Gaston East-West Connector

STIP NO. U-3321
GASTON AND MECKLENBURG COUNTIES, NC

CONCEPTUAL MITIGATION PLAN

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1.0 Introduction

The North Carolina Turnpike Authority (NCTA) is proposing to construct the Gaston East-West Connector, also known as the Garden Parkway, as a controlled-access toll road extending from I-85 west of Gastonia in Gaston County to I-485 near the Charlotte-Douglas International Airport in Mecklenburg County. As part of the mitigation strategy to help compensate for expected impacts caused by this project, the NCTA is evaluating several mitigation components. These include assets provided by the North Carolina Ecosystem Enhancement Program (EEP) as well as traditional and non-traditional on-site mitigation opportunities. This Conceptual Mitigation Plan, which is the conceptual mitigation plan for the Preferred Alternative refined preliminary design, provides a summation of the mitigation requirements and specifically all the potential mitigation components that may ultimately comprise the mitigation package for the project. These include:

- Off-Site Mitigation. Assets available in the 8-digit hydrologic units (HUCs) crossed by the Preferred Alternative for off-site mitigation credits to be provided by the North Carolina Ecosystem Enhancement Program (EEP).
- Off-Site Mitigation. Potential off-site mitigation sites closer to the Preferred Alternative in Gaston and Mecklenburg identified by EEP for potential future acquisition for mitigation credit.
- On-Site Mitigation. Traditional on-site mitigation opportunities identified for the Preferred Alternative (3 potential sites).
- On-Site Mitigation. Other on-site mitigation opportunities, including preservation and enhancement opportunities on the following types of parcels: 1) landlocked parcels that may be purchased by NCTA, 2) landlocked parcels that have a preliminary service road identified to provide access, 3) adjacent parcels with a portion of their area within the right-of-way but the remainder has existing access, and 4) nearby parcels that would need to be evaluated by EEP. In addition, non-traditional mitigation opportunities near the project were identified; including retrofitting storm water ponds for commercial/industrial areas and runoff collection ponds for residential curb-and-gutter communities that drain into streams without collection systems.

With the exception of the EEP mitigation assets already in hand in the 8-digit HUCs, the other potential mitigation resources listed in this report have not been acquired at this time. These other potential mitigation resources require additional evaluation, including an assessment of feasibility, more detailed determination of the amount of wetland or stream credits present on the potential site, and contact and buy-in with property owners. The total amounts of wetland and stream mitigation potentially available listed in this report should not be construed as the actual amounts that are feasible or that will be implemented for this project. This report serves to document that there are sufficient potential mitigation sites to cover the compensatory mitigation needs of the Gaston East-West Connector.

The NCTA and FHWA will work with the environmental resource and regulatory agencies during the permitting phase to further refine the mitigation plan for the project.

2.0 Background

A Draft Environmental Impact Statement (Draft EIS) was published April 24, 2009. The Draft EIS evaluated twelve Detailed Study Alternatives (DSAs), with DSA 9 identified as the Recommended Alternative. Public Hearings were held in June 2009.

Based on the Draft EIS and comments received during the public review period, the Federal Highway Administration (FHWA), North Carolina Turnpike Authority (NCTA), and North Carolina Department of Transportation (NCDOT) identified Detailed Study Alternative (DSA 9) as the Preferred Alternative. The Preferred Alternative is shown in **Figure 1**.

From project initiation in 2001 to 2005, when the project was adopted by the NCTA as a candidate toll facility, the project followed the NCDOT's NEPA/404 Merger Process. In 2005, the NCTA determined that project coordination would continue with a process similar to the NEPA/404 Merger Process, even though the NCTA is not a signatory to the Memorandum of Agreement that created the NEPA/404 Merger process. This process is included in the Project Coordination Plan developed for the project in accordance with Section 6002 of SAFETEA-LU (Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users).

Concurrence Points 1, 2, 2a, 3, and 4a have been completed for the project. The Preferred Alternative was identified as the Least Environmentally Damaging Practicable Alternative (LEDPA) at the October 13, 2009, Turnpike Environmental Agency Coordination (TEAC) meeting.

The purpose of Concurrence Point 4a in the NEPA/404 Merger Process is to identify additional avoidance and minimization efforts not included in the preliminary design during the alternative analysis phase of the project. Concurrence Point 4a is achieved upon agreement that project jurisdictional impacts have been avoided and minimized to the maximum extent practicable based on current information and design available at the time. When avoiding and minimizing jurisdictional resource impacts, other resources will be considered. Concurrence Point 4a was achieved at the TEAC meeting held February 16, 2010.

It should be recognized that additional minimization may be achieved during the final design process with more precise mapping, including the project hydraulic design (Concurrence Points 4b and 4c).

3.0 Modifications to the Preferred Alternative Preliminary Design

Several design modifications were made to the Preferred Alternative after the Draft EIS as a result of public involvement activities, coordination with environmental resource and regulatory agencies, and comments received during the Draft EIS public review period.

The preliminary design refinements include mainline design changes (median width and realignment), access road changes, interchange reconfiguration or elimination, and the addition of service roads, as listed below.

- Reduce Median by 20 Feet and Revise Typical Section
- Modify Access to Matthews Acres Subdivision
- Retain the US 29-74 Interchange
- Modify the Forbes Road Grade Separation
- Compress the Robinson Road Interchange
- Eliminate the Bud Wilson Road Interchange

- Compress the NC 274 (Union Road) Interchange
- Relocate Tucker Road Connection to Canal Road
- Realign Mainline to Avoid Recreation Fields and Provide Access Road to NC 273 (Southpoint Road)
- Reconfigure the NC 273 (Southpoint Road) Interchange to Avoid Historic Boundary of Mt. Pleasant Baptist Church Cemetery
- Relocate Boat Club Road Connection North of Mainline to NC 273 (Southpoint Road)
- Reconfigure the I-485 Interchange and Dixie River Road Interchange

These design changes were made to avoid and minimize impacts to the human and natural environment, and resulted in shifts to the alignment throughout the corridor.

4.0 Updated Impacts to Jurisdictional Resources

The refined preliminary design for the Preferred Alternative results in an approximately 25 percent reduction in stream impacts (2.36 miles), an approximately 6 percent reduction in wetland impacts (0.4 acre), a slight increase in impacts to ponds (0.4 acre), and a slight decrease in Catawba River buffer impacts. The changes in jurisdictional resource impacts resulting from the individual refinements are summarized in **Table 1**. **Appendix A** includes tables listing impacts by individual resource.

Impacts Grouped by Hydrologic Unit. The impacts listed in **Table 1** and **Appendix A** can also be grouped by hydrologic unit (HU). Most of the project is located in HU 03050101 (Gaston and Mecklenburg Counties), with a portion in HU 03050102 (South Fork Catawba River drainage in Gaston County).

In HU 03050102, perennial stream impacts (including service roads) would be reduced from 3,149 linear feet to 2,642 linear feet (a change of -507 linear feet), and intermittent stream impacts would stay approximately the same (previously 1,399 linear feet compared to currently 1,405 linear feet) as a result of the Preferred Alternative design refinements.

In HU 03050101, perennial stream impacts (including service roads) would be reduced from 35,745 linear feet to 26,391 linear feet (a change of -9,354 linear feet), and intermittent stream impacts would be reduced from 8,702 linear feet to 5,978 linear feet (a change of -2,724 linear feet) as a result of the Preferred Alternative design refinements.

Table 1. Summary of Changes in Jurisdictional Resource Impacts Due to Design Refinements and Service Roads

Design Refinement	Change in Impact to Resource Compared to Draft EIS DSA 9 Preliminary Design*					
	Catawba River Buffers (square feet)	Perennial Streams (linear feet)	Intermittent Streams (linear feet)	Total Streams (linear feet)	Wetlands (acres)	Ponds (acres)
Reduce Median Width	Zone 1- 6,758 Zone 2- 1,356	-980	-174	-1,154	-0.32	0
Modify Matthews Acres Access	0	0	0	0	0	0
Modify Forbes Rd Grade Separation	0	-71	0	-71	0	0
Compress Robinson Rd Interchange	0	-170	0	-170	0	-0.06
Eliminate Bud Wilson Rd Interchange	0	-3,109	-646	-3,755	0	0
Compress NC 274 (Union Rd) Interchange	0	-1,823	+398	-1,425	+0.02	+0.18
Relocate Tucker Road Connection	0	+37	0	+37	0	0
Realign Mainline At Optimist Club Fields	0	-181	+6	-175	0	0
Reconfigure NC 273 (Southpoint Rd) interchange to Avoid Cemetery	0	0	0	0	0	0
Relocation Boat Club Rd North Connection	0	-135	0	-135	0	0
Reconfigure I-485 Interchange	0	-3,783	-2,335	-6,118	-0.34	0
TOTAL CHANGE	Zone 1- 6,758 Zone 2- 1,356	**-10,215**	**-2,751**	**-12,966**	**-0.64**	**+0.12**
Impacts Reported in Draft EIS for DSA 9	Zone 1- 10,400 Zone 2- 10,215	38,894	10,101	48,995	7.50	4.1
Impacts for Preferred Alternative (no service roads)	Zone 1- 3,642 Zone 2- 8,859	28,679	7,350	36,029	6.90	4.2
Add Service Roads	0	+354	+33	+387	+0.12	+0.3
TOTAL IMPACTS FOR PREFERRED ALTERNATIVE	Zone 1- 3,642 Zone 2- 8,859	29,033	7,383	36,416	7.02	4.5

* Impacts calculated based on slope stake limits plus a 25-foot buffer.

5.0 Mitigation Requirements

Mitigation policy for Waters of the United States has been established by US Environmental Protection Agency (USEPA) and US Army Corps of Engineers (USACE) regulations in 33 CFR Part 332 and 40 CFR Part 230, Subpart J. Requirements related to wetlands mitigation are also contained in the Section 404(b)(1) Guidelines (40 CFR 230, Subpart B), FHWA wetlands and natural habitat mitigation regulations (23 CFR Part 777), Executive Order 11990 (42 FR 26961 [1977]), US Fish and Wildlife Service (USFWS) mitigation policy directives (46 FR 7644-7663 [1981]), and the Council on Environmental Quality (CEQ) regulations (40 CFR Part 1500).

The USEPA and USACE regulations governing wetlands mitigation embrace the policy of "no net loss of wetlands" and sequential consideration of avoidance, minimization, and mitigation. The purpose of this policy is to restore and maintain the chemical, biological, and physical integrity of Waters of the United States. Compensatory mitigation is sought only after all reasonable efforts have been made to avoid or minimize impacts.

Avoidance examines all appropriate and practical possibilities of averting impacts to Waters of the United States and Catawba River riparian buffers. According to a 1990 Memorandum of Agreement (MOA) between the USEPA and USACE, in determining "appropriate and practical" measures to offset unavoidable impacts, such measures should be appropriate to the scope and degree of those impacts and practical in terms of costs, existing technology, and logistics in light of overall project purposes.

Minimization includes the examination of appropriate and practical steps to reduce the adverse impacts to Waters of the United States and Catawba River riparian buffers. Implementation of these steps would be required through project modifications and permit conditions. Strict adherence to Best Management Practices (BMPs) would assist in minimizing project impacts. Minimization methods typically include:

- Decreasing the footprint of the proposed project through the reduction of median width, right-of-way widths, fill slopes and/or road shoulder widths.
- Installation of temporary silt fences, earth berms, and temporary ground cover during construction.
- Strict enforcement of sedimentation and erosion control BMPs for the protection of surface waters and wetlands.
- Minimizing clearing and grubbing activity in and adjacent to water bodies.
- Re-establishing vegetation on exposed areas with judicious pesticide and herbicide management.
- Bridge lengthening in environmentally sensitive areas.
- Minimizing in-stream activities.

The Preferred Alternative incorporates measures to avoid and minimize impacts to Waters of the United States and the Catawba River buffers.

The horizontal alignment of the preliminary engineering design was adjusted where possible to minimize or avoid impacts to streams, wetlands, and ponds. The presence of wetlands and streams, and minimizing or avoiding impacts to these resources, was a factor in considering interchange configurations.

Bridge lengths that were extended to maintain roadway and railway access adjacent to the Catawba River and South Fork Catawba River also avoided or minimized encroachment into Catawba River buffer areas.

To further address avoidance and minimization, the NCTA met with the environmental resource and regulatory agencies (USACE, NC Division of Water Quality [NCDWQ], USFWS, USEPA, NC Wildlife Resources Commission [NCWRC]) at Turnpike Environmental Agency Coordination (TEAC) Meetings on February 5, March 4, and April 8, 2008, to discuss bridging and alignment decisions for the DSAs' preliminary engineering designs. In the NEPA/404 Merger Process, this is Concurrence Point 2a – Bridging/Alignment Decisions.

As a result of those meetings, there were no changes to the alignments of any of the DSAs, including the Preferred Alternative. However, the NCTA agreed to include two bridges in the preliminary engineering design for the Preferred Alternative beyond those required to convey floodwaters, to avoid or minimize stream and wetland impacts. These bridge locations are described below.

- Corridor Segment H3 – bridge Blackwood Creek (Stream S135).
- Corridor Segment K3A – lengthen the mainline bridge over Catawba Creek (Stream S259) to span the main body of Wetland W248. This extension also avoids impacts to Catawba River buffer areas on the east side of the creek.

Compensatory Mitigation and Mitigation Ratios. Appropriate and practicable compensatory mitigation is required for unavoidable adverse impacts that remain after all appropriate and practicable avoidance and minimization has been incorporated. It is the decision of the USACE and the NCDWQ whether to require mitigation for impacts associated with construction.

Because this project would be permitted under an Individual Section 404 Permit, mitigation for impacts to surface waters will be required by the USACE and NCDWQ. Furthermore, in accordance with its regulations (33 CFR Part 332), the USACE requires compensatory mitigation when necessary to ensure that adverse effects to the aquatic environment are minimal. Stream impacts will be greater than USACE and NCDWQ regulatory thresholds and will require compensatory mitigation.

Based on correspondence with USACE and NCDWQ (field verification meeting held on April 12-13, 2010), the following mitigation ratios will be required:

- Intermittent streams (USACE stream quality rating score 0-49 [unimportant]) – 0.5:1 (meaning 0.5 linear feet of mitigation should be provided for every 1.0 linear feet of impact)
- Intermittent streams (USACE stream quality rating 50-100 [important]) – 1:1
- Perennial streams – 2:1
- Wetlands – 2:1

Table 2 lists the project's mitigation needs based on the current estimate of impacts to jurisdictional resources from the Preferred Alternative refined preliminary design. It should be noted that the impact estimates include a 25-foot buffer from the estimated construction limits based on the current preliminary level of design. It is likely that actual impacts will be less as the project moves into final design.

Table 2. Estimated Mitigation Needs for the Preferred Alternative

Resource	Impacts – Preferred Alternative Refined Preliminary Design	Mitigation Ratio	Estimated Mitigation Need
Wetlands	7.0 acres	2:1	14.0 WMUs
Perennial Streams	29,033 lf	2:1	58,066 SMUs
Intermittent – Important Streams	4,039	1:1	4,039 SMUs
Intermittent – Unimportant Streams	3,344	0.5:1	1,672 SMUs

WMU = Wetland Mitigation Unit SMU = Stream Mitigation Unit

Catawba River Buffers. Based on the refined preliminary design, the Preferred Alternative would impact 3,642 square feet of Zone 1 buffers and 8,859 square feet of Zone 2 buffers. The total impacts to buffers would be 12,501 square feet (0.28 acre). This is less than the threshold of one-third acre that requires mitigation.

During final design, the amount of buffer area required would be recalculated. Impacts less than one-third acre would still require, prior to construction, written authorization from the NCDWQ for disturbances to the buffer (15A NCAC 02B.0244).

6.0 Potential Mitigation Components

The preferred intent of the NCTA and the FHWA is to use the EEP's in-lieu fee payment program as the primary means of providing compensatory mitigation for the Gaston East-West Connector project.

The EEP was established by the *Memorandum of Agreement Among the North Carolina Department of Environment and Natural Resources, the North Carolina Department of Transportation, and the US Army Corps of Engineers, Wilmington District* (July 22, 2003). According to the three-party Memorandum of Agreement, the mission of the EEP is to "restore, enhance, preserve and protect the functions associated with wetlands, streams and riparian areas, including but not limited to those necessary for the restoration, maintenance and protection of water quality and riparian habitats throughout North Carolina."

EEP provides mitigation services on a watershed level basis as compensation for unavoidable environmental impacts associated with transportation infrastructure and economic development. EEP also focuses on detailed watershed planning and project implementation efforts within North Carolina's threatened or degraded watersheds.

In accordance with the watershed-based approach, mitigation provided by EEP for a project can be provided in locations throughout the same 8-digit hydrologic unit.

At meetings and in correspondence about the Gaston East-West Connector project, including a meeting held March 16, 2010, environmental resource and regulatory agencies expressed concern that much of EEP's available mitigation in Catawba 01 and Catawba 02 is not present in Gaston and Mecklenburg Counties, but rather at a distance from the project. Meeting minutes from the March 16, 2010 meeting are included in **Appendix B**.

In order to address agency concerns, the NCTA and EEP have agreed to investigate mitigation opportunities supplemental to or in addition to the typical EEP programmatic approach. In separate

efforts, EEP has conducted a search for potential near-site opportunities and the NCTA has conducted a review of on-site mitigation and non-traditional mitigation opportunities. The following sections provided a review of the potential components of the mitigation plan including:

1) Mitigation assets EEP currently has in hand in the two 8-digit HUCs crossed by the Preferred Alternative – 03050101 (Catawba 01) and 03050102 (Catawba 02)
2) Recent mitigation site search conducted by EEP for potential sites in these two HUCs that are within Gaston and Mecklenburg Counties
3) Traditional on-site mitigation
4) Other on-site mitigation sources
5) Non-traditional on-site mitigation

6.1. Existing EEP Mitigation Assets

The EEP has several sites in Catawba 01 and Catawba 02 with stream and wetland mitigation credits still available for commitment to projects. **Exhibit 1** shows the locations of these EEP projects.

