

MICHEL'S®

Northern California Pipe User's Group 32nd
Annual Sharing Technologies Seminar



www.norcalpug.com



Agenda

- Safety Moment
- Who We Are
- Michels Trenchless Rehab
- Contracting & Procurement Methods
- Project Profiles
- Wrap Up

MICHELS[®]

WE DO THAT ... **& MORE**

Safety Moment



Safety is the cornerstone of our culture.



Who We Are

Founded in 1959

Headquartered in Brownsville, WI

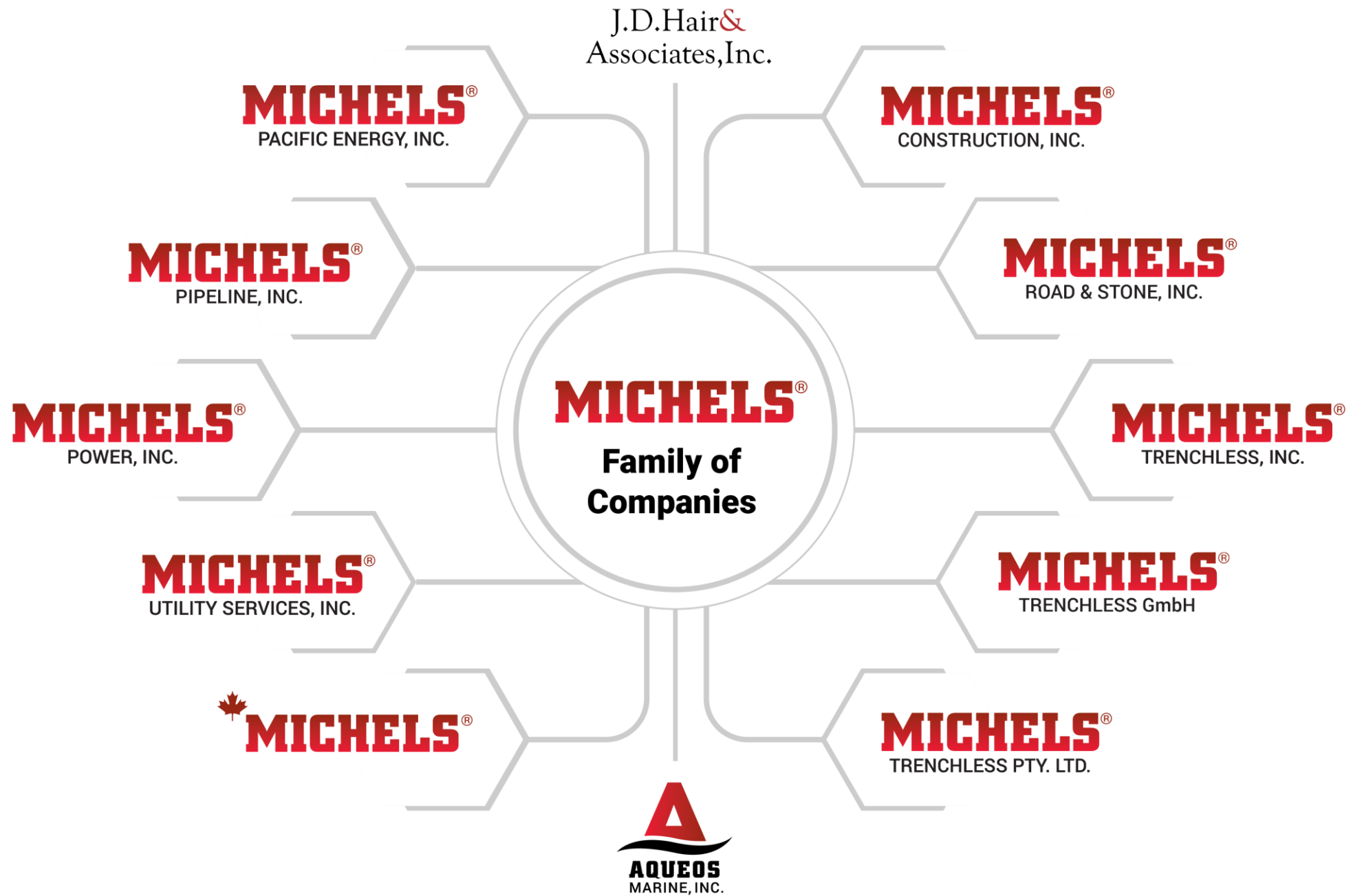
Licensed in all 50 states; operations in Canada and abroad

