



STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION

ROY COOPER
GOVERNOR

JAMES H. TROGDON, III
SECRETARY

March 8, 2017

U.S. Army Corps of Engineers
Raleigh Regulatory Field Office
3331 Heritage Trade Drive, Suite 105
Wake Forest, NC 27587

ATTN: Mr. Eric Alsmeyer
NCDOT Regulatory Coordinator

Subject: **Application for Section 404 Nationwide Permit 18, Section 401 Water Quality Certification and Neuse River Riparian Buffer Authorization** to repair and enhance the stormwater discharge to an unnamed tributary to Lake Johnson, Wake County, North Carolina; TIP No. I-5338; Federal Aid Project No. IMS-040-4(147)298. Debit \$270 from WBS 46157.1.1

Dear Sir:

The North Carolina Department of Transportation (NCDOT) proposes to extend the existing 42-inch stormwater pipe near Jones Franklin Road approximately 930-feet downslope to correct an erosive condition to a jurisdictional stream. It is anticipated that work at this site will be completed with the current I-5338 project which is currently under construction.

Due to stormwater input to a UT to Lake Johnson, severe erosion has occurred that is undermining the adjacent fill slope to I-40/US64 and residential townhomes. To correct this issue, NCDOT proposes to remove the stormwater contribution to the minor tributary to Lake Johnson and route that flow back into the stream in an area of flatter topography in a controlled manner. Please see enclosed copies of the Pre-Construction Notification (PCN), buffer re-vegetation plan, Marks Creek Mitigation Site Debit Ledger, stream assessment forms, stormwater management plan, buffer drawings, and permit drawings.

Permanent fill will be placed in 302 linear feet (277 intermittent, 25 perennial) of the jurisdictional portion of the remnant channel. The impact to the perennial section is due to a rip rap pad in the channel at the outlet of the stormwater pipe. Fill below the ordinary highwater mark (OHM) is considered to be no greater than approximately 17 cubic yards. A grass-lined ditch with open throat catch basins will be installed in its place to handle drainage down the slope from the townhome community and adjacent fill slope. It is believed that the groundwater contribution to this stream will not be impaired by the fill in the channel. Vegetative buffers disturbed by the pipe installation will be replanted.

Compensatory Mitigation

NCDOT proposes 1:1 mitigation for the 25 linear feet of permanent impact to the perennial section of the stream. Mitigation for unavoidable impacts to the unnamed tributary (UT) to Lake Johnson will be provided by the North Carolina Division of Mitigation Services (NCDMS). Proposed riparian buffer impacts for the UT to Lake Johnson total 34,612 square feet in zone 1 and 22,900 square feet in zone 2.

Mailing Address:
NC DEPARTMENT OF TRANSPORTATION
NATURAL ENVIRONMENT SECTION
1598 MAIL SERVICE CENTER
RALEIGH NC 27699-1598

Telephone: (919) 707-6000
Fax: (919) 212-5785
Customer Service: 1-877-368-4968
Website: www.ncdot.gov

Location:
1020 BIRCH RIDGE DRIVE
RALEIGH NC 27610

Impacts to the buffers are considered necessary to protect an existing structure and are deemed allowable. The unavoidable impacts to 25 linear feet of stream will be mitigated by the debiting of the Marks Creek Mitigation Site (ONEID 092-011).

Regulatory Approvals

Section 404 Permit: We anticipate that the work described above will be authorized under a Section 404 Nationwide Permit (NWP) No. 18.

Section 401 Permit: We anticipate 401 Water Quality Certification number 3890 will apply to this project. It is also anticipated that a Neuse River Riparian Buffer Authorization will be issued for this project. NCDOT is requesting written concurrence from the North Carolina Department of Environmental Quality, Division of Water Resources.

A copy of this permit application and its distribution list will be posted at the NCDOT website at <https://connect.ncdot.gov/resources/Environmental/>. Should you have any questions regarding this information, please contact Jason Dilday at (919)707-6111 or jldilday@ncdot.gov.

Sincerely,



Res

Philip S. Harris III, P.E., C.P.M.
Natural Environment Section Head

cc: NCDOT Permit Application Standard Distribution List



Office Use Only:
 Corps action ID no. _____
 DWQ project no. _____
 Form Version 1.3 Dec 10 2008

Pre-Construction Notification (PCN) Form

A. Applicant Information

1. Processing

1a. Type(s) of approval sought from the Corps:	<input checked="" type="checkbox"/> Section 404 Permit	<input type="checkbox"/> Section 10 Permit
1b. Specify Nationwide Permit (NWP) number: 18 or General Permit (GP) number:		
1c. Has the NWP or GP number been verified by the Corps?	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No
1d. Type(s) of approval sought from the DWQ (check all that apply):		
<input checked="" type="checkbox"/> 401 Water Quality Certification – Regular <input type="checkbox"/> Non-404 Jurisdictional General Permit <input type="checkbox"/> 401 Water Quality Certification – Express <input type="checkbox"/> Riparian Buffer Authorization		
1e. Is this notification solely for the record because written approval is not required?	For the record only for DWQ 401 Certification: <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	For the record only for Corps Permit: <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
1f. Is payment into a mitigation bank or in-lieu fee program proposed for mitigation of impacts? If so, attach the acceptance letter from mitigation bank or in-lieu fee program.	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No
1g. Is the project located in any of NC's twenty coastal counties. If yes, answer 1h below.	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No
1h. Is the project located within a NC DCM Area of Environmental Concern (AEC)?	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No

2. Project Information

2a. Name of project:	Repair and stabilization of stormwater facility of unnamed tributary to Lake Johnson
2b. County:	Wake
2c. Nearest municipality / town:	Raleigh
2d. Subdivision name:	<i>not applicable</i>
2e. NCDOT only, T.I.P. or state project no.:	I-5338

3. Owner Information

3a. Name(s) on Recorded Deed:	North Carolina Department of Transportation
3b. Deed Book and Page No.	<i>not applicable</i>
3c. Responsible Party (for LLC if applicable):	<i>not applicable</i>
3d. Street address:	1598 Mail Service Center
3e. City, state, zip:	Raleigh, NC 27699-1598
3f. Telephone no.:	(919) 707-6111
3g. Fax no.:	(919) 212-5785
3h. Email address:	jldilday@ncdot.gov

4. Applicant Information (if different from owner)	
4a. Applicant is:	<input type="checkbox"/> Agent <input type="checkbox"/> Other, specify:
4b. Name:	<i>not applicable</i>
4c. Business name (if applicable):	
4d. Street address:	
4e. City, state, zip:	
4f. Telephone no.:	
4g. Fax no.:	
4h. Email address:	
5. Agent/Consultant Information (if applicable)	
5a. Name:	<i>not applicable</i>
5b. Business name (if applicable):	
5c. Street address:	
5d. City, state, zip:	
5e. Telephone no.:	
5f. Fax no.:	
5g. Email address:	

B. Project Information and Prior Project History	
1. Property Identification	
1a. Property identification no. (tax PIN or parcel ID):	<i>not applicable</i>
1b. Site coordinates (in decimal degrees):	Latitude: 35.758141 (DD.DDDDDD) Longitude: -78.726766 (-DD.DDDDDD)
1c. Property size:	5.8 acres
2. Surface Waters	
2a. Name of nearest body of water (stream, river, etc.) to proposed project:	Walnut Creek (Lake Johnson)
2b. Water Quality Classification of nearest receiving water:	B; NSW
2c. River basin:	Neuse
3. Project Description	
3a. Describe the existing conditions on the site and the general land use in the vicinity of the project at the time of this application: The land use is predominately urban, with mixed residential and commercial properties.	
3b. List the total estimated acreage of all existing wetlands on the property: 0	
3c. List the total estimated linear feet of all existing streams (intermittent and perennial) on the property: 25 feet perennial; 277 intermittent	
3d. Explain the purpose of the proposed project: To correct the erosive forces of the stormwater discharge that is undermining the adjacent fill slope and townhomes.	
3e. Describe the overall project in detail, including the type of equipment to be used: The project involves filling the existing channel and extending the existing stormwater system down gradient to exit in a more stable area. Standard road building equipment, such as trucks, dozers, and cranes may be used.	
4. Jurisdictional Determinations	
4a. Have jurisdictional wetland or stream determinations by the Corps or State been requested or obtained for this property / project (including all prior phases) in the past? Comments: Area was a part of I-5338 JD.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unknown
4b. If the Corps made the jurisdictional determination, what type of determination was made?	<input type="checkbox"/> Preliminary <input checked="" type="checkbox"/> Final
4c. If yes, who delineated the jurisdictional areas? Name (if known): Eric Alsmeyer	Agency/Consultant Company: Other: RK&K Elizabeth Workman-Maurer
4d. If yes, list the dates of the Corps jurisdictional determinations or State determinations and attach documentation. SAW-2013-00068 issued 4/1/2013	
5. Project History	
5a. Have permits or certifications been requested or obtained for this project (including all prior phases) in the past?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unknown
5b. If yes, explain in detail according to "help file" instructions. A NW14 was issued for I-5338 adjacent to this area and a part of its original study area.	
6. Future Project Plans	
6a. Is this a phased project?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
6b. If yes, explain.	

C. Proposed Impacts Inventory						
1. Impacts Summary						
1a. Which sections were completed below for your project (check all that apply):						
<input type="checkbox"/> Wetlands		<input checked="" type="checkbox"/> Streams - tributaries		<input checked="" type="checkbox"/> Buffers		
<input type="checkbox"/> Open Waters		<input type="checkbox"/> Pond Construction				
2. Wetland Impacts						
If there are wetland impacts proposed on the site, then complete this question for each wetland area impacted.						
2a. Wetland impact number – Permanent (P) or Temporary (T)	2b. Type of impact	2c. Type of wetland (if known)	2d. Forested	2e. Type of jurisdiction (Corps - 404, 10 DWQ – non-404, other)	2f. Area of impact (acres)	
Site 1 <input type="checkbox"/> P <input type="checkbox"/> T			<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Corps <input type="checkbox"/> DWQ		
Site 1 <input type="checkbox"/> P <input type="checkbox"/> T			<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Corps <input type="checkbox"/> DWQ		
Site 3 <input type="checkbox"/> P <input type="checkbox"/> T			<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Corps <input type="checkbox"/> DWQ		
Site 4 <input type="checkbox"/> P <input type="checkbox"/> T			<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Corps <input type="checkbox"/> DWQ		
Site <input type="checkbox"/> P <input type="checkbox"/> T			<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Corps <input type="checkbox"/> DWQ		
Site <input type="checkbox"/> P <input type="checkbox"/> T			<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Corps <input type="checkbox"/> DWQ		
2g. Total wetland impacts						
2h. Comments:						
3. Stream Impacts						
If there are perennial or intermittent stream impacts (including temporary impacts) proposed on the site, then complete this question for all stream sites impacted.						
3a. Stream impact number - Permanent (P) or Temporary (T)	3b. Type of impact	3c. Stream name	3d. Perennial (PER) or intermittent (INT)?	3e. Type of jurisdiction (Corps - 404, 10 DWQ – non-404, other)	3f. Average stream width (feet)	3g. Impact length (linear feet)
Site 1 <input checked="" type="checkbox"/> P <input type="checkbox"/> T	Fill in channel	UT to Lake Johnson	<input type="checkbox"/> PER <input checked="" type="checkbox"/> INT	<input checked="" type="checkbox"/> Corps <input type="checkbox"/> DWQ	2	277
Site 1 <input type="checkbox"/> P <input checked="" type="checkbox"/> T	Fill in channel	UT to Lake Johnson	<input type="checkbox"/> PER <input checked="" type="checkbox"/> INT	<input checked="" type="checkbox"/> Corps <input type="checkbox"/> DWQ	2	10 ft (<0.01 ac)
Site 1 <input checked="" type="checkbox"/> P <input type="checkbox"/> T	Bank Stabilization	UT to Lake Johnson	<input checked="" type="checkbox"/> PER <input type="checkbox"/> INT	<input checked="" type="checkbox"/> Corps <input type="checkbox"/> DWQ	2	25
Site 4 <input type="checkbox"/> P <input checked="" type="checkbox"/> T	Bank Stabilization	UT to Lake Johnson	<input checked="" type="checkbox"/> PER <input type="checkbox"/> INT	<input checked="" type="checkbox"/> Corps <input type="checkbox"/> DWQ	2	20 (<0.01 ac)
Site 5 <input type="checkbox"/> P <input type="checkbox"/> T			<input type="checkbox"/> PER <input type="checkbox"/> INT	<input type="checkbox"/> Corps <input type="checkbox"/> DWQ		
Site 6 <input type="checkbox"/> P <input type="checkbox"/> T			<input type="checkbox"/> PER <input type="checkbox"/> INT	<input type="checkbox"/> Corps <input type="checkbox"/> DWQ		
3h. Total stream and tributary impacts						302 ft Perm <0.01 ac Temp
3i. Comments: Channel fill results in 17 cubic yards below the ordinary high water mark. Impacts to jurisdictional stream						

includes 25 lf perennial and 277 lf intermittent stream.

4. Open Water Impacts

If there are proposed impacts to lakes, ponds, estuaries, tributaries, sounds, the Atlantic Ocean, or any other open water of the U.S. then individually list all open water impacts below.

4a. Open water impact number – Permanent (P) or Temporary (T)	4b. Name of waterbody (if applicable)	4c. Type of impact	4d. Waterbody type	4e. Area of impact (acres)
O2 <input type="checkbox"/> P <input type="checkbox"/> T				
O2 <input type="checkbox"/> P <input type="checkbox"/> T				
O3 <input type="checkbox"/> P <input type="checkbox"/> T				
O4 <input type="checkbox"/> P <input type="checkbox"/> T				
4f. Total open water impacts				

4g. Comments:

5. Pond or Lake Construction

If pond or lake construction proposed, then complete the chart below.

5a. Pond ID number	5b. Proposed use or purpose of pond	5c. Wetland Impacts (acres)			5d. Stream Impacts (feet)			5e. Upland (acres)
		Flooded	Filled	Excavated	Flooded	Filled	Excavated	Flooded
P1								
P2								
5f. Total								

5g. Comments:

5h. Is a dam high hazard permit required?

Yes

No

If yes, permit ID no:

5i. Expected pond surface area (acres):

5j. Size of pond watershed (acres):

5k. Method of construction:

6. Buffer Impacts (for DWQ)

If project will impact a protected riparian buffer, then complete the chart below. If yes, then individually list all buffer impacts below. If any impacts require mitigation, then you **MUST** fill out Section D of this form.

6a. Project is in which protected basin?			<input checked="" type="checkbox"/> Neuse <input type="checkbox"/> Catawba	<input type="checkbox"/> Tar-Pamlico <input type="checkbox"/> Randleman	<input type="checkbox"/> Other: Jordan
6b. Buffer impact number – Permanent (P) or Temporary (T)	6c. Reason for impact	6d. Stream name	6e. Buffer mitigation required?	6f. Zone 1 impact (square feet)	6g. Zone 2 impact (square feet)
B1 <input checked="" type="checkbox"/> P <input type="checkbox"/> T	Protection of existing structure	UT to Lake Johnson	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	34,612	22,900
B1 <input type="checkbox"/> P <input type="checkbox"/> T			<input type="checkbox"/> Yes <input type="checkbox"/> No		
B3 <input type="checkbox"/> P <input type="checkbox"/> T			<input type="checkbox"/> Yes <input type="checkbox"/> No		
6h. Total buffer impacts				34,612	22,900
6i. Comments: A revegetation plan is attached to restore the buffer after construction is complete.					

D. Impact Justification and Mitigation

1. Avoidance and Minimization

1a. Specifically describe measures taken to avoid or minimize the proposed impacts in designing project.
The proposed project results in less than 25 cubic yards of fill within the ordinary high water of the stream. Work is being done to reduce excessive erosion by the current channel, which will result in a more stable stream. See Stormwater Management Plan for more measures.

1b. Specifically describe measures taken to avoid or minimize the proposed impacts through construction techniques.
NCDOT Design Standards for Sensitive Watersheds will be used.

2. Compensatory Mitigation for Impacts to Waters of the U.S. or Waters of the State

2a. Does the project require Compensatory Mitigation for impacts to Waters of the U.S. or Waters of the State?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No If no, explain
2b. If yes, mitigation is required by (check all that apply):	<input type="checkbox"/> DWQ <input checked="" type="checkbox"/> Corps
2c. If yes, which mitigation option will be used for this project?	<input type="checkbox"/> Mitigation bank <input type="checkbox"/> Payment to in-lieu fee program <input checked="" type="checkbox"/> Permittee Responsible Mitigation

3. Complete if Using a Mitigation Bank

3a. Name of Mitigation Bank: not applicable

3b. Credits Purchased (attach receipt and letter)	Type	Quantity
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3c. Comments:

4. Complete if Making a Payment to In-lieu Fee Program

4a. Approval letter from in-lieu fee program is attached.	<input type="checkbox"/> Yes
4b. Stream mitigation requested:	linear feet
4c. If using stream mitigation, stream temperature:	<input type="checkbox"/> warm <input type="checkbox"/> cool <input type="checkbox"/> cold
4d. Buffer mitigation requested (DWQ only):	square feet
4e. Riparian wetland mitigation requested:	acres
4f. Non-riparian wetland mitigation requested:	acres
4g. Coastal (tidal) wetland mitigation requested:	acres

4h. Comments:

5. Complete if Using a Permittee Responsible Mitigation Plan

5a. If using a permittee responsible mitigation plan, provide a description of the proposed mitigation plan.
See attached Marks Creek Mitigation Site (ONEID 092-011) debit summary for 25 linear feet of stream impact.

6. Buffer Mitigation (State Regulated Riparian Buffer Rules) – required by DWQ

6a. Will the project result in an impact within a protected riparian buffer that requires buffer mitigation?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
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6b. If yes, then identify the square feet of impact to each zone of the riparian buffer that requires mitigation. Calculate the amount of mitigation required.

Zone	6c. Reason for impact	6d. Total impact (square feet)	Multiplier	6e. Required mitigation (square feet)
Zone 1			3 (2 for Catawba)	
Zone 2			1.5	
6f. Total buffer mitigation required:				

6g. If buffer mitigation is required, discuss what type of mitigation is proposed (e.g., payment to private mitigation bank, permittee responsible riparian buffer restoration, payment into an approved in-lieu fee fund).

6h. Comments:

E. Stormwater Management and Diffuse Flow Plan (required by DWQ)	
1. Diffuse Flow Plan	
1a. Does the project include or is it adjacent to protected riparian buffers identified within one of the NC Riparian Buffer Protection Rules?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
1b. If yes, then is a diffuse flow plan included? If no, explain why. Comments: See attached permit drawings.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
2. Stormwater Management Plan	
2a. What is the overall percent imperviousness of this project?	N/A
2b. Does this project require a Stormwater Management Plan?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
2c. If this project DOES NOT require a Stormwater Management Plan, explain why:	
2d. If this project DOES require a Stormwater Management Plan, then provide a brief, narrative description of the plan: See attached permit drawings.	
2e. Who will be responsible for the review of the Stormwater Management Plan?	<input type="checkbox"/> Certified Local Government <input type="checkbox"/> DWQ Stormwater Program <input checked="" type="checkbox"/> DWQ 401 Unit
3. Certified Local Government Stormwater Review	
3a. In which local government's jurisdiction is this project?	N/A
3b. Which of the following locally-implemented stormwater management programs apply (check all that apply):	<input type="checkbox"/> Phase II <input type="checkbox"/> NSW <input type="checkbox"/> USMP <input type="checkbox"/> Water Supply Watershed <input type="checkbox"/> Other:
3c. Has the approved Stormwater Management Plan with proof of approval been attached?	<input type="checkbox"/> Yes <input type="checkbox"/> No
4. DWQ Stormwater Program Review	
4a. Which of the following state-implemented stormwater management programs apply (check all that apply):	<input type="checkbox"/> Coastal counties <input type="checkbox"/> HQW <input type="checkbox"/> ORW <input type="checkbox"/> Session Law 2006-246 <input type="checkbox"/> Other:
4b. Has the approved Stormwater Management Plan with proof of approval been attached?	<input type="checkbox"/> Yes <input type="checkbox"/> No N/A
5. DWQ 401 Unit Stormwater Review	
5a. Does the Stormwater Management Plan meet the appropriate requirements?	<input type="checkbox"/> Yes <input type="checkbox"/> No N/A
5b. Have all of the 401 Unit submittal requirements been met?	<input type="checkbox"/> Yes <input type="checkbox"/> No N/A

F. Supplementary Information	
1. Environmental Documentation (DWQ Requirement)	
1a. Does the project involve an expenditure of public (federal/state/local) funds or the use of public (federal/state) land?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
1b. If you answered "yes" to the above, does the project require preparation of an environmental document pursuant to the requirements of the National or State (North Carolina) Environmental Policy Act (NEPA/SEPA)?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
1c. If you answered "yes" to the above, has the document review been finalized by the State Clearing House? (If so, attach a copy of the NEPA or SEPA final approval letter.) Comments:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
2. Violations (DWQ Requirement)	
2a. Is the site in violation of DWQ Wetland Rules (15A NCAC 2H .0500), Isolated Wetland Rules (15A NCAC 2H .1300), DWQ Surface Water or Wetland Standards, or Riparian Buffer Rules (15A NCAC 2B .0200)?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
2b. Is this an after-the-fact permit application?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
2c. If you answered "yes" to one or both of the above questions, provide an explanation of the violation(s):	
3. Cumulative Impacts (DWQ Requirement)	
3a. Will this project (based on past and reasonably anticipated future impacts) result in additional development, which could impact nearby downstream water quality?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
3b. If you answered "yes" to the above, submit a qualitative or quantitative cumulative impact analysis in accordance with the most recent DWQ policy. If you answered "no," provide a short narrative description. This project is to repair/correct an erosive feature and will neither influence nearby land uses nor stimulate growth. Therefore, a detailed indirect or cumulative effects study will not be necessary.	
4. Sewage Disposal (DWQ Requirement)	
4a. Clearly detail the ultimate treatment methods and disposition (non-discharge or discharge) of wastewater generated from the proposed project, or available capacity of the subject facility. not applicable	

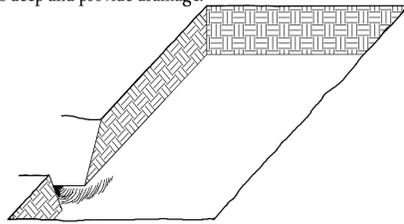
5. Endangered Species and Designated Critical Habitat (Corps Requirement)		
5a. Will this project occur in or near an area with federally protected species or habitat?	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No
5b. Have you checked with the USFWS concerning Endangered Species Act impacts?	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No
5c. If yes, indicate the USFWS Field Office you have contacted.	<input checked="" type="checkbox"/> Raleigh <input type="checkbox"/> Asheville	
5d. What data sources did you use to determine whether your site would impact Endangered Species or Designated Critical Habitat? N.C. Natural Heritage Program database; USFWS-Raleigh Field Office website; biological surveys for protected species listed for Wake County. No habitat exists for the listed species. NCDOT will adhere to conditions of the programmatic biological opinion for the northern long-eared bat for this project.		
6. Essential Fish Habitat (Corps Requirement)		
6a. Will this project occur in or near an area designated as essential fish habitat?	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No
6b. What data sources did you use to determine whether your site would impact Essential Fish Habitat? NMFS County Index		
7. Historic or Prehistoric Cultural Resources (Corps Requirement)		
7a. Will this project occur in or near an area that the state, federal or tribal governments have designated as having historic or cultural preservation status (e.g., National Historic Trust designation or properties significant in North Carolina history and archaeology)?	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No
7b. What data sources did you use to determine whether your site would impact historic or archeological resources? NEPA Documentation		
8. Flood Zone Designation (Corps Requirement)		
8a. Will this project occur in a FEMA-designated 100-year floodplain?	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No
8b. If yes, explain how project meets FEMA requirements: NCDOT Hydraulics Unit coordination with FEMA		
8c. What source(s) did you use to make the floodplain determination? FEMA Maps		
For Philip S. Harris III, P.E., C.P.M. Applicant/Agent's Printed Name	 Applicant/Agent's Signature (Agent's signature is valid only if an authorization letter from the applicant is provided.)	03-08-2017 Date

PLANTING DETAILS

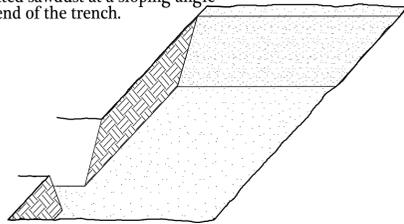
SEEDLING / LINER BAREROOT PLANTING DETAIL

HEALING IN

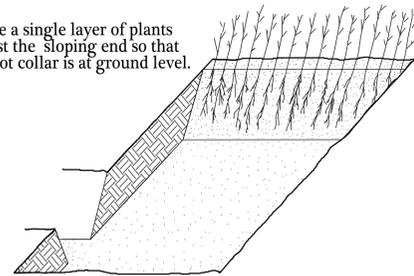
1. Locate a healing-in site in a shady, well protected area.
2. Excavate a flat bottom trench 12 inches deep and provide drainage.



