



ANTHC

**DIVISION OF ENVIRONMENTAL
HEALTH & ENGINEERING**

Current State of Wastewater Treatment and Disposal in Alaska

**5th Annual Water and Sanitation Workshop
January 2015**

Sources of Wastewater

- Domestic (Sanitary)
 - Piped
 - Hauled or Honey-bucket
- Industrial
- Infiltration and Inflow
- Combined Sewers



Kiana Lagoon Cell

Treatment Objectives

- Identify contaminants of concern.
- Effectively remove identified contaminants.
- Return effluent to the natural water bodies or the land.
- Dispose of Contaminants.
- Do so in a manner that protects the environment and human health.
- Do so in a sustainable manner.

Contaminants of Concern

- **Suspended Solids:** When unremoved, lead to sludge deposits and anaerobic conditions in the aquatic environment.
- **Biodegradable Organics:** If discharged untreated, leads to depletion of natural oxygen in the receiving waters.
- **Pathogens:** Diseases can be transmitted via pathogens in wastewater.
- **Nutrients:** Nitrogen and phosphorus can lead to growth of undesirable aquatic life.
- **Heavy Metals:** Usually added in industrial or commercial processes.
- **Priority Pollutants:** Other contaminants selected for removal based on known carcinogenicity or toxicity.

Wastewater Treatment Stages

- **Primary Treatment:** Physical Treatment (screening, settling, floating)
- **Secondary Treatment:** Biological and/or chemical processes to remove organic matter, suspended solids, and pathogens.
- **Tertiary Treatment:** Chemical and biological treatment for targeted contaminants.
- **Effluent Disposal:** Consistent with receiving body water quality standards.
- **Sludge Disposal:** Often misjudged level of effort – significant challenge.



Naknek Lagoon Cell

Governing Regulations

- Clean Water Act of 1972
 - Defines Minimum Requirements (Secondary Treatment)
 - Maximum Effluent Contaminant Levels
 - Total Suspended Solids (TSS): 30 mg/l
 - Bio-chemical Oxygen Demand (BOD): 30 mg/l
 - Chloroform Bacteria (# colonies / 100 ml)
 - Minimum Removal Requirements (%).
 - Establishes National Pollution Discharge Elimination System (NPDES) Program
 - Secondary Treatment Exceptions

Common Treatment Systems in Alaska

- Mechanical Plants
- Settling Tanks / Ocean Outfalls.
- Facultative Ponds (Lagoons)



Hoonah Bio-reactor



Angoon abandoned RBC

Mechanical Treatment Systems

- **Description:** Natural treatment mechanisms optimized in a controlled environment. Tight control the parameters necessary for optimum micro-organism growth.
- **Treatment Level:** Up to Tertiary