8,000 employees

17,000 pieces of heavy equipment

~\$3.5B in revenue





Michels – Local Everywhere

850+
completed
projects

50+
active projects



Alaska



Hawaii



Australia



Germany



Singapore

MICHELS[®] OFFICE LOCATIONS

UNITED STATES

- | | |
|-------------------|--------------------------|
| Anchorage, AK | Independence, OH |
| Peoria, AZ | Perrysburg, OH |
| Bakersfield, CA | Uniontown, OH |
| Elk Grove, CA | Tulsa, OK |
| Rio Vista, CA | Grants Pass, OR |
| Salinas, CA | Klamath Falls, OR |
| San Diego, CA | La Grande, OR |
| Santa Clara, CA | Roseburg, OR |
| South Windsor, CT | Salem, OR |
| Waterford, CT | White City, OR |
| Watertown, CT | Harrisburg, PA |
| Atlanta, GA | Washington, PA |
| Kapolei, HI | Houston, TX |
| Marion, IA | Gainesville, VA |
| Bedford Park, IL | Kirkland, WA |
| Montgomery, IL | Pasco, WA |
| Indianapolis, IN | Renton, WA |
| Muncie, IN | Tumwater, WA |
| Topeka, KS | Brownsville, WI M |
| Broussard, LA | Fond du Lac, WI |
| Baltimore, MD | Franksville, WI |
| Lakeville, MN | Green Bay, WI |
| Otsego, MN | Lomira, WI |
| Carrollton, MO | Milwaukee, WI |
| Missoula, MT | Neenah, WI |
| Pembroke, NH | Wausau, WI |
| East Syracuse, NY | St. Albans, WV |
| White Plains, NY | |

CANADA

- Edmonton, AB
- Toronto, ON
- Vancouver, BC

SINGAPORE

- Galaxis

GERMANY

- Lahr, Baden-Württemberg

AUSTRALIA

- Wangaratta, Victoria



SOLUTIONS



Horizontal Directional Drilling

Direct Pipe

Microtunneling and Tunneling

Rehabilitation

WE DO THAT ... **& MORE**



REHABILITATION

Spray-in-place pipe lining (SIPP)

Cured-in-place pipe (CIPP)

Sliplining

Chemical grouting

CCTV and cleaning

Other Rehab Methods



REHABILITATION

Spray-in-place pipe lining (SIPP)

- Two main Categories
 - Cementitious
 - Cement
 - Geopolymer
 - Polymeric
 - Epoxy
 - Polyurea

Determining Factors of Rehab Process Selection

What is Spray in Place Pipe (SIPP) Lining?

- Spray-in-place pipe lining, or SIPP lining, applies a thin coating to the interior of damaged pipes to repair and prevent deterioration.
- Lining is applied with robotic sprayers guided by CCTV inspections and assessments
- 50 year design life
- Trenchless technology



Determining Factors of Rehab Process Selection

What are the Benefits Spray in Place Pipe (SIPP) Lining?

- SIPP requires very little setup time and material hardens in minutes to form a resilient barrier.
- SIPP liners are resistant to chemical abrasion, corrosion from hydrogen sulfide gas, microbial buildup, and other detractors.
- VOC free and safe for Potable water
- Minimal reduction in host pipe diameter
- Minimally invasive with almost no trenching



Determining Factors of Rehab Process Selection

What are the obstacles Spray in Place Pipe (SIPP) Lining?

