



## Project Summary

### Organization:

Companhia de Saneamento Básico do Estado de São Paulo (Sabesp)

### Solution:

Water and Wastewater

### Location:

São Paulo, Brazil

### Project Objective:

- Improve the sewer collection system to limit overflows
- Increase treated sewage to reduce pollution of rivers

### Products used:

SewerGEMS

## Fast Facts

- With broken sewer pipes, effluent discharges in water bodies, and high infiltration, the sewer collection system needed to be improved.
- A hydraulic model developed in SewerGEMS helped Sabesp engineers make optimal design decisions.

## ROI

- The estimated project costs were reduced by over 80 percent.
- The hydraulic model saved months of network assessment.

# Sabesp Improves the Anhangabaú Sewer Collection System Below Projected Cost

## SewerGEMS Helps Reduce Initial Estimate by More Than 80 Percent

Sabesp provides water to and collects sewage from over half of the cities in the state of São Paulo, Brazil, including São Paulo the state capital and the country's largest city. The utility is currently in the process of upgrading the Anhangabaú sewer system, which consists of 122.88 kilometers of sewer conduit network, with 1,749 manholes and 14,832 household connections serving an estimated 400,000 inhabitants. The system is located in an important historic area of São Paulo that is being impacted by urban sprawl; and because much of the government operates here and it is home to many hospitals, the area is under constant surveillance.

During the past few decades, this region of the city has been through numerous urban improvements that heavily damaged the underground sewer infrastructure, to the extent that parts of the system stopped operating and were abandoned. Plans for a system upgrade were initiated and by using Bentley's SewerGEMS, Sabesp was able to design and develop a new collection system at a fraction of the initial cost estimate.

### Engineering Challenges

Given the area's rise in population in the 30 years since the system was abandoned, Sabesp could not determine how the complex sewer system would react to the increase demand for water and sewage without using simulations. By creating a hydraulic model using SewerGEMS, Sabesp was able to simulate the demand and enable engineers to simulate the effects of various network and weather conditions.

Sabesp engineers faced additional challenges with the large diameter (800 millimeter) trunk conduits that were broken as a result of redevelopment works performed in Vale do Anhangabaú in the late 1980s; the creation of effluent discharge points that were polluting a major urban stream; and significant rain volume (inflow) from storm sewers and household connections feeding directly into the collection system.

The major impediments to solving these challenges included the large investment in site works it would take to implement new conduits and the difficulty of performing these services in a busy, high-traffic region of the city.

Moreover, the area is affected by poor quality subsoil layers, as well as an immense amount of interference from other subsurface utilities such as fiber optic cables, water pipelines, streams channeled into large galleries, and power transmission lines, among others.

### Scope of the Sewer Project

To address these challenges, Sabesp first developed the hydraulic model for the entire sewer system using SewerGEMS. Several scenarios were created based on known information, such as interconnections of storm sewers and rainfall with a return period of 10 to 100 years, interconnections of new commercial and residential developments, and infiltration through pipe joints predominantly in ceramic pipes.

The entire system was then mapped using both new and old records, field books, and information entered manually in digitized plans. Field visits followed to identify manholes, as manhole covers had been partially obscured by asphalt resurfacing works performed during the years of abandonment. Next, the interconnection projects required to re-establish the system were performed, including unconventional interconnections such as the use of pipes with inverted slopes.

"SewerGEMS was a major decision-making tool," said André R. Miguel, engineer at Sabesp. "As the volume of effluent produced in the entire sewer network increased by the volume of stormwater and system infiltration, it was feared that the antiquated sewer conduits deployed in the early 20th century would not be capable of handling the increase in volume and that overflows might occur in various sections of the network. Using SewerGEMS, Sabesp prepared simulations for various what-if scenarios to prove that the sewer system could meet demands even under extreme conditions."

