Division of Environmental Health & Engineering

Public Heath today, Pathway to Pipes tomorrow

ALASKA NATIVE TRIBAL HEALTH CONSORTIUM

Innovative Design, Research and Development

Portable Alternative Sanitation System (P.A.S.S.)

Why P.A.S.S.?

Strategy to Eligibility
Improved Sanitation
Improved Quality of Life

Honey Bucket

Outhouse

P.A.S.S. unit

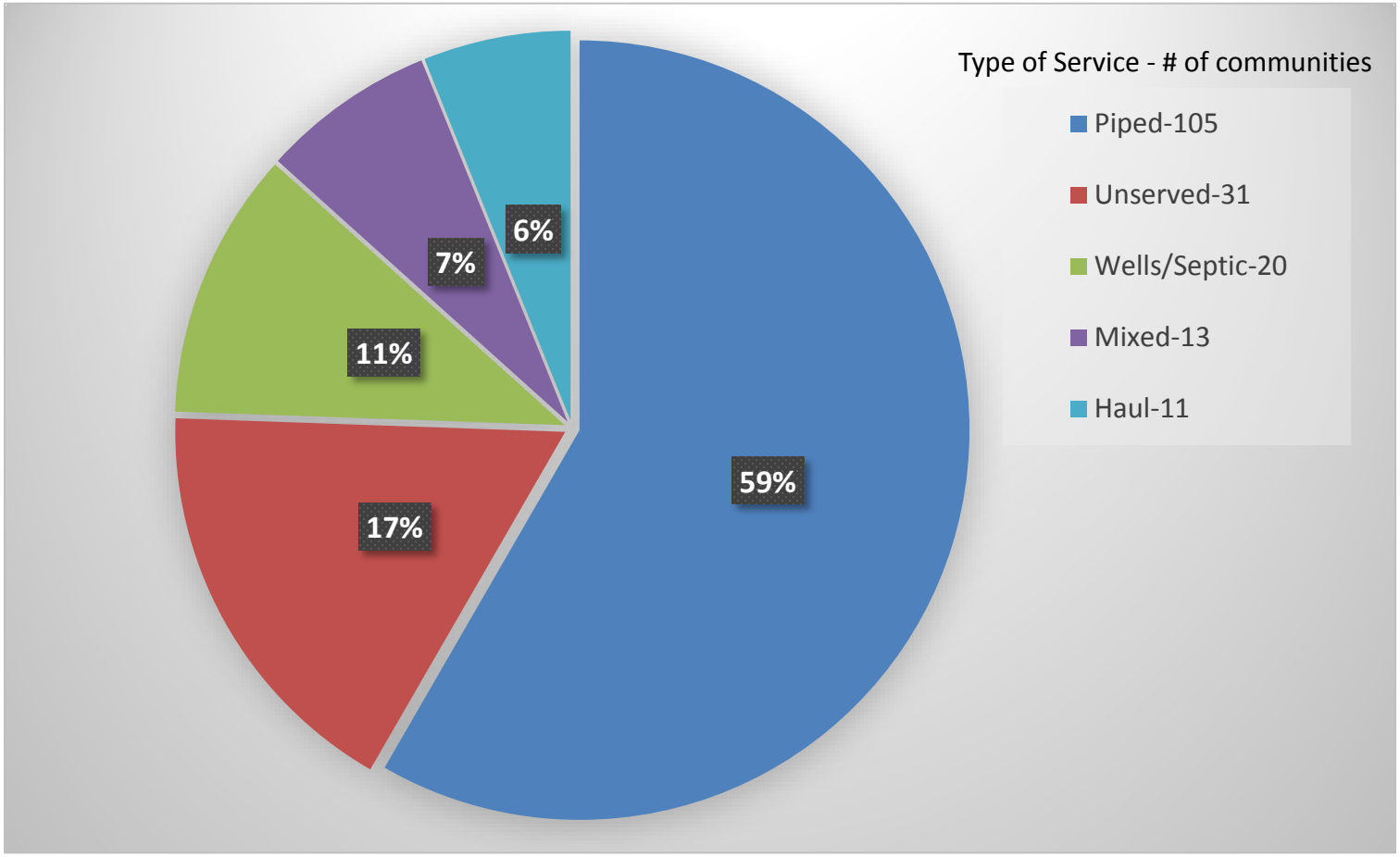
Flush/Haul System

Piped

Levels of sanitation service in rural Alaska

ALASKA NATIVE TRIBAL HEALTH CONSORTIUM

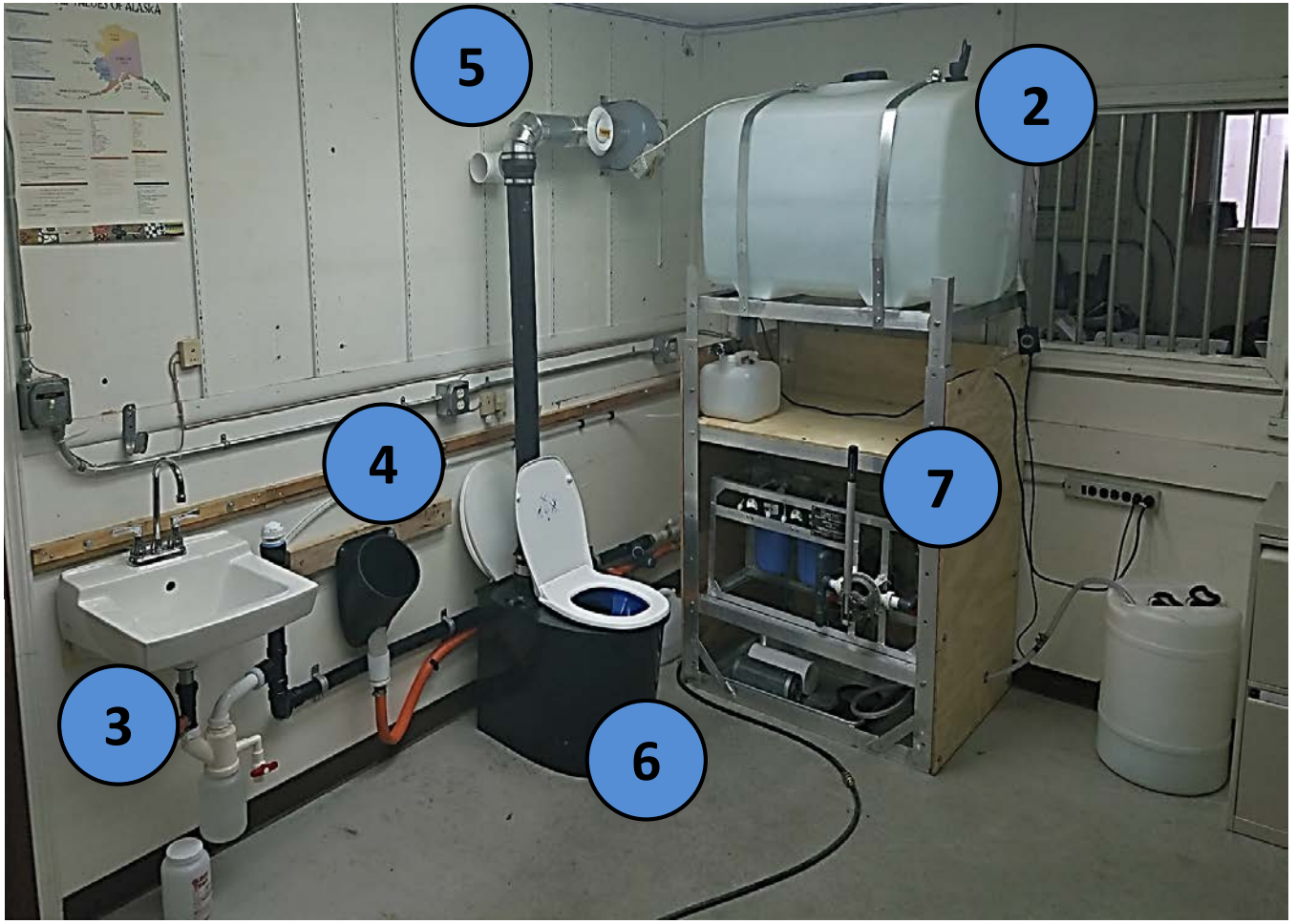
State of Alaska Sanitation Profile 2017



Benefits P.A.S.S. unit:

- **1. RAIN CATCHMENT:** Sediment separator begins filtering as it captures the raw water.
- **2. WATER STORAGE TANK:** Dual-filtration system prior to water storage changes how we think of our potable water and its storage.
- **3. LOW-FLOW SINK:** A gravity-fed flow of water to wash hands allows for better hygiene and **NO MORE WASH BASIN!**
- **4. WATERLESS URINAL:** Separating the liquid waste allows for less disposal and less odor.
- **5. INTEGRATED VENTILATION:** An energy-efficient combined ventilation system dries the solid waste, reduces odors, and ventilates the home – creating better air circulation throughout the home.
- **6. SEPARATING TOILET:** Waste is separated into liquid and solid components where the liquid is disposed of into a seepage pit and dried solids are disposed of in the landfill. This toilet provides the option to revert to a containerized system if the drainage system freezes in the cold winter months. **NO MORE HONEY BUCKET!**
- **7. WATER TREATMENT SYSTEM:** The water treatment system incorporates cartridge filters and chlorination for point-of-use treatment to ensure the water is safe to drink despite its condition upon entering the system.