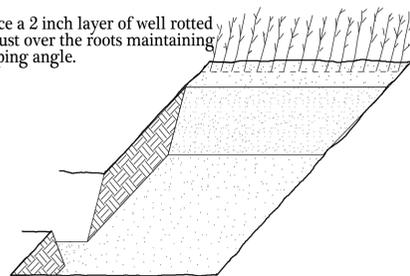
3. Backfill the trench with 2 inches well rotted sawdust. Place a 2 inch layer of well rotted sawdust at a sloping angle at one end of the trench.



4. Place a single layer of plants against the sloping end so that the root collar is at ground level.

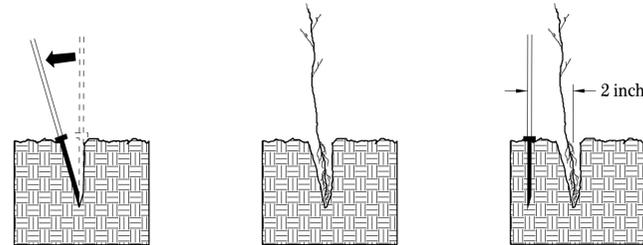


5. Place a 2 inch layer of well rotted sawdust over the roots maintaining a sloping angle.

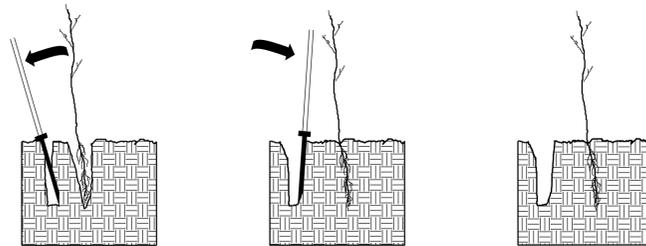


6. Repeat layers of plants and sawdust as necessary and water thoroughly.

DIBBLE PLANTING METHOD USING THE KBC PLANTING BAR



1. Insert planting bar as shown and pull handle toward planter.
2. Remove planting bar and place seedling at correct depth.
3. Insert planting bar 2 inches toward planter from seedling.



4. Pull handle of bar toward planter, firming soil at bottom.
5. Push handle forward firming soil at top.
6. Leave compaction hole open. Water thoroughly.

PLANTING NOTES:

PLANTING BAG
During planting, seedlings shall be kept in a moist canvas bag or similar container to prevent the root systems from drying.



KBC PLANTING BAR
Planting bar shall have a blade with a triangular cross section, and shall be 12 inches long, 4 inches wide and 1 inch thick at center.



ROOT PRUNING
All seedlings shall be root pruned, if necessary, so that no roots extend more than 10 inches below the root collar.

REFORESTATION

- TREE REFORESTATION SHALL BE PLANTED 6 FT. TO 10 FT. ON CENTER, RANDOM SPACING, AVERAGING 8 FT. ON CENTER, APPROXIMATELY 680 PLANTS PER ACRE.

REFORESTATION

MIXTURE, TYPE, SIZE, AND FURNISH SHALL CONFORM TO THE FOLLOWING:

25% PLATANUS OCCIDENTALIS	AMERICAN SYCAMORE	12 in - 18 in BR
25% LIRIODENDRON TULIPIFERA	YELLOW POPLAR	12 in - 18 in BR
25% SALIX NIGRA	BLACK WILLOW	12 in - 18 in BR
25% BETULA NIGRA	RIVER BIRCH	12 in - 18 in BR

Marks Creek Mitigation Site
ONEID 092-011

The Marks Creek Mitigation Site is located in Wake County within the USGS hydrologic unit 03020201 of the Neuse River. NCDOT acquired the 66 acre site to mitigate for unavoidable, jurisdictional impacts associated with TIP R-2547. Monitoring requirements were performed from 2004 to 2008 and the site was closed out in 2009. Table 1 shows the final mitigation quantities approved for the site. The site has been placed on the NCDOT On-site Debit Ledger for use within HUC 03020201. Tables 2-5 indicate all mitigation debits that have occurred per regulatory agency approval.

To offset unavoidable stream impacts associated with T.I.P. I-5338, the Marks Creek Mitigation Site will be debited 25 linear feet of stream restoration at a 1:1 ratio. This debit is reflected in the debit ledger below.

Table 1. Mitigation Quantities Approved

HUC	Mitigation Type	Starting Amount	Additional Notes
3020201	Stream Preservation	3247 (Ln.Ft.)	
3020201	Riparian Wetland Restoration	3.33 (Ac.)	No debits as of 8/18/14
3020201	Riparian Wetland Preservation	11 (Ac.)	No Debit as of 8/18/2014
3020201	Riparian Wetland Enhancement	13 (Ac)	
3020201	Buffer Restoration	324700 (Sq.Ft.)	

Table 2. Mitigation Debts – Stream Restoration

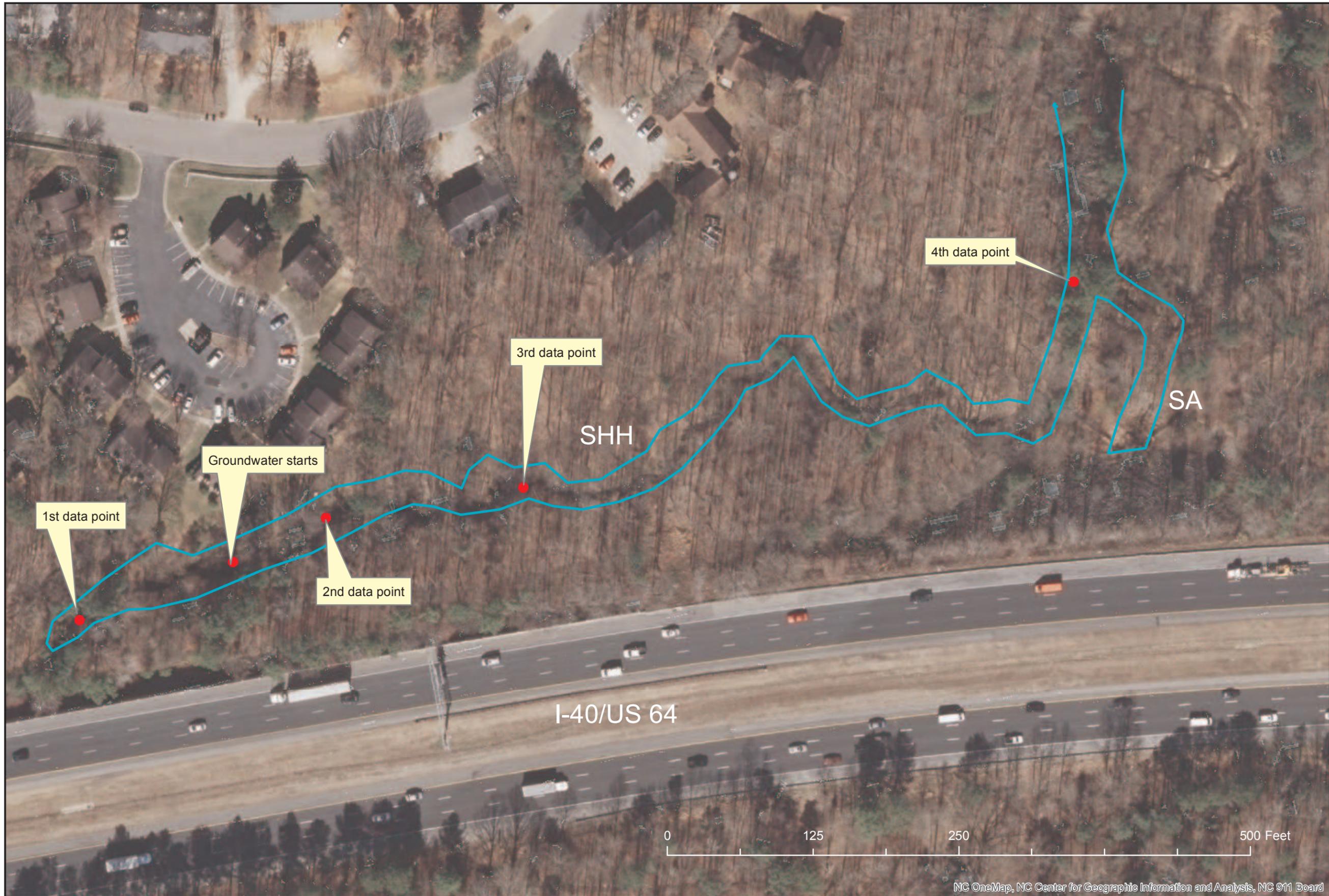
Mitigation Type	Debit Amount (Ln.Ft.)	Status	Site TIP	Action ID#	NOTES
Stream Restoration	2873	Close Out	R-2814A&B	2008-01316	Mod
Stream Restoration	80	Close Out	I-5338 (Areas 1, 2A, and 2b)		Impacts were 40 lin. Ft. @ 2:1 ratio
Stream Restoration	25	Closeout	I-5338		1:1 ratio

Table 3. Mitigation Debts – Riparian Wetland Enhancement

Mitigation Type	Debit Amount (Ac)	Status	Site TIP	Action ID#	NOTES
Riparian Wetland Enhancement	10.9	Close Out	R-2000F&G	199920387	
Riparian Wetland Enhancement	0.98	Close Out	R-3825A	201101695	.49 @2:1
Riparian Wetland Enhancement	.14	Close Out	B-5113		

Table 4. Mitigation Debits – Buffer Restoration

Mitigation Type	Debit Amount (Sq.Ft.)	Status	Site TIP	Action ID#	NOTES
Buffer Restoration	114659	Close Out	U-3804	200421647	
Buffer Restoration	114	Close Out	R-2814-B Mod	2008-01316	
Buffer Restoration	75581	Close Out	B-3528	2008-00153	
Buffer Restoration	1655	Close Out	B-4944	2009-00207	
Buffer Restoration	4242	Close Out	B-5113		
Buffer Restoration	34683	Close Out	I-5338 (Areas 1, 2A, and 2b)		6,915 sq ft of impacts for zone 1 and 9292 sq ft of zone 2 totaling 34,683 sq ft with 3:1 ratio for zone 1 and 1.5:1 for zone 2
Buffer Restoration	12,914	Close Out	B-4659		NCDOT was required to use a 3:1 ratio for zone 1 and a 1.5:1 ratio for zone 2.
Buffer Restoration	4,947	Close Out	B-5121		NCDOT was required to use a 3:1 ratio for zone 1 and a 1.5:1 ratio for zone 2.



NORTH CAROLINA DEPARTMENT
OF TRANSPORTATION
DIVISION OF HIGHWAYS
PROJECT DEVELOPMENT AND
ENVIRONMENTAL ANALYSIS BRANCH

STREAM SHH

WAKE COUNTY
TIP PROJECT I-5338



Div: 5	TIP# I-5338
--------	-------------

Date: September 2016

Figure 1

Point #1

NC DWQ Stream Identification Form Version 4.11

Date: 8/31/16	Project/Site: I-5338	Latitude:
Evaluator: J. Dilday, D. Riffe	County: Wake	Longitude:
Total Points: Stream is at least intermittent if ≥ 19 or perennial if $\geq 30^*$ 19	Stream Determination (circle one) Ephemeral Intermittent Perennial	Other e.g. Quad Name:

A. Geomorphology (Subtotal = 12.5)

	Absent	Weak	Moderate	Strong
1 ^a . Continuity of channel bed and bank	0	1	2	3
2. Sinuosity of channel along thalweg	0	1	2	3
3. In-channel structure: ex. riffle-pool, step-pool, ripple-pool sequence	0	1	2	3
4. Particle size of stream substrate	0	1	2	3
5. Active/relict floodplain	0	1	2	3
6. Depositional bars or benches	0	1	2	3
7. Recent alluvial deposits	0	1	2	3
8. Headcuts	0	1	2	3
9. Grade control	0	0.5	1	1.5
10. Natural valley	0	0.5	1	1.5
11. Second or greater order channel	No = 0		Yes = 3	

^a artificial ditches are not rated; see discussions in manual

B. Hydrology (Subtotal = 2.5)

12. Presence of Baseflow	0	1	2	3
13. Iron oxidizing bacteria	0	1	2	3
14. Leaf litter	1.5	1	0.5	0
15. Sediment on plants or debris	0	0.5	1	1.5
16. Organic debris lines or piles	0	0.5	1	1.5
17. Soil-based evidence of high water table?	No = 0		Yes = 3	

C. Biology (Subtotal = 4)

18. Fibrous roots in streambed	3	2	1	0
19. Rooted upland plants in streambed	3	2	1	0
20. Macroinvertebrates (note diversity and abundance)	0	1	2	3
21. Aquatic Mollusks	0	1	2	3
22. Fish	0	0.5	1	1.5
23. Crayfish	0	0.5	1	1.5
24. Amphibians	0	0.5	1	1.5
25. Algae	0	0.5	1	1.5
26. Wetland plants in streambed	FACW = 0.75; OBL = 1.5 Other = 0			

*perennial streams may also be identified using other methods. See p. 35 of manual.

Notes:

Sketch:

1180' of stream from pipe to first sign of ground water

BPT - Ephemeral - stormwater driven



STREAM QUALITY ASSESSMENT WORKSHEET



Provide the following information for the stream reach under assessment:

1. Applicant's name: NCDOT 2. Evaluator's name: J. Dillard
 3. Date of evaluation: 8/31/16 4. Time of evaluation: 10:00 am
 5. Name of stream: UT to Lake Johnson 6. River basin: Neuse
 7. Approximate drainage area: ~12 ac. 8. Stream order: 1st
 9. Length of reach evaluated: 180 ft. 10. County: Wake
 11. Site coordinates (if known): prefer in decimal degrees. 12. Subdivision name (if any): Westridge TH
 Latitude (ex. 34.872312): 35.758280 Longitude (ex. -77.556611): -78.727389
 Method location determined (circle): GPS Topo Sheet Ortho (Aerial) Photo/GIS Other GIS Other
 13. Location of reach under evaluation (note nearby roads and landmarks and attach map identifying stream(s) location):
Adjacent to I-40/US-64 W near Jones Franklin Road
 14. Proposed channel work (if any): installation of 48" pipe to control erosion at site
 15. Recent weather conditions: no significant rainfall in recent past.
 16. Site conditions at time of visit: sunny, approx. 90°
 17. Identify any special waterway classifications known: Section 10 Tidal Waters Essential Fisheries Habitat
 Trout Waters Outstanding Resource Waters Nutrient Sensitive Waters Water Supply Watershed (I-IV)
 18. Is there a pond or lake located upstream of the evaluation point? YES NO If yes, estimate the water surface area: _____
 19. Does channel appear on USGS quad map? YES NO 20. Does channel appear on USDA Soil Survey? YES NO
 21. Estimated watershed land use: 50% Residential 20% Commercial _____% Industrial _____% Agricultural
30% Forested _____% Cleared / Logged _____% Other (_____)
 22. Bankfull width: 6-20 ft. 23. Bank height (from bed to top of bank): 3-12 ft.
 24. Channel slope down center of stream: _____ Flat (0 to 2%) _____ Gentle (2 to 4%) _____ Moderate (4 to 10%) Steep (>10%)
 25. Channel sinuosity: _____ Straight Occasional bends _____ Frequent meander _____ Very sinuous _____ Braided channel

Instructions for completion of worksheet (located on page 2): Begin by determining the most appropriate ecoregion based on location, terrain, vegetation, stream classification, etc. Every characteristic must be scored using the same ecoregion. Assign points to each characteristic within the range shown for the ecoregion. Page 3 provides a brief description of how to review the characteristics identified in the worksheet. Scores should reflect an overall assessment of the stream reach under evaluation. If a characteristic cannot be evaluated due to site or weather conditions, enter 0 in the scoring box and provide an explanation in the comment section. Where there are obvious changes in the character of a stream under review (e.g., the stream flows from a pasture into a forest), the stream may be divided into smaller reaches that display more continuity, and a separate form used to evaluate each reach. The total score assigned to a stream reach must range between 0 and 100, with a score of 100 representing a stream of the highest quality.

Total Score (from reverse): 29Comments: 2" pipe to 1st sign of
groundwater
includes large headcutEvaluator's Signature [Signature]Date 8/31/16

This channel evaluation form is intended to be used only as a guide to assist landowners and environmental professionals in gathering the data required by the United States Army Corps of Engineers to make a preliminary assessment of stream quality. The total score resulting from the completion of this form is subject to USACE approval and does not imply a particular mitigation ratio or requirement. Form subject to change - version 06/03. To Comment, please call 919-876-8441 x 26.

STREAM QUALITY ASSESSMENT WORKSHEET

	#	CHARACTERISTICS	ECOREGION POINT RANGE			SCORE
			Coastal	Piedmont	Mountain	
PHYSICAL	1	Presence of flow / persistent pools in stream (no flow or saturation = 0; strong flow = max points)	0-5	0-4	0-5	0
	2	Evidence of past human alteration (extensive alteration = 0; no alteration = max points)	0-6	0-5	0-5	1
	3	Riparian zone (no buffer = 0; contiguous, wide buffer = max points)	0-6	0-4	0-5	2
	4	Evidence of nutrient or chemical discharges (extensive discharges = 0; no discharges = max points)	0-5	0-4	0-4	2
	5	Groundwater discharge (no discharge = 0; springs, seeps, wetlands, etc. = max points)	0-3	0-4	0-4	0
	6	Presence of adjacent floodplain (no floodplain = 0; extensive floodplain = max points)	0-4	0-4	0-2	0
	7	Entrenchment / floodplain access (deeply entrenched = 0; frequent flooding = max points)	0-5	0-4	0-2	1
	8	Presence of adjacent wetlands (no wetlands = 0; large adjacent wetlands = max points)	0-6	0-4	0-2	0
	9	Channel sinuosity (extensive channelization = 0; natural meander = max points)	0-5	0-4	0-3	1
	10	Sediment input (extensive deposition = 0; little or no sediment = max points)	0-5	0-4	0-4	0
	11	Size & diversity of channel bed substrate (fine, homogenous = 0; large, diverse sizes = max points)	NA*	0-4	0-5	1
STABILITY	12	Evidence of channel incision or widening (deeply incised = 0; stable bed & banks = max points)	0-5	0-4	0-5	1
	13	Presence of major bank failures (severe erosion = 0; no erosion, stable banks = max points)	0-5	0-5	0-5	3
	14	Root depth and density on banks (no visible roots = 0; dense roots throughout = max points)	0-3	0-4	0-5	3
	15	Impact by agriculture, livestock, or timber production (substantial impact = 0; no evidence = max points)	0-5	0-4	0-5	4
HABITAT	16	Presence of riffle-pool/ripple-pool complexes (no riffles/ripples or pools = 0; well-developed = max points)	0-3	0-5	0-6	3
	17	Habitat complexity (little or no habitat = 0; frequent, varied habitats = max points)	0-6	0-6	0-6	1
	18	Canopy coverage over streambed (no shading vegetation = 0; continuous canopy = max points)	0-5	0-5	0-5	4
	19	Substrate embeddedness (deeply embedded = 0; loose structure = max)	NA*	0-4	0-4	2
BIOLOGY	20	Presence of stream invertebrates (see page 4) (no evidence = 0; common, numerous types = max points)	0-4	0-5	0-5	0
	21	Presence of amphibians (no evidence = 0; common, numerous types = max points)	0-4	0-4	0-4	0
	22	Presence of fish (no evidence = 0; common, numerous types = max points)	0-4	0-4	0-4	0
	23	Evidence of wildlife use (no evidence = 0; abundant evidence = max points)	0-6	0-5	0-5	0
Total Points Possible			100	100	100	
TOTAL SCORE (also enter on first page)						29

* These characteristics are not assessed in coastal streams.

