

## QUALITY ASSURANCE HYDRO CHECKLIST FOR ROADWAY

QA Item	Checkbox	Reference
<b>Computer Models</b>		
Acceptable numerical models used for Hydrology and Hydraulics	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	RHDS p. 74
List computer models used: _____		
<b>Hydrologic Analysis</b>		
Design year event for <u>Storm sewer and ditch design</u> - 10 % AEP (10-year event) for 0<DA≤40 acres; 4 % AEP (25-year event) for 40<DA≤500 acres; 2 % AEP (50-year event) for DA>500 acres	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	RHDS 2.2.3
Design year event for <u>Crosslines</u> - 4 % AEP (25-year event) for Secondary roads; 2 % AEP (50-year event) for Primary Routes and Interstates; Analyze 1 % AEP (100-year event) or overtopping flood for all routes	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	RHDS 2.2.2
Appropriate Methodology used for design	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	RHDS 2.2.15
<input type="checkbox"/> <b>Rational</b>		
Drainage area up to 100 acres	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	RHDS 2.2.15.1
Reasonable runoff coefficient being used for terrain	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	RHDS 2.2.15.1; Table 4
C <sub>f</sub> used for applicable design event	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	RHDS 2.2.15.1
Min T <sub>c</sub> = 5 min	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	RHDS 2.2.15
Current SCDOT Rainfall Intensity Values used	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	SCDOT website; HDB 2019-2
Runoff factors being used	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	RHDS 2.2.15.1; Table 4
<input type="checkbox"/> <b>NRCS WinTR-55 Method</b>		
Drainage area 100-640 acres	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	RHDS 2.2.15.2
Accurate Peak Rate Factor (PRF)	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	RHDS 2.2.15.2; Table 6
Hydrologic Soil Groups determined	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	NRCS TR-55, Tables 2.2.a,b,c
Curve Number determined for corresponding land use and HSG	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	NRCS TR-55, Tables 2.2.a,b,c
<input type="checkbox"/> <b>USGS Rural Regression equations</b>		
Drainage area greater than 1 square mile in rural areas	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	RHDS 2.2.15.3; Table 7; USGS SIR 2009-5156
<input type="checkbox"/> <b>USGS Urban Regression equations</b>		
Drainage area greater than 1 square mile in urban areas	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	RHDS 2.2.15.4; USGS SIR 2004-5030
<input type="checkbox"/> <b>Log Pearson Type III</b>		
Gaged site with USGS gage	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	RHDS 2.2.15.5
<input type="checkbox"/> <b>Hydrograph Methods</b>		
Regression equations minimum drainage area exceeded	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	RHDS 2.2.15.6; USGS WRIR 89-4087; USGS WRIR 92-4040
<b>Closed Stormwater Drainage</b>		
Proper application of approved inlet type	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	719-000 Standard Drawings
Correct inlet spacing based on inlet spacing design aids.	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	SCDOT website
Spread criteria met	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	RHDS 2.2.4 Table 2; **Design Variance**
Storm sewer pipes not in pressure flow (HGL ≤ 94%)	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	RHDS 2.2.9 **Design Variance**
Min 18" pipe except for yard drains and driveway pipes	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	RHDS 2.2.6
<b>Ditches</b>		
Design high water level 1 ft below the road subgrade in ditches	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	RHDS 2.3 Step 5B
Adequate hydraulic capacity	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	RHDS 2.3 Step 5B
Ditch stability analysis	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	RHDS 2.3 Step 5B
Sideline ditches kept out of wetland areas	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Clean Water Act - Section 404

**Outfall Ditches**

Adequate hydraulic capacity for 10% AEP (10- year event)	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> N/A	RHDS 2.2.12
Stability analysis for 10% AEP (10- year event)	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> N/A	RHDS 2.2.12.2
Outfalls that are natural watercourses left undisturbed where possible	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> N/A	RHDS - Section 2.2.12.2; Engineering Directive 27 - Drainage Outfalls
Pre vs Post flow analysis at each outfall for 10% AEP (10- year event)	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> N/A	RHDS 2.2.12.2
Determination that no violations to Drainage Regulations exist	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> N/A	RHDS 2.2.12.1
Determination that there is no anticipated damage caused to the property by comparing tailwater elevations for pre- and post-discharges. If potential for property damage exists, the channel is to be improved and/or detention is to be utilized.	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> N/A	RHDS 2.2.12.2

**Roadway Culverts (<20 ft)**

Headwater requirements for culverts met (HW/D $\leq$ 1.2)	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> N/A	RHDS 2.3 Step 6 D
Design high water level 1 ft below the road subgrade in culverts	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> N/A	RHDS 2.2.1
HW <sub>post</sub> $\leq$ HW <sub>pre</sub> for design and 1% AEP (100-year event). No adverse impacts to property statement or CLOMR necessary for FEMA regulated crossings for non-compliance.	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> N/A	RHDS 2.3 Step 6 D
Fill height requirements met	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> N/A	<b>RCP</b> - Std Dwg 714-205-02 - Table 714-205B; <b>SRAP</b> - Std Dwg 714-605-02 - Table 714-605B; <b>HDPE</b> - Std Dwg 714-705-02 - Table 714-705B; Instructional Bulletin 2010-01
Determination whether culvert is in floodway or a flood hazard area	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> N/A	RHDS 2.3 Step 6 A 5
Box culvert invert elevations buried 1 ft.	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> N/A	RHDS 2.3 Step 6 D

**Stormwater Management**

Stormwater Management Design Study prepared	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> N/A	RHDS 2.2.13
Stormwater Management Report references current RHDS and is sealed by a Professional Engineer	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> N/A	RHDS 2.1, 2.5
Detention present where an increase in flow is determined to have negative impacts to property, but used as last resort	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> N/A	RHDS 2.2.12.2
Q <sub>post</sub> hydrograph peak $\leq$ Q <sub>pre</sub> peak. Demonstrate no negative impacts to downstream property for non-compliance.	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> N/A	RHDS 2.2.12.2

**Sediment & Erosion Control**

Stormwater Pollution Prevention Plan completed	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> N/A	RHDS 2.2.13; SCDOT internet SWPPP Plan checklist
Erosion prevention and sediment control BMP's based on SCDOT Stormwater Quality Design Manual (SWQDM) used	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> N/A	SWQDM
Notice of Intent to be submitted to SCDHEC for projects with disturbed acreage over 1 acre and over 0.5 acre for coastal counties				SCDOT internet NOI