添付資料 6.1
現場踏査報告書
（下水収集施設）

(1) ペルイベ市既存ポンプ場

Preparatory Survey for
the Project to Improve the Sanitation and Environment
in Baixada Santista

SPSs Inspections
JICA Study

Peruíbe - Existing places

August 17, 2021

日本工営株式会社
中南米工営株式会社

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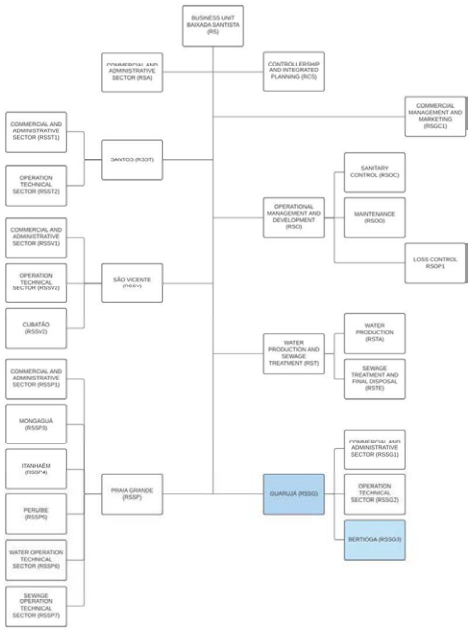
1 INTRODUCTION

This report has the objective to present the information collected in the field about the existing pumping stations in the municipality of Peruibe. The visits were carried out under the supervision of SABESP with the person in charge of the area.

The photos aim to present the conditions in which the visited operational units are, presenting general pictures of the property and the structures on site, from the manhole, railings, control panels and generators.

- Person in charge in SABESP Antonio Ferreira da Silva
- Person visited from consultant team: Beatriz Secanechia, Sofia Tori and Cristina Kirchner
- Number of operational team: 1 patrol team
- Shifts: 2 shifts of 8 hours
- Number of people in the operational team: 3
- Maintenance Team: INA
- Number of people in the maintenance team: INA

The following figure illustrates the organizational chart.



On August 17, 2021, 4 SPS were visited in Peruíbe: SI-8 Belmira Novaes, SP8 São José, 6A PIO XII, Veneza.

Table 1 – List of Locations Visited in Peruíbe

Treatment Area	Location	Start of operation	Flow	No. of pump
P2	SI-8 Belmira Novaes	2010	87 l/s	2 (1 + 1R)
	SP8 São José	2010	120 l/s	2 (1 + 1R)

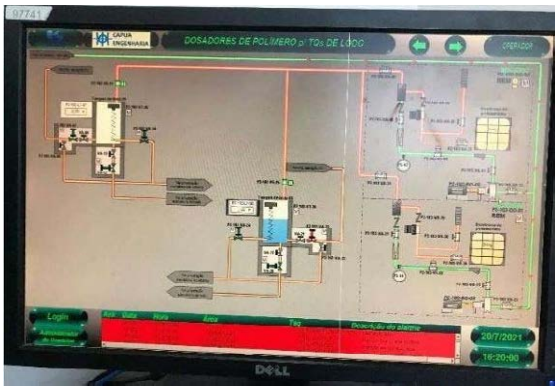
2 PERUÍBE 2 TREATMENT AREA

2.1 Monitoring system

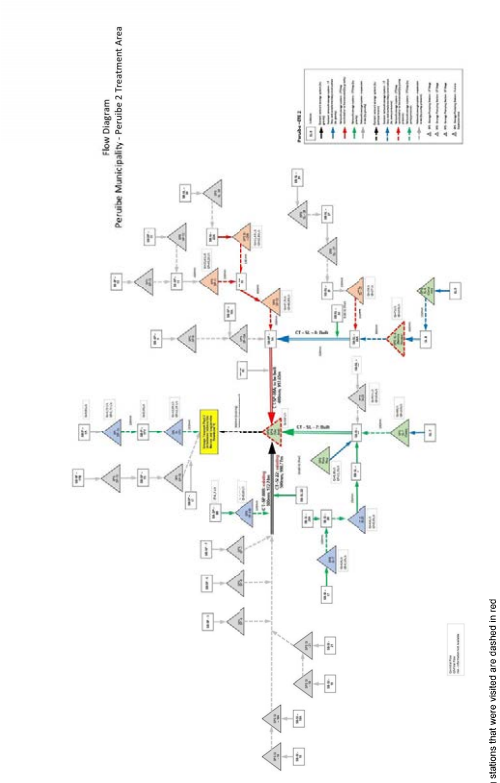
The WWTP has SCADA Software - version iFIX v.5.0 and it is working, but it has no communication with the OCC - Operation Control Center, and its license is installed in the Operational Station itself, located at ETE P in the city of Peruíbe. Version 6.0 has been installed on the OCC servers, but it is not yet functional.

- The use of the software is important and makes a difference, because through it it is possible to monitor the sewage level in the manhole;
- Which pump is operating and which ones are stopped;
- Flow;
- In some SPS it is possible to switch on and off;

A function of the SCADA software system was installed in the pump operation panel of the pumping stations that can start the pumps remotely from the WWTP P2 control room. This mechanism was not installed in all pumping stations and in some cases, there have been panel thefts that prevented this function from working.



2.2 Flow Diagram



*The pumping stations that were visited are dashed in red

2.3 SPS SL-8 Belmira Novaes

2.3.1 Location

Figure 2 - Geographic location of the pumping station

Geographical coordinates: 24°16'41.5"S 46°56'24.2"W

2.3.2 Condition and main characteristics

Parameter		Characteristics	Other comments
Year it started operating		2010	Information taken from the document made available by SABESP "SPS RMBS and Date of Operation"
Flow (Q)		87 L/s	Normal days: pump works 8h/day. Rainy days: 18 - 20h/ day
Pump	Qty	1 + 1	
	Type	self priming	has a level gauge that controls the pump's operation, turning it on and off depending on the level reached
	Head	INA	

Parameter		Characteristics	Other comments
	Power	40[1]	
	Maintenance Frequency	semi-annual maintenance	The day before the visit had a problem in the relief valve, it locked, not taking priming, but maintenance is quick. Almost never needs to be changed.
Cleaning Frequency	Well	1x/ month	debris, without much sand buildup
	Waste basket		
	Grid	—	
Inverter?		Yes	
Generator?		No	
External influences	Theft	Yes	
	Tide	No	
	Rain	Yes	
	Sand accumulation	No much	
Well dimensions	Type	Circular	
	Depth (m)	7	
	Diameter (m)	3	
Has a long standstill ever occurred?		No	
Drainage System		There is underwater drainage on the street in front	

Major problems: sea fog (oxidation); relief valve breaks; inverter burns out; screw burst, all due to overuse.

Sewage comes from the neighborhood and SPS SL9, and goes to SP 8 (final).

Before the neighbors complained about the odor and noise, this one from the self-priming pump, but four years ago it was isolated with wood and solved, as well as the vibration that cracked houses around.

[1] Sewage Plan Report Information

2.3.3 Photographic record

The following are photos of referred pumping station. It was not possible to open the covers to take internal pictures. The pumping station has sewage well with external pumps, located in the same house as the pump operation panel (figures 22 and 23), the inverters are located outside the house, as we can see in figure 25. In figure 19 we see the house of the pumps and panel located behind the well and the grid.

Figure 3 - Overview of the pumping station. In the front part is located the arrival structure with the solid waste screen and the gate control pedestal. Further down in the area of the circular slab is the suction well with concrete covers. And in the background, the building of the pump shelter and the panels.

Figure 4 - Location of the grid, pump well and piping of suction barrel.

Figure 5 – View of the inside of the suction well with loose power wires and oxidized piping.

Figure 6 - Non-drowning horizontal centrifugal sewage pump. Below the engine, there is liquid leakage, seemingly sewage, and the metal base of the pumps are in the process of rusting.

Figure 7 - Inside view the bomb shelter with pressure line barrel and purge system.

Figure 8 - Pump panel

Figure 9 - Inverter

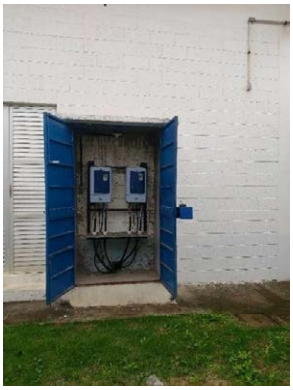
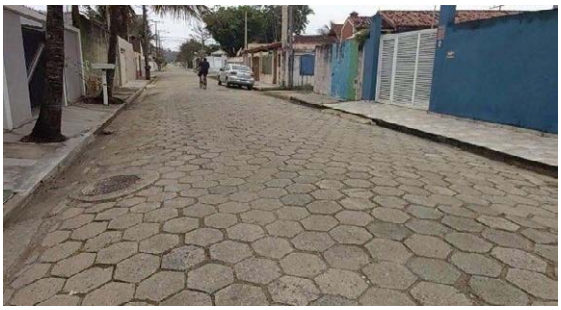


Figure 10 - The paving of the streets adjacent to the pumping station are made of hexagonal blocks, gutters and manholes for rainwater collection.

Figure 11 - Neighborhood with hexagonal block pavement



2.4 SPS SP8 São José

2.4.1 Location

Figure 12 - Geographic location of the pumping station

Geographical coordinates: 24°16'21.2"S 46°58'19.8"W

2.4.2 Condition and main characteristics

Parameter		Characteristics	Other comments
Year it started operating		2010	Information taken from the document made available by SABESP "SPS RMBS and Date of Operation"
Pump	Flow (Q)	120 L/s	230 - 240 L/s (rainy days and clandestine connections)
	Qty	1 + 1	
	Type	Submersible	
	Head	19,35[2]	
	Power	100 hp	
	Maintenance Frequency	Every 9 months approx.	

[2] Sewage Plan Report Information

Parameter		Characteristics	Other comments
Cleaning Frequency	Well	1x/ month	
	Waste basket		
	Grid	Yes, but never worked	2 mechanical grids (filsan technology), both never worked (unsuitable model - steel cable snapped all the time - went up crooked and burst).
Inverter		Yes	
Generator		Yes	
External influences	Theft	Yes	according to the operator, now the security fence is working, but they already took wiring from the generator; they broke concrete and took wiring from the contact box; water theft (every month 100 m³ of water was disappearing, so they sealed the register's clock and solved it)
	Tide	Yes	A lot, but not as much as rain
	Rain	Yes	A lot
	Sand accumulation	Yes	Rotor capacity decreases due to sand
Well dimensions	Type	Retangular	
	Depth (m)	9,5	
	Width (m)	6	
Has a long standstill ever occurred		No	
Drainage System		No drainage system; dirt road; when it rains, everything floods and it's impossible to enter the SPS	

Well cover has fallen, as well as the entrance channel cover, it will be necessary to stop the station to remove.

It is the only SPS that has a feed pipe and an external suction cup that does backup pumping, making it possible to stop the station, but without having to stop the sewage intake, which will be overflowed by this feed pipe.

There was subsidence of all the soil around the well structures (these did not suffer from subsidence due to Jet-Grouting);

Major problems: flood (inspection chambers stay under water on rainy days → a lot of influence from the rain) , vandalism, thief, sand accumulation.

Sewage comes from the neighborhood and from SPSs Belmira, SL-7 and Fundação Casa, and takes the sewage to WWTP P2.

2.4.3 Photographic record

The following are photos of the referred pumping station. It was not possible to open all the covers to take internal pictures. The pumping station has the suction well with submersible pump, the mechanized grids, generator shelter (could not be accessed for safety reasons) and panel hall.

Figure 13 - Overview of the pumping station. In the background is the mechanical railing and further ahead is the suction well slab with vent pipe and concrete covers.

Figure 14 - Overview of the pumping station. In the background: generator house and in the front the top view of the suction well slab with the air inlet and outlet system and concrete covers. There are gaps between the covers, as one of the covers fell into the well.

Figure 15 - The pumping station has a mechanized system for grating the solid waste, with two inlet channels with gates.

Figure 16 - View of the interior of pump well.

Figure 17 - External view of the upper slab of the suction well.

Figure 18 - Panel and generator house

Figure 19 - Pump panel

Figure 20 - The adjacent streets are unpaved and have no drainage system. Rainwater accumulates at the corners of theroads.

(2) イタニャエン市既存ポンプ場

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1 INTRODUCTION

This report has the objective to present the information collected in the field about the existing pumping stations in the municipality of Itanhaém. The visits were carried out under the supervision of SABESP with the person in charge of the area.

The photos aim to present the conditions in which the visited operational units are, presenting general pictures of the property and the structures on site, from the manhole, railings, control panels and generators.

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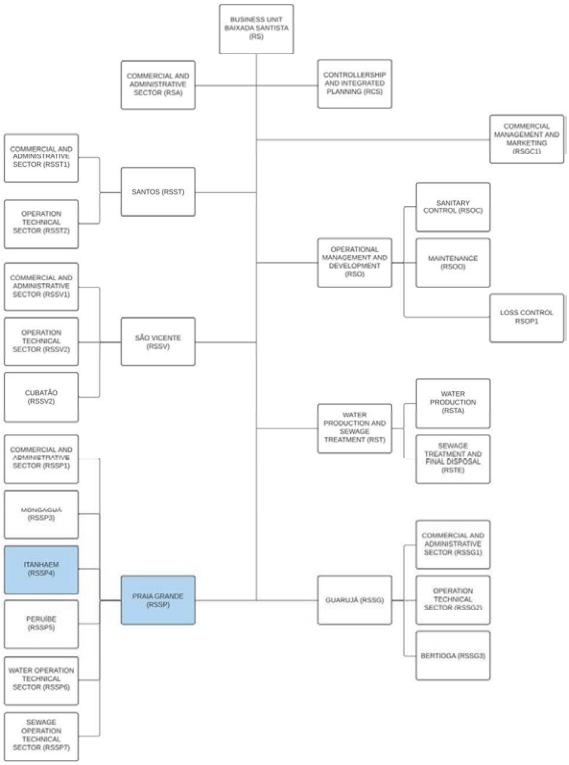
The following figure illustrates the organizational chart



On August 16, 2021, 7 SPS were visited in Itanhaém: Cibratel I, Cibratel II, M.D 2.5, Gaivota 1.1, Anchieta Final, M.E - 5.12, Mosteiro.

