

Border Environment Cooperation Commission Water Treatment Improvements in Lordsburg, New Mexico

1. General Criteria

1.1 Project Type

The City of Lordsburg, New Mexico proposes to improve its water treatment system to eliminate high levels of fluoride prior to distribution of water to the city's residents by means of an activated alumina treatment system. The project falls under the Border Environment Cooperation Commission (BECC) priority areas of water treatment. The project sponsor is the City of Lordsburg, New Mexico.

1.2 Project Location

The project will be developed in the City of Lordsburg, Hidalgo County, New Mexico. The City of Lordsburg is located in southwestern New Mexico, 119 miles west of Las Cruces, NM, 162 miles northwest of El Paso, Texas and 155 miles east of Tucson, Arizona. The City is 50 miles northwest of the Mexican border and 23 miles east of the Arizona border. The project is located within the 62.5 mile border zone. The location of Lordsburg is shown below.

Location of Lordsburg, New Mexico

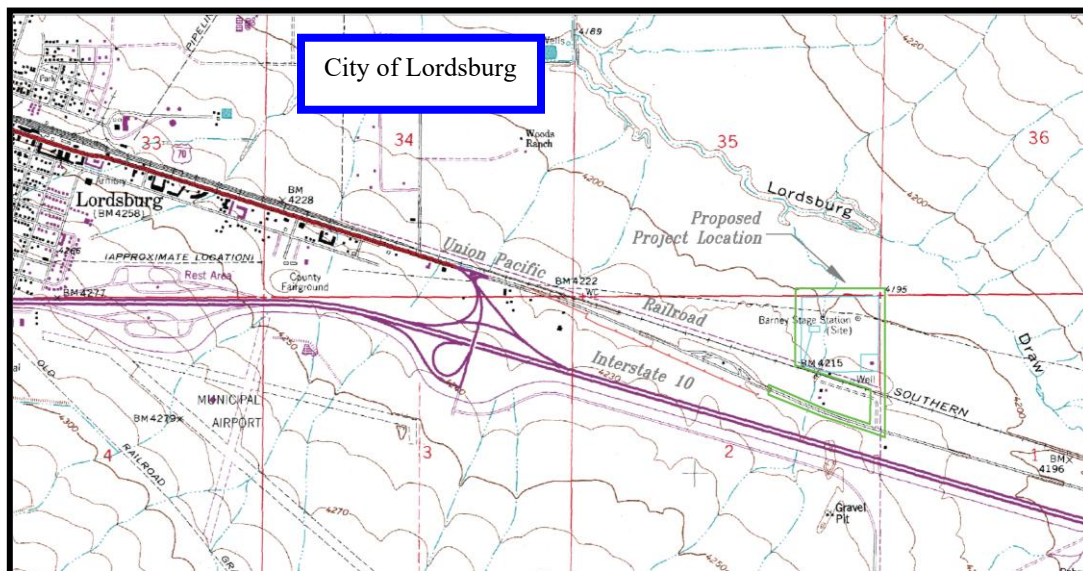


of a 1,200 linear feet of eight-inch PVC C-900 water line extension connecting the Smith Well to the Water Treatment Plant (WTP). The project also includes the installation of 3,720 linear feet of ten-inch HDPE sewer line to connect to an existing manhole and dispose of backwash flush water. The New Mexico Environment Department (NMED) issued a Cooperative Compliance Order to the City of Lordsburg in May 2004, which requires the City to reduce the level of fluoride in the community drinking water to below the maximum contaminant level (MCL) of 4 milligrams per liter (mg/L). The system would be designed to go below the Environmental Protection Agency (EPA) established maximum contaminant level (MCL) for fluoride in water of 4 mg/L for a design life of 20 years. The current MCL for fluoride in the City's water oscillates between 5 and 12 mg/L.

