



**ENVIRONMENTAL SERVICES, INC.**  
**9401-C Southern Pine Boulevard**  
**Charlotte, North Carolina 28273**

***TECHNICAL MEMORANDUM***

**TO: Carl Gibilaro, PE**  
**PBS&J**

**FROM: Paul Petitgout**

**DATE: February 12, 2010**

**RE: Review for Potential On-Site Mitigation**  
**Monroe Connector/Bypass**  
**STIP R-3329 and R-2559**  
**Mecklenburg and Union Counties, North Carolina**

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The purpose of this memorandum is to document potential on-site mitigation opportunities within the project study area to possibly aid in meeting the compensatory mitigation requirements of the proposed Monroe Connector/Bypass. For purposes of this memorandum, “on-site” is defined as an area in the vicinity of the preferred alternative, extending from the US 74/I-485 interchange near the town of Matthews in Mecklenburg County, to between the towns of Wingate and Marshville along US 74 in Union County.

**Site Selection Methodology**

Potential restoration sites were identified by examining aerial photography in areas where wetlands and streams were found to be coincident with disturbed land uses. Based on aerial photography interpretation, areas judged to have restoration/enhancement potential were recorded and those areas without potential were discounted. Specific methodology and data used in identifying wetland and stream restoration sites are described separately in this section. Aerial photography used in the identification of all restoration/enhancement sites was provided by PBS&J. The aerial photography, in concert with other data sets including soils (SSURGO database), hydrology, contour data (NCDOT), and county parcel data were used to locate the potential mitigation areas.

Site selection criteria were developed with consideration for guidance from the United States Army Corps of Engineers (USACE 2003) and the North Carolina Ecosystem Enhancement Program (NCEEP 2004). The following guidelines were generally observed:

### Stream Restoration/Enhancement

- Stream projects must have a minimum of 50 feet conservation easement on both sides of the stream for the entire project length. Easements are measured from the top of the stream bank on both sides of the stream. The easement may be wider if there is room for additional planting (up to 200 feet from the top on either side of the stream) or if there is a wetland component to the project (no easement width limit).
  - One side of stream must be free of utilities.
  - Streams with a utility on one side must have a 50 foot easement in addition to any existing utility easement. The width of the utility cannot count towards the 50 foot requirement.
- The stream segment proposed for restoration must be greater than or equal to 2,000 linear feet in length; however, exceptions may be made under certain circumstances. There is no maximum length for a stream project. Stream restoration opportunities that are less than 2,000 linear feet, but involve relocation of the existing stream as a result of the proposed roadway, were also considered.
- Less than 10 square miles drainage area (typically 1<sup>st</sup> and 2<sup>nd</sup> order streams, 3<sup>rd</sup> order streams in some cases), and no greater than a 3<sup>rd</sup> order stream.
- Proposed stream segments can be perennial or intermittent as indicated on USGS 24K Quadrangle Maps and/or in the NRCS Soil Surveys. No more than 50 percent of the proposed restoration or enhancement project can be intermittent.
- Proposed stream segments cannot generally occur over more than three property parcels that are under different ownership.

### Wetland Restoration/Enhancement

- Hydric soils must be present (might be relic).
- Original wetland hydrology is altered by ditching, tile drains, filling, or other means caused by human influences.
- Proposed wetland restoration area lacks appropriate wetland vegetation.
- Minimum of 2 acres (unless associated with a stream project) in size, but no maximum.
- Site is not comprised entirely of invasive vegetation species (i.e. manageable within reason).

After identification of potential mitigation opportunities, sites were further evaluated in the field. Field evaluations at prospective mitigation sites were performed over the course of two days by staff with extensive experience in mitigation implementation. Evaluations included an

assessment of soils, hydrology, vegetative cover, and landscape/watershed characteristics. Sites were evaluated with consideration for an existing buffer and proximity to existing jurisdictional systems. Notes were collected regarding species composition, soil matrix and chroma, and any site constraints (e.g. active farming, culverts, utilities). Site photos were also collected.

Based on this review, ESI identified over 25 sites, totaling approximately 2,000 acres that potentially contain stream mitigation opportunities. Of the 25 sites that had mitigation potential, 21 of them were not recommended because they violated one or more of the guidelines listed above. Four of the sites located during this review are considered viable mitigation opportunities and are described below (Table 1), and their general locations depicted on Figure 1. It should be noted that, in general, the mitigation opportunities extended across multiple parcels, which makes procuring these areas as potential mitigation sites much more difficult. However, all of the sites selected for review contain no more than three ownerships.