Table 1 – List of Locations Visited in Itanhaém

Treatment Area	Location	Start of operation	Flow	No. of pump
Guapiranga	Cibratel 2 (1.1)	2016	25 l/s	1(1+0)
	Cibratel 1 (CTMD)	2010	85,9 l/s[1]	1(1+0)
	M.D 2.5	2010	396 l/s [2]	1(1+1)
	Gaivota 1.1	2011	14,9 l/s [3]	1(1+1)
Anchieta	Anchieta Final	1994	286 l/s [4]	1(1+1)
	M.E - 5.12	(in the works)	-	-
	Mosteiro	1994	15 l/s [5]	1(1+1)

[1] Sewage Plan Report Information
[2] Sewage Plan Report Information
[3] Sewage Plan Report Information
[4] Sewage Plan Report Information
[5] Sewage Plan Report Information

2 GUAPIRANGA TREATMENT AREA

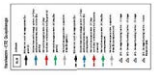
2.1 Monitoring system

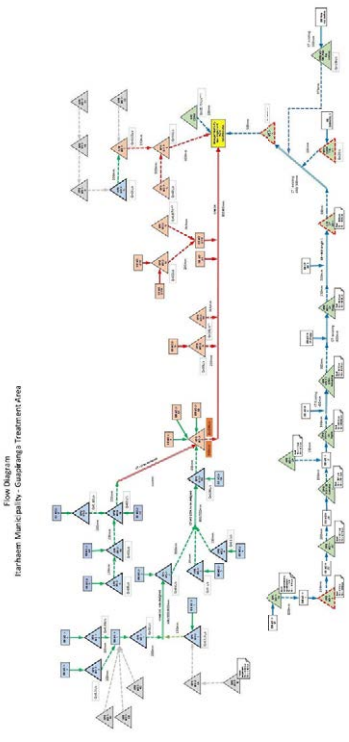
The WWTP has SCADA Software - version iFIX v.5.0 and it is working, but it has no communication with the OCC - Operation Control Center, and its license is installed in the Operational Station itself, located at ETE Guapiranga in the city of Itanhaém. Version 6.0 has been installed on the OCC servers, but it is not yet functional.

- *The use of the software is important and makes a difference, because through it it is possible to monitorthe sewage level in the manhole;*
- *Which pump is operating and which ones are stopped;*
- *Flow;*
- *In some SPS it is possible to switch on and off;*

A function of the SCADA software system was installed in the pump operation panel of the pumping stations that can start the pumps remotely from the WWTP Guapiranga control room. This mechanism was not installed in all pumping stations and in some cases, there have been panel thefts that prevented this function from working.

Figure 1 – Software SCADA





2.2 Flow Diagram

*The pumping stations that were visited are dashed in red

2.3 SPS Cibratel 2 (1.1)

2.3.1 Location

Figure 2 - Geographic location of the pumping station

Geographical coordinates: 24°11'49,9"S 46°48'37,6"W

2.3.2 Condition and main characteristics

Parameter		Characteristics	Other comments
Year it stated operating		2016[8]	
Flow (Q)		25 L/s	
Pump	Qty	1	No reserve pump;
	Type	Submersible	
	Head	INA	
	Power	INA (Information Not Available)	
	Maintenance Frequency	1 to 2 years	Due mainly to normal burnout; The pump is working 8h/day, as it should.
Cleaning Frequency	Well	1x/ month	
	Waste basket	1x/ month	

[8] Information taken from the document made available by SABESP "SPS RMBS and Date of Operation"

Parameter		Characteristics	Other comments
	Grid	No	
Inverter		No	
Generator		No	
External influences	Theft	Yes	Very Often, HMI and inverter, as well as its control, stolen (one inverter operating and the other being acquired)
	Problem with tide	Not too much	
	Problem with rain	Not too much	
Well dimensions	Type	Circular	
	Depth (m)	7,5	
	Diameter (m)	3	
Has a long standstill ever occurred?		No	
Drainage System		Only superficial drainage	

According to the operator, main problems:

- Vandalism;
- Clandestine connection, but less quantity than Cibratel II.

It was not possible to open the well cover for photographic records (because it is a street SPS, the covers are very heavy and resistant to withstand the weight of cars, besides making vandalism difficult).
Sewage comes from the neighborhood and goes to SPS MD 2.5

2.3.3 Photographic Record

The following are pictures of the referred pumping station. It was not possible to open the covers. The pumping station located on the street has a suction well with a submersible pump, and an operating control panel for the pumps. In Figure 7, we can verify a recurring act of vandalism at this pumping station.

Figure 3 - Pumping Station Control Panel located on the sidewalk.

Figure 4 - Pumping Station Input Manhole located on the street.

Figure 5 - Location of the grid, pump well and piping

Figure 6 - Panel at the front and pumping station at the back.

Figure 7 - Neighborhood with microdrainage system consisting of gutters and the pavements are hexagonal blocks. It is possible to identify the flat topography of the region

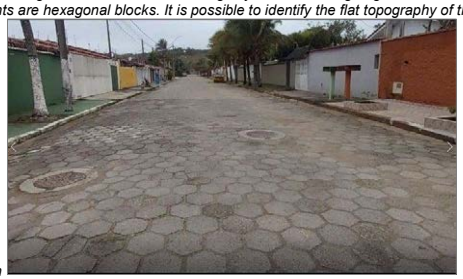


Figure 8 – One of the problems of installing the pumping stations on street instead of fenced lots is the vandalism. This photo illustrates the graffiti behind the panel shelter.

2.4 SPS Cibratel 1 (CTMD)

2.4.1 Location

Figure 9 - Geographic location of the pumping station

Geographical coordinates: 24°12'09.9"S 46°49'14.1"W

2.4.2 Condition and main characteristics

Parameter		Characteristics	Other comments
Year it started operating		2010[7]	
Flow (Q)		88 - 98 L/s	Flow forecasted to increase (will put another pump);
Pump	**Qty**	1	No reserve pump, however, its original configuration presented (1+1R)
	Type	Submersible	
	Head	INA	
	Power	25 cv	More powerful pump is planned
	Maintenance Frequency	6 - 12 months	Mainly due to breakage (bearing) and sand; The pump is working 18h/day, and it should be 8h/day
Cleaning	**Well**	1x/ month	

[7] Information taken from the document made available by SABESP "SPS RMBS and Date of Operation"

Parameter		Characteristics	Other comments
Frequency	**Waste basket**	1x/ 15 days	
	Grid	No	
Inverter		No	
Generator		No	
External influences	**Theft**	Yes	Very Often
	Tide	Yes	A lot of tidal influence (SPS is on the seashore); brings a lot of dirt and sand, needing more cleaning and maintenance (sometimes the tidal surge lasts for several hours)
	Rain	Yes	Quite a bit of influence, but less than tidal
	Sand	Yes	One of the main problems
Well dimensions	**Type**	Circular	
	Depth (m)	8,7	
	Diameter (m)	3,5	
Has a long standstill ever occurred?		Yes	More than one day - a portable generator was needed or else the sewage would leak through the inspection chamber
Drainage System		There is underwater drainage on the street in front (exception);	

According to the operator, the most frequent problems with this pumping station are:

- too much sand;
- too much debris;
- vandalism;
- probably plenty of clandestine connections.
- There is a problem in the network because the collector goes through the beach and any crack in the pipe, a lot of sand gets in.

Sewage comes from the neighborhoods: Gaivota, Jamaica, São Fernando, Tupi, California. From SPS it goes to a collector on Avenida Peribe that flows into MD 2.

2.4.3 Photographic Record

The following are pictures of the referred pumping station. It was not possible to open all the covers. The pumping station has a suction well with a submersible pump, and an operating control panel for the pumps.

Figure 10. Overview of the pumping station with the suction well in front, the panel in the background, and the intake structure in the right corner of the picture.

Figure 11 - Pumping station panel. It is apparently in good condition.

Figure 12 - Sewage arrival structure.

Figure 13 - Location of the grid, pump well and piping

Figure 14 - Internal view of the suction well. On the left: waste holding basket; On the right: pressure barrilette.

Figure 15 - Streets are paved with concrete blocks the adjacent streets are paved with concrete blocks and the microdrainage system counts on manholes and gutters

Figure 16 - Stormwater discharge occurs near the pumping station.

2.5 SPS M.D. 2.5 (final)

2.5.1 Location

Figure 17 - Geographic location of the pumping station

Geographical coordinates: 24°11'31.3"S 46°48'26.7"W

2.5.2 Condition and main characteristics

Parameter		Characteristics	Other comments
Year it started operating		2010[8]	
Flow (Q)		150 L/s	With only one pump working (currently situation): Without rain: 140 - 160 L/s With rain: 230 - 240 L/s. With two pumps working: reaches 300 L/s
Pump	Qty	1 + 1	One reserve pump. Only one working 24h/day.
	Type	Submersible	
	Head (m)	29,65[9]	

[8] Information taken from the document made available by SABESP "SPS RMBS and Date of Operation"
[9] Sewage Plan Report Information.

Parameter		Characteristics	Other comments
Cleaning Frequency	Power	62,3 hp[10]	
	Maintenance Frequency	6 - 12 months	
	Well	every 45 days	Because it is SPS final, it needs to stop the whole system. It occurs at night, from 8pm to 3am normally.
	Waste basket	every 45 days	
	Grid	Yes, but never worked	2 mechanical grids (filsan technology), both never worked (unsuitable model - steel cable snapped all the time - went up crooked and burst).
Inverter?		Yes	There were two inverters, one was stolen. Currently, one works for the 100 hp pump
Generator?		Yes	440V, 175 hp. Currently not working, but quick maintenance expected
External influences	Theft?	Yes	
	Tide?	Yes	
	Rain?	Yes	Worse than tide. When it rains, it drags more sand and works drowned
	Sand accumulation?	Yes	
Well dimensions	Type	Circular	
	Depth (m)	9,30	
	Diameter (m)	6	
Has a long standstill ever occurred?		No	
Drainage System		Only superficial	

From SPS it goes to WWTP Guapiranga.
Major problems:

[10] WWTP report information

- Vandalism;
- Dirt (sand, debris - no functioning grids).

There is probably a lot of clandestine connection due to the higher flow rate than there should be.
There is an infrared well level gauge.

2.5.3 Photographic Record

The following are photos of the referred pumping station. It was not possible to open all the covers to take internal pictures. The pumping station has the suction well with submersible pump, the mechanized grids, generator shelter and panel hall.

Figure 18 - Overview of the pumping station

Figure 19 - Mechanized grids

Figure 20 - Location of the grid, pump well and piping

Figure 21 - Pump well

Figure 22 - Piping

Figure 23 - Generator and panel house

Figure 24 - Pumping station panel

Figure 25 - Generator

2.6 SPS Gaivota 1.1

2.6.1 Location

Figure 26 - Geographic location of the pumping station

Geographical coordinates: 24°14'43.5"S 46°53'17.8"W

2.6.2 Condition and main characteristics

Parameter		Characteristics	Other comments
Year it stared operating		2011[11]	
Flow (Q)		12 - 14 L/s	With rain and tide, flow doubles
Pump	Qty	1 + 1	
	Type	Submersible	
	Head	INA	
	Power	INA (Information Not Available)	
	Maintenance Frequency	INA (Information Not Available)	

[11] Information taken from the document made available by SABESP "SPS RMBS and Date of Operation"

Parameter		Characteristics	Other comments
Cleaning Frequency	Well	1x/ month	
	Waste basket	1x/ month	
	Grid	—	
Inverter?		No	
Generator?		No	
External influences	Theft?	Yes	
	Tide?	Yes	A lot. SPS is very level with the sea, the topography is very flat, and when there is a sea wave, it floods everything
	Rain?	Yes	
	Sand accumulation?	Yes	A lot
Well dimensions	Type	Circular	
	Depth (m)	7,5	
	Diameter (m)	3	
Has a long standstill ever occurred?		Yes	For more than a day due to the panel that broke due to high tide. Paralyzes with power outages, a broken pump, and when everything floods, mainly due to a sea storm.
Drainage System		Only superficial. Floods a lot	

Comes from SPS Gaivota 1.1A and goes to SPS California.
It had a panel, but the tide came in so strong that it destroyed the sidewalk and the panel.
Today direct connection to the pole is used to supply power as a temporary solution.
Major problems: tide

2.6.3 Photographic Record

Following are pictures of the pumping station figures. It was not possible to open the covers. The pumping station has a suction well with a submersible pump, and a makeshift control panel for the pumps. Figures 30 and 31, show a panel that was improvised for the operation of the pumps due to the original panel being washed away by the tide.

Figure 27 - Overview of the pumping station. The pumping station is located on the beach and is susceptible to flooding from high tide.

Figure 28 - Pumping Station Input Manhole

Figure 29 - Location of the grid, pump well and piping

Figure 30 - Improvised open panel. The original panel installed was carried away by the tidal.

Figure 31 - Improvised closed panel: presents an advanced stage of corrosion and an improper closure with road signaling tape.

Figure 32 – The drainage system features gutters and manholes.

Figure 33 - Drain Water Discharge

3 ANCHIETA TREATMENT AREA

The WWTP has SCADA Software - version iFIX v.5.0 and it is working, but it has no communication with the OCC - Operation Control Center, and its license is installed in the Operational Station itself, located at ETE Anchieta in the city of Itanhaém. Version 6.0 has been installed on the OCC servers, but it is not yet functional.

- *The use of the software is important and makes a difference, because through it it is possible to monitorthe sewage level in the manhole;*
- *Which pump is operating and which ones are stopped;*
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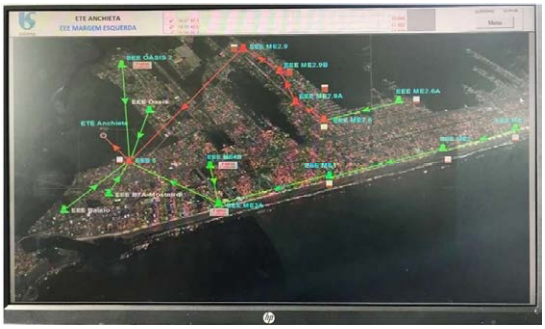
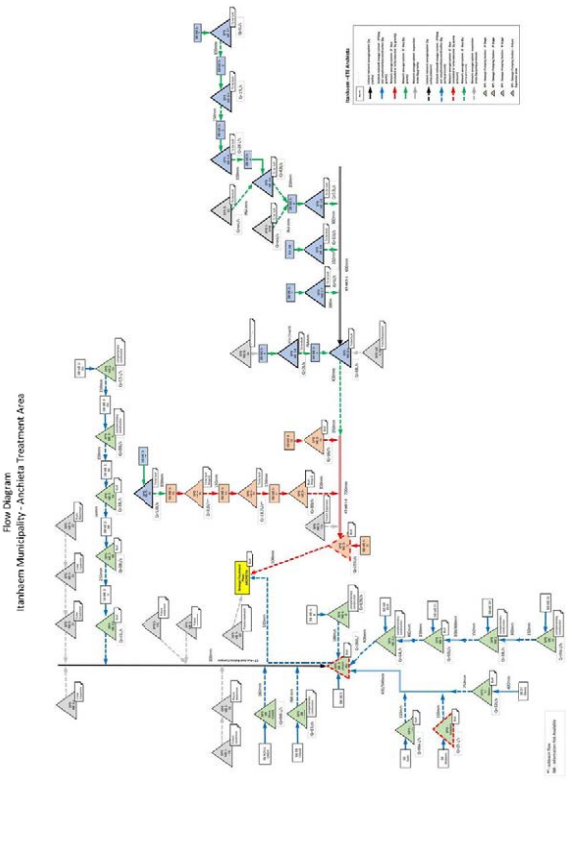
A function of the SCADA software system was installed in the pump operation panel of the pumping stations that can start the pumps remotely from the WWTP Anchieta control room. This mechanism was not installed in all pumping stations and in some cases, there have been panel thefts that prevented this function from working.