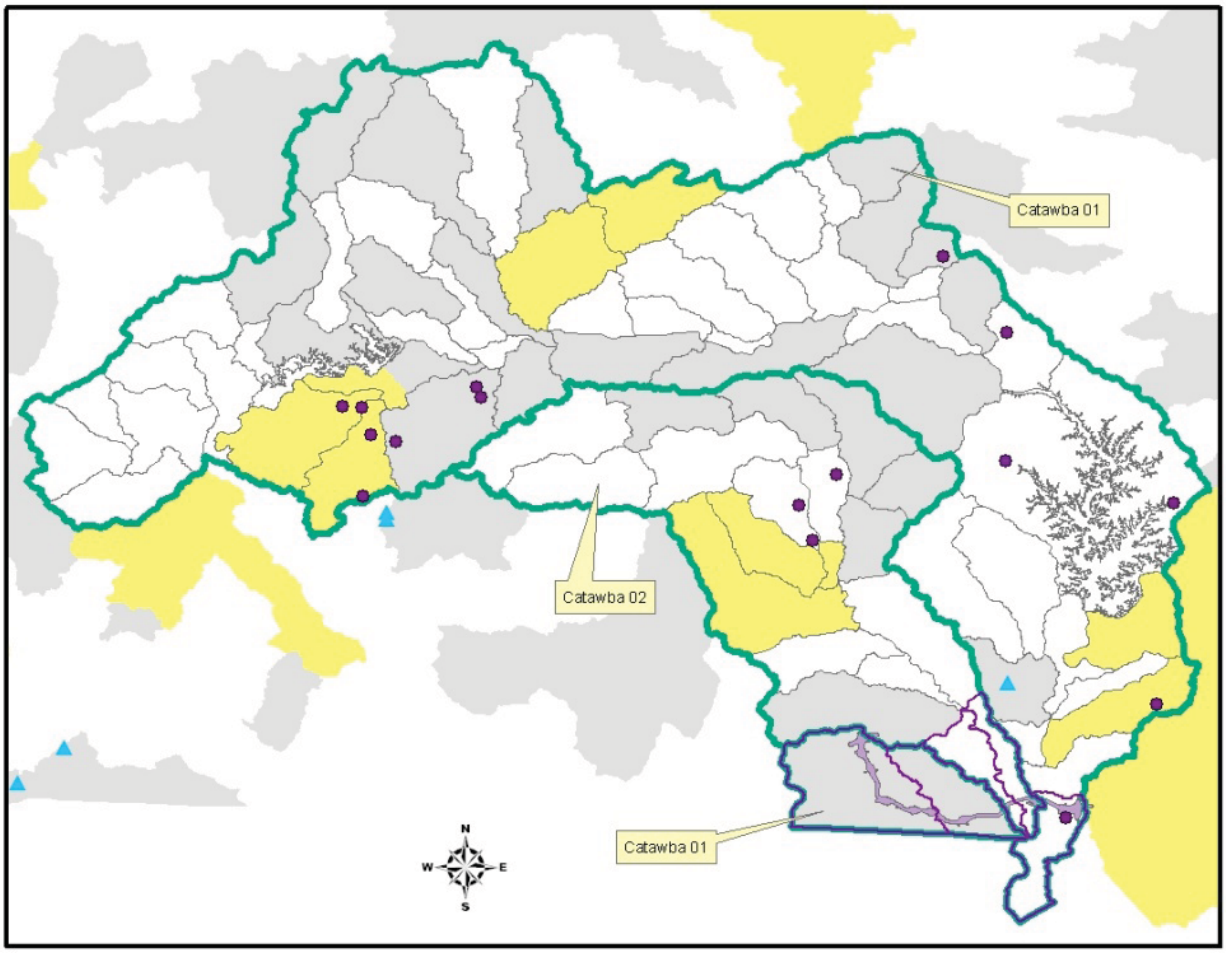


Exhibit 1. EEP Assets in Catawba 01 and Catawba 02

Table 3 lists the available assets at these sites. The nearest site to the Preferred Alternative is the Beaverdam Creek site located just south of the proposed project's interchange with I-485 within Berewick Regional Park. The Beaverdam Creek site (EEP Project 92217) includes 13,014 Stream Mitigation Units – Restoration (SMU-R) and 520 Stream Mitigation Units – Restoration Equivalent (SMU-RE).

Table 3. EEP Available Mitigation Resources

Resource	Mitigation Type	Watershed*		Total
		Catawba 01	Catawba 02	
Streams	Restoration	16,352 SMU	18,767 SMU	35,119 SMU
	Restoration Equivalent	5,107	0	5,107 SMU
	High Quality Preservation	--	--	32,928 SMU in Southern Piedmont Ecoregion
Wetlands	Restoration	8.6 WMU	2.4 WMU	11.0 WMU
	Restoration Equivalent	3.0	0.7	3.7 WMU
	High Quality Preservation	--	--	263.1 WMU in Southern Piedmont Ecoregion

Source: EEP
* SMU = Stream Mitigation Unit, WMU = Wetland Mitigation Unit

6.2. Potential EEP Mitigation Sites Identified in Catawba 01 and Catawba 02 in Gaston and Mecklenburg Counties

EEP conducted a GIS site search for potential stream projects in 14-Digit HUCs in Catawba 01 and Catawba 02 within Gaston and Mecklenburg Counties. The EEP is willing to pursue these potential projects as part of the normal process for identifying mitigation credits in Catawba 01 and Catawba 02. However, these mitigation projects would not be tied directly to the Gaston East-West Connector.

Consistent with the programmatic approach the EEP takes, these credits would be applied to future projects, but the Gaston East-West Connector would be the influence that steers these future credits to areas the agencies felt they were most needed. This is a normal process in the programmatic, watershed approach to mitigation.

The GIS site search of local watersheds for the Gaston East-West Connector included parcels in Mecklenburg and Gaston Counties that had more than 1,000 linear feet of stream with land use having restoration potential (open space, low density developed, pasture, herbaceous, or cropland). Project feasibility was evaluated by five criteria:

- Total project stream length greater than 1,500 linear feet, with at least one parcel containing 1,000 linear feet
- 1 to 3 landowners
- Drainage area less than 10 square miles
- Streams with narrow or no buffer on at least one side
- Riparian corridor without severe constraints

Sixteen sites were identified through the GIS evaluation and subsequently visited via windshield survey by EEP staff in March 2010. Landowners were not contacted in support of this effort. Based on the site visit, the potential feasibility of each site was ranked in three tiers, as listed below and shown in the adjacent exhibit. **Exhibit 2** shows the locations of these EEP projects.

Tier 1 – Good project possibility

Tier 2 – Project has significant constraints

Tier 3 – Project is not feasible

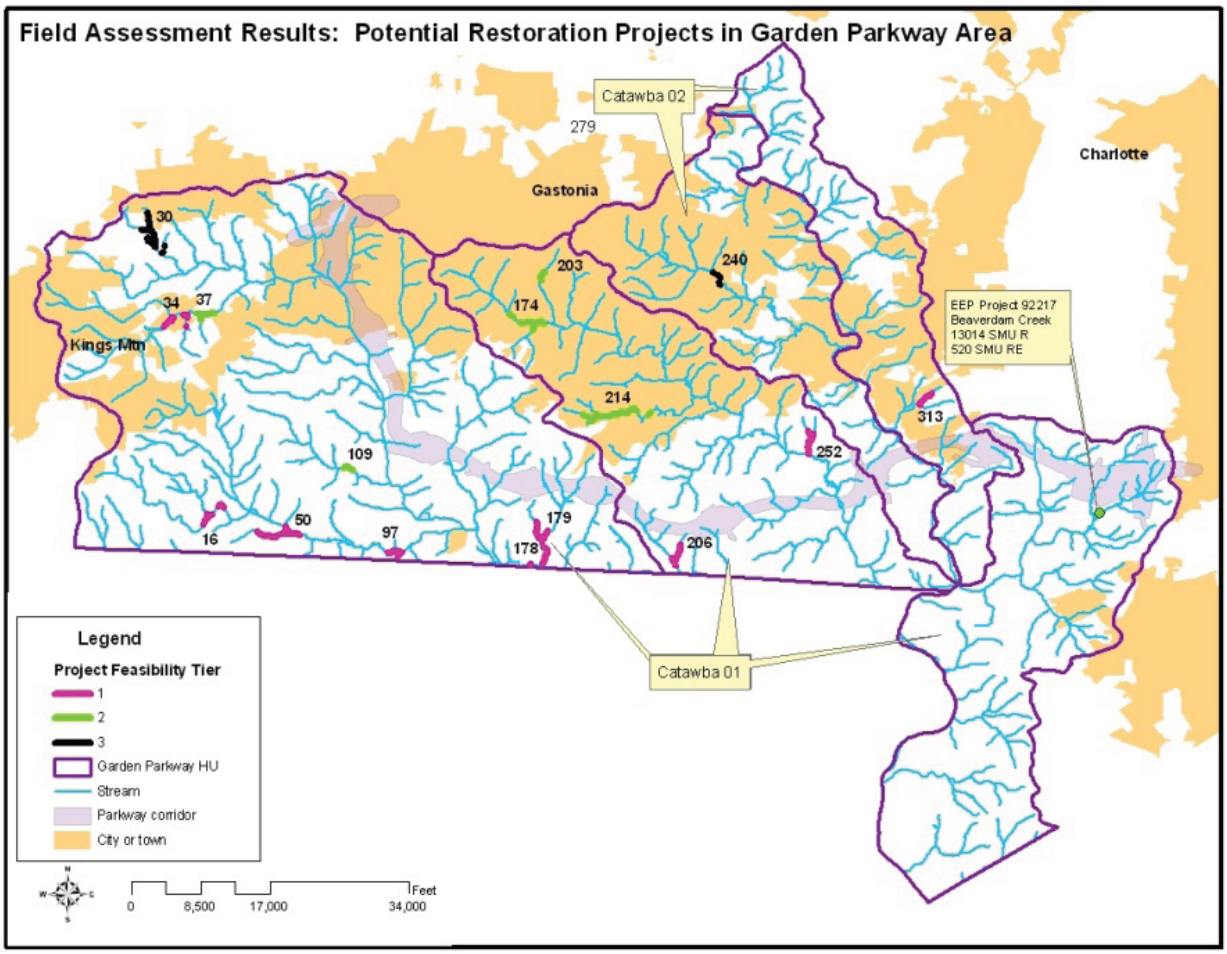


Exhibit 2. Potential EEP Restoration Sites in Catawba 01 and Catawba 02 in Gaston and Mecklenburg Counties

Table 4 lists the potential restoration projects identified as Tier 1 and Tier 2. Total potential stream restoration length is 32,400 linear feet in Tier 1 (most promising sites) and 12,100 linear feet in Tier 2 (site has significant constraints). There were nine Tier 1 projects and five Tier 2 projects identified.

Table 4. Potential Restoration Projects in Catawba 01 and Catawba 02 in Gaston and Mecklenburg Counties

14-Digit HUC	Major Stream	Number of Potential Projects	Total Project Length (ft)	Tier 1 Projects (ft)	Tier 2 Projects (ft)
Catawba 01					
03050101-170040	Catawba River	0	0	0	0
03050101-180010	Crowders Creek	8	28,500	23,400	5,100
03050101-180020	Catawba Creek	5	14,000	7,000	7,000
Catawba 02					
03050102-060020	South Fork Catawba River	1	2,000	2,000	0
03050102-070030	South Fork Catawba River	0	0	0	0
	TOTAL	14	44,500	32,400	12,100

Source: EEP

6.3. Traditional On-Site Mitigation

Traditional on-site stream and wetland mitigation opportunities within the project study area were reviewed and identified in November 2009. For the purposes of this discussion, "traditional" mitigation is defined primarily as those restoration techniques that are applied directly to a site that restores or enhances stream and wetland functions. For streams, traditional mitigation includes the Priority 1 through 4 options for restoring incised streams (NCSRI); and for wetlands includes hydrologic manipulations (e.g., plugging ditches) and intensive native plant community restoration. On-site mitigation opportunities were generally restricted to parcels adjacent to the Preferred Alternative.

6.3.1. Site Selection Methodology

Potential traditional wetland and stream restoration and enhancement sites were first identified through Geographic Information System (GIS) analysis. Aerial photography was examined in areas where wetlands, streams, and buffer areas were found to be coincident with disturbed land uses. Based on aerial photography interpretation, areas judged to have restoration potential were recorded and those areas without potential were discounted. Specific methodology and data used in identifying potential wetland and stream restoration sites are described below. Aerial photography used in the identification of all restoration sites consisted of 2008 aerial photography acquired from the National Agricultural Imaging Program for Mecklenburg and Gaston Counties. Aerial photography was used in concert with other data sets including soils (Soil Survey Geographic [SSURGO] database), hydrology (National Hydrography Dataset [NHD]), contour data (NCDOT), and county parcel data (Gaston and Mecklenburg).

Criteria for the selection of potential wetland and stream restoration and enhancement sites were established prior to the GIS analysis. Site selection criteria were developed with consideration for guidance from the USACE and the EEP. The following guidelines were observed throughout the GIS analysis:

Stream Restoration and 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 easement 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 mile drainage area (typically 1st and 2nd order streams, 3rd order streams in some cases), and no greater than a 3rd order stream.
- Proposed stream segments must be perennial as indicated on United States Geological Survey (USGS) 24K Quadrangle Maps and/or in the Natural Resources Conservation Service (NRCS) Soil Surveys. No more than 20 percent of the proposed restoration or enhancement project can be intermittent.

Wetland Restoration and 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. 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 taken.

Based on the GIS analysis, 20 tax parcels totalling approximately 1,050 acres were identified as potentially containing mitigation opportunities, as listed in **Table 5**.

Table 5. Parcel Data and Field Evaluated Traditional On-Site Mitigation Opportunities

PIN	Owner	Parcel Address	Size (acres)	Mitigation Potential
Sites with Mitigation Potential				
3535210554	DOCKERY DAVID N	Lin wood Rd	42.8	Stream Enhancement (Site 1)
3535229884	DOCKERY PROPERTIES LLLP	Hubert St	29.1	Stream Enhancement (Site 1)
3534287991	DOCKERY, DAVID N	2900 Linwood Rd	101.6	Stream Enhancement (Site 1)
3562837404	HARRISON, CHARLES	6338 Union Rd	15.5	Stream Enhancement and Restoration (Site 2)
3562839141	HARRISON, CHARLES	6338 Union Rd	19.3	Stream Enhancement and Restoration (Site 2)
3562920627	HARRISON, CHARLES	6338 Union Rd	22.3	Stream Enhancement and Restoration (Site 2)
3562922221	HARRISON, CHARLES	Wilson Rd	20.6	Stream Enhancement and Restoration (Site 2)
3533650153	FALLS, ROBERT P	362 Crowders Creek Rd	21.6	Wetland Enhancement (Site 3)
Sites with No Mitigation Potential				
3535098933	STILES, PARKS	1113 Shannon Bradley Rd	15.8	No Mitigation Potential: impaired stream reach too short
3535091505	ROBINSON, ROBERT F & ANNIE	Dundeen Dr	26.2	No Mitigation Potential: stable stream
3536009443	STILES, PARKS	Shannon Bradley Rd	4.1	No Mitigation Potential: impaired stream reach too short
3552053030	ENTLER, EARNEST L	Granny Trail	4.7	No Mitigation Potential: stable stream
3552039171	THOMPSON, JAMES C JR	Sparrow Dairy Rd	179.3	No Mitigation Potential: stable stream
3562438039	FERGUSON, MARGARET ANN QUINN	162 Wilson Farm Rd	137.2	No Mitigation Potential: functioning wetland system
3573819339	LAKHANI ,ZAHID R	1208 Union New Hope Rd	28.5	No Mitigation Potential: functioning wetland system
3573830015	STOWE, JEFFREY W	Union New Hope Rd	83.5	No Mitigation Potential: currently under construction
4502847583	MECKLENBURG COUNTY	Dixie River Rd	75.0	Completed stream restoration project
4512051925	MECKLENBURG COUNTY	Dixie River Rd	105.0	Completed stream restoration project
4502649026	DIXIE RIVER LAND COMPANY LLC	Dixie River Rd	15.9	Completed stream restoration project
4502820480	DIXIE RIVER LAND CO LLC	Dixie River Rd	102.8	No Mitigation Potential: stable stream

In most cases, the natural resource feature with mitigation opportunity extended across multiple parcels, in which case the parcels were combined to facilitate field evaluation. Following field evaluations, seven (7) parcels were found that contain opportunities for stream and/or wetland mitigation. These parcels are grouped into three (3) sites (Sites 1-3) and are described below.

Stream and wetland credit calculations are based on ratios provided on the USACE Wilmington District webpage (http://www.saw.usace.army.mil/WETLANDS/Mitigation/index.html, May 5, 2010). All of the recommended sites will require additional analysis and feasibility studies to determine the full mitigation potential.

6.3.2. Summary of Traditional On-Site Mitigation

Site 1: 2900 Linwood Road, Gastonia, NC (Linwood Springs Golf Course)
Mitigation Opportunity: Stream Restoration and Enhancement

Eroding banks and poor riparian buffer along Crowders Creek

Site 1, shown in **Figure 2**, is located at 2900 Linwood Road in southwest Gastonia. The site consists of all or a portion of four tax parcels that total approximately 204.9 acres. Land use consists of a golf course with routine maintenance associated with fairway upkeep.

The site contains approximately 5,744 linear feet of Crowders Creek. Crowders Creek is a 303(d)-listed stream for impaired biological integrity primarily resulting from urban runoff and storm sewers (NCDWQ 2006, 2010). The reach of Crowders Creek contained within the Site is deeply entrenched and characterized by steep and eroding banks, limited sinuosity, and a poor riparian buffer. Mowing occurs along both stream banks with only a limited stream buffer consisting of shrubs and grasses. Eroding stream banks were observed throughout this reach of Crowder's Creek. The site also contains approximately 3,589 linear feet of first- and second-order tributaries to Crowders Creek that have been rerouted though on-site ponds or degraded from past land-use practices.

Mitigation potential within Site 1 may include various Priority 1 through 4 stream restoration and enhancement opportunities along approximately 9,334 linear feet of Crowders Creek and tributaries. Stream restoration may involve activities that result in improvements to the impaired stream and riparian corridor that restore stream geomorphic dimension, pattern, and profile (USACE 2003).

Stream restoration and enhancement approaches that are appropriate for this reach of Crowders Creek may include stream realignment, stream bank stabilization (relaxing the grade of overly steep, unstable banks) and excavating a floodplain (or bankfull bench) adjacent to the channel. Additionally, planting a riparian buffer will enhance bank stability, increase channel shading, and provide additional wildlife habitat.

Discussions with the landowner indicated an interest in selling the entire property. NCDOT Natural Environmental Unit (NEU) is currently moving forward with a site appraisal. Additional analysis and feasibility studies are necessary to determine if mitigation activities are practical and cost effective.

The mitigation activity multiplier for stream restoration and enhancement ranges from 1.0 to 2.5 depending on the range of techniques that are applied to a site. Stream restoration and enhancement of approximately 9,334 linear feet of Crowders Creek and on-site tributaries may result in upwards of 9,334 stream mitigation units (SMU). The USACE (in conjunction with NCDWQ and any other relevant regulatory agencies) ultimately determines the mitigation credit ratio for each project on a case-by-case basis.

Site 2: 6338 Union Road, Gastonia, NC
Mitigation Opportunity: Stream Enhancement and Restoration

Site 2, shown on **Figure 3,** is located at 6338 Union Road in southeast Gastonia. The site consists of four tax parcels that total approximately 77.6 acres. The three southernmost parcels comprise the Harrison Family Dairy Farm, a historic site determined to be eligible for listing on the National Register of Historic Places (NRHP) (See Draft EIS, Section 5.2.2). Land use consists of cattle production with the majority of the site covered in pasture.

Narrow riparian buffer along Mill Creek and adjacent pasture

The Site contains approximately 1,700 linear feet of Mill Creek, a perennial stream that flows south to a confluence with Lake Wylie. The reach of Mill Creek contained within the Site is characterized by steep banks, limited sinuosity, and a limited riparian buffer consisting primarily of the invasive Chinese privet. The stream banks are eroded in some areas as a result of unrestricted access by cattle. The Site also contains an intermittent, unnamed tributary (UT) that transitions to a linear wetland before reaching a confluence with Mill Creek. The UT loses channel definition after approximately 200 linear feet, and then transitions to wetland due to the impacts of cattle on the tributary. The linear wetland extends to Mill Creek for a distance of approximately 650 feet, but lacks the characteristics to be classified as a stream. Both streams were delineated during the natural resources study performed for the Gaston East-West Connector.

Mitigation potential within Site 2 consists of stream enhancement opportunities along approximately 1,700 linear feet of Mill Creek, and stream restoration opportunities along approximately 270 linear feet of the UT (or more with agency approval to exceed 20 percent of the perennial reach length). Stream enhancement approaches that are appropriate for Mill Creek include excavating a floodplain (or bankfull bench) adjacent to the channel, cattle exclusion fencing, and invasive species management. Additionally, planting a riparian buffer will enhance bank stability, increase channel shading, and provide additional wildlife habitat. Cattle exclusion will provide for long term stream bank stability, reduced erosion and sedimentation, and improve water quality. Stream restoration entails the conversion of an unstable, degraded stream channel and its associated riparian corridor to a natural, stable condition (USACE 2003). Restoration of the UT could be achieved by the excavation of a new channel using the existing floodplain grade of the stream to be restored (Priority 1 Restoration). Performing riparian plantings along the UT and the installation of cattle exclusion fencing would also be necessary.