Additional simulations helped identify the best way to connect the abandoned sewer conduits to the existing system taking into account their elevation differences. The model played a crucial role in justifying the deployment of an inverted trap on a 1,200-millimeter main, which enabled the effective interconnection of all conduits upstream to the existing area. Ultimately, a review was

*“The reliability demonstrated by the results acquired through SewerGEMS is evident. We are very satisfied and believe that this tool will really help us understand and anticipate any correction for problems in the complex operation of hydraulic systems.”*

— André R. Miguel,  
engineer, Sabesp

**Find out about Bentley at: [www.bentley.com](http://www.bentley.com)**

**Contact Bentley**  
1-800-BENTLEY (1-800-236-8539)  
Outside the US +1 610-458-5000

**Global Office Listings**  
[www.bentley.com/contact](http://www.bentley.com/contact)

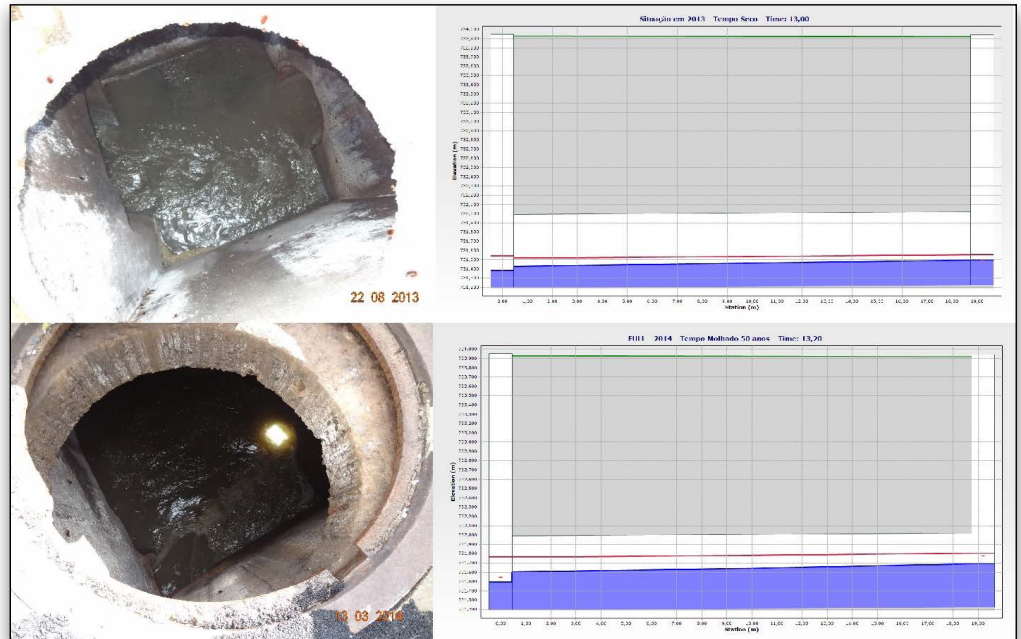
conducted on technical records, relisting sewer conduits and abandoned systems, as well as all other changes identified by inspections.

### Environmental Improvements and Reduced Costs

By treating 1,800 cubic meters per hour of sewage with the wastewater treatment plant of Barueri, this project significantly reduced effluent discharges into rivers and streams, ensuring less pollution. This improvement in water quality will not only decrease waterborne diseases, but it will also reduce the number of times service pipes are clogged, and limit the amount of associated cleaning and clearing services performed in the sewer system's conduits.

The SewerGEMS analysis project enabled a reduction of the initial estimated project costs from BRL 30 million to BRL 5 million, which includes the development of a new system of trunk conduits. Also, the hydraulic model enabled Sabesp to reduce project time considerably, saving months it would have required to evaluate the network and anticipate future events, especially those related to climatic conditions.

Miguel concluded: “The reliability demonstrated by the results acquired through SewerGEMS is evident. We are very satisfied and believe that this tool will really help us understand and anticipate any correction for problems in the complex operation of hydraulic systems.”



The main conduit simulation is shown before the proposed project (upper profile) and after modifying the topology.