- Thin lining may not provide enough protection against future damage
- Spray application can take several passes
- Host pipe condition is crucial and must be fully clean & dry prior to application
- Temperature requirements for material – no spraying in cold weather





REHABILITATION

Cured-In-Place Pipe (CIPP)

- Two Curing Methods:
 - Heat Cured
 - Air/Steam
 - Water/Boiler
 - Ultraviolet Light Cured
- Renews sewer, water & pressure lines
- Designed to add a minimum of 50 years to existing pipes
- Jointless lining system

Determining Factors of Rehab Process Selection

What is Cured in Place Pipe (CIPP) Lining?

- Jointless lining system “Pipe within a Pipe”
- Fully structural liner installation
- 50 year design life
- Trenchless technology
- Trusted rehab method for over 50 years



Determining Factors of Rehab Process Selection

What are the Benefits Cured in Place Pipe (CIPP) Lining?

- Different curing methods
 - Air/Steam
 - Hot Water
 - UV Light
- Safe for drinking water
- Diameters from 6" – 120"
- Minimal environmental impact



Determining Factors of Rehab Process Selection

What are the obstacles Cured in Place Pipe (CIPP) Lining?

- Not typically used in pipes smaller than 6” diameter
- Not typically used in pipes larger than 120”
- Once cured, the pipe is rigid and offers no flexibility
- Reduction in host pipe flow capacity
- Not a viable solution for pipes with extreme damage or collapses



Determining Factors of Rehab Process Selection

What are the criteria that determines CIPP vs SIPP?

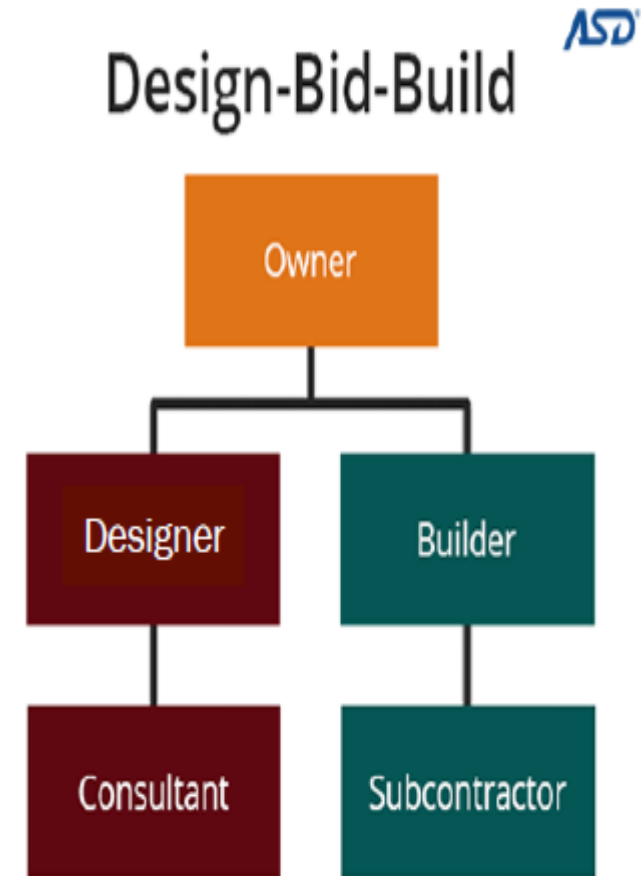
- Condition of pipe
- Infiltration
- Length, size, shape and bends
- Depth to pipe
- Bypass requirements
- Ground water
- Accessibility of the pipe
- Disruption to traffic and surrounding areas
- Construction footprint
- Environmental Concerns



Procurement Methods

Design Bid Build (DBB)

