# ENVIRONMENTAL ASSESSMENT
for
NOGALES INTERNATIONAL WASTEWATER TREATMENT PLANT (NIWTP)
UPGRADE/EXPANSION
INTERNATIONAL OUTFALL INTERCEPTOR REPLACEMENT
WASTEWATER COLLECTION SYSTEM REHABILITATION

Nogales, Arizona and Nogales, Sonora

Prepared
for
U.S. Environmental Protection Agency
Region IX
75 Hawthorne
San Francisco, CA 94105

Prepared
by
U.S. Section International Boundary and Water Commission
4171 N. Mesa
The Commons Building C
El Paso, TX 79902–1441

and

Camp Dresser & McKee Inc.
177 North Church Street
Suite 800
Tucson, AZ 85701

# List of Acronyms

| | |
|---|---|
| ADEQ | Arizona Department of Environmental Quality |
| ADWR | Arizona Department of Water Resources |
| BECC | Border Environment Cooperation Commission |
| CEQ | Council on Environmental Quality |
| CFR | Code of Federal Regulations |
| EA | Environmental Assessment |
| EI | Environmental Inventory |
| EIS | Environmental Impact Statement |
| EPA | U.S. Environmental Protection Agency |
| FONSI | Finding of No Significant Impact |
| IBWC | International Boundary and Water Commission |
| IOI | International Outfall Interceptor |
| NEPA | National Environmental Policy Act |
| NIWTP | Nogales International Wastewater Treatment Plant |
| PCE | Tetrachloroethylene |
| USIBWC | U.S. Section, IBWC |

# Section 1
# Environmental Assessment

This Environmental Assessment (EA) is a stand-alone document developed parallel with and supportive of the Ambos Nogales Facilities Plan. This EA satisfies the requirements of the National Environmental Policy Act (NEPA) of 1969, the Council on Environmental Quality (CEQ) NEPA regulations (40 CFR Parts 1500–1508), the Environmental Protection Agency (EPA) NEPA regulations (40 CFR Part 6), the International Boundary and Water Commission (USIBWC) Final Operational Procedures for Implementing Section 102 of the National Environmental Policy Act, and the Border Environment Cooperation Commission (BECC). The primary purpose of the EA is to gather sufficient evidence and analysis for determining whether to prepare an Environmental Impact Statement (EIS) or a Finding of No Significant Impact (FONSI). An EIS is required if significant environmental impacts are anticipated.

## 1.1 Scoping

The international concerns and diversity of projects dictate that this EA incorporate analyses at a level generally associated with a NEPA EIS. This EA therefore meets the general requirements of an EIS and, as a component of the parallel Ambos Nogales Facilities Plan, considers NEPA requirements related to public involvement and community outreach. Public involvement is a component of this EA. This EA addresses all important potential impacts on the U.S. side of the international boundary, as well as transboundary impacts. Impacts in Mexico are covered in a Mexican environmental assessment, as appropriate.

## 1.2 Introduction

NEPA, along with subsequent amendments, requires that environmental considerations be given careful attention and appropriate weight in every recommendation or report on proposals for legislation and for other federal actions significantly affecting the quality of the environment. The requirements of NEPA are to be integrated with other planning and environmental review procedures required by law or by agency practice so that all such procedures run concurrently rather than consecutively. To meet these requirements, this EA is conducted concurrently with the Ambos Nogales Facilities Plan to evaluate the potential for identified project alternatives to adversely affect the local environment. As part of the facilities plan, an Environmental Inventory (EI) has been developed, and constitutes Section 6 of the facilities plan report.

The EI and other sections of the Ambos Nogales Facilities Plan provides details and much of the basis for the information presented in this EA. For example, the EI includes detailed descriptions of the local environment and habitats as well as discussions of the value of intermittent and ephemeral waters, the identification of important environmental resources, and the biology of important species. Other sections of the Ambos Nogales Facilities Plan provide detailed information on related issues such as socioeconomic issues and wastewater treatment processes.

The potentially affected environment is assessed in this EA as sixteen (16) individual components. Fifteen of these components were previously identified in Element 6 of the Facilities Plan, the EI,

and include land use, geology and soils, topography, floodplains, surface water quality, groundwater aquifers, groundwater quality, biological resources (including threatened/endangered species), historic and cultural resources, public health and safety, air quality and odors, energy supply and natural resources, hazardous and solid waste, aesthetic resources, and parks. The category socioeconomics, which includes issues related to demographics, employment, and population growth, was not included in the EI. This category is also assessed in this EA. The EA therefore evaluates sixteen (16) resource categories, the fifteen (15) categories defined above and socioeconomics.

Another component discussed in the EI, applicable plans and policies, is not evaluated in the EA because it is not a component of the potentially affected environment. This EA does, however, consider how project actions and other related actions influence applicable plans and policies. No conflicts between applicable plans and policies and project actions or other related actions have been identified.

### *1.2.1 Purpose of the EA*

The primary purpose of the EA is to determine if a FONSI can be prepared for the proposed action described in the following sections. A FONSI precludes the need to perform an EIS, while a finding of potentially significant impact dictates that an EIS is required. CEQ 40 CFR Part 1508.9 provides the following definition and requirements for an EA:

***Environmental Assessment:***

(a) Means a concise public document for which a Federal agency is responsible that serves to:

(1) Briefly provide sufficient evidence and analysis for determining whether to prepare an environmental impact statement or a finding of no significant impact.

(2) Aid an agency's compliance with the Act when no environmental impact statement is necessary.

(3) Facilitate preparation of a statement when one is necessary.

(b) Shall include brief discussions of the need for the proposal, of alternatives as required by section 102 (2)(E), of the environmental impacts of the proposed action and alternatives, and a listing of agencies and persons contacted.

### *1.2.2 Project Identification and Location*

Currently, domestic wastewater generated in Nogales Sonora, is conveyed north by a gravity collection system to Nogales, Arizona where it is combined with Arizona flows in the International Outfall Interceptor or IOI. Together, the combined wastewater flows from both cities continue northward via the IOI, along the Nogales Wash, to the Nogales International Wastewater Treatment Plant (NIWTP) where treatment takes place prior to discharge to the Santa Cruz River basin.

Due to deficiencies within the Sonoran collection system, a certain amount of untreated wastewater escapes into the Nogales wash, a tributary of the Santa Cruz river. In addition, seasonal increases in

the water table caused by storm events account for a significant amount of infiltration especially into the IOI. This results in dilution of the wastewater as well as a reduction of hydraulic residence within the NIWTP. Both these factors can reduce the efficiency of treatment and may lead to the release of inadequately treated effluent to the Santa Cruz River.

The project area is located in southern Arizona and northern Sonora, Mexico. The northern boundary of the project area extends to the farthest reach of the Santa Cruz River with effluent–dominated surface flow (Figure 1). During most seasons and most years, this is near Tubac, Arizona, about 26 km (16 miles) downstream of the NIWTP. To the east, the project area is bounded by the Santa Rita and Patagonia Mountains, and to the west by the Pajarito Mountains. The southern boundary of the project area is delineated by the wellfields in the Los Alisos area of Sonora. Section 6.3 of the Facilities Plan (Topography) provides a more detailed description of the project area.

Specific sites identified in the Facilities Plan for the construction of treatment facilities under one or more alternatives include (1) the current NIWTP site near the confluence of the Nogales Wash and the Santa Cruz River; (2) at the Santa Cruz River between the NIWTP and Kino Springs near the intersection of Arizona State Route 82 and the Santa Cruz River; (3) the industrial site along River Road in the Rio Rico area. The disposal or discharge of treated wastewater generated at one or more of these WWTP sites requires an assessment of potential discharge locations. Several alternative sites were evaluated for wastewater discharge via direct discharge to the Santa Cruz River. Another potential discharge site was identified at Potrero Creek where discharge may be accomplished. At each potential discharge location, the added benefit of aquifer recharge is considered a positive secondary effect.

In Mexico, the initially selected sites of interest for treatment included (1) the Santa Cruz River at Mascareñas, east of Nogales; (2) the Santa Cruz River at El Mezquital, south of Mascareñas; (3) the Santa Cruz River at San Luis; (4) the Santa Cruz River at Paredes; and (5) two sites near the intersection of Rio Los Alisos and the Road to Saric south of Nogales, Sonora. These sites were also initially considered for their suitability for discharge of treated effluent, along with the added potential for aquifer recharge via direct discharge to the river followed by percolation. The parallel Mexican EA provides a detailed analysis of impacts to environmental resources in Mexico.

### 1.2.3 History of Proposed Action

There has been concern with pollution and public health issues along the U.S.–Mexico Border for several years. These concerns gained further importance in public opinion and the media during the negotiation of the North America Free Trade Agreement (NAFTA) which, according to some opponents, would increase the extent of contamination along the border as U.S. industries relocated to border areas in Mexico. A border sanitation problem has existed in Ambos Nogales since the 1940s, and has been attended to by the United States and Mexico by the construction of international outfalls and treatment plants; first, in the 1950s, then in the 1970s, and more recently in the 1990s. In Ambos Nogales, occurrences of raw or partially treated sewage in surface waters has been one of several border sanitation problems that threaten the health and well being of inhabitants along the border area. In 1995, the U.S. Congress passed an appropriations act, authorizing the U.S. Environmental Protection Agency (EPA) to spend US$47.4 million addressing

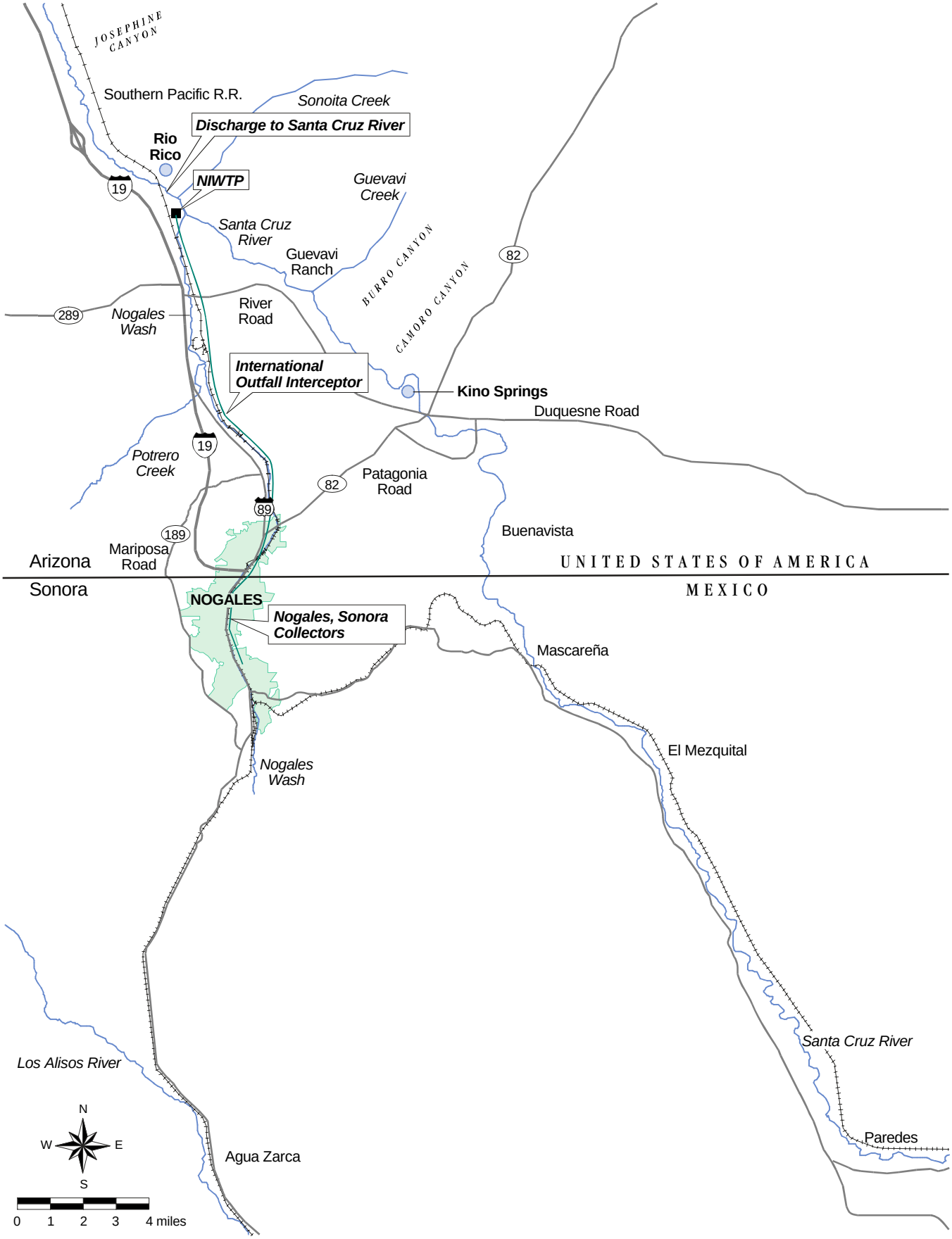



**Figure ES-1**
**Project Area**

sanitation problems on the border. EPA, Region IX, selected Ambos Nogales and Mexicali, Baja California for the development of sanitation facilities plans to develop alternative solutions for future implementation. Of these funds, EPA awarded US$33.6 million to USIBWC to develop facility plans and carry out selected wastewater sanitation improvements at Nogales and Mexicali.

The International Boundary and Water Commission (IBWC), represented by the United States and Mexico deliberated the terms of an international agreement made formal by IBWC Minute 294. This minute authorizes the formation of a multi-agency binational technical committee to coordinate the development of a wastewater facility plan facilitated by the IBWC. The Binational Technical Committee, as described in the following sections, represents federal, state, and local government agencies of both countries. In addition, the USIBWC retained the environmental consulting firm Camp Dresser & McKee Inc. (CDM) to act as an external consultant in the development of the Facilities Plan. It is expected that the responsible party or parties in the United States and Mexico will present the Facilities Plan to the BECC. If certified, the project would be eligible for North American Development Bank (NADBank) financing.

## 1.2.4 Relevant U.S. Lead and Cooperating Agencies

The IBWC under Minute 294 formed policy and technical binational committees to develop the Facilities Plan. The Binational Technical Committee is in charge of overseeing, providing guidance, and identifying relevant issues that require attention on a day–to–day basis. The Binational Policy Committee, on the other hand, is primarily responsible for decision making, but also provides directives on global or "big picture" issues. The binational committees are in turn divided into national committees. This section describes the members of the U.S. committees and their role in the Facilities Plan, followed by descriptions of Mexican agencies involved in the Facilities Plan.

International Boundary and Water Commission

The international coordinating agency for the facility plan development is the IBWC, an international organization established by the 1944 Water Treaty. The Governments of the United States and Mexico entrust to the IBWC the application of the 1944 Water Treaty (TS 944; 59 Stat 1219) and the regulation and exercise of the rights and obligations assumed by the two governments under this and other boundary and water treaties and agreements. The United States and Mexico obligations for the Nogales sanitation problem are in IBWC Minutes 227, 276 and 294. The IBWC is made up of two Sections, a United States Section (USIBWC) and a Mexican Section (MxIBWC) headed by an engineer commissioner appointed by the President of the respective country. Each Commissioner receives foreign policy guidance from his respective foreign office in those matters of joint action with the other country.

The IBWC may conduct studies and investigations on boundary and international water matters under the various boundary and water treaties and other international agreements in force between the United States and Mexico and as the two Governments may request.

The USIBWC has international oversight of the Nogales International Wastewater Treatment Plant (NIWTP), which has a design capacity of 754 L/s (17.2 mgd) average daily flow of which 320 L/s (7.3 mgd)is owned by Nogales, Arizona. Under Minute 276, 434 L/s (9.9 mgd) capacity was allocated to Nogales, Sonora. From 1954 to 1996, the City of Nogales operated and maintained the

wastewater treatment plant under IBWC oversight and was reimbursed by the USIBWC for the cost of treating Nogales, Sonora sewage. At the request of Nogales, Arizona, in 1996, the USIBWC operates and maintains the wastewater treatment plant and is reimbursed by the Nogales, Arizona for the cost of treating Nogales, Arizona sewage.

As previously indicated, USIBWC has received funds from the EPA to act as Project Manager for the Ambos Nogales Facilities Plan in coordination with the agencies described below and the external consultant firm.

***U.S. Environmental Protection Agency (EPA)***

EPA is a federal entity in charge, among other things, of establishing and enforcing water quality standards, providing guidance for maintaining or improving water quality, and in some instances, providing funds for conducting studies and implementing water quality related projects.

The EPA awarded funds to the USIBWC through an interagency agreement to coordinate the development of the binational facility plan and selection of wastewater improvements for Nogales. EPA funds are designated in this case for wastewater–related issues, e.g., for treatment and discharge of treated effluent.

***Arizona Department of Environmental Quality (ADEQ)***

The ADEQ was created in 1986 by the Arizona Environmental Quality Act. ADEQ is the primary agency responsible for all purposes of the Clean Water Act (CWA), the Safe Drinking Water Act (SDWA), the Resource Conservation and Recovery Act (RCRA), and other environmental programs in the State. ADEQ adopts water quality standards for navigable waters and aquifers. In addition, it requires programs to be adopted to control surface and ground water and to control point and nonpoint pollution discharges.

In Arizona, the National Pollutant Discharge Elimination System (NPDES) permits are issued by EPA rather than ADEQ. Nonetheless, ADEQ requires discharging facilities to obtain an Aquifer Protection Permit (APP).

ADEQ is an active member of the U.S. Committee dedicated to ensuring future effluent discharges comply with all state and federal laws. ADEQ has provided guidance throughout the facilities planning process to establish effluent water quality targets.

***Arizona Department of Water Resources (ADWR)***

In 1980, Arizona established the Groundwater Management Act (GMA) with the purpose of controlling overdraft of groundwater supplies. The GMA created the ADWR to manage groundwater resources and establish Active Management Areas (AMAs) in crucial areas where groundwater supplies were most threatened (SEAGO 1994).

"ADWR works to secure long–term water supplies for Arizona's communities. The Department administers state water laws (except those related to water quality), explores methods of augmenting water supplies to meet future demands, and develops policies that promote conservation and equitable distribution of water" (ADWR, December 17, 1997).

ADWR intends to accomplish safe–yield of the aquifers of four of its five AMAs, including the Santa Cruz AMA, by the year 2050. Safe–yield is defined as a condition in which no more groundwater is being extracted than is being replaced. To achieve this, ADWR is interested in evaluating the potential for groundwater recharge, which is one of the components of all alternatives of the Facilities Plan. The rules for the use of renewable sources, such as effluent, are included in the Adequate Water Supply Program. Some of the provisions associated with recharge projects are included in the Groundwater Code of 1980 (ADWR, December 17, 1997).

***Santa Cruz County***

Santa Cruz County, through its Health Department, is a stakeholder in the Facilities Plan. One of the most important concerns of the County Health Department is the elimination of fugitive raw wastewater flows in the area to reduce potential public exposure to contaminated waters. Additionally, the County is interested in guaranteeing that any groundwater recharge scheme would not compromise the quality of the receiving water.

***City of Nogales***

The City of Nogales, Arizona owns 42 percent of the capacity of the NIWTP, or approximately 320 L/s (7.3 mgd) daily average flow. In addition, the City owns the International Outfall Interceptor (IOI), which conveys raw wastewater originated in Ambos Nogales to the NIWTP. The City of Nogales also provides water and sewer service to its residents. The City of Nogales would act as a promoter of the project for purposes of BECC certification, as explained below.

