

**EXPANSION OF THE WASTEWATER COLLECTION SYSTEM IN THE SOUTH
SECTOR OF THE CITY
AGUA PRIETA, SONORA, MEXICO**

ENVIRONMENTAL ASSESSMENT

January 29, 2007

Prepared for:
U.S. Environmental Protection Agency
75 Hawthorne Street
San Francisco, California 94105



By:
Licon Engineering Company, Inc. (LEC)
2101 E. Missouri Ave.
El Paso, Texas 79903

TABLE OF CONTENTS

1.0	BACKGROUND.....	1-1
1.1	Introduction	1-1
1.1.1	Legal Framework.....	1-1
1.2	Purpose of the Environmental Assessment	1-1
1.3	Project Location	1-2
1.4	Purpose and Need for the Proposed Action.....	1-3
1.5	Scope of the Transboundary Environmental Assessment	1-4
1.5.1	Issues Studied in Detail	1-4
2.0	PROJECT DESCRIPTION AND ALTERNATIVES.....	2-1
2.1	Description of the Proposed Action.....	2-1
2.2	Wastewater Treatment Plant.....	2-2
2.3	Wastewater Collection System.....	2-3
2.4	Alternative 1 – No Action	2-3
2.5	Alternative 2 – Proposed Action – Conventional Gravity (CG) Sewer System.....	2-4
2.6	Alternative 3 – Septic Tanks and Small Diameter Gravity (SDG) Sewer System.....	2-5
2.7	Comparison of the Alternatives.....	2-7
2.8	Identification of Preferred Alternative	2-10
3.0	AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES	3-10
3.1	Land Use.....	3-10
3.1.1	Environmental Consequences.....	3-2
3.2	Air Quality.....	3-3
3.2.1	Environmental Consequences.....	3-4
3.3	Water Resources.....	3-4
3.3.1	Environmental Consequences.....	3-6
3.4	Biological Resources	3-7
3.4.1	Vegetation.....	3-7
3.4.2	Wildlife and Threatened and Endangered Species	3-8
3.4.3	Environmental Consequences.....	3-10
3.5	Scenic, Historic and Cultural Resources	3-10
3.5.1	Environmental Consequences.....	3-11
3.6	Noise.....	3-12
3.6.1	Environmental Consequences.....	3-12
3.7	Traffic and Transportation.....	3-13
3.7.1	Environmental Consequences.....	3-13
3.8	Socio-economic Conditions.....	3-14
3.8.1	Demography	3-14
3.8.2	Economic Activity.....	3-14
3.8.3	Housing	3-15
3.8.4	Environmental Consequences.....	3-16
3.9	Public Health	3-17
3.9.1	Environmental Consequences.....	3-18
3.10	Cumulative Impact	3-19
4.0	CONCLUSION	4-19
5.0	REFERENCES	5-20
6.0	AGENCIES AND PERSONS CONTACTED	6-22
7.0	ACRONYMS	7-22

LIST OF TABLES

Table 1. Wastewater Collection System Improvements, Summary of Alternative 2, Projects and Estimated Costs.....2-5

Table 2. Comparative Matrix Summary.....2-7

Table 3. Proposed Action and Alternatives Implementation Estimated Cost.....2-10

LIST OF FIGURES

Figure 1. Agua Prieta, Sonora Location Map.....1-3

Figure 2. Douglas, Arizona And Agua Prieta, Sonora Project Location Map..... 1-4

Figure 3. Area of Concern for the Proposed Action.....1-5

Figure 4. Proposed Action Divided in Zona B (Phase 1) and Zona A (Phase 2).....2-2

Figure 5. Septic Tanks and Small Diameter Gravity Sewer System.....2-7

1.0 BACKGROUND

1.1 INTRODUCTION

The United States Environmental Protection Agency (EPA) administers funds for water and wastewater infrastructure projects within 100 kilometers of the international boundary between the U.S. and Mexico. EPA policy for border funds requires certification by the Border Environment Cooperation Commission (BECC) as a condition for grant award. As part of the BECC certification process, the proposed project must comply with both (1) Mexico Environmental Regulations, and (2) EPA National Environmental Policy Act (NEPA) Regulations. EPA policy for border funds requires certification and evaluation by the BECC prior to approval. The Proposed Action under consideration for EPA funding is the expansion of the public wastewater collection system of the City of Agua Prieta, State of Sonora, Mexico.

