pulpit (5-leafed)	NI
Arisaema triphyllum	Jack-in-the-pulpit (3-leafed)	FACW-
Asclepias rubra	Red milkweed	OBL
Asclepias syriaca	Common milkweed	FACU-
Asclepias verticillata	Whorled milkweed	UPL
Aster spp.	Aster species	OBL thru UPL
Bidens coronata	Swamp beggar-ticks	OBL
Bidens laevis	Larger bur marigold	NE
Cannabis sativa	Hemp	FACU
Carex folliculata	Northern long sedge	OBL
Cichorium intybus	Chicory	NI
Cirsium arvense	Canada-thistle	FACU
Centaurea maculosa	Spotted knapweed	UPL
Commelina virginica	Virginia dayflower	FACW
Commelina asiatica	Asiatic dayflower	FAC-
Conyza canadensis	Canadian horseweed	UPL
Cyperus strigosus	Umbrella (Flat) sedge	FACW
Daucus carota	Queen Anne's lace	UPL
Eupatoriadelphus dubius	Joe Pye weed	OBL
Equisetum sylvaticum	Woodland horsetail	FACW
Gautheria hispidula	Creeping snowberry	FACW
Glechoma hederacea	Ground ivy	FACU
Impatiens capensis	Spotted touch-me-not (Jewelweed)	FACW
Impatiens pallida	Pale touch-me-not (Jewelweed)	FACW
Iris spp.	(Iris or Flag)	OBL
Lactuca canadensis	Wild lettuce	FACU-
Lycopodium obscurum	Tree clubmoss	FACU
Lythrum salicaria	Purple loosestrife	FACW+-
Oenothera fructicosa	Narrow-leafed sundrop	FAC
Onoclea sensibilis	Sensitive fern	FACW
Oxalis corniculata	Creeping woodsorrel	FACU
Oxalis europeae(stricta)	Upright yellow woodsorrel	UPL

TABLE 4A
I-295/I-76/Route 42 Direct Connection
LIST OF VEGETATION FOUND IN WETLAND AND UPLAND AREAS (Cont.)

Oxalis montana	White woodsorrel	FAC-
Panicum virgatum	Switch grass	FAC
Paspalum laeve	Smooth paspalum	FAC+
Peltandra virginica	Arrow-arum	OBL
Phragmites australis	Common reed	FACW
Physalis heterophylla	Common ground cherry	UPL
Physostegia purpurea	Purple dragon-head	FACW
Phytolacca americana	American pokeweed	FACU+
Pilea pumila	Canadian clearweed	FACW
Plantago major	Common plantain	FACU
Polygonum amphibium	Water smartweed	OBL
Polygonum cuspidatum	Japanese knotweed	FACU-
Polygonum hydropiper	Common smartweed	OBL
Polygonum hydropiperoides	Mild water pepper	OBL
Polygonum lapathifolium	Willow-weed	FACW+
Polygonum perfoliatum	Asiatic tearthumb	FAC
Polygonum punctatum	Dotted smartweed	OBL
Polygonum scandens	Climbing false buckwheat	FAC
Pontederia cordata	Pickerelweed	OBL
Ribes lacustre	Bristly black currant	FACW
Rubus spp.	Black berry species	FACU- thru FAC+
Rudbeckia hirta	Black-eyed-Susan	FACU-
Rumex crispus	Curly dock	FACU
Saururus cernuus	Lizard's tail	OBL
Setaria verticillata	Bristle grass	FAC
Sicyos angulatus	One-seed bur-cucumber	FACU
Solidago spp.	Goldenrod species	UPL thru OBL
Smilacina racemosa	False Solomon's seal	FACU-
Symphoricarpos albus	Common snowberry	FACU-
Symplocarpus foetidus	Skunk cabbage	OBL
Taraxacum officinale	Common dandelion	FACU-
Thelypteris noveboracensis	New York fern	FAC
Triodia flava	Purpletop tridens	NE
Typha angustifolia	Narrow-leaf cattail	OBL
Typha latifolia	Broad-leaf cattail	OBL
Urtica dioica	Stinging nettle	FACU
Veronia noveboracensis	New York ironweed	FACW+
Vicia americana	American purple vetch	NI
Vicia sativa	Common vetch	FACU-
Viola spp.	Violet species	OBL thru FAC
Zizania aquatica	Wild rice	OBL

4.8 Upland Vegetation and Wildlife

4.8.1 Upland Vegetation

Upland areas, other than those landscaped by homeowners or the NJDOT, trend towards a successional deciduous forest assemblage with an increasingly strong presence of invasive species (See Figure 17 at the end of Section 4.0). The upper story consists of a mix of tulip poplar (*Liriodendron tulipifera*), northern red oak (*Quercus rubra*), and red maple (*Acer rubrum*) with the invasive Norway maple (*Acer platanoides*) gaining in numbers. Based on the NJDEP data layer, a total of approximately 72 acres of upland vegetation are identified within the study area. Approximately 17 acres of the total amount are within the roadway medians or are isolated upland areas and are not part of large contiguous forests. All of the wetland transition areas, or buffers, are located within the upland areas. Depending on location, the transition areas contain disturbed roadway areas or forest fringe areas.

The shrub understory is dominated by flowering dogwood (*Cornus florida*) several varieties of honeysuckles (*Lonicera dioica, L. canadensis, and L. tartarica*), and maple-leaf viburnum (*Vibiurnum acerifolium*). The highly aggressive and invasive multiflora rose (*Rosa multiflora*) is rapidly complicating this picture, as is the spotty invasion of common reed (*Phragmites australis*). While the latter is considered to be an herbaceous species, its stature where it grows, is competitive in both the middle and understory levels.

Herbaceous ground covers include goldenrods (*Solidago spp.*), asters (*Asteraceae*), white snake root (*Ageratina* altissima), violets (*Viola spp.*), and shade-tolerant grasses such as panic grass (*Panicum spp.*). A strong presence of invasive species is widely represented by garlic mustard (*Alliaria petiolata*), which is predominant throughout the area.

Soil conditions supporting these assemblages are highly variable due to the vast amount of residential, commercial, and highway construction in the area. Almost all of the soil is classified either as made land or urban land with very little remaining in the historical categories represented in the non-urban complexes.

Upland vegetation species observed during the field effort are shown on Table 4A.

4.8.2 Upland Wildlife

Only birds, mammals, reptiles and amphibious species expected to be noted in urban/suburban areas have been observed by project team scientists during the study area reconnaissance or during numerous study area visits conducted in all seasons of the year over a two year period. No threatened or endangered bird species or bog turtles (*Clemmys muhlenbergii*) were observed during the extensive wetland delineation effort or in surveys performed in June of 2004. The New Jersey Division of Fish & Wildlife has prepared species lists for mammals, birds, amphibians, turtles, lizards and snakes that may potentially be found within the study area. All species observed during site work are included on these lists. Mammals, birds, amphibians and reptiles commonly found in the vicinity of BTC are listed on Table 4B.

According to correspondence from the NJDEP Office of Natural Lands Management Natural Heritage Program dated September 11, 2003, only herptile species of special concern are identified with no additional information provided (see Appendix D).

TABLE 4B
I-295/I-76/Route 42 Direct Connection
COMMON MAMMALS, BIRDS, AMPHIBIANS AND REPTILES IN BTC AREA

MAMMALS

Scientific Name	Common Name	Observed
Ondatra zibethica	Muskrat	
Procyon lotor	Raccoon	X
Vulpes vulpes	Red fox	
Sciurus carolinensis	Eastern gray squirrel	X
Mephitis mephitis	Striped skunk	
Odocoileus virginianus	White-tailed deer	X

BIRDS

Scientific Name	Common Name	Observed
Butorides striatus	Green heron	
Anas rubripes	American black duck	
Anas platyrhnychos	Mallard	X
Cathartes aura	Turkey vulture	X
Buteo platypterus	Broad-winged hawk	
Buteo jamaicensis	Red-tailed hawk	X
Bonasa umbellus	Ruffed grouse	
Rallus limicola	Virginia rail	
Charadrius vociferous	Killdeer	
Scolopax minor	American woodcock	
Coccyzus erythropthalmus	Black-billed cuckoo	
Coccyzus americanus	Yellow-billed cuckoo	
Otus asio	Eastern screech owl	
Bubo virginianus	Great horned owl	
Chaetura pelagica	Chimney swift	
Archilochus colubris	Ruby-throated hummingbird	
Melanerpes carolinus	Red-bellied woodpecker	X
Picoides pubescens	Downy woodpecker	X
Picoides villosus	Hairy woodpecker	X
Colaptes auratus	Northern flicker	X
Dryocopus pileatus	Pileated woodpecker	
Contopus virens	Eastern wood-pewee	
Empidonax virescens	Acadian flycatcher	
Empidonax alnorum	Alder flycatcher	
Empidonax traillii	Willow flycatcher	
Sayornis phoebe	Eastern phoebe	X
Myiarchus tyrannus	Great crested flycatcher	
Tyrannus tyrannus	Eastern kingbird	

TABLE 4B
I-295/I-76/Route 42 Direct Connection
COMMON MAMMALS, BIRDS, AMPHIBIANS AND REPTILES IN BTC AREA

Scientific Name	Common Name	Observed
Progne subis	Purple martin	
Tachycieneta bicolor	Tree swallow	X
Stelgidopteryx serripennis	Northern rough-winged swallow	X
Certhia americana	Brown creeper	
Polioptila acerulea	Blue-gray gnatcatcher	
Sialia sialis	Eastern bluebird	
Catharus fuscenscens	Veery	
Catharus guttatus	Hermit thrush	
Hylocichla mustelina	Wood thrush	
Turdus migratorius	American robin	X
Dumetella carolinensis	Gray catbird	X
Bombycilla cedrorum	Cedar waxwing	
Vireo solitarius	Blue-headed vireo	
Vireo flavifrons	Yellow-throated vireo	
Vireo gilvus	Warbling vireo	
Vireo olivaceus	Red-eyed vireo	
Vermivora pinus	Blue-winged warbler	
Verivora chrysoptera	Golden-winged warbler	
Dendroica petechia	Yellow warbler	
Dendroica pensylvanica	Chestnut-sided warbler	
Dendroica virens	Black-throated green warbler	
Dendroica cerulean	Cerulean warbler	
Mniotilta varia	Black-and-white warbler	
Setophaga reticulla	American redstart	
Helmitheros vermivorus	Worm-eating warbler	
Seiurus aurocapillus	Ovenbird	
Seiurus motacilla	Louisiana waterthrush	
Geothlypis trichas	Common yellowthroat	
Wilsonia Canadensis	Canada warbler	
Piranga olivacea	Scarlet tanager	
Cardinalis cardinalis	Northern cardinal	X
Pheucticus ludovicianus	Rose-breasted grosbeak	
Passerina cyanea	Indigo bunting	
Pipilo erythrophthalmus	Eastern towhee	
Spizella passerina	Chipping sparrow	
Spizella pusilla	Field sparrow	
Melospiza melodia	Song sparrow	X
Melospiza georgiana	Swamp sparrow	
Agelaius phoeniceus	Red-winged blackbird	X

Quiscalus quiscula	Common grackle	X

TABLE 4B
I-295/I-76/Route 42 Direct Connection
COMMON MAMMALS, BIRDS, AMPHIBIANS AND REPTILES IN BTC AREA

Scientific Name	**Common Name**	**Observed**
Icterus galbula	Baltimore oriole	
Carduelis tristis	American goldfinch	X

AMPHIBIANS

Scientific Name	**Common Name**	**Observed**
Plethodon cinereus cinereus	Red-backed salamander	
Bufo americanus	American toad	
Rana clamitans melanota	Green frog	X
Rana catesbeiana	Bullfrog	
Rana utricularia	Southern leopard frog	
Hyla crucifer	Spring peeper	

REPTILES

Scientific Name	**Common Name**	**Observed**
Thamnophis sirtalis sirtalis	Eastern garter snake	
Neroidida sipedon	Northern water snake	
Clemmys muhlenbergii	Bog turtle	
Clemmys insculpta	Wood turtle	
Chrysemys picta	Painted turtle	
Chelydra serpentina	Snapping turtle	
Terrapene Carolina Carolina	Eastern box turtle	

According to correspondence dated October 9, 2003 from the United States Department of Interior, Fish and Wildlife Service, no federally listed or proposed threatened or endangered flora or fauna are known to occur within the vicinity of the study area. An occasional transient bald eagle (*Haliaeetus leucocephalus*) has been noted within the vicinity of the study area (See Appendix D)

Many bird species utilize the Delaware River corridor as their migratory route and the study area is considered within this route. Wild rice (*Zizania aquatica)* and similar species contribute to the importance of this area as a foraging site for migratory species.

4.8.3 Threatened and Endangered Species Survey

4.8.3.1 *Background*

The September 11, 2003 letter from the Natural Heritage Program lists no rare bird species within the study area. In addition, the October 9, 2003 US Fish and Wildlife Service correspondence states "Except for a occasional transient bald eagle (*Haliaeetus leucocephalus*), no other federally listed or proposed threatened or endangered flora or fauna under Service jurisdiction are known to occur within the vicinity of the proposed project site". The June 27, 2002 *Camden County Rare Species and Natural Communities Presently Recorded in the New Jersey Natural Heritage Database* lists the peregrine falcon (*Falco peregrinus*) and the red-headed woodpecker (*Melanerpes erythrocephalus*) as the only threatened or endangered bird species expected to occur within Camden County. Refer to Appendix D for copies of the correspondence.

4.8.3.2 *Bird Surveys*

Several residents presented photographs and other information regarding bird sightings within the study area. Several photographs of raptors and woodpeckers were presented for review. The residents believed that there may have been threatened or endangered species present within the study area. Representatives from the project team met with several residents on June 8, 2004 and reviewed photographs in June 2005 regarding the bird sightings and clarified the species shown on the photographs.

The photographs reviewed by the project team and professional ornithologists during the past year were identified as:

Red-bellied woodpecker (*Melanerpes carolinus*);
Red-tailed hawk (*Buteo jamaicensis*);
Turkey vulture (*Cathartes aura*); and,
Sharp-shinned hawk (*Accipiter striatus*)

Photographs of the sharp-shinned hawk (*Accipiter striatus*) were also reviewed by other professionals including Neil B. Sabine, Associate Professor of Biology at Indiana University and Dr. Clayton M. White, Professor of Biology at Brigham Young University. They concur with the Dresdner Robin staff identification of the sharp-shinned hawk (*Accipiter striatus*).

None of the birds in the photographs were identified by Dresdner Robin scientists as threatened and endangered species.

To further evaluate whether threatened or endangered species were present near the Essex Avenue portion of the study area, bird surveys were performed. The primary purpose of the bird surveys conducted was to establish a species presence/absence list for the study area. Population size and density were not a primary objective of this survey; however, habitat suitability was taken into consideration during the course of the site surveys.

The surveys conducted were designed to provide the most data possible from as many points as possible in the time allowed for the surveys. "Point Count" surveys and "Line Transects" were used to establish a species list for birds observed within the study area. Feeding stations were set up at several locations within the study area and viewed from a distance to aid in the establishing the species list.

The point count method as described within the Handbook of Field Methods for Monitoring Landbirds (USDA May 1993) was used to conduct counts within the marsh since line transects could not be performed. The point count method is generally considered the best method for most surveys.

Bird surveys were conducted in the early morning hours from approximately 30 minutes before sunrise to no later than 10:00 AM. The numbers and rate of birds singing is generally higher near sunrise. No comparability was conducted between the points or transects.

The bird surveys were conducted between June 8, 2004 and June 21, 2004, which is within the late April through early July breeding season. Surveys are optimally conducted during the breeding season to establish resident species or native nesters rather than transient, temporary, or migratory species that may visit an area. The survey assessed what would be considered seasonal use species.

Surveys were not conducted on rainy or extremely windy days since bird activity is significantly reduced during these conditions.

4.8.3.3 Point Count Methodology

The point count methodology is generally used to allow comparable results for population changes in breeding landbirds by utilizing fixed survey points. This survey was used to establish a species list.

In the point count method, an observer stands in one spot and then records all the birds seen or heard within a fixed or unlimited distance. In this survey, an unlimited distance was utilized since the concern for overlap in population counts was not a concern. Since population counts were not crucial during this survey, this method was also considered suitable for waterfowl. Points were established prior to the fieldwork in a systematic method which allowed for an even distribution around the surveyed areas. The points also were within similar habitats although some vegetation varied between points selected. The observers walked between the points. The counts were conducted in 8 to 10 minute intervals. The points were spaced about ¼ mile apart from each other.

4.8.3.4 Line Transects

Wooded and open field areas were surveyed utilizing the line transect methodology. Transect lines were spaced far enough apart (approximately 400 feet) to prevent an overlap in the counting of species. A hand-held global positioning system GPS receiver was used to stay on course with the transect line and to locate the line for follow-up surveys conducted during this

effort. The observer then walked the transect line at a gradual pace and recorded birds seen and heard.

Uneven terrain and vegetative cover was somewhat of a concern since the observers had to confirm footing through many forested and open areas and thus were unable to concentrate on visual observations at all times. The lines were systematically established to prevent overlap. Two (2) observers were utilized during this survey; therefore, the observers reversed the direction of travel at the end of each transect.

Line transects could not be conducted within the marsh since these areas are subject to tidal influences and in many areas they have a very soft, mucky substrate making it unsuitable to walk across the open marsh as required in a line transect. In addition, the open water depths are too shallow to utilize canoes or rowboats.

4.8.3.5 Feeding Stations

Three (3) separate feeding stations were established on two (2) separate days in the wooded area near Essex Road. These stations were set up at varying heights from the forest floor in order to observe the species that might frequent the feeders and to aid in establishing a species list for the area. A mixture of seed and suet were used within each station. These stations were observed during various times throughout the day.

No threatened or endangered bird species were observed during these surveys. Birds commonly found within this area are indicated on Table 4B.

4.8.3.6 Bog Turtle Surveys

Several turtles were observed by the project team survey crew within the forested area to the west of Essex Avenue. The June 27, 2002 *Camden County Rare Species and Natural Communities Presently Recorded in the New Jersey Natural Heritage Database* lists the bog turtle (*Clemmys muhlenbergii*) as a rare species that may potentially be present within Camden County. Since the species observed by the survey crew could not be verified, a bog turtle survey was conducted in this portion of the study area. It should be noted, the optimal time of the year for conducting a bog turtle survey is between mid-April to mid-June, however, surveys to determine potential bog turtle wetland habitat may be conducted at any time of the year. The bog turtle survey was conducted on June 8, 11, and 14, 2004. No turtles were observed within this portion of the study area or sunning in the open water or marsh areas east of Creek Road.

Habitat evaluation surveys were utilized to determine whether suitable habitat for the bog turtle exists within the study area. The preferred habitat for bog turtles is wetlands that consist of deep, soft, mucky soils where the bog turtle can avoid predators and escape climatic extremes. In addition, open canopy that allows abundant sunlight to reach ground level is an essential component of the bog turtle habitat (Shiels, PFBC). Dominant vegetation within bog turtle habitat consists primarily of low grasses, mosses, and sedges (emergent wetland) often with a scrub-shrub wetland component (USFWS, 1998).

Although the lowland area of the site contains several seeps and a stream corridor with the sparse presence of skunk cabbage (*Symplocarpus foetidus*) and soft mucky soils, the soils contain an extremely sandy substrate. The forested area of this portion of the study area is covered in a late

succession, mixed hardwood upland forest with a thick canopy consisting primarily of hardwood species that block the sunlight to the forest floor. The site also lacks the low grasses and sedges preferred by bog turtles. Photographs of the site are included in the wetland report for the study area.

Bog turtles often hibernate in water and in the mud bottom of marsh rivulets under 5-15 cm of water (Bury, 1979). None of the habitats surveyed within the study area that have similar conditions contain sphagnum, tussocks, low grasses, or other early successional vegetation typically preferred by the bog turtle.

4.8.3.7 Findings

Based upon the extensive field work performed within the study area by qualified scientists (i.e., wetland delineation, Letter of Interpretation, agency field check, ecological studies, bird surveys, turtle surveys, etc.) no threatened and endangered species were ever identified. Furthermore, the project team field work was conducted in all portions of the study area, during both the spring and fall migratory periods as well as the breeding season, and there were never any observations of threatened and endangered species. Birds commonly found within this area are indicated on Table 4B.

Even though potential habitat may exist within the study area, there are no unique habitat niches that exist within any portion of the study area, except for stands of wild rice in the LTC tidal area, which were discussed earlier.

PROJECT NORTH

Legend

Existing Alignment of Interchange
Study Area Boundary
Study Area Geology

Ket- Englishtown Formation
Kmt- Marshalltown Formation
Kmv- Merchantville Formation
Kwb- Woodbury Formation

0 600 1,200 2,400 Feet

New Jersey Department of Transportation

I-295 / I-76 / Route 42
Direct Connection
Camden County

FIGURE 8
Study Area Geology Map

Date	April 14, 2006

Source: USGS, 2002 and NJDEP Bureau of Geographic Information and Analysis, 1995

PROJECT NORTH

Legend

Study Area Boundary
Existing Alignment of Interchange

Soil Classifications

FrpB, FREEHOLD
FrpC, DOWNER
FrpkB, DOWNER
HowB, HOWELL
HowC, HOWELL
Mamuv, TIDAL MARSH
Ps, MADE LAND
UR, URBAN LAND
URUF, URBAN LAND
Tidal Marsh- Little Timber Creek

Note: Extent of Little Timber Creek Tidal Marshwas determined from photo-interpretation.

0 600 1,200 2,400 Feet

New Jersey Department of Transportation

I-295 / I-76 / Route 42
Direct Connection
Camden County

FIGURE 9
Study Area Soils Map

Date	April 14, 2006

Source: USGS, 2002 and NJDEP Bureau of Geographic Information and Analysis, 1995

PROJECT NORTH

Legend

- Existing Alignment of Interchange
- Study Area Boundary
- Municipal Well Locations
- NJDEP Well Number (Monitoring Wells)

Note: NJDEP well numbers correlate to information provided on documents received from NJDEP regarding well locations within the study area boundary (See Appendix A).