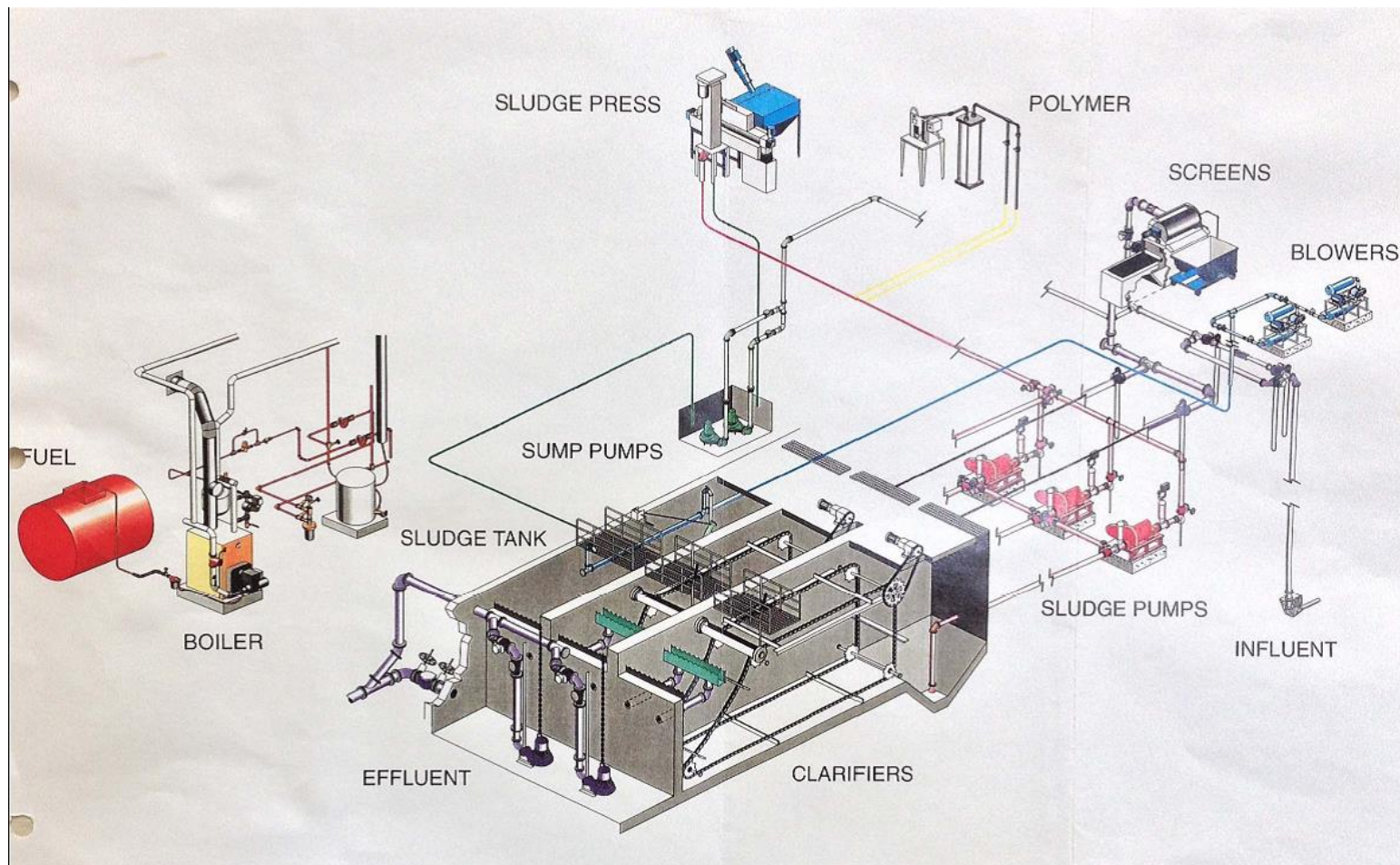
Hoonah Bar Screen



Klawock Rotating Drum Screen



Mechanical Treatment Systems



Mechanical Treatment Systems

- **Advantages:**
 - Lower Capital Cost
 - High Loading Rate/Smaller Footprint
 - Consistent Effluent (with good O&M control)
- **Disadvantages:**
 - Highest O&M Costs
 - Highest operator cert. requirements
 - Daily O&M required
 - Continuous removal of sludge.



Hoonah WWTP

Settling Tank/Outfall Systems

- **Description:** Large tanks in series provide primary treatment prior to effluent disposal via an ocean outfall.
- **Treatment Level:** Primary



Tyonek Settling Tanks



Tyonek Ocean Outfall

Settling Tank/Outfall Systems

- **Advantages:**
 - Low capital cost
 - Lower operator cert. requirements
 - Periodic sludge removal and handling
- **Disadvantages:**
 - Primary treatment only
 - Suitable only for small communities
 - Requires sludge pumping equipment
 - Requires long outfall construction



Angoon Settling Tanks

Wastewater Treatment Ponds

- **Description:** Shallow ponds used to treat wastewater through natural processes.
 - Tundra ponds
 - Constructed single and multi-cell facultative lagoons
 - Aerated Lagoons
- **Treatment Level:** Typically Secondary
- **Cold Climate Considerations:** Biological treatment achieved only in the summer.