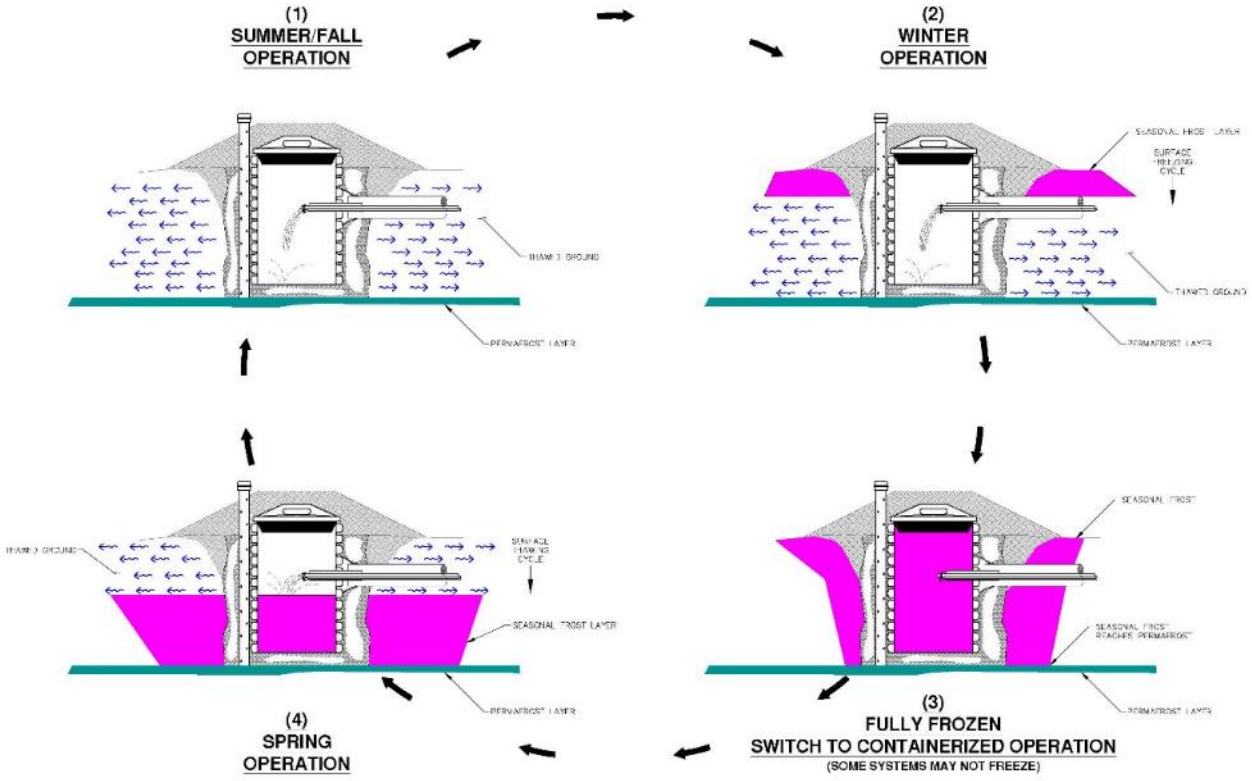
Typical System Layout:



1. RAIN CATCHMENT
2. WATER STORAGE TANK
3. LOW-FLOW SINK
4. WATERLESS URINAL
5. INTEGRATED VENTILATION
6. SEPARATING TOILET
7. WATER TREATMENT SYSTEM

Re-engineered modifications to address space constraints in older homes
PASS 2.0 2018

Engineering design to work with environment: Freeze/Thaw cycle seepage pit



Working **WITH** the environment, not against it.

Challenges:

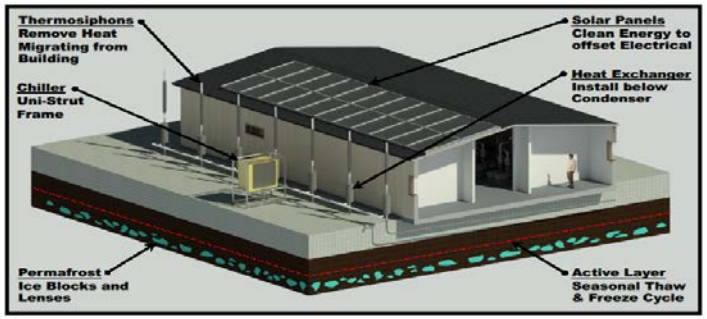
- Soil conditions need to be perkable
- Temperature variances could freeze system drainage pit
- Design retrofitting to current housing infrastructure could require extensive remodels
- Homeowner buy-in is essential for success
- User education must be provided one-on-one
- Short-term alternative, possibly only alternative

Opportunities:

- Low Cost compared to piped infrastructure
- Stand alone system with low electrical use
- Portability of components
- Potential for homeowner add-on: circulating pump, hot water on demand, shower
- Potential for phased design approach while awaiting infrastructure

Supporting Infrastructure:

Modular Water Treatment Plant



Modular Laundromat/Washeteria

- Watering Point – Water Treatment Plant, School, Raw Water Source
- Solid Waste Disposal system
- Landfill

Cost for P.A.S.S. unit:

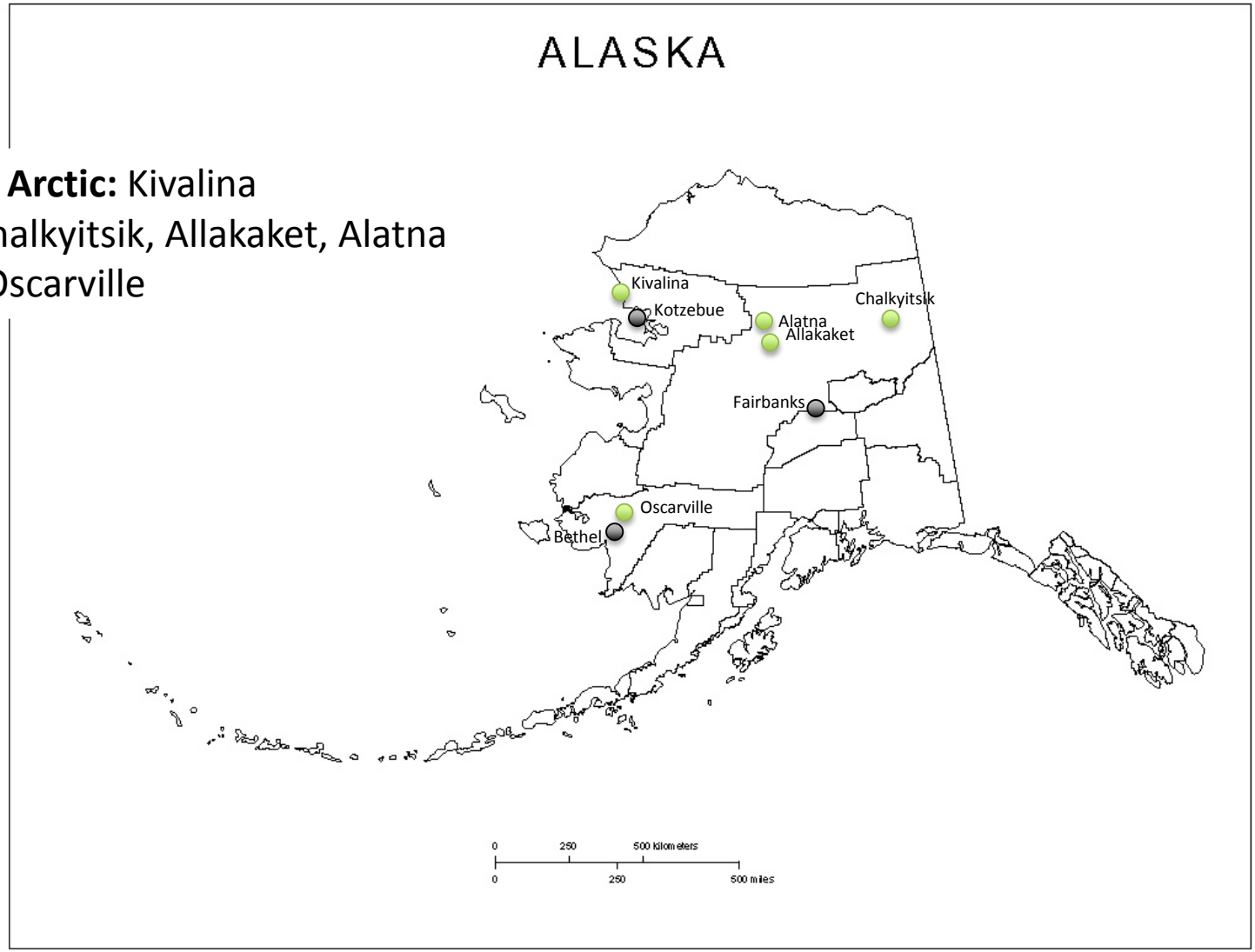
Materials ONLY:

Seepage Pit	$600.00
Diverting Toilet	$1,926.00
Ventilation	$500.00
Water Treatment System & Tank	$5,567.00
Rain Catchment System	$500.00
Sink, Faucet, & Misc. Plumbing fittings and valves	$1,000.00
	$10,093.00 TOTAL

Variable Costs:

Archeological
Remodeling
Installation
Logistics and transportation
Design & Engineering (if needed)

Northwest Arctic: Kivalina
Interior: Chalkyitsik, Allakaket, Alatna
YK Delta: Oscarville



Current PASS Projects

Current Projects:

Northwest Arctic: Kivalina
Interior: Chalkyitsik, Allakaket, Alatna
YK Delta: Oscarville

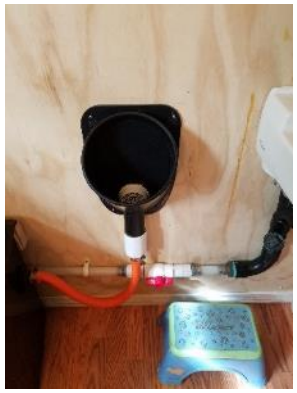
Elder, Allakaket

Seepage Pit, Chalkyitsik

Elder Home, Allakaket

Current Projects:

