

Wastewater Reuse in North Dakota

North Dakota Water & Pollution Control Conference
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Presentation Overview

- **Reuse Technologies**
- **Reuse Applications**
- **Reuse Operations & Regulations**
- **Reuse in North Dakota**
 - Jamestown, ND
 - Fargo, ND
 - Dickinson, ND
- **Conclusions & Questions**

Reuse Technologies

Reuse Technologies

- **Almost any technology can be applied for reuse**
 - Precipitation & Sedimentation
 - Biological Treatment
 - Media Filtration
 - Membrane Filtration
 - Ion Exchange
 - Reverse Osmosis
 - Disinfection
 - Evaporation & Crystallization

Reuse Technologies

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Reuse Technologies

- **Potential Areas of Reuse**
 - Irrigation
 - General – Landscape
 - Crops
 - Ground Water Recharge
 - Boiler Feed Water
 - Cooling Water Make-up
 - Utility Water
 - Process Water



Reuse Technologies

- **Constituents of Concern**
 - pH
 - Alkalinity
 - TDS
 - TSS
 - Silica
 - Hardness
 - Chloride
 - Phosphates
 - Others...

Reuse Technologies

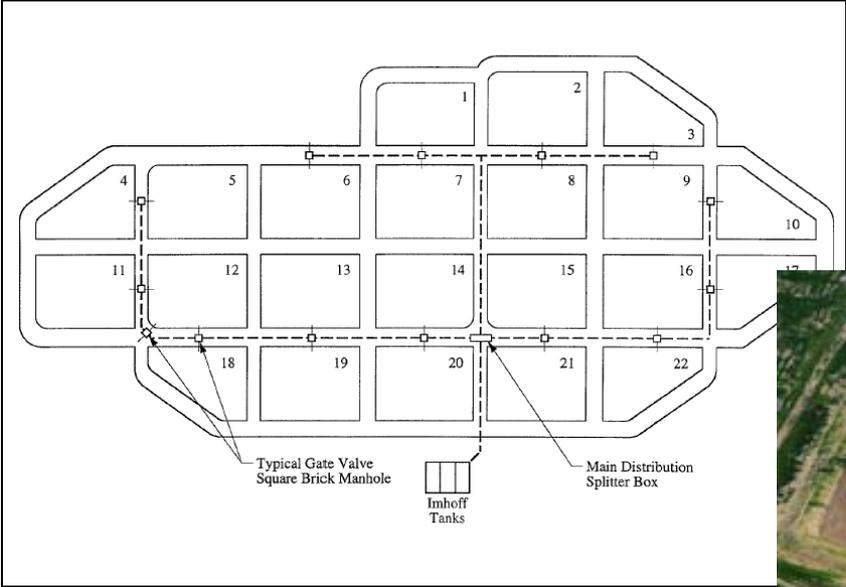
- **Source Water – Choose the source that will...**
 - Require the fewest number of treatment steps or technologies
 - Provide the most consistent effluent quality
 - Be the least expensive to treat

