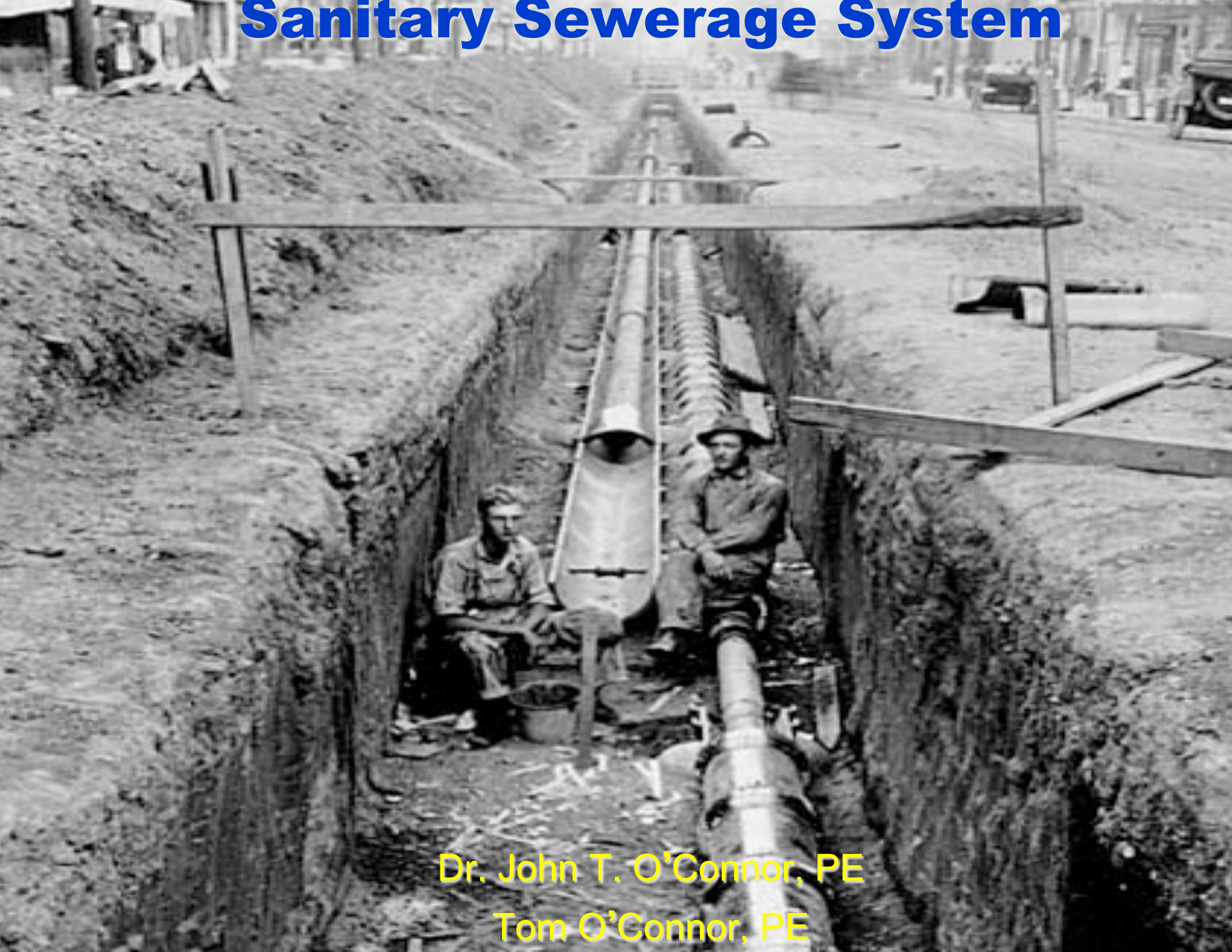


Sanitary Sewerage System



Dr. John T. O'Connor, PE

Tom O'Connor, PE

India, Pakistan: 3300-13000 BCE
China: City of Linzi

Cloaca Maxima (Greatest Sewer), 600 BCE
presided over by the goddess, Cloacina.



al Europe waterways functioned as sewers
street drains = 'kennels' (canals, channels)

Brick-vaulted sewers, 1370

chamber pot contents prohibited



The background of the slide is a photograph of the U.S. Supreme Court building. It features a series of tall, white, fluted columns supporting a pediment. A statue is visible on the left side of the steps. The sky is clear and blue.