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 1,700 linear feet of Mill Creek may result in approximately 680 to 1,700 SMU. The mitigation activity multiplier for stream restoration is 1.0, resulting in approximately 270 SMU from the restoration of 270 linear feet of the UT. The USACE (in conjunction with NCDWQ and any other applicable regulatory agencies) ultimately determines the mitigation credit ratio for each project on a case-by-case basis. Due to its

status as a potential significant historic site eligible for listing on the National Register Historic Places (NRHP), determining potential for stream restoration on this site will require coordination with the State Historic Preservation Office.

Site 3: 362 Crowders Creek Road, Gastonia, NC
Mitigation Opportunity: Wetland Enhancement

Site 3, shown on **Figure 4**, is located at 362 Crowders Creek Road at the intersection with Angler Road near the Berkley Oaks mobile home park. The Site is approximately 21.6 acres and is situated adjacent to Crowders Creek, a 303(d)-listed stream.

Early successional wetland community and timber slash deposits following logging

Approximately 7.78 acres of the site consists of jurisdictional wetlands delineated during the natural resources studies performed for the Gaston East-West Connector. When the wetland was delineated in February 2007, the site was forested and characterized as a high quality wetland system. The majority of the site has subsequently been logged, with the exception of a narrow riparian buffer along Crowders Creek and along the eastern property boundary. All canopy species have been removed, and an early successional wetland community has begun to develop. Slash piles remaining from the timber harvest are scattered throughout the site and have inhibited recruitment of vegetation within those areas. Ditches were also observed within the limits of the wetland, likely created in support of logging activities.

Mitigation potential within Site 3 consists of wetland enhancement opportunities for approximately 7.0 acres. Wetland enhancement primarily involves the re-introduction of functions that the existing wetland area previously performed. Wetland enhancement approaches that are appropriate for this Site include removal of timber slash, filling/grading ditches, ripping/discing areas compacted by logging equipment, and planting characteristic hydrophytic vegetation in wetland areas to restore the pre-disturbance community.

The mitigation activity multiplier for wetland enhancement is 0.50 (2:1 ratio). Wetland enhancement of approximately 7.0 acres may result in 3.5 wetland mitigation units (WMU). The USACE (in conjunction with NCDWQ and any other relevant regulatory agencies) ultimately determines the mitigation credit ratio for each project on a case-by-case basis.

6.4. Other On-Site, Adjacent, and Nearby Mitigation Opportunities

NCTA conducted an evaluation of potential “on-site" mitigation opportunities associated with the Preferred Alternative. These opportunities included potential stream and wetland sites and also potential locations for storm water Best Management Practices (BMPs).

For the purpose of this discussion, "on-site" refers primarily to sites that would be located in future landlocked parcels or parcels adjacent to the Preferred Alternative mainline and major crossing streets rights of way. In some cases where an opportunity presented itself, particularly when it extended an existing on-site opportunity, non-adjacent parcels (nearby) were included in the analysis.

The information collected for this on-site evaluation has been consolidated into an on-site Project Atlas. The Project Atlas is provided in **Appendix C**. Stream and wetland resource opportunities located in proximity to each other were grouped into 43 sites to assist in presentation and general site accounting. Each project site entry includes a location/resource map and a data sheet with a project description, location details, parcel type, types of opportunities (restoration, enhancement, etc.), resource summary and resource details (including stream and wetland ID, stream name, and length or area). All sites have been color coded to identify which of the five 14-digit HUCs each site resides in (Long Creek HU: 03050102070020, Crowders Creek HU: 03050101-180010, Catawba Creek HU: 03050101-180020, South Fork Catawba River – western side HU: 03050102-070030, South Fork Catawba River – eastern side HU: 03050102-060020, Catawba River HU: 03050101-170040).

6.4.1. GIS Analysis Methodology

Mitigation opportunities were identified through Geographic Information System (GIS) analysis. The following sources of data were used for the streams and wetlands analysis:

- Hydrography: ftp://nhdftp.usgs.gov/SubRegions/High/ - High resolution NHD Flowline
- NAIP Photography: http://datagateway.nrcs.usda.gov/ - 2009 NAIP
- Wetlands Data: http://www.fws.gov/wetlands/ - NWI Polygons
- Stream and Wetland Delineations: EarthTech (AECOM)
- Parcel Data: Gaston County GIS Tax Mapping (October 2009), Mecklenburg County (October 2009)
- LiDAR: http://www.ncdot.org/it/gis/DataDistribution/ContourElevationData/default.html - Gaston and Mecklenburg Counties- Generated from April 2007 NC Floodplain Mapping Program LiDAR and converted to TIN format
- Gaston East-West Connector Preferred Alternative refined preliminary design

The following guidelines were observed throughout the GIS analysis:

- Evaluated sites including primarily preservation and enhancement sites, located on the following types of parcels:
    1) Landlocked parcels that may be purchased by NCTA
    2) Landlocked parcels that have a preliminary service road identified to provide access
    3) Adjacent parcels with a portion of their area within the right-of-way but the remainder has existing access
    4) Nearby parcels that would need to be evaluated by EEP.

- Adjacent parcels were considered only adjacent to the mainline right of way and major crossing street rights of way. The adjacent parcels were extracted from the parcel layer by selecting the parcels that intersected the Preferred Alternative right of way.
- High value opportunities outside of adjacent parcels were included as "Nearby Sites". These usually required a connection to stream systems already included in landlocked or adjacent parcels and could be acquired to create a larger mitigation site.
- Perennial and intermittent stream layers delineated as part of the project were clipped to each layer. In areas where delineations were not conducted, NHD streams were clipped to the adjacent and landlocked parcel layers. The delineations covered the entire study area corridor, and delineated resources took precedence over the NHD layer. In some instances, a delineated stream did not connect to an NHD stream outside the study corridor (most likely because it was too minor a stream to be included in the NHD layer). For these cases, streams connecting outside the corridor were added to the "Estimated Streams" layer using LiDAR data to estimate the stream path. These streams lengths are only estimates and will require future field verification.
- In some locations, adjacent parcels contained a stream that ran along the parcel boundary. In these situations, the adjoining parcel would also need to be acquired in order to fulfill the 100-foot buffer requirements. These locations were labeled with both sides, such as "Landlocked/Adjacent."
- Delineated wetlands were clipped to the landlocked parcel layer and the adjacent parcel layer. FWS National Wetlands Inventory (NWI) polygons were clipped to the adjacent and landlocked parcel layers, and then the areas inside the study area corridor were deleted because the delineated wetlands inside the study area corridor took precedence. NWI polygons that overlapped with delineated wetlands were erased.
- Unlike landlocked parcels, in which all stream and wetland opportunities are included with this analysis, adjacent parcel opportunities were sometimes excluded. Reasons for such exclusions include opportunities too far from the right of way due to large parcels that make such opportunities no longer "adjacent." Also, opportunities in the 100-year floodway could be excluded, due to the likelihood these resources are already protected and are not viable mitigation opportunities.
- Also considered in each site are Best Management Practices (BMPs) opportunities for creating or improving storm water ponds for commercial/industrial areas. These sites were field checked on May 4 and 5, 2010, but require further investigation to determine actual benefit. Also, residential curb-and-gutter communities that drain into streams without collection systems were reviewed throughout the project study corridor, but there was no potential for practical improvements.

6.4.2. Summary of On-Site Potential Stream and Wetland Mitigation

A total of 43 project sites were identified for potential on-site mitigation. The distribution of project sites across the Preferred Alternative corridor is shown in **Figure 5**. **Tables 6 and 7** provide a summary of stream lengths, wetland areas within the potential on-site mitigation sites. These sites require additional evaluation to determine feasibility and property owner interest. Many sites will turn out to be infeasible, not cost effective, or will lack property owner interest. However, this evaluation does illustrate that there are numerous potential on-site mitigation opportunities in the project area.

Table 6. Summary of Stream Lengths within On-Site and Adjacent Parcels

Types of Parcels Where Streams Are Located	Stream Length (Linear Feet)
Landlocked	17,647
Landlocked With Access	10,041
Landlocked / Adjacent	2,220
Landlocked / Nearby Site	572
Landlocked With Access / Adjacent	3,140
Adjacent	133,700
Nearby Site	13,577
Nearby Site / Adjacent	6,454
Total Potential Stream Length	**187,351**
Total Perennial	***137,699***
Total Intermittent	***19,273***
Total NHD (Unclassified)	***30,379***

Table 7. Summary of Wetland Acreage within On-Site and Adjacent Parcels

Types of Parcels Where Wetlands Are Located	Acres
Landlocked	3.7
Landlocked With Access	4.4
Nearby Site	1.0
Adjacent	32.3
Total Potential Wetlands	**41.4**

6.5. Non-Traditional Mitigation Opportunities

As recognized by the regulatory agencies, traditional stream mitigation may not be possible in urban areas due to multiple landowners, physical constraints, or hydrologic concerns (e.g., flooding). The regulatory agencies also have recognized that the possibility exists for innovative approaches to mitigation that may also benefit many stream functions, including water quality and aquatic life. This is known as non-traditional mitigation or "Flexible Stream Mitigation."

For the Gaston East-West Connector project, potential opportunities for creating or improving storm water ponds were investigated. Potential commercial/industrial and residential sites were identified using the GIS data and aerial photography. Sites were field checked on May 4 and 5, 2010. Six potential commercial/industrial sites were identified, as listed in **Table 8** and in **Appendix C** (as part of Sites 01, 02, 10, and 25). These sites require further investigation to determine actual benefit and whether improvements at these sites would result in mitigation credits.

Residential curb-and-gutter communities that drain into streams without collection systems were reviewed throughout the project study area, but there was no potential for practical improvements.

Table 8. Summary of Potential Storm Water Control Locations

Site Number*	BMP ID Number	Existing Storm Water Control Present?	Description
01	1	No	Located in the northeast corner of the WIX plant parcel, there is a possible opportunity for a storm water pond in this grassy area of approximately 1 acre
	2	Yes	Located behind the parking lot of Curtiss Wright Controls Inc. There is the possibility of improvements to an existing BMP. The existing BMP does not appear to hold water.
02	3	Yes	Located at the end of Myrtle Avenue. Storm water flow off roof and parking lot directed into an outflow pipe along property line ending at a headwater stream. Potential for storm water pond creation.
10	4	Yes	Located south of the Bi-Lo Supermarket, proper maintenance of the existing BMP could increase its effectiveness.
	5	Yes	Located west of the Family Dollar, the existing BMP could be improved by ensuring flow is restricted and water is held for a longer time period. Additionally, the outflow could be better managed to reduce erosion.
25	6	No	Located north of the Carolina Speedway dirt track, a new BMP facility would capture sediment runoff from the clay parking lots.

* See **Appendix C** for Map of Site

7.0 Conclusions

The preferred intent of the NCTA and the FHWA is to use the EEP's in-lieu fee payment program as the primary means of providing compensatory mitigation for the Gaston East-West Connector project. Other components of the project's ultimate mitigation package could include traditional on-site mitigation, other on-site mitigation together with adjacent and nearby mitigation, and non-traditional mitigation. The NCTA and FHWA will work with the environmental resource and regulatory agencies during the permitting phase to further refine the mitigation plan for the project.

This Conceptual Mitigation Plan provides a description of all the potential mitigation components that may ultimately comprise the mitigation package for the project. These are summarized below.

EEP Existing Off-Site Mitigation Assets. These are assets available in the 8-digit hydrologic units (HUCs) crossed by the Preferred Alternative for off-site mitigation credits to be provided by the North Carolina Ecosystem Enhancement Program (EEP).

Existing assets include 73,154 Stream Mitigation Units (SMUs) and 277.7 Wetland Mitigation Units (WMUs). Of these, 13,534 SMUs are located in the Beaverdam Creek mitigation site, located immediately southwest of the Gaston East-West Connector's interchange at I-485.

EEP Potential Off-Site Mitigation for Future Projects. These are potential off-site mitigation sites closer to the Preferred Alternative in Gaston and Mecklenburg identified by EEP for potential future acquisition for mitigation credit. Fourteen sites were identified with a total potential stream restoration length of 32,400 linear feet in Tier 1 (most promising sites) and 12,100 linear feet in

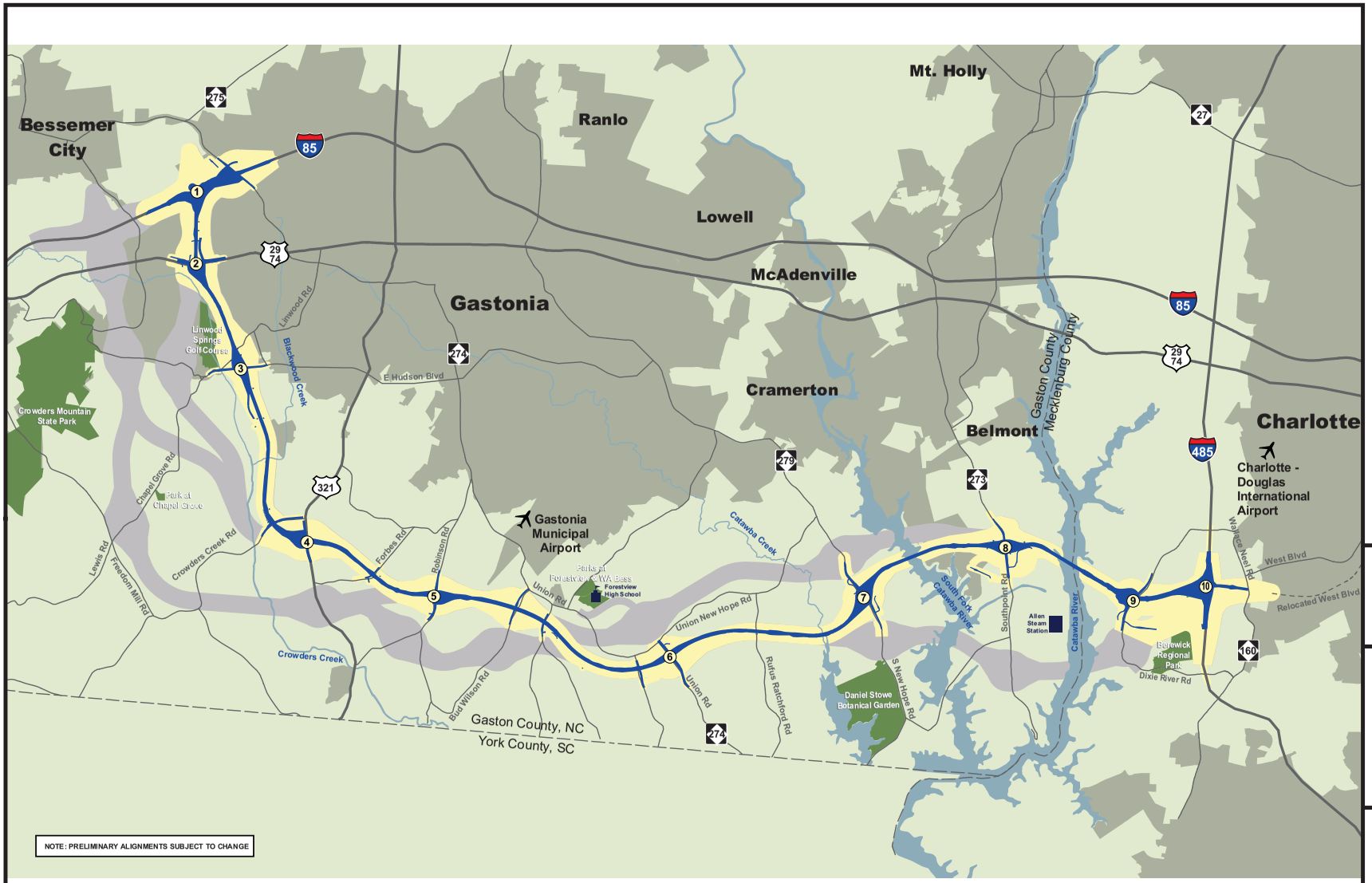
Tier 2 (site has significant constraints). There were nine Tier 1 projects and five Tier 2 projects identified.

Traditional On-Site Mitigation. Three potential sites were identified as traditional on-site mitigation opportunities. Two are potential stream mitigation sites; Site 1 – Linwood Springs Golf Course, and Site 2 – 6338 Union Road. The third is a potential wetland mitigation site, Site 3 – 362 Crowders Creek Road.

Other On-Site, Adjacent and Nearby Mitigation Opportunities. These sites are other on-site mitigation opportunities, including preservation and enhancement opportunities on the following types of parcels: 1) landlocked parcels that may be purchased by NCTA, 2) landlocked parcels that have a preliminary service road identified to provide access, 3) adjacent parcels with a portion of their area within the right-of-way but the remainder has existing access, and 4) nearby parcels that would need to be evaluated by EEP. This evaluation identified 187,351 linear feet of potential stream mitigation (27,688 lf of this total is on landlocked parcels and landlocked parcels with proposed service roads). This evaluation also identified 41.4 acres of potential wetland mitigation (8.1 acres of this total is on landlocked parcels and landlocked parcels with proposed service roads).

Non-Traditional Mitigation Opportunities. These types of opportunities searched for near the project included new or retrofitted storm water ponds for commercial/industrial areas and runoff collection ponds for residential curb-and-gutter communities that drain into streams without collection systems. Six commercial/industrial sites were identified for potential storm water BMPs. Of these, four are existing storm water control facilities in need of improvement. The other two would be new storm water control facilities.

With the exception of the EEP mitigation assets already in hand in the 8-digit HUCs, the other potential mitigation resources listed in this report have not been acquired at this time. These other potential mitigation resources require additional evaluation, including an assessment of feasibility, more detailed determination of the amount of wetland or stream credits present on the potential site, and contact and buy-in with property owners. The total amounts of wetland and stream mitigation potentially available listed in this report should not be construed as the actual amounts that are feasible or that will be implemented for this project. This report serves to document that there are sufficient potential mitigation sites to cover the compensatory mitigation needs of the Gaston East-West Connector.



