APPENDIX C

UTAH INDIVIDUAL CHAPTER IMPROVEMENTS

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1 INTRODUCTION

This study addresses each Utah chapter of the Navajo Nation individually. The study focused on project alternatives to provide sustainable water to the remote areas of each chapter where there is currently not a water system. 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. **Table 1** summarized each chapter's estimated costs for projects, as well as homes benefitted by each project. The Navajo Nation's Utah chapters, encompassing Aneth, Red Mesa, Teec Nos Pos, Mexican Water, Dennehotso, Oljato, and Navajo Mountain, are characterized by vast, sparsely populated landscapes. This geographic dispersion has resulted in a significant water access gap. Many residents rely on water hauling from distant fill stations, a time-consuming and unsustainable practice that places a heavy burden on families and communities. This reliance on hauled water also carries potential health risks due to storage and transportation challenges.

The central focus of this report is to propose various project alternatives to address these deficiencies. These alternatives include pipeline extensions, tank connections, booster pump installations, and the development of entirely new water systems. Each proposed project is accompanied by detailed cost estimates, allowing for informed decision-making and strategic planning.

Table 1 - Summary of Estimated Costs for Each Chapter's Project

Chapter	Description of Projects	Estimated Cost	Homes Benefitted	Cost Per Home
Aneth	Connection from the Aneth North Tank to the Montezuma Tank #2, and an extension along McElmo Creek	$ 11,800,000	22	$ 536,364
Red Mesa	Connection to the waterline near the Red Mesa Senior Center and be routed strategically towards the Todahaidekani South Tank	$ 7,581,000	6	$ 1,263,500
Teec Nos Pos	Includes a pipeline approximately 19,250 feet long to connect to 5 homes	$ 2,744,000	5	$ 548,800
Mexican Water	Includes a connection to the Todahaidekani North Tank and 70,000 feet of pipe.	$ 14,456,000	33	$ 438,061
Dennehotso	Connection to the existing pipeline north of the Arizona state line and routing a pipeline on top of the mesa to connect to various homes.	$ 9,584,000	13	$ 737,231
Oljato	Projects would total approximately 58,000 linear feet of pipeline, as well as a new storage tank and three booster pump stations.	$ 12,875,000	81	$ 158,951
Navajo Mountain	Construct an entirely new water system for 22 homes not connected to existing Navajo Mountain's system.	$ 9,000,000	22	$ 409,091

2 ANALYSIS/DESIGN CRITERIA

Water usage was unknown for the areas analyzed; therefore, the minimum sizing standards outlined in Utah Administrative Code (UAC) R309-510 were used to estimate sizing requirements. To gain a better understanding of system demands, water meters should be installed to monitor water usage throughout the system. A hydraulic water model should be created that would evaluate water age, existing pipe network hydraulics, and build-out scenarios. UAC R309-510 also provides design guidelines for sizing a distribution system and all components. The minimum required Peak Day Demand is 800 gallons per day (gpd) per equivalent residential connection (ERC); the minimum required Average Day Demand is 400 gpd per ERC. These minimum standards identify what would be required for infrastructure improvements throughout the different chapters of the Navajo Nation in Utah.

3 EXISTING CONDITIONS

Each chapter has centralized communities that have access to water through various pipe networks. However, many residents within each chapter live in remote locations and do not have readily available water. A large proportion of Navajo Nation residents must travel several miles to a fill station in order to acquire water that must then be hauled back to their residences. The water is then stored in cisterns or used directly from the fill tanks.

The existing distribution systems consist of mainly PVC pipes ranging from 2 to 8 inches in diameter. Currently, the pipe condition, installation date, and total lengths are unknown. New lines will likely need to be installed as the systems grow. The deficiencies of the existing systems include source capacity, pipe size, aging pipes, and insufficient storage and treatment.

4 INDIVIDUAL CHAPTER SUMMARIES & RECOMMENDATIONS

4.1 Aneth

There are several projects that have been identified in Report 3 "Eastern Unit of the Utah Chapters of the Navajo Nation" to improve water supply and accessibility in the Aneth Chapter. Additional improvements and recommendations would be to conduct an inventory of pipe sizes and their condition. This would provide insight into areas within the chapter that need updates. A hydraulic water model could provide additional insight into how to optimize flow to the more remote areas of the system and ensure necessary pressures are met throughout the system.

Creating system-specific water models and future build-out plans can help NTUA and the Navajo Nation chapters stage and plan improvements. This would also help to identify areas with low pressure or low flow. Two potential additional projects were analyzed to loop lines and to deliver potable water to more remote areas. The larger of the two projects would connect the Aneth North Tank to the Montezuma Tank #2, with the smaller project being an extension along McElmo Creek. These two projects would benefit approximately 22 homes, with an estimated cost of 11,800,000; the detailed cost estimate is provided in 0 D.

