

Objectives

- o Put water & wastewater (W & WW) treatment into historical context
- o Describe relevant W&WW legislation & regulation

Historical Perspective

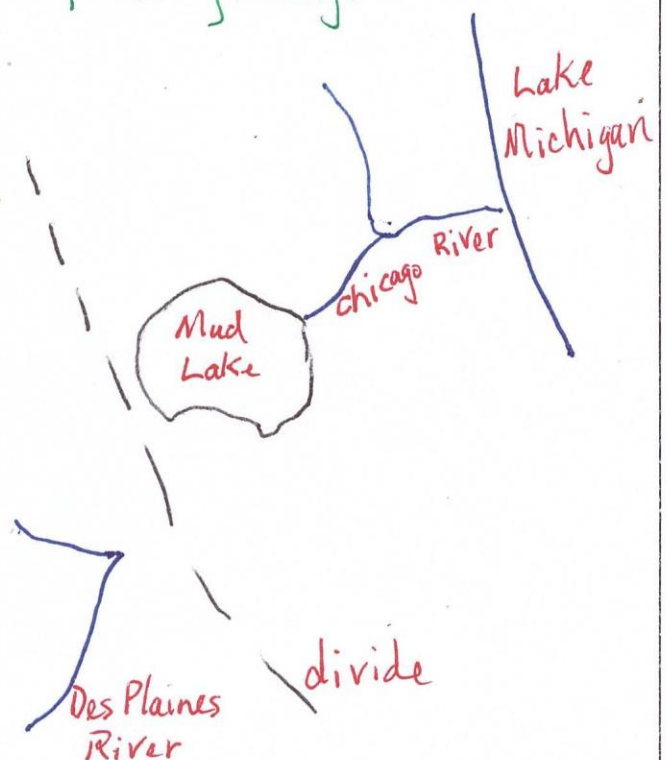
- o Earliest efforts of water purification related to taste & clarity
 - * sunlight exposure
 - * filtration (including with charcoal)
 - * boiling
- o First public water treatment & supply
 - * Romans - aqueducts included pebble catchers (settling)
 - * Italy (later) improved on Romans by adding granular filtration

WW Purification History

- o First sewers: Mesopotamia & Rome
 - * Collected stormwater runoff
 - * Used aqueduct water for periodic flushing for cleaning streets
- o latter 1800's: **Great Awakening**
 - * Science found link between microorganisms & waterborne disease (Koch, Pasteur)
 - * Civic leaders emphasized benefits of public health → hygiene education
 - * Separation of drinking water & human waste was a "public imperative"

Chicago Sewer System Example

- o Map of early Chicago

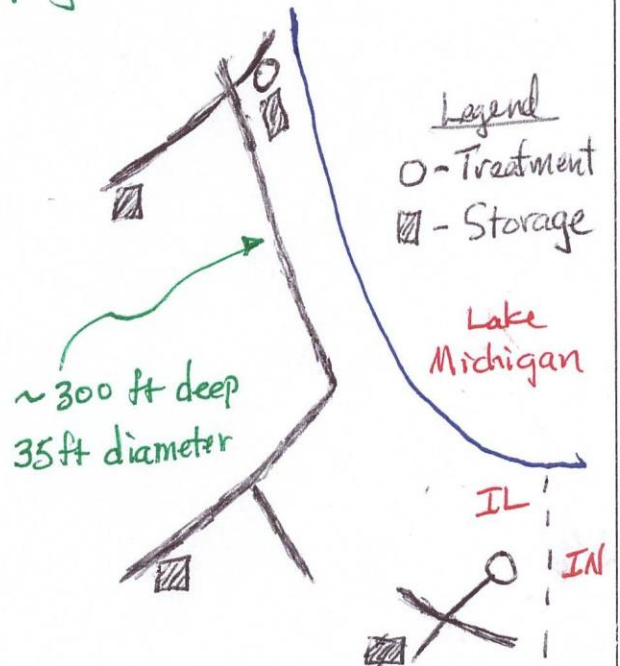


Chicago Ex., Cont.

- o Initial sewer sys. flowed into Chicago River collecting both stormwater runoff & wastewater (WW)
- o Stock yards made Chicago River "Bubbly Creek"
- o First location for water supply intake from Lake Michigan was close to Chicago River outfall → heavy storms lead to cholera outbreak
- o Chicago sewer system to this day carries both stormwater & sanitary (WW) → combined sewer system
- o New sewers outside of old cities have separate storm & sanitary sewer systems
- o Combined sewer systems are susceptible to combined sewer overflow (CSO)

Modern Chicago Sewer System

- o Map of Deep Tunnel (major underground system construction project to eliminate CSO)



London WW Treatment Example

- o 1885 London constructed treatment works acknowledging the beneficial effect of aerobic organisms
- o Original process:
 - Anaerobic digestion
 - ↓
 - chemical treatment
 - ↓
 - discharge
- o Key WW treatment discovery was that sewage exerts an oxygen demand due to microbial action

England's Role in BOD Test

- o Royal Commission on Sewage Disposal (1908) set 5-day test as standard
- o 5 days was estimate of longest river flow time to sea
- o The test measures oxygen consumption by microbes → oxygen uptake (demand) is an indirect measure of organic (biodegradable) content

Water Regs & Policy

- o Relevant legislation
 - * Wastewater: **CWA** 1977
 - were amendments to **WPCA** 1948, 1972
 - * Water: **SDWA** 1974
 - set tapwater standards (potable water)
 - set treatment technology **(TT)** standards
- o Enforcement responsibilities **lies** with states
 - * **IEPA** Springfield (state)
Marion (local)
 - * Permitting (NPDES, construction)
 - * Reporting (W & WW quality)

Quality - vs. Tech-based Regs

- o Quality-based vs. Tech-based
 - * Quality: based on maximum pollution a water system can handle
 - * Technology: based on maximum allowable pollutant load for available treatment technology
 - * Integrated regulation: more Quality than tech, but across gov. & non-gov. agencies
- o Quality depends heavily on modeling to predict effects
- o This course will focus on Tech-based regs

Integrated Water Management

- o Some states provide some oversight responsibility to look at overall quality of water resources - e.g. Florida Water Management Board which oversees
 - * **GW** recharge & **WW** reclamation
 - * Salinity intrusion control
 - * Non-point source pollution control