Capital Improvements Division

SEMSWA's Pipe Rehabilitation Program

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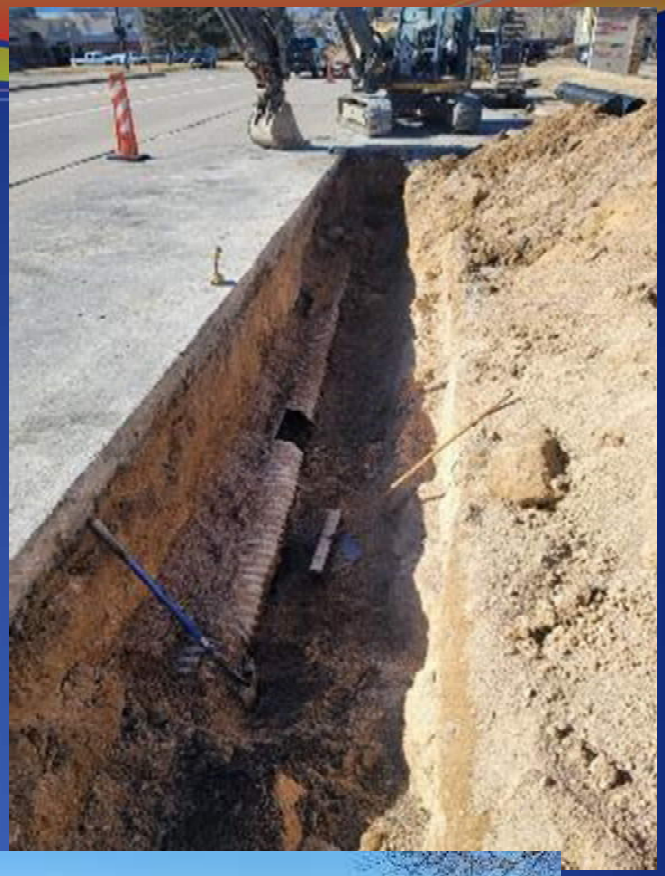


The Problems:

Corrugated Metal Pipe (CMP):
CMP deteriorates, corrodes, rusts and disintegrates overtime especially along the bottom of the pipe.

Reinforced Concrete Pipe (RCP):
Joints Separate, Concrete deteriorates and cracks.

The Problem (continued):

Once pipe is compromised water infiltrates and can erode the pipe bedding and soils around the pipe, potentially causing sink holes, compromising safety, roads, and other infrastructure both public and private.

Repairs become very costly and disruptive…

The Solutions:

Cured in Place Pipe (CIPP)
Spray in Place Pipe (SIPP)
Polyurethane Pipe liner
Direct replacement
Point Repairs

CURED IN PLACE PIPE (CIPP):

The process was first developed in England in the 1970s as a means to repair/replace broken sanitary pipes, without having to dig them out.

Process generally utilizes a felt or fiberglass liner impregnated with a resin, pulled into place, then inflated and cured, generally with either heat (steam or hot water), or ultraviolet light. Finished product is a new structural pipe within the existing pipe.

SPRAYED IN PLACE PIPE (SIPP)

New technology is developing to apply various types of coatings to the inside of pipes.

In larger pipes coatings may be hand applied or sprayed.

In smaller pipes coatings may be applied by specialized machines and robots.

Coating material may be polymer based, or cement based depending on the specific project parameters and needs.

Great option for protecting and significantly extending the service life of CMPs in fair or poor condition.

CIPP - SEMSWA HISTORY:

In 2011 sinkholes began to form along the 60" CMP alignment running under County Line Road at Chester St. Pipe inspection revealed several holes along the invert of the CMP.

SEMSWA partnered with the City of Lone Tree to install CIPP within the CMP. Total project cost ~$160,000. Completed over the course of a week (October, 2011) with minimal disruption to traffic. Direct replacement estimated at ~$350,000.

Pipe re-inspected in March of 2018, liner was observed to still be in excellent condition after ~6 years of service.

2011 – SEMSWA purchased video pipe inspection van to inspect and assess existing infrastructure.

CMP – SEMSWA HISTORY:

As of June, 2012 SEMSWA had identified 41,109 linear feet of CMP within its service area, of which nearly 10,000 linear feet was classified as being in “Poor” or “Critical” Condition.