NC DWQ Stream Identification Form Version 4.11

Date: 8/31/16	Project/Site: I-5338	Latitude:
Evaluator: J. D. Ilduy, D. Riffey	County: Wake	Longitude:
Total Points: Stream is at least intermittent if ≥ 19 or perennial if $\geq 30^*$ 30.5	Stream Determination (circle one) Ephemeral <u>Intermittent</u> Perennial	Other e.g. Quad Name:

A. Geomorphology (Subtotal = 15)

	Absent	Weak	Moderate	Strong
1 ^a Continuity of channel bed and bank	0	1	2	3
2. Sinuosity of channel along thalweg	0	1	2	3
3. In-channel structure: ex. riffle-pool, step-pool, ripple-pool sequence	0	1	2	3
4. Particle size of stream substrate	0	1	2	3
5. Active/relict floodplain	0	1	2	3
6. Depositional bars or benches	0	1	2	3
7. Recent alluvial deposits	0	1	2	3
8. Headcuts	0	1	2	3
9. Grade control	0	0.5	1	1.5
10. Natural valley	0	0.5	1	1.5
11. Second or greater order channel	No = 0		Yes = 3	

^a artificial ditches are not rated; see discussions in manual

B. Hydrology (Subtotal = 8.5)

12. Presence of Baseflow	0	1	2	3
13. Iron oxidizing bacteria	0	1	2	3
14. Leaf litter	1.5	1	0.5	0
15. Sediment on plants or debris	0	0.5	1	1.5
16. Organic debris lines or piles	0	0.5	1	1.5
17. Soil-based evidence of high water table?	No = 0		Yes = 3	

C. Biology (Subtotal = 7)

18. Fibrous roots in streambed	3	2	1	0
19. Rooted upland plants in streambed	3	2	1	0
20. Macroinvertebrates (note diversity and abundance)	0	1	2	3
21. Aquatic Mollusks	0	1	2	3
22. Fish	0	0.5	1	1.5
23. Crayfish	0	0.5	1	1.5
24. Amphibians	0	0.5	1	1.5
25. Algae	0	0.5	1	1.5
26. Wetland plants in streambed	FACW = 0.75; OBL = 1.5; Other = 0			

*perennial streams may also be identified using other methods. See p. 35 of manual.

Notes:

Sketch:

1 page

taken approximately 100ft below where water first observed.



STREAM QUALITY ASSESSMENT WORKSHEET



Provide the following information for the stream reach under assessment:

- 1. Applicant's name: NCDOT
- 2. Evaluator's name: J. Dilday
- 3. Date of evaluation: 8/31/16
- 4. Time of evaluation: 10:30 am
- 5. Name of stream: UT to Lake Johnson
- 6. River basin: Neuse
- 7. Approximate drainage area: ~12 ac.
- 8. Stream order: 2nd
- 9. Length of reach evaluated: 250 ft.
- 10. County: Wake
- 11. Site coordinates (if known): prefer in decimal degrees.
- 12. Subdivision name (if any): Westridge TH
- Latitude (ex. 34.872312): 35.758086
- Longitude (ex. -77.556611): -78.724747
- Method location determined (circle): GPS Topo Sheet Ortho (Aerial) Photo/GIS Other GIS Other _____
- 13. Location of reach under evaluation (note nearby roads and landmarks and attach map identifying stream(s) location):
Adjacent to I40/US64W near Jones Franklin Rd.
- 14. Proposed channel work (if any): installation of 48" pipe to control erosion
- 15. Recent weather conditions: no significant rainfall in recent past.
- 16. Site conditions at time of visit: sunny, approx. 90°
- 17. Identify any special waterway classifications known: Section 10 Tidal Waters Essential Fisheries Habitat Trout Waters Outstanding Resource Waters Nutrient Sensitive Waters Water Supply Watershed (I-IV)
- 18. Is there a pond or lake located upstream of the evaluation point? YES NO If yes, estimate the water surface area: _____
- 19. Does channel appear on USGS quad map? YES NO 20. Does channel appear on USDA Soil Survey? YES NO
- 21. Estimated watershed land use: 50% Residential 20% Commercial % Industrial % Agricultural 30% Forested % Cleared / Logged % Other (_____)
- 22. Bankfull width: 20-30 ft.
- 23. Bank height (from bed to top of bank): 12-14 ft.
- 24. Channel slope down center of stream: Flat (0 to 2%) Gentle (2 to 4%) Moderate (4 to 10%) Steep (>10%)
- 25. Channel sinuosity: Straight Occasional bends Frequent meander Very sinuous Braided channel

Instructions for completion of worksheet (located on page 2): Begin by determining the most appropriate ecoregion based on location, terrain, vegetation, stream classification, etc. Every characteristic must be scored using the same ecoregion. Assign points to each characteristic within the range shown for the ecoregion. Page 3 provides a brief description of how to review the characteristics identified in the worksheet. Scores should reflect an overall assessment of the stream reach under evaluation. If a characteristic cannot be evaluated due to site or weather conditions, enter 0 in the scoring box and provide an explanation in the comment section. Where there are obvious changes in the character of a stream under review (e.g., the stream flows from a pasture into a forest), the stream may be divided into smaller reaches that display more continuity, and a separate form used to evaluate each reach. The total score assigned to a stream reach must range between 0 and 100, with a score of 100 representing a stream of the highest quality.

Total Score (from reverse): 38 Comments: Covers area of stream from first sign of groundwater for approx. 250 feet

Evaluator's Signature [Signature] Date 8/31/16

This channel evaluation form is intended to be used only as a guide to assist landowners and environmental professionals in gathering the data required by the United States Army Corps of Engineers to make a preliminary assessment of stream quality. The total score resulting from the completion of this form is subject to USACE approval and does not imply a particular mitigation ratio or requirement. Form subject to change - version 06/03. To Comment, please call 919-876-8441 x 26.

STREAM QUALITY ASSESSMENT WORKSHEET

	#	CHARACTERISTICS	ECOREGION POINT RANGE			SCORE
			Coastal	Piedmont	Mountain	
PHYSICAL	1	Presence of flow / persistent pools in stream (no flow or saturation = 0; strong flow = max points)	0-5	0-4	0-5	3
	2	Evidence of past human alteration (extensive alteration = 0; no alteration = max points)	0-6	0-5	0-5	1
	3	Riparian zone (no buffer = 0; contiguous, wide buffer = max points)	0-6	0-4	0-5	2
	4	Evidence of nutrient or chemical discharges (extensive discharges = 0; no discharges = max points)	0-5	0-4	0-4	2
	5	Groundwater discharge (no discharge = 0; springs, seeps, wetlands, etc. = max points)	0-3	0-4	0-4	3
	6	Presence of adjacent floodplain (no floodplain = 0; extensive floodplain = max points)	0-4	0-4	0-2	0
	7	Entrenchment / floodplain access (deeply entrenched = 0; frequent flooding = max points)	0-5	0-4	0-2	0
	8	Presence of adjacent wetlands (no wetlands = 0; large adjacent wetlands = max points)	0-6	0-4	0-2	0
	9	Channel sinuosity (extensive channelization = 0; natural meander = max points)	0-5	0-4	0-3	3
	10	Sediment input (extensive deposition = 0; little or no sediment = max points)	0-5	0-4	0-4	0
	11	Size & diversity of channel bed substrate (fine, homogenous = 0; large, diverse sizes = max points)	NA*	0-4	0-5	3
STABILITY	12	Evidence of channel incision or widening (deeply incised = 0; stable bed & banks = max points)	0-5	0-4	0-5	0
	13	Presence of major bank failures (severe erosion = 0; no erosion, stable banks = max points)	0-5	0-5	0-5	0
	14	Root depth and density on banks (no visible roots = 0; dense roots throughout = max points)	0-3	0-4	0-5	3
	15	Impact by agriculture, livestock, or timber production (substantial impact = 0; no evidence = max points)	0-5	0-4	0-5	4
HABITAT	16	Presence of riffle-pool/ripple-pool complexes (no riffles/ripples or pools = 0; well-developed = max points)	0-3	0-5	0-6	4
	17	Habitat complexity (little or no habitat = 0; frequent, varied habitats = max points)	0-6	0-6	0-6	3
	18	Canopy coverage over streambed (no shading vegetation = 0; continuous canopy = max points)	0-5	0-5	0-5	4
	19	Substrate embeddedness (deeply embedded = 0; loose structure = max)	NA*	0-4	0-4	1
BIOLOGY	20	Presence of stream invertebrates (see page 4) (no evidence = 0; common, numerous types = max points)	0-4	0-5	0-5	0
	21	Presence of amphibians (no evidence = 0; common, numerous types = max points)	0-4	0-4	0-4	0
	22	Presence of fish (no evidence = 0; common, numerous types = max points)	0-4	0-4	0-4	0
	23	Evidence of wildlife use (no evidence = 0; abundant evidence = max points)	0-6	0-5	0-5	1
Total Points Possible			100	100	100	
TOTAL SCORE (also enter on first page)						38

* These characteristics are not assessed in coastal streams.

NC DWQ Stream Identification Form Version 4.11

Date: 8/31/16	Project/Site: E-5838	Latitude:
Evaluator: J. Dilday, D. Riffley	County: Wake	Longitude:
Total Points: Stream is at least intermittent if ≥ 19 or perennial if $\geq 30^*$ 31.5	Stream Determination (circle one) Ephemeral Intermittent <u>Perennial</u>	Other e.g. Quad Name:

A. Geomorphology (Subtotal = 15)

	Absent	Weak	Moderate	Strong
1 ^a Continuity of channel bed and bank	0	1	2	3
2. Sinuosity of channel along thalweg	0	1	2	3
3. In-channel structure: ex. riffle-pool, step-pool, ripple-pool sequence	0	1	2	3
4. Particle size of stream substrate	0	1	2	3
5. Active/relict floodplain	0	1	2	3
6. Depositional bars or benches	0	1	2	3
7. Recent alluvial deposits	0	1	2	3
8. Headcuts	0	1	2	3
9. Grade control	0	0.5	1	1.5
10. Natural valley	0	0.5	1	1.5
11. Second or greater order channel	No = 0		Yes = 3	

^a artificial ditches are not rated; see discussions in manual

B. Hydrology (Subtotal = 8.5)

12. Presence of Baseflow	0	1	2	3
13. Iron oxidizing bacteria	0	1	2	3
14. Leaf litter	1.5	1	0.5	0
15. Sediment on plants or debris	0	0.5	1	1.5
16. Organic debris lines or piles	0	0.5	1	1.5
17. Soil-based evidence of high water table?	No = 0		Yes = 3	

C. Biology (Subtotal = 8)

18. Fibrous roots in streambed	3	2	1	0
19. Rooted upland plants in streambed	3	2	1	0
20. Macroinvertebrates (note diversity and abundance)	0	1	2	3
21. Aquatic Mollusks	0	1	2	3
22. Fish	0	0.5	1	1.5
23. Crayfish	0	0.5	1	1.5
24. Amphibians	0	0.5	1	1.5
25. Algae	0	0.5	1	1.5
26. Wetland plants in streambed	FACW = 0.75; OBL = 1.5 Other = 0			

*perennial streams may also be identified using other methods. See p. 35 of manual.

Notes:

Sketch: Overall stream did not change from previous point with the exception of prominent algae within stream. ~200 ft. downstream returned to pooled areas and dry sections.

from data point

until confluence with other stream



STREAM QUALITY ASSESSMENT WORKSHEET



Provide the following information for the stream reach under assessment:

- 1. Applicant's name: NC DOT
- 2. Evaluator's name: J. Dildrey
- 3. Date of evaluation: 8/31/16
- 4. Time of evaluation: 11:00 am
- 5. Name of stream: UT to Lake Johnson
- 6. River basin: Neuse
- 7. Approximate drainage area: N 1/2 ac.
- 8. Stream order: 1st
- 9. Length of reach evaluated: 500 ft.
- 10. County: Wake
- 11. Site coordinates (if known): prefer in decimal degrees.
- 12. Subdivision name (if any): Westridge TH
- Latitude (ex. 34.872312): 35.758103
- Longitude (ex. -77.556611): -78.723460
- Method location determined (circle): GPS Topo Sheet Ortho (Aerial) Photo/GIS Other GIS Other _____
- 13. Location of reach under evaluation (note nearby roads and landmarks and attach map identifying stream(s) location):
Adjacent to I-40/US64 W at Jones Franklin Road
- 14. Proposed channel work (if any): install a 48 inch pipe to control erosion
- 15. Recent weather conditions: no significant rainfall in recent past
- 16. Site conditions at time of visit: sunny, approx. 90°
- 17. Identify any special waterway classifications known: Section 10 Tidal Waters Essential Fisheries Habitat
 Trout Waters Outstanding Resource Waters Nutrient Sensitive Waters Water Supply Watershed (I-IV)
- 18. Is there a pond or lake located upstream of the evaluation point? YES NO If yes, estimate the water surface area: _____
- 19. Does channel appear on USGS quad map? YES NO 20. Does channel appear on USDA Soil Survey? YES NO
- 21. Estimated watershed land use: 50% Residential 20% Commercial Industrial Agricultural
30% Forested Cleared / Logged Other (_____)
- 22. Bankfull width: 10-20 ft.
- 23. Bank height (from bed to top of bank): 6-10 ft.
- 24. Channel slope down center of stream: Flat (0 to 2%) Gentle (2 to 4%) Moderate (4 to 10%) Steep (>10%)
- 25. Channel sinuosity: Straight Occasional bends Frequent meander Very sinuous Braided channel

Instructions for completion of worksheet (located on page 2): Begin by determining the most appropriate ecoregion based on location, terrain, vegetation, stream classification, etc. Every characteristic must be scored using the same ecoregion. Assign points to each characteristic within the range shown for the ecoregion. Page 3 provides a brief description of how to review the characteristics identified in the worksheet. Scores should reflect an overall assessment of the stream reach under evaluation. If a characteristic cannot be evaluated due to site or weather conditions, enter 0 in the scoring box and provide an explanation in the comment section. Where there are obvious changes in the character of a stream under review (e.g., the stream flows from a pasture into a forest), the stream may be divided into smaller reaches that display more continuity, and a separate form used to evaluate each reach. The total score assigned to a stream reach must range between 0 and 100, with a score of 100 representing a stream of the highest quality.

Total Score (from reverse): 42 Comments: Stream picks up significant amount of algae for approximately 200 ft. before stream returned to pooled and dry sections prior to confluence.

Evaluator's Signature [Signature] Date 8/31/16

This channel evaluation form is intended to be used only as a guide to assist landowners and environmental professionals in gathering the data required by the United States Army Corps of Engineers to make a preliminary assessment of stream quality. The total score resulting from the completion of this form is subject to USACE approval and does not imply a particular mitigation ratio or requirement. Form subject to change - version 06/03. To Comment, please call 919-876-8441 x 26.

STREAM QUALITY ASSESSMENT WORKSHEET

	#	CHARACTERISTICS	ECOREGION POINT RANGE			SCORE
			Coastal	Piedmont	Mountain	
PHYSICAL	1	Presence of flow / persistent pools in stream (no flow or saturation = 0; strong flow = max points)	0-5	0-4	0-5	3
	2	Evidence of past human alteration (extensive alteration = 0; no alteration = max points)	0-6	0-5	0-5	2
	3	Riparian zone (no buffer = 0; contiguous, wide buffer = max points)	0-6	0-4	0-5	2
	4	Evidence of nutrient or chemical discharges (extensive discharges = 0; no discharges = max points)	0-5	0-4	0-4	2
	5	Groundwater discharge (no discharge = 0; springs, seeps, wetlands, etc. = max points)	0-3	0-4	0-4	3
	6	Presence of adjacent floodplain (no floodplain = 0; extensive floodplain = max points)	0-4	0-4	0-2	0
	7	Entrenchment / floodplain access (deeply entrenched = 0; frequent flooding = max points)	0-5	0-4	0-2	0
	8	Presence of adjacent wetlands (no wetlands = 0; large adjacent wetlands = max points)	0-6	0-4	0-2	0
	9	Channel sinuosity (extensive channelization = 0; natural meander = max points)	0-5	0-4	0-3	3
	10	Sediment input (extensive deposition = 0; little or no sediment = max points)	0-5	0-4	0-4	1
	11	Size & diversity of channel bed substrate (fine, homogenous = 0; large, diverse sizes = max points)	NA*	0-4	0-5	3
STABILITY	12	Evidence of channel incision or widening (deeply incised = 0; stable bed & banks = max points)	0-5	0-4	0-5	0
	13	Presence of major bank failures (severe erosion = 0; no erosion, stable banks = max points)	0-5	0-5	0-5	1
	14	Root depth and density on banks (no visible roots = 0; dense roots throughout = max points)	0-3	0-4	0-5	3
	15	Impact by agriculture, livestock, or timber production (substantial impact = 0; no evidence = max points)	0-5	0-4	0-5	4
HABITAT	16	Presence of riffle-pool/ripple-pool complexes (no riffles/ripples or pools = 0; well-developed = max points)	0-3	0-5	0-6	4
	17	Habitat complexity (little or no habitat = 0; frequent, varied habitats = max points)	0-6	0-6	0-6	3
	18	Canopy coverage over streambed (no shading vegetation = 0; continuous canopy = max points)	0-5	0-5	0-5	4
	19	Substrate embeddedness (deeply embedded = 0; loose structure = max)	NA*	0-4	0-4	2
BIOLOGY	20	Presence of stream invertebrates (see page 4) (no evidence = 0; common, numerous types = max points)	0-4	0-5	0-5	0
	21	Presence of amphibians (no evidence = 0; common, numerous types = max points)	0-4	0-4	0-4	1
	22	Presence of fish (no evidence = 0; common, numerous types = max points)	0-4	0-4	0-4	0
	23	Evidence of wildlife use (no evidence = 0; abundant evidence = max points)	0-6	0-5	0-5	1
Total Points Possible			100	100	100	
TOTAL SCORE (also enter on first page)						42

* These characteristics are not assessed in coastal streams.

James Franklin Road

2111

NC DWQ Stream Identification Form Version 4.11

Date: 8/31/16	Project/Site: I-5338	Latitude: 35.758187
Evaluator: J. Dilday, D. R. ...	County: Wake	Longitude: -78.73510
Total Points: Stream is at least intermittent if ≥ 19 or perennial if $\geq 30^*$ 33.5	Stream Determination (circle one) Ephemeral Intermittent <u>Perennial</u>	Other e.g. Quad Name:

A. Geomorphology (Subtotal = 16.5)

	Absent	Weak	Moderate	Strong
1 ^a Continuity of channel bed and bank	0	1	2	3
2. Sinuosity of channel along thalweg	0	1	2	3
3. In-channel structure: ex. riffle-pool, step-pool, ripple-pool sequence	0	1	2	3
4. Particle size of stream substrate	0	1	2	3
5. Active/relict floodplain	0	1	2	3
6. Depositional bars or benches	0	1	2	3
7. Recent alluvial deposits	0	1	2	3
8. Headcuts	0	1	2	3
9. Grade control	0	0.5	1	1.5
10. Natural valley	0	0.5	1	1.5
11. Second or greater order channel	No = 0		Yes = 3	

^a artificial ditches are not rated; see discussions in manual

B. Hydrology (Subtotal = 9.5)

12. Presence of Baseflow	0	1	2	3
13. Iron oxidizing bacteria	0	1	2	3
14. Leaf litter	1.5	1	0.5	0
15. Sediment on plants or debris	0	0.5	1	1.5
16. Organic debris lines or piles	0	0.5	1	1.5
17. Soil-based evidence of high water table?	No = 0		Yes = 3	

C. Biology (Subtotal = 7.5)

18. Fibrous roots in streambed	3	2	1	0
19. Rooted upland plants in streambed	3	2	1	0
20. Macroinvertebrates (note diversity and abundance)	0	1	2	3
21. Aquatic Mollusks	0	1	2	3
22. Fish	0	0.5	1	1.5
23. Crayfish	0	0.5	1	1.5
24. Amphibians	0	0.5	1	1.5
25. Algae	0	0.5	1	1.5
26. Wetland plants in streambed	FACW = 0.75; OBL = 1.5 other = 0			

*perennial streams may also be identified using other methods. See p. 35 of manual.

Notes:

Sketch: Couple of isopods + amphipods
point taken at confluence



STREAM QUALITY ASSESSMENT WORKSHEET



Provide the following information for the stream reach under assessment:

- 1. Applicant's name: NC DOT
- 2. Evaluator's name: J. Dilday
- 3. Date of evaluation: 8/31/16
- 4. Time of evaluation: 11:30 am
- 5. Name of stream: UT to Lake Johnson
- 6. River basin: Neuse
- 7. Approximate drainage area: 60 ac.
- 8. Stream order: 1st
- 9. Length of reach evaluated: 100 ft.
- 10. County: Wake
- 11. Site coordinates (if known): prefer in decimal degrees.
- 12. Subdivision name (if any): Westridge TH
- Latitude (ex. 34.872312): 35.758187 Longitude (ex. -77.556611): -78.722510
- Method location determined (circle): GPS Topo Sheet Ortho (Aerial) Photo/GIS Other GIS Other _____
- 13. Location of reach under evaluation (note nearby roads and landmarks and attach map identifying stream(s) location):
Adjacent to I-40/US 64 W @ Jones Franklin Rd.
- 14. Proposed channel work (if any): install 48 inch pipe to control erosion
- 15. Recent weather conditions: no significant rainfall in recent past
- 16. Site conditions at time of visit: sunny, approx. 90°
- 17. Identify any special waterway classifications known: Section 10 Tidal Waters Essential Fisheries Habitat
 Trout Waters Outstanding Resource Waters Nutrient Sensitive Waters Water Supply Watershed (I-IV)
- 18. Is there a pond or lake located upstream of the evaluation point? YES NO If yes, estimate the water surface area: _____
- 19. Does channel appear on USGS quad map? YES NO 20. Does channel appear on USDA Soil Survey? YES NO
- 21. Estimated watershed land use: 50% Residential 20% Commercial % Industrial % Agricultural
30% Forested % Cleared / Logged % Other (_____)
- 22. Bankfull width: 15-25 ft.
- 23. Bank height (from bed to top of bank): 6-10 ft.
- 24. Channel slope down center of stream: Flat (0 to 2%) Gentle (2 to 4%) Moderate (4 to 10%) Steep (>10%)
- 25. Channel sinuosity: Straight Occasional bends Frequent meander Very sinuous Braided channel

Instructions for completion of worksheet (located on page 2): Begin by determining the most appropriate ecoregion based on location, terrain, vegetation, stream classification, etc. Every characteristic must be scored using the same ecoregion. Assign points to each characteristic within the range shown for the ecoregion. Page 3 provides a brief description of how to review the characteristics identified in the worksheet. Scores should reflect an overall assessment of the stream reach under evaluation. If a characteristic cannot be evaluated due to site or weather conditions, enter 0 in the scoring box and provide an explanation in the comment section. Where there are obvious changes in the character of a stream under review (e.g., the stream flows from a pasture into a forest), the stream may be divided into smaller reaches that display more continuity, and a separate form used to evaluate each reach. The total score assigned to a stream reach must range between 0 and 100, with a score of 100 representing a stream of the highest quality.

