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November 3, 2014

Derril Gleim, President
East Culpepper Flats
Domestic Water Consumer Association
108 Llano Street
Aztec, New Mexico 87410

RE: **Review of Final East Culpepper Flats Domestic Water Consumers Association Preliminary Engineering Report, September 2014 (NMFA 3071-PG)**

Mr. Gleim:

The New Mexico Environment Department (NMED) Construction Programs Bureau (CPB) has reviewed the Final East Culpepper Flats Domestic Water Consumers Association Preliminary Engineering Report (PER) which was prepared by Forsgren Associates, Inc. and received on October 28, 2014. The final PER adequately addresses the comments in the review letter dated September 17, 2014 and the NMED CPB hereby recommends approval of the PER.

If you have any questions or comments, please contact me at 505.222.9567 or david.bishop@state.nm.us.

Sincerely,

David E. Bishop, P.E.
Project Manager
New Mexico Environment Department
Construction Programs Bureau
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Albuquerque, NM 87109
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cc: Jennifer M. Walter, P.E., Forsgren Associates, Inc.
Jim Perry, Sr. Program Administrator, LGPF, NMFA
File

**East Culpepper
Flats Domestic Water
Consumers Association**

**WATER SYSTEM
IMPROVEMENTS**

**PRELIMINARY
ENGINEERING REPORT**

SEPTEMBER 2014

FORSGREN
Associates Inc.

WATER SYSTEM
PRELIMINARY ENGINEERING REPORT

FOR

East Culpepper Flats Domestic Water Consumers Association,
NM

108 Llano Street

Aztec, NM 87410

505-334-1500

BY

FORSGREN ASSOCIATES, INC.

4110 Cutler NE

Albuquerque, NM 87110

505-814-2796

FA Project 06-14-0040

This report was developed under the direct supervision and direction of the undersigned, whose seal as a Professional Engineer, licensed to practice in the State of New Mexico, is affixed below.

Jennifer Walters, PE

License No.

Water System Preliminary Engineering Report
East Culpepper Flats DWCA, NM
TABLE OF CONTENTS

1. GENERAL INTRODUCTION
 - a. Purpose of Report
 - b. Scope of Report
2. PROJECT PLANNING
 - a. Location
 - b. Environmental Resources Present
 - c. Population Trends
 - d. Community Involvement
3. EXISTING FACILITIES
 - a. Utility History
 - b. Utility System Map
 - c. Condition of Existing Facilities
 - d. Financial Status of any Existing Facilities
 - e. Water/Energy/Waste Audits
4. NEED FOR PROJECT
 - a. Health, Sanitation, and Security
 - b. Aging Infrastructure
 - c. Reasonable Growth
 - d. ISO Fire Suppression Rating Schedule
5. ALTERNATIVES CONSIDERED
 - a. Descriptions
 - b. Design Criteria
 - c. Map
 - d. Environmental Impacts
 - e. Land Requirements
 - f. Potential Construction Problems
 - g. Sustainability Considerations
 - i. Water and Energy Efficiency
 - ii. Green Infrastructure
 - iii. Other
 - h. Cost Estimate
 - i. Advantages and Disadvantages
6. SELECTION OF ALTERNATIVE
 - a. Life Cycle Cost Analysis
 - b. Non-Monetary Factors
7. PROPOSED PROJECT (RECOMMENDED ALTERNATIVE)
 - a. Preliminary Project Design
 - b. Project Schedule
 - c. Permit Requirements
 - d. Sustainability Considerations
 - i. Water and Energy Efficiency
 - ii. Green Infrastructure

- iii. Other
 - e. Total Project Cost Estimate (Engineer’s Opinion of Probable Cost)
 - f. Annual Operating Budget
 - i. Income
 - ii. Annual O&M Costs
 - iii. Debt Repayments
 - iv. Reserves
8. CONCLUSIONS AND RECOMMENDATIONS
- a. Conclusion
 - b. Recommendations

LIST OF FIGURES

- Figure 1: Project Planning Area
- Figure 2: Location Map
- Figure 3: Existing System Schematics
- Figure 4: Ground Storage Tank
- Figure 5: Map of Alternate 2, Installing a Well
- Figure 6: Map of Alternate 3, North Star & Booster Pump
- Figure 7: Map of Alternate 4, Upper La Plata & Booster Pump
- Figure 8: Map of Alternate 5, North Star, Upper La Plata & Booster Pump

LIST OF TABLES

- Table 1: Endangered Species List, San Juan County, NM
- Table 2: San Juan County, NM Population Project
- Table 3: O&M Cost Estimate – Alternative 1, Do Nothing
- Table 4: Cost Estimate - Alternate 2, Installing a Well
- Table 5: O&M Cost Estimate -Alternate 2, Installing a Well
- Table 6: Cost Estimate - Alternate 3, North Star & Booster Pump
- Table 7: O&M Cost Estimate - Alternate 3, North Star & Booster Pump
- Table 8: Cost Estimate - Alternate 4, Upper La Plata & Booster Pump
- Table 9: O&M Cost Estimate - Alternate 4, Upper La Plata & Booster Pump
- Table 10: Cost Estimate – Alternate 5, North Star, Upper La Plata & Booster Pump
- Table 11: O&M Cost Estimate – Alternate 5, North Star, Upper La Plata & Booster Pump
- Table 12: Life Cycle Project Costs
- Table 13: Total Project Costs

LIST OF APPENDICES

- Appendix 1 Meeting Minutes for PER
- Appendix 2 SDWIS Report for North Star & Upper La Plata
- Appendix 3 US EPA Consumer Confidence Report
- Appendix 4 East Culpepper Board Information and Rates
- Appendix 5 Well Logs for San Juan County
- Appendix 6 U.S. Fish and Wildlife Services endangered species report for San Juan County
- Appendix 7 USDA Soil Resource Report for E. Culpepper
- Appendix 8 FIRM: Flood Insurance Rate Map, San Juan County

Appendix 9	Population Estimates
Appendix 10	Northwest New Mexico Factbook 2012
Appendix 11	State ROW information on NM 574
Appendix 12	Property ownership along NM 574
Appendix 13	Asset Management Plan
Appendix 14	Preliminary Environmental Scoping Analysis

East Culpepper Flats DWCA Water System Preliminary Engineering Report

CHAPTER 1 – GENERAL INTRODUCTION

1. GENERAL INTRODUCTION

- a. Purpose of the Report.** This investigation is to evaluate the overall water system of East Culpepper Flats Domestic Water Consumers Associations (East Culpepper Flats DWCA). This investigation will identify the population served and potential growth that should be expected, existing facilities that are in use presently and develop needed replacements or expansion that may be required, resources to provide a permanent provider to the existing system and finally estimate costs of such improvements. Many of the improvement recommendations may be outside the realistic scope of future implementation, but are included to provide a future gauge to the costs that could be considered if funds are available.
- b. Scope of the Report.** This report follows the requirements of USDA RUS Technical Bulletin 1780-2, “Preliminary Engineering Reports for the Water and Waste Disposal Program”, latest edition dated April 4, 2013, as follows:

 - i.** Project Planning – Provides description of the Project Planning Area, environmental resources present affecting design, population trends, and community engagement.
 - ii.** Existing Facilities – Identifies existing facilities (wells, tanks, piping, pumps) that comprise the overall system and condition of the facilities, the demands and supplies of water to the customers, financial condition of the water system, and any audits that have been performed on the municipality.
 - iii.** Need for Project – Evaluates the need for improvement and specifics of improvement considering health/safety, age of the facilities, and expected future growth requirements.
 - iv.** Alternatives Considered – Identifies improvements for consideration to be conducted to the facilities in order to improve weaknesses of the system. Such alternatives would include comparative alternates that would perform the same improvement as well as singular alternatives that would provide overall improvement for the system. Capital costs would be included in the alternate considered.
 - v.** Selection of an Alternative – Considers life cycle cost analysis and non-cost evaluation of alternates in the final selection of a recommended alternative.
 - vi.** Proposed Project (Recommended Alternative) – Provides specific design criteria for the proposed project.
 - vii.** Conclusions and Recommendations – Identifies conclusions and recommendations for further action

CHAPTER 2 – PROJECT PLANNING

2. PROJECT PLANNING

- a. **Location.** East Culpepper DWCA is located in the north-west portion of the state of New Mexico approximately 9 miles northeast of Aztec. The Project Planning Area covers not only the existing infrastructure in East Culpepper, but also includes NM 574 from Upper La Plata to Aztec where most of the work would be taking place, as seen in Figure 1.

Elevations in the area vary from 5,623 ft. in Aztec, NM and 5,813 ft. in La Plata, NM with the East Culpepper Flats DWCA water tank elevation being approximately 6,300 ft. The entire Project Planning Area consists of topographical changes that will be factored accordingly upon design.

