

# Engineering and Construction Division

## SEMSWA's Pipe Rehabilitation Program

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## The Problem:

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



## The Problem (continued):

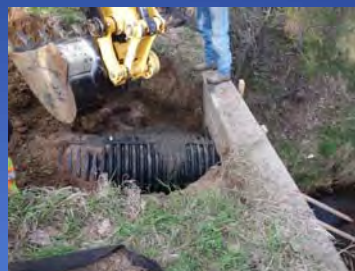
Once pipe invert is compromised water infiltrates and can erode the pipe bedding and soils around the pipe, potentially causing sink holes, compromising safety, roads, and other infrastructure both public and private.



Repairs become very costly and disruptive...

## The Solution:

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



## 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 ultra violet 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



## 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

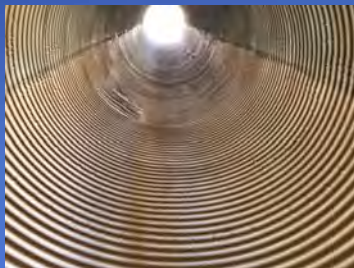


## CURRENT PROGRAM:

In 2018 SEMSWA plans to line  
~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.





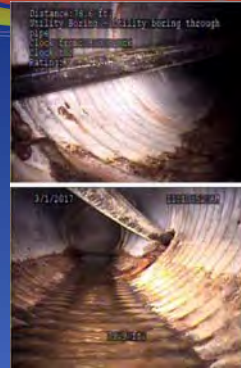
## FUTURE EFFORTS:

Most known critical and high priority CMP pipes within SEMWA's jurisdiction have been rehabilitated with CIPP or replaced.

Remaining critical pipes not being addressed in 2018 will generally 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.



## FUTURE EFFORTS:

SEMSWA is proposing to utilize new SIPP polymer based liners to rehabilitate several CMP segments currently in poor but serviceable condition. Based on the performance of the SIPP at these sites, this technique may be continued to be used to rehabilitate and protect other CMPs in poor condition throughout the jurisdiction.

CIPP will still be used as appropriate as new issues arise, or critical CMPs are discovered, and when the previously known CMPs that could not be lined due to other issues become ready.



## SUMMARY:

We're making progress! To date SEMSWA has utilized CIPP and other methods to treat, rehabilitate or replace over 10,200 linear feet of CMPs of various sizes and lengths throughout the jurisdiction.

Upon completion of this year's rehabilitation efforts it is estimated that there will still be over 2,000 linear feet of pipe segments in either poor or critical condition. Active ongoing video inspections often reveal previously unknown issues and new utility intrusions.

