# QUALITY ASSURANCE HYDRO CHECKLIST FOR ROADWAY FOR R/W PLANS REVIEW

Updated 9/15/2021

Closed Stormwater Drainage       Proper application of approved inlet type       Proper application of approved inlet type       Proper application of approved inlet type       Proper application of drainage system pipes shown in roadway cross-section appropriate locations to propriot drainage system pipes shown in roadway cross-section of drainage system pipes shown in roadway cross-section appropriate location to provide the system pipes shown in roadway cross-section appropriate location to provide the system pipes shown in roadway cross-section provide the system provide the system pipes shown in plans       Pres       Pros       PNA       RHDS 2.2.6         Sideline ditches fall within designated R/W (backslope can be covered by permission)       Pres       No       N/A       Prese       No       N/A         Sideline ditches continuous all the way to an outfall ditch or to start of wetlands area       Pres       No       N/A       RHDS 2.2.12 & 2.2.12.2         Outfall ditch profile and cross-section shown in plans       Pres       No       N/A       RHDS 2.2.12 & 2.2.12.2         Outfall ditch profile and cross-section shown in plans       Pres       No       N/A       RtDS 2.2.12 & 2.2.12.2         Outfall ditch profile and cross-section shown in plans       Pres	QA Item	Check	box		Reference
Proper application of approved inlet typeINEINA719-000 Standard DrawingsDrainage structures placed at appropriate locations of adequately drain systemINEINAINAInstructional Bulletin 2009-5Coss-section of drainage system pipes shown in roadway ross sectionsINEINAINFLInstructional Bulletin 2009-5Nin 187 pipe except for yard drains and driveway pipesINEINAINFLINEDESEStatemetterINEINAINAINEDESEStation OttomsINEINAINAINEDESEStation OttomsINEINAINAINEDESEOptimission Station of weathing and actions and driveway for any fight of the station of weathing and actions and driveway for any fight of the station of the statio	Closed Stormwater Drainage				
Drainage structures placed at appropriate locations to adequately drain systemImage of the systemImage o	Proper application of approved inlet type	□Yes	□ No	□N/A	719-000 Standard Drawings
adequately drain system       Inso       Instructional Bulletin 2009-5         Cross-section of drainage system pipes shown in roadway rops       IPso       INO       IN/A       RHDS 2.2.6       INO       IN/A         Pipes arranged in a hydraulically and economically efficient manner       IPso       INO       IN/A       RHDS 2.2.6         Sideline Ditches       INO       IN/A       INO       IN/A       INO       IN/A         Sideline ditches fall within designated R/W (backslope can be covered by permission)       INO       IN/A       INO       IN/A         Positive drainage maintained       IPso       INO       IN/A       Instructional Bulletin 2009-5         Sideline ditches continuous all the way to an outfall ditch or to start of wellands area       INO       IN/A       INO       IN/A         Outfall ditche profile and cross-section shown in plans       IPso       INO       IN/A       RHDS 2.2.12 & 2.2.12.2         Outfall ditche profile and cross-section shown in plans       IPso       INO       IN/A       RHDS - Section 2.2.12.2         Outfall ditche profile and cross-section shown in plans       IPso       INO       IN/A       RHDS - Section 2.2.12.2	Drainage structures placed at appropriate locations to				
Cross-section of drainage system pipes shown in roadway cross- sectionsImage of the section of drainage system pipes arranged in a hydraulically and economically efficient mannerImage of the section of th	adequately drain system			⊔IN/A	
Sections       Insc       Invo	Cross-section of drainage system pipes shown in roadway cross-	- □Ves		<b>□N</b> /Λ	Instructional Bulletin 2009-5