- b. **Environmental Resources Present.** The East Culpepper Flats DWCA service area is 1,103.38 acres in size accessed by mainly unpaved roads. This area consists of 44 land owners, currently serving 9 accounts. A preliminary environmental scoping analysis was performed for the project area by Animas Environmental Services, LLC. There are no national battlefield sites, national historic sites or parks, wilderness areas, national scenic trails, national grasslands, national forests, or Native American owned lands. Nor are there any national natural landmarks, national landmarks, national parks or monuments, or national wildlife refuges. Based on the current National Flood Insurance map there are wetlands in the project area and may need further evaluation.

The Project Planning Area running along NM 574 is currently being preliminary evaluated for environmental resources and impacts by Animas Environmental Services, LLC and that report will be added accordingly once findings are received.

Per the U.S. Fish & Wildlife Services, below are a list of species that are either endangered, candidates, proposed threatened within the Project Planning Area.

Group:	Name:	Status:
Birds	Yellow-billed Cuckoo	Proposed Threatened
	Southwestern willow flycatcher	Endangered
	Sprague's pipit	Candidate
Fishes	Colorado pikeminnow	Endangered
	Razorback sucker	Endangered
	Zuni bluehead Sucker	Proposed Endangered
Flowering Plants	Mancos Milk-vetch	Endangered
	Knowlton's cactus	Endangered
	Mesa Verde cactus	Threatened

Table 1: Endangered Species list, San Juan County, NM

An Environmental Information Document to describe the environmental resources and potential impacts of this project is not under way at the present time but may be required depending on the funding sources used for improvements. A copy of the Preliminary Environmental Scoping Analysis for East Culpepper Flats Drinking Water Distribution System Improvement Project is located in the Appendix 14.

c. Population Trends. Population for San Juan County reported in the 2010 census was 130,044 and is projected to increase to 175,678 residents in 2040. This is on average between 2010 and 2040 a 1% increase in population per year. The Project Planning Area consist of roughly properties served with roughly 9 active services. However, upon the availability of water, it can be anticipated to increase more quickly which factoring in increasing population this is equivalent to the addition of roughly 1 home per year in the Project Plan Area.

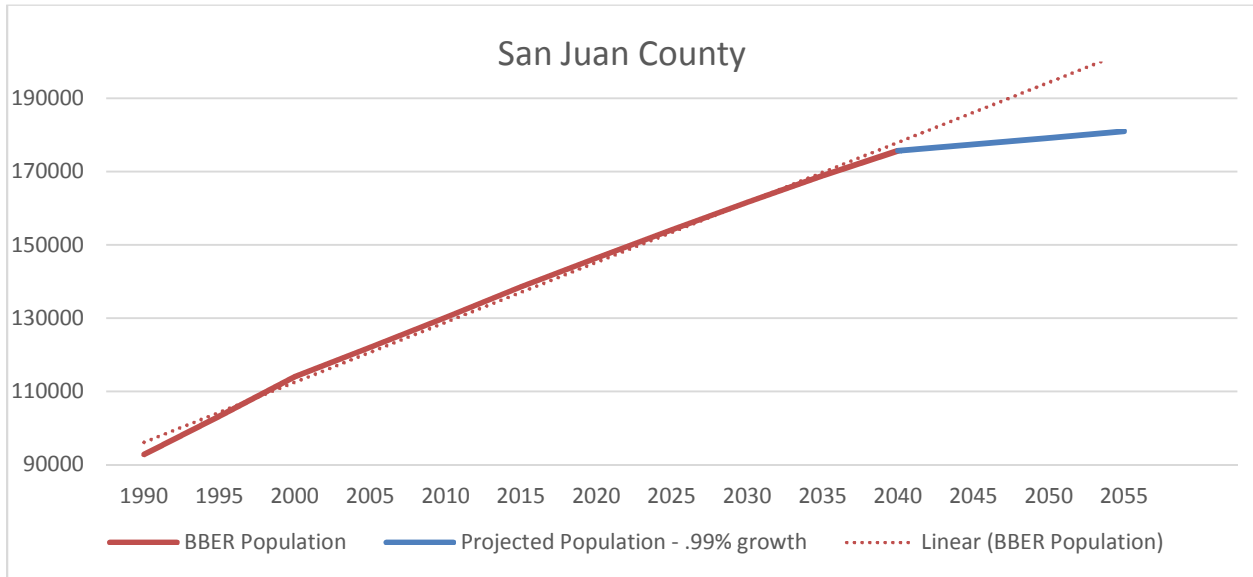


Table 2: San Juan County, NM Population Projection

d. Community Involvement. The East Culpepper Flats DWCA engages the community in the project planning process via regular communication with the users. In order to develop an understanding of the need for the project, utility operational service levels, funding and revenue strategies are conducted in formal and informal communications with their users.

Figure 1: Project Planning Area

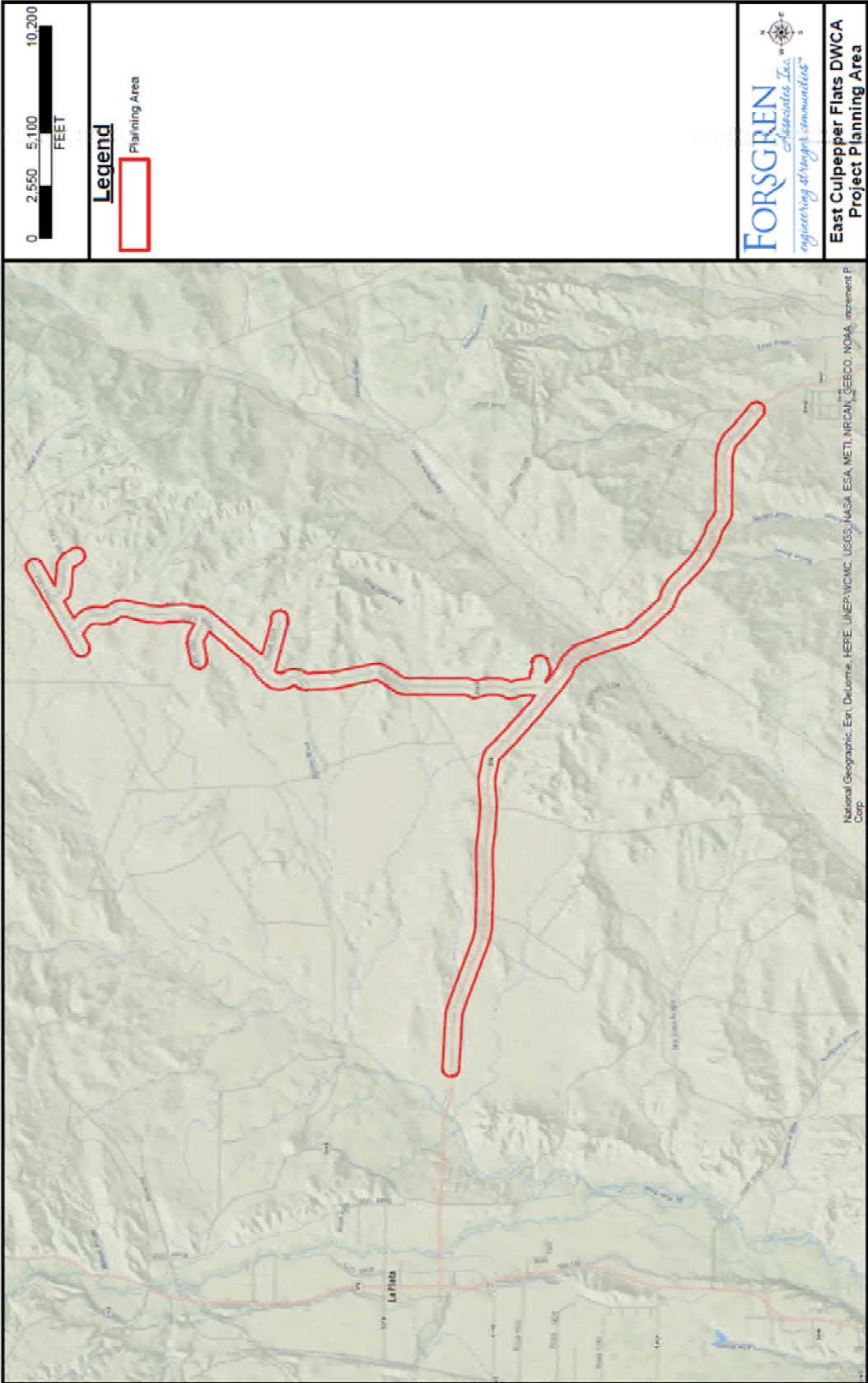
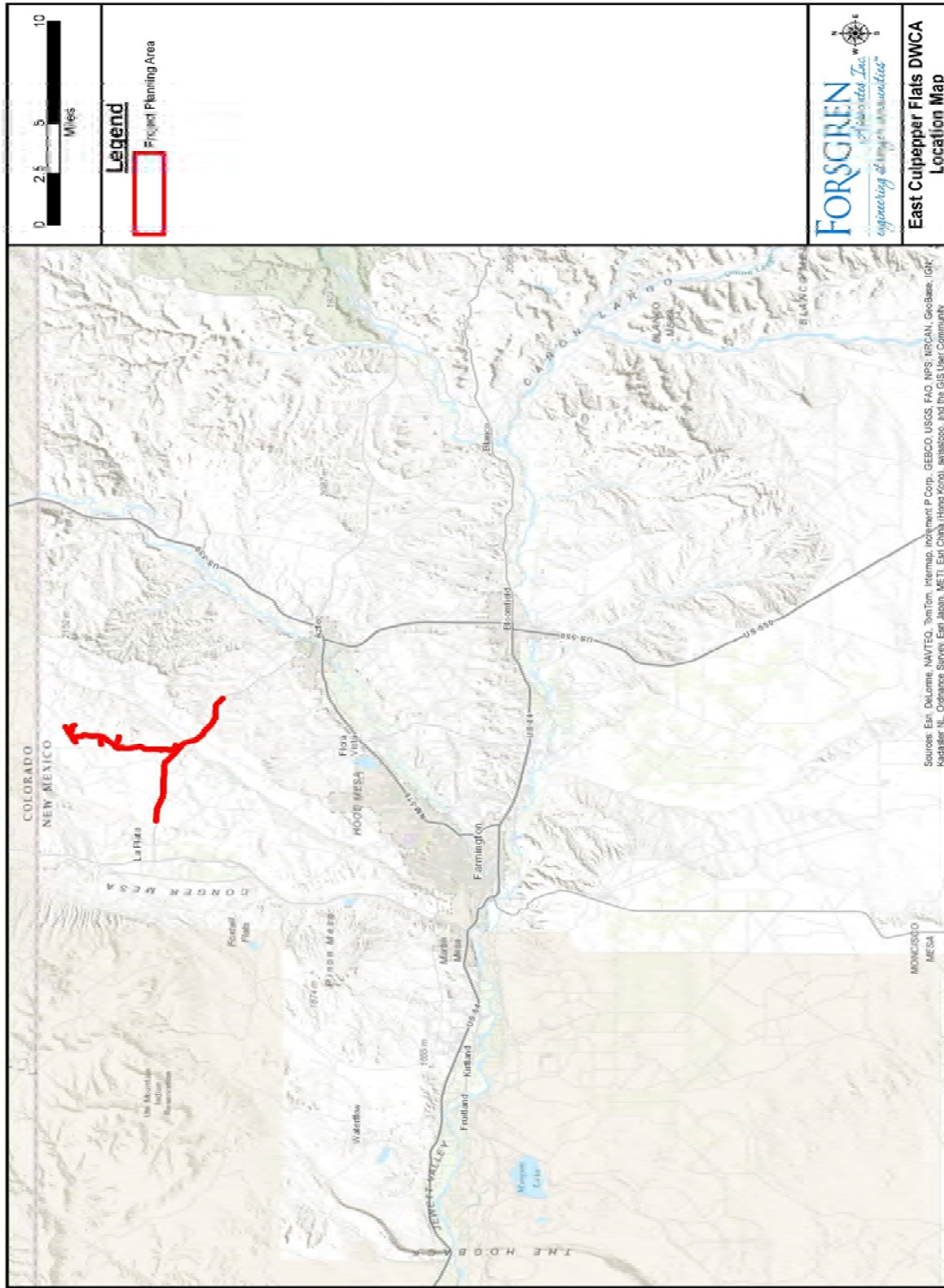


