

SAWS SSORP Progress

Jeff Haby, P.E.

Vice President – Production & Treatment

September 13, 2019



MAKING SAN ANTONIO
WATERFUL



Agenda

- San Antonio Water System Utility
- Consent Decree
- CD Objectives
- Condition Remedial Measures
- Capacity Remedial Measures
- Lessons Learned
- Keys to success



SAWS Infrastructure by the Numbers

One of Nation's Largest Municipally Owned Utilities

- Projected 5 year Capital Program over \$2B
- Avg. \$525M Annual CIP
 - 12,500 miles of pipelines
 - 154 lift stations
 - 4 major plants
 - 73 water pump stations
 - 182 wells
 - 117 storage tanks



SSORP Objectives

- Reduce SSOs and comply with the CD
- Implement sustainable business practices
- Enforce standards and ordinances
- Continue to manage capacity constraints and condition issues



CD Overview:

- **Timeline**

1. 2007-2013 Negotiations
2. July 23, 2013 Lodged
3. October 15, 2013 Entered
4. 10-12 Year Duration

- **8 Major Components:**

1. Capacity, Management, Operation & Maintenance (CMOM)
2. Early Action Program
3. Condition Assessment and Remedial Measures
4. Capacity Assessment and Remedial Measures
5. Lift Stations
6. Force Mains
7. Water Quality Program
8. Reporting

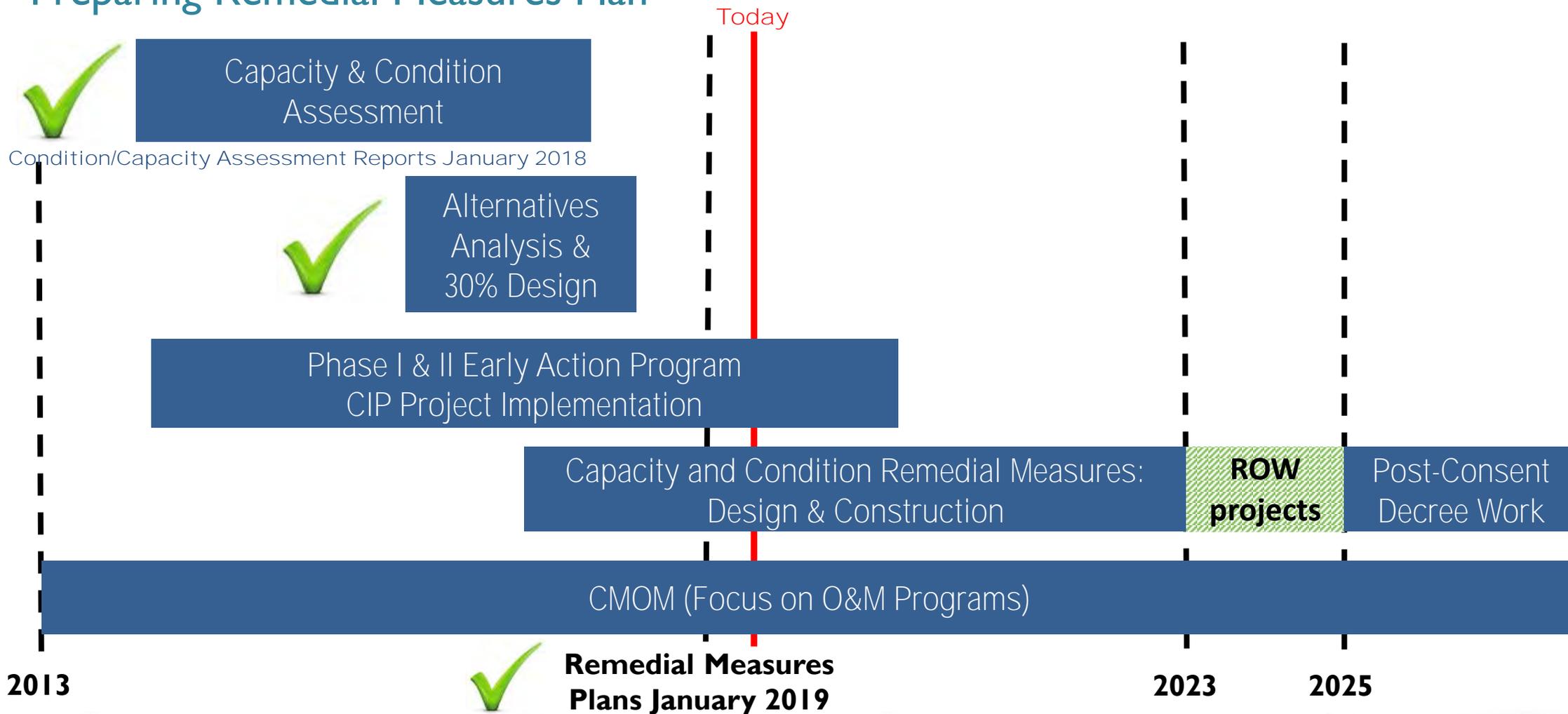
**UNITED STATES DISTRICT COURT
WESTERN DISTRICT OF TEXAS
SAN ANTONIO DIVISION**

UNITED STATES OF AMERICA,	§	
	§	
and	§	Civil Action No.
	§	
STATE OF TEXAS,	§	
	§	
Plaintiffs,	§	
	§	
v.	§	
	§	
SAN ANTONIO WATER SYSTEM,	§	
	§	
Defendant.	§	
	§	

CONSENT DECREE

Consent Decree Timeline

Preparing Remedial Measures Plan



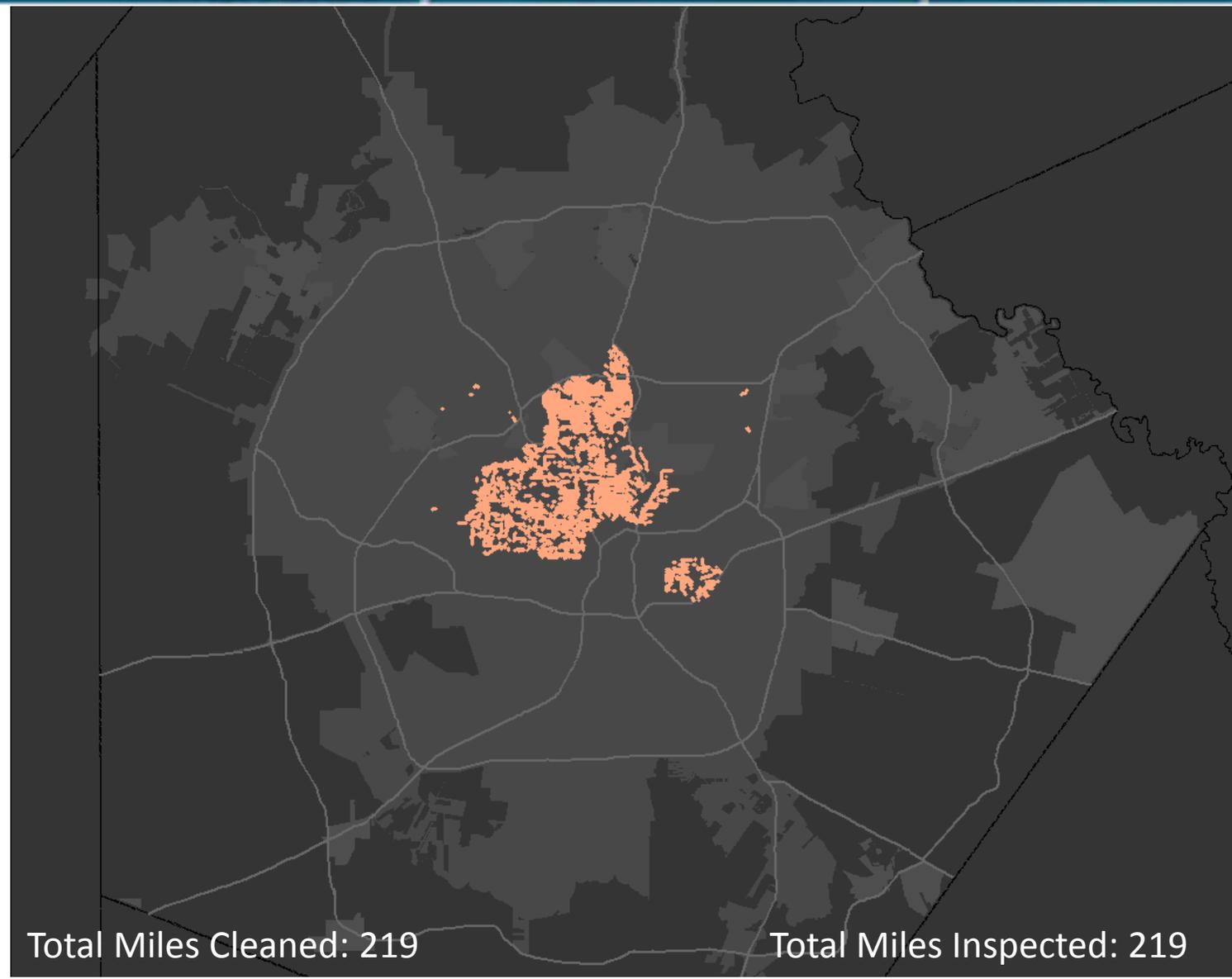
First Step

- Inspection & Cleaning



2013 - Year 1

— Small Mains: Clean/TV Inspect



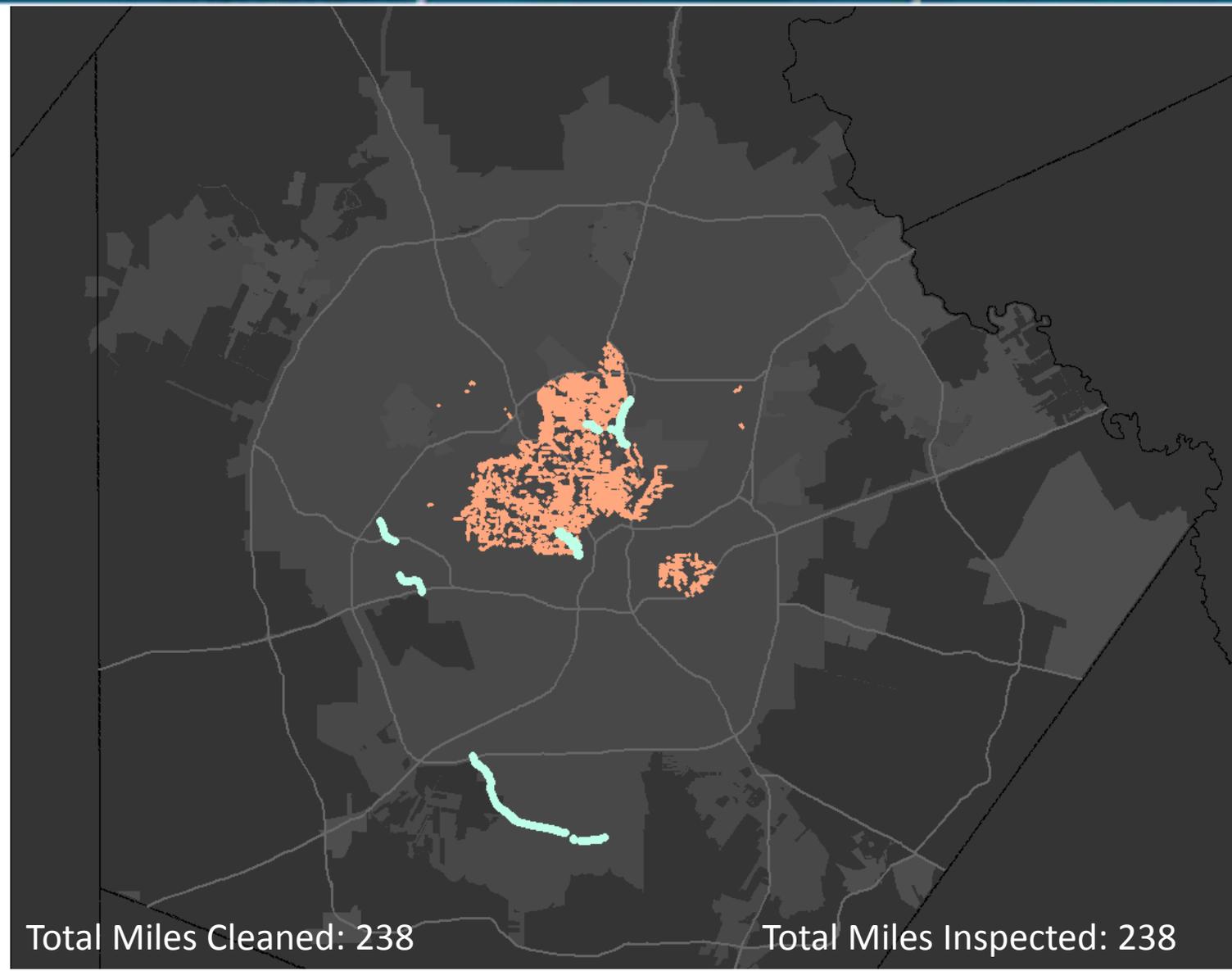
Total Miles Cleaned: 219

Total Miles Inspected: 219



2013 - Year 1

- Small Mains: Clean/TV Inspect
- Large Mains: Clean/TV Inspect



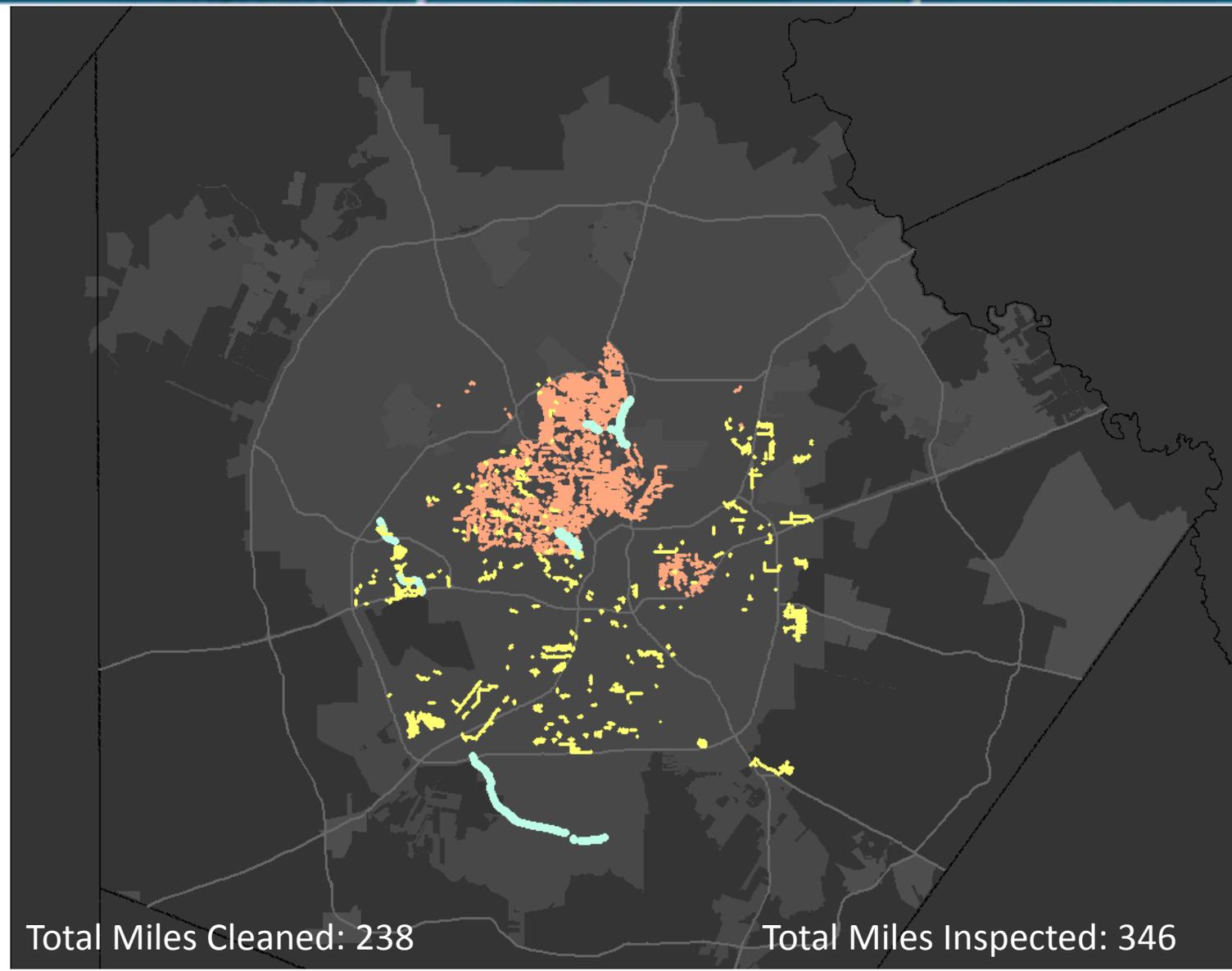
Total Miles Cleaned: 238

Total Miles Inspected: 238



2013 - Year 1

- Small Mains: Clean/TV Inspect
- Large Mains: Clean/TV Inspect
- Small Mains: Polecam Inspect



