



ALASKA NATIVE
TRIBAL HEALTH
CONSORTIUM



Impacts on Communities: Innovations for Community Energy and Engineering

Climate change is occurring, is very likely caused by human activities, and poses significant risks for a broad range of human and natural systems.

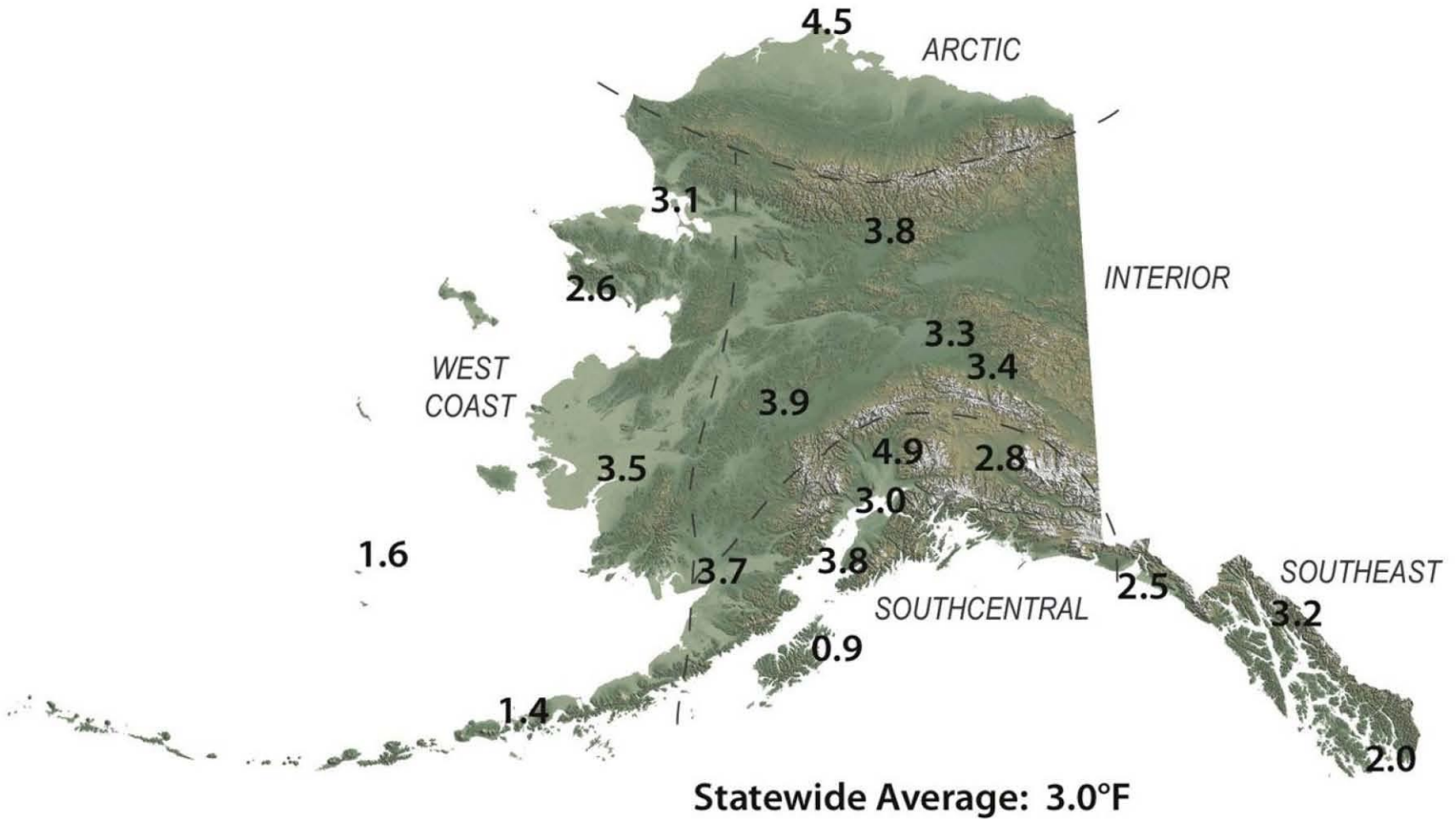
-America's Climate Choices: Final Report

The National Academies, 2011



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Total Change in Mean Annual Temperature (°F), 1949 - 2009