0 600 1,200 2,400 Feet

New Jersey Department of Transportation

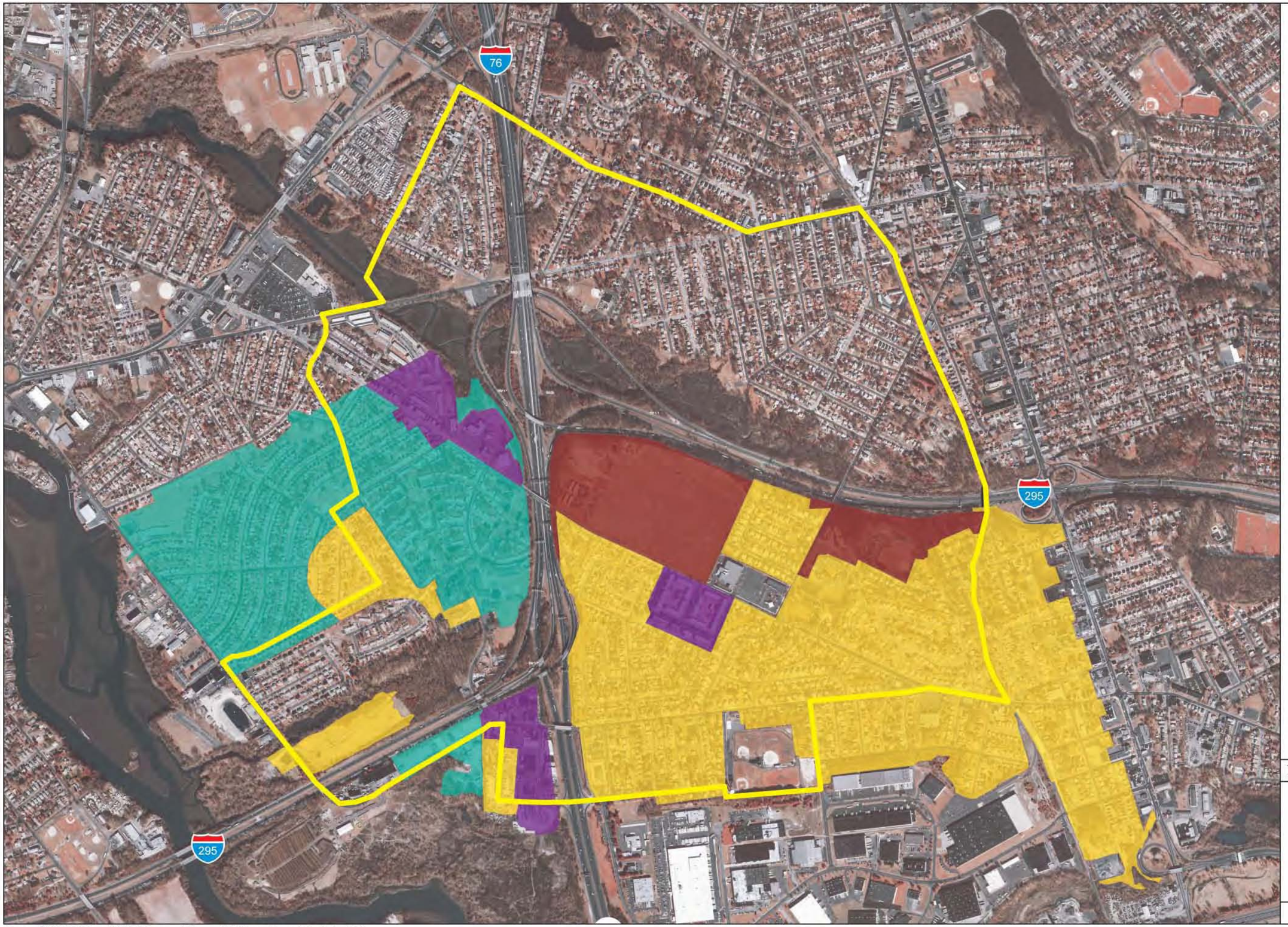
I-295 / I-76 / Route 42
Direct Connection
Camden County

FIGURE 10

Well Data Map

Date	April 14, 2006

Source: USGS, 2002, NJDEP Bureau of Geographic Information and Analysis, 2005 NJDEP 2004



PROJECT NORTH

Legend

Study Area Boundary

GroundwaterRecharge (in/yr)

- 0 or no information available
- 1 - 4
- 5 - 8
- 9 - 10
- 11 - 12

0 500 1,000 2,000 Feet

New Jersey Department of Transportation

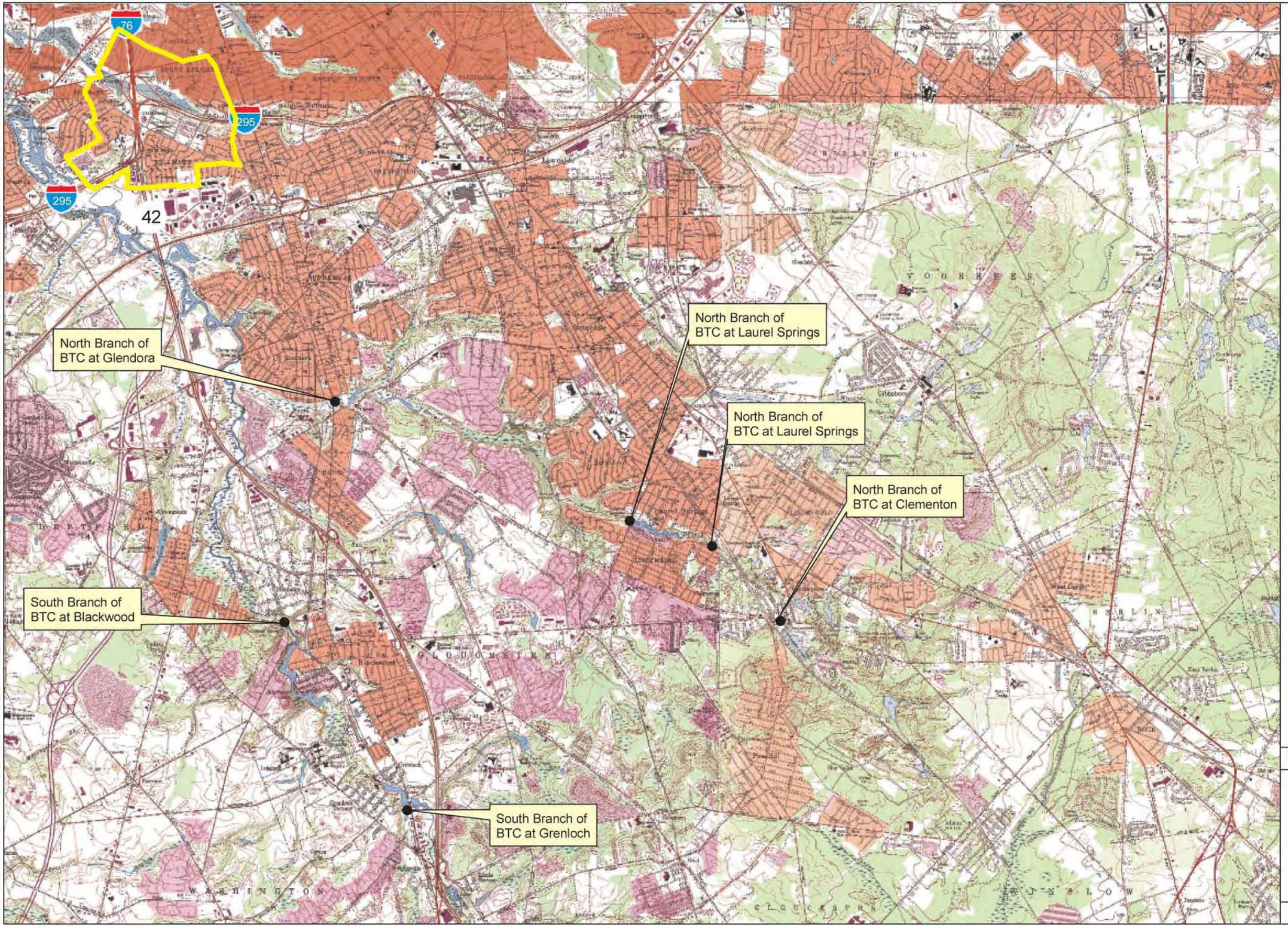
I-295 / I-76 / Route 42
Direct Connection
Camden County

FIGURE 11

Groundwater Recharge Map

Date	April 14, 2006

Source: USGS, 2002 and NJDEP Bureau of Geographic Information and Analysis, 1995



PROJECT NORTH

Legend

Study Area Boundary

Surface Water Quality Monitoring Locations

0 2,250 4,500 9,000 Feet

New Jersey Department of Transportation

I-295 / I-76 / Route 42
Direct Connection
Camden County

FIGURE 12
BTC Surface Water Quality Monitoring Locations Map

Date	April 14, 2006

Source: USGS, 2002 and NJDEP Bureau of Geographic Information and Analysis, 1995

PROJECT NORTH

Legend

- Existing Alignment of Interchange
- Study Area Boundary
- 100-Year Floodplain
- 500-Year Floodplain

0 600 1,200 2,400 Feet

New Jersey Department of Transportation

I-295 / I-76 / Route 42
Direct Connection
Camden County

FIGURE 13

Study Area Floodplain Map

Date	April 14, 2006

Source: USGS, 2002, FEMA 1996

PROJECT NORTH

Legend

- Study Area Boundary
- Existing Alignment of Interchange
- Wetlands Right of Way (Former Wetland Areas)
- Freshwater Tidal Marshes
- Deciduous Wooded Wetlands
- Deciduous Scrub Wetlands
- Mixed Scrub/Shrub Wetlands
- Herbaceous Wetlands
- Head-of-Tide

0 600 1,200 2,400 Feet

New Jersey Department of Transportation

I-295 / I-76 / Route 42
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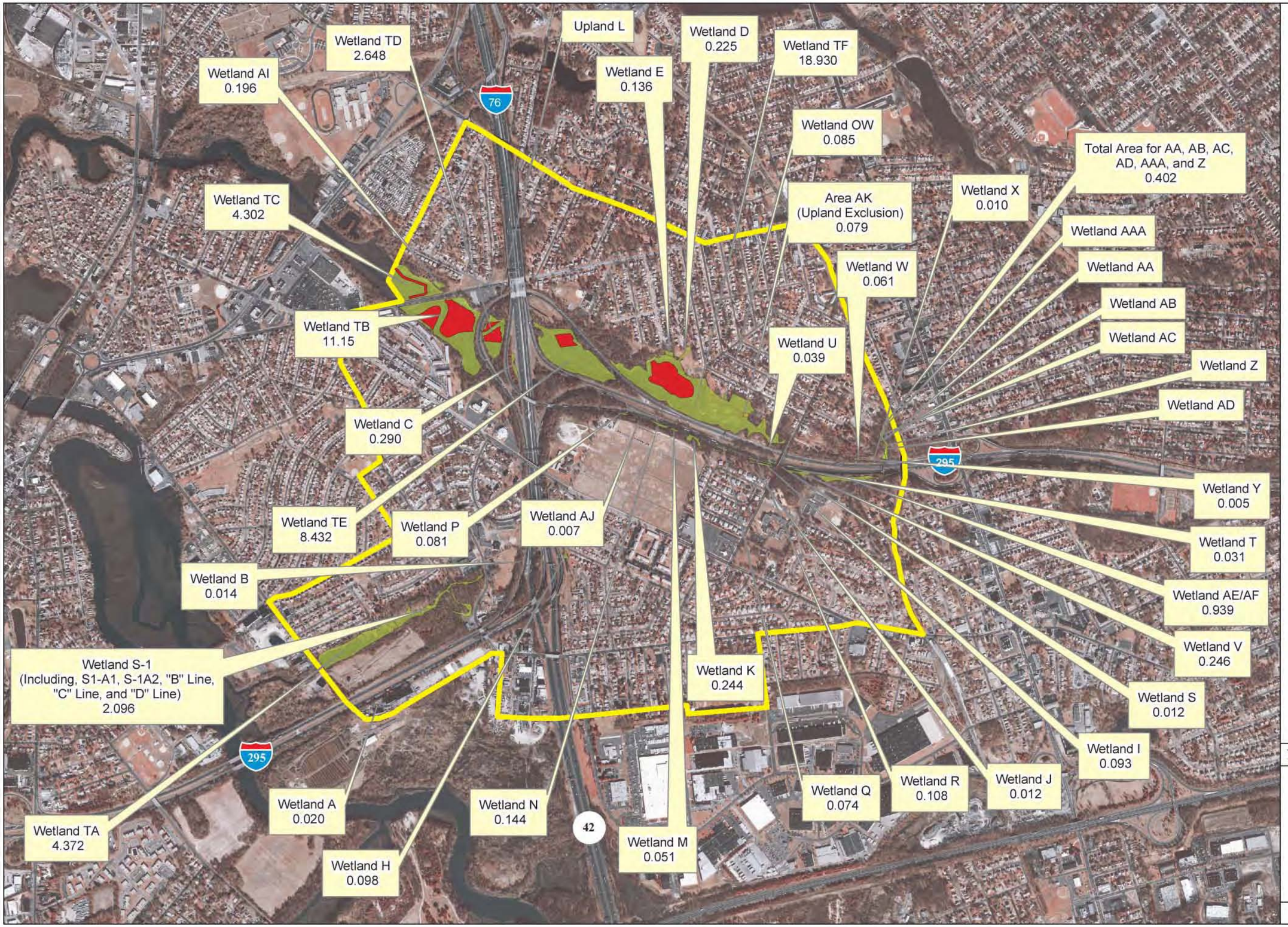
Camden County

FIGURE 14

NJDEP Wetlands Map

Date	April 14, 2006

Source: USGS, 2002; NJDEP Bureau of Geographic Information and Analysis, 1995; and Dresdner Robin Wetland Delineation, Fall 2003



PROJECT NORTH

Legend

- Study Area
- Delineated Wetlands
- Delineated Upland Exclusion Area
- Approximate Limit of Areas with Wild Rice
- Wetland Designation and Acreage

0 600 1,200 2,400 Feet

New Jersey Department of Transportation

I-295 / I-76 / Route 42
Direct Connection
Camden County

FIGURE 15

Field Delineated Study Area
Wetlands

Date	April 14, 2006

Source: USGS, 2002 and Dresdner Robin Wetland Delineation, Fall 2003

PROJECT NORTH

Legend

- Study Area Boundary
- Existing Alignment of Interchange

Wetland Designation

- PEM
- PEM/FLR
- PEMR
- PFO1
- PFO1/EM
- POW
- PSS1
- PSS1/EM
- R1FL
- R1OW

Note: Refer to Table 2 for wetland classification descriptions.

0 600 1,200 2,400 Feet

New Jersey Department of Transportation

I-295 / I-76 / Route 42
Direct Connection
Camden County

FIGURE 16
National Wetlands Inventory Map

Date	March 21, 2006

Source: USGS, 2002 and Wildlife Service National Wetland Inventory, 1982

PROJECT NORTH

Legend

Existing Alignment of Interchange
Study Area Boundary

Project Area Vegetation

Deciduous Forest (10-50% Crown Closure)

Deciduous Forest (>50% Crown Closure)

0 600 1,200 2,400 Feet

New Jersey Department of Transportation

I-295 / I-76 / Route 42
Direct Connection
Camden County

FIGURE 17

Study Area Upland
Vegetation Communities Map

Date	April 14, 2006

Source: USGS, 2002, NJDEP Bureau of Geographic Information and Analysis, 1995 and Dresdner Robin, 2004

5.0 DISCUSSION/ IMPACT ANALYSIS AND CONCEPTUAL MITIGATION

5.1 Geology

5.1.1 Alternatives D, D1, G2, H1 and K

The construction of all of the Build Alternatives would cause disturbance of subsurface materials by excavations and the deep foundations for structures. Short-term dewatering will occur during construction which would depress the water table locally for a short period, and induce flow toward the excavation. This impact would be temporary and would not extend significantly beyond project boundaries. Installation of deep foundation elements such as piles may result in vibratory impacts and possibly minor short-term settlement of adjacent loose sand materials and will not result in significant geologic impacts.

5.1.2 No Build

No geologic impacts would result from the No Build alternative.

5.2 Soils

5.2.1 Alternatives D, D1, G2, H1 and K

Disturbance of soil materials may increase the potential for short-term erosion and sedimentation, including turbidity in adjacent surface waters. Construction activities would be conducted pursuant to an approved soil erosion and sediment control plan and, therefore, are not expected to result in significant impacts. It will include procedures such as:

- Taking precautions to minimize spillage and tracking of sand and silt on the road surface and prompt clean up should they occur;
- Using silt fences, hay bales and stabilized entrances to construction sites, as necessary, for control of erosion and sedimentation;
- Placing mulch or suitable ground cover immediately after a slope is graded;
- Seeding of slopes simultaneously with roadbed construction; and using turbidity curtains, where practicable, for construction operations.

Excavating soil below the 100-year floodplain elevation may slightly alter currents, and future erosion and deposition rates and patterns, especially during flooding. These changes are minor compared to ongoing natural changes and are not expected to have a significant impact on soils. Soil disturbance areas within the floodplain will be isolated from potential water contact during construction through the use of cofferdams or other suitable techniques, further minimizing the potential for soil erosion.

Significant cuts of Made Land would be required for all of these alternatives. Additionally, Freehold land would also be cut for Alternative G2.

Any excavated areas that require backfill would be filled with clean soil meeting NJDOT standards as well as NJDEP requirements as set forth in the Technical Requirements for Site Remediation. Even though acid soils exist within the study area, appropriate mitigation measures would be undertaken to ensure that backfill material would not be acidic. Therefore, no acid soils or contaminated soils would be used as backfill.

Alternative K would increase the amount of disturbed soil material compared to the other Build Alternatives due to the anticipated cut and cover construction under I-76/Route 42 .

No cumulative or secondary impacts are anticipated for any of the Build Alternatives.

5.2.2 No Build

No soil impacts would result from the No Build alternative.

5.3 Groundwater

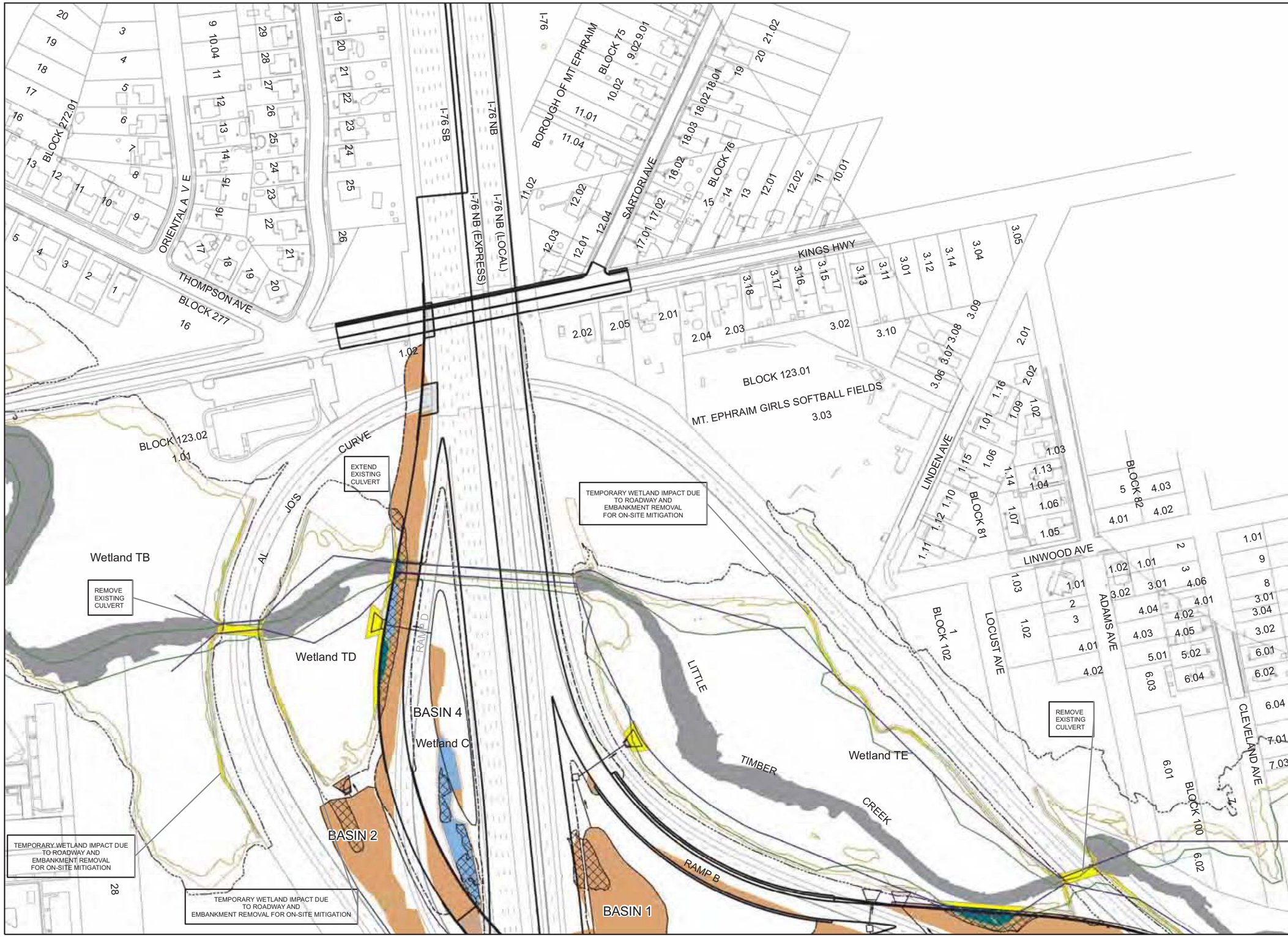
5.3.1 Alternatives D, D1, G2, H1 and K

During construction and at the completion of this project, there would be no significant new pathways created for the highway runoff to the Potomac-Magothy-Raritan (PRM) aquifer because the aquifer is confined. The principal recharge areas for the PRM aquifer are located along the Delaware River approximately two miles west of the study area. Additionally, if minor localized changes to shallow groundwater recharge do occur, they would not affect the water supply because there are no shallow potable wells (as determined by the NJDEP well search) within the study area. In addition, the public supply wells are not located in areas where the proposed improvements would occur. No adverse groundwater quality impacts are anticipated based on there being no shallow potable wells in the study area.

Stormwater runoff mitigation efforts to address the surface water quality impacts would further reduce any potential for groundwater impacts. All of the alternatives would include a drainage system that would improve water quality compared to the existing highway drainage system by channeling runoff to pipes and five bioretention basins prior to discharging into water bodies.

The existing roadway drainage along I-295/Route 42 and exterior drainage on I-76 is an umbrella type with runoff flowing into ditches that drain to culverts which flow to LTC and BTC. A limited measure of water quality and groundwater recharge is achieved for those existing areas flowing through ditches prior to discharge into closed storm sewer systems and culverts. The remaining portions of the existing ramps and I-76 interior drainage are conveyed directly into storm sewer systems, and directly to LTC and BTC, with no measurable groundwater recharge or water quality measures.

The proposed bioretention basins are situated in different locations, depending on the alternative (See Figures 18-22 at the end of Section 5.0). Table 5 summarizes the stormwater management water quality treatment proposed for each alternative. Appendix F presents a schematic representation of the proposed bioretention basins.



PROJECT NORTH

KEY MAP

Legend

- Existing Conditions
- Proposed Edge of Pavement
- Proposed Retaining Wall
- Proposed Slope Limits
- Proposed Drainage Improvements
- Proposed Bridges
- Spring High Tide (El. 3.81' NAVD 1988)
- Upper Wetlands Boundary (1970 Wetlands)
- Open Water
- 100-Year Floodplain
- Floodway
- Wetland Boundaries
- Floodplain Impacts
- Upland Vegetation Impacts

Wetland and State Open Water Impacts

- Non Tidal Permanent
- Non Tidal Temporary
- Tidal Permanent
- Tidal Temporary

0 200 400 Feet

New Jersey Department of Transportation

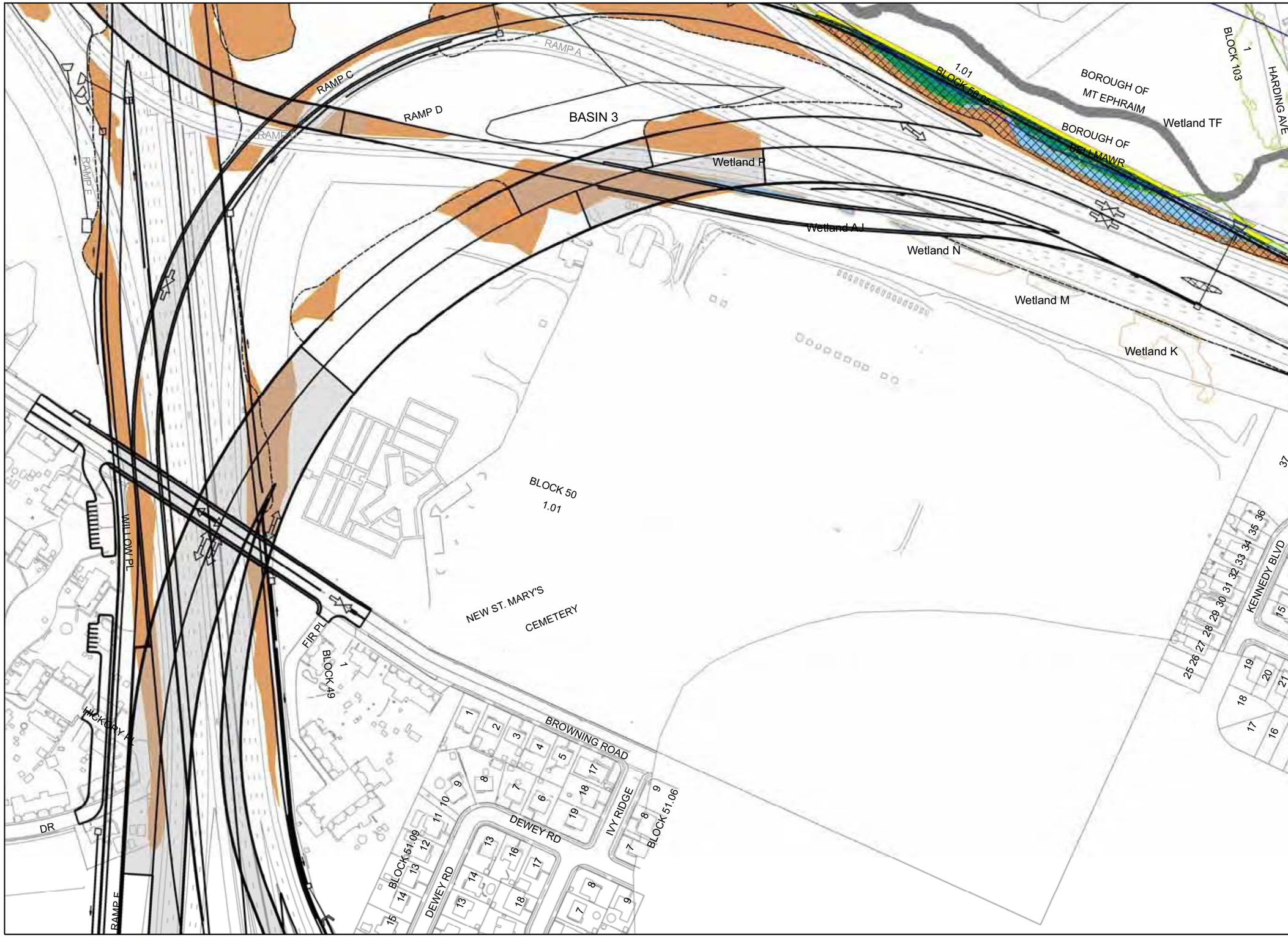
I-295 / I-76 / Route 42
Direct Connection
Camden County