Figure 34 - Software SCADA



Fonte: ETE Inspection



3.2 SPS ME 5 - Anchieta Final

3.2.1 Location

Figure 35 - Geographic location of the pumping station

Geographical coordinates: 24°10'28.3"S 46°47'15.4"W

3.2.2 Condition and main characteristics

Parameter		Characteristics	Other comments
Year it started operating		1994 [12]	
Flow (Q)		160L/s (normal)	320 L/s (rain + high tide)
Pump	Qty	1+1	At night it works with one pump, during the day it works with two pumps on. One of the pumps runs non-stop.
	Type	Submersible	
	Head (m)	16,09[13]	
	Power	45 hp[14]	

[12] Information taken from the document made available by SABESP "SPS RMBS and Date of Operation"
[13] WTTP Report Information
[14] WTTP Report Information

Parameter		Characteristics	Other comments
Cleaning Frequency	Maintenance Frequency	Every 3 months approx.	Due to continuous use at high flow rates, the pump burns out.
	Well	Every 2 months	
	Waste basket		
	Grid	——-	1 mechanical grid (filsan technology), but never worked (unsuitable model - steel cable snapped all the time - went up crooked and burst).
Inverter?		No	
Generator?		No	
External influences	Theft?	Yes	
	Tide?	Yes, a lot	According to the operator, one of the most tidally influenced
	Rain?	Yes, a lot	
	Sand accumulation?	Yes	
Well dimensions	Type	Circular	
	Depth (m)	8,5	
	Diameter (m)	5,5	
Has a long standstill ever occurred?		No	Power oscillation problem (voltage peaks). SPS needs to shut down, but not for long
Drainage System		Only superficial	

Major problems:

- Lateral leakage, probably a hole in the piping.
- Vandalism, tide (mangrove region); street: high tide: floods everything.
- A strong odor of sewage was noticed
- Probable clandestine connections.
- In events where heavy rainfall and high tide result in flooding of the pumping station area, and it entails of leakage of sewage and mixtures rains and sewage.

Sewage comes from the entire left margin of Itanhaém, arriving from the collector. This is a final SPS, taking sewage to the ETE Anchieta.

It has electrode level indicator.

3.2.3 Photographic record

The following are photos of the referred pumping station. It was not possible to open all the covers to take internal pictures. The pumping station has the suction well with submersible pump, the mechanized grids, generator shelter (could not be accessed for safety reasons) and panel hall. On the day of the station visit, vandalism occurred, as shown in figure 41, for the theft of drinking water.

Figure 36 - Overview of the pumping station. View of the suction well at the bottom of the photo, and the mechanized railing and generator shelter. On the left of the photo is the panel and control

Figure 37 - Mechanized grids

Figure 38 – Location of pump well and column swivel arm (for pump removal and maintenance)

Figure 39 - Open panel

Figure 40 - Neighborhood with surface microdrenagem with gutters. There is an accumulation of sand in the waters brought by the rains.

Figure 41 - Vandalism on the station gate.

3.3 SPS ME - 5.12 - Laranjeiras (ongoing)

3.3.1 Location

Figure 42 - Geographic location of the pumping station

Geographical coordinates: 24°10'19.2"S 46°46'51.4"W

This SPS has not been delivered yet, so the information presented is for when it will be working in the future

3.3.2 Condition and main characteristics

Parameter		Characteristics	Other Comments
Year it started operating		Ongoing implementation	
Flow (Q)		155 L/s	
Pump	Type	Submersible	
	Head (m)	14	
	Power	INA	
Generator?		A generator is planned	
Ground	Was it necessary to lower the water table?	Yes (mangrove area)	
	Soil	Sandy soil	

Parameter		Characteristics	Other Comments
Well dimensions	Solution for soil	Jet-Grouting	
	Soil destination	Landfill	
	Type	Circular	
	Depth (m)	8,5	
	Diameter (m)	5	
Drainage System		No drainage system, floods everything	
Sewage will come from		All of neighborhood Laranjeiras (most populated area in Itanhaém)	
Sewage will goes to		WWTP Anchieta	
Was it difficult to acquire the land?		Yes	

3.3.3 Photographic record

The referred station is still under construction. In the future it will have a suction well with submersible pumps and a house for the operations panel. No information has been given as to whether there will be a generator.

Figure 43 - Overview of the future pumping station

Figure 44 - Pump well under construction. The pressure pipe has been installed, as well as the gate.

Figure 45 - Piping under construction

Figure 46 - Panel house under construction

Figure 47 – The streets adjacent to the pumping station.

3.4 SPS Mosteiro

3.4.1 Location

Figure 48 - Geographic location of the pumping station

Geographical coordinates: 24°10'51.3"S 46°47'30.3"W

3.4.2 Condition and main characteristics

Parameter		Characteristics	Other comments
Year it started operating		1994[15]	
Flow (Q)		12 - 15 L/s	30 L/s (rainy days)
Pump	Qty	1 + 1	works 20h/day
	Type	Submersible	
	Power	INA	
	Maintenance Frequency	3 - 4 months	a lot of sand and debris, burns out the pump
Cleaning Frequency	Well	1x/ month	
	Waste basket		
	Grid	---	
Inverter?		No	

[15] Information taken from the document made available by SABESP "SPS RMBS and Date of Operation"

Generator?		No	
External influences	Theft?	Yes	A lot
	Tide?	Yes	
	Rain?	Yes	worse than tide (direct influence)
	Sand accumulation?	Yes	
Well dimensions	Type	Circular	
	Depth (m)	5	
	Diameter (m)	2	
Has a long standstill ever occurred?		No	
Drainage System		No drainage system	

Major problems:

- Land subsidence
- Rain.
- Suspected illegal connections (drainage)
- Corroded covers, and passing vehicles aggravates the deterioration problem.

Sewage comes from the neighborhood and from the SPS Baixiu, and goes to SPS Anchieta Final.

3.4.3 Photographic record

The following are pictures of the referred pumping station. It was not possible to open the covers. The pumping station has a suction well with a submersible pump, and an operating control panel for the pumps.

Figure 49 - Overview of the pumping station. In the front is the panel shelter and in the back, at the corner, is the suction well

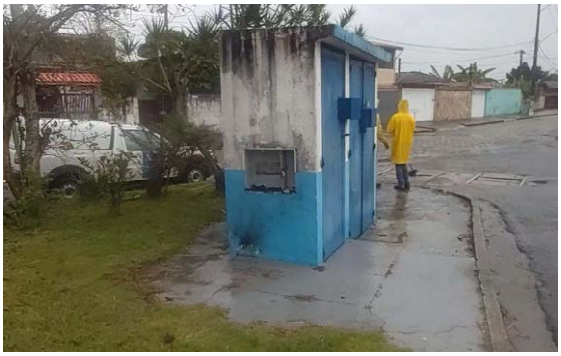


Figure 50 - Pumping Station Input Manhole

Figure 51 - Location of the grid, pump well and piping. On the sides of the well slab, the asphalt has burrs due to inappropriate finishing

Figure 4 - Pumping station panel

Figure 5 - The adjacent streets have hexagonal block sidewalk the microdrainage system on the evaluated section has gutters

(3) ペルイベ市計画ポンプ場用地

Preparatory Survey for
the Project to Improve the Sanitation and Environment
in Baixada Santista

SPSs Inspections
JICA Study

Peruíbe – New projects

September 7, 2021

日本工営株式会社
中南米工営株式会社

Table of Contents

1 INTRODUCTION

This report has the objective to present the information collected in the field about areas where sewage networks are projected for installation in the municipality of Peruíbe. The visits were carried out under the supervision of SABESP with the person in charge of the area.

The photos are intended to show the condition of the areas where the new sewage pumping stations will be built, the new WWTP Guarau.and and a linear work for a construction of pumping line.

2 NEW SEWAGE PUMPING STATIONS IN THE WWTP P2 AREA

2.1 SPS SP – 17A

2.1.1 LOCATION

Figure 1 - Geographic location of the pumping station

Geographical coordinates: 24°15'20.35"S 46°58'51.62"O

2.1.2 PHOTOGRAPH RECORDS

Figure 2 - Overview of the backside of the location where the pumping station will be built

Figure 3 - Overview of the front part of the site where the pumping station will be built

Figure 4 - Neighborhood of the site where the pumping station will be built

2.2 SPS SP – 17A1

2.2.1 LOCATION

Figure 5 - Geographic location of the pumping station

Geographical coordinates: 24°15'23.54"S 46°59'15.78"O

2.2.2 PHOTOGRAPH RECORDS

Figure 6 - Overview of the location where the pumping station will be built

Figure 7 - Overview of the location where the pumping station will be built

Figure 8 - - Neighborhood of the site where the pumping station will be built

Figure 9 - Neighborhood of the site where the pumping station will be built

(4) イタニャエン市計画ポンプ場用地

Preparatory Survey for
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JICA Study

Itanhaém – new projects

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1 INTRODUCTION

This report has the objective to present the information collected in the field about areas where sewage networks are projected for installation in the municipality of Itanhaém. The visits were carried out under the supervision of SABESP with the person in charge of the area.

The photos are intended to show the condition of the areas where the new sewage pumping stations will be built and a linear work for a construction of pumping line.

2 NEW SEWAGE PUMPING STATIONS IN THE WWTP GUAPIRANGA AREA

2.1 SPS MD 2-1

2.1.1 LOCATION

Figure 1 - Geographic location of the pumping station

Geographical coordinates: 24°14'17.55"S 46°53'56.59"O

2.1.2 PHOTGRAPH RECORDS

Figure 2 - Background of the lot where the pumping station will be built

Figure 3 - Front of the lot where the pumping station will be built

2.2 SPS MD 2-2

2.2.1 LOCATION

Figure 4 - Geographic location of the pumping station

Geographical coordinates: 24°14'2.00"S 46°53'28.74"O

2.2.2 PHOTOGRAPH RECORDS

Figure 5 - Overview of the location where the pumping station will be built

Figure 6 - Neighborhood where the pumping station will be built

2.3 SPS MD 2-3

2.3.1 LOCATION

Figure 7 - Geographic location of the pumping station

Geographical coordinates: 24°13'51.33"S 46°53'8.60"O

2.3.2 PHOGRAPH RECORDS

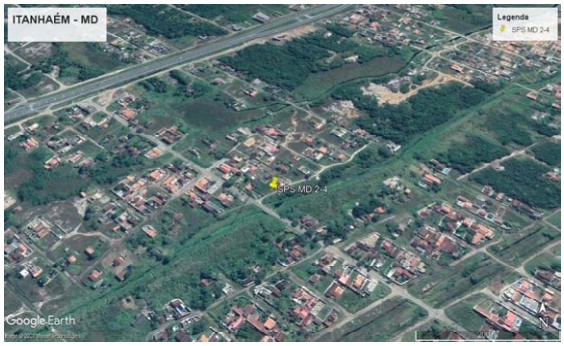
Figure 8 - Overview of the location where the pumping station will be built

Figure 9 - Neighborhood where the pumping station will be built

2.4 SPS MD 2-4

2.4.1 LOCATION

Figure 10 - Geographic location of the pumping station



Geographical coordinates: 24°13'27.63"S 46°52'37.20"O

2.4.2 PHOTOGRAPH RECORDS

Figure 11 - Overview of the location where the pumping station will be built

Figure 12 - Overview of the location where the pumping station will be built

Figure 13 - Neighborhood where the pumping station will be built

Figure 14 - Neighborhood where the pumping station will be built

2.5 SPS MD 2-5A

2.5.1 LOCATION

Figure 15 - Geographic location of the pumping station

Geographical coordinates: 24°13'12.25"S 46°52'5.75"O

2.5.2 PHOTOGRAPH RECORDS

It was not possible to reach the location where the pumping station will be built, because of the inaccessibility due to flooding.