Selawik River

Photo by Yuri Gorokhovich



Noatak River

Photo courtesy of Dean Westlake

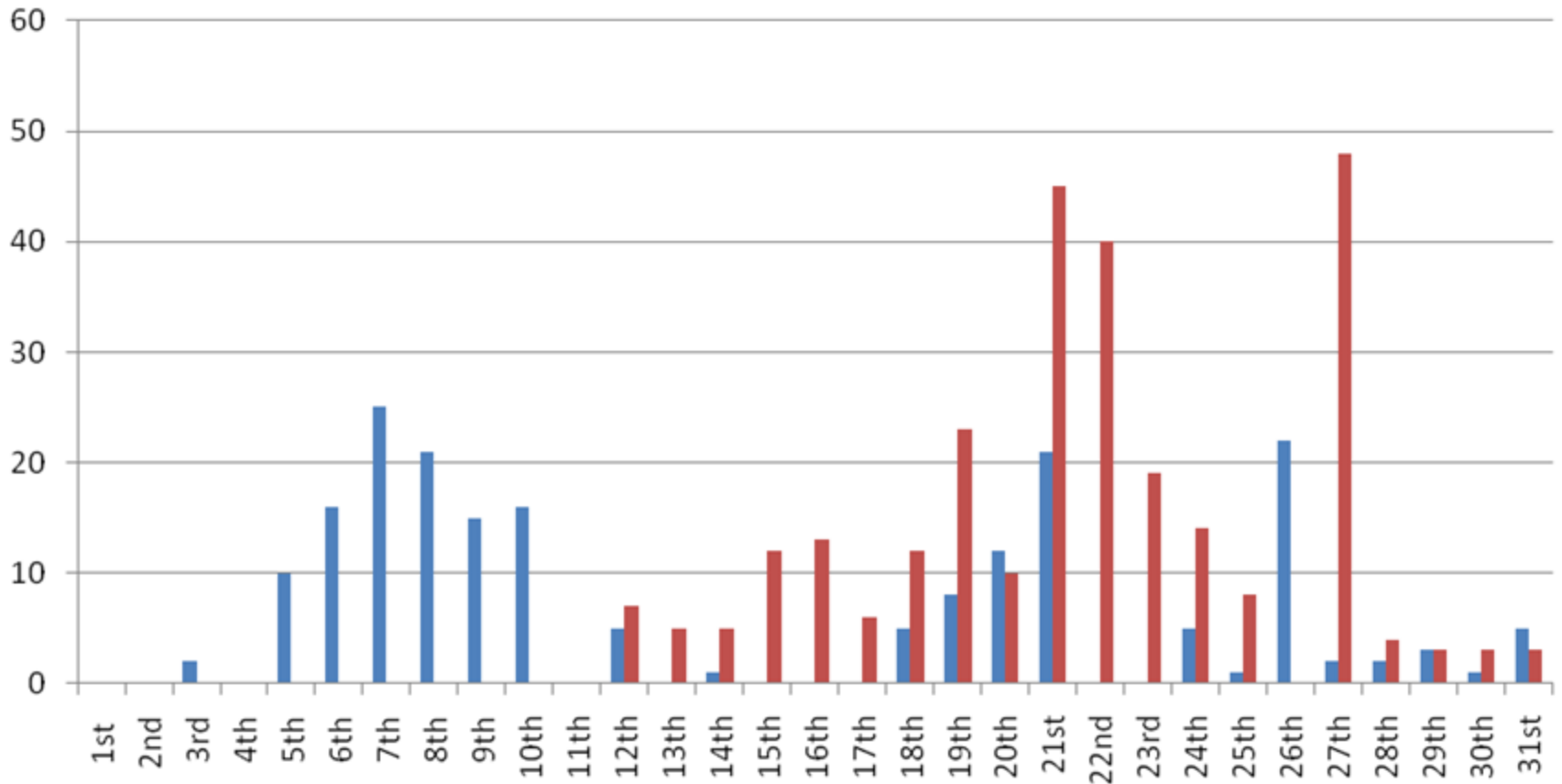


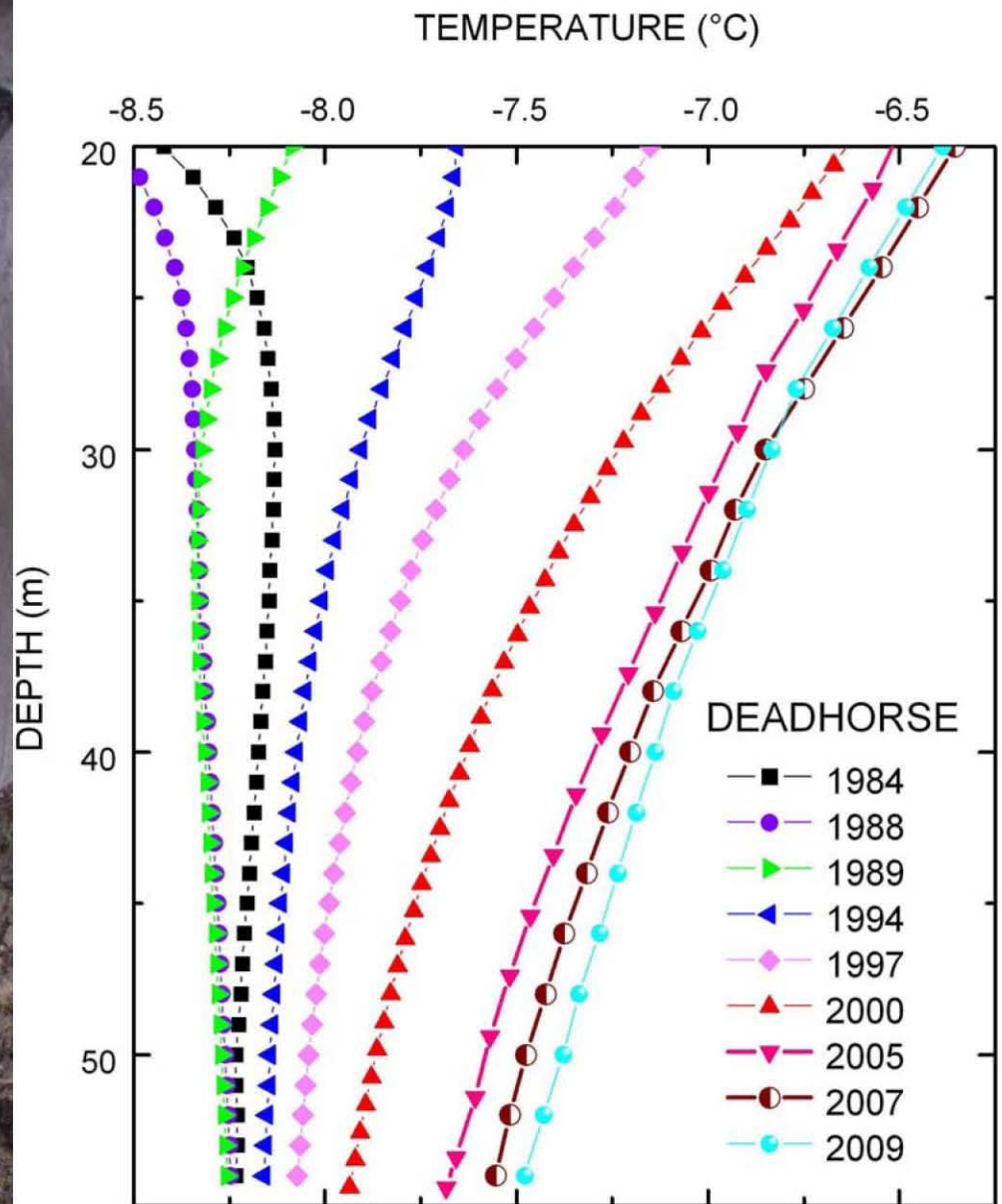
Wulik River

Filter Changes/Day - July 2007 and July 2008

Point Hope, Alaska

■ 2007 ■ 2008









The take home

- 1. Communities across Alaska are increasingly fragile and vulnerable.**
- 2. Permafrost thaw and erosion are leading threats to infrastructure.**
- 3. Guidelines on design parameters and best practices is lacking.**
- 4. Some infrastructure is operating outside of it's design parameters.**
- 5. Monitoring is needed to address problems before catastrophic failures.**
- 6. Rapid change is compounding existing problems in community systems.**
- 7. Capacity to ensure compatibility between systems is needed.**
- 8. Climate change is effecting the ability to provide basic health services.**

Adapting Infrastructure to Climate Change

- Water and Sewer along with Transportation Infrastructure is estimated to be most vulnerable to climate change.
- Cost of not adapting infrastructure has been estimated in a 2007 study by University of Alaska (ISER) to shorten the useful life of water and sewer infrastructure by 3.5 years (20 year normal design life assumed).
- Compounding this shortened life over decades adds Billions of dollars to preserving the sanitation utility. Estimated to add \$3-6 B (rebuilding) by 2030 for Alaskan villages.
- (Larsen, Goldsmith, Smith, et al (2007) Estimating Future Costs for Alaska Public Infrastructure At Risk from Climate Change.