FIGURE 18.1

"Alternative D" Ecological Impacts

Date	April 14, 2006

Source: Dewberry Goodkind Inc. 2005, Dresdner Robin Wetland Delineation Fall 2003, and Dresdner Robin Analysis 2005



PROJECT NORTH

KEY MAP

Legend

- Existing Conditions
- Proposed Edge of Pavement
- Proposed Retaining Wall
- Proposed Slope Limits
- Proposed Drainage Improvements
- Proposed Bridges
- Spring High Tide (El. 3.81' NAVD 1988)
- Upper Wetlands Boundary (1970 Wetlands)
- Open Water
- 100-Year Floodplain
- Floodway
- Wetland Boundaries
- Floodplain Impacts
- Upland Vegetation Impacts

Wetland and State Open Water Impacts

- Non Tidal Permanent
- Non Tidal Temporary
- Tidal Permanent
- Tidal Temporary

0 200 400 Feet

New Jersey Department of Transportation

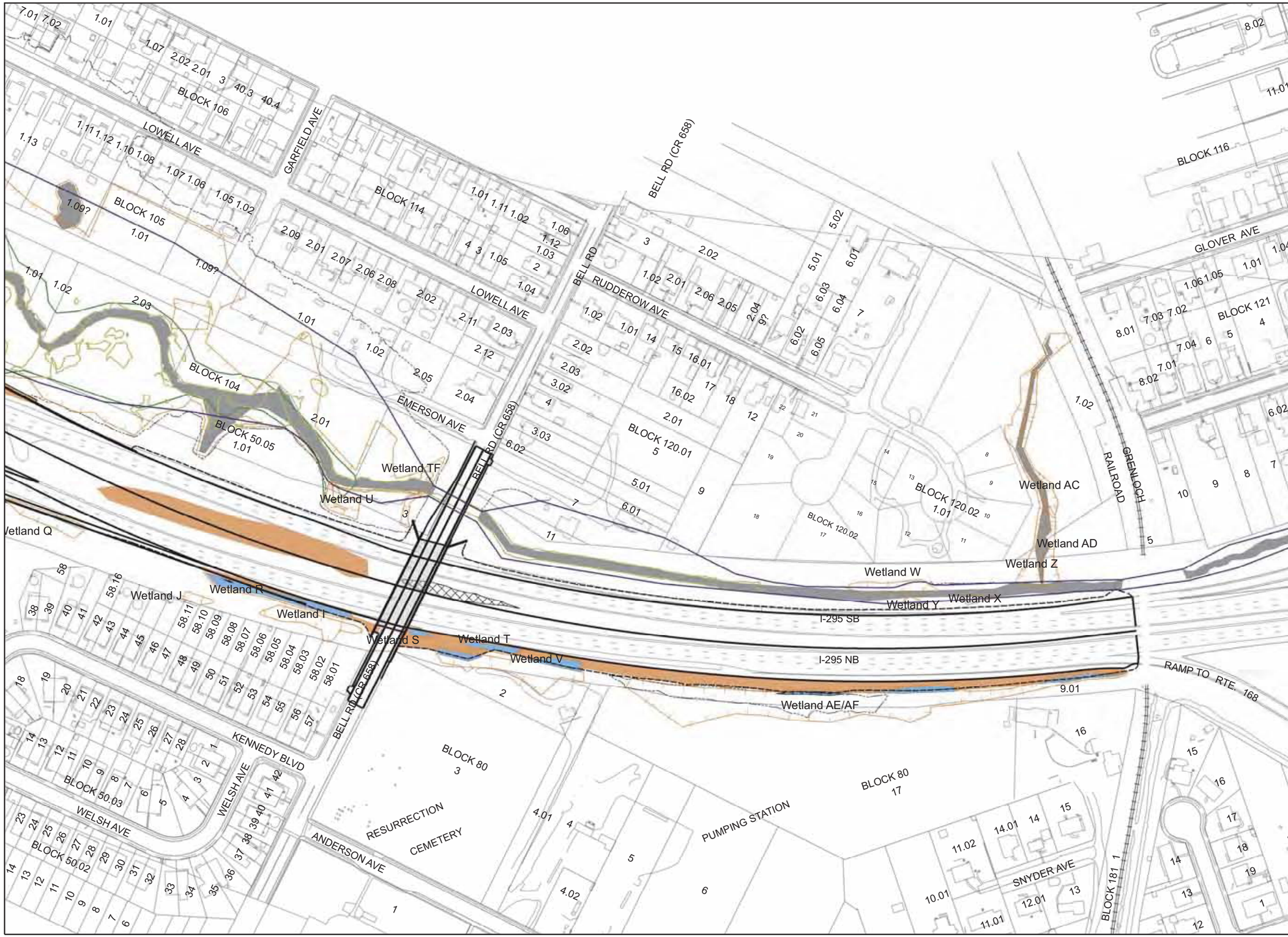
I-295 / I-76 / Route 42
Direct Connection
Camden County

FIGURE 18.2

"Alternative D" Ecological Impacts

Date	April 14, 2006

Source: Dewberry Goodkind Inc. 2005, Dresdner Robin Wetland Delineation Fall 2003, and Dresdner Robin Analysis 2005



PROJECT NORTH

KEY MAP

Legend

- Existing Conditions
- Proposed Edge of Pavement
- Proposed Retaining Wall
- Proposed Slope Limits
- Proposed Drainage Improvements
- Proposed Bridges
- Spring High Tide (El. 3.81' NAVD 1988
- Upper Wetlands Boundary (1970 Wetlands)
- Open Water
- 100-Year Floodplain
- Floodway
- Wetland Boundaries
- Floodplain Impacts
- Upland Vegetation Impacts

Wetland and State Open Water Impacts

- Non Tidal Permanent
- Non Tidal Temporary
- Tidal Permanent
- Tidal Temporary

0 100 200 400 Feet

New Jersey Department of Transportation

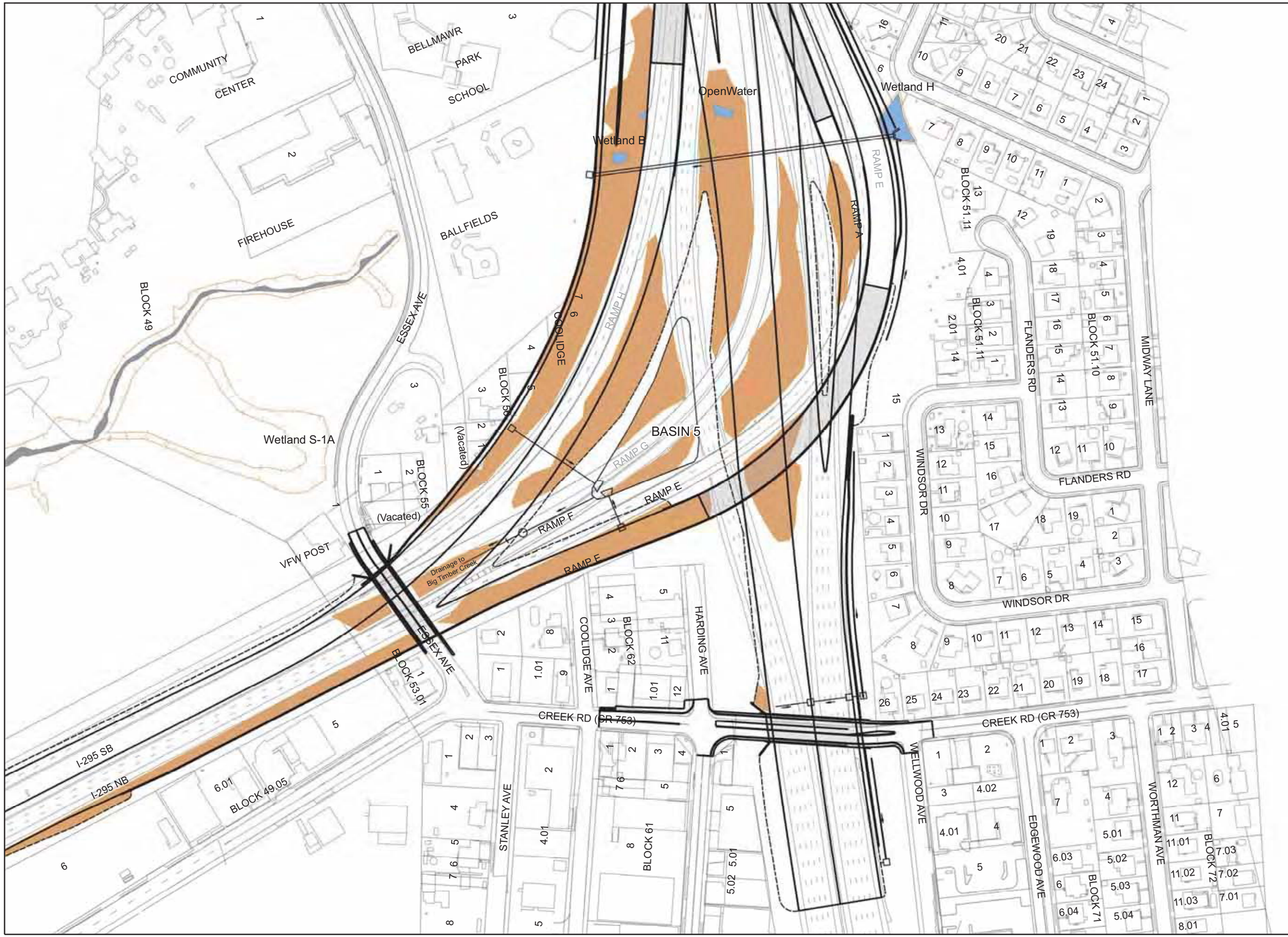
I-295 / I-76 / Route 42
Direct Connection
Camden County

FIGURE 18.3

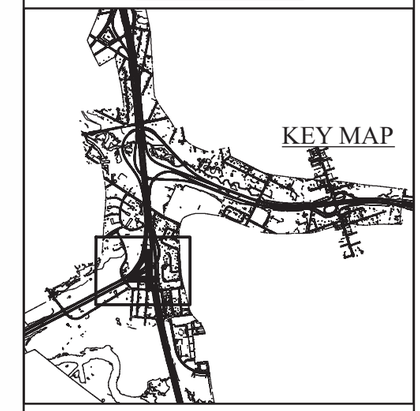
"Alternative D" Ecological Impacts

Date	April 14, 2006

Source: Dewberry Goodkind Inc. 2005, Dresdner Robin Wetland Delineation Fall 2003, and Dresdner Robin Analysis 2005



PROJECT NORTH



Legend

- Existing Conditions
- Proposed Edge of Pavement
- Proposed Retaining Wall
- Proposed Slope Limits
- Proposed Drainage Improvements
- Proposed Bridges
- Spring High Tide (El. 3.81' NAVD 1988)
- Upper Wetlands Boundary (1970 Wetlands)
- Open Water
- 100-Year Floodplain
- Wetland Boundaries
- Floodplain Impacts
- Upland Vegetation Impacts

Wetland and State Open Water Impacts

- Non Tidal Permanent
- Non Tidal Temporary
- Tidal Permanent
- Tidal Temporary

0 200 400 Feet

New Jersey Department of Transportation

I-295 / I-76 / Route 42
Direct Connection
Camden County

FIGURE 18.4

"Alternative D" Ecological Impacts

Date	April 14, 2006

Source: Dewberry Goodkind Inc. 2005, Dresdner Robin Wetland Delineation Fall 2003, and Dresdner Robin Analysis 2005

PROJECT NORTH

KEY MAP

Legend

- Existing Conditions
- Proposed Edge of Pavement
- Proposed Retaining Wall
- Proposed Slope Limit
- Proposed Drainage Improvements
- Proposed Bridges
- Spring High Tide (El. 3.81' NAVD 1988)
- Upper Wetlands Boundary (1970 Wetlands)
- Open Water
- 100-Year Floodplain
- Floodway
- Wetland Boundaries
- Floodplain Impacts
- Uplands Impacts

Wetland and State Open Water Impacts

- Non Tidal Permanent
- Non Tidal Temporary
- Tidal Permanent
- Tidal Temporary

0 100 200 400 Feet

New Jersey Department of Transportation

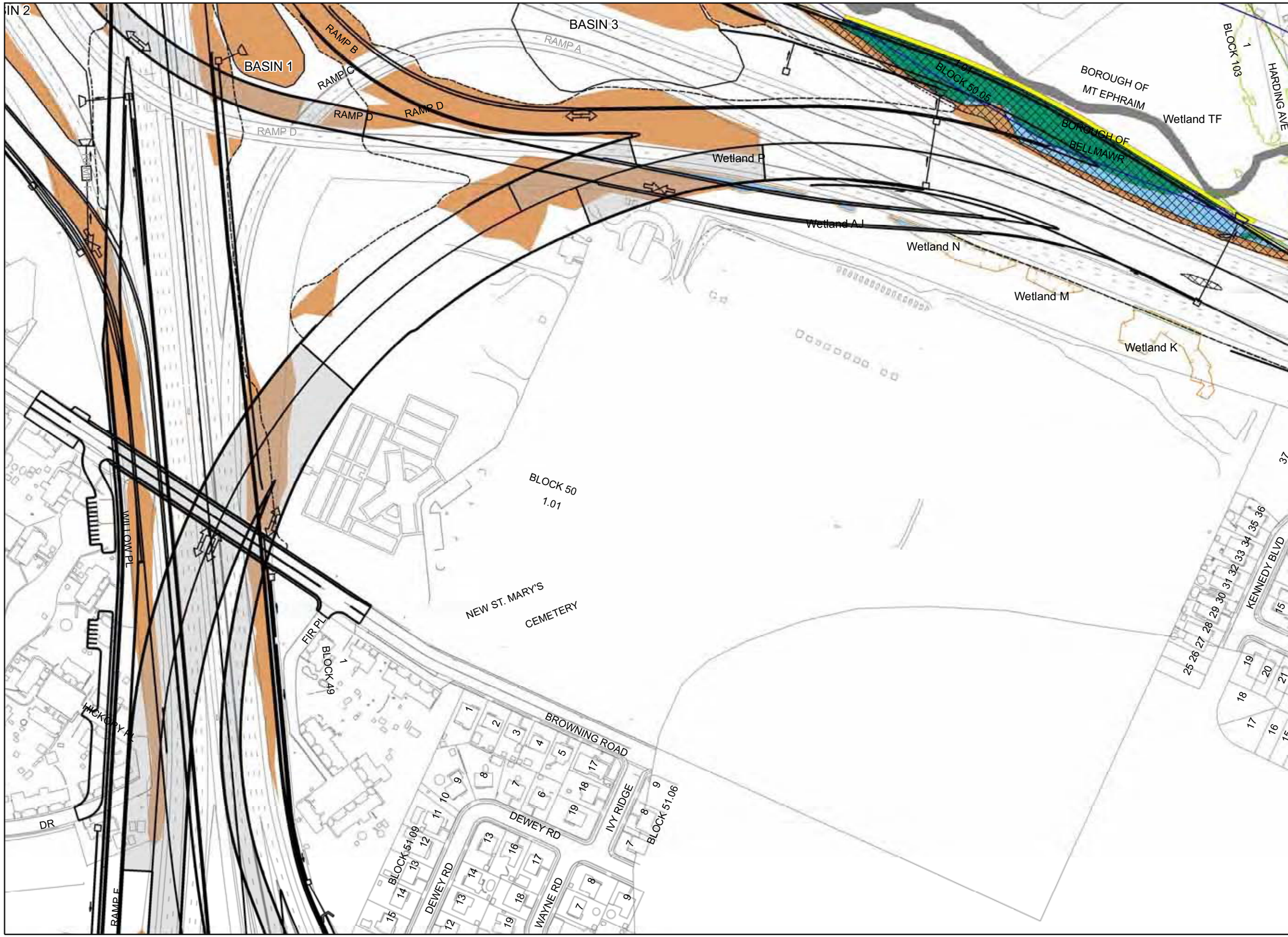
I-295 / I-76 / Route 42
Direct Connection
Camden County

FIGURE 19.1

"Alternative D1" Ecological Impacts

Date	April 14, 2006

Source: Dewberry Goodkind Inc. 2005, Dresdner Robin Wetland Delineation Fall 2003, and Dresdner Robin Analysis 2005



PROJECT NORTH

KEY MAP

Legend

- Existing Conditions
- Proposed Edge of Pavement
- Proposed Retaining Wall
- Proposed Slope Limits
- Proposed Drainage Improvements
- Proposed Bridges
- Spring High Tide (El. 3.81' NAVD 1988)
- Upper Wetlands Boundary (1970 Wetlands)
- Open Water
- 100-Year Floodplain
- Floodway
- Wetland Boundaries
- Floodplain Impacts
- Uplands Impacts

Wetland and State Open Water Impacts

- Non Tidal Permanent
- Non Tidal Temporary; Temporary
- Tidal Permanent
- Tidal Temporary

0 100 200 400 Feet

New Jersey Department of Transportation

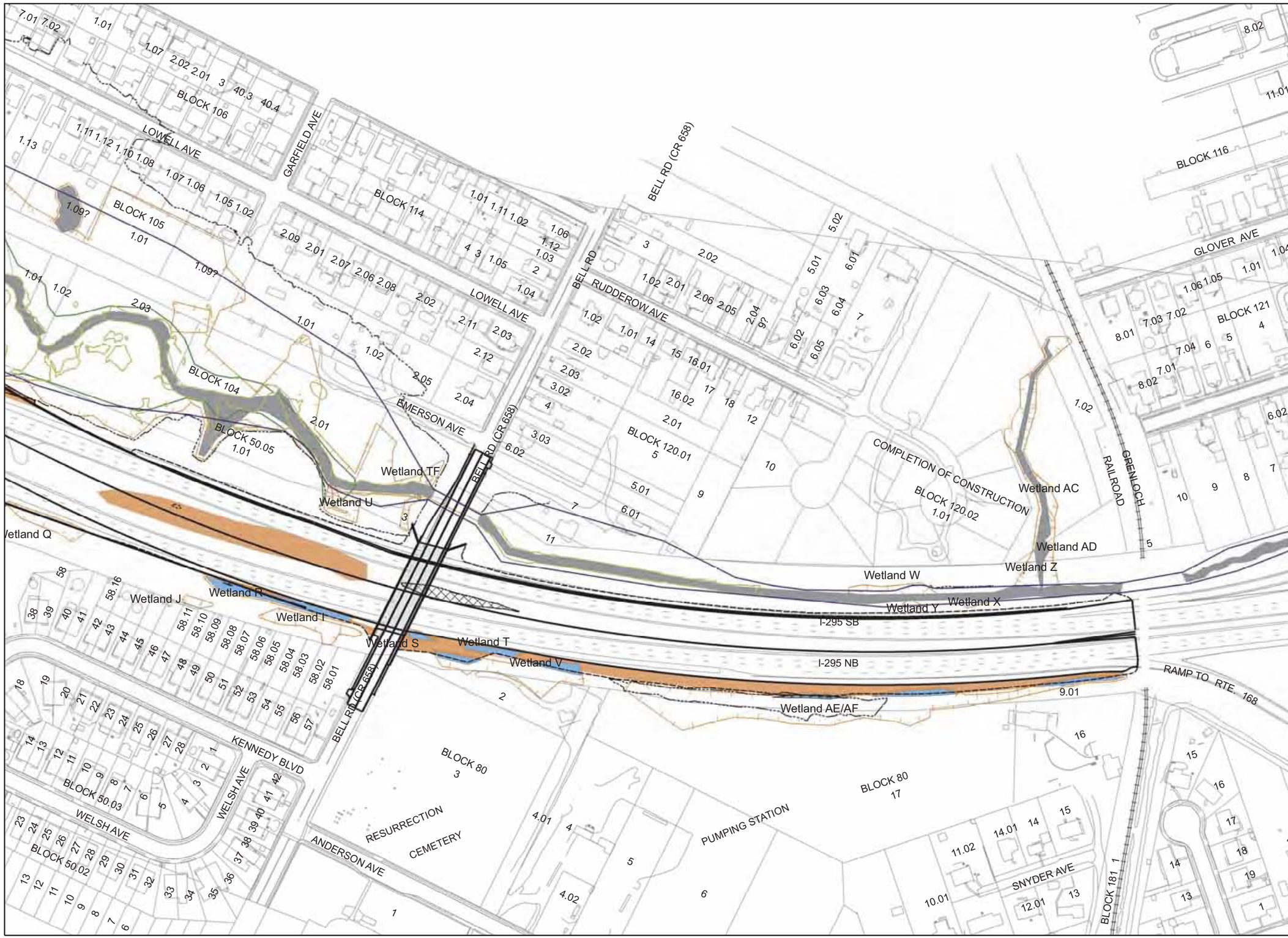
I-295 / I-76 / Route 42
Direct Connection
Camden County

FIGURE 19.2

"Alternative D1" Ecological Impacts

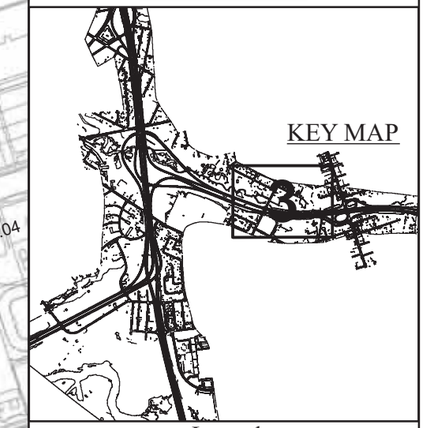
Date	April 14, 2006

Source: Dewberry Goodkind Inc. 2005, Dresdner Robin Wetland Delineation Fall 2003, and Dresdner Robin Analysis 2005



PROJECT NORTH

KEY MAP



Legend

- Existing Conditions
- Proposed Edge of Pavement
- Proposed Retaining Wall
- Proposed Slope Limit
- Proposed Drainage Improvements
- Proposed Bridges
- Spring High Tide (El. 3.81' NAVD 1988)
- Upper Wetlands Boundary (1970 Wetlands)
- Open Water
- 100-Year Floodplain
- Floodway
- Wetland Boundaries
- Floodplain Impacts
- Uplands Impacts

Wetland and State Open Water Impacts

- Non Tidal Permanent
- Non Tidal Temporary
- Tidal Permanent
- Tidal Temporary

0 100 200 400 Feet

New Jersey Department of Transportation

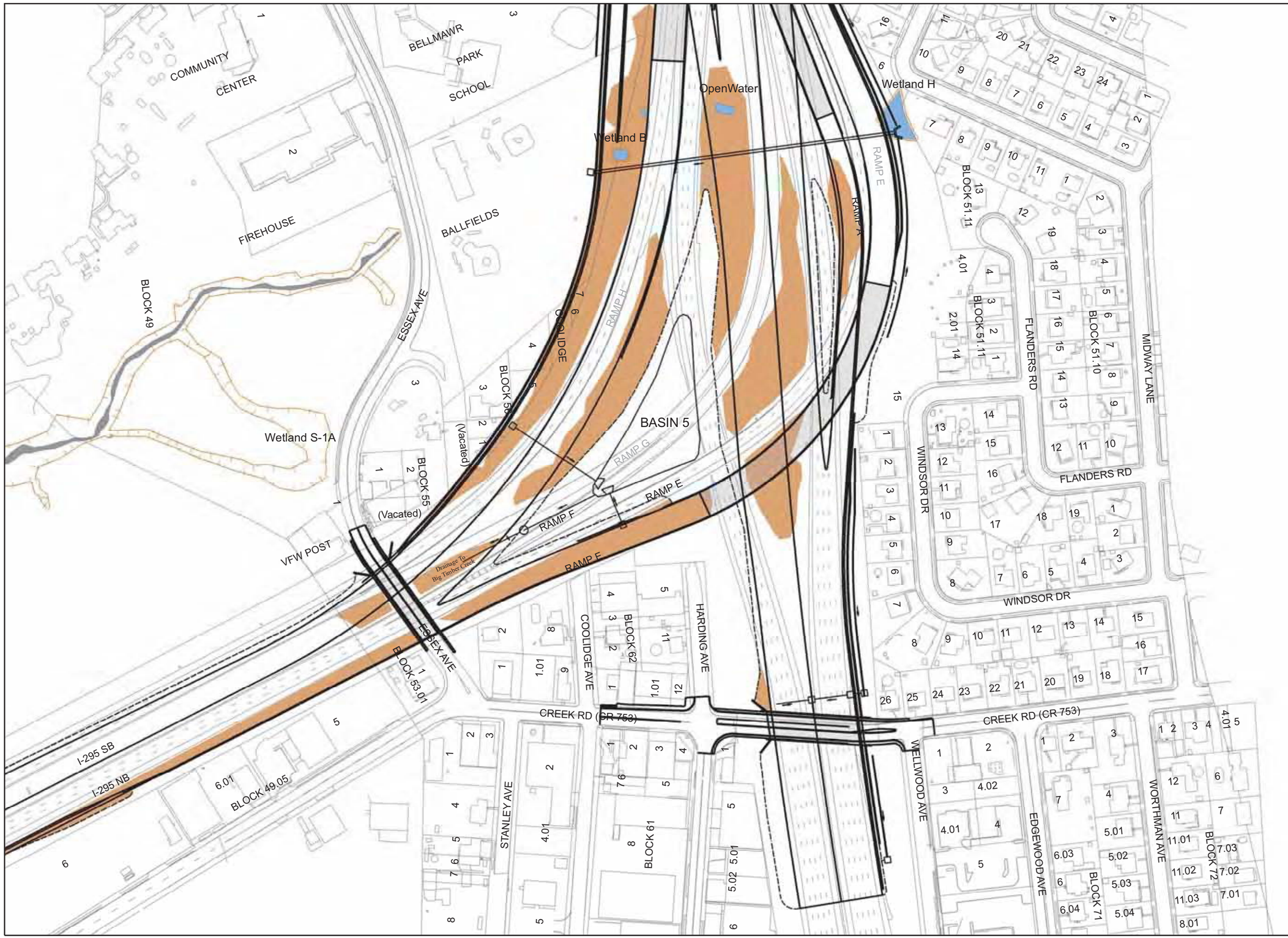
I-295 / I-76 / Route 42
Direct Connection
Camden County

