

**FINAL  
PRELIMINARY HYDRAULIC  
TECHNICAL MEMORANDUM**

**MONROE CONNECTOR/BYPASS  
UNION AND MECKLENBURG COUNTIES**

**NCDOT STIP Project Nos. R-3329 and R-2559**

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# 1 PROJECT NARRATIVE

## 1.1 Project Description

The North Carolina Turnpike Authority (NCTA) proposes to improve east-west travel between I-485 west in Mecklenburg County and the area just west of the Town of Marshville in Union County. This proposed action is designated as STIP Project Nos. R-3329 (Monroe Connector) and R-2559 (Monroe Bypass) in the NCDOT's 2007-2013 State Transportation Improvement Program (STIP).

The purpose of the Monroe Connector/Bypass is to improve transportation mobility and capacity of US 74 in the area around the City of Monroe and serve high-speed regional travel. US 74 is a major east-west route connecting the Charlotte metropolitan region to the North Carolina coast.

Mecklenburg and Union Counties are located in the south central Piedmont area of North Carolina. Mecklenburg County is bounded on the west by the Catawba River and Gaston & Lincoln Counties, on the east by Cabarrus & Union Counties, on the north by Iredell County and on the south by York & Lancaster Counties, South Carolina. Union County is bounded on the west by Mecklenburg County, on the east by Anson County, on the north by Cabarrus & Stanly Counties and on the south by Lancaster & Chesterfield Counties, South Carolina. The nearest major metropolitan area is Charlotte, in Mecklenburg County, which is 25 miles (40 km) to the west.

The proposed project study area is located in southern Union County and eastern Mecklenburg County. There are sixteen (16) Detailed Study Alternatives (DSAs) under consideration for the proposed project, according to the Alternatives Development and Analysis Report for Monroe Connector/Bypass prepared by PBS&J. **Figure 1 - Project Location Map** and **Table 1** show the corridor segments comprising these sixteen (16) DSAs. Generally, there are two (2) to four (4) corridor options at any one location. Combinations of these options add up to the sixteen (16) DSAs.

**Table 1. Detailed Study Alternatives Summary**

DSA	Corridor Segments	Length (miles)
A	0 18A 21 22A 31 36 40 42 43	21.82
B	0 18A 21 30 31 36 40 42 43	21.77
C	0 1 2 21 22A 31 36 42 43	21.87
D	0 1 2 21 30 31 36 40 42 43	21.81
A1	0 18A 21 22A 31 34 40 42 43	21.77
B1	0 18A 21 30 31 34 40 42 43	21.71
C1	0 1 2 21 22A 31 34 40 42 43	21.81

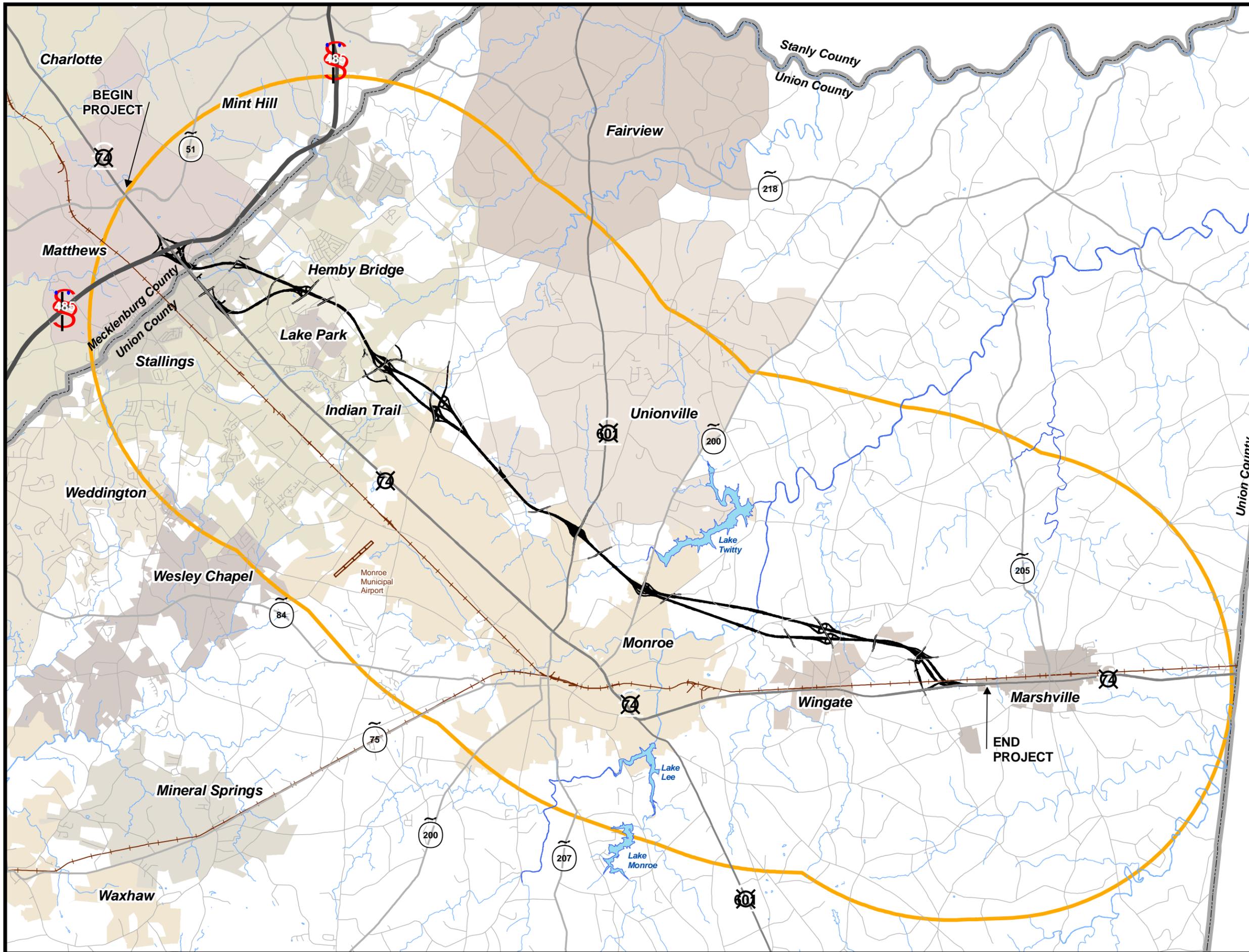
**Table 1. Detailed Study Alternatives Summary**