1.1.1 Legal Framework

EPA has determined that it will follow the NEPA and EPA regulations contained in 40 CFR Part 6 as reference for environmental impact in the U.S. from projects located in the U.S. or Mexico (EPA 1997a). EPA follows the U.S. Agency for International Development (AID) approach as summarized in Title 22 CFR Part 216.1-216.10 as guidance for assessing environmental impacts in Mexico. The AID regulations envision collaboration with affected countries to the maximum extent possible in developing an EA. AID regulations authorize use of either a study prepared by an international body in which the U.S. is a participant, or a concise review of the relevant environmental issues, with appropriate documentation, as a substitute for an EA.

This EA was prepared using Council of Environmental Quality (CEQ) regulations 40 CFR Parts 1500-1508 and EPA regulations (40 CFR Part 6) as guidance. A separate *Manifestación de Impacto Ambiental* (MIA) document customarily evaluates the environmental impacts of proposed federal actions in Mexico. However, the Secretaría de Medio Ambiente y Recursos Naturales (SEMARNAT) has determined that the proposed actions are exempt from their substantive environmental review process. Therefore, although this EA will focus on the environmental consequences of the proposed federal action in the U.S., it will also document the environmental consequences of these actions in Mexico.

1.2 PURPOSE OF THE ENVIRONMENTAL ASSESSMENT

The City of Agua Prieta, Sonora (City) is developing two infrastructure projects to address wastewater system deficiencies in the southern part of the City in compliance with state and federal regulatory requirements. EPA intends to authorize the use of Border Environmental Infrastructure Funds (BEIF), for Agua Prieta to implement the first of these two projects, which will deliver wastewater collection services to the eastern half of the southern part of the City (Section B). This proposed BEIF project will cover approximately 250 acres of established housing and will protect the public health of residents living in Section B by eliminating untreated sewage discharges from cesspools in this area of the City that is currently not receiving centralized wastewater services.

Section A, which comprises the western half of the southern part of the City, plus a strip of land south of Section B will not be part of the proposed BEIF project and will not receive new service

until sometime in the future when more funding becomes available. However, because the City hopes to provide sewage collection services to Section A in the near future and is seeking U.S. federal government project funding, this EA will assess impacts to both Sections B (the proposed BEIF Project) and A (the Anticipated Project) and, unless it is necessary to distinguish them, will refer to the two of them as the ‘Proposed Projects’.

This EA will address those environmental resources that would be affected in the United States and Mexico by describing the potential affected environment, or area of concern, and assessing the direct, indirect and cumulative impacts of the construction and operation of the proposed projects in Agua Prieta, Sonora, Mexico on that environment.

1.3 PROJECTS LOCATION

The proposed projects are located within the City of Agua Prieta, Sonora, Mexico. The City is located in the northeastern part of the State of Sonora, Mexico, on the U.S./Mexico border, adjacent to the town of Douglas, Arizona and serves as a municipal seat of the Municipality of Agua Prieta (Figure 1). The City of Agua Prieta is situated on the east bank of the Agua Prieta River and is bordered on the north by the City of Douglas, Arizona (Figure 2). The City spans an area of 25.94 km², and has an estimated population of 75,210 based on year 2006 data¹. Within the City of Agua Prieta, 30.04% of the population is under the age of 19, 10.3% between 19-24, 30.06% between 25-44, 10.49% between 45-64, 3.24% above 65 and 0.75% unspecified.

The City is divided in two areas, the northern area runs from the Janos-Cananea highway to Avenida Internacional located along the U.S./Mexico border (North Area). The area to the south of the same highway to the outskirts of the City is the South Area.

The area of concern,² or the area that would likely be affected by implementing the proposed projects was defined by the BECC to be the South Side of the City and the area within a 6.2-mile (10-kilometer [km]) radius of Agua Prieta across the U.S. border to the north (Figure 3).



Figure 1. Agua Prieta, Sonora Location Map

¹ Consejo Nacional de Población (CONAPO) 2006. Also referenced by OOAPASAP correspondence received on April 20, 2006.

² Scope of Work to prepare a Transboundary Environmental Information Document compliant with the Border Environment Infrastructure Fund Requirements for the proposed expansion of the wastewater collection system in areas of the City of Agua Prieta, Sonora that are currently not served, October, 2005.