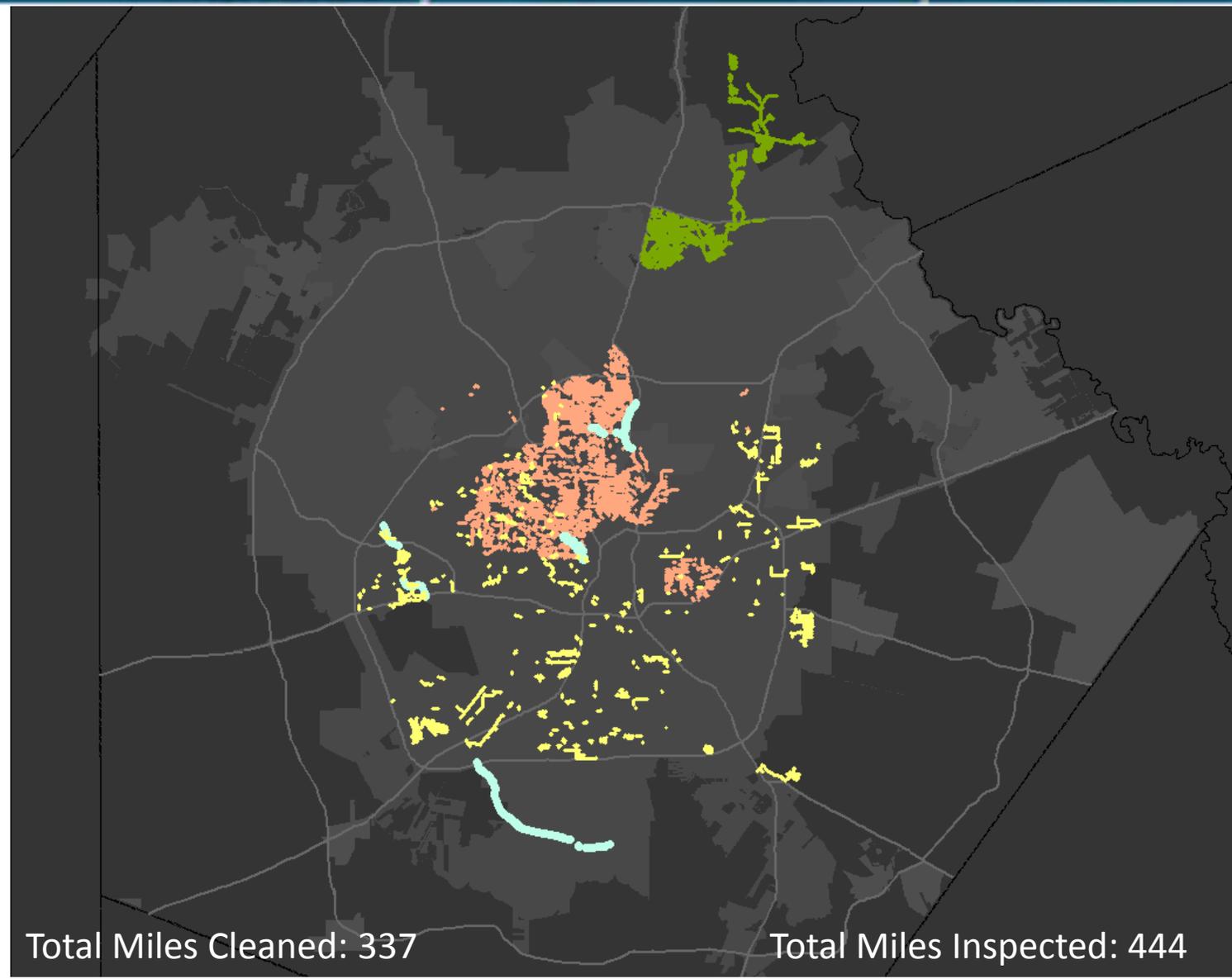
Total Miles Cleaned: 238

Total Miles Inspected: 346



2013 - Year 1

- Small Mains: Clean/TV Inspect
- Large Mains: Clean/TV Inspect
- Small Mains: Polecam Inspect
- EARZ Mains: Clean/TV Inspect



Total Miles Cleaned: 337

Total Miles Inspected: 444

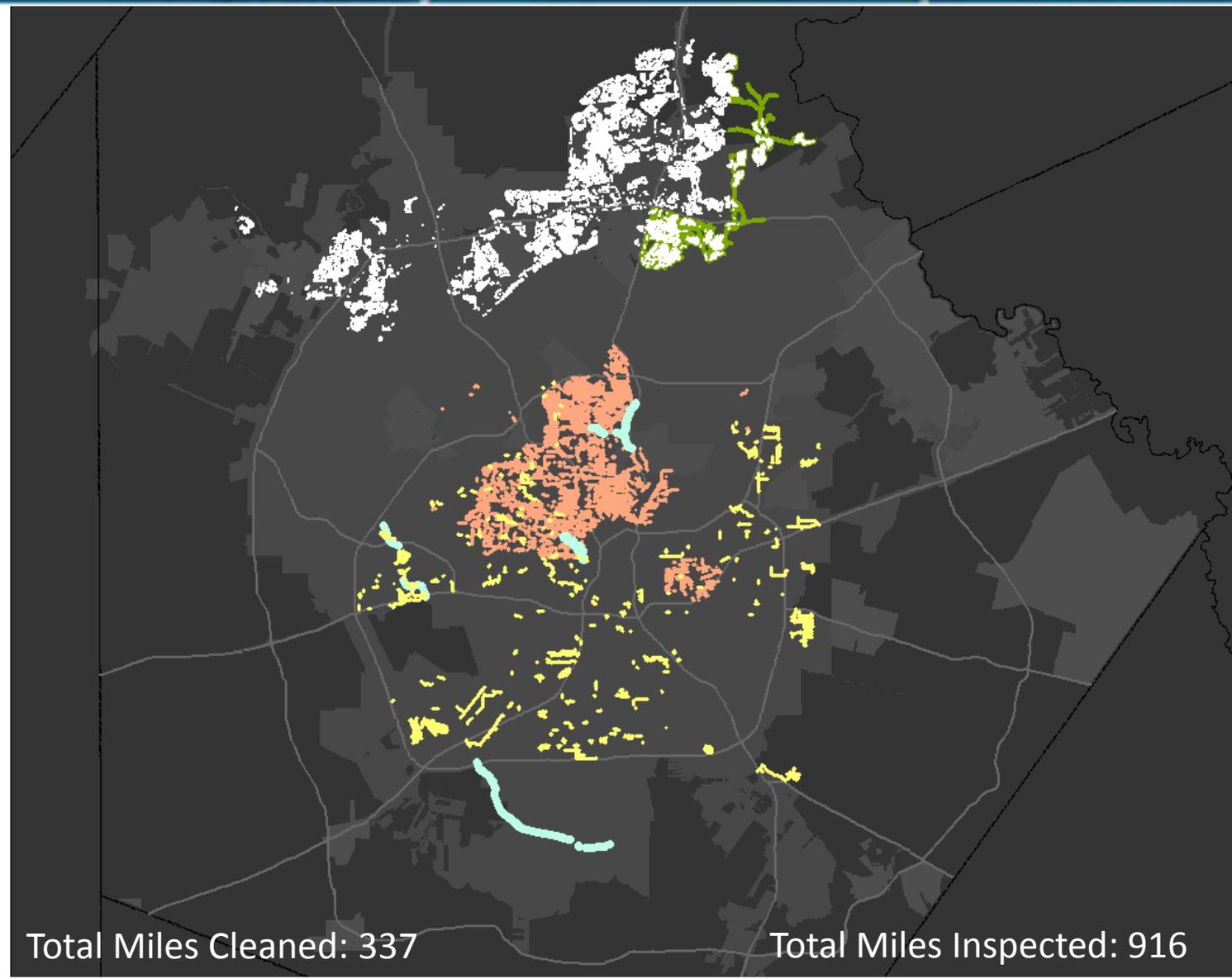


2013 - Year 1

- Small Mains: Clean/TV Inspect
- Large Mains: Clean/TV Inspect
- Small Mains: Polecam Inspect
- EARZ Mains: Clean/TV Inspect

2014 - Year 2

EARZ Smoke Inspect



Total Miles Cleaned: 337

Total Miles Inspected: 916

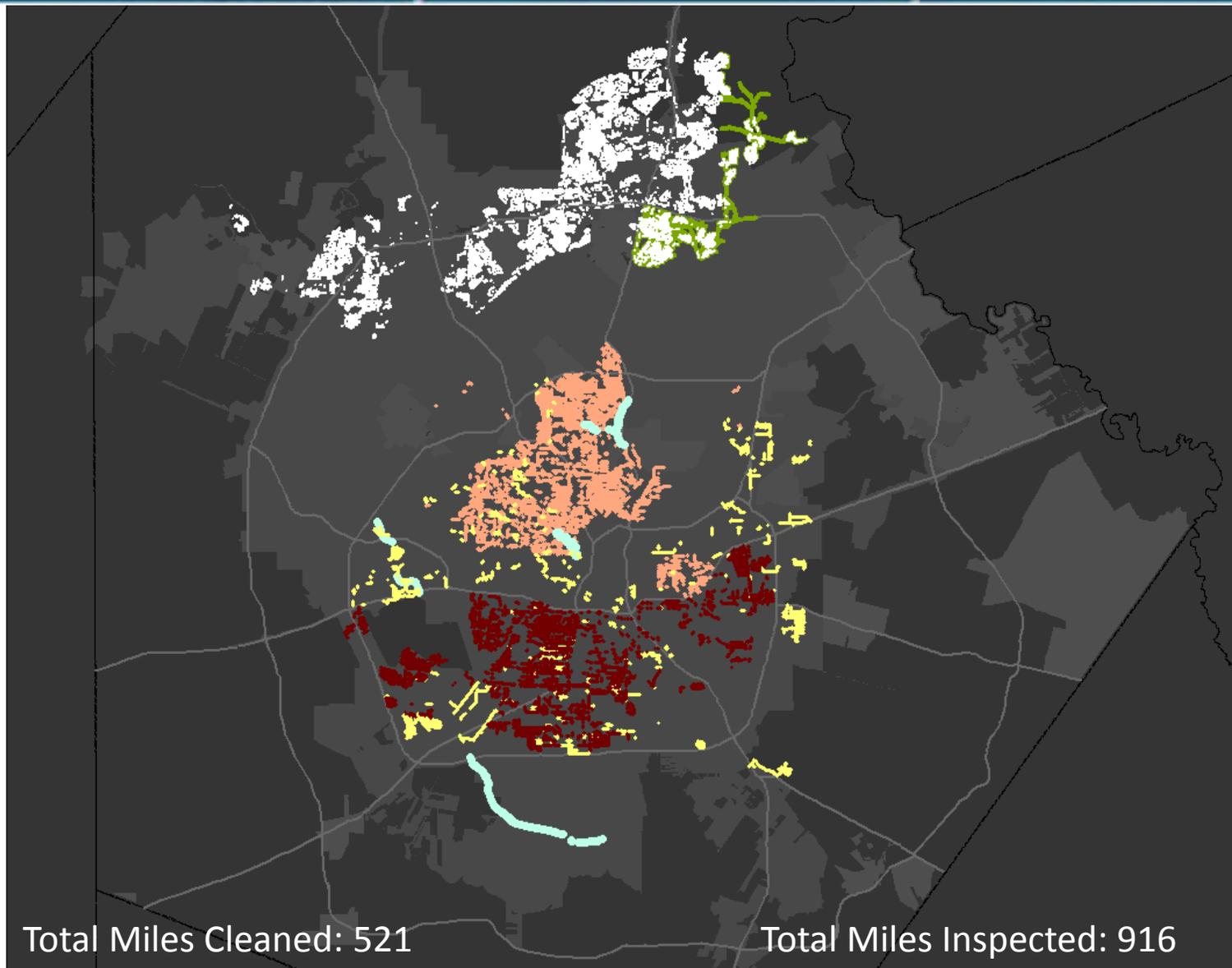


2013 - Year 1

- Small Mains: Clean/TV Inspect
- Large Mains: Clean/TV Inspect
- Small Mains: Polecam Inspect
- EARZ Mains: Clean/TV Inspect

2014 - Year 2

- EARZ Smoke Inspect
- Small Mains: Clean

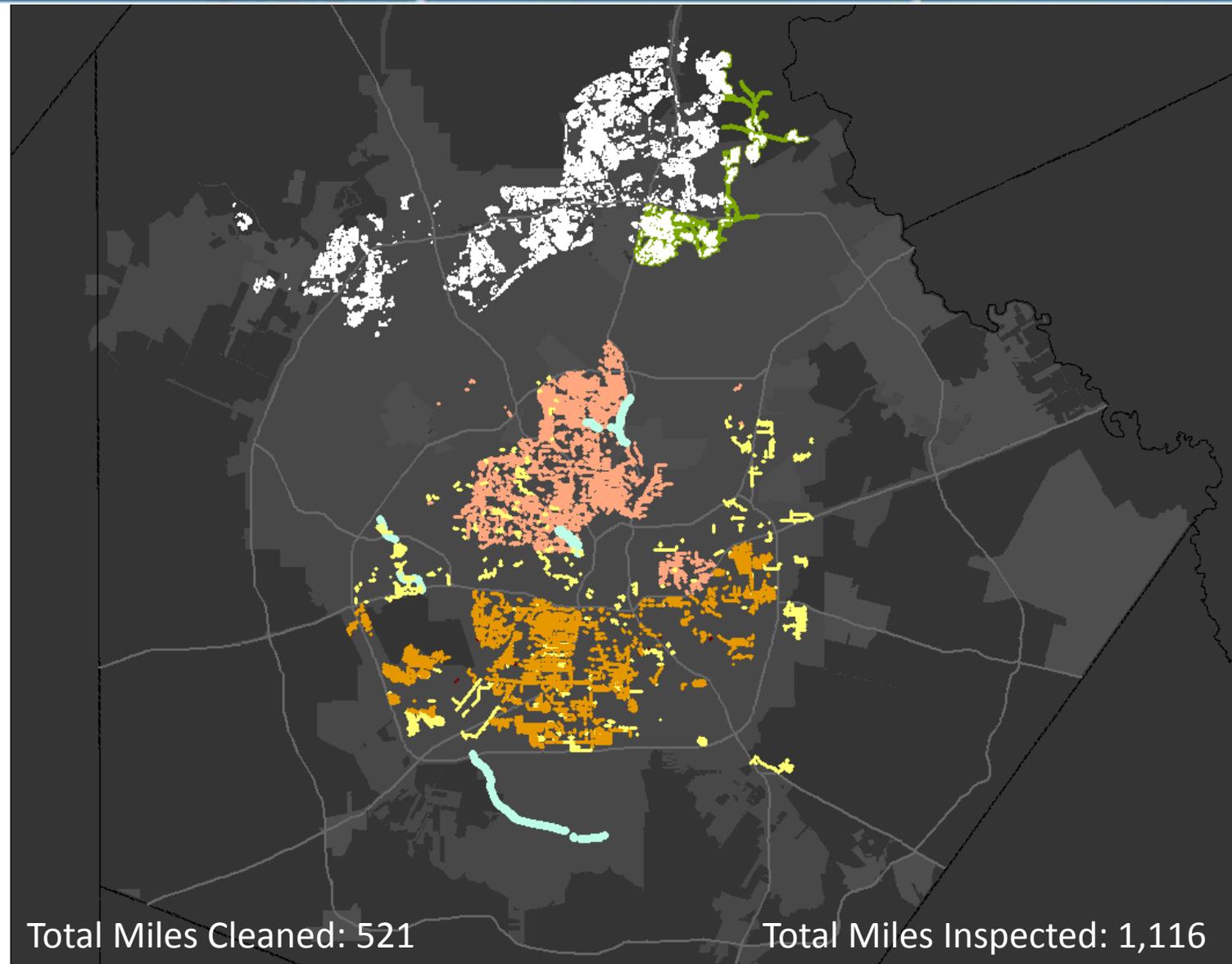


2013 - Year 1

- Small Mains: Clean/TV Inspect
- Large Mains: Clean/TV Inspect
- Small Mains: Polecam Inspect
- EARZ Mains: Clean/TV Inspect

2014 - Year 2

- EARZ Smoke Inspect
- Small Mains: Clean
- Small Mains: TV Inspect



Total Miles Cleaned: 521

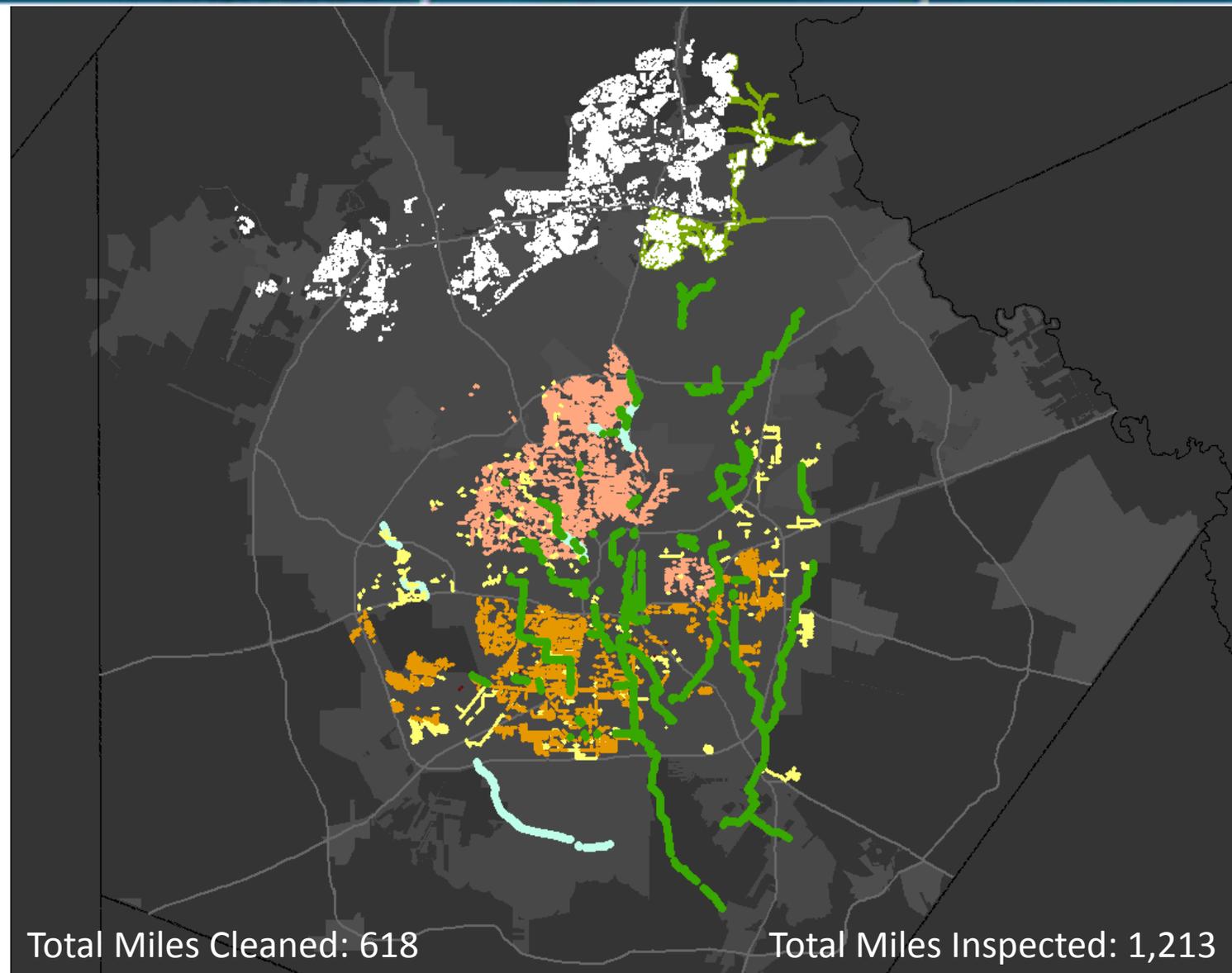
Total Miles Inspected: 1,116

2013 - Year 1

- Small Mains: Clean/TV Inspect
- Large Mains: Clean/TV Inspect
- Small Mains: Polecam Inspect
- EARZ Mains: Clean/TV Inspect