The nearby residential area of Rio Rico, north of the City of Nogales, is served by Rio Rico Utilities, a private water and sewerage company. Currently, Rio Rico has an agreement with the City of Nogales by which Rio Rico is allowed to use 24 L/s (0.55 mgd) of treatment capacity at the NIWTP. Rio Rico is a stakeholder in the Facilities Plan mainly due to its current and potential future use of the NIWTP, and by the potential impact of the NIWTP discharge on its wells located along the Santa Cruz River, downstream of the NIWTP.

## *1.2.5 Relevant Mexican Lead and Cooperating Agencies*

As previously indicated, these agencies are also members of the Mexican Policy Committee and the Mexican Technical Committee involved in the Ambos Nogales Facilities Plan. The functions of these committees are analogous to the functions of their U.S. counterparts. The Technical Committee is responsible for the day–to–day coordination and guidance, whereas the Policy Committee acts as a decision maker and provides guidance in global "big picture" issues. The Mexican committees are composed of federal and state government agencies as described below.

***Comisión Internacional de Límites y Aguas***

CILA (*Comisión Internacional de Límites y Aguas*) is an acronym for the Spanish name for the IBWC. CILA has essentially the same role as USIBWC.

***Comisión Nacional del Agua***

The Comisión Nacional del Agua (CNA) is a federal entity charged with regulating water rights and water quality. The specific responsibilities of CNA include, among others:

- To encourage and support the development of water, sewer, treatment, irrigation, and flood control programs
- To administer and protect the national waters, and to preserve and protect their quality, as well as to manage watersheds
- To plan, study, construct, operate, and maintain federal hydraulic projects or infrastructure
- To issue water allocations, concessions, permits and rights to act as an arbiter in water conflict resolution
- To promote the efficient use of water and its conservation in all phases of the hydrologic cycle
- To enforce the application of the Ley Nacional de Aguas (National Water Act) and to apply the appropriate sanctions in case of the violation of the law (CNA 1992).

For the case of the Ambos Nogales Facilities Plan, CNA has issued site specific standards referred to as *condiciones particulares de descarga,* as described in Section 9.3 of the Facilities Plan Report (Modifications for the Short List of Alternatives).

***Secretaría de Infraestructura Urbana y Ecología (SIUE)***

SIUE is a state government agency responsible for establishing infrastructure and environmental policies at the State level. SIUE also coordinates with COAPAES (described below) for planning water and wastewater infrastructure. In the case of the Facilities Plan, SIUE acts as the representative of the interests of the government of the State of Sonora to enhance the well–being of the residents of the State.

***Comisión de Agua Potable y Alcantarillado del Estado de Sonora (COAPAES)***

COAPAES, a decentralized agency of the State Government, whose responsibilities include: planning and budgeting of the hydraulic sector of the state; executing the State Government policies for the coordination of potable water and sewer systems; supporting and providing technical assistance to municipal operators; and acting as operator of the water and sewer systems in municipalities which do not have developed operating agencies. In the case of Nogales, Sonora, COAPAES is in charge of managing and operating the water and sewer systems (CNA 1996).

### *1.2.6 Relevant Binational Agencies*

In addition to the national U.S. and Mexican agencies, there are two binational agencies, which are extremely important in ensuring the financial feasibility of the project. These two agencies are described below.

***Border Environment Cooperation Commission (BECC)***

The North American Free Trade Agreement (NAFTA) produced a side agreement related to the environment, referred to as the Border Funding Agreement between the United States and Mexico. The signing of this agreement led to the creation of three binational institutions to address water, wastewater, and solid waste concerns: (1) the North American Commission on Environmental

Cooperation (NACEC); (2) BECC; and (3) NADBank (*ASCE and the U.S.–Mexican Policy Studies Program 1995*).

The NACEC was created to settle trade disputes involving pollution or the enforcement of environmental laws and its members include Canada, the United States, and Mexico (*ASCE and the U.S.–Mexican Policy Studies Program 1995*), whereas the BECC and NADBank include only the U.S. and Mexico. These organizations are responsible for addressing environmental problems along the U.S.–Mexico border.

"The purpose of BECC is to help preserve, protect, and enhance the environment of the border region in order to advance the well–being of the people of the United States and Mexico" (BECC 1996). In keeping with its mission, the BECC is responsible for evaluating the feasibility, efficiency, and effectiveness of proposed water, wastewater, and solid waste infrastructure projects within a 100 km region along both sides of the U.S.-Mexico border. Projects must comply with criteria established by the BECC. A project would then be eligible for possible funding from the NADBank. The certification criteria established by BECC are classified as follows (BECC 1996):

- Human health and Environment
- Technical feasibility
- Financial feasibility and Project Management
- Community participation
- Sustainable development

The Ambos Nogales Facilities Plan is the planning document that will be used to identify a wastewater infrastructure project for Nogales, Arizona, and Nogales, Sonora that will be submitted to BECC for certification. Once certified, the proposed projects would be eligible for NADBank financing. The following paragraph summarizes briefly the role of the NADBank as a financing institution for environmental infrastructure projects along the border.

***North American Development Bank (NADBank)***

NADBank was also created as part of the Border Funding Agreement. "The purposes of NADBank are to use a small amount of federal capital to leverage a large volume of private–sector lending; to make effective use of local grants and loans from federal and state sources; and to involve financial participation of local citizens" (ASCE and the U.S.–Mexican Policy Studies Program 1995). In addition, the NADBank was established to: "provide financing for projects certified by BECC, as appropriate, and at the request of the BECC, to otherwise assist the BECC in fulfilling its purposes and functions"; and "to provide financing endorsement by [either the United States or Mexico] for community adjustment and investment in support of the purposes of the NAFTA" (Holub 1997).

## 1.3 Statement of Purpose and Need

Some of the concerns identified in Section 1.2.3 are a result of inadequate or incomplete coverage of the sewer system in Nogales, Sonora. According to the operating agency, COAPAES, there were in December 1997 a total of 23,699 registered connections to the sewer system. Multiplying the number of connections by the average residential population density provided by Instituto Nacional de Estadístion, Geografía e Informática (INEGI) of 4.3 people per household, and dividing

by the CNA population estimate for the same year of 187,820 people, indicates that only about 54 percent of the population has access to the sewer system. In addition to the incomplete coverage of the system in Nogales, Sonora, many sewer lines in Ambos Nogales are in less than optimal condition, as observed during the infiltration/inflow investigations conducted in both communities (Section 3 of the Facilities Plan). Moreover, the capacity of the IOI, which conveys Ambos Nogales wastewater flows to the NIWTP, is limited by several bottlenecks. Flows in excess of the IOI capacity result in overflows of untreated sewage into the Nogales Wash. Incomplete coverage coupled with less than optimal conditions of the sewer system in its upstream sections also result in fugitive flows, which in most circumstances travel from Mexico into the United States via the Nogales Wash. These fugitive flows are an important public concern, as evidenced by the frequent publication of articles in local newspapers.

In addition to the fugitive flow problem, the hydraulic capacity of the NIWTP is near its limit. As population grows, the remaining capacity of the NIWTP will be exhausted. Furthermore, water supply and consumption and the accompanying wastewater production are expected to grow in the near future as the *acuaférico* project is implemented in Nogales, Sonora. The *acuaférico* project would increase the amount of water delivered, the level of coverage of the water system, and the per capita water consumption (Section 5 of the Facilities Plan).

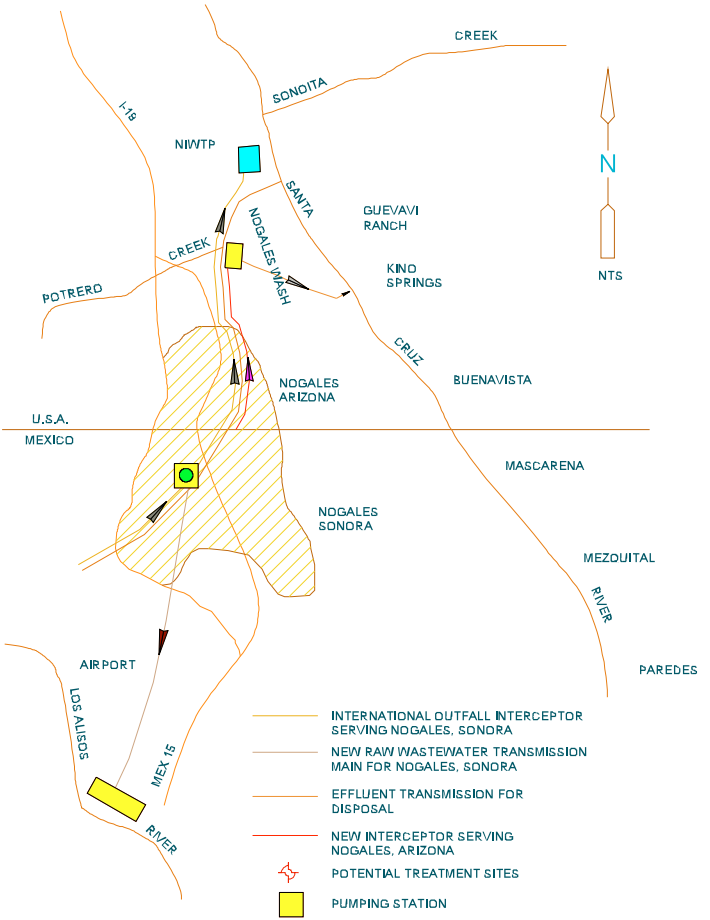
From a water quality perspective, the effluent quality limits for the NIWTP are currently being revised (Section 2.3 of the Facilities Plan). The proposed permit calls for the reduction of potential toxicity to aquatic life, which implies a reduction in ammonia concentrations. Additionally, there is a concern about the potential impact of effluent with high total nitrogen concentrations, since nitrogen could potentially be transformed to nitrate [$(NO_3)^-$], affecting the potable water wells located downstream of the wastewater treatment plant, such as those serving Rio Rico. As a result of these new regulatory requirements, the wastewater treatment plant will require upgrading in the near future regardless of concerns with capacity limitations.

## 1.4 Project Description

Sections 9.1 and 9.2 of the Facilities Plan present a detailed discussion of preliminary screening of alternatives and plan selection, respectively. As indicated in the Facilities Plan, seventy–six (76) alternatives were developed and evaluated. These seventy–six alternatives can be grouped into six (6) conceptual alternatives.

Following standard NEPA practice, this EA evaluates three action alternatives and a "no action" alternative, for a total of four evaluated alternatives. The three Action Alternatives for the EA are associated with changes to the wastewater treatment system currently in place. EA Alternatives A, B, and C were originally identified as conceptual Alternatives 3, 4, and 6, respectively. The No Action Alternative (D) assumes no changes to the current system, and corresponds to conceptual Alternative 5. Each of these alternatives are described below and the three action Alternatives (A, B, and C) are graphically presented as Figures 2, 3, and 4, respectively.

Alternative C is the recommended alternative. Alternative C, like Alternatives A and B, includes components in Nogales, Arizona and Nogales, Sonora. Construction of the different components may be phased, depending on funding availability and other factors.




CONCEPTUAL DIAGRAM OF ALTERNATIVE A

FIGURE 9.3-1

CDM
environmental engineers, scientists, planners, & management consultants

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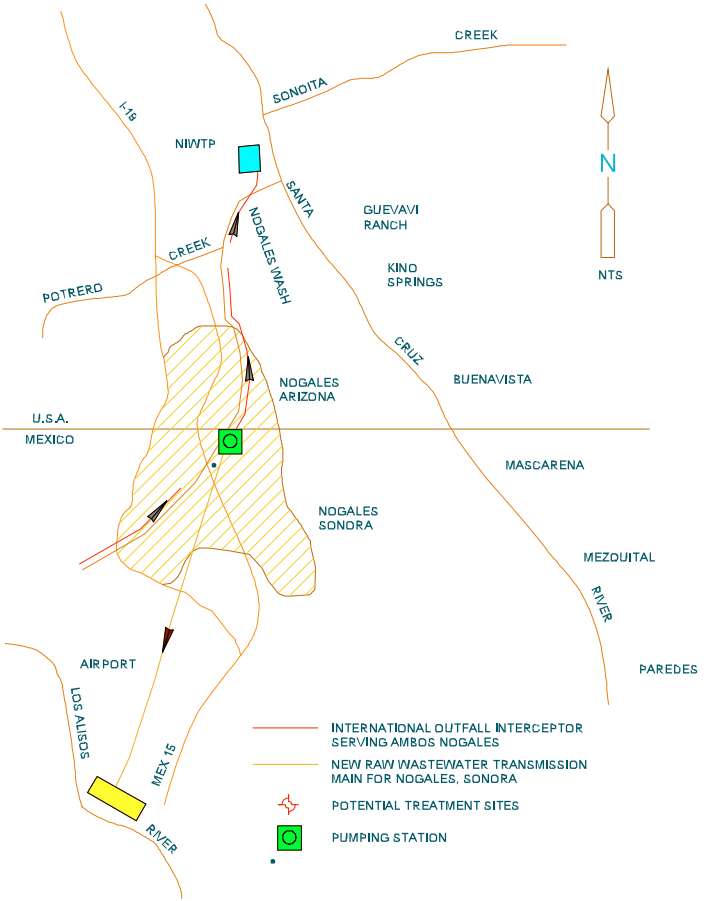


CONCEPTUAL DIAGRAM OF ALTERNATIVE B

FIGURE 9.3-2

CDM
environmental engineers, scientists, planners, & management consultants

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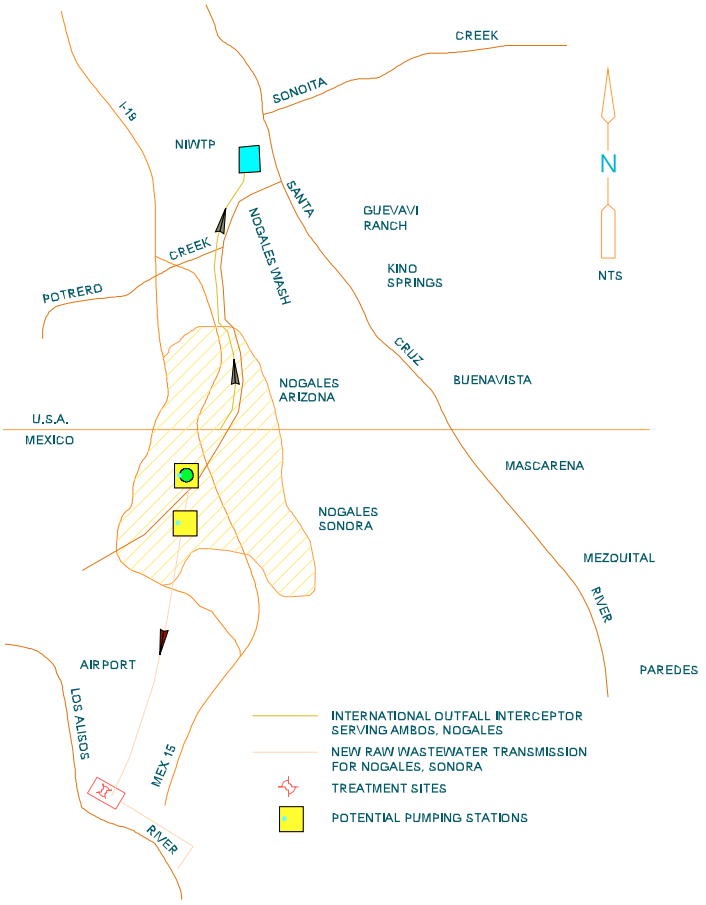



CONCEPTUAL DIAGRAM OF ALTERNATIVE 6

CDM
environmental engineers, scientists, planners, & management consultants

## 1.4.1 Environmental Assessment Alternatives

The descriptions of the four environmental alternatives are presented below.

### 1.4.1.1 Environmental Assessment Alternative A

Alternative A was originally identified as conceptual Alternative 3. This alternative would retain the NIWTP, which would be upgraded and used exclusively for treating flows from Mexico conveyed by the existing IOI, which will also be rehabilitated. Upgrade of the NIWTP will be accomplished by converting the aerated lagoon system to a conventional activated sludge system with sludge recirculation. Existing basins will be retrofitted to an activated sludge process using nitrification and denitrification, and secondary clarifiers will be added. The new system will allow the facility to increase the removal of nitrogen as well as Biochemical Oxygen Demand (BOD) and Total Suspended Solids (TSS). The capacity of the upgraded NIWTP will be 412 L/s (9.4 mgd).

Mexican flows in excess of the IOI and/or NIWTP capacity would be conveyed to a new WWTP in Mexico located adjacent to Los Alisos River. A pumping system will be in place in Nogales, Sonora, based on a series of pump stations capable of handling Mexican flows in excess of the Mexican allocation to the NIWTP. The wastewater treatment plant in Los Alisos under this alternative would be based on an activated sludge system with biological nutrient removal. The biological treatment would be accomplished by means of an oxidation ditch, and the wastewater treatment plant would include headworks, clarifiers and disinfection, as well.

Wastewater originating in Arizona would be treated at a new WWTP at the Nogales, Arizona Industrial Site. Associated with the new Arizona WWTP would be the construction of a new interceptor that would convey wastewater from Nogales, Arizona to the new WWTP at the Industrial Site. Treated effluent would be pumped to the Santa Cruz River near Kino Springs or to Potrero Creek for discharge in Arizona. Mexico would discharge at the new WWTP site at Los Alisos directly to the Los Alisos River. The wastewater collection systems in Nogales, Arizona and Nogales, Sonora, as well as the IOI, would also be rehabilitated under this alternative.

Currently, the NIWTP discharges an average of about 504 L/s (11.5 mgd) to the Santa Cruz River at the existing outfall. Under Alternative A, flows to the NIWTP would drop to approximately 412 L/s (9.4 mgd) in 2020. The effluent from the NIWTP would contain reduced concentrations of total nitrogen, BOD, and TSS, under this alternative.

### 1.4.1.2 Environmental Assessment Alternative B

Alternative B was originally identified as conceptual Alternative 4. Under this alternative, the NIWTP and the IOI would be upgraded as necessary to collect and treat all flows from Nogales, Arizona. The IOI and the wastewater collection systems in Nogales, Arizona and Nogales, Sonora would be replaced or rehabilitated as needed. Effluent treated at the upgraded NIWTP would be discharged to the Santa Cruz River using the existing outfall. All wastewater originating in Mexico would be collected in Mexico near the International Border and pumped back to Los Alisos for treatment and subsequent discharge directly to the Los Alisos River.

Upgrade of the NIWTP would also be accomplished by converting the aerated lagoon system to a conventional activated sludge system with sludge recirculation. Existing basins will be retrofitted

to an activated sludge process employing nitrification/denitrification and secondary clarifiers would be added. The new system will allow the facility to reduce the overall nitrogen as well as biochemical oxygen demand (BOD) and suspended solids (SS). The capacity of the upgraded NIWTP would only be required to be 202 L/s (4.6 mgd) based on the projected wastewater production of Nogales, Arizona for the year 2020. The wastewater treatment plant in Los Alisos would incorporate the same process train proposed for Alternative A, and only the capacity would be different. Under this alternative, the Mexican wastewater treatment plant would have an average capacity of about 1,117 L/s (25.5 mgd). Wastewater would be delivered to the wastewater treatment plant by means of a pumping scheme, similar to the system described under Alternative A. This pumping system, however, would incorporate a pump station at the U.S.-Mexico border, and multiple pump stations would be required for appropriate conveyance of all the Mexican flows to Los Alisos.

