

# APPENDIX B

EASTERN UNIT OF THE UTAH  
CHAPTERS OF THE NAVAJO NATION



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## 1 INTRODUCTION

This study focuses on communities in the eastern unit of the Utah chapters of the Navajo Nation: Montezuma Creek, Aneth, and Red Mesa. Alternatives were considered to provide sustainable water to each of the above areas, as well as provide water sources in closer proximity to those who currently do not have water readily available. Existing water sources, distribution systems, and transmission lines were analyzed in reference to previous reports and summarized in this study. Subsequently, proposed project alternatives with cost estimates and recommendations are also included. Recommendations are listed in order of priority and should be reevaluated as necessary. See **Table 1** below for corresponding costs for each project listed in order of what is understood to be the highest priority.

Table 1 - Project Summary

Project Name	Description	Estimated Cost
Montezuma Creek Distribution Improvements	Includes providing fill stations, adding transmission line, and providing better hydraulic functionality to the Montezuma Creek area.	\$ 21,501,000.00
Aneth to Red Mesa	A transmission line that would connect Aneth, Montezuma Creek and Red Mesa	\$ 43,316,000.00
Montezuma Creek Water Treatment Plant	Add a water treatment plant at Montezuma Creek to add source capacity to system.	\$ 7,204,000.00
Connecting Aneth, Red Mesa & Mexican Water	Transmission lines that will connect water systems in Aneth, Red Mesa, and Mexican Water to increase reliability of system and hydraulic performance.	\$ 20,354,000.00

## 2 ANALYSIS/DESIGN CRITERIA

Water usage was unknown for the areas analyzed, therefore, the minimum sizing standards outlined in Utah Admin Code (UAC) R309-510 were used to estimate sizing requirements. To gain a better understanding of system demands, it is recommended to install water meters to monitor water usage throughout the system. It is also recommended to create a hydraulic water model that would evaluate water age, existing pipe network hydraulics, and buildout scenarios.

It is recommended that NTUA and the Navajo Nation plan for future system specific capital facility plans. These plans help to identify deficiencies and make plans to improve water supply, quality and distribution for future buildout and growth. More insight and data for each system individually will allow better decisions to be made for more sustainable water infrastructure throughout Navajo Nation.

## 3 EXISTING CONDITIONS

### 3.1 Existing Water Sources

Water sources include the San Juan River, shallow wells and horizontal wells. The wells should be evaluated to determine current equipment conditions and flow capacity. Additional evaluation is recommended to better understand the horizontal wells to determine if rehabilitation or replacement is necessary. There are currently 31 water rights on the Utah side of the Navajo Nation. There are additional federal reserved water rights and the current state of those are unknown at the time of this study. The groundwater in that region is known to contain high arsenic levels which requires reverse osmosis water treatment before it can be used. The San Juan River is known for high levels of Turbidity, Total Suspended Solids, and Total Dissolved Solids. Because of those high levels, Reverse Osmosis or Ultra-Filtration are typically required and would be recommended to treat water from the river.

### 3.2 Existing Distribution System

The different existing distribution system consists of mainly PVC pipes ranging from 2 to 8-inches. Currently the pipe condition, installation date, and total lengths are unknown. It is anticipated that new lines will need to be installed as the system grows. The deficiencies of the existing system include source capacity, pipe size, aging pipes, and insufficient storage and treatment. Homes not connected to the system travel long distances and invest a great deal of time and energy into transporting water to their homes. The water is then added to cisterns or used directly from the fill tanks.

## 4 PROPOSED PROJECTS

This study considered four different projects to improve access to water across the eastern side of the Utah chapters of Navajo Nation. Each project focuses on improving source capacity, system hydraulics, or water quality. The four projects discussed are intended to provide a baseline of improvements to the different systems, allowing for immediate improvements in each system. These projects are discussed in detail in the following sections, cost estimates associated with these projects are found in Appendix B.2.

### 4.1 Montezuma Creek Distribution Improvements

This project includes providing fill stations, adding transmission line, and providing better hydraulic functionality to the system. It is proposed to add three fill stations and three 30,000-gallon tanks to provide water to those further than half of a mile from main lines. This would help make water more accessible to at least 79 homes near Montezuma Creek. The proposed locations of these fill stations are shown in Appendix B.1. The fill station is manufactured by Aquaflow International; this system is currently used by NTUA and allows for easy user access, flow metering, and a payment method. The total length of pipe for this alternative is approximately 13 miles. This proposed transmission line would cross the San Juan River, see section 4.1.1 for more information on the river crossing. It is estimated to cost \$21,501,000 to add this line which includes piping, bridge crossing, fill stations, and other improvements. The cost estimate can be found in Appendix B.2. The cut sheets for the fill station as well as the cost estimates from the manufacturer are shown in Appendix B.2.

