



BMPs to SCMs

Cary's Adaptive Approach to
Post-Construction

Charles Brown & Emily Cochran

Town of Cary
Stormwater Division



What we'll talk about today:

A. Background: Cary & its SCMs

B. Regulatory Requirements

C. Site Plan Process

D. Construction Site Turnover

E. Post-Construction Program

A. Inventory

B. Inspections

C. Tracking & Enforcement

F. Why has Cary's program been successful?

All About Cary

SIZE

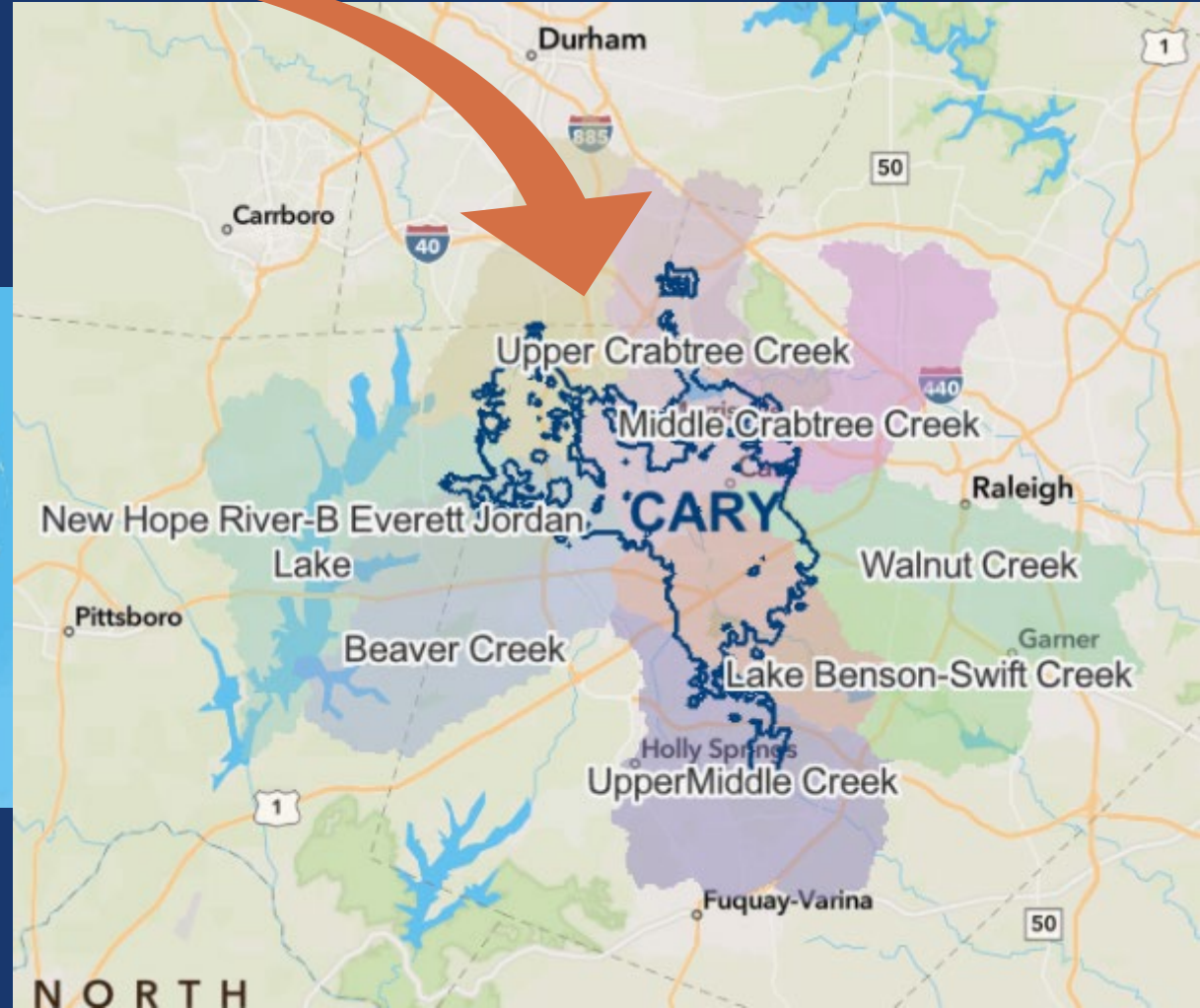
- City limits are 61.9 sq. miles
- ETJ is 58 sq. miles
- Population is 174,888
- 7th largest municipality in NC

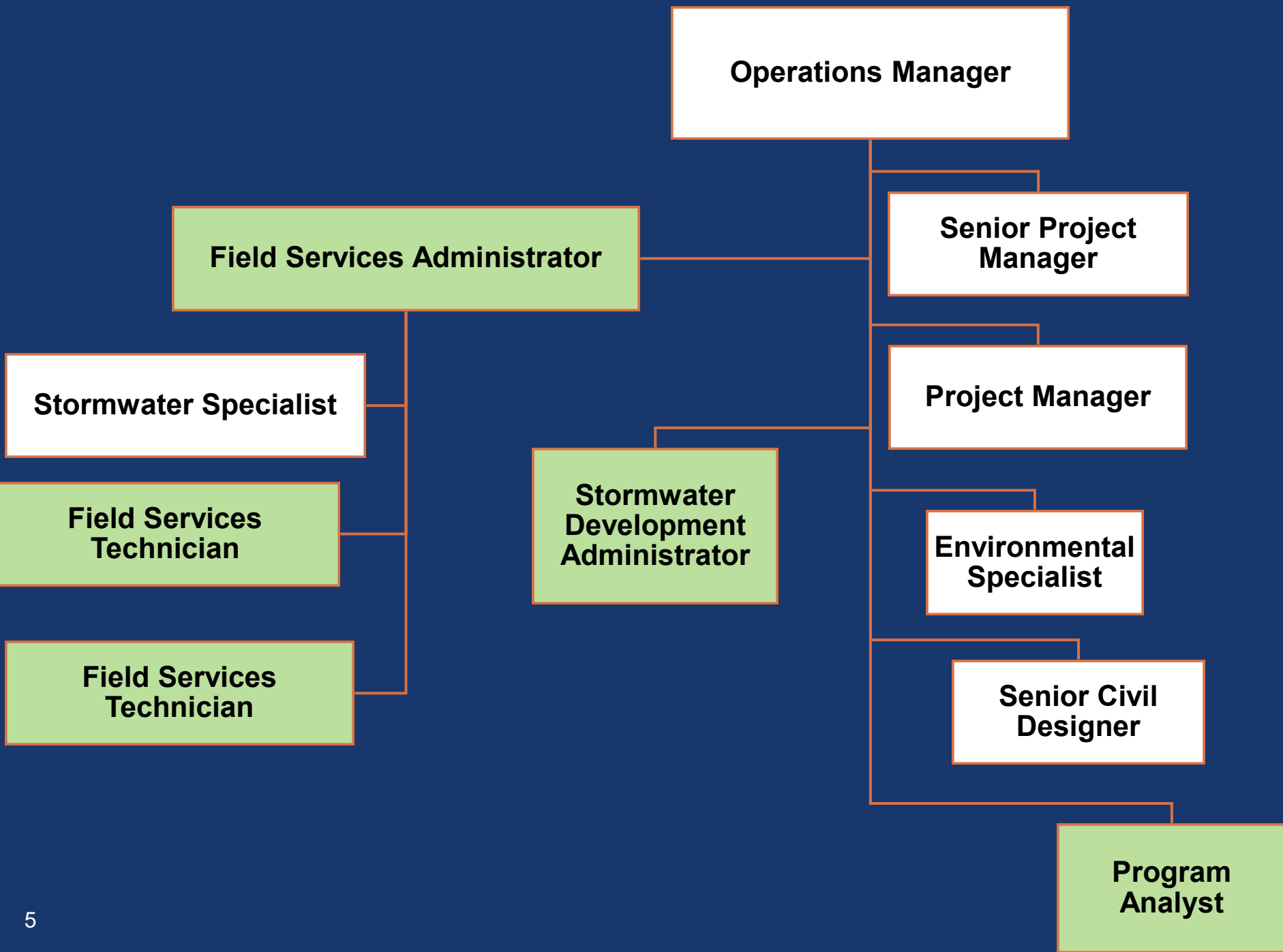
LOCATION

- Primarily in Wake County, partially in Durham and Chatham Counties
- Surrounded by Raleigh, RTP, Morrisville, Apex and Holly Springs

WATERSHEDS

- Split between Neuse River Basin and Cape Fear River Basin
- Two water supply watersheds (Jordan Lake and Swift Creek)