Min 18" pipe except for yard drains and driveway pipes       Pres       No       N/A       RHDS 2.2.6         Pipes arranged in a hydraulically and economically efficient manner       Pres       No       N/A       RHDS 2.2.6         Sideline Ditches       Pres       No       N/A       N/A       RHDS 2.2.6         Sideline Ditches       Pres       No       N/A       N/A       Sideline Ditches         Sideline ditches fall within designated R/W (backslope can be covered by permission)       Pres       No       N/A       N/A         Positive drainage maintained       Pres       No       N/A       Clean Water Act - Section 404         Sideline ditches continuous all the way to an outfall ditch or to start of wetlands area       Pres       No       N/A       RHDS 2.2.12 & 2.2.12.2         Outfall ditch profile and cross-section shown in plans       Pres       No       N/A       RHDS 2.2.12 & 2.2.12.2         Outfall ditch profile and cross-section shown in plans       Pres       No       N/A       RHDS 2.2.12 & 2.2.12.2         Outfall sthat are natural watercourses left undisturbed where possible       Pres       No       N/A       RHDS - Section 2.2.12.2;         Engineering Directive 27 - Drainage Outfalls       Pres       No       N/A       RCP - Std Dwg 714-205-02 - Table 714-205B; SRAP - Std Dwg 714-205-02 - Table 714-	sections				
Pipes arranged in a hydraulically and economically efficient mannerIVesINOIN/ASideline DitchesIVesINOIN/ASideline ditches fall within designated R/W (backslope can be covered by permission)IVesINOIN/APositive drainage maintainedIVesINOIN/AClean Water Act - Section 404Sideline ditches continuous all the way to an outfall ditch or to start of wetlands areaIVesINOIN/ARHDS 2.2.12 & 2.2.12.2Outfall ditch profile and cross-section shown in plansIVesINOIN/ARHDS 2.2.12 & 2.2.12.2Outfall ditches maintain positive drainageIVesINOIN/ARHDS 2.2.12 & 2.2.12.2Outfalls that are natural watercourses left undisturbed where 	Min 18" pipe except for yard drains and driveway pipes	□Yes	□ No	□N/A	RHDS 2.2.6
manner       INGS	Pipes arranged in a hydraulically and economically efficient	⊓Yes	□ No	<b>□N/A</b>	
Sideline Ditches         Sideline ditches fall within designated R/W (backslope can be covered by permission)       Pes       No       N/A         Positive drainage maintained       Pes       No       N/A         Sideline ditches continuous all the way to an outfall ditch or to start of wetlands area       Pes       No       N/A         Outfall Ditches       Pes       No       N/A       Clean Water Act - Section 404         Outfall ditch profile and cross-section shown in plans       Pes       No       N/A       RHDS 2.2.12 & 2.2.12.2         Outfall ditches maintain positive drainage       Pes       No       N/A       RHDS 2.2.12 & 2.2.12.2         Outfall ditches maintain positive drainage       Pes       No       N/A       RHDS 2.2.12 & 2.2.12.2         Outfall ditches maintain positive drainage       Pes       No       N/A       RHDS 2.2.12 & 2.2.12.2         Outfall ditches maintain positive drainage       Pes       No       N/A       RHDS 2.2.12 & 2.2.12.2         Outfall ditches maintain positive drainage       Pes       No       N/A       RHDS 2.2.12 & 2.2.12.2         Outfall ditches maintain positive drainage       Pes       No       N/A       RHDS 2.2.12 & 2.2.12.2         Outfall ditches maintain positive drainage       Pes       No       N/A       Phos 2.2.12 & 2.2	manner				
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Covered by permission)CitesNoDN/APositive drainage maintainedYesNoN/AClean Water Act - Section 404Sideline ditches continuous all the way to an outfall ditch or to start of wetlands areaYesNoN/AClean Water Act - Section 404Outfall DitchesYesNoN/ARHDS 2.2.12 & 2.2.12.2Outfall ditches maintain positive drainageYesNoN/ARHDS 2.2.12 & 2.2.12.2Outfalls that are natural watercourses left undisturbed where possibleYesNoN/ARHDS - Section 2.2.12.2;Cross-linesYesNoN/ARHDS - Section 2.2.12.2;Engineering Directive 27 - Drainage OutfallsFill height requirements metYesNoN/ARCP - Std Dwg 714-205-02 - Table 714-605;Fill height requirements metYesNoN/AInstructional Bulletin 2009-01Cross-lines labeled in roadway cross-sectionsYesNoN/AInstructional Bulletin 2009-5Cross-lines less than 10% gradeYesNoN/APlan Preparation Guide - Chapter 9Beveled end section used on cross-lines for primary routesYesNoN/APlan Preparation Guide - Chapter 9Ensure adequate R/W for installation of ends treatmentIPesNoN/ASection 804-205-00	Sideline ditches fall within designated R/W (backslope can be				