Implementation of this alternative would then reduce the volume of water currently discharged from the NIWTP to the Santa Cruz River from approximately 504 L/s (11.5 mgd) to the 202 L/s (4.6 mgd) referenced above. The effluent from the NIWTP would also contain reduced concentrations of nitrogen (overall), BOD, and TSS under this alternative. The effluent from the NIWTP would also contain reduced concentrations of total nitrogen, BOD, and TSS, under this alternative.

#### *1.4.1.3 Environmental Assessment Alternative C*

Alternative C was originally identified as conceptual Alternative 6. Under this alternative, the existing IOI would be replaced with a new enlarged version and the NIWTP will be upgraded and expanded in capacity. The NIWTP will continue to service the wastewater generated in both the communities of Nogales, Arizona and Sonora. In addition, the wastewater collection systems in Nogales, Arizona and Nogales, Sonora would be rehabilitated.

The respective allocations to Nogales, Sonora, defined in a binational agreement will remain at 434 L/s (9.9 mgd). The remainder of the current capacity, 320 L/s (7.3 mgd), is reserved for Arizona. Mexican flows in excess of that treated at the NIWTP would be conveyed to a new WWTP in Mexico at Los Alisos. Effluent from the new Los Alisos WWTP would be discharged directly to the Rio Los Alisos.

Even though the respective allocations for Nogales, Sonora and Nogales, Arizona will remain the same (434 L/s [9.9 mgd] and 320 L/s [7.3 mgd], respectively) for a total capacity of 754 L/s (17.2 mgd), this alternative provides for expansion of the NIWTP to accommodate potential flows from Mexico in excess of their allocation as a result of storm events, system failures and until later phases of the Mexican wastewater system are implemented. In addition, projected water system improvements in Nogales, Sonora will possibly lead to increased wastewater flows ahead of the pumping system improvements associated with this alternative. Although the exact amount of expansion is undetermined at this time, it is anticipated that the NIWTP capacity may be increased by 131 L/s (3 mgd) to 219 L/s (5 mgd).

This increase in the NIWTP capacity is not necessarily associated with an immediate increase in the amount of effluent discharged to the Santa Cruz River from the wastewater treatment plant. Over time, as the increased treatment capacity is utilized, the volume of effluent discharged to the Santa Cruz River would increase. Therefore, increases in effluent discharged to the river would be realized only gradually as human population and water use increased.

Upgrade of the NIWTP would also be accomplished by converting the aerated lagoon system to a conventional activated sludge system with sludge recirculation. Existing basins will be retrofitted to an activated sludge process employing nitrification/denitrification and secondary clarifiers would be added. The new system will allow the facility to reduce nitrogen as well as BOD and TSS.
The wastewater treatment plant in Los Alisos, under this alternative, will be based on a natural system. The treatment train will consist of a series of lagoons (deep facultative, high algae growth, settling, and maturation/filtration), with configuration known as Advanced Pond Systems. These ponds will be capable of lowering the concentration of BOD, TSS and, to a varying degree, total nitrogen, to comply with the site specific discharge conditions issued by the Mexican government for this site, as described in Section 9 of the facilities plan (Plan Screening and Selection). Under this alternative, a pumping system very similar to the system described under Alternative A, would be required for wastewater conveyance to Los Alisos. In this case, however, the pump stations would have the capacity to pump only the average flows in excess of the Mexican allocation to the NIWTP. Peak flows associated to storm events would not be pumped to Los Alisos, and would be bypassed to the gravity system, allowing them to flow north, cross the border and be conveyed to the NIWTP. Under this scheme, additional hydraulic capacity would be provided in the gravity lines downstream of the pump stations (Mexican collectors and the IOI), to assure appropriate conveyance of the peak flows to the NIWTP.

Implementation of this alternative would not decrease the volume of water currently discharged from the NIWTP. Typical current discharge flows are based on the minimum (386 L/s (8.8 mgd)) and maximum (701 L/s (16.0 mgd)) average monthly flows measured during the 1994–1997 time period. The average discharge flow (504 L/s (11.5 mgd)) is the overall 4–year average daily flow measured at the NIWTP. Effluent volume leaving the NIWTP would be maintained at levels equal to or exceeding the current minimum monthly flow of 386 L/s (8.8 mgd). The new system will allow the facility to reduce the overall nitrogen as well as biochemical oxygen demand (BOD) and suspended solids (SS).

#### *1.4.1.4 Environmental Assessment Alternative D (No–Action Alternative)*

Implementation of this alternative would result in no major upgrades and/or expansions to the existing infrastructure or wastewater treatment processes. Currently, all wastewater generated in Ambos Nogales is conveyed to the NIWTP where it undergoes aerated lagoon–based treatment, sludge retention and polishing, prior to discharge to the Santa Cruz River just downstream of the NIWTP. Any current beneficial or adverse environmental effects would remain under this alternative.

The population projections performed under this facility plan indicate that the average daily flow of domestic wastewater generated in Ambos Nogales will increase from its present level of 504 l/s (11.5 mgd) to 1,207 l/s (29 mgd) by the year 2020. Under this option, no improvements would be made to the IOI and wastewater from Sonora would be crossing the international border by gravity under increasingly surcharged conditions on its way to the NIWTP. This is because a constriction in the IOI itself exists near the border to limit the flow from Mexico. As a result, sewer overflows on the Mexican side will become more frequent, and increasing amounts of raw or untreated wastewater would be discharged to the Nogales Wash and the Santa Cruz River. Under this scenario, the overall annual loadings of BOD, SS and nutrients to the environment will most likely incur a steady increase in Arizona over time. This would occur as a result of the following factors; 1) Increased flows to the NIWTP which would lower detention time and therefore reduce treatment; 2) increased fugitive flows

as a result of wastewater backup as described in section 1.3; 3) higher volume of exfiltration from the interceptor lines in areas and/or periods of lower water table.

The frequency of NIWTP effluent limit violations could potentially increase for BOD, solids and coliform organisms and the concentration of ammonia would not be significantly reduced prior to discharge. Since people use the river for recreational or other purposes, there would be increased potential to be subjected to exposure to a harmful constituent. An increased risk for exposure to bacterial and/or viral pathogens would also result with regard to increased fugitive flows. With respect to the aquatic environment and especially the water quality of the Santa Cruz River immediately downstream of the NIWTP discharge point, water quality would become increasingly worse as the relative contribution of untreated wastewater is increased over time. From an ecosystem habitat standpoint, however, the average increase in volume of water discharged will most likely result in an increase of the available amount of habitat for aquatic species. In addition, the vegetation of the riparian habitat particularly the willow trees, could actually be enhanced by increased nutrient loading. From a public health perspective, the chance of exposure to hazardous constituents would increase for those who use the river for recreational or other purposes(dermal and inhalation routes). Also, the nitrogen present in the effluent may cause nitrate levels in the downstream aquifers to rise to levels that exceed primary drinking water standards.

### *1.4.2 Historical and Projected Flows*

To fully understand the potential impacts of each alternative on Ambos Nogales environmental resources, the flow to each WWTP and the corresponding discharge point(s) must be known. To assess potentially significant changes in NIWTP discharge flows, typical discharges for the four–year time period from 1994 to 1997 were evaluated. Data from years earlier than 1994 are not included because beginning in late 1993 there was a substantial increase in water supply in Nogales, Sonora. The earlier data would therefore not be adequately representative of current conditions. Over the four–year period, the minimum monthly flow was 386 L/s (8.8 mgd), while the maximum monthly flow was 701 L/s (16.0 mgd). Therefore, flows of 386 to 701 L/s (8.76 to 15.98 mgd) are considered representative of current conditions. The average daily flow over the entire time period was 504 L/s (11.5 mgd). The fact that the overall average is closer to the minimum monthly flow than the maximum monthly flow is indicative of the high–flow storm events that occur occasionally throughout the monsoon season, driving up maximum monthly flow numbers. It is important to note that monthly average discharges from the NIWTP varied by as much as 90 L/s (2 mgd) from one month to the next during the study period.

In addition to the amount of water discharged to the stream, the length of the aboveground flowing portion of the Santa Cruz River downstream of the NIWTP is also influenced by spatially and temporally variable parameters such as storm events and groundwater hydrology as well as effluent volumes. Precise control of the NIWTP effluent volume therefore does not guarantee a specific number of miles of flow in the Santa Cruz River downstream of the NIWTP. It is clear, however, that during the vast majority of the time, the primary contributor to surface flow downstream of the NIWTP is the volume of effluent discharged to the Santa Cruz River.

Table 1 summarizes recently measured and projected future wastewater flows for the year 2020 for Ambos Nogales for each of the four Environmental Assessment alternatives. Recently measured data

presented in this table were collected at the NIWTP influent structure and at the International Boundary from 1994 through 1997. Under Alternative A, discharge from the NIWTP site would be limited to about 412 L/s (9.4 mgd). However, depending on the discharge location selected for the new Arizona wastewater treatment plant, another 163 L/s (3.7 mgd) could be discharged to the Santa Cruz at Kino Springs. Under Alternative B, discharges to the Santa Cruz at the existing NIWTP outfall would decrease substantially since this discharge would consist only of treated wastewater from Arizona.

For Alternative C, as long as the inflow of wastewater to the NIWTP remains within its present capacity of 754 L/s (17.2 mgd), average discharges from the NIWTP to the Santa Cruz River at the existing outfall would be maintained within the 386 L/s (8.8 mgd) to 701 L/s (16.0 mgd) range described above. However, if the NIWTP expanded capacity is used, the volume of effluent discharged to the Santa Cruz River would increase to 973 L/s (22.2 mgd) (average flow) in the most extreme case. As previously mentioned, such increases would be gradual, paralleling the population growth in Nogales, Sonora.

Alternative D (no action) would result in increasing untreated NIWTP discharge flows to the Santa Cruz at the existing outfall because existing capacity would soon be exceeded.

## 1.5 Summary of the Environmental Assessment

This section describes the general approach for conducting the EA, identifies the major environmental resources that may be at risk, and provides recommendations based on the conclusions of the EA.

### *1.5.1 General Approach*

The Environmental Assessment is based on an assessment of the potential effects to each of the sixteen (16) previously identified environmental resource categories from implementation of Alternatives A, B, C, and D, presented in Section 1.4. These sixteen resource categories are not equal with regard to likelihood or severity of effects that may be experienced. Certain resource categories are therefore deemed more vulnerable or important than others.

For example, it is clear that the resource category identified as Topography is less likely to exhibit measurable effects than Surface Water Quality. The unique potential for each alternative to cause adverse environmental effects suggests that, although all resource categories are assessed, the EA can and should focus on selected environmental resources that are especially vulnerable or important.

The most vulnerable or important resource categories are described below, along with a statement of why these particular resources are considered the most important with regard to this Ambos Nogales project.

Table 1

### *1.5.2 Major Environmental Resources*

All sixteen identified categories of environmental resources have at least some potential to be affected by implementation of the alternatives. Those resource categories considered most likely to be affected by the project are defined as primary environmental resource categories. These are listed below.

- Surface Water Quality
  (directly affected by treated effluent quality and potential untreated wastewater overflows and directly affects aquatic habitat quality)

- Groundwater Aquifers
  (seasonally affected by surface water quantity and directly related to surface discharge and water availability)

- Groundwater Quality
  (directly affected by treated effluent quality and surface water/groundwater interface)

- Biological Resources
  [biota (including threatened/endangered species), habitats, surface water quantity; (directly affected by quality and quantity of treated effluents, potential untreated wastewater overflows and by surface discharge of effluent)]

- Public Health and Safety
  (directly affected by treated effluent quality and potential untreated wastewater overflows)

- Energy Supply/Natural Resources
  (directly related to power availability for operation of a new WWTP or pump station)

Other resource categories are considered secondary based on the assumption that impacts to these categories are either unlikely or, if impacts occur, they are expected to be minor or unmeasurable. These categories are listed below.

- Land Use (e.g., zoning, current and future use)
- Geology and Soil
- Topography
- Floodplains/Wild and Scenic Rivers
- Historic/Architectural/Archaeological/Cultural Resources
- Climatology/Air Quality/Odors
- Hazardous and Solid Waste
- Aesthetic Resources
- Parks and Historic Areas
- Socioeconomics (e.g., demographics, water supply, employment, transportation)

The potential environmental effects to both the primary and secondary environmental resource categories are assessed using an evaluation matrix (Section 1.8), supported by qualitative discussions and in some cases quantitative evaluations. These discussions and evaluations are presented below in Section 1.7.

## 1.6 Affected Environment

The potentially affected environment relevant to this project includes those environmental resource categories identified in the Environmental Inventory (EI, Section 6 of the Facilities Plan) and the socioeconomic category specific to this EA.

The EI summarizes the key environmental factors that are of concern now and those that may be more or less affected following implementation of a project alternative. Other sections of the Facilities Plan, along with supporting information in the EI, provide the bases upon which project alternatives are identified, evaluated, screened, and selected for full assessment in the EA. The EI serves as a description of the Affected Environment, a NEPA EA requirement. In addition, the EI meets the needs of the Mexican Preventive Report (PR) and the Mexican EIS.

## 1.7 Environmental Consequences

Environmental impacts or consequences can be direct or indirect. Direct impacts are defined here as those with clear or obvious cause–and–effect relationships. For example, the addition of a toxicant in toxic amounts to surface water can have a direct adverse impact on aquatic organisms. Indirect effects are discussed below, followed by the presentation of potential direct impacts for each of the sixteen resource categories.

***Indirect or Secondary Impacts***

Also of concern for this EA are indirect or secondary impacts to environmental resources, which include impacts that can indirectly cause a substantial change in the local environment. For example, implementation of an action may indirectly cause environmental impacts by inducing growth or development in a community. Growth and development resulting from what are viewed as more favorable conditions could cause adverse impacts on environmental resources. For this project, however, no significant or substantial indirect or secondary impacts are identified. Growth and development of Ambos Nogales is currently not limited by issues directly or indirectly related to wastewater treatment capacity or efficiency. More accurately, growth in Nogales, Arizona is limited to some degree by the availability of drinking water and not wastewater capacity or treatment capability.

***Direct Impacts***

The direct environmental consequences or impacts potentially associated with each of the four EA alternatives are summarized below for each of the 16 environmental resource categories.

### *1.7.1 Compatible Land Use/Farmlands*

This evaluation is based on the text and figures in Section 4, the Socioeconomic Evaluation, that describes the types of land uses for the project area on both sides of the international border. Current land uses, including, for example, agriculture, urban, and industrial uses, are used to help determine potential future uses and impacts related to project alternatives. In addition, zoning plans have been utilized to determine areas in which the construction of a wastewater treatment plant would bepermitted. Land use is considered a secondary resource category for this project because land use effects, if observed, are likely to be very localized.

***Alternative A***

Alternative A provides for the construction of a new wastewater treatment plant in Nogales, Arizona at the previously defined Industrial Site, construction of a new IOI, rehabilitation of the collection system, and upgrades to the existing NIWTP. The Industrial Site is currently zoned industrial and construction of a new WWTP at this site is therefore compatible with the existing zoning. Transmission lines to conduct treated effluent from the new WWTP at the Industrial Site to a discharge point would likely follow existing roads; therefore, these activities would not substantially affect land uses beyond the areas occupied by existing roads. Upgrades to the existing NIWTP would use the land currently in use as lagoons and there would be no net gain in the amount of land used for the upgraded NIWTP compared to the amount used for the existing wastewater treatment plant. Construction of a new IOI would not significantly affect land uses because the placement of the new IOI would be parallel with or alongside the existing IOI. Similarly, rehabilitation of the collection system would not significantly affect land uses since improvements will be made to existing pipelines within existing right-of-ways.

***Alternative B***

No new WWTP is proposed in Arizona under Alternative B and there would be little or no impact on the existing land uses in the U.S. Any realized impact in the U.S. would be from minor land use changes during the transition from lagoons to upgraded treatment facilities at the NIWTP, with no net increase in the amount of land required. As described in Alternative A, potential impacts associated with the IOI and collection system improvements are not considered significant.

***Alternative C***

The wastewater infrastructure in Arizona would be upgraded under this alternative, but the upgrades are expected to have little or no impact on existing land uses in the U.S., as described above.

***Alternative D***

Any identified environmental impacts related to this resource category are not anticipated to change in the short term under this alternative because there would be no immediate changes to current conditions, facilities, or processes. The projected future growth of Ambos Nogales will, however, be associated with increased amounts of wastewater requiring treatment. Effects to this resource category are, however, likely to remain minimal or nonexistent. Descriptions of current Compatible Land Use/Farmlands are provided in the EI.

## *1.7.2 Geology and Soils*

This evaluation is based on the overview of the physiography, geology, and soils of the Ambos Nogales area presented in the EI. These components are related to groundwater and surface water availability and are considered secondary resource categories for this project based on the minimal potential for project alternatives to substantially affect local geology.

The discussion of potential impacts presented below for each alternative is primarily limited to effects on physiography. With the exception of the potential impact of recharge on the recent alluvial deposits, the alternatives are not anticipated to affect unconsolidated materials, bedrock, or

geologic structures such as folds and faults. Soil impacts other than those discussed below are not anticipated to be significant.

***Alternative A***

Only minimal project–related impacts to this resource category are expected to follow full implementation of Alternative A. The most important impacts to the physiography of Ambos Nogales are associated with the discharge of treated effluent from a new WWTP in Arizona. Treated effluent would be discharged directly to the Santa Cruz River bed at Kino Springs or to Potrero Creek. The potential impacts associated with these discharges on geology and soils are minor and localized. This includes the primarily localized movement of surface soils or minor changes in soil characteristics (e.g., particle size, moisture content) at the point of discharge. Any leveling or grading required to support construction of WWTP, IOI, collection system, and transmission mains would also have some minimal, localized impacts. These impacts are also not considered environmentally significant.

***Alternative B***

Impacts are expected to be similar to those experienced under Alternative A.

***Alternative C***

As with the previous alternatives, the physiography of the Ambos Nogales area is unlikely to be measurably impacted by implementation of this alternative.

***Alternative D***

No significant environmental impacts related to this resource category are anticipated in the short term under this Alternative Because there would be no immediate changes to current conditions, facilities, or processes.

## *1.7.3 Topography*

This evaluation is based on the overview of the topography of the Ambos Nogales area presented in the EI. Topography is a secondary resource categories for this project because the project alternatives will not affect topography except in an extremely localized manner, if at all.

***Alternatives A, B, and C***

Changes in the location, width, depth, and/or shape of the Santa Cruz River are possible on a localized scale due to discharge of treated effluent directly into the river bed. Such changes are not expected to be substantial or meaningful because the nature and extent of such impacts will be limited and localized. These minor localized changes in topography would apply to the alternatives with provisions for new WWTPs: Alternatives A, B, and C.

Similarly, any leveling or grading required to support construction of WWTPs, transmission mains, IOI replacement, or rehabilitation of wastewater collection systems would also have some minimal, localized impacts on topography. These impacts are also not considered environmentally significant.

***Alternative D***

Any identified environmental impacts related to this resource category are not anticipated to change in the short term under this Alternative Because there would be no immediate changes to current conditions, facilities, or processes. Significant impacts to topography, however, are not expected if no action is taken. Descriptions of the local topography are presented in the EI, Section 6.

