

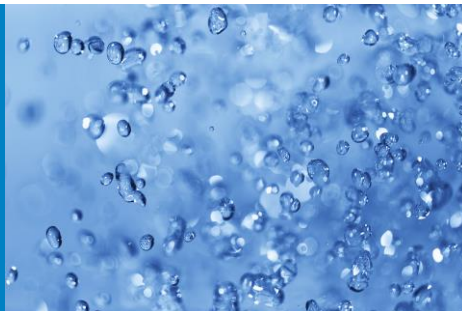


SCDOT Scour Critical Assessment & Management System

Consultant Kickoff Meeting

Rob Bedenbaugh, SCDOT
Blake Gerken, FHWA
Tom Knight, SCDOT
Pat Gambill, PM
Heidi Elliott, DPM
Clayon McCathern, PTL

October 5th, 2020



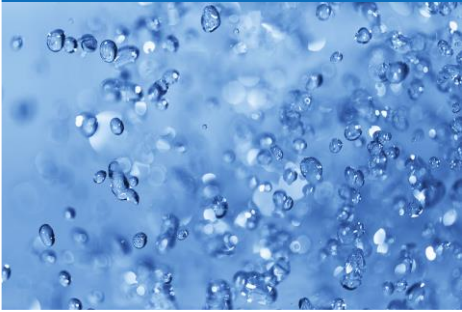
**CDM
Smith**

WATER + ENVIRONMENT + TRANSPORTATION + ENERGY + FACILITIES

SCDOT Scour Critical Assessment & Management System Consultant Kickoff Meeting Agenda

- Welcome
- Metric 18: A Scour Odyssey
- Project Guidance
- Task Overview
- Schedule
- Bridge List
- Questions





METRIC 18:
A Scour Odyssey



Metric 18: One Giant Team

- Almost all Non-Lead Consultants under contract
- One Giant Team: SCDOT, Lead and Non-Lead Consultants
- Impressive amount of talent with reputations in SC, US and Internationally
- Goal is to get the most out of the talent
- CDM Smith will handle coordination with all the Non-Leads
- Expect everyone to be professional
- Hydrology and Hydraulics are a small world



Metric 18: Vision

- Policy, Procedures, Guidance and Documents that are:
 - Project specific
 - Lead to improvements and updates
 - Cutting edge
- Make SCDOT Scour Program a model for other states
- Meet all FHWA requirements for Metric 18
- Have some fun on this journey 🎯



Scour Program at SCDOT

- FHWA spear-headed training and guidance on bridge scour
 - HIRE 1975
 - HEC-18
 - Research and Implementation
- Scour not a major part of the design process until the late 1980s
- Bridge failures at US-51 Over the Hatchie River and I-90 over Schoharie Creek changed the role of scour, hydrology and hydraulics in bridge design and FHWA regulations
- SCDOT's first official scour design requirements were included in the RHDS 1992 edition



Scour Program at SCDOT

Level 1 & Level 2 Scour Study Programs

- Late 1980s through mid 1990s
- First statewide scour program in SC
- SCDOT and USGS Level 1
- USGS and Consultants Level 2

USGS Scour Research and SC Scour Envelope Curves

Tidal Pool Fund Study

- First major tidal hydraulics and scour research project



Scour Program at SCDOT

I-35 W collapse over the Mississippi River

- Unknown Foundation Program
- SCDOT used foundation testing to develop guidance to classify bridges with unknown foundations.
- Developed simple POAs

HDM-3 major update to SCDOT's scour guidance

PCA 2018-present

- FHWA directed SCDOT to change the bridge file system
- Improvement in use of POAs
- "U" became an allowable Item 113 code
- HDSO tasked with improvement to meet Metric 18 requirements

Scour Program at SCDOT

- Metric 18: A Scour Odyssey
 - Locate, review and determine status of all existing scour studies
 - Perform scour studies on all bridges with foundation data
 - Develop a new risk based POA, Guidance and Procedures
 - Develop POAs for all bridges classified as being scour critical, having non-designed countermeasures and having unknown foundations
 - Develop guidance and procedures to monitor bridges, POA triggers and documentation
 - Use BridgeWatch as part of the scour and POA programs to assist with monitoring and POA management
 - Contract with consultants to meet FHWA PCA milestones and schedule



Project Guidance



Project Guidance- Introductions

Lead Consultant:

- CDM Smith
 - Parrish & Partners




Non-Lead Consultants:

- AECOM
- ICE
- RK&K
- TranSystems



Project Guidance - Task 2 Document Review

SCDOT Scour Critical Assessment and Management System
Documentation Review Form



SITE INFORMATION

Bridge ID: 2140005100200 Asset ID: 28
 Item 113: 5 Latitude: 33°59'56 Longitude: 79°35'16
 Stream Crossing: Big Swamp RD/RT: 06-51 County: Florence
 Physiographic Region: Coastal Plain Multiple Bridge: YES / NO (circle one)
 Riveline Flow / Tidal Flow (circle one) Drainage Area: 17 (sq mi)
 Bridge Length: 120 (ft) Bridge Width: 47 to 60 (ft) Bridge Construction Date: 2007

SCOUR STUDY

Scour Study Performed By: LPA **Date of Analysis: 3/2005
 Scour Method Used: HCC-1B Hydraulic Model: HEC RAS
 Historic Flood Elevation: _____ Computed 100yr Flood Elevation: 61.54
 Hydraulic Data Source: (circle all that apply)
 EXISTING PLANS TOPOGRAPHIC MAP (SURVEY) LIDAR FEMA
 **Check SIA and plans library for bridge construction date or widening date to ensure existing bridge geometry has not been altered.

SCOUR COMPUTATIONS (check all that apply)

Long Term Scour: _____ Abutment Scour: M(g): _____
 Contraction Scour: LIVE BED _____ CLEARWATER
 Pier Scour: LIVE BED _____ CLEARWATER

SUPPORTING DOCUMENTS

Roadway Plans: _____ (File #) Bridge Plans: _____ (File #)
 Plan Datum: _____ Plan Datum: NAVD 88
 FEMA Maps: _____ (Panel #) FEMA Datum: _____
 Bridge As-Built Plans: 21B5B (File #) Bridge Photos: yes

SCOUR STUDY ACCEPTED: ITEM 113 ACCEPTED: BY: Kbyme Colley DATE: 5/2020
 SCOUR STUDY REJECTED: _____ ITEM 113 REJECTED: _____ BY: _____ DATE: _____
 HDSO ACCEPTED: ITEM 113 ACCEPTED: BY: Thomas Knight DATE: 5/30/2020
 HDSO REJECTED: _____ ITEM 113 ACCEPTED: _____ BY: _____ DATE: _____

REMARKS:
Bridge supported by 20° prestressed concrete piles with pile points.

- Task 2: Documentation Review
 - Over 7,000 documents
 - 3,600 Potential Studies/Plans
- Task 3: Risk Prioritization
- Bridge List
 - Approximately 3,000 bridges require new studies
 - 3,000 bridges require POAs

Task Overview



Task Overview

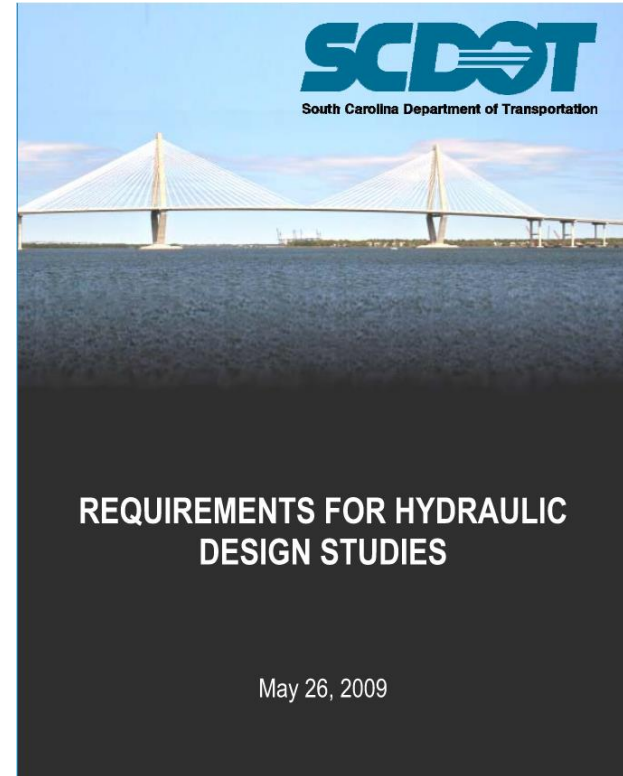
SCOUR CRITICAL ASSESSMENT AND MANAGEMENT SYSTEM PROJECT