NOTE: PRELIMINARY ALIGNMENTS SUBJECT TO CHANGE

POTENTIAL INTERCHANGE LOCATIONS

① I-85	④ US 321	⑧ NC 273 (Southpoint Road)
② US 29-74	⑤ Robinson Road	⑨ Dixie River Road
③ Linwood Road	⑥ NC 274 (Union Road)	⑩ I-485
	⑦ NC 279 (S. New Hope Rd)	

Legend

- Preferred Alternative Right of Way
- Preferred Alternative Study Corridor
- Other Detailed Study Corridors
- Parks and Recreation Areas
- Municipal Areas
- Rivers and Streams

Source: Gaston County and Mecklenburg County GIS
Map printed March 2010

N

0 0.5 1 Miles

NORTH CAROLINA Turnpike Authority

STIP PROJECT NO. U-3321

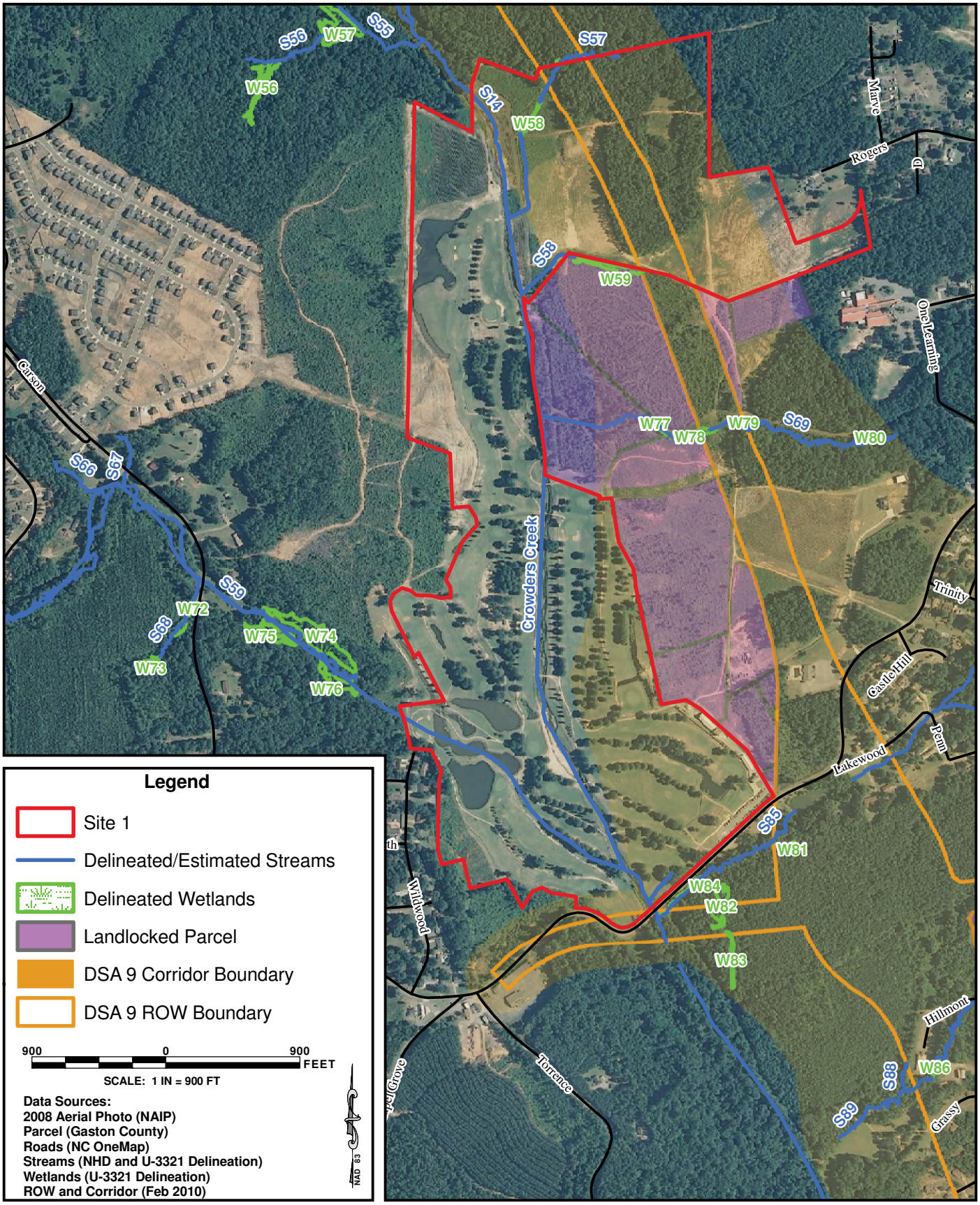
Gaston County and Mecklenburg County

GASTON EAST-WEST CONNECTOR

PREFERRED ALTERNATIVE DSA 9

Figure 1

NoiseAdd_Fig1_PreferredAlternativesDSA9.ai AKH 03.31.10



Prepared By:

PBSJ

Mitigation Potential

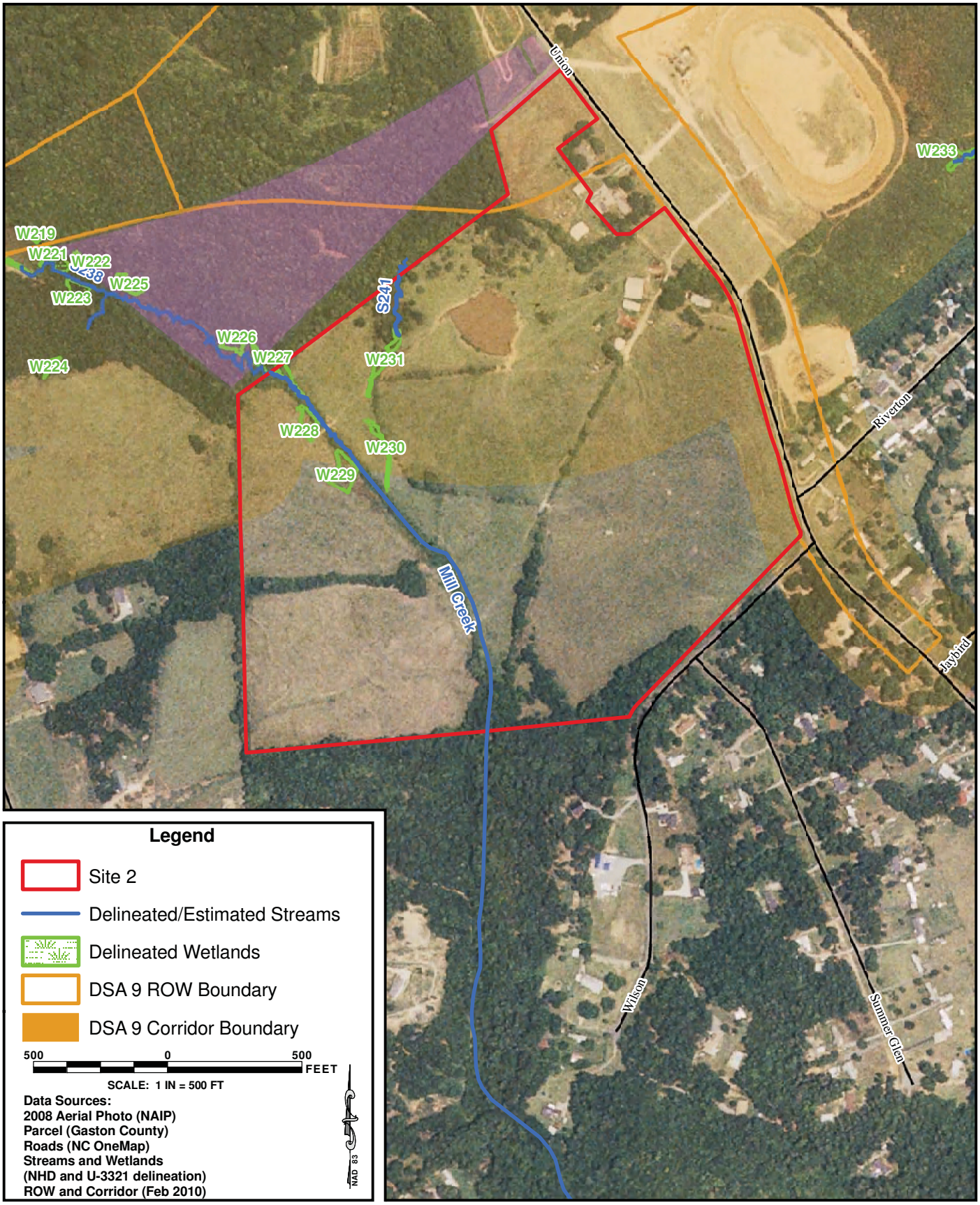
Site 1: 2900 Linwood Road

Gaston County, North Carolina

Dwn By:	MCG
Ckd By:	JWG
Date:	MAY 2010
Project:	100010933

FIGURE

2



Prepared By:

PBSJ

Mitigation Potential

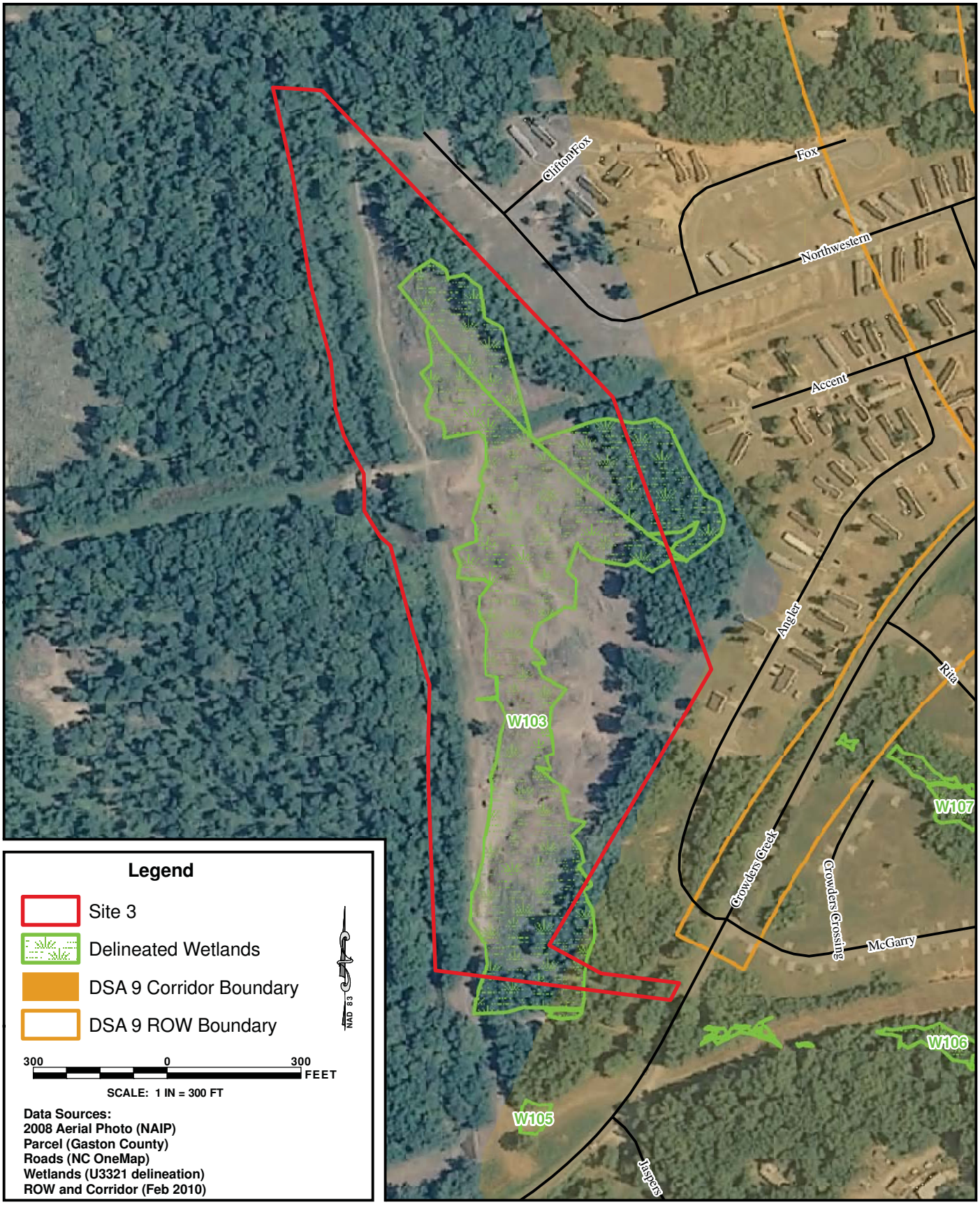
Site 2: 6338 Union Road

Gaston County, North Carolina

Dwn By:	MCG
Ckd By:	JWG
Date:	MAY 2010
Project:	100010933

FIGURE

3



Prepared By:

PBSJ

Mitigation Potential

Site 3: 362 Crowders Creek Road

Gaston County, North Carolina

Dwn By:	MCG
Ckd By:	JWG
Date:	MAY 2010
Project:	100010933

FIGURE

4

APPENDIX A

Impacts to Jurisdictional Resources

APPENDIX A - TABLE 1
STREAM IMPACTS FOR PREFERRED ALTERNATIVE REFINED PRELIMINARY DESIGN
STIP Project U-3321 - Gaston East-West Connector Final EIS

Streams bridged for hydraulic conveyance or as a result of Concurrence Point 2a are noted
Stream impacts calculated based on right-of-way limits plus a buffer of 25 feet from each slope stake line
Sources for Stream Attributes and DEIS DSA 9 Impacts: *Natural Resources Technical Report for the Gaston East-West Connector,* Earth Tech, Inc., February 2008
and the Turnpike Environmental Agency Coordination Meeting held April 8, 2008
Source for Preferred Alternative Impacts: PBS&J

Stream ID*	Corridor Segment	Stream Name	Hydrologic Unit	Intermittent / Perennial	Bank Height (ft)	Average Width (ft)	Depth (in)	Substrate	Water Quality Classification	USACE Score	NCDWQ Score	Draft EIS DSA 9 Preliminary Design	Preferred Alternative Refined Design*	Preferred Alternative Service Roads
14	West of US 321	Crowders Creek	3050101	Perennial	10 - 15	40 - 55	12	Sand, cobble, bedrock	C	70	34.5 - 52.5	Bridged[1]	Bridged[1]	
22	H2a	UT to Oates Branch	3050101	Perennial	10	4-8	2-3	Sand, gravel, cobble	C	59	38			
22A	H2a	UT to Oates Branch	3050101	Perennial	3	4	2	Gravel	C	NA	NA			
24	H2a	Oates Branch	3050101	Perennial	4	8	6	Cobble	C	62	44	116	116	
25	H2a	Bessemer Branch[2]	3050101	Perennial	2 - 4	5 - 14	2 - 6	Silt, sand, cobble, bedrock	C	48	47	141	141	
26	H2a	UT to Bessemer Branch	3050101	Intermittent	5 - 15	4	1 - 3	Sand, gravel, cobble	C	37	27.5			
27	H2a	UT to Bessemer Branch	3050101	Perennial	5	8	2	Gravel, cobble	C	68	43.5	506	506	
28	H2a	UT to Bessemer Branch	3050101	Intermittent	<1	3	NA	Sand, gravel	C	62	21.25			33
28	H2a	UT to Bessemer Branch	3050101	Perennial	<1 - 2	4 - 8	4	Silt	C	62	48	2231	2231	
29	H2a	UT to Bessemer Branch	3050101	Intermittent	<1	2 - 4	6	Silt	C	64	25.5			
30	H2a	UT to Bessemer Branch	3050101	Intermittent	1 - 4	3	2	Silt	C	56	24.5			
31	H2a	UT to Bessemer Branch	3050101	Intermittent	5	3	1	Sand, silt	C	34	22	183	183	
32	H2a	UT to Bessemer Branch	3050101	Perennial	2	4	2	Gravel, sand	C	65	32	813	813	
33	H2a	UT to Bessemer Branch	3050101	Intermittent	15	8	<1	Sand	C	48	19.5	97	97	
34	H2a	UT to Bessemer Branch	3050101	Perennial	3	4 - 6	6	Silt, sand	C	66	37.5			
35	H2a	UT to Bessemer Branch	3050101	Intermittent	2	3	1	Sand	C	66	NA			
35	H2a	UT to Bessemer Branch	3050101	Perennial	2	3	1	Sand	C	66	38.5			
36	H2a	UT to Crowders Creek	3050101	Perennial	2	8	2	Sand, gravel	C	55	37	1092	1092	
37	H2a	UT to Crowders Creek	3050101	Perennial	4	6	<1	Sand, gravel	C	35	30			
38	H2a	UT to Crowders Creek	3050101	Perennial	1	4	<1	Sand	C	44	34.5			
39	H2a	UT to Crowders Creek	3050101	Perennial	2	4	4	Sand	C	59	41			
40	H2a	UT to Crowders Creek	3050101	Perennial	10	4	1	Gravel, cobble	C	48	29.5[4]			
41	H2a	UT to Long Creek	3050102	Intermittent	15	4	2	Silt	C	53	NA			
41	H2a	UT to Long Creek	3050102	Perennial	15	4	2	Silt	C	53	31.5			
42	H2a	UT to Long Creek	3050102	Perennial	5 - 20	8 - 12	2	Sand, cobble	C	50	36.5			
43	H2a	UT to Kaglor Branch	3050102	Perennial	4 - 15	12	4	Sand, boulders	C	49	33.5			
44	H2a	UT to Kaglor Branch	3050102	Perennial	5 - 15	8 - 12	6	Sand, gravel, cobble	C	51	36	1461	1203	
45	H2a	UT to Kaglor Branch	3050102	Perennial	3	3	3	Cobble, gravel	C	42	26[4]			
46	H2a	UT to Crowders Creek	3050101	Perennial	1	4 - 8	3	Silt, sand	C	61	32.5	923	698	125
46A	H2a	UT to Crowders Creek	3050101	Intermittent	2	3	1	Silt	C	28	20.5	28	28	
47	H2a	UT to Crowders Creek	3050101	Intermittent	5	4	<1	Gravel	C	43	28	116	116	
48	H2a	UT to Crowders Creek	3050101	Intermittent	<1	4	1	Silt	C	54	23.5			
49	H3	UT to Crowders Creek	3050101	Perennial	1	6	3	Silt	C	42	16[4]			
50	H3	UT to Crowders Creek	3050101	Intermittent	1	6	4	Impacted by junkyard and no longer considered jurisdictional based on 4/13/10 verification site visit						
51	H3	UT to Crowders Creek	3050101	Perennial	2	5	1	Sand	C	51	24[4]			
52	H2a/H3	UT to Crowders Creek	3050101	Perennial	8	16	3	Gravel	C	55	48.5	726	663	83
53	H3	UT to Crowders Creek	3050101	Perennial	4	6	2	Gravel	C	52	30			
54	H3	UT to Crowders Creek	3050101	Perennial	3	6	4	Sand, gravel	C	70	37	188	177	
55	H3	UT to Crowders Creek	3050101	Perennial	1 - 2	3	1	Silt	C	NA	26[4]			
56	Just outside H3	UT to Crowders Creek	3050101	Intermittent	2	5	4	Sand	C	66	NA			
56	Just outside H3	UT to Crowders Creek	3050101	Perennial	2	5	4	Sand	C	66	37			
57	H3	UT to Crowders Creek	3050101	Perennial	1 - 6	4 - 8	1	Gravel, sand	C	64	38.3	453	430	
58	H3	UT to Crowders Creek	3050101	Perennial	3	3	1	Sand	C	34	26.5[4]			
69	H3	UT to Crowders Creek	3050101	Perennial	2 - 7	4 - 8	2 - 4	Bedrock, gravel	C	59	41	244	197	
85	H3	UT to Crowders Creek	3050101	Perennial	4	4 - 8	3	Gravel, cobble	C	51	43.5	742	715	
86	H3	UT to Crowders Creek	3050101	Intermittent	2	1 - 6	6	Silt	C	40	25			
87	H3	UT to Crowders Creek	3050101	Perennial	3	2	3	Sand	C	36	23[4]			
88	H3	UT to Crowders Creek	3050101	Intermittent	8	4 - 5	1	Silt	C	46	25.5			
89	H3	UT to Crowders Creek	3050101	Perennial	1 - 15	1 - 5	4	Sand, gravel, bedrock	C	56	31.5	1010	934	
89	H3	UT to Crowders Creek	3050101	Intermittent	<1	3	1	Sand, gravel	C	56	23.25			
90	H3	UT to Crowders Creek	3050101	Perennial	3	1 - 4	1	gravel	C	59	27.5[4]			
91	H3	UT to Crowders Creek	3050101	Perennial	4	3 - 4	1	Silt	C	36	19.5[4]			
92	H3	UT to Crowders Creek	3050101	Perennial	3	8	3	Gravel, silt	C	46	44.5	827	736	
92A	H3	UT to Crowders Creek	3050101	Intermittent	5	8 - 14	3	Silt	C	43	22.5	133	133	
129	J4a	UT to Crowders Creek	3050101	Perennial	<1	6	4	Sand	C	47	23[4]			
130	J4a	UT to Crowders Creek	3050101	Perennial	8 - 10	4 - 6	1	Sand	C	42	29.5[4]	207	197	
131	J4a	UT to Crowders Creek	3050101	Perennial	3 - 5	2	1	Gravel	C	46	26	2054	1960	
132	J4a	UT to Crowders Creek	3050101	Intermittent	2 - 4	4 - 12	6	Bedrock, boulder, sand	C	63	44	25	4	
133	J4a	UT to Crowders Creek	3050101	Perennial	<1 - 2	2 - 4	2	Sand, gravel	C	64	39			
134	H3	UT to Blackwood Creek	3050101	Perennial	4	4 - 8	6	Silt	C	44	26[4]	296	282	
135	H3	Blackwood Creek	3050101	Perennial	8	24 - 32	6	Sand, gravel	C	47	40	Bridged[3]	Bridged[3]	
142	J4b	UT to Crowders Creek	3050101	Intermittent	<1	2	4-5	fine/course sand	C	51	25, 26			
142	J4b	UT to Crowders Creek	3050101	Perennial	2-5	5	5	sand, gravel, cobble, rock	C	74	46			
143	J4b	UT to Crowders Creek	3050101	Intermittent	2	2-3	2	fine/course sand	C	50	25			