Total Score (from reverse): 50 Comments: Data reflects area approximately 100 ft. at confluence to other stream

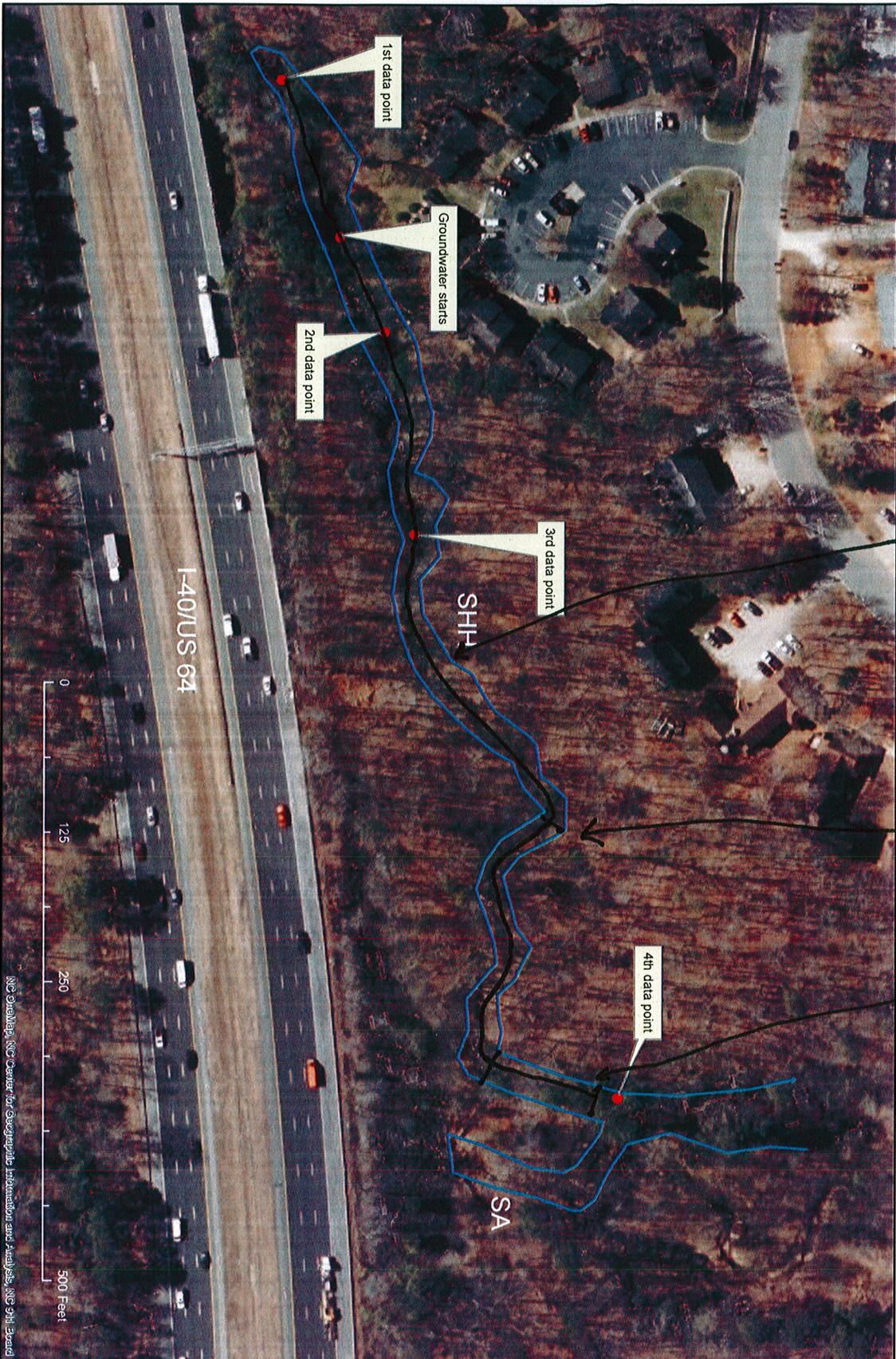
Evaluator's Signature [Signature] Date 8/31/16

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STREAM QUALITY ASSESSMENT WORKSHEET

	#	CHARACTERISTICS	ECOREGION POINT RANGE			SCORE
			Coastal	Piedmont	Mountain	
PHYSICAL	1	Presence of flow / persistent pools in stream (no flow or saturation = 0; strong flow = max points)	0-5	0-4	0-5	4
	2	Evidence of past human alteration (extensive alteration = 0; no alteration = max points)	0-6	0-5	0-5	3
	3	Riparian zone (no buffer = 0; contiguous, wide buffer = max points)	0-6	0-4	0-5	3
	4	Evidence of nutrient or chemical discharges (extensive discharges = 0; no discharges = max points)	0-5	0-4	0-4	2
	5	Groundwater discharge (no discharge = 0; springs, seeps, wetlands, etc. = max points)	0-3	0-4	0-4	3
	6	Presence of adjacent floodplain (no floodplain = 0; extensive floodplain = max points)	0-4	0-4	0-2	0
	7	Entrenchment / floodplain access (deeply entrenched = 0; frequent flooding = max points)	0-5	0-4	0-2	0
	8	Presence of adjacent wetlands (no wetlands = 0; large adjacent wetlands = max points)	0-6	0-4	0-2	0
	9	Channel sinuosity (extensive channelization = 0; natural meander = max points)	0-5	0-4	0-3	3
	10	Sediment input (extensive deposition = 0; little or no sediment = max points)	0-5	0-4	0-4	2
	11	Size & diversity of channel bed substrate (fine, homogenous = 0; large, diverse sizes = max points)	NA*	0-4	0-5	3
STABILITY	12	Evidence of channel incision or widening (deeply incised = 0; stable bed & banks = max points)	0-5	0-4	0-5	1
	13	Presence of major bank failures (severe erosion = 0; no erosion, stable banks = max points)	0-5	0-5	0-5	1
	14	Root depth and density on banks (no visible roots = 0; dense roots throughout = max points)	0-3	0-4	0-5	3
	15	Impact by agriculture, livestock, or timber production (substantial impact = 0; no evidence = max points)	0-5	0-4	0-5	4
HABITAT	16	Presence of riffle-pool/ripple-pool complexes (no riffles/ripples or pools = 0; well-developed = max points)	0-3	0-5	0-6	4
	17	Habitat complexity (little or no habitat = 0; frequent, varied habitats = max points)	0-6	0-6	0-6	3
	18	Canopy coverage over streambed (no shading vegetation = 0; continuous canopy = max points)	0-5	0-5	0-5	4
	19	Substrate embeddedness (deeply embedded = 0; loose structure = max)	NA*	0-4	0-4	2
BIOLOGY	20	Presence of stream invertebrates (see page 4) (no evidence = 0; common, numerous types = max points)	0-4	0-5	0-5	2
	21	Presence of amphibians (no evidence = 0; common, numerous types = max points)	0-4	0-4	0-4	1
	22	Presence of fish (no evidence = 0; common, numerous types = max points)	0-4	0-4	0-4	0
	23	Evidence of wildlife use (no evidence = 0; abundant evidence = max points)	0-6	0-5	0-5	2
Total Points Possible			100	100	100	
TOTAL SCORE (also enter on first page)						50

* These characteristics are not assessed in coastal streams.



NCSAM Form 3 Location

NCSAM Form 2 Location

NCSAM Form 1 Location

STREAM SHH

WAKE COUNTY
TIP PROJECT I-5338

NORTH CAROLINA DEPARTMENT
OF TRANSPORTATION
DIVISION OF HIGHWAYS
PROJECT DEVELOPMENT AND
ENVIRONMENTAL ANALYSIS BRANCH



Div	5	TIP#	I-5338
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Date	September 2016
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Figure
1

Map provided by NCSAM Center for Geographic Information and Analysis, NCSAM Board

NC SAM FIELD ASSESSMENT RESULTS
Accompanies User Manual Version 2.1

USACE AID #:	NCDWR #:																												
<p>INSTRUCTIONS: Attach a sketch of the assessment area and photographs. Attach a copy of the USGS 7.5-minute topographic quadrangle, and circle the location of the stream reach under evaluation. If multiple stream reaches will be evaluated on the same property, identify and number all reaches on the attached map, and include a separate form for each reach. See the NC SAM User Manual for detailed descriptions and explanations of requested information. Record in the "Notes/Sketch" section if supplementary measurements were performed. See the NC SAM User Manual for examples of additional measurements that may be relevant.</p> <p>NOTE EVIDENCE OF STRESSORS AFFECTING THE ASSESSMENT AREA (do not need to be within the assessment area).</p> <p>PROJECT/SITE INFORMATION:</p> <table style="width:100%; border: none;"> <tr> <td style="width:50%;">1. Project name (if any): <u>I-5338</u></td> <td style="width:50%;">2. Date of evaluation: <u>9/27/16</u></td> </tr> <tr> <td>3. Applicant/owner name: <u>NCDOT</u></td> <td>4. Assessor name/organization: <u>WBC, JD,CSU</u></td> </tr> <tr> <td>5. County: <u>Wake</u></td> <td>6. Nearest named water body on USGS 7.5-minute quad: <u>Lake Johnson</u></td> </tr> <tr> <td>7. River basin: <u>Neuse</u></td> <td></td> </tr> </table> <p>8. Site coordinates (decimal degrees, at lower end of assessment reach): _____</p> <p>STREAM INFORMATION: (depth and width can be approximations)</p> <table style="width:100%; border: none;"> <tr> <td style="width:50%;">9. Site number (show on attached map): <u>SAM 1</u></td> <td style="width:50%;">10. Length of assessment reach evaluated (feet): <u>150ft</u></td> </tr> <tr> <td>11. Channel depth from bed (in riffle, if present) to top of bank (feet): <u>9 feet</u></td> <td><input type="checkbox"/> Unable to assess channel depth.</td> </tr> <tr> <td>12. Channel width at top of bank (feet): <u>7 feet</u></td> <td>13. Is assessment reach a swamp steam? <input type="checkbox"/> Yes <input type="checkbox"/> No</td> </tr> </table> <p>14. Feature type: <input checked="" type="checkbox"/> Perennial flow <input type="checkbox"/> Intermittent flow <input type="checkbox"/> Tidal Marsh Stream</p> <p>STREAM CATEGORY INFORMATION:</p> <p>15. NC SAM Zone: <input type="checkbox"/> Mountains (M) <input checked="" type="checkbox"/> Piedmont (P) <input type="checkbox"/> Inner Coastal Plain (I) <input type="checkbox"/> Outer Coastal Plain (O)</p> <p>16. Estimated geomorphic valley shape (skip for Tidal Marsh Stream):</p> <table style="width:100%; border: none;"> <tr> <td style="width:50%; vertical-align: top;"> <input type="checkbox"/> A  (more sinuous stream, flatter valley slope) </td> <td style="width:50%; vertical-align: top;"> <input checked="" type="checkbox"/> B  (less sinuous stream, steeper valley slope) </td> </tr> </table> <p>17. Watershed size: (skip for Tidal Marsh Stream)</p> <p><input checked="" type="checkbox"/> Size 1 (< 0.1 mi²) <input type="checkbox"/> Size 2 (0.1 to < 0.5 mi²) <input type="checkbox"/> Size 3 (0.5 to < 5 mi²) <input type="checkbox"/> Size 4 (≥ 5 mi²)</p> <p>ADDITIONAL INFORMATION:</p> <p>18. Were regulatory considerations evaluated? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No If Yes, check all that apply to the assessment area.</p> <table style="width:100%; border: none;"> <tr> <td><input type="checkbox"/> Section 10 water</td> <td><input type="checkbox"/> Classified Trout Waters</td> <td><input type="checkbox"/> Water Supply Watershed (<input type="checkbox"/> I <input type="checkbox"/> II <input type="checkbox"/> III <input type="checkbox"/> IV <input type="checkbox"/> V)</td> </tr> <tr> <td><input type="checkbox"/> Essential Fish Habitat</td> <td><input type="checkbox"/> Primary Nursery Area</td> <td><input type="checkbox"/> High Quality Waters/Outstanding Resource Waters</td> </tr> <tr> <td><input type="checkbox"/> Publicly owned property</td> <td><input checked="" type="checkbox"/> NCDWR Riparian buffer rule in effect</td> <td><input type="checkbox"/> Nutrient Sensitive Waters</td> </tr> <tr> <td><input type="checkbox"/> Anadromous fish</td> <td><input checked="" type="checkbox"/> 303(d) List</td> <td><input type="checkbox"/> CAMA Area of Environmental Concern (AEC)</td> </tr> </table> <p><input type="checkbox"/> Documented presence of a federal and/or state listed protected species within the assessment area. List species: _____</p> <p><input type="checkbox"/> Designated Critical Habitat (list species) _____</p> <p>19. Are additional stream information/supplementary measurements included in "Notes/Sketch" section or attached? <input type="checkbox"/> Yes <input type="checkbox"/> No</p>		1. Project name (if any): <u>I-5338</u>	2. Date of evaluation: <u>9/27/16</u>	3. Applicant/owner name: <u>NCDOT</u>	4. Assessor name/organization: <u>WBC, JD,CSU</u>	5. County: <u>Wake</u>	6. Nearest named water body on USGS 7.5-minute quad: <u>Lake Johnson</u>	7. River basin: <u>Neuse</u>		9. Site number (show on attached map): <u>SAM 1</u>	10. Length of assessment reach evaluated (feet): <u>150ft</u>	11. Channel depth from bed (in riffle, if present) to top of bank (feet): <u>9 feet</u>	<input type="checkbox"/> Unable to assess channel depth.	12. Channel width at top of bank (feet): <u>7 feet</u>	13. 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1. **Channel Water – assessment reach metric (skip for Size 1 streams and Tidal Marsh Streams)**
 - A Water throughout assessment reach.
 - B No flow, water in pools only.
 - C No water in assessment reach.

2. **Evidence of Flow Restriction – assessment reach metric**
 - A At least 10% of assessment reach in-stream habitat or riffle-pool sequence is severely affected by a flow restriction or fill to the point of obstructing flow or a channel choked with aquatic macrophytes or ponded water or impoundment on flood or ebb within the assessment reach (examples: undersized or perched culverts, causeways that constrict the channel, tidal gates, debris jams, beaver dams).
 - B Not A

3. **Feature Pattern – assessment reach metric**
 - A A majority of the assessment reach has altered pattern (examples: straightening, modification above or below culvert).
 - B Not A

4. **Feature Longitudinal Profile – assessment reach metric**
 - A Majority of assessment reach has a substantially altered stream profile (examples: channel down-cutting, existing damming, over widening, active aggradation, dredging, and excavation where appropriate channel profile has not reformed from any of these disturbances).
 - B Not A

5. **Signs of Active Instability – assessment reach metric**

Consider only current instability, not past events from which the stream has currently recovered. Examples of instability include active bank failure, active channel down-cutting (head-cut), active widening, and artificial hardening (such as concrete, gabion, rip-rap).

 - A < 10% of channel unstable
 - B 10 to 25% of channel unstable
 - C > 25% of channel unstable

6. Streamside Area Interaction – streamside area metric

Consider for the Left Bank (LB) and the Right Bank (RB).

- | | | |
|---------------------------------------|---------------------------------------|---|
| LB | RB | |
| <input type="checkbox"/> A | <input type="checkbox"/> A | Little or no evidence of conditions that adversely affect reference interaction |
| <input type="checkbox"/> B | <input type="checkbox"/> B | Moderate evidence of conditions (examples: berms, levees, down-cutting, aggradation, dredging) that adversely affect reference interaction (examples: limited streamside area access, disruption of flood flows through streamside area, leaky or intermittent bulkheads, causeways with floodplain constriction, minor ditching [including mosquito ditching]) |
| <input checked="" type="checkbox"/> C | <input checked="" type="checkbox"/> C | Extensive evidence of conditions that adversely affect reference interaction (little to no floodplain/intertidal zone access [examples: causeways with floodplain and channel constriction, bulkheads, retaining walls, fill, stream incision, disruption of flood flows through streamside area] <u>or</u> too much floodplain/intertidal zone access [examples: impoundments, intensive mosquito ditching]) <u>or</u> floodplain/intertidal zone unnaturally absent <u>or</u> assessment reach is a man-made feature on an interstream divide |

7. Water Quality Stressors – assessment reach/intertidal zone metric

Check all that apply.

- A Discolored water in stream or intertidal zone (milky white, blue, unnatural water discoloration, oil sheen, stream foam)
- B Excessive sedimentation (burying of stream features or intertidal zone)
- C Noticeable evidence of pollutant discharges entering the assessment reach and causing a water quality problem
- D Odor (not including natural sulfide odors)
- E Current published or collected data indicating degraded water quality in the assessment reach. Cite source in “Notes/Sketch” section.
- F Livestock with access to stream or intertidal zone
- G Excessive algae in stream or intertidal zone
- H Degraded marsh vegetation in the intertidal zone (removal, burning, regular mowing, destruction, etc)
- I Other: _____ (explain in “Notes/Sketch” section)
- J Little to no stressors

8. Recent Weather – watershed metric (skip for Tidal Marsh Streams)

For Size 1 or 2 streams, D1 drought or higher is considered a drought; for Size 3 or 4 streams, D2 drought or higher is considered a drought.

- A Drought conditions and no rainfall or rainfall not exceeding 1 inch within the last 48 hours
- B Drought conditions and rainfall exceeding 1 inch within the last 48 hours
- C No drought conditions

9. Large or Dangerous Stream – assessment reach metric

Yes No Is stream is too large or dangerous to assess? If Yes, skip to Metric 13 (Streamside Area Ground Surface Condition).

10. Natural In-stream Habitat Types – assessment reach metric

10a. Yes No Degraded in-stream habitat over majority of the assessment reach (examples of stressors include excessive sedimentation, mining, excavation, in-stream hardening [for example, rip-rap], recent dredging, and snagging) (evaluate for Size 4 Coastal Plain streams only, then skip to Metric 12)

10b. Check all that occur (occurs if > 5% coverage of assessment reach) (skip for Size 4 Coastal Plain streams)

- | | | |
|--|------------------------------------|---|
| <input checked="" type="checkbox"/> A Multiple aquatic macrophytes and aquatic mosses (include liverworts, lichens, and algal mats) | Check for Tidal Marsh Streams Only | <input type="checkbox"/> F 5% oysters or other natural hard bottoms |
| <input type="checkbox"/> B Multiple sticks and/or leaf packs and/or emergent vegetation | | <input type="checkbox"/> G Submerged aquatic vegetation |
| <input type="checkbox"/> C Multiple snags and logs (including lap trees) | | <input type="checkbox"/> H Low-tide refugia (pools) |
| <input checked="" type="checkbox"/> D 5% undercut banks and/or root mats and/or roots in banks extend to the normal wetted perimeter | | <input type="checkbox"/> I Sand bottom |
| <input type="checkbox"/> E Little or no habitat | | <input type="checkbox"/> J 5% vertical bank along the marsh |
| | | <input type="checkbox"/> K Little or no habitat |

*****REMAINING QUESTIONS ARE NOT APPLICABLE FOR TIDAL MARSH STREAMS*****

11. Bedform and Substrate – assessment reach metric (skip for Size 4 Coastal Plain streams and Tidal Marsh Streams)

11a. Yes No Is assessment reach in a natural sand-bed stream? (skip for Coastal Plain streams)

11b. Bedform evaluated. Check the appropriate box(es).

- A Riffle-run section (evaluate 11c)
- B Pool-glide section (evaluate 11d)
- C Natural bedform absent (skip to Metric 12, Aquatic Life)

11c. In riffle sections, check all that occur below the normal wetted perimeter of the assessment reach – whether or not submerged. Check at least one box in each row (skip for Size 4 Coastal Plain streams and Tidal Marsh Streams). Not Present (NP) = absent, Rare (R) = present but ≤ 10%, Common (C) = > 10-40%, Abundant (A) = > 40-70%, Predominant (P) = > 70%. Cumulative percentages should not exceed 100% for each assessment reach.

- | | | | | | |
|-------------------------------------|--------------------------|-------------------------------------|-------------------------------------|--------------------------|--------------------------------------|
| <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | Bedrock/saprolite |
| <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | Boulder (256 – 4096 mm) |
| <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | Cobble (64 – 256 mm) |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | Gravel (2 – 64 mm) |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | Sand (.062 – 2 mm) |
| <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | Silt/clay (< 0.062 mm) |
| <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | Detritus |
| <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | Artificial (rip-rap, concrete, etc.) |

11d. Yes No Are pools filled with sediment? (skip for Size 4 Coastal Plain streams and Tidal Marsh Streams)

12. Aquatic Life – assessment reach metric (skip for Tidal Marsh Streams)

12a. Yes No Was an in-stream aquatic life assessment performed as described in the User Manual?
If No, select one of the following reasons and skip to Metric 13. No Water Other: _____

12b. Yes No Are aquatic organisms present in the assessment reach (look in riffles, pools, then snags)? If Yes, check all that apply. If No, skip to Metric 13.

1 >1 Numbers over columns refer to "individuals" for Size 1 and 2 streams and "taxa" for Size 3 and 4 streams.

- Adult frogs
- Aquatic reptiles
- Aquatic macrophytes and aquatic mosses (include liverworts, lichens, and algal mats)
- Beetles
- Caddisfly larvae (T)
- Asian clam (*Corbicula*)
- Crustacean (isopod/amphipod/crayfish/shrimp)
- Damselfly and dragonfly larvae
- Dipterans
- Mayfly larvae (E)
- Megaloptera (alderfly, fishfly, dobsonfly larvae)
- Midges/mosquito larvae
- Mosquito fish (*Gambusia*) or mud minnows (*Umbra pygmaea*)
- Mussels/Clams (not *Corbicula*)
- Other fish
- Salamanders/tadpoles
- Snails
- Stonefly larvae (P)
- Tipulid larvae
- Worms/leeches

13. Streamside Area Ground Surface Condition – streamside area metric (skip for Tidal Marsh Streams and B valley types)

Consider for the Left Bank (LB) and the Right Bank (RB). Consider storage capacity with regard to both overbank flow and upland runoff.

- | LB | RB | |
|----------------------------|----------------------------|--|
| <input type="checkbox"/> A | <input type="checkbox"/> A | Little or no alteration to water storage capacity over a majority of the streamside area |
| <input type="checkbox"/> B | <input type="checkbox"/> B | Moderate alteration to water storage capacity over a majority of the streamside area |
| <input type="checkbox"/> C | <input type="checkbox"/> C | Severe alteration to water storage capacity over a majority of the streamside area (examples: ditches, fill, soil compaction, livestock disturbance, buildings, man-made levees, drainage pipes) |

14. Streamside Area Water Storage – streamside area metric (skip for Size 1 streams, Tidal Marsh Streams, and B valley types)

Consider for the Left Bank (LB) and the Right Bank (RB) of the streamside area.