1.4 PURPOSE AND NEED FOR THE PROPOSED ACTIONS

Over the last 30 years, the border region between the United States and Mexico has experienced a surge in population and industrialization. This growth has often exceeded the capacity of the existing infrastructure, leading to inadequate potable water distribution, wastewater collection, and wastewater treatment. The South Area of Agua Prieta (both sections B & A) lacks wastewater collection and treatment services and residents must rely on cesspools and direct discharge for disposal of domestic wastewater. Cesspool failures in the south area of the City result in the discharge of raw sewage to streets, backyards, and the environment. A wastewater collection system is needed to protect public health and the environment in Agua Prieta.

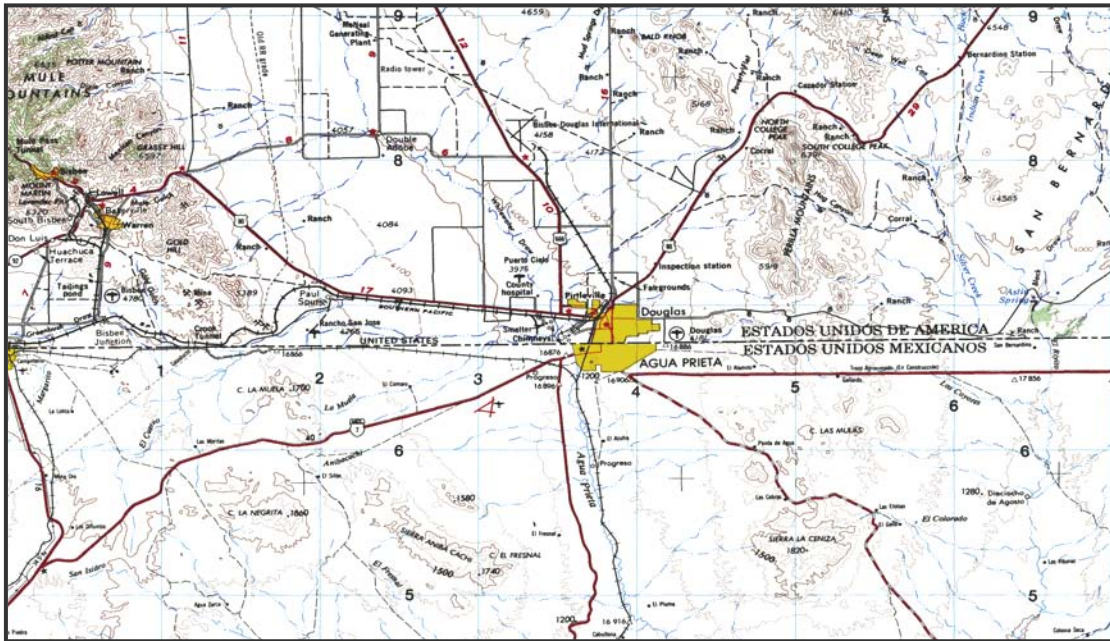


Figure 2. Douglas, Arizona and Agua Prieta, Sonora Project Location Map

Communities lacking wastewater collection and treatment frequently experience problems with respect to human health and environmental compliance. Potential problems in the unserved areas of southern Agua Prieta include but are not limited to:

- Public health and environmental problems related to contamination of surface water. Raw sewage spilling from cesspools flows to ditches and low-lying areas where water collects resulting in a high potential for contact by area residents.
- The large number of cesspools in this small, densely populated area coupled with shallow ground water increases the potential for groundwater, and source water contamination.
- Operation and maintenance costs for the existing systems are related to pumping of individual cesspools and the need for an upgrade of disposal areas. Because of the low income of area residents, pumping of cesspools either does not occur or occurs only in cases of total system failure. Similarly, replacing or upgrading the disposal areas does not happen due to the relatively high cost of such work.