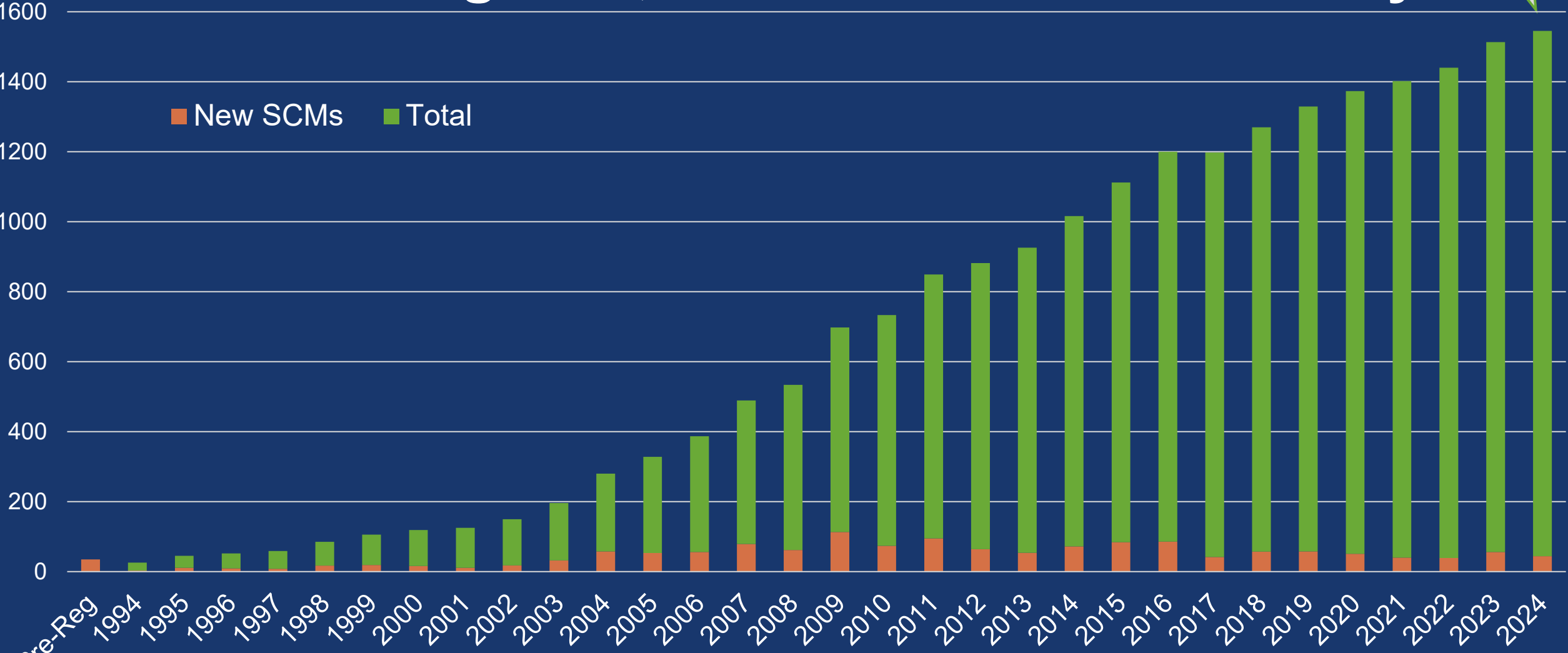




As a Town grows, so does its SCM inventory

1516

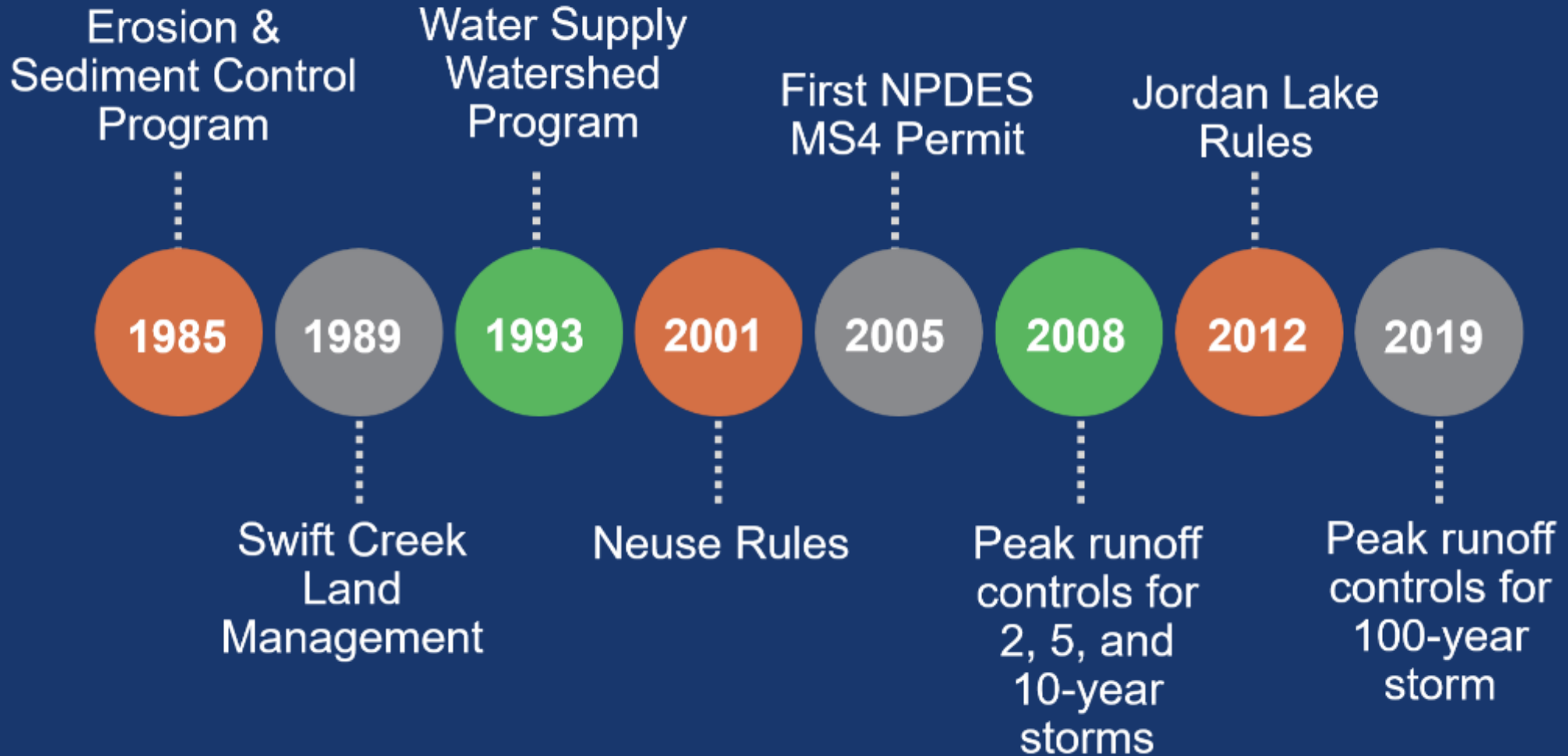
New SCMs Total



SCMs by Type

	Privately-Owned	Town-Owned	Grand Total
Bioretention	189	21	210
Constructed Wetland	281	21	302
Dry Pond	112	14	126
Grass Swale	37	2	39
Level Spreader	194	9	203
Permeable Pavement	3	0	3
Proprietary Devices	23	1	24
Riparian Buffer	3	0	3
Sand Filter	78	2	80
Scour Hole	3	9	12
Step Pool	1	0	1
Underground Detention	87	2	89
Unregulated	18	4	22
Wet Pond	391	11	402
Grand Total	1420	96	1516

Post-Construction Regulatory Requirements



Site Plan Process

Plan Submittal

- Development Review Committee (DRC)
- Erosion and Sediment Control Plan (Construction)
- Stormwater Management Plan (Post Construction)

Construction

- Grading permit issued and work starts
- Paperwork for the SCM initiated

Post Construction

- Final paperwork submitted/inspection of device in final form
- Certificate of Compliance issued and SCM enters post construction program with annual inspections
- Grading permit closed out

Site Inspections

- Ensure site is meeting requirements of grading and drainage plan
- Provide reports to all parties to indicate if site is compliant or noncompliant
- Provide information on what next steps are for the site
- Plan grid now Autodesk Builder

Alston Landing
Cary, North Carolina
21-DP-1251
SEC Inspection Report (updated)
Mar 14, 2024, ID #68

REPORT DETAILS
Description Copied from Mar 1, 2024
Submitted by mike thompson
Status Submitted
Last update Mar 14, 2024 4:15 PM
Last updated by mike thompson



TOWN OF CARY
STORMWATER DIVISION

Date March 14, 2024

Registered Agent
MI Homes of Raleigh LLC
Attn: Erica Leatham
2626 Glenwood Ave. Suite 550
Raleigh NC 27607