2012 SEMSWA began to allocate $800,000 per year to address the deteriorating CMPs within the SEMSWA jurisdiction.

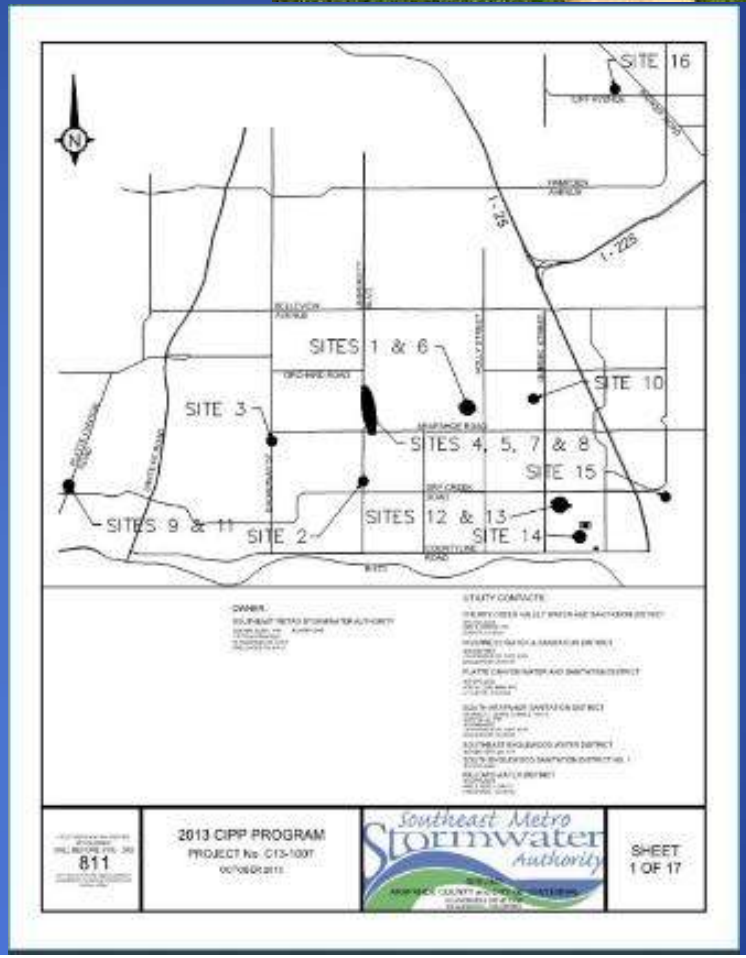
CMP – SEMSWA HISTORY:

October 2012 – SEMSWA utilized CIPP to rehabilitate 3 large CMPs at the intersection of Arapahoe Rd and Fairfax St.
3-48” CMP segments lined, total of 536 Linear Feet.
Total project cost of ~$244,690.00

CMP – SEMSWA HISTORY:

2013 SEMSWA lined ~4,200 LF of CMPs with CIPP
22 Sites across SEMSWA's jurisdiction
Project cost $770,000.00

Typically target putting out a large lining program every other year.



CMP – SEMSWA HISTORY:

2014 SEMSWA utilized a Sprayed in Place Pipe (SIPP) to line the 57”x 83” (153 lf)Arch CMP at Goldsmith Gulch and Arapahoe Rd crossing.

Lining material consisted of a high strength Geopolymer and Concrete mix, spun in place by high speed centrifuge device. Final product provided a new, highly durable structural pipe.

Project cost ~ $130,000.00. Estimated cost to replace ~ $350,000.00.

CMP – SEMSWA HISTORY:

2014 SEMSWA used a Polyurethane Spray on product to line and protect the bottom of an 80" x 132" arch CMP crossing for the Phillips tributary at E Phillips Pl.

Project cost ~ $26,000.00. Very economical solution to extend the life of existing CMPs in poor but not critical condition

Site visit in March 2018 confirmed the CMP and the liner is still in good condition.

CMP – SEMSWA HISTORY:

2015 SEMSWA replaced a severely damaged and corroded 30" storm sewer within a green belt near E Mineral Drive and S Vincennes Way.
Pipe deformation eliminated the option of relining the CMP. SEMSWA utilized High Density Polyethylene (HDPE) storm sewer in lieu of the traditional Reinforced Concrete Pipe (RCP). Lower risk site provided a good location for a case study of HDPE and it's performance over time.
Replaced ~ 350 lf of CMP, project cost ~ $75,000.00.

