



# BASIN FAILURE

## A Case Study on a Skimmer Basin Failure and Downstream Remediation

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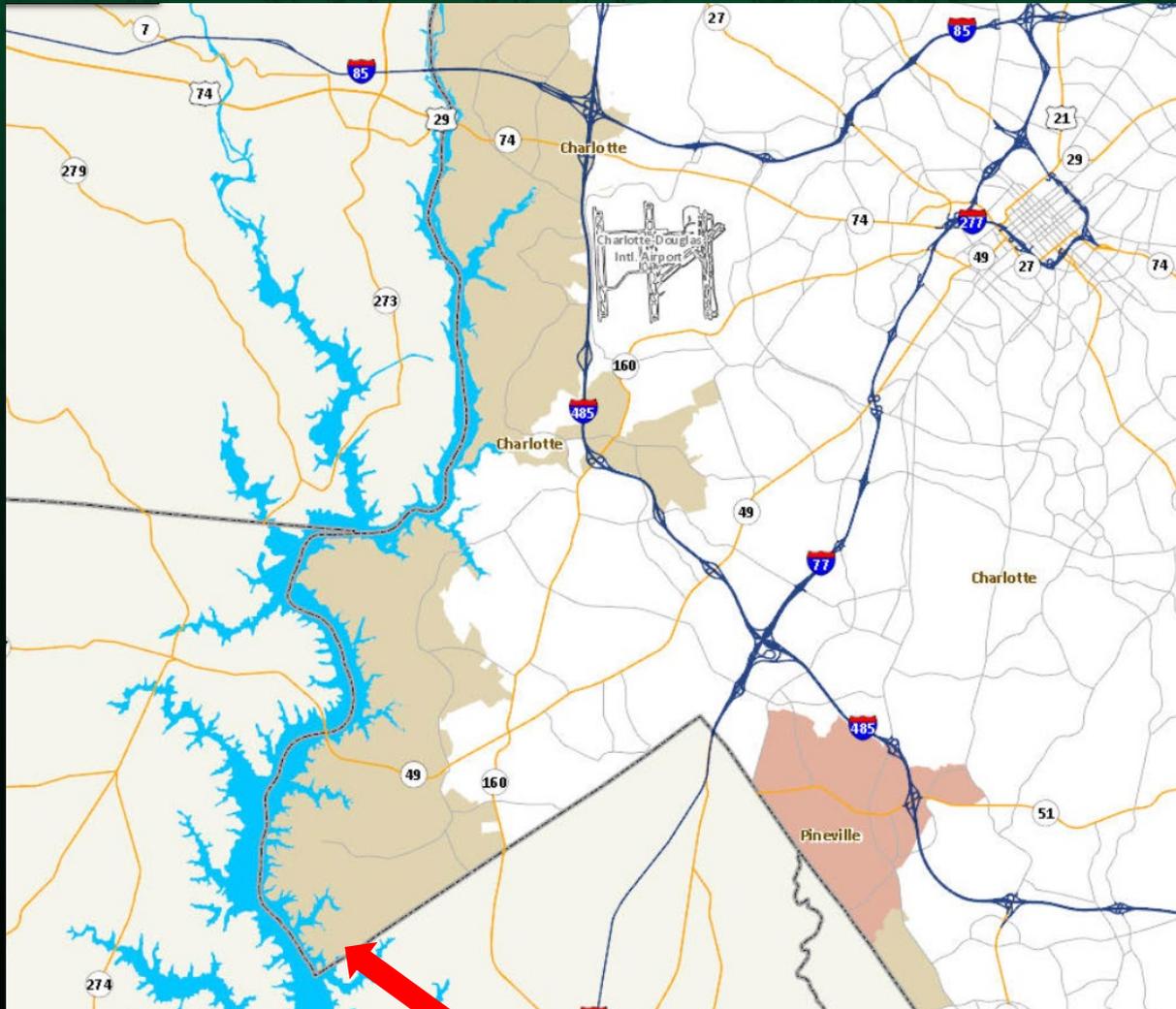


# TIMELINE

- July 21, 2016 – Early grading approval
- August 4, 2016 – Preconstruction Mtg
- November 11, 2016 – Permit issued
- August 21, 2017 – Basin failure
- November 3, 2017 – Clean up completed