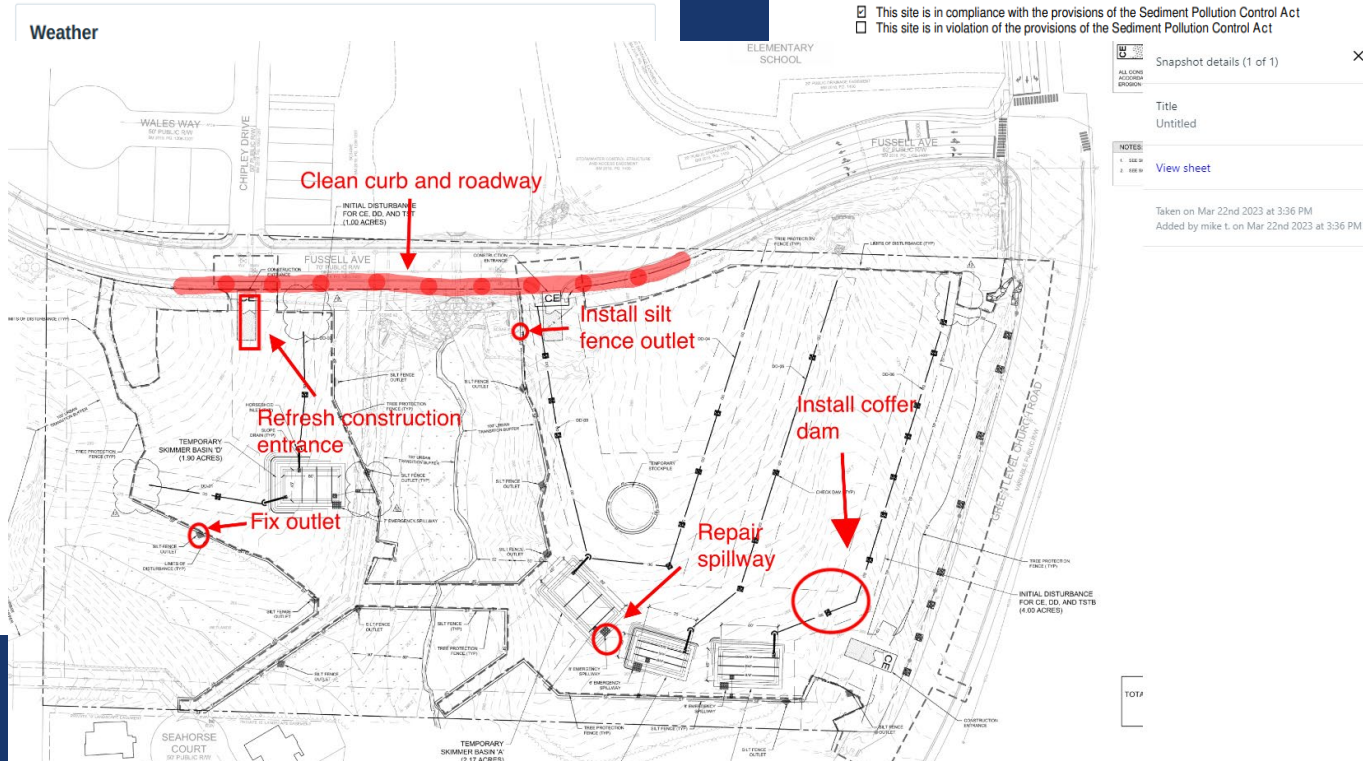
Financially Responsible Party
MI Homes of Raleigh LLC
Attn: Erica Leatham
2626 Glenwood Ave. Suite 550
Raleigh NC 27607

Erosion Control Officer: Mike Thompson

SEDIMENTATION/EROSION CONTROL INSPECTION REPORT

Project Name: Alston Landing
TOC Project #: 21-DP-1251
Watershed: Jordan

- This site is in compliance with the provisions of the Sediment Pollution Control Act
- This site is in violation of the provisions of the Sediment Pollution Control Act



20240314_090948_photo
mike thompson
Mar 14, 2024 9:10 AM



20240314_090738_photo
mike thompson
Mar 14, 2024 9:07 AM





Construction Site Turnover

- 1995 – required paperwork at device installation (Water Supply Watershed Program)
- 2001 – access easement agreement (Neuse Rules and subsequent LDO changes)
- 2009 – PE Certification within 30 days of conversion from construction to post construction.
- Collaboration with site/field inspectors

Owners List	Date Received
1. Executed Deed (Property Description)	
2. Operations & Maintenance Manual	
3. Maintenance Agreement (notarized)	
4. Survey Plot of Structure recorded with the County Register of Deeds showing the related Stormwater Control Structure and Access Easement (all pages)	
5. Establishment of Dedicated Maintenance Account (per LDO Chap. 4.4.6 (G)(7)) <ul style="list-style-type: none"> • Engineer's estimate for 10% of the total cost of SCM construction • SCM Dedicated Maintenance Account Certification form 	
6. Stormwater Control Structure and Access Easement Agreement recorded with the County Register of Deeds.	
7. Certification (sealed by PE) stating that structure is complete and complies fully with approved plans and specifications for each stormwater control measure	
8. Reproducible as-built plans for all SCM structures and storm drain infrastructure following Cary Standard Specification Section 10000 Record Drawing Checklist	
9. For bioretention devices only, Soil Report showing media mix and P-index of media used meet requirements of NCDEQ Minimum Design Criteria manual.	
10. Closed Circuit Television (CCTV) video files of all public and private storm drain infrastructure for staff review; identified punch list items rectified.	

In the beginning... there was paper

WITHERS & RAVENEL Engineering & Surveying
 711 Mackinnon Drive • Cary, N.C. 27511
 JOB NO. 30
 SHEET NO. P
 DATE 1/26/56
 COMPUTED BY AS-BUILT
 CHECKED BY
 JOB NAME Concrete - L Dam #2
 SUBJECT

I) COMPLETE WEIGHING OF IMPROVEMENTS
 Description Area %IMP EXTENSION
 Concrete 13.6 80 10.28
 RL - Earth 7 450% 4.26
 RL - Water 5.3 58 3.07
 26.2 142 13.95
 %IMP = 10.21/26 = 74.0% 53.4%

II) COMPUTE RUNOFF - WADSWORTH FOR 1" RAINFALL
 Vol = 26.0K x 43560 SQ FT x 0.170 x 1/12 in = 66,000 LF
 No. = 50,400 LF

III) DETERMINE STORAGE/STORAGE + GRADE/SURFACE AREA
 RELATIONSHIP FOR WADSWORTH POINT AS-BUILT

ELEV.	AREA SQ	AVOL CF.	EVOL EF.	AREA	Δ Vol	Σ Vol
370	667	5067	5067	15,508		5067
372	4400	16,114	21,781	11,108	28,572	20,575
374	12,314	56,795	56,576	17,870	41,124	49,153
376	22,481	52,224	108,800	25,650	53,908	90,277
378	21,803	67,922	176,772	30,254		144,185
380	30,129	40,114	216,906		78,254	
381	42,100	49,909	266,815	48,000		222,939
382	57,718					

- Paper files mailed or faxed
- Handwritten checklists
- Scanned & uploaded to Laserfiche

Construction Site Turnover

- Shared digital systems:
 - Emailed PDFs
 - DocuSign
 - Box folder (shared online network drive)
 - Salesforce – stormwater permits
- Laserfiche & paper files still used for permanent storage
- Allows multiple staff to upload/edit/review documents

Search files and folders

2016 > Pipers Grove 16-SB-001 > SCM

NAME ↑

- As-Builts
- 00 Pipers Grove Townhomes Certificate of Watershed Compliance Letter.pdf
- 01 executed deed.pdf
- 02 maintenance agreement.pdf
- 03 OM manual.pdf
- 04 recorded plat.pdf
- 05 maintenance security.pdf
- 06 SCSAEA.pdf
- 07 PipersGrove Engineering Cert.pdf
- 07 PipersGrove Soil Report.pdf
- Pipers Grove Townhomes 16-SB-001.p

Stormwater Regulat... Permits Development Review Activities

Permit **Wet Pond #1**

Fee Line Items (0)

Required Documentation (9)
9 items • Updated a few seconds ago

<input type="checkbox"/>	Line Item Name	Type of Line Item
1 <input type="checkbox"/>	Maintenance Agreement	Maintenance Agreement
2 <input type="checkbox"/>	Plat	Plat
3 <input type="checkbox"/>	Deed	Deed
4 <input type="checkbox"/>	O&M Manual	Operations and Maintenance Manual
5 <input type="checkbox"/>	As-Built	As-Built
6 <input type="checkbox"/>	Engineer's Estimate	Engineer's Estimate
7 <input type="checkbox"/>	Easement Agreement	Easement Agreement
8 <input type="checkbox"/>	PE Certification	PE Certification
9 <input type="checkbox"/>	Landscaping Agreement	Landscape Agreement