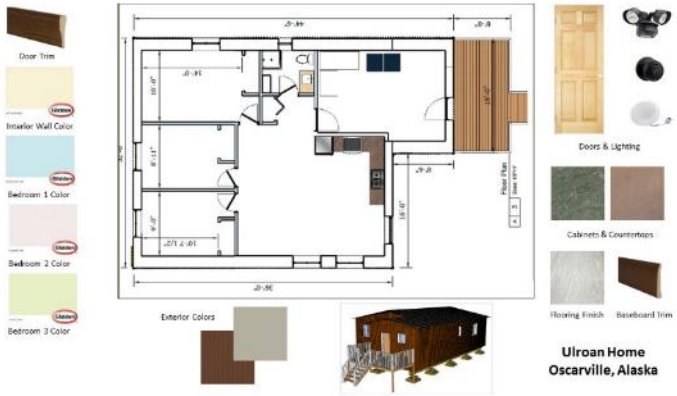
Chalkyitsik Home
Complete Install
Bath remodel
Elder + 3 grandkids



ALASKA NATIVE TRIBAL HEALTH CONSORTIUM

Current Projects:

Oscarville Home
Complete Install
New Construction
2 Adults, 5 children



Design Boards

Finished Kitchen

ALASKA NATIVE TRIBAL HEALTH CONSORTIUM

Benefits of water and sanitation

Toilets

Hand-washing

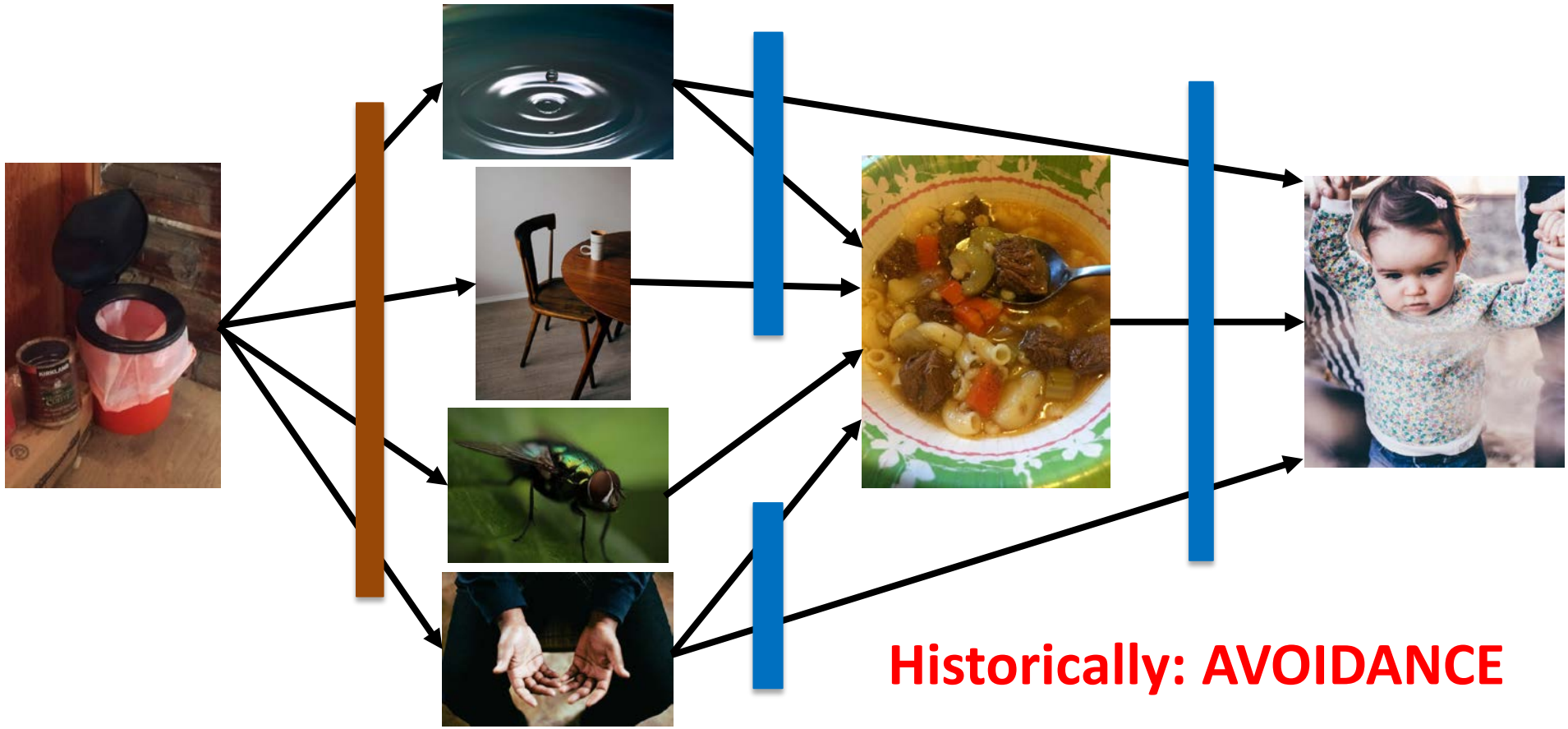
Drinking water

Cooking

Benefits of water and sanitation

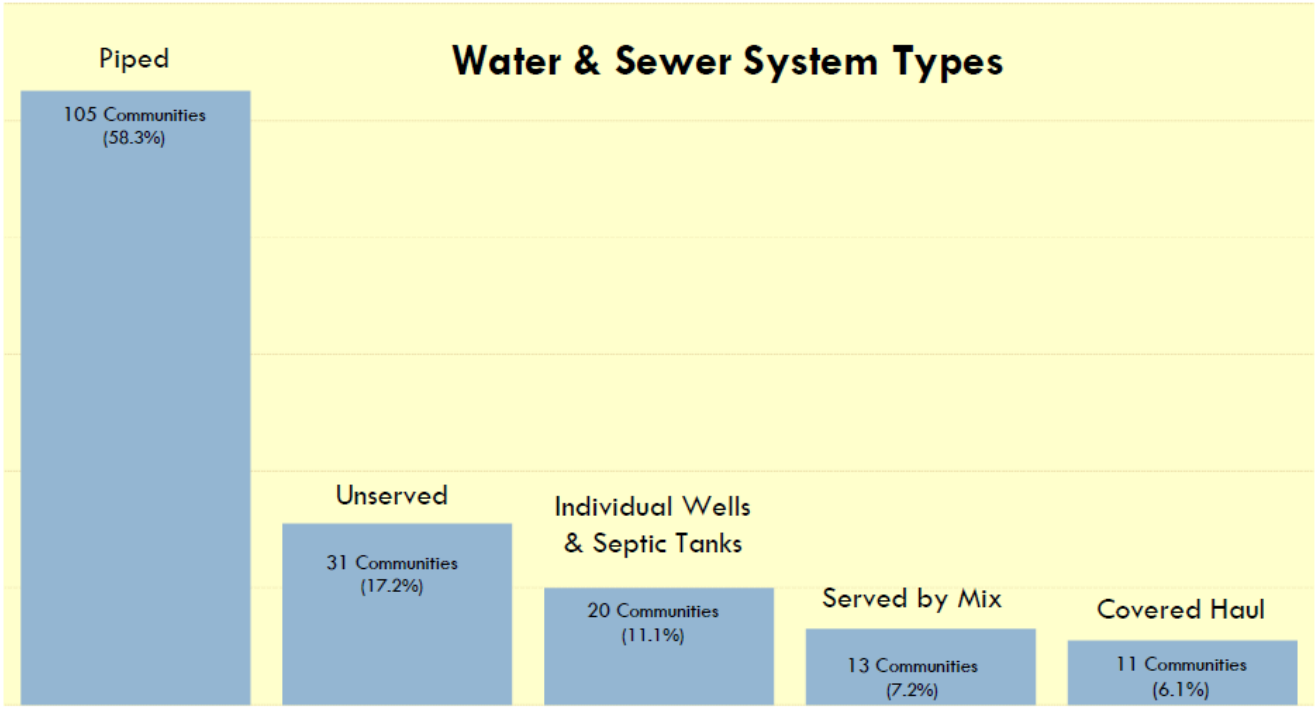
Primary barrier: prevention of infectious organisms from getting into the environment

Secondary barriers: avoidance of infectious organisms, removal or destruction of infectious organisms



Historically: AVOIDANCE

Now: high-tech systems that require a lot of work



From: Alaska Water and Sewer Challenge website
http://watersewerchallenge.alaska.gov/ruralCommunities.html

02/02/2015

Overview of water and sanitation research in Alaska

Multiple and natural water sources

Waste spread through communities

Low water use linked to illnesses

Poor indoor air quality

Failure of technologies

Water quality

- Contamination during transport
- Treatment and disinfection
- Waste disposal (manual and uncontained)
- Untreated reuse

Water quantity

Thomas et al. 2016

Journal of Water and Health

Water use increasing from **1.5 to 25** gal/person/day leads to decline in illnesses:

- 16% decrease in respiratory
- 20% decrease in skin
- 38% decrease in gastrointestinal