Program of Project Work Tasks

The City of Lordsburg expects construction of the project to be implemented in one phase and to take no more than six months after certification. Construction of the treatment system would most likely be done using prefabricated units transported to the site via truck. A building to house the equipment could either be partially pre-fabricated or site built using common construction materials (e.g. metal frame, metal paneling, concrete masonry units, etc.). Underground piping for untreated water, treated water, and wastewater will be PVC and high density polyethylene. The waste stream will be disposed into the current wastewater lagoon system. The current wastewater lagoon system is lined using a synthetic liner material resistant to both acid and base. Only minimal cut and fill work is anticipated. Some earthwork may be required in order to construct adequate foundations for tanks or buildings, and additional earthwork would be required if a disposal lagoon was required.

The cost of the project is \$ 2 million dollars. The City has received funding commitments from the Environmental Protection Agency (EPA), through a State and Tribal Assistance Grant, and the United States Department of Agriculture (USDA). The City has provided funding and is seeking additional funding from the North American Development Bank-Border Environmental Infrastructure Fund.



Site Map w/ Location of City and Project Area

Description of the Community

According to the 2000 Census, Lordsburg has a population of 3,379, an increase of 14.5% from the 1990 Census. This percentage increase made Lordsburg one of the faster growing communities in the State. The 2000 Census indicated the Hidalgo County's population, as a whole was 5,932 and Lordsburg's population accounts for more than half of the county's total population.

The City of Lordsburg is a small city containing residential, commercial, industrial and agricultural development. According to the New Mexico Natural Resource Conservation Service, ranches occupy approximately 98.5 percent of Hidalgo County, and irrigated farms occupy less than 1.5 percent. The county is rich in minerals, and some heavy metals have been mined in the area. Copper is the main metal mined, but manganese, zinc and lead are also mined. The principal mining area in Hidalgo County is in the Pyramid Mountains near Lordsburg. Historically, the chief products of the county have been beef cattle, cotton, grain sorghum, barley, alfalfa and beans. Present land use in the APE is comprised of livestock grazing, pre-existing utility facilities, and road right-of-way.

A linear growth model and geometric growth model were used to calculate the population projection for Lordsburg. The preliminary design of this project is based on the more conservative population projection, the linear growth model. Population projections indicate that the 20-year population of Lordsburg will be approximately 4,406 people.

Local Environmental Services

The existing Lordsburg water system consists of four (4) production wells, two (2) storage tanks, a booster station, and 30 miles of distribution water lines with 1,250 water connections. The wells have a combined production of approximately 2,600 gallons per minute (gpm). In addition, the city operates a wastewater treatment facility, and provides solid waste services to the community.

Project Alternatives

The treatment alternatives considered and evaluated were based on the best technology available (BAT) for removal of fluoride. Other criteria taken into consideration included:

- Infrastructure needs of the area
- Environmental and public acceptability
- Costs and system reliability
- Land availability
- Optimum reuse of existing facilities
- Accommodation for expansion
- Compliance with local, state and federal regulations

Two alternatives were considered.

Water Treatment Using Activated Alumina (AA) (Preferred Alternative). This alternative would construct an activated alumina WTP and would be designed to meet the MCL for fluoride for a design life of 20 years. The project includes the construction of a 1,200 linear feet water line extension connecting the Smith Well to the WTP, and a four-inch line for backwash flush water disposal.

Water Treatment Using Reverse Osmosis. This treatment process is considered acceptable for small water systems, and the Lordsburg water system is not considered a small system. This alternative would also include the construction of a 1,200 linear feet water line extension connecting the Smith Well to the WTP, and a four-inch sewer line for disposal of the waste stream. This alternative was not considered viable and was eliminated from further consideration.

A matrix rating system was used to summarize the evaluation information on each of the proposed water treatment alternatives. The matrix evaluates both economic and non-economic criteria. The operations and maintenance cost, and the ease of operation and maintenance, were considered the most critical factors in the evaluation; thus, these factors were weighted most heavily.

While the rankings were fairly close, the AA was rated higher due to the lower capital and operations cost and the smaller waste stream with its related implications in operations and required infrastructure improvements.