Figure 16 - Difficulty of access due to flooding shown in the picture

2.6 SPS MD 2-6

2.6.1 LOCATION

Figure 17 - Geographic location of the pumping station

Geographical coordinates: 24°12'58.37"S 46°51'44.74"O

2.6.2 PHOTOGRAPH RECORDS

Figure 18 - Overview of the location where the pumping station will be built

Figure 19 - Overview of the location where the pumping station will be built

Figure 20 - Neighborhood where the pumping station will be built

Figure 21 - Neighborhood where the pumping station will be built

2.7 SPS MD 2-6A

2.7.1 LOCATION

Figure 22 - Geographic location of the pumping station

Geographical coordinates: 24°12'40.82"S 46°51'18.23"O

2.7.2 PHOTOGRAPH RECORDS

Figure 23 - Overview of the location where the pumping station will be built

Figure 24 - Overview of the location where the pumping station will be built

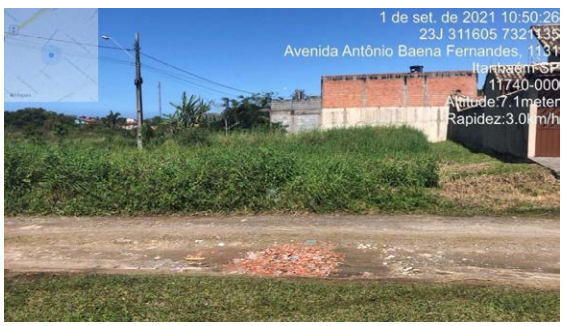


Figure 25 - Neighborhood where the pumping station will be built

Figure 26 - Neighborhood where the pumping station will be built

Figure 20 - Neighborhood where the pumping station will be built

Figure 21 - Neighborhood where the pumping station will be built

2.7 SPS MD 2-6A

2.7.1 LOCATION

Figure 22 - Geographic location of the pumping station

Geographical coordinates: 24°12'40.82"S 46°51'18.23"O

2.7.2 PHOTOGRAPH RECORDS

Figure 23 - Overview of the location where the pumping station will be built

Figure 24 - Overview of the location where the pumping station will be built

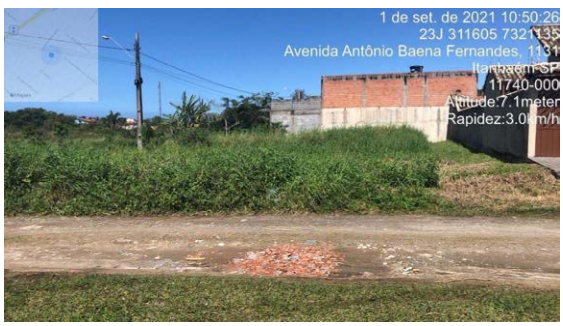


Figure 25 - Neighborhood where the pumping station will be built

Figure 26 - Neighborhood where the pumping station will be built

2.8 SPS MD 2-6B

2.8.1 LOCATION

Figure 27 - Geographic location of the pumping station

Geographical coordinates: 24°12'30.70"S 46°51'3.16"O

2.8.2 PHOTOGRAPH RECORDS

Figure 28 - Overview of the location where the pumping station will be built

Figure 29 - Overview of the location where the pumping station will be built

Figure 30 - Neighborhood where the pumping station will be built

Figure 31 - Neighborhood where the pumping station will be built

2.9 SPS MD 2-7

2.9.1 LOCATION

Figure 32 - Geographic location of the pumping station

Geographical coordinates: 24°12'29.34"S 46°51'21.57"O

2.9.2 PHOTOGRAPH RECORDS

Figure 33 - Overview of the location where the pumping station will be built

Figure 34 - Overview of the location where the pumping station will be built

Figure 35 - Neighborhood where the pumping station will be built

Figure 36 - Neighborhood where the pumping station will be built

2.10 SPS MD 3-1

2.10.1 LOCATION

Figure 37 - Geographic location of the pumping station

Geographical coordinates: 24°13'54.66"S 46°54'9.75"O

2.10.2 PHOTOGRAPH RECORDS

Figure 38 - Overview of the location where the pumping station will be built

Figure 39 - Overview of the location where the pumping station will be built

Figure 40 - Neighborhood where the pumping station will be built

Figure 41 - Neighborhood where the pumping station will be built

2.11 SPS MD 3-5

2.11.1 LOCATION

Figure 42 - Geographic location of the pumping station

Geographical coordinates: 24°10'35.64"S 24°10'35.64"S

2.11.2 PHOTOGRAPH RECORDS

Figure 43 - Overview of the location where the pumping station will be built

Figure 44 - Overview of the location where the pumping station will be built

Figure 45 - Neighborhood where the pumping station will be built

Figure 46 - Neighborhood where the pumping station will be built

3 LINEAR WORK OF THE PUMPING LINE

3.1 CROSSING PUMPING LINE NEXT SPS MD 3-1

3.1.1 LOCATION

Figure 47 - Geographic location of the pumping station

Geographical coordinates: 24°14'4.00"S 46°54'8.00"O

3.1.2 PHOTOGRAPH RECORDS

Figure 48 - Overview of the A side of the crossing where the pumping line will be built

Figure 49 - Overview of the A side of the crossing where the pumping line will be built

Figure 50 - Overview of the B side of the crossing where the pumping line will be built

Figure 51 - Overview of the B side of the crossing where the pumping line will be built

4 NEW SEWAGE PUMPING STATIONS IN THE WWTP ANCHIETA AREA

4.1 SPS ME 5-1

4.1.1 LOCATION

Figure 52 - Geographic location of the pumping station

Geographical coordinates: 24° 8'14.69"S 46°43'8.23"O

4.1.2 PHOTOGRAPH RECORDS

Figure 53 -Overview of the location where the pumping station will be built

Figure 54 - Overview of the location where the pumping station will be built

Figure 55 - Neighborhood where the pumping station will be built

Figure 56 - Neighborhood where the pumping station will be built

4.2 SPS ME 5-2

4.2.1 LOCATION

Figure 57 -Geographic location of the pumping station

Geographical coordinates: 24° 8'13.91"S 46°43'22.78"O

4.2.2 PHOTOGRAPH RECORDS

Figure 58 - -Overview of the location where the pumping station will be built

Figure 59 - -Overview of the location where the pumping station will be built

Figure 60 - Neighborhood where the pumping station will be built

Figure 61 - Neighborhood where the pumping station will be built

4.3 SPS ME 5-3

4.3.1 LOCATION

Figure 62 - Geographic location of the pumping station

Geographical coordinates: 24° 8'27.70"S 46°43'33.73"O

4.3.2 PHOTOGRAGH RECORDS

Figure 63 - Overview of the location where the pumping station will be buil

Figure 64 - Overview of the location where the pumping station will be buil

Figure 65 - Neighborhood where the pumping station will be built

Figure 66 - Neighborhood where the pumping station will be built

4.4 SPS ME 5-5

4.4.1 LOCATION

Figure 67 - Geographic location of the pumping station

Geographical coordinates: 24° 8'49.07"S 46°43'57.79"O

4.4.2 PHOTOGRAPH RECORDS

Figure 68 - Overview of the location where the pumping station will be built

Figure 69 - Overview of the location where the pumping station will be built

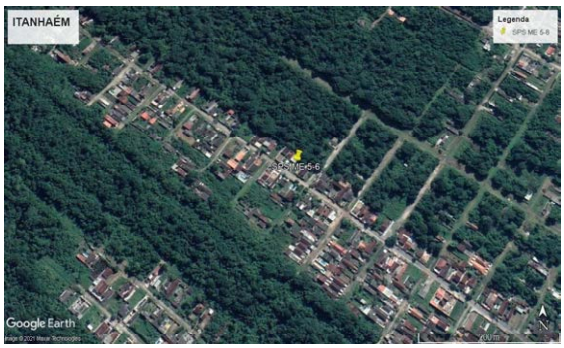
Figure 70 - Neighborhood where the pumping station will be built

Figure 71 - Neighborhood where the pumping station will be built

4.5 SPS ME 5-6

4.5.1 LOCATION

Figure 72 - Geographic location of the pumping station



Geographical coordinates: 24° 8'47.73"S 46°44'24.23"O

4.5.2 PHOTOGRAPH RECORDS

Figure 73 - Overview of the location where the pumping station will be buil

Figure 74 - Overview of the location where the pumping station will be buil

Figure 75 - Neighborhood where the pumping station will be built

Figure 76 - - Neighborhood where the pumping station will be built

4.6 SPS ME 5-8

4.6.1 LOCATION

Figure 77 - Geographic location of the pumping station

Geographical coordinates: 24° 9'18.74"S 46°44'32.66"O

4.6.2 PHOTOGRAPH RECODS

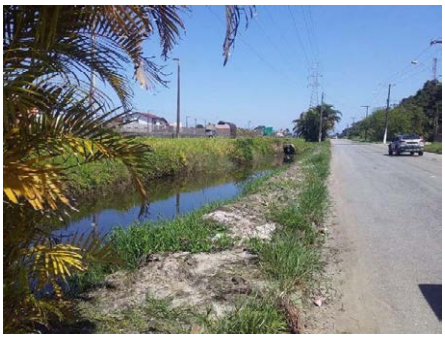
Figure 78 - Overview of the location where the pumping station will be buil

Figure 79 - Overview of the location where the pumping station will be buil

Figure 80 - Overview of the location where the pumping station will be buil

Figure 81 - Neighborhood where the pumping station will be built

Figure 82 - Neighborhood where the pumping station will be built



4.7 SPS ME 5-16

4.7.1 LOCATION

Figure 83 - Geographic location of the pumping station

Geographical coordinates: 24° 8'57.78"S 46°47'18.73"O

4.7.2 PHOTOGRAPH RECORDS

Figure 84 - Overview of the location where the pumping station will be buil

Figure 85 - - Overview of the location where the pumping station will be buil

Figure 86 - Neighborhood where the pumping station will be built

Figure 87 - Neighborhood where the pumping station will be built

(5) ベルチオガ市計画ポンプ場用地

Preparatory Survey for
the Project to Improve the Sanitation and Environment
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JICA Study

Bertioga – New projects

August 26, 2021

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中南米工営株式会社

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1 INTRODUCTION

This report has the objective to present the information collected in the field about areas where sewage networks are projected for installation in the municipality of Bertioga. The visits were carried out under the supervision of SABESP with the person in charge of the area.

The photos are intended to show the condition of the areas where the sewage vacuum stations will be installed and….

2 VACUUM STATIONS

2.1 EV1

2.1.1 LOCATION

Figure 1 - Geographic location of the pumping station

Geographical coordinates: 23°45'42"S 45°55'08"W

2.1.2 PHOTOGRAPH RECORDS

Figure 2 - Overview of the location where the work will take place

Figure 3 - Neighborhood of the location where the work will take place

Figure 4 - Neighborhood with surface drainage

2.2 EV2

2.2.1 LOCATION

Figure 5 - Geographic location of the pumping station

Geographical coordinates: 23°45'25,47"S 45°54'4,89"O

2.2.2 PHOTOGRAPH RECORDS

Figure 6 - Overview of the road leading to the site where the EV2 will be installed

Figure 7 - Area where EV2 will be installed

Figure 8 - Neighborhood on the way to the EV2 installation location

Figure 9 - Neighborhood on the way to the EV2 installation location

3 LINEAR WORK

3.1 CROSSING COSTA DO SOL 1

3.1.1 LOCATION

Figure 10 - Geographic location of the pumping station

Geographical coordinates: 23°45'29.88"S 45°54'23.64"O

3.1.2 PHOTOGRAPH RECORDS

Figure 11 - Crossing where the pipeline will pass

Figure 12 - Crossing where the pipeline will pass

Figure 13 - Crossing where the pipeline will pass

Figure 14 - Area where the petrobrás gas pipeline passes

3.2 CROSSING COSTA DO SOL 2

3.2.1 LOCATION

3.2.2 PHOTOGRAPH RECORDS

Figure 15 - Crossing where the pipeline will pass

Figure 16 - Crossing where the pipeline will pass

Figure 17 - Crossing where the pipeline will pass

Figure 18 - Area where the petrobrás gas pipeline passes

添付資料 6.2
下水量の見直し計算

汚水量の見直し計算集計雨氷：SABESPの既往計画との比較

冬季の汚水量

Municipality	ETE	SABESP / JICA Study Team	Ano	Economias Totais	% de esgotamento	Economias Totais Atendidas	Contr. (l/eco.dia)	Contr. (l/eco.dia)	Contribuição Parcial			Indl(l/s)	Extensão de Rede (km)	Infiltr (l/s)	Contribuição Total Doméstico+Industrial+Infiltração (l/s)		
									Qmédia	Qmáx.dia	Qmáx.hora				Qmédia	Qmáx.dia	Qmáx.hora
市	下水処理場	原計画/調査団提案	年	世帯数	下水道接続率(%)	下水道接続世帯数	汚水量原単位(L/世帯/日)	汚水量原単位(L/世帯/日)	汚水量（地下水含まず）(L/秒)			工業からの排水(L/秒)	管路延長(km)	地下水浸透量(L/秒)	工業からの排水、地下水浸透量を含めた汚水量(L/秒)		
									日平均(Qmédia)	日最大(Qmédia)	時間最大(Qmédia)				日平均(Qmédia)	日最大(Qmédia)	時間最大(Qmédia)
ペルイペ	ETE P1	既往計画	2039	35,926	100	35,926	258	206	85.72	102.86	154.30	0.00	326.67	163.34	249.06	266.20	317.63
		調査団提案-100%接続	2039	35,926	100	35,926	258	206	85.66	102.79	154.18	0.00	326.67	163.34	248.99	266.12	317.52
		調査団提案-95%接続	2039	35,926	95	34,130	258	206	81.37	97.65	146.47	0.00	326.67	163.34	244.71	260.98	309.81
	ETE P2	既往計画	2039	16,906	100	16,906	258	206	40.34	48.41	72.61	0.00	241.46	120.73	161.07	169.14	193.34
		調査団提案-100%接続	2039	16,906	100	16,906	258	206	40.31	48.37	72.55	0.00	241.46	120.73	161.04	169.10	193.28
		調査団提案-95%接続	2039	16,906	95	16,061	258	206	38.29	45.95	68.93	0.00	241.46	120.73	159.02	166.68	189.66
イタニャエン	Guapiranga	既往計画	2039	45,941	100	45,941	224	179	95.22	114.26	171.39	28.33	353.83	176.91	300.46	319.50	376.63
		調査団提案-100%接続	2039	45,941	100	45,941	224	179	95.22	114.26	171.39	0.00	353.83	176.91	300.46	319.50	376.63
		調査団提案-95%接続	2039	45,941	95	43,644	224	179	90.42	108.50	162.76	0.00	353.83	176.91	267.33	285.41	339.67
	Anchieta	既往計画	2039	49,770	100	49,770	224	179	103.15	123.78	185.67	0.00	258.84	129.42	232.57	253.20	315.09
		調査団提案-100%接続	2039	49,770	100	49,770	224	179	103.15	123.78	185.67	0.00	258.84	129.42	232.57	253.20	315.09
		調査団提案-95%接続	2039	49,770	95	47,282	224	179	97.96	117.55	176.32	0.00	258.84	129.42	227.38	246.97	305.74
モンガグア	Bichoro	既往計画	2039	15,505	100	15,505	194	155	27.76	33.32	49.97	0.00	35.50	28.40	56.16	61.72	78.37
		調査団提案-100%接続	2039	15,505	100	15,505	200	160	28.71	34.46	51.68	0.00	35.50	17.75	46.46	52.21	69.43
		調査団提案-95%接続	2039	15,505	95	15,505	200	160	28.71	34.46	51.68	0.00	35.50	17.75	46.46	52.21	69.43
	Barigui	既往計画	2039	41,922	100	41,922	194	155	75.06	90.08	135.11	0.00	240.00	120.00	195.06	210.08	255.11
		調査団提案-100%接続	2039	41,922	100	41,922	200	160	77.63	93.16	139.74	0.00	240.00	120.00	197.63	213.16	259.74
		調査団提案-95%接続	2039	41,922	95	41,922	200	160	77.63	93.16	139.74	0.00	240.00	120.00	197.63	213.16	259.74
クバトン	Casquero	既往計画	2039	32,084	100	32,084	453	362	134.25	161.10	241.65	0.00	36.59	18.29	152.54	179.39	259.94
		調査団提案-100%接続	2039	32,084	100	32,084	467	374	138.73	166.48	249.72	0.00	36.59	18.29	157.02	184.77	268.01
		調査団提案-95%接続	2039	32,084	95	30,480	467	374	131.80	158.16	237.23	0.00	36.59	18.29	150.09	176.45	255.52
グアルジャ	Carvalho	既往計画	2039	54,892	100	54,892	394	315	199.84	239.81	359.71	0.00	115.00	57.50	257.34	297.31	417.21
		調査団提案-100%接続	2039	54,892	100	54,892	317	254	161.12	193.34	290.01	0.00	115.00	57.50	218.62	250.84	347.51
		調査団提案-95%接続	2039	54,892	95	52,147	317	254	153.06	183.67	275.51	0.00	115.00	57.50	210.56	241.17	333.01
ベルチオガ	Centro	既往計画	2039	27,716	100	27,716	309	247	79.39	95.26	142.90	0.00	80.27	40.13	119.52	135.39	183.03
		調査団提案-100%接続	2039	27,716	100	27,716	309	247	79.30	95.16	142.74	0.00	80.27	40.13	119.43	135.29	182.87
		調査団提案-95%接続	2039	27,716	95	26,330	309	247	75.33	90.40	135.60	0.00	80.27	40.13	115.46	130.53	175.73
	Vista Linda	既往計画	2039	15,910	100	15,910	309	247	45.57	54.68	82.02	11.00	134.66	67.33	151.59	166.23	210.18
		調査団提案-100%接続	2039	15,910	100	15,910	309	247	45.57	54.68	82.02	0.00	134.66	67.33	140.59	155.23	199.18
		調査団提案-95%接続	2039	15,910	95	15,115	309	247	43.24	51.89	77.84	0.00	134.66	67.33	138.26	152.44	195.00