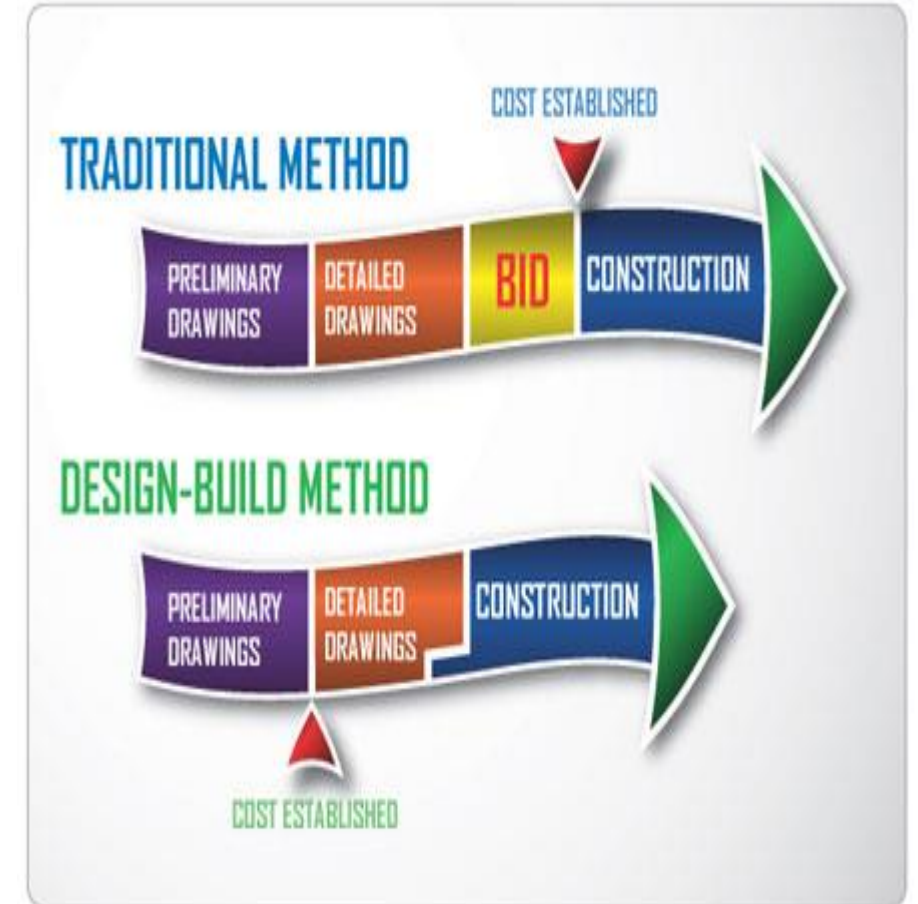
- What is Design Bid Build?
 - Most traditional project delivery method
 - Appealing to those looking for low-cost bids
 - The owner assumes the risk associated with the design & document completeness
 - Designers and builders have no contractual obligation to each other – owners contract them separately
 - Design firms deliver 100% complete design documents
 - Owners solicit bids from contractors to execute the documented scope of work



Procurement Methods

Design Build (DB)

- What is Design Build (DB)?
 - Used in the private sector for decades
 - Single entity responsible for the design and construction of the project
 - Valued for collaboration, efficiency and ability to provide single point of responsibility
 - Public owners often require final project price at the time a design builder is selected