Project Justification

The City of Lordsburg and many surrounding communities have fluoride levels that exceed the MCL of four (4) mg/L. The October 2004 water quality results measured a concentration of 5.02 mg/L of Fluoride at the Entry Point (Well No. 1, Well No. 2 and SP Well) and 12.52 mg/L of Fluoride at the Smith Well.

The implementation of the project will provide the following benefits:

- The reduction of fluoride in the city's water
- An improved water treatment system
- Improved health for the community
- Regulatory compliance
- The eventual elimination of dental fluorosis or mottled teeth
- The eventual elimination of skeletal fluorosis
- The elimination of fluoride poisoning

1.4 Compliance with International Treaties and Agreements

The project complies with international agreements between Mexico and the United States, targeted at improving the environment and the quality of life of border residents, such as the La Paz Agreement, the Comprehensive Border Environment Plan, the Environmental Side Agreement of the North American Free Trade Agreement and particularly the Border 2012 Program. The guiding principles of the program are aimed to reduce the highest public health risks, preserve and restore the natural environment, adopt a bottom-up approach for setting priorities and making decisions through partnerships with state, local and U.S. tribal governments, and address disproportionate environmental impacts in border communities in areas of water and wastewater.

2. Human Health and the Environment

2.1 Human Health and Environmental Need

The City of Lordsburg is challenged by a fluoride water quality issue that has threatened the health and welfare of the community for many years. EPA has established the MCL for fluoride in water at four (4) mg/L to protect against skeletal fluorosis. A secondary MCL of two (2) mg/L is set to protect against objectionable dental fluorosis or mottled teeth. The health effects of fluoride are summarized below.

Concentration	Health Effects of Fluoride				
	0-1 mg/L	1.5 mg/L	2.0 mg/L	4.0 mg/L	>10 mg/L
Health Effect	Reduce Tooth Decay	Little Additional Benefit	Dental Fluorosis, Mottling Teeth	Skeletal Fluorosis, Weakens Bones	Crippling Skeletal Fluorosis

The City, as well as many of the surrounding communities, has fluoride levels that exceed the MCL of four (4) mg/L; therefore, the concentration needs to be reduced to a level below 4 mg/L. An October 2004 water quality results measured a concentration of 5.02 mg/L of Fluoride at the Entry Point (Well No. 1, Well No. 2 and SP Well) and 12.52 mg/L of Fluoride at the Smith Well. Well No. 1, Well No. 2, SP Well and the Smith Well are the only water source operated by the City.

According to the terms of the Compliance Order, the City of Lordsburg will need to demonstrate to the NMED and the EPA that sufficient funding and resources have been obtained, the construction plans and specifications, including the names of all contractors who will be performing any required action for the project. By 2007, which is within three (3) years of receipt of the Compliance Order, the City of Lordsburg is expected to provide clean drinking water containing levels of fluoride below the four (4) mg/L MCL.

Substantiating fluoride poisoning in Lordsburg are two sources. One is from an article of The Journal of the American Dental Association, *High-Fluoride Drinking Water, Fluorosis, and Dental Caries in Adults*, by Eklund S.A; B.A. Burt; A.I. Ismail; and J.J. Calderone. JADA, Vol. 114, March 1987, which describes the different levels of fluoride and fluorosis in Deming and Lordsburg, New Mexico.

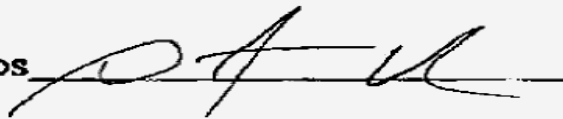
An additional source of the impacts of fluoride poisoning is an Hidalgo (County) Dental Report of March 21, 2005 of a local dentist presented below.