CMP – SEMSWA HISTORY:

2015 – Higher than usual precipitation led to the formation of several sinkholes including 2 on County Line Rd. and Yosemite St. along the alignment of a 36" CMP. Emergency repairs included flash filling the sink holes and relining the 36" CMP running under County Line Rd.

Costs:
Sinkhole repair work - $34,100
310 LF 36" CIPP - $64,000

Fortunate timing allowed SEMSWA to acquire the lining at a heavily discounted price, since Insituform had a "wetted out" 36" liner that they needed to get rid off. ~Estimated savings of $60,000.

CMP – SEMSWA HISTORY:

2015/2016 SEMSWA rehabilitated ~3,774 LF of CMPs with CIPP at 15 Sites across SEMSWA's jurisdiction.
Additionally partnered with Arapahoe County to line 3 irrigation culverts off Platte Canyon Road
Project cost ~ $800,000.00

CMP – SEMSWA HISTORY:

In 2018 SEMSWA lined
~3,177 LF of CMPs with CIPPs across 15 Sites.

84” x 132” Arch CMP under Yosemite Rd to be lined with new type of Carbon Fiber Reinforced Polymer SIPP – proposed cost $117,500. Direct Replacement estimated at ~$600,000.

Treated Invert of 72” CMP – at E Jamison Dr. – Cost of $25,850.00.

RECENT & CURRENT EFFORTS:

Program has expanded to address both CMP, RCP, and other storm water conveyance structures.

2022/2023 – 11 Sites – 25 Segments, ~3,324 linear feet $730,564.00

Dry Creek at Adams St.

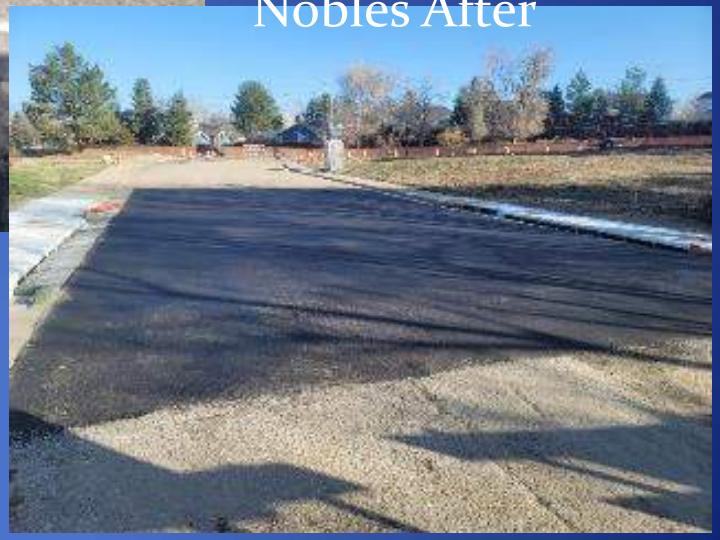
2023/2024

- Dry Creek and Adams – Install New Headwall & Pipe Lining –296 liner feet 96" CMP, invert lining and new headwall~ $252,186.00

- Arapahoe and Nobles – Trench Drain System – remove and replace with Type R Inlets - $216,436.00