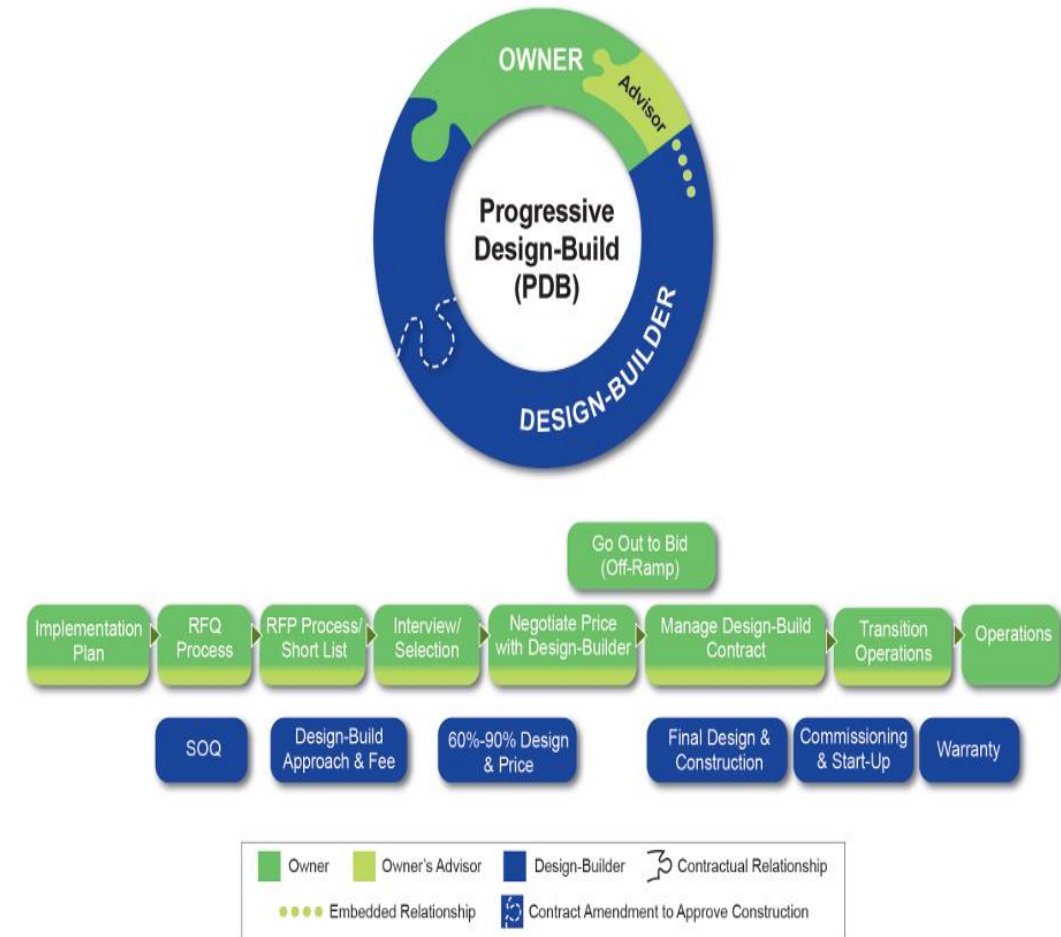


Procurement Methods

Progressive Design Build (PDB)

- What is PDB?
 - A Stepped or “Progressive” process to design build opportunities
 - PDB uses a qualifications based or best value selection
 - The owner(s) then “progress” towards a contract/price with the team already qualified
 - 2 distinct phases exist in PDB
 - Phase 1: Budget level design, pre-con services
 - Phase 2: final design, construction & commissioning

THE PDB PROCUREMENT PROCESS



Project Profile

Lucas County, OH

Interceptor Sanitary
Sewer Rehabilitation

- 1,800 feet of 90-inch Sanitary Sewer Pipe
- 24-inch fused HDPE bypass average flow of 9,000 gpm
- 50 ft deep 96-inch diameter shaft installed
- Geopolymer mortar was installed in four passes to create a 2-inch-thick structural pipe



Project Profile

Owensboro, KY

Breckenridge
Tunnel Sewer Lining



- 1,122 linear feet of 72-inch 2" geopolymer application
- 130 linear feet of 3" thickness to Plated Tunnel Sewer
- 50 VF of manhole lining
- The tunnel had been repaired by sliplining multiple times throughout its life resulting in several diameter changes
- Crews utilized hand spraying in smaller diameter sections

Project Profile

San Diego, CA

SDCWA First Aqueduct Tunnel Rehabilitation

- 3 Main Tunnels:
 - Lilac Tunnel (~500 feet)
 - Red Mountain Tunnel (~3,100 feet)
 - Oat Hills (~3,600 feet)