HIDALGO DENTAL REPORT

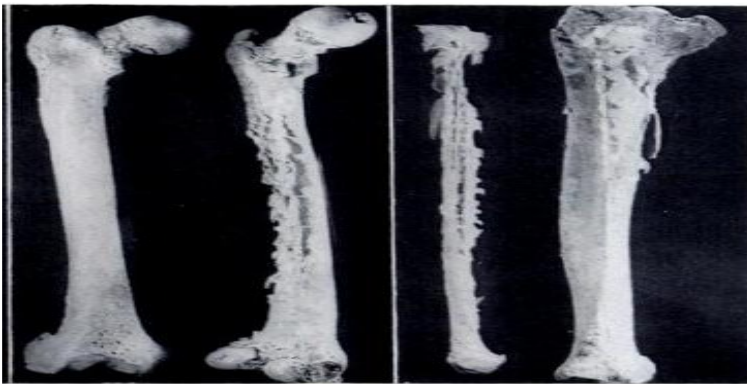
MARCH 21, 2005
FLUROSIS

A REPORT WAS COMPILED FOR THE PATIENTS SEEN AT LORDSBURG DENTAL CLINIC. THE DATES OF THIS REPORT WERE FROM 01-01-2003 TO 12-31-2004. THE AGES OF PATIENTS SEEN WERE 0-99 YEARS OF AGE. 2,573 PATIENTS WERE SEEN IN THIS TIME FRAME. THE DENTIST AND HYGIENISTS CONFIRMED THAT VIRTUALLY ALL PATIENTS RESIDING IN HIDALGO COUNTY PRESENT SIGNS OF FLUROSIS.

Dr. DESTRY COOK, DDS
jr



Examples of Skeletal fluorosis



Examples of Dental Fluorosis



2.2 Environmental Assessment

An environmental information document (EID) was submitted to the NMED. Per agreement between the NMED and the EPA, the NMED drafted an environmental assessment of the EID and submitted the document to the EPA for their review and ruling.

EPA finalized their review and a preliminary Finding of No Significant Impact (FNSI) was issued in January 18, 2007 for the required 30-day comment period. The EPA issued the final FNSI on February 20, 2007.

2.3 Compliance with Applicable Environmental and Cultural Resource Laws and Regulations

Based on the review of the EID by the EPA of the proposed water treatment system improvements, no significant adverse impacts to the environment or cultural resources were identified. The EPA reviewed the potential direct, indirect, and cumulative environmental impacts to the immediate and adjacent areas, which could result from the implementation of the proposed action. Based upon coordination with the United States Fish and Wildlife Service and the New Mexico Department of Game and Fish, construction of the proposed project should not have significant adverse impacts to biological resources. The State Historic Preservation Office

(SHPO) identified three historic buildings in Lordsburg. The SHPO determined that these properties are not located near the proposed project site and will not be affected by the proposed construction, or continued operation of the improvements.

3. Technical Feasibility

3.1 Appropriate Technology

The project utilizes appropriate technology which matches the ability of the city to operate and maintain, and was designed to be constructed, operated and maintained in a cost effective manner to achieve the main goal of eliminating fluoride in the public water system. The project's Facility Plan and Final Design were completed with this in mind. The project was selected during the 05/06 Prioritization Process as a Category 1 Project which demonstrates and/or documents evidence of a history of cases of health problems caused by water borne diseases documented with an epidemiological report. Two alternatives were considered but the Activated Alumina alternative was selected based on criteria described in Chapter 1 of this document.

Technical Process

The main design criteria of the AA process include:

- It operates on demand
- It is insensitive to flow and total dissolved solids background
- It has a low effluent contaminant level
- It is highly selective for fluoride and arsenic removal
- It is easy to operate and maintain
- It is cost effective

Aluminum oxide (Al_2O_3) is also known as activated alumina. It is a highly porous, granular material with a preferential absorptive capacity for moisture from gases, vapors and some liquids. One of the principal uses in water systems is for the removal of excess levels of fluorides from drinking water by percolating the water through beds of alumina. The beds can be arranged as either pressure or gravity filters, and piped for backwashing and regeneration.