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Start of wetlands area       Ites       <	Sideline ditches continuous all the way to an outfall ditch or to	⊡Voc		<b>□N</b> /Λ	Clean Water Act - Section 404
Outfall Ditches         Outfall ditch profile and cross-section shown in plans       \frac{1}{48}       \frac{1}{8}       \frac{1}{1}       \frac{1}{1}       \frac{1}{1}       \frac{1}{1}       \frac{1}{1}       \frac{1}{1}       \frac{1}{1}       \frac{1}{1}       \frac{1}{1}       \fra	start of wetlands area				
Outfall ditch profile and cross-section shown in plansIMSIMSIMARHDS 2.2.12 & 2.2.12.2Outfall ditches maintain positive drainageIMSIMARHDS 2.2.12 & 2.2.12.2RHDS - Section 2.2.12.2; Engineering Directive 27 - Drainage OutfallsOutfalls that are natural watercourses left undisturbed where possibleIMSIMARCP - Std Dwg 714-205-02 - Table 714-205B; Std Dwg 714-205-02 - Table 714-605B; HDPE - Std Dwg 714-605B; HDPE - Std Dwg 714-705-02 - Table 714-705B; Instructional Bulletin 2010- 01Cross-lines labeled in roadway cross-sectionsIMSIMAIMAInstructional Bulletin 2009-5 Or Instructional Bulletin 2009-5Beveled end section used on cross-lines for primary routesIMSIMAIMAPlan Preparation Guide - Chapter 9 Ensure adequate R/W for installation of ends treatmentIMSIMASection 804-205-00	Outfall Ditches				
Outfall ditches maintain positive drainageIMIMRHDS 2.2.12 & 2.2.12.2Outfalls that are natural watercourses left undisturbed where possibleIMIMRHDS - Section 2.2.12.2; Engineering Directive 27 - Drainage OutfallsCross-linesImage OutfallsImage OutfallsImage OutfallsFill height requirements metImage OutfallsImage OutfallsImage OutfallsFill height requirements metImage OutfallsImage OutfallsImage OutfallsCross-lines labeled in roadway cross-sectionsImage OutfallsImage OutfallsImage OutfallsCross-lines labeled in roadway cross-sectionsImage OutfallsImage OutfallsImage OutfallsBeveled end section used on cross-lines for primary routesImage OutfallsImage OutfallsImage OutfallsImage Outfalls treatmentImage OutfallsImage Outf	Outfall ditch profile and cross-section shown in plans	□Yes	□ No	□N/A	RHDS 2.2.12 & 2.2.12.2
Outfalls that are natural watercourses left undisturbed where possibleYesINOIN/ARHDS - Section 2.2.12.2; Engineering Directive 27 - Drainage OutfallsCross-lines </td <td>Outfall ditches maintain positive drainage</td> <td>□Yes</td> <td>□ No</td> <td>□N/A</td> <td>RHDS 2.2.12 &amp; 2.2.12.2</td>	Outfall ditches maintain positive drainage	□Yes	□ No	□N/A	RHDS 2.2.12 & 2.2.12.2
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possible       Drainage Outfalls         Cross-lines       RCP - Std Dwg 714-205-02 - Table         Fill height requirements met	possible	□Yes	□ No	□N/A	Engineering Directive 27 -
Cross-lines       RCP - Std Dwg 714-205-02 - Table 714-205B; SRAP - Std Dwg 714-205B; SRAP - Std Dwg 714-205B; SRAP - Std Dwg 714-605B; HDPE - Std Dwg 714-705-02 - Table 714-605B; HDPE - Std Dwg 714-705-02 - Table 714-705B; Instructional Bulletin 2010-01         Cross-lines labeled in roadway cross-sections       IMA       IMA       Instructional Bulletin 2010-01         Cross-lines labeled in roadway cross-sections       IMA       IN/A       Instructional Bulletin 2009-5         Cross-lines labeled in roadway cross-sections       IMA       IN/A       Concrete Pipe Design Manual         Beveled end section used on cross-lines for primary routes       IMA       IMA       Plan Preparation Guide - Chapter 9         Ensure adequate R/W for installation of ends treatment       IMA       IMA       Section 804-205-00	possible				Drainage Outfalls