- | LB | RB | |
|----------------------------|----------------------------|--|
| <input type="checkbox"/> A | <input type="checkbox"/> A | Majority of streamside area with depressions able to pond water ≥ 6 inches deep |
| <input type="checkbox"/> B | <input type="checkbox"/> B | Majority of streamside area with depressions able to pond water 3 to 6 inches deep |
| <input type="checkbox"/> C | <input type="checkbox"/> C | Majority of streamside area with depressions able to pond water < 3 inches deep |

15. Wetland Presence – streamside area metric (skip for Tidal Marsh Streams)

Consider for the Left Bank (LB) and the Right Bank (RB). Do not consider wetlands outside of the streamside area or within the normal wetted perimeter of assessment reach.

- | LB | RB | |
|---------------------------------------|---------------------------------------|--|
| <input type="checkbox"/> Y | <input type="checkbox"/> Y | Are wetlands present in the streamside area? |
| <input checked="" type="checkbox"/> N | <input checked="" type="checkbox"/> N | |

16. Baseflow Contributors – assessment reach metric (skip for Size 4 streams and Tidal Marsh Streams)

Check all contributors within the assessment reach or within view of and draining to the assessment reach.

- A Streams and/or springs (jurisdictional discharges)
- B Ponds (include wet detention basins; do not include sediment basins or dry detention basins)
- C Obstruction passing flow during low-flow periods within the assessment area (beaver dam, leaky dam, bottom-release dam, weir)
- D Evidence of bank seepage or sweating (iron in water indicates seepage)
- E Stream bed or bank soil reduced (dig through deposited sediment if present)
- F None of the above

17. Baseflow Detractors – assessment area metric (skip for Tidal Marsh Streams)

Check all that apply.

- A Evidence of substantial water withdrawals from the assessment reach (includes areas excavated for pump installation)
- B Obstruction not passing flow during low-flow periods affecting the assessment reach (ex: watertight dam, sediment deposit)
- C Urban stream (≥ 24% impervious surface for watershed)
- D Evidence that the streamside area has been modified resulting in accelerated drainage into the assessment reach
- E Assessment reach relocated to valley edge
- F None of the above

18. Shading – assessment reach metric (skip for Tidal Marsh Streams)

Consider aspect. Consider "leaf-on" condition.

- A Stream shading is appropriate for stream category (may include gaps associated with natural processes)
- B Degraded (example: scattered trees)
- C Stream shading is gone or largely absent

19. Buffer Width – streamside area metric (skip for Tidal Marsh Streams)

Consider “vegetated buffer” and “wooded buffer” separately for left bank (LB) and right bank (RB) starting at the top of bank out to the first break.

Vegetated		Wooded		
LB	RB	LB	RB	
<input checked="" type="checkbox"/> A	<input type="checkbox"/> A	<input checked="" type="checkbox"/> A	<input type="checkbox"/> A	≥ 100 feet wide <u>or</u> extends to the edge of the watershed
<input type="checkbox"/> B	<input checked="" type="checkbox"/> B	<input type="checkbox"/> B	<input checked="" type="checkbox"/> B	From 50 to < 100 feet wide
<input type="checkbox"/> C	<input type="checkbox"/> C	<input type="checkbox"/> C	<input type="checkbox"/> C	From 30 to < 50 feet wide
<input type="checkbox"/> D	<input type="checkbox"/> D	<input type="checkbox"/> D	<input type="checkbox"/> D	From 10 to < 30 feet wide
<input type="checkbox"/> E	<input type="checkbox"/> E	<input type="checkbox"/> E	<input type="checkbox"/> E	< 10 feet wide <u>or</u> no trees

20. Buffer Structure – streamside area metric (skip for Tidal Marsh Streams)

Consider for left bank (LB) and right bank (RB) for Metric 19 (“Vegetated” Buffer Width).

LB	RB	
<input checked="" type="checkbox"/> A	<input checked="" type="checkbox"/> A	Mature forest
<input type="checkbox"/> B	<input type="checkbox"/> B	Non-mature woody vegetation <u>or</u> modified vegetation structure
<input type="checkbox"/> C	<input type="checkbox"/> C	Herbaceous vegetation with or without a strip of trees < 10 feet wide
<input type="checkbox"/> D	<input type="checkbox"/> D	Maintained shrubs
<input type="checkbox"/> E	<input type="checkbox"/> E	Little or no vegetation

21. Buffer Stressors – streamside area metric (skip for Tidal Marsh Streams)

Check all appropriate boxes for left bank (LB) and right bank (RB). Indicate if listed stressor abuts stream (Abuts), does not abut but is within 30 feet of stream (< 30 feet), or is between 30 to 50 feet of stream (30-50 feet).

If none of the following stressors occurs on either bank, check here and skip to Metric 22:

Abuts		< 30 feet		30-50 feet		
LB	RB	LB	RB	LB	RB	
<input type="checkbox"/> A	Row crops					
<input type="checkbox"/> B	Maintained turf					
<input type="checkbox"/> C	Pasture (no livestock)/commercial horticulture					
<input type="checkbox"/> D	Pasture (active livestock use)					

22. Stem Density – streamside area metric (skip for Tidal Marsh Streams)

Consider for left bank (LB) and right bank (RB) for Metric 19 (“Wooded” Buffer Width).

LB	RB	
<input checked="" type="checkbox"/> A	<input checked="" type="checkbox"/> A	Medium to high stem density
<input type="checkbox"/> B	<input type="checkbox"/> B	Low stem density
<input type="checkbox"/> C	<input type="checkbox"/> C	No wooded riparian buffer <u>or</u> predominantly herbaceous species <u>or</u> bare ground

23. Continuity of Vegetated Buffer – streamside area metric (skip for Tidal Marsh Streams)

Consider whether vegetated buffer is continuous along stream (parallel). Breaks are areas lacking vegetation > 10 feet wide.

LB	RB	
<input checked="" type="checkbox"/> A	<input checked="" type="checkbox"/> A	The total length of buffer breaks is < 25 percent.
<input type="checkbox"/> B	<input type="checkbox"/> B	The total length of buffer breaks is between 25 and 50 percent.
<input type="checkbox"/> C	<input type="checkbox"/> C	The total length of buffer breaks is > 50 percent.

24. Vegetative Composition – streamside area metric (skip for Tidal Marsh Streams)

Evaluate the dominant vegetation within 100 feet of each bank or to the edge of the watershed (whichever comes first) as it contributes to assessment reach habitat.

LB	RB	
<input checked="" type="checkbox"/> A	<input checked="" type="checkbox"/> A	Vegetation is close to undisturbed in species present and their proportions. Lower strata composed of native species, with non-native invasive species absent or sparse.
<input type="checkbox"/> B	<input type="checkbox"/> B	Vegetation indicates disturbance in terms of species diversity or proportions, but is still largely composed of native species. This may include communities of weedy native species that develop after clear-cutting or clearing <u>or</u> communities with non-native invasive species present, but not dominant, over a large portion of the expected strata <u>or</u> communities missing understory but retaining canopy trees.
<input type="checkbox"/> C	<input type="checkbox"/> C	Vegetation is severely disturbed in terms of species diversity or proportions. Mature canopy is absent <u>or</u> communities with non-native invasive species dominant over a large portion of expected strata <u>or</u> communities composed of planted stands of non-characteristic species <u>or</u> communities inappropriately composed of a single species <u>or</u> no vegetation.

25. Conductivity – assessment reach metric (skip for all Coastal Plain streams)

25a. Yes No Was conductivity measurement recorded?
If No, select one of the following reasons. No Water Other: _____

25b. Check the box corresponding to the conductivity measurement (units of microsiemens per centimeter).
A < 46 B 46 to < 67 C 67 to < 79 D 79 to < 230 E ≥ 230

Notes/Sketch:

Draft NC SAM Stream Rating Sheet
Accompanies User Manual Version 2.1

Stream Site Name I-5338 Date of Assessment 9/27/16
 Stream Category Pb1 Assessor Name/Organization WBC, JD,CSU

Notes of Field Assessment Form (Y/N) NO
 Presence of regulatory considerations (Y/N) NO
 Additional stream information/supplementary measurements included (Y/N) _____
 NC SAM feature type (perennial, intermittent, Tidal Marsh Stream) Perennial

Function Class Rating Summary	USACE/ All Streams	NCDWR Intermittent
(1) Hydrology	LOW	
(2) Baseflow	MEDIUM	
(2) Flood Flow	LOW	
(3) Streamside Area Attenuation	LOW	
(4) Floodplain Access	LOW	
(4) Wooded Riparian Buffer	HIGH	
(4) Microtopography	NA	
(3) Stream Stability	LOW	
(4) Channel Stability	LOW	
(4) Sediment Transport	MEDIUM	
(4) Stream Geomorphology	MEDIUM	
(2) Stream/Intertidal Zone Interaction	NA	
(2) Longitudinal Tidal Flow	NA	
(2) Tidal Marsh Stream Stability	NA	
(3) Tidal Marsh Channel Stability	NA	
(3) Tidal Marsh Stream Geomorphology	NA	
(1) Water Quality	LOW	
(2) Baseflow	MEDIUM	
(2) Streamside Area Vegetation	HIGH	
(3) Upland Pollutant Filtration	HIGH	
(3) Thermoregulation	HIGH	
(2) Indicators of Stressors	YES	
(2) Aquatic Life Tolerance	LOW	
(2) Intertidal Zone Filtration	NA	
(1) Habitat	HIGH	
(2) In-stream Habitat	MEDIUM	
(3) Baseflow	MEDIUM	
(3) Substrate	MEDIUM	
(3) Stream Stability	LOW	
(3) In-stream Habitat	MEDIUM	
(2) Stream-side Habitat	HIGH	
(3) Stream-side Habitat	MEDIUM	
(3) Thermoregulation	HIGH	
(2) Tidal Marsh In-stream Habitat	NA	
(3) Flow Restriction	NA	
(3) Tidal Marsh Stream Stability	NA	
(4) Tidal Marsh Channel Stability	NA	
(4) Tidal Marsh Stream Geomorphology	NA	
(3) Tidal Marsh In-stream Habitat	NA	
(2) Intertidal Zone	NA	
Overall	LOW	

NC SAM FIELD ASSESSMENT RESULTS
Accompanies User Manual Version 2.1

USACE AID #:	NCDWR #:		
<p>INSTRUCTIONS: Attach a sketch of the assessment area and photographs. Attach a copy of the USGS 7.5-minute topographic quadrangle, and circle the location of the stream reach under evaluation. If multiple stream reaches will be evaluated on the same property, identify and number all reaches on the attached map, and include a separate form for each reach. See the NC SAM User Manual for detailed descriptions and explanations of requested information. Record in the "Notes/Sketch" section if supplementary measurements were performed. See the NC SAM User Manual for examples of additional measurements that may be relevant.</p> <p>NOTE EVIDENCE OF STRESSORS AFFECTING THE ASSESSMENT AREA (do not need to be within the assessment area).</p> <p>PROJECT/SITE INFORMATION:</p>			
1. Project name (if any):	I-5338	2. Date of evaluation:	9/27/16
3. Applicant/owner name:	NCDOT	4. Assessor name/organization:	WBC, JD,CSU
5. County:	Wake	6. Nearest named water body on USGS 7.5-minute quad:	Lake Johnson
7. River basin:	Neuse	8. Site coordinates (decimal degrees, at lower end of assessment reach):	
STREAM INFORMATION: (depth and width can be approximations)			
9. Site number (show on attached map):	SAM 2	10. Length of assessment reach evaluated (feet):	120ft
11. Channel depth from bed (in riffle, if present) to top of bank (feet):	6 feet	<input type="checkbox"/> Unable to assess channel depth.	
12. Channel width at top of bank (feet):	8 feet	13. Is assessment reach a swamp steam? <input type="checkbox"/> Yes <input type="checkbox"/> No	
14. Feature type: <input checked="" type="checkbox"/> Perennial flow <input type="checkbox"/> Intermittent flow <input type="checkbox"/> Tidal Marsh Stream			
STREAM CATEGORY INFORMATION:			
15. NC SAM Zone: <input type="checkbox"/> Mountains (M) <input checked="" type="checkbox"/> Piedmont (P) <input type="checkbox"/> Inner Coastal Plain (I) <input type="checkbox"/> Outer Coastal Plain (O)			
16. Estimated geomorphic valley shape (skip for Tidal Marsh Stream):	<input type="checkbox"/> A 	<input checked="" type="checkbox"/> B 	
	(more sinuous stream, flatter valley slope)	(less sinuous stream, steeper valley slope)	
17. Watershed size: (skip for Tidal Marsh Stream)	<input checked="" type="checkbox"/> Size 1 (< 0.1 mi ²) <input type="checkbox"/> Size 2 (0.1 to < 0.5 mi ²) <input type="checkbox"/> Size 3 (0.5 to < 5 mi ²) <input type="checkbox"/> Size 4 (≥ 5 mi ²)		
ADDITIONAL INFORMATION:			
18. Were regulatory considerations evaluated? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No If Yes, check all that apply to the assessment area.			
<input type="checkbox"/> Section 10 water	<input type="checkbox"/> Classified Trout Waters	<input type="checkbox"/> Water Supply Watershed (<input type="checkbox"/> I <input type="checkbox"/> II <input type="checkbox"/> III <input type="checkbox"/> IV <input type="checkbox"/> V)	
<input type="checkbox"/> Essential Fish Habitat	<input type="checkbox"/> Primary Nursery Area	<input type="checkbox"/> High Quality Waters/Outstanding Resource Waters	
<input type="checkbox"/> Publicly owned property	<input checked="" type="checkbox"/> NCDWR Riparian buffer rule in effect	<input type="checkbox"/> Nutrient Sensitive Waters	
<input type="checkbox"/> Anadromous fish	<input checked="" type="checkbox"/> 303(d) List	<input type="checkbox"/> CAMA Area of Environmental Concern (AEC)	
<input type="checkbox"/> Documented presence of a federal and/or state listed protected species within the assessment area.			
List species: _____			
<input type="checkbox"/> Designated Critical Habitat (list species) _____			
19. Are additional stream information/supplementary measurements included in "Notes/Sketch" section or attached? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No			

1. **Channel Water – assessment reach metric (skip for Size 1 streams and Tidal Marsh Streams)**
 - A Water throughout assessment reach.
 - B No flow, water in pools only.
 - C No water in assessment reach.

2. **Evidence of Flow Restriction – assessment reach metric**
 - A At least 10% of assessment reach in-stream habitat or riffle-pool sequence is severely affected by a flow restriction or fill to the point of obstructing flow or a channel choked with aquatic macrophytes or ponded water or impoundment on flood or ebb within the assessment reach (examples: undersized or perched culverts, causeways that constrict the channel, tidal gates, debris jams, beaver dams).
 - B Not A

3. **Feature Pattern – assessment reach metric**
 - A A majority of the assessment reach has altered pattern (examples: straightening, modification above or below culvert).
 - B Not A

4. **Feature Longitudinal Profile – assessment reach metric**
 - A Majority of assessment reach has a substantially altered stream profile (examples: channel down-cutting, existing damming, over widening, active aggradation, dredging, and excavation where appropriate channel profile has not reformed from any of these disturbances).
 - B Not A

5. **Signs of Active Instability – assessment reach metric**

Consider only current instability, not past events from which the stream has currently recovered. Examples of instability include active bank failure, active channel down-cutting (head-cut), active widening, and artificial hardening (such as concrete, gabion, rip-rap).

 - A < 10% of channel unstable
 - B 10 to 25% of channel unstable
 - C > 25% of channel unstable

6. Streamside Area Interaction – streamside area metric

Consider for the Left Bank (LB) and the Right Bank (RB).

- LB RB
A A Little or no evidence of conditions that adversely affect reference interaction
B B Moderate evidence of conditions (examples: berms, levees, down-cutting, aggradation, dredging) that adversely affect reference interaction
C C Extensive evidence of conditions that adversely affect reference interaction

7. Water Quality Stressors – assessment reach/intertidal zone metric

Check all that apply.

- A Discolored water in stream or intertidal zone (milky white, blue, unnatural water discoloration, oil sheen, stream foam)
B Excessive sedimentation (burying of stream features or intertidal zone)
C Noticeable evidence of pollutant discharges entering the assessment reach and causing a water quality problem
D Odor (not including natural sulfide odors)
E Current published or collected data indicating degraded water quality in the assessment reach.
F Livestock with access to stream or intertidal zone
G Excessive algae in stream or intertidal zone
H Degraded marsh vegetation in the intertidal zone (removal, burning, regular mowing, destruction, etc)
I Other:
J Little to no stressors

8. Recent Weather – watershed metric (skip for Tidal Marsh Streams)

For Size 1 or 2 streams, D1 drought or higher is considered a drought; for Size 3 or 4 streams, D2 drought or higher is considered a drought.

- A Drought conditions and no rainfall or rainfall not exceeding 1 inch within the last 48 hours
B Drought conditions and rainfall exceeding 1 inch within the last 48 hours
C No drought conditions

9. Large or Dangerous Stream – assessment reach metric

Yes No Is stream is too large or dangerous to assess? If Yes, skip to Metric 13 (Streamside Area Ground Surface Condition).

10. Natural In-stream Habitat Types – assessment reach metric

10a. Yes No Degraded in-stream habitat over majority of the assessment reach (examples of stressors include excessive sedimentation, mining, excavation, in-stream hardening [for example, rip-rap], recent dredging, and snagging) (evaluate for Size 4 Coastal Plain streams only, then skip to Metric 12)

10b. Check all that occur (occurs if > 5% coverage of assessment reach) (skip for Size 4 Coastal Plain streams)

- A Multiple aquatic macrophytes and aquatic mosses (include liverworts, lichens, and algal mats)
B Multiple sticks and/or leaf packs and/or emergent vegetation
C Multiple snags and logs (including lap trees)
D 5% undercut banks and/or root mats and/or roots in banks extend to the normal wetted perimeter
E Little or no habitat
F 5% oysters or other natural hard bottoms
G Submerged aquatic vegetation
H Low-tide refugia (pools)
I Sand bottom
J 5% vertical bank along the marsh
K Little or no habitat

*****REMAINING QUESTIONS ARE NOT APPLICABLE FOR TIDAL MARSH STREAMS*****

11. Bedform and Substrate – assessment reach metric (skip for Size 4 Coastal Plain streams and Tidal Marsh Streams)

11a. Yes No Is assessment reach in a natural sand-bed stream? (skip for Coastal Plain streams)

11b. Bedform evaluated. Check the appropriate box(es).

- A Riffle-run section (evaluate 11c)
B Pool-glide section (evaluate 11d)
C Natural bedform absent (skip to Metric 12, Aquatic Life)

11c. In riffle sections, check all that occur below the normal wetted perimeter of the assessment reach – whether or not submerged. Check at least one box in each row (skip for Size 4 Coastal Plain streams and Tidal Marsh Streams). Not Present (NP) = absent, Rare (R) = present but <= 10%, Common (C) = > 10-40%, Abundant (A) = > 40-70%, Predominant (P) = > 70%. Cumulative percentages should not exceed 100% for each assessment reach.

Table with 5 columns (NP, R, C, A, P) and 7 rows of substrate types: Bedrock/saprolite, Boulder (256 – 4096 mm), Cobble (64 – 256 mm), Gravel (2 – 64 mm), Sand (.062 – 2 mm), Silt/clay (< 0.062 mm), Detritus, Artificial (rip-rap, concrete, etc.)

11d. Yes No Are pools filled with sediment? (skip for Size 4 Coastal Plain streams and Tidal Marsh Streams)

12. Aquatic Life – assessment reach metric (skip for Tidal Marsh Streams)

- 12a. Yes No Was an in-stream aquatic life assessment performed as described in the User Manual?
If No, select one of the following reasons and skip to Metric 13. No Water Other: _____
- 12b. Yes No Are aquatic organisms present in the assessment reach (look in riffles, pools, then snags)? If Yes, check all that apply. If No, skip to Metric 13.

- 1 >1 Numbers over columns refer to "individuals" for Size 1 and 2 streams and "taxa" for Size 3 and 4 streams.
- Adult frogs
 - Aquatic reptiles
 - Aquatic macrophytes and aquatic mosses (include liverworts, lichens, and algal mats)
 - Beetles
 - Caddisfly larvae (T)
 - Asian clam (*Corbicula*)
 - Crustacean (isopod/amphipod/crayfish/shrimp)
 - Damselfly and dragonfly larvae
 - Dipterans
 - Mayfly larvae (E)
 - Megaloptera (alderfly, fishfly, dobsonfly larvae)
 - Midges/mosquito larvae
 - Mosquito fish (*Gambusia*) or mud minnows (*Umbra pygmaea*)
 - Mussels/Clams (not *Corbicula*)
 - Other fish
 - Salamanders/tadpoles
 - Snails
 - Stonefly larvae (P)
 - Tipulid larvae
 - Worms/leeches

13. Streamside Area Ground Surface Condition – streamside area metric (skip for Tidal Marsh Streams and B valley types)

Consider for the Left Bank (LB) and the Right Bank (RB). Consider storage capacity with regard to both overbank flow and upland runoff.

- | LB | RB | |
|----------------------------|----------------------------|--|
| <input type="checkbox"/> A | <input type="checkbox"/> A | Little or no alteration to water storage capacity over a majority of the streamside area |
| <input type="checkbox"/> B | <input type="checkbox"/> B | Moderate alteration to water storage capacity over a majority of the streamside area |
| <input type="checkbox"/> C | <input type="checkbox"/> C | Severe alteration to water storage capacity over a majority of the streamside area (examples: ditches, fill, soil compaction, livestock disturbance, buildings, man-made levees, drainage pipes) |

14. Streamside Area Water Storage – streamside area metric (skip for Size 1 streams, Tidal Marsh Streams, and B valley types)

Consider for the Left Bank (LB) and the Right Bank (RB) of the streamside area.

- | LB | RB | |
|----------------------------|----------------------------|--|
| <input type="checkbox"/> A | <input type="checkbox"/> A | Majority of streamside area with depressions able to pond water \geq 6 inches deep |
| <input type="checkbox"/> B | <input type="checkbox"/> B | Majority of streamside area with depressions able to pond water 3 to 6 inches deep |
| <input type="checkbox"/> C | <input type="checkbox"/> C | Majority of streamside area with depressions able to pond water < 3 inches deep |

15. Wetland Presence – streamside area metric (skip for Tidal Marsh Streams)

Consider for the Left Bank (LB) and the Right Bank (RB). Do not consider wetlands outside of the streamside area or within the normal wetted perimeter of assessment reach.