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Stream ID*	Corridor Segment	Stream Name	Hydrologic Unit	Intermittent / Perennial	Bank Height (ft)	Average Width (ft)	Depth (in)	Substrate	Water Quality Classification	USACE Score	NCDWQ Score	Draft EIS DSA 9 Preliminary Design	Preferred Alternative Refined Design*	Preferred Alternative Service Roads
144	J4b	UT to Crowders Creek	3050101	Perennial	2-6	2-3	1	sand, gravel	C	46	31.25			
145	J4b	UT to Crowders Creek	3050101	Intermittent	3- 7	4 - 5	0 - 1	sand, gravel	C	29	21, 28	820	805	
146	J4b	UT to Crowders Creek	3050101	Perennial	7	12	8-10	sand, gravel, cobble, rock	C	75	53	Bridged[1]	Bridged[1]	
147	J2c	UT to Crowders Creek	3050101	Perennial	4-6	10	8	Sand, gravel, bedrock	C	73	46	382	358	
148	J2c	UT to Crowders Creek	3050101	Perennial	<1	2-3	4	fine/course sand	C	72	39.25	71		
156	J2c	UT to Crowders Creek	3050101	Perennial	3 - 8	10 - 12	12	sand, gravel, cobble, boulder	C	77	50.25	603	571	
157	J2c	UT to Crowders Creek	3050101	Perennial	2-4	3-4	4	sand, gravel, cobble, rock	C	79	45	1033	938	
158	J2c	UT to Crowders Creek	3050101	Intermittent	5-8	3	0	fine/course sand	C	34	11.5	178	168	
159	J2c	UT to Crowders Creek	3050101	Intermittent	1-2.5	4	0	fine/course sand	C	NA	20.75			
161	J2c/J2d	UT to Crowders Creek	3050101	Intermittent	1-2	2	1	sand, gravel	C	40	19			
161	J2c	UT to Crowders Creek	3050101	Perennial	3-7	4-8	4	sand, gravel, cobble, rock	C	40	48.75	70		
174	J2d	UT to Crowders Creek	3050101	Perennial	1-2	2	2	sand, gravel	C	55	34.5	908	908	
175	J2d	UT to Crowders Creek	3050101	Perennial	5	3	3	sand, gravel, rock	C	51	35.5			
176	J2d	UT to Crowders Creek	3050101	Intermittent	5	2	1	sand, gravel	C	51	22.5			
177	J2d	UT to Crowders Creek	3050101	Perennial	2-6	4-8	7	sand, gravel, rock, boulder	C	74	51	956	786	
178	J2d	UT to Crowders Creek	3050101	Perennial	4-7	6 - 15	6 - 12	sand, gravel, rock, boulder	C	66, 74	44.5, 50	391	365	
179	J2d	UT to Crowders Creek	3050101	Intermittent	3-4	3	1	fine/course sand	C	44	24.5			
180	J2d	UT to Crowders Creek	3050101	Intermittent	2-3	2	1	fine sand/clay	C	47	24.5			
181	J2d	UT to Crowders Creek	3050101	Perennial	4-7	12	10	sand, gravel, rock, boulder	C	72	55	567	340	
182	J2d	UT to Crowders Creek	3050101	Intermittent	1.5	2	0	fine sand/clay	C	45	17.5	183		
182	J2d	UT to Crowders Creek	3050101	Perennial	1.5	3.5	1	sand, gravel, cobble	C	55	30.5	1866	891	
183	J2d	UT to Crowders Creek	3050101	Perennial	3-7	4	5	sand, gravel, cobble, rock	C	74	48.5	1474	707	
184	J2d	UT to Crowders Creek	3050101	Perennial	NA	NA	NA	NA	C	NA	NA	121	35	
196	J2d	UT to Crowders Creek	3050101	Perennial	4-6	12	12	sand, gravel, rock, boulder	C	72	51	1175	515	
197	J2d	UT to Crowders Creek	3050101	Perennial	0.5-2	3	4	sand, gravel	C	65	40.5			
198	J2d/JX4	UT to Crowders Creek	3050101	Perennial	0.5-3	2-3	4	sand, gravel	C	62	45	159		
199	J2d	UT to Crowders Creek	3050101	Intermittent	0.5-2	2	2	sand, gravel	C	58	28.5	311		
200	J2d/JX4	UT to Crowders Creek	3050101	Intermittent	<1-2	2	1	fine/course sand	C	49	24.5	562	562	
201	J2d	UT to Crowders Creek	3050101	Intermittent	1	2	0	fine sand, rock	C	40	15	152		
202	J2d	UT to Crowders Creek	3050101	Perennial	3-4	2.5-3	5	sand, gravel	C	45	33	487	251	
203	J2d	UT to Crowders Creek	3050101	Perennial	3-4	3	3	sand, gravel, cobble	C	51	38			
210	JX4	UT to Mill Creek	3050101	Perennial	0.5-3.5	2 - 7	5 - 6	sand, gravel, cobble, boulder	C	63, 66	38.5, 44.5	288	265	
211	JX4	UT to Mill Creek	3050101	Perennial	3.5-5	3	3	fine/course sand, gravel	C	42, 66	30, 37, 39.5			
212	JX4	UT to Mill Creek	3050101	Perennial	1.5-2	2-3	3	fine/course sand, gravel	C	47	35			
213	JX4	Mill Creek	3050101	Perennial	1 - 4	2 - 10	2 - 8	sand, gravel, rock, boulder	C	63, 69	34.5, 39.5	530	509	
215	JX4	UT to Mill Creek	3050101	Perennial	1-2	2-3	3	fine/course sand	C	69	42.5			
216	JX4	UT to Mill Creek	3050101	Perennial	1	3	3	sand, gravel	C	72	39.5			
217	JX4	UT to Mill Creek	3050101	Intermittent	1-2	2	2	fine/course sand	C	50	27			
218	JX4	UT to Mill Creek	3050101	Perennial	1	3	4	sand, gravel	C	65	31.5	138	128	
219	JX4	UT to Mill Creek	3050101	Perennial	< 1	2-2.5	4	sand, gravel	C	53	34.25	43	33	
220	JX4	UT to Mill Creek	3050101	Perennial	1-4	4-6	4 - 5	sand, gravel, cobble, bedrock	C	64, 70	42, 43.5	474	439	
221	JX4	UT to Mill Creek	3050101	Perennial	< 1	3.5	3	sand, gravel	C	70	35			
222	JX4	UT to Mill Creek	3050101	Intermittent	< 1	2	2	fine sand/clay	C	76	28.5	413	392	
222	JX4	UT to Mill Creek	3050101	Perennial	< 1	3.5	4	sand, gravel, cobble	C	66	41.25			
223	J1e	UT to Mill Creek	3050101	Perennial	1-1.5	3.5-4.5	7	fine/course sand	C	61	34.25			
224	J1e	UT to Mill Creek	3050101	Perennial	2	2	2	fine/course sand	C	51	33			
225	J1e	UT to Mill Creek	3050101	Perennial	< 1-2	1-3	2	fine/course sand	C	63	34.25			
235	J1f	UT to Catawba Creek	3050101	Perennial	2-5	3-6	4	fine/course sand	C	50	36			146
237	J1f	UT to Catawba Creek	3050101	Perennial	2 - 6	2 - 20	3 - 8	sand, gravel, cobble, bedrock	C	67-75	45.5 - 55	1257	1114	
238	J1e	UT to Mill Creek	3050101	Intermittent	1	1	2	fine sand/clay	C	44	19.5	38	38	
238	J1e	UT to Mill Creek	3050101	Perennial	1-3	2-3	4 - 6	sand, gravel, cobble	C	55, 63	34.5, 35.75	75	70	
239	J1e	UT to Mill Creek	3050101	Intermittent	< 1	1	2	sand, gravel	C	49	20.5	249	249	
240	J1e	UT to Mill Creek	3050101	Intermittent	1	2-3	2	fine sand/clay	C	36	29.5			
241	J1f	UT to Mill Creek	3050101	Intermittent	< 1	2.5	3	sand, gravel	C	39	22.5			
242	J1f	UT to Catawba Creek	3050101	Perennial	1-4	3-5	3 - 4	silt, sand, gravel, rock	C	51, 62	34, 47	2178		
243	J1f	UT to Catawba Creek	3050101	Perennial	< 1	1 - 2	2 - 3	sand, gravel, rock	C	64	34.5			
243	J1f	UT to Catawba Creek	3050101	Intermittent	< 1	1-3	3	sand, gravel, cobble	C	53, 62	25.5, 26		512	
244	J1f	UT to Catawba Creek	3050101	Perennial	< 1	2-3	3	sand, gravel	C	59	33		339	
245	J1f	UT to Catawba Creek	3050101	Intermittent	<1-5	3-4	1	sand, gravel, cobble	C	51	19.5			
246	J1f	UT to Catawba Creek	3050101	Intermittent	1-2	2-3	1	sand, gravel	C	58	29.5	114		

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247	J1f	UT to Catawba Creek	3050101	Intermittent	< 1	< 1.5	2	fine sand/clay	C	54	27.25			
247	J1f	UT to Catawba Creek	3050101	Perennial	1-4	4-12	4	sand, gravel, cobble, bedrock	C	63	44	437		
259	K3a	Catawba Creek	3050101	Perennial	3-6	25 - 50	14 - 15	sand, gravel, cobble	C	71, 86	51, 57.5	Bridged[1]	Bridged[1]	
265	K3a	UT to Catawba Creek	3050101	Perennial	1-2.5	3-4	2	sand, gravel, rock	C	59	34.5			
266	K3a	UT to Catawba Creek	3050101	Perennial	1-2	3-4	5	sand, gravel, rock	C	69	47			
267	K3a	UT to Catawba Creek	3050101	Intermittent	2-3	3-4	2	sediment, sand, gravel	C	27	23.5	120	39	
268	K3a	UT to Catawba Creek	3050101	Perennial	2 - 4	2 - 10	2 - 5	sand, gravel, cobble, rock	C	46, 80	35.25, 52			
270	K1a	UT to Catawba Creek	3050101	Perennial	4-8	6-9	8	sand, gravel, cobble, rock	C	62	50	610	578	
271	K1a	UT to Catawba Creek	3050101	Perennial	4-8	3-6	4	sand, gravel, cobble, rock	C	64	46.5	133	1105	
272	K1a	UT to Catawba Creek	3050101	Perennial	<1-2	2-5	1	sand, gravel, cobble	C	65	35.75			
273	K1a	UT to Catawba Creek	3050101	Perennial	1	2	2	sand, gravel, cobble	C	66	35.5			
274	K1a	UT to Catawba Creek	3050101	Perennial	<1-3	1.5-3.5	4	sand, gravel, cobble	C	74	38.5	363	351	
275	K1a	UT to Catawba Creek	3050101	Perennial	< 1	1.5-3	2	fine/course sand	C	71	35	302	302	
276	K1a	UT to Catawba Creek	3050101	Perennial	2-3	3-7	4	sand, gravel, cobble	C	62	42			
277	K1a	UT to Catawba Creek	3050101	Perennial	1-2	2	3	sand, gravel	C	49	40.75			
278	K1a	UT to Catawba Creek	3050101	Intermittent	1	2.5	2	sand, gravel	C	58	22.5			
279	K3a	UT to Catawba Creek	3050101	Intermittent	1	1-2	3	fine/course sand	C	57	28.5			
280	K3a	UT to Catawba Creek	3050101	Intermittent	1	1.5	1	sand, gravel	C	59.5	22.5	843	843	
281	K3a	UT to Catawba Creek	3050101	Perennial	1-2	2	3	sand, gravel, rock	C	59	30			
286	K3a	UT to S. F. Catawba River	3050102	Intermittent	<1	1-2	1	Silt, sand, gravel	WS-V	54	21, 27.5			
286	K3a	UT to S. F. Catawba River	3050102	Perennial	1-4	2-7	4-6	Silt, sand, gravel, cobble	WS-V	62	31			
286A	K3a	UT to S. F. Catawba River	3050102	Intermittent	1	1-2	1	Silt, sand	WS-V	NA	NA			
287	K3a	UT to S. F. Catawba River	3050102	Intermittent	1	2-3	4	Silt, sand	WS-V	36	23			
287	K3a	UT to S. F. Catawba River	3050102	Perennial	>6	4-6	4	Sand, gravel	WS-V	36	NA			
293A	K3a	UT to S. F. Catawba River	3050102	Intermittent	1	1-2	1	Silt, sand	WS-V	54	22.75			
293A	K3a	UT to S. F. Catawba River	3050102	Perennial	<1	2-3	3-4	Silt, Sand, gravel	WS-V	54	NA			
295	K3a	UT to S. F. Catawba River	3050102	Perennial	2-4	3-5	1-4	Silt, sand, gravel, cobble	WS-V	68	32, 32.25			
296	K3a	UT to S. F. Catawba River	3050102	Perennial	4	6	2-4	Silt, Sand, gravel	WS-V	65.5	34	578	557	
297	K3a	UT to S. F. Catawba River	3050102	Perennial	1-4	3-6	1-4	Silt to cobble, boulder	WS-V	83	31.5	917	652	
298	K3a	UT to S. F. Catawba River	3050102	Intermittent	1-2	3	1	Silt, sand gravel	WS-V	45	19			
298	K3a	UT to S. F. Catawba River	3050102	Perennial	1-2	3	1	Silt, sand gravel	WS-V	45	19[4]			
299	K3a	UT to S. F. Catawba River	3050102	Intermittent	1-2	3	1-2	Silt, Sand, gravel	WS-V	67	26.5			
299	K3a	UT to S. F. Catawba River	3050102	Perennial	2-3	3-4	1-4	Silt, Sand, gravel	WS-V	67	26.5[4]			
300	K3a	UT to S. F. Catawba River	3050102	Intermittent	3	3	1-3	Silt, sand, gravel, cobble	WS-V	79	23.5	1399	1405	
300	K3a	UT to S. F. Catawba River	3050102	Perennial	3	3-5	1-3	Silt, sand, gravel, cobble	WS-V	79	33	193	230	
300A	K3a	UT to S. F. Catawba River	3050102	Intermittent	6	3	1-3	Silt, Sand, gravel	WS-V	42	21			
301	K3a	UT to S. F. Catawba River	3050102	Intermittent	4	3-6	1-2	Silt, Sand, gravel	WS-V	79	23			
301	K3a	UT to S. F. Catawba River	3050102	Perennial	3-4	4-7	1-6	Silt, sand, gravel, cobble	WS-V	79	28.5[4]			
301A	K3a	UT to S. F. Catawba River	3050102	Intermittent	5	3	1-3	Sand, gravel	WS-V	51	19.5			
301B	K3a	UT to S. F. Catawba River	3050102	Intermittent	5	3	1-3	Silt, Sand, gravel	WS-V	51	19.5			
302	K3b	UT to Catawba River	3050101	Intermittent	2-4	3	1-2	Silt, sand	WS-V, B	65	19.5			
303	K3b	UT to Catawba River	3050101	Intermittent	1	2	1	Sand, gravel	WS-V, B	42	23			
303	K3b	UT to Catawba River	3050101	Perennial	2-3	2-4	1-3	Silt, sand, gravel, cobble	WS-V, B	42	31			
304	K3b	UT to Catawba River	3050101	Intermittent	1	3	1-2	Silt, sand	WS-V, B	85	22	260	260	
304	K3b	UT to Catawba River	3050101	Perennial	3	3-5	1-4	Silt, sand, gravel, cobble	WS-V, B	85	31	484	568	
305	K3b	UT to Catawba River	3050101	Perennial	3-4	4-6	3-10	Silt, sand, gravel, cobble	WS-V, B	82	31.5	135		
310	K3c	UT to Catawba River	3050101	Intermittent	1-2	1-3	1-2	Silt, sand, gravel	WS-V, B	NA	NA			
311	K3c	UT to Catawba River	3050101	Intermittent	1	1-2	1	Silt, sand, gravel	WS-V, B	46	19			
311	K3c	UT to Catawba River	3050101	Perennial	1 - 4	3 - 10	2 - 12	Sand, gravel, cobble, boulder	WS-V, B	57, 77	35, 39			
311A	K3c	UT to Catawba River	3050101	Intermittent	<1	1-2	1-2	Silt, sand	WS-V, B	49	23.5			
312	K3c	UT to Catawba River	3050101	Intermittent	1	2-3	1	Silt, sand	WS-V, B	53	23.5	52	26	
312A	K3c	Beaverdam Creek	3050101	Perennial	3-5	8-10	2-12	Silt to cobble, boulder	C	66	50	973	742	
312B	K3c	UT to Catawba River	3050101	Intermittent	1	2	2	Silt, sand	WS-V, B	47	19			
S313	K3c	UT to Catawba River	3050101	Intermittent	4	2-8	2	Silt, Sand, gravel	WS-V, B	63	22			
313A	K3c	UT to Beaverdam Creek	3050101	Intermittent	1-3	3-5	2	Silt, Sand, gravel	C	42	19			
314A	K3c	UT to Beaverdam Creek	3050101	Intermittent	1-3	4-5	1-3	Silt, sand, gravel, cobble	C	50	21.75	226		
314A	K3c	UT to Beaverdam Creek	3050101	Perennial	1-2	2-4	1-2	Silt, sand, gravel, cobble	C	63	33	969		
S315	K3c	UT to Catawba River	3050101	Intermittent	1	1-2	1-3	Silt, sand, gravel	WS-V, B	50	27			
315A	K3c	UT to Beaverdam Creek	3050101	Intermittent	1-2	2-4	1-2	Silt, sand, gravel, cobble	C	NA	NA	176		
316A	K3c	UT to Beaverdam Creek	3050101	Intermittent	1-2	3	1-2	Silt, sand, gravel	C	53	23.5			
317	K3c	UT to Beaverdam Creek	3050101	Intermittent	1	2-3	1-2	Silt, sand, gravel	C	50	22.5			
318	K3c	UT to Beaverdam Creek	3050101	Intermittent	1-3	2-5	1-3	Silt to cobble, boulder	C	47	25	464	466	
318	K3c	UT to Beaverdam Creek	3050101	Perennial	NA	NA	NA	NA	C	47	25[4]			

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and the Turnpike Environmental Agency Coordination Meeting held April 8, 2008
Source for Preferred Alternative Impacts: PBS&J