2014 - Year 2

- EARZ Smoke Inspect
- Small Mains: Clean
- Small Mains: TV Inspect
- Large Mains: Clean/TV Inspect



Total Miles Cleaned: 618

Total Miles Inspected: 1,213

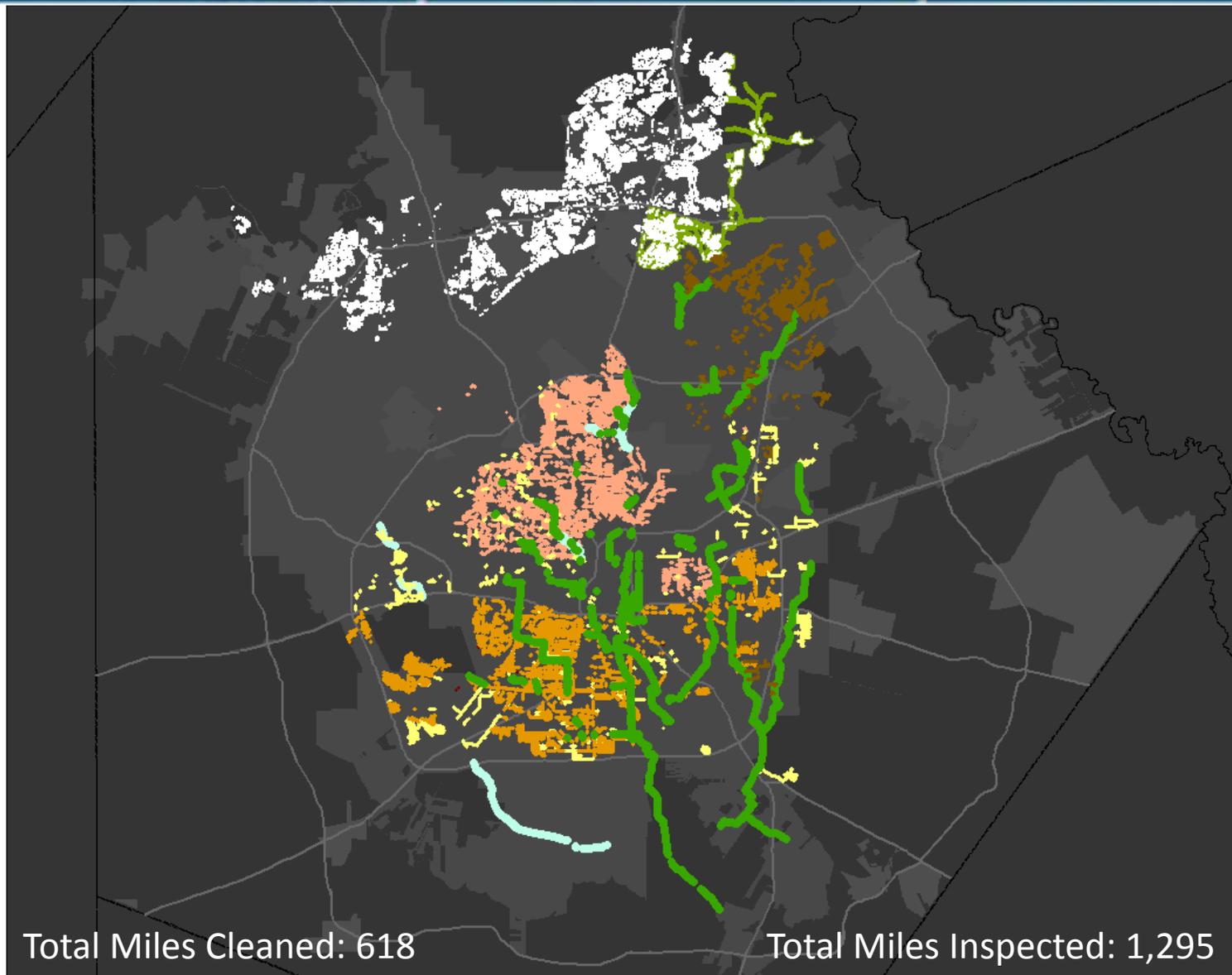


2013 - Year 1

- Small Mains: Clean/TV Inspect
- Large Mains: Clean/TV Inspect
- Small Mains: Polecam Inspect
- EARZ Mains: Clean/TV Inspect

2014 - Year 2

- EARZ Smoke Inspect
- Small Mains: Clean
- Small Mains: TV Inspect
- Large Mains: Clean/TV Inspect
- Small Mains: Polecam Inspect

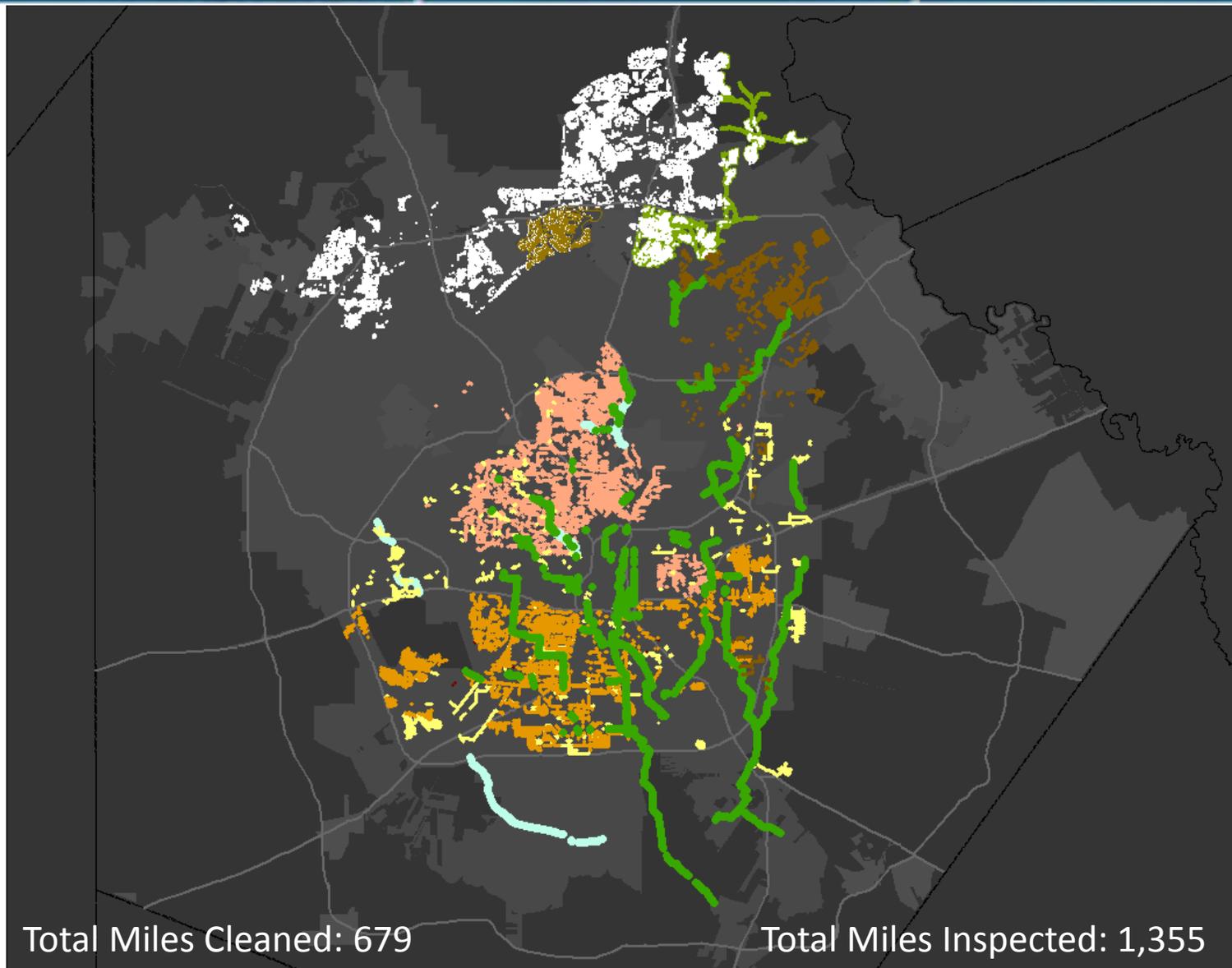


2013 - Year 1

- Small Mains: Clean/TV Inspect
- Large Mains: Clean/TV Inspect
- Small Mains: Polecam Inspect
- EARZ Mains: Clean/TV Inspect

2014 - Year 2

- EARZ Smoke Inspect
- Small Mains: Clean
- Small Mains: TV Inspect
- Large Mains: Clean/TV Inspect
- Small Mains: Polecam Inspect
- EARZ Mains: Clean/TV Inspect



2013 - Year 1

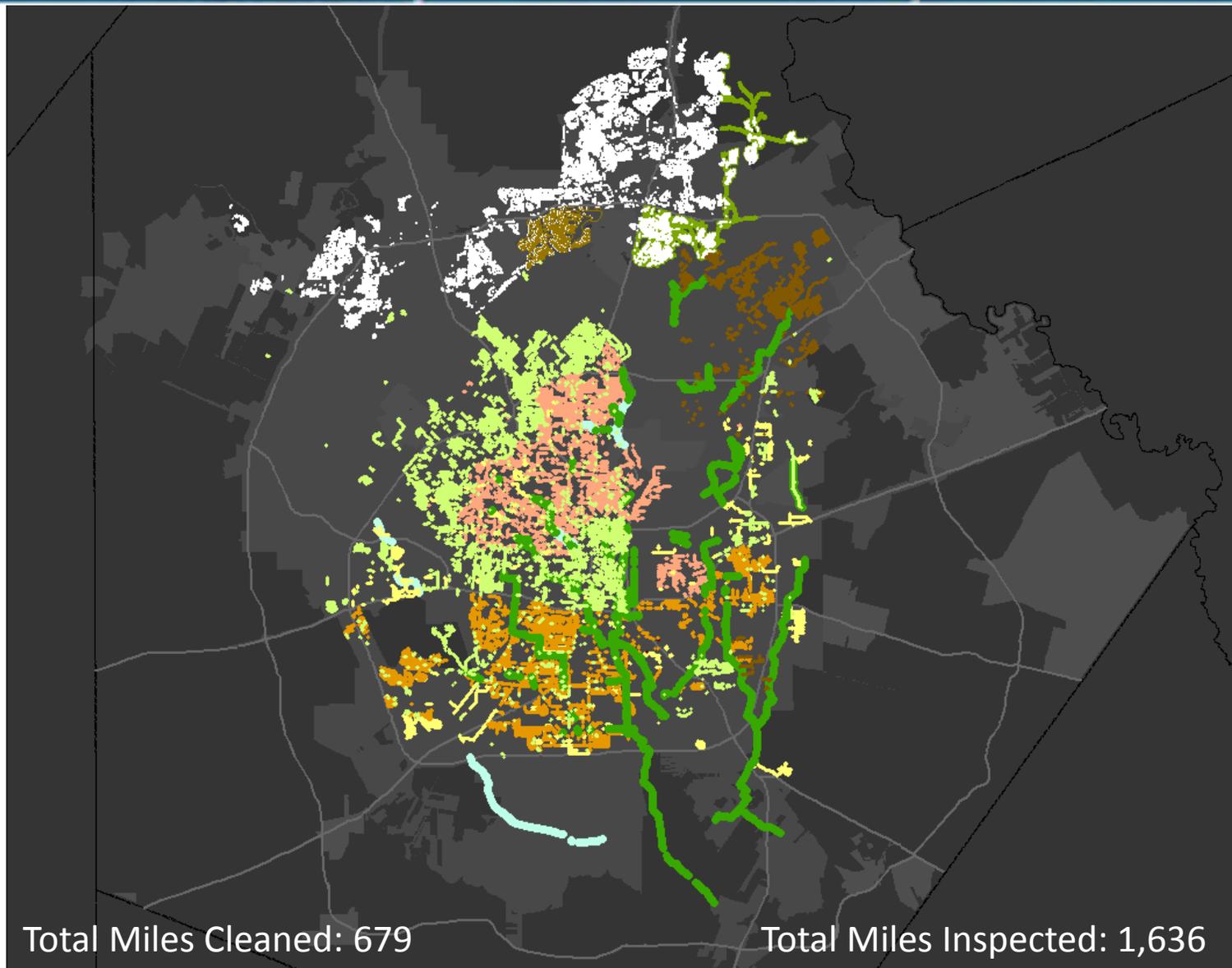
- Small Mains: Clean/TV Inspect
- Large Mains: Clean/TV Inspect
- Small Mains: Polecam Inspect
- EARZ Mains: Clean/TV Inspect

2014 - Year 2

- EARZ Smoke Inspect
- Small Mains: Clean
- Small Mains: TV Inspect
- Large Mains: Clean/TV Inspect
- Small Mains: Polecam Inspect
- EARZ Mains: Clean/TV Inspect

2015 - Year 3

- Small Mains: TV Inspect



2013 - Year 1

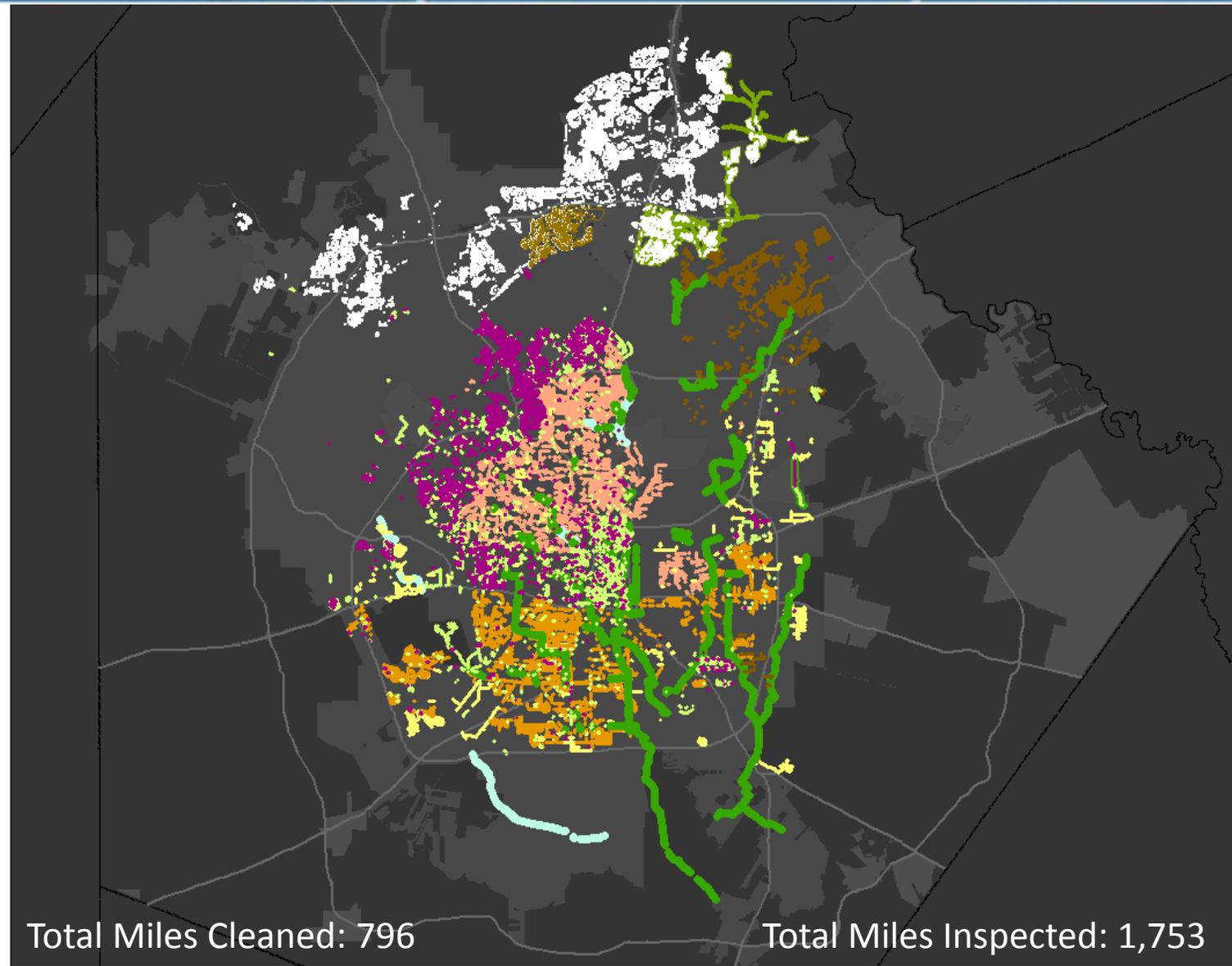
- Small Mains: Clean/TV Inspect
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2014 - Year 2

- EARZ Smoke Inspect
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- Small Mains: Polecam Inspect
- EARZ Mains: Clean/TV Inspect