夏季の汚水量予測

市	下水処理場	原計画/調査団提案	年	世帯数	下水道接続率(%)	下水道接続世帯数	汚水量原単位(L/世帯/日)	汚水量原単位(L/世帯/日)	汚水量（地下水含まず）(L/秒)			工業からの排水(L/秒)	管路延長(km)	地下水浸透量(L/秒)	工業からの排水、地下水浸透量を含めた汚水量(L/秒)		
									日平均(Qmédia)	日最大(Qmédia)	時間最大(Qmédia)				日平均(Qmédia)	日最大(Qmédia)	時間最大(Qmédia)
ペルイペ	ETE P1	既往計画	2039	35,926	100	35,926	394	315	131.16	157.39	236.08	0.00	326.67	163.33	294.49	320.72	399.42
		調査団提案-100%接続	2039	35,926	100	35,926	465	372	154.68	185.62	278.43	0.00	326.67	163.34	318.02	348.95	441.76
		調査団提案-95%接続	2039	35,926	95	34,130	465	372	146.95	176.34	264.51	0.00	326.67	163.34	310.28	339.67	427.84
	ETE P2	既往計画	2039	16,906	100	16,906	394	315	61.72	74.07	111.10	0.00	241.46	120.73	182.45	194.79	231.83
		調査団提案-100%接続	2039	16,906	100	16,906	465	372	72.79	87.35	131.02	0.00	241.46	120.73	193.52	208.08	251.75
		調査団提案-95%接続	2039	16,906	95	16,061	465	372	69.15	82.98	124.47	0.00	241.46	120.73	189.88	203.71	245.20
イタニャエン	Guapiranga	既往計画	2039	45,941	100	45,941	376	301	160.03	192.04	288.06	28.33	353.83	176.91	365.28	397.28	493.30
		調査団提案-100%接続	2039	45,941	100	45,941	434	347	184.61	221.54	332.31	0.00	353.83	176.92	361.53	398.45	509.22
		調査団提案-95%接続	2039	45,941	95	43,644	434	347	175.38	210.46	315.69	0.00	353.83	176.92	352.30	387.38	492.61
	Anchieta	既往計画	2039	49,770	100	49,770	376	301	173.37	208.04	312.07	0.00	258.84	129.42	302.79	337.46	441.49
		調査団提案-100%接続	2039	49,770	100	49,770	434	347	200.00	240.00	360.00	0.00	258.84	129.42	329.42	369.42	489.42
		調査団提案-95%接続	2039	49,770	95	47,282	434	347	190.00	228.00	342.00	0.00	258.84	129.42	319.42	357.42	471.42
モンガグア	Bichoro	既往計画	2039	15,505	100	15,505	354	283	50.88	61.05	91.58	0.00	35.50	17.75	68.63	78.80	109.33
		調査団提案-100%接続	2039	15,505	100	15,505	410	328	58.86	70.63	105.95	0.00	35.50	17.75	76.61	88.38	123.70
		調査団提案-95%接続	2039	15,505	95	15,505	410	328	58.86	70.63	105.95	0.00	35.50	17.75	76.61	88.38	123.70
	Barigui	既往計画	2039	41,922	100	41,922	354	283	137.55	165.06	247.59	0.00	240.00	120.00	257.55	285.06	367.59
		調査団提案-100%接続	2039	41,922	100	41,922	410	328	159.15	190.98	286.47	0.00	240.00	120.00	279.15	310.98	406.47
		調査団提案-95%接続	2039	41,922	95	39,826	410	328	151.19	181.43	272.14	0.00	240.00	120.00	271.19	301.43	392.14
クバトン	Casquero	既往計画	2039	32,084	100	32,084	531	425	157.74	189.29	283.93	0.00	36.59	18.29	176.03	207.58	302.22
		調査団提案-100%接続	2039	32,084	100	32,084	562	450	166.96	200.35	300.52	0.00	36.59	18.29	185.25	218.64	318.81
		調査団提案-95%接続	2039	32,084	95	30,480	562	450	158.61	190.33	285.49	0.00	36.59	18.29	176.90	208.62	303.78
グアルジャ	Carvalho	既往計画	2039	54,892	100	54,892	445	356	226.44	271.73	407.60	0.00	115.58	57.79	284.23	329.52	465.39
		調査団提案-100%接続	2039	54,892	100	54,892	566	453	287.67	345.21	517.81	0.00	115.00	57.50	345.17	402.71	575.31
		調査団提案-95%接続	2039	54,892	95	52,147	566	453	273.29	327.95	491.92	0.00	115.00	57.50	330.79	385.45	549.42
ベルチオガ	Centro	既往計画	2039	27,716	100	27,716	513	410	131.62	157.95	236.92	0.00	80.27	40.13	171.76	198.08	277.05
		調査団提案-100%接続	2039	27,716	100	27,716	558	446	143.20	171.84	257.76	0.00	80.27	40.13	183.33	211.97	297.89
		調査団提案-95%接続	2039	27,716	95	26,330	558	446	136.04	163.25	244.87	0.00	80.27	40.13	176.17	203.38	285.00
	Vista Linda	既往計画	2039	15,910	100	15,910	513	410	75.55	90.66	135.99	11.00	134.66	67.33	181.57	202.21	264.15
		調査団提案-100%接続	2039	15,910	100	15,910	558	446	82.20	98.64	147.96	0.00	134.66	67.33	177.22	199.19	265.12
		調査団提案-95%接続	2039	15,910	95	15,115	558	446	78.09	93.71	140.56	0.00	134.66	67.33	173.11	194.26	257.72

日本工営株式会社
中南米工営株式会社

ペルイベ市：P1下水処理場

冬季の汚水量予測

年	世帯数	下水道接続率(%)	下水道接続世帯数	消費水量原単位(L/世帯/日)	汚水量原単位(L/世帯/日)	汚水量(地下水含まず)(L/秒) 日平均(Qmédia)	汚水量(地下水含まず)(L/秒) 日最大(Qmédia)	汚水量(地下水含まず)(L/秒) 時間最大(Qmédia)	工業からの排水(L/秒)	管路延長(km)	地下水浸透量(L/秒)	工業からの排水、地下水浸透量を含めた汚水量(L/秒) 日平均(Qmédia)	工業からの排水、地下水浸透量を含めた汚水量(L/秒) 日最大(Qmédia)	工業からの排水、地下水浸透量を含めた汚水量(L/秒) 時間最大(Qmédia)
2018	29,926	100	29,926	258	206	71.35	85.62	128.43	0.00	326.67	163.34	234.69	248.96	291.77
2019	30,284	100	30,284	258	206	72.20	86.65	129.97	0.00	326.67	163.34	235.54	249.98	293.30
2020	30,645	100	30,645	258	206	73.07	87.68	131.52	0.00	326.67	163.34	236.40	251.01	294.85
2021	30,953	100	30,953	258	206	73.80	88.56	132.84	0.00	326.67	163.34	237.13	251.89	296.17
2022	31,264	100	31,264	258	206	74.54	89.45	134.17	0.00	326.67	163.34	237.88	252.78	297.51
2023	31,578	100	31,578	258	206	75.29	90.35	135.52	0.00	326.67	163.34	238.63	253.68	298.86
2024	31,895	100	31,895	258	206	76.05	91.26	136.88	0.00	326.67	163.34	239.38	254.59	300.22
2025	32,217	100	32,217	258	206	76.81	92.18	138.26	0.00	326.67	163.34	240.15	255.51	301.60
2026	32,510	100	32,510	258	206	77.51	93.01	139.52	0.00	326.67	163.34	240.85	256.35	302.86
2027	32,806	100	32,806	258	206	78.22	93.86	140.79	0.00	326.67	163.34	241.55	257.20	304.13
2028	33,104	100	33,104	258	206	78.93	94.71	142.07	0.00	326.67	163.34	242.26	258.05	305.41
2029	33,406	100	33,406	258	206	79.65	95.58	143.37	0.00	326.67	163.34	242.98	258.91	306.70
2030	33,712	100	33,712	258	206	80.38	96.45	144.68	0.00	326.67	163.34	243.71	259.79	308.02
2031	33,954	100	33,954	258	206	80.96	97.15	145.72	0.00	326.67	163.34	244.29	260.48	309.05
2032	34,198	100	34,198	258	206	81.54	97.84	146.77	0.00	326.67	163.34	244.87	261.18	310.10
2033	34,443	100	34,443	258	206	82.12	98.55	147.82	0.00	326.67	163.34	245.46	261.88	311.15
2034	34,691	100	34,691	258	206	82.71	99.25	148.88	0.00	326.67	163.34	246.05	262.59	312.22
2035	34,940	100	34,940	258	206	83.31	99.97	149.95	0.00	326.67	163.34	246.64	263.30	313.29
2036	35,184	100	35,184	258	206	83.89	100.67	151.00	0.00	326.67	163.34	247.22	264.00	314.33
2037	35,429	100	35,429	258	206	84.47	101.37	152.05	0.00	326.67	163.34	247.81	264.70	315.38
2038	35,676	100	35,676	258	206	85.06	102.07	153.11	0.00	326.67	163.34	248.40	265.41	316.44
2039	35,926	100	35,926	258	206	85.66	102.79	154.18	0.00	326.67	163.34	248.99	266.12	317.52

夏季の汚水量予測

Ano	Economias Totais	% de esgotamento	Economias Totais Atendidas	Contr. (l/eco.dia) - Água	Contr. (l/eco.dia)	Contribuição Parcial Doméstico(l/s) Qmédia	Contribuição Parcial Doméstico(l/s) Qmáx.dia	Contribuição Parcial Doméstico(l/s) Qmáx.hora	Indl(l/s)	Extensão de Rede (km)	Infiltr (l/s)	Contribuição Total Doméstico+Industrial+Infiltração (l/s) Qmédia	Contribuição Total Doméstico+Industrial+Infiltração (l/s) Qmáx.dia	Contribuição Total Doméstico+Industrial+Infiltração (l/s) Qmáx.hora
年	世帯数	下水道接続率(%)	下水道接続世帯数	消費水量原単位(L/世帯/日)	汚水量原単位(L/世帯/日)	汚水量(地下水含まず)(L/秒) 日平均(Qmédia)	汚水量(地下水含まず)(L/秒) 日最大(Qmédia)	汚水量(地下水含まず)(L/秒) 時間最大(Qmédia)	工業からの排水(L/秒)	管路延長(km)	地下水浸透量(L/秒)	工業からの排水、地下水浸透量を含めた汚水量(L/秒) 日平均(Qmédia)	工業からの排水、地下水浸透量を含めた汚水量(L/秒) 日最大(Qmédia)	工業からの排水、地下水浸透量を含めた汚水量(L/秒) 時間最大(Qmédia)
2018	29,926	100	29,926	465	372	128.85	154.62	231.93	0.00	326.67	163.34	292.18	317.95	395.26
2019	30,284	100	30,284	465	372	130.39	156.47	234.70	0.00	326.67	163.34	293.72	319.80	398.04
2020	30,645	100	30,645	465	372	131.94	158.33	237.50	0.00	326.67	163.34	295.28	321.67	400.83
2021	30,953	100	30,953	465	372	133.27	159.92	239.89	0.00	326.67	163.34	296.60	323.26	403.22
2022	31,264	100	31,264	465	372	134.61	161.53	242.30	0.00	326.67	163.34	297.94	324.87	405.63
2023	31,578	100	31,578	465	372	135.96	163.15	244.73	0.00	326.67	163.34	299.30	326.49	408.06
2024	31,895	100	31,895	465	372	137.33	164.79	247.19	0.00	326.67	163.34	300.66	328.13	410.52
2025	32,217	100	32,217	465	372	138.71	166.45	249.68	0.00	326.67	163.34	302.05	329.79	413.02
2026	32,510	100	32,510	465	372	139.97	167.97	251.95	0.00	326.67	163.34	303.31	331.30	415.29
2027	32,806	100	32,806	465	372	141.25	169.50	254.25	0.00	326.67	163.34	304.58	332.83	417.58
2028	33,104	100	33,104	465	372	142.53	171.04	256.56	0.00	326.67	163.34	305.87	334.37	419.89
2029	33,406	100	33,406	465	372	143.83	172.60	258.90	0.00	326.67	163.34	307.17	335.93	422.23
2030	33,712	100	33,712	465	372	145.15	174.18	261.27	0.00	326.67	163.34	308.48	337.51	424.60
2031	33,954	100	33,954	465	372	146.19	175.43	263.14	0.00	326.67	163.34	309.53	338.78	426.48
2032	34,198	100	34,198	465	372	147.24	176.69	265.03	0.00	326.67	163.34	310.58	340.02	428.37
2033	34,443	100	34,443	465	372	148.30	177.96	266.93	0.00	326.67	163.34	311.63	341.29	430.27
2034	34,691	100	34,691	465	372	149.36	179.24	268.86	0.00	326.67	163.34	312.70	342.57	432.19
2035	34,940	100	34,940	465	372	150.44	180.52	270.79	0.00	326.67	163.34	313.77	343.86	434.12
2036	35,184	100	35,184	465	372	151.49	181.78	272.68	0.00	326.67	163.34	314.82	345.12	436.01
2037	35,429	100	35,429	465	372	152.54	183.05	274.57	0.00	326.67	163.34	315.88	346.38	437.91
2038	35,676	100	35,676	465	372	153.61	184.33	276.49	0.00	326.67	163.34	316.94	347.66	439.82
2039	35,926	100	35,926	465	372	154.68	185.62	278.43	0.00	326.67	163.34	318.02	348.95	441.76