FIGURE 19.3

"Alternative D1" Ecological Impacts

Date	April 14, 2006

Source: Dewberry Goodkind Inc. 2005, Dresdner Robin Wetland Delineation Fall 2003, and Dresdner Robin Analysis 2005



PROJECT NORTH

KEY MAP

Legend

- Existing Conditions
- Proposed Edge of Pavement
- Proposed Retaining Wall
- Proposed Slope Limit
- Proposed Drainage Improvements
- Proposed Bridges
- Spring High Tide (El. 3.81' NAVD 1988)
- Upper Wetlands Boundary (1970 Wetlands)
- Open Water
- 100-Year Floodplain
- Wetland Boundaries
- Floodplain Impacts
- Uplands Impacts

Wetland and State Open Water Impacts

- Non Tidal Permanent
- Non Tidal Temporary
- Tidal Permanent
- Tidal Temporary

0 100 200 400 Feet

New Jersey Department of Transportation

I-295 / I-76 / Route 42
Direct Connection
Camden County

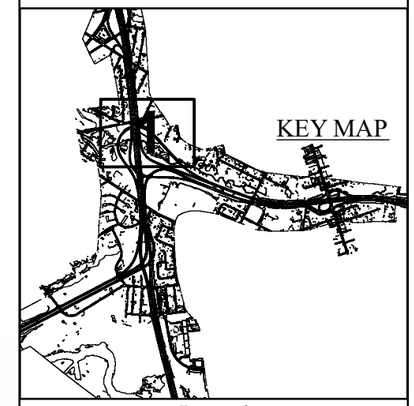
FIGURE 19.4

"Alternative D1" Ecological Impacts

Date	April 14, 2006

Source: Dewberry Goodkind Inc. 2005, Dresdner Robin Wetland Delineation Fall 2003, and Dresdner Robin Analysis 2005

PROJECT NORTH



Legend

- Existing Conditions
- Proposed Edge of Pavement
- Proposed Retaining Walls
- Proposed Slope Limits
- Proposed Drainage Improvements
- Proposed Bridges
- Spring High Tide (El. 3.81' NAVD 1988)
- Upper Wetlands Boundary (1970 Wetlands)
- Open Water
- 100-Year Floodplain
- Floodway
- Wetland Boundaries
- Floodplain Impacts
- Upland Vegetation Impacts

Wetland and State Open Water Impacts

- Non Tidal Permanent
- Non Tidal Temporary
- Tidal Permanent
- Tidal Temporary

0 100 200 400 Feet

New Jersey Department of Transportation

I-295 / I-76 / Route 42
Direct Connection
Camden County

FIGURE 20.1

"Alternative G2" Wetlands Impacts

Date	April 14, 2006

Source: Dewberry Goodkind Inc. 2005, Dresdner Robin Wetland Delineation Fall 2003, and Dresdner Robin Analysis 2005

N 2

BASIN 1

BASIN 3

RAMP A

RAMP B

RAMP C

RAMP D

RAMP F

Wetland P

Wetland A-I

Wetland N

Wetland M

Wetland K

Wetland TF

BOROUGH OF MT EPHRAIM

BOROUGH OF BELLMAWR

1.01 BLOCK 50.05

BLOCK 103 1

HARDING AVE

BLOCK 50 1.01

NEW ST. MARY'S CEMETERY

WILLOW PL

FIR PL

BLOCK 49 1

HICKORY PL

DR

BROWNING ROAD

DEWEY RD

IVY RIDGE

BLOCK 51.06

BLOCK 51.09

KENNEDY BLVD

PROJECT NORTH

KEY MAP

Legend

- Existing Conditions
- Proposed Edge of Pavement
- Proposed Retaining Walls
- Proposed Slope Limits
- Proposed Drainage Improvements
- Proposed Bridges
- Spring High Tide (El. 3.81' NAVD 1988)
- Upper Wetlands Boundary (1970 Wetlands)
- Open Water
- 100-Year Floodplain
- Floodway
- Wetland Boundaries
- Floodplain Impacts
- Upland Vegetation Impacts

Wetland and State Open Water Impacts

- Non Tidal Permanent
- Non Tidal Temporary
- Tidal Permanent
- Tidal Temporary

0 100 200 400 Feet

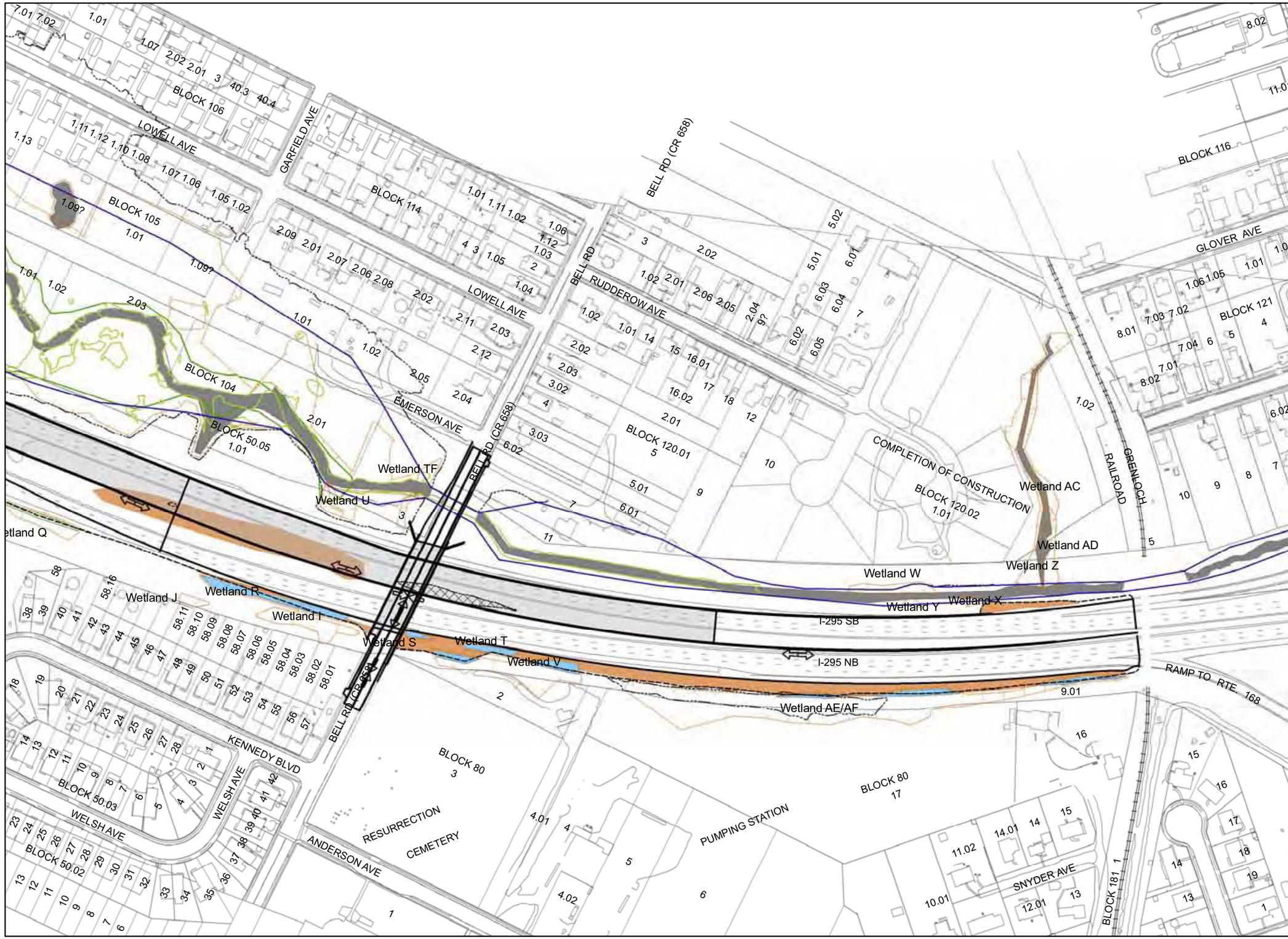
New Jersey Department of Transportation

I-295 / I-76 / Route 42
Direct Connection
Camden County

FIGURE 20.2
"Alternative G2" Wetlands Impacts

Date	April 14, 2006

Source: Dewberry Goodkind Inc. 2005, Dresdner Robin Wetland Delineation Fall 2003, and Dresdner Robin Analysis 2005



PROJECT NORTH

KEY MAP

Legend

- Existing Conditions
- Proposed Edge of Pavement
- Proposed Retaining Walls
- Proposed Slope Limits
- Proposed Drainage Improvements
- Proposed Bridges
- Spring High Tide (El. 3.81' NAVD 1988)
- Upper Wetlands Boundary (1970 Wetlands)
- Open Water
- 100-Year Floodplain
- Floodway
- Wetland Boundaries
- Floodplain Impacts
- Upland Vegetation Impacts

Wetland and State Open Water Impacts

- Non Tidal Permanent
- Non Tidal Temporary
- Tidal Permanent
- Tidal Temporary

0 100 200 400 Feet

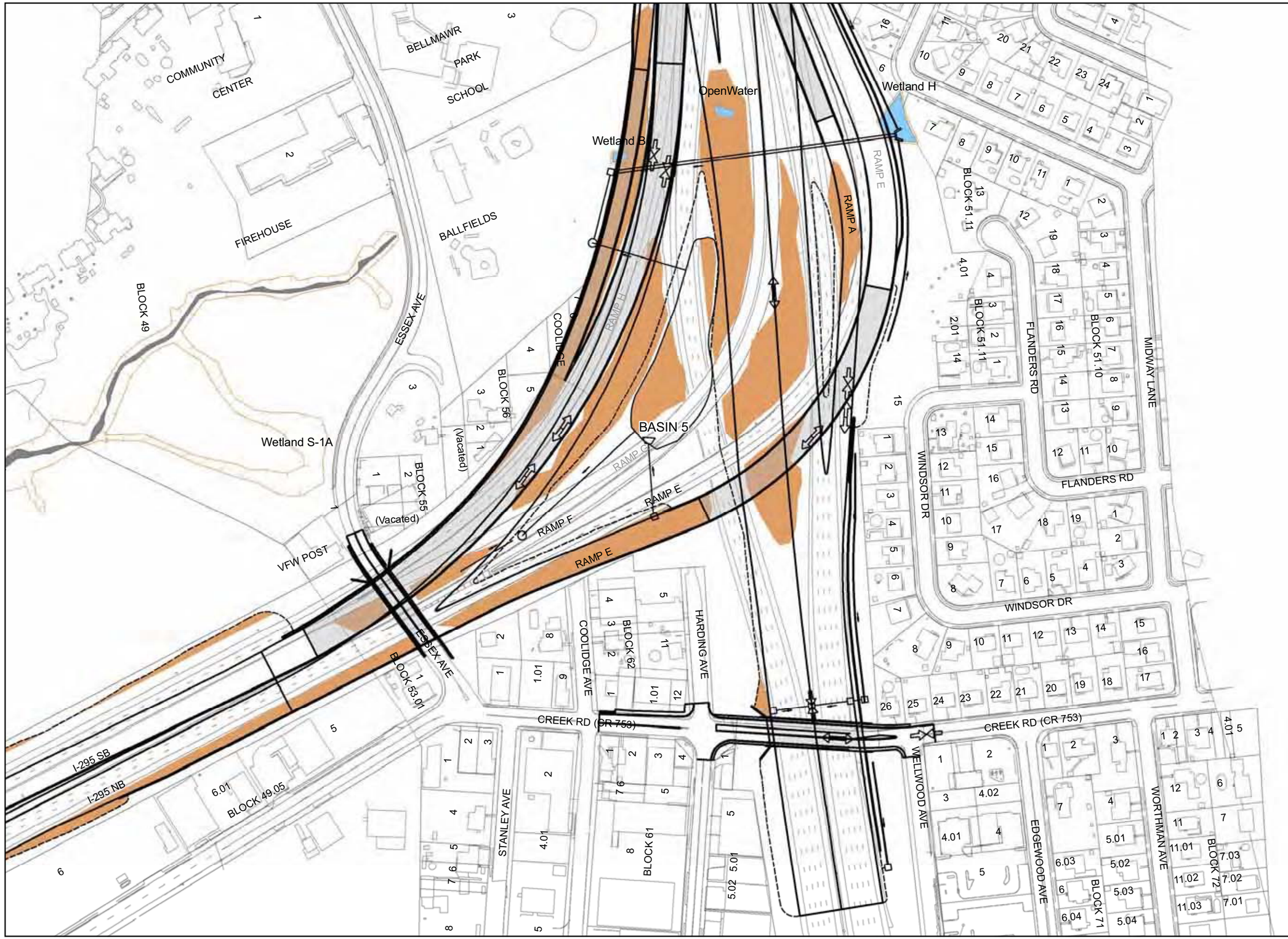
New Jersey Department of Transportation

I-295 / I-76 / Route 42
Direct Connection
Camden County

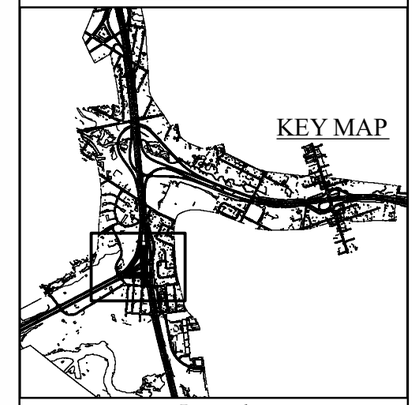
FIGURE 20.3
"Alternative G2" Wetlands Impacts

Date	April 14, 2006

Source: Dewberry Goodkind Inc. 2005, Dresdner Robin Wetland Delineation Fall 2003, and Dresdner Robin Analysis 2005



PROJECT NORTH



Legend

- Existing Conditions
- Proposed Edge of Pavement
- Proposed Retaining Walls
- Proposed Slope Limits
- Proposed Drainage Improvements
- Proposed Bridges
- Spring High Tide (El. 3.81' NAVD 1988)
- Upper Wetlands Boundary (1970 Wetlands)
- Open Water
- 100-Year Floodplain
- Floodway
- Wetland Boundaries
- Floodplain Impacts
- Upland Vegetation Impacts

Wetland and State Open Water Impacts

- Non Tidal Permanent
- Non Tidal Temporary
- Tidal Permanent
- Tidal Temporary

0 100 200 400 Feet

New Jersey Department of Transportation

I-295 / I-76 / Route 42
Direct Connection
Camden County

FIGURE 20.4

"Alternative G2" Wetlands Impacts

Date	April 14, 2006

Source: Dewberry Goodkind Inc. 2005, Dresdner Robin Wetland Delineation Fall 2003, and Dresdner Robin Analysis 2005

PROJECT NORTH

KEY MAP

Legend

- Existing Conditions
- Proposed Edge of Pavement
- Proposed Retaining Walls
- Proposed Slope Limits
- Proposed Drainage Improvements
- Proposed Bridges
- Spring High Tide (El. 3.81' NAVD 1988)
- Upper Wetlands Boundary (1970 Wetlands)
- Open Water
- 100-Year Floodplain
- Floodway
- Wetland Boundaries
- Floodplain Impacts
- Upland Vegetation Impacts

Wetland and State Open Water Impacts

- Non Tidal Permanent
- Non Tidal Temporary
- Tidal Permanent
- Tidal Temporary

0 100 200 400 Feet

New Jersey Department of Transportation

I-295 / I-76 / Route 42
Direct Connection
Camden County

FIGURE 21.1

"Alternative H1" Ecological Impacts

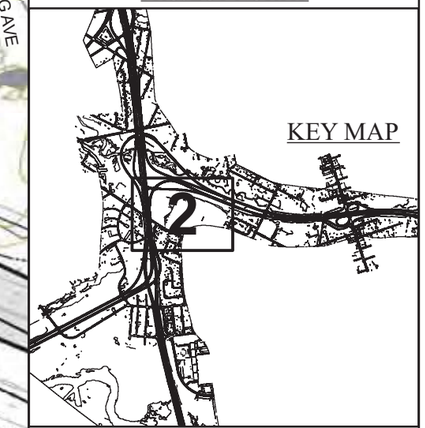
Date	April 14, 2006

Source: Dewberry Goodkind Inc. 2005, Dresdner Robin Wetland Delineation Fall 2003, and Dresdner Robin Analysis 2005

BASIN 3
RAMP A
RAMP D
RAMP D
Wetland P
Wetland A-I
Wetland N
Wetland M
Wetland K
Wetland TF
1.01
BLOCK 50.05
BOROUGH OF
MT EPHRAIM
BOROUGH OF
BELLMAWR
BLOCK 103
1
HARDING AVE
BLOCK 50
1.01
NEW ST. MARY'S
CEMETERY
WILLOW PL
FIR PL
BLOCK 49
1
HICKORY PL
DR
RAMP F
BROWNING ROAD
DEWEY RD
DEWEY RD
IVY RIDGE
WAYNE RD
BLOCK 51.09
BLOCK 51.06
KENNEDY BLVD
37

PROJECT NORTH

KEY MAP



Legend

- Existing Conditions
- Proposed Edge of Pavement
- Proposed Retaining Walls
- Proposed Slope Limits
- Proposed Drainage Improvements
- Proposed Bridges
- Spring High Tide (El. 3.81' NAVD 1988)
- Upper Wetlands Boundary (1970 Wetlands)
- Open Water
- 100-Year Floodplain
- Floodway
- Wetland Boundaries
- Floodplain Impacts
- Upland Vegetation Impacts

Wetland and State Open Water Impacts

- Non Tidal Permanent
- Non Tidal Temporary
- Tidal Permanent
- Tidal Temporary

0 100 200 400 Feet

New Jersey Department of Transportation

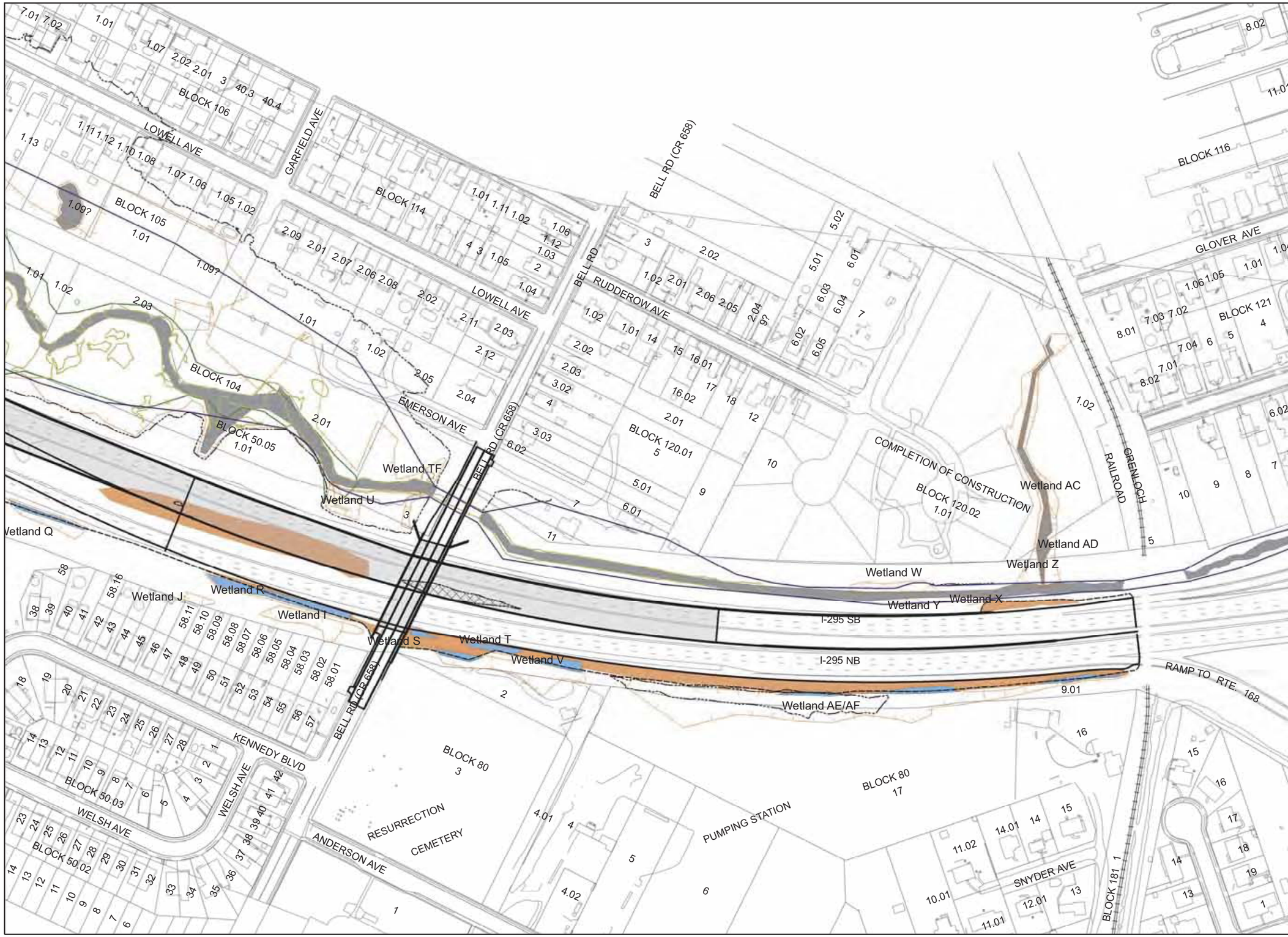
I-295 / I-76 / Route 42
Direct Connection
Camden County

FIGURE 21.2

"Alternative H1" Ecological Impacts

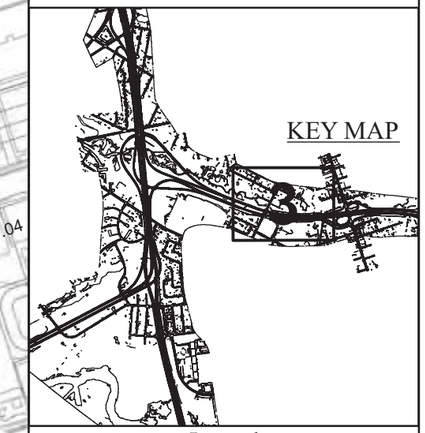
Date	April 14, 2006

Source: Dewberry Goodkind Inc. 2005, Dresdner Robin Wetland Delineation Fall 2003, and Dresdner Robin Analysis 2005



PROJECT NORTH

KEY MAP



Legend

- Existing Conditions
- Proposed Edge of Pavement
- Proposed Retaining Walls
- Proposed Slope Limits
- Proposed Drainage Improvements
- Proposed Bridges
- Spring High Tide (El. 3.81' NAVD 1988)
- Upper Wetlands Boundary (1970 Wetlands)
- Open Water
- 100-Year Floodplain
- Floodway
- Wetland Boundaries
- Floodplain Impacts
- Upland Vegetation Impacts