**Table 1. Parcel Data for Selected Mitigation Opportunities.**

PIN	Owner	Mailing Address	Acreage	Mitigation Site Number
M7081003 07081003	Vance Adam Sherin (and others) –Heirs	7216 Oak Spring Road Indian Trail, NC 28079	45.3 45.3	Site 1
07081002	Vance Adam Sherin (and others) – Heirs	7403 Stinson-Hartis Road Indian Trail, NC 28079	32.2	Site 1
K7078011	Crosland – Fairhaven LLC	227 W. Trade Street Charlotte, NC 28202	84.6	Site 1
07078012C	Kathleen Bowden	3725 Morningstar Drive Mathews, NC 28105	17.1	Site 1
07027033 90	Carlton Tyson (and others), Trustee	PO Box 748 Monroe, NC 28111	60.7	Site 2
07027033A	Franklin W. Howey, Jr.	PO Box 429 Monroe, NC 28111	37.0	Site 2
08303014	Billy F. Acycoth	2211 White Store Road Monroe, NC 28112	38.3	Site 3
08273001	Thomas Ray & Judy H. Poplin	3310 Poplin Road Monroe, NC 28110	182.0	Site 3
02211024 02211024 H	Thomas E. & Sarah H. Traywick	PO Box 131 Wingate, NC 28174	16.4 38.5	Site 4
02211024 G	NCDOT	206 Charter Street Albemarle, NC 28001	66.8	Site 4

Following field evaluations, ten parcels were found that contain opportunities for stream mitigation. These parcels are grouped into 4 sites (Sites 1-4) and are described below. Figures and photographs for each site are also provided. All of the recommended sites will require additional analysis and feasibility studies to determine the full mitigation potential.

**Site 1: Oak Spring Road Site**  
**Mitigation Opportunity: Stream Enhancement**

Site one (Figure 2, Photo Plate 1), the Oak Spring Road Site, is located approximately 2,500 feet north of the intersection of Oak Spring Road and Stinson-Hartis Road, in western Union County. The site consists of four tax parcels, two of which are under the same ownership. The potential mitigation area consists of a severely degraded, 2,000 foot stream reach of North Fork Crooked Creek. Cattle operations on this property have severely degraded the overall stability and water quality of this reach of North Fork Crooked Creek. Stream enhancement potential exists due to the reach’s degraded dimension and profile along with its non-existent riparian buffer. Riffles

and pools appear to be ill-formed and mid-channel bars are also forming, causing this stream reach to become more unstable.

Stream enhancement techniques that could possibly be utilized for this reach include (but are not limited to) bank stabilization, the use of in-stream structures to redefine the stream profile, construction of bankfull benches (where appropriate), the planting of a riparian buffer, and exclusion of the cattle from the restored riparian buffer area through fencing. No contact has been initiated with the landowner(s). Additional analysis and feasibility studies will be required to determine if stream mitigation activities are both practical and cost effective for this site.

The mitigation activity multiplier for stream enhancement ranges from 1.0 to 2.5, depending on the range of techniques that are prescribed for a particular site. With this range of multipliers in mind, a stream reach of approximately 2,000 linear feet would generate approximately 800 to 2,000 stream mitigation units (SMU). The USACE, in conjunction with NC Division of Water Quality (NCDWQ) and all other relevant regulatory agencies, will ultimately determine the mitigation credit ratio for each mitigation project.

**Site 2: Rocky River Road Site**  
**Mitigation Opportunity: Stream Enhancement**

Site two (Figure 3, Photo Plate 2) is located approximately 3,000 feet north of the intersection of Rocky River Road and Secrest Shortcut Road. The site consists of two tax parcels that total approximately 97.8 acres. The current land use would be characterized as cultivated agricultural land. The site contains approximately 1,800 linear feet of perennial stream and 1,800 linear feet of intermittent stream that would be available for mitigation. Both reaches can be generally described as having relatively steep banks, low sinuosity and a non-existent riparian buffer. The stream banks are eroded in some areas as a result of the lack of a maintained buffer between the stream and the cultivation activities.

Mitigation potential within Site 2 consists of stream enhancement opportunities along approximately 1,800 linear feet of perennial stream and 1,800 linear feet of intermittent stream. Stream enhancement approaches that are appropriate for the perennial and intermittent reaches of Site 2 include (but are not limited to) the excavation of a bankfull benches (when necessary), the use of in-stream structures to redefine the stream dimension and profile, and the planting a riparian buffer that will enhance stream bank stability, increase channel shading, and provide travel corridors for wildlife.

The mitigation activity multiplier for stream enhancement ranges from 1.0 to 2.5 depending on the techniques that are applied to the site. Stream enhancement of approximately 3,600 linear feet of intermittent and perennial stream could result in 1,440 to 3,600 SMU. The USACE, in conjunction with NCDWQ and all other relevant regulatory agencies, will ultimately determine the mitigation credit ratio for each mitigation project.