Cross-linesRCP - Std Dwg 714-205-02 - Table 714-205B; SRAP - Std Dwg 714- 605-02 - Table 714-605B; HDPE - Std Dwg 714-705-02 - Table 714- 705B; Instructional Bulletin 2010- 01Cross-lines labeled in roadway cross-sectionsYesNoN/AInstructional Bulletin 2010- 01Cross-lines labeled in roadway cross-sectionsYesNoN/AConcrete Pipe Design ManualBeveled end section used on cross-lines for primary routesYesNoN/APlan Preparation Guide - Chapter 9Ensure adequate R/W for installation of ends treatmentYesNoN/ASection 804-205-00	Croce lines				
Fill height requirements metYesNoN/A <th< td=""><td><u>cross-intes</u></td><td></td><td></td><td></td><td><b>BCB</b> Std Dwg 714 205 02 Table</td></th<>	<u>cross-intes</u>				<b>BCB</b> Std Dwg 714 205 02 Table
Fill height requirements metYesNoN/AAA <th< td=""><td></td><td></td><td></td><td></td><td>71/205B <b>SRAP</b> - Std Dwg 71/2</td></th<>					71/205B <b>SRAP</b> - Std Dwg 71/2
Fill height requirements metYesNoN/AStop of 2 Hable 714-0000, HBF2Std Dwg 714-705-02 - Table 714- 705B; Instructional Bulletin 2010- 01Std Dwg 714-705-02 - Table 714- 705B; Instructional Bulletin 2010- 01Cross-lines labeled in roadway cross-sectionsYesNoN/AInstructional Bulletin 2009-5Cross-lines less than 10% gradeYesNoN/AConcrete Pipe Design ManualBeveled end section used on cross-lines for primary routesYesNoN/APlan Preparation Guide - Chapter 9Ensure adequate R/W for installation of ends treatmentYesNoN/ASection 804-205-00					605-02 - Table 714-605B' HDPF -
Cross-lines labeled in roadway cross-sections       Yes       No       N/A       Instructional Bulletin 2009-5         Cross-lines less than 10% grade       Yes       No       N/A       Concrete Pipe Design Manual         Beveled end section used on cross-lines for primary routes       Yes       No       N/A       Plan Preparation Guide - Chapter 9         Ensure adequate R/W for installation of ends treatment       Yes       No       N/A       Section 804-205-00	Fill height requirements met	□Yes	□ No	□N/A	Std Dwg 714-705-02 - Table 714-
Cross-lines labeled in roadway cross-sections       Yes       No       N/A       Instructional Bulletin 2009-5         Cross-lines less than 10% grade       Yes       No       N/A       Concrete Pipe Design Manual         Beveled end section used on cross-lines for primary routes       Yes       No       N/A       Plan Preparation Guide - Chapter 9         Ensure adequate R/W for installation of ends treatment       Yes       No       N/A       Section 804-205-00					705B: Instructional Bulletin 2010-
Cross-lines labeled in roadway cross-sections       IVes       No       N/A       Instructional Bulletin 2009-5         Cross-lines less than 10% grade       IVes       No       N/A       Concrete Pipe Design Manual         Beveled end section used on cross-lines for primary routes       IVes       No       N/A       Plan Preparation Guide - Chapter 9         Ensure adequate R/W for installation of ends treatment       IVes       No       N/A       Section 804-205-00					01
Cross-lines less than 10% grade $\Box$ Yes $\Box$ No $\Box$ N/AConcrete Pipe Design ManualBeveled end section used on cross-lines for primary routes $\Box$ Yes $\Box$ No $\Box$ N/APlan Preparation Guide - Chapter 9Ensure adequate R/W for installation of ends treatment $\Box$ Yes $\Box$ No $\Box$ N/ASection 804-205-00	Cross-lines labeled in roadway cross-sections	□Yes	□ No	□N/A	Instructional Bulletin 2009-5
Beveled end section used on cross-lines for primary routes       Image: Yes in the Noise inthe Noise in the Noise in the Noise in the	Cross-lines less than 10% grade	□Yes	□ No	, □N/A	Concrete Pipe Design Manual
Ensure adequate R/W for installation of ends treatment $\Box$ Yes $\Box$ No $\Box$ N/A Section 804-205-00	Povalad and saction used on cross lines for primary routes				Plan Proparation Guida Chapter 9
Ensure adequate R/W for installation of ends treatment □Yes □ No □N/A Section 804-205-00	Beveled end section used on cross-lines for primary routes			⊔IN/A	Plan Preparation Guide - Chapter 9
	Ensure adequate R/W for installation of ends treatment	□Yes	□ No	□N/A	Section 804-205-00
Stormwater Management	Stormwater Management				