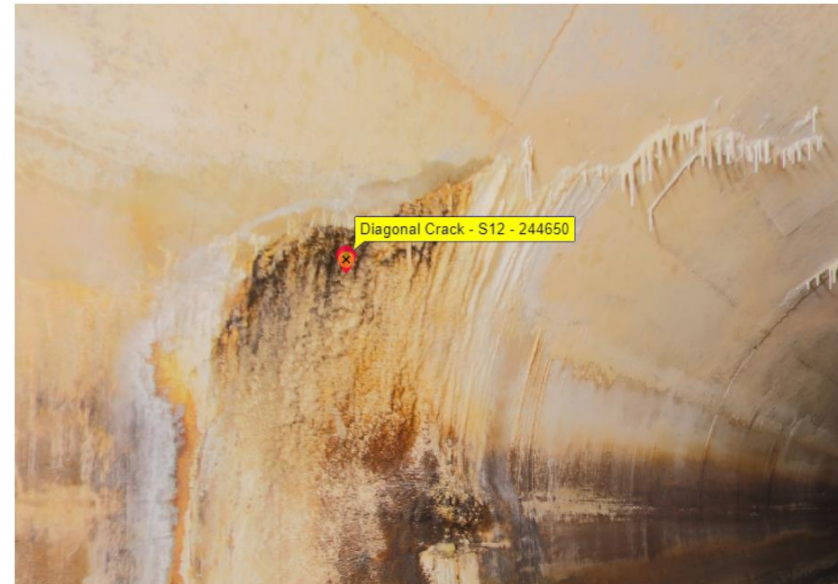
Geopolymer Benefits

- 75+ life span
- Does not require bonding to substrate
- Watertight secondary lining
- Resists high external head
- Flexible installation approach

FRP Slip Lining Benefits

- Non-corrosive with over 75-year life span
- Does not require extensive prep work
- Watertight secondary lining
- Resists high external head
- Rapid installation by jacking

Condition Assessment



SDCWA Design Considerations

Design Element	Design Criteria
Existing Tunnel Diameter	72 inches - Horseshoe
Tunnel Infiltration Requirement	No visible groundwater infiltration into the tunnels as rehabilitation
Groundwater Readings	Ranged from 44.0 feet to 45.35 feet below ground surface, ~1171 feet to 1169.65 feet elevation. ~20 feet above top of pipe.
Hydraulic Requirements	180 CFS flowrate
Certification Requirements	NSF 61 certified
Condition Assessment	<ul style="list-style-type: none">• GPR performed on crown of Tunnels (Lilac and Red Mountain)• Installation of GW monitoring well
Thrust Capacity (Jacking)	150 Tons
Design Life	All permanent structures: 75-year design life
Shutdown Periods	All rehabilitation work was completed during three shutdown periods: <ul style="list-style-type: none">• December 5 to December 15, 2022• January 23 to February 3rd, 2023• February 27 to March 9, 2023