Wastewater Treatment Ponds

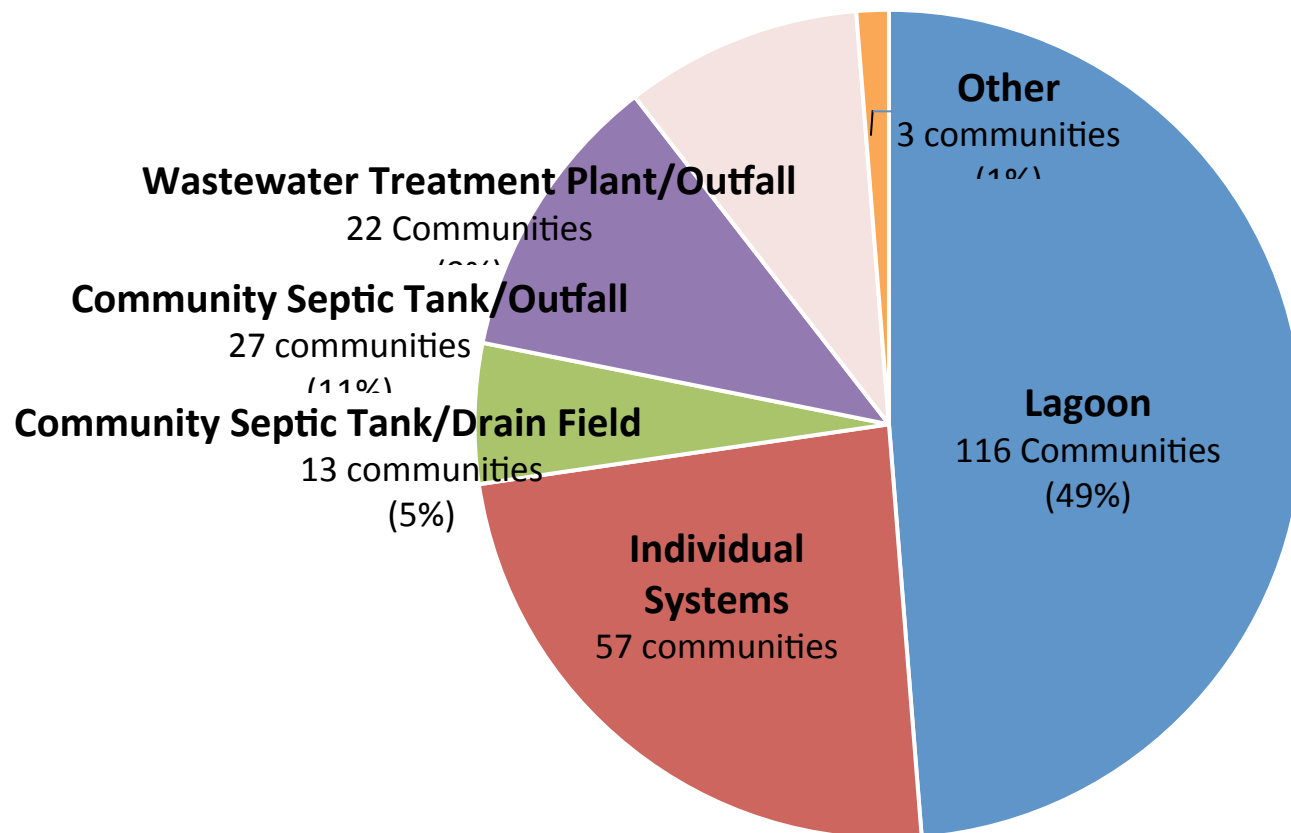
- **Advantages:**
 - Lowest O&M cost
 - Lower operator cert. requirements
 - Infrequent discharge
 - Sludge storage in the cells
 - Secondary treatment
- **Disadvantages:**
 - Potentially highest capital cost
 - Very large foot print
 - Large volume annual/bi-annual discharges
 - Separation requirements
 - Inconsistent treatment



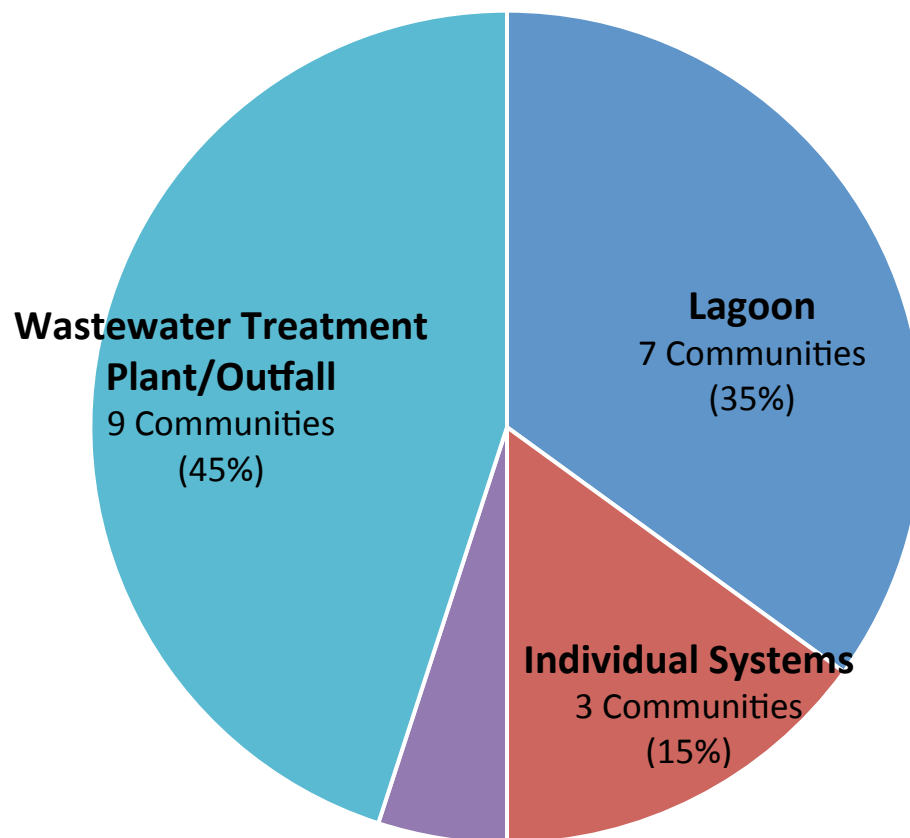
Kwethluk Lagoon



Wastewater Systems in All Rural Alaska Communities (238 Communities with a combined population of 109,652)