Figure 2: Location Map



CHAPTER 3 – EXISTING FACILITIES

3. EXISTING FACILITIES

- a. Utility History.** The utility began as the East Culpepper Flats Domestic Water Users Association, formed in 2012, and was formed so to provide water to the Hartley Springs Subdivision. Water is currently purchased from North Star Water Users Association and is trucked in by East Culpepper Flats DWCA members.

The current water system is 100% metered and has 9 active connections. There is no wastewater system in this area. There is only residential water use in the Project Planning Area with a minimum rate of \$165.82 for 6,000 gallons. These rates have been adjusted within the last 2 years.

High rates are due to the cost of manually bringing in water, minimal user accounts, and overall operations costs.

- b. Utility System Map.** Figure 3 provides an overview of the existing water system which includes a storage tank and water distribution system. Figure 8 presents a photograph of the 30,000 gallon ground storage tank which provides fire uses and distribution system use. The following assets are included within the utility itself (based on best available data and has been estimated where appropriate) :

i. Ground Storage Tank

- | | |
|--------------------------|---|
| 1. Capacity: | 30,000 gallons |
| 2. Dimensions: | 16' tall X 18' wide |
| 3. Type: | Welded Steel |
| 4. Constructed: | ~14 years ago (2000) |
| 5. Base Elevation: | 6,300 feet |
| 6. Construction Details: | Water is gravity feed into the joint distribution and fire system from this tank. |

The ground storage tank was installed in roughly 2002 and is currently being used to store water which is trucked in from local bulk water sources. The tank sits at an elevation of approximately 6,300 feet and is roughly .43 miles from Road 1980 near Aztec, NM.

ii. Water Lines:

- | | |
|--|------------------|
| 1. Size: 4" & 6" in diameter | |
| a. 4" diameter: | 2,320 LF |
| b. 6" diameter: | <u>32,722 LF</u> |
| c. Total Length: | 35,042 LF |
| 2. Materials of construction: | PVC-900 |
| 3. The existing water line system is limited to approximately 6.6 miles, centered generally along Road 1350 off of NM 574 and is all 6" diameter pipe. | |

The existing waterline currently provides water service to open residents from the existing ground storage tank. The entire system is approximately 6.6 miles in length with the southerly extent terminating a few hundred feet North of NM 574. The East Culpepper Flats DWCA recently acquired SAP funding to extend the distribution system to NM 574.

iii. Fire Hydrants:

- 1. Number:** 8
- 2. Type:** 6" Fire Hydrants

c. Condition of Existing Facilities: The current asset management plan can be found in the appendix for this utility. Conditions of the facilities are as follows:

- i. Ground Storage Tank:** Operational condition. The tank hasn't been inspected.
- ii. Water Lines/Valves:** Operational condition.
- iii. Water Truck:** Operational condition.
- iv. Fire Hydrants:** Good.

d. Financial Status of Existing System:

- iv.** Current rate schedule for East Culpepper Flats DWCA is a monthly minimum of \$53.82 flat rate with rates as follows (rates below include flat rate):
 - 1. 0-2,000 gal/mo. :** Between \$53.82 and \$75.82
 - 2. 2,000 gal/mo. – 4,000 gal/mo. :** Between \$75.82 and \$119.82
 - 3. 4,000 gal/mo. – 6,000 gal/mo. :** Between \$119.82 and \$165.82
 - 4. Over 6,000 gal/mo.:** \$165.85 and above.

These rates were gathered from the East Culpepper Flats DWCA Water Rate Board Approved March 4, 2014 changes.

- v. Annual Revenue:** Tier 2 utility, East Culpepper Flats DWCA files quarterly reports.
- vi. Annual O/M Costs:** Based on the financial information supplied from the "East Culpepper Flats DWCA Profit & Loss YTD Comparison" the annual O/M cost is \$11,797.74. A more detailed breakdown of this information can be found in the appendix.
- vii. Capital Improvement Plan:** Connect East Culpepper Flats DWCA water distribution system to the planned Regional Supply system. Ensure availability of safe water meeting all public safety requirements. Provide a safe accessible work environment and storage for water trucks, maintenance equipment, and water testing and treatment supplies. These Capital Improvement Goals are from the East Culpepper Flats DWCA "Infrastructure Capital Improvement Plan FY 2015-2019."
- viii. Existing Debts:** None to report.
- ix. Reserve Accounts:** A line item cost of \$15.42 is added to each customer's water bill until the reserve account reaches \$4,000. At that point the line item will be removed from their monthly bill. This line item along with rate changes went into effect on the March 2014 water bill.

e. Water/Energy/Waste Audits: There has been no water/energy/waste audits conducted on the utility.