Cary's Post-Construction Program

A. Inventory

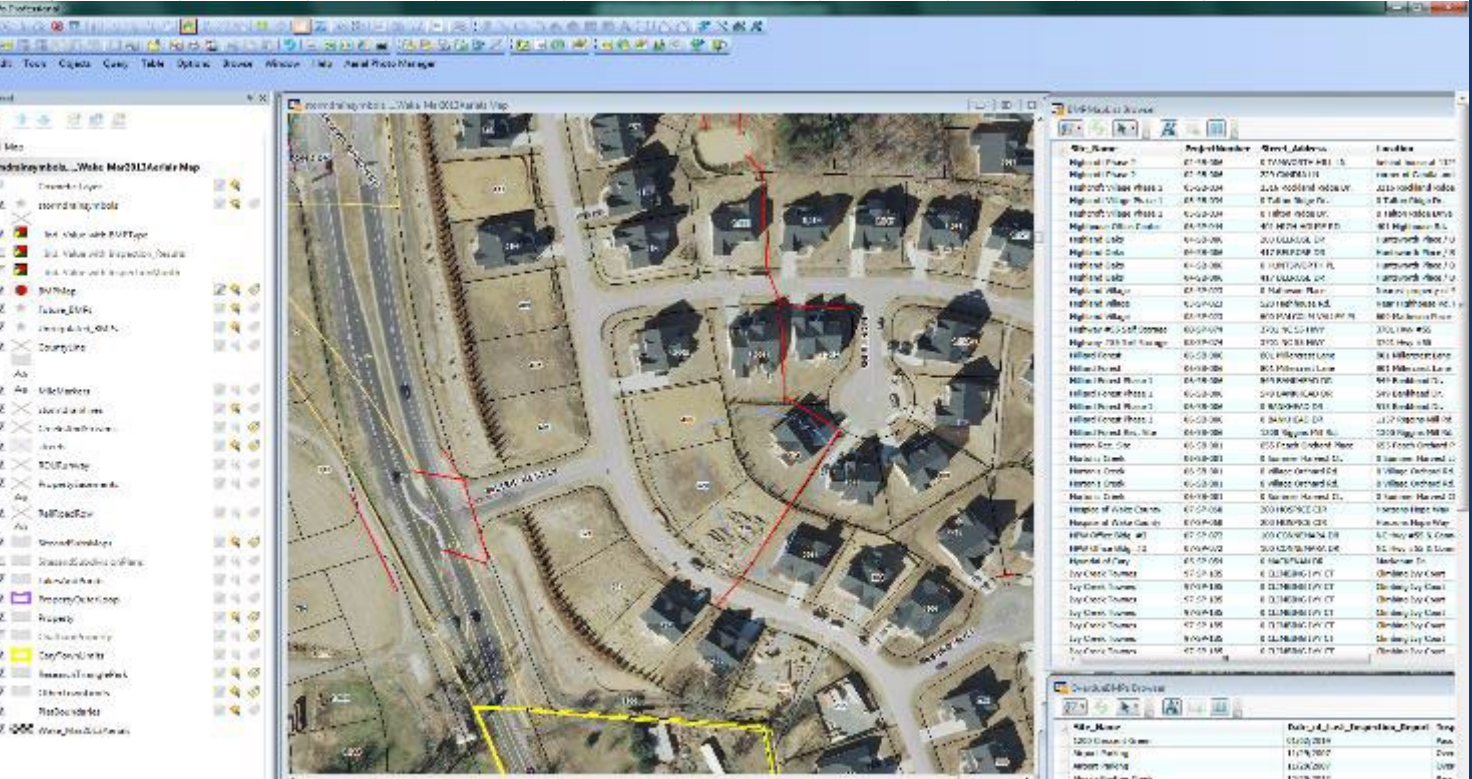
B. Inspections

C. Tracking & Enforcement

	A	B	C	D	E	F	G	H	I	J	K
1	OBJECTID	SiteName	ProjectNu	Location	ProjectCit	OwnersNa	OwnerAdc	OwnerCity	OwnerPhc	OwnerEm	SiteManag
2	3128	MacKenan	99-SP-196	111 MacKe	Cary, NC 2	111 Macke	P.O. Box 3	Raleigh, N	919-	bpa	111 Macke
3	3129	1200 Cresc	96-SP-175	1200 Cresc	Cary, NC 2	GH Cresce	3433 Peac	Atlanta, GA	303	12	BrightView
4	3130	A+ Self Sto	99-SP-130	160 Haven	Cary, NC 2	Sovran Acc	6467 Main	Williamsville, N		1	Extra Spac
5	3131	Advance A	07-SP-086	205 Grand	Cary, NC 2	Stella Kala	326 Bamp	Mt. Pleasant, SC		4	Insight Fac
6	3132	Airport Pai	01-SP-140	251 Airgat	Morrisville	Airgate CH	5975 Cava	Raleigh, N	919-	chk	@gmail.cor
7	3133	ALDI, Inc.	06-SP-062	2303 NW I	Cary, NC 2	ALDI, Inc.	1985 Old U	Salisbury, I	704-	stu	od@aldi.us
8	3134	ARS Buildir	03-SP-155	1631 NW I	Cary, NC 2	Triangle Re	113 Dunca	Cary, NC 27511-			Accident R
9	3135	Best West	96-SP-112	1722 Waln	Cary, NC 2	GSS Raleig	5640 Dillar	Cary, NC 2 919-		sus	nas@cmchc
10	3136	Bishops Ge	03-SP-021	Behind 22	Cary, NC 2	Bishops Ge	1612 Milit	Wilmington	919-	bpe	amsmgmt.co
11	3137	Bishops Ge	03-SP-036	330 Westh	Cary, NC 2	Bishops Ge	1612 Milit	Wilmington	919-	bpe	amsmgmt.co
12	3138	Cary Comr	96-SP-114	SE Corner	Cary, NC 2	Town of C	316 N Aca	Cary, NC 27513			
13	3139	Faculty Av	01-SP-155	408 Facult	Cary, NC 2	Town of C	316 N. Aca	Cary, NC 2 919-		331	
14	3140	Cary Good	08-SP-001	220 Kilmay	Cary, NC 2	Goodwill I	4721 Empe	Durham, N 919-		sco	odwillinc.cor
15	3141	Cornerstor	05-SP-130	200 Corne	Cary, NC 2	200 Corne	2509 Victo	Raleigh, NC 276			York Prop
16	3142	Coventry V	97-SP-263	Behind 11	Cary, NC 2	Coventry V	P.O. Box 9	Raleigh, N 919-		llan	charlestonr