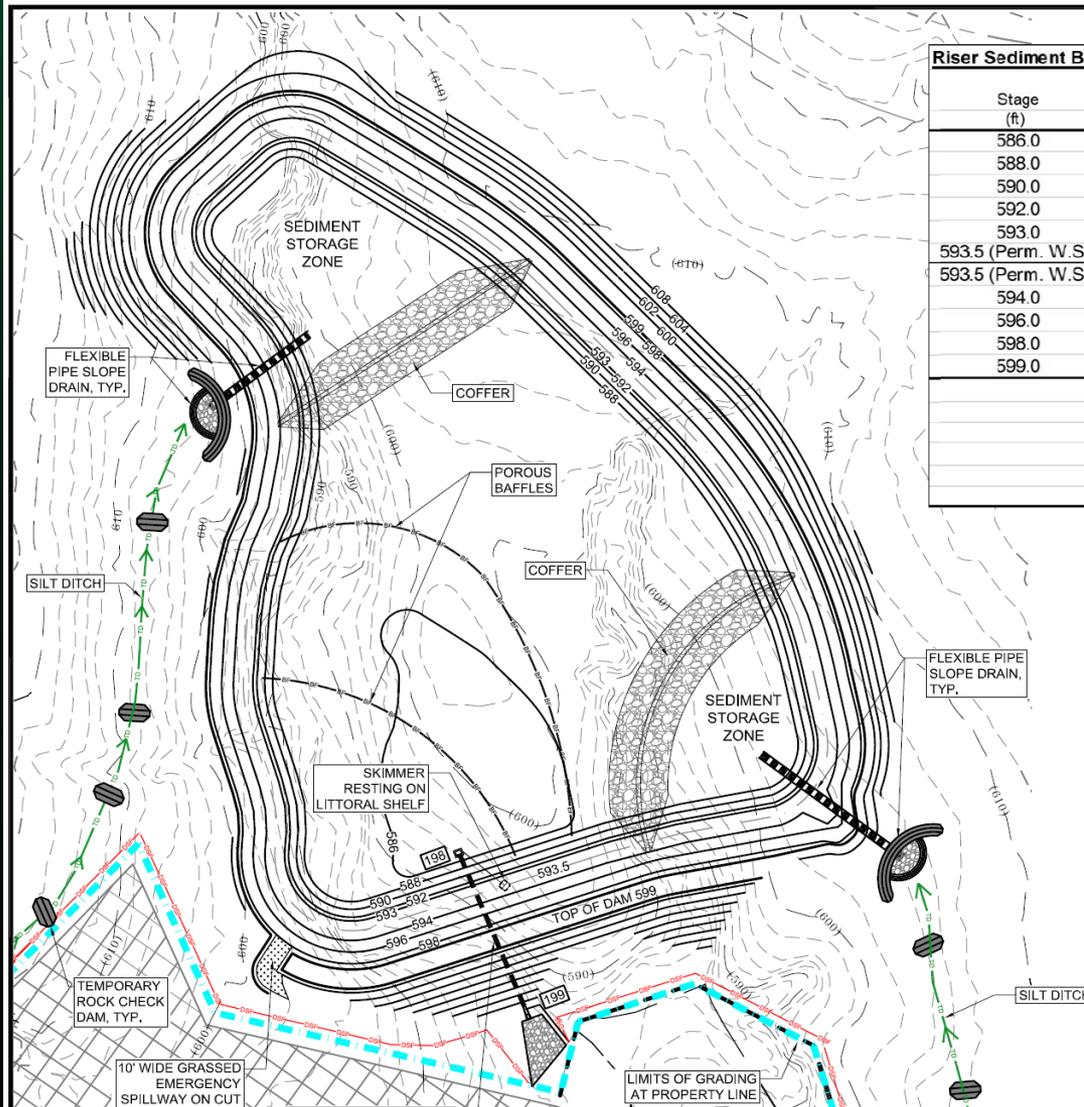


# Located in SW Mecklenburg Co.





# EC Basin I



Riser Sediment Basin 1 Storage Volume Provided:

Stage (ft)	Surface Area (sfi)	Incremental Storage (cf)	Total Storage (c)	Note
586.0	17,000	0	0	Bottom of Basin
588.0	49,000	66,000	66,000	ADDITIONAL SEDIMENT STORAGE
590.0	54,000	103,000	169,000	
592.0	60,000	114,000	283,000	
593.0	63,000	61,500	344,500	
593.5 (Perm. W.S.)	70,000	33,250	377,750	Top of Perm. Pool
593.5 (Perm. W.S.)	70,000	0	0	Bottom of Temp. Pool
594.0	79,000	37,250	37,250	
596.0	89,000	168,000	205,250	Storage Depth
598.0	97,000	186,000	391,250	Spillway
599.0	100,000	98,500	489,750	Top of Dam
Required Storage =			113,220	cf
Storage Provided =			205,250	cf
Surface Area Required =			95,875	sf
Surface Area Provided =			97,000	sf
Use 4" Skimmer w/ 3.8" Dia. Orifice				
Skimmer Invert Elev. @ 593.5'				