2015 - Year 3

- Small Mains: TV Inspect
- Small Mains: Clean/TV Inspect



2013 - Year 1

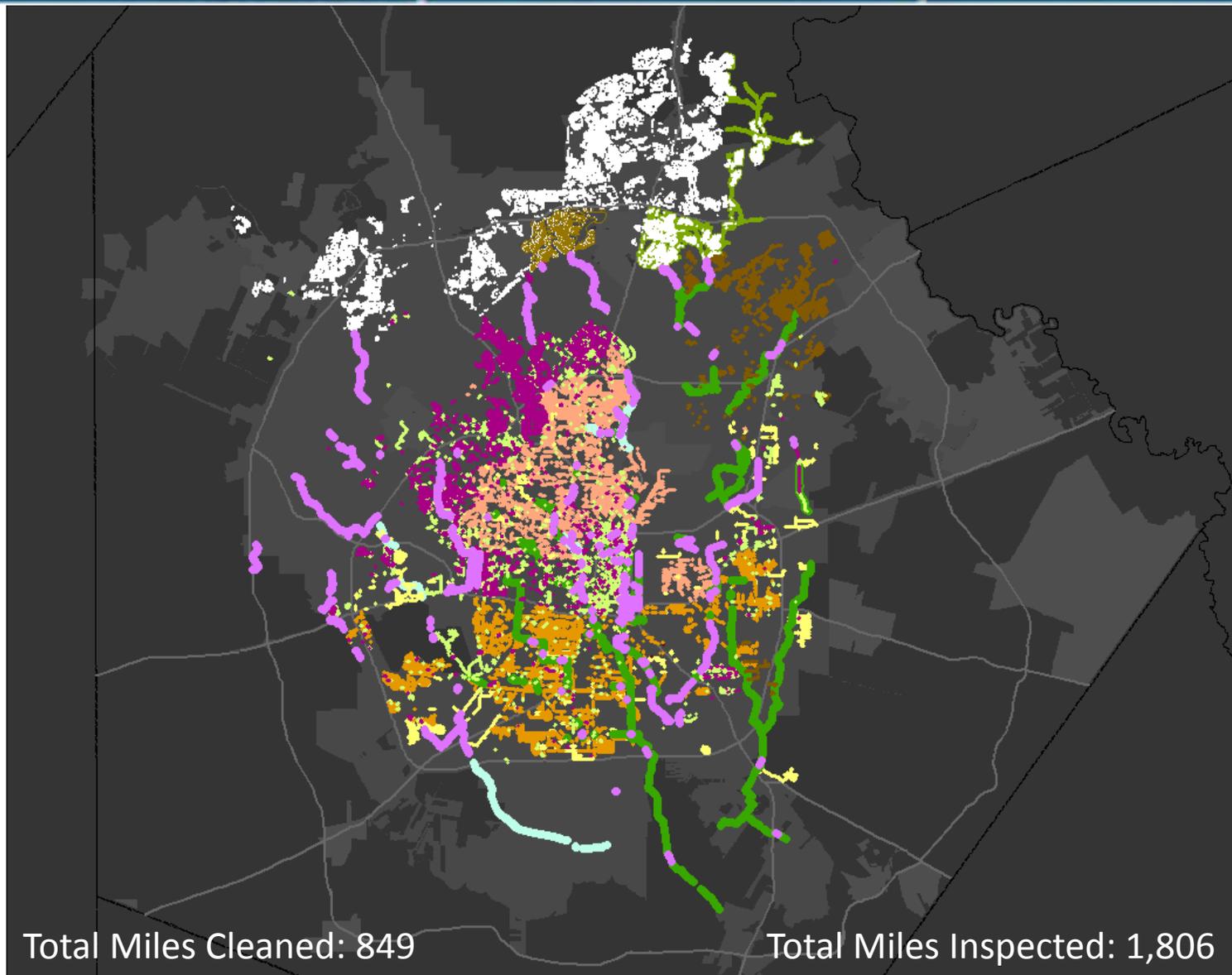
- Small Mains: Clean/TV Inspect
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2014 - Year 2

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- Small Mains: Polecam Inspect
- EARZ Mains: Clean/TV Inspect

2015 - Year 3

- Small Mains: TV Inspect
- Small Mains: Clean/TV Inspect
- Large Mains Phase 1: Clean/TV Inspect



2013 - Year 1

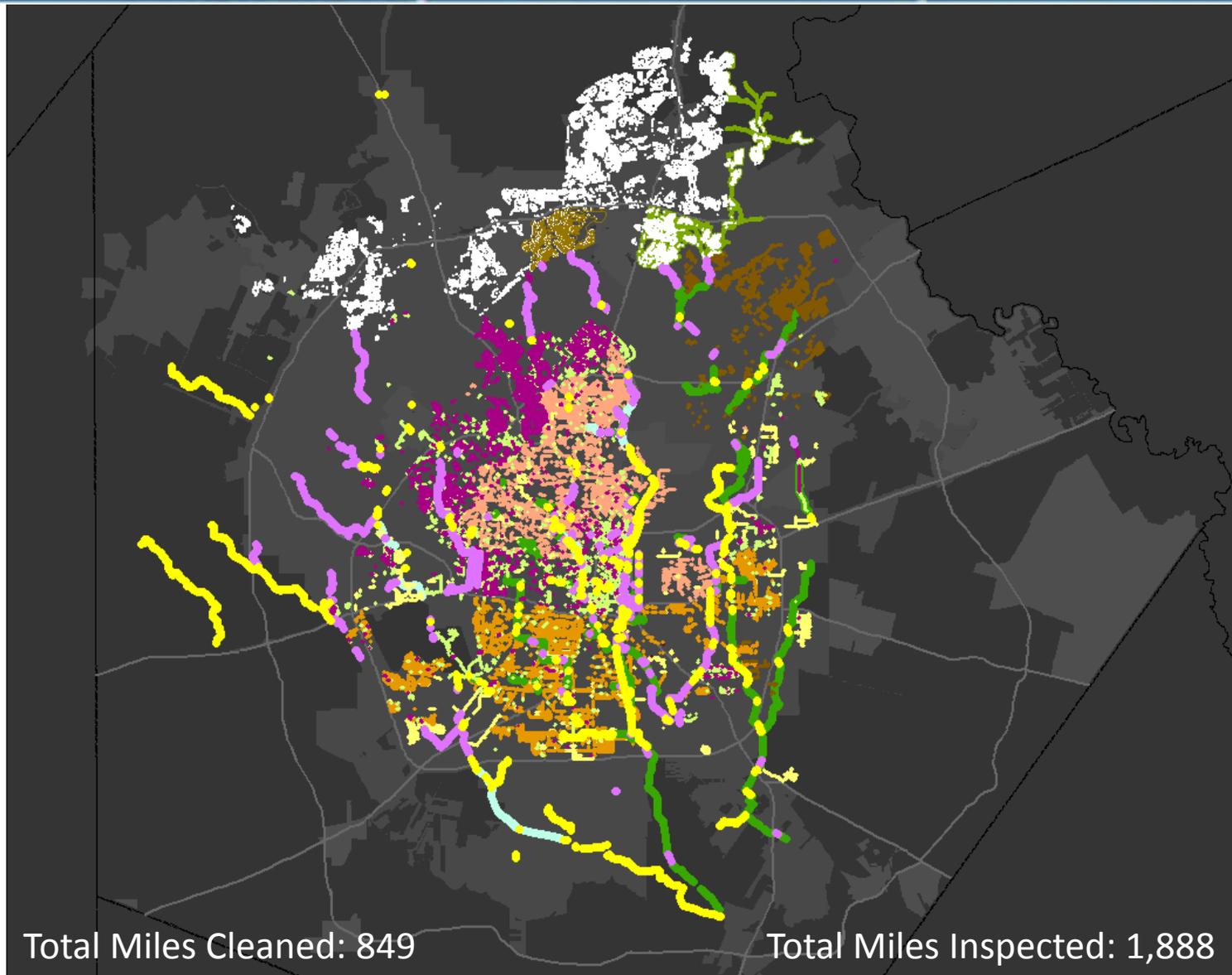
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- Small Mains: Polecam Inspect
- EARZ Mains: Clean/TV Inspect

2014 - Year 2

- EARZ Smoke Inspect
- Small Mains: Clean
- Small Mains: TV Inspect
- Large Mains: Clean/TV Inspect
- Small Mains: Polecam Inspect
- EARZ Mains: Clean/TV Inspect

2015 - Year 3

- Small Mains: TV Inspect
- Small Mains: Clean/TV Inspect
- Large Mains Phase 1: Clean/TV Inspect
- Large Mains Phase 2: Sonar/TV Inspect



2013 - Year 1

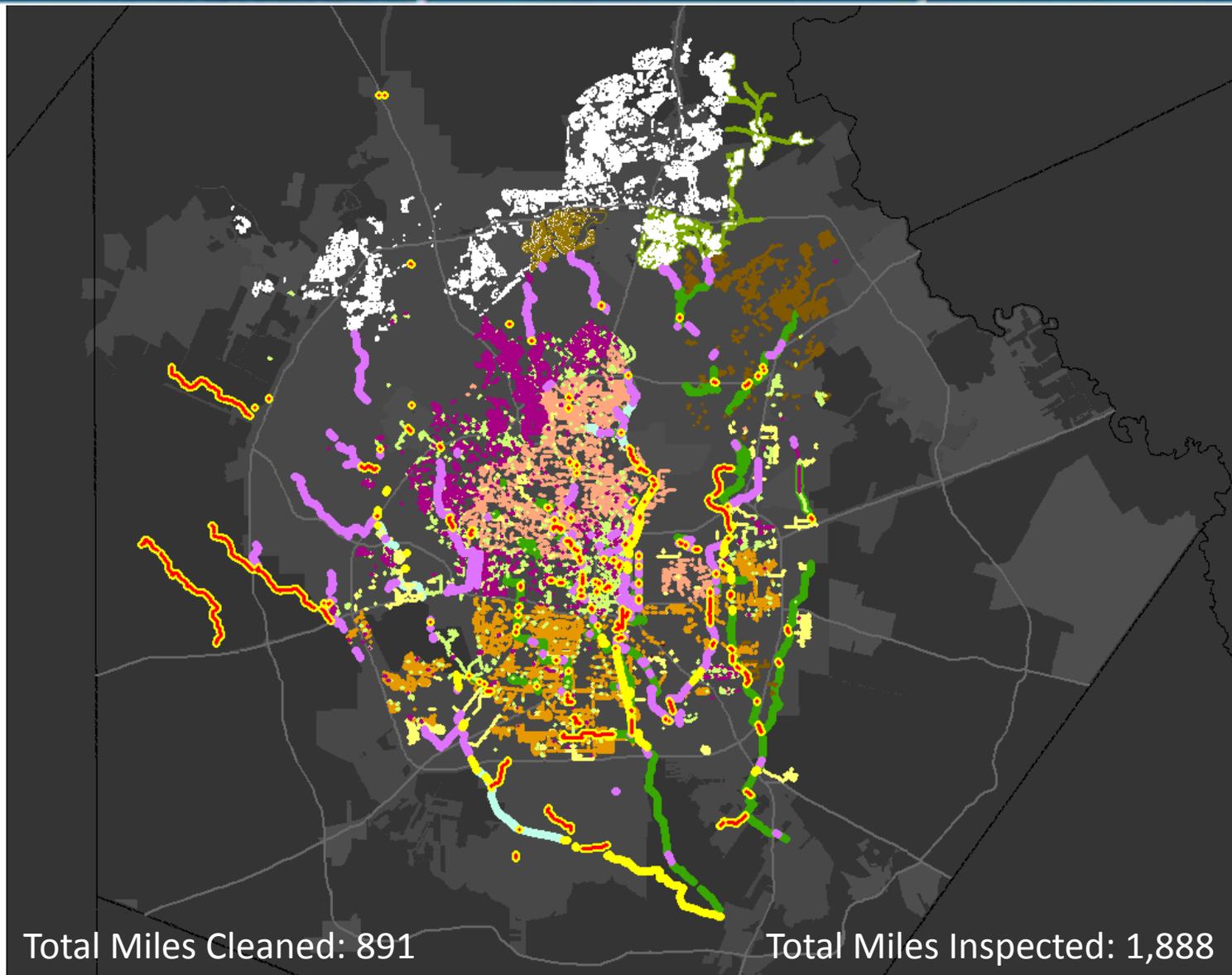
- Small Mains: Clean/TV Inspect
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- Small Mains: Polecam Inspect
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2014 - Year 2

- EARZ Smoke Inspect
- Small Mains: Clean
- Small Mains: TV Inspect
- Large Mains: Clean/TV Inspect
- Small Mains: Polecam Inspect
- EARZ Mains: Clean/TV Inspect

2015 - Year 3

- Small Mains: TV Inspect
- Small Mains: Clean/TV Inspect
- Large Mains Phase 1: Clean/TV Inspect
- Large Mains Phase 2: Sonar/TV Inspect
- Large Mains Phase 2: Clean



2013 - Year 1

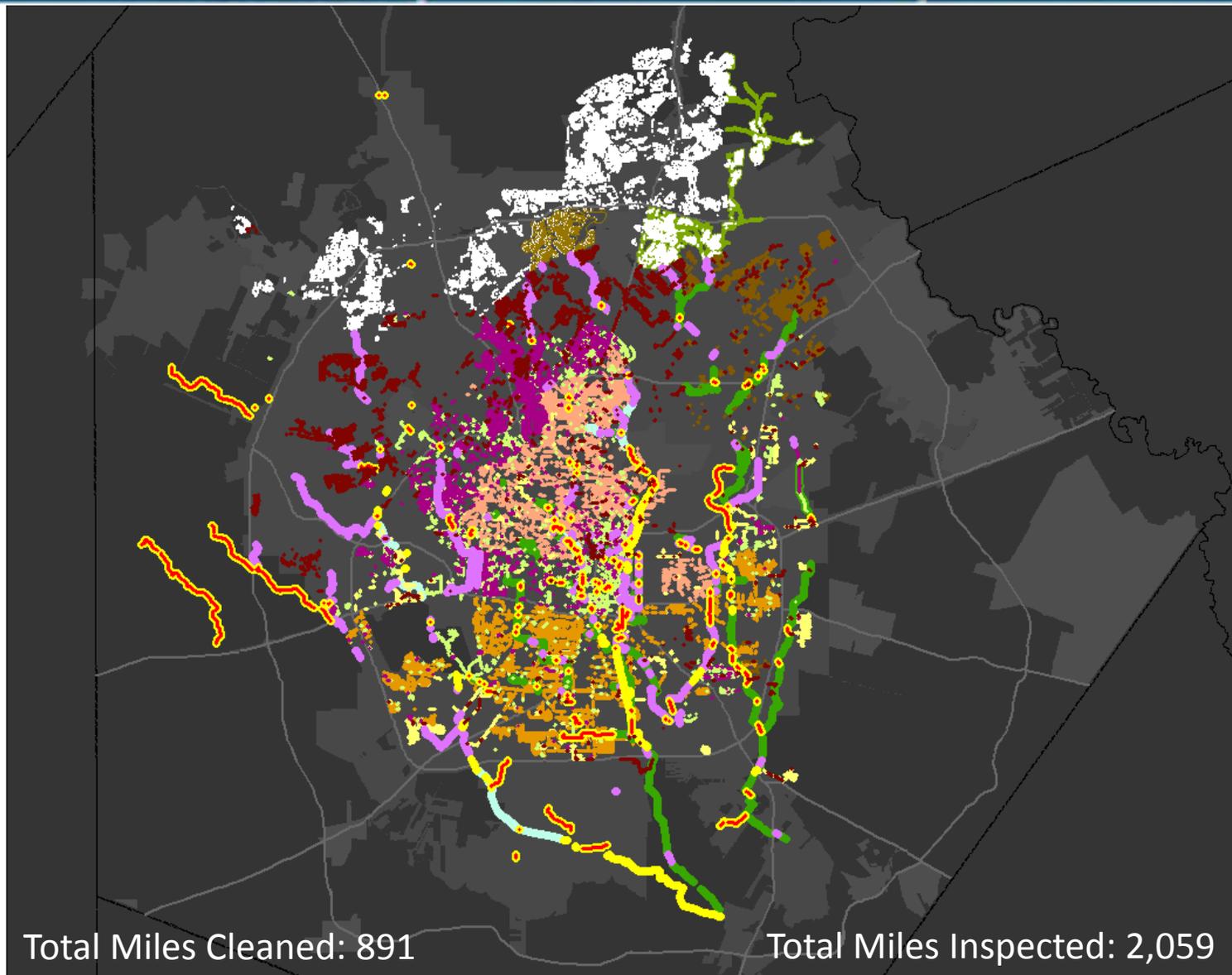
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2014 - Year 2

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2015 - Year 3

- Small Mains: TV Inspect
- Small Mains: Clean/TV Inspect
- Large Mains Phase 1: Clean/TV Inspect
- Large Mains Phase 2: Sonar/TV Inspect
- Large Mains Phase 2: Clean
- Small Mains: Polecam Inspect