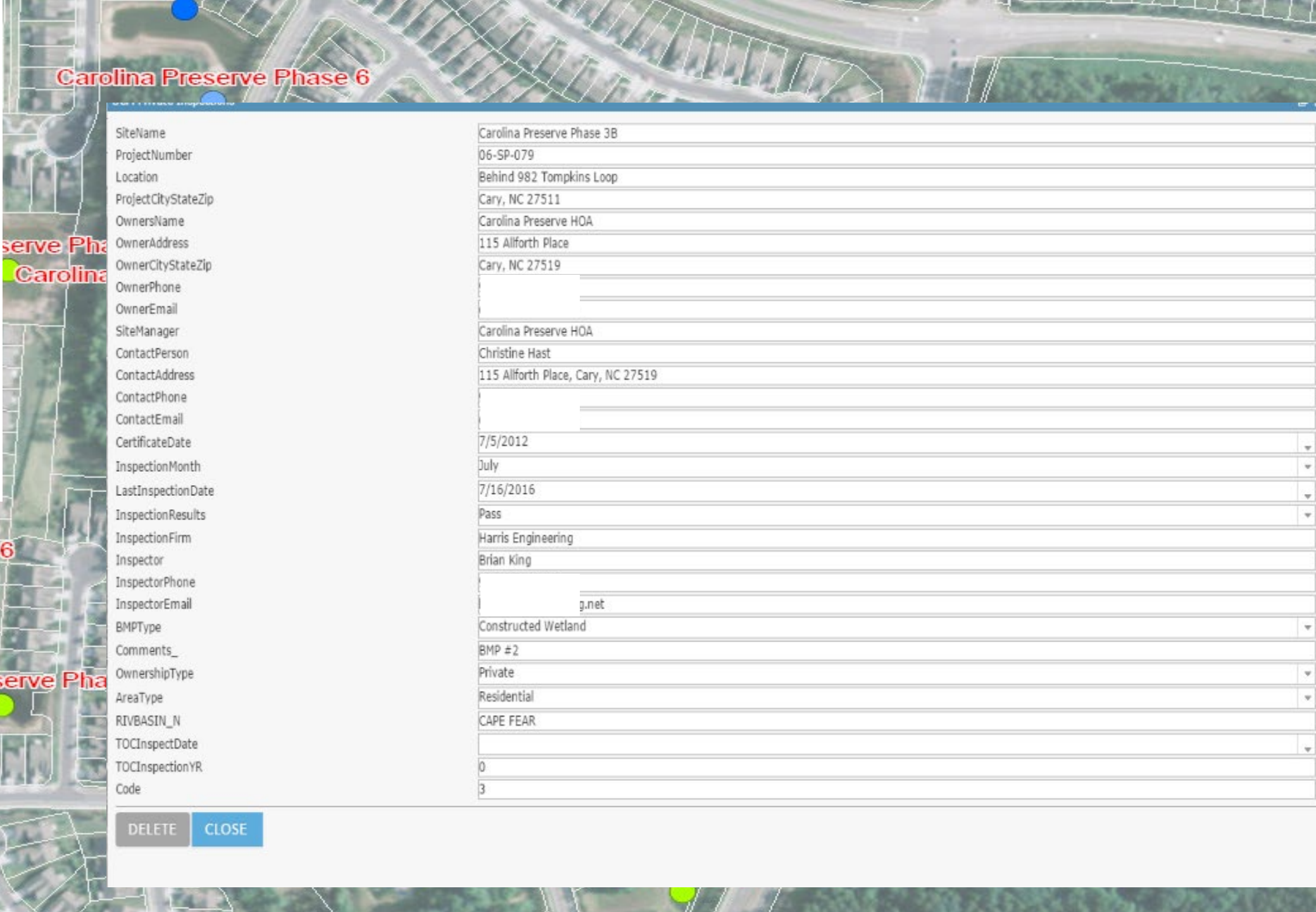
A. Inventory

- Started with spreadsheet of sites
- MapInfo (2010) > ArcGIS Online (2017) > ArcPro (2023)
- Schema update – SCM assets separate from inspections and compliance (related table)



SCM

- Bioretention
- Constructed Wetland
- Detention
- Dry Pond
- Grass Swale
- Level Spreader
- Permeable Pavement
- Plunge Pool
- Proprietary Devices
- Riparian Buffer
- Sand Filter
- Scour Hole
- Step Pool
- Underground Detention
- Unregulated
- Wet Pond



SiteName	Carolina Preserve Phase 3B
ProjectNumber	06-SP-079
Location	Behind 982 Tompkins Loop
ProjectCityStateZip	Cary, NC 27511
OwnersName	Carolina Preserve HOA
OwnerAddress	115 Allforth Place
OwnerCityStateZip	Cary, NC 27519
OwnerPhone	
OwnerEmail	
SiteManager	Carolina Preserve HOA
ContactPerson	Christine Hast
ContactAddress	115 Allforth Place, Cary, NC 27519
ContactPhone	
ContactEmail	
CertificateDate	7/5/2012
InspectionMonth	July
LastInspectionDate	7/16/2016
InspectionResults	Pass
InspectionFirm	Harris Engineering
Inspector	Brian King
InspectorPhone	
InspectorEmail	g.net
BMPTYPE	Constructed Wetland
Comments_	BMP #2
OwnershipType	Private
AreaType	Residential
RIVBASIN_N	CAPE FEAR
TOCInspectDate	
TOCInspectionYR	0
Code	3

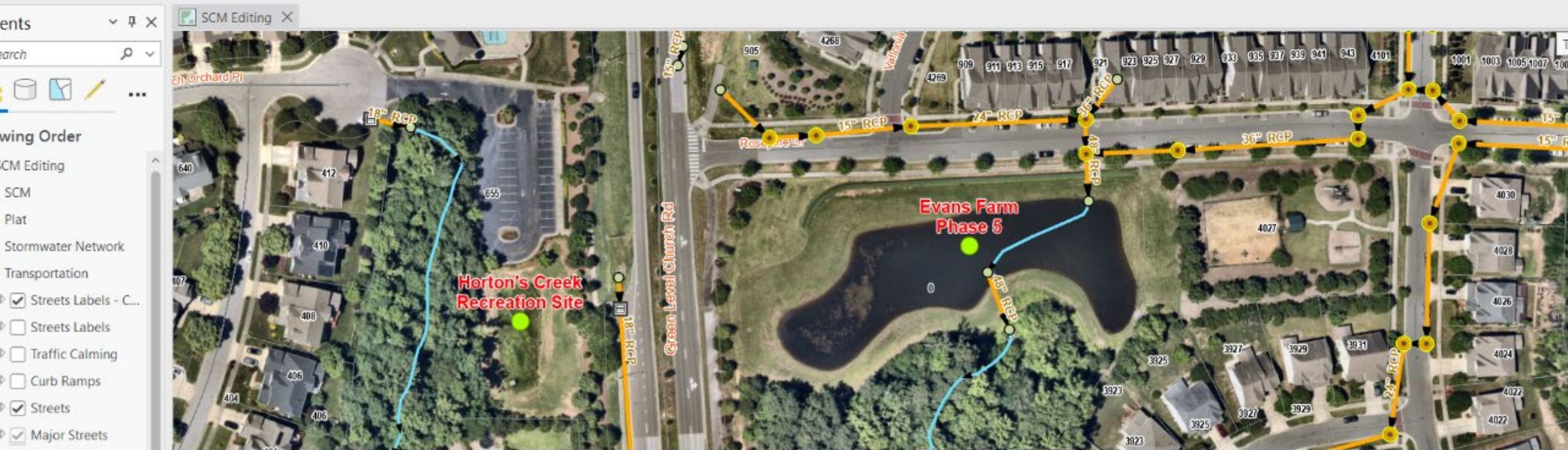
DELETE CLOSE

Map Insert Analysis View Edit Imagery Share Help Table Time

Create Import Add Remove Enable Location
 Color Vision Simulator
 Accessibility Animation Device L...

Illumination Visual
 Weather Camera
 Postprocessing

Mode Distance
 View Clipping

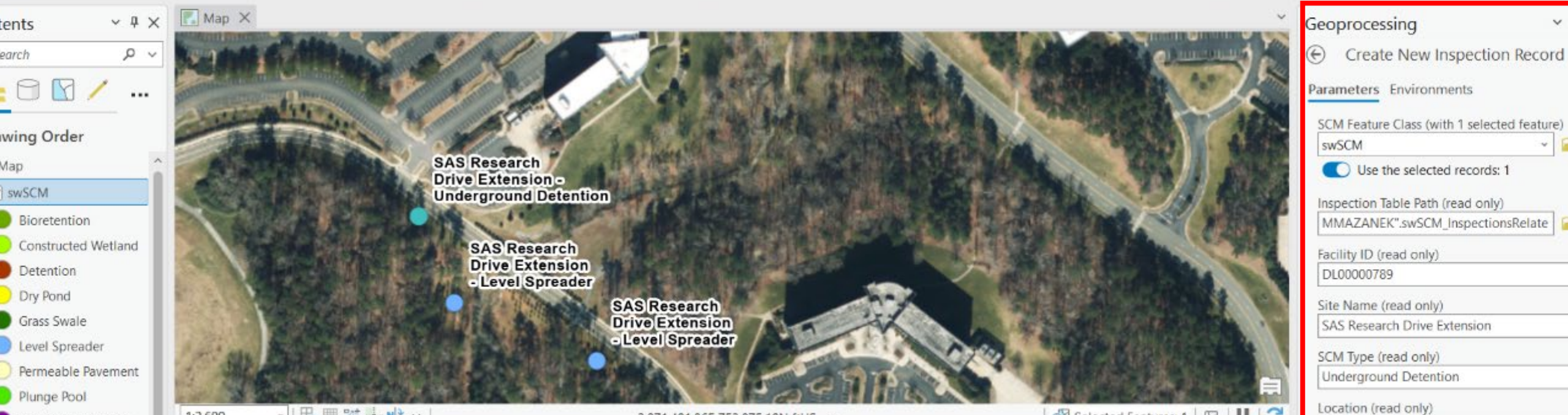


1:1,612 78.9014417°W 35.8399668°N Selected Features: 0

Field: Add Calculate Selection: Select By Attributes Zoom To Switch Clear Delete Copy

SiteName	ProjectNumber	Location	ProjectCityStateZip	OwnersName	OwnerAddress	OwnerCityStateZip	Owner
1 1100 Crescent Green	99-SP-001	off Crescent Commons Drive	Cary, NC 27511	GH Crescent Green Inc., Attn: John Ginle...	3433 Peach	Atlanta, GA 30326-1112	<N...
2 11000 Regency Pkwy Parking Expansion	18-DP-0476	11000 Regency Parkway	Cary NC 27518	Regency Lakeview GL LP	5310 South	Durham, NC 27713	<N...
3 11000 Regency Pkwy Parking Expansion	18-DP-0476	11000 Regency Parkway	Cary NC 27518	Regency Lakeview GL LP	5310 South	Durham, NC 27713	<N...