Structural Health Monitoring Systems

Massive ice formation exist in permafrost soil beneath many communities and structures.

When ice melts, the soils subside and the structures above the ice experience settlement that can be up to several feet, damaging foundations and pipelines.



Structural Health Monitoring Systems



Structural health monitoring is used as a preventive measure to monitor the structural health of infrastructure built on thaw susceptible frozen soils

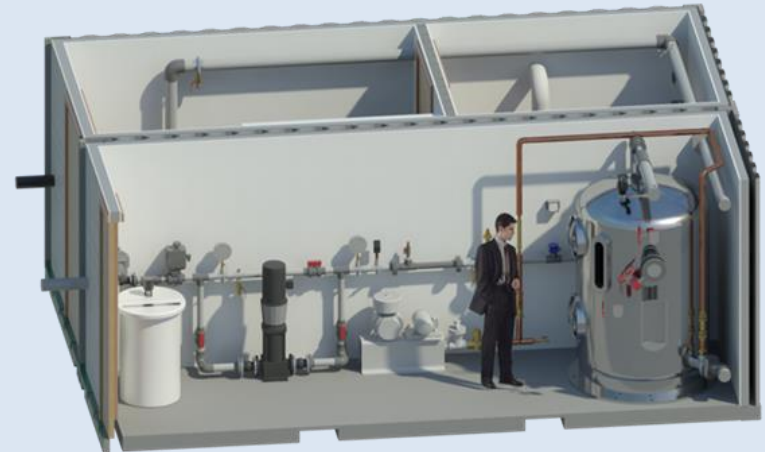
The monitoring system can be installed in a water treatment facility for about \$30,000; or 0.5% of the cost to replace a typical facility.



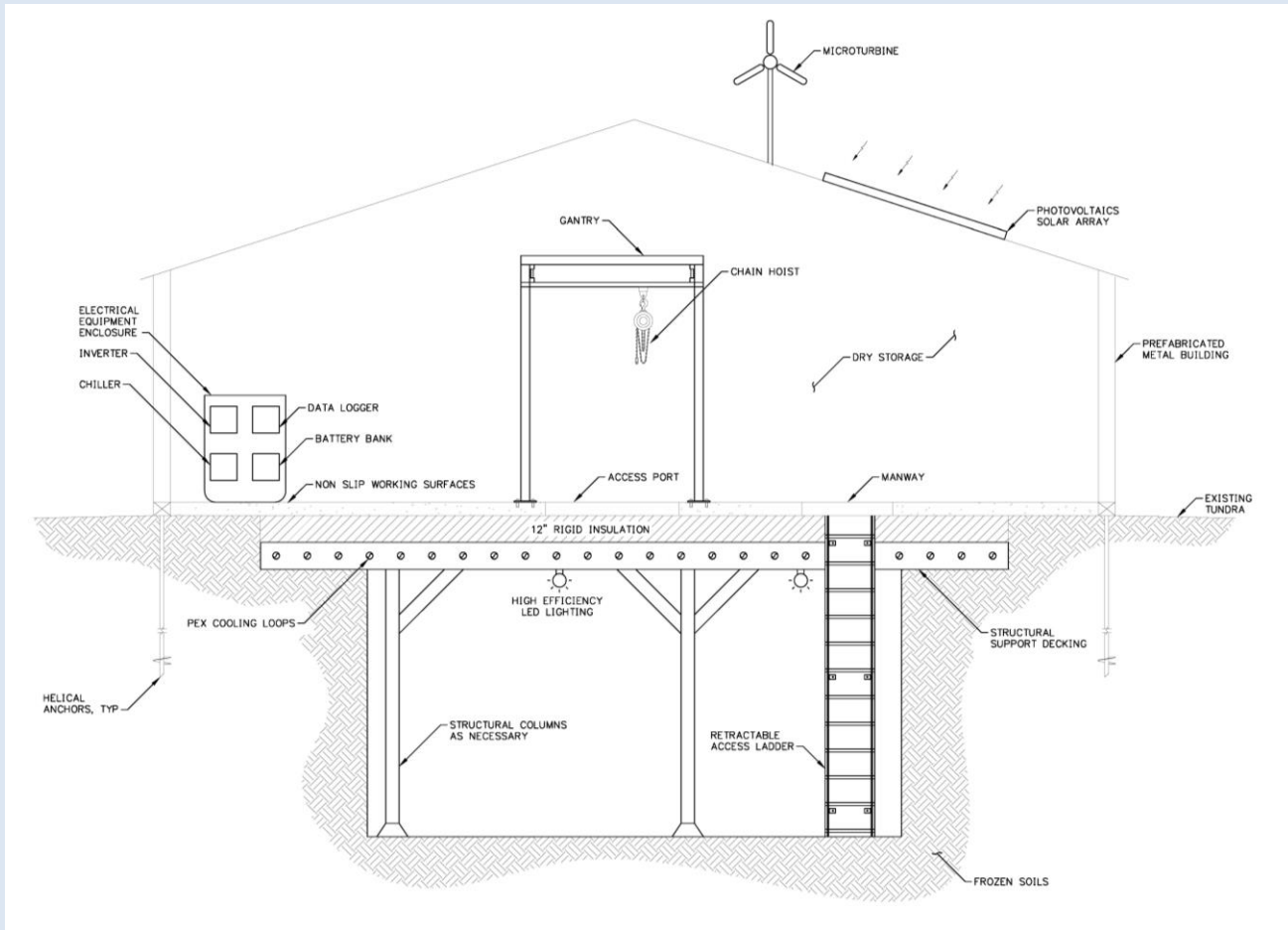
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Modular Water Treatment Plant