2013 - Year 1

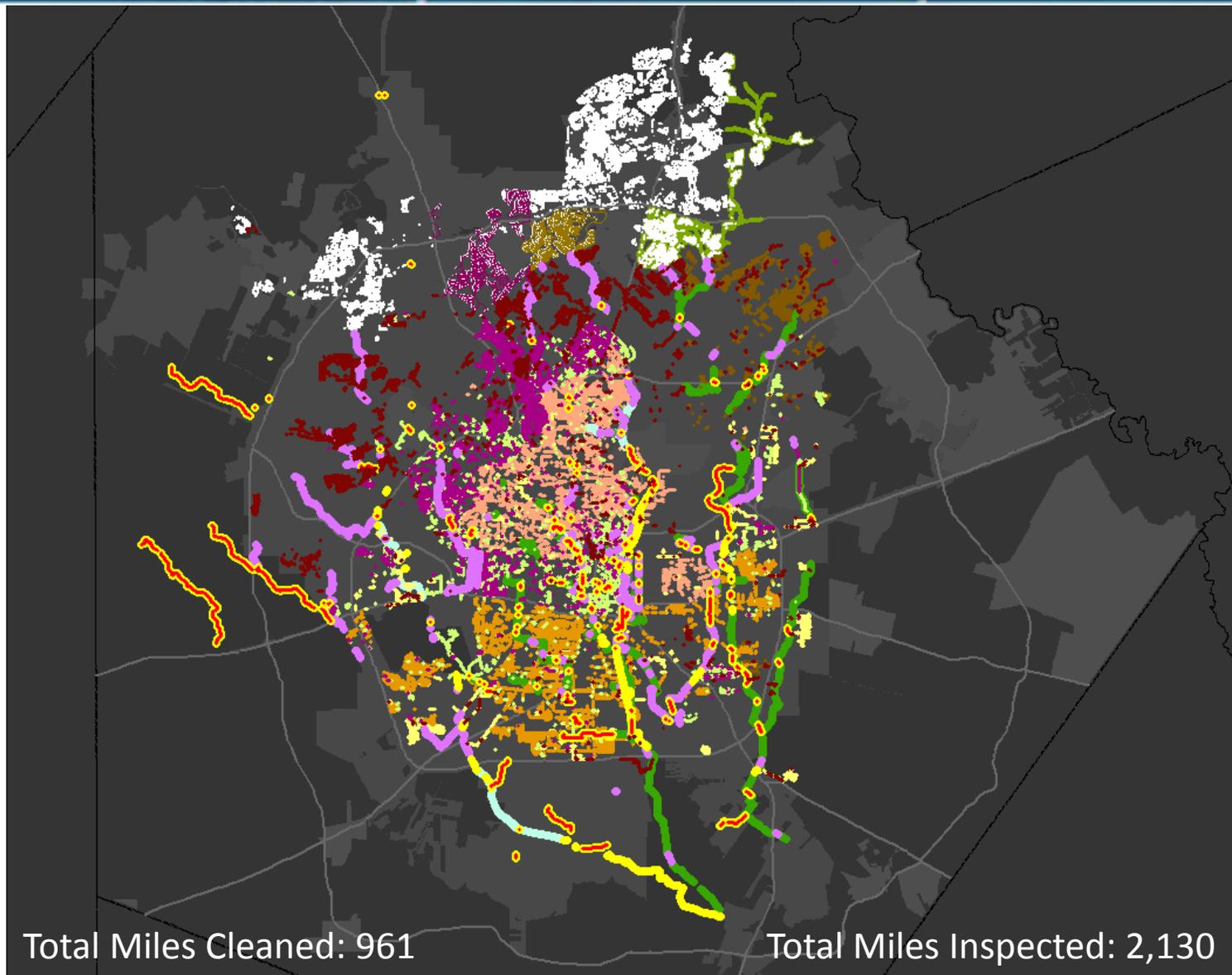
- Small Mains: Clean/TV Inspect
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2014 - Year 2

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2015 - Year 3

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- Large Mains Phase 2: Clean
- Small Mains: Polecam Inspect
- EARZ Mains: Clean/TV Inspect



2013 - Year 1

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2014 - Year 2

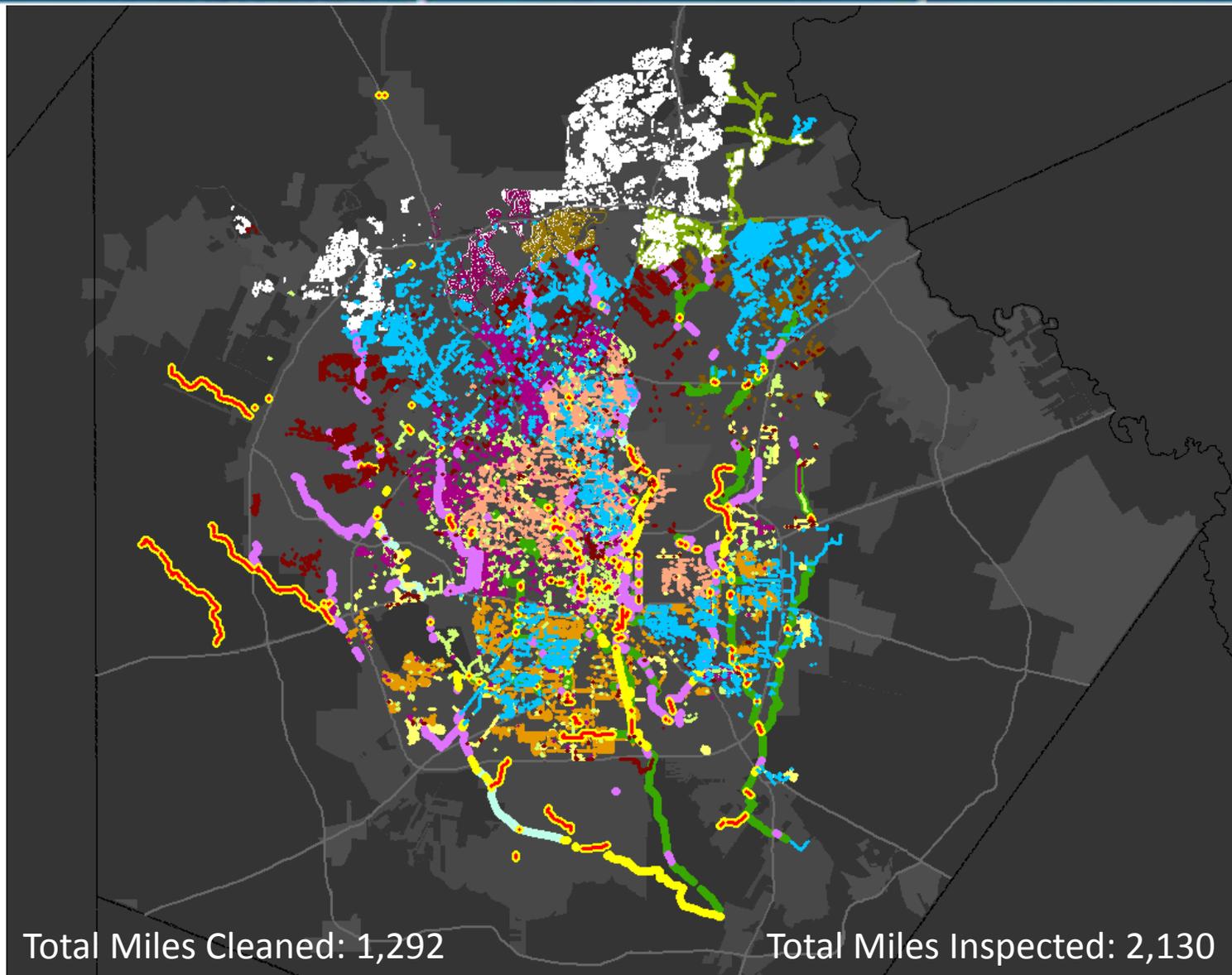
- EARZ Smoke Inspect
- Small Mains: Clean
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2015 - Year 3

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- Large Mains Phase 1: Clean/TV Inspect
- Large Mains Phase 2: Sonar/TV Inspect
- Large Mains Phase 2: Clean
- Small Mains: Polecam Inspect
- EARZ Mains: Clean/TV Inspect

2016 - Year 4

- Small Mains: Clean



2013 - Year 1

- Small Mains: Clean/TV Inspect
- Large Mains: Clean/TV Inspect
- Small Mains: Polecam Inspect
- EARZ Mains: Clean/TV Inspect

2014 - Year 2

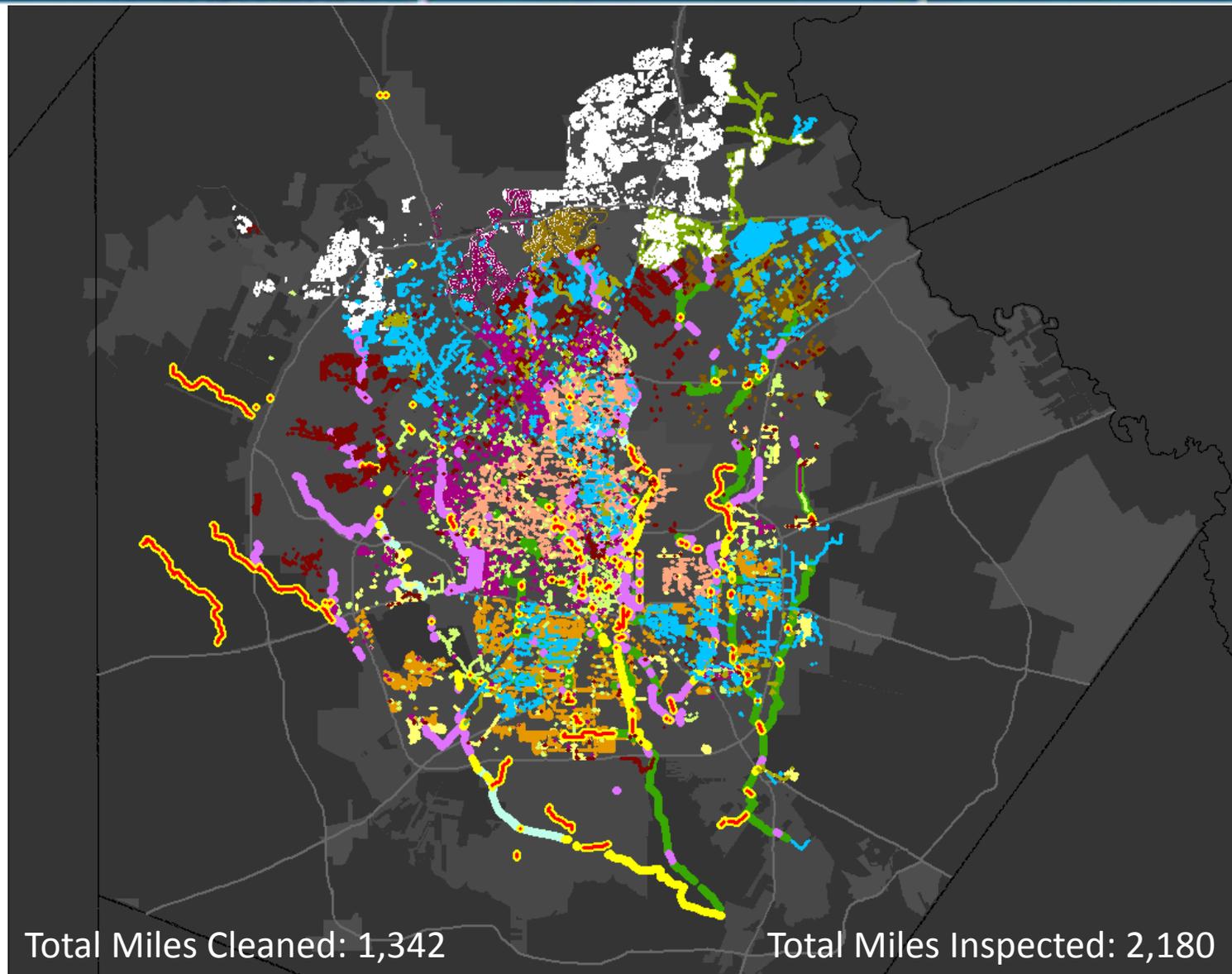
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2015 - Year 3

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- Large Mains Phase 2: Sonar/TV Inspect
- Large Mains Phase 2: Clean
- Small Mains: Polecam Inspect
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2016 - Year 4

- Small Mains: Clean
- Small Mains: Clean/TV Inspect



2013 - Year 1

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- Small Mains: Polecam Inspect
- EARZ Mains: Clean/TV Inspect

2014 - Year 2

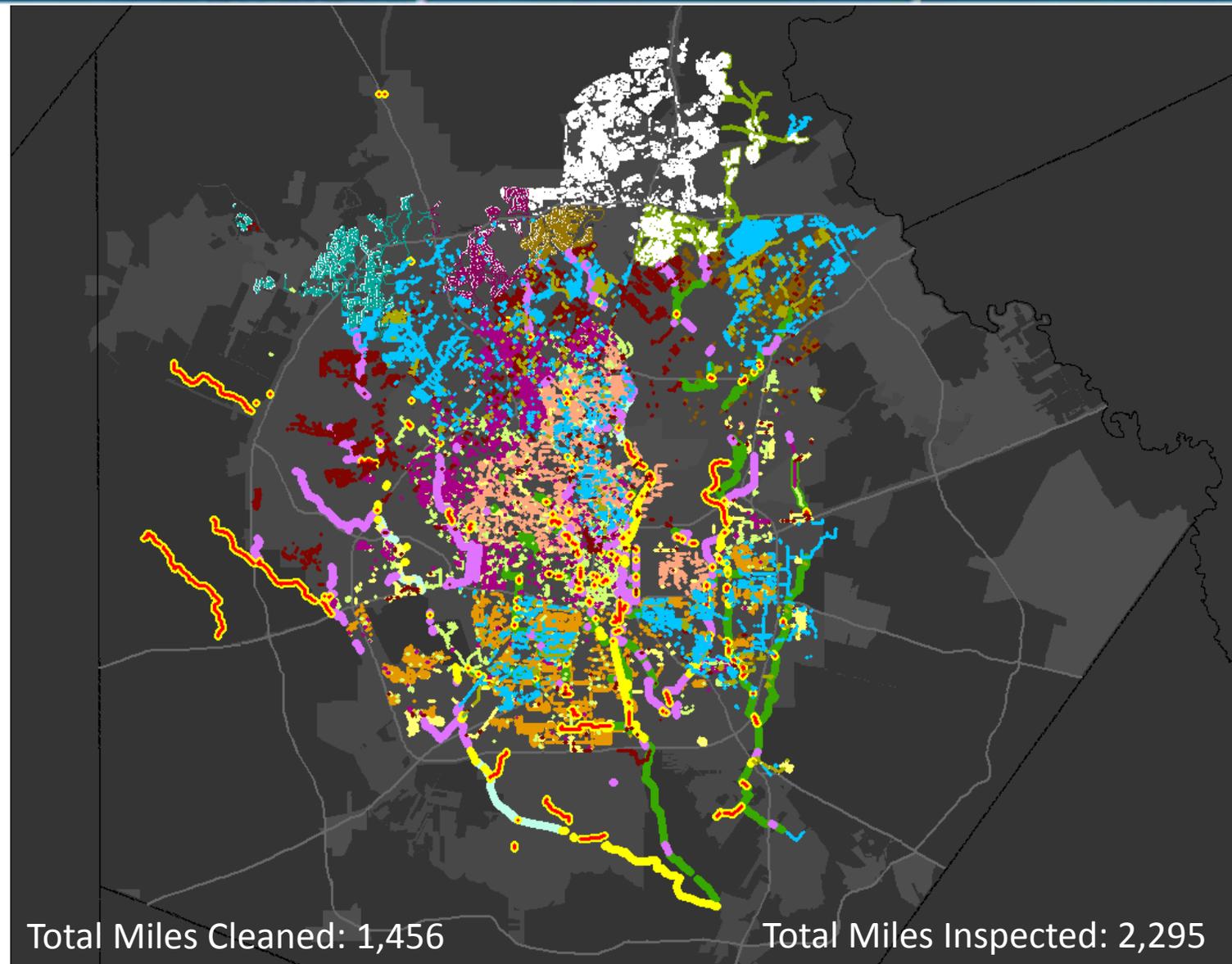
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2015 - Year 3

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- Large Mains Phase 2: Clean
- Small Mains: Polecam Inspect
- EARZ Mains: Clean/TV Inspect

2016 - Year 4

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- Small Mains: Clean/TV Inspect
- EARZ Mains: Clean/TV Inspect



2013 - Year 1

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2015 - Year 3

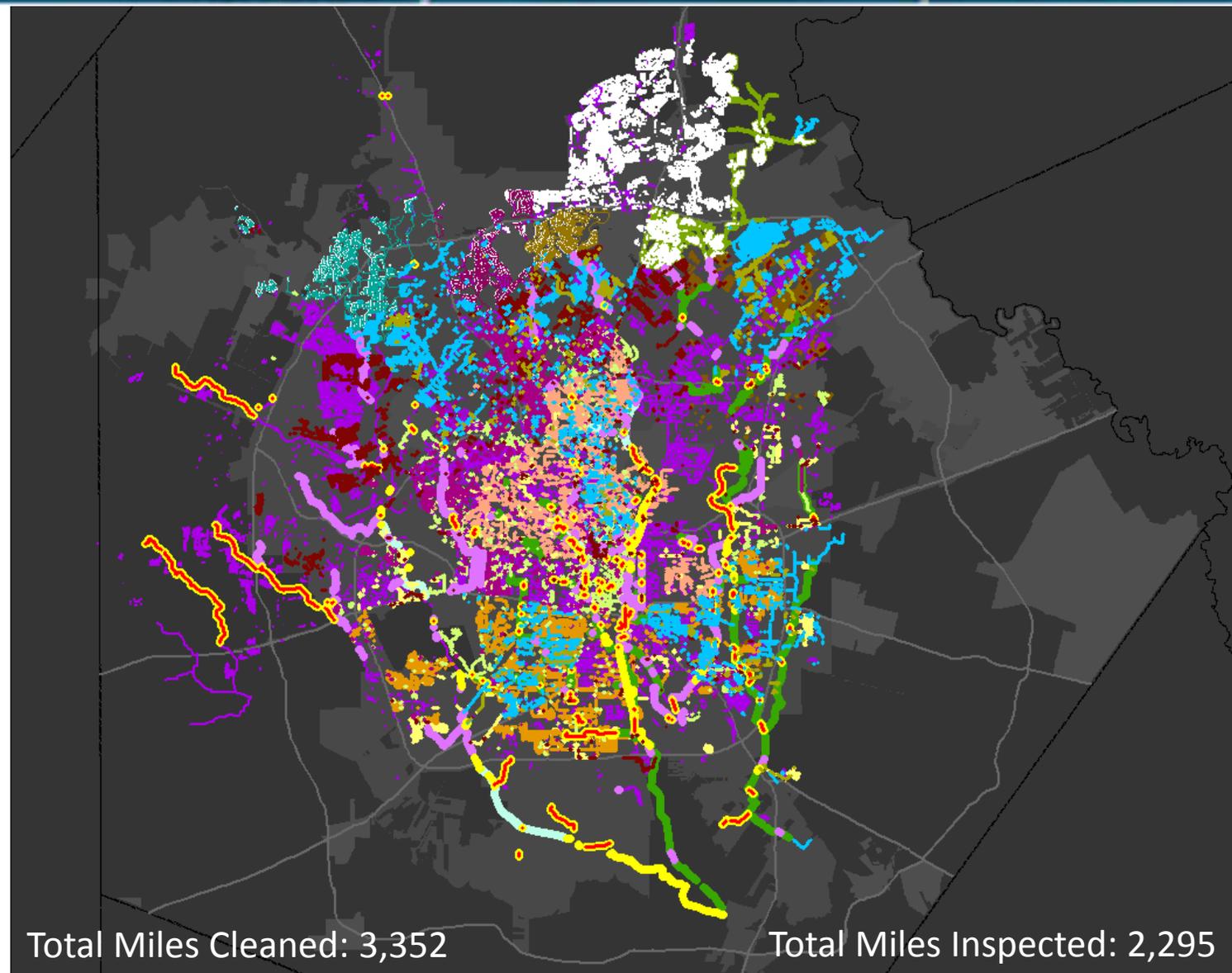
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- Large Mains Phase 2: Clean
- Small Mains: Polecam Inspect
- EARZ Mains: Clean/TV Inspect

