



A Trenchless Technology Prescription for Addressing Our Ailing Utility Infrastructure

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Urban Centers

- It took us 5,000 years to get to this point; however, it is expected that we will **double** our urban infrastructure in the next 35 years through construction. These new systems will last more than 50 years.
- Currently, **49%** of the world's population (**81%** in the U.S.) live in urban areas.
- This figure is expected to increase to **75%** by the year **2050** as people look to urban centers for employment opportunities.

Present - Urban Population over 3 billion



2050 - Urban population over 6.5 billion

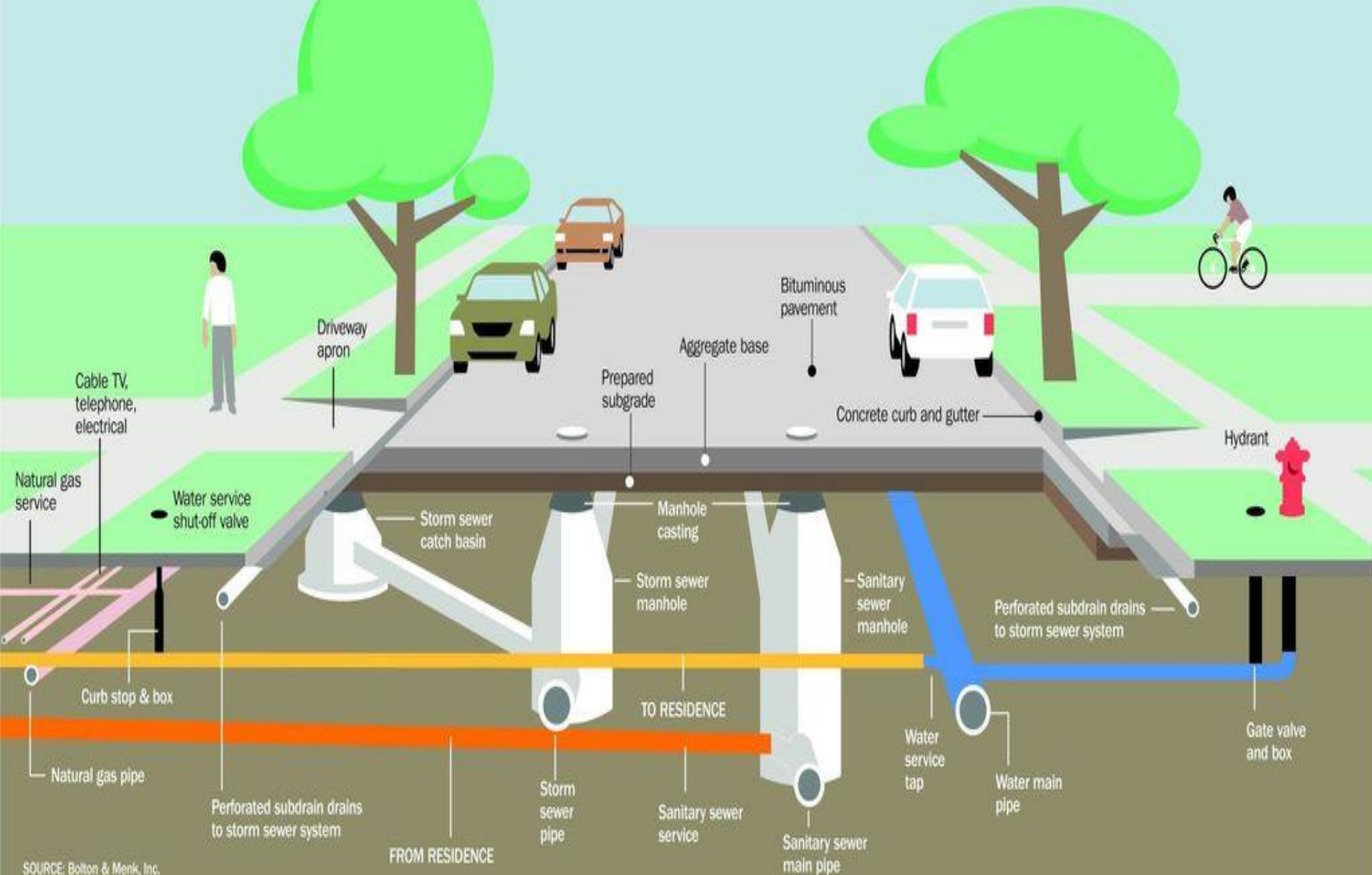


Urbanization is Turning Big Cities into Megacities

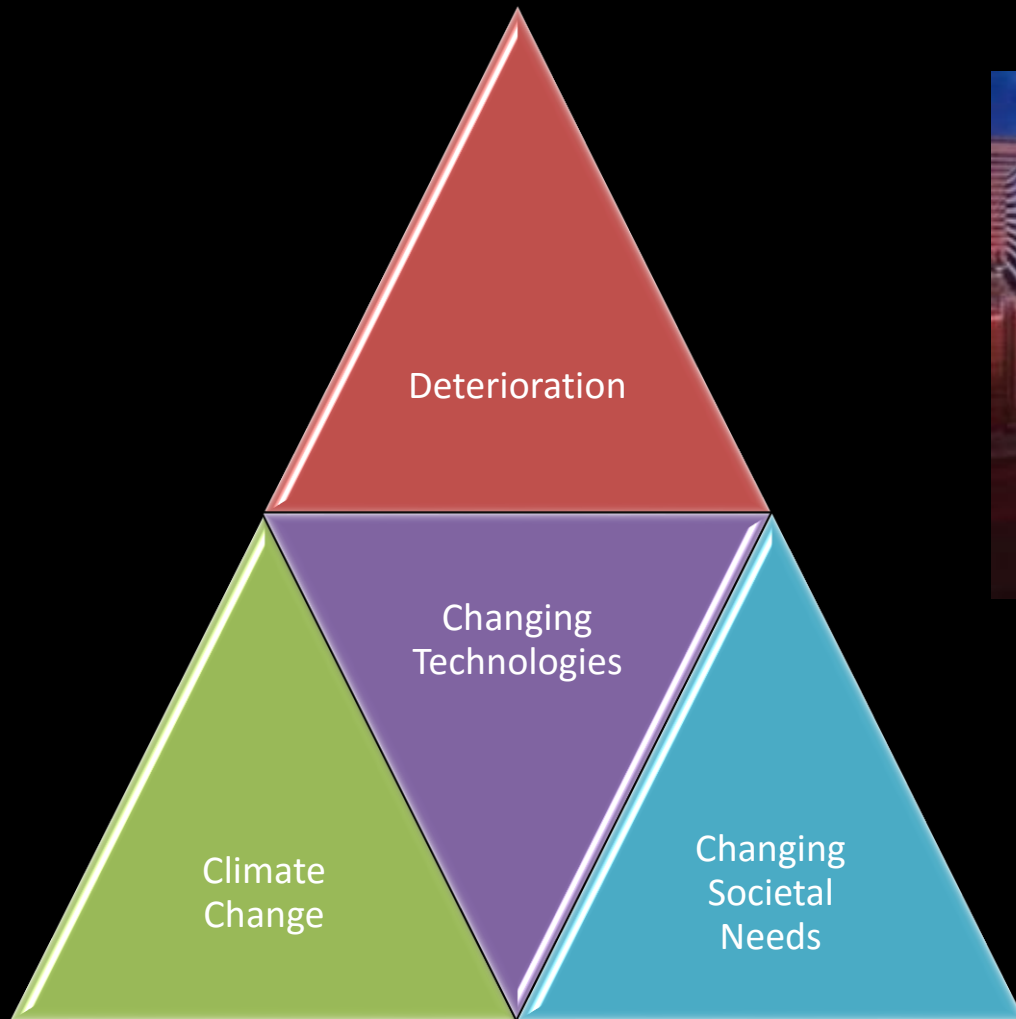


- Limited space available to install utility services such as sewage lines, water pipeline, electric cables, gas pipelines, communication cables etc.

The world beneath our feet



Aging Underground Infrastructure



Source: ECTP, 2005



2017 INFRASTRUCTURE REPORT CARD

America's Grade: **D+**

Bridges

C+

9.1% of bridges rated structurally deficient

Aviation

D

U.S. Airports serve 2 million passengers daily

Dams

D

15,498 (17%) dams identified as high-hazard potential

Schools

D+

53% of schools need improvements to reach "good" condition

Drinking Water

D

6 billion gallons of treated water lost every day

Solid Waste

C+

258 million tons of municipal solid waste generated in one year

Parks

D+