- Task 1 – Project Organization, Management and Coordination
- Task 2 – Existing Scour Documentation Organization & Review
- Task 3 - Risk Prioritization and Field Inspections
- Task 4 – Perform Scour Assessments, QC and QA
- Task 5 – Establish Bridge Monitoring Procedure
- Task 6 – Conduct Training for Bridge Monitoring
- Task 7 – QA/QC and Final Delivery



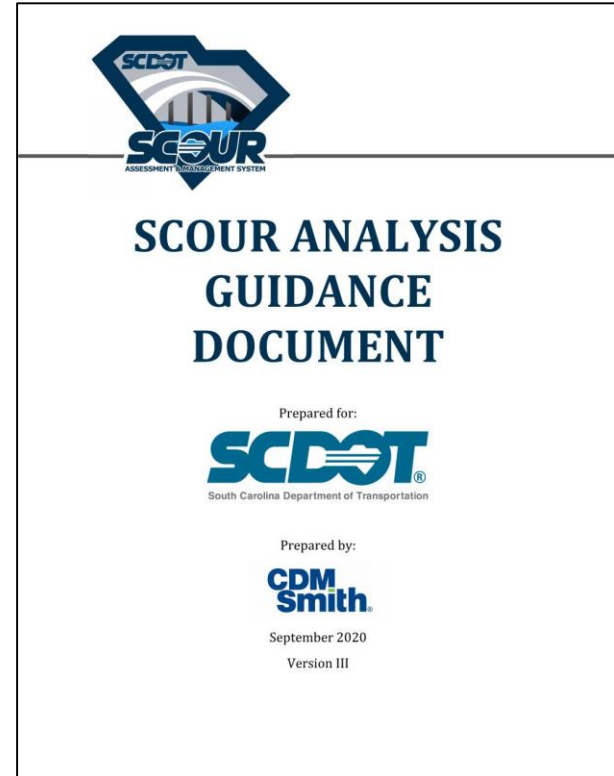
Guidance Documents

- SCDOT Requirements for Hydraulic Design Studies (RHDS)
- Scour Analysis Guidance Document
- Plan of Action (POA) Guidance Document (Under Development)
- QC Forms (Excel Spreadsheets)
- QA Procedure (Bluebeam Revu)
- Bridge Inspection Data Collection (QuickBase)
- Bridge Inspection Forms (Excel Spreadsheets)



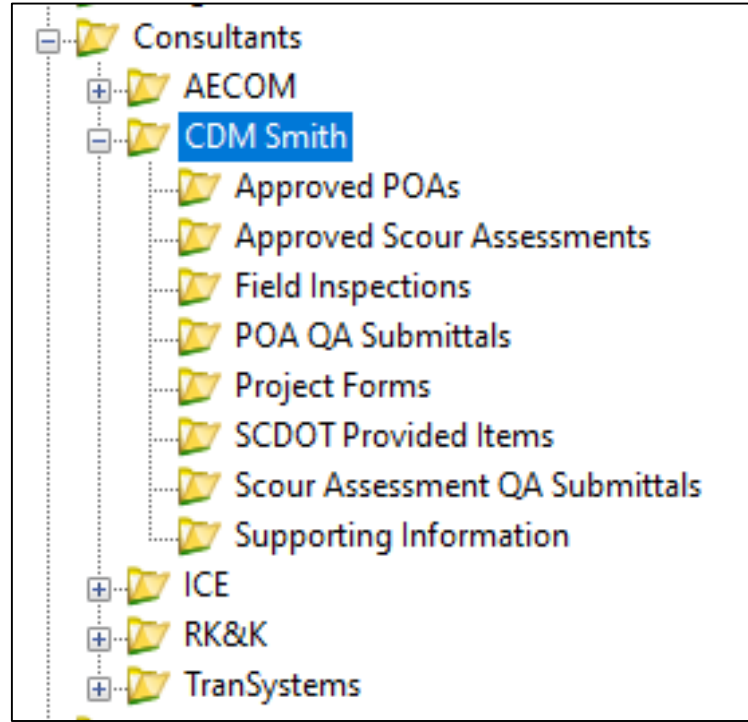
Task 4 - Scour Analysis Guidance Document