**Site 3: Poplin Road Site**  
**Mitigation Opportunity: Stream Enhancement**

Site three (Figure 4, Photo Plate 3) is located approximately 2,500 feet north of the intersection of Poplin Road and Secrest Shortcut Road. The site consists of two tax parcels that total

approximately 220.3 acres. The current land use would be characterized as cultivated agricultural land. The site contains approximately 4,225 linear feet of perennial stream that would be available for mitigation. This reach can be generally described as having relatively steep banks, low sinuosity and a non-existent riparian buffer. The stream banks are eroded in some areas as a result of the lack of a maintained riparian area between the stream and the cultivated agricultural land.

Mitigation potential within Site 3 consists of stream enhancement opportunities along approximately 4,225 linear feet of perennial stream. Stream enhancement approaches that are appropriate for this perennial reach on Site 3 include (but are not limited to) the excavation of a bankfull benches (when necessary), the use of in-stream structures to redefine the stream dimension and profile, and the planting a riparian buffer that will enhance stream bank stability, increase channel shading, and provide travel corridors for wildlife.

The mitigation activity multiplier for stream enhancement ranges from 1.0 to 2.5 depending on the techniques that are applied to the site. Stream enhancement of approximately 4,225 linear feet of intermittent and perennial stream could result in 1,690 to 4,225 SMU. The USACE, in conjunction with NCDWQ and all other relevant regulatory agencies, will ultimately determine the mitigation credit ratio for each mitigation project.

#### **Site 4: Poplin Road Site**

##### **Mitigation Opportunity: Stream Enhancement**

Site four (Figure 5, Photo Plate 4) is located approximately 500 feet east of the intersection of Phifer Road and Forest Hills School Road. The site consists of three tax parcels that total approximately 121.7 acres. The current land use would be characterized as pasture land. The site contains approximately 425 linear feet of perennial stream and 2,100 linear feet of intermittent stream that would be available for mitigation. Both reaches can be generally described as having relatively steep banks, low sinuosity and a non-existent riparian buffer. The stream banks are eroded in some areas as a result of the lack of a maintained buffer between the stream and the adjacent pasture land.

Mitigation potential within Site 4 consists of stream enhancement opportunities along approximately 425 linear feet of perennial stream and 2,100 linear feet of intermittent stream. Stream enhancement approaches that are appropriate for the perennial and intermittent reaches of Site 4 include (but are not limited to) the excavation of a bankfull benches (when necessary), the use of in-stream structures to redefine the stream dimension and profile, cattle exclusion fencing, and the planting a riparian buffer that will enhance stream bank stability, increase channel shading, and provide travel corridors for wildlife.

The mitigation activity multiplier for stream enhancement ranges from 1.0 to 2.5 depending on the techniques that are applied to the site. Stream enhancement of approximately 2,525 linear feet of intermittent and perennial stream could result in 1,010 to 2,525 SMU. The USACE, in conjunction with NCDWQ and all other relevant regulatory agencies, will ultimately determine the mitigation credit ratio for each mitigation project.

## **Wetland Mitigation Opportunities**

During the review for potential wetland and stream mitigation sites, no wetlands sites were revealed that met the site selection criteria described above. There may be the potential for wetland mitigation created through the stream mitigation opportunities, but the amount would be small (potentially less than 0.25 acre).