11.9 billion in National Park Service deferred maintenance

Roads

D

6.9 billion hours delayed in traffic - 42 hours per driver

Transit

D-

\$90 billion transit maintenance backlog

Rail

B

\$27 billion in improvements in one year by the freight railroads

Wastewater

D+

Demand on treatment plants will grow more than 23% by 2032

D+

Energy

3,571 total power outages reported in one year

Inland Waterways

D

49% of vessels experience delays across the inland waterways system

Levees

D

Over \$1.3 trillion in property value behind levees

Ports

C+

99% of America's overseas trade passes through ports

Hazardous Waste

D+

53% of Americans lives within 3 miles of a hazardous waste site

THE VALUE OF WATER AMERICANS ON THE U.S. WATER CRISIS

xylem
Let's Solve Water

Growing populations, rapid urbanization and chronic underinvestment are putting pressure on our nation's aging water infrastructure.

BROKEN/ LEAKING
PIPES LOSE

1.7
TRILLION
GALLONS

OF WATER
PER YEAR

COST
OF
\$2.6B*

A WATER MAIN BREAK
IN AMERICA EVERY 45

TWO 
MINUTES*

RECOGNITION OF THE WATER CRISIS

Americans recognize that our nation's water resources are increasingly at risk and are concerned about the state of our infrastructure system.

79%

recognize demands
on water resources are
growing and water is
becoming increasingly scarce

77%

are concerned about
our nation's water
infrastructure system

88%

believe our water
infrastructure needs

REFORM

86%

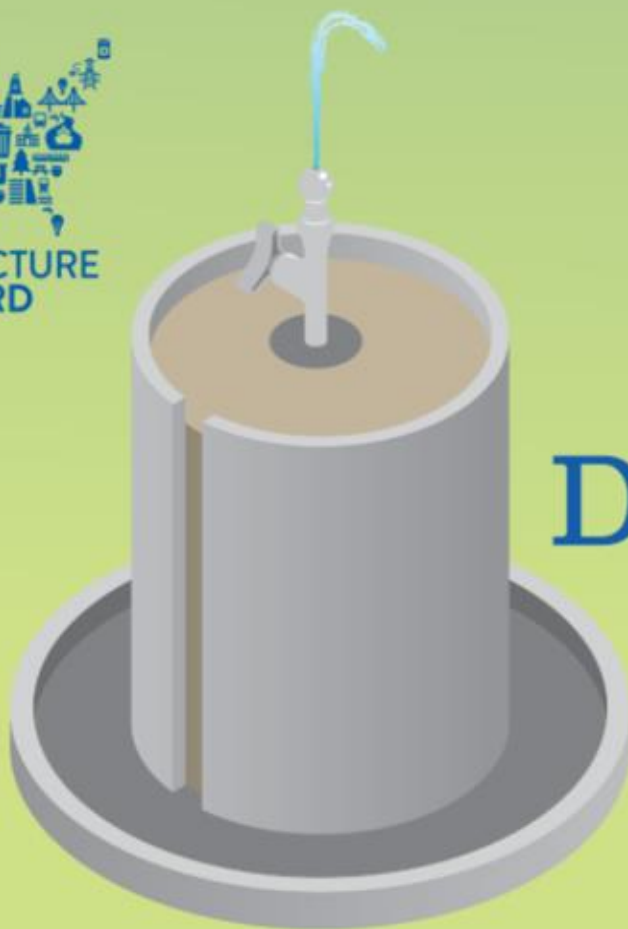
say they have experienced
the impact of water shortages
and contamination

