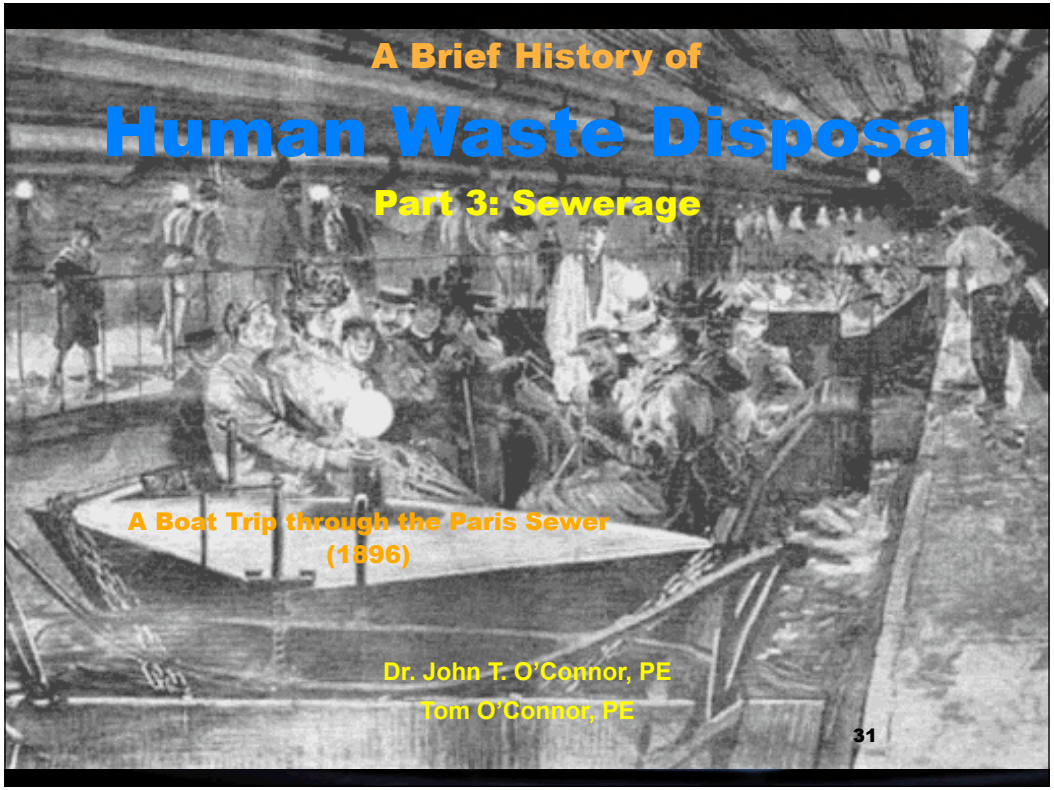
A Brief History of

Human Waste Disposal

Part 3: Sewerage



A Boat Trip through the Paris Sewer
(1896)

Dr. John T. O'Connor, PE
Tom O'Connor, PE

Sewer Socialists?