Figure 3: Existing system schematic

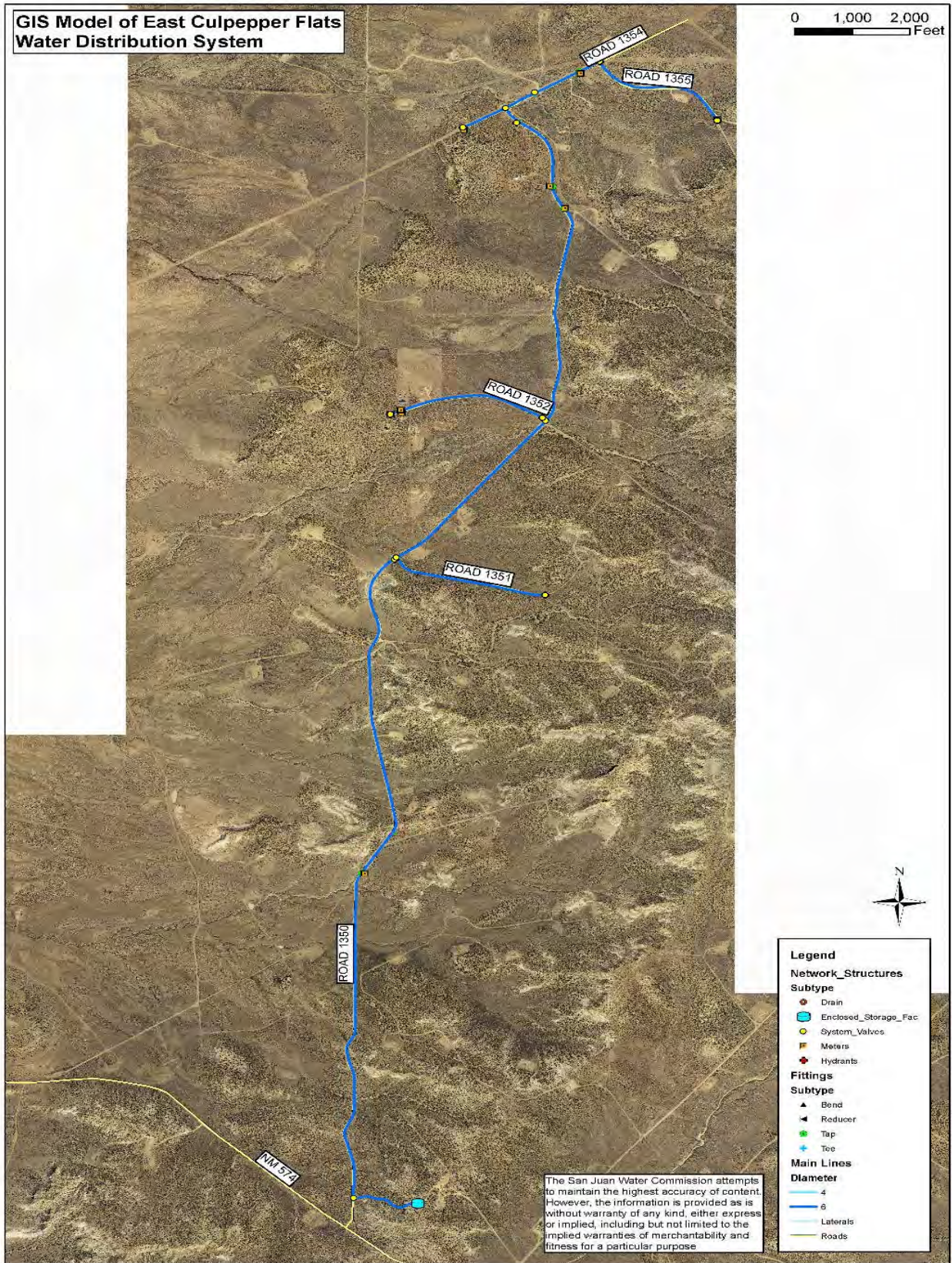


Figure 4: Ground Storage Tank



CHAPTER 4 – NEED FOR THE PROJECT

4. NEED FOR THE PROJECT

- a. **Health, Sanitation, and Security.** The water is tested for chlorine levels to assure required residuals and additional is added as needed. Since water is brought in directly from the North Star WCA, their water reports are used for quality assurance. The water is flushed through the hydrants on a monthly basis and is tested weekly. Outside of this there are no health, sanitation or security risks identified.
- b. **Aging Infrastructure.** The existing water system is approx. 14 years old, no specific evaluations have been made to determine water loss, storage needs, or safety concerns, since no deficiencies in these areas have been noted.
- c. **Reasonable Growth.** As presented previously, there is little growth potential for the East Culpepper Flats DWCA area specifically, however there is potential for customer growth within the entire Project Planning Area. There is the potential of growth throughout the project area and into other areas of the County and community.
- d. **ISO Fire Suppression Rating Schedule.** The Insurance Services Office (ISO) provides a standard against which communities and fire departments are measured. The Public Protection Classification (PPC) is a measurement on a 1 to 10 scale of the readiness of the firefighting capability of both the community and the fire department to protect the community. A lower PPC rating provides the opportunity to have lower insurance rates for residential and commercial property owners, so can be directly felt by the water system users. The PPC uses the Fire Suppression Rating Schedule (FSRS) to determine the PPC classification. The FSRS includes the following:

<u>FSRS Item</u>	<u>Percent of Total Rating</u>
i. Receiving and Handling Fire Alarms	
1. Receipt of Alarms by telephone	2%
2. Operators Provided vs Needed	3%
3. Alarm Dispatch Circuits	5%
ii. Fire Department	
1. Pumpers	10%
2. Reserve Pumpers	1%
3. Pump Capacity	5%
4. Ladders/Service	5%
5. Reserve Ladders/Service	1%
6. Distribution of Companies – Distance from Residences	4%
7. Company personnel – located at or remote from station	15%
8. Training	9%
iii. Water Supply	
1. Adequacy of Water supply – volume & number of hydrants	35%
2. Hydrants – Size, type, capacity	2%
3. Hydrants – inspection and condition	<u>3%</u>
Total: 100%	

The rating system, based on the FSRS scores, are as follows:

<u>PPC Rating</u>	<u>FSRS Percentage</u>
1	90% or more
2	80-89.99%
3	70-79.99%
4	60-69.99%
5	50-59.99%
6	40-49.99%
7	30-39.99%
8	20-29.99%
9	10-19.99%
10	0.00-9.99%

The scoring can be complicated and much more detailed than can be presented in this report. There was not a PPC rating given for East Culpepper Flats DWCA however adjacent communities within the county's ratings can be seen below for comparison. For more details and explanation of the FSRS rating system, please refer to.

This PPC rating is significant as a local issue because an improvement in the PPC score can lower insurance rates for all served by the system. Adjacent communities have scores as follows:

La Plata	6	Aztec	5
Farmington	4		

CHAPTER 5 – ALTERNATIVES CONSIDERED

5. Alternatives Considered

There are a variety of options that could be considered for improvements to the existing system. Thus, alternates for consideration include the following:

Alternative 1: Do Nothing.

Alternative 2: Installation of a Well.

Alternative 3: Install line connecting East Culpepper Flats DWCA to North Star Water Users Associations and Booster Pump.

Alternative 4: Install line connecting East Culpepper Flats DWCA to Upper La Plata and Booster Pump.

Alternative 5: Install line connecting East Culpepper Flats DWCA to both North Star Water Users Association and Upper La Plata and Booster Pump.

Alternative 1: Do Nothing

a. Description.

This alternative proposes to provide no permanent water infrastructure resulting in weekly trucking of water

b. Design Criteria.

No design criteria are required for this alternative.

c. Map.

A map is not required for this alternative.

d. Environmental Impacts.

No new environmental impacts will result from this alternative. Though any previously existing will still remain.

e. Land Requirements.

There are no land requirements for this alternative.

f. Potential Construction Problems.

There are no potential construction problems for this alternative.

g. Sustainability Considerations

i. Water and Energy Efficiency. There are no water/energy efficiencies for this alternative.

ii. Green Infrastructure. There are no Green components to this alternative.

iii. Other. There are no other sustainability considerations for this alternative.

h. Cost Estimate.

There are no additional costs for this alternative due to no changes being made.

Table 3: O&M Cost Estimate - Alternate 1, Do Nothing

Alternative 1: Do Nothing

Item / Description	Total Cost
Personnel (i.e. Salary, Benefits, Payroll Tax, Insurance, Training)	
Administrative Costs (e.g. office supplies, printing, etc.)	\$243.38
Insurance	\$413.20
Energy Cost (Fuel and/or Electrical)	\$2,471.18
Short Lived Asset Maintenance/Replacement	
Professional Services	
Miscellaneous	
Total Cost	\$11,797.74

i. Advantages and Disadvantages

The benefits of this alternative are:

- No project costs
- No debt is required

The disadvantages of this alternative are:

- Residents will still be required to haul water to the storage tank for distribution.

Alternative 2: Installation of a Well

a. Alternate Description.

This alternative is presented to consider installing a well near the existing storage tank to provide water directly to the tank thus providing a permanent water supply to East Culpepper Flats DWCA.

- **Well with Well House:** A new well with well house would be constructed to provide water. The well would have to be located near the water tank to supply water to the storage tank. The probability of the well producing sufficient water volume with good quality is not good due to poor quality wells located in this area.

b. Design Criteria

Design would follow NMED “Recommended Standards for Water Facilities” and construction would follow NM APWA “Standard Specifications for Public Works Construction”.

c. Map.

See Figure 7 Map of Alternate 2, Installing a Well, for the schematics and layout of new well.

d. Environmental Impacts.