- | LB | RB | |
|---------------------------------------|---------------------------------------|--|
| <input type="checkbox"/> Y | <input type="checkbox"/> Y | Are wetlands present in the streamside area? |
| <input checked="" type="checkbox"/> N | <input checked="" type="checkbox"/> N | |

16. Baseflow Contributors – assessment reach metric (skip for Size 4 streams and Tidal Marsh Streams)

Check all contributors within the assessment reach or within view of and draining to the assessment reach.

- A Streams and/or springs (jurisdictional discharges)
- B Ponds (include wet detention basins; do not include sediment basins or dry detention basins)
- C Obstruction passing flow during low-flow periods within the assessment area (beaver dam, leaky dam, bottom-release dam, weir)
- D Evidence of bank seepage or sweating (iron in water indicates seepage)
- E Stream bed or bank soil reduced (dig through deposited sediment if present)
- F None of the above

17. Baseflow Detractors – assessment area metric (skip for Tidal Marsh Streams)

Check all that apply.

- A Evidence of substantial water withdrawals from the assessment reach (includes areas excavated for pump installation)
- B Obstruction not passing flow during low-flow periods affecting the assessment reach (ex: watertight dam, sediment deposit)
- C Urban stream (\geq 24% impervious surface for watershed)
- D Evidence that the streamside area has been modified resulting in accelerated drainage into the assessment reach
- E Assessment reach relocated to valley edge
- F None of the above

18. Shading – assessment reach metric (skip for Tidal Marsh Streams)

Consider aspect. Consider "leaf-on" condition.

- A Stream shading is appropriate for stream category (may include gaps associated with natural processes)
- B Degraded (example: scattered trees)
- C Stream shading is gone or largely absent

19. Buffer Width – streamside area metric (skip for Tidal Marsh Streams)

Consider “vegetated buffer” and “wooded buffer” separately for left bank (LB) and right bank (RB) starting at the top of bank out to the first break.

Vegetated		Wooded		
LB	RB	LB	RB	
<input type="checkbox"/> A	<input type="checkbox"/> A	<input type="checkbox"/> A	<input type="checkbox"/> A	≥ 100 feet wide <u>or</u> extends to the edge of the watershed
<input checked="" type="checkbox"/> B	<input type="checkbox"/> B	<input checked="" type="checkbox"/> B	<input type="checkbox"/> B	From 50 to < 100 feet wide
<input type="checkbox"/> C	<input checked="" type="checkbox"/> C	<input type="checkbox"/> C	<input checked="" type="checkbox"/> C	From 30 to < 50 feet wide
<input type="checkbox"/> D	<input type="checkbox"/> D	<input type="checkbox"/> D	<input type="checkbox"/> D	From 10 to < 30 feet wide
<input type="checkbox"/> E	<input type="checkbox"/> E	<input type="checkbox"/> E	<input type="checkbox"/> E	< 10 feet wide <u>or</u> no trees

20. Buffer Structure – streamside area metric (skip for Tidal Marsh Streams)

Consider for left bank (LB) and right bank (RB) for Metric 19 (“Vegetated” Buffer Width).

LB	RB	
<input checked="" type="checkbox"/> A	<input checked="" type="checkbox"/> A	Mature forest
<input type="checkbox"/> B	<input type="checkbox"/> B	Non-mature woody vegetation <u>or</u> modified vegetation structure
<input type="checkbox"/> C	<input type="checkbox"/> C	Herbaceous vegetation with or without a strip of trees < 10 feet wide
<input type="checkbox"/> D	<input type="checkbox"/> D	Maintained shrubs
<input type="checkbox"/> E	<input type="checkbox"/> E	Little or no vegetation

21. Buffer Stressors – streamside area metric (skip for Tidal Marsh Streams)

Check all appropriate boxes for left bank (LB) and right bank (RB). Indicate if listed stressor abuts stream (Abuts), does not abut but is within 30 feet of stream (< 30 feet), or is between 30 to 50 feet of stream (30-50 feet).

If none of the following stressors occurs on either bank, check here and skip to Metric 22:

Abuts		< 30 feet		30-50 feet		
LB	RB	LB	RB	LB	RB	
<input type="checkbox"/> A	Row crops					
<input type="checkbox"/> B	Maintained turf					
<input type="checkbox"/> C	Pasture (no livestock)/commercial horticulture					
<input type="checkbox"/> D	Pasture (active livestock use)					

22. Stem Density – streamside area metric (skip for Tidal Marsh Streams)

Consider for left bank (LB) and right bank (RB) for Metric 19 (“Wooded” Buffer Width).

LB	RB	
<input checked="" type="checkbox"/> A	<input checked="" type="checkbox"/> A	Medium to high stem density
<input type="checkbox"/> B	<input type="checkbox"/> B	Low stem density
<input type="checkbox"/> C	<input type="checkbox"/> C	No wooded riparian buffer <u>or</u> predominantly herbaceous species <u>or</u> bare ground

23. Continuity of Vegetated Buffer – streamside area metric (skip for Tidal Marsh Streams)

Consider whether vegetated buffer is continuous along stream (parallel). Breaks are areas lacking vegetation > 10 feet wide.

LB	RB	
<input checked="" type="checkbox"/> A	<input checked="" type="checkbox"/> A	The total length of buffer breaks is < 25 percent.
<input type="checkbox"/> B	<input type="checkbox"/> B	The total length of buffer breaks is between 25 and 50 percent.
<input type="checkbox"/> C	<input type="checkbox"/> C	The total length of buffer breaks is > 50 percent.

24. Vegetative Composition – streamside area metric (skip for Tidal Marsh Streams)

Evaluate the dominant vegetation within 100 feet of each bank or to the edge of the watershed (whichever comes first) as it contributes to assessment reach habitat.

LB	RB	
<input checked="" type="checkbox"/> A	<input checked="" type="checkbox"/> A	Vegetation is close to undisturbed in species present and their proportions. Lower strata composed of native species, with non-native invasive species absent or sparse.
<input type="checkbox"/> B	<input type="checkbox"/> B	Vegetation indicates disturbance in terms of species diversity or proportions, but is still largely composed of native species. This may include communities of weedy native species that develop after clear-cutting or clearing <u>or</u> communities with non-native invasive species present, but not dominant, over a large portion of the expected strata <u>or</u> communities missing understory but retaining canopy trees.
<input type="checkbox"/> C	<input type="checkbox"/> C	Vegetation is severely disturbed in terms of species diversity or proportions. Mature canopy is absent <u>or</u> communities with non-native invasive species dominant over a large portion of expected strata <u>or</u> communities composed of planted stands of non-characteristic species <u>or</u> communities inappropriately composed of a single species <u>or</u> no vegetation.

25. Conductivity – assessment reach metric (skip for all Coastal Plain streams)

25a. Yes No Was conductivity measurement recorded?
If No, select one of the following reasons. No Water Other: _____

25b. Check the box corresponding to the conductivity measurement (units of microsiemens per centimeter).
A < 46 B 46 to < 67 C 67 to < 79 D 79 to < 230 E ≥ 230

Notes/Sketch:

Draft NC SAM Stream Rating Sheet
Accompanies User Manual Version 2.1

Stream Site Name I-5338 Date of Assessment 9/27/16
 Stream Category Pb1 Assessor Name/Organization WBC, JD,CSU

Notes of Field Assessment Form (Y/N) NO
 Presence of regulatory considerations (Y/N) NO
 Additional stream information/supplementary measurements included (Y/N) NO
 NC SAM feature type (perennial, intermittent, Tidal Marsh Stream) Perennial

Function Class Rating Summary	USACE/ All Streams	NCDWR Intermittent
(1) Hydrology	LOW	
(2) Baseflow	MEDIUM	
(2) Flood Flow	LOW	
(3) Streamside Area Attenuation	LOW	
(4) Floodplain Access	LOW	
(4) Wooded Riparian Buffer	HIGH	
(4) Microtopography	NA	
(3) Stream Stability	LOW	
(4) Channel Stability	LOW	
(4) Sediment Transport	LOW	
(4) Stream Geomorphology	MEDIUM	
(2) Stream/Intertidal Zone Interaction	NA	
(2) Longitudinal Tidal Flow	NA	
(2) Tidal Marsh Stream Stability	NA	
(3) Tidal Marsh Channel Stability	NA	
(3) Tidal Marsh Stream Geomorphology	NA	
(1) Water Quality	LOW	
(2) Baseflow	MEDIUM	
(2) Streamside Area Vegetation	HIGH	
(3) Upland Pollutant Filtration	HIGH	
(3) Thermoregulation	HIGH	
(2) Indicators of Stressors	YES	
(2) Aquatic Life Tolerance	LOW	
(2) Intertidal Zone Filtration	NA	
(1) Habitat	MEDIUM	
(2) In-stream Habitat	LOW	
(3) Baseflow	MEDIUM	
(3) Substrate	LOW	
(3) Stream Stability	LOW	
(3) In-stream Habitat	LOW	
(2) Stream-side Habitat	HIGH	
(3) Stream-side Habitat	MEDIUM	
(3) Thermoregulation	HIGH	
(2) Tidal Marsh In-stream Habitat	NA	
(3) Flow Restriction	NA	
(3) Tidal Marsh Stream Stability	NA	
(4) Tidal Marsh Channel Stability	NA	
(4) Tidal Marsh Stream Geomorphology	NA	
(3) Tidal Marsh In-stream Habitat	NA	
(2) Intertidal Zone	NA	
Overall	LOW	

NC SAM FIELD ASSESSMENT RESULTS
Accompanies User Manual Version 2.1

USACE AID #:	NCDWR #:		
<p>INSTRUCTIONS: Attach a sketch of the assessment area and photographs. Attach a copy of the USGS 7.5-minute topographic quadrangle, and circle the location of the stream reach under evaluation. If multiple stream reaches will be evaluated on the same property, identify and number all reaches on the attached map, and include a separate form for each reach. See the NC SAM User Manual for detailed descriptions and explanations of requested information. Record in the "Notes/Sketch" section if supplementary measurements were performed. See the NC SAM User Manual for examples of additional measurements that may be relevant.</p> <p>NOTE EVIDENCE OF STRESSORS AFFECTING THE ASSESSMENT AREA (do not need to be within the assessment area).</p> <p>PROJECT/SITE INFORMATION:</p>			
1. Project name (if any):	I-5338	2. Date of evaluation:	9/27/16
3. Applicant/owner name:	NCDOT	4. Assessor name/organization:	WBC, JD,CSU
5. County:	Wake	6. Nearest named water body on USGS 7.5-minute quad:	Lake Johnson
7. River basin:	Neuse	8. Site coordinates (decimal degrees, at lower end of assessment reach):	
STREAM INFORMATION: (depth and width can be approximations)			
9. Site number (show on attached map):	SAM 3	10. Length of assessment reach evaluated (feet):	150ft
11. Channel depth from bed (in riffle, if present) to top of bank (feet):	8 feet	<input type="checkbox"/> Unable to assess channel depth.	
12. Channel width at top of bank (feet):	12 feet	13. Is assessment reach a swamp steam?	<input type="checkbox"/> Yes <input type="checkbox"/> No
14. Feature type: <input checked="" type="checkbox"/> Perennial flow <input type="checkbox"/> Intermittent flow <input type="checkbox"/> Tidal Marsh Stream			
STREAM CATEGORY INFORMATION:			
15. NC SAM Zone: <input type="checkbox"/> Mountains (M) <input checked="" type="checkbox"/> Piedmont (P) <input type="checkbox"/> Inner Coastal Plain (I) <input type="checkbox"/> Outer Coastal Plain (O)			
16. Estimated geomorphic valley shape (skip for Tidal Marsh Stream):	<input type="checkbox"/> A 	<input checked="" type="checkbox"/> B 	
	(more sinuous stream, flatter valley slope)	(less sinuous stream, steeper valley slope)	
17. Watershed size: (skip for Tidal Marsh Stream)	<input checked="" type="checkbox"/> Size 1 (< 0.1 mi ²)	<input type="checkbox"/> Size 2 (0.1 to < 0.5 mi ²)	<input type="checkbox"/> Size 3 (0.5 to < 5 mi ²) <input type="checkbox"/> Size 4 (≥ 5 mi ²)
ADDITIONAL INFORMATION:			
18. Were regulatory considerations evaluated? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No If Yes, check all that apply to the assessment area.			
<input type="checkbox"/> Section 10 water	<input type="checkbox"/> Classified Trout Waters	<input type="checkbox"/> Water Supply Watershed (<input type="checkbox"/> I <input type="checkbox"/> II <input type="checkbox"/> III <input type="checkbox"/> IV <input type="checkbox"/> V)	
<input type="checkbox"/> Essential Fish Habitat	<input type="checkbox"/> Primary Nursery Area	<input type="checkbox"/> High Quality Waters/Outstanding Resource Waters	
<input type="checkbox"/> Publicly owned property	<input checked="" type="checkbox"/> NCDWR Riparian buffer rule in effect	<input type="checkbox"/> Nutrient Sensitive Waters	
<input type="checkbox"/> Anadromous fish	<input checked="" type="checkbox"/> 303(d) List	<input type="checkbox"/> CAMA Area of Environmental Concern (AEC)	
<input type="checkbox"/> Documented presence of a federal and/or state listed protected species within the assessment area.			
List species: _____			
<input type="checkbox"/> Designated Critical Habitat (list species) _____			
19. Are additional stream information/supplementary measurements included in "Notes/Sketch" section or attached? <input type="checkbox"/> Yes <input type="checkbox"/> No			

1. **Channel Water – assessment reach metric (skip for Size 1 streams and Tidal Marsh Streams)**
 - A Water throughout assessment reach.
 - B No flow, water in pools only.
 - C No water in assessment reach.

2. **Evidence of Flow Restriction – assessment reach metric**
 - A At least 10% of assessment reach in-stream habitat or riffle-pool sequence is severely affected by a flow restriction or fill to the point of obstructing flow or a channel choked with aquatic macrophytes or ponded water or impoundment on flood or ebb within the assessment reach (examples: undersized or perched culverts, causeways that constrict the channel, tidal gates, debris jams, beaver dams).
 - B Not A

3. **Feature Pattern – assessment reach metric**
 - A A majority of the assessment reach has altered pattern (examples: straightening, modification above or below culvert).
 - B Not A

4. **Feature Longitudinal Profile – assessment reach metric**
 - A Majority of assessment reach has a substantially altered stream profile (examples: channel down-cutting, existing damming, over widening, active aggradation, dredging, and excavation where appropriate channel profile has not reformed from any of these disturbances).
 - B Not A

5. **Signs of Active Instability – assessment reach metric**

Consider only current instability, not past events from which the stream has currently recovered. Examples of instability include active bank failure, active channel down-cutting (head-cut), active widening, and artificial hardening (such as concrete, gabion, rip-rap).

 - A < 10% of channel unstable
 - B 10 to 25% of channel unstable
 - C > 25% of channel unstable

6. Streamside Area Interaction – streamside area metric

Consider for the Left Bank (LB) and the Right Bank (RB).

- LB RB
A A Little or no evidence of conditions that adversely affect reference interaction
B B Moderate evidence of conditions (examples: berms, levees, down-cutting, aggradation, dredging) that adversely affect reference interaction
C C Extensive evidence of conditions that adversely affect reference interaction

7. Water Quality Stressors – assessment reach/intertidal zone metric

Check all that apply.

- A Discolored water in stream or intertidal zone (milky white, blue, unnatural water discoloration, oil sheen, stream foam)
B Excessive sedimentation (burying of stream features or intertidal zone)
C Noticeable evidence of pollutant discharges entering the assessment reach and causing a water quality problem
D Odor (not including natural sulfide odors)
E Current published or collected data indicating degraded water quality in the assessment reach.
F Livestock with access to stream or intertidal zone
G Excessive algae in stream or intertidal zone
H Degraded marsh vegetation in the intertidal zone
I Other:
J Little to no stressors

8. Recent Weather – watershed metric (skip for Tidal Marsh Streams)

For Size 1 or 2 streams, D1 drought or higher is considered a drought; for Size 3 or 4 streams, D2 drought or higher is considered a drought.

- A Drought conditions and no rainfall or rainfall not exceeding 1 inch within the last 48 hours
B Drought conditions and rainfall exceeding 1 inch within the last 48 hours
C No drought conditions

9. Large or Dangerous Stream – assessment reach metric

Yes No Is stream is too large or dangerous to assess? If Yes, skip to Metric 13 (Streamside Area Ground Surface Condition).

10. Natural In-stream Habitat Types – assessment reach metric

10a. Yes No Degraded in-stream habitat over majority of the assessment reach (examples of stressors include excessive sedimentation, mining, excavation, in-stream hardening [for example, rip-rap], recent dredging, and snagging) (evaluate for Size 4 Coastal Plain streams only, then skip to Metric 12)

10b. Check all that occur (occurs if > 5% coverage of assessment reach) (skip for Size 4 Coastal Plain streams)

- A Multiple aquatic macrophytes and aquatic mosses (include liverworts, lichens, and algal mats)
B Multiple sticks and/or leaf packs and/or emergent vegetation
C Multiple snags and logs (including lap trees)
D 5% undercut banks and/or root mats and/or roots in banks extend to the normal wetted perimeter
E Little or no habitat
F 5% oysters or other natural hard bottoms
G Submerged aquatic vegetation
H Low-tide refugia (pools)
I Sand bottom
J 5% vertical bank along the marsh
K Little or no habitat

*****REMAINING QUESTIONS ARE NOT APPLICABLE FOR TIDAL MARSH STREAMS*****

11. Bedform and Substrate – assessment reach metric (skip for Size 4 Coastal Plain streams and Tidal Marsh Streams)

11a. Yes No Is assessment reach in a natural sand-bed stream? (skip for Coastal Plain streams)

11b. Bedform evaluated. Check the appropriate box(es).

- A Riffle-run section (evaluate 11c)
B Pool-glide section (evaluate 11d)
C Natural bedform absent (skip to Metric 12, Aquatic Life)

11c. In riffle sections, check all that occur below the normal wetted perimeter of the assessment reach – whether or not submerged. Check at least one box in each row (skip for Size 4 Coastal Plain streams and Tidal Marsh Streams). Not Present (NP) = absent, Rare (R) = present but <= 10%, Common (C) = > 10-40%, Abundant (A) = > 40-70%, Predominant (P) = > 70%. Cumulative percentages should not exceed 100% for each assessment reach.

Table with 5 columns (NP, R, C, A, P) and 7 rows of substrate types: Bedrock/saprolite, Boulder (256 – 4096 mm), Cobble (64 – 256 mm), Gravel (2 – 64 mm), Sand (.062 – 2 mm), Silt/clay (< 0.062 mm), Detritus, Artificial (rip-rap, concrete, etc.)

11d. Yes No Are pools filled with sediment? (skip for Size 4 Coastal Plain streams and Tidal Marsh Streams)

12. Aquatic Life – assessment reach metric (skip for Tidal Marsh Streams)

- 12a. Yes No Was an in-stream aquatic life assessment performed as described in the User Manual?
If No, select one of the following reasons and skip to Metric 13. No Water Other: _____
- 12b. Yes No Are aquatic organisms present in the assessment reach (look in riffles, pools, then snags)? If Yes, check all that apply. If No, skip to Metric 13.

- 1 >1 Numbers over columns refer to "individuals" for Size 1 and 2 streams and "taxa" for Size 3 and 4 streams.
- Adult frogs
 - Aquatic reptiles
 - Aquatic macrophytes and aquatic mosses (include liverworts, lichens, and algal mats)
 - Beetles
 - Caddisfly larvae (T)
 - Asian clam (*Corbicula*)
 - Crustacean (isopod/amphipod/crayfish/shrimp)
 - Damselfly and dragonfly larvae
 - Dipterans
 - Mayfly larvae (E)
 - Megaloptera (alderfly, fishfly, dobsonfly larvae)
 - Midges/mosquito larvae
 - Mosquito fish (*Gambusia*) or mud minnows (*Umbra pygmaea*)
 - Mussels/Clams (not *Corbicula*)
 - Other fish
 - Salamanders/tadpoles
 - Snails
 - Stonefly larvae (P)
 - Tipulid larvae
 - Worms/leeches

13. Streamside Area Ground Surface Condition – streamside area metric (skip for Tidal Marsh Streams and B valley types)

Consider for the Left Bank (LB) and the Right Bank (RB). Consider storage capacity with regard to both overbank flow and upland runoff.

- | | | |
|----------------------------|----------------------------|--|
| LB | RB | |
| <input type="checkbox"/> A | <input type="checkbox"/> A | Little or no alteration to water storage capacity over a majority of the streamside area |
| <input type="checkbox"/> B | <input type="checkbox"/> B | Moderate alteration to water storage capacity over a majority of the streamside area |
| <input type="checkbox"/> C | <input type="checkbox"/> C | Severe alteration to water storage capacity over a majority of the streamside area (examples: ditches, fill, soil compaction, livestock disturbance, buildings, man-made levees, drainage pipes) |

14. Streamside Area Water Storage – streamside area metric (skip for Size 1 streams, Tidal Marsh Streams, and B valley types)

Consider for the Left Bank (LB) and the Right Bank (RB) of the streamside area.

- | | | |
|----------------------------|----------------------------|--|
| LB | RB | |
| <input type="checkbox"/> A | <input type="checkbox"/> A | Majority of streamside area with depressions able to pond water ≥ 6 inches deep |
| <input type="checkbox"/> B | <input type="checkbox"/> B | Majority of streamside area with depressions able to pond water 3 to 6 inches deep |
| <input type="checkbox"/> C | <input type="checkbox"/> C | Majority of streamside area with depressions able to pond water < 3 inches deep |

15. Wetland Presence – streamside area metric (skip for Tidal Marsh Streams)

Consider for the Left Bank (LB) and the Right Bank (RB). Do not consider wetlands outside of the streamside area or within the normal wetted perimeter of assessment reach.

- | | | |
|---------------------------------------|---------------------------------------|--|
| LB | RB | |
| <input type="checkbox"/> Y | <input type="checkbox"/> Y | Are wetlands present in the streamside area? |
| <input checked="" type="checkbox"/> N | <input checked="" type="checkbox"/> N | |

16. Baseflow Contributors – assessment reach metric (skip for Size 4 streams and Tidal Marsh Streams)

Check all contributors within the assessment reach or within view of and draining to the assessment reach.