The AA adsorption processes attracts the fluoride ions in the water and are held by the surface of the AA. The fluoride removal adsorption process is extremely pH sensitive. The AA attraction for the fluoride ion is the strongest at pH 5.5, the pH at which the AA capacity for fluoride is the greatest. At this optimum pH, the fluoride concentration can be treated to levels below 0.5 mg/L. The AA fluoride removal capacity varies depending on the concentration of the fluoride in the raw water. For example, when the raw water fluoride concentration is 4 mg/L, the AA fluoride capacity is 4,500 g/m³ (2,000 grains/ft³); and when the raw water fluoride concentration is 12 mg/L, the AA removal capacity for fluoride is 9,000 g/m³ (4,000 grains/ft³).

When the alumina becomes saturated with fluorides, it must be regenerated. This is accomplished by first backwashing with water in order to remove the accumulated solids, and then backwashing with a weak caustic solution to remove fluorides. The residual caustic is then neutralized with a weak acid, followed by water rinses.

Since the population projection indicates that the population of Lordsburg will be approximately 4,406 people, the maximum amount of water required should not exceed a demand of 1,300 gpm including fire flow. Therefore, it was determined that the 1,660 gpm AA treatment system would be sufficient to provide water for the population. For the combined treatment of 1,300 gpm, two 12-foot diameter vessels are recommended, each containing 555 cubic feet of AA. This system

would be located at the Entry Point site. Since chlorine degrades the AA, the disinfection would occur after the fluoride removal.

The backwash water, which contains the fluoride removed from the AA along with chemicals (acid and caustic) employed during the regeneration, may be disposed in one of several ways depending on local regulations and conditions. In Lordsburg, the backwash water will be pumped to the nearest sewer line and will flow to the wastewater treatment plant, an Advanced Integrated Wastewater Pond System.

The waste disposal cost from this process also includes disposal of the media. The media in the AA system will be regenerated. The media is appropriate for landfill and will not require special handling. The cost for this option includes approximately 4,000 feet of discharge piping and a small pumping system. It also includes the annualized cost for the landfill disposal of the media.

Fortunately, the volume of wastewater produced by the AA system is small, approximately three percent (3%) compared to the total treated water produced. The wastewater treatment plant capacity is 0.6 MGD and its operating is at 0.28 GPM, and the plant complies with the NMED Ground Water Quality Bureau Discharge Permit.

3.2 Operation and Maintenance Plan

Based on the estimated cost for treatment, the operations and maintenance cost for water system operation is expected to increase approximately 13% in 2007, 3% in 2008 and 19% in 2009, the years when the cost will have the greatest effect. Beginning in 2010 and onward the increases should stabilize at 3% per year and increase only due to inflation. The City of Lordsburg will allocate the necessary budget for the operation and maintenance of the project. The construction contractor will be required to develop an operation and maintenance manual and training associated with the new water treatment plant.

3.3 Compliance with Applicable Design Regulations and Standards

The project was designed according to standard engineering practices, and it complies with state and federal regulations for water systems. The project considered EPA approved "best technology available" (BTA) for the removal of fluoride, such as activated alumina and reverse osmosis, both considered as alternatives for the project. This project complies with applicable design standards and regulations that are required by the NMED, United States Department of Agriculture and the EPA.

4. Financial Feasibility and Project Administration

1. Financial Feasibility

The North American Development Bank (NADB) has reviewed the financial information presented by the Project Sponsor and, based on it, determined that the financial and structural capacity proposed by the City of Lordsburg is adequate. The information presented and the financial analysis includes, among other items:

- Historic Financial Statements;
- Financial structure of the project;
- Investment budget;
- Budget for operation and maintenance, historic and pro forma; and
- Economic and demographic information of the project area.

The following is a summary of the financial analysis. The total cost of the project is estimated at \$ 2.00 million dollars, including the costs for construction and supervision.

