

# Chapter 1 - Introduction

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## 1.1 Project Background and Study Area

### 1.1.1 Location

Panamá City is located in the Republic of Panamá on the Pacific coast and is the largest population center in the Republic. The City is located within the District of Panamá. The City includes the “Corregimientos” or Electoral Districts of San Miguelito, part of Ancón, Santa Ana, Chorrillo, San Felipe, San Francisco, Parque Lefevre, Juan Diaz, Rio Abajo, Bella Vista, Tocumen, Betania, Pedregal Pueblo Nuevo, part of Curundu and Calidonia. According to the 2000 Census, the existing population is 955,850 and has an area of 220 km<sup>2</sup>. The climate is tropical with mild fluctuations in temperature ranging from 70 to 95 degrees Fahrenheit. The wet season typically lasts from May to December and the dry season from January to April. Total annual precipitation is approximately 2,000 mm.

### 1.1.2 History of the System and Past Studies

The origins of the existing wastewater system in Panama City date to the construction of the Panama Canal in 1903 during the implementation of sanitation programs to control the outbreaks of yellow fever and malaria. The United States built the water and wastewater systems for Panama City and Colon as stipulated in the Panama Canal Treaty. In addition, they would manage and operate the systems for 50 years to allow for the payback of the works constructed and provide time for the development of a skilled Panamanian workforce. In 1945, the remaining debt was pardoned by the United States and the responsibility for the system’s operation and management was transferred to the Panama Canal Company. The systems were transferred into Panamanian authority in 1953 to a new department within the Ministry of Health. In 1961, this department was formalized into an autonomous agency known as the Instituto de Acueductos y Alcantarrillados Nacionales (IDAAN) which continues in existence as the national authority responsible for the water and wastewater systems in the country.

The first major study undertaken under Panamanian control was in 1959 when Greely and Hansen completed the first wastewater master plan. This study provided a framework for the expansion of the wastewater collection system in Panama City. The collector system was designed to follow the natural grade of the existing drainage basins leading to Panama Bay. Some of the recommended collectors were built in accordance with the master plan but the implementation lagged and was unable to maintain pace with the explosive population growth of the suburban areas of the city. Construction of new infrastructure lagged and repairs to the existing systems declined. Wastewater treatment plants were never constructed and untreated flows continued to discharge into rivers, streams and directly into Panama Bay.

A major push was underway in 1975 to update the initial master plan with new population and land use projections and new treatment works were recommended. Hazen and Sawyer-Tecnipan prepared the second master plan that resulted in a comprehensive study of the deteriorating conditions and proposed solutions to achieve the sanitation of Panama Bay and the urban areas.

The second master plan determined the level of pollution for the first time in Panama Bay and studied the movement of pollutants with water quality models that were considered state of the art at that time. The second master plan divided the city into two subsystems each with its service

area and treatment plant. The plan proposed new collectors along the coastline to intercept the flows from existing collectors discharging into Panama Bay and transmit them to treatment plants. In the second master plan, the Juan Diaz treatment plant concept was initially proposed.

Similarly to the first master plan, the implementation of recommended solutions trickled and never fully implemented. Population continued to grow and some of the recommendations became obsolete when population centers encroached on areas previously identified for treatment works. Major wastewater infrastructure improvements in Panama City were again deferred.

The City's population continued to increase and raw wastewater generated within the City continued to be discharged without treatment to receiving streams or drainage canals leading up to Panama Bay resulting in a severely polluted receiving body.

The most recent efforts were in 1998 when the Inter-American Development Bank (IDB) funded the Master Plan and Feasibility Studies for the Sanitation of Panama City and Panama Bay, known as the CESOC Master Plan after the consortium of consultants who prepared it.

After the CESOC Master Plan was completed, the Government of Panama (GOP) finalized and published environmental regulations and norms for Panama that were stricter than the norms used in the CESOC Master Plan. These new Panamanian norms have wastewater treatment effluent discharge standards similar to those of the European Blue Flag campaign standards.

As a result, the GOP conducted additional studies where the CESOC wastewater treatment options were reviewed and adjusted to comply with the Panamanian discharge regulations enacted in 2000. The resulting efforts were compiled into the Consolidated Master Plan for the Sanitation of Panama City and Panama Bay (CMP).

The CMP recommended the implementation of the Selected Plan consisting in the construction of wastewater treatment plants, force mains, collector and pump stations capable of meeting the Panamanian effluent discharge standards.

To execute the selected plan, the GOP established the Coordinating Unit (CU) serving within the Ministry of Health. The CU's main priority is the implementation of the Panama Bay Clean Up Project by securing the necessary financing, contracting and overseeing of consultants, bidding the proposed works and reporting to the appropriate agencies. An initial loan request was submitted to the IDB and the Japan Bank for International Cooperation (JBIC) on January 3, 2002.

Subsequently, fact-finding missions from IDB and JBIC determined that additional information was necessary to supplement the CMP and satisfy their lending requirements. The GOP approached the United States Trade Development Agency (TDA) for assistance in funding specific complementary studies which agreed to sponsor a Definitional Mission (DM) to determine the project's viability and estimate the US goods and services potential. The DM was completed in May 2002 and concluded that the Panama Bay Sanitation Project is economically, financially and technically viable.