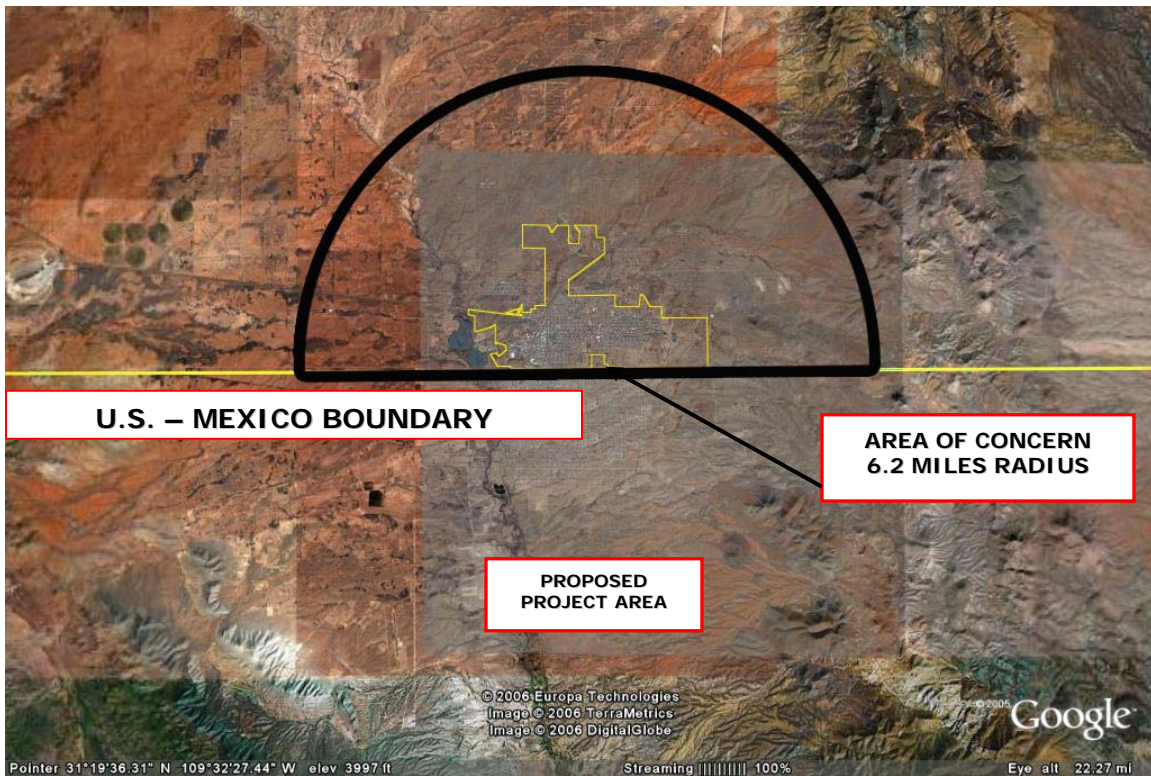


Figure 3. Area of Concern for the Proposed Action is a 6.2 Mile Radius north of U.S. Border.

1.5 SCOPE OF THE ENVIRONMENTAL ASSESSMENT

As defined in CEQ regulations (§ 1508.25), the scope consists of the range of actions, alternatives, and impacts to be considered in a NEPA document. The scope of this EA is limited to the relevant resources within the defined area of concern in the U.S. and Mexico that may be affected by the no action alternative or one of the action alternatives.

1.5.1 Issues studied in detail

In accordance with CEQ regulations (§ 1500.4 and § 1501.7) and BECC-BEIF environmental requirements, issues to be addressed relating to this proposal, are the direct, indirect and cumulative impacts to land use, air quality, water resources, wetlands, farmlands, biological resources, scenic, historic and cultural resources, noise, traffic, socio-economic and public health conditions and environmental justice. Specific attention is given to non-land based issues, such as air and water, and to resources where there may be project-induced effects, such as public health and socio-economic resources.

1.5.2 Issues Eliminated from Detailed Study

Hazardous and solid waste, wetlands, farmlands, national landmarks and wild and scenic rivers are resources unlikely to be directly or indirectly affected by implementation of any of the alternatives and are therefore not relevant for further detailed evaluation.

2.0 PROJECT DESCRIPTION AND ALTERNATIVES

In accordance with CEQ regulations (§ 1502.14), this section of the EA: (1) presents and objectively evaluates all alternatives, including alternatives which were eliminated from detailed study and the reasons for elimination; (2) devotes substantial discussion to each alternative considered in detail so the reviewers may evaluate comparative merits; and (3) includes appropriate mitigation measures.