Item	Quantity (Millions of Dollars)
Construction	1.91
Supervision	0.09
TOTAL	2.00

The City proposes a financial structure that will allow the implementation of the project, as further indicated:

Financial Source	Amount (Millions of Dollars)	%
U.S. Rural Development	0.73	37
New Mexico 2004 & 2005 Grants	0.35	17
EPA STAG* Grant	0.10	5
City of Lordsburg	0.12	6
NADB-BEIF Construction Assistance	0.70	35
TOTAL	2.00	100

* State and Tribal Assistance Grant

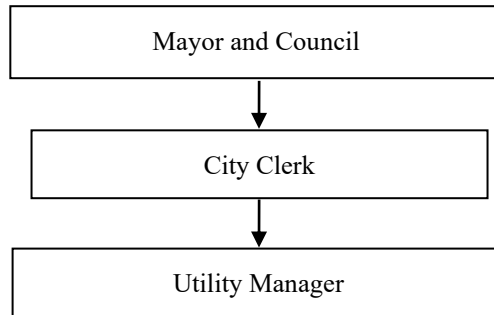
2. Fee/Rate Model

The revenues from the water utility of Lordsburg will cover the operation and maintenance expenses, such as water treatment and distribution, as well as necessary maintenance and improvements to the water system.

3. Project Management

The water utility system is managed by a Utility Manager. The City Clerk is the chief administrative officer for the City under the Mayor and Council. The City has adequate personnel to manage the proposed infrastructure and the capacity to solve any potential emergency in relation to the operation and maintenance of the works.

This is the organizational chart for the operation of the City of Lordsburg's water system:



5. Public Participation

5.1 Public Participation Plan

To comply with the BECC public participation objectives, a Public Participation Plan (Plan) was submitted by City of Lordsburg and approved by BECC in February 2006. The Plan includes the development of a steering committee, a list of local organizations to contact to present the project and solicit support for it, provide public access to project information and hold public meetings.

Local Steering Committee

The project steering committee was composed of Carmen Gonzalez, Public School Nurse; Jeannie LaMarca, Journalist; Arturo Talavera, superintendent (ret); Freddy Morelos, Teacher; and Julia Ramirez, Jenny Aguilera and Becky Varela, citizens. The steering committee was formed on January 2006. The committee was supported by a Technical Team of Arthur Clark, City Mayor; Lilla Reid, Engineering Consultant; and Irene Galvan, City Clerk.

Meetings with Local Organizations

The steering committee met with the following organizations: the Hidalgo Medical Services Board of Directors; Hidalgo Dental, Dr. Ashley Smith; Pyramid Village Tenant Advisory Board; La Escuelita Parents Teacher Association; Church of Jesus Christ of Latter Day Saints; Lordsburg Public High School Board; RV Traylor Elementary School Teachers; Hidalgo County Transition Coalition Board; Elks Lodge #1813; Lordsburg Housing Authority Board of Directors; Southside Elementary School Teachers; Lions Club; and Lordsburg Independent School District Board. Letters were provided from twelve of these organizations in support of the project.

Public Access to Project Information

The Facility Plan, Draft Environmental Assessment, and Public Participation Plan were available at the Lordsburg City Hall, the Lordsburg-Hidalgo Library and the Special Events Center thirty days prior to the first public meeting. The public meeting notices were published in the Hidalgo County Herald and the Lordsburg Liberal newspapers as well as around the city in public locations. A project fact sheet was developed that included basic technical, financial and public participation information and several articles appeared in the local newspapers about the project.

Public Meetings

Two public meetings were held. The first public meeting was held on March 27, 2006. The second public meeting was held on February 26, 2007

5.2 Final Public Participation Report

The Final Public Participation Report was submitted to BECC per certification requirements on March 2, 2007.

6. Sustainable Development

6.1 Definition and Principles

According to the sustainable development definition, the water treatment system must comply with an economic and social development principle based on the conservation and protection of the environment and rational use of the natural resources, always considering the present needs without compromising the possibilities for future generations to satisfy their own needs.