U.S. Supreme Court:

Carson v. Brockton (Mass.) Sewerage Commission (1901)

Mandates, Taxes for Public Sewers?
Municipal Socialism?
Unconstitutional?

Flammables



Any liquid, solid, or gas

gasoline, kerosene, naphtha, benzene, toluene, xylene, ethers, alcohols, ketones, aldehydes, peroxides and methyl ethyl ketone

which may create a fire or explosion hazard

or injure the sewerage system.

H₂O



Restrictions on Discharges Solids



nd, mud, metal, glass, wood, paper, plastics, rags, rubber, latex, lime or other
curries, **garbage**, bones, hair, human parts, hides or fleshings, animal guts or
ssues, feathers, ashes, cinders, stone or marble dust, straw, shavings, grass
ppings, spent grains, spent hops, tar, asphalt residues, residues from refining
r processing fuel or lubricating oil, **grease**, glass grinding or polishing waste

capable of causing obstruction to the flow in sewers,
or interfering with the proper operation of the wastewater system.





Stinky Stuff



Noxious or malodorous liquids, gases or solids

which prevent safe entry into
purposes of inspection, maintenance
repair.

	Odor intensity		
	2.5	3	3.5
1	0.002	2	5
0.002	0.02	0.004	0.01
0.01	0.009	0.06	0.2
0.009	0.005	0.04	0.2
0.005	0.05	0.03	0.1
0.05	0.4	0.02	0.07
0.4	0.03	0.1	0.5
0.03	0.001	0.8	2.0
0.001	0.0009	0.07	0.2
0.0009	0.001	0.002	0.006
0.001	10	0.002	0.004
10	1	0.004	0.01
1	3	30	60
3	1	2	5
1	0.9	7	20
0.9		3	6
		4	20
			20



Poisons & Pharmaceuticals



Mercury, polychlorinated biphenyls (PCBs), phenanthrene or pesticides: dieldrin, chlordane, 1,1,1-Trichloro-2,2-bis(p-chlorophenyl)-ethane (4-4 DDT), demeton, endosulfan I, endosulfan II, endrin, guthion, heptachlor, malathion, methoxychlor, mirex, parathion, acrolein, aldrin, TDE, DDE, Hexachlorocyclohexane, lindane, benzene-cis-hexachloride and benzene-transhexachloride (BHC), hexachlorocyclopentadiene and toxaphene



H₂O



Restrictions on Discharges

Metals + Toxins



Metals

Antimony
Arsenic
Boron
Cadmium
Chromium
Copper
Lead
Nickel
Selenium
Silver
Zinc

Organics

Cyanide

Chlorinated Naphthalenes; Fluoranthene
Hexachlorobutadiene; Pentachlorophenol
Phenolic Compounds; 2-chlorophenol
2,4-dichlorophenol; 2,4-dimethylphenol
4,6-dinitro-o-cresol; 2,4-dinitrophenol
2-nitrophenol; 4-nitrophenol
p-chloro-m-cresol; 2,4,6-trichlorophenol

Total Toxic Organics
Trichloroethylene260

H₂O



Restrictions on Discharges

F-O-G



fats, oils, grease of vegetable or animal origin
which may solidify or become viscous.

Restaurants are commonly required to install and maintain grease traps.

Used Oil and Grease is scavenged for rendering into lard, tallow, soap, biodiesel.