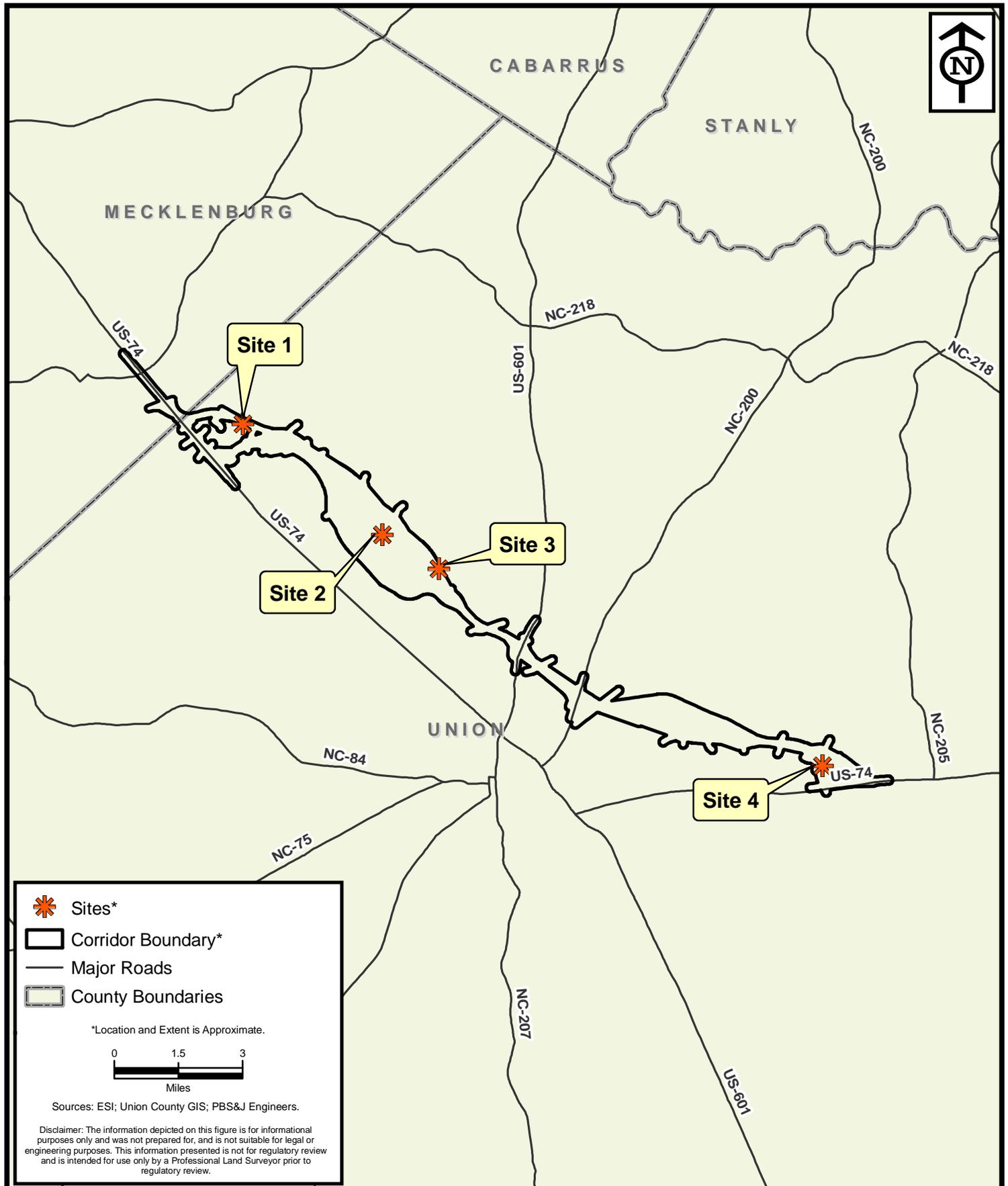
## **Literature Cited**

NC Ecosystem Enhancement Program. 2004. Guidelines for Riparian Buffer Restoration. NC Department of Environment and Natural Resources. 12 pp.

US Army Corps of Engineers. 2003. Stream Mitigation Guidelines. USACE Wilmington District, Regulatory Branch. 26 pp + appendices.

## ***Acknowledgement***

ESI would like to acknowledge PBS&J for providing the template for this technical memorandum.