The first principle of the sustainable development criterion states that the project must produce human health benefit based on the right to a healthy and productive life in harmony with nature. This project will improve the quality of health of the people of Lordsburg by reducing the harmful exposure to high levels of fluoride from its drinking water.

The second principle states the right to development as long as the development needs and the environment of present and future generations can be accomplished. This project satisfies this principle as it will enable the city to provide better water services to present and future populations.

The third principle establishes that in order to accomplish sustainable development, environmental protection should be an essential component of the project. The project has met all federal and state environmental protection regulations. The environmental assessment shows no adverse impacts to the biological areas and cultural resources as a result of this project.

The fourth principle states that groups directly affected by the implementation of an environmental infrastructure project must be given the opportunity to participate in the decision-making process. The City of Lordsburg developed a Public Participation Plan that included the formation of a citizen steering committee to promote the project and gather public support for it. Chapter 5 provides more detailed information on how the citizens and the project sponsor were involved in the public participation process.

6.2 Institutional and Human Capacity Building

The activities that contribute to the strengthening of the institutional and human capacity of the City of Lordsburg are the following:

- Improve the city's infrastructure in the areas of water treatment management (treatment plant and distribution)
- Improve the water treatment system
- Operate a water system that complies with the state and federal regulations
- Provide technical training the city's water system operators

6.3 Conformance with Applicable Local and Regional Conservation and Development Plans

This project complies with the 1974 Federal Safe Drinking Water Act (SDWA) which was enacted to protect public health by regulating the nation's public drinking water supply. The NMED Drinking Water Bureau, responsible for preserving, protecting, and improving New Mexico's drinking water quality, upholds the SDWA by providing technical assistance, system oversight and community outreach about safe drinking water. At the local level, the City of

Lordsburg complied with the requirement by enacting in 2004 a Water Conservation Plan Ordinance which requires and encourages water conservation and reduction of waste.

6.4 Natural Resource Conservation

As presented in the environmental information document, construction of the proposed project will not have any significant adverse impacts on natural surface or ground water resources, and the proposed project will not over time have a negative impact on the quality of the human or natural environment. No new water supply sources are anticipated under the preferred alternative. However, the treatment method under consideration will require additional consumption from existing sources, but the amount of additional water required for the Activated Alumina Treatment is not in excess of that which can be provided by the existing City of Lordsburg system at this time. The City of Lordsburg currently has sufficient water supply to meet the water consumption demand for the current population and projected population.

6.5 Community Development

The existing water treatment system has a disinfection process that is not adequate for the existing needs of the people of Lordsburg and a financial burden for them due to the cumulative health impacts of fluoride poisoning. The completion of this project is essential for a healthy community to contribute to the long-term development of the City.

Project available documents

High-Flouride Drinking Water, Flourosis, and Dental Caries in Adults. The Journal of the American Dental Association. By Eklund S.A, B.A. Burt, A.I. Ismail, and J.J. Calderone. JADA, Vol. 114, March 1987.

Preliminary Engineering Report for the Water Treatment Project for the City of Lordsburg. Souder, Miller and Associates, Civil/Engineering Scientists & Engineers. July 11, 2005

Biological Evaluation for the Proposed City of Lordsburg Flouride Water Treatment System Project, Hidalgo County, New Mexico. Souder, Miller and Associates, Civil/Engineering Scientists & Engineers. December 21, 2005.

Environmental Assessment Report for the Water Treatment Project for the City of Lordsburg. Souder, Miller and Associates, Civil/Engineering Scientists & Engineers. May 5, 2006.

City of Lordsburg Project Strategic Plan. Brown and Caldwell Environmental Engineers & Consultants. August 23, 2004.

City of Lordsburg Final Public Participation Report. Souder, Miller and Associates, Civil/Engineering Scientists & Engineers. March 2, 2007.

Finding of No Significant Impact. United States Environmental Protection Agency, 2006