Ensure adequate R/W for Stormwater Management ponds and □Yes □ No □N/A RHDS 815-305-01 through 815-

	sediment	basins
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## 305-07

Sediment & Erosion Control				
Ensure adequate R/W for installation of silt fence	□Yes	□ No	□N/A	Std Dwg 815-605-00
Ensure adequate R/W for installation of sediment dams	□Yes	□ No	□N/A	Std Dwg 815-405-01
Ensure adequate R/W for installation of other BMP's	□Yes	□ No	□N/A	Section 815-000 Std Dwg's
Ensure adequate R/W for pipe outlet rip-rap pads	□Yes	□ No	□N/A	Sections 804-000 to 310

## QUALITY ASSURANCE HYDRO CHECKLIST FOR ROADWAY FOR CONSTRUCTION PLANS REVIEW

Updated 9/15/2021 **QA** Item Checkbox Reference **Computer Models** Acceptable numerical models used for Hydrology and □Yes □ No □N/A **RHDS p. 74** Hydraulics List computer models used: **Hydrologic Analysis** Design year event for Storm sewer and ditch design - 10 % AEP (10-year event) for  $0 < DA \le 40$  acres; 4 % AEP (25-year event) for  $\Box$  Yes  $\Box$  No  $\Box$ N/A **RHDS 2.2.3** 40<DA≤500 acres; 2 % AEP (50-year event) for DA>500 acres Design year event for Crosslines - 4 % AEP (25-year event) for Secondary roads; 2 % AEP (50-year event) for Primary Routes □Yes □ No □N/A **RHDS 2.2.2** and Interstates; Analyze 1 % AEP (100-year event) or overtopping flood for all routes Appropriate Methodology used for design □ No □N/A RHDS 2.2.15 □Yes □Rational Drainage area up to 100 acres □Yes □ No □N/A RHDS 2.2.15.1 Reasonable runoff coefficient being used for terrain □Yes □ No □N/A RHDS 2.2.15.1; Table 4 C<sub>f</sub> used for applicable design event □Yes □ No □N/A RHDS 2.2.15.1 Min Tc = 5 min□Yes □ No □N/A RHDS 2.2.15 □Yes □ No □N/A Current SCDOT Rainfall Intensity Values used SCDOT website; HDB 2019-2 Runoff factors being used □Yes □ No □N/A RHDS 2.2.15.1; Table 4 □NRCS WinTR-55 Method RHDS 2.2.15.2 Drainage area 100-640 acres □Yes □ No □N/A □N/A Accurate Peak Rate Factor (PRF) □Yes □ No RHDS 2.2.15.2; Table 6 Hydrologic Soil Groups determined □Yes □ No □N/A NRCS TR-55, Tables 2.2.a,b,c NRCS TR-55, Tables 2.2.a,b,c Curve Number determined for corresponding land use and HSG 

Yes 
No □N/A □USGS Rural Regression equations RHDS 2.2.15.3; Table 7; USGS SIR Drainage area greater than 1 square mile in rural areas □N/A  $\Box$ Yes  $\Box$  No 2009-5156 □USGS Urban Regression equations RHDS 2.2.15.4; USGS SIR 2004- $\Box$ Yes  $\Box$  No □N/A Drainage area greater than 1 square mile in urban areas 5030 □Log Pearson Type III Gaged site with USGS gage □Yes 🗆 No □N/A RHDS 2.2.15.5 □Hydrograph Methods RHDS 2.2.15.6; USGS WRIR 89-Regression equations minimum drainage area exceeded □Yes □ No □N/A 4087; USGS WRIR 92-4040