- Chapter 1 – Introduction
- Chapter 2 – Desktop Data Collection
- Chapter 3 – Field Inspections
- Chapter 4 – Field Surveys
- Chapter 5 – Hydrologic & Hydraulic Modeling
- Chapter 6 – Scour Assessment
- Chapter 7 – QC & QA Procedures
- Chapter 8 – Item 113 Coding
- Chapter 9 – Plan of Action



Document Exchange (Filing System)

- SCDOT ProjectWise
 - Consultant Access Forms
- SCDOT Project Web Site



Project Overview - Task 3 and Task 4

SCOUR CRITICAL ASSESSMENT AND MANAGEMENT SYSTEM

Task 1 Management and Organization

Task 2 Document Review

Task 3

- Field Inspections

Task 4

- Scour Assessments
- Scour Assessment QC
- Scour Assessment QA

Task 5 Monitoring

Task 6 Training

Task 7 QA and Final Delivery



Task 3 – CDM Smith Field Inspections Schedule

Start: October 12, 2020

Complete: April 2, 2021

- Total Number of Weeks = 22 (Accounting for Holiday weeks in Nov. & Dec.)
- 5 Day Work Week
 - Intended to allow each Team to complete a *minimum* of 10 bridges/week
- 2 Inspectors (1 Hydraulics Engineer) per team must always be present to inspect any bridge

Task 3 – Field Inspections/Data Collection

QuickBase:

- Equipment Requirements
- Licenses
- In Case of Failure
- QC
- Delivery

INSPECTION FORM > Add Inspection

PROJECT DESCRIPTION

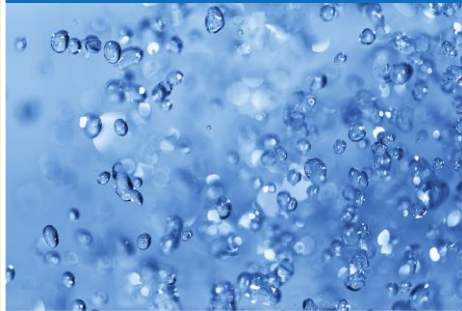
Related Bridge - Asset ID: 4
Related Bridge - Structure Number: 520002100100
Related Bridge - Flood Zone: A
Related Bridge - County: BAMBERG
Related Bridge - Road: US 21
Related Bridge - Stream: EDISTO RIVER
Team: [Dropdown]
Inspector Name: KO
Date: 09-09-2020
Asset ID: 4
Please Re-Enter Asset ID Number for Photo Naming Scheme

EXISTING BRIDGE

Length FT: 60
Width FT: 25
Max Span Length FT: 50
Alignment: Tangent
Bridge Skewed: Yes
Skew Angle: 15
End Abutment Type: Vertical
Riprap On Fills: Yes
Condition: Good
Superstructure Type: Concrete T-Beams

SUBSTRUCTURE TYPE

NO. PIERS / BENTS: Left Overbank: [Input]
NO. PIERS / BENTS: Main Channel: [Input]
NO. PIERS / BENTS: Right Overbank: [Input]