Nobles Before

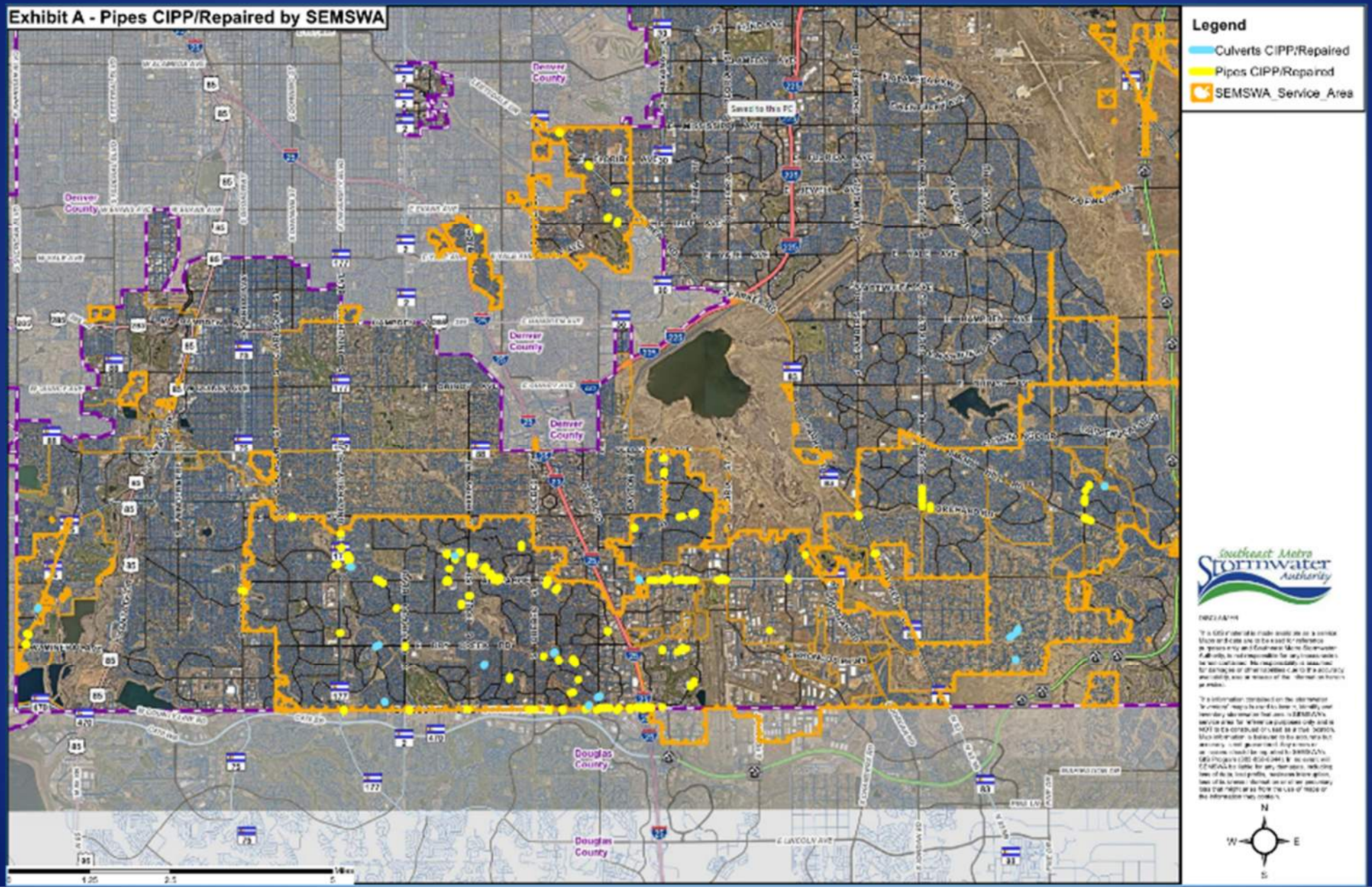
Nobles After



2024 – Created On-Call category for Pipe Rehabilitation, have specialized contractors on call for all types of repairs

CMP – SUMMARY TO DATE:

To date SEMSWA has repaired, rehabilitated or replaced approximately 5 miles (~26,191 linear feet) of Culverts and Pipes.



PIPE REHABILIATION PROGRAM – CURRENT STATUS

While many high priority and critical CMP pipes within SEMWA's jurisdiction have been rehabilitated with CIPP or replaced, we still have a long way to go!

Corrugated Metal Pipes

Critical Condition – 58 segments ~ 8130 Linear Feet

- Poor Condition - 176 segments ~ 20,351 Linear Feet
- Abandoned not Filled – 18 segments ~755 Linear Feet

Reinforced Concrete Pipe

- Joint Separation - 184 segments ~3890 Linear Feet
- Hole in pipe- 225 segments ~3569 Linear Feet
- Joint Offset – 63 segments ~3397 Linear Feet
- Cracked Pipe – 100 segments ~2568 Linear Feet
- Utility Boring – 44 segments ~2920 Linear Feet

Active camera inspections find new issues constantly!

FUTURE EFFORTS:

Many remaining critical pipes still in need of being addressed will generally have been recently discovered, have accessibility issues, easement issues, or have been compromised by other utilities that need to be removed before they can be rehabilitated.

SEMSWA is actively working with the various utilities to get the utilities removed and is working with property owners to acquire easements where appropriate.

Ongoing video inspections identify new issues and pipes that may need rehabilitation, both with CMPs and RCPs.

Begin addressing known issues with RCPs.