2016 - Year 4

- Small Mains: Clean
- Small Mains: Clean/TV Inspect
- EARZ Mains: Clean/TV Inspect

Ad Hoc 2013-2016

- Clean



Total Miles Cleaned: 3,352

Total Miles Inspected: 2,295

2013 - Year 1

- Small Mains: Clean/TV Inspect
- Large Mains: Clean/TV Inspect
- Small Mains: Polecam Inspect
- EARZ Mains: Clean/TV Inspect

2014 - Year 2

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2015 - Year 3

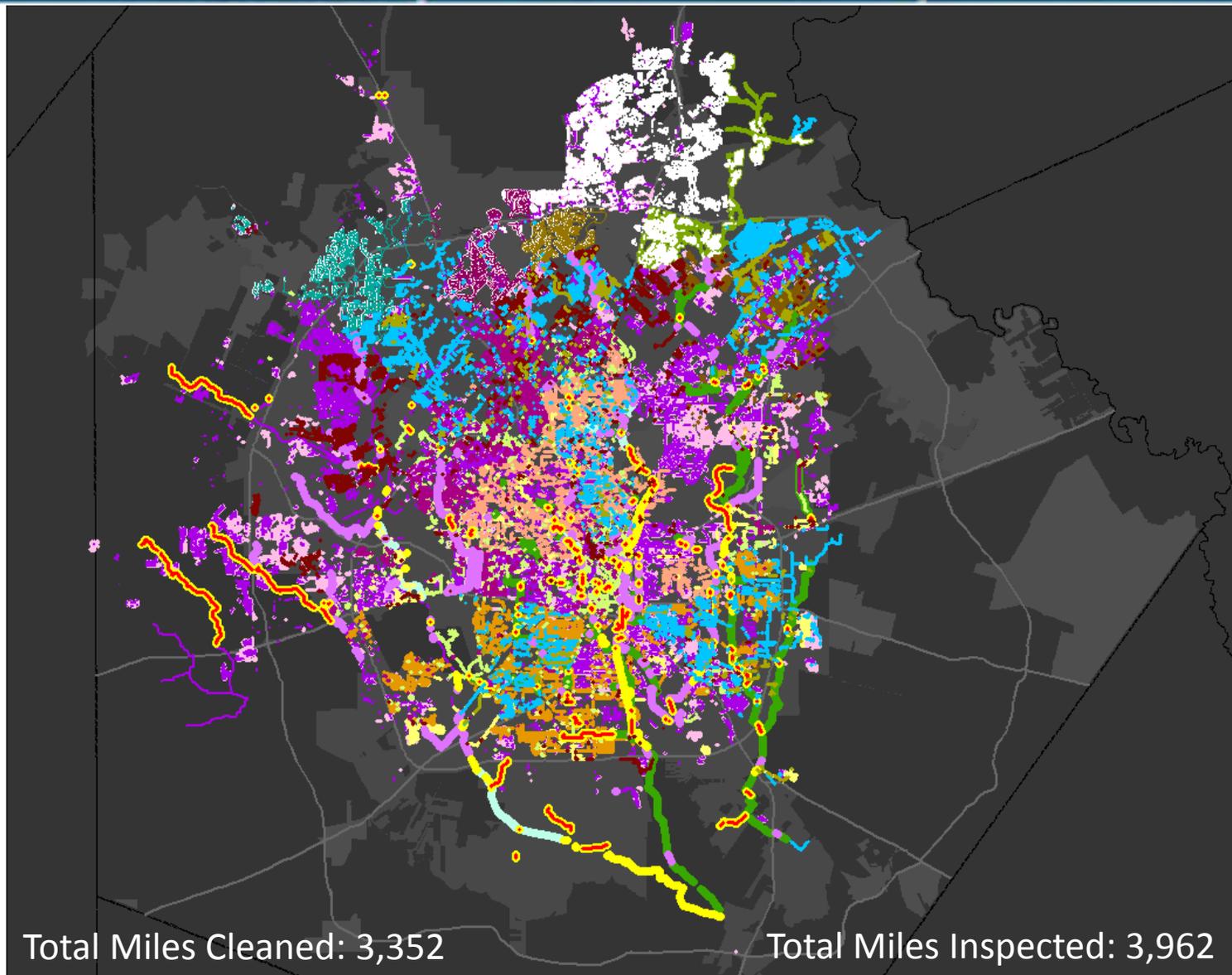
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- Large Mains Phase 2: Sonar/TV Inspect
- Large Mains Phase 2: Clean
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2016 - Year 4

- Small Mains: Clean
- Small Mains: Clean/TV Inspect
- EARZ Mains: Clean/TV Inspect

Ad Hoc 2013-2016

- Clean
- TV Inspect



Condition Assessment Requirements

CCTV or Pole Cam



Asset Description To be Assessed by July 2017	Miles of Inspections Required Under CD	Miles of Inspections Completed	% Complete
Small Diameter Gravity Sewer - EARZ, Concrete Pipe and Clay Pipe Installed Prior to 1973	1,869	1,909	102%
Small Diameter Gravity Sewer - Clay Pipe Installed from 1973 through 1982	410	411	100%
Large Diameter Gravity Sewer	364	378	104%

Condition Assessment: Rate A-E



Table VII-I:
Condition Categorization Summary

Condition Category	Miles of Small Diameter Sewer Mains ^{1,2}	Miles of Large Diameter Sewer Mains ^{1,3}	Number of Manholes
Category A – Very Good	1,019.32	79.22	21,611
Category B – Good	415.67	52.72	32,406
Category C – Fair Condition	1,156.74	114.29	270
Category D – Poor	332.26	83.18	1,171
Category E – Very Poor	178.93	32.27	262
TOTAL	3,102.92	361.68	55,720

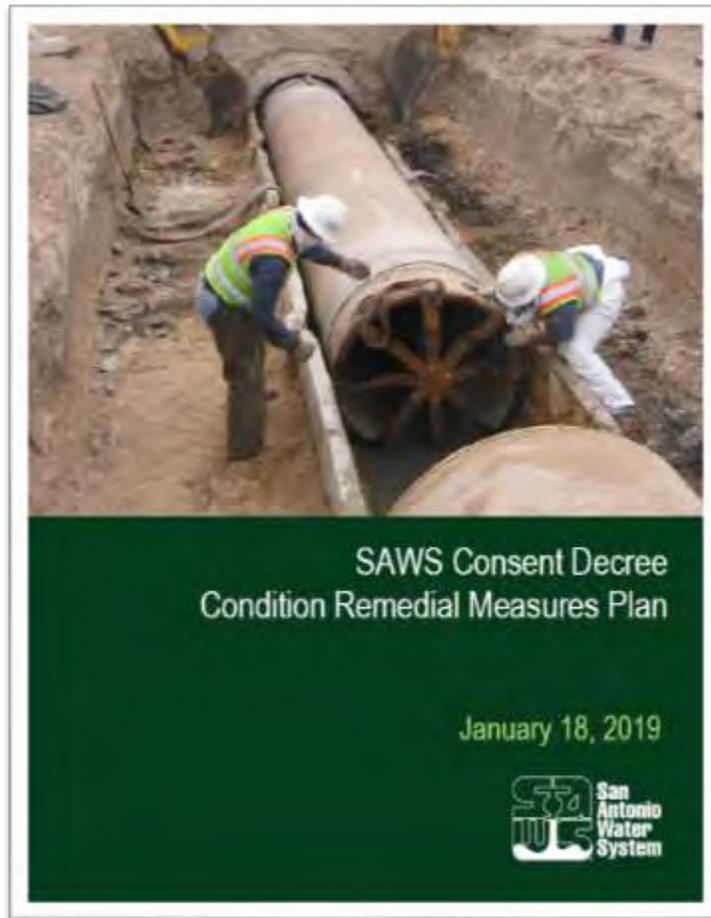
Plan



Alternative Analysis Remedial Measure

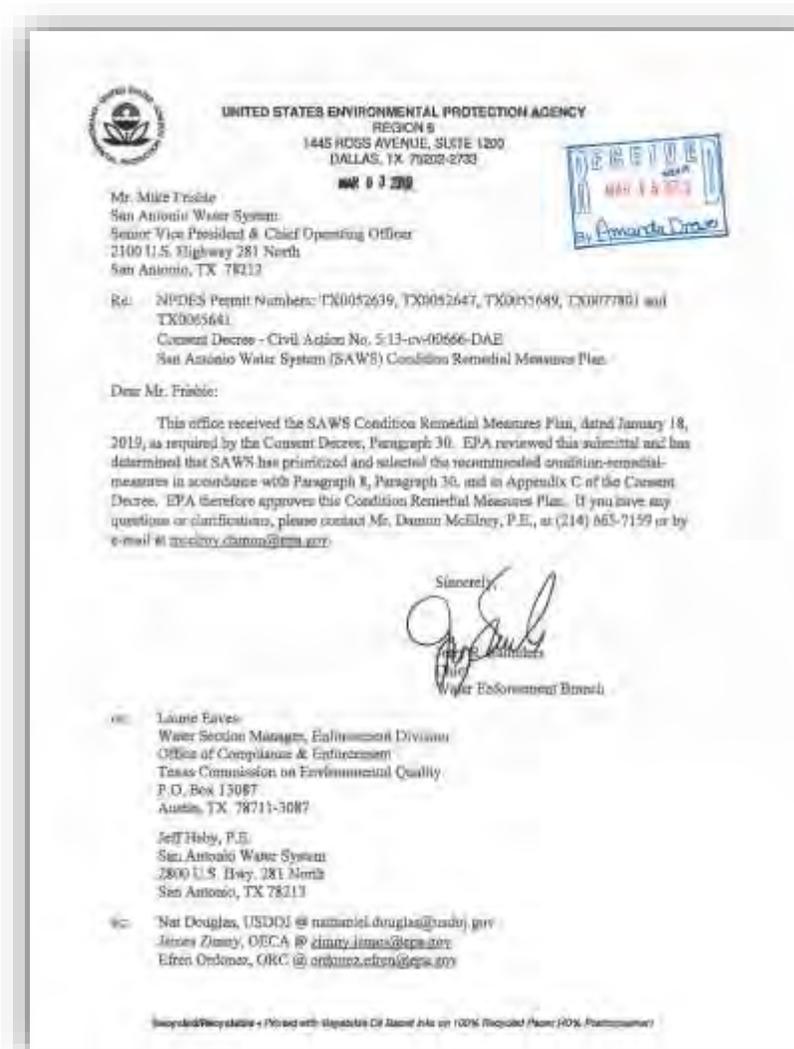
- Best Option “Alternative” to Resolve “Remediate”
- Most Practical Solution & Timeframe
- Long-term Performance and Life-Cycle Cost

- Coordinate both Condition & Capacity Projects
- Prioritize & Develop Schedule
- Determine Budget Requirements



Condition Remedial Measures Plan

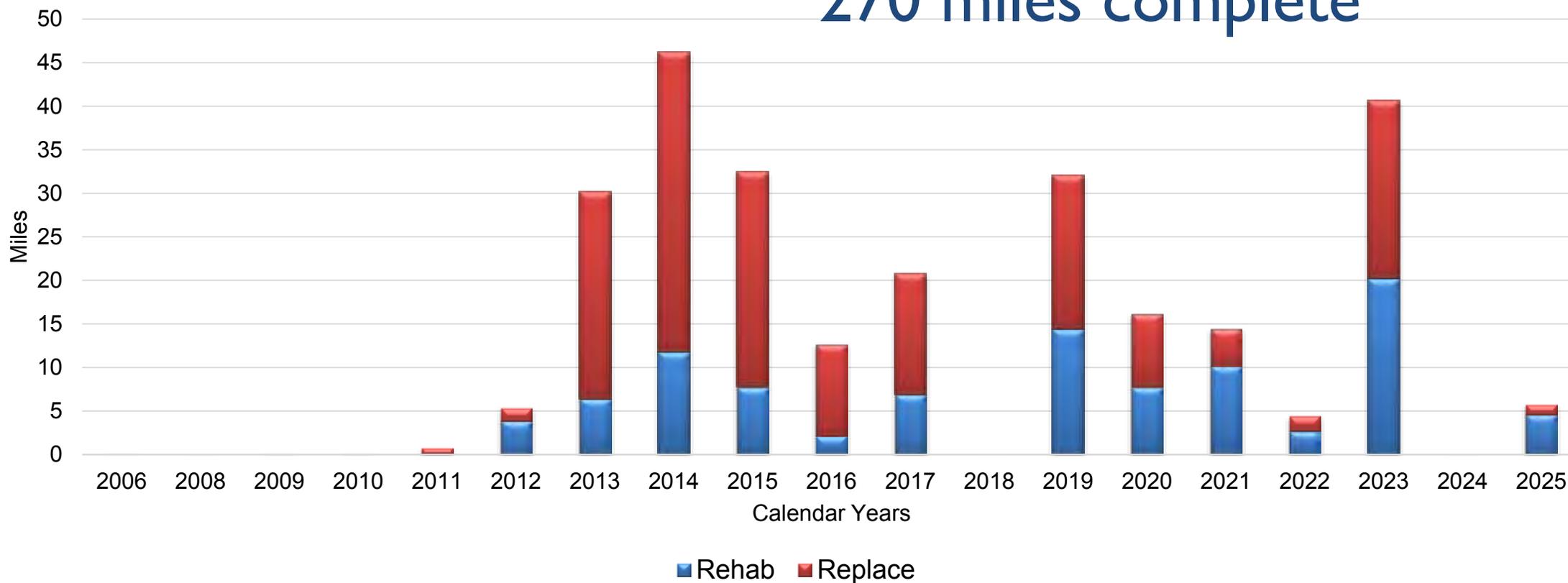
- Approved March 3, 2019



Condition Mileage

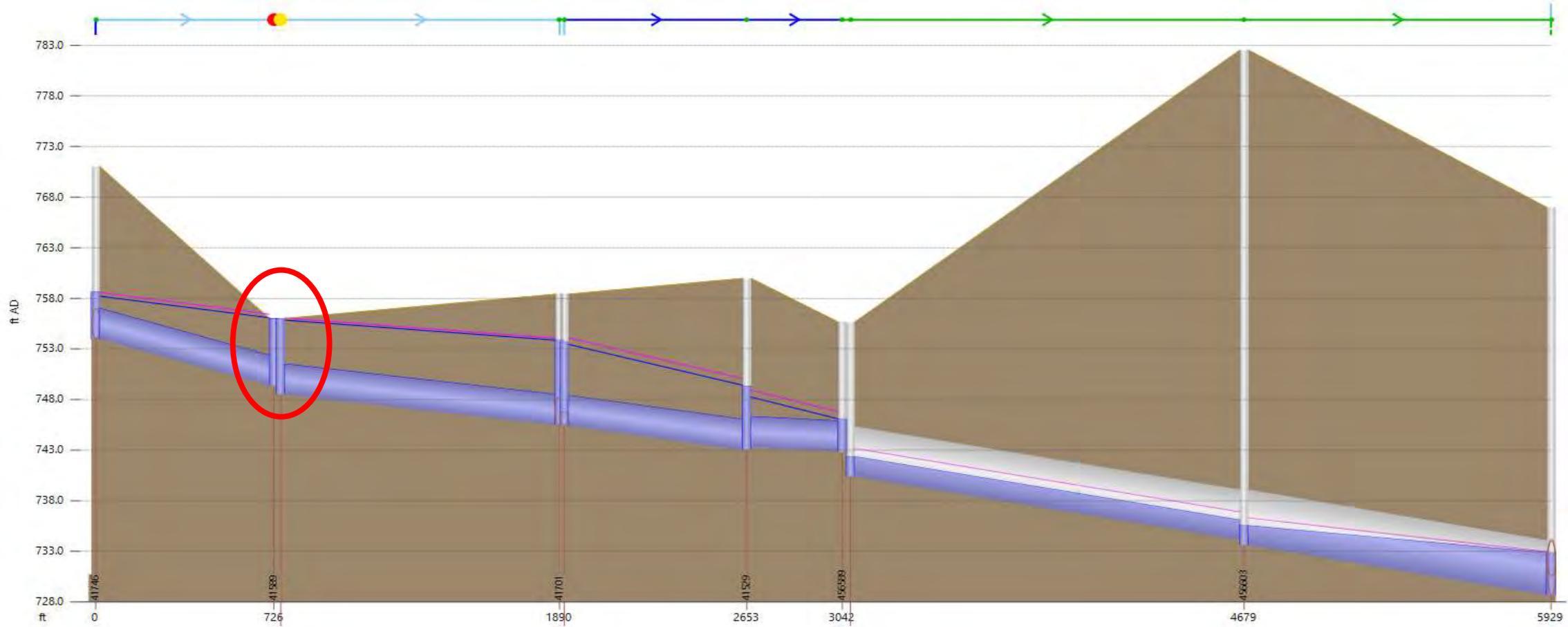
Completed, Planned Rehab and Replace Mileage

270 miles complete



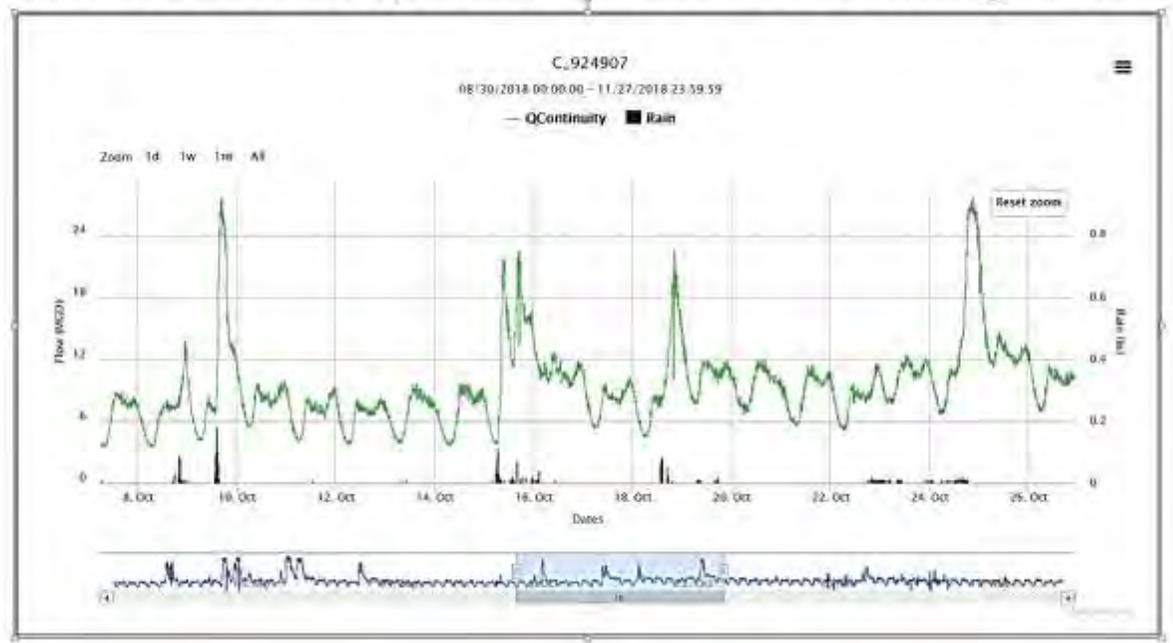
Capacity

What is a Capacity Constraint?