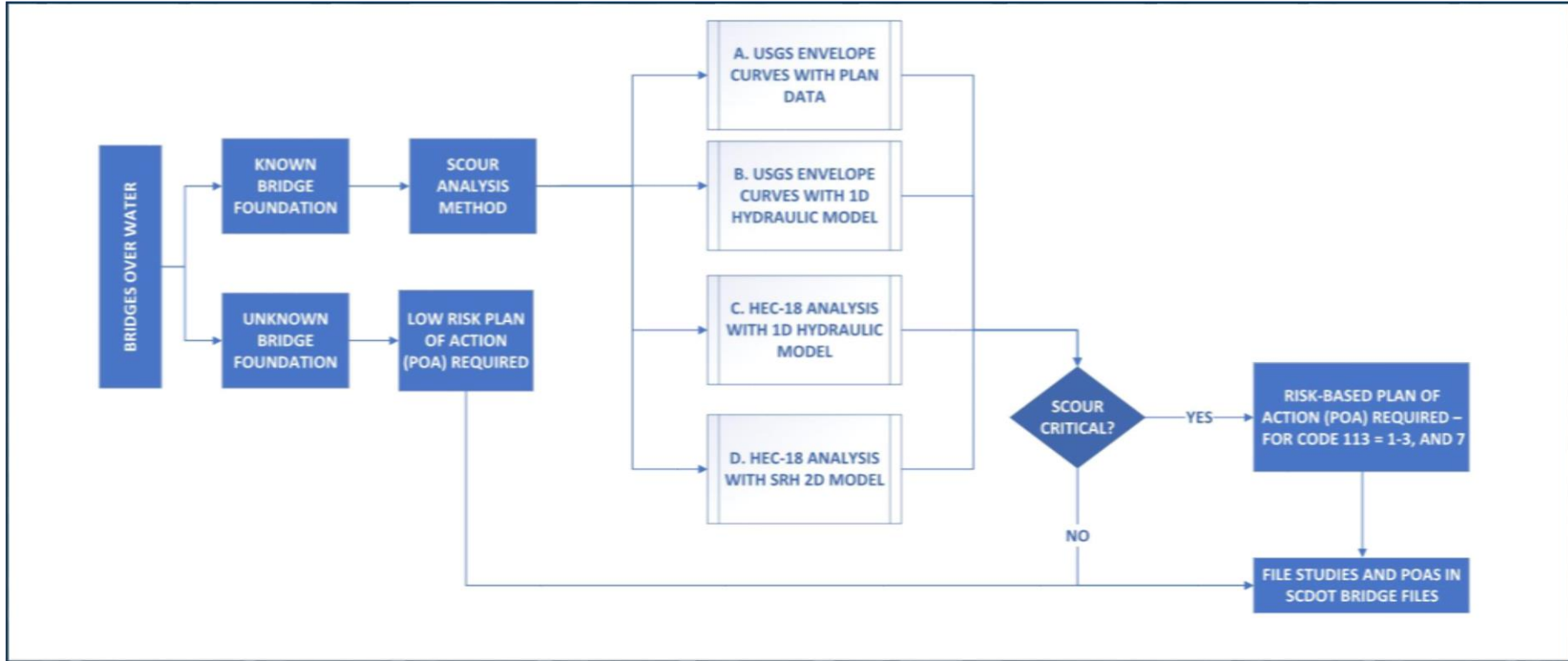


Task 4

Scour Assessments



Task 4 - Hydraulic Analysis and Scour Analysis




Task 4 - Scour Analysis Schedule

- Assume 20 months / 80 Weeks
 - Note: Holidays Weeks
 - 6 weeks (Thanksgiving, Christmas, New Years - 2020 & 2021)
- SCDOT prefers submittals every 2 weeks / twice a month
 - 1st submittal date **To Be Determined** to allow for Ramp up
- Analysis portion of the Task 4 – Manage your own process
 - Will need to dovetail into QA schedule
- Assuming **4000** analyses over 20 months, Target will be:
 - 200 per month (40 per consultant)
 - 100 per submittal (20 per consultant)
 - 50 bridges per week (10 per consultant)