XYLEM



2017

INFRASTRUCTURE REPORT CARD



Drinking Water

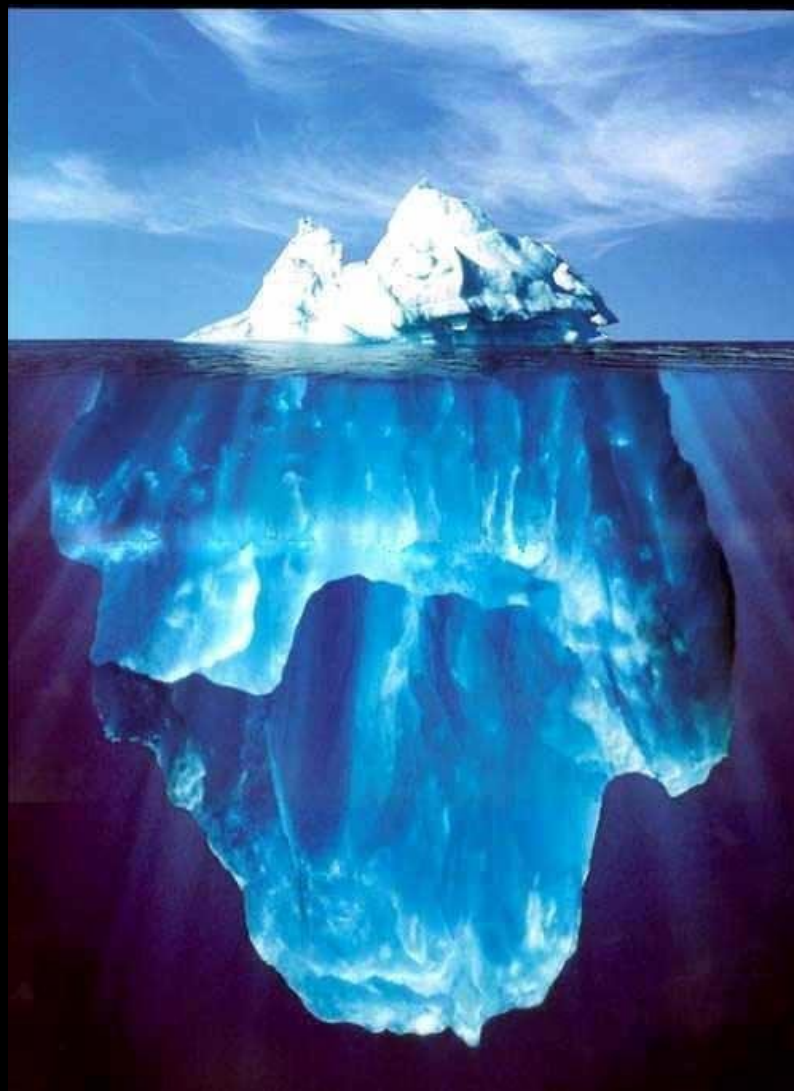
6 billion gallons of
treated water lost every day

Wastewater Treatment Infrastructure in the U.S.



1. Wastewater Stats in the U.S. (2013, September 10). In Public Works. Retrieved March 19, 2017, from http://www.pwmag.com/water-sewer/wastewater-stats-in-the-us_o
2. "Wastewater." Infrastructure Report Card, ASCE, 2017, www.infrastructurereportcard.org/cat-item/wastewater/. Accessed 19 Mar. 2017.

How big is this issue?



What is underground?











Sewer Lines



- Offset pipes
- Deterioration
- Root intrusion
- Crowned or cracked
- Leaking
- Capacity issues
- Rain infiltration/inflow

Water Lines

- Encrusted
- Corroded
- Leaking
- Capacity issues











Pic from nytimes.com







Los Angeles, CA







"Your infrastructure needs work."



R_x

PRESCRIPTION

NAME _____

AGE _____

ADDRESS _____

DATE _____



Open Heart Surgery



Open Cut Construction







Potential for dust pollution



Costs of Open Cut Pipe Replacement

- Pavement saw-cutting
- Excavation
- Trucking spoil and dump fees
- Backfill and transport
- Compaction
- Concrete or asphalt
- Traffic control





Angioplasty



Trenchless Technology



Why Trenchless?

- ✓ Minimal disruption of traffic
- ✓ Year round construction
- ✓ Improved safety
- ✓ Reduced landscape damage
- ✓ Minimal disturbance to local business
- ✓ Improved construction productivity
- ✓ Can access otherwise inaccessible areas

Many Arizona agencies are taking advantage of the benefits of trenchless technology