### *1.7.4 Floodplain/Wild and Scenic Rivers*

This evaluation is based on the results of investigations of (1) the presence of rivers or other surface water bodies of special designation (e.g., wild and scenic) in the Ambos Nogales area, and (2) the description of the floodplains and floodplain maps. These results are presented in the EI. This resource category is considered of secondary importance because of the low likelihood of significant project–related impacts.

The EI identified one river within the Santa Cruz River watershed, Cienega Creek, that was proposed for the Wild and Scenic Rivers program in Arizona. This designation has since been denied. This river is tributary of Sonoita Creek and flows into the Santa Cruz River north of the Ambos Nogales area. No impacts to this stream are anticipated under the four alternatives under consideration.

Potential environmental impacts associated with flood plains are based on plans to locate one or more new WWTPs within floodplains. Although the candidate locations have not been mapped for the 100–year and 500–year floods, the broad flat areas adjacent the stream channels are potentially subject to flooding. Inundation of the WWTPs during a flood could lead to the release of untreated or partially treated sewage to the rivers, negatively impacting surface water quality.

***Alternative A***

Alternative A includes provision for a new WWTP and a new interceptor in Arizona as well as rehabilitation of the existing IOI and collection system in Nogales, Arizona. The new WWTP is proposed for the Industrial Site in Nogales, Arizona. The Industrial Site is probably not at great risk from floods because of its distance from the river and elevation relative to the Santa Cruz River. Currently available information indicates that it is outside the 100–year floodplain. The current NIWTP is at greater risk from flooding because of its proximity to the Santa Cruz River. Construction of the new interceptor is not expected to substantially affect the floodplain or increase the likelihood of flooding, because it would be placed alongside the existing IOI. Rehabilitation of the existing IOI and the collection system in the U.S. is unlikely to result in significant impacts on floodplains. Finally, Alternative A includes rehabilitation of the collection system in Nogales, Sonora. This action will have a positive impact in Nogales, Sonora because of reductions in the frequency and magnitude of fugitive flows. Although this effect is one primarily related to public health benefits, there may be some impact on local flooding potential. However, the decreased potential for flooding due to greater capture of untreated wastewater is likely to be offset by reduced infiltration of rainwater into the collection system during and following storm events. This alternative is therefore expected to result in no significant change in the likelihood of flooding in Nogales, Sonora.

***Alternative B***

Alternative B includes rehabilitation of the IOI and the collection system in the U.S., upgrade of the NIWTP, and a provision for a new WWTP at Los Alisos. Rehabilitation of the existing IOI and the collection system in the U.S. is unlikely to result in significant impacts on floodplains. The new IOI will generally follow the current IOI route, and the rehabilitated collection system is not expected to extend beyond current boundaries. Alternative B also includes rehabilitation of the collection system in Nogales, Sonora. As for Alternative A, this alternative is not expected to result in a significant change in the likelihood of flooding in Nogales, Sonora.

***Alternative C***

Alternative C also includes replacement of the IOI and rehabilitation of the collection system in the U.S., upgrade and expansion of the NIWTP, and a provision for a new WWTP at Los Alisos. As described for Alternative B, the IOI replacement and rehabilitation of the collection system in the U.S. are unlikely to result in significant impacts on floodplains. Alternative C also includes rehabilitation of the collection system in Nogales, Sonora. As for Alternatives A and B, this alternative is not expected to result in a significant change in the likelihood of flooding in Nogales, Sonora. Positive impacts in Nogales, Sonora include fewer fugitive flows.

An increase in discharge from the expanded NIWTP will also increase the potential for flooding downstream. However, the expected increase of 3-5 mgd would be distributed among surface flows, groundwater aquifer storage, vegetative uptake and evapotranspiration. In addition, the physical dimensions of the river itself (i.e. length, width & depth) are all likely to contribute in partitioning the excess flow. In general, only small increases in many components (e.g., river length, width, depth, plant uptake, evaporation, aquifer recharge, etc.) are expected to follow increased effluent discharges. The degree of increase or the relative distribution of additional effluent cannot be quantified at this time, and is expected to vary both seasonally and from year to year, as discussed in Section 1.7.8 (Surface Water Quantity / Biological Resources). In summary, the likelihood of measurable increases in flooding potential as a result of NIWTP expansion is considered to be low.

***Alternative D***

Any identified environmental impacts related to this resource category are not anticipated to change in the short term under this Alternative Because there would be no immediate changes to current conditions, facilities, or processes. Effects to this resource category are likely to remain minimal or nonexistent. Descriptions of local Floodplains/Wild and Scenic Rivers are presented in Section 6 of the Facilities Plan.

## *1.7.5 Surface Water Quality*

This evaluation is based on the summary of surface water quality data, from a variety of sources, presented in the EI. In addition, this evaluation briefly considers the potential alternative–related changes to key surface water quality parameters (e.g., ammonia), as discussed in the EI. Toxicity–related impacts are primarily addressed in Section 1.7.8, Biological Resources. Surface water quality is a primary resource category because it is directly related to wastewater treatment

and discharge, and chemical and biological effects, including effects on species and habitats of concern.

Preliminary effluent quality targets were initially developed for each treated effluent discharge considered in the Facilities Plan. These targets considered use-classification-based stream standards for the Santa Cruz River in Arizona, and Sonoran standards proposed by CNA for the Rio Los Alisos. Three sets of surface water standards were therefore identified: one for Rio Los Alisos in Sonora; one for the Santa Cruz River between the international border and the NIWTP (classified as Aquatic and Wildlife, warmwater); and one for the Santa Cruz River downstream of the NIWTP (classified as Aquatic and Wildlife, effluent dependent water). The stream standards for selected constituents for each of these reaches are presented in Table 2.

Although EPA established federal criteria (40 CFR 131.31) for total phosphates in the Santa Cruz River from the international boundary near Nogales to Sahuarita, no criteria for phosphorus or phosphates [$(PO_4)^{3-}$] are included in Table 2 for discharges in Arizona. USIBWC and the City of Nogales received a variance to this criteria for the segment of the Santa Cruz from the NIWTP outfall to the point at which aboveground flow typically ceases (approximately 26 km (16 miles) downstream). This variance is associated with the requirements for instream monitoring (CDM, 1998).

Water quality criteria listed in Table 2 for Sonora are based on site–specific criteria developed by CNA for Los Alisos in early 1998. These limits differ from those listed in Section 8 of the Facilities Plan (Development of Alternatives), which were based on Mexican federal regulations. Nonetheless, this modification has been included in Section 9.3 of the Facilities Plan (Modifications to Short-listed Alternatives). Only major parameters are included in Table 2; metals and other parameters are not shown here.

As stated previously, the ADEQ water quality standards presented in Table 2 provide the basis for NIWTP effluent limits. These limits will be specified in the NPDES permit for the facility. The wastewater treatment processes proposed for the action alternatives will allow effluent discharged to the Santa Cruz River to meet all applicable water quality standards both, listed on the NPDES permit and based on use classification. Therefore, under each action alternative, all applicable standards and permit conditions will be met, and, in accordance with EPA and State regulations, there will be no discharges of toxic chemicals in toxic amounts to U.S. waters. Similarly, effluent discharged to the Rio Los Alisos will meet all applicable Sonoran water quality standards.

### *Water Quality Impacts Related to Rehabilitation of Collection Systems and IOI Replacement for Alternatives A, B, and C*

Alternatives A, B, and C provide for replacement of the IOI in the U.S. and rehabilitation of the wastewater collection systems in Nogales, Arizona and Nogales, Sonora. Although the flows within the IOI could be reduced from the current capacity under Alternative B, these projects will reduce the quantities of debris and suspended solids in the wastewater entering the NIWTP similarly under alternatives A, B, and C. In addition, rehabilitation of the collection system in Nogales, Sonora would significantly reduce fugitive flows of raw sewage and therefore improve the surface water quality of naturally flowing streams entering the US such as the Nogales Wash. Related to the rehabilitation of the IOI in U.S. are potential impacts to surface water quality from dewatering activities required during construction. PCE has been detected in shallow groundwater in monitoring wells near the U.S.-Mexico border. PCE or other contaminants detected in surface

water or groundwater in the U.S. during dewatering activities will be captured and treated to the extent necessary to ensure compliance with surface water quality standards. Because of this treatment requirement, no significant surface water quality impacts are anticipated as a result of implementation of Alternatives A, B, or C.

The following discussions of surface water quality–related impacts are limited to those associated with wastewater treatment and do not include the impacts related to IOI replacement and collection system upgrades.

***Alternative A***

Under Alternative A, substantial upgrades will be made to the NIWTP process, resulting in significant improvements to water quality in the Santa Cruz River downstream of the wastewater treatment plant. A portion of the Sonoran flows will be treated at the NIWTP and released to the Santa Cruz at the existing outfall. The remainder of the Sonoran flows will be captured in Sonora, treated at a new wastewater treatment plant at Los Alisos, and released to the Rio Los Alisos streambed. All Arizona flow will be treated at a new WWTP located at the Industrial Site, with effluent discharged at one of two sites, Kino Springs or Potrero Creek.

*NIWTP Processes*. Process improvements at the NIWTP are in part driven by anticipated changes in the NIWTP NPDES permit for discharge to the Santa Cruz River at the existing outfall. The most substantial changes to the permit are expected to include the following:

- New limits on effluent chronic toxicity, effectively limiting effluent total ammonia concentrations to approximately 3 mg/L as nitrogen (N) or lower
- Reduction in effluent total suspended solids (TSS) limits from a monthly average of 90 mg/L to a monthly average of 30 mg/L and a weekly average of 45 mg/L

Major improvements planned for the NIWTP under Alternative A consist of the following:

- Replacement of the existing headworks process with new screening and grit removal processes
- Conversion of the aerated lagoons to an activated sludge process with biological ammonia removal (nitrification) and nitrate removal (denitrification)
- Addition of secondary clarifiers

The headworks improvements will allow the wastewater treatment plant to run more efficiently, but may not directly impact effluent quality. In contrast, the conversion of the aerated lagoons to activated sludge with additional nitrogen removal will benefit effluent quality. Currently, virtually no ammonia is removed at the NIWTP, resulting in a zone of impairment for aquatic biota downstream of the

***Table 2***
***Effluent Water Quality Criteria for Major Constituents***

| ***Constituent*** | ***Units*** | ***ADEQ Standards*** | | ***U.S. Federal Standards*** | ***CNA Proposed Standards*** |
|---|---|---|---|---|---|
| | | ***Santa Cruz River Upstream of NIWTP (A&W,w)*** | ***Santa Cruz River Downstream of NIWTP (A&W,edw)*** | ***Expected NPDES Permit for NIWTP*** | ***Rio Los Alisos, Sonora[i]*** |
| Total ammonia as N | mg/L | pH dependent | pH dependent | 8.4[g] | NNS |
| Total nitrogen | mg/L | water body specific | water body specific | NNS | 40-60 |
| Nitrate as N | mg/L | NNS[b] | NNS[b] | NNS[b] | NNS |
| Nitrite as N | mg/L | NNS | NNS | NNS | NNS |
| Nitrate plus Nitrite as N | mg/L | NNS | NNS | NNS | NNS |
| $BOD_5$ | mg/L | No A&W standard | No A&W standard | 30[h] | 75-150 |
| Total suspended solids | mg/L | NNS | NNS | 90[h] | 75-125 |
| Total phosphorus | mg/L | [c] | [c] | [c] | 30-30 |
| Total chlorine residual | µg/L | 5.0 chronic | 5.0 chronic | 5[h] | NNS |
| Viruses | HEV [d]/40 L | NNS | NNS | NNS | NNS |
| Fecal coliform (max single sample) | cfu/100 mL[f] | 4,000 | 800 | 200[h] | 1,000-2,000 (MPN/100 mL) |
| Settleable solids | mL/L | Narrative standard | Narrative standard | 1[h] | 1-2 |
| Turbidity | NTU | 50 | 50 | NNS | NNS |
| pH | SU | 4.5 - 9 | 6.5 - 9 | 6.5 - 9 | 5 - 10 |
| Dissolved oxygen | mg/L | 6.0 | 1 - 3 [e] | NNS | NNS |

Santa Cruz River downstream of NIWTP is classified as Aquatic and Wildlife, effluent dependent water ($A\&W_{EDW}$)
Santa Cruz River upstream of NIWTP is classified as Aquatic and Wildlife, warm water ($A\&W_w$)
NNS: no numeric standard
[b]10 mg/L $NO_3$-N meets potable water criteria.
[c]A variance to the EPA total phosphate criterion (avg. 0.5 mg/L as $PO_4$) has been accepted by the State and EPA.
[d] Hepatitis/enteric viruses
[e] Minimum requirement; range of values indicates minimum varies with time of day. 90 percent of saturation conc.acceptable.
[f] cfu: coliform forming units.
[g]Daily maximum at T=25°C and pH = 7.5.
[h]Monthly average.
[i] Monthly average - daily average.

NIWTP outfall. NIWTP effluent typically contains between 20 mg/L–N and 30 mg/L-N total ammonia, a level at which chronic toxicity would be expected for most or nearly all macroinvertebrate and fish species inhabiting the Santa Cruz River downstream of the wastewater treatment plant. Water quality data for ammonia collected by Friends of the Santa Cruz, and ADEQ, stored in the EPA Storet Database, show that ammonia concentrations quickly decay downstream of the NIWTP outfall, likely due to stripping and other natural processes.

Under Alternative A, existing lagoons at the wastewater treatment plant will be retrofitted to an activated sludge process capable of removing both ammonia and nitrate from the wastewater. Although the preliminary design criteria for effluent ammonia is 3 mg/L–N, WWTPs using activated sludge processes with additional biological removal of ammonia are typically capable of producing effluent with less than 1 mg/L–N. This is due to the nitrification (ammonia removal) reaction that proceeds nearly to completion under most operating conditions (especially at warm ambient temperatures). Under the proposed wastewater treatment plant improvements, reduction in effluent ammonia concentrations from existing conditions (20 to 30 mg/L) to the target effluent concentration of 3 mg/L will result in a substantial reduction in ammonia concentrations in the Santa Cruz River downstream of the NIWTP. This is expected to alleviate the current ammonia toxicity concerns in the Santa Cruz River downstream of the NIWTP. The biological nitrification reaction converts ammonia to nitrate. Thus, without nitrate removal (denitrification), high nitrate concentrations would be anticipated in the Santa Cruz River downstream of the NIWTP. In recognition of the present and increasing use of the Santa Cruz River as a source for replenishing drinking water aquifers the new NIWTP activated sludge process will be designed to remove nitrate to below the U.S. drinking water Maximum Contaminant Level (MCL) of 10 mg/L–N nitrate. Similarly, effluent nitrite will be less than 1 mg/L–N, and nitrate plus nitrite will be less than 10 mg/L–N. Nitrate levels in the NIWTP effluent will thus be higher than the present levels (around 1 mg/L–N), but will continue to be below drinking water standards. It is important to note, however, that the NIWTP discharge (like all WWTPs proposed for Ambos Nogales) will constitute a high–quality source for replenishing drinking water aquifers, but the effluent will require further treatment (e.g., additional disinfection) after withdrawal from the river or aquifer before it is suitable for potable consumption.

In sufficient quantities, nitrite is toxic to aquatic biota, but surface waters rarely contain toxic levels of nitrite under most conditions. Nitrate is not considered a toxicant, and the major ecological concerns with elevated nitrate focus on eutrophication and related decreases in dissolved oxygen. Maintaining nitrate below the 10 mg/L–N MCL for drinking water provides adequate protection against excessive algal growth and eutrophication–related processes.

The use of secondary clarifiers is a required component of the new activated sludge treatment process. They will also help the NIWTP comply with the new more stringent TSS discharge requirements and allow for more effective filtration and UV disinfection. With the new clarifiers and renovated filters, the reduced TSS in the NIWTP effluent will have beneficial effects on light penetration and photosynthetic processes, filter–feeding organisms, and sedimentation of aquatic habitats.

Treated effluent will contain less than 200 fecal coliform colony forming units (CFU) per 100 mL; a clear public health advantage. Since UV provides disinfection without changing water quality or adding chemicals, it is ideal for maintaining high effluent water quality. Also, overdosing of dechlorination chemical (sulfur dioxide) can depress effluent dissolved oxygen. This is not an issue with UV disinfection and UV also does not form the carcinogenic disinfection byproducts that are formed with chlorination. To summarize, the use of UV eliminates virtually all aquatic toxicity and human health concerns associated with chlorination/dechlorination.

Overall, discharges of treated NIWTP effluent will be of substantially higher quality than at present. Key concerns regarding aquatic toxicity, such as ammonia, will be addressed and resolved. Aquatic habitats throughout the length of the aboveground portion of the Santa Cruz River downstream of the NIWTP would not be impaired by poor water quality. The designated uses of the river and its underlying aquifer as a drinking water supply will also be protected, with key constituents such as nitrate maintained at levels below drinking water MCLs.

As noted in Section 1.4.5, flows discharged to the Santa Cruz at the NIWTP outfall would drop from typical recent flows of about 11.5 mgd to about 9.4 mgd, due to Mexico's limited allocation of treatment capacity at the NIWTP

*New Arizona WWTP*. Treated effluent of virtually identical quality to that of the rehabilitated NIWTP would be discharged to the Santa Cruz River at Kino Springs or to Potrero Creek from the new Arizona WWTP. Gradually growing over time, the flow available for discharge will be about 162 L/s (3.7 mgd). The process train will be identical to the rehabilitated NIWTP, except the secondary treatment with nitrification and denitrification will be accomplished using an oxidation ditch instead of the activated sludge process. While activated sludge was the most cost–effective option for retrofitting the NIWTP, an oxidation ditch is less expensive for new construction at the Arizona WWTP. Like activated sludge processes, oxidation ditches have proven throughout the world to effectively treat wastewater for ammonia and nitrate removal. The new discharge in Arizona will be of very high quality, capable of supporting a diverse range of aquatic biota and acceptable for use as a source of raw drinking water.

*New Sonora WWTP*. Discharges to the Rio Los Alisos river bed will meet the Sonoran water quality criteria listed in Table 2, at increasing flows over time (692 L/s (15.8 mgd) in 2020) as noted in Table 1. The discharge will be to the Rio Los Alisos, which flows towards the south. This will result in a positive transboundary effect because untreated sewage will no longer, nor in the future, diminish water quality in the U.S. No negative transboundary impacts related to this discharge are anticipated. As under Alternative A, no significant transboundary or U.S. effects are anticipated. There is also some potential for infrequent releases of raw or inadequately treated wastewater from plant upsets. Such upsets could, for example, result from power outages or inappropriate maintenance, but these events are expected to be rare. Overall, the net effect of a new Sonora WWTP is clearly a positive or beneficial effect.

***Alternative B***

All Arizona wastewater would continue to flow to the NIWTP under Alternative B, whereas all Sonora wastewater would be captured in Sonora and treated at a new WWTP at Los Alisos. All

NIWTP effluent would be discharged to the Santa Cruz River at the existing outfall. All effluent from the new Sonora wastewater treatment plant would be discharged to the Rio Los Alisos.