Wetland and State Open Water Impacts

- Non Tidal Permanent
- Non Tidal Temporary
- Tidal Permanent
- Tidal Temporary

0 100 200 400 Feet

New Jersey Department of Transportation

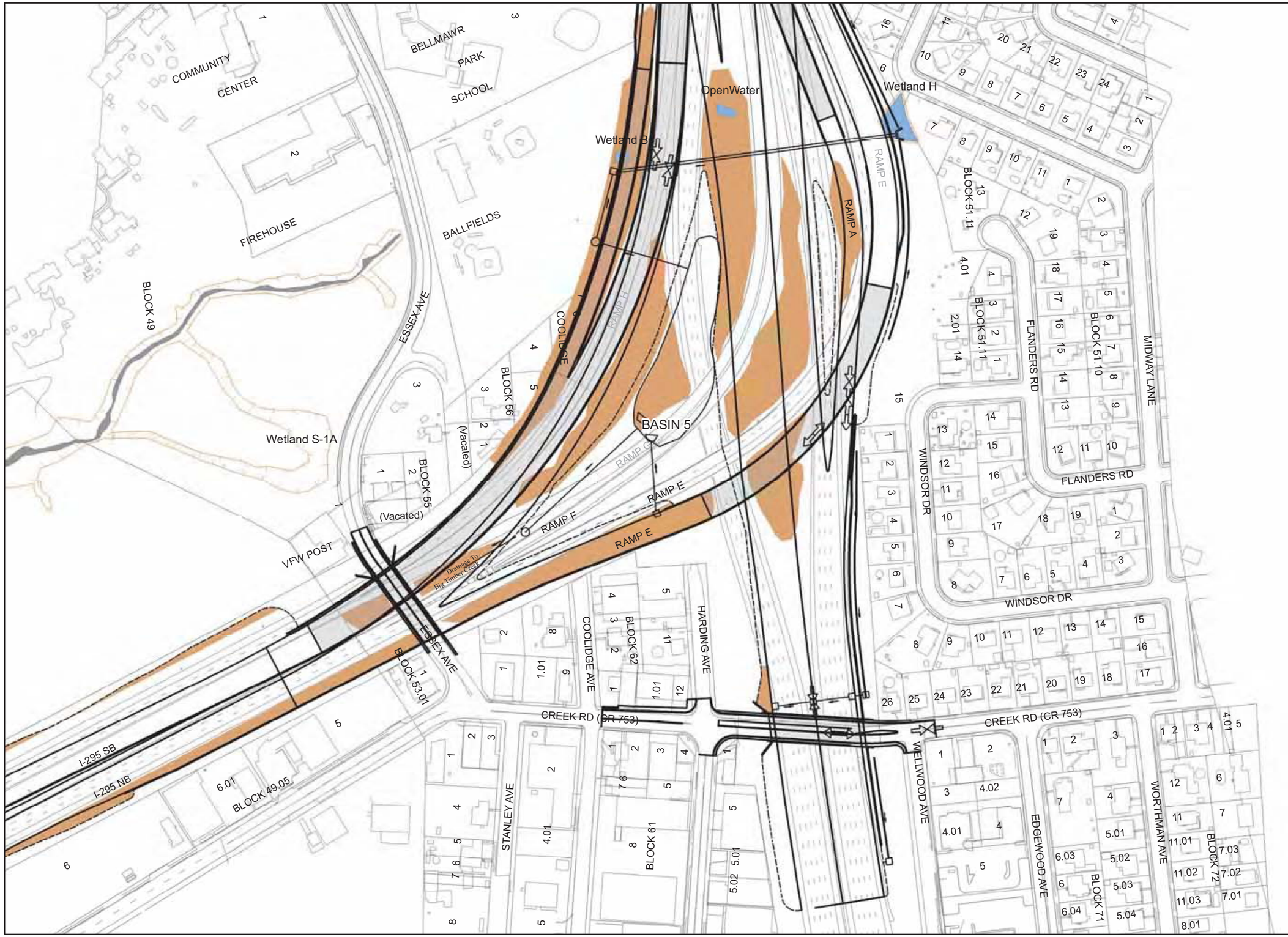
I-295 / I-76 / Route 42
Direct Connection
Camden County

FIGURE 21.3

"Alternative H1" Ecological Impacts

Date	April 14, 2006

Source: Dewberry Goodkind Inc. 2005, Dresdner Robin Wetland Delineation Fall 2003, and Dresdner Robin Analysis 2005



PROJECT NORTH

KEY MAP

Legend

- Existing Conditions
- Proposed Edge of Pavement
- Proposed Retaining Walls
- Proposed Slope Limits
- Proposed Bridges
- Spring High Tide (El. 3.81' NAVD 1988)
- Upper Wetlands Boundary (1970 Wetlands)
- Open Water
- 100-Year Floodplain
- Proposed Drainage Improvements
- Wetland Boundaries
- Floodplain Impacts
- Upland Vegetation Impacts

Wetland and State Open Water Impacts

- Non Tidal Permanent
- Non Tidal Temporary
- Tidal Permanent
- Tidal Temporary

0 100 200 400 Feet

New Jersey Department of Transportation

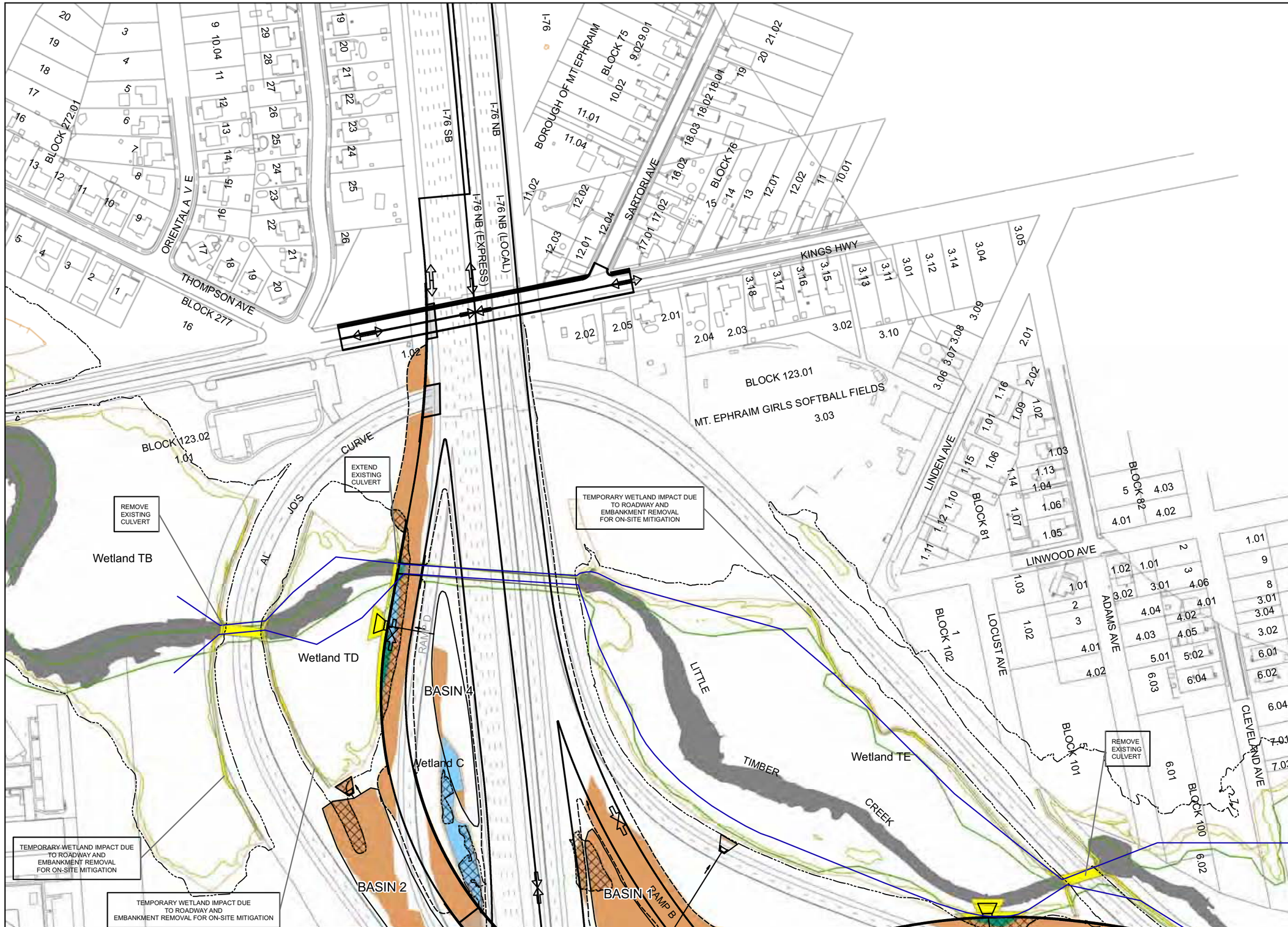
I-295 / I-76 / Route 42
Direct Connection
Camden County

FIGURE 21.4

"Alternative H1" Ecological Impacts

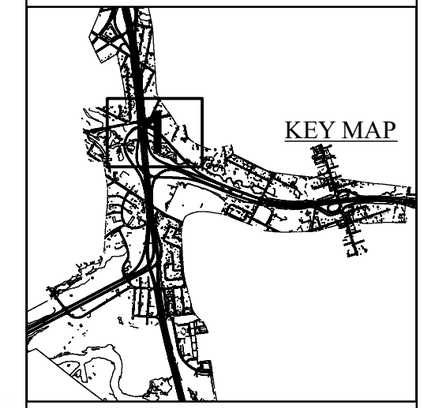
Date	April 14, 2006

Source: Dewberry Goodkind Inc. 2005, Dresdner Robin Wetland Delineation Fall 2003, and Dresdner Robin Analysis 2005



PROJECT NORTH

KEY MAP



Legend

- Existing Conditions
- Proposed Edge of Pavement
- Proposed Retaining Walls
- Proposed Slope Limits
- Proposed Drainage Improvements
- Proposed Bridges
- Spring High Tide (El. 3.81' NAVD 1988)
- Upper Wetlands Boundary (1970 Wetlands)
- Open Water
- 100-Year Floodplain
- Floodway
- Wetland Boundaries
- Floodplain Impacts
- Upland Vegetation Impacts

Wetlands and State Open Water Impacts

- Non Tidal Permanent
- Non Tidal Temporary
- Tidal Permanent
- Tidal Temporary

0 100 200 400 Feet

New Jersey Department of Transportation

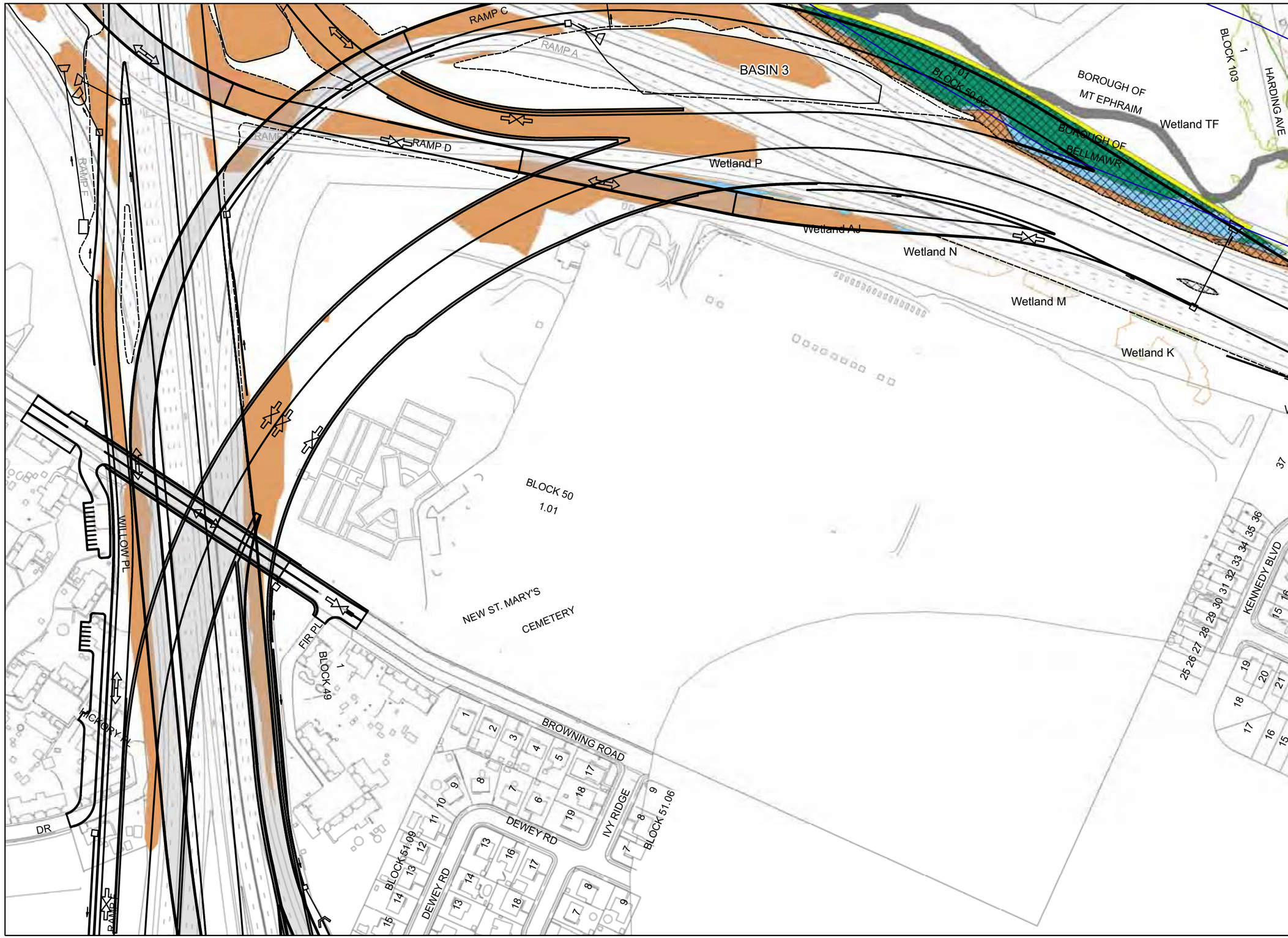
I-295 / I-76 / Route 42
Direct Connection
Camden County

FIGURE 22.1

"Alternative K" Ecological Impacts

Date	April 14, 2006

Source: Dewberry Goodkind Inc. 2005, Dresdner Robin Wetland Delineation Fall 2003, and Dresdner Robin Analysis 2005



PROJECT NORTH

Legend

- Existing Conditions
- Proposed Edge of Pavement
- Proposed Retaining Walls
- Proposed Slope Limits
- Proposed Drainage Improvements
- Proposed Bridges
- Spring High Tide (El. 3.81' NAVD 1988)
- Upper Wetlands Boundary (1970 Wetlands)
- Open Water
- 100-Year Floodplain
- Floodway
- Wetland Boundaries
- Floodplain Impacts
- Upland Vegetation Impacts

Wetlands and State Open Water Impacts

- Non Tidal Permanent
- Non Tidal Temporary
- Tidal Permanent
- Tidal Temporary

0 100 200 400 Feet

New Jersey Department of Transportation

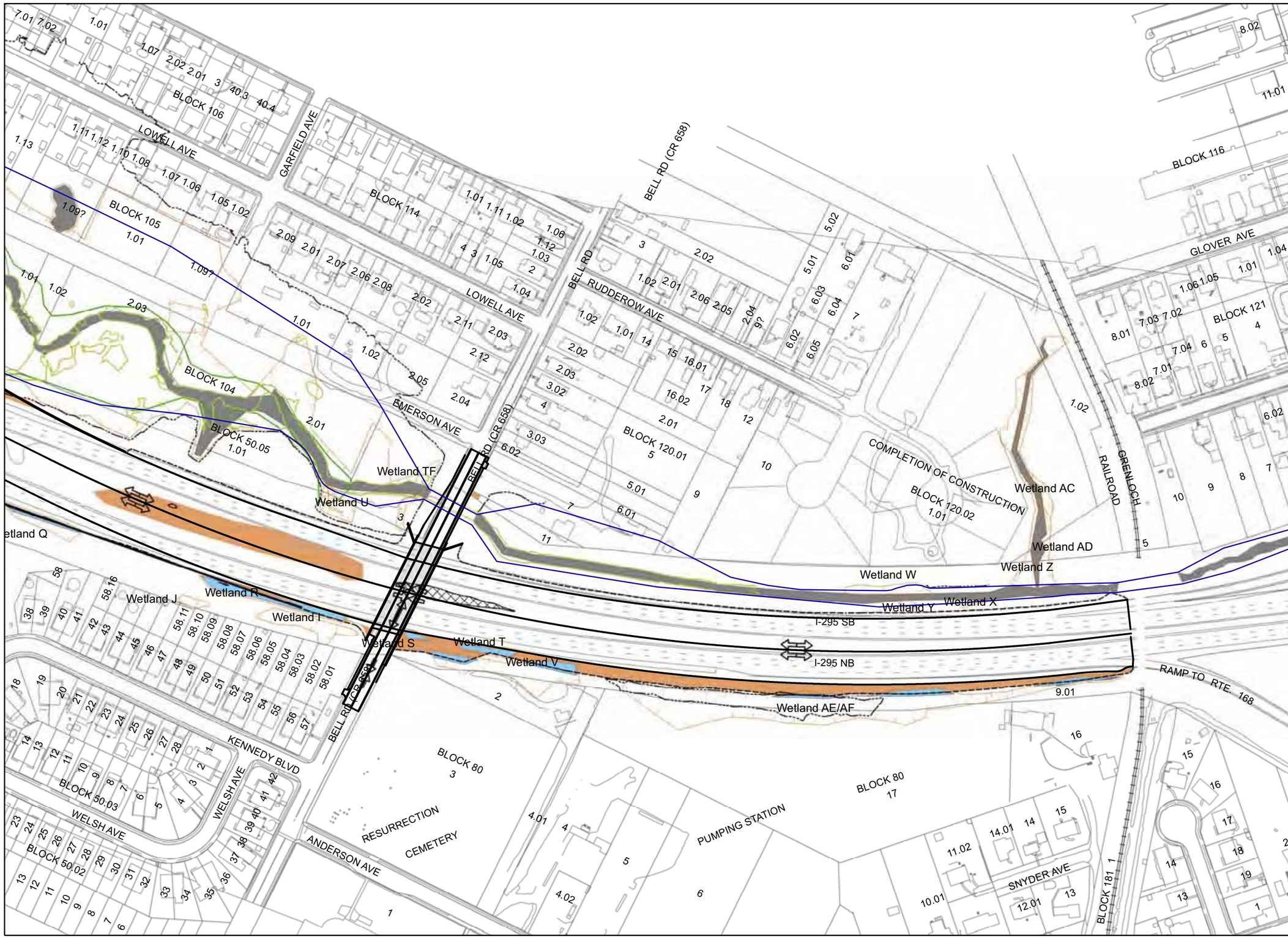
I-295 / I-76 / Route 42
Direct Connection
Camden County

FIGURE 22.2

"Alternative K" Ecological Impacts

Date	April 14, 2006

Source: Dewberry Goodkind Inc. 2005, Dresdner Robin Wetland Delineation Fall 2003, and Dresdner Robin Analysis 2005



PROJECT NORTH

KEY MAP

Legend

- Existing Conditions
- Proposed Edge of Pavement
- Proposed Retaining Walls
- Proposed Slope Limits
- Proposed Drainage Improvements
- Proposed Bridges
- Spring High Tide (El. 3.81' NAVD 1988)
- Upper Wetlands Boundary (1970 Wetlands)
- Open Water
- 100-Year Floodplain
- Floodway
- Wetland Boundaries
- Floodplain Impacts
- Upland Vegetation Impacts

Wetlands and State Open Water Impacts

- Non Tidal Permanent
- Non Tidal Temporary
- Tidal Permanent
- Tidal Temporary

0 100 200 400 Feet

New Jersey Department of Transportation

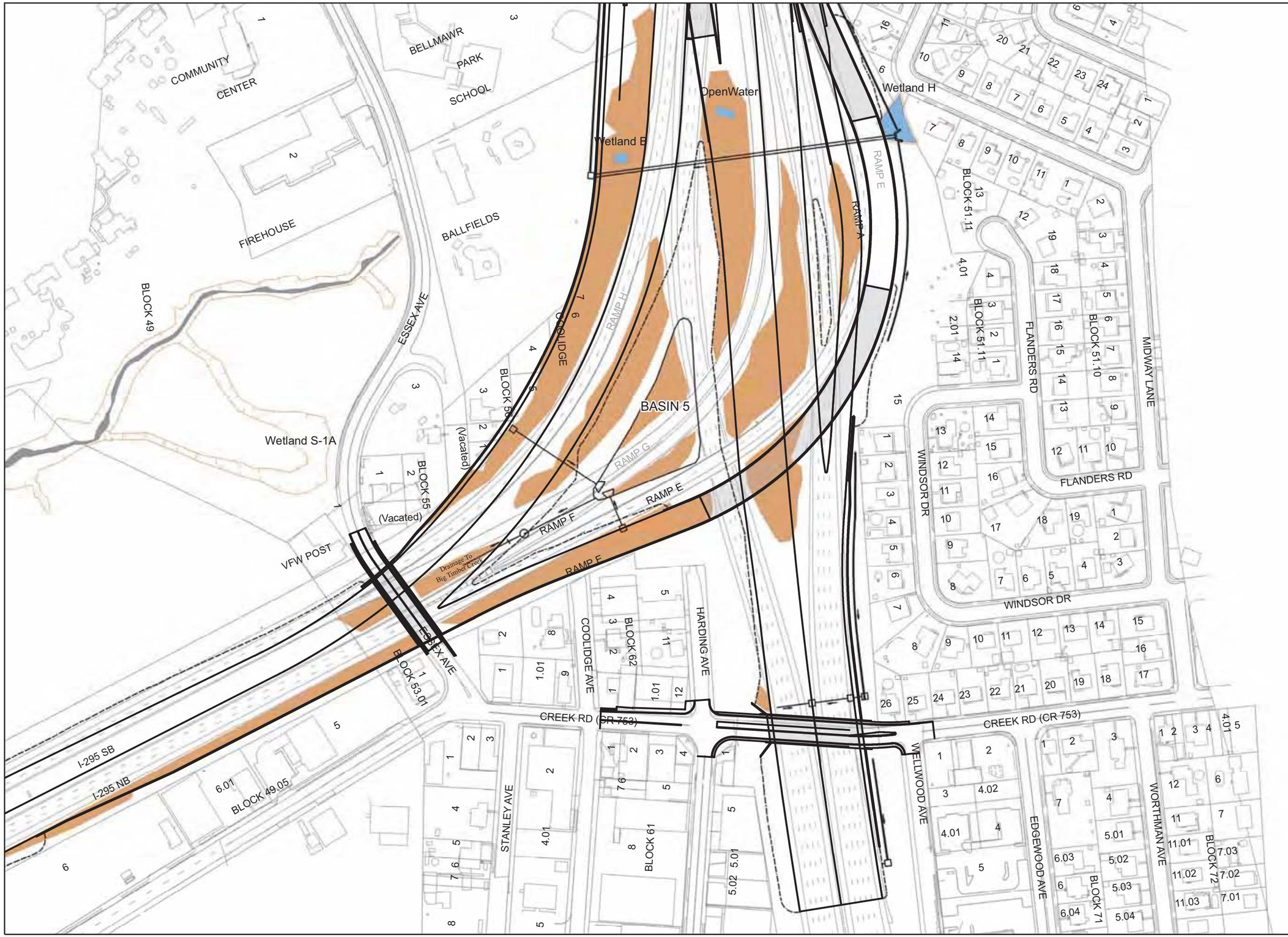
I-295 / I-76 / Route 42
Direct Connection
Camden County

FIGURE 22.3

"Alternative K" Ecological Impacts

Date	April 14, 2006

Source: Dewberry Goodkind Inc. 2005, Dresdner Robin Wetland Delineation Fall 2003, and Dresdner Robin Analysis 2005



PROJECT NORTH

KEY MAP

Legend

- Existing Conditions
- Proposed Edge of Pavement
- Proposed Retaining Walls
- Proposed Slope Limits
- Proposed Drainage Improvements
- Proposed Bridges
- Spring High Tide (El. 3.81' NAVD 1988)
- Upper Wetlands Boundary (1970 Wetlands)
- Open Water
- 100-Year Floodplain
- Wetland Boundaries
- Floodplain Impacts
- Upland Vegetation Impacts