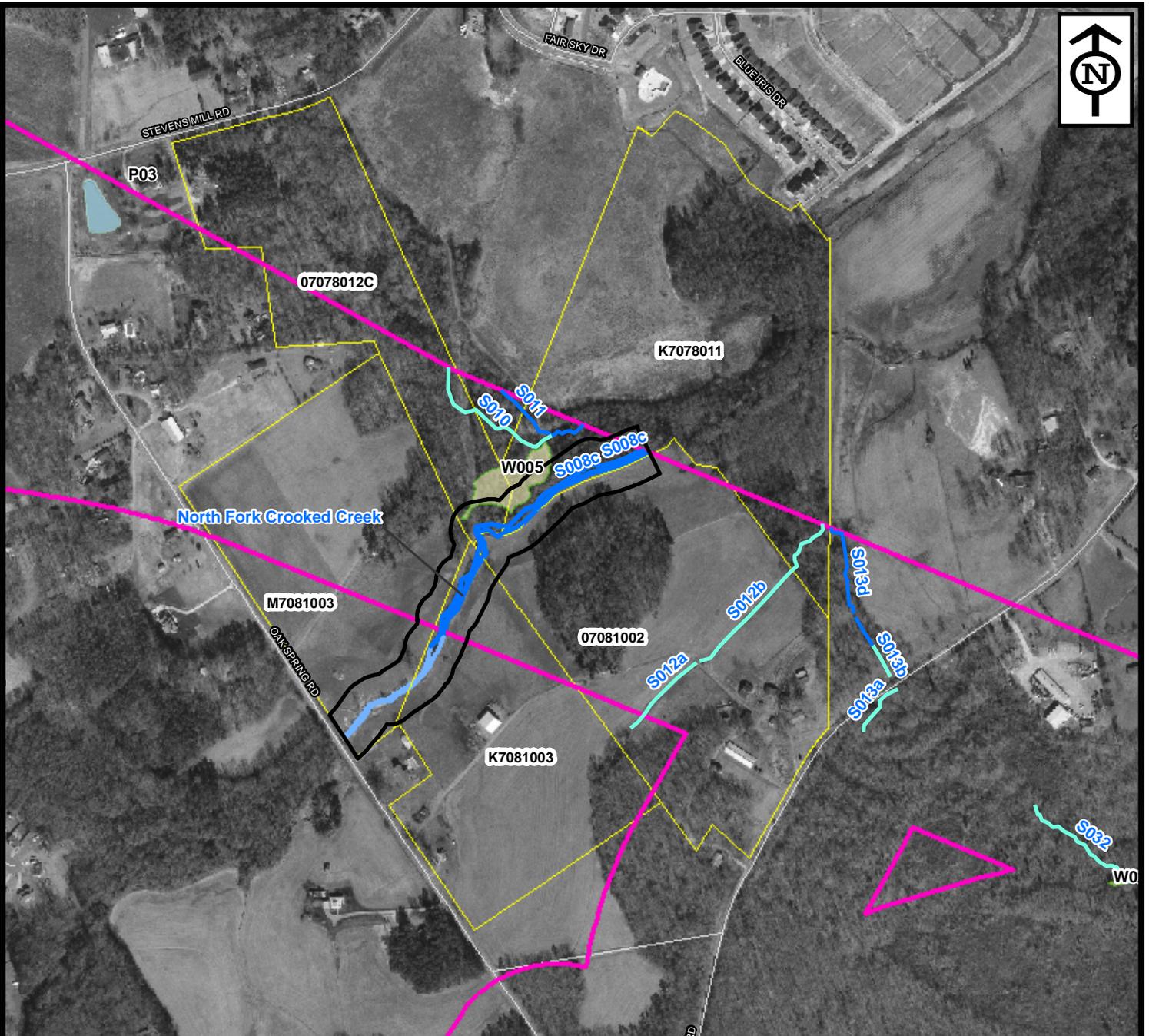
Potential On-Site Mitigation Overview

**Monroe Connector / Bypass**

Mecklenburg and Union Counties, North Carolina

Project:	ET09028.00
Date:	Jan. 2010
Drwn/Chkd:	JDS/JRN
Figure:	1



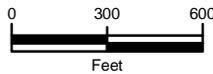


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|--------------------|----------------------------|
| Site Boundaries*   | Site Parcels               |
| Corridor Boundary* | 2008 Intermittent Stream*  |
| 2008 Pond*         | 2008 Perennial Stream*     |
| 2008 Wetland*      | 2009 Intermittent Stream*  |
| 2009 Pond*         | 2009 Perennial Stream*     |
| 2009 Wetland*      | Aerial Interpreted Stream* |

Sources: ESI; Union County GIS; PBS&J Engineers.

\*Location and Extent is Approximate.

Disclaimer: The information depicted on this figure is for informational purposes only and was not prepared for, and is not suitable for legal or engineering purposes. This information presented is not for regulatory review and is intended for use only by a Professional Land Surveyor prior to regulatory review.



Potential On-Site Mitigation - Site 1

## Monroe Connector / Bypass

Mecklenburg and Union Counties, North Carolina

Project:	ET09028.00
Date:	Jan. 2010
Drwn/Chkd:	JDS/JRN
Figure:	2



Photo 1: View of North Fork Crooked Creek and adjacent pastureland comprising Site 1.