Methods Considered and Product Evaluation

1. Continue Repairing Leaks as Needed

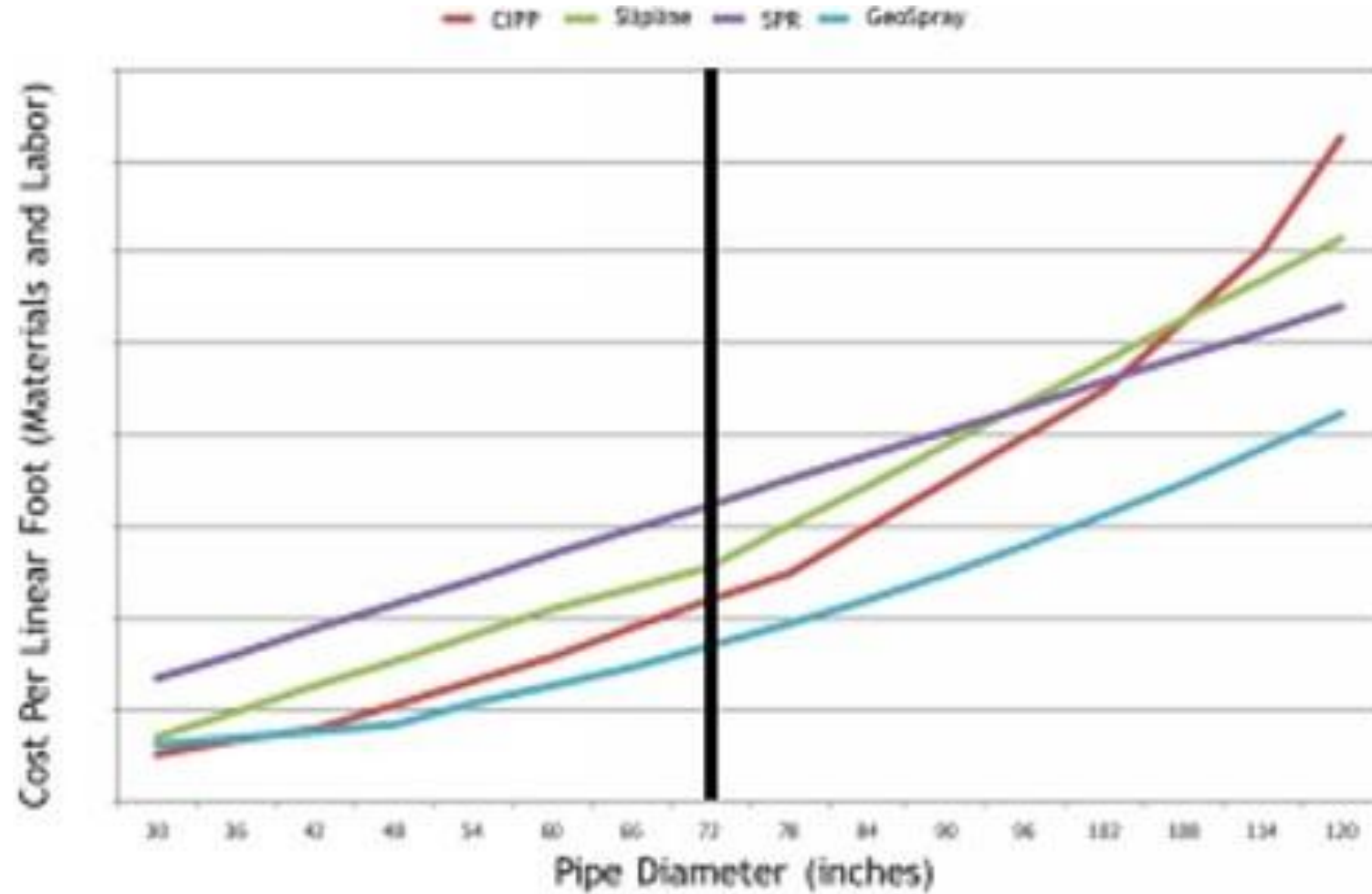
2. Tunnel Replacement

3. FRP Sliplining

4. CIPP

5. Geopolymer Mortar Lining

6. Steel Sliplining



Proposed Rehabilitation Methods for Each Tunnel

Lilac Tunnel (500')

- Install 1 drop shaft near tunnel transition
- Infiltration control
- Install 1.5" of Geopolymer