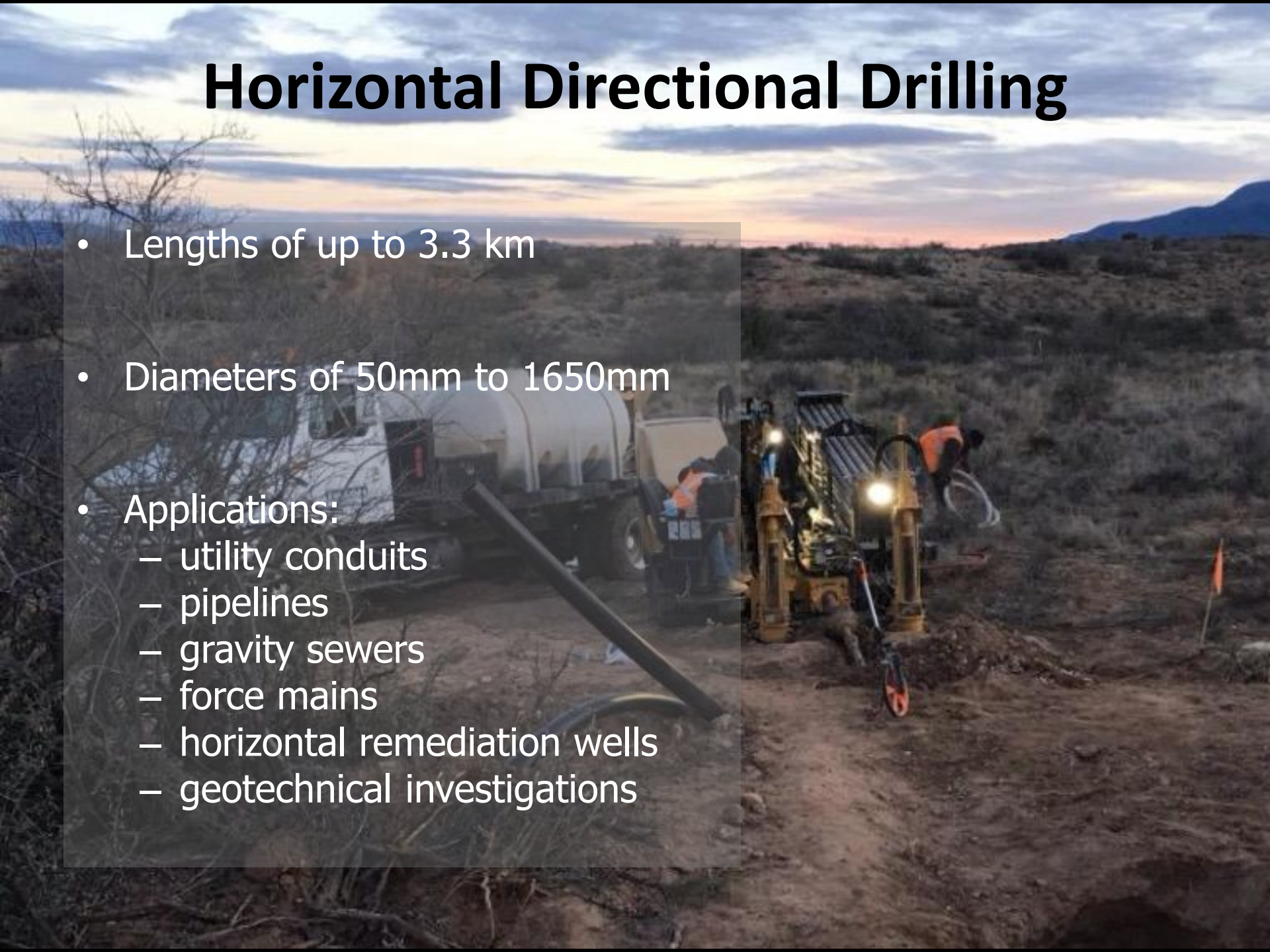


City of Phoenix

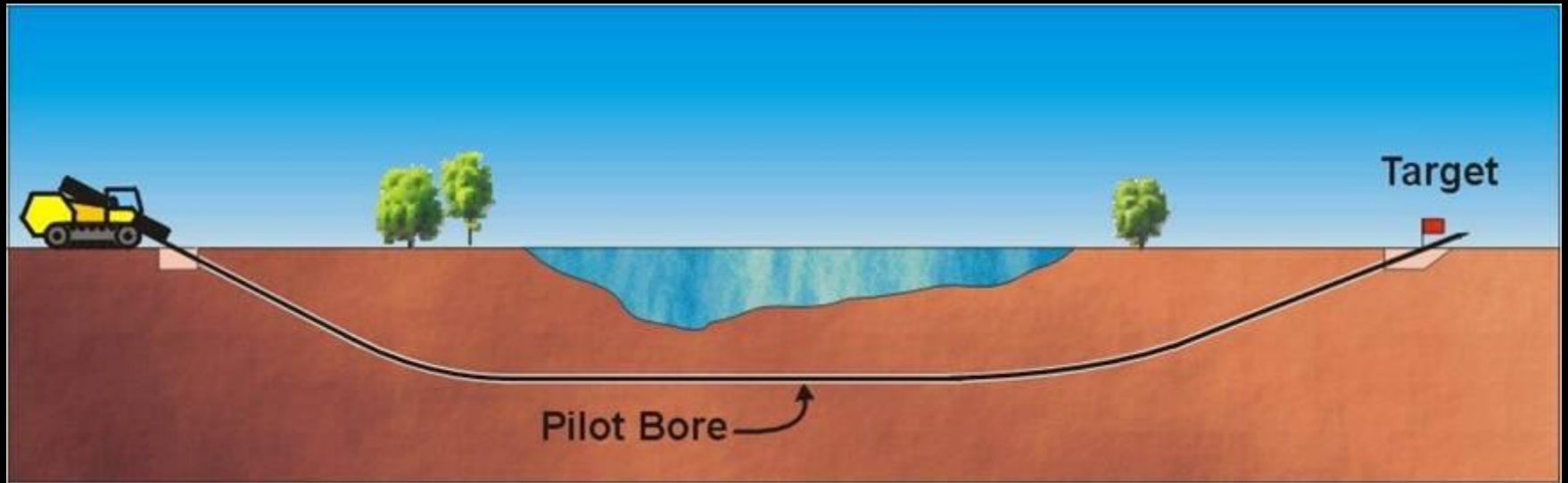


Horizontal Directional Drilling

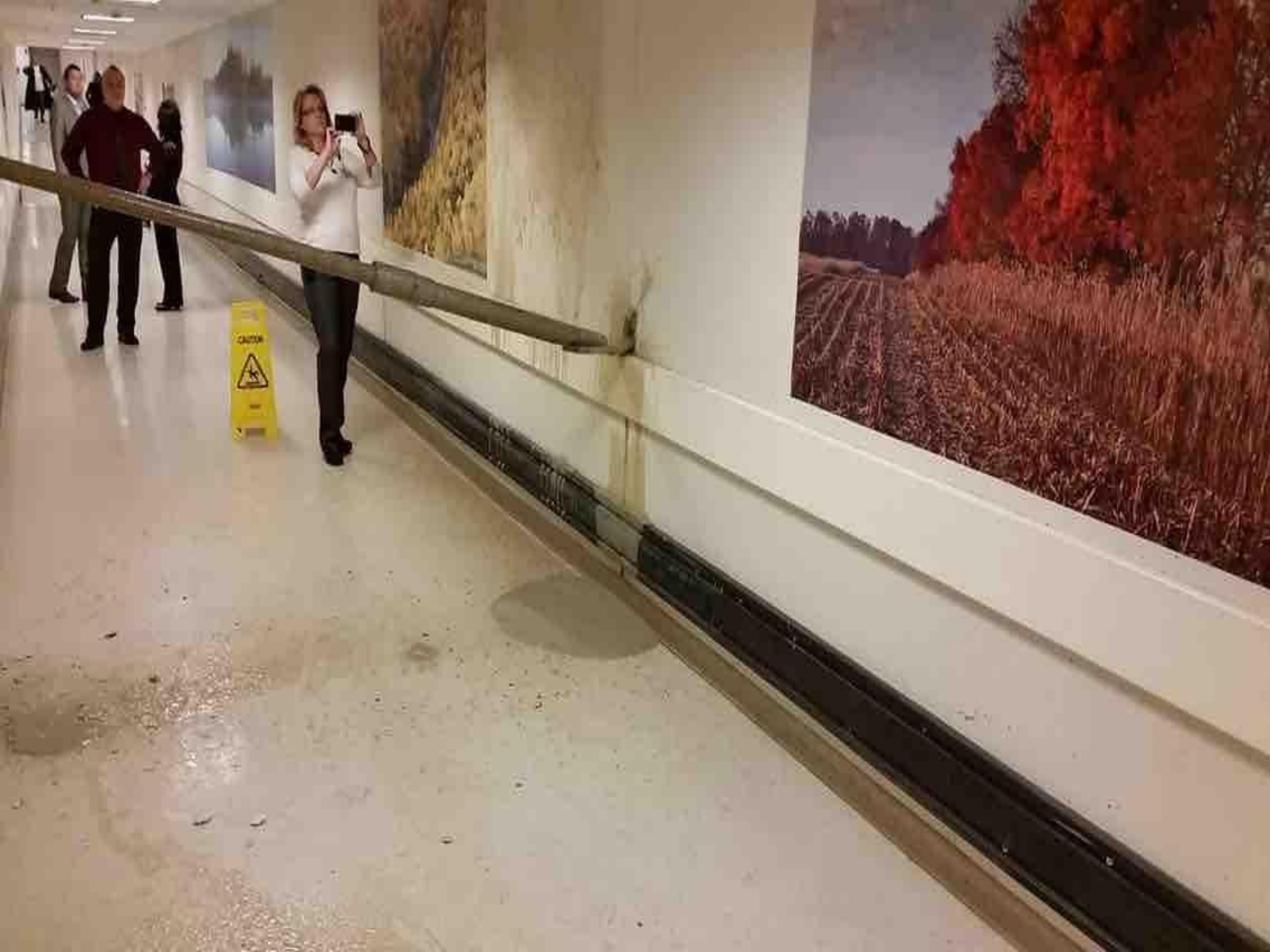
- Lengths of up to 3.3 km
- Diameters of 50mm to 1650mm
- Applications:
 - utility conduits
 - pipelines
 - gravity sewers
 - force mains
 - horizontal remediation wells
 - geotechnical investigations



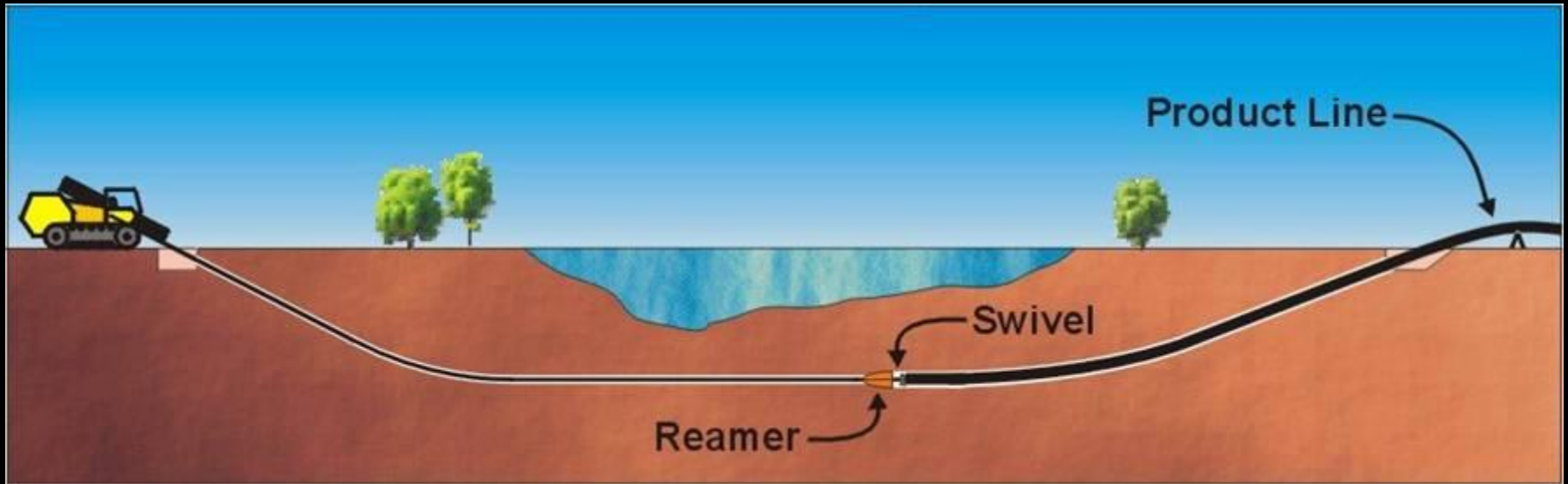
HDD Process







HDD Process



Speed Camera (Shea Blvd/124 St.)