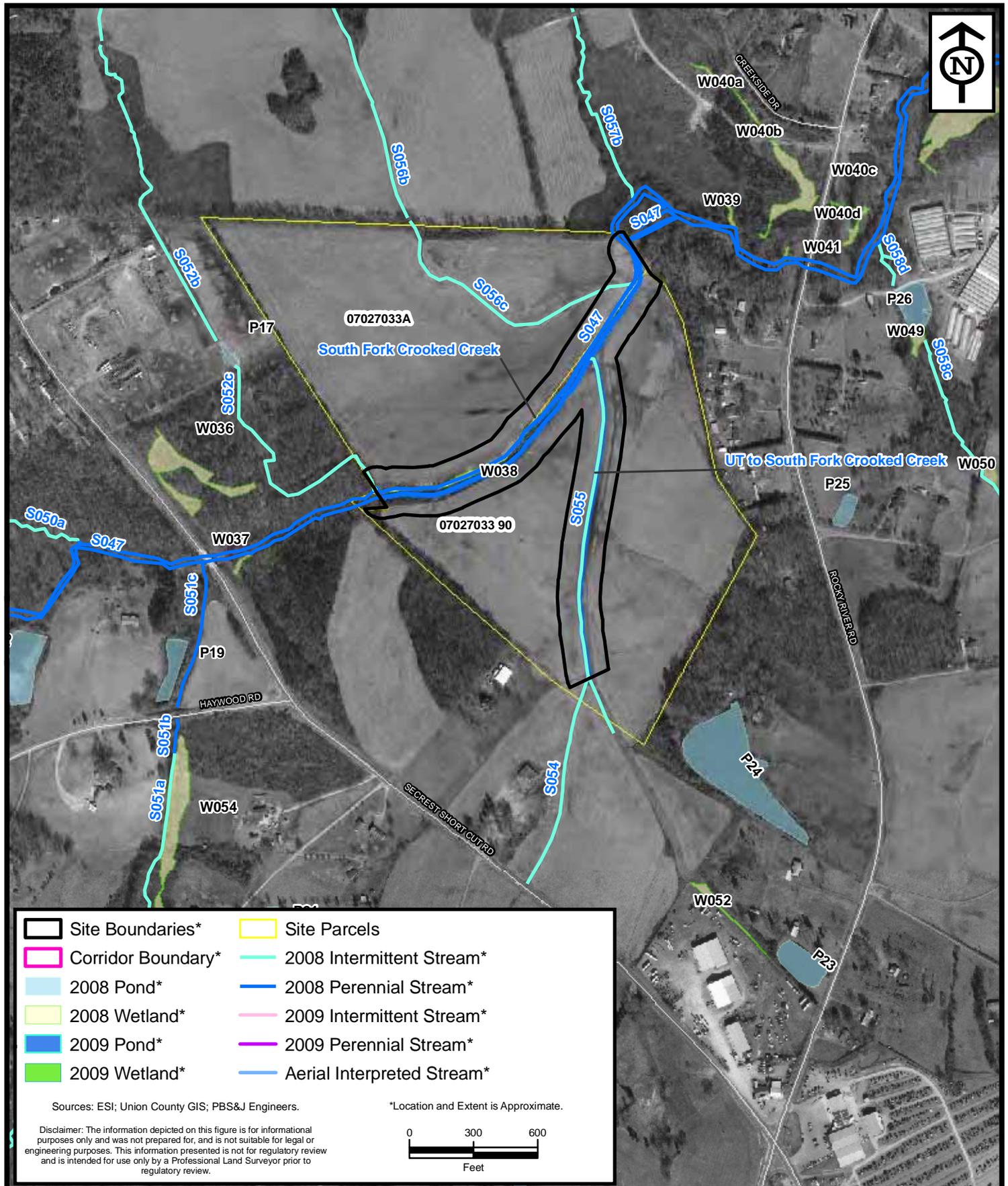
Photo 2: View of eroding banks and extensive sediment deposition within Site 1.



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Site Photographs  
**Potential On-Site Mitigation - Site 1**  
**Monroe Connector-Bypass**  
 Union County, North Carolina

Project:	ET09028.00
Date:	Jan 2010
Drwn/Chkd:	JMB/SPP
Photo Plate:	1



Potential On-Site Mitigation - Site 2

## Monroe Connector / Bypass

Mecklenburg and Union Counties, North Carolina

Project: ET09028.00

Date: Jan. 2010

Drwn/Chkd: JDS/JRN

Figure: 3





Photo 1: View of North Fork Crooked Creek and adjacent pastureland comprising Site 1.