Based on the information and analysis presented in Section 3.0 (Affected Environment and Environmental Consequences), this section also presents the potential local and transboundary environmental impacts of the alternatives in comparative form.

2.1 DESCRIPTION OF THE PROPOSED ACTIONS

Presently there is no existing sewage collection system in the southern part of the City. The only waste disposal facilities that exist are on-site disposal units, which consist primarily of cesspools and septic tanks with no leach field, which are technically equivalent to cesspools.

The proposed projects will provide wastewater collection service to the current population that lacks this service. The trunk sewers will be designed to accommodate up to twenty years of projected growth (not to exceed 30% growth) in addition to the current population. Collection sewers will be provided for existing residents within the planning area and will not be extended into undeveloped areas.

The proposed BEIF project, covering the eastern half of the southern part of the City (Section B), will be implemented immediately. Pending the availability of funds, Section A on the western half of the City's southern side will be implemented.

Section B encompasses the area bounded to the north by the Janos - Cananea Highway, to the west by Avenida 34, to the east by Avenida 46 continuing to Avenida 44, and to the south along Calle 35. Section A includes three sections south of the Janos - Cananea Highway to the west of Section B.

The proposed wastewater collection systems would be installed to provide wastewater collection coverage to an area of approximately 500-acres and will serve approximately 20,000 existing residents once both proposed projects are completed. The proposed wastewater collection system improvements for Section B will serve 7,000 existing residents by covering an area of 250-acres by the end of 2007. Pending the acquisition of additional funding, the second part of the proposed actions would bring service to the remaining 14,000 existing users to cover a slightly larger sized area in the western and southernmost sections (Section A) south of the Cananea-Janos Highway with a planned completion in 2008 (Figure 4).



Figure 4. Proposed Action in Zona B (in red) and additional planned Zona A (,in magenta).

2.2 WASTEWATER TREATMENT PLANT

Improvements to the Agua Prieta wastewater treatment plant (WWTP) are not part of these projects and are not included in any of the Alternatives presented in this EA. However, compliance with all applicable operational and discharge regulations is a prerequisite for any U.S. federal funding and the WWTP must be in total compliance before any U.S. federal funds are awarded.

The existing WWTP, which is located 3.0 miles south of the U.S.-Mexico border in the southwest corner of the City of Agua Prieta, includes two separate oxidation ponds with a total area of 12 hectares (29.6-acres). The WWTP was designed to handle a total volume of 260 liters per second [l.p.s.] (5.94 MGD); however, recent studies indicate the actual WWTP capacity is 200 l.p.s. (4.57 MGD)³.

Currently the WWTP is treating an average influent volume of 135 l.p.s. (3.08 MGD)⁴ from domestic and non-domestic users; therefore, the City has treatment capacity to accommodate additional flows from potential expansion of the wastewater collection system in the south sector of Agua Prieta. According to the OOAPASAP, these additional flows are estimated to be 29 l.p.s. (0.66 MGD).

At the present time, around 100 l.p.s.⁵ (2.28 MGD) of the 135 l.p.s. (3.08 MGD) total treated effluent, are sent to the Comisión Federal de Electricidad (CFE), Federal Commission of Electricity Power Plant for its reuse. The treated effluent is reused in the water-cooling towers. Once the effluent is reused for cooling purposes at the power plant, the remaining effluent, of approximately 40 l.p.s. (0.91 MGD) is discharged to the Rio Agua Prieta. CFE has a current discharge permit from the Comisión Nacional del Agua, *National Water Commission* (CONAGUA), allowing it to discharge (41 l.p.s.)⁶ The remaining treated effluent 35 l.p.s. (0.80 MGD) produced at the WWTP, is discharged under a federal permit from CONAGUA directly to the Rio Agua Prieta and is used for irrigation purposes by the Ejido Agua Prieta. OOAPASAP presented a contract document between the Agua Prieta Municipal Administration (the City

³ Plan Maestro COCEF pg. 53-69; RAP 2002 anexo 6-7 and OOAPASAP correspondence received on April 20, 2006.

⁴ Plan Maestro COCEF pg. 53-69; Aforo COAPAES 2000 and OOAPASAP correspondence received on April 20, 2006.

⁵ Aforo Planta Termoeléctrica (CFE). BECC's Cuadro-Resumén, July, 2006.