ペルイベ市：P2下水処理場

冬季の汚水量予測

年	世帯数	下水道接続率(%)	下水道接続世帯数	消費水量原単位(L/世帯/日)	汚水量原単位(L/世帯/日)	汚水量(地下水含まず)(L/秒) 日平均(Qmédia)	汚水量(地下水含まず)(L/秒) 日最大(Qmédia)	汚水量(地下水含まず)(L/秒) 時間最大(Qmédia)	工業からの排水(L/秒)	管路延長(km)	地下水浸透量(L/秒)	工業からの排水、地下水浸透量を含めた汚水量(L/秒) 日平均(Qmédia)	工業からの排水、地下水浸透量を含めた汚水量(L/秒) 日最大(Qmédia)	工業からの排水、地下水浸透量を含めた汚水量(L/秒) 時間最大(Qmédia)
2018	14,083	100	14,083	258	206	33.58	40.29	60.44	0.00	143.34	71.67	105.25	111.96	132.11
2019	14,251	100	14,251	258	206	33.98	40.77	61.16	0.00	148.01	74.01	107.98	114.78	135.17
2020	14,421	100	14,421	258	206	34.38	41.26	61.89	0.00	152.68	76.34	110.72	117.60	138.23
2021	14,566	100	14,566	258	206	34.73	41.67	62.51	0.00	157.35	78.68	113.40	120.35	141.19
2022	14,712	100	14,712	258	206	35.08	42.09	63.14	0.00	162.03	81.02	116.09	123.11	144.15
2023	14,860	100	14,860	258	206	35.43	42.52	63.77	0.00	166.70	83.35	118.78	125.87	147.12
2024	15,010	100	15,010	258	206	35.79	42.95	64.42	0.00	171.37	85.69	121.47	128.63	150.10
2025	15,161	100	15,161	258	206	36.15	43.38	65.07	0.00	176.04	88.02	124.17	131.40	153.09
2026	15,299	100	15,299	258	206	36.48	43.77	65.66	0.00	180.72	90.36	126.84	134.13	156.02
2027	15,438	100	15,438	258	206	36.81	44.17	66.25	0.00	185.39	92.70	129.50	136.86	158.95
2028	15,579	100	15,579	258	206	37.14	44.57	66.86	0.00	190.06	95.03	132.17	139.60	161.89
2029	15,721	100	15,721	258	206	37.48	44.98	67.47	0.00	194.73	97.37	134.85	142.34	164.83
2030	15,864	100	15,864	258	206	37.82	45.39	68.08	0.00	199.41	99.71	137.53	145.09	167.79
2031	15,978	100	15,978	258	206	38.10	45.71	68.57	0.00	204.08	102.04	140.14	147.75	170.61
2032	16,093	100	16,093	258	206	38.37	46.04	69.07	0.00	208.75	104.38	142.74	150.42	173.44
2033	16,209	100	16,209	258	206	38.65	46.38	69.56	0.00	213.42	106.71	145.36	153.09	176.27
2034	16,325	100	16,325	258	206	38.92	46.71	70.06	0.00	218.10	109.05	147.97	155.76	179.11
2035	16,442	100	16,442	258	206	39.20	47.04	70.56	0.00	222.77	111.39	150.59	158.43	181.95
2036	16,557	100	16,557	258	206	39.48	47.37	71.06	0.00	227.44	113.72	153.20	161.09	184.78
2037	16,673	100	16,673	258	206	39.75	47.70	71.55	0.00	232.11	116.06	155.81	163.76	187.61
2038	16,789	100	16,789	258	206	40.03	48.04	72.05	0.00	236.79	118.40	158.42	166.43	190.45
2039	16,906	100	16,906	258	206	40.31	48.37	72.55	0.00	241.46	120.73	161.04	169.10	193.28

夏季の汚水量予測

年	世帯数	下水道接続率(%)	下水道接続世帯数	消費水量原単位(L/世帯/日)	汚水量原単位(L/世帯/日)	汚水量(地下水含まず)(L/秒) 日平均(Qmédia)	汚水量(地下水含まず)(L/秒) 日最大(Qmédia)	汚水量(地下水含まず)(L/秒) 時間最大(Qmédia)	工業からの排水(L/秒)	管路延長(km)	地下水浸透量(L/秒)	工業からの排水、地下水浸透量を含めた汚水量(L/秒) 日平均(Qmédia)	工業からの排水、地下水浸透量を含めた汚水量(L/秒) 日最大(Qmédia)	工業からの排水、地下水浸透量を含めた汚水量(L/秒) 時間最大(Qmédia)
2018	14,083	100	14,083	465	372	60.64	72.76	109.14	0.00	143.34	71.67	132.31	144.43	180.81
2019	14,251	100	14,251	465	372	61.36	73.63	110.45	0.00	148.01	74.01	135.36	147.64	184.45
2020	14,421	100	14,421	465	372	62.09	74.51	111.76	0.00	152.68	76.34	138.43	150.85	188.10
2021	14,566	100	14,566	465	372	62.71	75.26	112.89	0.00	157.35	78.68	141.39	153.93	191.56
2022	14,712	100	14,712	465	372	63.34	76.01	114.02	0.00	162.03	81.02	144.36	157.03	195.03
2023	14,860	100	14,860	465	372	63.98	76.78	115.17	0.00	166.70	83.35	147.33	160.13	198.52
2024	15,010	100	15,010	465	372	64.63	77.55	116.33	0.00	171.37	85.69	150.31	163.24	202.01
2025	15,161	100	15,161	465	372	65.28	78.33	117.50	0.00	176.04	88.02	153.30	166.35	205.52
2026	15,299	100	15,299	465	372	65.87	79.04	118.57	0.00	180.72	90.36	156.23	169.40	208.93
2027	15,438	100	15,438	465	372	66.47	79.76	119.64	0.00	185.39	92.70	159.16	172.46	212.34
2028	15,579	100	15,579	465	372	67.08	80.49	120.74	0.00	190.06	95.03	162.11	175.52	215.77
2029	15,721	100	15,721	465	372	67.69	81.23	121.84	0.00	194.73	97.37	165.05	178.59	219.20
2030	15,864	100	15,864	465	372	68.30	81.96	122.95	0.00	199.41	99.71	168.01	181.67	222.65
2031	15,978	100	15,978	465	372	68.79	82.55	123.83	0.00	204.08	102.04	170.83	184.59	225.87
2032	16,093	100	16,093	465	372	69.29	83.15	124.72	0.00	208.75	104.38	173.66	187.52	229.10
2033	16,209	100	16,209	465	372	69.79	83.75	125.62	0.00	213.42	106.71	176.50	190.46	232.33
2034	16,325	100	16,325	465	372	70.29	84.35	126.52	0.00	218.10	109.05	179.34	193.40	235.57
2035	16,442	100	16,442	465	372	70.79	84.95	127.43	0.00	222.77	111.39	182.18	196.34	238.81
2036	16,557	100	16,557	465	372	71.29	85.54	128.32	0.00	227.44	113.72	185.01	199.26	242.04
2037	16,673	100	16,673	465	372	71.79	86.14	129.22	0.00	232.11	116.06	187.84	202.20	245.27
2038	16,789	100	16,789	465	372	72.29	86.74	130.11	0.00	236.79	118.40	190.68	205.14	248.51
2039	16,906	100	16,906	465	372	72.79	87.35	131.02	0.00	241.46	120.73	193.52	208.08	251.75

イタニャエン：Guapiranga下水処理場

冬季の汚水量

年	世帯数	下水道接続率(%)	下水道接続世帯数	消費水量原単位(L/世帯/日)	汚水量原単位(L/世帯/日)	汚水量(地下水含まず)(L/秒) 日平均($Q_{média}$)	日最大($Q_{média}$)	時間最大($Q_{média}$)	工業からの排水(L/秒)	管路延長(km)	地下水浸透量(L/秒)	工業からの排水、地下水浸透量を含めた汚水量(L/秒) 日平均($Q_{média}$)	日最大($Q_{média}$)	時間最大($Q_{média}$)
2018	36,457	100	36,457	224	179	75.56	90.67	136.01	0.00	144.22	72.11	176.00	191.11	236.45
2019	37,023	100	37,023	224	179	76.73	92.08	138.12	0.00	162.49	81.24	186.31	201.65	247.69
2020	37,597	100	37,597	224	179	77.92	93.51	140.26	0.00	180.76	90.38	196.63	212.22	258.97
2021	38,095	100	38,095	224	179	78.95	94.74	142.12	0.00	199.03	99.51	206.80	222.59	269.96
2022	38,600	100	38,600	224	179	80.00	96.00	144.00	0.00	217.30	108.65	216.98	232.98	280.98
2023	39,111	100	39,111	224	179	81.06	97.27	145.91	0.00	235.57	117.78	227.17	243.39	292.02
2024	39,630	100	39,630	224	179	82.14	98.56	147.84	0.00	253.84	126.92	237.38	253.81	303.09
2025	40,155	100	40,155	224	179	83.22	99.87	149.80	0.00	272.14	136.07	247.62	264.27	314.20
2026	40,631	100	40,631	224	179	84.21	10..05	151.58	0.00	287.47	143.73	256.27	273.12	323.64
2027	41,113	100	41,113	224	179	85.21	102.25	153.38	0.00	302.80	151.40	264.94	281.98	333.10
2028	41,601	100	41,601	224	179	86.22	103.46	155.19	0.00	318.13	159.06	273.61	290.86	342.59
2029	42,093	100	42,093	224	179	87.24	104.69	157.03	0.00	333.46	166.73	282.30	299.75	352.09
2030	42,592	100	42,592	224	179	88.27	105.93	158.89	0.00	348.81	174.40	291.01	308.66	361.63
2031	42,962	100	42,962	224	179	89.04	106.85	160.27	0.00	349.81	174.90	292.27	310.08	363.51
2032	43,335	100	43,335	224	179	89.81	107.78	161.67	0.00	350.81	175.40	293.55	311.51	365.40
2033	43,712	100	43,712	224	179	90.60	108.71	163.07	0.00	351.81	175.90	294.83	312.95	367.31
2034	44,092	100	44,092	224	179	91.38	109.66	164.49	0.00	352.81	176.40	296.12	314.39	369.22
2035	44,475	100	44,475	224	179	92.18	110.61	165.92	0.00	353.83	176.91	297.42	315.86	371.16
2036	44,837	100	44,837	224	179	92.93	111.51	167.27	0.00	353.83	176.91	298.17	316.76	372.51
2037	45,202	100	45,202	224	179	93.68	112.42	168.63	0.00	353.83	176.91	298.93	317.66	373.87
2038	45,570	100	45,570	224	179	94.45	113.34	170.00	0.00	353.83	176.91	299.69	318.58	375.25
2039	45,941	100	45,941	224	179	95.22	114.26	171.39	0.00	353.83	176.91	300.46	319.50	376.63

夏季の汚水量予測

年	世帯数	下水道接続率(%)	下水道接続世帯数	消費水量原単位(L/世帯/日)	汚水量原単位(L/世帯/日)	汚水量(地下水含まず)(L/秒) 日平均($Q_{média}$)	日最大($Q_{média}$)	時間最大($Q_{média}$)	工業からの排水(L/秒)	管路延長(km)	地下水浸透量(L/秒)	工業からの排水、地下水浸透量を含めた汚水量(L/秒) 日平均($Q_{média}$)	日最大($Q_{média}$)	時間最大($Q_{média}$)
2018	36,457	100	36,457	434	347	146.50	175.80	263.71	0.00	144.22	72.11	218.61	247.91	335.82
2019	37,023	100	37,023	434	347	148.78	178.53	267.80	0.00	162.49	81.25	230.02	259.78	349.04
2020	37,597	100	37,597	434	347	151.08	181.30	271.95	0.00	180.76	90.38	241.46	271.68	362.33
2021	38,095	100	38,095	434	347	153.09	183.70	275.55	0.00	199.03	99.52	252.60	283.22	375.07
2022	38,600	100	38,600	434	347	155.11	186.14	279.21	0.00	217.30	108.65	263.76	294.79	387.86
2023	39,111	100	39,111	434	347	157.17	188.60	282.90	0.00	235.57	117.79	274.95	306.39	400.69
2024	39,630	100	39,630	434	347	159.25	191.10	286.66	0.00	253.84	126.92	286.17	318.02	413.58
2025	40,155	100	40,155	434	347	161.36	193.64	290.45	0.00	272.14	136.07	297.43	329.71	426.52
2026	40,631	100	40,631	434	347	163.28	195.93	293.90	0.00	287.47	143.74	307.01	339.67	437.63
2027	41,113	100	41,113	434	347	165.21	198.26	297.38	0.00	302.80	151.40	316.61	349.66	448.78
2028	41,601	100	41,601	434	347	167.17	200.61	300.91	0.00	318.13	159.07	326.24	359.67	459.98
2029	42,093	100	42,093	434	347	169.15	202.98	304.47	0.00	333.46	166.73	335.88	369.71	471.20
2030	42,592	100	42,592	434	347	171.16	205.39	308.08	0.00	348.81	174.41	345.56	379.79	482.49
2031	42,962	100	42,962	434	347	172.64	207.17	310.76	0.00	349.81	174.91	347.55	382.08	485.66
2032	43,335	100	43,335	434	347	174.14	208.97	313.46	0.00	350.81	175.41	349.55	384.38	488.86
2033	43,712	100	43,712	434	347	175.66	210.79	316.18	0.00	351.81	175.91	351.56	386.69	492.09
2034	44,092	100	44,092	434	347	177.18	212.62	318.93	0.00	352.81	176.41	353.59	389.03	495.34
2035	44,475	100	44,475	434	347	178.72	214.47	321.70	0.00	353.83	176.92	355.64	391.38	498.62
2036	44,837	100	44,837	434	347	180.18	216.21	324.32	0.00	353.83	176.92	357.09	393.13	501.24
2037	45,202	100	45,202	434	347	181.65	217.97	326.96	0.00	353.83	176.92	358.56	394.89	503.88
2038	45,570	100	45,570	434	347	183.12	219.75	329.62	0.00	353.83	176.92	360.04	396.66	506.54
2039	45,941	100	45,941	434	347	184.61	221.54	332.31	0.00	353.83	176.92	361.53	398.45	509.22