### **Closed Stormwater Drainage**

Proper application of approved inlet type	□Yes	□ No	□N/A	719-000 Standard Drawings
Correct inlet spacing based on inlet spacing design aids.	□Yes	□ No	□N/A	SCDOT website
Spread criteria met	□Yes	□ No	□N/A	RHDS 2.2.4 Table 2; **Design Variance**
Storm sewer pipes not in pressure flow (HGL $\leq$ 94%)	□Yes	□ No	□N/A	RHDS 2.2.9 **Design Variance**
Min 18" pipe except for yard drains and driveway pipes	□Yes	□ No	□N/A	RHDS 2.2.6

Design high water level 1 ft below the road subgrade in ditches	□Yes	□ No	□N/A	RHDS 2.3 Step 5B
Adequate hydraulic capacity	□Yes	□ No	□N/A	RHDS 2.3 Step 5B

Ditch stability analysis	□Yes	□ No	□N/A	RHDS 2.3 Step 5B
Sideline ditches kept out of wetland areas	□Yes	□ No	□N/A	Clean Water Act - Section 404
Outfall Ditches				
Adequate hydraulic capacity for 10% AEP (10- year event)	□Yes	□ No	□N/A	RHDS 2.2.12
Stability analysis for 10% AEP (10- year event)	□Yes	□ No	□N/A	RHDS 2.2.12.2
Outfalls that are natural watercourses left undisturbed where				RHDS - Section 2.2.12.2;
possible	□Yes	□ No	□N/A	Engineering Directive 27 -
				Drainage Outfalls
Prevs Post flow analysis at each outfall for 10% AEP (10- year	□Yes	□ No	□N/A	RHDS 2.2.12.2
Determination that no violations to Drainage Regulations exist			<b>□N/</b> Δ	RHDS 2 2 12 1
Determination that there is no anticipated damage caused to				NIDS 2.2.12.1
the property by comparing tailwater elevations for pre- and				
post-discharges. If potential for property damage exists, the	□Yes	□ No	□N/A	RHDS 2.2.12.2
channel is to be improved and/or detention is to be utilized.				
Roadway Culverts (<20 ft)				
Headwater requirements for culverts met (HW/D ≤1.2)	□Yes	□ No	□N/A	RHDS 2.3 Step 6 D
Design high water level 1 ft below the road subgrade in culverts	□Yes	□ No	□N/A	RHDS 2.2.1
HWpost ≤ HWpre for design and 1% AEP (100-year event). No				
adverse impacts to property statement or CLOMR necessary for	□Yes	□ No	□N/A	RHDS 2.3 Step 6 D
FEMA regulated crossings for non-compliance.				
				<b>RCP</b> - Std Dwg 714-205-02 - Table
				714-205B; <b>SRAP</b> - Std Dwg 714-
Fill height requirements met	□Yes	□ No	□N/A	605-02 - Table 714-605B; <b>HDPE</b> -
				Std DWg /14-705-02 - Table /14-
				01
Determination whether culvert is in floodway or a flood hazard				01
area	□Yes	□ No	□N/A	RHDS 2.3 Step 6 A 5
Box culvert invert elevations buried 1 ft.	□Yes	□ No	□N/A	RHDS 2.3 Step 6 D
Stormwater Management				
Stormwater Management Design Study prepared	□Yes	□ No	□N/A	RHDS 2.2.13
Stormwater Management Report references current RHDS and	⊓Yes	□ No	<b>□N/A</b>	RHDS 2.1. 2.5
is sealed by a Professional Engineer	2.00		,.	
Detention present where an increase in flow is determined to	□Yes	□ No	□N/A	RHDS 2.2.12.2
nave negative impacts to property, but used as last resort				
$Q_{post}$ hydrograph peak $\leq Q_{pre}$ peak. Demonstrate no negative	□Yes	□ No	□N/A	RHDS 2.2.12.2
impacts to downstream property for non-compliance.				
Sediment & Frasion Control				
				RHDS 2 2 13: SCDOT internet
Stormwater Pollution Prevention Plan completed	□Yes	□ No	□N/A	CWDDD Dlan chooklist

Erosion prevention and sediment control BMP's based on SCDOT Stormwater Quality Design Manual (SWQDM) used Notice of Intent to be submitted to SCDHEC for projects with disturbed acreage over 1 acre and over 0.5 acre for coastal counties SWPPP Plan checklist

□Yes □No □N/A

SWQDM

SCDOT internet NOI