0 of 1,507 selected Filters: 110%



swSCM_Inspections swSCM

Field: Add Calculate Selection: Select By Attributes Zoom To Switch Clear Delete Copy Rows: Insert

	OBJECTID *	GlobalID *	Facility ID *	Certificate Date	Inspection Month	Inspection Type	Inspection Date	Inspection
1	1645	{8EAC9B21-5982-442C-92B2-E3C04A8F194B}	DL00000272	4/2/2008	April	Private	8/12/2024	Compliant
2	1644	{675E0C5A-0EE1-4CC7-ACD6-2D0F96C21E36}	DL00000564	12/12/2014	December	Private	8/9/2024	Compliant
3	1643	{6FF4A685-FC6A-4D5A-9A9D-2C0C97D0E69E}	DL00000330	7/20/2009	July	Private	8/9/2024	Compliant
4	1642	{EF41635E-DC70-4604-8D55-36CD9CE64743}	DL00001395	10/10/2018	October	Private	<Null>	Compliant
5	1641	{369D1201-B3FA-4049-AB60-3A83E0AB1823}	DL00001395	10/10/2018	October	Private	8/16/2024	Compliant

Geoprocessing

Create New Inspection Record

Parameters Environments

SCM Feature Class (with 1 selected feature)
swSCM

Use the selected records: 1

Inspection Table Path (read only)
MMAZANEK".swSCM_InspectionsRelate

Facility ID (read only)
DL00000789

Site Name (read only)
SAS Research Drive Extension

SCM Type (read only)
Underground Detention

Location (read only)
Detention Structure #17

Certificate Date (read only)
10/10/2018

Inspection Month
October

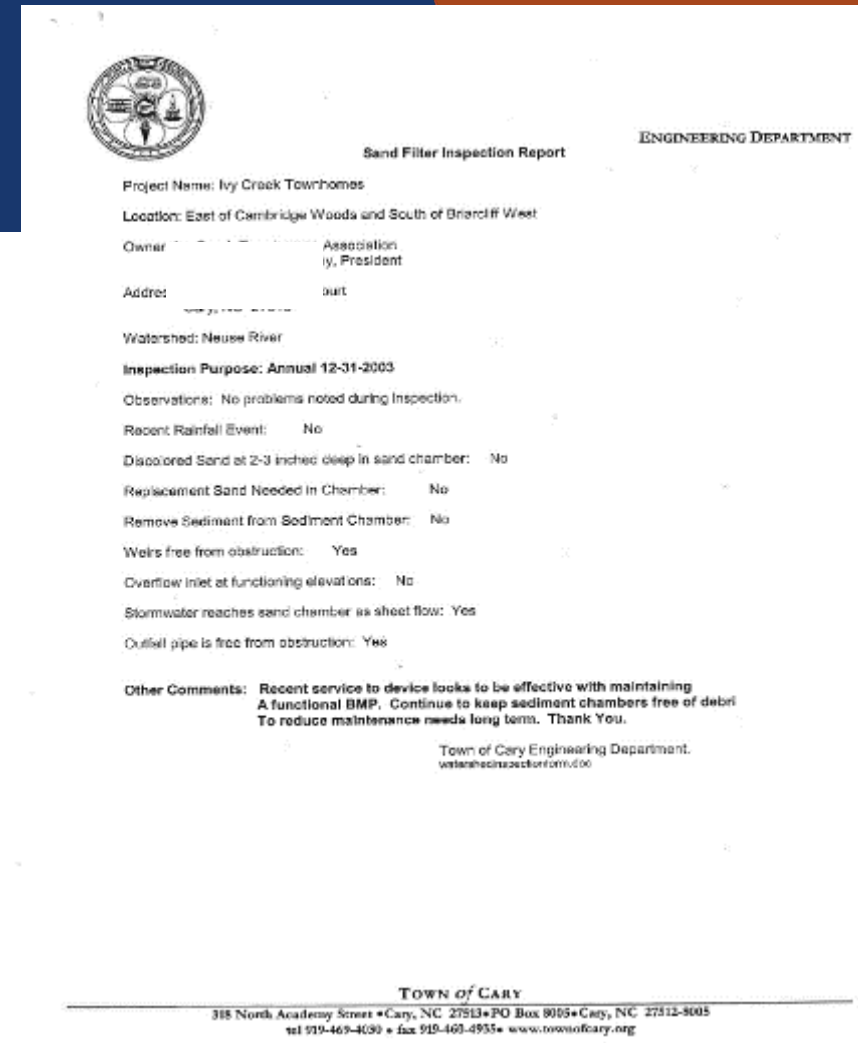
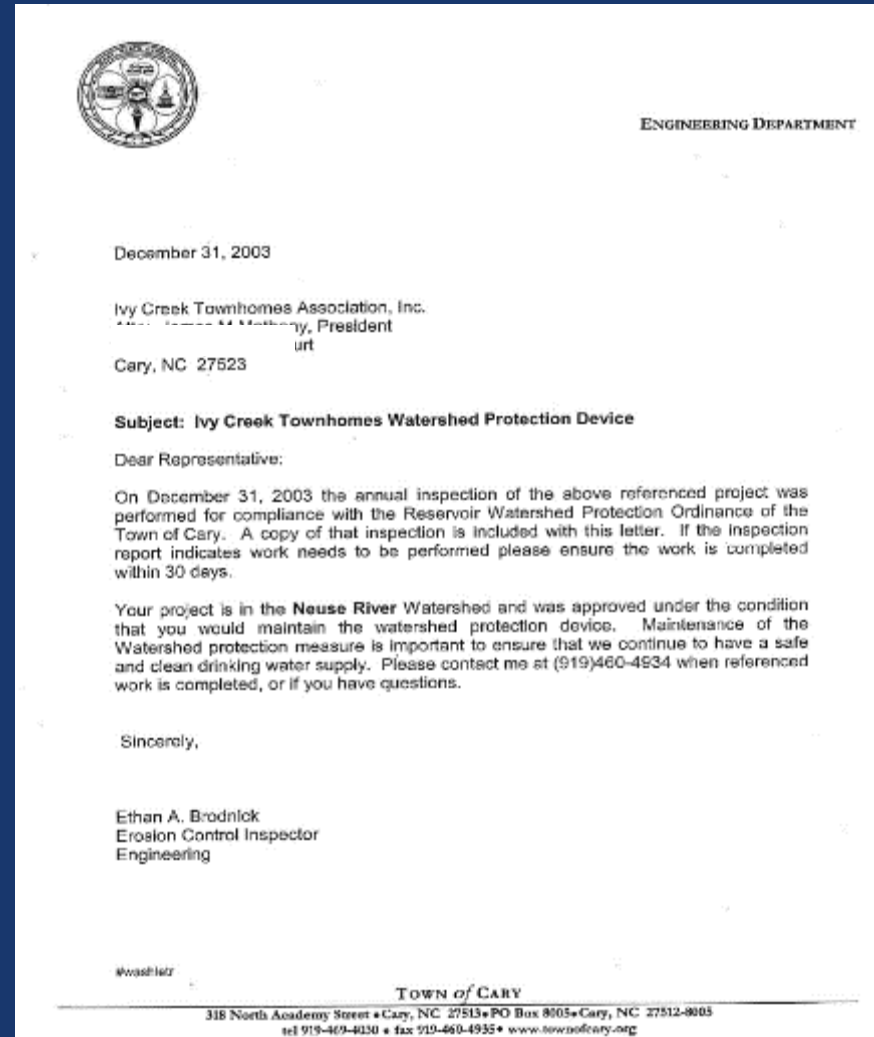
Inspection Type

Inspection Date

Inspection Results

B. Inspections

- 2001 – Staff inspected all devices
- 2007 – Required owners to hire PE/PLS/CLA to inspect
- Monthly notification letters



B. Inspections

- 2016 – inspection template updated
- 2019 – Pass/Fail to Compliant, Compliant with Maintenance or Non-Compliant
- Establishment of repair periods

STORMWATER SCM ANNUAL MAINTENANCE INSPECTION REPORT Post-Construction Maintenance Report Form (Revised July 1, 2016)

(All previous versions of this form are invalid)

Town of Cary, North Carolina

Inspection Date: _____

The Town of Cary Land Development Ordinance (4.4.6) requires that Stormwater SCM runoff control devices/structures be inspected annually to certify they are being maintained properly and are functioning as originally designed and intended.