H₂O



Restrictions on Discharges

Pathogens



disease-causing organisms

biological waste, hospital or medical wastes,

animal or veterinarian wastes



Water



Swimming Pool Water

Storm Water

Ground Water

Dewatering Drainage

Subsurface Drainage

Tidewater

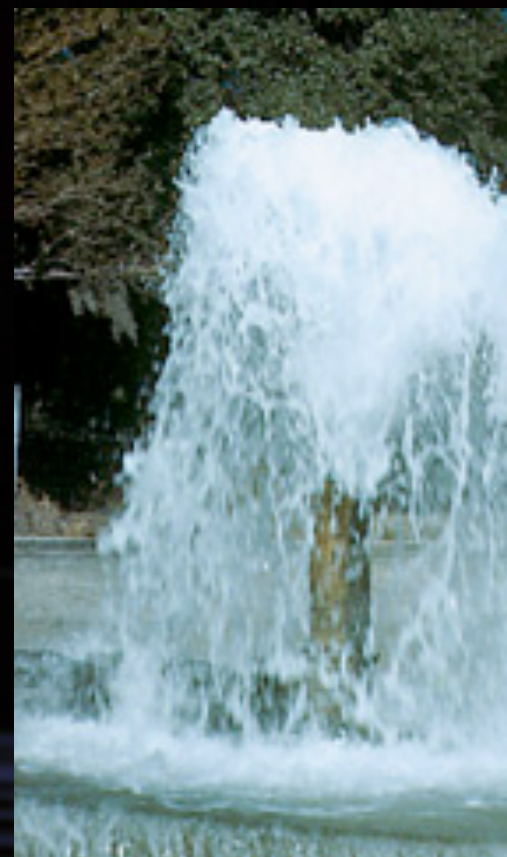
Accumulated Surface Water

Cooling Water

Industrial Process Waters

Foundation Water

Manhole Water



H₂O

Smoke Bomb Testing

ration/Inflow causes dilution in sanitary sewers,
reasing the efficiency of wastewater treatment.

bombs are used to check sanitary sewers for illegal
m water connections & groundwater infiltration.



Impairers of Treatment Capacity

Acids, Plating Solutions (neutralized or not)

Dyes (causing discoloration or turbidity)

Hot Liquids (temperatures $>150^{\circ}$ Fahrenheit)

Corrosive Liquids [pH < 5.5 (acidic) or > 10.5 (alkaline)]



Radioactive Wastes (Hospitals & Reactor Labs)



Strong Wastes (BOD > 400 mg/l; e.g., septage)



Hazardous Waste

(or wastewater which
has come in contact

H₂O



**Toilet,
Trashcan!**



Drug-Free Drains

You can help protect our water
from pharmaceuticals and
personal care products!



Bill Stuffers

Wastewater Utili

campaign to stop dangerous, ext
and untreatable substances from
discharged to sanitary sewe

Even drain cleaner is cited as un
for discharge to sewer drain

H₂O

What Is Acceptable?



**Please don't injure my biological processes
or increase the organic loads I have to bear.**

% Daily Indoor Water Use



Conservation

Water Utiliti

urge consumers to fix leaks

install flow restrictors on

showers and faucets;

purchase low-flow toilets,

flush less frequently, and

buy water-efficient washing ma

H₂O

Think of it from my Point of View!



I work down the manhole
With a guy named Bruce.
And we are in charge
Of all the refuse.
He lets me go first
While he holds the lid.
I'm telling you, sheesh...
What a sweet kid.

My father he worked
In the sewer Upto
I followed his foot
And worked my v
That's how I beg
In this here indus
I just sort of fell in
Sheesh, lucky me

work in the sewer,
a very hard job.
I know they won't hire
any old slob.
I don't have to wear
a coat.
I just have to know
how to float.

A funny thing happened
To Bruce yesterday.
The tide came along
He got carried away.
He come out in Jersey.
But it's O.K. now.
Cause that's where
He lives anyhow.