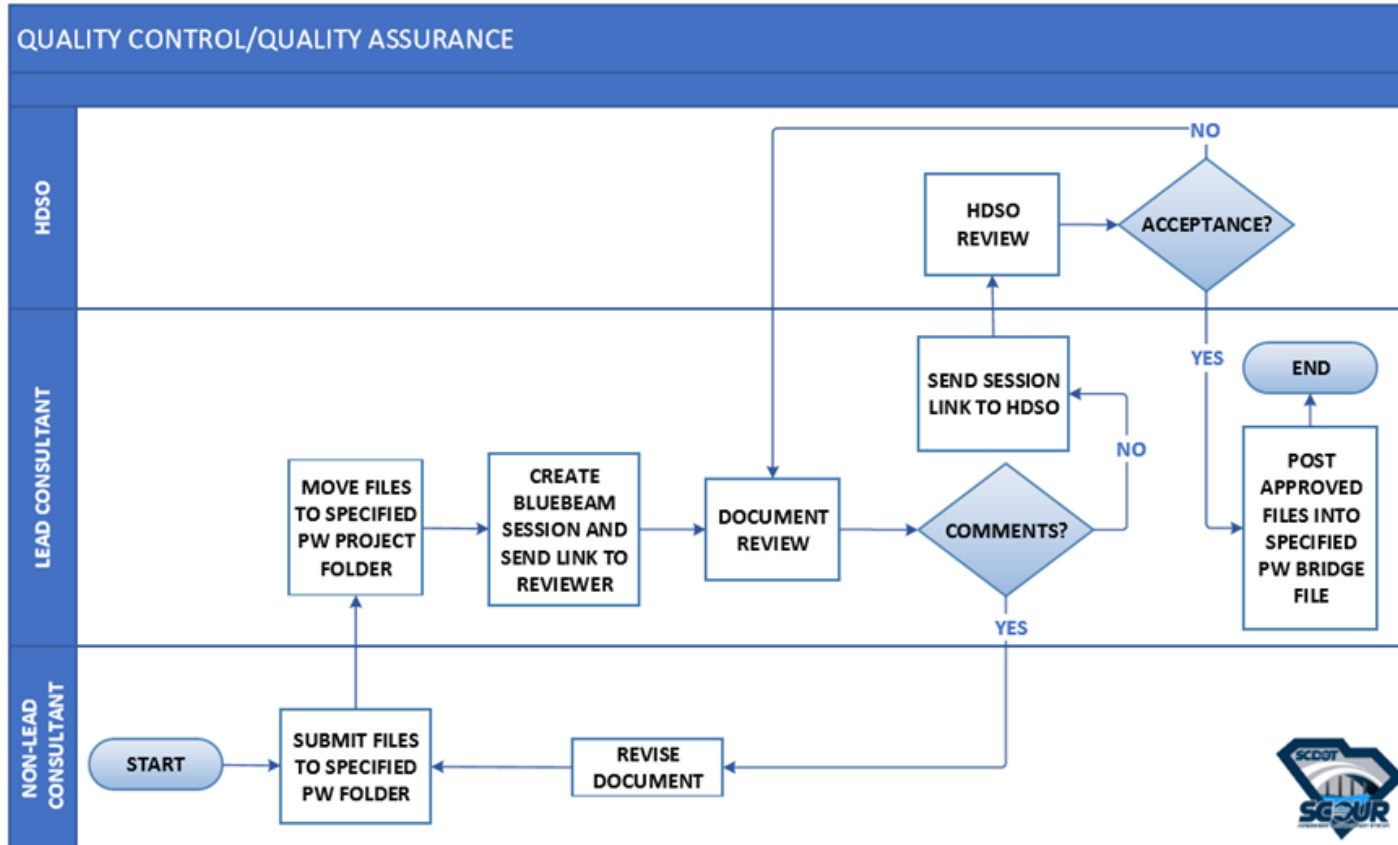
Task 4 - Quality Control

- QC is the process of checking that all computations are correct, complete and in compliance with requirements
- QC Excel spreadsheets, such as the one shown, will be provided to use as a minimum QC check

Bridge Asset ID:		0		
Hydrology QC Checklist		SCDOT Scour Critical Assessment and Management System		
Originator:		Instructions:		
Technical Review By:		1. Populate "originator" & "review by" cells to left		
Date QC Certified for Submittal:		2. Provide comments below per instructions on the Summary Sheet.		
		3. For each round of comment, add additional lines.		
		4. When all comments are satisfied, reviewer fills in date certified for submittal		
				
ID	QC Check and Description	Quality Control Review		
		Status*	QC Review Comment	Originator Response
General				
1	If a previously accepted model is used as the source for peak discharge(s), the source model is identified			
2	If peak discharge(s) are from a previously accepted model, discharges used agree with the source			
3	If 0.2% AEP discharge is extrapolated from 1% AEP discharge, confirm correct methodology			
Stream Stats				
4	Basin delineation			
5	Confirm rural vs. urban regression scenario			
6	Basin characteristics			
7	Peak-flow report appears reasonable			
Unsteady Flow Hydrographs				
8	Source of stillwater height appropriate			
9	Development of hydrograph in accordance with SCDOT 2009 HDM			
10	Duration of time series extends past recession of storm surge			
11	Timing of storm surge plus tide represents worst case condition			
12				
13				
14				
9				
10				
11				

*Comment Status: 1 = Comment Submitted; 2 = Unresolved; 3 = Resolved; 4 = N/A; 5 = Closed