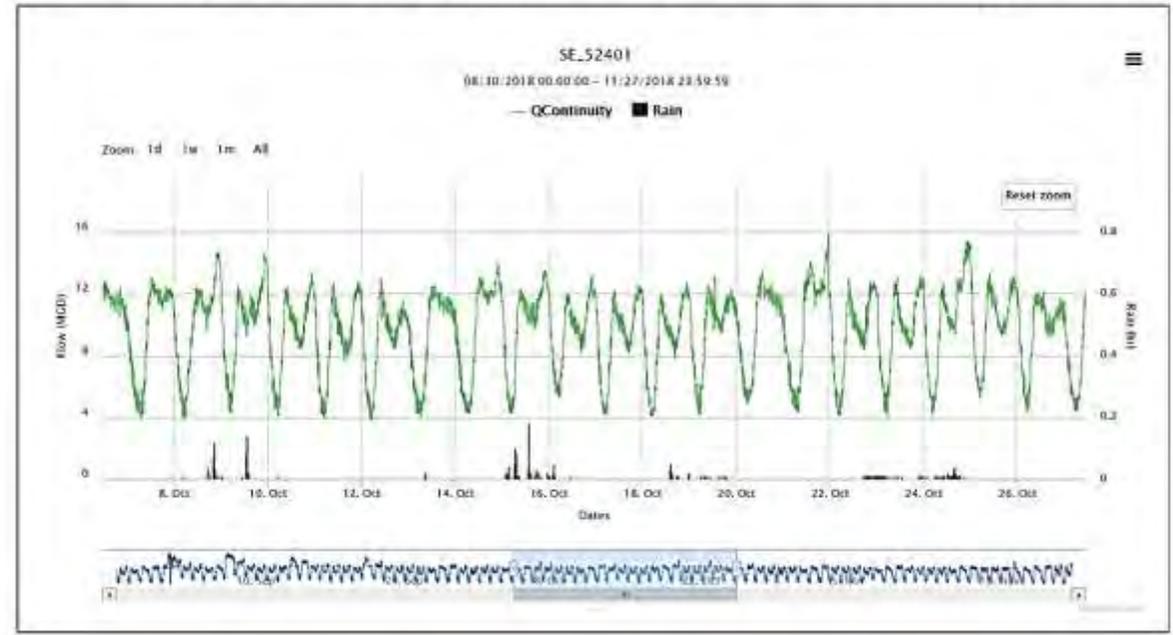


Flow Monitoring

Wet Weather Response – Poor Performing Area



Wet Weather Response – Well Performing Area



Capacity

Table VII-I: Potential Capacity Constraints Summary	
Category	Number of Potential Capacity Constraints
Priority 1 – Category A SSO per Wet-Weather SSO Categorization and where model also predicts an SSO	45
Priority 2 – Where model predicts SSO, but with no observed SSO, or a Category A SSO per Wet-Weather SSO Categorization, but model does not predict an SSO	130
Priority 3 – Where model predicts HGL near ground elevation	87
Priority 4 – Category B SSO per Wet-Weather SSO Categorization	137
Priority 5 – Where pipe design capacity is exceeded for sustained 60 minutes or more but the HGL is not near the ground elevation	139
Total	538



Table IX-I: Capacity Assessment Results	
Capacity Assessment Result	Number of Potential Capacity Constraints
Remedial Measures Alternatives Analysis	170
Monitor in the Future per Capacity Assessment and Remediation Process and Guidelines Appendix (CMOM)	273
Not a Capacity Constraint	95
Total	538

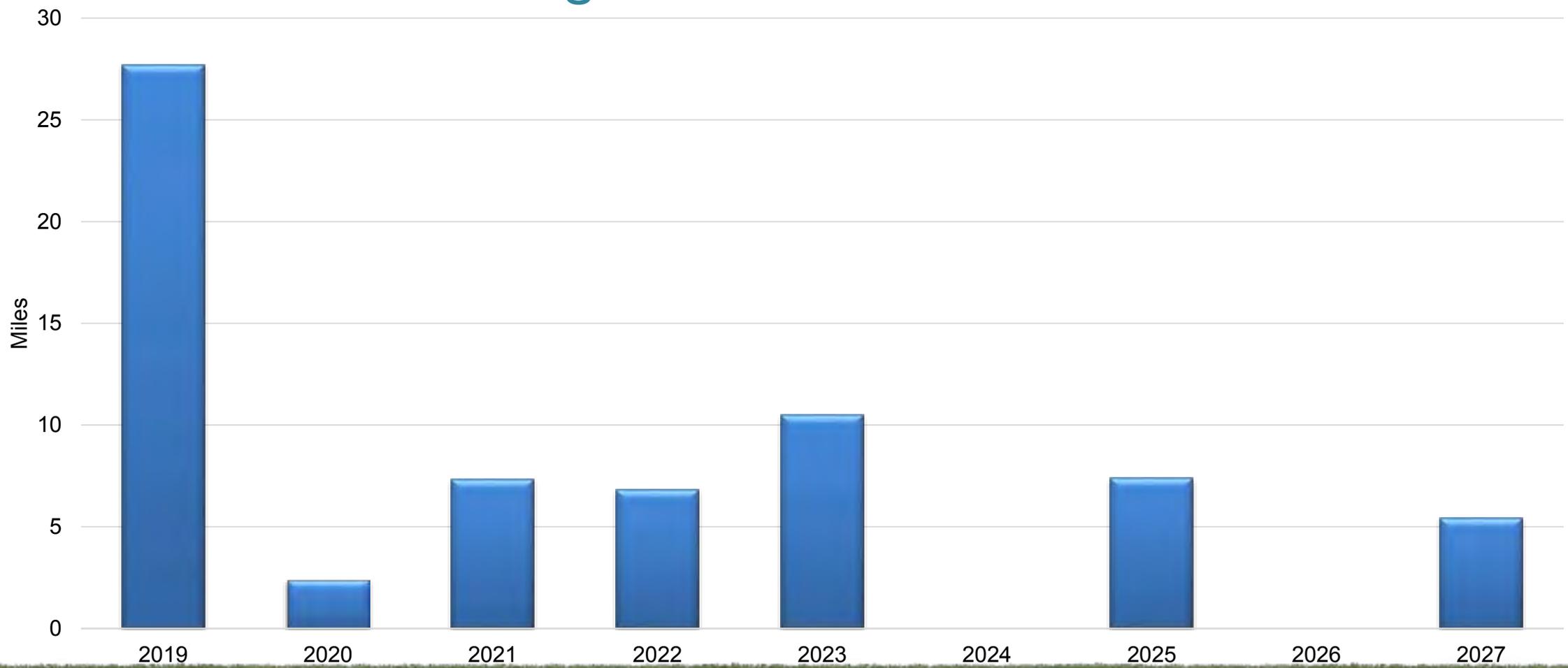
Alternatives Analysis Results

Capacity Table VII-1

Table VII-1: Results of Remedial Measures Alternatives Analyses	
Remedial Measures Alternatives Analysis Result¹	Number of Potential Capacity Constraints
Re-route a portion of upstream wastewater flows	2
Reduce flows entering the WCTS	0
Reduce inflow	41
Reduce infiltration	0
Increase conveyance capacity	52
Upstream flow detention facilities	18
Continued monitoring	27
Other (Lift Station)	10
Other (Not a Constraint)	5
Other (Main Stem)	15
Totals:	170

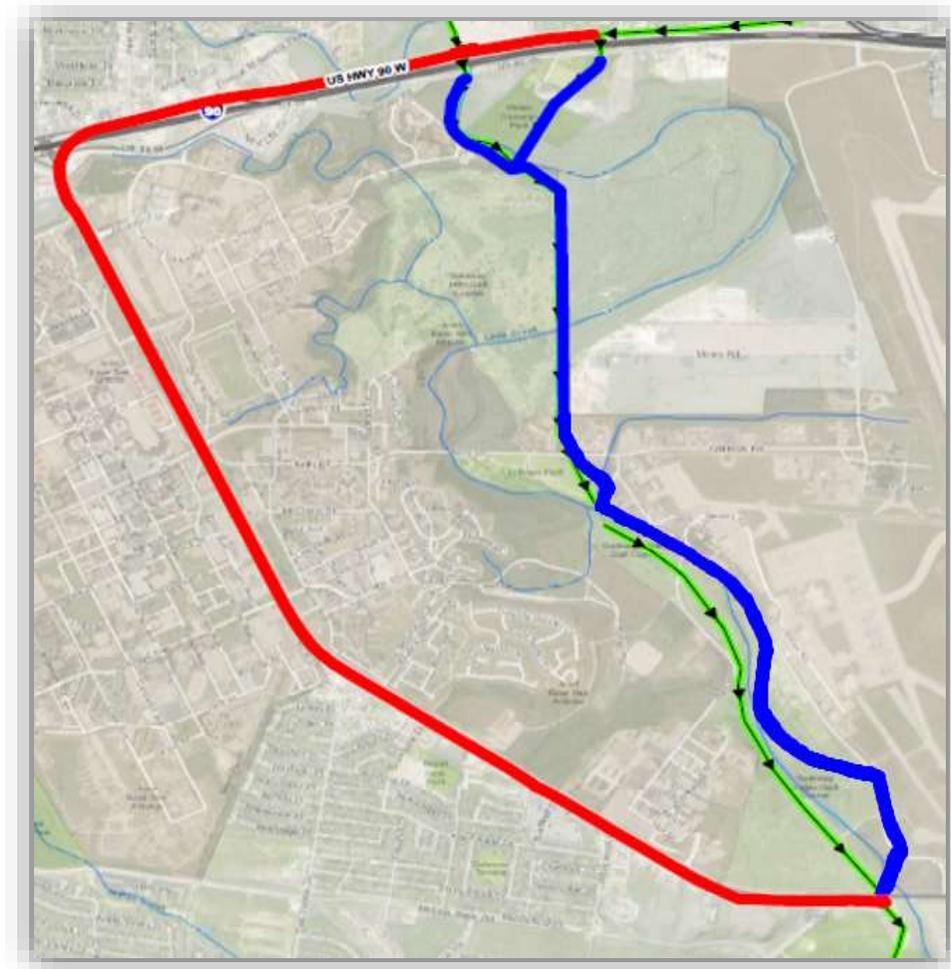
Capacity Projects

67.5 miles remaining



W-6 Final Alignment & Schedule

- \$175-210 Million construction cost
- Most costly sewer project in San Antonio history
- Highly specialized construction
 - 5.3 miles tunneling up to 140 ft. deep
- Aggressive Schedule
 - Design: Feb. 2019-Feb. 2020
 - Construction: June 2020-2023



W-6 Groundbreaking/Signing Ceremony



Unanticipated Project – Flow Storage Facility Central Basin

Mitigate overflows in Central Basin

~\$100M CIP cost forecast



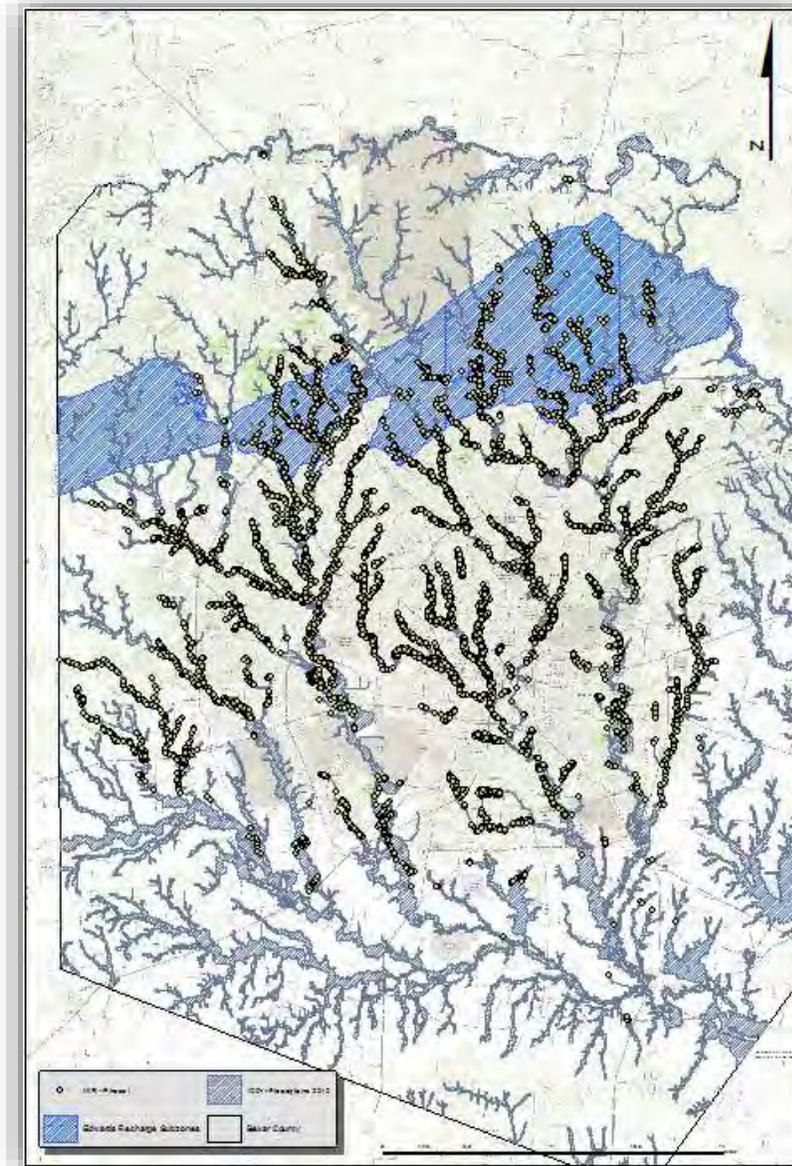
Inflow – Lessons Learned

- Rerouting flows to minimize crossing of creeks and rivers
- Renewal of mains in floodways to minimize potential for inflow



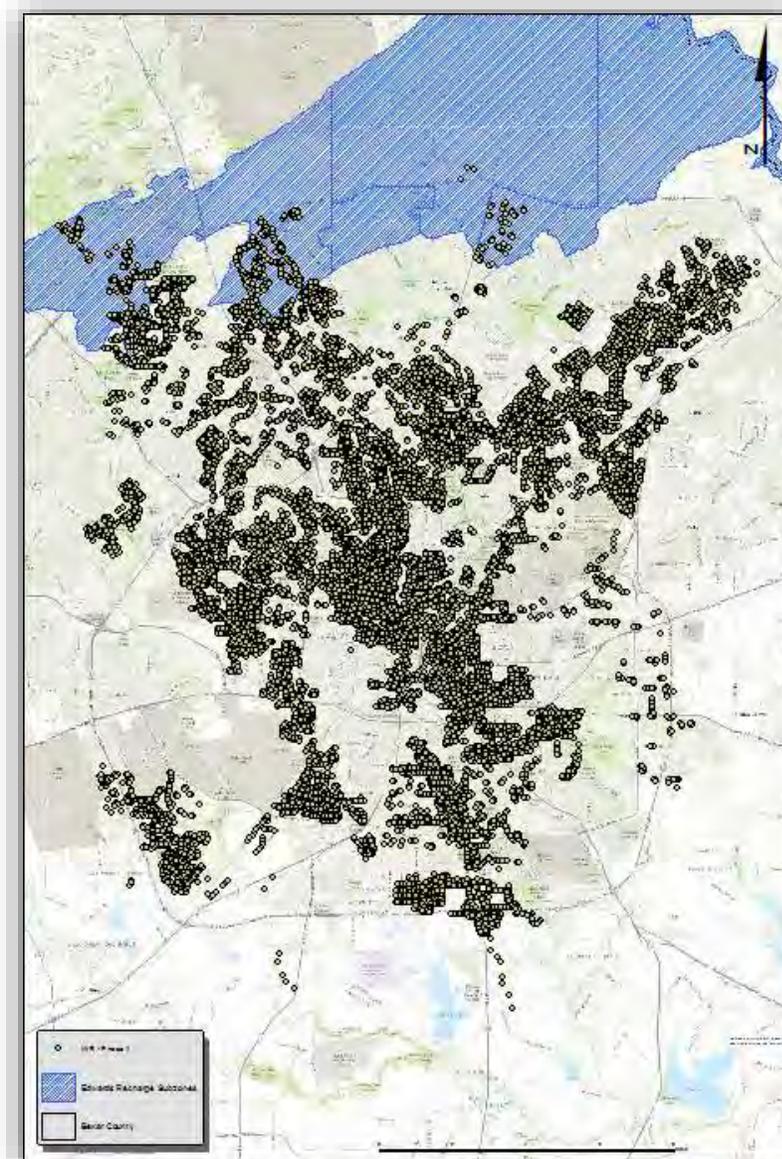
Phase I – Manhole Inspections

- 8,885 Manholes within 100 year floodplain & creekbeds
- 9% of SAWS manholes are located in the 100-year flood plain