1,600 Pennsylvania Avenue

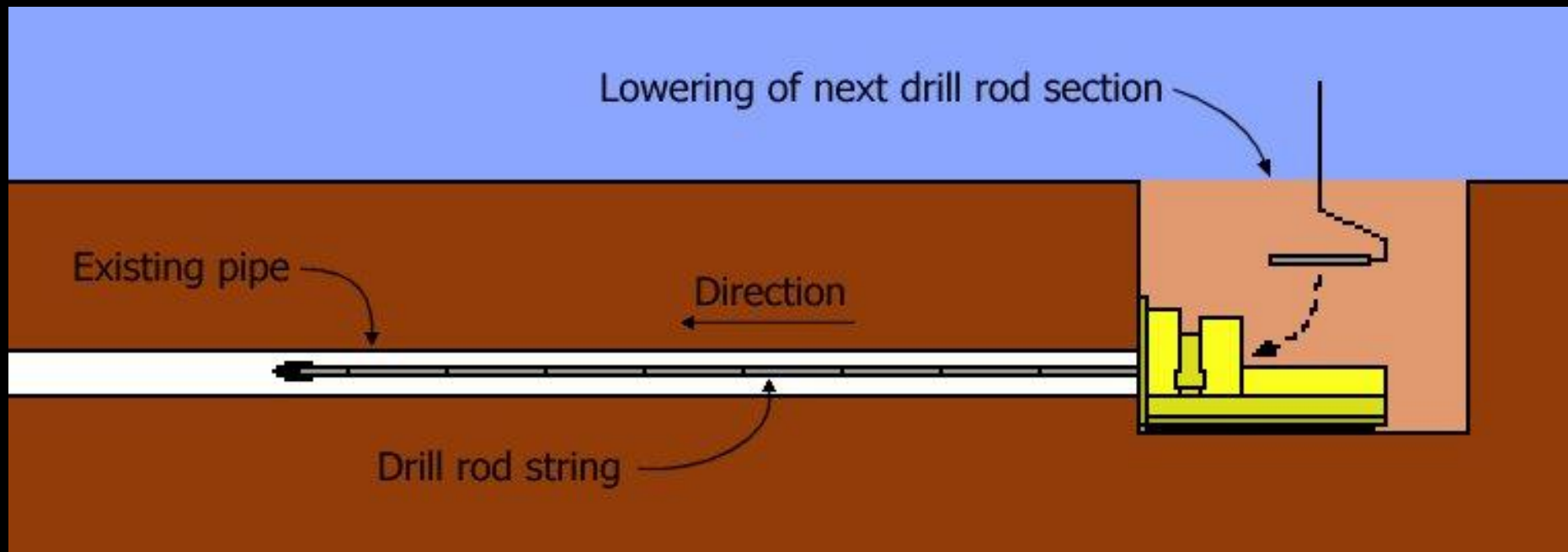


Trenchless Pipe Replacement

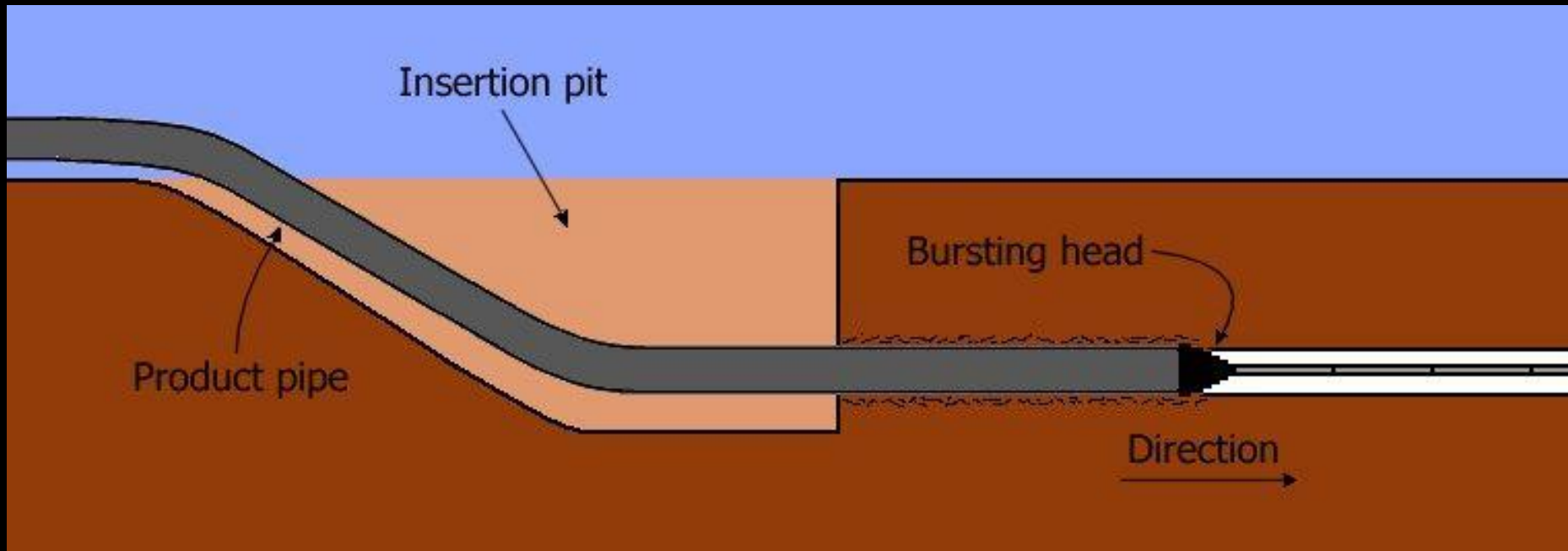


- Lengths typically 100m to 200m
- Diameters up to 1050mm
- Applications:
 - replacement of force mains
 - replacement of gravity sewers

Pipe Replacement Process (Static)



Pipe Replacement Process (Static Cont.)



City of Phoenix Sanitary Sewer Replacement Program

- 35th Avenue and Peoria Avenue
- Approximately 7,400 LF replacement







**Existing water main
under stalls**

Completed in 3 hrs vs. 7 days



Microtunneling

A photograph of a microtunneling construction site. The image shows a large, circular concrete structure, likely a tunnel or shaft, with various pipes and cables running through it. A red and white striped pipe is visible on the right side. The background is a rough, rocky wall.