Stream ID*	Corridor Segment	Stream Name	Hydrologic Unit	Intermittent / Perennial	Bank Height (ft)	Average Width (ft)	Depth (in)	Substrate	Water Quality Classification	USACE Score	NCDWQ Score	Draft EIS DSA 9 Preliminary Design	Preferred Alternative Refined Design*	Preferred Alternative Service Roads
318A	K3c	UT to Beaverdam Creek	3050101	Perennial	2-4	3-5	2-6	Silt, Sand, gravel	C	68	25.75[4]			
318A	K3c	UT to Beaverdam Creek	3050101	Intermittent	1-3	1-2	1	Silt, Sand, gravel	C	68	21.5	131	131	
318B	K3c	UT to Beaverdam Creek	3050101	Intermittent	1-3	3-5	3	Silt, Sand, gravel	C	41	21.5		90	
318C	K3c	UT to Beaverdam Creek	3050101	Intermittent	2-4	2	3	Silt, sand	C	54	25			
318D	K3c	UT to Beaverdam Creek	3050101	Perennial	1-2	1-2	2	Silt, sand, gravel	C	56	19[4]			
319	K3c	UT to Beaverdam Creek	3050101	Intermittent	1	3	2-5	Silt, sand	C	53	19			
321	K3c	Legion Lake Stream	3050101	Intermittent	1-3	3-6	1-6	Silt, Sand, gravel	C	83	24			
321	K3c	Legion Lake Stream	3050101	Perennial	2-4	5-8	1-12	Silt to cobble, boulder	C	83	33	1610	830	
323	K3c	UT to Beaverdam Creek	3050101	Perennial	1	1-2	1	Silt, sand	C	66	19.5[4]	99	25	
323A	K3c	UT to Beaverdam Creek	3050101	Intermittent	1-2	5	2	Silt, sand, gravel, cobble	C	42	25.5			
324	K3c	UT to Beaverdam Creek	3050101	Intermittent	1	1-2	1-3	Silt, sand	C	48	23			
325	K3c	UT to Beaverdam Creek	3050101	Intermittent	1-2	1-4	1-5	Silt, sand, gravel, cobble	C	48	21.25			
326	K3c	UT to Beaverdam Creek	3050101	Intermittent	1-2	1-2	1-4	Silt, sand, gravel	C	41	21.25	239	336	
326	K3c	UT to Beaverdam Creek	3050101	Perennial	4	3	2-4	Silt, sand, gravel, cobble	C	52	30.5			
328	K3c	UT to Legion Lake Stream	3050101	Intermittent	3-4	4	1-4	Silt, sand, gravel, cobble	C	69	23.5			
328	K3c	UT to Legion Lake Stream	3050101	Perennial	NA	NA	NA	NA	C	69	NA			
329	K3c	UT to Legion Lake Stream	3050101	Intermittent	3-4	3-5	1-3	Silt to cobble, boulder	C	67	24			
330	K3c	UT to Legion Lake Stream	3050101	Intermittent	3-4	3-5	1-3	Silt to cobble, boulder	C	77	26			
330	K3c	UT to Legion Lake Stream	3050101	Perennial	3-4	3-5	1-3	Silt, sand, gravel	C	77	26[4]	74	9	
330A	K3c	UT to Legion Lake Stream	3050101	Intermittent	3-4	2	1-2	Silt, sand, gravel	C	60	20.5			
331	K3c	UT to Legion Lake Stream	3050101	Intermittent	1-3	2-3	1-2	Silt, sand, gravel	C	76.5	27			
331	K3c	UT to Legion Lake Stream	3050101	Perennial	3-6	2-6	1-4	Silt, sand, gravel, cobble	C	76.5	34			
332	K3c	UT to Legion Lake Stream	3050101	Perennial	2-4	2-3	1-3	Silt, sand, gravel	C	82	41	317	58	
333	K3c	UT to Legion Lake Stream	3050101	Intermittent	1-2	1-2	1-2	Silt, sand, gravel	C	74	24.5			
334	K3c	UT to Legion Lake Stream	3050101	Intermittent	2-4	3-5	2-5	Sand, gravel, boulder, bedrock	C	68	21			
335	K3c	UT to Legion Lake Stream	3050101	Perennial	2-3	2-3	2-4	Silt, sand gravel	C	63	34	180	19	
336	K3c	UT to Legion Lake Stream	3050101	Intermittent	1-2	1-3	1-3	Silt, sand, gravel	C	43	20.5			
337	K3c	UT to Legion Lake Stream	3050101	Intermittent	1-4	2-4	1-4	Silt, sand, gravel	C	56	26			
337	K3c	UT to Legion Lake Stream	3050101	Perennial	2-3	3	1-2	Silt, sand, gravel	C	57	23.5[4]			
337A	K3c	UT to Legion Lake Stream	3050101	Intermittent	1-4	2-4	1-4	Silt, sand, gravel	C	74	23.5			
338	K3c	UT to Legion Lake Stream	3050101	Intermittent	1	2	1-2	Silt, sand	C	44	24.5			
338A	K3c	UT to Legion Lake Stream	3050101	Intermittent	1	2	1-2	Silt, sand	C	44	19		34	
338B	K3c	UT to Legion Lake Stream	3050101	Intermittent	1-2	2-3	4	Silt, sand, gravel	C	57.5	20.5	68		
339	K3c	UT to Legion Lake Stream	3050101	Intermittent	1	2	1-2	Silt, sand	C	50	23.5	735	238	
339A	K3c	UT to Legion Lake Stream	3050101	Intermittent	2-4	3-5	2-6	Silt, sand, gravel, cobble	C	53	19	63		
340	K3c	UT to Legion Lake Stream	3050101	Intermittent	2-4	4-6	2-6	Silt, sand, gravel, cobble	C	82	28.5	1082	13	
340	K3c	UT to Legion Lake Stream	3050101	Perennial	1-2	3	1-3	Silt, Sand, gravel	C	82	34	1244		
340A	K3c	UT to Legion Lake Stream	3050101	Intermittent	1-2	2	2	Silt, sand, gravel, cobble	C	70	25	359	182	
341	K3c	UT to Legion Lake Stream	3050101	Intermittent	1-2	2	1-3	Silt, sand, gravel	C	59	21	282		
342	K3c	UT to Legion Lake Stream	3050101	Intermittent	1-2	2	1-2	Silt, sand, gravel	C	53	19.5			
343	K3c	UT to Coffey Creek	3050103	Intermittent	Stream outside study corridor added from USGS mapping				C	73	20.5			
346	J2c	UT to Crowders Creek	3050101	Intermittent	1	2-3	1-2	Silt, sand	C	39	20.5			
347	K3c	UT to Beaverdam Creek	3050101	Perennial	3-4	5	2-3	Silt, sand	C	48	26[4]			
													NO MECK	NO MECK
Total Stream Impacts												**48995**	**36029**	**387**
Perennial Stream Impacts												**38894**	**28679**	**354**
Intermittent Stream Impacts												**10101**	**7350**	**33**

* Stream numbers not consecutive because only those streams within the Preferred Alternative Corridor are listed.

1. Bridge required for hydraulic conveyance.

2. Bessemer Branch - The service road proposed under DSAs 4, 5, 9, 22, 23, and 27 was bridged by request of resource agencies at the Turnpike Environmental Agency Coordination Meeting held April 8, 2008. Preferred Alternative Refined Design changed access

3. Bridged by request of resource agencies at the Turnpike Environmental Agency Coordination Meeting held April 8, 2008.

4. Stream classification elevated to perennial (due to biology) per NCDWQ

APPENDIX A - TABLE 2
WETLAND IMPACTS FOR PREFERRED ALTERNATIVE REFINED PRELIMINARY DESIGN
STIP Project U-3321 - Gaston East-West Connector Final EIS

Wetlands bridged as a result of Concurrence Point 2a are noted
Wetland impacts calculated based on right-of-way limits plus a buffer of 25 feet from each slope stake line
Sources for Attributes and Draft EIS DSA 9 Impacts: *Natural Resources Technical Report for the Gaston East-West Connector,* Earth Tech, Inc., February 2008 and the Turnpike Environmental Agency Coordination Meeting held April 8, 2008
Sources for Preferred Alternative Impacts: PBS&J

Wetland Number*	Corridor Segment	Wetland Size (acres)	Cowardin Classification	DWQ Rating	Wetland Quality Rating	Draft EIS DSA 9 Preliminary Design	Preferred Alternative Refined Design*	Preferred Alternative Service Roads
25	H2a	0.03	PEM1B	37	Low			
26	H2a	0.01	PEM1F	20	Low			
27	H2a	0.01	PSS3C	31	Low			
28	H2a	0.01	PEM1B	27	Low			
29	H2a	0.14	PSS1C	40	Low	0.10	0.10	
30	H2a	0.03	PSS1/3C	44	Low	0.03	0.03	
31	H2a	0.70	PEM1Fh	39	Low			
32	H2a	0.02	PSS1B	31	Low			
33	H2a	0.10	PFO1C	47	Medium			
34	H2a	2.91	PFO1C	73	High			0.07
35	H2a	1.17	PEM1/SS1C	78	High	1.17	1.17	
36	H2a	0.06	PFO1B	40	Low	0.06	0.06	
37	H2a	0.06	PFO1B	21	Low			
37A	H2a	0.01	PFO1B	23	Low			
38	H2a	0.04	PEM1B	21	Low			
39	H2a	0.38	PFO1C	47	Medium			
40	H2a	0.05	PFO1A	26	Low			
41	H2a	0.02	PFO1B	31	Low			
42	H2a	0.002	PFO1B	32	Low			
43	H2a	0.01	NA	NA	NA	0.01	0.01	
44	H2a	0.37	PFO1G	42	Low	0.05	0.05	
45	H2a	0.04	PFO1Ah	19	Low			
46	H3	0.57	PSS1Bds	69	High			
47	H3	0.11	PFO1Cs	16	Low			0.04
48	H3	0.09	PFO1C	59	Medium			0.01
49	H3	0.16	PFO1C	34	Low			
50	H3	0.14	PFO1C	28	Low			
51	H3	2.07	PFO1C	70	High	1.35	1.25	
52	H3	0.23	PFO1Cd	55	Medium			
53	H3	0.20	PFO1C	22	Low			
54	H3	0.48	PFO1C	22	Low			
58	H3	0.06	PEM1C	36	Low	0.01	0.01	
59	H3	0.38	PSS1Fh	46	Medium	0.01	0.01	
77	H3	0.02	PFO1C	39	Low			
78	H3	0.22	PEM1/SS1F	36	Low	0.04	0.03	
79	H3	0.02	PEM1/SS1Fd	39	Low	< 0.01		
80	H3	0.01	PFO1G	36	Low			
81	H3	0.03	PFO1B	20	Low	0.03	0.03	
82	H3	0.38	PFO1Cd	20	Low	0.21	0.21	
83	H3	0.10	PFO1Cd	20	Low	0.01	0.01	
84	H3	0.06	PSS1B	32	Low	0.01	0.01	
85	H3	0.35	PFO1C	63	High			
86	H3	0.03	PEM1B	27	Low	0.03	0.01	
87	H3	0.14	PFO1B	19	Low	< 0.01	< 0.01	
95	H3	0.02	PFO1/4C	23	Low			
99	J4a	2.19	PFO1C/PUBH	34	Low	0.46	0.38	
100	J4a	0.26	PFO1/EM1C	24	Low	0.04	0.02	
103	J4a	6.70	PFO1C	83	High			
106	J4a	0.47	PFO1C/B	39	Low	< 0.01		

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Wetland impacts calculated based on right-of-way limits plus a buffer of 25 feet from each slope stake line
Sources for Attributes and Draft EIS DSA 9 Impacts: *Natural Resources Technical Report for the Gaston East-West Connector,* Earth Tech, Inc., February 2008 and the Turnpike Environmental Agency Coordination Meeting held April 8, 2008
Sources for Preferred Alternative Impacts: PBS&J

Wetland Number*	Corridor Segment	Wetland Size (acres)	Cowardin Classification	DWQ Rating	Wetland Quality Rating	Draft EIS DSA 9 Preliminary Design	Preferred Alternative Refined Design*	Preferred Alternative Service Roads
107	J4a	0.44	PFO/SS1Fh	48	Medium	0.01	0.01	
108	J4a	0.04	PEM1C	16	Low	0.04	0.04	
109	J4a	0.03	PFO1/EM1C	28	Low	0.03	0.03	
142	J2d	1.52	NA	NA	NA			
147	J2d	0.02	PFO1	36	Medium			
148	J2d	0.20	PEM1	41	Medium			
149	J2d	0.17	PFO1	33	Low			
150	J2d	0.40	PFO1	39	Medium			
151	J2d	0.03	PFO1	35	Medium			
152	J2d	0.32	PFO1	39	Medium			
153	JX4	0.05	PFO1	37	Medium			
154	JX4	0.42	PFO1F	43	Medium			
155	JX4	0.13	PFO1	9	Low			
157	JX4	0.39	PFO1	30	Low			
158	JX4	0.01	PFO1	8	Low			
159	JX4	0.63	PEM1	25	Low			
160	JX4	0.05	PFO1	13	Low			
161	JX4	0.17	PFO1	33	Low	< 0.01	< 0.01	
162	JX4	0.10	PFO1	21	Low			
163	JX4	0.03	NA	NA	NA			
164	JX4	0.02	PFO1	4	Low	0.02	0.02	
165	JX4	0.35	PFO1	35	Medium			
166	JX4	0.05	PFO1	7	Low	0.05	0.05	
167	JX4	0.06	PFO1	19	Low			
168	JX4	0.17	NA	NA	NA			
169	JX4	0.21	PFO1	42	Medium			
176	JX4	0.004	PFO1	0	Low			
177	JX4	0.01	PFO1	13	Low			
178	JX4	0.01	PFO1	13	Low			
179	JX4	0.22	PFO1	55	Medium			
180	JX4	0.03	PFO1	21	Low			
181	JX4	0.004	PFO1	13	Low			
182	JX4	0.01	PFO1	2	Low			
183	JX4	0.05	PFO1	23	Low			
184	JX4	0.03	PFO1	8	Low			
187	JX4	0.56	PFO1A	53	Medium			
188	JX4	0.54	PFO1A	43	Medium	0.17	0.16	
189	J1e	5.51	PSS1	51	Medium	0.36	0.33	
190	J1e	0.09	PFO1	13	Low			
191	J1e	0.20	PFO1	13	Low			
192	J1e	0.99	PFO1	59	Medium			
214	J1e	0.15	PFO1	58	Medium			
214	J1e		PFO1	58	Medium			
215	J1e	0.02	PFO1	4	Low			
216	J1e	0.01	PFO1	4	Low			
217	J1e	0.02	PFO1	8	Low	0.02	0.02	
218	J1e	0.05	PEM1	17	Low	0.05	0.05	
219	J1e	0.01	PEM1	15	Low	0.01	0.01	
220	J1e	0.03	PEM1	17	Low			

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Wetland Number*	Corridor Segment	Wetland Size (acres)	Cowardin Classification	DWQ Rating	Wetland Quality Rating	Draft EIS DSA 9 Preliminary Design	Preferred Alternative Refined Design*	Preferred Alternative Service Roads
221	J1e	0.12	PFO1	18	Low			
222	J1e	0.02	PFO1	18	Low			
223	J1e	0.09	PEM1	17	Low			
224	J1e	0.02	PFO1	12	Low			
225	J1e	0.06	PFO1	18	Low			
226	J1f	0.06	PFO1	23	Low			
227	J1f	0.18	PFO1	23	Low			
228	J1f	0.12	PEM1	16	Low			
229	J1f	0.22	PEM1	16	Low			
230	J1f	0.06	PEM1	28	Low			
231	J1f	0.10	PEM1	23	Low			
232	J1f	1.20	PEM1	21	Low			
233	J1f	0.07	PSS1	0	Low			
234	J1f	0.03	PFO1	11	Low		0.03	
235	J1f	0.05	PEM1/PFO1	61	Medium	< 0.01		
235A	K1a	0.07	PFO1	17	Low			
236	K1a	0.01	PFO1	0	Low	0.01		
237	K1a	0.56	PFO1	37	Medium			
238	K1a	0.13	PFO1	35	Medium			
239	K1a	0.02	PEM1	18	Low			
239A	K1a	0.05	PEM1	28	Low			
240	K1a	0.09	PFO1	22	Low			
241	K1a	1.34	PFO1	39	Medium	0.89	0.83	
242	K1a	0.15	PSS1	13	Low			
243	K3a	0.10	PFO1	20	Low			
244	K3a	0.06	PFO1	25	Low			
245	K3a	0.59	PFO1Ah	77	High			
246	K3a	0.08	PFO1Ah	77	High	0.03	0.08	
247	K3a	1.26	PFO1Ah	77	High			
248	K3a	4.76	PFO1Ah	93	High	0.66[1]	0.66[1]	
249	K3a	0.18	PFO1Ah	61	Medium			
252	K3a	0.42	PEM1/PSS1/PFO1	9	Low		0.01	
252A	K3a	0.01	PFO1	7	Low			
253	K3a	0.35	PEM1	26	Low	0.35	0.35	
254	K3a	0.11	PEM1	15	Low	0.01		
255	K3a	0.01	PEM1	15	Low	0.01	0.01	
256	K3a	0.02	PEM1	15	Low			
278	K3b	0.18	Palustrine	23	Low			
283A	K3a	0.01	Palustrine	70	High			
284	K3a	0.47	Palustrine	70	High			
285	K3a	0.05	Palustrine	44	Medium	0.04		
286	K3a	0.33	Palustrine	68	High			
287	K3a	0.02	Palustrine	42	Medium			
288	K3a	0.004	Palustrine	46	Medium	< 0.01	< 0.01	
289	K3b	0.23	Palustrine	43	Medium	0.23	0.23	
290	K3b	0.05	Palustrine	64	Medium			
291	K3b	0.07	Palustrine	9	Low			
292	K3b	0.01	Palustrine	32	Low			
293	K3b	0.02	Palustrine	23	Low			

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Sources for Preferred Alternative Impacts: PBS&J

Wetland Number*	Corridor Segment	Wetland Size (acres)	Cowardin Classification	DWQ Rating	Wetland Quality Rating	Draft EIS DSA 9 Preliminary Design	Preferred Alternative Refined Design*	Preferred Alternative Service Roads
293A	K3b	0.00	Palustrine	23	Low			
294	K3b	0.18	Palustrine	38	Medium			
295	K3b	0.01	Palustrine	22	Low			
296	K3c	0.01	Palustrine	NA	NA			
297	K3c	0.30	Palustrine	58	Medium			
317	K3c	4.78	Palustrine	62	Medium	0.37	0.37	
317A	K3c	0.03	Palustrine	31	Low			
318	K3c	0.09	Palustrine	24	Low			
319	K3c	0.30	Palustrine	23	Low			
320	K3c	0.01	Palustrine	23	Low	0.01		
321	K3c	0.02	Palustrine	14	Low	0.02	0.02	
323	K3c	0.02	Palustrine	17	Low	0.02	0.02	
324	K3c	0.02	Palustrine	22	Low	0.02	0.02	
325	K3c	0.03	Palustrine	15	Low	0.03	0.02	
326	K3c	0.08	Palustrine	41	Medium			
327	K3c	0.12	Palustrine	60	Medium			
328	K3c	0.03	Palustrine	53	Medium			
329	K3c	0.56	Palustrine	43	Medium	0.42		
329A	K3c	0.00	Palustrine	27	Low			
330	K3c	0.05	Palustrine	19	Low			
331	K3c	0.05	Palustrine	17	Low			
331A	K3c	0.01	Palustrine	38	Medium			
332	K3c	0.10	Palustrine	38	Medium		0.10	
333	K3c	0.05	Palustrine	17	Low	0.02	0.02	
333A	K3c	0.01	Palustrine	16	Low	0.01		
334	K3c	0.14	Palustrine	42	Medium	0.02	0.03	
335	K3c	0.43	Palustrine	33	Medium			
336	K3c	0.07	Palustrine	11	Low			
337	K3c	0.23	Palustrine	68	High			
337A	K3c	0.03	Palustrine	27	Low			
337B	K3c	0.02	Palustrine	35	Medium			
338	H3	0.35	PEM1	16	Low			
340	H3	0.02	PFO1B	36	High			
TOTAL						**7.5**	**6.9**	**0.1**

* Wetland numbers not consecutive because only those within the Preferred Alternative Corridor are listed.