Reuse Applications

Reuse Applications



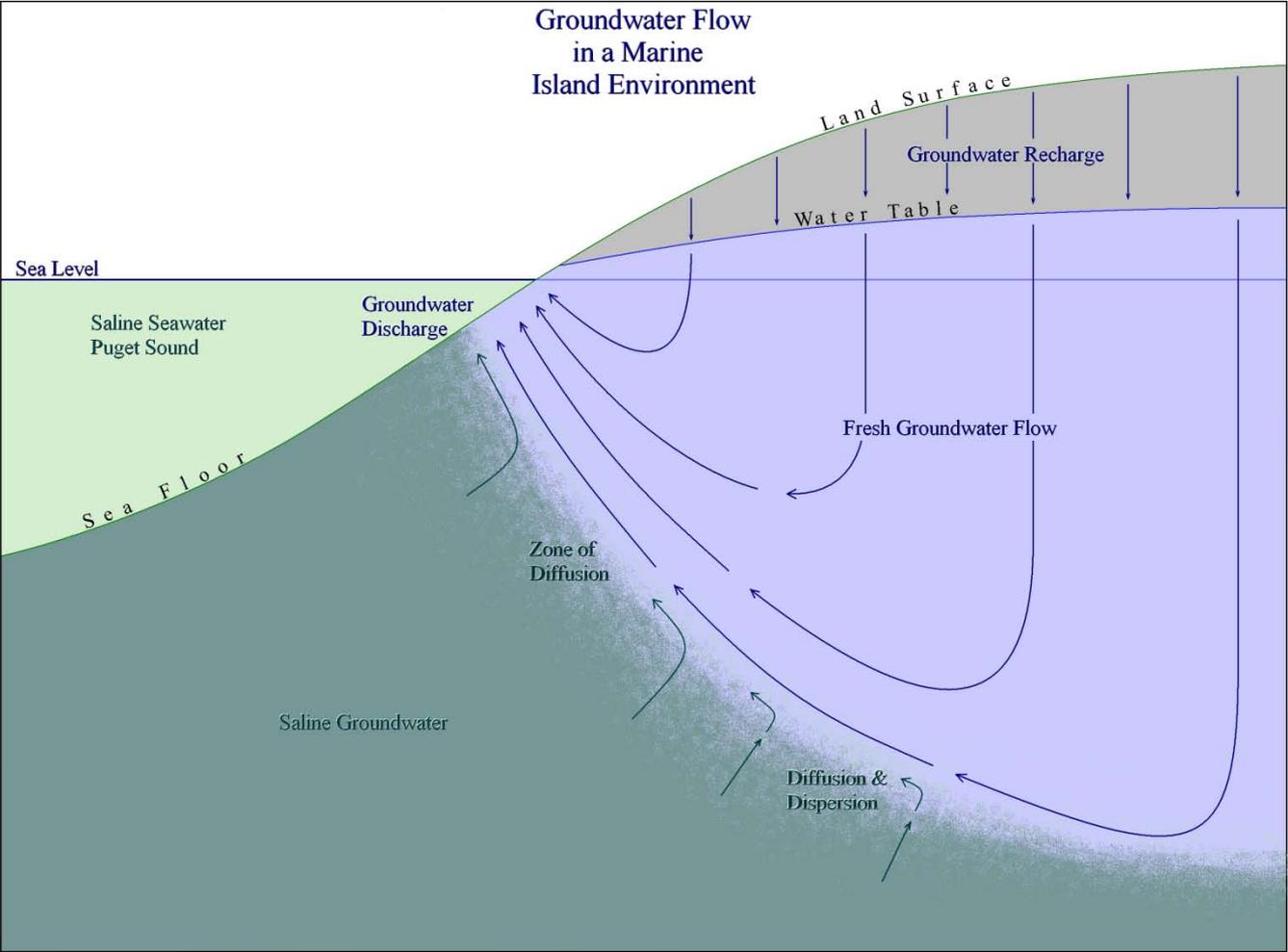
Reuse Applications



Reuse Applications



Reuse Applications



Reuse Technologies

Lake Contains Reclaimed Water

“Do Not Drink”



“No Beber”

“Do Not Swim”



“No Nadar”

Reclaimed Water
Used for Irrigation

“Do Not Drink”



“No Beber”

Fountain Contains Reclaimed Water

“Do Not Drink”



“No Beber”

“Do Not Swim”



“No Nadar”

Reuse Applications

- **Goal: Silica and Hardness Removal**
- **Applications**
 - Irrigation Water
 - Cooling System Make-up
 - Boiler Feed Water
- **Technologies**
 - Solids Contact Clarifier
 - Reverse Osmosis
 - Hot and Warm Lime Softening
 - Ion Exchange Softeners

Reuse Applications

- **Goal: Suspended Solids Removal**
- **Applications**
 - Irrigation or Utility Water
 - Cooling System Make-up
 - Boiler Feed Water
- **Technologies**
 - Media Filtration
 - Membrane Filtration

Reuse Applications

- **Goal: Disinfection**
- **Applications**
 - Irrigation or Utility Water
- **Technologies**
 - Chlorination
 - Ultraviolet Disinfection

Reuse Applications

- **Goal: Dissolved Solids Removal**
- **Applications**
 - Irrigation or Utility Water
 - Cooling Tower make-up
 - Boiler Feed Water
- **Technologies**
 - Reverse Osmosis
 - Ion Exchange
 - Evaporators

Reuse Operations & Regulations

Reuse Operations & Regulations

- **Many reuse technologies are susceptible to:**
 - Scale Formation
 - Oil Fouling
 - Biological Fouling
- **Wastewater treatment design can affect reuse technologies**
- **Pilot Studies**