Task 4 - Quality Assurance





Bridge List



Bridge List

3000 Bridges Need a Scour Study:
 Process
 Priority Class
 Interstates, Others
 Resulting Bridges

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	Q	S	T
	Asset ID	STRUCTURE NUMBER	Facility Carried	Waterway	Scour Code Item	Priority Class	Interstate Rank	US Primary Secondary Local Rank	Unknown Foundation	Over Reservoir	Countermeasures	FEMA Study	Hydro Data In Plans	Tidal/Riverine	Hydraulic Method	Scour Method	County	Consultant
1					113													
2	7451	000000000007451 I-77 SBL		LTL WATEREE CK	Code 3	1	34 N/A		No	No	No	no	No	Riverine Flow	1D	USGS or HEC-18 w/1D	FAIRFIELD	Transystems
3	7913	000000000007913 I-77 NBL		CONGAREE RIVER	Code 5	1	48 N/A		No	No	No	yes	No	Riverine Flow	Existing 1D	USGS or HEC-18 w/Existing 1D	LEXINGTON	Transystems
4	7911	000000000007911 I-77 NBL		C-66 & OVERFLOW #2	Code 5	1	53 N/A		No	No	No	yes	No	Riverine Flow	Existing 1D	USGS or HEC-18 w/Existing 1D	LEXINGTON	Transystems
5	7915	000000000007915 I-77 SBL		C-66 & OVERFLOW #2	Code 5	1	53 N/A		No	No	No	yes	No	Riverine Flow	Existing 1D	USGS or HEC-18 w/Existing 1D	LEXINGTON	Transystems
6	7912	000000000007912 I-77 NBL		CONGAREE CREEK	Code 5	1	61 N/A		No	No	No	yes	No	Riverine Flow	Existing 1D	USGS or HEC-18 w/Existing 1D	LEXINGTON	Transystems
7	7916	000000000007916 I-77 SBL		CONGAREE CREEK	Code 5	1	61 N/A		No	No	No	yes	No	Riverine Flow	Existing 1D	USGS or HEC-18 w/Existing 1D	LEXINGTON	Transystems
8	7917	000000000007917 I-77 SBL		CONGAREE RIVER	Code 5	1	61 N/A		No	No	No	yes	No	Riverine Flow	Existing 1D	USGS or HEC-18 w/Existing 1D	LEXINGTON	Transystems
9	7813	000000000007813 I-77 SBL		CONGAREE RV OVERFLOW	Code 5	1	65 N/A		No	No	No	yes	No	Riverine Flow	Existing 1D	USGS or HEC-18 w/Existing 1D	LEXINGTON	Transystems
10	5047	000000000005047 I-95 SB		SPARROW SWAMP	Code 5	1	70 N/A		No	No	No	yes	No	Riverine Flow	Existing 1D	USGS or HEC-18 w/Existing 1D	FLORENCE	Transystems
11	7812	000000000007812 I-77 NBL		CONGAREE RV OVERFLOW	Code 5	2	75 N/A		No	No	No	yes	No	Riverine Flow	Existing 1D	USGS or HEC-18 w/Existing 1D	LEXINGTON	Transystems
12	5041	000000000005041 I-95 NB		SPARROW SWAMP	Code 5	2	78 N/A		No	No	No	yes	No	Riverine Flow	Existing 1D	USGS or HEC-18 w/Existing 1D	FLORENCE	Transystems
13	5042	000000000005042 I-95 NB		SPARROW SWAMP	Code 5	2	78 N/A		No	No	No	yes	No	Riverine Flow	Existing 1D	USGS or HEC-18 w/Existing 1D	FLORENCE	Transystems
14	5048	000000000005048 I-95 SB		SPARROW SWAMP	Code 5	2	78 N/A		No	No	No	yes	No	Riverine Flow	Existing 1D	USGS or HEC-18 w/Existing 1D	FLORENCE	Transystems

Plans of Action (POA) List

- 3000 Bridges Require a POA
 - Scour Critical
 - Unknown Foundations
 - Code 7 Bridges



Goals & Objectives



#1 Goal: Do a Great Job for SCDOT

TASK OBJECTIVES:

- Complete field inspections and scour assessments for ~3,000 bridges
- Complete POAs for 1,300+ bridges that are classified as scour critical
- Complete field inspections and POAs for 2,000+ bridges that are classified as “unknown foundations” (the four non-lead consultants are responsible for this task)
- Complete all scour assessments and QC/QA within 20 months (by July 2022)

Questions?