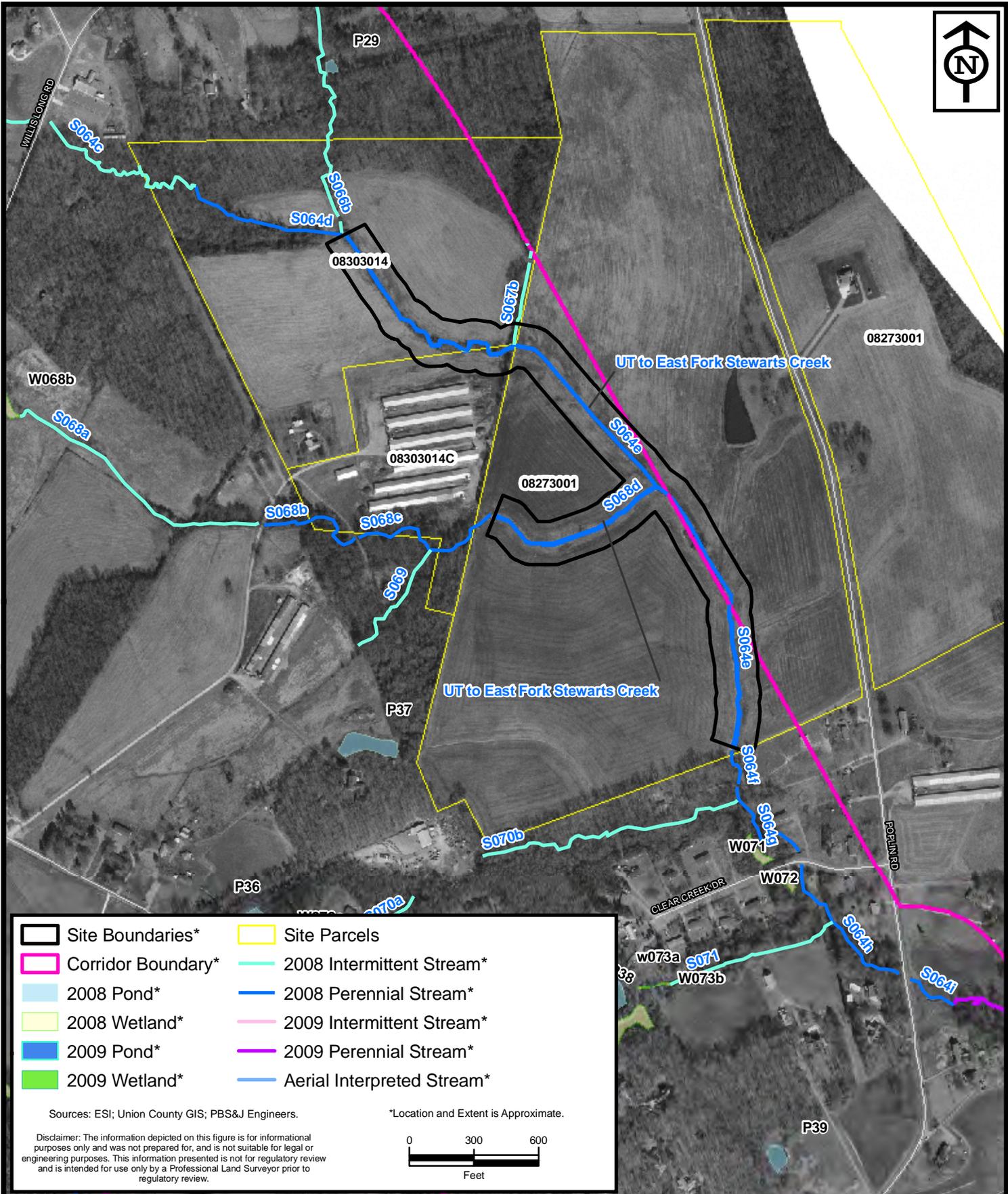
Photo 2: View of eroding banks and extensive sediment deposition within Site 1.



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Site Photographs  
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**Monroe Connector/Bypass**  
 Union County, North Carolina

Project:	ET09028.00
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Drwn/Chkd:	JMB/SPP
Photo Plate:	1

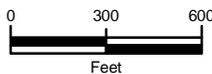


- |                    |                            |
|--------------------|----------------------------|
| Site Boundaries*   | Site Parcels               |
| Corridor Boundary* | 2008 Intermittent Stream*  |
| 2008 Pond*         | 2008 Perennial Stream*     |
| 2008 Wetland*      | 2009 Intermittent Stream*  |
| 2009 Pond*         | 2009 Perennial Stream*     |
| 2009 Wetland*      | Aerial Interpreted Stream* |

Sources: ESI; Union County GIS; PBS&J Engineers.

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Potential On-Site Mitigation - Site 3  
**Monroe Connector / Bypass**  
 Mecklenburg and Union Counties, North Carolina

Project:	ET09028.00
Date:	Jan. 2010
Drwn/Chkd:	JDS/JRN
Figure:	4



Photo 5: View of channelized UT to East Fork Stewarts Creek and adjacent agricultural field within Site 3.



Photo 6: View of southwestern tributary exhibiting severe bank erosion and non-existent riparian buffer within Site 3.