Wetlands and State Open Water Impacts

- Non Tidal Permanent
- Non Tidal Temporary
- Tidal Permanent
- Tidal Temporary

0 100 200 400 Feet

New Jersey Department of Transportation

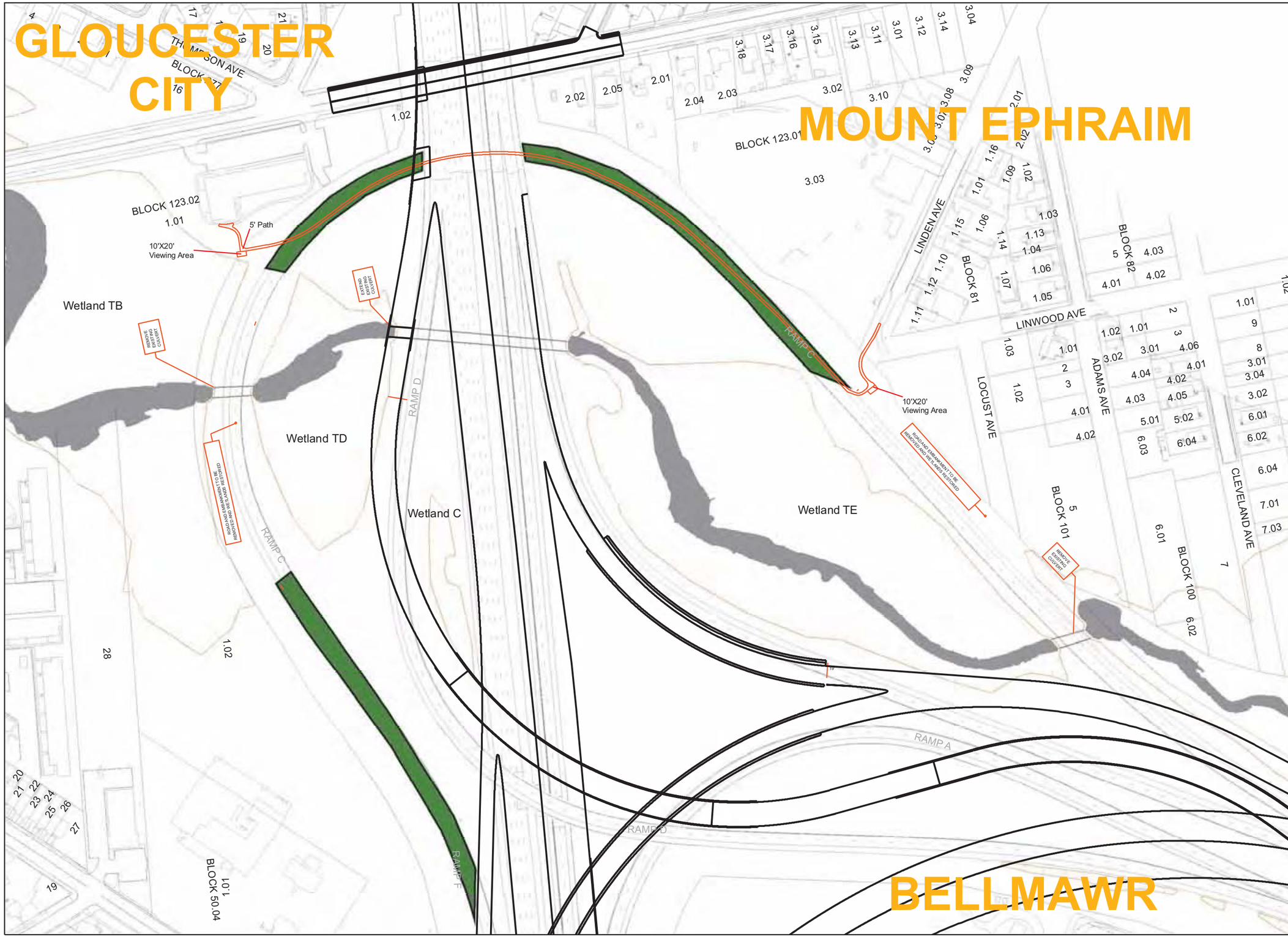
I-295 / I-76 / Route 42
Direct Connection
Camden County

FIGURE 22.4

"Alternative K" Ecological Impacts

Date	April 14, 2006

Source: Dewberry Goodkind Inc. 2005, Dresdner Robin Wetland Delineation Fall 2003, and Dresdner Robin Analysis 2005



PROJECT NORTH

Legend

- Existing Conditions
- Edge of Roadway
- Proposed Waterfront Access Enhancement
- Open Water
- Upland Vegetation Mitigation Areas
- Wetland Boundaries

0 100 200 400 Feet

New Jersey Department of Transportation

I-295 / I-76 / Route 42
Direct Connection
Camden County

FIGURE 23

Proposed Enhancements
Alternatives D, G2, and K

Date	April 14, 2006

Source: Dewberry Goodkind Inc., 2005 and Dresdner Robin Analysis, 2005

TABLE 5

I-295 / I-76 / Route 42 Direct Connection

Stormwater Management - Water Quality Treatment Summary

	Water Quality Treatment Required					**Water Quality Treatment Provided**		
	New Pavement (Acres)	TSS Removal Rate (%)	Reconstructed Pavement (Acres)	TSS Removal Rate (%)	**Total Required (Acres)**	Pavement Draining to Basins (Acres)	TSS Removal Rate (%)	**Total Provided (Acres)**
Alternative	*(1)*	*(2)*	*(3)*	*(4)*	*(5) = (1x2) + (3x4)*	*(6)*	*(7)*	*(8) = (6x7)*
D	19	0.80	23	0.50	**27**	33	0.90	**30**
D1	23	0.80	23	0.50	**30**	35	0.90	**32**
G2	22	0.80	23	0.50	**29**	34	0.90	**31**
H1	25	0.80	24	0.50	**32**	36	0.90	**32**
K	25	0.80	16	0.50	**28**	34	0.90	**31**

The following are definitions of terminology used in Table 5:

Water Quality Treatment Required = Total suspended solids (TSS) removal required by NJDEP Stormwater Management Rules (N.J.A.C. 7:8).

New Pavement = Net increase in pavement for each respective alternative including credit for existing pavement removed.

Reconstructed Pavement = Area of pavement removed and replaced within the footprint of existing pavement.

TSS Removal Rate =Removal rate required as per N.J.A.C. 7:8.

Total Required = Total EQUIVALENT pavement requiring water quality treatment for each alternative based on 100% TSS removal.
Pavement Draining to Basins = Sum of all pavement areas draining to the 5 proposed bioretention basins for each respective alternative.

Total Provided = Total EQUIVALENT pavement receiving water quality treatment for each alternative based on 100% TSS removal.

The bioretention basins would be designed and utilized to meet the current NJDEP stormwater management requirements (N.J.A.C. 7:8). Each bioretention basin would consist of a soil bed planted with native vegetation located above underdrained sand and stone layers. Stormwater runoff entering the bioretention basin would be filtered first through the vegetation, and then through the soil and sand mixture, before being conveyed by the underdrain system to the outlet and receiving waterway or storm sewer. The basin would be designed such that the water quality storm, defined as 1.25" of rainfall within 2 hours by N.J.A.C. 7:8, would pass through the

basin in this manner, thereby resulting in the removal of 90 percent of the total suspended solids (TSS) from the runoff. The outlet structure typically would consist of a rectangular structure with a combination of orifice and weir openings set above the maximum water quality storm level, designed to regulate the outflow rate as required.

The proposed additional pavement constructed for each alternative would slightly reduce groundwater recharge with the elimination of the pervious area it covers. Calculations regarding groundwater recharge in relation to the five Build Alternatives have not been made. These calculations would be made after the selection of a preferred alternative. However, the proposed bioretention basins would provide for groundwater recharge, if needed, by allowing the underdrain system for each basin to infiltrate to underlying soils. Conversely, if groundwater recharge is not required, or not desired (such as if the existing water table is shallow in the area of the basins), the underdrain for each bioretention basin would be fitted with an impermeable liner to prevent runoff from infiltrating to underlying soils. After the calculations have been performed, then determination would be made as to the need for groundwater recharge from the bioretention basins.

In either event, no significant impact to the quantity of groundwater is expected to result from the Build Alternatives. Either the calculations would demonstrate that the effect on recharge is minor or the basins would provide for recharge. None of the alternatives are expected to impact quantity or quality of local public potable water supplies due to the depth of the potable water supply wells and the use of bioretention basins. Under all the alternatives, construction activities would be conducted pursuant to an approved soil erosion and sediment control plan and, therefore, are not expected to result in significant impacts.

Based on the project size and volume of excavation below groundwater in all of the alternatives, dewatering activities beyond thirty days in a year and 100,000 gallons per day (gpd) is expected. A short-term water use permit-by-rule would be applicable since the dewatering is related to construction activity and cofferdams would be utilized.

Additionally, the dewatering effluent is expected to be discharged to surface water and a NJPDES General Permit would be required.

If it is determined during initial design investigation that soil or groundwater contamination is present, then the contaminated material would be properly characterized for proper management during construction. Anticipated remediation costs for contaminated properties would be considered during the ROW acquisition process. Remedial actions to be conducted by NJDOT as part of the roadway construction would be addressed in construction plans and specifications accordingly.

No cumulative or secondary impacts are anticipated for any of the Build Alternatives.

5.3.2 No Build

No groundwater impacts would result from the No Build alternative, other than those that are presently occurring from the existing stormwater drainage system.

5.4 Surface Water Quality

5.4.1 Alternatives D, D1, G2 and K

Potential impacts to surface water quality relate mainly to non-point source stormwater runoff impacts. The greatest potential for long-term impacts to surface water quality associated with this project would be increased highway-derived contaminants in stormwater runoff reaching LTC and BTC and surrounding wetlands. However, all of the proposed Build Alternatives incorporate stormwater pretreatment facilities in their design.

Some of the most common pollutants found on highway surfaces include bacteria, heavy metals, inorganic salts, nutrients (e.g., nitrogen, phosphorus), organic matter, pesticides, and dropped or windblown particulates, such as dust, clay, glass and silt. These pollutants find their way into the surrounding environment via precipitation and stormwater runoff.

The heaviest pollutant loads occur immediately after rainfall, flushing the contaminants from roadway surfaces. Such short-term loadings result in an elevated biological oxygen demand and an increase in heavy metal and chemical contamination settlement into the riverbed sediments. Although these potential Build Alternatives would result in an overall increase in impervious area and runoff (ranging from 19 acres for Alternative D to a high of 25 acres for Alternatives H1 and K), the anticipated unrestricted flow of vehicles would reduce conditions of stopping, idling, and delays, and result in less time for traffic to deposit pollutants. Additionally, the ratio of cumulative impervious roadway surface to total watershed area for the receiving waters (dilution ratio) is sufficient to protect aquatic life downstream within the watershed. Based on a 25 acre increase in new pavement, approximately 0.01 percent of the total Lower Delaware River tributaries watershed would be impacted. The overall percent of new impervious area ranges from a low of approximately 45% for Alternative D to a high of approximately 59% for Alternatives H1 and K (see Table 6).

TABLE 6
I-295/I-76/Route 42 Direct Connection
INCREASE IN IMPERVIOUS AREA

Alternative	New Pavement (Acres)	Percent Increase*
D	19	45%
D1	23	54%
G2	22	52%
H1	25	59%
K	25	59%

* Percent increase is based on existing pavement equaling 42 acres

Pursuant to N.J.A.C. 7:8-2.2, the proposed alternatives would be designed to meet the NJDEP goals of stormwater management planning, including:

- reducing flood damage
- minimizing, to the extent practicable, any increase in stormwater runoff
- reducing soil erosion
- assuring the adequacy of existing and proposed culverts and bridges
- maintaining groundwater recharge

- preventing, to the greatest extent feasible, an increase in non-point source pollution
- maintaining the integrity of stream channels
- minimizing pollutants in stream channels
- protecting public safety.

The stormwater management plan developed for each Build Alternative would meet NJDEP Stormwater Regulation requirements, and provide improvements over existing conditions. Existing water quality measures are limited to treatment achieved along portions of the interchange where runoff drains through ditches and swales before entering surface water bodies.

The proposed stormwater drainage system, including the upgraded piping system pump stations and new pretreatment facilities, would be a significant improvement over the existing umbrella drainage system. The proposed drainage system provides for pretreatment of runoff from the water quality storm through the use of bioretention facilities. Storms of greater rainfall, such as the 2-, 10- and 100-year storms, would have excess runoff volume pass through an outlet control structure to the receiving watercourse. See Section 5.3.1 for a description of the proposed bioretention systems.

The drainage and stormwater management plan for each alternative would provide for treatment of contaminants in stormwater runoff from both the net additional pavement and the rebuilt pavement proposed for this project. Non-structural measures would be incorporated to the greatest extent practicable in later design stages.

The majority of the interchange area would drain to proposed bioretention basins prior to discharging to outfalls. Stormwater treatment facilities within the interchange area would treat the required area/volume of stormwater runoff in accordance with NJDEP stormwater management requirements. There are areas that cannot be treated (along I-295 east and west of the interchange, I-76 north of the interchange, and Route 42 south of the interchange) due to ROW, elevation and grade constraints. The remaining untreated drainage would continue to discharge, via existing and proposed storm sewer outlets, to Little Timber Creek or into conveyance systems discharging to Big Timber Creek. However, overall the project would still meet NJDEP stormwater management requirements.

In conjunction with the roadway drainage systems, stormwater pumping stations would be required for each alternative for areas where gravity flow is insufficient. Alternatives D, G2 and K would include one stormwater pumping station in the vicinity of Browning Road, within the Annunciation B.V.M. Church property. Alternatives D1 and H1 would utilize 2 pumping stations along Ramps D and F, on opposite sides of Little Timber Creek, each discharging into a bioretention basin. The proposed stormwater pumping stations for each Build Alternative would provide additional water quality treatment measures through screening of runoff and deposition of solids within the wet well areas of each facility.

Alternatives D and K would include the removal of portions of Al Jo's Curve and two (2) existing Ramp C culverts, and a 20-foot extension of the existing Ramp D culvert based upon the proposed new Ramp D location. Alternative D1 would include the relocation of the two (2) existing Ramp C culverts based upon the new Ramp C alignment, along with a 20-foot extension

of the existing Ramp D culvert based upon the proposed new Ramp D location. Alternative G2 includes removal of Al Jo's Curve and two (2) existing Ramp C culverts and 20-foot extension of the existing Ramp D culvert based upon the proposed new Ramp D location.

The relocated and extended culverts would accommodate existing stream flow and be designed to pass the 100-year flood.

All of these Build Alternatives would have similar stormwater management systems, except for the number of pumping stations, and the discharge impacts to the surface waters are anticipated to be similar with no appreciable differences between alternatives. Alternative D, however, has the smallest percentage increase in new pavement at 45%, while the other Build Alternatives range from 52% to 59% (see Table 6).

In addition, short-term water quality impacts can occur resulting from construction-related soil erosion that can increase turbidity and suspended solids, lower dissolved oxygen, and alter pH values. Even though acid soils exist within the study area, appropriate mitigation measures would be undertaken to ensure that backfill material would not be acidic. Therefore, no acid soils or contaminated soils would be used as backfill. Water quality impacts due to soil erosion and sedimentation during construction would be minimized through implementation of a soil erosion and sediment control plan in accordance with NJDOT standards. Construction techniques, such as prefabrication of drainage structures, also can significantly reduce on-site construction duration and subsequent erosion and sedimentation concerns.

5.4.2 Alternative H1

Alternative H1 would have similar impacts as described in Section 5.4.1 for the other Build Alternatives; however, Alternative H1 is the only alternative that would require a stream channel relocation. Alternative H1 would include the relocation of the two existing Ramp C culverts, the relocation of approximately 250 feet of Little Timber Creek channel near Ramp C, and a 20-foot extension of the existing Ramp D culvert. A portion of the LTC channel relocation (approximately 80 feet) would be confined flow. This portion represents approximately 0.6 percent of the total length of LTC. An increase of 59% of impervious area is anticipated for this alternative (See Table 6).

Additionally, Alternative H1 would utilize two pumping stations along Ramps D and F, on opposite sides of Little Timber Creek, each discharging into a bioretention basin.

No cumulative or secondary impacts are anticipated for any of the Build Alternatives.

5.4.3 No Build

Any ongoing impacts from the existing roadway and drainage system would remain.

5.5 Aquatic Ecology

5.5.1 Alternatives D, D1, G2 and K

Pile-driving and construction activities near LTC may temporarily increase sediment within the watercourse. However, due to the relatively narrow width and shallow depth of the channel, no significant impact is anticipated. The area where construction impacts are likely to occur for all alternatives is mainly mudflat. The impacts on mudflat and associated benthic species would be minimized through the use of cofferdams, where necessary, to separate work areas from any potentially ecologically sensitive areas. An increase in impervious area associated with road upgrades would be mitigated through the proposed drainage system which would provide for pretreatment of runoff from stormwater through the use of detention and bioretention facilities and grass-lined swales. This new drainage system would result in the enhancement of the stormwater treatment in the area of road improvement as previously discussed in Section 5.4.

None of the five (5) Build Alternatives would have direct impacts to the BTC or the unnamed tributary that flows through the western portion of the study area and eventually to the BTC. Some temporary construction impacts may be experienced via storm water control systems, etc.; however, these impacts should not result in disturbance of the waterways.

Based upon this information and after review of the NJDEP *Freshwater Fish Management Database Reports,* the NMFS provided correspondence dated July 18, 2005 (Appendix D). The letter indicates that the study area contains no sightings or evidence of threatened or endangered fish species. NMFS recommends a seasonal restriction for "in water" activities or work within the BTC from March 15 to June 30 (the breeding season) with the caveat that if there is no "in water" disturbance, then no restrictions are necessary. Furthermore, any BTC work would be conducted within the upper reaches of the small, unnamed tributary. NJDOT typically conducts "in water" construction activities during the breeding season provided that cofferdams or other closely sealed cells are utilized, when there is a potential for a substantial increase in turbidity. Based on the above, no restrictions are anticipated for work within the LTC corridor.

The fish species of concern listed within the NMFS letter are presented below by watershed:

BTC	**LTC**
Alewife (*Alosa pseudoharengus*)	None
Blueback herring (*Alosa aestivalis*)	
Striped bass (*Morone saxatilis*)	
American shad (*Alosa sapidissima*)	

For Alternatives D, G2 and K, modifications of the stream would be limited to culvert removal, 20-foot culvert extensions, and bank restoration. Any impact to benthic habitat would be temporary. A soil erosion and sediment control plan would be prepared and implemented to minimize impacts associated with bank erosion and channel cuts during construction. Stream areas disturbed by construction activity would receive stream restoration measures. The culvert removal and bank/stream restoration activities associated with the removal of Al Jo's Curve in Alternatives D, G2, and K would result in a long-term benefit for aquatic ecology by "day-lighting" these additional portions of LTC. In regard to Alternative K, there is the potential in three (3) locations (see Figure 22.2) for up to a total of approximately 200 feet of channel/bank modifications based on the proximity of the proposed roadway to the stream channel. These

potential modifications (e.g., rip-rap, etc.) may be necessary to protect the proposed roadway retaining wall from erosion and scour. The potential need for these modifications would be determined during the final design process.

Alternative D1 would require the relocation and/or extension of existing culverts. This would result in a minimal, long-term adverse impact to aquatic ecology. The activities associated with Alternative H1 would have a greater adverse impact, as discussed below.

5.5.2 Alternative H1

Alternative H1 would require a channel relocation. Approximately 250 feet of the LTC channel would be relocated under Alternative H1. A portion of this channel (approximately 80 feet) would be confined flow within a culvert. Benthic habitat would be lost within the culverted area. Within the balance of the relocated channel, benthic habitat would be temporarily impacted, but once construction is completed, the habitat is expected to return over the long term. Additionally, an increase in erosion and channel cuts would be anticipated for the short term, but this would be mitigated by implementation of a soil erosion and sediment control plan. Portions of the existing stream channel would be impacted by construction of the proposed roadway, in the area where the relocation would be required.

No cumulative or secondary impacts are anticipated for any of the Build Alternatives.

5.5.3 No Build

No aquatic ecology impacts will result with the No Build alternative, other than those that exist with the present stormwater drainage system

5.6 Floodplain

5.6.1 Alternatives D, D1, G2, H1 and K

Filling activities within the floodplain would be related to the placement of piles and roadway structures themselves throughout the interchange. The proposed floodplain crossing would not constitute a significant risk to life and property. Furthermore, construction staging would not interrupt service by emergency vehicles or eliminate evacuation routes during flood events, since there are alternate routes, which could be used in the event of an emergency.

Table 7 indicates the floodplain impacts for each alternative. All of the floodplain impacts would be within the 100-year floodplain zone. Most of the floodplain impacts would be associated with fill. Alternative D1 would have the greatest impact at 4.449 acres and Alternative G2 would have the least impact with 0.900 acres affected. Figures 18 to 22 show the location of floodplain impacts for each alternative. Most of the floodplain impacts would be along LTC in tidal areas. NJDEP stream encroachment requirements do not apply to tidal areas.

Compliance with 23 CFR 650 Subpart A

The FHWA has developed guidelines for encroachment in the floodplain (23 CFR 650 Subpart A). The purpose of this regulation is to prescribe "FHWA policies and procedures for the location and hydraulic design of highway encroachment on floodplains."

The guidelines require that appropriate and practicable steps be taken to minimize impacts including longitudinal encroachments, base floodplains (100-year floodplain), "restore and preserve the natural and beneficial flood-plain values" and avoid incompatible floodplain development.

There are no practicable Build Alternatives that would avoid impacts to floodplains. NJDOT evaluated twenty-six possible alternatives in an extensive screening process that included representatives from the USACOE, the USEPA and the NJDEP. All of the Build Alternatives evaluated would have resulted in floodplain impacts. The five Build Alternatives studied in this TES were selected as having the least potential adverse impacts, including those related to floodplains, while still meeting the project purpose and need.

The only alternatives evaluated that might have resulted in less floodplain impacts would have divided the Bellmawr Park community and resulted in the most severe relocation of residents. These socioeconomic impacts were not acceptable to the community.

To minimize longitudinal encroachments and overall floodplain impacts, the five Build Alternatives have been evaluated with the objective of reducing the extent of the floodplain impacts to the maximum extent practicable. Each of the five Build Alternatives has been designed to comply with the minimization requirement. Specifically, retaining walls are proposed to minimize slopes. Culverts and bridges would allow unimpeded stream flow. Further minimization may be feasible at subsequent steps in the design process.

Each of the five Build Alternatives include measures (floodwalls and/or berms) which would isolate the roadways from flooding from Little Timber Creek for the 100-year tidal event. Roadway storm sewers and stormwater pumping stations would be designed in accordance with NJDOT drainage design criteria to provide adequate drainage within the project limits.

The project alternatives would result in minimal fill placed in the floodway necessitated by the relocation of the existing ramps. This would be offset by the removal of an equal or greater quantity of floodway fill under each proposed build alternative. The result would be no net increase in fill within the floodway and no associated flooding impacts. The following is a summary of floodway impacts for each Build Alternative:

- Alternative D- Minimal fill for Ramps B and C; offset by the removal of existing Ramp C.
- Alternative D1- Minimal fill for Ramp C; offset by the removal of existing Ramp C.
- Alternative G2- Insignificant fill associated with the relocation of Ramp C; offset by the removal of portions of the fill embankment for existing Ramp C.
- Alternative H1- Insignificant fill for Ramps B and C; offset by the removal of a portion of the existing Ramp C.
- Alternative K- Minimal fill for Ramps B and C; offset by the removal of a portion of existing Ramp C.

To comply with Executive Order 11988, entitled "Floodplain Management," the project would be designed to avoid floodplain impacts where practicable, minimize impacts to the greatest

extent possible and to adequately mitigate unavoidable impacts. There is no Build Alternative that would completely avoid floodplain impacts. Each Build Alternative would include measures (floodwalls and/or berms) which would isolate flooding from Little Timber Creek for the 50- and 100-year tidal flood events. Roadway storm sewers and stormwater pumping stations would be designed in accordance with NJDOT drainage design criteria to provide adequate drainage within the study limits.

No secondary impacts are anticipated for any of the Build Alternatives. In addition to this project, the NJDOT Missing Moves project, which includes a highway connection between I-295 and Route 42, is located south of the study area. A cumulative total of as much as 7.15 acres (4.45 acres for Alternative D1 and 2.70 acres for the Missing Moves preferred alternative) of the 100-year floodplain of the LTC and BTC watersheds would be impacted. This amount equals approximately 0.01 percent of the 100-year floodplain located within the Lower Delaware watershed management area.

It is possible that the Missing Moves project would not proceed. In this event, there would be no cumulative floodplain impacts.

TABLE 7
I-295/I-76/Route 42 Direct Connection
FLOODPLAIN IMPACTS

Alternative	Floodplain Impacts (acres)
D	2.275
D1	4.449
G2	0.900
H1	4.263
K	3.036

5.6.2 No Build

No floodplain impacts will result from the No Build alternative.

5.7 Wetlands

5.7.1 Alternatives D, D1, G2, H1 and K

Wetland impacts associated with these Build Alternatives are related to the new roadways, driving of pilings, shading, and the placement of embankment fill. The following assumptions were developed to help in the quantifying of wetland impacts:

- Freshwater (Non-Tidal) wetland impacts are calculated from the wetland delineation line to Spring High Tide Line or Upper Wetland Boundary Line (whichever is higher)
- Tidal wetland impacts are calculated from below the Upper Wetland Boundary or Spring High Tide Line (whichever is higher) to the edge of construction or to the edge of State Open Water
- State Open Water impacts are calculated from the lower edge of the wetlands to the edge of construction

- Ten foot temporary impact is assumed for the construction of retaining walls in wetlands not along Little Timber Creek due to construction work areas.
- Ten foot temporary impact is assumed for the construction of the outfalls in wetlands. Impacts as a result of the construction of headwalls, end sections and ripraps are quantified as permanent impacts
- Five foot permanent impact is assumed beyond the proposed fill slopes to account for the potential slump of fill materials and the minor erosion of soils upgradient of the silt fence.
- For roadway removal abutting wetlands, 5 feet of temporary impacts are assumed beyond the existing fill slopes.
- Along Little Timber Creek (Wetland TF) where rip-rap is proposed, a ten foot permanent impact is assumed. A ten foot temporary impact beyond the permanent impact due to construction work areas is assumed.
- Any elevated road area that crosses over wetlands for Alternatives G2 and H1 will be assumed to create a permanent impact.