Portable Alternative Sanitation System

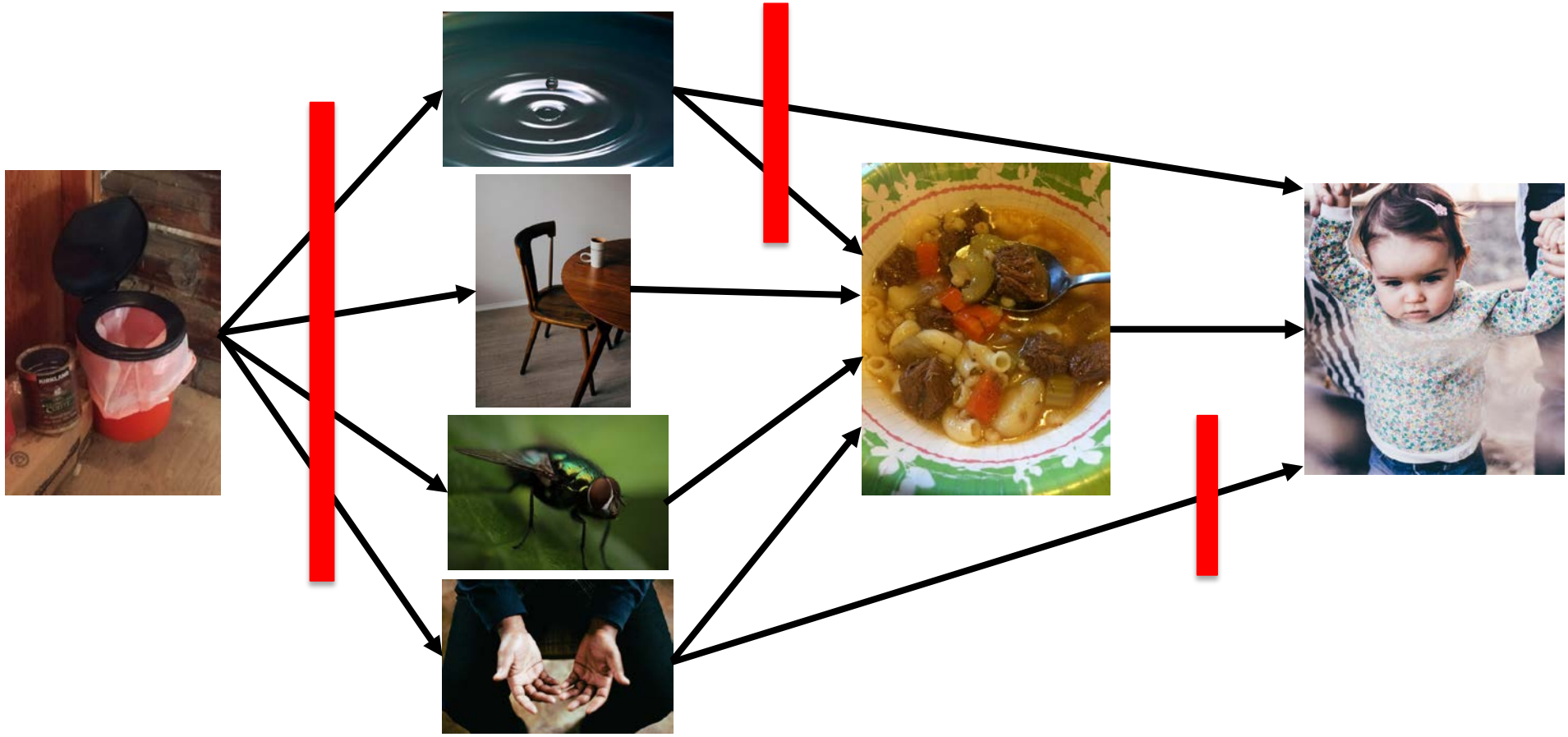
Water treatment unit and storage tank

Low-flow gravity-fed sink and drainage

Separating toilet w/ ventilation

Photo credit: Jackie Schaeffer, ANTHC

Theoretical benefits of PASS



PASS Health Impact Study

Research Questions

1) How is water used inside and outside of the home?
2) How is waste managed inside and outside of the home?
3) Have the PASS units improved overall health?
4) How have the PASS units affected household water access, sources, and uses?
5) Does the PASS unit fit into existing behaviors, desires and culture?

Year 1

Collect data from homes with honeybuckets in two communities

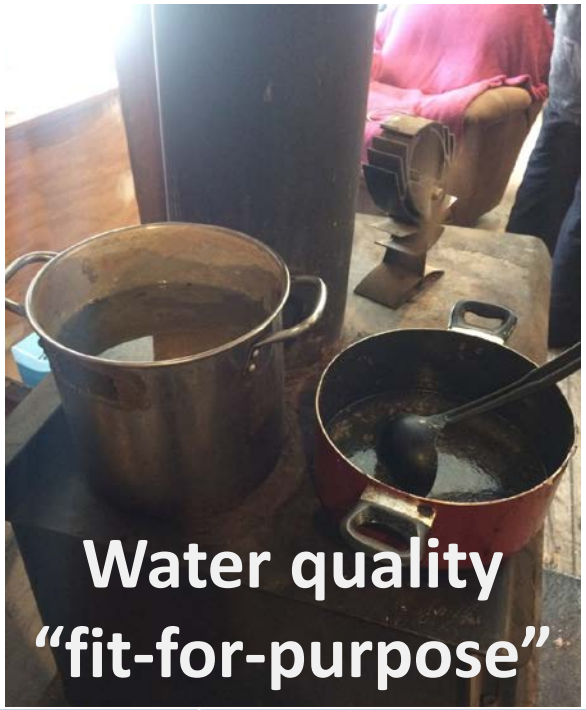
Install PASS in volunteer homes

Year 2

See how water quality, quantity and behaviors change.