4.2 Red Mesa

The Red Mesa chapter has multiple projects outlined in Report 3 "Eastern Unit of the Utah Chapters of the Navajo Nation". In addition to those recommended updates, another project has been included in this report for this chapter. This additional project would connect to the waterline near the Red Mesa Senior Center and be routed strategically towards the Todahaidekani South Tank, connecting to multiple homes along the way. Figure 1 below shows the Todahaidekani South Tank and highlights the potential difficulties of constructing a pipeline in that area. Roughly 51,000 linear feet of pipe would be required for this alternative, benefitting 6 homes directly while adding hydraulic benefits to two other systems. This project is estimated to cost approximately $7,581,000, the detailed cost estimated is located in Appendix D.

4.3 Teec Nos Pos

The Teec Nos Pos Chapter's improvements to get water supply to a more remote area would include a pipeline approximately 19,250 feet long to connect to 5 homes. This project would be anticipated to require a PRV vault and cost approximately $2,744,000. A detailed cost estimate is included in Appendix D. Other improvements for this chapter would include a pipe size inventory and potential upgrades to existing infrastructure. Most pipes within the system appear to be undersized for what is typically recommended.

Figure 1 - Todahaidekani South Tank

4.4 Mexican Water

There are two recommendations for this chapter to improve water supply to remote areas within Mexican Water. Both of these project alternatives connect to the Todahaidekani North Tank, because of the increased demand on this tank it would be recommended to add a storage tank. These two pipelines totaling 70,000 linear feet for this alternative would serve approximately 33 homes. The estimated cost for this project is approximately $14,456,000, the detailed cost estimated is included in Appendix C.

4.5 Dennehotso

The improvement for Dennehotso would be to connect to the existing pipeline north of the Arizona state line and routing a pipeline on top of the mesa to connect to various homes. This alternative would include approximately 43,000 linear feet of pipeline and serve 13 homes. A new concrete storage tank as well as two booster stations would be anticipated. The estimated cost for this alternative is $9,584,000, the detailed cost estimate is located in Appendix C.

4.6 Oljato

The Oljato chapter has multiple projects outlined in the Western Unit report. Two additional pipelines are recommended to supply water to multiple homes within this chapter. This chapter's projects would total approximately 58,000 linear feet of pipeline, as well as a new storage tank and three booster pump stations. The recommended improvements would serve approximately 81 homes, which is the most homes benefitted from any of the previous projects outlined in this section of the report. The anticipated cost for this project would be $12,875,000, the detailed cost estimate is in Appendix C.

4.7 Navajo Mountain

Within the Navajo Mountain Chapter, there are approximately 22 homes not connected to the Navajo Mountain water system. The improvement for this system would be to construct an entirely new water system for those 22 homes, including 49,000 linear feet of pipe, a new water source, a new storage tank, and a PRV vault. This project is estimated to cost $9,000,000; the detailed cost estimate is included in Appendix D "Cost Estimates"

5 CONCLUSION AND RECOMMENDATIONS

This study has provided a comprehensive assessment of the urgent need for sustainable water solutions across the Utah chapters of the Navajo Nation, focusing specifically on extending water access to remote, underserved communities. The analysis, detailed in the preceding sections, reveals a critical disparity in water availability. By examining existing infrastructure, identifying deficiencies, and proposing targeted project alternatives, this report aims to provide a roadmap for addressing these critical water needs.

The project alternatives presented, ranging from pipeline extensions and tank connections to entirely new water systems, were developed based on the unique challenges and requirements of each chapter. The estimated costs, while substantial, underscore the magnitude of the infrastructure deficit and the necessity for significant investment. Future phases of project development should prioritize a thorough environmental review to ensure the sustainability and minimal impact of these infrastructure improvements.

This report highlights the critical need for comprehensive data collection and system modeling. Implementing water metering and developing hydraulic water models, as recommended for Aneth and other chapters, will provide invaluable insights for optimizing system performance, identifying leaks, and planning future expansions. A systematic inventory of pipe sizes and conditions, a recommendation that should be applied to all chapters and not just Aneth, is also essential for proactive maintenance and infrastructure upgrades.

Prioritization of these projects should be guided by a multi-faceted approach, considering not only cost-effectiveness but also the severity of existing water shortages, the potential for community impact, and the long-term sustainability of each solution. The recommendations presented are intended to serve as a starting point, and should be regularly reevaluated based on evolving needs, funding availability, and technological advancements.

In conclusion, this study serves as a critical step toward ensuring equitable access to safe and reliable water for all residents of the Utah chapters of the Navajo Nation.

Utah Navajo Water Settlement Planning