#### 4.1.1 San Juan River Pipe Crossing

This project includes constructing an overhead river crossing of the San Juan River. This would be a valuable aspect of the transmission line for the existing and proposed systems and would cost approximately \$500,000 dollars at the time of this report. See appendix B.3 for the detailed cost estimate from Contech. This river crossing would be a critical project to ensure water demands are met for communities on either side of the river. This piece of infrastructure is also a part of Alternative 2B below, which would help to connect more communities and supply more water to those that are going without.

### 4.1.2 Environmental Requirements

The proposed Montezuma Creek Improvements would likely require a National Environmental Policy Act (NEPA) analysis, which is anticipated to be an Environmental Assessment (EA)-level analysis. A cultural resource inventory would be required along the pipeline corridor. In coordination with funding agencies and the Navajo Nation Department of Fish and Wildlife (NNDFW) and Navajo Natural Heritage Program (NNHP), a Biological Evaluation document would need to be prepared to address potential impacts to federally listed species; however, no adverse impacts to federally listed species are anticipated. The proposed pipeline alignment would cross at least one ephemeral channel and the San Juan River; even though the river crossing would be overhead, pipeline trenching may be required within the river floodplain, which may be considered wetlands. An aquatic resource delineation and CWA Section 404 permitting with the U.S. Army Corps of Engineers may be required, depending on the design of the crossings; however, no compensatory mitigation requirements are anticipated. A CWA Section 401 Certification would likely be required. Coordination would be required with the funding agency, the Navajo Nation, and Bureau of Indian Affairs (BIA). During construction, a stormwater pollution prevention plan (SWPPP) would likely be required. Region IX of the Environmental Protection Agency (EPA) oversees section 402 permits for stormwater management.

### 4.2 Aneth to Red Mesa

The second proposed project is to add a transmission line that would connect Aneth, Montezuma Creek and Red Mesa. This would be fundamental in creating a reliable water supply and setting the foundation for more connections to be made in the future. This would allow for a reliable water source south of the Montezuma Creek area in the event the San Juan River does not yield sufficient flows. This proposed project exhibit can be found in Appendix B.1. The estimated cost of this proposed project is \$43,316,000. This project would include adding 115,000 linear feet of 12" pipe with appurtenances, five booster stations, two fill stations, three storage tanks and 25 miles of 3-phase power lines. This proposed project assumes the amount of available water is sufficient, which would need to be verified through additional analysis. A detailed cost estimate for this project is shown in Appendix B.2.

#### 4.2.1 Environmental Requirements

The Aneth to Red Mesa Project would likely require a NEPA analysis, which is anticipated to be an EA-level analysis. A cultural resource inventory would be required along the pipeline corridor. In coordination with funding agencies and the NNDFW and NNHP, a Biological Evaluation document would need to be prepared to address potential impacts to federally listed species; however, no adverse impacts to federally listed species are anticipated. The proposed pipeline alignment would cross at multiple ephemeral channels and the San Juan River; even though the river crossing would be overhead, pipeline trenching may be required within the river floodplain, which may be considered wetlands. An aquatic resource delineation and CWA Section 404 permitting with the U.S. Army Corps of Engineers may be required, depending on the design of the crossings; however, no compensatory mitigation requirements are anticipated. A CWA Section 401 Certification would likely be required. Coordination would be required with the funding agency, the Navajo Nation, and BIA. During construction, a SWPPP would likely be required. Region IX of the EPA oversees section 402 permits for stormwater management.

### 4.3 Montezuma Creek Water Treatment Plant

The third proposed project is to add a water treatment plant at Montezuma Creek. This treatment plant would provide clean water to residents from Aneth to Montezuma. Adding source capacity in this area would be critical to ensure that other systems downstream have access to clean water. Due to anticipated high levels of turbidity, TDS and TSS, extensive levels of treatment would be required including reverse osmosis.