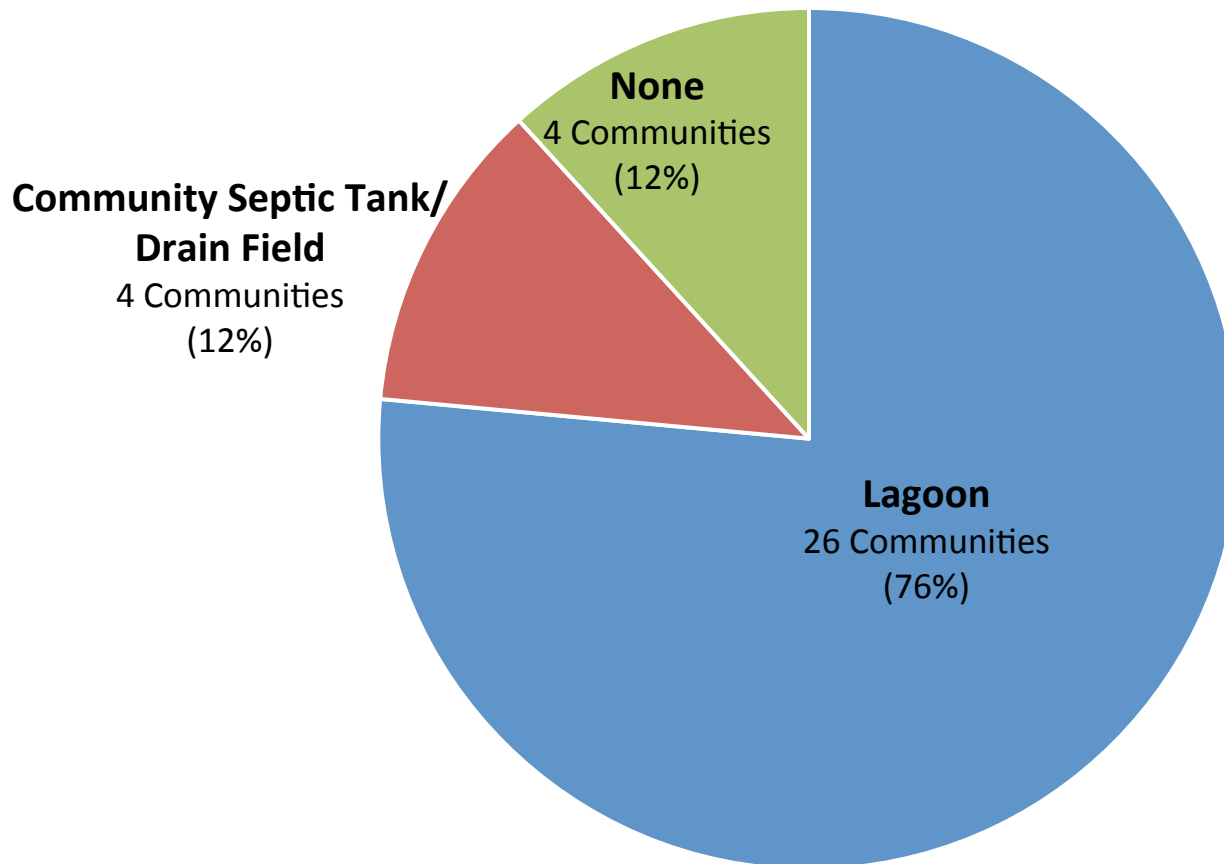


Wastewater Systems in Rural Communities with a Pop > 1,000 (20 Communities with a combined population of 49,393)





Wastewater Systems in Unserved* Communities (34 Communities with a Combined Population of 6,353)



*A community is considered “unserved” if 55% or less of the homes in the community have a piped, septic tank & well, or covered haul system.

For More Information:

Don Antrobus, PE
Director of Design
ANTHC, DEHE
907-729-3544
dantrobus@anthc.org



ANTHC

DIVISION OF ENVIRONMENTAL HEALTH & ENGINEERING