- A Streams and/or springs (jurisdictional discharges)
- B Ponds (include wet detention basins; do not include sediment basins or dry detention basins)
- C Obstruction passing flow during low-flow periods within the assessment area (beaver dam, leaky dam, bottom-release dam, weir)
- D Evidence of bank seepage or sweating (iron in water indicates seepage)
- E Stream bed or bank soil reduced (dig through deposited sediment if present)
- F None of the above

17. Baseflow Detractors – assessment area metric (skip for Tidal Marsh Streams)

Check all that apply.

- A Evidence of substantial water withdrawals from the assessment reach (includes areas excavated for pump installation)
- B Obstruction not passing flow during low-flow periods affecting the assessment reach (ex: watertight dam, sediment deposit)
- C Urban stream (≥ 24% impervious surface for watershed)
- D Evidence that the streamside area has been modified resulting in accelerated drainage into the assessment reach
- E Assessment reach relocated to valley edge
- F None of the above

18. Shading – assessment reach metric (skip for Tidal Marsh Streams)

Consider aspect. Consider "leaf-on" condition.

- A Stream shading is appropriate for stream category (may include gaps associated with natural processes)
- B Degraded (example: scattered trees)
- C Stream shading is gone or largely absent

19. Buffer Width – streamside area metric (skip for Tidal Marsh Streams)

Consider “vegetated buffer” and “wooded buffer” separately for left bank (LB) and right bank (RB) starting at the top of bank out to the first break.

Vegetated		Wooded		
LB	RB	LB	RB	
<input type="checkbox"/> A	<input type="checkbox"/> A	<input type="checkbox"/> A	<input type="checkbox"/> A	≥ 100 feet wide <u>or</u> extends to the edge of the watershed
<input checked="" type="checkbox"/> B	<input checked="" type="checkbox"/> B	<input checked="" type="checkbox"/> B	<input type="checkbox"/> B	From 50 to < 100 feet wide
<input type="checkbox"/> C	<input type="checkbox"/> C	<input type="checkbox"/> C	<input checked="" type="checkbox"/> C	From 30 to < 50 feet wide
<input type="checkbox"/> D	<input type="checkbox"/> D	<input type="checkbox"/> D	<input type="checkbox"/> D	From 10 to < 30 feet wide
<input type="checkbox"/> E	<input type="checkbox"/> E	<input type="checkbox"/> E	<input type="checkbox"/> E	< 10 feet wide <u>or</u> no trees

20. Buffer Structure – streamside area metric (skip for Tidal Marsh Streams)

Consider for left bank (LB) and right bank (RB) for Metric 19 (“Vegetated” Buffer Width).

LB	RB	
<input checked="" type="checkbox"/> A	<input checked="" type="checkbox"/> A	Mature forest
<input type="checkbox"/> B	<input type="checkbox"/> B	Non-mature woody vegetation <u>or</u> modified vegetation structure
<input type="checkbox"/> C	<input type="checkbox"/> C	Herbaceous vegetation with or without a strip of trees < 10 feet wide
<input type="checkbox"/> D	<input type="checkbox"/> D	Maintained shrubs
<input type="checkbox"/> E	<input type="checkbox"/> E	Little or no vegetation

21. Buffer Stressors – streamside area metric (skip for Tidal Marsh Streams)

Check all appropriate boxes for left bank (LB) and right bank (RB). Indicate if listed stressor abuts stream (Abuts), does not abut but is within 30 feet of stream (< 30 feet), or is between 30 to 50 feet of stream (30-50 feet).

If none of the following stressors occurs on either bank, check here and skip to Metric 22:

Abuts		< 30 feet		30-50 feet		
LB	RB	LB	RB	LB	RB	
<input type="checkbox"/> A	Row crops					
<input type="checkbox"/> B	Maintained turf					
<input type="checkbox"/> C	Pasture (no livestock)/commercial horticulture					
<input type="checkbox"/> D	Pasture (active livestock use)					

22. Stem Density – streamside area metric (skip for Tidal Marsh Streams)

Consider for left bank (LB) and right bank (RB) for Metric 19 (“Wooded” Buffer Width).

LB	RB	
<input checked="" type="checkbox"/> A	<input checked="" type="checkbox"/> A	Medium to high stem density
<input type="checkbox"/> B	<input type="checkbox"/> B	Low stem density
<input type="checkbox"/> C	<input type="checkbox"/> C	No wooded riparian buffer <u>or</u> predominantly herbaceous species <u>or</u> bare ground

23. Continuity of Vegetated Buffer – streamside area metric (skip for Tidal Marsh Streams)

Consider whether vegetated buffer is continuous along stream (parallel). Breaks are areas lacking vegetation > 10 feet wide.

LB	RB	
<input checked="" type="checkbox"/> A	<input checked="" type="checkbox"/> A	The total length of buffer breaks is < 25 percent.
<input type="checkbox"/> B	<input type="checkbox"/> B	The total length of buffer breaks is between 25 and 50 percent.
<input type="checkbox"/> C	<input type="checkbox"/> C	The total length of buffer breaks is > 50 percent.

24. Vegetative Composition – streamside area metric (skip for Tidal Marsh Streams)

Evaluate the dominant vegetation within 100 feet of each bank or to the edge of the watershed (whichever comes first) as it contributes to assessment reach habitat.

LB	RB	
<input checked="" type="checkbox"/> A	<input checked="" type="checkbox"/> A	Vegetation is close to undisturbed in species present and their proportions. Lower strata composed of native species, with non-native invasive species absent or sparse.
<input type="checkbox"/> B	<input type="checkbox"/> B	Vegetation indicates disturbance in terms of species diversity or proportions, but is still largely composed of native species. This may include communities of weedy native species that develop after clear-cutting or clearing <u>or</u> communities with non-native invasive species present, but not dominant, over a large portion of the expected strata <u>or</u> communities missing understory but retaining canopy trees.
<input type="checkbox"/> C	<input type="checkbox"/> C	Vegetation is severely disturbed in terms of species diversity or proportions. Mature canopy is absent <u>or</u> communities with non-native invasive species dominant over a large portion of expected strata <u>or</u> communities composed of planted stands of non-characteristic species <u>or</u> communities inappropriately composed of a single species <u>or</u> no vegetation.

25. Conductivity – assessment reach metric (skip for all Coastal Plain streams)

25a. Yes No Was conductivity measurement recorded?
If No, select one of the following reasons. No Water Other: _____

25b. Check the box corresponding to the conductivity measurement (units of microsiemens per centimeter).
A < 46 B 46 to < 67 C 67 to < 79 D 79 to < 230 E ≥ 230

Notes/Sketch:

Draft NC SAM Stream Rating Sheet
Accompanies User Manual Version 2.1

Stream Site Name I-5338 Date of Assessment 9/27/16
 Stream Category Pb1 Assessor Name/Organization WBC, JD,CSU

Notes of Field Assessment Form (Y/N) NO
 Presence of regulatory considerations (Y/N) NO
 Additional stream information/supplementary measurements included (Y/N) _____
 NC SAM feature type (perennial, intermittent, Tidal Marsh Stream) Perennial

Function Class Rating Summary	USACE/ All Streams	NCDWR Intermittent
(1) Hydrology	LOW	
(2) Baseflow	MEDIUM	
(2) Flood Flow	LOW	
(3) Streamside Area Attenuation	LOW	
(4) Floodplain Access	LOW	
(4) Wooded Riparian Buffer	HIGH	
(4) Microtopography	NA	
(3) Stream Stability	LOW	
(4) Channel Stability	LOW	
(4) Sediment Transport	LOW	
(4) Stream Geomorphology	MEDIUM	
(2) Stream/Intertidal Zone Interaction	NA	
(2) Longitudinal Tidal Flow	NA	
(2) Tidal Marsh Stream Stability	NA	
(3) Tidal Marsh Channel Stability	NA	
(3) Tidal Marsh Stream Geomorphology	NA	
(1) Water Quality	LOW	
(2) Baseflow	MEDIUM	
(2) Streamside Area Vegetation	HIGH	
(3) Upland Pollutant Filtration	HIGH	
(3) Thermoregulation	HIGH	
(2) Indicators of Stressors	YES	
(2) Aquatic Life Tolerance	LOW	
(2) Intertidal Zone Filtration	NA	
(1) Habitat	MEDIUM	
(2) In-stream Habitat	LOW	
(3) Baseflow	MEDIUM	
(3) Substrate	LOW	
(3) Stream Stability	LOW	
(3) In-stream Habitat	LOW	
(2) Stream-side Habitat	HIGH	
(3) Stream-side Habitat	MEDIUM	
(3) Thermoregulation	HIGH	
(2) Tidal Marsh In-stream Habitat	NA	
(3) Flow Restriction	NA	
(3) Tidal Marsh Stream Stability	NA	
(4) Tidal Marsh Channel Stability	NA	
(4) Tidal Marsh Stream Geomorphology	NA	
(3) Tidal Marsh In-stream Habitat	NA	
(2) Intertidal Zone	NA	
Overall	LOW	



North Carolina Department of Transportation

Highway Stormwater Program
STORMWATER MANAGEMENT PLAN
 FOR NCDOT PROJECTS



(Version 2.06; Released June 2016)

WBS Element: _____ TIP No.: _____ County(ies): Wake Page 1 of 1

General Project Information

WBS Element:		TIP Number:		Project Type:	Other	Date:	3/1/2017
NCDOT Contact:	Christopher R. Lewis, PE		Contractor / Designer:				
Address:	1020 Birch Ridge Dr. Raleigh, NC 27610		Address:				
	Phone:	(919) 707-6714		Phone:			
	Email:	crlewis2@ncdot.gov		Email:			
City/Town:	Raleigh, NC 27610		County(ies):	Wake			
River Basin(s):	Neuse		CAMA County?	No			
Wetlands within Project Limits?			No				

Project Description

Project Length (lin. miles or feet):	950.00	Surrounding Land Use:	Interstate, urban housing, and woods.				
		Proposed Project			Existing Site		
Project Built-Upon Area (ac.)	N/A	ac.	N/A	ac.			
Typical Cross Section Description:	N/A		N/A				

Annual Avg Daily Traffic (veh/hr/day):	Design/Future:	N/A	Year:	N/A	Existing:	N/A	Year:	N/A
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General Project Narrative:
(Description of Minimization of Water Quality Impacts)

This project is proposed to stabilize and reduce the sediment load of an existing stream that runs parallel to I-40/I-440 in Raleigh. The existing stream is the outfall for approximately 27 acres of drainage south of and within right of way for I-40/I-440. The stream banks have been severely eroded from a head cut which occurred around 1996 after Hurricane Fran came through the area. The head cut made the area unstable and the roadway drainage continued to erode the banks. The proposed stabilization of the stream includes filling in the majority of the intermittent section of stream with a very small portion of perennial stream being stabilized with rip rap. The proposed fill will utilize 10:1 grassed side slopes with Open Throat Catch Basins (OTCBs) placed approximately 300' apart within the grass-lined swale in an effort to reduce the concentrated flow in the ditch. The OTCBs collect the ditch flow and place it in the system to be released farther downstream. The ditch will be grass lined and will have Q10 velocities under 4 ft./sec. The ditch will tie back into the stream and will utilize class II rip rap bank stabilization to prevent future erosion of the stream banks. The storm drainage collected in the system will be released from a minimum sloped 54" pipe onto a rip rap pad. The disturbed area will be revegetated upon completion of stabilizing the stream.

Waterbody Information

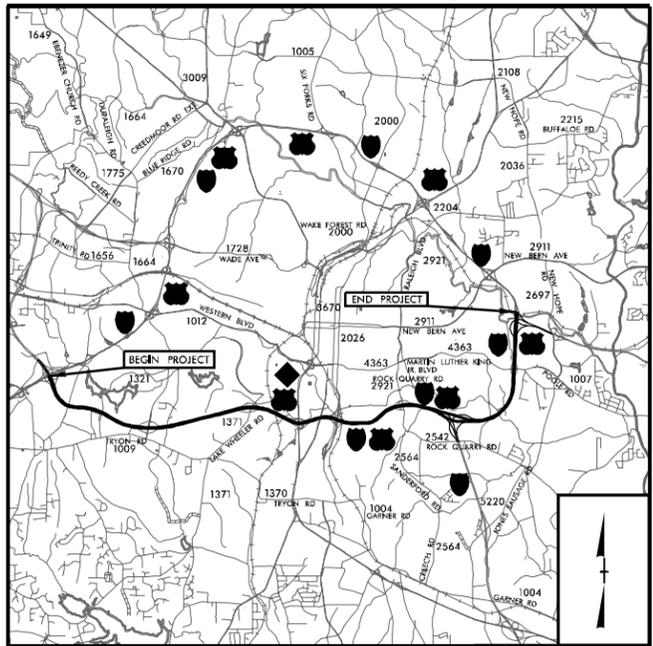
Surface Water Body (1):	Lake Johnson		NCDWR Stream Index No.:	27-34-(1.5)			
NCDWR Surface Water Classification for Water Body	Primary Classification:		Class B				
	Supplemental Classification:		Nutrient Sensitive Waters (NSW)				
Other Stream Classification:							
Impairments:							
Aquatic T&E Species?	Comments:						
NRTR Stream ID:			Buffer Rules in Effect:	Neuse			
Project Includes Bridge Spanning Water Body?	No	Deck Drains Discharge Over Buffer?	No	Dissipator Pads Provided in Buffer?	N/A		
Deck Drains Discharge Over Water Body?	No	(If yes, provide justification in the General Project Narrative)		(If yes, describe in the General Project Narrative; if no, justify in the General Project Narrative)			
(If yes, provide justification in the General Project Narrative)							

09/26/13

TIP PROJECT: I-5338, I-5311

CONTRACT: C203166

See Sheet 1-A For Index of Sheets
See Sheet 1-B For Conventional Symbols



VICINITY MAP

STATE OF NORTH CAROLINA DIVISION OF HIGHWAYS WAKE COUNTY

**LOCATION: I-40 / US 64 FROM WEST OF SR 1319 (JONES FRANKLIN RD)
CONTINUING ALONG I-440 / US 64 TO NORTH OF US 64 / US 264**

**TYPE OF WORK: PAVING, GRADING, DRAINAGE, STRUCTURE REHABILITATION,
STRUCTURE WIDENING, GUARDRAIL, CABLE GUIDERAIL,
SIGNING, LIGHTING, AND ITS**

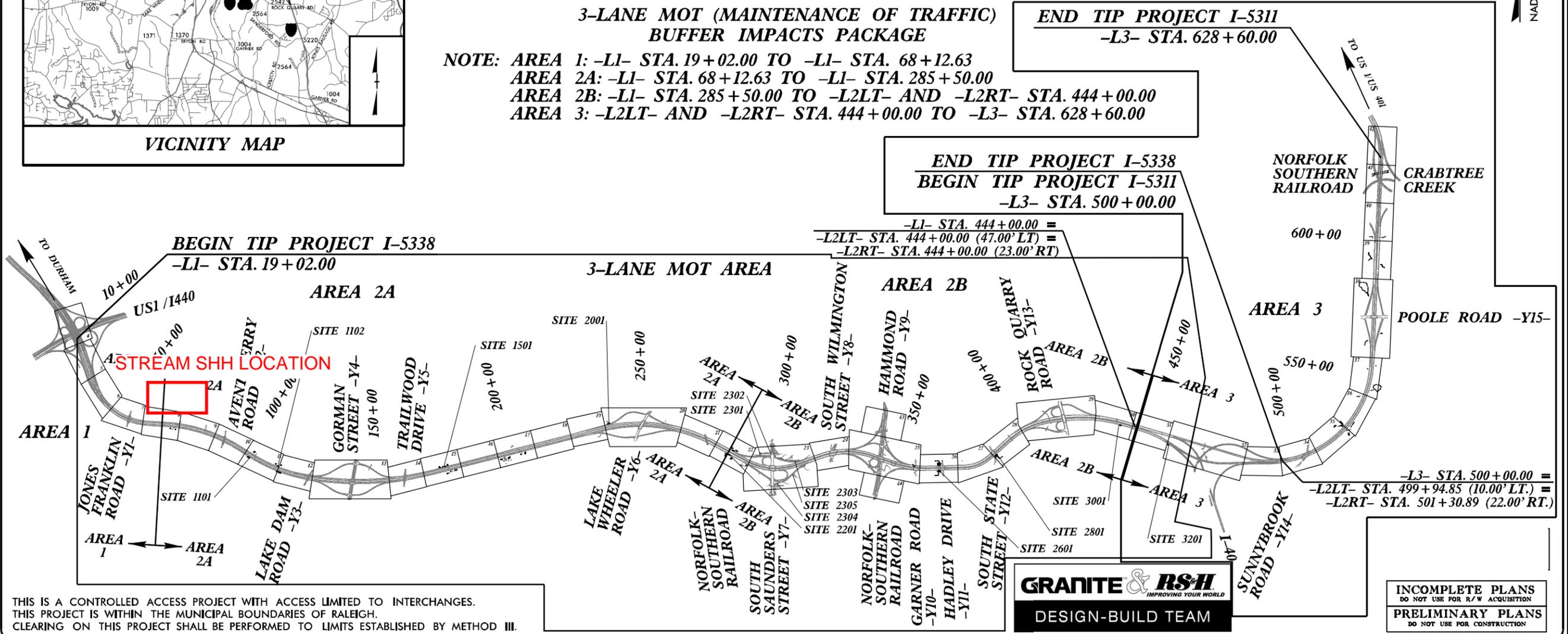
**3-LANE MOT (MAINTENANCE OF TRAFFIC)
BUFFER IMPACTS PACKAGE**

**NOTE: AREA 1: -L1- STA. 19+02.00 TO -L1- STA. 68+12.63
AREA 2A: -L1- STA. 68+12.63 TO -L1- STA. 285+50.00
AREA 2B: -L1- STA. 285+50.00 TO -L2LT- AND -L2RT- STA. 444+00.00
AREA 3: -L2LT- AND -L2RT- STA. 444+00.00 TO -L3- STA. 628+60.00**

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	I-5338, I-5311	1	
STATE PROJ. NO.	F.A. PROJ. NO.	DESCRIPTION	
46265.3.1	IMS-0440(13)	PE	

3-LANE MOT (MAINTENANCE OF TRAFFIC)
PERMIT PLANS
SUBMITTAL D-062R2
NOVEMBER 27, 2013

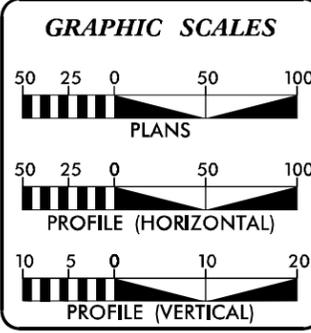
NAD 83 NSRS 2007



THIS IS A CONTROLLED ACCESS PROJECT WITH ACCESS LIMITED TO INTERCHANGES.
THIS PROJECT IS WITHIN THE MUNICIPAL BOUNDARIES OF RALEIGH.
CLEARING ON THIS PROJECT SHALL BE PERFORMED TO LIMITS ESTABLISHED BY METHOD III.

GRANITE & RSH
IMPROVING YOUR WORLD
DESIGN-BUILD TEAM

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION
PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION



DESIGN DATA

ADT 2013	=	126,025
ADT 2035	=	184,600
DHV	=	9 %
D	=	55 %
T	=	8 % *
V	=	70 MPH
* (TTST = 4% + DUAL = 4%)		
FUNC CLASS	=	INTERSTATE

PROJECT LENGTH

LENGTH ROADWAY TIP PROJECT I-5338 / I-5311	=	11.503 MILES
LENGTH STRUCTURE TIP PROJECT I-5338 / I-5311	=	0.042 MILES
TOTAL LENGTH TIP PROJECT I-5338 / I-5311	=	11.545 MILES

*NOTE: EASTBOUND LANES USED TO CALCULATE LENGTH OF PROJECT.

K. ZAK HAMIDI, PE
NCDOT CONTACT

Prepared In the Office of:
RS&H
ARCHITECTS-ENGINEERS-PLANNERS, INC.
8601 SIX FORKS ROAD, SUITE 260
RALEIGH, NC 27615

2012 STANDARD SPECIFICATIONS

RIGHT OF WAY DATE: MAY 13, 2013

LETTING DATE: MAY 13, 2013

CHAD ROGERS, PE
PROJECT ENGINEER

JASON TALLEY, PE
PROJECT DESIGN ENGINEER

HYDRAULICS ENGINEER

SIGNATURE: _____ P.E.

ROADWAY DESIGN ENGINEER

SIGNATURE: _____ P.E.