⁶ CNA No. 02SON100293/09FAGC03 wastewater discharge permit.

Mayor) and OOAPASAP where authorization to use the treated effluent is granted to the municipal government. One of the clauses in the agreement is that the municipal government must comply with all federal and state health regulations related to the re-use of the subject effluent. Currently, the WWTP is operating out of compliance with its discharge permit for fecal coliforms and hydraulic load. Upgrade to the treatment process and a new or modified permit allowing larger discharges must be achieved before U.S. federal funds will be awarded for the expansion of the collection system. It is expected that the existing WWTP will reach 82 percent (3.74 MGD) of its total capacity of (4.57 MGD), by the year 2008, if implementation of the proposed projects occurs. CONAGUA recommends that planning for WWTP expansion be instituted at 85% capacity,, so improvements to increase the existing WWTP capacity will be needed in the near future for the City of Agua Prieta.

There is a possibility that the CFE will request to the City of Agua Prieta municipal government and the OOAPASAP under a memorandum of understanding (MOU), currently being discussed⁷, that they be allowed to handle and use the total current and future raw sewage that is collected in the City of Agua Prieta. As such, there would be no need for future WWTP facilities in the City.

2.3 WASTEWATER COLLECTION SYSTEM

The City provides wastewater collection services to the area known as Zona Norte (North Area) which is bounded to the north by Calle Internacional, along the U.S./Mexico border to the west by Calle Margallan continuing to Avenida Ferrocarril (Railroad Avenue), to the east by Avenida 46 continuing to Avenida 44, and to the south along the Janos - Cananea Highway.

The City's wastewater collection system and treatment facilities serve approximately (66%)⁸ of the 75,210⁹ city residents. The City's population is expected to increase to approximately 110,522 by the year 2024. Continued population and service area growth has resulted in the need for capacity increases on the Wastewater Collection System to efficiently meet the growing demand for wastewater service.

The City currently provides wastewater collection services to approximately 50,185 residents. Therefore, more than 25,000 individuals do not have access to wastewater collection services in Agua Prieta, 21,000 of those individuals reside in the south area of the City. To date, individuals residing in the south area of the City are not connected to the wastewater collection system, and rely on private cesspools for sewage treatment and disposal (Miguel A. Santana, *pers comm.* January 17, 2006).

2.4 ALTERNATIVE 1 – NO ACTION

Under the no action alternative, proposed improvements to the existing wastewater collection system would not be completed. No construction activities would occur and wastewater collection system operations would not change. The existing wastewater collection systems would not be expanded to the south sector of the City of Agua Prieta under Alternative 1.

⁷ OOAPASAP, personal interview with Miguel A. Santana, January 17, 2006.

⁸ OOAPASAP, personal interview with Miguel A. Santana, January 17, 2006.

⁹ Población total de los municipios a mitad de año, 2000-2030, CONAPO, 2006. www.conapo.gob.mx/micros/proymunloc

If the No Action Alternative is selected, the current situation will remain as the projects will not be engineered and constructed. Soil pollution will continue in the Projects Area, and the wastewater problems identified in the previous section are expected to worsen as the number of users increases. The No Action Alternative would not eliminate the health hazards associated with failing on-site sewage treatment units that occasionally overflow and send raw sewage onto the streets. Groundwater currently used as potable water could become contaminated because of continued use of malfunctioning septic tanks and cesspools for wastewater disposal.

2.5 ALTERNATIVE 2 –CONVENTIONAL GRAVITY (CG) SEWER SYSTEM

Alternative 2, is based on the recommendations of the City of Agua Prieta Water and Wastewater Master Plan (Miguel A. Santana 2005, 2006), and will address the wastewater collection needs of the City's south sector's 14,500 inhabitants with the implementation of a conventional gravity sewer system to be connected to the municipality's WWTP.

The proposed projects would install more than 39,526 linear meters (129,645 LF) of new sewer lines providing 96 percent coverage to the current population within the Projects' Area. Each home, most of which have been relying on cesspools for their wastewater disposal, will be connected via 6" hook-ups to a system of 8" PVC laterals that will discharge to an existing 24" subcollector that will convey flows to the WWTP. Construction and installation of new wastewater collection pipelines may involve removal of soils contaminated by cess pool sewage and transportation of impacted soils to an approved local landfill.