*NIWTP*. The NIWTP would be rehabilitated to have the same processes and effluent quality described under Alternative A. As noted previously, there would be a major reduction in the amount of water discharged at the NIWTP (and thus also in the length of the aboveground portion of the river) under Alternative B. It is projected that in 2020, NIWTP effluent flows would be about 202 L/s (4.6 mgd), with increases happening gradually over time. However, the quality of the treated effluent discharged to the river at the NIWTP would be substantially improved than at present. As under Alternative A, the effluent would be improved in the following major areas:

- Reduction in ammonia and thus aquatic toxicity, such that the effluent meets the chronic aquatic toxicity criteria specified in the draft NPDES permit revisions
- Lower effluent TSS

After the proposed NIWTP improvements, the resulting effluent will be substantially improved for supporting aquatic communities, and will be suitable for use as indirect aquifer recharge and a raw drinking water supply source.

*New Sonora WWTP.* The new Sonora WWTP would be identical (except for flow rates and sizing of processes and equipment) to that proposed under Alternative A. Flows to this wastewater treatment plant are projected to be about 1,104 L/s (25.2 mgd) in 2020 and continue to increase after 2020 due to likely substantial population growth in Nogales, Sonora.

As under Alternative A, no significant transboundary or U.S. effects are anticipated. As in Alternative A, there is a beneficial impact of greatly reducing or eliminating the release of raw sewage and a limited potential for releases of raw or inadequately treated wastewater due to plant upsets. However, as stated for Alternative A, the net effect of the new Sonora WWTP is positive.

***Alternative C***

With all of Arizona's flow and a portion of Sonoran flow treated at the NIWTP, Alternative C allows continued discharge to the Santa Cruz River at the existing outfall and at current or increased volumes. The remainder of Sonoran flow would be captured in Sonora and treated at a new WWTP at Los Alisos.

*NIWTP*. The NIWTP will be upgraded to a process matching that proposed under Alternatives A and B, but may be sized for a higher flow rate between 876 L/s (20 mgd) and 973 L/s (22.2 mgd). The resulting effluent will be discharged at the existing outfall to the Santa Cruz River.

The water quality at the discharge point will protect exposed aquatic biota from acute or chronic effects. This represents a substantial improvement in water quality over present NIWTP effluent discharges.

*New Sonora WWTP*. The new Sonora WWTP will be different to those proposed under Alternatives A and B. The wastewater treatment plant in Los Alisos, under this alternative, will be based on a

natural system. The treatment train will consist of a series of lagoons (deep facultative, high algae growth, settling, and maturation/filtration), with configuration known as Advanced Pond Systems Type I. These ponds will be capable of lowering the BOD, and the concentration of TSS and total nitrogen, to comply with the site specific discharge conditions issued by the Mexican government for this site. Flow to the new Sonora WWTP would be about 692 L/s (15.8 mgd) in 2020 with increases due to population growth in Nogales, Sonora happening over time. The transboundary or U.S. effects that can be anticipated are the elimination of untreated sewage from the Nogales Wash and improvement of water quality in the Wash.

***Alternative D***

Any identified environmental impacts related to this resource category are not anticipated to change in the short term under this alternative because there would be no immediate changes to current conditions, facilities, or processes. The projected future growth of Ambos Nogales will, however, be associated with increased amounts of wastewater requiring treatment. Existing conditions, such as aquatic toxicity in the Santa Cruz near the NIWTP outfall, will either remain the same or worsen. Implementation of the No Action Alternative will therefore adversely affect this resource category. Descriptions of existing Surface Water Quality are presented in the EI. Flow at the NIWTP will increase from typical averages of about 504 L/s (11.5 mgd) at present until the Mexican flows exceed the capacity of the IOI and sewer overflows become more frequent.

### *1.7.6 Groundwater Aquifers*

This evaluation is based on the overview of the groundwater aquifers of the Ambos Nogales area presented in the EI. This information provides an important basis for evaluating project alternatives with respect to groundwater quantity. Groundwater aquifers are considered a primary resource category because of potential depletion and/or recharge of aquifers under the different alternatives.

The discussion of groundwater aquifers presented in the EI described the major aquifers in the Ambos Nogales region including the occurrence of groundwater, lithology of the aquifers, water levels and hydraulic gradients, historical water levels changes, aquifer hydraulic parameters, groundwater pumping rates, and water budgets. In general, the alternatives under consideration are not expected to have significant impact on aquifer lithology or aquifer hydraulic parameters, such as transmissivity and storage coefficients. The discussion presented here therefore focuses primarily on qualitative changes to groundwater availability caused by changes to treated effluent discharge rates and locations. Potential groundwater quality impacts are addressed in Section 1.7.7, while groundwater impacts related to rehabilitation of the collection systems and IOI replacement for all alternatives are discussed in Section 1.7.5.

***Alternative A***

Potential impacts to groundwater aquifers under this alternative are expected to be minimal. Although the capacity of the upgraded NIWTP will be reduced to approximately 412 L/s (9.4 mgd) under this alternative, the associated reduction in volume of effluent discharged could be offset if the selected discharge point for the new Arizona WWTP was upstream of the NIWTP, for example at Kino Springs. Measurable impacts on groundwater aquifers, if realized, would result primarily from the discharge of effluent from new WWTPs in Arizona and Sonora. These impacts are expected to include the recharge of aquifers underlying the stream beds receiving the discharges.

The degree of aquifer recharge that might occur under this Alternative Cannot be determined at this time, but is expected to vary substantially from season to season and year to year.

***Alternative B***

Potential impacts to groundwater aquifers under this alternative could be substantial under certain conditions that are likely to vary seasonally and from year to year. The most important potential transboundary impact to groundwater aquifers would be the decreased discharge to the Santa Cruz River downstream of the NIWTP. This decreased volume of effluent entering the Santa Cruz River at the NIWTP could affect groundwater aquifers by reducing aquifer recharge from overlying surface waters. This potential outcome is expected to be most important during the dry season or during especially dry years. Measurable impacts to groundwater aquifers are likely to be realized under this alternative, depending on the impacts of evaporation, phreatophyte uptake, groundwater pumping rates, and other processes associated with surface water/groundwater relationships.

***Alternative C***

Under the scenario in which the flows to the NIWTP do not exceed 754 L/s (17.2 mgd), the current wastewater treatment plant capacity, potential impacts to groundwater aquifers under this alternative are not expected to be measurable because changes in the volume of effluent discharged into the Santa Cruz River from the NIWTP are not expected.

Increased discharge volumes at the NIWTP could affect the groundwater recharge in the aquifer underlying the Santa Cruz River. The degree to which groundwater quantity is affected will depend on the season and current and recent weather conditions, and site-specific considerations such as groundwater/surface water hydrologic connections, aquifer storage characteristics, wastewater treatment plant uptake, evaporation rate, slope of streambank, degree of channelization, etc.

Under some conditions, an increase in the amount of effluent discharged to the Santa Cruz River could result in increased groundwater availability and in turn, potential increases in groundwater use by local residents. This scenario would be most likely to occur if surface water directly recharged groundwater aquifers and if evaporation, wastewater treatment plant uptake, or other losses of surface water were not significant. It is expected, however, that surface water will be lost to wastewater treatment plant uptake, evaporation, downstream transport, and other "compartments" as well as groundwater recharge. The degree of loss to any particular component is likely to vary seasonally and from one year to another. For these reasons, significant increases in groundwater availability and therefore potential groundwater use by local residents is not considered a likely scenario under most conditions.

***Alternative D***

Any identified environmental impacts related to this resource category are not anticipated to change in the short term under this Alternative Because there would be no immediate changes to current conditions, facilities, or processes. The projected future growth of Ambos Nogales will, however, be associated with increased amounts of wastewater requiring treatment, and implementation of the No Action Alternative will likely cause adverse effects to this resource category. Discharge to the Santa Cruz River downgradient of the NIWTP will increase in volume

and decrease in quality. This will increase the length of perennial flow in the river and the availability of groundwater in the vicinity of the river. However, the quality of the effluent will negatively impact the groundwater aquifers as a potential water supply source. Descriptions of existing Groundwater Aquifers are presented in the EI.

### *1.7.7 Groundwater Quality*

Similar to the surface water quality evaluation, this section is based on water quality parameters for groundwater as presented in the EI. Groundwater Quality is a primary resource category for this project mostly because of concerns with drinking water quality and standards.

As discussed in the EI, the regional groundwater system is linked to surface water flow patterns and chemistry. Groundwater in the basins flows through basin–fill sediments towards the streambeds, and surface water bodies and the groundwater are in hydraulic communication. Several alternatives have potential to replenish groundwater through effluent discharge to streambeds in Arizona and Sonora.

Also as discussed in the EI, the bulk of the groundwater in the area is unimpacted and suitable for most uses. The most significant area of degraded groundwater quality is the shallow groundwater along Nogales Wash. Groundwater in this area has been contaminated from leaks in the wastewater lines feeding the NIWTP and running along the Wash, and direct industrial and domestic wastewater discharges to Nogales Wash. In addition, there are likely to be other unreported sources of contamination to the Nogales Wash which may adversely affect the underlying aquifer. These discharges and releases have led to significant concentrations of fecal coliforms, nitrates, and volatile organic compounds (VOCs) in the groundwater along Nogales Wash, as explained in Section 6.7 of the Facilities Plan.

The most important potential impacts to groundwater quality associated with implementation of the alternatives under consideration are expected to result from:

- Upgrades of the system of wastewater collector and interceptor lines leading to the NIWTP
- Improvements to the wastewater treatment process at the NIWTP
- Discharge of treated effluent at new locations in Arizona and Sonora

***Alternative A***

Under this alternative, an upgraded NIWTP will be retained to treat wastewater flow from Nogales, Sonora. This alternative also includes provision for new WWTPs in Nogales, Arizona and Los Alisos, Sonora. A new interceptor would be constructed to conduct wastewater from Nogales, Arizona to the new Arizona WWTP. Effluents from these treatment plants will be discharged to the Santa Cruz River at Kino Springs and/or Potrero Creek in Arizona and to Rio Los Alisos in Sonora.

The upgrades to the NIWTP treatment process will result in substantial improvements to water quality in the Santa Cruz River downstream of the wastewater treatment plant. This will, in turn, lead to improving groundwater quality in the vicinity of the river. Potential impacts associated with improvements to the wastewater collection systems in Arizona and Sonora, and impacts related to the IOI replacement are discussed in Section 1.7.5.

The most important potential impact resulting from the discharge of treated effluent from new WWTPs in Arizona and Sonora relate to increased concentrations of nitrogen. The discharged effluent will be required to meet effluent water quality criteria, as discussed in Section 1.7.5, that limit nitrogen in Arizona to less than approximately 3 mg/L total ammonia as N, 10 mg/L nitrates as N, and 1 mg/L nitrite as N. Background concentrations of nitrates in groundwater are below detection levels. Near Nogales Wash, nitrate concentrations up to 300 mg/L as N have been detected in shallow wells.

Increased concentrations of nitrates in groundwater adjacent to the effluent discharge points on the Santa Cruz River may be expected from infiltration of the effluent. These impacts are not expected to significantly degrade groundwater quality or to limit the potential uses of groundwater in these areas because nitrate concentrations will remain below drinking water standards.

***Alternative B***

Under this alternative, the NIWTP will be retained to treat wastewater flow from Nogales, Arizona with substantial upgrades to the treatment process and the wastewater lines. This alternative also includes provision for a new WWTP at Rio Los Alisos in Sonora. Related to this alternative is the discharge of effluent to the Rio Los Alisos in Sonora.

As discussed previously, the upgrades to the NIWTP treatment process will result in substantial improvements to water quality in the Santa Cruz River downstream of the NIWTP. These improvements, which include significant reductions in effluent ammonia concentrations, have potential to improve groundwater quality in the vicinity of the river. Furthermore, improvements to the wastewater collection system in Nogales, Sonora also has potential to improve groundwater quality in and near the Nogales Wash.

***Alternative C***

Under this alternative, the NIWTP and the wastewater lines would be retained to treat wastewater from both Arizona and Sonora, with substantial upgrades to the treatment process and the wastewater lines. Wastewater flows from Mexico in excess of the current allocation would go to a new WWTP at Los Alisos, with discharge directly to the Rio Los Alisos.

As discussed for Alternatives A and B, the upgrades to the NIWTP treatment process will result in substantial improvements to water quality in the Santa Cruz River downstream of the NIWTP, in terms of its oxygen demand, suspended solids and ammonia content, potentially leading to improved groundwater quality near the river. Again, improvements to the wastewater collection system in Nogales, Sonora are expected to result in improvements in groundwater quality in the vicinity of Nogales Wash as raw wastewater fugitive flows are reduced. As for Alternatives A and B, the most substantial potential impact resulting from discharge of treated effluent from the NIWTP in Arizona relate to increased concentrations of nitrogen. As discussed under Alternative A, the effluent will contain low concentrations of nitrogen as ammonia, nitrates or nitrites. Increased concentrations of nitrates in groundwater adjacent to the effluent discharge points on the Santa Cruz River and at Rio Los Alisos are likely due to infiltration of the effluent. However, these increases are not expected to represent significant degradation of groundwater quality or to limit the potential uses of groundwater in this area. Finally, improvements to the IOI have potential to affect local groundwater quality. These potential impacts are discussed in Section 1.7.5.

***Alternative D***

Any identified environmental impacts related to this resource category are not anticipated to change in the short term under this alternative because there would be no immediate changes to current conditions, facilities, or processes. The projected future growth of Ambos Nogales will, however, be associated with increased amounts of wastewater requiring treatment. Implementation of the No Action Alternative will therefore result in adverse effects to this resource category. Descriptions of existing Groundwater Aquifers are presented in the EI.

## *1.7.8 Surface Water Quantity / Biological Resources*

This evaluation considers the important habitats and representative species that may be affected by current or future conditions. Key to this evaluation are aquatic and riparian habitats and species of special concern, including threatened or endangered species that may be affected by project alternatives. Surface water quantity and biological resources are important to this project because of the potential direct impacts to aquatic and riparian habitats and biota. In addition, several species of special concern (e.g., a federal endangered species) are associated with the Ambos Nogales area.

Much of the discussion of current and potential future effects that may result from implementation of Alternatives A, B, or C is based on the amount of treated effluent that would be discharged to the Santa Cruz River. This issue is critical because aquatic and riparian habitats within the project area are an uncommon and unique resource for which protection is required or desirable. The availability and quality of these important habitats are most influenced by the amount and quality of available water. Maintaining at least the current flows in the Santa Cruz River below the NIWTP is therefore an important project goal related to minimizing impacts to project area biological resources.

As discussed previously, NIWTP discharge flows less than 386 L/s (8.8 mgd) or greater than 701 L/s (16.0 mgd) are assumed to be associated with substantial effects on biological resources. Substantial effects may be adverse (i.e., resulting from flows less than 386 L/s (8.8 mgd)), beneficial (i.e., resulting from flows greater than 701 L/s (16.0 mgd) ), or have both adverse and beneficial effects. Designations of flow–related effects as adverse or beneficial are based on the assumption that more water is beneficial—higher flows are assumed to create additional aquatic and riparian habitat. The creation of additional aquatic and riparian habitat may be viewed by some as an unnatural and therefore adverse state compared to current conditions. However, there is evidence that prior to development of the Santa Cruz River valley, the Santa Cruz River was in many places a perennial stream with extensive aquatic and riparian habitats. Miller (1961) provides the following information:

> "Pumping of water and the deep trenching of the valley floors has gradually lowered the water table in the Southwest. Springs and cienegas went dry, streams ceased to flow or diminished in size, and wells had to be drilled to greater depths. ...For example, in 1950, one of the few remaining perennial flows of the Santa Cruz River went dry near San Xavier Mission for the first time in recorded history. Even when exceptionally heavy runoff occurs, the expected additional recharge of the water table by downward percolation now fails to be effective--probably because of shallow penetration and subsequent evaporation" (Smith, 1940, p. 41).

Increased volumes of water in the Santa Cruz River over current volumes are therefore assumed to more closely approach the historical natural conditions to which native species have adapted. Such increases in water volumes are therefore deemed beneficial to local biological resources.

The volume of effluent discharged from the NIWTP is directly but not completely correlated with the length of the aboveground portions of the Santa Cruz River. This length, depending on season and year, currently averages about 26 km (16 miles). As discussed in Section 8 of the Facilities Plan, recently collected flow data, infiltration estimates, and modeling suggest that the relationship between NIWTP effluent volumes and aboveground river length can be reasonably approximated for typical conditions. This relationship, which does not consider the spatially and temporally variable parameters such as storm flow, is presented graphically in Figure 6.

Also included in this figure are the minimum monthly, average, and maximum monthly NIWTP discharges from 1994 through 1997, and the corresponding typical length of aboveground river

flow. Figure 6 therefore serves as one basis for evaluating potential impacts to biological resources in the project area.

***Alternative A***

Minimal adverse impacts to biological resources downstream of the NIWTP are expected under this project Alternative Because the volume of water discharged from the NIWTP (approximately 412 L/s (1 mgd)) would remain within the current range of 386 to 701 L/s 8.8 to 16.0 mgd. In addition, should Kino Springs be selected to be the discharge point for the new Arizona wastewater treatment plant, the reduction in flows at the NIWTP would be made up at this new location. Upgrades to the NIWTP would result in higher quality effluents being discharged, and areas currently impaired immediately downstream of the NIWTP would likely experience a degree of recovery due to substantially reduced ammonia concentrations in the effluent.

The degree of recovery would depend on the extent to which current impairment is attributable to elevated ammonia concentrations in the effluent–dominated Santa Cruz River. Data recently collected by the U.S. Fish and Wildlife Service (USFWS), Friends of the Santa Cruz River, and interpretation of these and other data by CDM and others strongly indicate that elevated ammonia is a primary contributor to impairment of aquatic habitats downstream of the NIWTP. Typical concentrations of total ammonia discharged from the NIWTP are conservatively expected to decrease from over 20 mg/L–N (current) to less than approximately 3 mg/L–N following upgrades to the wastewater treatment plant. In fact, ammonia concentrations in treated effluent will probably approach 1 mg/L–N following wastewater treatment plant upgrades. Certain limiting physical habitat factors that are present on a localized scale (e.g., channelization) would not be significantly improved under this project alternative.

INSERT FIGURE 6 - PREVIOUSLY 1-5

Other physical factors currently affecting aquatic habitat quality, such as siltation originating from high suspended solids, are likely to reduced because of improved effluent quality.

Neither the construction of a new WWTP at the Industrial Site in Nogales, Arizona, the repair of the collection system and IOI, nor the construction of a new interceptor alongside the existing IOI are expected to significantly impact local biological communities. A limited amount of marginal terrestrial habitat would be replaced by the new WWTP. This loss is considered insignificant because the conditions currently existing at the site are generally unsuitable for most if not all terrestrial species of concern (the site is zoned industrial). Construction of a new interceptor alongside the existing IOI is unlikely to affect local biota beyond the effects caused by the existing IOI—the additional land taken will be minimal.

Positive effects to biological resources associated with this alternative include reduced ammonia concentrations in the NIWTP effluent and in the Santa Cruz River downstream of the NIWTP. Another benefit anticipated is the creation of additional aquatic and riparian habitats at the new discharge point in Kino Springs. Undesirable components of this alternative are limited to a minimal decline in water volume discharged at the NIWTP (with corresponding aquatic habitat loss) and the loss of marginal terrestrial habitat at the Industrial Site in Nogales, Arizona.

***Alternative B***

The effects of this alternative on surface water quantity and biological resources are more pronounced compared to those described for Alternative A. Under this alternative, no new WWTP would be constructed in Arizona, and NIWTP discharge volumes would be substantially reduced, from about 504 L/s (11.5 mgd) to about 202 L/s (4.6 mgd) in 2020.