Figures 18 to 22 and Table 8 show the wetland impacts for each alternative. Alternative D1 would have the greatest permanent wetland/state open water impact with 3.732 acres affected. Alternative G2 would have the lowest permanent impact with 0.952 acres affected. Since all of the alternatives would have wetland impacts, mitigation would be required.

Alternative G2 would have the least freshwater wetland buffer impact with 2.479 acres affected while Alternative H1 would have the greatest amount of wetland buffer affected (4.674 acres). The buffer area is located within the upland vegetation area discussed in Section 4.8.

TABLE 8
I-295/I-76/Route 42 Direct Connection
WETLAND IMPACTS (Acres)

	Fresh Water Tidal		State Open Water (Tidal)		Fresh Water (Non-Tidal)		State Open Water (Non Tidal)		Total Wetland and SOW Impacts		Wetland Buffer Impact
Alternative	Perm	Temp	Perm	Temp	Perm	Temp	Perm	Temp	Perm	Temp	
Alternative D	0.637	0.568	0.010	0.102	1.278	0.313	0.046	0	1.971	0.983	3.586
Alternative D1	2.139	0.657	0.064	0.068	1.489	0.110	0.040	0	3.732	0.835	4.199
Alternative G2	0.041	0.217	0.010	0.102	0.855	0.255	0.046	0	0.952	0.574	2.479
Alternative H1	1. 534	0.640	0.195	0.077	1.396	0.156	0.026	0	3.151	0.873	4.674
Alternative K	1.443	0.694	0.012	0.134	1.400	0.280	0.045	0	2.900	1.108	3.351

Perm- Permanent
Temp- Temporary

The National Science Foundation 1995, and Mitsch 1993, have developed a method to assess wetland functions and values. Based on this information, Table 9 describes the wetland impacted by each Build Alternative and its wetland functions and values. Two types of wetland functions and values are identified for the impacted wetlands. All of the freshwater (non-tidal) wetlands provide "short term surface water storage", which help in the reduction of downstream flood peaks. These wetlands are small, isolated wetlands. All of the Build Alternatives would

completely eliminate Wetlands AJ, B, C, H, P R, S and T. Only one of these eight wetlands (Wetland C) is defined by NJDEP as having an Intermediate Resource Value. Wetland C is characterized as being a wetland due to the area being poorly drained. The remaining seven wetlands are classified as having Ordinary Resource Value.

All of the Build Alternatives would also reduce the size of Wetlands AE/AF, K, N and Q to a small degree (about 10 percent or less). Wetlands AE/AF, K and Q are classified as Intermediate Resource Values, with Wetland N having an Ordinary Resource Value. Wetland V (classified as an Intermediate Resource Value) would be more heavily impacted depending on the alternative (16 to 27 percent). The maximum amount of these isolated wetland impacts would be 0.85 acres. The new stormwater system would improve upon the lost functions of these wetland areas and help to alleviate flooding in this area. None of the impacted wetlands are classified as having an Exceptional Resource Value as defined by NJDEP. Additionally, due to their relatively small size, loss of habitat is considered to be minimal. The wild rice stands discussed in Section 4.7 were not found in these wetlands.

The remaining wetlands (TB, TD, TE and TF) are all tidally influenced and represent the largest wetlands within the study area. These wetlands provide long term surface water storage and habitat for vegetation and wildlife. All of these wetlands are classified as Intermediate Resource Value. The total amount of these tidally influenced wetlands is 41.16 acres. Alternative D1 would impact 2.895 acres of these wetlands or 7.0 percent. Alternative G2 would have the smallest effect on these wetlands, 0.103 acres or 0.25 percent. Wild rice stands were identified within these wetlands; however, the impacted areas are along the edge of each wetland with most of the wetland habitat remaining intact. The wild rice stands were identified in the central, lower elevation portions of these wetlands.

TABLE 9
I-295/I-76/Route 42 Direct Connection
WETLAND FUNCTIONS/VALUES
AND IMPACTS BY ALTERNATIVE

Impacted Wetland	Location	Wetland Description	NJDEP Approved Wetland Resource Value	Total Wetland Acreage	Acreage Impacted by Alternative					Wetland Functions/Values
					D	D1	G2	H1	K	
Wetland AE/AF	East of Bell Rd. W.of RR bridge	North and South side of Channel	Intermediate	0.939	0.092	0.092	0.092	0.092	0.092	Short Term Surface Water Storage/Reduction of Flooding (percent of total wetland impacted is 9.8 percent)
Wetland AJ	Along I-295 NB	Seeps along similar elevation of the slope	Ordinary	0.007	0.007	0.007	0.007	0.007	0.007	Short Term Surface Water Storage/Reduction of Flooding (100 percent of wetland is impacted)
Wetland B	Near ballfield @ Essex Rd.	Storm water and high water event flooding and/or saturation	Ordinary	0.014	0.014	0.014	0.014	0.014	0.014	Short Term Surface Water Storage/Reduction of Flooding (100 percent of wetland is impacted)
Wetland C	At I-295 SB ramp from I-76 EB	Storm water is poorly drained from this infield area of I-295	Intermediate	0.290	0.290	0.290	0.290	0.290	0.290	Short Term Surface Water Storage/Reduction of Flooding (100 percent of wetland is impacted)
Wetland H	At corner of Colonial and Dewey	Seep and drainage from upland areas to channel	Ordinary	0.098	0.098	0.098	0.098	0.098	0.098	Short Term Surface Water Storage/Reduction of Flooding (100 percent of wetland is impacted)
Wetland K	South of St. Mary's Cemetery	Seep/spring flow to drop inlet	Intermediate	0.244	0.001	0.001	0.001	0.001	0.001	Short Term Surface Water Storage (less than 1 percent of wetland is impacted)
Wetland N	Along I-295 NB	Seeps along similar elevation of the slope	Ordinary	0.144	0.015	0.015	0.015	0.015	0.015	Short Term Surface Water Storage (10.4 percent of wetland is impacted)
Wetland P	I-295 NB @ on ramp from NB 42	Seeps along similar elevation of the slope	Ordinary	0.081	0.081	0.081	0.081	0.081	0.081	Short Term Surface Water Storage/Reduction of Flooding (100 percent of wetland is impacted)
Wetland Q	Along I-295 NB	Seeps along similar elevation of the slope	Intermediate	0.074	-	-	-	0.034	0.034	Short Term Surface Water Storage/Reduction of Flooding (alternative with largest percent of total wetland impacted is 45.9 percent)
Wetland R	Along I-295 NB	Seeps along similar elevation of the slope	Ordinary	0.108	0.108	0.108	0.108	0.108	0.108	Short Term Surface Water Storage/Reduction of Flooding (100 percent of wetland is impacted)
Wetland S	Along I-295 NB East of Bell Road	Seeps along similar elevation of the slope	Ordinary	0.012	0.012	0.012	0.012	0.012	0.012	Short Term Surface Water Storage/Reduction of Flooding (100 percent of wetland is impacted)
Wetland T	Along I-295 NB East of Bell Road	Seeps along similar elevation of the slope	Ordinary	0.031	0.031	0.031	0.031	0.031	0.031	Short Term Surface Water Storage/Reduction of Flooding (100 percent of wetland is impacted)
Wetland TB	Near bridge at W. Kings Highway	Tidally Influenced	Intermediate	11.150	-	0.310	-	0.310	-	Long Term surface water storage and provides habitat for vegetation and wildlife (2.7 percent of total wetland impacted)
Wetland TD	West of I-76 SB and east of Al Jo's Curve	Tidally Influenced	Intermediate	2.648	0.103	0.238	0.103	0.257	0.103	Long Term surface water storage and provides habitat for vegetation and wildlife (alternative with largest percent of total wetland impacted is 9.7 percent)
Wetland TE	East of I-76 NB and west of Al Jo's Curve	Tidally Influenced	Intermediate	8.432	0.090	0.744	-	1.204	0.034	Long Term surface water storage and provides habitat for vegetation and wildlife (alternative with largest percent of total wetland impacted is 14.2 percent)
Wetland TF	Near Shining Star Park	Tidally Influenced	Intermediate	18.930	0.930	1.603	-	0.412	1.830	Long Term surface water storage and provides habitat for vegetation and wildlife (alternative with largest percent of total wetland impacted is 9.6 percent)
Wetland V	Behind noise barrier by Bell Road	Wet area shaded by the noise barrier	Intermediate	0.246	0.040	0.067	0.040	0.067	0.040	Short Term Surface Water Storage /Reduction of Flooding (alternative with largest percent of total wetland impacted is 27.2 percent)

- No Impact for this wetland
Total wetland impacted

For Alternatives D, G2 and K, Al Jo's Curve would be removed. This would allow the wetlands divided by the existing roadway (Wetlands TB, TD, TE and TF) to be reconnected and provide improved and additional habitat for the wild rice, as well as for other vegetation and wildlife species (see discussion of mitigation in Section 5.7.2).

No secondary impacts are anticipated for any of the Build Alternatives. In addition to this project, the NJDOT Missing Moves project, which includes a highway connection between I-295 and Route 42, is located south of the study area. A maximum total of 5.660 acres (3.729 acres for Alternative D1 and 1.931 for the Missing Moves preferred alternative) of permanent wetland impact would result. This amount equals approximately 0.02 percent of the total NJDEP identified wetland areas identified within the Lower Delaware watershed management area.

It is possible that the Missing Moves project would not proceed. In this event, there would be no cumulative wetland impacts.

Compliance with Section 404 (b)(1) of the Clean Water Act

The USACOE has developed guidelines for discharges of dredged or fill material in the waters of the United States (40 CFR Part 230). As the proposed improvements are located in tidal wetlands, these guidelines must be complied with. The guidelines require that no discharge shall be permitted if there is a practicable alternative "which would have less adverse impact on the aquatic ecosystem, so long as the alternative does not have other significant adverse environmental consequences."

There are no practicable Build Alternatives that would avoid impacts to wetlands. The NJDOT evaluated twenty-six possible alternatives in an extensive screening process that included representatives from the USACOE, the USEPA and the NJDEP. All of the Build Alternatives evaluated would have resulted in wetland impacts. The five Build Alternatives studied in this TES were selected as having the least potential adverse impacts, including those related to wetlands, while still meeting the project purpose and need.

The only Build Alternatives that might have resulted in less wetland impacts would have divided the Bellmawr community and resulted in the most severe relocation of residents. These socioeconomic impacts were not acceptable to the community.

As documented in other sections of this report, the proposed project would not cause or contribute to significant degradation of the waters of the United States. There would be no significant impacts on human health or welfare, on life stages of aquatic life and other wildlife dependent on aquatic ecosystems, on aquatic ecosystem diversity, productivity and stability or on recreational, aesthetic and economic values. No special aquatic sites, defined as areas "generally recognized as significantly influencing or positively contributing to the general overall environmental health or vitality of the entire ecosystem of a region", would be affected.

The guidelines also require that appropriate and practicable steps be taken "which will minimize potential adverse impacts on the aquatic ecosystem." The guidelines call for "[d]esigning access roads and channel spanning structures using culverts, open channels and diversions that

will pass both low and high water flows, accommodate fluctuating water levels and maintain circulation and faunal movement…"

To comply with this minimization requirement, NJDOT has evaluated five alternatives in detail with the objective of reducing the extent of the wetlands impacts to the maximum extent practicable. Each of the five Build Alternatives has been designed to comply with the minimization requirement. Specifically, retaining walls are proposed at the wetland edges to minimize slopes. Culverts and bridges would allow unimpeded stream flow. All existing functions of impacted tidal wetlands, such as surface water retention and habitat, would be maintained. Only the edges of tidal wetlands would be affected. The loss of these edges would minimally affect their overall functions and values. While a few isolated, non-tidal freshwater wetlands would be lost, their function of short-term water retention would be replaced by the proposed stormwater systems.

Further minimization may be feasible at subsequent steps in the design process. As noted earlier in calculating the wetland impacts, it has been assumed that roadways crossing over wetlands impact those wetlands. This assumption has been made as it is premature at this stage to determine whether fill or pile-supported structures are feasible. In subsequent design phases, detailed engineering studies would be performed and pile-supported structures would be used wherever feasible and prudent. It is likely that this would result in further reductions in the amount of wetlands that would be impacted.

Section 5.7.2. below, discusses wetland mitigation to offset wetland impacts that cannot be avoided. On-site mitigation would be available in whole or in part, depending on the alternative. On-site mitigation is the preferable form of mitigation, since the same ecosystem that is impacted would be benefited by the mitigation.

The Build Alternatives that do not include the reuse of Al Jo's Curve (Alternative D, G2 and K) would provide an enhancement to the community in the form of public access (trail and viewing area) to LTC (See Figure 23). Alternatives D1 and H1 would only contain a viewing area over LTC, but no access since Al Jo's Curve would block passage to LTC.

5.7.2 Wetland Mitigation

5.7.2.1 Introduction

As required by Executive Order 11990 and in accordance with Section 404(b)1 guidelines, wetland mitigation should include compensation for unavoidable losses. Further, the New Jersey Department of Environmental Protection (NJDEP) requires that wetlands impacted by the construction of roadways or other site development be mitigated as part of the project plan. Mitigation sites must be identified during the design of the project to ensure that suitable areas are available.

Generally, mitigation must be conducted in concert with the construction of the project to compensate for the loss of wetland functions and values.. One potential option for mitigation is the creation of wetlands. Wetland creation as mitigation is generally required on a 2:1 basis, i.e. 2 acres of wetlands created for every 1 acre of wetland impacted. The 2:1 ratio was developed to

ensure that equal functions and values of wetlands are replaced after the project area wetlands are impacted. Therefore, based on the estimated potential project area wetland impacts that range from 0.952 to 3.732 acres (depending on the alternative) associated with the I-295/I-76/Route 42 Direct Connection Project, a data review and field search was performed to identify potential wetland mitigation sites within the Little Timber Creek watershed and the surrounding areas. Based on the 2:1 ratio for wetland mitigation:

- Alternative D would require 3.830 acres;
- Alternative D1 would require 7.256 acres;
- Alternative G2 would require 1.792acres;
- Alternative H1 would require 5.860 acres; and
- Alternative K would require 5.686 acres.

This site search was conducted in accordance with the mitigation site identification process, i.e. look first for potential sites within the project area (onsite) and then within the watershed. If necessary, then look for potential sites outside the watershed, but as close to the project area as possible.

The site search identified three (3) onsite areas that are considered suitable for mitigation, as well as one (1) offsite area. These sites would replace all of the functions and values of the wetlands that would be impacted. These recommended sites are discussed below, as are the additional sites that were evaluated, but found not to be suitable. In total, thirty six (36) potential sites were identified and evaluated. A detailed description of the sites evaluated and their suitability for use as mitigation is described in Appendix G.

The four (4) most promising sites are onsite mitigation area Nos. 1, 3, 5, and offsite mitigation area No. 36. The onsite areas (Sites 1 and 3) include the existing ramps of Al Jo's Curve, which would be removed depending on the alternative selected (Alternative D, G2 and K) and replaced with tidal wetlands. The third onsite area (Site 5) is located at Bell Road and involves the cleanout and restoration of the silt filled channel of Little Timber Creek.

Offsite mitigation area Site 36 is located in West Deptford and includes the GreenVest Main Ditch property, which is the property selected for the I-295/42 Missing Moves project. There is additional land on this property which would be suitable for mitigation for the needs of the Direct Connection project.

5.7.2.2 Methods

During April and May 2004 and June and July 2005, wetland specialists visited a total of thirty six (36) sites. Many of these locations were selected for evaluation because they were depicted on USGS maps as disturbed and/or open land, which might provide viable sites for the construction and/or enhancement of wetlands for mitigation purposes related to the I-295/I-76/Route 42 Direct Connection Project. Other potential locations were identified through discussions with local municipal officials, as discussed below.

Prior to the site visits, five municipal offices were contacted in an attempt to identify properties that might provide potential mitigation land for acquisition. In addition, a review was conducted of aerial photographs and county soil data prepared by the Natural Resources Conservation Service (U.S. Department of Agriculture).

The municipal contacts included: Borough of Westville (Borough Administrator), Township of Deptford (Township Engineer), Borough of Brooklawn (Township Engineer), Borough of Bellmawr (Engineering/Sewer Department), and County of Camden (Director, Division of Environmental Affairs). The Borough of Westville indicated that there is land (an island) owned by the Borough located in the mouth of Big Timber Creek adjacent to the Delaware River. The Borough of Bellmawr suggested areas adjacent to the landfills located near the proposed Missing Moves project. The Township of Deptford and the Borough of Brooklawn provided no information on potential sites. The Camden County official also suggested the landfill areas near the proposed Missing Moves project.

5.7.2.3 Findings

The potential onsite mitigation areas that were evaluated are shown on Figure 24. All of the sites, both onsite and offsite, that were evaluated are shown on Figure 25. A detail of the sites reviewed in the immediate area of the proposed Direct Connection project, including the three (3) sites proposed for further evaluation in this area, is provided on Figure 26. Figures 26A through 26E illustrate the soil types, known contaminated sites, and NJDEP-mapped potential critical habitat cover types for the sites evaluated in the immediate area of the project. The viable onsite areas are discussed below first, followed by the viable offsite area. A discussion of all sites reviewed for potential mitigation areas for the Direct Connection project is provided in Appendix G.

Onsite Mitigation

Sites 1 and 3

These sites consists of the existing roadway and adjacent NJDOT ROW located within the western (Site 1 with 2.2 acres) and eastern (Site 3 with 2.4 acres) portion of Al Jo's Curve on I-295 SB. According to the NJDEP Division of Coastal Resources map (Atlas Sheet No. 378-1878), these areas of former tidelands were granted to the NJ State Highway Department on July 20, 1964. Mitigation in this area would consist of removal of the existing paved roadway and adjacent shoulders and slopes, and creation of tidal wetlands, up to the approximate limits of the former tidelands lines on each side of LTC, and upgradient of the delineated wetland lines. These sites would be available for mitigation for Alternatives D, G2 or K, i.e. those in which Al Jo's Curve would be removed. Small portions of these sites also would be available if either Alternative D1 or H1 is selected.

Since removal of these roadway ramp areas would restore tidal wetlands to the floodplain of LTC (and increase flood storage) and ownership is not an issue, these areas are considered suitable for mitigation given the selection of one of the Alternatives noted above. In addition, creation of wetlands in these areas would replace the functions and values that would be

impacted by construction of the new interchange, including storage of surface water, dissipation of energy, improvement of water quality and wetland habitat for many wildlife species.

The wetlands that would be created in these locations would function as part of the existing, larger wetlands complex found in this portion of Little Timber Creek, which includes the existing natural tidal marsh adjacent to the Creek. This marsh contains stands of wild rice, *Zizania aquatica*, an important source of food for wildlife, which could be expanded into the mitigation areas. Upon construction of these proposed mitigation areas, there would be approximately 4.6 acres of additional open tidal water and wetlands along LTC. In addition, the immediately adjacent upland area would be left undeveloped, and enhanced with a proposed public access trail and wetland viewing area. These site conditions would serve to enhance and protect the habitat of the created wetland and adjacent areas. This would result in improved wetland functions and values within the immediate project area, including habitat, water quality and vegetative diversity. Consideration of Sites 1 and 3 as potential mitigation sites is recommended.

Site 5

This site is located at and immediately west of Bell Road and includes the silt-filled channel of LTC (0.75 acres). During the Agency line check of the wetland delineation for the Direct Connection project, the NJDEP and USACOE representatives commented on the poor condition of the Creek channel in this area. The Creek channel, including the culvert beneath Bell Road, is clogged with sediment from upland erosion and runoff. There also are a significant number of trees, snags and debris in the streambed that block the flow of water downstream. The build-up of silt and obstructions result in increased flooding in the near-stream areas because of the restricted flow of storm water. Consequently, enhancement of the open water channel and adjacent wetlands would improve the condition of the Creek and reduce the severity of flooding in the immediately adjacent areas. This potential mitigation option is available for all five Build Alternatives and appears to be an opportunity to enhance the hydraulic functions of LTC in this area. Mitigation in this area would replace some of the functions and values that would be impacted by construction of the new interchange, including storage of surface water, dissipation of energy, improvement of water quality and wetland habitat for wildlife species.

5.7.2.4 Summary of Onsite Potential Mitigation Areas Evaluated

Sites 1, 3 and 5 are the preferred onsite potential mitigation areas that were identified. These sites are considered suitable to satisfy the mitigation requirements of the Direct Connection project and replace the functions and values of the wetlands that will be impacted, depending on the alternative selected. Sites 1 and 3 consist of the portions of Al Jo's Curve that could be removed and used for mitigation for Alternatives D, G2 or K. Sites 1, 3 and 5 total 5.35 acres which exceeds the acreage needed as compensation for the taking of wetlands for Alternatives D and G2. Portions of Sites 1 and 3, and all of Site 5, could be used for Alternatives D1 or H1, but additional mitigation area(s) would likely be required. Sites 2 and 6 consist of an upland area within Al Jo's Curve and a fill area to the north of Bell Road, respectively. These sites are small and not as desirable as Sites 1, 3 and 5. Site 4 is a large fill area adjacent to the eastern portion of Al Jo's Curve and contains large volumes of solid waste and debris. Site 4 also has the

potential for soil and/or groundwater contamination and therefore, is not considered viable as a potential mitigation area at this time.

Offsite Mitigation

Site 36

Potential mitigation areas are located on an approximately 150-acre parcel (Block 328, Lot 5) located within West Deptford Township, Gloucester County, New Jersey. The specific location of the mitigation area within the property would have to be negotiated with the property owner, based on availability of land within the parcel and the specific needs of the Direct Connection project. However, the property contains areas that are currently occupied by successional and primarily invasive herbaceous and tree species that have colonized a former dredge spoil deposition area, as well as lower lying farmed areas that could be utilized for mitigation. The site is owned by GreenVest, LLC, and has an existing mitigation area that was created for New Jersey Transit Authority, which is approximately two years old. A portion of this property also has been proposed for use as mitigation in the I-295/Rte. 42 Missing Moves project. A Conceptual Mitigation Plan was submitted to the NJDEP and USACOE and it has recently been approved by the Agencies. In addition, the State Historic Preservation Office (SHPO) has recently agreed with the findings of a cultural resources investigation of the site that no significant historic or prehistoric cultural resources are present within the area of potential effects.

The GreenVest property is located within the same Hydrologic Unit Code (HUC) 11 Watershed as the Direct Connection project site. A tidal waterway, Main Ditch, is located within the property and drains to the Delaware River, providing a readily accessible tidal source. This property is large enough to potentially allow for replacement of all of the wetland systems that will be impacted at the Direct Connection project site, i.e. open tidal water, tidal wetlands and non-tidal wetlands. In addition, the functions and values of any created open tidal water and wetlands at the GreenVest site will be of higher quality than those that will be impacted at the Direct Connection project location, because they will not be subject to roadway and urban land runoff. The created wetlands will replace all of the functions and values impacted at the project site, including storage of surface water, dissipation of energy, replenishment of soil moisture and improvement of water quality. The mitigation site also will provide habitat for many wildlife species.

Any created wetlands at the GreenVest site would function as part of the existing, larger wetlands complex found in this area, which includes the adjacent New Jersey Transit mitigation area, the naturally developed tidal marsh lying to the southeast of the proposed mitigation location and the nearby Delaware River and adjacent wetlands. Also, as noted above, a Conceptual Mitigation Plan proposal for the I-295/Rte. 42 Missing Moves project has been approved by the NJDEP and USACOE. Upon construction of this proposed mitigation area, there will be approximately 6.5 acres of additional open tidal water and wetlands in the immediate proximity of any wetlands created for the Direct Connection project. Furthermore, the immediately adjacent upland area is expected to be left undeveloped, both on the GreenVest property, as well as on the neighboring properties. All of these site conditions will serve to enhance and protect the habitat of any created wetland and surrounding areas. This will result in improved wetland functions and values within this HUC11 watershed, including habitat, water

quality and vegetative diversity. Consideration of the GreenVest property as a potential mitigation site is recommended.

5.7.2.5 Summary of Offsite Potential Mitigation Areas Evaluated

Site 36 is the preferred offsite potential mitigation area that was identified. This site, the GreenVest Main Ditch site, contains adequate land, in conjunction with the preferred onsite areas identified, to satisfy the mitigation requirements of the Direct Connection project and replace the functions and values of the wetlands that will be impacted. The remaining offsite areas evaluated, Sites 7 through 35 (See Appendix G), are not considered suitable mitigation sites due to various reasons, including their existing uses as housing developments, landfills, or town open space areas. Other offsite areas contain large tracts of forested land or wetlands, making them unsuitable as potential mitigation areas.