None other impacts than temporary construction issues during the drilling of the well and installation of the well housing.

e. Land Requirements.

Private right-of-way may be needed depending on the exact location of the well and piping work that would need done to connect the well to the storage tank.

- **Well & Well House:** 1-2 acres site

f. Potential Construction Problems.

No construction problems of significance are anticipated.

- **Exact location of facilities:** If this alternative is chosen, the locations of the pipelines and well will need to be identified.
- **Rock excavation:** The extent of rock in the proposed areas is unknown.
- **Groundwater:** The depth of groundwater that will be encountered during construction is unknown.

g. Sustainability Considerations

- **Water and Energy Efficiency.** Water and energy would be utilized efficiently through larger diameter waterline during high flow conditions.
- **Green Infrastructure.** The infrastructure involved in this alternative would not exhibit ‘green’ infrastructure characteristics, although the facilities would improve the normal and peak fire demands of the system.
- **Other.** None

h. Cost Estimate.

Table 1 presents the estimated construction cost of installing a new well with an 8” transmission line near the existing ground water storage tank for East Culpepper Flats DWCA. Total Project Costs for this alternative is \$553,500 including water quality testing, construction costs and engineering costs, permit costs, and other additional resources needed. This alternative includes 5’ of transmission line installation. Depending on the amount of water flow generated from the well it can limit potential growth and usage of the facility, thus only temporarily fixing a potential long term problem. This cost of water service is not economically feasible and is therefore dropped from further consideration.

Table 4: Cost Estimate - Alternate 2, Installing a Well

Alternative 2: Installation of a well.

Item / Description	Unit	Quantity	Unit Cost	Total Cost
Deep Well with Pump House	LS	1	\$300,000	\$300,000
Pipeline to Distribution System (8")	LF	1000	\$30	\$30,000
Dispensing Station	LS	1	\$80,000	\$80,000
Sub-Total				\$410,000
Professional Services (Engineering, Legal, Permitting)			20%	\$82,000
Land/Easement Acquisition			10%	\$41,000
Contingency			5%	\$20,500
Total Cost				\$553,500

Table 5: O&M Cost Estimate - Alternate 2, Installing a Well

Alternative 2: Installation of a well.

Item / Description	Total Cost
Personnel (i.e. Salary, Benefits, Payroll Tax, Insurance, Training)	
Administrative Costs (e.g. office supplies, printing, etc.)	
Insurance	
Energy Cost (Fuel and/or Electrical)	
Short Lived Asset Maintenance/Replacement)	
Professional Services	
Miscellaneous	
Total Cost	

i. Advantages and Disadvantages

The benefits of this alternative are:

- Water supply is not shared

The disadvantages of this alternative are:

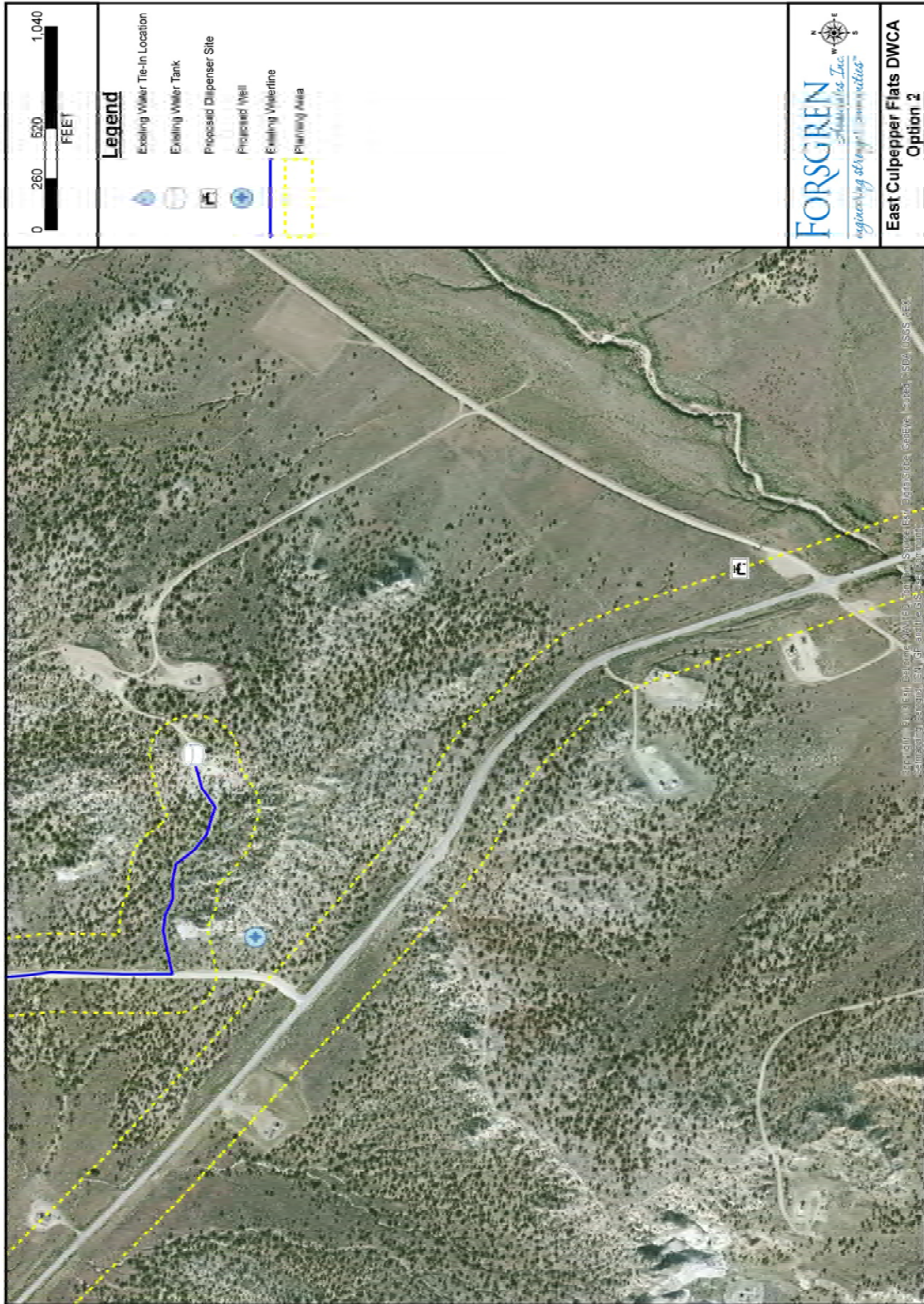
- High capital cost.

- Probability of constructing high volume, high quality well is not likely due to poor quality water wells in the area. Adjacent oil fields also contribute to the poor quality ground water. Well information was obtained from the Office of the State Engineer, see Appendix for well information.



Oil Field Equipment adjacent to Project Area.

Figure 5: Map of Alternate 2, Installing a Well



Alternative 3: Install line connecting East Culpepper Flats DWCA to North Star Water Users Associations and Booster Pump

a. Alternate Description.

The scope of this option is to construct a shared system with North Star, who is the neighboring water district to the south. North Star has expressed interest in serving the East Culpepper Flats DWCA area in the past, and may consider entering into an agreement to share or provide water to the Association. The main components of this alternative are discussed below:

- Construction of a pump station located near the North Star Pipeline connection. A new pump station will be constructed to convey the water to the existing water tank.
- Pipeline from North Star's line, near Aztec to tie into the existing 6" mainline owned by East Culpepper Flats DWCA located off of RD 1350 This pipeline will convey water in the most direct route possible (8" pipeline is proposed, approximately 22,757 feet long or approx. 4 miles).
- Dispensing Station: The dispensing (or bulk loading) station will be constructed at a location along NM 574 to provide water to the residents.

Approximately 22,757 lineal feet of 8" water mainline would be installed from the end of North Star's line, near Aztec, along NM 574 to tie into the existing 6" mainline owned by East Culpepper Flats DWCA located off of RD 1350. The end of North Star's line is marked by a red fire hydrant that is south of RD 3092 and north of RD 3093. The hydrant is located near what appears to be a residential driveway. The line would be installed along the south side of NM 574 and run through state highway right-of-way for a majority of the way with approximately a mile anticipated to be installed in private easements adjacent to the highway. This route may require a state permit for 2 road crossings as well as 1 section of private right-of-way.

b. Design Criteria.

NMED "Recommended Standards for Water Supply Systems", with construction standards following NM APWA "Standard Specifications for Public Works Construction".

NMED requirements for total water storage are found in NMED "Recommended Standards for Water Supply Systems", Chapter 7. The minimum fire flow requirements are, for a single family residential condition, 500-1500 gpm for at least 2 hours.

c. Map.

See Figure 6 for the layout of the new transmission pipeline connecting North Star to East Culpepper Flats DWCA along with the booster pump station location options for this alternative.

d. Environmental Impacts.