The majority of these wastewater collection lines will be constructed under unpaved streets, while the remainder will be placed under paved right-of-ways and existing utility easements (OOAPASAP, 2006). Table 1, presents a summary of proposed Alternative 2 wastewater collection improvement projects, year of planned implementation, and estimated costs. As mentioned in Section 1.2 of this study, this EA will be evaluating the impacts of installation of sewage lines in Section B as a stand-alone project as well as the planned additions for the expansion of the wastewater collection system to Section A proposed to be carried out between 2007 and 2008.

Under Alternative 2, wastewater collection will be extended to approximately two thirds of the current south sector residents of the City of Agua Prieta. The service area population to benefit from the implementation of the proposed projects is estimated at 14,500 based upon current water accounts (OOAPASAP, 2006). Additional daily residential wastewater flow will average approximately 29 l/s, assuming a daily wastewater production rate of 173 lpcd, an increase of approximately 21.5% over existing residential wastewater flow.

The Agua Prieta Water and Wastewater Master Plan (SEPSA, 2004) estimates that commercial land uses will generate a negligible wastewater volume, since according to the Plan Municipal de Desarrollo de la Ciudad de Agua Prieta, Sonora 1998-2003, *City of Agua Prieta Municipal Development Plan Study*, land use in the south sector of the City is authorized for housing and minor business facilities.

Table 1. Wastewater Collection System Improvements, Summary of Alternative 2, Projects and Estimated Costs of the Proposed Action and Planned Additions to be executed by 2008.

Project Name and Feature	Year of Execution	Estimated Cost (U.S. Dollars) Proposed Actions		Total Cost (U.S. Dollars)
		Proposed BEIF	Anticipated	
2,500 linear meters (8,200 l.f.) 24-inch polyvinyl chloride (PVC) sanitary sewer main.	2007 -2009		\$147,600	\$147,600
2,750 linear meters (9,020 l.f.) 18-inch polyvinyl chloride (PVC) sanitary sewer main.	2007 -2009		\$135,300	\$135,300
2,250 linear meters (7,380 l.f.) 14-inch polyvinyl chloride (PVC) sanitary sewer line.	2007 -2009		\$95,940	\$95,940
1,448 linear meters (4,750 l.f.) 12-inch polyvinyl chloride (PVC) sanitary sewer line.	2007 -2009	\$52,250		\$120,161
1,882 linear meters (6,173 l.f.) 12-inch polyvinyl chloride (PVC) sanitary sewer line.	2007 -2009		\$67,911	
70,104 linear meters (229,940 l.f.) 8-inch polyvinyl chloride (PVC) sanitary sewer laterals.	2007 -2008	\$1,103,717		\$2,538,546
91,135 linear meters (298,923 l.f.) 8-inch polyvinyl chloride (PVC) sanitary sewer laterals.	2007 -2008		\$1,434,829	
Hook-ups (6-inch)	2007	\$65,289		\$150,165
Hook-ups (6-inch)	2008		\$84,876	
Total (BEIF Proposed Action)	2007-2008	\$1,221,256		
Total (Future Additions)	2007-2009		\$1,966,456	
Grand Total				\$3,187,712

Source: OOAPASAP, 2006 (OPA/2006-019-DG)
Exchange rate as of 05/02/2006: 1 dollar per 10.44 pesos

2.6 ALTERNATIVE 3 – SEPTIC TANKS AND SMALL DIAMETER GRAVITY (SDG) SEWER SYSTEM

This alternative would consist of identifying existing cesspools that are experiencing some degree of failure or that are incapable of handling the present wastewater loading. Cesspools would be replaced with a small diameter gravity (SDG) system.

The majority of the existing homes within the area of concern rely on cesspools. These are located on individual private properties requiring operation and maintenance costs to be borne by the property owner. This alternative would eliminate some surface water contamination and the resulting health concerns from direct contact with raw sewage, but it might not be applicable to the smaller lots where there is no room for cesspool replacement.

An SDG system uses gravity to transport sewage, much like conventional sewers do. However, small diameter gravity sewers are always preceded by a septic tank. Refer to Figure 3. The settling that first occurs in the septic tank eliminates much of the solid matter from the wastewater. This enables the collection pipes to have a smaller diameter and a more gradual incline. The pipes used are made of lightweight plastic and can be buried at a relatively shallow depth.