NOTES:  
 TEMPORARY DIVERSION DITCH ON TOP OF FILL SLOPE IS REQUIRED DURING CONSTRUCTION TO DIVERT RUNOFF AWAY FROM FLOWING OVER FILL MATERIAL

CONTRACTOR TO INSTALL PROPOSED SKIMMER DEVICES ON TOP OF A RIPRAP BASE ELEVATED AT 1' MIN ABOVE BMP BASIN BOTTOM

CONTRACTOR TO EXCAVATE OUT ADDITIONAL AREA BELOW BMP BASIN BOTTOM FOR ADDITIONAL STORAGE AREA FOR SILT DEPOSIT (USE SAME SIZE AS PROP. AREA FOR SAND FILTER)

2.22 acres  
 1.5 million gallons



# EC Basin I (Critical Watershed)

Grading  
limited to 20  
acres

Diversion  
ditches,  
interior and  
exterior basin  
slopes  
stabilized with  
RECP

Temporary  
groundcover  
within 5 days



NC  
SC

1,400 linear  
feet of  
downstream  
channel.



# Installation of EC Basin I





# Installation of EC Basin I





# Dewater Basin from Littoral Shelf





# Addition of Polyacrylamides (PAM)





# Floc logs in Storm Sewer System





July 31, 2017





July 31, 2017





July 31, 2017





August 21, 2017





## AUGUST 21, 2017

- Received calls from downstream residents in NC and SC
- Developer called to self-report the incident







- Sunny day breach; had not rained in a week
- Trench-type failure over the barrel pipe







BMP 1  
PIECE 4

BMP  
1

BMP  
1











Before failure...

3'





After failure...