There will be minimal environmental impact during the temporary construction of the booster pump and mainline installation.

e. Land Requirements.

The location of the new mainline will be on state right-of-way which will require permits along with approximately 1 mile of private right-of-way or easement. Additional land may need to be purchased based on the location of the booster pump.

f. Potential Construction Problems.

Potential problems could be rock excavation, narrow right-of-way, fence restoration, drainage features, traffic control, reseeding, and possible highway bore crossing.

g. Sustainability Considerations

i. Water and Energy Efficiency. Water and energy efficiency will include use of energy-efficient pumps and motors in the booster pump station.

ii. Green Infrastructure. The infrastructure involved in this alternative would not exhibit 'green' infrastructure characteristics, although the facilities would improve the total water available for use and increased capacity for the overall system.

iii. Other. None

h. Cost Estimate.

Table 2 represents the estimated construction and engineering costs for the new water mainline from North Star Water Users Association to East Culpepper Flats DWCA including the cost of a Booster Pump. Total Project Costs for this alternative is \$1,299,657 including undeveloped design details (5% contingency costs), engineering, legal and administrative costs.

Table 6: Cost Estimate – Alternate 3, North Star & Booster Pump

Alternative 3: Install line connecting East Culpepper Flats DWCA to North Star Water Users Association and Booster Pump

Item / Description	Unit	Quantity	Unit Cost	Total Cost
Booster Pump Station	LS	1	\$200,000	\$200,000
Pipeline to Distribution System (8") including fittings	LF	22,757	\$30	\$682,710
Dispensing Station	LS	1	\$80,000	\$80,000
Sub-Total				\$962,710
Professional Services (Engineering, Environmental Legal, Permitting)			20%	\$192,542
Land/Easement Acquisition			10%	\$96,270
Contingency			5%	\$48,135
Total Project Cost				\$1,299,657

Table 7: O&M Cost Estimate – Alternate 3, North Star & Booster Pump

Alternative 3: Install line connecting East Culpepper Flats DWCA to North Star Water Users Association and Booster Pump

Item / Description	Total Cost
Personnel (i.e. Salary, Benefits, Payroll Tax, Insurance, Training)	
Administrative Costs (e.g. office supplies, printing, etc.)	
Insurance	
Energy Cost (Fuel and/or Electrical)	
Short Lived Asset Maintenance/Replacement)	
Professional Services	
Miscellaneous	
Total Cost	

i. Advantages and Disadvantages

The benefits of this alternative are:

- Transmission line connection provides a backbone system which can be expanded at a later date.
- Ability to comply with ISO Fire Requirements.
- No longer need to truck water to fill tank.

The disadvantages of this alternative are:

- High capital cost.
- High rates needed to meet expenses
- One way water feed for customers.

Alternate 4: Install line connecting East Culpepper Flats DWCA to Upper La Plata and Booster Pump

a. Alternate Description.

NMED requirements for total water storage are found in NMED “Recommended Standards for Water Supply Systems”, Chapter 7. The minimum fire flow requirements are, for a single family residential condition, 500-1500 gpm for at least 2 hours. The ISO minimum Needed Fire Flow (NFF) is calculated to be 1197 gpm. Providing this fire flow for 2 hours would require a storage volume of $1197 \text{ gpm} \times 120 \text{ minutes} = 143,640$ gallons, rounding to 150,000 gallons. While the current tank is only 30,000 gallons in size the live feed connection from Upper La Plata would be sufficient to cover the quantity of water required for fire resistance thus negating the need for a new and/or additional storage tank. The main components of this alternative are discussed below:

- Construction of a pump station located near the Upper La Plata Pipeline connection. A new pump station will be constructed to convey the water to the existing water tank.
- Pipeline from Upper La Plata’s line, near La Plata to tie into the existing 6” mainline owned by East Culpepper Flats DWCA located off of RD 1350 This pipeline will convey water in the most direct route possible (8” pipeline is proposed, approximately 19,642 feet long or approx. 4 miles).
- Dispensing Station: The dispensing (or bulk loading) station will be constructed at a location along NM 574 to provide water to the residents.

Approximately 19,642 lineal feet of 8” water mainline would be installed from the end of Upper La Plata’s line, near La Plata, along NM 574 to tie into the existing 6” mainline owned by East Culpepper Flats DWCA located off of RD 1350. The end of Upper La Plata’s line is marked by a yellow fire hydrant near the residence of 191 New Mexico 574, La Plata, NM 87418. This East most extent of the Upper La Plata distribution system terminates near the driveway entrance on the south side of the road. The proposed new transmission pipeline would be installed on the south side of NM 574 and run within state right-of-way approximately 4 miles to CR 1350 where it will then end on San Juan County right-of-way. This route may require a state permit for 2 road crossings.

To be able to provide sufficient pressure at the end of transmission pipeline and to account for changes in elevation a booster pump is required. The pump can potentially be installed in two locations. Either “Option A” or “Option C” from Figure 9.

b. Design Criteria.

Design criteria would follow NMED “Recommended Standards for Water Supply Systems”, with construction standards following NM APWA “Standard Specifications for Public Works Construction”.

c. Map.

See Figure 9 for the layout of the new mainline feed connecting Upper La Plata to East Culpepper Flats DWCA along with the pump station location options for this alternative.

d. Environmental Impacts.

There will be minimal to no environmental impact during the temporary construction of the booster pump and mainline installation.

e. Land Requirements.

The location of the new mainline will be on state right-of-way which will require permits. Additional land may need to be purchased based on the location of the booster pump.

f. Potential Construction Problems.

Potential problems could be rock excavation, narrow right-of-way, fence restoration, drainage features, and traffic control.

g. Sustainability Considerations

- i. Water and Energy Efficiency.** The disinfection system chosen would include water and energy efficiencies where applicable.
- ii. Green Infrastructure.** The disinfection system chosen for this alternative would not exhibit ‘green’ infrastructure characteristics, although the system would provide safe water for consumption.
- iii. Other.** None.

h. Cost Estimate.

Table 3 represents the estimated construction and engineering costs for the new water mainline from Upper La Plata to East Culpepper Flats DWCA including the cost of a Booster Pump. Total Project Costs for this alternative is \$1,107,112 including undeveloped design details (5% contingency costs), engineering, legal and administrative costs.

Table 8: Cost Estimate – Alternate 4, Upper La Plata & Booster Pump

Alternative 4: Install line connecting East Culpepper to Upper La Plata and Booster Pump

Item / Description	Unit	Quantity	Unit Cost	Total Cost
Booster Pump Station	LS	1	\$200,000	\$200,000
Dispensing Station	LS	1	\$80,000	\$80,000
Pipeline to Distribution System (8") including fittings	LF	19,642	\$30	\$589,260
Sub-Total				\$869,260
Professional Services (Engineering, Environmental Legal, Permitting)			20%	\$117,852
Land/Easement Acquisition			10%	\$80,000
Contingency			5%	\$40,000
Total Project Cost				\$1,107,112

Table 9: O&M Cost Estimate – Alternate 4, Upper La Plata & Booster Pump

Alternative 4: Install line connecting East Culpepper to Upper La Plata and Booster Pump

Item / Description	Total Cost
Personnel (i.e. Salary, Benefits, Payroll Tax, Insurance, Training)	
Administrative Costs (e.g. office supplies, printing, etc.)	
Insurance	
Energy Cost (Fuel and/or Electrical)	
Short Lived Asset Maintenance/Replacement)	
Professional Services	
Miscellaneous	
Total Cost	

i. Advantages and Disadvantages

The benefits of this alternative are:

- Transmission line connection provides a backbone system which can be expanded at a later date.
- Ability to comply with ISO Fire Requirements.
- No longer need to truck water to fill tank.

The disadvantages of this alternative are:

- High capital cost.
- High rates needed to meet expenses
- One way water feed for customers.

Alternate 5: Install line connecting East Culpepper Flats DWCA to both North Star Water Users Association and Upper La Plata and Booster Pump

a. Description.

NMED requirements for total water storage are found in NMED “Recommended Standards for Water Supply Systems”, Chapter 7. The minimum fire flow requirements are, for a single family residential condition, 500-1500 gpm for at least 2 hours. The ISO minimum Needed Fire Flow (NFF) is calculated to be 1197 gpm. Providing this fire flow for 2 hours would require a storage volume of $1197 \text{ gpm} \times 120 \text{ minutes} = 143,640$ gallons, rounding to 150,000 gallons. While the current tank is only 30,000 gallons in size the live feed connection from both North Star and Upper La Plata as a regionalization will be sufficient to cover the quantity of water required for fire regulation, thus negating the need for a new and/or additional storage tank. The main components of this alternative are discussed below:

- Construction of a pump station located near either the North Star Pipeline connection or Upper La Plata pipeline connection. A new pump station will be constructed to convey the water to the existing water tank.
- Pipeline from North Star’s line, near Aztec connecting to Upper La Plata’s end of line to tie into the existing 6” mainline owned by East Culpepper Flats DWCA located off of RD 1350 This pipeline will convey water in the most direct route possible (8” pipeline is proposed, approximately 43,394 feet long or approx. 8 miles).
- Dispensing Station: The dispensing (or bulk loading) station will be constructed at a location along NM 574 to provide water to the residents.