<b>DSA</b>	<b>Corridor Segments</b>	<b>Length (miles)</b>
D1	0 1 2 21 30 31 34 40 42 43	21.75
A2	0 18A 21 22A 31 36 41 43	21.65
B2	0 18A 21 30 31 36 41 43	21.59
C2	0 1 2 21 22A 31 36 41 43	21.69
D2	0 1 2 21 30 31 36 41 43	21.63
A3	0 18A 21 22A 31 34 40 42 43	21.77
B3	0 18A 21 30 31 34 41 43	21.53
C3	0 1 2 21 22A 31 34 41 43	21.63
D3	0 1 2 21 30 31 34 41 43	21.57

## 1.2 Report Purpose

An Environmental Impact Statement (EIS) is currently being prepared for this project in accordance with the requirements set forth in the National Environmental Policy Act (NEPA) of 1969, as amended. The purpose of this report, which will become a part of the overall EIS document, is to evaluate the off-site drainage basins and to determine preliminary sizes for drainage structures at all major crossings (those requiring the equivalent conveyance of a 72" pipe or larger structure). The results of this analysis will assist in the selection of the least environmentally damaging practicable alternative (LEDPA). Following selection of the LEDPA, a more detailed analysis will be conducted that will examine each of the crossings in greater detail.

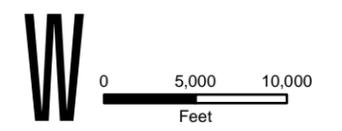
It should be noted that the results of this report are not intended to establish the final design size of any of the drainage structures under evaluation. There is insufficient data at this preliminary stage to perform final design level hydraulic analysis and an additional, more detailed, study will be required once a preferred alignment is selected in order to determine the final structure dimensions. Once the LEDPA alternative is selected and a maximum allowable headwater (AHW) is determined for each site, a larger structure may be required in order to meet this constraint.



- Legend**
- Study Area
  - Proposed Alignments
  - Interstate Highway
  - US Highway
  - NC State Highway
  - State Road
  - Railroad
  - River / Stream
  - Lake
  - County Boundary



Source: Mecklenburg County and Union County GIS.  
Map Printed On 09-19-08.



