Demonstration of Off-Grid Water Purification Systems

Neilroy Singer, Dine College, School of STEM

Introduction

- It is not economically feasible to extend water and electrical services from central infrastructure to off-grid-homes in many parts of the Navajo Nation.
- As much as 35% percent of Navajo Nation residents live in such off-grid locations.
- Off-grid residents generally haul water, often from unregulated sources of questionable quality. Water hauling requires time and significant effort.
- This project will:

1. Examine water quality in Monument Valley
2. Design, build and demonstrate use of household scale water treatment systems for Monument Valley (MV) residents.

PreliminaryResults

Analyte	EPA-MCL (µg/L)	Sand Springs	Iron Springs	Pine Springs
		Results (µg/L)	Results (µg/L)	Results (µg/L)
Arsenic	10	1.88	4.59	2.19
Uranium	30	4.23	4.54	1.05
Bacteria		**Results (MPN/100 mL)**	**Results (MPN/100 mL)**	**Results (MPN/100 mL)**
Coliform		>2419.6	488.4	325.5
E coli		< 1.0	< 1.0	< 1.0

Material/ Methods

MV cisterns (water tanks) exist near community natural spring locations.
Raw water samples will be characterized in terms of bacteriological quality using IDEXX Quanti-tray system and API strip methods.
Effects of water storage practices (length and manner of storage) on bacteriological quality will be determined.
Candidate filtration/UV disinfection units will be installed to control microorganisms present in raw and stored waters.
Project will install and evaluate 2 or more home scale ultraviolet (UV) water purification systems for demonstration purposes.

Discussion

Solar-driven water purification systems will be designed for single-home needs while producing excess energy for home illumination.
If chemical water quality is satisfactory, UV treatment alone can meet potable water quality requirements.
Project will provide two or more water purification systems for areas of MV not connected to central infrastructure.
Project team will monitor these units, make related design and/or operational simplifications, better document and simplify user instructions, redeploy the units, and closely observe their operation in the field.