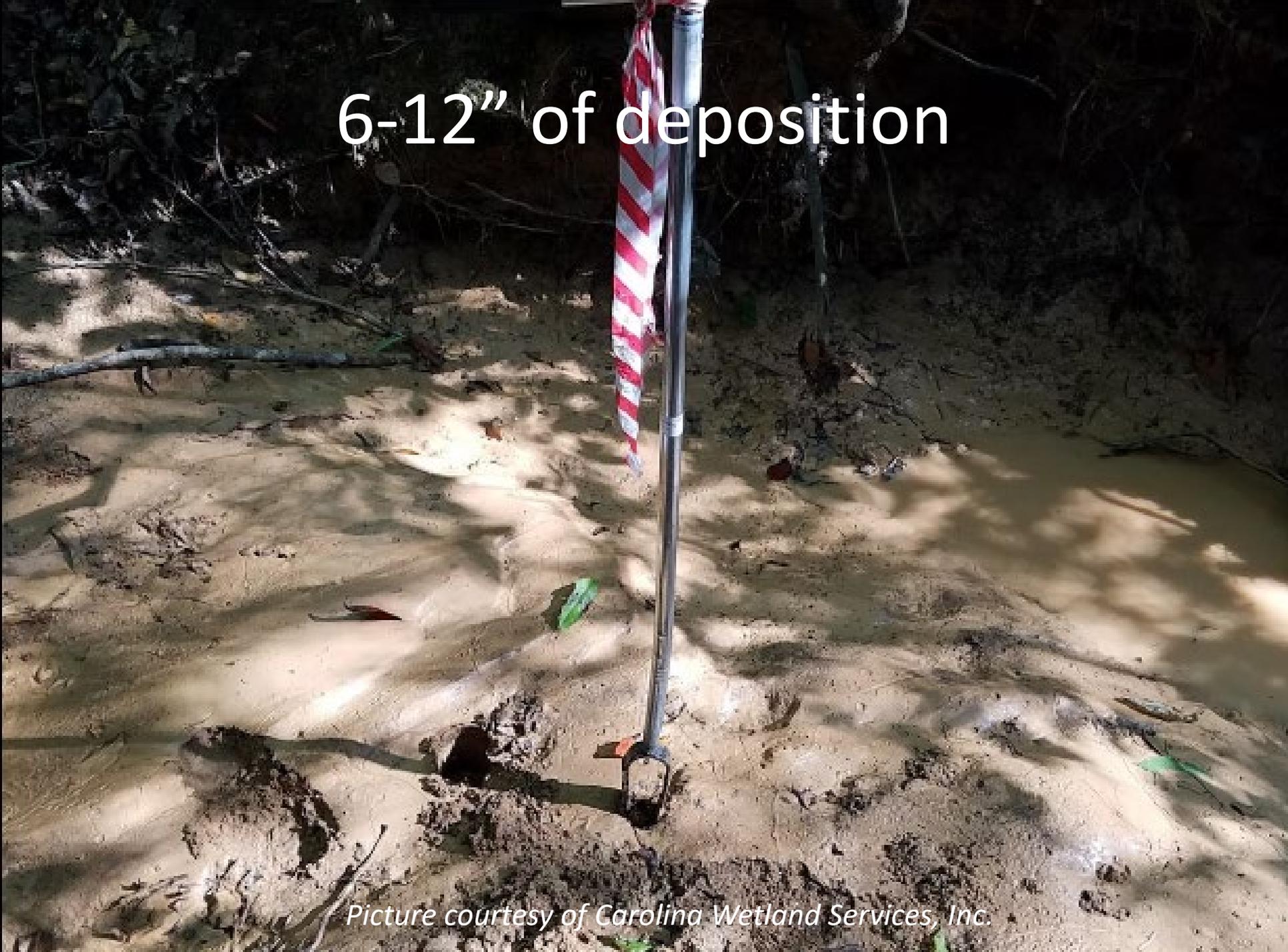


12-18" of deposition



*Picture courtesy of Carolina Wetland Services, Inc.*

6-12" of deposition



*Picture courtesy of Carolina Wetland Services, Inc.*

1-6" of deposition



*Picture courtesy of Carolina Wetland Services, Inc.*





# POST-FAILURE PRIORITIES

- Safety
- Assessment of impacts
- Remediation and clean up plan
- Repair and/or modification of dam
- Appropriate plan of action for future phases



# SAFETY

- City required:
  - Temporary and/or permanent repairs take place under direct supervision of qualified, licensed professional
    - Engineers and regulatory staff were on site within 1.5 hours of notification
    - Engineering memos received on 8/23 with field observations and plan of action for ensuring interim dam safety (while causes were identified and repairs designed/constructed)



## FIELD OBSERVATIONS:

- Approximate 10' gap over barrel pipe at location of breach
- Pipe joints aligned but disrupted
- Grout seal between OCS riser and barrel pipe “rough”
- No visible external grout at pipe joints
- No anti-seep collar constructed
- Organic debris observed within embankment fill material
- Insufficient compaction
- Soil types not ideal (sandy Pacolet series)



# IMPACT ASSESSMENT

- Upland impacts assessed quickly
- Report from Carolina Wetland Services, Inc. received on 8/22 – “Sediment Assessment and Stream Restoration Plan”
- Noted approximately 200 feet of buried tributary channel
- Noted “very little sediment was deposited within the Lake Wylie cove” and recommended no remediation within cove



# Sediment Assessment and Stream Restoration Plan

- Remove sediment where possible by shovels and/or hand tools
- Application of wetland seed mix and coconut matting
- Use coir logs for grade control in 100-foot intervals along stream channel, to prevent sediment from migrating downstream



## AUGUST 22, 2017

- Coordination between City of Charlotte, York County and Duke Energy Lake Management Officials
- Adjacent property owner disputed location of property line
- Would not allow anyone on their property to remove offsite sediment









## AUGUST 24, 2017

- Imported clay material for new barrel pipe
- Surveyed property line
- Began removing deposited sediment from tree save area with skid steers
- Turbidity curtain installed



10-8  
P110









## AUGUST 28, 2017

- Anti-seep collars installed with new barrel pipe
- All sediment had been removed from the Developer's tree save area





3'

Damaged roots?







## AUGUST 31, 2017

- Biodegradable coconut jute matting installed in the Developer's tree save area.
- Allowed temporary conveyance of stormwater around deposited sediment.
- Embankment dam repaired











## OCTOBER 30, 2017

- Finally obtained approval from downstream property owner to remove offsite sediment
- No machinery was allowed on their property, hand tool removal only
- Oversight by City Officials at all times









## NOVEMBER 1 , 2017

- Located and flagged the original stream with assistance from Carolina Wetland Services, Inc.
- Used a Dutch auger to differentiate between existing streambed substrate and deposited sediment



6"











## NOVEMBER 2-3 , 2017

- Biodegradable coconut jute matting installed in impacted bottomland
- Two layers installed in stream channel and on banks
- Matting secured with metal pins and wooden stakes every 2 sqft.

















# REMEDIATION AND CLEAN UP

- Began on August 22, 2017
- Continued in stops and starts due to access concerns from adjacent neighbor
- Completed on November 3, 2017
- Seventy-four (74) calendar days, twelve (12) days of actual clean up



# REMEDIATION AND CLEAN UP

- Roughly 2.75 acres of impacted bottomland (0.75 acres in NC)
- An estimated **500** cubic yards of material was removed in total
- Of that 500 cubic yards, roughly **450** cubic yards was removed by hand, using buckets shovels and rakes
- Willow and River Birch live stakes will be planted in Fall of 2018



Spring 2018



















Fall 2018









# Fall 2019