- Lengths up to 600m
- Diameters up to 2.1m
- Applications
 - gravity sewer installations

快速反应体系

100

中國鐵建

中铁十八局集团有限公司

HERRENK NECHT

Auger Boring



- Lengths of up to 150 m
- Diameters of 200mm to 1,500mm
- Applications:
 - relatively short crossings of pipes and conduits





Auger Boring in Glendale, AZ







Pipe Jacking



- Lengths of up to 300m
- Diameters up to 4.2m
- Applications:
 - large diameter gravity sewers and force mains



USMH: 1386A

DSMH: 1386

Vermin Rat

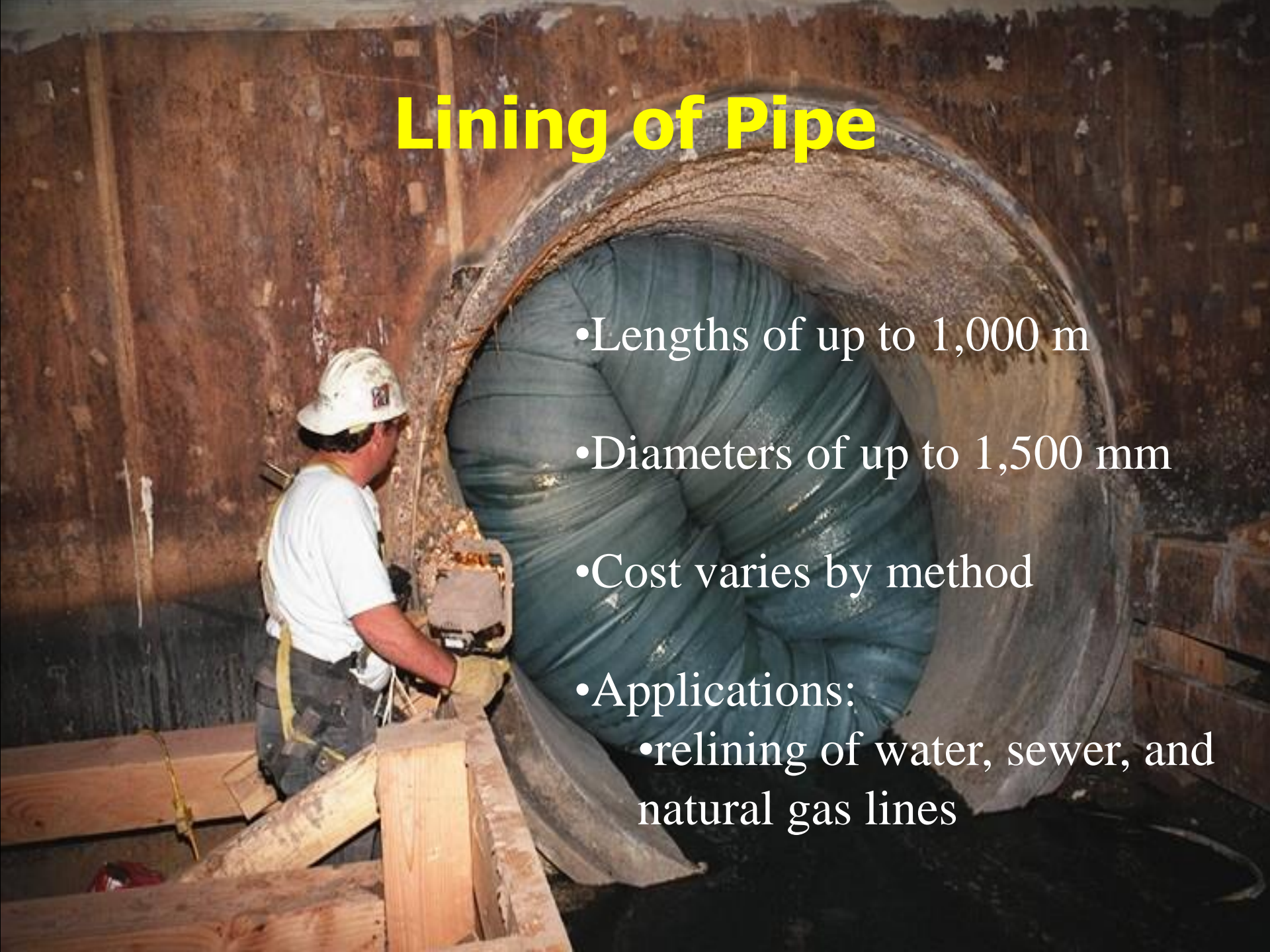
14.5 ft.





Lining of Pipe

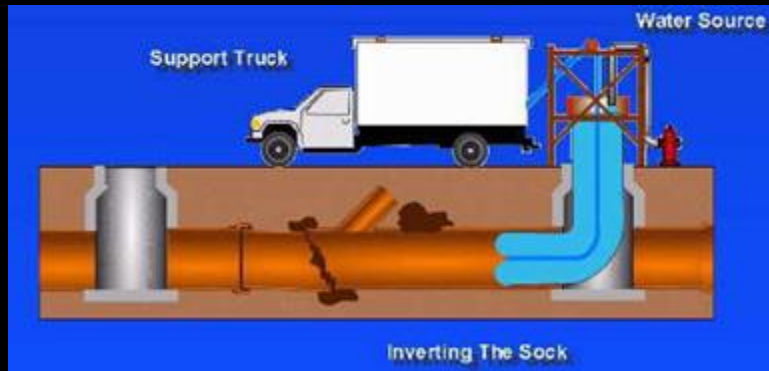
- Lengths of up to 1,000 m
- Diameters of up to 1,500 mm
- Cost varies by method
- Applications:
 - relining of water, sewer, and natural gas lines



Before and After Rehabilitation



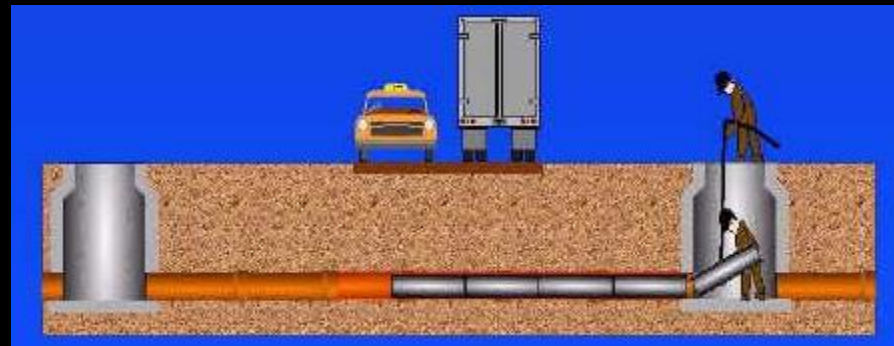
Lining of Pipe



Cured-In-Place



Fold and Form



Segmental Sliplining

Mobile CIPP System Heads to Arizona State Campus

By Michele Enrie

If the ground could talk, it would likely say, "Look below the surface and help."