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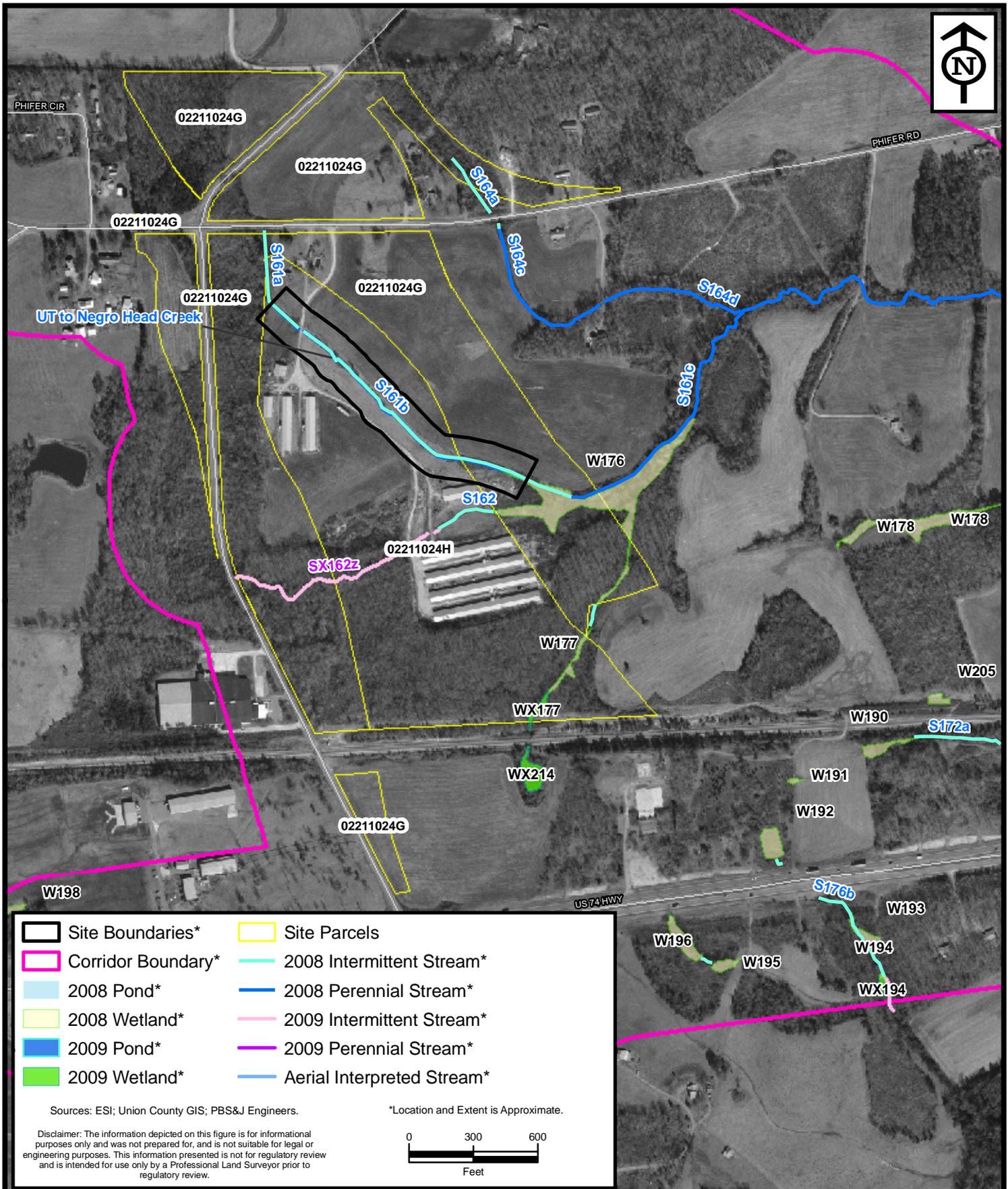
Site Photographs  
**Potential On-Site Mitigation - Site 3**  
**Monroe Connector/Bypass**  
 Union County, North Carolina

Project: ET09028.00

Date: Jan 2010

Drwn/Chkd: JMB/SPP

Photo Plate: 3

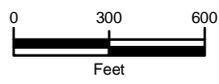


- Site Boundaries\*
- Site Parcels
- Corridor Boundary\*
- 2008 Pond\*
- 2008 Wetland\*
- 2009 Pond\*
- 2009 Wetland\*
- 2008 Intermittent Stream\*
- 2008 Perennial Stream\*
- 2009 Intermittent Stream\*
- 2009 Perennial Stream\*
- Aerial Interpreted Stream\*

Sources: ESI; Union County GIS; PBS&J Engineers.

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Potential On-Site Mitigation - Site 4

## Monroe Connector / Bypass

Mecklenburg and Union Counties, North Carolina

Project:	ET09028.00
Date:	Jan. 2010
Drwn/Chkd:	JDS/JRN
Figure:	<b>5</b>



Photo 7: View of unstable channel and adjacent pastureland within Site 4.



Photo 8: View of bank erosion and poor riparian buffer within Site 4.



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Site Photographs  
**Potential On-Site Mitigation - Site 4**  
**Monroe Connector/Bypass**  
 Union County, North Carolina

Project:	ET09028.00
Date:	Jan 2010
Drwn/Chkd:	JMB/SPP
Photo Plate:	4