Approximately 42,394 lineal feet of 8” water mainline would be installed from the end of North Star’s and Upper La Plata’s, near Aztec and La Plata, along NM 574 to tie into the existing 6” mainline owned by East Culpepper Flats DWCA located off of RD 1350 to form regionalization between North Star, Upper La Plata and East Culpepper Flats DWCA. The line will be installed on the south side of NM 574 and run through state right-of-way for a majority of the way with roughly a mile in private easements, near the North Star end of line, that will need obtained until the two lines will be tied together with an inline T onto CR 1350 where it will then end on San Juan County right-of-way. This route will require a state permit for 3 road crossings and private right-of-way for approximately one mile.

To be able to provide sufficient pressure at the end of transmission line and to account for changes in elevation a booster pump will need to be installed. The pump can potentially be installed in two locations. Either “Option A”, “Option B” or “Option C” from Figure 8.

b. Design Criteria.

Design criteria would follow NMED “Recommended Standards for Water Supply Systems”, with construction standards following NM APWA “Standard Specifications for Public Works Construction”.

c. Map.

See Figure 10 for the layout of the new mainline feed connecting North Star and Upper La Plata to East Culpepper Flats DWCA along with the booster pump station location options for this alternative.

d. Environmental Impacts.

There will be minimal to no environmental impact during the temporary construction of the booster pump and mainline installation.

e. Land Requirements.

The location of the new mainline will be on state right-of-way which will require permits along with approximately 1 mile of private right-of-way or easement. Additional land may need to be purchased based on the location of the booster pump.

f. Potential Construction Problems.

Potential problems could be rock excavation, narrow right-of-way, fence restoration, drainage features, and traffic control.



NM 574 – Highway and Right-of-Way Area

g. Sustainability Considerations

- i. Water and Energy Efficiency.** The disinfection system chosen would include water and energy efficiencies where applicable.
- ii. Green Infrastructure.** The infrastructure involved in this alternative would not exhibit ‘green’ infrastructure characteristics, although the facilities would improve the normal and peak fire demands of the system.
- iii. Other.** None

h. Cost Estimate.

Table 4 represents the estimated construction and engineering costs for the new water mainline from both North Star and Upper La Plata to East Culpepper DWCA including the cost of a Booster Pump. Total Project Costs for this alternative is \$2,201,957 including undeveloped design details (5% contingency costs), engineering, legal and administrative costs.

Table 10: Cost Estimate – Alternate 5, North Star, Upper La Plata & Booster Pump

Alternative 5: Install line Connecting East Culpepper Flats DWCA to both North Star Water Users Associates & Upper La Plata and Booster Pump

Item / Description	Unit	Quantity	Unit Cost	Total Cost
Booster Pump Station	LS	1	\$300,000	\$300,000
Dispensing Station	LS	1	\$80,000	\$80,000
Completed Pipeline to Distribution System (8") including fittings	LF	42,394	\$30	\$1,271,820
Sub-Total				\$1,651,820
Professional Services (Engineering, Environmental Legal, Permitting)			20%	\$314,364
Land/Easement Acquisition			10%	\$157,182
Contingency			5%	\$78,591
Total Project Cost				\$2,201,957

Table 11: O&M Cost Estimate – Alternate 5, North Star, Upper La Plata & Booster Pump

Alternative 5: Install line Connecting East Culpepper Flats DWCA to both North Star Water Users Associates & Upper La Plata and Booster Pump

Item / Description	Total Cost
Personnel (i.e. Salary, Benefits, Payroll Tax, Insurance, Training)	
Administrative Costs (e.g. office supplies, printing, etc.)	
Insurance	
Energy Cost (Fuel and/or Electrical)	
Short Lived Asset Maintenance/Replacement	
Professional Services	
Miscellaneous	
Total Cost	

i. Advantages and Disadvantages

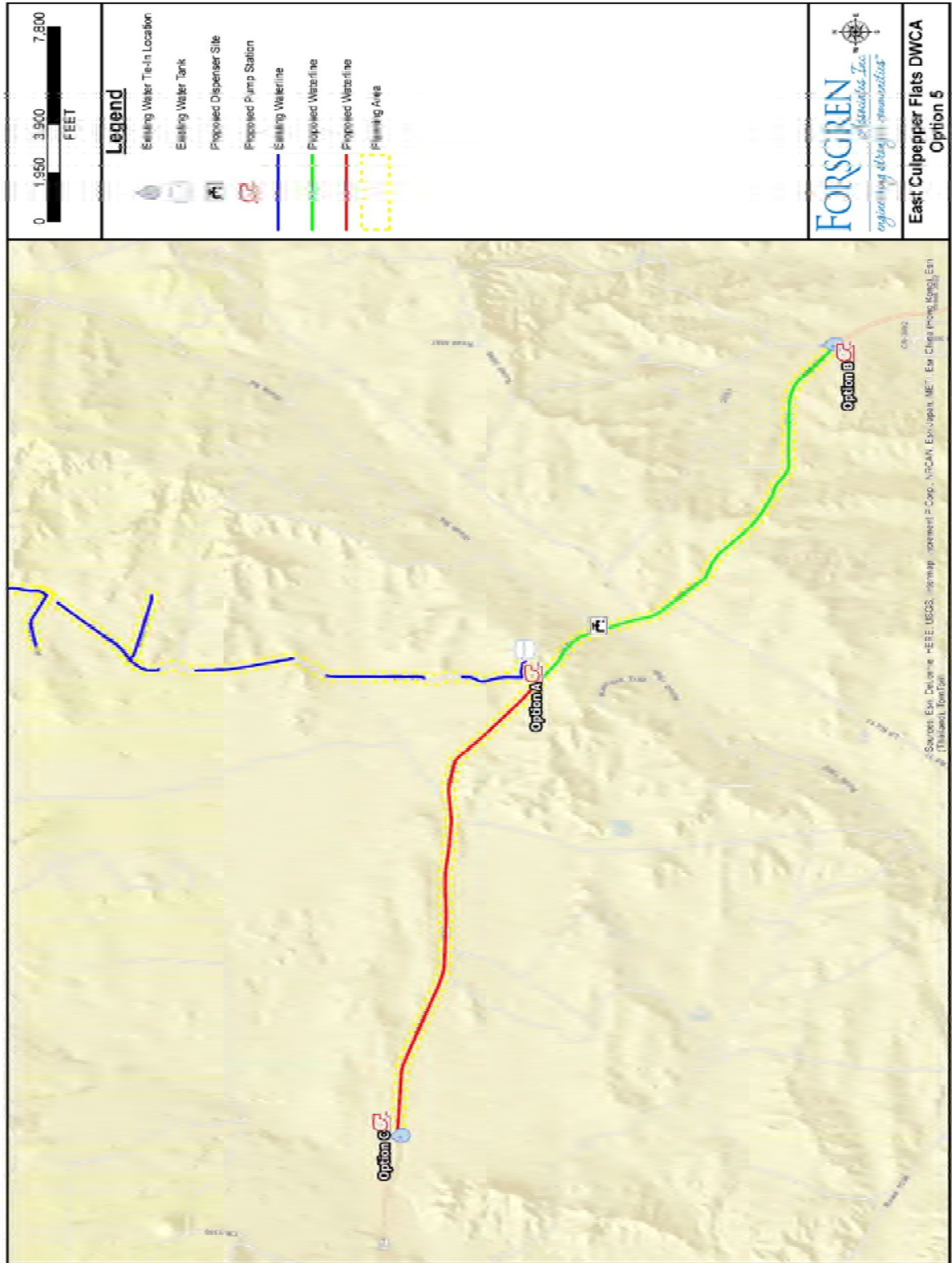
The benefits of this alternative are:

- Transmission line connection provides a backbone system.
- Ability to comply with ISO Fire Requirements.
- No longer need to truck water to fill tank.
- Regionalization for the area and two way water feed.

The disadvantages of this alternative are:

- High capital cost.
- High rates needed to meet expenses
- One way water feed for customers.

Figure 8: Map of Alternate 5, North Star, Upper La Plata & Booster Pump



CHAPTER 6 – SELECTION OF ALTERNATIVE

6. Selection of Alternative

- a. **Life Cycle Cost Analysis.** Each of the alternatives studied are not comparative and therefore direct life cycle cost comparisons have limited value. However, evaluation of the total costs (capital and operation/maintenance) does provide valuable information as to the comparative costs of each alternative. Table 7 presents these life cycle costs for each alternative evaluated. This uses a CRF factor of 0.6116 for a 2% return over 20 year period.

Alternative 1: Do Nothing.