This treatment plant would be sized according to current and future demands. Due to minimal data on the water usage in the area at the time of this report, it was assumed via UAC R309-510, that a treatment plant would need to provide 800 GPM to meet the needs of Montezuma Creek and Aneth. An exhibit for this project is shown in Appendix B.1. The cost of this treatment plant was estimated to be \$7,204,000, this includes a new building, piping and appurtenances, and the facility parking lot. This estimate assumes that power is onsite and available to use. A detailed cost estimate can be found in Appendix B.2.

#### **4.3.1 Environmental Requirements**

The Montezuma Creek Water Treatment Plant would likely require a NEPA analysis, which is anticipated to be an EA-level analysis. A cultural resource inventory would be required for any proposed new structures or site improvements. In coordination with funding agencies and the NNDF and the NNHP, a Biological Evaluation document would need to be prepared to address potential impacts to federally listed species; however, no adverse impacts to federally listed species are anticipated. No impacts to Waters of the U.S. are anticipated due to the lack of channel crossings at the site and the position of the site above the San Juan River floodplain. No CWA Section 404 permitting requirements are anticipated; however, a CWA Section 401 Certification would likely be required. Coordination would be required with the funding agency, the Navajo Nation, and BIA. During construction, a SWPPP may be required if there is an acre or more of disturbance. Region IX of the EPA oversees section 402 permits for stormwater management.

#### **4.4 Connecting Aneth, Red Mesa & Mexican Water**

The fourth proposed project is to add three transmission lines to help the system hydraulically by creating large, looped lines which would connect multiple systems. This would allow the area to better distribute the cost and provide a better system overall. This project would connect water systems in Aneth, Red Mesa, and Mexican Water. This system would be more advanced but would allow for reliable water for the area. A fill station would also be included in the Mexican Water chapter which would provide potable water to more residents. NTUA uses fill stations provided by Aquaflow International, these fill stations are recommended to keep the system consistent. This would allow for the area to share the costs of operation and maintenance and be set up to provide reliable water. Adding reliable source capacity to each system is of great importance. The greater the source capacity within a system, the more individuals that system can expand to serve. The total length of pipeline for this alternative is approximately 14 miles. It is estimated to cost \$20,354,000, the cost estimate in Appendix B.2 includes the pipeline and appurtenances, and booster stations.

#### **4.4.1 Environmental Requirements**

Connecting the Aneth, Red Mesa and Mexican Water systems would likely require a NEPA analysis, which is anticipated to be an EA-level analysis. A cultural resource inventory would be required along the pipeline corridor. In coordination with funding agencies and the NNDFW and NNHP, a Biological Evaluation document would need to be prepared to address potential impacts to federally listed species; however, no adverse impacts to federally listed species are anticipated. The proposed pipeline alignment would cross at multiple ephemeral channels and the San Juan River; even though the river crossing would be overhead, pipeline trenching may be required within the river floodplain, which may be considered wetlands. An aquatic resource delineation and CWA Section 404 permitting with the U.S. Army Corps of Engineers may be required, depending on the design of the crossings; however, no compensatory mitigation requirements are anticipated. A CWA Section 401 Certification would likely be required. Coordination would be required with the funding agency, the Navajo Nation, and BIA. During construction, a SWPPP would likely be required. Region IX of the EPA oversees section 402 permits for stormwater management.

## **5 WATER QUALITY**

Each alternative includes important updates to existing infrastructure. One consideration that is important to each alternative is the water quality and age when being piped over long distances with little to no use in between point A and point B. A general guideline is to maintain water that is less than 7 days old, from treatment to use. Water that has exceeded that 7-day limit is susceptible to bacterial growth, affecting users downstream.

In April of 2016 Carollo was contracted to conduct an investigation into water quality. Part of that study highlighted water quality concerns with water drawn from the San Juan River, where water would be drawn for the proposed water treatment plant. This study found that Ultra-Filtration worked very well when coupled with pretreatment to properly treat the water.

## **6 CONCLUSION & RECOMMENDATIONS**

In conclusion additional flow and demand data is needed. It is recommended to meter all connections and key locations to better understand the overall systems and how they work currently. The proposed projects will increase the water availability in the area and improve the hydraulics for the systems. The recommendations below are intended to act as a baseline for the next phase of planning and design.

1. Verify water rights are in order from both state and Federal rights.
2. Install meters to collect flow data to update design requirements.
3. Conduct an evaluation of the existing system including well capacities, treatment system evaluations, PRV checks, and visual inspection on all tanks.
4. Update pipes in GIS or similar software to include pipe diameter, length, installation year, material, and location.
5. Build hydraulic water model and identify deficiencies throughout distribution system