1. Without extending the Catawba Creek bridge, the impact to Wetland 248 would be 1.50 acres

APPENDIX A - TABLE 3
POND IMPACTS FOR PREFERRED ALTERNATIVE REFINED PRELIMINARY DESIGN
STIP Project U-3321 - Gaston East-West Connector Final EIS

Pond impacts calculated based on right-of-way limits plus a buffer of 25 feet from each slope stake line
Source for Pond Attributes and DSA 9 Impacts: *Natural Resources Technical Report for the Gaston East-West Connector,* Earth Tech, Inc., February 2008
Source for Refined Design Impacts: PBS&J

Earth Tech Pond ID	Corridor Segment	General Location Along Corridor	Total Acres Within Corridor	Cowardin Classification	Draft EIS DSA 9 Preliminary Design	Preferred Alternative Refined Design*	Preferred Alternative Service Roads
4	H2A	South of Belfast Dr	1.31	PEM1/PUBHh			
5	H2A	South of Belfast Dr	1.56	PUBHh/PEM1Fh			0.33
10	H3	Linwood Springs Golf Course	0.82	PUB3Hhx			
11	J4a	Linwood Springs Golf Course	0.93	PUB3Hhx			
12	J4a	Linwood Springs Golf Course	1.23	PUB3Hh	1.23	1.23	
17	J4a	North of New Haven Dr	0.26	PUB3H			
18	J4a	Adjacent to Crowders Creek Rd	0.07	PUB3Hh	0.03	0.03	
24	J2d	East of Robinson Rd	1.43	PUBHh	1.15	1.09	
25	J2d	East of Robinson Rd	1.93	PUBHh			
26	J2d	East of Robinson Rd	0.27	PUBHh			
27	J2d	West of Bud Wilson Rd	0.72	PUBHh			
28	J2d	East of Bud Wilson Rd	0.90	PUBHh			
29	J2d	East of Bud Wilson Rd	0.17	PUBHh			
30	J2d	East of Bud Wilson Rd	0.68	PUBHh	0.68	0.68	
31	JX4	End of Dorchester Dr	0.08	PUBHh			
32	JX4	East of Patrick Rd	0.30	PUBHh			
37	J1e	East of Wilson Farm Rd	0.47	PUBHh	0.34	0.34	
38	J1f	East of Union Rd (NC 274)	0.54	PUBHh		0.52	
40	K1A	East of Rufus Ratchford Rd	0.41	PUBHh	0.41	0.07	
41	K1A	West of Rufus Ratchford Rd	0.65	PUBHh			
44	K3A	West of South New Hope Rd (SR 279)	2.42	PUBHh			
45	K3B	East of South New Hope Rd (SR 279)	1.00	PUBHh			
46	K3B	East of South New Hope Rd (SR 279)	1.04	PUBHh			
52	K3B	East of Boat Club Rd	0.20	PUBHh	0.20	0.20	
56	K3C	West of I-485	1.06	PUBHh			
57	K3C	West of I-485	0.06	PUBHh	0.06	0.06	
58	K3C	East of I-485	1.063	PUBHh			
Total					**4.1**	**4.2**	**0.3**

* This column includes mainline and Y-lines

Pond numbers not consecutive because only those within the Preferred Alternative Study Corridor are listed.

APPENDIX B

Meeting Minutes – March 16, 2010 Agency Meeting

Meeting – Gaston East-West Connector

MEETING MINUTES

Date: March 16, 2010
1:00 pm to 4:00 pm
NCDOT Board Room – Transportation Building, Raleigh, NC

Project: STIP U-3321 Gaston E-W Connector – STP-1213(6)

Gaston E-W Connector – Meeting Regarding Mitigation:

Attendees:
George Hoops, FHWA
Donnie Brew, FHWA
Steve DeWitt, NCDOT-NCTA
Jennifer Harris, NCDOT-NCTA
Todd Tugwell, USACE
Mickey Sugg, USACE
Chris Militscher, USEPA
Polly Lespinasse, NCDENR-DWQ
Brian Wrenn, NCDENR-DWQ
Bill Gilmore, NCDENR-EEP
Jim Stanfill, NCDENR-EEP
Marc Recktenwald, NCDENR-EEP
Beth Harmon, NCDENR-EEP
Andrea Leslie, NCDENR-EEP
Amy Simes, NCDENR
Leilani Paugh, NCDOT-NEU
Bill Barrett, NCDOT-NEU
Linda Fitzgerald, NCDOT-NEU
Greg Thorpe, NCDOT-PDEA
Missy Pair, NCDOT-PDEA
Jeff Dayton, HNTB
Jill Gurak, PBS&J
Michael Gloden, PBS&J
Jens Geratz, PBS&J

Via Telephone:
Liz Hair, USACE

Presentation Materials:
- Agenda
- Handout – NCTA - Garden Parkway - Impacts to Jurisdictional Resources
- Handout – EEP - Garden Parkway Project Search: GIS Search and Field Reconnaissance Results
- Handout – EEP - Available Assets in Catawba 01 and Catawba 02
- Presentation on Site Search Conducted by EEP - Powerpoint Slideshow Printout

Purpose:

Discuss and agree upon the mitigation approach for the Gaston East-West Connector for impacts to jurisdictional resources.

Introduction and Presentation:

Donnie Brew opened the meeting with introductions. He then asked the attendees whether there were any high-level regulatory issues regarding permitting of the Garden Parkway project and the proposed approach of using programmatic mitigation through EEP.

> NCDWQ stated that the location of the mitigation does not hinge on the fact that there are several 303d-listed streams impacted by the project. However, because there are numerous of 303d-listed streams, then mitigation implemented nearby may be more appropriate. NCDWQ always prefers on-site mitigation where feasible, and since there are so many 303d-listed streams, NCDWQ would like to see more local mitigation. However, NCDWQ is not opposed to off-site mitigation.

Bill Gilmore asked whether the project was following the merger process. In the merger process, mitigation is normally discussed after a Least Environmentally Damaging Practicable Alternative (LEDPA) is identified.

> The project is following a modified merger process and Concurrence Points (CP) 1 through 4a have been achieved. LEDPA (CP 3) was identified in October 2009. Avoidance and Minimization (CP 4a) was achieved in February,2010. The refined designs for the Preferred Alternative reduced impacts substantially (by 12,966 linear feet). NCTA has been providing annual updates to EEP on estimated impacts. NCTA has also discussed mitigation with the environmental resource and regulatory agencies since last summer at the monthly meetings.

USACE requested a summary of past discussions with USEPA since Mickey Sugg, Todd Tugwell, and Liz Hair had not attended the meetings. Steve Lund, recently retired, has been the USACE representative on the project.

> NCTA stated that Kathy Matthews of USEPA has expressed concern about the magnitude of impacts and potential impacts to 303d-listed streams. When it was discussed that EEP would be the primary source for mitigation, Ms. Matthews recommended also looking at other potential mitigation such as on-site mitigation or non-traditional mitigation.
>
> Chris Militscher stated that Ms. Matthew's notes indicated she had three basic concerns. One was the use of Bobs Pocket for mitigation credit on this project since the Bobs Pocket is far away from the project and the Bobs Pocket site is not under immediate threat of development. Another recommendation was to have a more aggressive approach to searching for local or more nearby mitigation opportunities and to make sure no good local opportunities were being missed. Finally, USEPA always prefers on-site mitigation if it makes sense from ecosystem, water quality and cost perspectives.
>
> Polly Lespinasse noted that the amount of mitigation available for this project was a concern for NCDWQ since there are other projects in the area that also will need mitigation.

Todd Tugwell stated he was aware of some of USEPA's concerns and that there was also concern that mitigation ratios at Bobs Pocket would not be high.

Jim Stanfill asked if the permitting agencies thought this project is a unique situation (no immediate responses). EEP prepares mitigation in advance for many transportation projects and does not know which mitigation site credits will be applied to each project until the permit is issued. In the case of the Garden Parkway, there is some opportunity to look at mitigation beforehand, which does not happen often. Normally, all mitigation is already in hand before permits and mitigation discussions occur for a project.

Donnie Brew stated that agreement between the agencies for the programmatic approach to mitigation is an effective approach, but sometimes there can be exceptions.

Jill Gurak provided an overview of the project impacts to jurisdictional resources. She noted:

- Draft EIS signed in April 2009
- Draft EIS included impacts for 12 Detailed Study Alternatives (DSAs) based on preliminary engineering designs
- LEDPA and Preferred Alternative is DSA 9
- Design refinements made to DSA 9 reduced stream impacts by over 12,000 linear feet (12,966 linear feet). These included
    - Reducing median width by 20 feet
    - Eliminating the Bud Wilson Road interchange (substantial savings at this location)

  - Reducing the footprint of the Robinson Road, NC 274 (Union Road), and NC 273 (Southpoint Road) interchanges
  - Redesigning the I-485 interchange and reducing the footprint (substantial savings at this location)
- Impacts were calculated based on the preliminary engineering design construction limits with a 25-foot buffer, which is standard NCDOT practice for calculating impacts based on preliminary level design.
- There will be incentives for the Design-Build team to further reduce impacts.
- The impacts to 303d-listed streams noted in the handout are impacts to unnamed tributaries that feed named streams included in the Final 303d list (2008), and are not listed streams themselves. The listed named streams are bridged, including an extended bridge over Catawba Creek to span an adjacent wetland.
- The Draft 2010 list also included South Fork Catawba River, which would be bridged, and McGill Branch and South Crowders Creek, neither of which are impacted by the Preferred Alternative.

Donnie Brew asked if any of the attendees thought the proposed project would not be able to obtain a permit. None of the attendees replied in the affirmative.

Michael Gloden provided an overview of the on-site mitigation survey conducted for the Preferred Alternative (*Technical Memorandum – On-Site Mitigation Field Review*, PBS&J, January 2010). He noted:

- 20 tax parcels containing 1,050 acres were initially identified using GIS.
- The field survey narrowed the sites to seven parcels grouped into three locations. Additional evaluations are still needed, as well as discussions with the property owners.
    1. Stream enhancement of approximately 5,600 linear feet (Linwood Springs Golf Course)
    2. Stream enhancement and restoration of approximately 1,700 linear feet (Harrison Family Dairy Farm)
    3. Wetland enhancement of approximately 6 acres (logged site)
- Enhancement means measures such as revegetation and bank repair.

Leilani Paugh stated the report provides a good survey of sites based on a traditional approach, but there may be opportunities for more creative or non-traditional mitigation. For example: stormwater issues, in-stream work, and watershed preservation. If a potential site is immediately adjacent to the project, then condemnation for this mitigation would not be prohibited. NCDOT is in the process of scheduling a site visit with permitting agencies in Mecklenburg County for a couple projects that include some non-traditional mitigation.

USEPA is interested in non-traditional mitigation opportunities. Chris Militscher stated he thought there were some good opportunities near the Carolina Speedway, and he believes a number of the systems in the project area have degraded over the last several years, even without the proposed project having been implemented.

NCDWQ is interested in considering non-traditional mitigation. However, Brian Wrenn stated the measures would need to be above and beyond what would be required by regulation in order to receive mitigation credit.

USACE stated that it is difficult to determine mitigation ratios for non-traditional mitigation, and when enough is proposed. Mr. Tugwell asked if there has been any monitoring of non-traditional sites.

Leilani Paugh stated NCDOT has not conducted any monitoring in the project area. NCDOT currently is establishing a monitoring program for a project on the coast.

Jim Stanfill suggested that the Charlotte mitigation bank may be the closest example site. They are conducting some monitoring.

EEP has enough mitigation credits now to permit the project fully. EEP provided a list of available assets in a meeting handout. However, no other project would be able to be permitted until additional mitigation credits were obtained in the watershed. Most of the credits that would be used for the proposed project are located in the lower Catawba. Less than half of the credits available from the Bobs Pocket site might have been applied to the Garden Parkway. The available credits are in the monitoring stage, with just a couple sites in the design stage. Required ratios for a project are not normally known until the permit is issued. Historically, ratios have been between 1:1 – 2:1, with the ratio average usually about 1.5:1. The EEP plans for a ratio of 2:1 to be conservative.

Andrea Leslie gave a Powerpoint presentation (attached) on EEP watershed planning in the project area. She noted:

- EEP uses a watershed planning approach based on 8-digit Catalog Unit. Catawba 01 and 02 have several local watershed plans, although none are in Gaston County.
- EEP currently has the following assets (see full list in handout):
    - Restoration: Catawba 01 – 16,352 Stream Mitigation Unit (SMU), Catawba 02 – 18,767 SMU
    - Restoration Equivalent – High Quality Preservation Southern Piedmont ecoregion: 32,928 SMU and Catawba 01 – 5,107 SMU
    - EEP also has riparian wetland credits available, as listed in the handout.
- The GIS site search of local watersheds for the Garden Parkway included parcels in Mecklenburg and Gaston Counties that had more than 1,000 linear feet of stream with land use restoration potential. Project feasibility determined by five criteria: total project stream length greater than 1,500 linear feet, 1-3 landowners, drainage area less than 10 square miles, streams with narrow or no buffer on at least one side, and riparian corridor without severe constraints.
- The GIS analysis sites were then visited in the field in March 2010. After field reconnaissance, EEP identified 8 projects in Crowders Creek drainage (14 digit HU = 3050101180010), 5 projects in Catawba Creek drainage (HU = 3050101180020), and 1 project in South Fork Catawba River East (HU = 3050102060020). Total potential stream restoration length is 32,400 linear feet in Tier 1 (most promising sites) and 12,100 linear feet in Tier 2 (project has significant constraints).
- Further evaluation is needed, along with property owner contact.

Greg Thorpe asked if the agencies would consider mitigation across the state line in South Carolina, since the project is close to the state line. USACE will not accept mitigation outside North Carolina. USEPA and NCDWQ agreed with this statement.

Donnie Brew reviewed some of the main points of the programmatic agreement for mitigating the impacts of transportation projects in North Carolina.

- Requires mitigation to be in the ground before the project is constructed. The mitigation should be in the same 8-digit hydrologic unit and be of the same type as the impacted resource.
- Mitigation ratios are typically 1:1 for restoration and 2:1 for restoration equivalent.
- The benefits of the programmatic approach include achieving mitigation in advance of an impact, and implementing mitigation based on watershed planning. The programmatic approach allows focus on problem watershed areas. This approach also results in predictability for the NCDOT and FHWA in planning and scheduling projects.

Mr. Brew stated that if the programmatic approach is not used for the Garden Parkway, then mitigation already in the ground would not be applied to this project and there would be a project delay while other mitigation is implemented. The programmatic approach does not have a static direct link between particular mitigation sites and projects until the project permit is issued, then the locations/origins of the credits are established so the same credits are not used for another project.

Bill Gilmore stated the EEP program matches impacts of all types of projects in a watershed area with overall watershed needs.

Donnie Brew asked again whether the programmatic mitigation approach would be acceptable for the Garden Parkway. Donnie Brew suggested that the programmatic approach would allow for the EEP to focus future efforts in watershed areas where mitigation is needed. These credits would be applied to future projects, but the Garden Parkway would be the influence that steers these future credits to areas the agencies felt they were most needed. This is a normal process in the programmatic, watershed approach to mitigation.

> USEPA wants FHWA and NCTA to document on-site mitigation opportunities more fully, and also whether there are potential mitigation sites within 1-2 miles of the project. Non-traditional measures also should be fully evaluated and their feasibility or infeasibility documented in the mitigation plan.

Mr. Brew noted this suggestion for studying nearby (not adjacent) mitigation and non-traditional measures would not be the normal process. The non-traditional measures would be difficult to assign ratios to, so would these be "bonus" mitigation?

USACE stated non-traditional opportunities would be implemented only because traditional approaches not available. The programmatic approach was acceptable.

NCDWQ would consider on-site mitigation as the first priority. NCDWQ's permit constraints likely would be related to providing mitigation in Piedmont streams, not Mountain streams (i.e., using credits that are from the same ecoregion). NCDWQ would not be as concerned with thermal classification (cold/cool/warm). However, NCDWQ was comfortable with the programmatic approach to mitigation for the Garden Parkway, with a programmatic adjustment in the focus of the location of mitigation projects in the Catawba 01 and Catawba 02 areas.

EEP noted that there are a number of mitigation opportunities in the Catawba 01 watershed.

NCDWQ stated that the Catawba 01 watershed is large and crosses several ecoregions. Some mitigation in this region may not be appropriate for the project if it occurs in a different ecoregion.

USACE stated that if NCDWQ wants mitigation to occur in specific 14-digit HUCS, then the permit would need to specify this requirement. Greg Thorpe stated that a restriction such as this would likely result in EEP spending more money to find specific mitigation.

EEP has nearby mitigation credits available at Beaverdam Creek of approximately 13,000 linear feet of stream credit. The search for potential nearby mitigation projects presented by Andrea Leslie identified another 32,000 linear feet of Tier 1 projects (those with good possibility) for potential stream mitigation. The EEP would be willing to pursue these potential projects as part of the normal process for identifying mitigation credits in Catawba 01 and Catawba 02. However, these mitigation projects would not be tied directly to the Garden Parkway.

Todd Tugwell also noted that the USACE likely will require mitigation for some intermittent streams. Polly Lespinasse stated that based on her field visits, many of the intermittent streams would be considered "important" from a permitting perspective.

Jim Stanfill noted that EEP does try to provide associated credits that are of the same stream regimen (i.e. cool stream mitigation for cool stream impacts). However, Catawba 01 is large and a few projects in the past have had cold/cool and cool/warm credits allowed.

Chris Militscher noted that USEPA has been providing comments on the proposed project since 2001 and the FHWA and NCTA have known about the impacts and should have been pursuing on-site and nearby mitigation for this project. A conceptual mitigation plan was requested to be included in the Draft EIS.

The Preferred Alternative was identified in October 2009, and an on-site mitigation survey was initiated shortly afterward, following standard procedures. The refined preliminary designs reduced stream impacts by approximately 12,966 linear feet. NCTA was not in a position in the Draft EIS to develop a conceptual mitigation plan. The Final EIS is not completed yet, and FHWA and NCTA intend to include a conceptual mitigation in the Final EIS.

USEPA stated that they cannot comment on the proposed mitigation until there is a more formal presentation of mitigation that considers on-site mitigation, nearby (or near-site) mitigation, and non-traditional measures. USEPA also is concerned about the potential amount of indirect and cumulative impacts since waters in the area are already impaired. The Clean Water Act prohibits actions that further degrade already degraded waters.

FHWA stated they would work with USEPA separately to try to address concerns. NCDOT and FHWA do not mitigate for indirect and cumulative effects.

Marc Recktenwald stated EEP can focus efforts on the potential nearby mitigation sites identified in Andrea Leslie's presentation and have more information to include in a conceptual mitigation plan regarding the feasibility of these sites. EEP can also provide a list of projects already implemented that have benefited the watershed.

NCDOT will work with NCTA and their consultants to evaluate non-traditional measures.

Leilani Paugh will provide examples of other conceptual mitigation plans for use in developing the plan for the Garden Parkway.

Conclusions

A conceptual mitigation plan for the Preferred Alternative will be prepared and summarized in the Final EIS.