イタニャエン：Anchieta下水処理場

冬季の汚水量

年	世帯数	下水道接続率(%)	下水道接続世帯数	消費水量原単位(L/世帯/日)	汚水量原単位(L/世帯/日)	汚水量(地下水含まず)(L/秒) 日平均($Q_{média}$)	日最大($Q_{média}$)	時間最大($Q_{média}$)	工業からの排水(L/秒)	管路延長(km)	地下水浸透量(L/秒)	工業からの排水、地下水浸透量を含めた汚水量(L/秒) 日平均($Q_{média}$)	日最大($Q_{média}$)	時間最大($Q_{média}$)
2018	39,496	100	39,496	224	179	81.86	98.23	147.34	0.00	258.84	129.42	211.28	227.65	276.76
2019	40,108	100	40,108	224	179	83.13	99.75	149.63	0.00	258.84	129.42	212.55	229.17	279.05
2020	40,731	100	40,731	224	179	84.42	101.30	151.95	0.00	258.84	129.42	213.84	230.72	281.37
2021	41,270	100	41,270	224	179	85.53	102.64	153.96	0.00	258.84	129.42	214.95	232.06	283.38
2022	41,817	100	41,817	224	179	86.67	104.00	156.00	0.00	258.84	129.42	216.09	233.42	285.42
2023	42,371	100	42,371	224	179	87.82	105.38	158.07	0.00	258.84	129.42	217.24	234.80	287.49
2024	42,933	100	42,933	224	179	88.98	106.78	160.16	0.00	258.84	129.42	218.40	236.20	289.58
2025	43,502	100	43,502	224	179	90.16	108.19	162.29	0.00	258.84	129.42	219.58	237.61	291.71
2026	44,017	100	44,017	224	179	91.23	109.47	164.21	0.00	258.84	129.42	220.65	238.89	293.63
2027	44,539	100	44,539	224	179	92.31	110.77	166.16	0.00	258.84	129.42	221.73	240.19	295.58
2028	45,067	100	45,067	224	179	93.40	112.08	168.13	0.00	258.84	129.42	222.82	241.50	297.55
2029	45,601	100	45,601	224	179	94.51	113.41	170.12	0.00	258.84	129.42	223.93	242.83	299.54
2030	46,142	100	46,142	224	179	95.63	114.76	172.14	0.00	258.84	129.42	225.05	244.18	301.56
2031	46,543	100	46,543	224	179	96.46	115.75	173.63	0.00	258.84	129.42	225.88	245.17	303.05
2032	46,947	100	46,947	224	179	97.30	116.76	175.14	0.00	258.84	129.42	226.72	246.18	304.56
2033	47,355	100	47,355	224	179	98.14	117.77	176.66	0.00	258.84	129.42	227.56	247.19	306.08
2034	47,767	100	47,767	224	179	99.00	118.80	178.20	0.00	258.84	129.42	228.42	248.22	307.62
2035	48,182	100	48,182	224	179	99.86	119.83	179.75	0.00	258.84	129.42	229.28	249.25	309.17
2036	48,574	100	48,574	224	179	100.67	120.81	181.21	0.00	258.84	129.42	230.09	250.23	310.63
2037	48,969	100	48,969	224	179	101.49	121.79	182.68	0.00	258.84	129.42	230.91	251.21	312.10
2038	49,368	100	49,368	224	179	102.32	122.78	184.17	0.00	258.84	129.42	231.74	252.20	313.59
2039	49,770	100	49,770	224	179	103.15	123.78	185.67	0.00	258.84	129.42	232.57	253.20	315.09

夏季の汚水量予測

年	世帯数	下水道接続率(%)	下水道接続世帯数	消費水量原単位(L/世帯/日)	汚水量原単位(L/世帯/日)	汚水量(地下水含まず)(L/秒) 日平均($Q_{média}$)	日最大($Q_{média}$)	時間最大($Q_{média}$)	工業からの排水(L/秒)	管路延長(km)	地下水浸透量(L/秒)	工業からの排水、地下水浸透量を含めた汚水量(L/秒) 日平均($Q_{média}$)	日最大($Q_{média}$)	時間最大($Q_{média}$)
2018	39,496	100	39,496	434	347	158.72	190.46	285.69	0.00	258.84	129.42	288.14	319.88	415.11
2019	40,108	100	40,108	434	347	161.17	193.41	290.11	0.00	258.84	129.42	290.59	322.83	419.53
2020	40,731	100	40,731	434	347	163.68	196.41	294.62	0.00	258.84	129.42	293.10	325.83	424.04
2021	41,270	100	41,270	434	347	165.84	199.01	298.52	0.00	258.84	129.42	295.26	328.43	427.94
2022	41,817	100	41,817	434	347	168.04	201.65	302.48	0.00	258.84	129.42	297.46	331.07	431.90
2023	42,371	100	42,371	434	347	170.27	204.32	306.48	0.00	258.84	129.42	299.69	333.74	435.90
2024	42,933	100	42,933	434	347	172.53	207.03	310.55	0.00	258.84	129.42	301.95	336.45	439.97
2025	43,502	100	43,502	434	347	174.81	209.78	314.66	0.00	258.84	129.42	304.23	339.20	444.08
2026	44,017	100	44,017	434	347	176.88	212.26	318.39	0.00	258.84	129.42	306.30	341.68	447.81
2027	44,539	100	44,539	434	347	178.98	214.78	322.17	0.00	258.84	129.42	308.40	344.20	451.59
2028	45,067	100	45,067	434	347	181.10	217.32	325.98	0.00	258.84	129.42	310.52	346.74	455.40
2029	45,601	100	45,601	434	347	183.25	219.90	329.85	0.00	258.84	129.42	312.67	349.32	459.27
2030	46,142	100	46,142	434	347	185.42	222.51	333.76	0.00	258.84	129.42	314.84	351.93	463.18
2031	46,543	100	46,543	434	347	187.03	224.44	336.66	0.00	258.84	129.42	316.45	353.86	466.08
2032	46,947	100	46,947	434	347	188.66	226.39	339.58	0.00	258.84	129.42	318.08	355.81	469.00
2033	47,355	100	47,355	434	347	190.30	228.36	342.53	0.00	258.84	129.42	319.72	357.78	471.95
2034	47,767	100	47,767	434	347	191.95	230.34	345.51	0.00	258.84	129.42	321.37	359.76	474.93
2035	48,182	100	48,182	434	347	193.62	232.34	348.52	0.00	258.84	129.42	323.04	361.76	477.94
2036	48,574	100	48,574	434	347	195.20	234.23	351.35	0.00	258.84	129.42	324.62	363.65	480.77
2037	48,969	100	48,969	434	347	196.78	236.14	354.21	0.00	258.84	129.42	326.20	365.56	483.63
2038	49,368	100	49,368	434	347	198.39	238.06	357.10	0.00	258.84	129.42	327.81	367.48	486.52
2039	49,770	100	49,770	434	347	200.00	240.00	360.00	0.00	258.84	129.42	329.42	369.42	489.42

モンガグア：Bichoro下水処理場

冬季の汚水量

年	世帯数	下水道接続率(%)	下水道接続世帯数	消費水量原単位(L/世帯/日)	汚水量原単位(L/世帯/日)	汚水量(地下水含まず)(L/秒) 日平均($Q_{média}$)	日最大($Q_{média}$)	時間最大($Q_{média}$)	工業からの排水(L/秒)	管路延長(km)	地下水浸透量(L/秒)	工業からの排水、地下水浸透量を含めた汚水量(L/秒) 日平均($Q_{média}$)	日最大($Q_{média}$)	時間最大($Q_{média}$)
2018	12,707	100	12,707	200	160	23.53	28.24	42.36	0.00	35.50	17.75	41.28	45.99	60.11
2019	12,890	100	12,890	200	160	23.87	28.64	42.97	0.00	35.50	17.75	41.62	46.39	60.72
2020	13,077	100	13,077	200	160	24.22	29.06	43.59	0.00	35.50	17.75	41.97	46.81	61.34
2021	13,222	100	13,222	200	160	24.49	29.38	44.07	0.00	35.50	17.75	42.24	47.13	61.82
2022	13,370	100	13,370	200	160	24.76	29.71	44.57	0.00	35.50	17.75	42.51	47.46	62.32
2023	13,519	100	13,519	200	160	25.04	30.04	45.06	0.00	35.50	17.75	42.79	47.79	62.81
2024	13,670	100	13,670	200	160	25.31	30.38	45.57	0.00	35.50	17.75	43.06	48.13	63.32
2025	13,823	100	13,823	200	160	25.60	30.72	46.08	0.00	35.50	17.75	43.35	48.47	63.83
2026	13,964	100	13,964	200	160	25.86	31.03	46.55	0.00	35.50	17.75	43.61	48.78	64.30
2027	14,106	100	14,106	200	160	26.12	31.35	47.02	0.00	35.50	17.75	43.87	49.10	64.77
2028	14,249	100	14,249	200	160	26.39	31.66	47.50	0.00	35.50	17.75	44.14	49.41	65.25
2029	14,394	100	14,394	200	160	26.66	31.99	47.98	0.00	35.50	17.75	44.41	49.74	65.73
2030	14,541	100	14,541	200	160	26.93	32.31	48.47	0.00	35.50	17.75	44.68	50.06	66.22
2031	14,649	100	14,649	200	160	27.13	32.55	48.83	0.00	35.50	17.75	44.88	50.30	66.58
2032	14,758	100	14,758	200	160	27.33	32.80	49.19	0.00	35.50	17.75	45.08	50.55	66.94
2033	14,868	100	14,868	200	160	27.53	33.04	49.56	0.00	35.50	17.75	45.28	50.79	67.31
2034	14,979	100	14,979	200	160	27.74	33.29	49.93	0.00	35.50	17.75	45.49	51.04	67.68
2035	15,091	100	15,091	200	160	27.95	33.54	50.30	0.00	35.50	17.75	45.70	51.29	68.05
2036	15,193	100	15,193	200	160	28.14	33.76	50.64	0.00	35.50	17.75	45.89	51.51	68.39
2037	15,296	100	15,296	200	160	28.33	33.99	50.99	0.00	35.50	17.75	46.08	51.74	68.74
2038	15,401	100	15,401	200	160	28.52	34.22	51.34	0.00	35.50	17.75	46.27	51.97	69.09
2039	15,505	100	15,505	200	160	28.71	34.46	51.68	0.00	35.50	17.75	46.46	52.21	69.43

夏季の汚水量予測

年	世帯数	下水道接続率(%)	下水道接続世帯数	消費水量原単位(L/世帯/日)	汚水量原単位(L/世帯/日)	汚水量(地下水含まず)(L/秒) 日平均($Q_{média}$)	日最大($Q_{média}$)	時間最大($Q_{média}$)	工業からの排水(L/秒)	管路延長(km)	地下水浸透量(L/秒)	工業からの排水、地下水浸透量を含めた汚水量(L/秒) 日平均($Q_{média}$)	日最大($Q_{média}$)	時間最大($Q_{média}$)
2018	12,707	100	12,707	410	328	48.24	57.89	86.83	0.00	35.50	17.75	65.99	75.64	104.58
2019	12,890	100	12,890	410	328	48.93	58.72	88.08	0.00	35.50	17.75	66.68	76.47	105.83
2020	13,077	100	13,077	410	328	49.64	59.57	89.36	0.00	35.50	17.75	67.39	77.32	107.11
2021	13,222	100	13,222	410	328	50.19	60.23	90.35	0.00	35.50	17.75	67.94	77.98	108.10
2022	13,370	100	13,370	410	328	50.76	60.91	91.36	0.00	35.50	17.75	68.51	78.66	109.11
2023	13,519	100	13,519	410	328	51.32	61.59	92.38	0.00	35.50	17.75	69.07	79.34	110.13
2024	13,670	100	13,670	410	328	51.90	62.27	93.41	0.00	35.50	17.75	69.65	80.02	111.16
2025	13,823	100	13,823	410	328	52.48	62.97	94.46	0.00	35.50	17.75	70.23	80.72	112.21
2026	13,964	100	13,964	410	328	53.01	63.61	95.42	0.00	35.50	17.75	70.76	81.36	113.17
2027	14,106	100	14,106	410	328	53.55	64.26	96.39	0.00	35.50	17.75	71.30	82.01	114.14
2028	14,249	100	14,249	410	328	54.09	64.91	97.37	0.00	35.50	17.75	71.84	82.66	115.12
2029	14,394	100	14,394	410	328	54.64	65.57	98.36	0.00	35.50	17.75	72.39	83.32	116.11
2030	14,541	100	14,541	410	328	55.20	66.24	99.36	0.00	35.50	17.75	72.95	83.99	117.11
2031	14,649	100	14,649	410	328	55.61	66.73	100.10	0.00	35.50	17.75	73.36	84.48	117.85
2032	14,758	100	14,758	410	328	56.03	67.23	100.85	0.00	35.50	17.75	73.78	84.98	118.60
2033	14,868	100	14,868	410	328	56.44	67.73	101.60	0.00	35.50	17.75	74.19	85.48	119.35
2034	14,979	100	14,979	410	328	56.86	68.24	102.36	0.00	35.50	17.75	74.61	85.99	120.11
2035	15,091	100	15,091	410	328	57.29	68.75	103.12	0.00	35.50	17.75	75.04	86.50	120.87
2036	15,193	100	15,193	410	328	57.68	69.21	103.82	0.00	35.50	17.75	75.43	86.96	121.57
2037	15,296	100	15,296	410	328	58.07	69.68	104.52	0.00	35.50	17.75	75.82	87.43	122.27
2038	15,401	100	15,401	410	328	58.47	70.16	105.24	0.00	35.50	17.75	76.22	87.91	122.99
2039	15,505	100	15,505	410	328	58.86	70.63	105.95	0.00	35.50	17.75	76.61	88.38	123.70