ANTHC has implemented a new approach to water treatment by constructing water treatment plants off-site. The buildings have one or more modules that are built in Anchorage and shipped to the community. The structures are stronger than conventional construction because each module is engineered to independently withstand the rigors of shipping. While the conventional method continues to be a viable water treatment option in larger communities, this method has proven successful in small communities.



Ice Cellar Refrigeration

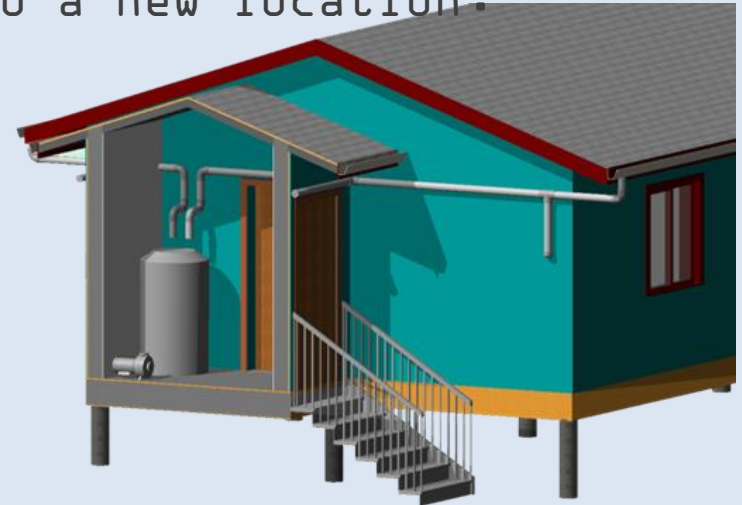


Non-piped, in-home sanitation systems in Kivalina

ANTHC has developed a small demonstration project in Kivalina that will allow the community to adapt to climate change. This system is entirely homeowner-based and is designed to address the most basic sanitation needs and is portable so it can be moved with the community to a new location.