All wastewater originating in Nogales, Sonora would be collected near the International Boundary and pumped to a new WWTP in Los Alisos for treatment and discharge.

This alternative is associated with potentially significant adverse effects to biological resources because the volume of treated effluent discharged from the NIWTP would be substantially reduced. Marked reductions in effluent volumes would, under typical conditions, directly influence the aboveground length of the Santa Cruz River downstream of the NIWTP. Discharges of about 202 L/s (4.6 mgd) are associated with estimated aboveground river flows of just under 16 km (10 miles), a decrease from current conditions of approximately 10 km (6 miles). The most downstream 10 km (6 miles) of the Santa Cruz River downstream of the NIWTP are therefore expected to be dry most of the year under this alternative. Although this estimated reduction in aboveground flow is likely to be influenced by processes such as evaporation, phreatophyte uptake, loss to groundwater, degree of channelization, etc., there is no doubt that the reduced volume of surface water would have a measurable impact on the most downstream reach of the Santa Cruz River. This portion of the Santa Cruz River currently provides the most suitable aquatic habitat, as measured by macroinvertebrate and fish populations. The loss of this reach of river is considered unacceptable in locations such as this where important aquatic and riparian habitats have been identified.

Finally, the loss of suitable habitat for the endangered Gila topminnow would be in violation of the Endangered Species Act, which forbids the taking of individuals. Although a discussion of what constitutes "take" as defined by the Endangered Species Act is beyond the scope of this EA, it is

sufficient to clarify here that "take" can occur directly through harm to individuals or indirectly through habitat destruction or loss. For biological resources, this alternative is considered undesirable, primarily on the basis of water volume.

***Alternative C***

The effects to biological resources under this alternative are similar to but somewhat less adverse than those described for Alternative A. Differences between this alternative and Alternative A are for the most part limited to construction of a new WWTP at the Industrial Site and a new IOI under Alternative A, and no reductions in NIWTP discharge flow under Alternative C. No new Arizona WWTP or new IOI construction is included in this alternative, and the minor loss of terrestrial habitat expected under Alternative A would not be seen under this alternative. This is considered a minimally beneficial component of this alternative.

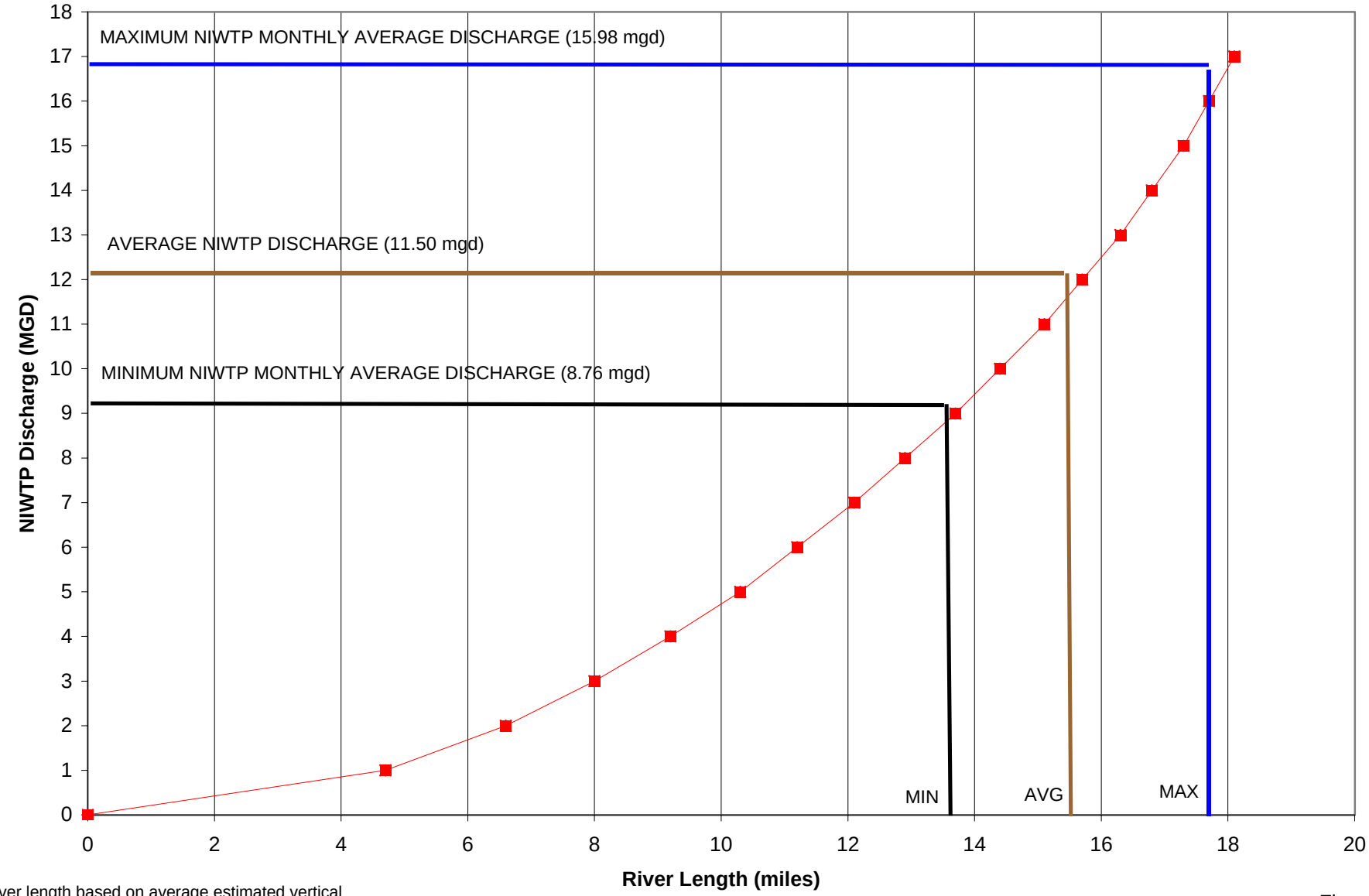
For as long as the flow to the NIWTP stays within the existing wastewater treatment plant capacity of 454 L/s (17.2 mgd), significant or measurable adverse impacts to biological resources downstream of the NIWTP are not expected under this project Alternative Because the average volume of water discharged from the NIWTP would not decrease from current conditions. Again as in Alternative A, upgrades to the NIWTP would result in greatly reduced ammonia concentrations in the effluent. The wastewater flows associated with Alternative C projected for 1999 to 2020 are presented in Figure 7. For biological resources, this alternative is considered the most desirable, primarily on the basis of water volume and water quality.

An increase in the capacity of the NIWTP from 17.2 to as much as 22.2 mgd has potential to affect biological resources downstream of the NIWTP. Biological resources are defined here as the plants, animals, and habitats in and near the Santa Cruz River from the NIWTP downstream to where surface flow terminates. As mentioned before, an increase in NIWTP effluent is believed to have a greater potential for positive of beneficial impacts, rather than negative impacts, on downstream biological resources. Whether or not effects are actually observed would depend on numerous factors.

First, this increased capacity is not necessarily associated with an increase in the amount of effluent discharged from the NIWTP. In the future, the increased treatment capacity may be utilized and the volume of effluent discharged to the Santa Cruz River would then increase. Under this future scenario, increases in effluent discharged to the river would be realized only gradually as human population and water use increased.

The evaluation of potential impacts to biological resources presented here is based on the assumption that human population and water use will increase to the point that the NIWTP will need to discharge effluent in volumes greater than can be discharged today. This evaluation also assumes the reasonable “worst case” conditions where the maximum wastewater treatment plant capacity is utilized and that effluent is discharged at a rate consistent with the maximum capacity of 22.2 mgd.

The primary question of concern is whether or not a 5 mgd increase in effluent volume is likely to affect the biological resources downstream of the NIWTP. The Arizona Department of Water Resources (ADWR) in Phoenix was contacted for information that could help determine the degree




River length based on average estimated vertical hydraulic conductivity of 7 ft/day, as discussed in Element 8

Figure 6.xls

Figure 6
Projected Santa Cruz River Length vs.
Typical NIWTP Discharge (1994-1997)

and type of changes the Santa Cruz River might experience following an increased discharge at the NIWTP. From this contact it was determined that ADWR has produced a stream model that eventually may be able to predict surface water conditions as a result of changes in flow. At this time, however, there is apparently insufficient data available to input into the model to allow it to be used as a predictive tool. In summary, it appears that ADWR currently possesses the best available tool that, unfortunately, requires additional refinement. There is currently no way to accurately or confidently predict the changes that could result from an increase in the amount of effluent discharged. The assessment of potential impacts presented here is therefore based on a qualitative discussion of the range of conditions that have reasonable potential to result from increased effluent discharges.

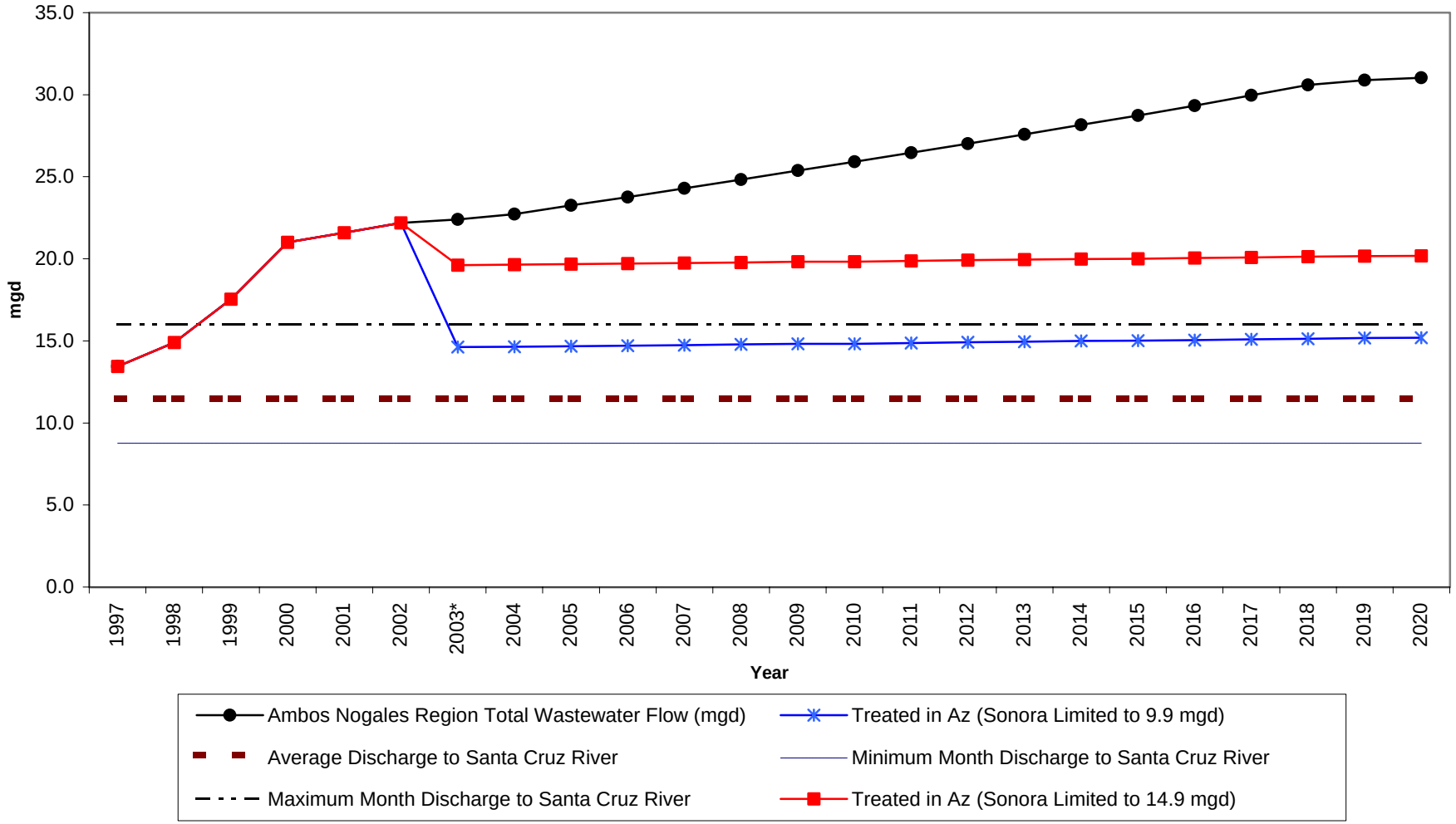
An additional 5 mgd of effluent added to the Santa Cruz River is believed to have a greater potential for positive or beneficial impacts, rather than negative impacts, on downstream biological resources. In an arid environment such as that found in Santa Cruz County, more volumes at the NIWTP may affect the length, width, and/or depth of the above-ground flow in the Santa Cruz River, depending on site-specific considerations such as ground water/surface water channelization, etc. The degree to which one or move of these parameters is affected will depend on the season and current and recent weather conditions so that any measurable change will be intermittent, realized only when the same combination of factors are present.

Positive effects may include, for example, extending the *length* of the aboveground flow farther downstream. This would increase the amount of available habitat for aquatic species, including species of concern such as Gila topminnow and Chiricahua leopard frog (*Rana chiricahuensis*). If aboveground river length were permanently increased, riparian woods (e.g., cottonwood and willow) would likely become established further downstream. That would be beneficial to species that depend on wooded riparian areas, such as the southwestern willow flycatcher and numerous other species.

Increased river channel *width* might occur where the river bank is not severely sloped or where channelization is minimal. This could increase the amount of shallow water habitat that is important for invertebrate, fish, and amphibian reproduction. Again, species of concern such as the Chiricahua leopard frog and Gila topminnow would benefit from this type of effect.

For aquatic species, increased surface water *depth* could provide increased amounts or better refuge from temperature extremes, and in some cases can provide safe haven from certain types of predators. Measurable depth increases would not be expected to occur uniformly throughout the Santa Cruz River downstream of the NIWTP. Instead, measurable increases in surface water depth would likely occur only where the river bottom and bank morphology allows water to pool.

While expected to be limited, negative effects could be associated with increased effluent flows in the Santa Cruz River. Such effects could include the inundation of dry or shallow areas currently required by a variety of species. For example, certain aquatic species, possibly including the endangered Gila topminnow, may currently use shallow warmwater areas for spawning or rearing of young, and increasing the water depth in these areas could affect the useability of these areas. It is expected that inundation of such shallow areas would be infrequent or minimal in area, and would not affect aquatic species at the population or community level. Another potentially negative effect is the possible increase in suitable habitat for undesirable nonnative species such as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Ambos Nogales Region Total Wastewater Flow (mgd)
Treated in Az (Sonora Limited to 9.9 mgd)
Average Discharge to Santa Cruz River
Minimum Month Discharge to Santa Cruz River
Maximum Month Discharge to Santa Cruz River
Treated in Az (Sonora Limited to 14.9 mgd)

bullfrog (*Rana catesbeiana*) or mosquitofish (*Gambusia affinis*). Habitat suitable for bullfrogs and mosquitofish is, however, sufficiently similar to that used by a large number of desirable native species, including species of concern. Therefore, an increase in aquatic habitat is expected to have a net positive effect on most biological resources.

Summarizing, an increase in the amount of effluent discharged to the Santa Cruz River could result in a variety of effects on biological resources. Even under the most extreme condition that is unlikely to be realized in near future, an increase of up to 5 mgd should not adversely affect species and habitats downstream of the NIWTP.

***Alternative D***

Any identified environmental impacts related to biological resources are not anticipated to change in the short term under this alternative because there would be no immediate changes to current conditions, facilities, or processes. The projected future growth of Ambos Nogales will, however, be associated with increased amounts of wastewater requiring treatment. Implementation of the No Action Alternative will therefore cause adverse effects to biological resources category. Descriptions of existing Biotic Communities and Species of Concern are presented in the EI.

In summary, this alternative is associated with substantial adverse effects to biological resources because elevated ammonia concentrations in treated effluent would not be reduced, overall water quality would likely be further degraded as local human populations increased, and the capacity of the IOI would quickly be exceeded, resulting in more frequent sewer overflows and negative impacts on water quality. For biological resources, this alternative is considered undesirable, primarily on the basis of water quality.

### *1.7.9 Historic/Architectural/Archaeological/Cultural Resources*

This evaluation is based on the overview of the historical, architectural, archaeological, and cultural resources of Ambos Nogales as presented in the EI. That overview was a summary of the complete report titled Cultural Resources Overview: Tubac, Arizona to Agua Zarca, Mexico, and the Upper Santa Cruz River to the La Parrilla Drainage, Mexico prepared by SWCA, Inc. (1996). That report is referenced here and is an appendix to the EI.

These resource categories are considered secondary resources for this project because the EI identified few areas of concern, all of which can be addressed by relatively simple measures. Although the potential is considered minimal, impacts to historical, architectural, archaeological, and cultural resources may derive from construction of new WWTPs or related facilities such as the IOI. The potential impacts associated with the discharge of effluent at new locations that can alter land use are discussed in Section 1.7. The potential project–related impacts on this resource category are based on the following:

- The Industrial Site in Nogales, Arizona has been proposed for construction of a new WWTP. The site is adjacent to a major surface water body. In addition, transmission lines are likely to be constructed along roads or other features such as streambeds where construction is most feasible.

- Most significant archaeological/cultural sites are located near rivers, streams, and other bodies of water because ancient people were more likely to settle near readily available water in dry climates.

***Alternatives A, B, and C***

The SWCA report documents that only limited surveys have been conducted near Kino Springs. There are, however, five mapped sites in this area. None of these is currently listed on the National Register of Historic Places. The sites are predominantly Hohokam sites, including the fortified village, the Schoolhouse village, and the Kino Springs village sites. Alternative A has potential to damage archaeological/cultural sites where construction takes place. This potential can be effectively mitigated by completing an archaeological survey of aquifer recharge site at Kino Springs prior to disturbing the area. Mitigating measures are discussed in Section 1.12.

Given the limited extent of previous surveys in the study area and the probability of archaeological sites near water, the site at Los Alisos should also be surveyed for archaeological/cultural sites prior to construction or land disturbance.

***Alternative D***

Any identified environmental impacts related to this resource category are not anticipated to change in the short term under this alternative because there would be no immediate changes to current conditions, facilities, or processes. Implementation of the No Action Alternative will likely not adversely effect this resource category. Descriptions of existing historical, architectural, archaeological, and cultural resources are presented in the EI.

### *1.7.10 Public Health and Safety*

Public health concerns associated with wastewater treatment and conveyance in the Ambos Nogales Area have been described in detail in the EI. This resource category is of primary importance to this project because of actual and potential risks to public health. In summary, the most important human health concerns associated with the existing wastewater treatment system are potential impacts to surface water and groundwater from:

- Release of pathogens and chemical contaminants in treatment plant effluents
- Release of raw sewage from leaks and breaks in the existing collection system
- Effluent from the NIWTP is currently discharged into the Santa Cruz River, and people using the river for recreational or other purposes may be exposed to contaminants released in the effluent. During high flow events, during which the capacity of the NIWTP is exceeded, release of chemicals and pathogens in excess of NPDES standards may occur. The existing wastewater treatment plant's capacity has been challenged by increasing flows from Nogales, Sonora, and without action, incidences of releases may increase in the future. Few events with chemical releases exceeding their NPDES standards have been observed in the past; however, release of fecal coliform bacteria in excess of NPDES standards has been more frequent (EI, Table 6.10–1). Presence of fecal coliform bacteria indicate that other bacterial and viral pathogens may also be present, and people contacting surface water with excess fecal coliform levels may therefore be at risk of contracting a variety of diseases.