Like so many other established areas, cracks, holes and other defects were plying the 1950s vintage concrete and vitrified clay pipe sewer lines that lie beneath the pristine 814-acre, suburban campus of Arizona State University (ASU) in Tempe, Ariz.

Other maintenance issues were regularly addressed. In December 2006, ASU established an annual contract with \$35,000 to perform CCTV inspection of more than 10,000 lf of sewer pipe and minor sewer repair maintenance. Despite these preventive measures over the years, a growing structural problem of cracked and defective pipes significantly impacted flow and capacity.

ing solutions for pipe repairs.

Pro Pipe was tasked with cleaning and video inspecting all sewer lines, and conducting pipe relining and point repairs where needed. Using RS Lining Systems' CityLiner technology, a mobile cured-in-place pipeline (CIPP) rehabilitation system, Pro Pipe overcame challenges such as extreme heat that exceeded 140 F while protecting the campus grounds. Highly engineered to meet growing environmental challenges, CityLiner is a CIPP sewer repair technology designed specifically for repairing deteriorated municipal, residential and industrial pipelines, as well as storm drains, sewers, gas lines and ventilation ducts. Cary, N.C.-based RS Lining Systems is the exclusive distributor of CityLiner in North, South and Central America.

Inside Pro Pipe's specially designed truck was everything that was needed for a traditional CIPP rehabilitation project such as onboard holding tanks for resin and hardener, a mixing unit and a calibration roller assembly.

"This CityLiner truck is amazing," says Pro Pipe regional manager Dean Monk. "Being able to perform all the steps for relining right here inside our truck gives us tremendous flexibility and superior logistical advantages."

The self-contained CIPP impregnation and installation unit on wheels enables jobs to be conducted in a time-

Trenchless Technology Magazine February 2007

3,200 LF of 8" sewer and 10 MH's (completed in 90 days)

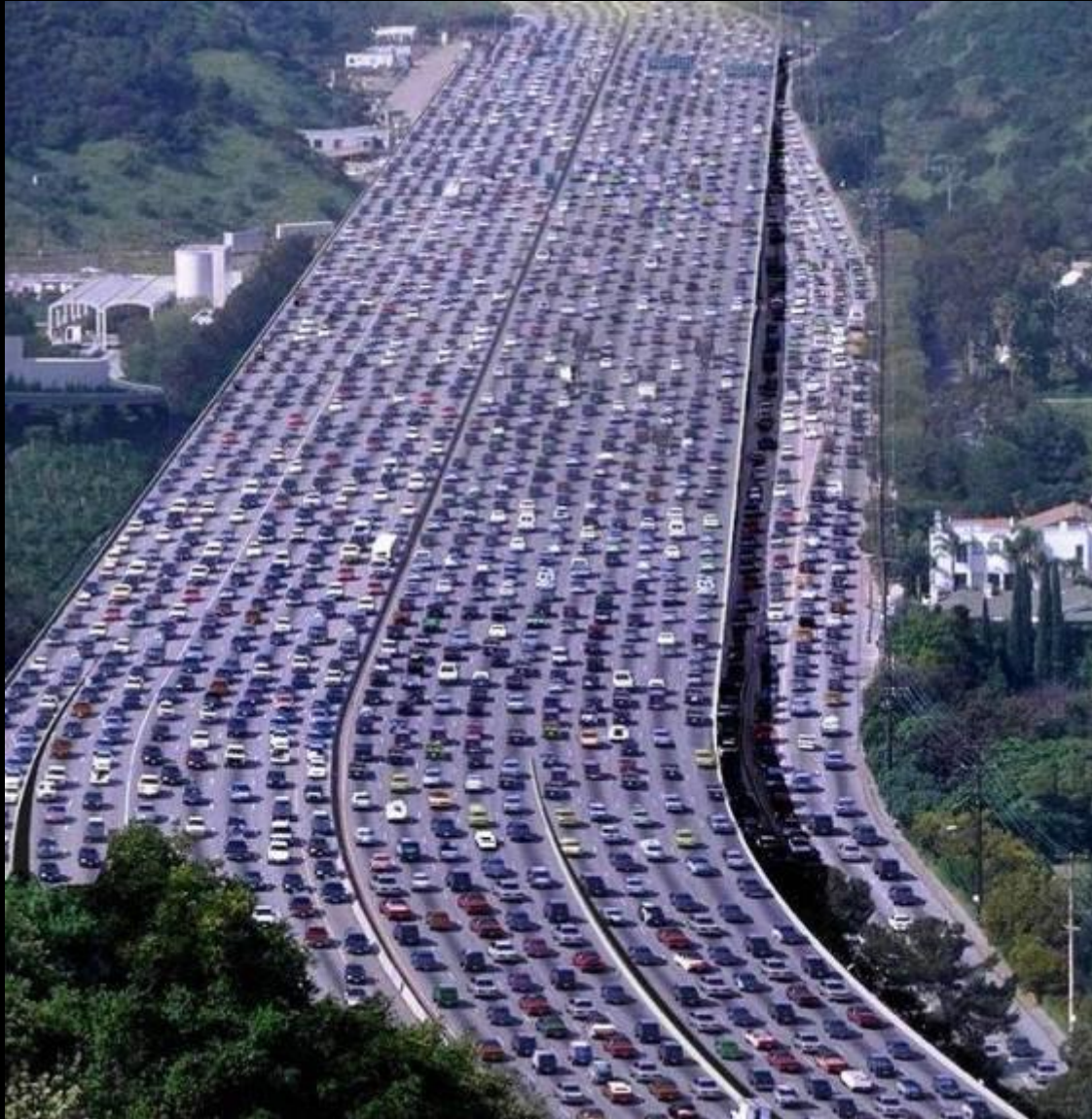


Pro Pipe's specially designed truck is a self-sustained CIPP impregnation and installation unit on wheels that enables jobs to be conducted in a timely manner and specific to the most stringent requirements.

Conclusions

- Urbanization of metropolitan areas has resulted in a need for minimizing surface damage
- There is a need for repairing and expanding our utility infrastructure
- There are various prescriptions to address these needs
- Minimally-intrusive construction practices should be employed





**HOW WOULD
YOU PUT A
UTILITY
ACROSS?**

Contact Information



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