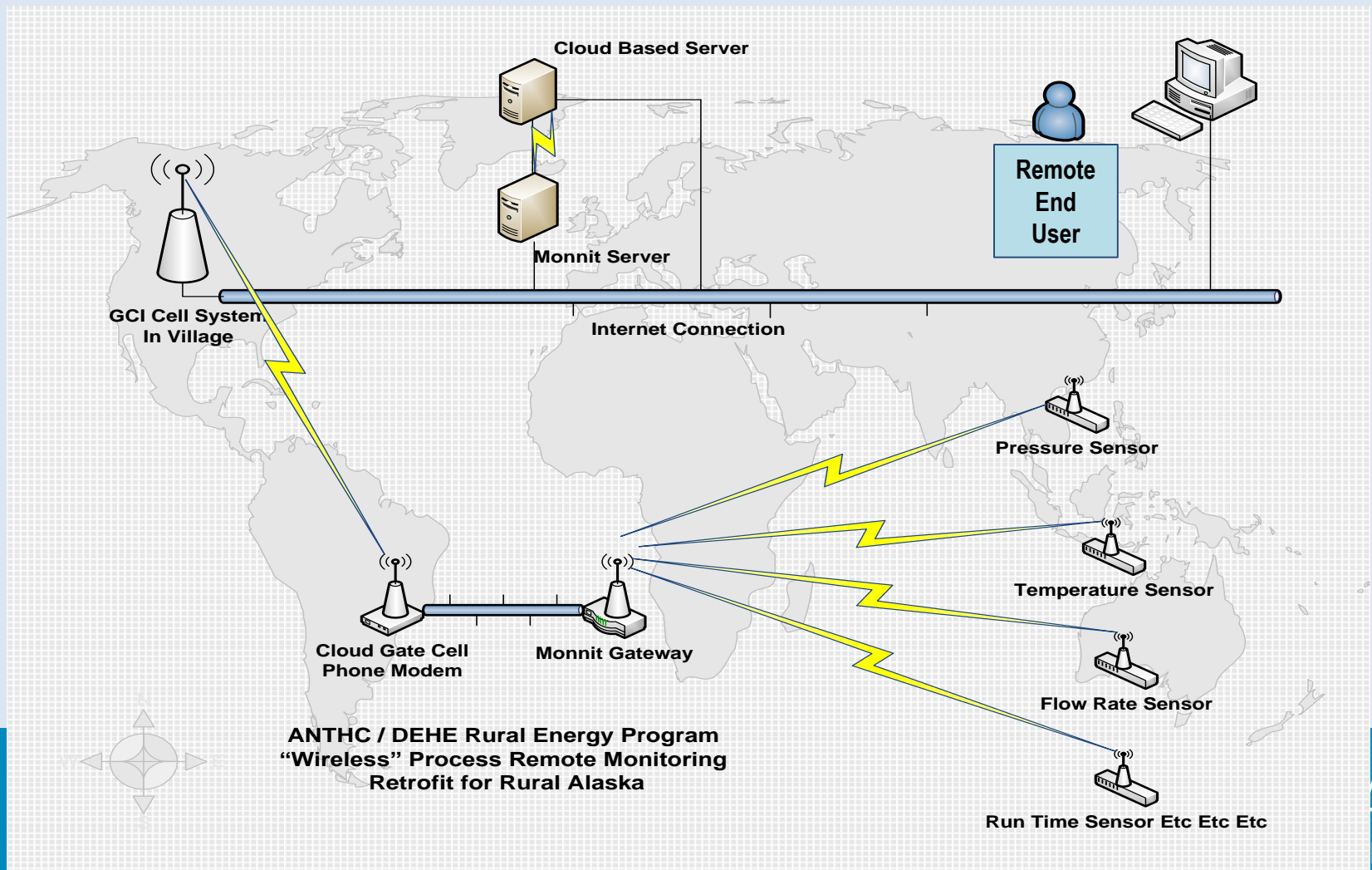
Typical system layout



Rain catchment system



Remote Monitoring: System Concept



ANTHC Remote Monitoring

Map Data Charts and Reports Training Videos and Project Reports

Charts and Reports

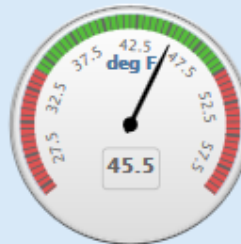
Select Facility:

Select Chart/Report:

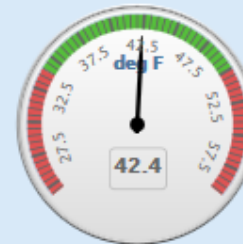
Ambler Water Plant Dashboard

Loop Temperatures

South Loop Return Temp

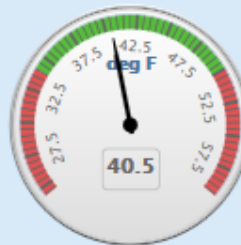


North Loop Return Temp

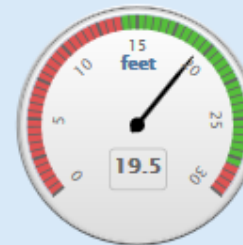


Water Storage Tank

Tank Temperature



Storage Tank Level



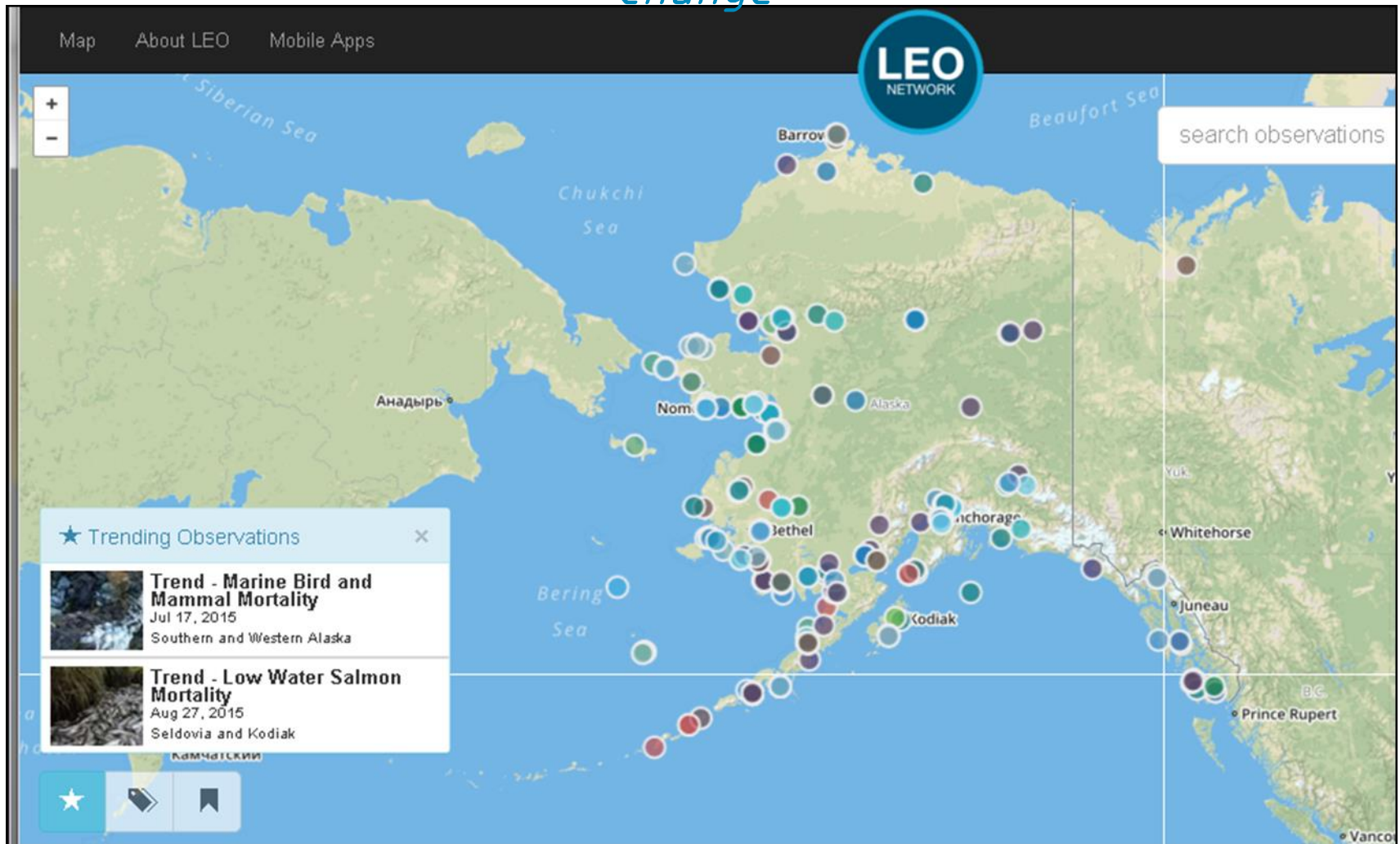
Local Environmental Observer (LEO) Network

Through these three activities:

- Scanning for events in the press,
- performing local assessments,
- and working with the LEO Network



LEO: *The eyes, ears and voice of environmental change*





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OUR VISION:

**Alaska Native people are the
healthiest people in the world.**



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