Phase 2 - Manhole Inspections

- ~20,000 manholes in flood prone areas
- Selection Criteria:
 - Upstream of capacity constraint
 - Rain event submergence



CMOM - Condition Monitoring Plan

- Ongoing inspection and reassessment
- EARZ assets - 5 year cycles
- Condition Assessment of Re-inspected Assets (3 buckets)
 - Maintenance Analysis –Cleaning Program
 - Monitoring
 - Remedial Measures Alternative Analysis

CMOM - Capacity Monitoring Plan

- Flow Monitoring Plan
- System-Wide Hydraulic Modeling
- Evaluation of Reported Wet Weather SSOs and Model Predicted SSOs
- Remedial Measures Alternative Analysis
- Plan and Implement Remedial Measures



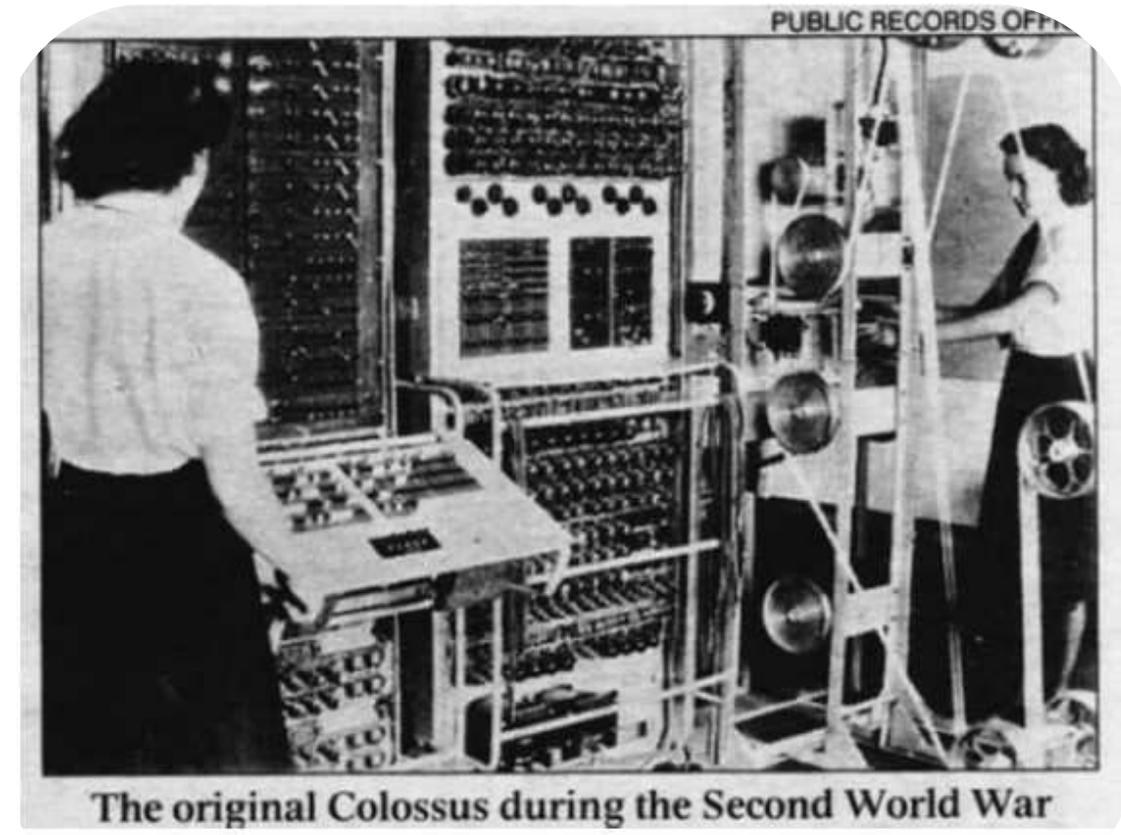
KEY LESSONS LEARNED



Lesson Learned: Post SSO Root Cause Analysis



Lessons Learned: Data Management & Project Controls



The original Colossus during the Second World War

Colossus—the first electronic computer.



Project Controls Team

Integrated Project Management System

- Integrated Project Management System
 - Utilized by SAWS staff, consultants and contractors
 - Linked to SAWS financial system
 - Project documentation required to advance projects
- Program/Project Master Schedule
 - Monitor slippage
 - Road Blocks



Here's the Breakdown

Scope

SSO Remedial Measures
900+ Projects
+23k Assets

CPMS
+23k Assets

Schedule

12 Planned

104 Active

Budget

2019 CIP
\$377M

5 Year CIP
\$2.6B

Leveraging Technology

- Contract & Project Management System (CPMS)
 - Asset Information and Project Status/Contract
- Primavera P6
 - Project Schedule
- Tableau
 - Dashboarding



SSORP Management Dashboard

Remedial Measures Plan/CPMS Asset Mileage (Condition)

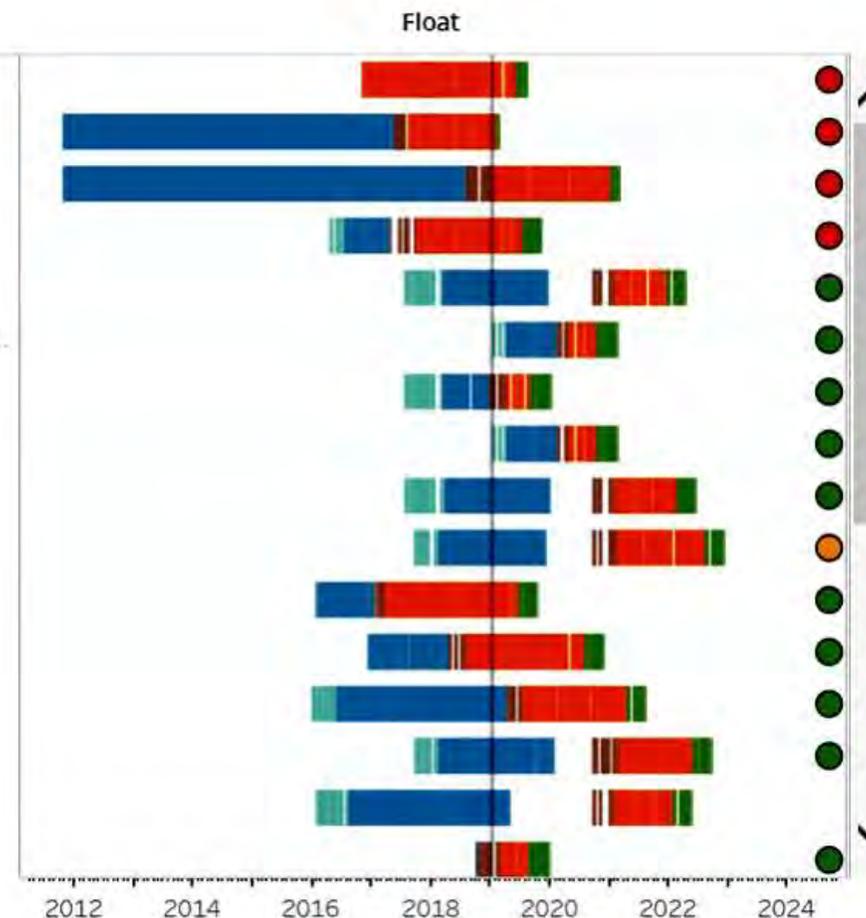


Schedule Dashboard

Engineering Project Schedule Dashboard

Projects

- C-5 C-28 Phase 1B
- C-5 C-28 Phase 2
- C-5 C-28 Phase 3
- C-13 Broadway Corridor Pkg B.1 and B.2
- C-18 McCullough Avenue Sewer Rehab, Birch Leaf Drive to Oblate Drive
- C-22 Babcock Road Sewer Capacity Replacement, Crestview Drive to Concord Pl.
- C-30 San Joaquin to Gen McMullen
- C-36 Jackson Keller Rd Sewer Capacity Reroute, West Ave-Orland Park
- C-69 S Zarzamora St Sewer Upsize and Relief
- E-16 Wurzbach Pkwy Sewer Capacity Storage at Hwy 281
- E-19 Segment 1 - Seguin Road to Nacogdoches Road
- E-19 Segment 2 - Rittiman Road to Nacogdoches Road
- E-20 Seg 1 Wurzbach: Jones Malts to Naco
- E-74 Rosillo Creek Sewer Capacity Storage South of IH-10
- Helotes Creek Gravity Main and Lift Station #246 Elimination
- Install sewer main from LS 224 to SBSP



Asset Tracking

CPMS Asset Tab

Every RM Asset has a RM Tag

Asset Remedial Measures	Associated Project	Job No.	Associated Proposal
2021 Condition - RM	Pro-10782 - Multiple Sewershed Pac...	17-4557	RMC-00015 - Project 15 - 2021 SD Re-hab Program
2021 Condition - RM	Pro-10782 - Multiple Sewershed Pac...	17-4557	RMC-00015 - Project 15 - 2021 SD Re-hab Program
2021 Condition - RM	Pro-10782 - Multiple Sewershed Pac...	17-4557	RMC-00015 - Project 15 - 2021 SD Re-hab Program
2021 Condition - RM	Pro-10782 - Multiple Sewershed Pac...	17-4557	RMC-00015 - Project 15 - 2021 SD Re-hab Program

Change Management

Capital Project Control Form (CPCF)

- Mechanism to capture
 - schedule delays
 - budget overruns
 - scope changes
- Workflow to enable approval by management

San Antonio Water System Contract & Project Management System

Workspace | Planning | Implementation | Projects | Resource | Financials | Documents | Assets | Reports | Users

Edit Capital Project Control Form

Capital Project Control Form Information

* Primary Project: Pro-10812 - Camaron, Santa Rosa & Dolorosa (PFS Only) * Primary Contract: PS-00035-04-6 - Camaron, Santa Rosa & Dolorosa
 Job Number: 17-4553 Created On: 07/19/2018 10:44:42 AM
 * Work Package: 0 * CPCF Type: Owner's Request
 * CPCF ID: Pro-10812-CPCF-00-001 Status: Approved
 * CPCF Title: Addition of segment 983076 along Camaron St.
 * Date Reported: 7/19/2018 * Type: Design
 Description: An adjacent segment is being added to the scope of this project in preparation of an upcoming change order. That change order will reassign the construction of these two segments to the existing San Pedro Creek Gov. Project. It was decided to finish the design portion of these two segments under this contract since the design is currently in progress.

Proposed Project Revision (Check all applicable)

Scope Revision Budget Revision
 Schedule Revision Package Revision

Scoping Revision

Original Scope (Miles): 0.17 Proposed Revised Scope (Miles): 0.20
 Justification: With the additional 150' segment, 983076, the total rehabilitated mileage is increased by 0.03 miles.

Budget Revision

Original Budget (Dollars): \$37,765.00 Proposed Revised Budget (Dollars): \$55,085.00
 Justification: Additional funds are required to compensate the additional services involved in designing the rehabilitation of the additional segment as well as for SUE services on existing utilities in the area.

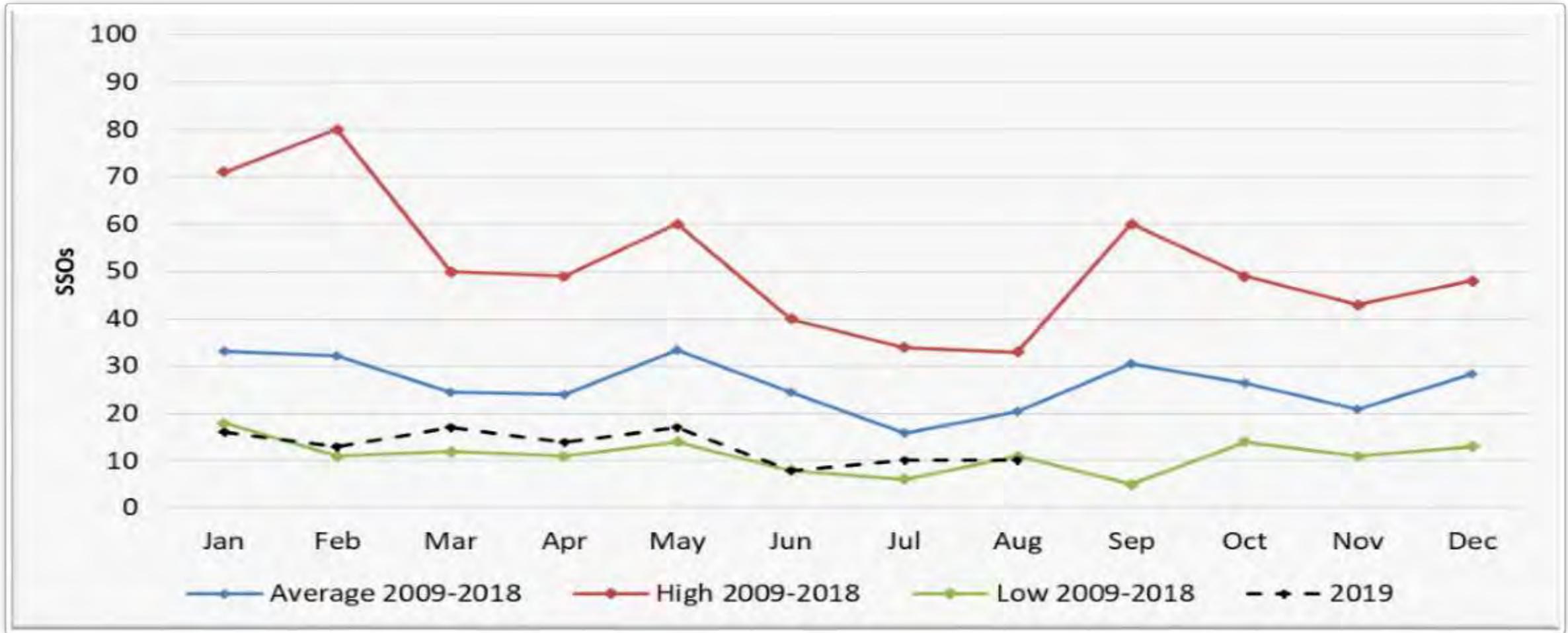
Next Steps in the Program

Manage Scope, Schedules and Budget

- Keys to our success
 - Project Controls Team is critical
 - Create an Asset Management/Change Control Team
 - Always more that we want and need to do
 - Execute CMOM

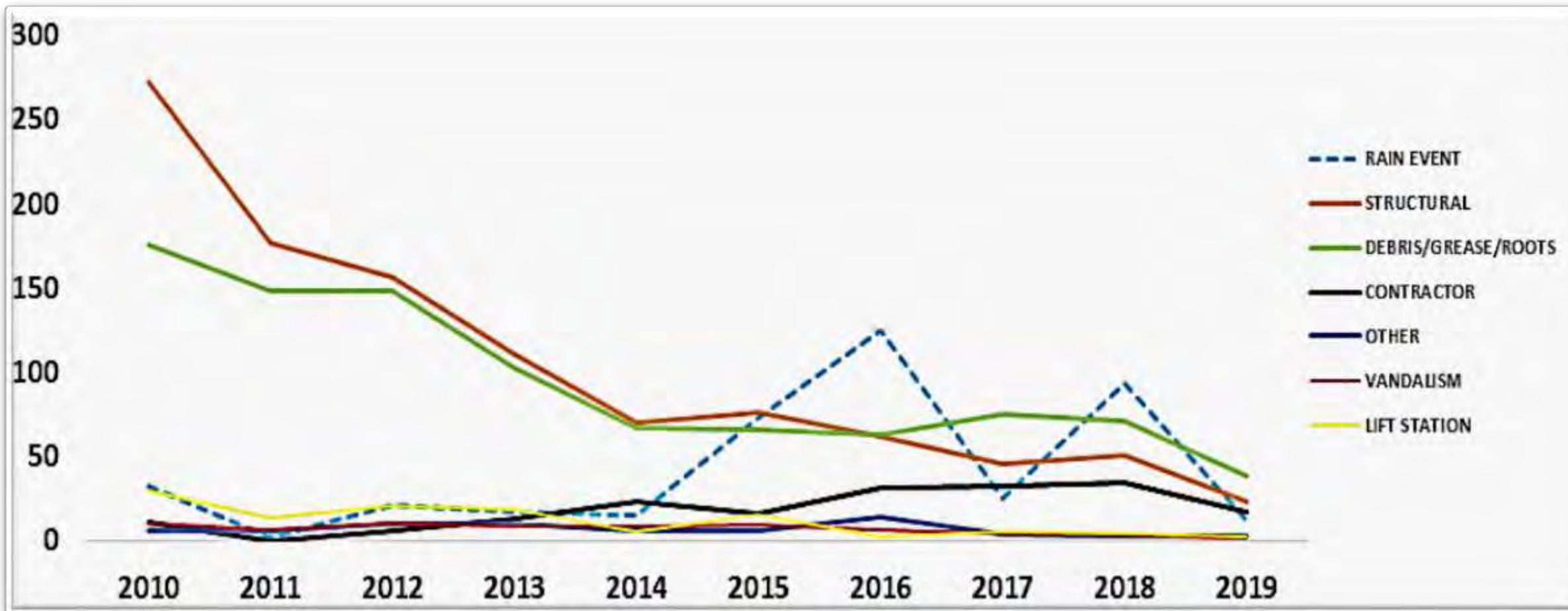
SSORP Progress

105 SSOs in 2019



Program Effectiveness

2010-2019 YTD SSOs by Root Cause



SAWS SSORP Progress

Jeff Haby, P.E.

Vice President – Production & Treatment

September 13, 2019



MAKING SAN ANTONIO
WATERFUL



Inflow Reduction Work Plan

This **I/I Reduction Work Plan**, the **Capacity Monitoring Plan**, and the **Condition Remedial Measures Plan** will work in concert. Not only will the **Capacity Monitoring Plan** identify capacity constraints to be remediated by I/I reduction, but it will also provide the ongoing analysis of the hydraulic performance of the collection system necessary to measure the level of success remediating capacity constraints by virtue of reducing I/I.