STIP PROJECT  
NO. R-3329/R-2559  
Mecklenburg County and Union County

**MONROE CONNECTOR/  
BYPASS**

**PROJECT  
LOCATION MAP**

**Figure 1**

Figure\_1\_ProjectLocationMap.mxd 09-19-08

### **1.3 Data Collection**

The PBS&J team included one (1) sub-consultant (ESI – Environmental Services Incorporated) to conduct field surveys of jurisdictional streams and wetlands within the study area. This firm collected data on the existing drainage features including the presence of wetlands or ponds, stream classification (ephemeral, intermittent, or perennial), average bottom width and average bankfull depth. In order to perform the preliminary hydrologic/hydraulic analysis, PBS&J independently collected the following data for the project study area (eastern Mecklenburg and Union Counties):

- LIDAR-based topographic mapping (2-, 4-, 20- & 100-foot contour intervals)
- Stream Centerlines
- Soils
- Zoning
- Aerial photography
- Digital Flood Insurance Rate Maps (DFIRMs)
- Digital USGS 7.5-Minute Topographic Quadrangle Maps
- Street Centerlines

## **2 EXISTING CONDITIONS**

### **2.1 Land Use**

Outside the municipal boundaries, the land uses in southern Union County are predominantly rural, with residential subdivisions scattered among large tracts of undeveloped land. Businesses and industries are concentrated within and outside the various city limits and outside the city along US 74 where water and sewer services are provided.

The small portion of eastern Mecklenburg County contained within the project study area is highly developed. Business and commercial uses are concentrated in areas along US 74.

The 1998 Union County Comprehensive Plan is currently being updated according to a news article listed on the county's website homepage (Union County website: [www.co.union.nc.us/](http://www.co.union.nc.us/)). Pending updates, the future land use GIS data available for download from the same website above indicates that southern Union County is an area that will remain predominantly rural.

### **2.2 Manmade Features**

There are numerous stock ponds and drainage structures throughout the project. Detailed data was not available for the ponds; therefore a conservative approach was used, and the attenuating effect of these ponds on the peak discharges was not modeled in the hydrologic analysis. There are numerous small, state-registered dams throughout the drainage basin, but none of these are expected to be impacted.

### **2.3 Site Topography, Drainage Patterns, Flow Paths**

The entire project is located in the Yadkin-Pee Dee River basin, and all of the runoff from this project eventually drains to the Yadkin-Pee Dee River. Although individual basins may flow in any direction, streams generally flow to the north and/or northeast.

Located in the Southern Piedmont physiographic region, Union County covers a total area of approximately 643 square miles (944.0 square kilometers) (Union County website: [www.co.union.nc.us/](http://www.co.union.nc.us/)). The topography of the county is primarily gentle slopes with steeper areas along watercourses.

Elevations above sea level in Union County range from approximately 275 feet near Rocky River in the northeastern portion of the county to 770 feet in an area two (2) miles southwest of Waxhaw in the southwestern portion of the county. The majority of streams flow into the Rocky River, which is a major tributary of the Yadkin-Pee Dee River and serves as the north boundary for the county. The Catawba River basin drains the western and southwestern portions of the county. Three (3) lakes—Lake Lee, Lake Monroe, Lake Twitty— provide Gastonia’s water supply, as well as boating, fishing and other recreational opportunities.

Located within the Southern Piedmont physiographic region, Mecklenburg County has a total area of approximately 525 square miles. The topography of the county is primarily gently rolling with steeper areas along watercourses, ranging from approximately 830 feet in the northern portion of the county to 520 feet at the State line in the southern portion of the county. The Catawba River drains the majority of the county and forms the western boundary of the county. The remaining one-fourth of the county is drained by the Rocky River within the Yadkin-Pee Dee River basin. Impoundments (i.e. Lake Norman) along the Catawba River provide water supply for the majority of the county’s municipalities. Mecklenburg County is the hub of the 13-county Charlotte region, which also includes Gaston County.

The Mecklenburg-Union County area has a temperate climate characterized by moderate temperature variations and moderate humidity. The temperature ranges from a winter average of 43 degrees to a summer average of 77 degrees. The total annual precipitation is approximately 45 inches, and the average relative humidity is approximately 58 percent (Mecklenburg and Union Counties Soil Surveys available at the Natural Resources Conservation Services website: <http://www.nrcs.usda.gov/>).

The general topography of the project area is illustrated on **Figure 2 – USGS Quadrangle Map** and an aerial view of the project area is provided on **Figure 3 – Aerials With FEMA Floodplains and Floodways**. The primary flow patterns within the project are illustrated on **Figure 5 – Off-Site Drainage Area Map**.



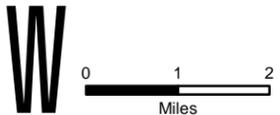
**Legend**

■ Proposed Alignments



■ Mecklenburg and Union Counties  
□ North Carolina Counties

Source: North Carolina Department of Transportation Website.  
Map Printed On 09-19-08.



STIP PROJECT  
NO. R-3329/R-2559

Mecklenburg County and  
Union County

**MONROE CONNECTOR/  
BYPASS**

**USGS  
Quadrangle Map**

**Figure 2**