A. **General Information: (Fill out ALL information)** *USE ONLY ONE INSPECTION FORM PER SITE WITH AS MANY ACCOMPANYING SCM CHECKLIST ATTACHMENT SHEETS AS NEEDED. IF MULTIPLE SCM'S EXIST AT A SITE, SUBMIT MULTIPLE CHECK-OFF ATTACHMENT SHEETS ALONG WITH THE STANDARD 2-PAGE FORM. ALSO, ATTACH DIGITAL PHOTOGRAPHS OF THE SITE, STRUCTURES, AND DEVICES AS APPLICABLE. COMPLETE ALL BOXES – LEAVE NOTHING BLANK Boxes

Project Name: (as found in Town of Cary Files)	Legal Owner of Record: (Name from County Real Estate/Tax Website or from the owner if more recently updated):
Alternate Name if applicable:	Legal Owner of Record Address: (from County Real Estate/Tax Website or from the owner if more recently updated):
Physical Address/Location of SCM:	Owner Name:
Town of Cary Site Plan # or Subdivision Plan #	Owner Telephone Number w/ Area Code: ()
Site Contact Entity: (Owner, Management Company, or HOA)	Name of Inspection Company:
Site Contact Person Name/Title:	SCM Inspector Name: (a person's name - not a company name)
Site Contact Entity Mailing Address:	Mailing Address of Inspection Company:
Site Contact Person Telephone Number:	Qualification//Credentials of Inspector: Type _____ Name of Entity _____ State # _____ Registration: _____

C. The results of this inspection are as follows:

- NON-COMPLIANT**
VISUAL INSPECTION FOUND APPARENT ISSUES WHICH NEED IMMEDIATE ATTENTION. COMPLETE THE REPAIR ITEMS INDICATED ON THE ATTACHED CHECKLISTS WITHIN 60-DAYS OF THE DATE OF THIS REPORT. RE-INSPECTION AND CERTIFICATION PRIOR TO OR AT THE 60-DAY INTERVAL WILL FOLLOW SATISFACTORY COMPLETION OF ALL REPAIRS. REPORTS NOT RECEIVED WITHIN 60-DAYS WILL LEAD INTO ENFORCEMENT ACTIONS. SEE ITEM "D" BELOW REGARDING ENFORCEMENT.
- COMPLIANT WITH MAINTENANCE**
VISUAL INSPECTION FOUND DEFICIENCIES THAT NEED ATTENTION. COMPLETE THE MAINTENANCE ITEMS INDICATED ON THE ATTACHED CHECKLISTS WITHIN 30-DAYS OF THE DATE OF THIS REPORT. THE TOWN SHALL BE NOTIFIED OF THE REPAIRS HAVE BEEN PERFORMED WITH PHOTOS OF MAINTENANCE PERFORMED. IF NOTIFICATION HAS NOT BEEN RECEIVED WITHIN 30-DAYS THIS WILL BE CONSIDERED A VIOLATION. SEE ITEM "D" BELOW.
- COMPLIANT** (CHECK HERE IF INITIAL INSPECTION WAS NON COMPLIANT AND THIS IS A RE-INSPECTION)
VISUAL INSPECTION FOUND NO APPARENT ISSUES, (CERTIFICATION BELOW; SEE ITEM "E").

_____ and Inspection Seminar _____

_____ Certification # _____

Phone Number: () _____

Mailing Address: _____

B. Inspections

- Town must inspect all privately-owned SCMs once per permit cycle
- Inspect about 20% per year
- 2 days per month, about 9 months of the year
- Field Maps for inspections
- Export GIS data and use MailMerge to send out reports



C. Tracking & Enforcement

- 2010 – MapInfo allowed us to see sites with most recent inspection date and identify overdue reports
- Outlook calendar with events to remember when due dates were
- Excel spreadsheet
- Schema update – historical data

	A	B	C	D	E	F	G	H	I	J	K	L
1	SiteName	Dev. Plan #	Inspectio	LastInspectionDate	Complia	Need	Contacted I	Via	Compliance Action	Next Action	Action Date	Note
3	Alstc	19-DP-0082	March	3/14/2024	NC	Repair and reinspection	3/26/2024	Email	Request repair and reins	Overdue letter	7/24/2024	called 8/9
4	Amb	06-SP-032	July & Dec	11/20/2023 0:00	NC	Repair and reinspection	3/26/2024	Email, mai	Overdue letter	NOV	7/24/2024	called 8/9
5	Ame		September	10/11/2019	On hold	#N/A				#N/A		On hold due to redevelopment
6	Bee	16-SP-069	June	6/17/2024	NC	Repair and reinspection	7/9/2024	Email, mai	Request repair and reins	Overdue letter	9/7/2024	
7	BSN	05-SP-052	March	7/10/2024	NC	Repair and reinspection	7/12/2024	Email	Request repair and reins	Overdue letter	9/10/2024	
8	Carr	04-SB-012	August	8/5/2024	CWM	Repair photos	8/9/2024	Email	Request repair photos	Overdue letter	9/8/2024	
9	Cary	01-SP-139	September	8/13/2024	CWM	Repair photos	8/15/2024	Email	Request repair photos	Overdue letter	9/14/2024	WP #1 only
10	Chai	07-SP-099	September	10/7/2022	NC	Repair and reinspection	5/31/2024	Email, mai	Overdue letter	NOV	7/30/2024	emailed 8/9. previous retrofit -- n
11	Chat	16-DP-031	april	7/18/2024	CWM	Repair photos	7/25/2024	Email	Request repair photos	Overdue letter	8/24/2024	
12	Chri	13-SP-058	April	4/15/2024	NC	Repair and reinspection	5/13/2024	Email	Request repair and reins	Overdue letter	8/11/2024	should be done soon 7/16
13	Cop	05-SB-016	March	3/21/2024	NC	Repair and reinspection	4/15/2024	Email	Request repair and reins	Overdue letter	8/13/2024	work should be done by 7/26

Stormwater Project Status Dashboard

Filter Assets By Date

Predefined Calendar

- All Time
- This Week
- Last Week
- This Month
- Last Month
- Last Year

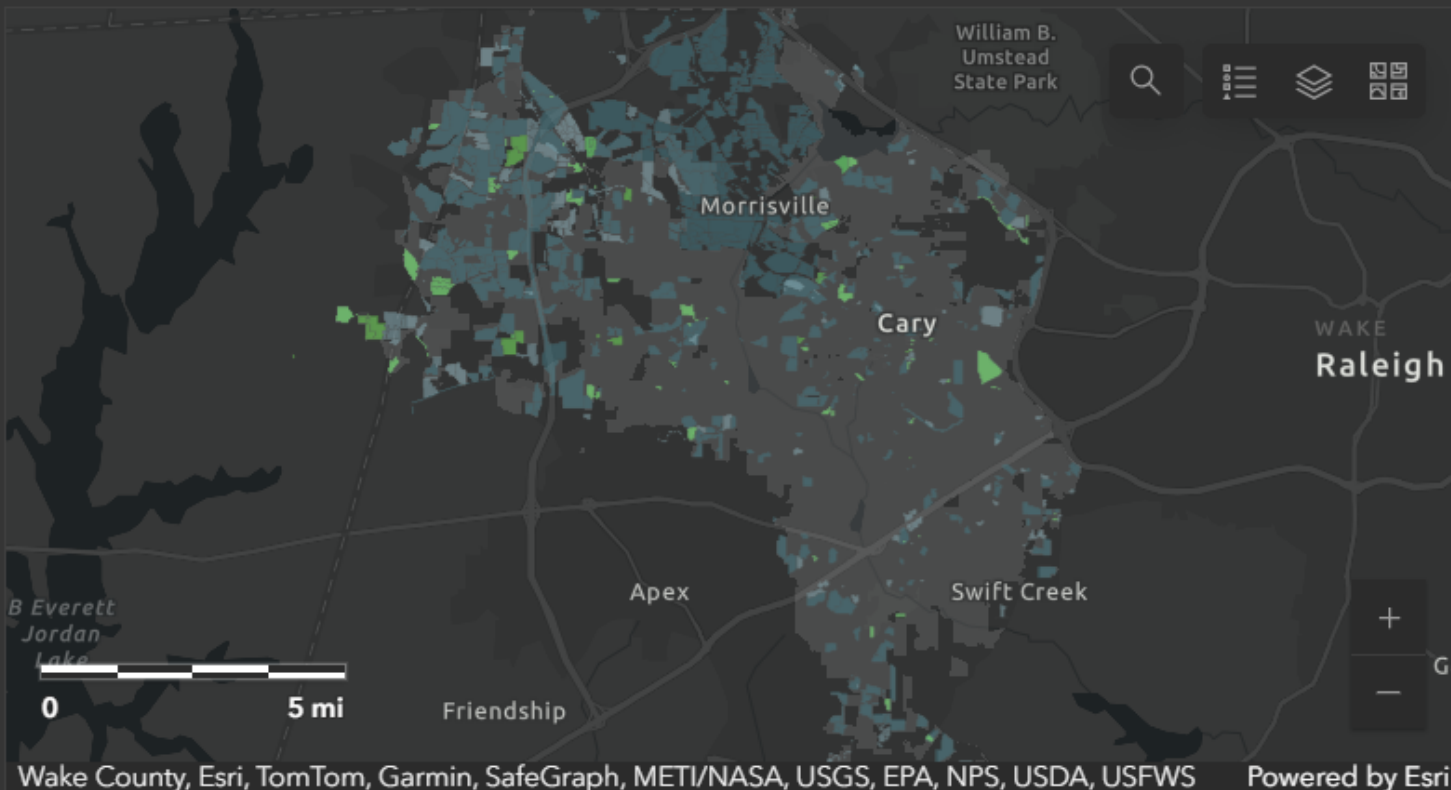
This Year

Reset

Filter Completed Projects By Date

Predefined Calendar

Today



Wake County, Esri, TomTom, Garmin, SafeGraph, METI/NASA, USGS, EPA, NPS, USDA, USFWS Powered by Esri