Leaks and spills associated with the existing collection system have resulted in release of raw sewage to streets and into surface water in Nogales, Sonora. Due to such releases, high levels of fecal coliforms and VOCs have been detected in the Nogales Wash in Arizona and in groundwater in the border area. A chlorination system installed at the border has been effective in reducing fecal coliform bacteria in the wash to acceptable levels. In the absence of any action, it is likely that the wash and surrounding groundwater would be at increased risk in the future. Leaks and spills in the conveyance system are due to factors such as insufficient capacity, poor design and inadequate maintenance (i.e., sediment enters the system in several places and causes clogging). Permanent minimization of potential impacts from the conveyance system will be needed to address each of these factors.

The following paragraphs briefly discuss how implementation of the different alternatives will impact releases associated with wastewater treatment and conveyance. Since all of the alternatives, except the No Action Alternative (D), will involve substantial modifications to current treatment and conveyance systems, substantial improvement over current conditions is expected in all cases. An increase in wastewater treatment capacity, realized through upgrades of the NIWTP or through construction of new wastewater treatment plants, will prevent or decrease the frequency of overflow events, thus minimizing the release of untreated or insufficiently treated wastewaters. In addition, improved treatment technologies are expected to result in better effluent quality. Upgrades to the collection system would also prevent or reduce the frequency of releases that can affect public health.

***Alternative A***

Alternative A includes substantial upgrades to the NIWTP process, resulting in improved water quality in the Santa Cruz River downstream of the NIWTP. The most important improvements will be achieved by preventing overflows through the routing of all Arizonan (via a new interceptor) and excess Sonoran flows (via upgraded existing interceptor) to new WWTPs in Arizona and Mexico, and by using improved treatment techniques at the NIWTP. Improvements will result in reductions in effluent of TSS, ammonia, chlorine, and pathogens. Fecal coliform bacteria will be reduced to less than 200 colony–forming units (CFU) per 100 mL. This level, 200 CFU/100 mL, is considered safe for activities involving direct contact with water (e.g., swimming) during which small quantities of water may be incidentally ingested. Also, the State of Arizona has established a criterion of 200 CFU/100 mL for effluent–dependent drinking water sources. Overall, the quality of surface water impacted by WWTP discharges would be greatly improved over current conditions. However, an increase in NIWTP effluent nitrate concentrations is expected under this alternative as well as under Alternatives B and C. Nitrate is a regulated drinking water contaminant due to its adverse health effects, especially in young children. Typical concentrations of nitrate in the NIWTP effluent at present are between 1 and 2 mg/L as N. EPA drinking water criterion for nitrate is 10 mg/L as N. Nitrate is a byproduct of the biological ammonia removal reaction, which is a component of each proposed WWTP for Arizona to meet aquatic toxicity criteria. In light of the intention to use treated effluent as a raw drinking water source, each Arizona WWTP proposed (including NIWTP upgrades) includes nitrate removal facilities to bring effluent nitrate concentrations to below the 10 mg/L as N standard. Thus, while nitrate concentrations will

increase over current levels, they will be maintained below the drinking water criteria at all times in all WWTP effluents in Arizona to protect its use as a source of raw drinking water.

Upon construction of the new Sonora WWTP, the IOI will not be loaded beyond its capacity and the frequency of sewer overflows is expected to decline substantially. Water quality at the new WWTP in Sonora will meet the surface water discharge criteria specified in Table 2. It is anticipated that natural processes (e.g., soil–aquifer treatment, dilution) will reduce fecal coliforms to acceptable levels by the time the water percolates through soil and reaches the aquifer.

***Alternative B***

The quality of effluent released from the NIWTP into the Santa Cruz River would be identical to that under Alternative A, but the quantity of the discharge would be reduced. Since overall effluent quality would be improved over current conditions (i.e., lower TSS, ammonia, chlorine, and pathogens), adverse impacts on humans coming in contact with water in the Santa Cruz River would be reduced or eliminated. As with Alternative A, water in the Santa Cruz River would be safe for recreational activities and as a drinking water source. Nitrate concentrations in the Santa Cruz, while higher than at present, will be maintained below drinking water criteria. Since flow in the Santa Cruz River would be greatly reduced under Alternative B, resulting in fewer miles of aboveground river flow, the possibility for human contact with effluent would be reduced.

Under Alternative B, effluent from a new WWTP in Mexico would be discharged to surface water upstream of well fields. Effluent quality will be such that the effluent will be suitable for indirect recharge to a drinking water aquifer. It is anticipated that natural processes (e.g., soil–aquifer treatment, dilution) will reduce fecal coliforms to acceptable levels by the time the water percolates through soil and reaches the aquifer.

***Alternative C***

Upgrades to the NIWTP will be similar to those proposed under Alternatives A and B, and effluent quality would be identical. Under this alternative, effluent will be discharged at the existing outfall to the Santa Cruz River. The net potential impact to people contacting water in the Santa Cruz River would be positive, since water quality would be improved over current conditions. The water quality at the discharge point will be suitable for recreational purposes and could be suitable as a drinking water source, as well. Again, removal of ammonia at the Arizona WWTPs (for aquatic toxicity compliance) will result in increased nitrate concentrations, but these concentrations will remain in compliance with drinking water criteria with the use of nitrate removal processes.

***Alternative D***

Under Alternative D, the No Action alternative, no improvements to treatment plants or collection systems would occur, and further deterioration of surface water and groundwater quality is likely because of projected population growth and increasing amounts of wastewater requiring treatment. The existing wastewater treatment plant's capacity is already challenged by increasing flows from Nogales, Sonora and without action, incidences of untreated or inadequately treated releases may increase in the future. Likewise, if no action is taken, the frequency and degree of releases from the collection system would likely increase in the future. Descriptions of existing conditions related to Public Health and Safety are presented in the EI.

### *1.7.11 Climatology/Air Quality/Odors*

This evaluation is based on the EI overview of the climate and general air quality of Ambos Nogales. Also assessed are air quality issues specifically associated with odors. This is considered to be a secondary resource category for this project because of the relatively low potential for significant impact.

*Climate*. None of the alternatives under consideration are expected to impact the overall climate (temperature, rainfall, wind direction, and speed, frequency of storms, etc.) in the Ambos Nogales region.

*Air Quality/Odors*. Impacts to air quality from implementation of any of the alternatives are generally expected to be short–lived, localized, and mostly limited to temporary increases in particulates during construction phases. Implementation of Alternatives A, B, and C could also result in the release of volatile organic chemicals (VOCs) during wastewater treatment plant operations. Any such releases would be maintained at levels within state regulatory limits, primarily because of mitigation efforts at the WWTP headworks. Implementation of Alternatives A, B, or C can also be expected to reduce the odors associated with WWTP effluents slightly because effluent quality will be improved under all of these alternatives. Air quality impacts associated with each of the alternatives are discussed below.

***Alternative A***

Odors from Santa Cruz River downstream of the NIWTP are likely to be reduced because of improved effluent quality. Odors would be generated at the new WWTP at the Industrial site in Arizona, but these are not expected to be significant. No transboundary air quality impacts are anticipated from the new Los Alisos WWTP. During the construction phase of new WWTPs and collection system and IOI improvements, blowing dust and dirt may originate from disturbed ground in the construction site vicinity. Construction activities near the border may have short-term transboundary air impacts. These impacts can be mitigated by dust control measures such as wetting the soil. Mitigation measures are discussed in Section 1.12.

***Alternative B***

Blowing dust and dirt may originate from disturbed ground during the construction phase of the wastewater infrastructure projects. Construction activities near the border may have short-term transboundary air impacts. These impacts can be mitigated by dust control measures such as wetting the soil. Mitigation measures are discussed in Section 1.12. No transboundary air quality impacts are anticipated from the new Los Alisos WWTP.

***Alternative C***

Blowing dust and dirt may originate from disturbed ground during the construction phase of the wastewater infrastructure projects. As mentioned above, construction activities near the border may have short-term transboundary air impacts. These impacts can be mitigated by dust control measures such as wetting the soil. Mitigation measures are discussed in Section 1.12. No transboundary air quality impacts are anticipated from the new Los Alisos WWTP.

***Alternative D***

Any identified environmental impacts related to this resource category are not anticipated to change in the short term under this Alternative Because there would be no immediate changes to current conditions, facilities, or processes. Adverse effects to this resource category are likely to remain minimal or nonexistent. Descriptions of existing air quality are presented in the EI.

## *1.7.12 Energy Supply/Natural Resources*

This evaluation is based on the EI summary of existing Energy Supply and Natural Resources and provides a basis for assessing potential sources of energy for project alternatives. This is considered a primary resource category because of the importance of power availability for all the action alternatives.

Impacts to non–electricity energy and/or utility requirements, such as natural gas and telephone, resulting from implementation of the four alternatives are not expected to be significant. The following discussion is therefore limited to electricity resources. The analyses presented below are based on the projected energy requirements of each alternative for the year 2020, at which time all facilities proposed under each alternative would be in full operation. These requirements are summarized in Table 3.

***Table 3***
***Summary of Electricity Requirements by Alternative (Year 2020)***

| ***Electricity Consumer*** | ***Alternative A (1,000 kW hr/year)*** | ***Alternative B (1,000 kW hr/year)*** | ***Alternative C (1,000 kW hr/year)*** | ***Alternative D (1,000 kW hr/year)*** |
|---|---|---|---|---|
| NIWTP | 11,711 | 5,730 | 21,428* | 12,439 |
| New Arizona WWTP | 4,610 | – | – | – |
| Force main from AZ WWTP to discharge site** | 1,222 | – | – | – |
| Arizona Totals: | 17,543 | 5,730 | 21,428 | 12,439 |

*Energy requirements corresponding to an average capacity of 754 L/s (17.2 mgd). If the NIWTP operates at 973 L/s (22.2 mgd), the energy requirements for this alternative would be 25,471 kWhr/year.
**Assumes discharge to Santa Cruz River at Kino Springs. Discharge to Potrero Creek or any other site would result in different quantitative estimates, but would not substantially change the conclusions regarding this resource category.

Recent records indicate an average rate of electricity use of about 8,033,000 kW–hours/year at the NIWTP for flows of approximately 11.5 mgd (less than the wastewater treatment plant's rated capacity of 17.2 mgd). In 2020, projected Ambos Nogales wastewater flows are about 30 mgd. Although not all of this flow would be seen at the NIWTP under Alternative D (due to existing collection system capacity limitations), it is likely that NIWTP flows would exceed 17.2 mgd. If no additional treatment equipment is installed, all existing NIWTP equipment would run at 100 percent capacity in 2020, but discharge water quality requirements would not be met. The energy consumption under Alternative D, the no action alternative, would therefore increase with

increasing flows over time until all existing NIWTP equipment is operating at 100 percent, using about 12,439,000 kW–hours/ year.

Changes in energy use by all Arizona WWTPs under Alternatives A, B, and C are roughly proportional to changes in flows treated in Arizona. This is reflective of a balance between more efficient secondary treatment (i.e., lower mixed/aerated volume per unit flow in an oxidation ditch than a lagoon) and the proposed use of additional processes (e.g., aerated grit removal, nitrification, denitrification, aerobic digestion). Power requirements in Arizona are lowest under Alternative B due to the low flows to be treated (i.e., all Mexican wastewater would be treated in Mexico). However, other actions associated with alternatives A have additional energy uses related to transmission of treated effluent from Nogales, Arizona to the discharge sites at Kino Springs or Potrero Creek.

Power requirements for new Mexican wastewater treatment and conveyance facilities are addressed in the Mexican EA. No significant transboundary effects related to Mexican power consumption are expected.

***Alternative A***

Alternative A includes operation of the NIWTP and existing IOI at current rates with continued discharge to the Santa Cruz River. Also included in this alternative is a new WWTP in Sonora and Arizona, a new IOI in Arizona, and two new force mains. One would move wastewater from Nogales, Sonora to the new WWTP in Los Alisos and the other would convey effluent from the new WWTP in Nogales, Arizona to a discharge site at Kino Springs or possibly Potrero Creek.

The energy requirements under this alternative for wastewater treatment operations in Arizona are slightly higher than current rates (primarily due to increases in flow) but lower than predicted rates if no action is taken (Alternative D), since a substantial fraction of the wastewater from Nogales, Sonora would remain in Mexico for treatment at the new WWTP at Los Alisos. Power availability in Arizona is not expected to limit the feasibility of this alternative, and no significant energy–related impacts are anticipated.

Electricity requirements on the Mexican side of the border increase substantially under this alternative since there are presently no wastewater treatment or pumping facilities in Nogales, Sonora.

***Alternative B***

Under Alternative B, the NIWTP would operate at a lower rate, and a new WWTP at Los Alisos would be built, requiring a new force main for wastewater from Nogales, Sonora. Energy requirements for wastewater treatment in Arizona would be substantially lower than at present, because all wastewater from Mexico would remain in Mexico for treatment at the new WWTP. Power availability in Arizona will not impact the feasibility of this alternative, and no significant energy–related impacts are anticipated.

Similar to Alternative A, the energy requirements for wastewater treatment and pumping in Mexico would increase substantially. The energy requirements on the Mexican side of the border may limit the feasibility of this alternative.

***Alternative C***

Under Alternative C, the NIWTP would continue at current rates and Mexican flows in excess of current rates would be pumped via a force main the a new WWTP at Los Alisos. Arizona electricity requirements would be higher than current rates. Improvements to the NIWTP that enhance treatment efficiency are likely to reduce energy needs, but these slight reductions will, over time, be offset by the need to treat larger volumes of wastewater. Power availability in Arizona is not expected to impact the feasibility of this alternative, and no significant energy–related impacts are anticipated.

Similar to the other action alternatives, the energy requirements for wastewater treatment in Mexico would increase substantially. The energy requirement on the Mexican side of the border may limit the feasibility of this alternative. However, projected Mexican energy consumption under this alternative is lower than under either Alternative A or B. Also reducing the energy needs in Mexico is the fact that the upgraded IOI in Arizona will be able to control peak flows from Mexico. This should allow for smaller or fewer pump stations in Mexico, thereby reducing the energy needs under this alternative.

***Alternative D***

Any identified environmental impacts related to this resource category are not anticipated to change in the short term under this Alternative Because there would be no immediate changes to current conditions, facilities, or processes. The projected future growth of Ambos Nogales will, however, be associated with increased amounts of wastewater requiring treatment. By the year 2020, the NIWTP electricity requirements will have increased from 8,033,000 kW–hours/year to 12,439,000 kW–hours/year (i.e., all existing NIWTP equipment operating at 100 percent capacity), with all the increase in energy consumption occurring in Arizona. Power consumption would be highest under Alternative D, reflective of the fact that the existing treatment process is inefficient for flows of this magnitude. Thus, Alternative D is unattractive from a power consumption perspective. Descriptions of existing energy supply and natural resources are presented in the EI.

## *1.7.13 Hazardous and Solid Waste*

This evaluation is based on the EI summary of the actual or potential sources and types of hazardous wastes that are or may be associated with the Ambos Nogales area. This is considered a secondary resource category because of the low likelihood that project alternatives will significantly affect the types and amounts of Hazardous and Solid Waste. As discussed previously, water from dewatering activities that are found to contain hazardous chemicals will be treated prior to release. The upgraded WWTP may also be more susceptible to hazardous inputs or shock loads compared to current aerated lagoon system. These effects can be mitigated by a pretreatment program. Pretreatment is an enforceable requirement that should minimize the potential for hazardous inputs to upset the treatment system. Following effective pretreatment, WWTP sludge will meet all land disposal requirements.

***Alternative A***

Residual solids from the headworks (screenings and grit) from the operation of a new WWTP in Arizona would be processed and disposed in the same manner currently used at the NIWTP. The

biosolids, which were last removed in 1992, were transported to Pima County, Arizona for land disposal. This disposal of sludge meets all regulatory requirements for land disposal. The disposal of the additional solid wastes produced by new wastewater treatment plant operations will be studied during the design phase of the project, early in the process. An environmentally sound solid disposal alternative will be determined, taking into account all applicable environmental regulations. For this reason, the additional solids resulting from the technology upgrade, are not expected to significantly impact the local environment because they would be transported away from the site and disposed on land using environmentally acceptable methods. In the case of a new WWTP in Mexico, sludge would be conveyed to the landfill located near Los Alisos, and no transboundary impacts would result from the sludge generated at the Los Alisos WWTP.

***Alternative B***

There would be no new WWTP in Arizona under Alternative B, and even though the solid waste volumes would increase slightly, this increase is not expected to significantly impact the local environment because the solids would be transported away from the site and disposed on land using environmentally acceptable methods. In the case of a new WWTP in Mexico, sludge would be conveyed to the landfill located near Los Alisos. The additional solid wastes produced by new wastewater treatment plant operations are not expected to significantly impact the local environment or cause transboundary impacts.

***Alternative C***

The existing wastewater infrastructure would be upgraded and may be expanded in Arizona under this alternative. As in the case of Alternative A, the solid waste would increase as a result of the use of an activated sludge technology. However, as in the case of Alternatives A and B, this increase is not expected to significantly impact the local environment because the solids would be transported away from the site and disposed on land using environmentally acceptable methods. In the case of a new WWTP in Mexico, sludge would be conveyed to the landfill located near Los Alisos. The additional solid wastes produced by new Los Alisos WWTP operations are not expected to significantly impact the local environment or cause transboundary impacts.

***Alternative D***

Any identified environmental impacts related to this resource category are not anticipated to change in the short term under this alternative because there would be no immediate changes to current conditions, facilities, or processes. The projected future growth of Ambos Nogales will, however, be associated with increased amounts of wastewater requiring treatment, resulting in increased sludge volumes over time. However, adverse effects to this resource category are likely to remain minimal or nonexistent. Descriptions of existing Hazardous and Solid Wastes are presented in the EI.

### *1.7.14 Aesthetic Resources*

This evaluation is based on the EI presentation of the aesthetic resources of Ambos Nogales. Aesthetic Resources are a secondary resource category because of the expectation of little or no impact from project alternatives except perhaps on a very localized basis.

One localized effect on aesthetics that may result from upgrading the NIWTP from the existing aerated lagoon system to an advanced secondary treatment process is the loss or extensive modification of existing bird habitat at the NIWTP site. The existing aerated lagoons are currently frequented by large numbers of several species of birds, especially during certain times of the year. Birds commonly congregate around the existing lagoons, and bird watching has become a common pastime at the existing NIWTP site. Loss of the lagoons at the NIWTP would clearly affect bird watching opportunities at or near the NIWTP, but would probably not affect bird populations because the birds that currently frequent the NIWTP would move to other suitable sites in the area. Finally, there may be mixed impacts with the loss of lagoons because not attracting birds to a wastewater treatment plant, where birds may be exposed to water containing potentially harmful constituents, may be viewed by some as a positive impact.

***Alternative A***

The construction of a new wastewater treatment plant in Arizona entails adding a new structure to a site that is currently vacant. Section 8 (Development of Alternatives) of the Facilities Plan, provides an aerial view of the site. Similarly, construction of a new IOI entails adding new pipe alongside the existing IOI. The impact on aesthetic resources would be minimal because (1) the WWTP site is currently an industrial area comprised mostly of warehouses and heavily used by large trucks, and (2) the new IOI will be placed alongside the existing IOI. The slight reduction in effluent volume discharged to the Santa Cruz River from the NIWTP (from about 11.5 mgd to about 9.4 mgd) could reduce the amount of aesthetically pleasing riparian vegetation downstream of the NIWTP.