EEP has enough credits in hand to permit the Garden Parkway project, including 13,000 linear feet of stream mitigation credits at Beaverdam Creek, just south of the Preferred Alternative.

The programmatic approach is acceptable to NCDWQ and USACE. EEP should initiate a programmatic adjustment in the focus of the location of mitigation projects in the Catawba 01 and Catawba 02 areas.

NCDWQ permit constraints may include provisions related to providing mitigation in Piedmont streams within Catawba 01 and Catawba 02 (rather than Mountain streams).

The USACE and NCDWQ will not accept credits outside of North Carolina (i.e., credits in South Carolina).

NCDWQ and USEPA prefer on-site mitigation where feasible. The on-site mitigation search should be fully documented, including contact with property owners.

NCDWQ and USEPA are interested in more information regarding the feasibility of non-traditional measures for on-site mitigation, and possibly near-site mitigation. NCDOT NEU and NCTA will evaluate non-traditional measures, and will report the results in the conceptual mitigation plan.

USEPA will not comment until they review the conceptual mitigation plan. USEPA would like to see on-site and near-site mitigation and non-traditional measures. They are also concerned with indirect and cumulative effects and further degradation of area streams.

Action Items:

- EEP will provide additional information about the potential mitigation projects identified in the 14-digit HUCs near the project.
- NCTA and NCDOT NEU will evaluate the feasibility of non-traditional mitigation measures for on-site mitigation.
- NCTA will contact the property owners of the three site identified in the on-site mitigation survey to determine their interest.
- NCTA will prepare a conceptual mitigation plan and include a summary in the Final EIS.
- NCTA will coordinate with USACE and NCDWQ to determine the remaining tasks required to identify which intermittent streams are “important”. *Follow-up – For this project, NCDWQ indicated that only “perennial” streams will require mitigation. The project was far enough in the planning process that the new requirement for intermittent stream mitigation does not apply. The mitigation ratio will be 1:1.*

Garden Parkway Project Search: GIS Search and Field Reconnaissance Results
Ecosystem Enhancement Program
10 March 2010

Introduction

This document summarizes the results of a stream restoration project search in the 14-digit hydrologic units affected by the preferred alternative of Garden Parkway. A GIS-based project search was performed in December 2009 and modified in February 2010. All possible projects identified through the GIS analyses were visited in the field to determine feasibility in March 2010.

There are five 14-digit hydrologic units that have streams that may be impacted by the Garden Parkway corridor; three of these are in Catawba 01 and two are in Catawba 02. Most of this 177 square mile area is in Gaston County, although a portion is also in Mecklenburg County. Much of Gastonia, as well as portions of Kings Mountain, Bessemer City, Belmont, and Charlotte, are contained in this area.

GIS Methods & Results

The following steps were performed via GIS:

1. Mecklenburg and Gaston County parcel data from 2009 were intersected with 1:24,000 NHD streams clipped to the 5 14-digit HUs that contain the Garden Parkway corridor.
2. The resulting dataset was dissolved in order to determine total stream length by pin number.
3. Parcels with at least 1,000 ft of stream length were selected.
4. Land use/cover (2001 NLCD) was reclassified and converted to a vector dataset in order to determine buffer type for restoration potential. Two land use/cover classes were determined: those with restoration project potential and without potential. Those land use/cover categories used as restoration potential were-
    - 21- Developed, Open Space of less than 20% impervious cover
    - 22- Developed, Low Density where impervious cover is 20-49%
    - 71- Grassland/Herbaceous not subject to intensive management but can be used for grazing
    - 81- Pasture/Hay
    - 82- Cultivated Crops
5. The parcel dataset determined in step 3 was clipped by the land use/cover with restoration potential.
6. Parcels with stream length of at least 1,000 ft of stream length were selected and a new dataset containing 92 potential projects was created.
7. Each potential project was then analyzed for feasibility with parcel ownership information and 2005 aerial photographs. Possibility for upstream and downstream extension of the project was examined. The following criteria were used to determine whether a project was feasible:
    a. Stream length >1500 ft

b. <4 landowners
c. Drainage area ≤10 square miles
d. Streams with little or no buffer on at least one side
e. Riparian corridor without severe constraints such as large buildings, large roads, and large power line right-of-ways.

Sixteen projects that met the criteria in step 7 above were found in the search area (see Table 1 and Figure 1), which comprise 49,300 ft of stream. Three of the sixteen projects are in golf courses. Most of the sixteen projects are in the western two hydrologic units of Catawba 01. Only 15,900 ft of project were found within 1 mi of the Garden Parkway corridor. 22,400 ft of project (which includes the 15,900 ft within 1 mi) were found within 2 mi of the corridor. Limitations in finding feasible projects were primarily due to the small size of most parcels in this developed area and constraints within the riparian corridors. Those 76 projects that were rejected due to criteria in step 7 are listed in Table 2.

Table 1. Possible restoration projects in the Garden Parkway area.

14-digit HU	Major stream	Number of projects	Total project length (ft)	Project length w/in 1 mi of Parkway corridor (ft)	Project length w/in 2 mi of Parkway corridor (ft)
Catawba 01					
03050101170040	Catawba R	0	0		
03050101180010	Crowders Cr	9	31500	6900	10900
03050101180020	Catawba Cr	5	14000	7000	9500
Catawba 02					
03050102060020	S Fk Catawba R East	1	2000	2000	2000
03050102070030	S Fk Catawba R West	1	1800		
TOTAL		**16**	**49300**	**15900**	**22400**

Figure 1. Potential projects identified through GIS screen.

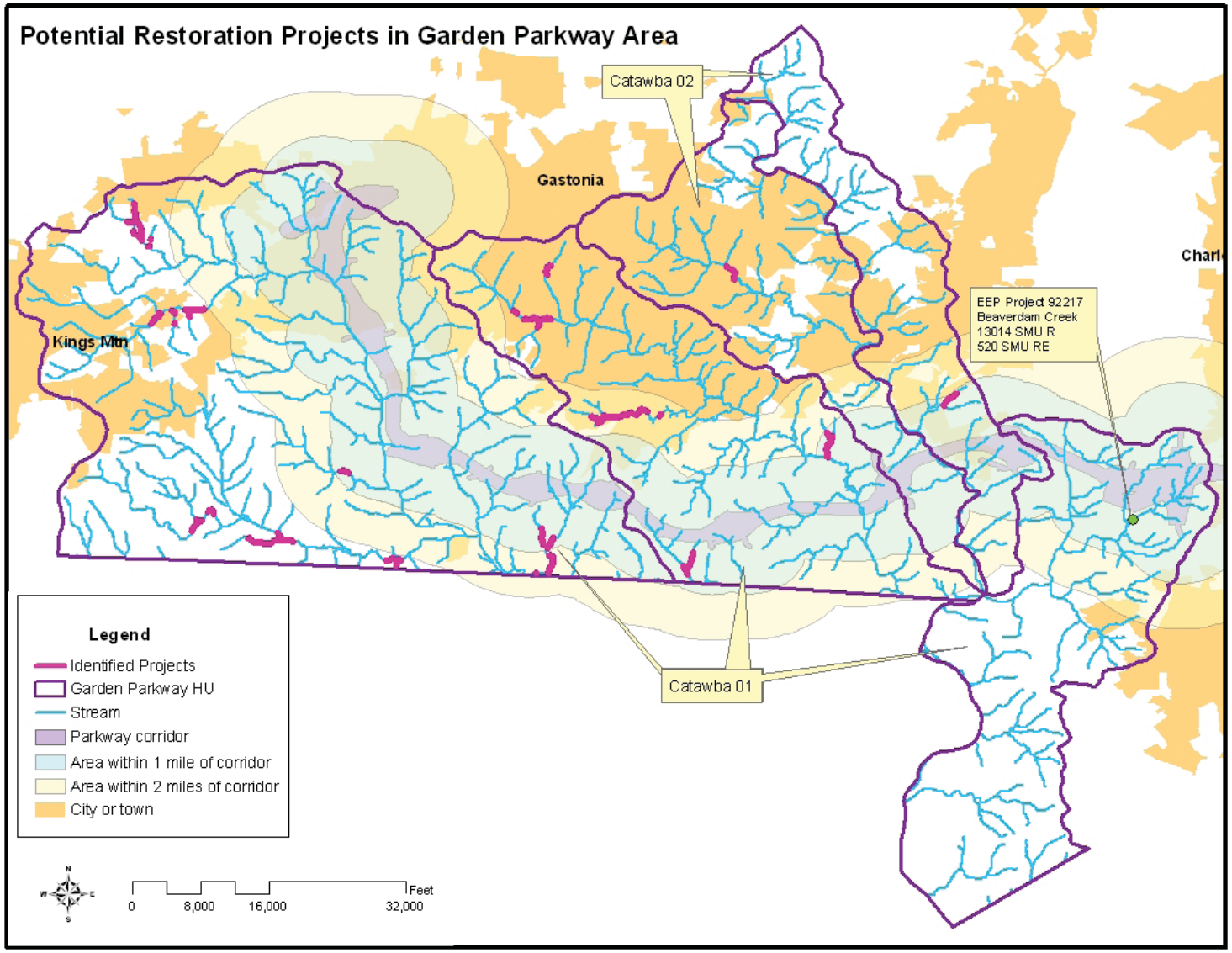

Table 2. Potential projects that did not meet minimal criteria.

Project #	Limiting factors for rejected sites				
	Forested buffer	≥4 landowners	<1500 ft	Drainage area >10 sq mi	Physical constraints
19			x		pond
27	x				along major road
46			x		
54	x				
55	x				
59			x		pond downstream
65			x		golf course
72	x				
83	x				
85	x				
86	x				school in construction?
87	x				
107	x				
113			x		
118				x	golf course, manicured to stream
123		x	x		
124	x				
126	x				
127	x				
130				x	golf course, manicured to stream
131				x	golf course, manicured to stream
132	x				
136	x				
137			x		
138		x			corridor constrained by buildings
141	x				powerline
154	x				
155	x				
160	x	x			
165	x	x			in-line pond
166		x			
167	x				
168	x	x			
175	x	x			
176			x		powerlines in corridor
185		x			powerlines in corridor
186	x	x			
187			x		stream culverted under soccer field
189	x				
190	x	x			
191	x		x		
192			x		in-line pond
193	x				
194	x				
196	x				
197	x				
199			x		apartment complex, corridor constrained
202	x				

Table 2. Potential projects that did not meet minimal criteria (cont).

Project #	Limiting factors for rejected sites				
	Forested buffer	≥4 landowners	<1500 ft	Drainage area >10 sq mi	Physical constraints
204	x				in-line pond
205	x				
224	x				
227	x			x	
229		x	x		
230	x		x		
231	x		x		
233			x		roads in for future development, in corridor
234	x		x		
235			x		in developing property of Franklin Square Mall
237	x		x		
247			x		buffer on 1 side
255	x	x			
257	x				
259	x				
263	x	x			powerline in corridor
265	x				
267	x		x		condominiums along narrow corridor
269	x				
272	x				upstream of pond
273	x				upstream of pond
279	x				in-line pond
280	x		x		in-line pond
281			x		in-line pond
295	x		x		near WTP or WWTP
296	x		x		in-line pond
300			x		in-line pond
312					quarry

Results of Field Reconnaissance

Each of the 16 projects identified through the GIS screen were visited in March 2010. Due to limited time available, landowners were not contacted to determine interest in a project. Projects on private land were not thoroughly evaluated; feasibility was determined based on what could be seen from public right-of-ways.

Projects were placed in one of three feasibility tiers (Table 3), which are:

1. Tier 1: good project possibility
2. Tier 2: project has significant constraints
3. Tier 3: project is not feasible

Nine projects (for a total of 32,400 ft) are in Feasibility Tier 1. Five projects (for a total of 12,100 ft, all in Catawba 01) are in Feasibility Tier 2. Two projects were dropped and are in Feasibility Tier 3. See Figure 2 for project locations and Table 4 for descriptions of each of the sixteen projects evaluated in the field.

Table 3. Possible restoration projects in the Garden Parkway area post-field reconnaissance.

14-digit HU	Major stream	Number of projects	Total project length (ft)	Tier 1 (ft) (good project possibility)	Tier 2 (ft) (projects have considerable constraints)
Catawba 01					
03050101170040	Catawba R	0	0		
03050101180010	Crowders Cr	8	28500	23400	5100
03050101180020	Catawba Cr	5	14000	7000	7000
Catawba 02					
03050102060020	S Fk Catawba R East	1	2000	2000	
03050102070030	S Fk Catawba R West	0	0		
TOTAL		**14**	**44500**	**32400**	**12100**

Figure 2. Potential projects and feasibility tiers after field reconnaissance.

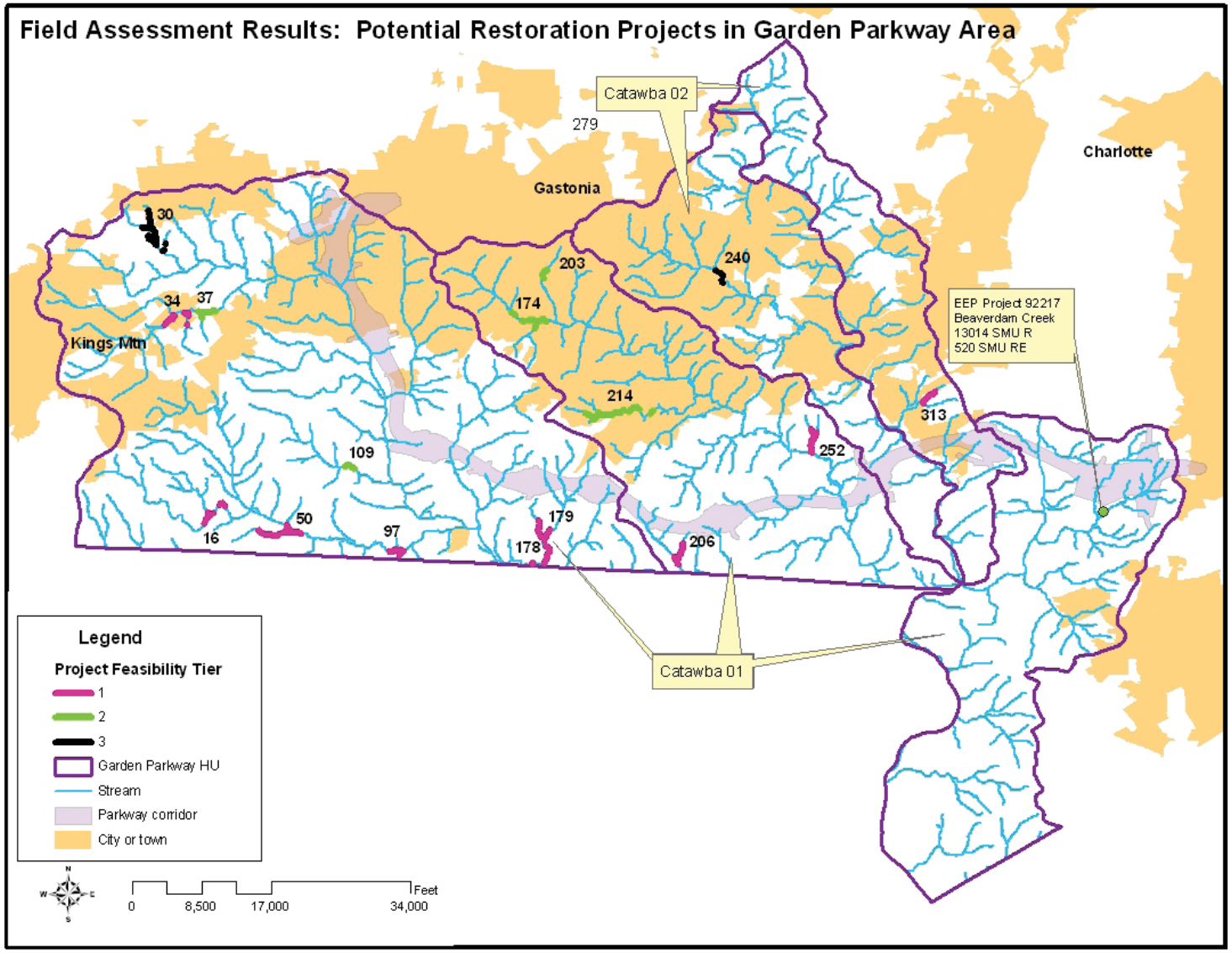

Table 4. Field determinations of project feasibility.

Project #	Est. length (ft)	Key landowner	Description	Constraints	Project Type*	Project Feasiblity**
16	5000	Kenneth & Evelyn Oates	Crop &/or pasture; could view only small portion of property. There, streams eroding & buffered on 1 side	Unknown	R & E?	1
34	1600	Pinnacle Resource Group, LLC	Could view only small portion of property. There, streams with cattle access & limited buffer	Unknown	R & E?	1
50	4000	Alfred Lee Stowe	Cattle access, no buffer, streams eroding. Possible wetland restoration potential	Some streams in narrow pasture; project would cause pasture loss	R & E	1
97	4000	George & Barbara Jackson	Could view only small portion of property. There, streams with horse access & limited buffer	Horse pasture area; project would cause pasture loss	R & E	1
178	4000	Joy Sparrow	Could view only small portion of property. Hayfield & inactive pasture. Stream not fenced out. Buffer on 1 side.		E	1
179	4800	James Thompson	Horse farm, couldn't see streams up close. Horses with stream access, high density use. Some limited woody buffer.		R & E	1
206	2000	David & Katherine Deas	Cattle pasture, with limited stream access. Buffered on 1 side. Stream reasonably stable.		E	1
252	5000	Jeffrey Stowe & Laura Henkel	Nursery & cattle use. Pond. No buffer, overgrazed pasture, livestock access.	Irrigation pond	R	1

*R = restoration; E = enhancement
**Tier 1 = good project possibility, Tier 2 = project has significant constraints, Tier 3 = project is not feasible

Table 4. Field determinations of project feasibility (cont).

Project #	Est. length (ft)	Key landowner	Description	Constraints	Project Type*	Project Feasiblity**
313	2000	Pearl Hand	Good buffer on left bank, selectively logged on right bank. Stream is incised. Stream has been flagged/surveyed.	Possibly current restoration project	R & E	1
37	3000	Lewis & Juanita Young	Crowders Mtn Golf Course; green & rough to stream edge; large stream, active erosion; much privet	Play areas at stream edge, multiple stream crossings	E	2
109	2100	Earl Dwayne Goodson	Could view only small portion of property. There, streams with horse access. Stream with no buffer, eroding.	Intensive horse use, various small structures on bank.	R & E	2
174	3000	City of Gastonia Golf Course	Green at stream edge. No woody vegetation, massive bank failure. Entire property is highly maintained	Play areas at stream edge, multiple stream crossings	E	2
203	1500	City of Gastonia	Lineberger Park. High intensity maintenance. Channel restoration in place (cross vanes, floodplain bench). Buffer needed.	Paved paths & play equipment in 50' buffer	E	2
214	2500	City of Gastonia Country Club	Stream with several in-line ponds & then against property line with multi landowners. Play areas at stream edge	In-line ponds, play areas at stream edge, multiple crossings	R & E	2
30	3000	FMC Corporation	FMC Lithium plant, manufactures buyllithium. Would likely necessitate a Phase 1 enviro assessment	Chemical plant, pond at downstream end		3
240	1800	City of Gastonia	Sewerline easement on right bank, left bank forested with much privet	Sewerline easement		3

*R = restoration; E = enhancement
**Tier 1 = good project possibility, Tier 2 = project has significant constraints, Tier 3 = project is not feasible

APPENDIX C

Project Atlas for Potential On-Site, Adjacent, and Nearby Mitigation Opportunities