Reuse Operations & Regulations

- **Title 22**
 - California Code of Regulations: Title 22, Chapter 3, Division 4
 - State Department of Health Services standards for recycled water
 - “The Purple Book”



Reuse Operations & Regulations

- **USEPA – Guidelines for Water Reuse**
 - Most states have either regulations or guidelines
 - 10 States have neither
 - ND has guidelines

Reuse in North Dakota

Reuse in North Dakota

- **Jamestown, ND – Great River Energy**
- **Fargo, ND – Theraldson Ethanol**
- **Dickinson, ND**

Reuse in North Dakota

- **Jamestown, ND – Great River Energy**
 - Spiritwood Station Power Plant – 100MW



Reuse in North Dakota

- **Jamestown, ND – Great River Energy**
 - WWTF Effluent Pumped to Spiritwood Station
 - Spiritwood Station provides further treatment
 - Pipeline owned by Stutsman Rural Water

Reuse in North Dakota

- **Fargo, ND – Theraldson Ethanol**
 - Ethanol Plant located west of Casselton
 - 150 MGY of Ethanol produced
 - 1.4 MGD of water needed.



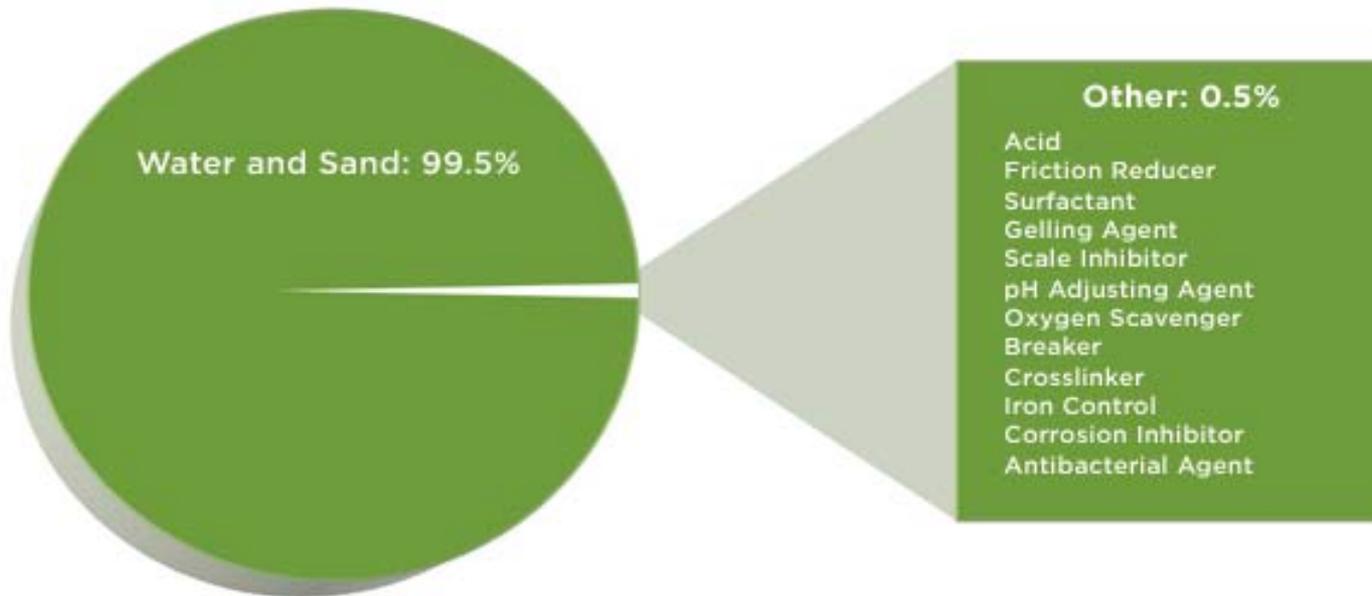
Reuse in North Dakota

- **Fargo, ND – Theraldson Ethanol**
 - Effluent Reuse Facility (ERF)
 - UF followed by RO



Reuse in North Dakota

- **Dickinson, ND**
 - Effluent Reuse for hydraulic fracturing



Reuse in North Dakota

- **Dickinson, ND**
 - Effluent Reuse for hydraulic fracturing
 - Currently under development
 - Effluent water quality

Conclusions

Conclusions

- **Effluent Reuse is currently widely used in areas where water is scarce**
- **Effluent Reuse can be a viable alternative for many uses**
- **Proper selection of technology will benefit long term O&M**

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