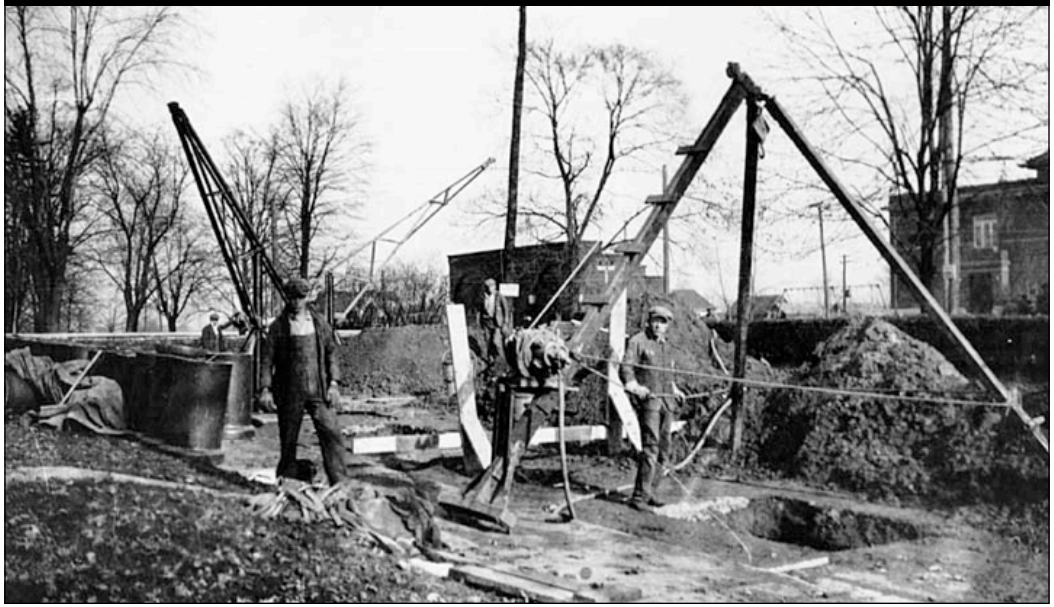
"Municipal Socialism" 1900-today

Bristol, England

Hollowed-Out Wooden Water Pipe - 500 years old

Museum of Edinburgh, Scotland

Sewer Construction - 1900



Salt Lake City to Sewer Farms 1908

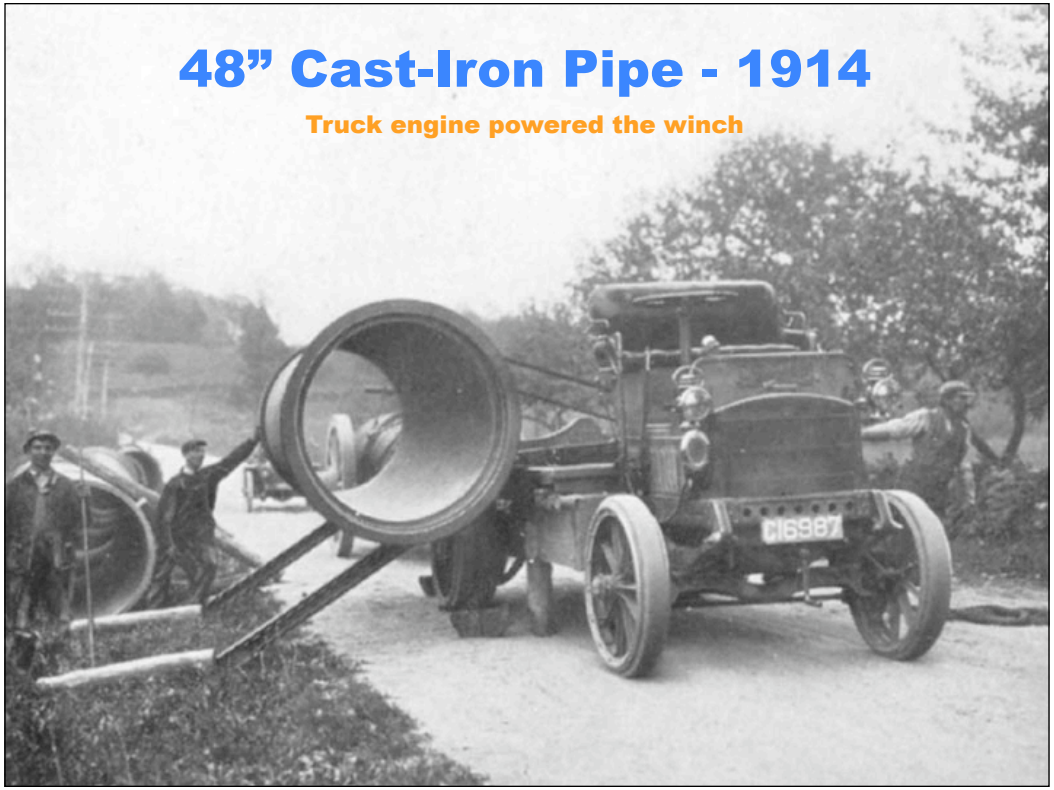
Wood Stave Pipe assembled in the trench

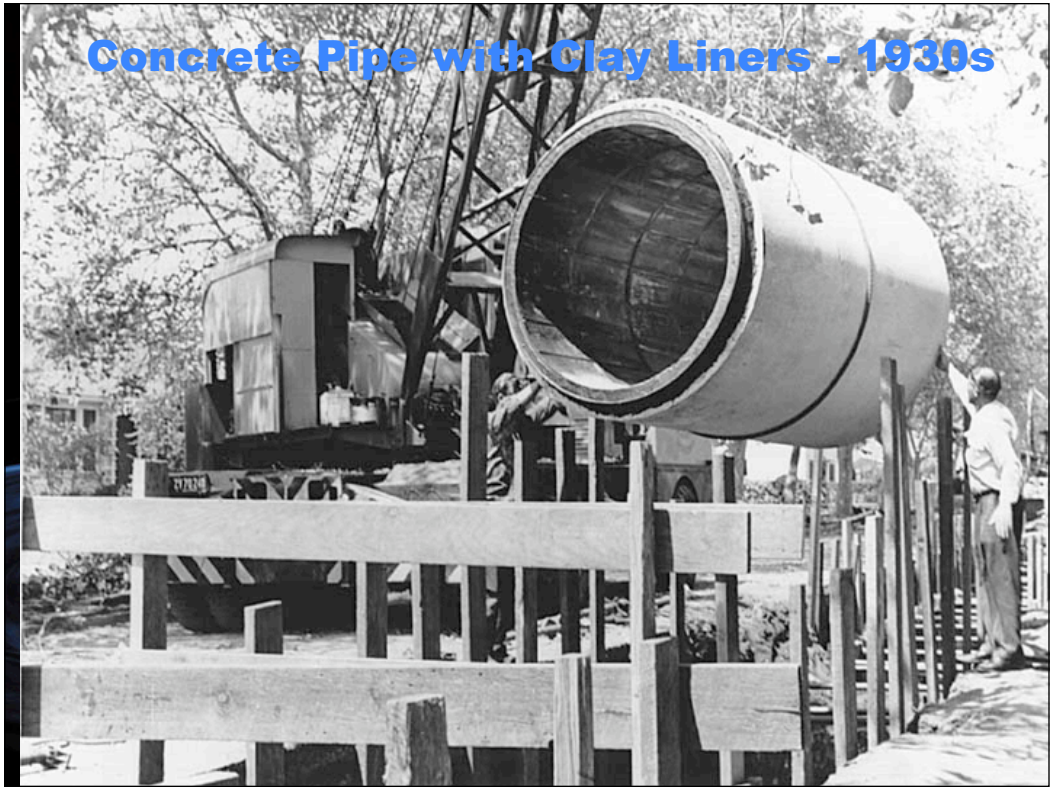
Sewer Construction 1900


NOW IN
PROGRESS
Joske's
PEP

48” Cast-Iron Pipe - 1914

Truck engine powered the winch




Concrete Pipe with Clay Liners - 1930s

Springfield, Missouri

Sanitary Sewerage Timeline

1894-1910: 41 miles - brick and clay sewers

1911-1937: 96 miles

1937-1957: 68 miles - clay pipe

1960 - vitrified clay, cast iron, rein. conc. pipe

1976 - polyvinyl chloride pipe

2010: 1,176 miles + *25 miles/year*

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Separate Sewer System

Combined Sewer System

Combined or Separate Sewers?

In the older parts of Kansas City, the same pipe that carried stormwater also carried sewage in a *Combined Sewer System.*

Combined Sewer Systems were common until the 1970s as wastes were simply carried to streams.

Combined Sewers were constructed because sewage treatment was not anticipated. It was thought to be more economical to build one pipe rather than two.

Costly choice, as it turns out. Kansas City will spend $2.5 billion over 25 years to curb unauthorized overflows of untreated raw sewage.

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U.S. has ≈**600,000 miles** of publicly-owned sewer pipe

Evolution of Sewer Systems

Gravity Sewers, Pumping Stations (Conventional)

Small-Diameter Variable-Slope Sewers (USDA)
laid at uniform depth, downhill & uphill flow
effluent filter vault, pigging required

Pressure Sewers: Septic Tank Effluent Pump (STEP) or Grinder Pump System (35 psi)
rolling topography, high groundwater table, unstable soils, rock near surface

Vacuum Sewers: vacuum ejector, central station
vacuum pump (400 mm Hg)