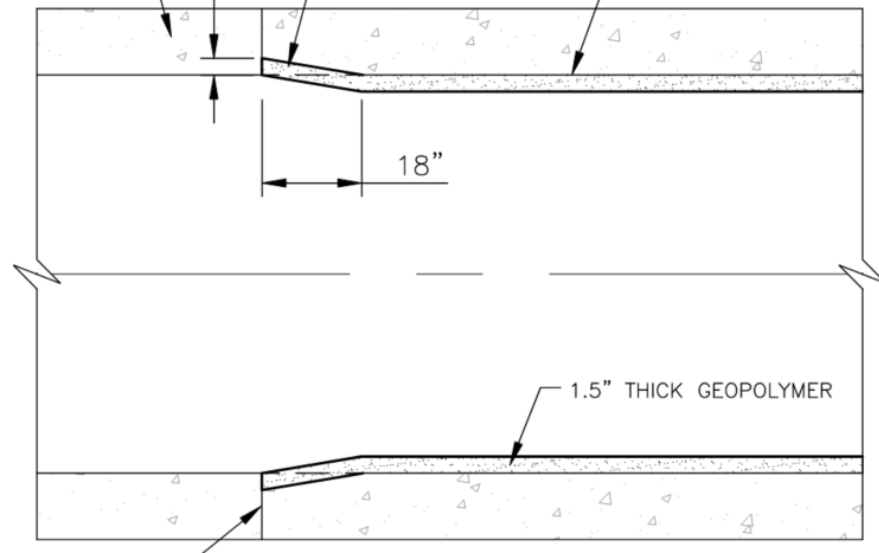
Red Mtn Tunnel (3,100')

- Install 2 drop shafts (North and South) near tunnel transitions
- Infiltration control
- Install 1.5" of Geopolymer

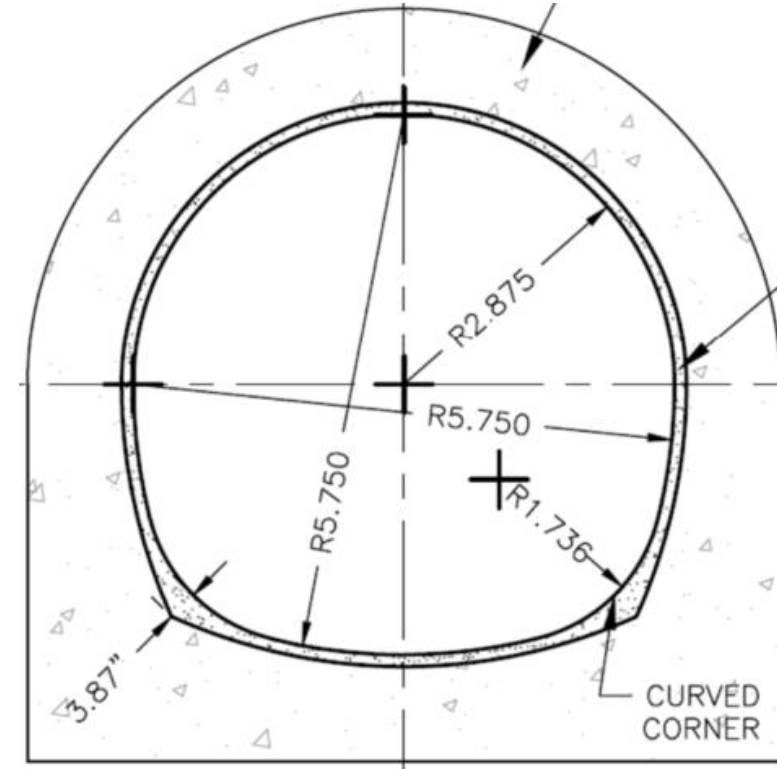
Oat Hills Tunnel (3,600')

- Install insertion pit at southern bifurcation structure
- **Slipline 63" ID FRP pipe via jacking**
- Annular space grouting

Lilac and Red Mountain Tunnel Geopolymer Installation



Transition Detail



Geopolymer Application Detail

Lilac and Red Mountain Tunnel Geopolymer Installation



Geopolymer Application at Transition



Michels – Markets Served



Civil
Construction



Energy



Energy Transition
& Renewables



Foundations



Marine



Transportation



Water &
Wastewater



Questions?

M www.michels.us



Let's Connect!