ALASKA NATIVE TRIBAL HEALTH CONSORTIUM

Current observations

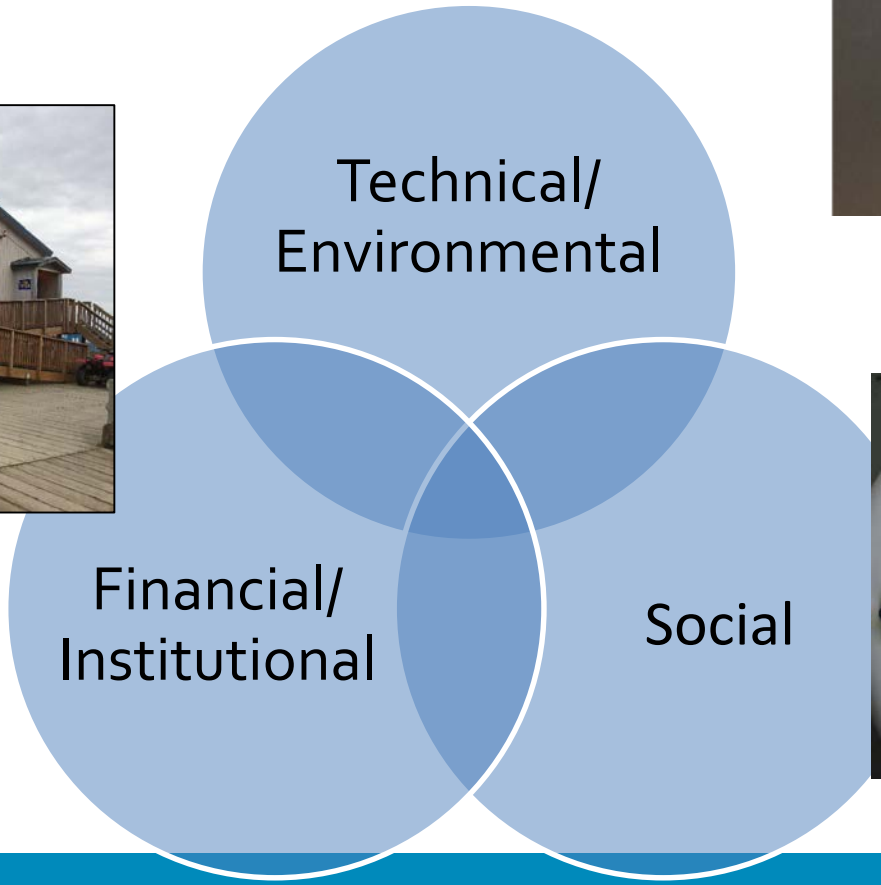


EPA Parameter	Traditional Parameter
Bacteria	Odor, stagnant water
TOC	Color of ice, time of year
pH	
Turbidity	Cloudy, silty

Adaptive capacity

27

Evaluating the sustainability of PASS



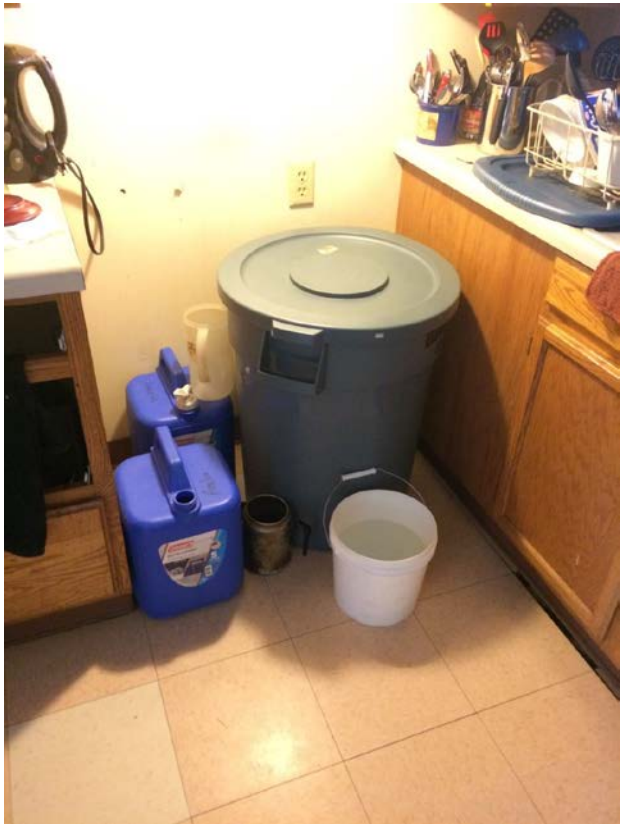
ALASKA NATIVE TRIBAL HEALTH CONSORTIUM

Improving the way we do things

Primary sustainability criteria	SELECTED secondary sustainability criteria
Institutional and financial	Operation and maintenance support Tribal support and advocacy Supporting water, waste, hygiene, transportation infrastructure Assistance for vulnerable households
Technical and environmental	Engineering planning Quality materials and pre-fabricated kits User-centered design and installation Freeze-prevention
Social	Management of expectations Homeowner training Awareness of culture and traditions User acceptance Reduce barriers to proper operation Routine minor maintenance Transfer ownership to homeowners

PASS conclusions

- Water for critical hygiene needs
- Simple, low operation and maintenance
- Good results – but real health improvements?
- Improve sustainability



…Stay tuned!

Questions?

Quyana! Taikuu!
Thank you!

Alaska Native Tribal Health Consortium
Division of Environmental Health and Engineering
4500 Diplomacy Drive, Suite 454
Anchorage, Alaska 99508
(907) 729-1900

Email:
Jackie Qataliña Schaeffer:
jdschaeffer@anthc.org
Kaitlin Mattos: kjmattos@anthc.org