Alternative 2: Installation of a Well.

Alternative 3: Install line connecting East Culpepper Flats DWCA to North Star Water Users Associations and Booster Pump.

Alternative 4: Install line connecting East Culpepper Flats DWCA to Upper La Plata and Booster Pump.

Alternative 5: Install line connecting East Culpepper Flats DWCA to both North Star Water Users Association and Upper La Plata and Booster Pump.

Table 12
Life Cycle Project Costs

Item	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5
Capital Cost	\$0	\$545,000	\$1,299,657	\$1,107,112	\$2,278,000
Annual Debt Service (80% Grant 20% Loan)	\$0	\$9,083	\$21,660	\$18,451	\$37,966
Annual Operating Budget	\$4,400	\$11,283	\$23,660	\$20,451	\$40,218
Monthly Residential Rate (Based on 6,000 gallons)	\$400	\$250	\$366	\$336	\$517

- b. **Non-Monetary Factors.** Similarly, non-monetary factors of each alternative are not necessarily directly comparable. Non-cost factors would include the following potential issues for consideration:
- i. **Sustainability Considerations.** Such sustainability considerations would include issues that might provide sustainability including energy conservation, reuse, and other ‘green’ concepts, as well as a second source of water.
 - ii. **Operator Training Requirements.** Factors related to operator training would identify more complicated facilities of one alternative over the other that would be more difficult to train for in operation or maintenance. Although regionalization would allow a larger pool of certified operators.
 - i. **Water Source.** The water quality, quantity, and long-term reliability, as well as second source.
 - ii. **Reduction of Greenhouse Emissions.** If one alternative has an increased or decreased reduction of greenhouse emissions, the factors would be identified for this issue.

iii. Expandability

Expandability refers to how conducive the specific system is to future expansion to serve more customers. Planned expansion allows a community time to save for expenses associated with growth, typically paying for expansion through some form of an impact fee.

The analysis below is considering the non-monetary factors identified above. Quantification of these non-monetary factors is that a value of 1 is less desirable than a 5, thus the higher score indicates a more favorable non-monetary factor for the particular alternative.

<u>Factor</u>	<u>Alternate 2</u>	<u>Alternate 3</u>	<u>Alternate 4</u>	<u>Alternate 5</u>
Alternative Costs	3	2	2	1
Sustainability Considerations	1	3	3	4
Operator Training Requirements	1	2	2	3
Water Source	1	4	4	5
Reduction of Greenhouse Emissions	4	4	4	4
Expandability	1	3	3	4
Totals	11	18	18.0	21

From this analysis above, out of a possible 30 points, Alternate 5 scored the highest. Although the overall cost and the extremely high rates would make this alternative not feasible without a cost sharing venture with the North Star and or La Plata Water departments. While the Alternate 5 is identified as the best water service solution for the area, it is largely comprised of Alternative 3 and 4 combined. This is a natural phased approach and reduces initial capital cost, showing a more affordable approach to ultimate regionalization while addressing the water district's immediate needs.

CHAPTER 7 – PROPOSED PROJECT

7. Proposed Project (Recommended Alternatives)

a. Preliminary Project Design.

After consideration of the alternatives, it is recommended that the proposed project, Installation of water transmission line with connection to North Star and Upper La Plata, be a phased approach with connection to North Star Water Utility as Phase 1 and Upper La Plata Water as Phase 2.

iv. Water Supply. By purchasing water from North Star Water Utility and La Plata Mutual Domestic Water Association the East Culpepper Flats DWCA would insure the water quality meets all drinking water standards.

v. Pumping Stations. The booster pump station should be an above-ground vertical turbine pre-assembled skid mounted package unit including all of its hydrostatic, flow, instrument and electrical components sized for a demand less than 1500 gpm.

vi. Distribution Layout. The 8” transmission water line will be installed within the NM 574 right of way.

b. Project Schedule. Project schedule is dictated by the funds obtained for construction. Actual dates would be affected with schedule of funding availability.

- Enter into a cooperative agreement with North Star Water Users Association: January 2015
- Secure Funding: July 2015
- Design Water System Improvements: July 2015-December 2015
- Construct Water Transmission Line: March 2016

c. Permit Requirements. As identified in the Preliminary Environmental Scoping Analysis, the following permits may be required:

- New Mexico Department of Transportation right-of-way and road crossings;
- U.S. Department of the Interior Bureau of Land Management managed lands;
- U.S. Army Corps of Engineers and NMED Surface Water Quality Bureau;
- U.S. Environmental Protection Agency National Pollutant Elimination System Construction General Permit;

d. Sustainability Considerations

i. Water and Energy Efficiency. Water and energy efficiency will be realized with high efficiency motors and pumps. Lower friction of the larger pipelines will reduce the electricity requirements of the pumps.

ii. Green Infrastructure. Construction procedures will require that soil and water conservation measures be taken during construction in order to reduce erosion.

iii. Other. None.

e. Total Project Cost Estimate (Engineer’s Opinion of Probable Cost). Total project cost for the project cost are as follows;

**Table 13
Total Project Costs**

Item / Description	Unit	Quantity	Unit Cost	Total Cost
Booster Pump Station	LS	1	\$300,000	\$300,000
Dispensing Station	LS	1	\$80,000	\$80,000
Completed Pipeline to Distribution System (8") including fittings	LF	42,394	\$30	\$1,271,820
Sub-Total				\$1,651,820
NMGRT 7.8125%				\$129,048
Total Project Cost				\$1,780,868
Professional Services (Engineering, Environmental Legal, Permitting)			20%	\$314,364
Land/Easement Acquisition			10%	\$157,182
Contingency			5%	\$78,591
Total Project Cost				\$2,331,005

f. Annual Operating Budget

i. Income. At the present time, the East Culpepper Flats DWCA operations funds have no debt on the water system. Generally any significant capital improvements made to the system will require the project to be bonded and repaid out of the income generated by the water rates. It is unlikely that 100% grant funding will be obtained for this work given the funding climate and limited number of customers benefiting from the project initially. The scenario presented is based upon the most logical approach that may be available to the East Culpepper Flats DWCA with a co-venture and partial funding by state legislative funds or State Drinking Water Funds or other grants.

The addition of a bulk water dispensing station would allow for additional income by allowing East Culpepper Flats DWCA to sell water to individuals that live in surrounding areas that are currently hauling water.

ii. Annual O&M Costs. Incremental additional O&M costs for these improvements would likely be zero. While dual booster pumps and the addition of a standby generator may add to the equipment provided, such increase would be balanced by the elimination of older infrastructure removed from the system. There is no additional operations related to the larger piping.

iii. Debt Repayments. At this time, the amount of debt that would be incurred is not actually known. However, an estimate of the type of debt structure would likely follow the following:

Total Capital Project Cost	Construction, land, engineering, legal, admin	<u>\$ 2,331,005</u>
Drinking Water Grant	Assume 80% grant	<u>\$ 1,864,804</u>
Legislative Appropriation Requirements		<u>\$ 466,201</u>

CHAPTER 8 – CONCLUSIONS AND RECOMMENDATIONS

8. Conclusions and Recommendations

a. Conclusions

Based on the analysis of this report, Forsgren Associates concludes that even with the logical phased approaches of Alternate 5 with construction of the pipeline from North Star System as Phase 1 and construction of the pipeline from La Plata Mutual Domestic Water Association water system as Phase 2 it does not appear financially feasible due to the initial capital costs. In order to proceed with this project the East Culpepper Flats DWCA would need to secure 100% subsidized funding, which is unlikely, unless there is participation by the larger existing water associations, North Star Mutual Domestic Water Association to the La Plata Mutual Domestic Water Association that would benefit from regionalizing these water systems.

A transmission line connecting North Star Mutual Domestic Water Association to the La Plata Mutual Domestic Water Association creates a regionalized approach to water source supply for each existing system and addresses the immediate need of a sustainable supply of drinking water to the East Culpepper Flats DWCA. While this benefits the East Culpepper Flats DWCA water users, it also provides substantial benefit for the existing larger water systems.

b. Recommendations

It is the recommendation of this report that the East Culpepper Flats DWCA select Alternate 5, transmission pipeline to the North Star System as the selected alternative for implementation as Phase 1 of the complete project.

The following items are recommended in order to begin final design of the project.

- Pursue a cooperative agreement with North Star Mutual Domestic Water Association and La Plata Mutual Domestic Water Association.
- Pursue funding strategies in conjunction with North Star Mutual Domestic Water, Upper La Plata Water System, and the County.
- Develop a strategy for regionalization of this area to allow funding and construction of the selected projects to be affordable and acceptable to the East Culpepper Flats DWCA.

c. Project Schedule

The basic schedule is listed below:

- Enter into a cooperative agreement with North Star Water Users Association: January 2015
- Secure Funding: July 2015
- Design Water System Improvements: July 2015-December 2015
- Construct Water Transmission Line: March 2016