The TDA decided to fund and assist the GOP with the IDB and JBIC requested studies since the Panama Bay Sanitation Program is the largest environmental program in the country and would likely generate a substantial amount of exports to US firms.

### 1.1.3 Study Area

The project study area primarily consists of four distinct regions within Panama City and the town of Veracruz. The four areas are graphically represented in Figure 1-1.

- **Area 1** consists of the basins bounded by the Tapia River, Tocumen River and the Cabuya River and the sub-basins conformed by Las Mañanitas Creek and the Tagaré River. The following communities are within Area 1: Ciudad Jardin, Las Mañanitas, Barriada 24 de Diciembre, Barriada Tocumen, Barriada Paredes and Barriada Illueca. The communities located in this area lack wastewater collection works and are mostly served by septic tanks or latrines. The majority of the residents are in the lower economic strata.
- **Area 2** includes the following districts: Juan Diaz, Pedregal, part of Rio Abajo, part of Parque Lefevre, Jose Domingo Espinar, Belisario Porras and part of Mateo Iturralde. The area is characterized as a suburb or bedroom community of downtown Panama City. Commercial and small industrial activities are localized and in a well defined sector. The area has a high potential for residential development growth.
- **Areas 3 and 4** is considered the central sector in Panama City with the highest population density and concentration of commercial, financial, political and social activities. These areas are bounded by the river basins conformed of the Matias Hernández River, Abajo River, Matasnillo River and the La Entrada Creek. The following communities are part of this sector: Bella Vista, San Francisco, San Felipe, El Chorrillo, Santa Ana, Calidonia, Bethania, Pueblo Nuevo, part of Parque Lefevre, part of Rio Abajo, Ancon, Amelia Denis, Victoriano Lorenzo and part of Mateo Iturralde. The oldest part of Panama City, “Casco Viejo” is within Area 3. The wastewater collection network within these areas is well developed and mostly built in the 1960 to 1970 and primarily discharging directly to Panama Bay without treatment.
- **Area 11** consists of the Veracruz community located on the western side of the Panama Canal. The area has a high potential for growth in the tourist, residential, commercial and industrial sectors. The area has pristine beaches creating an interest for the tourist industry. This community does not have a sewer collection and treatment infrastructure and served by septic tanks or latrines. The area is bounded by the basins consisting of the Chumical, Bique, Majagua and Veracruz Creeks.

### 1.1.4 Existing Wastewater System

The existing wastewater system lacks adequate treatment and the raw wastewater generated within the City continues to be discharged without treatment to receiving streams or drainage

canals leading up to Panama Bay. Treatment is limited to newer residential developments consisting of septic tank systems, Imhoff tanks, and in some cases package treatment plants.

The majority of the wastewater collection network is concentrated in Areas 3 and 4 that includes the oldest in the “Casco Viejo” area. This network was built as part of the Panama Canal Treaty and for the most part is a combined system serving both stormwater and sewer flows. During wet weather periods, the system is overwhelmed with frequent overflows to streets. The majority of the flows collected in Areas 3 and 4 are directly discharged to Panama Bay without treatment. Figure 1-2 shows the known outfalls directly discharging into Panama Bay.

Towards the eastern parts of Panama City, the wastewater system is a conventional and separated from the stormwater system. The collection works were mostly built between 1960 and 1970. This area has a network collection system between 6 and 15 inches in diameter connecting to a collector system reaching 60 inches in diameter. Eight pump stations are within this basin and only four remain in operation. Overflows are in use to discharge flows to the nearest receiving water body at those stations not in operation.

In Area 2, the existing system is newer and mostly built by developers to serve the residential developments. Residential developments have their onsite treatment systems consisting of septic tanks, Imhoff tanks and some package plants that discharge their effluent to the nearest receiving water body. The maintenance to these onsite system is practicably nonexistent and the treatment efficiency is marginal.

The existing wastewater systems in Areas 1 and 11 are limited only to septic tank systems and latrines. The communities in these areas lack a centralized wastewater system.

The overall condition of the existing wastewater system can be described as deficient. Collectors are undersized, broken and overflows widely used and discharging to the nearest receiving water body flowing to Panama Bay. Treatment is inadequate and expansion of the existing system is mostly limited to the new systems built in new developments mostly located in Area 2.

### **1.2 Scope of Work**

Hazen and Sawyer was retained by the CU to conduct the four complementary studies necessary to obtain funding from the multilateral lending agencies interested in the project. The TDA approved funding for the following studies:

1. Wastewater Flow Monitoring and Sampling Study
2. Wastewater Treatment Plant Sites Acquisition Study
3. Sludge Management Feasibility Study
4. Engineering Report and Implementation Plan
5. Final Technical Assistance Report

The following discussion relates to the fifth study, the Final Technical Assistance Report. This report is comprised of the tasks from the previous four complementary studies by presenting their conclusions, recommendations and details. The Final Technical Assistance Report also includes and identifies the availability of U.S. sources of supply. A point of contact is included for each identified commercial source.