5.7.2.6 Conclusions and Recommendations

Thirty-six sites were reviewed, four of which (Sites 1, 3, 5 and 36) are considered the most viable for mitigation purposes related to the I-295/I-76/Route 42 Direct Connection Project, depending on the Build Alternative selected. Site 2, located adjacent to Site 3, also could potentially be used for mitigation, depending on the Alternative selected, and if this additional mitigation area is needed. Likewise, Site 6, adjacent to the LTC, would be suitable for mitigation given the need for this additional area.

The four (4) preferred sites include:

- the existing roadway and adjacent slopes in the NJDOT ROW located within the western portion of Al Jo's Curve on I-295 SB (Site 1) crossing LTC;
- the existing roadway and adjacent slopes in the NJDOT ROW located within the eastern approach of Al Jo's Curve on I-295 SB (Site 3) crossing LTC;
- the silt-filled channel of LTC in the area of Bell Road (Site 5); and
- the GreenVest property in West Deptford, New Jersey, on Main Ditch (Site 36).

Sites 1, 3 and 5 are the preferred onsite mitigation areas. They are suitable for use with Alternatives D, G2 and K, although additional mitigation area would likely be required for Alternative K. Small portions of Sites 1 and 3, as well as all of Site 5, could be used if either Alternative D1 or H1 is selected. These areas would likely not be adequate to satisfy the entire mitigation requirements of Alternative D1 or H1, but they would allow for some onsite mitigation.

The two (2) additional potential onsite mitigation areas include:

- a small upland area (Site 2) located along the west side ("infield area") of the eastern portion of Al Jo's Curve, immediately upgradient of the wetlands delineation line and the NJDEP former tidelands line. The site is located across Al Jo's Curve from the end of Linden Avenue and is adjacent to Little Timber Creek and Site 3; and

- the filled floodplain area (Site 6) partially on private property on the northern bank of Little Timber Creek, to the east of Bell Road.

Site 36 is the preferred offsite mitigation area which could be used if additional mitigation area is required, based on project impacts.

Photographs of the four (4) preferred mitigation sites, the two (2) additional potential sites, and selected photographs of several of the unsuitable sites visited, are provided in Appendix G.

Due to the highly disturbed nature of Sites 1 and 3, i.e. their use as state highways, and their former status as tidelands, no archaeological investigations are believed to be necessary, if they are ultimately chosen for mitigation purposes. Likewise, no archaeological investigations are believed to be necessary for Site 5 (LTC channel), due to the large quantities of recently deposited silt and sediments that have built up in the stream channel.

A Cultural Resources Investigation was completed for a portion of Site 36 (the GreenVest site, in the area proposed for the I-295/Route 42 Missing Moves mitigation) in December 2005. The investigation found no significant historic or prehistoric cultural resources within the area of potential effects. An additional cultural resources investigation on the GreenVest property may be necessary for the I-295/I-76/Route 42 Direct Connection project depending on the specific portion of the property that is selected for mitigation. Due to the highly disturbed nature of potential Sites 2 and 6, it is believed that no archaeological investigations are necessary in these areas, should they be considered for use as mitigation areas.

5.7.3 No Build

No wetland impacts would result from the No Build alternative.

5.8 Upland Vegetation and Wildlife

5.8.1 Alternatives D, D1, G2, H1, and K

Upland vegetation impacts would result for all the Build Alternatives. The greatest upland vegetation impact would result from Alternative H1 at 21.951 acres and the least upland vegetation impact would result from Alternative D at 19.039 acres (see Table 10). Figures 18 to 22 show the areas where upland vegetation would be impacted for each alternative. Most of the upland vegetation area impacted is classified by NJDEP as woodland. More than half of the total upland vegetation impacted, with the exception of H1, would be located within the interchange. According to NJDEP, this upland vegetation area is identified as deciduous. All of the upland impacts would be in these disturbed, isolated areas within the interchange or along the fringe of larger contiguous areas. As discussed in Section 4.8, since only typical urban/suburban plant and animal species were observed in these areas, this loss of upland vegetation does not constitute a significant impact.

As discussed in section 4.8.3, no threatened and endangered species have been identified within the study area. Therefore, minimal adverse impacts to the wildlife species would result from any Build Alternative. The adverse impacts that occur would be to the existing marginal or relatively poor habitat.

According to the New Jersey No Net Loss Reforestation Act, any loss of more than one-half acre of forested area would need to be replaced. Therefore, a reforestation plan would be developed by the NJDOT Landscape Unit once a preferred alternative is selected. The NJDOT Landscape Unit, as part of their reforestation plan, would plant native vegetation to replace marginal and poor upland habitat which would be impacted by the Build Alternatives.

Additionally, with the removal of Al Jo's Curve for Alternatives D, G2 and K, the areas not designated as wetland mitigation areas may be utilized as upland vegetation mitigation (See Figure 23 at the end of this section). The amount that would be available for upland vegetation mitigation is approximately 1.652 acres.

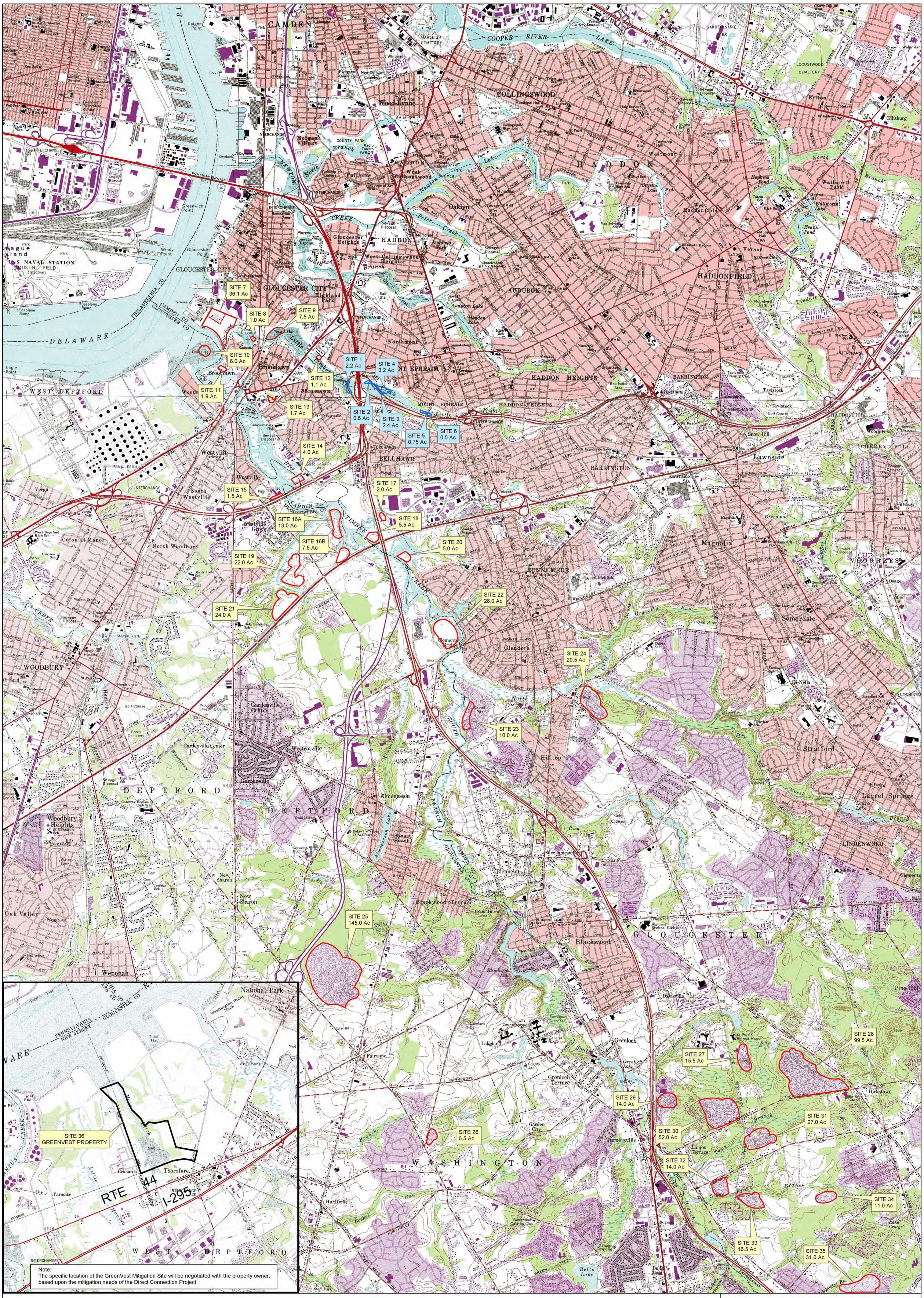
No cumulative or secondary impacts are anticipated for any of the Build Alternatives.

TABLE 10
I-295/I-76/Route 42 Direct Connection
UPLAND VEGETATION IMPACTS

Alternative	Edge of Forested Uplands Impacted (acres)	Within Interchange Uplands (acres)	Total Upland Vegetation Impacts (acres)
D	9.057	9.982	19.039
D1	10.382	10.542	20.923
G2	8.934	11.635	20.569
H1	11.013	10.938	21.951
K	10.516	10.911	21.427

5.8.2 No Build

No upland vegetation and wildlife impacts will result from the No Build Alternative.



N

LEGEND

SITE 26 6.5 Ac — Potential Off-Site Wetland Mitigation Sites Approximate Site Boundary and Acreage

SITE 3 2.4 Ac — Potential On-Site Wetland Mitigation Sites Approximate Site Boundary and Acreage

0 2,000 4,000 8,000 Feet

Q:\2652\technical\GIS\GIS database\Wetlands\Potential Wetland Mitigation 1-06 USGS

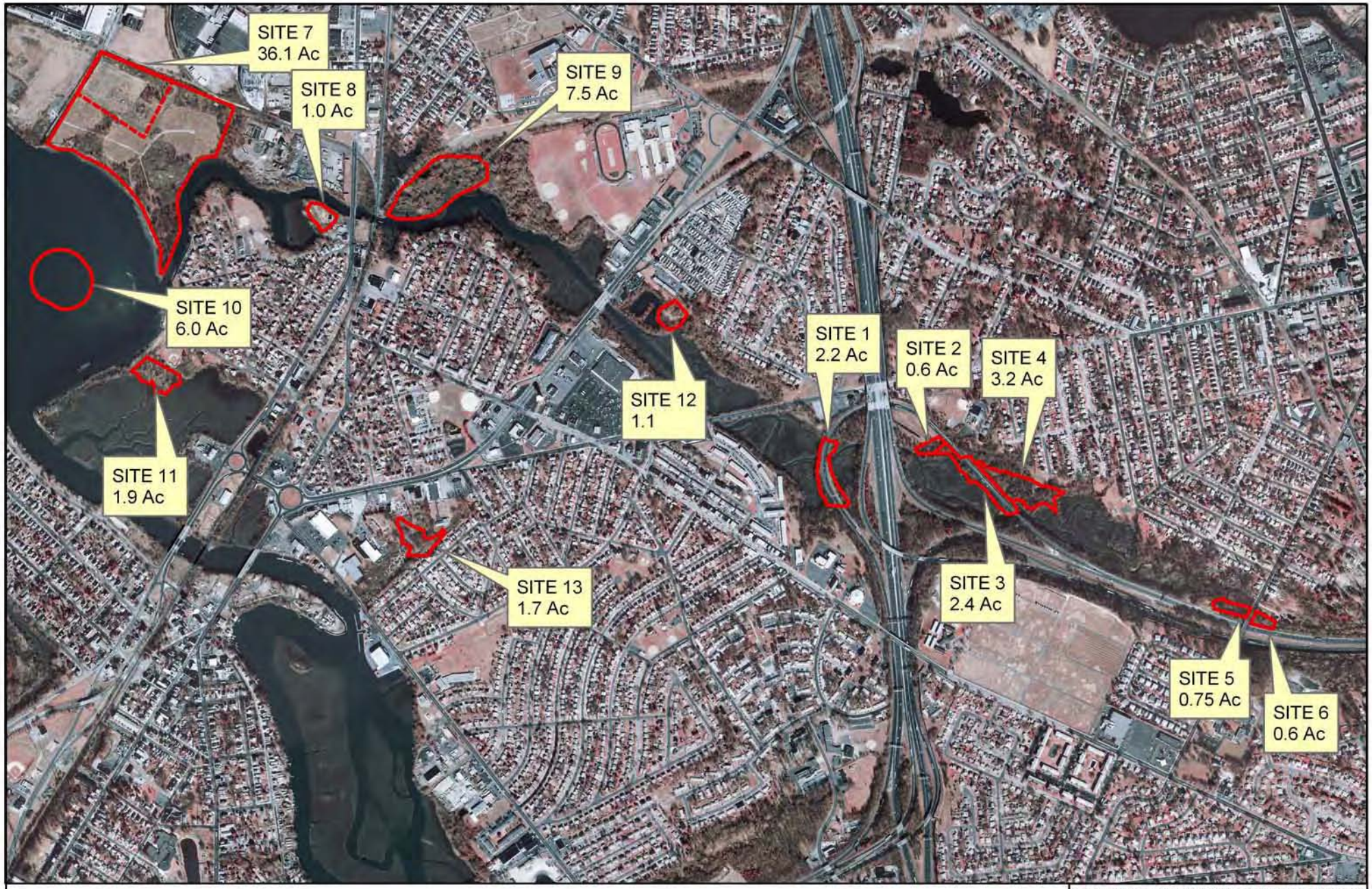
NEW JERSEY DEPARTMENT OF TRANSPORTATION

ALL SITES INSPECTED FOR POTENTIAL WETLAND MITIGATION

I-295 / I-76/ ROUTE 42 DIRECT CONNECTION CAMDEN COUNTY

SCALE: 1:24,000 DATE: JANUARY 2006

Dewberry-Goodkind, Inc. FIGURE 25



N

LEGEND

SITE 9
6.5 Ac

Approximate Site Boundary and Acreage

0 625 1,250 2,500 Feet

Q:\2652\technical\GIS\GIS database\Wetlands\Potential Wetland Mitigation 7-05

NEW JERSEY DEPARTMENT OF TRANSPORTATION

SITES INSPECTED FOR POTENTIAL WETLAND MITIGATION IN PROJECT AREA

I-295 / I-76/ ROUTE 42
DIRECT CONNECTION
CAMDEN COUNTY

SCALE: 1:15,000 DATE: JANUARY 2006

Dewberry-Goodkind, Inc. | Figure 26

N

Legend

- Approximate Wetland Mitigation Site Boundary
- Soil Survey Boundaries/Soil Type
- Known Contaminated Sites

0 625 1,250 2,500 Feet

Q:\2652\technical\GIS\GIS database\Wetland\Potential Wetland Mitigation Soils-KCSL

NEW JERSEY DEPARTMENT OF TRANSPORTATION

SOIL TYPES & KNOWN CONTAMINATED SITES

I-295 / I-76/ ROUTE 42
DIRECT CONNECTION
CAMDEN COUNTY

SCALE: 1:15,000 DATE: JNAUARY 2006

Dewberry-Goodkind, Inc. Figure 26A

N

Legend

Approximate Wetland Mitigation Site Boundary

Forested Wetland

Suitable Habitat (1)

0 625 1,250 2,500 Feet

Q:\2652\technical\GIS\GIS database\Wetlands\Potential Wetland Mitigation CH-Forested Wetland

NEW JERSEY DEPARTMENT OF TRANSPORTATION

CRITICAL HABITAT
FORESTED WETLANDS

I-295 / I-76/ ROUTE 42
DIRECT CONNECTION
CAMDEN COUNTY

SCALE: 1:15,000 DATE: JANUARY 2006

Dewberry-Goodkind, Inc. Figure 26B

N

Legend

Approximate Wetland Mitigation Site Boundary

Emergent Vegetation

Suitable Habitat (1)

0 625 1,250 2,500 Feet

Q:\2652\technical\GIS\GIS database\Wetlands\Potential Wetland Mitigation CH-Emergent

NEW JERSEY DEPARTMENT OF TRANSPORTATION

CRITICAL HABITAT
EMERGENT VEGETATION
I-295 / I-76/ ROUTE 42
DIRECT CONNECTION
CAMDEN COUNTY

SCALE: 1:15,000 DATE: JANUARY 2006

Dewberry-Goodkind, Inc. Figure 26C

N

Legend

Approximate Wetland Mitigation Site Boundary

Forest Vegetation

Priority Species (2)

0 625 1,250 2,500 Feet

Q:\2652\technical\GIS\GIS database\Wetlands\Potential Wetland Mitigation CH-Forest

NEW JERSEY DEPARTMENT OF TRANSPORTATION

CRITICAL HABITAT
FOREST VEGETATION

I-295 / I-76/ ROUTE 42
DIRECT CONNECTION
CAMDEN COUNTY

SCALE: 1:15,000 DATE: JANUARY 2006

Dewberry-Goodkind, Inc. Figure 26D

N

Legend

Approximate Wetland Mitigation Site Boundary

Grassland Vegetation

Priority Species (2)

0 625 1,250 2,500 Feet

Q:\2652\technical\GIS\GIS database\Wetlands\Potential Wetland Mitigation CH-Grassland

NEW JERSEY DEPARTMENT OF TRANSPORTATION

CRITICAL HABITAT
GRASSLAND VEGETATION

I-295 / I-76/ ROUTE 42
DIRECT CONNECTION
CAMDEN COUNTY

SCALE: 1:15,000 DATE: JANUARY 2006

Dewberry-Goodkind, Inc. Figure 26E

6.0 CONCLUSIONS AND RECOMMENDATIONS

No significant impacts are identified from the proposed project Build Alternatives on geology, soil, groundwater, and aquatic ecology. Below is a summary of impacts related to surface water, floodplain, wetlands and upland vegetation.

Surface Water

Potential impacts to surface water quality relate mainly to non-point source stormwater runoff impacts. The greatest potential for long-term impacts to surface water quality associated with this project would be increased highway-derived contaminants in stormwater runoff reaching LTC and BTC and surrounding wetlands. However, all of the proposed Build Alternatives incorporate stormwater pretreatment facilities in their design.

The proposed stormwater drainage system, including the upgraded piping system pump stations and new pretreatment facilities, would be a significant improvement over the existing umbrella drainage system. The proposed drainage system provides for pretreatment of runoff from the water quality storm through the use of bioretention facilities. Storms of greater rainfall, such as the 2-, 10- and 100-year storms, would have excess runoff volume pass through an outlet control structure to the receiving watercourse. See Section 5.3.1 for a description of the bioretention system.

The drainage and stormwater management plan for each alternative meet NJDEP stormwater management planning requirements and would provide for treatment of contaminants in stormwater runoff from both the net additional pavement and the rebuilt pavement proposed for this project. Non-structural measures would be incorporated to the greatest extent practicable in later design stages.

In conjunction with the roadway drainage systems, stormwater pumping stations would be required for each alternative for areas where gravity flow is insufficient. Alternatives D, G2 and K would include one stormwater pumping station in the vicinity of Browning Road, within the Annunciation B.V.M. Church property. Alternatives D1 and H1 would utilize 2 pumping stations along Ramps D and F, on opposite sides of Little Timber Creek, each discharging into a bioretention basin. The proposed stormwater pumping stations for each Build Alternative would provide additional water quality treatment measures through screening of runoff and deposition of solids within the wet well areas of each facility. Alternative H1 would require the relocation of 250 feet of the Little Timber Creek channel. A soil erosion and sediment control plan would be prepared and implemented to address temporary surface water impacts during construction.

Floodplain

All alternatives would result in some impacts within the 100-year floodplain zone. Alternative D1 would have the greatest impact at 4.449 acres and Alternative G2 would have the least impact with 0.900 acres affected. There would be minimal or insignificant fills in the floodway which would be offset by removal of existing fills for all five Build Alternatives.

The FHWA has developed guidelines for encroachment into the floodplain (23 CFR 650 Subpart A). The purpose of this regulation is to prescribe "FHWA policies and procedures for the location and hydraulic design of highway encroachment on floodplains."

There are no practicable Build Alternatives that would avoid impacts to floodplains. The NJDOT evaluated twenty-six possible alternatives in an extensive screening process that included representatives from the USACOE, USEPA and the NJDEP. All of the alternatives evaluated would have resulted in floodplain impacts. The five Build Alternatives studied in this TES were selected as having the least potential adverse impacts, including those related to floodplain, while still meeting the project purpose and need.

To comply with Executive Order 11988, entitled "Floodplain Management," the project would be designed to avoid floodplain impacts where practicable, minimize impacts to the greatest extent possible and to adequately mitigate unavoidable impacts. None of the Build Alternatives would completely avoid floodplain impacts. Each Build Alternative would include measures (floodwalls and/or berms) which would isolate flooding from Little Timber Creek for the 50- and 100-year tidal flood events. Roadway storm sewers and stormwater pumping stations would be designed in accordance with NJDOT drainage design criteria to provide adequate drainage within the study limits.

Wetlands

Alternative D1 represents the greatest permanent wetland impact with 3.732 acres affected. Alternative G2 represents the lowest permanent impact with 0.952 acres affected. Since all of the Build Alternatives would have wetland impacts, mitigation would be required. All of the impacted wetlands were classified by NJDEP as having ordinary or intermediate resource values. None were classified as having exceptional resource values.

Alternative G2 would have the least freshwater wetland buffer impact with 2.479 acres affected while Alternative H1 would have the greatest amount of wetland buffer affected (4.674 acres). The buffer area is located within the upland vegetation area discussed in Section 4.8.

There are no feasible Build Alternatives that would avoid impacts to wetlands. The NJDOT evaluated twenty-six possible alternatives in an extensive screening process that included representatives from the USACOE, USEPA and NJDEP. All of the alternatives evaluated would have resulted in wetland impacts. The five Build Alternatives studied in this TES were selected as having the least potential adverse impacts, including those related to wetlands, while still meeting the project purpose and need.

For Alternatives D, G2 and K, Al Jo's Curve would be removed. This would allow the wetlands divided by the existing roadway (Wetlands TB, TD, TE and TF) to be reconnected and provide improved and additional habitat for the wild rice as well as other vegetation and wildlife species.

Alternatives D, G2 and K would also provide enhancement to the community in the form of public access to LTC. Alternatives D1 and H1 would have the viewing areas for LTC, but no access, since Al Jo's Curve would remain in place.

If the loss of wetlands is compensated by the creation of new wetlands, the NJDEP requires wetland mitigation in the ratio of two acres created for each acre impacted. Three preferred onsite potential wetland mitigation areas have been identified for the alternatives that do not re-use Al Jo's Curve (Alternative D, G2 and K). These three preferred mitigation areas total approximately 5.35 acres and are, therefore, sufficient compensation for Alternatives D and G2 and partly sufficient for Alternative K. The wetlands impacted by Alternatives D1 and H1 would require offsite mitigation. However, one potential offsite area has been identified for these two alternatives and for the partial off-site mitigation required for Alternative K. The existing functions and values of the impacted wetlands would be replaced by the mitigated wetlands provided as compensation.

Upland Vegetation

Upland vegetation impacts would result for all the Build Alternatives. The greatest upland vegetation impact would result from Alternative H1 at 21.951 acres and the least upland vegetation impact would result from Alternative D at 19.039 acres. Figures 18 to 22 show the areas where upland vegetation would be impacted for each alternative. Most of the upland vegetation area impacted is classified by NJDEP as woodland. More than half of the total upland vegetation impacted, with the exception of Alternative H1, would be located within the interchange. According to NJDEP, this area is identified as deciduous woodland.

All of the upland impacts would be in isolated areas within the interchange or along the fringe of larger contiguous areas. Since only typical urban/suburban plant and animal species were observed in these areas, this loss of upland vegetation does not constitute a significant impact.

According to the New Jersey No Net Loss Reforestation Act, any loss of more than one-half acre of forested area would need to be replaced. Therefore, a reforestation plan would be developed by the NJDOT Landscape Unit once a preferred alternative is selected. With the removal of Al Jo's Curve for Alternatives D, G2 and K, the areas not designated as wetland mitigation areas may be utilized as upland vegetation mitigation. The amount that would be available for upland vegetation mitigation is approximately 1.652 acres.

From an ecological perspective, Alternatives D, G2 and K are preferable in that on-site wetlands mitigation is available for these alternatives. Based on the information within this report, Alternatives D and G2 have the least ecological impacts.

Permits for environmental impacts would be required for any of the five Build Alternatives, including NJDEP Stream Encroachment, Waterfront Development, Water Quality Certificate and a Freshwater Wetlands Individual permit. A USACOE permit would be required for construction in tidally influenced wetlands or open water.

7.0 LIST OF PREPARERS

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