1,997

Inlets Added

334

Junctions Added

157,299 LF

Gravity Mains Added

4,128

LF of Culverts Added

Gravity Mains

186

Unknown Materials

118

Unknown Diameters

Culverts (Missing)

7

Unknown Materials

13

Unknown Diameters

46

Record Plans in Progress

(currently being edited or queued)

Projects In

11000 Regency Parkway Parking Expansion

Alston Village PH 1

Bee Safe Storage at

150 of 262

Record Plans (1/1/2018+) Digitized (Backlog)

2018+

All Time

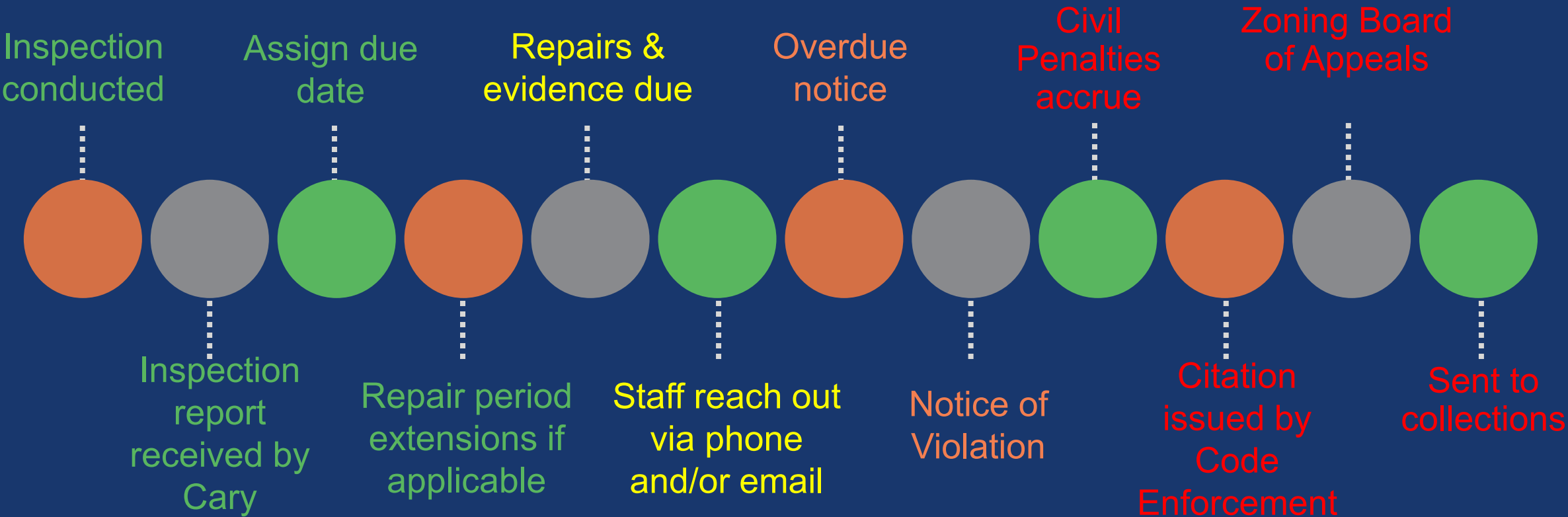
Projects Recently

One Walker & One Walnut Mixed Use Phase 1

FMC Morrisville

Johnson Subaru

C. Tracking & Enforcement



How do we measure success?

Current compliance rates (in percentage of sites):

Non-Compliant	4.9%
Compliant with Maintenance	4.4%
Overdue	0.1%
Active enforcement (overdue letter, NOV and beyond)	1.3%

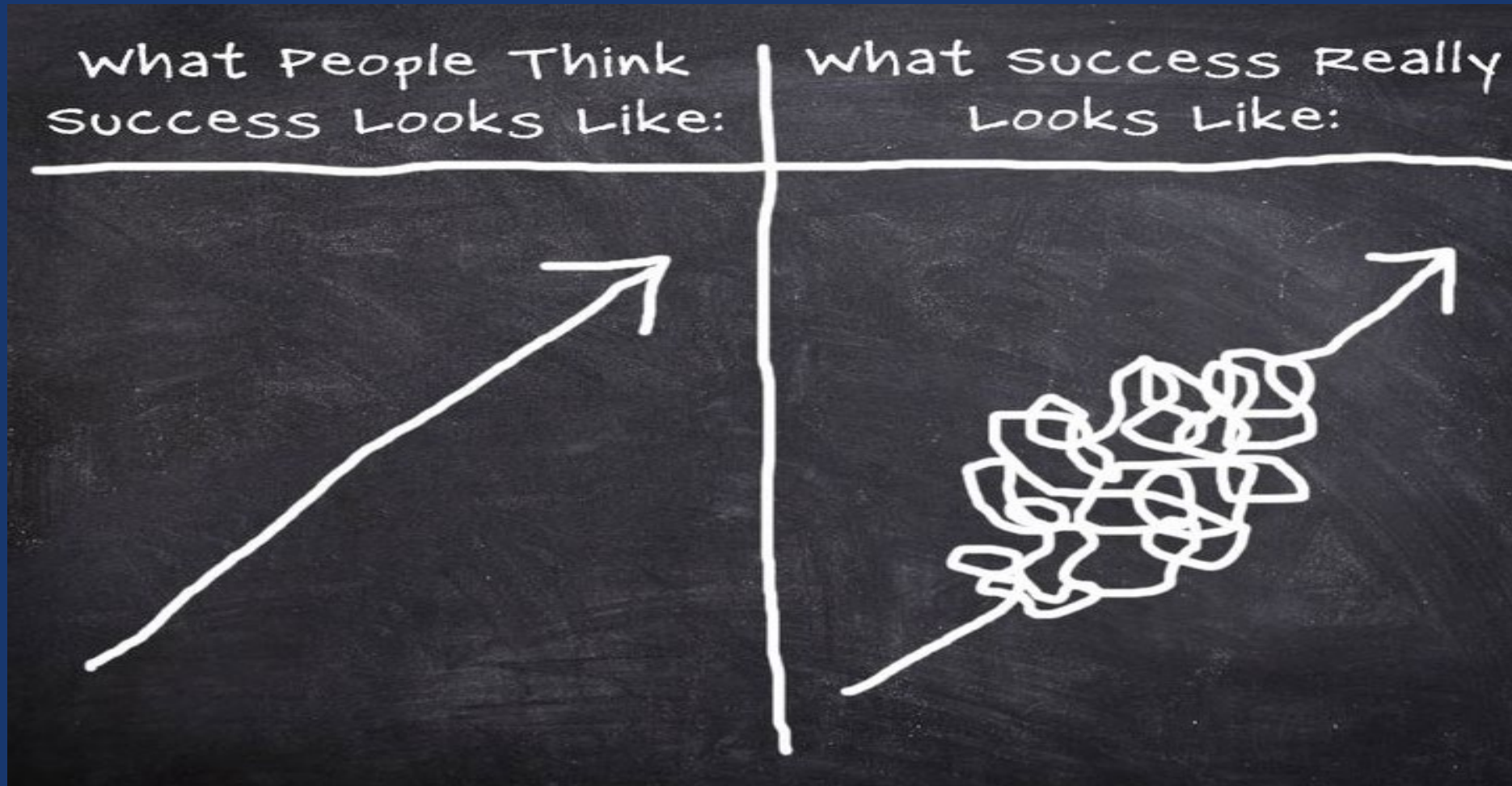
Why do we care?

Protect our water
quality and
downstream
neighbors

Compliance &
enforcement are
enormous time
sinks

Culture of pride
and stewardship

Why has Cary's program been successful?



Why has Cary's program been successful?

Institutional Knowledge

- Historical site & compliance information
- Sometimes no paper trail

Processes

- Monthly notification letters
- Using new technology
- Repair period extensions

Cooperation

- Cultivating relationships with all parties
- Recognizing unusual situations
- Patience!!

Step Back and Evaluate the Program

- Get up on the balcony to look at the dance floor
 - What are recurring issues/sticking points?
 - What is taking up too much time?
 - How do things fall through the cracks?
 - Who else can I ask for perspective and feedback?



Thank You!

Charles Brown
Stormwater Field Services Administrator
919-469-4038
Charles.brown@carync.gov

Emily Cochran
Stormwater Program Analyst
919-469-4032
Emily.Cochran@carync.gov

PDH Evaluation:



<https://bit.ly/2024EscEval>



carync.gov