The SDG system does not utilize pumps at individual septic tanks as other more sophisticated systems do. Therefore, the SDG sewers are laid at a relatively constant grade, to match the terrain. Manholes are not required for small diameter gravity systems; instead, clean out ports are used to service collector pipes. When it is necessary for the flow to be directed upwards, effluent pumps can be utilized to move the wastewater to higher elevations. High water alarms are normally installed in the septic tanks to alert property owners of any potential problems with their part of the system.

SDG sewer systems are well suited for communities where the houses are far apart, or where most houses are served by an existing septic tank. Areas with a high housing density or with extremely hilly terrain are not as conducive for the use of this type of system. Operation and maintenance costs for SDG sewer systems are comparable to those of conventional gravity (CG) systems. The only additional maintenance requirement is the periodic pump out of the septic tanks, which is usually done every three to five years.

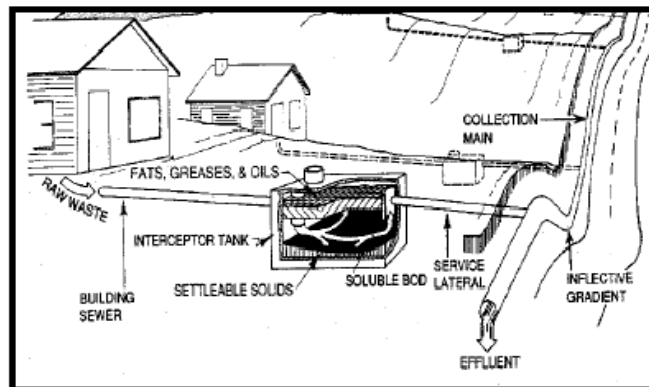


Figure 3. Septic Tanks and Small Diameter Gravity Sewer System.

Though not necessarily a disadvantage, limited experience with SDG sewer system technology has yielded some situations where systems have performed inadequately. This is more a function of poor design and construction than the ability of a properly designed and constructed SDG system to perform adequately. SDG systems cannot handle commercial wastewater with high grit or settle-able solid levels. Odors are the most common problem and are caused by inadequate

house ventilation systems and mainline manholes or venting structures. And lastly, SDG systems must be buried deep enough so that they will not freeze.

The main advantage of the SDG sewer system over the CG sewer system is low capital cost due to reduced pipe costs, cleanouts in place of manholes, reduced lift station sizes due to peak flow attenuation by septic tanks, and potential reduction in treatment costs due to septic tank pretreatment. However, construction costs for this septic tank system in Agua Prieta, in compliance with CONAGUA regulations and acceptable construction guidelines, is estimated to be around \$8,500.00 pesos (\$810.00 U.S. Dollars) per household¹⁰. The total of households to be served in the proposed projects area is 5,000; therefore, the total cost to implement this alternative would be approximately \$4,050,000.00 (4.05 million U.S. dollars). The estimated total cost to implement this alternative in section B, would be of approximately 1.62 million U.S. dollars.

2.7 COMPARISON OF THE ALTERNATIVES

Table 2 compares the potential environmental trans boundary impacts to the project area of the alternatives. Refer to *Chapter3 (Affected Environment and Environmental Consequences)* for further discussion of these potential environmental impacts.

Table 2. Comparative Matrix Summary

Alternatives: Receptors:	No Action	Conventional Gravity (CG) Alternative	Septic Tanks (SDG) Alternative
Land Use	No impact on land use.	Locations of the proposed sewer system will be constructed / installed in already disturbed areas of existing streets and right- of-ways; therefore, not disturbing additional resources. No transboundary impact.	Locations of the proposed sewer system will be constructed / installed in private property and in already disturbed area of the existing streets and right-of-ways. No transboundary impact
Air Quality	Air quality in the area of concern would not be impacted by the no action alternative.	Construction improvements associated with this alternative have the potential of some temporary pollution to the air resources in the proposed projects' area of concern. Also, there is a potential effect especially with odors in the event some of the septic tanks are removed and the contaminated	Construction improvements associated with this alternative have the potential of some temporary pollution to the air resources in the proposed projects' area of concern. Also, there is a potential effect especially with odors in the event some of the septic tanks are removed and the contaminated

¹⁰ OOAPASAP, personal interview with Miguel A. Santana, January 17, 2006.