***Alternative B***

Under this alternative, there would be no new wastewater treatment plant constructed in Arizona, and there would be no significant impact on the area's aesthetics resources from new construction. Similarly, the rehabilitation of the existing NIWTP would cause no significant aesthetic impacts. The reduction of effluent being discharged to the Santa Cruz River, from about 11.5 to about 4.6 mgd under this scenario, would, however, cause adverse impacts to aesthetic resources in this area. Such impacts are likely to eventually include dead trees along the Santa Cruz River streambank and a dry riverbed in the most downstream reaches of the reach that is currently effluent–dominated.

***Alternative C***

Under this alternative, there would be no new wastewater treatment plant constructed in Arizona, and there would be no significant water quantity–related impacts on the area's aesthetics resources because current flows would be maintained downstream of the NIWTP. Similarly, in all three alternatives (A, B, and C), the rehabilitation of the existing NIWTP, collection system and IOI would cause no significant aesthetic impacts.

***Alternative D***

Any identified environmental impacts related to aesthetic resources are not anticipated to change in the short term under this alternative because there would be no immediate changes to current conditions, facilities, or processes. Adverse effects to aesthetic resources in the short term are likely to remain generally as they are today. Over time, the increased amounts of wastewater requiring treatment may result in increased flows in the Santa Cruz River downstream of the NIWTP.

These water quantity increases, while probably beneficial, would be offset by increasingly poor water quality. Descriptions of existing Aesthetic Resources are presented in the EI.

## *1.7.15 Parks and Historic Areas*

***Alternative A***

The construction of a new wastewater facility and new IOI in Arizona would not impact existing parks or historic areas. Historic resources are discussed more fully in Section 1.7.9. The proposed site for the WWTP is located in an area zoned for industrial development, and no nearby areas are zoned for recreational purposes. No historic areas are reported near the proposed site. The new IOI would be parallel to the existing IOI. The park nearest the proposed site is Calabazas Park, and it is sufficiently distant from the proposed construction site that it would not be affected by implementation of this alternative. Similarly, upgrades and improvements to existing wastewater infrastructure would not impact parks and historic areas.

***Alternative B***

Since no new wastewater facility is proposed for Arizona under Alternative B, there would be no impacts to parks and historic areas in Arizona from new construction. Similarly, upgrades and improvements to the existing infrastructure would not impact parks and historic areas.

***Alternative C***

Since no new wastewater facility is proposed for Arizona under Alternative C, there would be no impacts to parks and historic areas in Arizona from new construction. As in Alternatives A and B above, upgrades and improvements to the existing infrastructure would not impact parks and historic areas.

***Alternative D***

There are currently no environmental impacts related to parks and historic areas as a result of current NIWTP operations or discharges. This situation is not anticipated to change in the short term because there would be no immediate changes to current conditions, facilities, or processes. Adverse effects to parks and historic areas are likely to remain nonexistent. Descriptions of existing Parks and Historic Areas are presented in the EI.

## *1.7.16 Socioeconomic Issues*

Socioeconomic concerns are centered on impacts on or changes to human population, employment, demographics, and other related socioeconomic issues. As discussed previously in Section 1.5.3, growth and development resulting from implementation of an alternative could in some cases cause adverse impacts on environmental resources. For this project, however, no significant or substantial indirect or secondary impacts related to demographics, induced growth, or changes in employment patterns. In addition, no changes to local utilities, telecommunications, transportation, parking, noise, or social services such as schools, police, and fire protection are identified for this project.

Growth and development of Ambos Nogales is currently not limited by issues directly or indirectly related to wastewater treatment capacity or efficiency. Arizona has sufficient treatment capacity in the existing wastewater treatment plant and none of the alternatives pertaining to Arizona involves

significant expansion of capacity to be used by the City of Nogales, Arizona or the towns surrounding the NIWTP. More accurately, growth in Nogales, Arizona may be limited to some degree by the availability of drinking water. Potential impacts to groundwater availability under Alternative A are expected to be minimal, since the effluent discharged to the Santa Cruz River would be reduce only slightly.

Under Alternative B, potential impacts to groundwater aquifers could be substantial under certain conditions that are likely to vary seasonally and from year to year. The most important potential transboundary impact to groundwater aquifers would be the decreased discharge to the Santa Cruz River downstream of the NIWTP. This decreased volume of effluent entering the Santa Cruz River at the NIWTP could affect groundwater aquifers by reducing aquifer recharge from overlying surface waters. This potential outcome is expected to be most important during the dry season or during especially dry years. Measurable impacts to groundwater aquifers are likely to be realized under this alternative, depending on the impacts of evaporation, phreatophyte uptake, groundwater pumping rates, and other processes associated with surface water/groundwater relationships.

In the case of Alternative C, under the scenario in which the flows to the NIWTP are maintained at 754 L/s (17.2 mgd), potential impacts to groundwater aquifers are not expected to be measurable because changes in flows discharged into the Santa Cruz River from the NIWTP are not expected. However, under the scenario in which the flow from Mexico into the NIWTP increases over time, increased discharge volumes at the NIWTP could affect the groundwater recharge in the aquifer underlying the Santa Cruz River, increasing drinking water availability. The degree to which groundwater quantity is affected will depend on the season and current and recent weather conditions, and site-specific considerations such as groundwater and surface water hydrologic connections, aquifer storage characteristics, wastewater treatment plant uptake, evaporation rate, slope of streambank, degree of channelization, etc. An increase in groundwater recharge would not necessarily signify an increase in groundwater supply. Increased groundwater recharge would need to be followed by the development of well fields downstream of the NIWTP, as well as the implementation of water supply projects in the region.

Implementation of the preferred alternative is unlikely to significantly affect employment opportunities, employment patterns, human population, regional demographics, or other socioeconomic concerns in Ambos Nogales beyond those discussed independently in the EA (e.g., water quality, public health, etc.).

***Table 4***
***Evaluation Matrix for Four Alternatives vs. Potentially Affected Environment Components***
***U.S. and Transboundary Impacts Only****

| *Resource Category Alternative* | *Land Use* | *Geology, Soils* | *Topography* | *Flood-plains, Wild & Scenic Rivers* | *Surface Water Quality* | *Ground-water Aquifers* | *Ground-water Quality* | *Biol-ogical Re-sources* | *Historic, Archi-tectural, Archaeo-logical, Resources* | *Public Health and Safety* | *Clima-tology, Air Quality, Odors* | *Energy Supply, Natural Re-sources* | *Hazar-dous, Solid Waste* | *Aesthetic Re-sources* | *Parks and Historic Areas* | *Socioeco nomic* | *Total Score* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A | 0 | 0 | 0 | 0 | 2 | 1 | 1 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 0 | 8 |
| B | 0 | 0 | 0 | 0 | 2 | -1 | 1 | -2 | 0 | 1 | 0 | 1 | 0 | -1 | 0 | 0 | 1 |
| C | 0 | 0 | 0 | 0 | 2 | 2 | 1 | 2 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 0 | 10 |
| D (No Action) | 0 | 0 | 0 | 0 | -2 | 1 | -1 | -1 | 0 | -1 | -1 | 0 | 0 | -1 | 0 | 0 | -6 |

* This matrix does not consider the environmental impacts of Mexican projects on Mexico

## 1.8 Evaluation Matrix

This matrix, presented as Table 4, supports the previous qualitative discussions evaluating environmental impacts. This matrix provides a quantitative means for evaluating the potential or expected impacts associated with implementation of the four alternative for each of the 16 environmental resource categories previously identified. This approach uses a ranking system in which a numeric value is assigned to each pairing of alternative and resource category. The numeric values are based on potential to cause significant impacts, where

–2 = negative impacts
–1 = minor negative impacts
0 = neutral – no impacts or equally positive and negative impacts
1 = minor positive impacts
2 = positive impacts

Scores are summed for each alternative, with lower scores indicating a greater likelihood of measurable or significant adverse environmental impacts. Higher scores are associated with positive effects, and reveal the most desirable alternatives from an environmental assessment viewpoint.

## 1.9 Conclusions and Recommendations

Alternative C has the highest matrix score, indicating the least potential for adverse environmental impacts and the greatest potential for positive impacts in the U.S. Alternative C is, from an environmental viewpoint, recommended as the preferred alternative for this project. Alternative C is also estimated to be less costly than Alternative A, the next most environmentally desirable alternative. Implementation of Alternative C provides the following benefits to the local environment, compared to the other alternatives:

- Improved effluent quality (especially reduced ammonia concentrations) from more advanced treatment

- Preservation of desirable aquatic and riparian habitats downstream of the NIWTP

These are considered major environmental benefits. Alternative A shares the first major benefit of Alternative C, but includes the disadvantage of the potentially important loss of aquatic habitat downstream of the NIWTP (as a result of the average effluent flows being reduced from 11.5 to 9.4 mgd) and the loss of terrestrial habitat and construction impacts at a new treatment site (strikethrough: the Industrial Site) in Nogales, Arizona. Alternative A is therefore not considered substantially better than Alternative C from an environmental viewpoint, and is considered somewhat less favorable overall. Other criteria, such as technical feasibility or costs, are likely to reflect more substantial differences between Alternatives A and C. Another factor affecting the consideration of Alternative A is that the Industrial Site has recently become unavailable. Construction has started at the Industrial Site which had been envisioned as the potential site of the new Nogales, Arizona wastewater treatment plant when the feasibility study of the alternatives was

conducted. Although Alternative A can no longer be considered, it was fully considered during the preparation of this document.

Alternative B shares with the other action alternatives the benefit of improved effluent quality. In sharp contrast, however, Alternative B is associated with substantially reduced (from about 11.5 to 4.6 mgd) effluent flows and hence a loss of substantial aquatic and riparian habitats in and along the reaches of the Santa Cruz River downstream of the NIWTP. The lost habitats would not be offset in this case by the creation of additional aquatic and riparian habitat because there would be no new discharge locations as under Alternative A. There would, however, be a reduction in the amount of impaired aquatic habitats downstream of the NIWTP, primarily as a result of a substantial reduction in the effluent ammonia concentration. Reduced aquatic and riparian habitats would negatively affect a wide variety of aquatic and riparian species, including the federally endangered Gila topminnow. Implementation of this alternative would therefore be in opposition to the Endangered Species Act, and the lost habitat would constitute a "taking" of endangered species as defined by the U.S. Fish and Wildlife Service.

Alternative D (the No Action alternative) maintains current effluent flows but also maintains current concentrations of ammonia in discharged effluents. Ammonia concentrations are currently sufficiently elevated to cause mortality and sub–lethal effects in sensitive aquatic biota, as shown in the results of chronic whole effluent toxicity (WET) tests and as suggested by instream macroinvertebrate and fish abundance and diversity. Elevated ammonia is suspected of currently causing substantial impairment of aquatic habitats in the Santa Cruz River, especially just downstream of the NIWTP. Implementation of this alternative, that is, to do nothing, will maintain impaired conditions in the Santa Cruz River downstream of the NIWTP. Further, increased frequencies of sewer overflows will occur over time, with potentially adverse impacts to public health.

## 1.10 Transboundary Impacts

Transboundary impacts are, for the purpose of the EA, defined as impacts with a source or origination on the opposite side of the International Boundary. For example, a transboundary impact might include an impact on Mexican resources as a result of an action taken in the U.S. Obvious transboundary impacts are included in the previous discussions of potential impacts to environmental resources. For example, untreated wastewater flowing into the U.S. from Mexico has potential for causing transboundary impacts, and this issue has been addressed in previous sections. Less obvious transboundary impacts are included in this section.

Impacts from U.S. actions on Mexican resources are specific for each alternative. For example, under Alternative B, the reduction of effluent being discharged to the Santa Cruz River is expected to cause a substantial loss of riparian and aquatic habitat downstream of the NIWTP. This loss can indirectly affect migratory birds and other wildlife dependent on a contiguous or nearly contiguous riparian corridor for foraging, roosting, nesting, and other activities. Mexican populations can be affected if northerly migrations are hindered by lack of suitable riparian habitats on the U.S. side for one or more of the activities identified above.

Only one adverse U.S.–origin transboundary impact is identified for Alternative C, the preferred alternative. This impact is related to groundwater quality in the U.S. Currently, PCE exists in the

groundwater aquifer beneath Nogales, Sonora. This aquifer is hydraulically connected to the aquifer underlying the Nogales Wash in the U.S. The PCE is apparently moving northward, and is currently thought to be near the U.S./Mexican border. Replacement of the IOI in the U.S. and collection system improvements in Mexico are likely to require short–term dewatering of the Nogales Wash in construction areas. This dewatering action may increase the rate at which the identified PCE-contaminated groundwater in Sonora migrates north into the U.S. It is therefore possible that IOI replacement in the U.S. results in groundwater quality impacts in the U.S. as a result of Mexican–origin PCE contamination. However, during the dewatering process, groundwater found to be contaminated with PCE would be captured and treated to levels in compliance with all applicable State and Federal standards prior to release to the environment.

Positive transboundary impacts may result from implementation of any alternative that (1) improves water quality of U.S. surface waters used by migratory wildlife, and (2) increases the amount of aquatic and riparian habitats in the U.S. Improved (i.e., nontoxic) water quality and more aquatic and riparian habitats in the U.S. can benefit Mexican wildlife that migrates into the U.S. and is dependent on water for drinking and suitable aquatic and/or riparian habitats for foraging, nesting, cover, etc. Increasing the amount of aquatic and riparian habitats at Los Alisos in Sonora can benefit U.S. wildlife that migrates into Mexico and is dependent on aquatic and/or riparian habitats.

## 1.11 Cumulative Impacts

Cumulative impacts can result from this project in combination with other projects that are anticipated to be implemented in the foreseeable future. Also, cumulative impacts are evaluated for projects allowed by implementation of this project. Projects with reasonable potential to be implemented in the foreseeable future include the following:

<u>City of Nogales, Arizona - Water Projects</u>
Vista del Cielo Water Storage Tank
Connect Guevavi Ranch wells to Proto Canyon Wastewater Treatment Plant
Rehabilitation/upgrade of Potrero Canyon System

<u>City of Nogales, Arizona - Wastewater Projects</u>
Replacement of 6" and 4" sanitary sewers in Calle la Castellana

<u>Sonora Drinking Water Project</u>
In Nogales, Sonora, a water project known as acuaferico is being constructed. The project consists of pump stations, forcemains and elevated tanks in the perimeter of the city to improve the water supply. Later phases the acuaferico project will include work on the water supply network inside the city, and possibly, micrometering.

The cumulative impacts of project actions and these other actions that may be implemented in the near future are similar to the environmental impacts described for the project actions alone. The potential for the other projects listed above to significantly impact environmental resources is

considered low. Each of these projects are either associated with a small local area or a very narrow linear area with little potential to adversely impact environmental resources.

## 1.12 Mitigation Measures

NEPA guidance states that implementation of an action alternative should consider means to reduce or mitigate adverse environmental impacts. Often, mitigation measures allow adverse effects to be:

- Avoided by not taking certain actions
- Minimized by limiting the degree or magnitude of the action
- Rectified by repairing, rehabilitating, or restoring the affected environment
- Reduced or eliminated by preservation or maintenance of resources
- Compensated by replacing or providing substitute resources or environments

In this case, however, mitigation of negative impacts is of lesser importance because few negative effects have been identified for the preferred alternative. In fact, the implementation of Alternative C would be substantially beneficial to the local environment. The following positive effects can be realized by implementing Alternative C:

- Improvements to the aquatic habitats immediately downstream of the NIWTP through reductions of ammonia and possibly other toxicants

- Preservation of existing aquatic and riparian habitats downstream of the NIWTP by maintaining effluent discharge flows at current levels (likely scenario)

- Possible creation of additional or enhancement of existing aquatic and riparian habitats downstream of the NIWTP if the full capacity of the expanded NIWTP is used in the future (less likely scenario)

- Minimizing sewer overflows and the adverse environmental effects from such events

The few negative effects that may be realized by implementing Alternative C would be minimized to the extent practicable using appropriate practices and technologies. Upgrades to the NIWTP and new construction would be accomplished in a manner sensitive to potential environmental impacts.

For example, runoff and associated sedimentation of nearby water courses would be minimized using appropriate and accepted methods to collect runoff and reduce erosion. Protection of the effluent channel downstream of the NIWTP and the Santa Cruz River adjacent to and downstream of the NIWTP would be major concerns of upgrade activities at the NIWTP.

The acceptance of Alternative C can also include the following to ensure protection of environmental resources:

- Pilot testing unique or special treatment processes prior to full implementation to ensure the efficiency of effluent treatment

- In–plant safeguards and backup systems, including redundant equipment in key processes, to prevent upset conditions that could impair environmental resources

- In–plant monitoring and WET testing as needed to confirm effluent quality

- Instream monitoring as needed to confirm the expectation of no adverse impacts
- Treatment of contaminated groundwater prior to release to the environment if found during de-watering activities

## 1.13 References

American Society of Civil Engineers (ASCE) and the U.S.–Mexican Policy Studies Program. 1995. NAFTA Handbook for Water Resource Managers and Engineers.

Arizona Department of Water Resources(ADWR). 1997. Internet home page (www.adwr.state.az.us). December 17.

Border Environmental Cooperation Commission (BECC). 1996. Project Certification Criteria. November 9.

Camp Dresser & McKee Inc., 1999. Ambos Nogales Wastewater Facility Plan Final Report. Prepared for the International Boundary and Water Commission.

Camp Dresser & McKee Inc., 1998. Nogales International Wastewater Treatment Plant. Application for Variance: Phosphorous Discharge Limits. Prepared for the International Boundary and Water Commission.

Comisión Nacional del Agua (CNA). 1992. Ley Nacional de Aguas Nacionales. December.

Comisión Nacional del Agua (CNA). 1996. Actualización del Plan Maestro de los Servicios de Agua Potable, Alcantarillado y Saneamiento de la Ciudad de Nogales, Sonora. November.

Environmental Inventory (EI). 1996. Element 6 of the Ambos Nogales Facilities Plan. U.S. Section, International Boundary and Water Commission.

Holub, H.A. 1997. International Agencies Treaties – Evolving Relationship along the Border. Unpublished paper presented at the Environmental Law on the Border. Tucson, Arizona. January 23.

International Boundary Water Commission (IBWC). 1996. Two Countries, their Borders and their Waters.

Miller, R.R. 1961. Man and the Changing Fish Fauna of the American Southwest. Papers of the Michigan Academy of Science, Arts, and Letters. Vol. XLVI, 1961 (1960 Meeting).

Ruhe, R.V. 1975. Geomorphology: Geomorphic Processes and Surficial Geology. Houghton Mifflin Company.

Schumann, Herbert H. and S.R. Anderson. 1988. Land–Subsidence Measurements and Aquifer–Compaction Monitoring in the Tucson Basin and Avra Valley, Arizona. U.S. Geological Survey: Water–Resources Investigations Report 88–4167.

South–Eastern Arizona Governments Association (SEAGA). 1994. 208 Water Quality Management Plan.

U.S. Environmental Protection Agency. 1984. The Enhanced Stream Water Quality Models (QUAL2E and QUAL2E-UNCAS). Environmental Research Laboratory, Athens, Georgia. EPA/600/3-87/007.