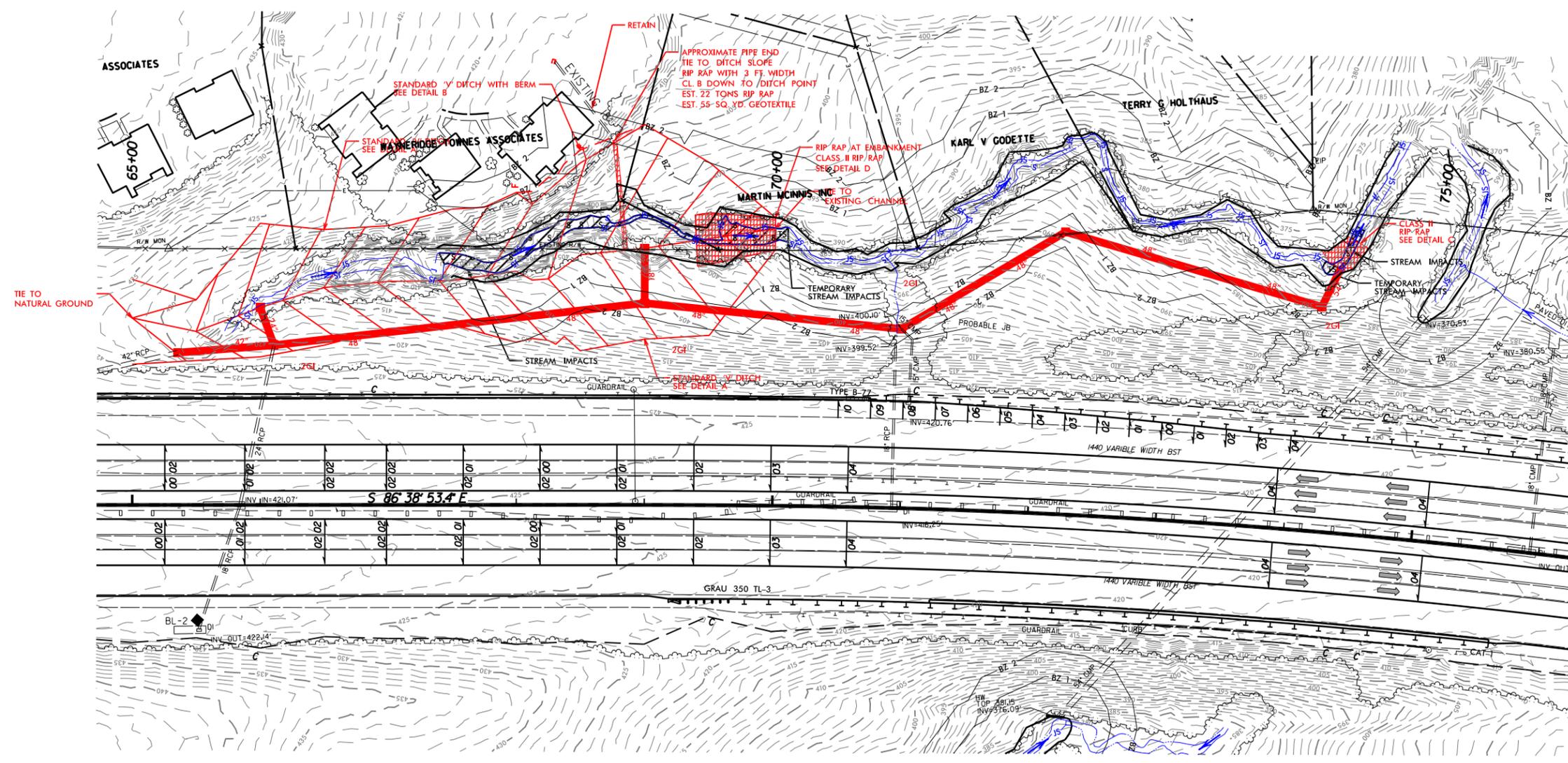
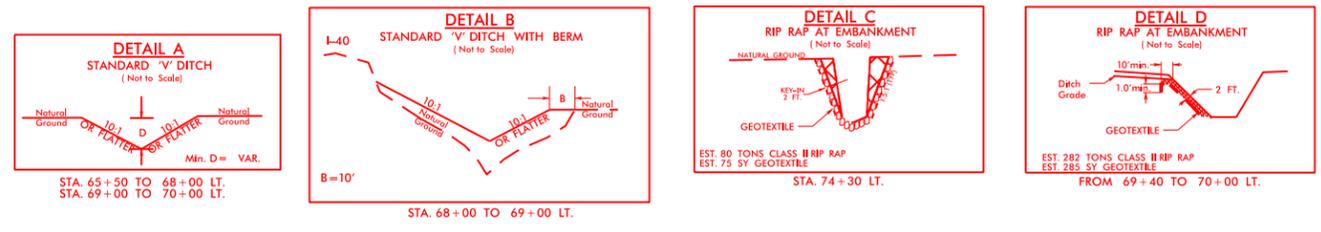
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\$\$\$\$\$ DGN\$\$\$\$\$
\$\$\$\$\$ USERNAME\$\$\$\$\$

PROJECT REFERENCE NO.	SHEET NO.
RW SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
INCOMPLETE PLANS DO NOT USE FOR R/W ACQUISITION	

DOCUMENT NOT CONSIDERED FINAL
UNLESS ALL SIGNATURES COMPLETED

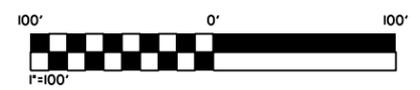
PERMIT DRAWING
SHEET 2 OF 5

EST. FILL REQUIRED = 8672 CY



 DENOTES IMPACTS IN SURFACE WATER
 DENOTES TEMPORARY IMPACTS IN SURFACE WATER

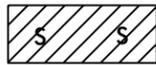
SITE 1



REVISIONS

3/2017
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 B.17/99

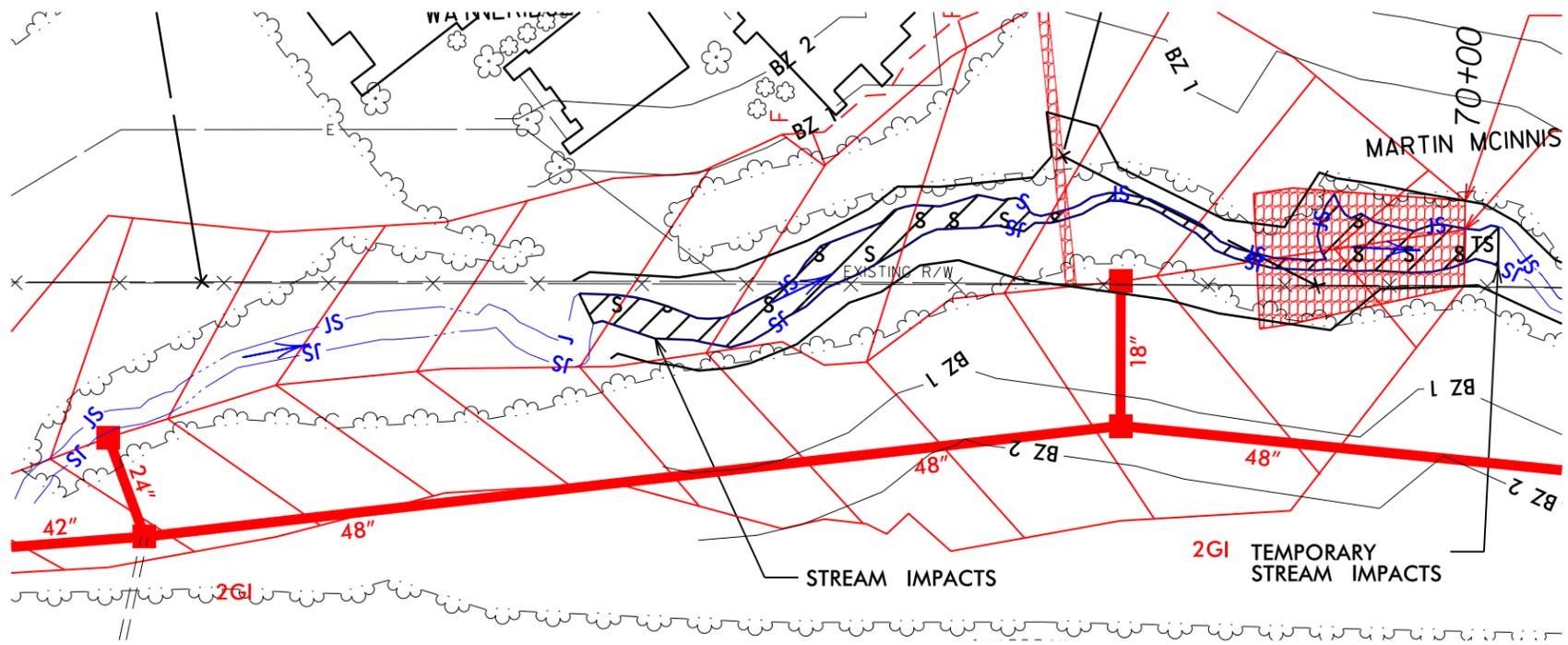
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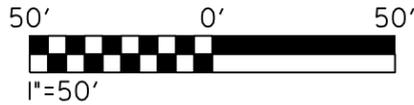
DENOTES IMPACTS IN SURFACE WATER



DENOTES TEMPORARY IMPACTS IN SURFACE WATER



PLAN VIEW



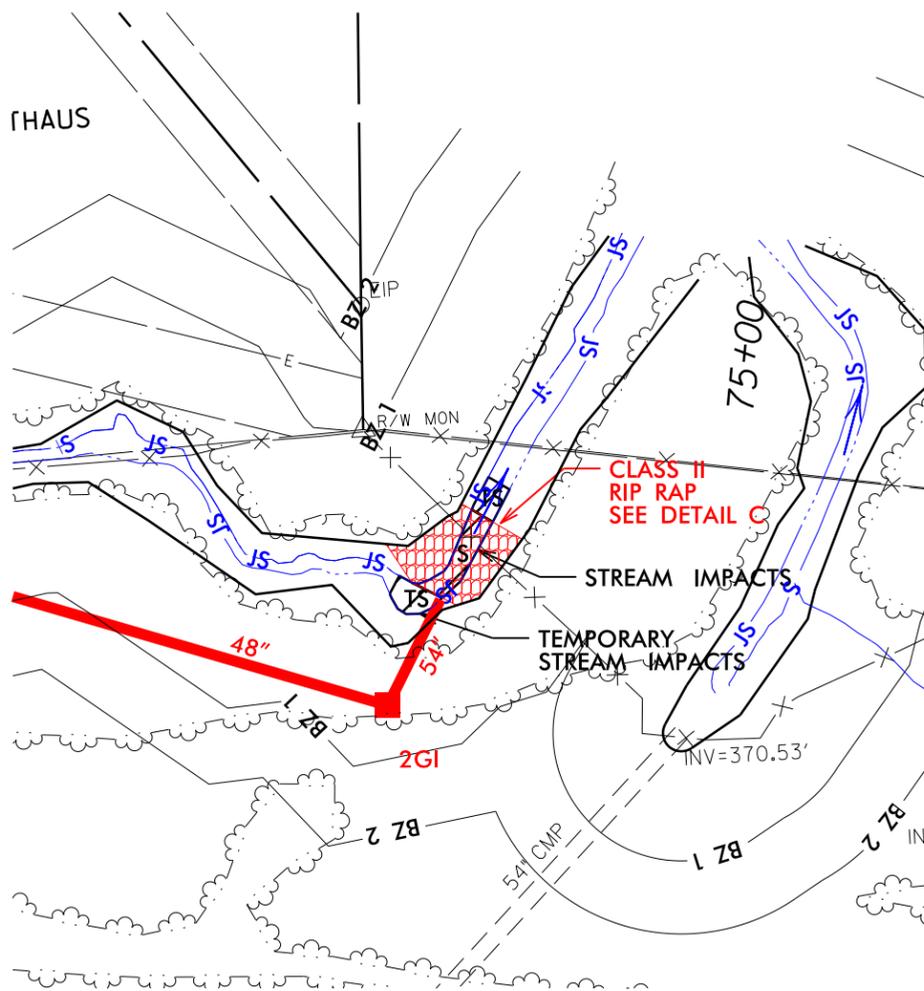
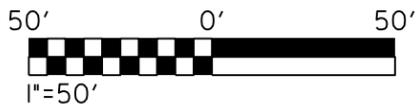
NCDOT
DIVISION OF HIGHWAYS
WAKE COUNTY
PROJECT: I-5338

REHABILITATION OF GORGE

SHEET 3 OF 5

3/1/17

3/1/2017
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SITE 1

PLAN VIEW



DENOTES IMPACTS IN SURFACE WATER



DENOTES TEMPORARY IMPACTS IN SURFACE WATER

NCDOT
DIVISION OF HIGHWAYS
WAKE COUNTY
PROJECT: I-5338

REHABILITATION OF GORGE

SHEET 4 OF 5

12/8/16

12/8/2016
 c:\wv\2
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WETLAND PERMIT IMPACT SUMMARY

Site No.	Station (From/To)	Structure Size / Type	WETLAND IMPACTS					SURFACE WATER IMPACTS				
			Permanent Fill In Wetlands (ac)	Temp. Fill In Wetlands (ac)	Excavation in Wetlands (ac)	Mechanized Clearing in Wetlands (ac)	Hand Clearing in Wetlands (ac)	Permanent SW impacts (ac)	Temp. SW impacts (ac)	Existing Channel Impacts Permanent (ft)	Existing Channel Impacts Temp. (ft)	Natural Stream Design (ft)
1	65+75 TO 70+10 -L1-	DITCH						0.05	< 0.01	277	10	
1	74+14 TO 74+40 -L1-	BANK STABILIZATION						< 0.01	< 0.01	25	20	
TOTALS*:								0.05	< 0.01	302	30	0

*Rounded totals are sum of actual impacts

NOTES:
 Intermittent Stream Impacts are equal to 0.05 acres of the Permanent SW Impacts and 277 ft. of impact.
 All other impacts are to the Permanent Stream.

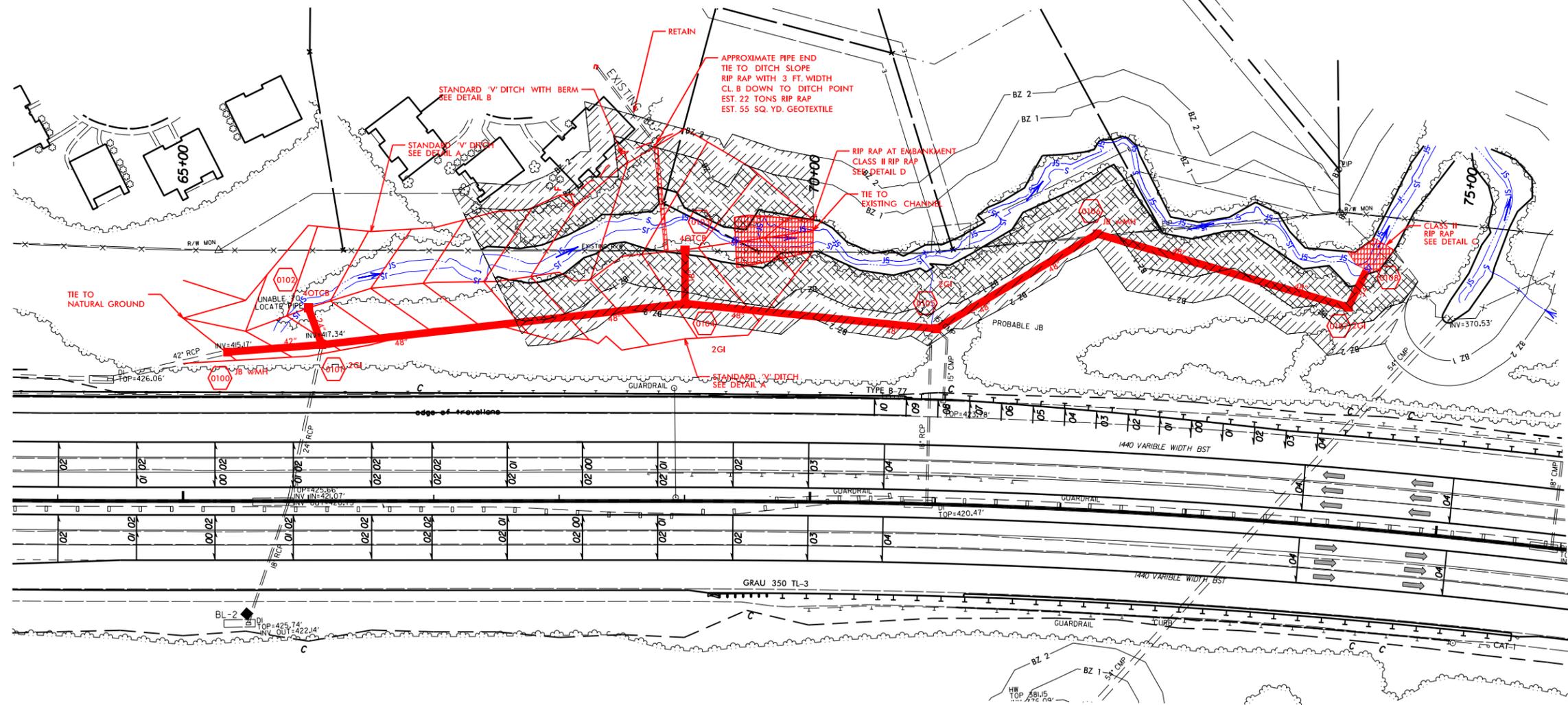
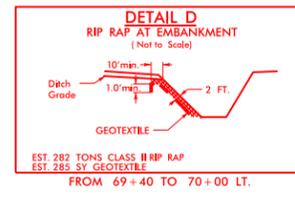
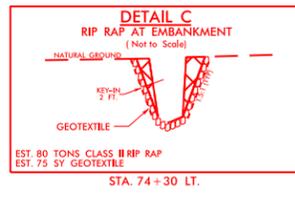
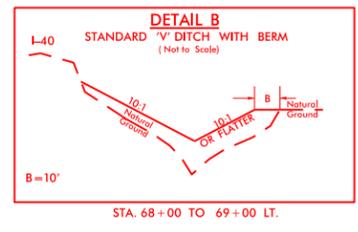
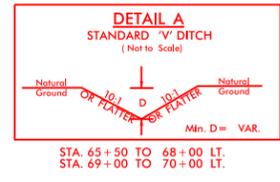
NC DEPARTMENT OF TRANSPORTATION
 DIVISION OF HIGHWAYS
 3/1/2017
 WAKE COUNTY
 GORGE ON 1-40
 I-5338
 SHEET 5 OF 5

PROJECT REFERENCE NO.	SHEET NO.
RW SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
INCOMPLETE PLANS DO NOT USE FOR R/W ACQUISITION	

DOCUMENT NOT CONSIDERED FINAL
UNLESS ALL SIGNATURES COMPLETED

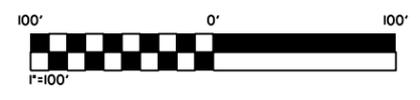
BUFFER DRAWING
SHEET 1 OF 3

EST. FILL REQUIRED = 8672 CY



- ALLOWABLE IMPACTS ZONE 1
- ALLOWABLE IMPACTS ZONE 2

SITE 1



REVISIONS

3/17/2017 cfw12 8/17/99

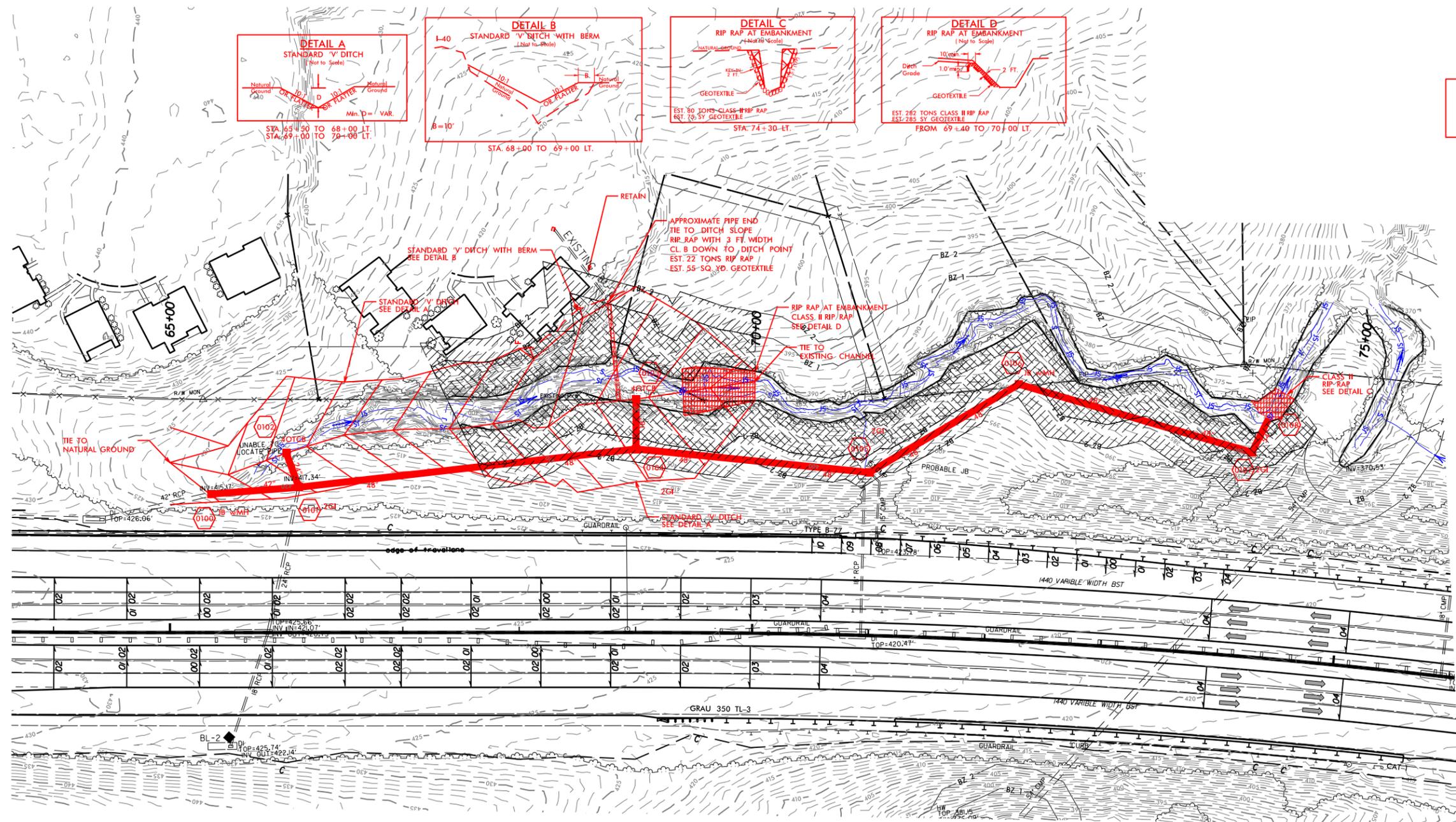
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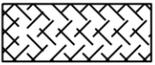
PROJECT REFERENCE NO.	SHEET NO.
RW SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
INCOMPLETE PLANS DO NOT USE FOR R/W ACQUISITION	

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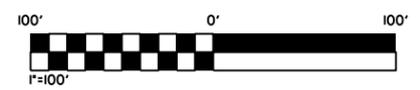
EST. FILL REQUIRED = 8672 CY

BUFFER DRAWING SHEET 2 OF 3



-  ALLOWABLE IMPACTS ZONE 1
-  ALLOWABLE IMPACTS ZONE 2

SITE 1



REVISIONS

BUFFER IMPACTS SUMMARY

			IMPACT									BUFFER REPLACEMENT	
SITE NO.	STRUCTURE SIZE / TYPE	STATION (FROM/TO)	TYPE			ALLOWABLE			MITIGABLE			ZONE 1 (ft ²)	ZONE 2 (ft ²)
			ROAD CROSSING	BRIDGE	PARALLEL IMPACT	ZONE 1 (ft ²)	ZONE 2 (ft ²)	TOTAL (ft ²)	ZONE 1 (ft ²)	ZONE 2 (ft ²)	TOTAL (ft ²)		
1	48" Drainage System	65+75 to 74+40 -L1-			X	34612.0	22900.0	57512.0					
TOTAL:						34612.0	22900.0	57512.0	0.0	0.0	0.0		

N.C. DEPT. OF TRANSPORTATION
 DIVISION OF HIGHWAYS

 WAKE COUNTY

 3/1/2017
 SHEET 3 OF 3