モンガグア：Barigui下水処理場

冬季の汚水量

年	世帯数	下水道接続率(%)	下水道接続世帯数	消費水量原単位(L/世帯/日)	汚水量原単位(L/世帯/日)	汚水量(地下水含まず)(L/秒) 日平均($Q_{média}$)	日最大($Q_{média}$)	時間最大($Q_{média}$)	工業からの排水(L/秒)	管路延長(km)	地下水浸透量(L/秒)	工業からの排水、地下水浸透量を含めた汚水量(L/秒) 日平均($Q_{média}$)	日最大($Q_{média}$)	時間最大($Q_{média}$)
2018	34,355	100	34,355	200	160	63.62	76.34	114.52	0.00	190.00	95.00	158.62	171.34	209.52
2019	34,852	100	34,852	200	160	64.54	77.45	116.17	0.00	192.38	96.19	160.73	173.64	212.36
2020	35,355	100	35,355	200	160	65.47	78.57	117.85	0.00	194.76	97.38	162.85	175.95	215.23
2021	35,749	100	35,749	200	160	66.20	79.44	119.16	0.00	197.14	98.57	164.77	178.01	217.73
2022	36,147	100	36,147	200	160	66.94	80.33	120.49	0.00	199.52	99.76	166.70	180.09	220.25
2023	36,552	100	36,552	200	160	67.69	81.23	121.84	0.00	201.90	100.95	168.64	182.18	222.79
2024	36,961	100	36,961	200	160	68.45	82.14	123.20	0.00	204.29	102.15	170.59	184.28	225.35
2025	37,375	100	37,375	200	160	69.21	83.06	124.58	0.00	206.67	103.34	172.55	186.39	227.92
2026	37,754	100	37,754	200	160	69.91	83.90	125.85	0.00	209.05	104.53	174.44	188.42	230.37
2027	38,138	100	38,138	200	160	70.63	84.75	127.13	0.00	211.43	105.72	176.34	190.47	232.84
2028	38,526	100	38,526	200	160	71.34	85.61	128.42	0.00	213.81	106.91	178.25	192.52	235.33
2029	38,918	100	38,918	200	160	72.07	86.48	129.73	0.00	216.19	108.10	180.17	194.58	237.82
2030	39,314	100	39,314	200	160	72.80	87.36	131.05	0.00	218.57	109.29	182.09	196.65	240.33
2031	39,606	100	39,606	200	160	73.34	88.01	132.02	0.00	220.95	110.48	183.82	198.49	242.50
2032	39,901	100	39,901	200	160	73.89	88.67	133.00	0.00	223.33	111.67	185.56	200.33	244.67
2033	40,197	100	40,197	200	160	74.44	89.33	133.99	0.00	225.71	112.86	187.29	202.18	246.85
2034	40,497	100	40,497	200	160	74.99	89.99	134.99	0.00	228.10	114.05	189.04	204.04	249.04
2035	40,800	100	40,800	200	160	75.56	90.67	136.00	0.00	230.48	115.24	190.80	205.91	251.24
2036	41,078	100	41,078	200	160	76.07	91.28	136.93	0.00	232.86	116.43	192.50	207.71	253.36
2037	41,357	100	41,357	200	160	76.59	91.90	137.86	0.00	235.24	117.62	194.21	209.52	255.48
2038	41,638	100	41,638	200	160	77.11	92.53	138.79	0.00	237.62	118.81	195.92	211.34	257.60
2039	41,922	100	41,922	200	160	77.63	93.16	139.74	0.00	240.00	120.00	197.63	213.16	259.74

夏季の汚水量予測

年	世帯数	下水道接続率(%)	下水道接続世帯数	消費水量原単位(L/世帯/日)	汚水量原単位(L/世帯/日)	汚水量(地下水含まず)(L/秒) 日平均($Q_{média}$)	日最大($Q_{média}$)	時間最大($Q_{média}$)	工業からの排水(L/秒)	管路延長(km)	地下水浸透量(L/秒)	工業からの排水、地下水浸透量を含めた汚水量(L/秒) 日平均($Q_{média}$)	日最大($Q_{média}$)	時間最大($Q_{média}$)
2018	34,355	100	34,355	410	328	130.42	156.51	234.76	0.00	190.00	95.00	225.42	251.51	329.76
2019	34,852	100	34,852	410	328	132.31	158.77	238.16	0.00	192.38	96.19	228.50	254.96	334.35
2020	35,355	100	35,355	410	328	134.22	161.06	241.59	0.00	194.76	97.38	231.60	258.44	338.97
2021	35,749	100	35,749	410	328	135.71	162.86	244.28	0.00	197.14	98.57	234.28	261.43	342.85
2022	36,147	100	36,147	410	328	137.22	164.67	247.00	0.00	199.52	99.76	236.98	264.43	346.76
2023	36,552	100	36,552	410	328	138.76	166.51	249.77	0.00	201.90	100.95	239.71	267.46	350.72
2024	36,961	100	36,961	410	328	140.31	168.38	252.57	0.00	204.29	102.15	242.46	270.52	354.71
2025	37,375	100	37,375	410	328	141.89	170.26	255.40	0.00	206.67	103.34	245.22	273.60	358.73
2026	37,754	100	37,754	410	328	143.33	171.99	257.99	0.00	209.05	104.53	247.85	276.52	362.51
2027	38,138	100	38,138	410	328	144.78	173.74	260.61	0.00	211.43	105.72	250.50	279.45	366.32
2028	38,526	100	38,526	410	328	146.26	175.51	263.26	0.00	213.81	106.91	253.16	282.41	370.17
2029	38,918	100	38,918	410	328	147.74	177.29	265.94	0.00	216.19	108.10	255.84	285.39	374.03
2030	39,314	100	39,314	410	328	149.25	179.10	268.65	0.00	218.57	109.29	258.53	288.38	377.93
2031	39,606	100	39,606	410	328	150.36	180.43	270.64	0.00	220.95	110.48	260.83	290.90	381.12
2032	39,901	100	39,901	410	328	151.48	181.77	272.66	0.00	223.33	111.67	263.14	293.44	384.32
2033	40,197	100	40,197	410	328	152.60	183.12	274.68	0.00	225.71	112.86	265.45	295.97	387.53
2034	40,497	100	40,497	410	328	153.74	184.49	276.73	0.00	228.10	114.05	267.79	298.54	390.78
2035	40,800	100	40,800	410	328	154.89	185.87	278.80	0.00	230.48	115.24	270.13	301.11	394.04
2036	41,078	100	41,078	410	328	155.94	187.13	280.70	0.00	232.86	116.43	272.37	303.56	397.13
2037	41,357	100	41,357	410	328	157.00	188.40	282.61	0.00	235.24	117.62	274.62	306.02	400.23
2038	41,638	100	41,638	410	328	158.07	189.68	284.53	0.00	237.62	118.81	276.88	308.49	403.34
2039	41,922	100	41,922	410	328	159.15	190.98	286.47	0.00	240.00	120.00	279.15	310.98	406.47

クバトン：Casqueiro下水処理場

冬季の汚水量

年	世帯数	下水道接続率(%)	下水道接続世帯数	消費水量原単位(L/世帯/日)	汚水量原単位(L/世帯/日)	汚水量(地下水含まず)(L/秒) 日平均($Q_{média}$)	日最大($Q_{média}$)	時間最大($Q_{média}$)	工業からの排水(L/秒)	管路延長(km)	地下水浸透量(L/秒)	工業からの排水、地下水浸透量を含めた汚水量(L/秒) 日平均($Q_{média}$)	日最大($Q_{média}$)	時間最大($Q_{média}$)
2018	20,302	100	20,302	467	374	87.79	105.34	158.02	0.00	23.15	11.57	99.36	116.91	169.59
2019	20,706	100	20,706	467	374	89.53	107.44	161.16	0.00	23.61	11.80	101.33	119.24	172.96
2020	21,598	100	21,598	467	374	93.39	112.07	168.10	0.00	24.63	12.31	105.70	124.38	180.41
2021	2,196	100	2,196	467	374	9.50	11.39	17.09	0.00	25.04	12.52	22.02	23.91	29.61
2022	22,823	100	22,823	467	374	98.69	118.43	177.64	0.00	26.03	13.01	111.70	131.44	190.65
2023	23,206	100	23,206	467	374	100.34	120.41	180.62	0.00	26.46	13.23	113.57	133.64	193.85
2024	24,107	100	24,107	467	374	104.24	125.09	187.63	0.00	27.49	13.74	117.98	138.83	201.37
2025	24,511	100	24,511	467	374	105.99	127.18	190.78	0.00	27.95	13.97	119.96	141.15	204.75
2026	24,845	100	24,845	467	374	107.43	128.92	193.38	0.00	28.33	14.16	121.59	143.08	207.54
2027	25,719	100	25,719	467	374	111.21	133.45	200.18	0.00	29.33	14.66	125.87	148.11	214.84
2028	26,069	100	26,069	467	374	112.72	135.27	202.90	0.00	29.73	14.86	127.58	150.13	217.76
2029	26,975	100	26,975	467	374	116.64	139.97	209.96	0.00	30.76	15.38	132.02	155.35	225.34
2030	27,343	100	27,343	467	374	118.23	141.88	212.82	0.00	31.18	15.59	133.82	157.47	228.41
2031	27,626	100	27,626	467	374	119.46	143.35	215.02	0.00	31.51	15.75	135.21	159.10	230.77
2032	28,483	100	28,483	467	374	123.16	147.80	221.69	0.00	32.48	16.24	139.40	164.04	237.93
2033	28,778	100	28,778	467	374	124.44	149.33	223.99	0.00	32.82	16.41	140.85	165.74	240.40
2034	29,658	100	29,658	467	374	128.24	153.89	230.84	0.00	33.82	16.91	145.15	170.80	247.75
2035	29,965	100	29,965	467	374	129.57	155.49	233.23	0.00	34.17	17.08	146.65	172.57	250.31
2036	30,189	100	30,189	467	374	130.54	156.65	234.97	0.00	34.43	17.21	147.75	173.86	252.18
2037	31,012	100	31,012	467	374	134.10	160.92	241.38	0.00	35.37	17.68	151.78	178.60	259.06
2038	31,244	100	31,244	467	374	135.10	162.12	243.18	0.00	35.63	17.81	152.91	179.93	260.99
2039	32,084	100	32,084	467	374	138.73	166.48	249.72	0.00	36.59	18.29	157.02	184.77	268.01

夏季の汚水量予測

年	世帯数	下水道接続率(%)	下水道接続世帯数	消費水量原単位(L/世帯/日)	汚水量原単位(L/世帯/日)	汚水量(地下水含まず)(L/秒) 日平均($Q_{média}$)	日最大($Q_{média}$)	時間最大($Q_{média}$)	工業からの排水(L/秒)	管路延長(km)	地下水浸透量(L/秒)	工業からの排水、地下水浸透量を含めた汚水量(L/秒) 日平均($Q_{média}$)	日最大($Q_{média}$)	時間最大($Q_{média}$)
2018	20,302	100	20,302	562	450	105.65	126.77	190.16	0.00	23.15	11.57	117.22	138.34	201.73
2019	20,706	100	20,706	562	450	107.75	129.30	193.95	0.00	23.61	11.80	119.55	141.10	205.75
2020	21,598	100	21,598	562	450	112.39	134.87	202.30	0.00	24.63	12.31	124.70	147.18	214.61
2021	2,196	100	21,960	562	450	114.27	137.13	205.69	0.00	25.04	12.52	126.79	149.65	218.21
2022	22,823	100	22,823	562	450	118.76	142.52	213.78	0.00	26.03	13.01	131.77	155.53	226.79
2023	23,206	100	23,206	562	450	120.76	144.91	217.36	0.00	26.46	13.23	133.99	158.14	230.59
2024	24,107	100	24,107	562	450	125.45	150.53	225.80	0.00	27.49	13.74	139.19	164.27	239.54
2025	24,511	100	24,511	562	450	127.55	153.06	229.59	0.00	27.95	13.97	141.52	167.03	243.56
2026	24,845	100	24,845	562	450	129.29	155.14	232.71	0.00	28.33	14.16	143.45	169.30	246.87
2027	25,719	100	25,719	562	450	133.83	160.60	240.90	0.00	29.33	14.66	148.49	175.26	255.56
2028	26,069	100	26,069	562	450	135.66	162.79	244.18	0.00	29.73	14.86	150.52	177.65	259.04
2029	26,975	100	26,975	562	450	140.37	168.44	252.67	0.00	30.76	15.38	155.75	183.82	268.05
2030	27,343	100	27,343	562	450	142.28	170.74	256.11	0.00	31.18	15.59	157.87	186.33	271.70
2031	27,626	100	27,626	562	450	143.76	172.51	258.76	0.00	31.51	15.75	159.51	188.26	274.51
2032	28,483	100	28,483	562	450	148.22	177.86	266.79	0.00	32.48	16.24	164.46	194.10	283.03
2033	28,778	100	28,778	562	450	149.75	179.70	269.55	0.00	32.82	16.41	166.16	196.11	285.96
2034	29,658	100	29,658	562	450	154.33	185.20	277.80	0.00	33.82	16.91	171.24	202.11	294.71
2035	29,965	100	29,965	562	450	155.93	187.11	280.67	0.00	34.17	17.08	173.01	204.19	297.75
2036	30,189	100	30,189	562	450	157.09	188.51	282.77	0.00	34.43	17.21	174.30	205.72	299.98
2037	31,012	100	31,012	562	450	161.38	193.65	290.48	0.00	35.37	17.68	179.06	211.33	308.16
2038	31,244	100	31,244	562	450	162.58	195.10	292.65	0.00	35.63	17.81	180.39	212.91	310.46
2039	32,084	100	32,084	562	450	166.96	200.35	300.52	0.00	36.59	18.29	185.25	218.64	318.81

グアルジャ：Carvalho下水処理場

冬季の汚水量

年	世帯数	下水道接続率(%)	下水道接続世帯数	消費水量原単位(L/世帯/日)	汚水量原単位(L/世帯/日)	汚水量(地下水含まず)(L/秒) 日平均($Q_{média}$)	日最大($Q_{média}$)	時間最大($Q_{média}$)	工業からの排水(L/秒)	管路延長(km)	地下水浸透量(L/秒)	工業からの排水、地下水浸透量を含めた汚水量(L/秒) 日平均($Q_{média}$)	日最大($Q_{média}$)	時間最大($Q_{média}$)
2018	44,736	100	44,736	317	254	131.31	157.57	236.36	0.00	115.00	57.50	188.81	215.07	293.86
2019	45,370	100	45,370	317	254	133.17	159.80	239.70	0.00	115.00	57.50	190.67	217.30	297.20
2020	46,015	100	46,015	317	254	135.06	162.08	243.11	0.00	115.00	57.50	192.56	219.58	300.61
2021	46,583	100	46,583	317	254	136.73	164.08	246.11	0.00	115.00	57.50	194.23	221.58	303.61
2022	47,161	100	47,161	317	254	138.43	166.11	249.17	0.00	115.00	57.50	195.93	223.61	306.67
2023	47,747	100	47,747	317	254	140.15	168.18	252.26	0.00	115.00	57.50	197.65	225.68	309.76
2024	48,342	100	48,342	317	254	141.89	170.27	255.41	0.00	115.00	57.50	199.39	227.77	312.91
2025	48,947	100	48,947	317	254	143.67	172.40	258.60	0.00	115.00	57.50	201.17	229.90	316.10
2026	49,448	100	49,448	317	254	145.14	174.17	261.25	0.00	115.00	57.50	202.64	231.67	318.75
2027	49,956	100	49,956	317	254	146.63	175.96	263.93	0.00	115.00	57.50	204.13	233.46	321.43
2028	50,470	100	50,470	317	254	148.14	177.77	266.65	0.00	115.00	57.50	205.64	235.27	324.15
2029	50,990	100	50,990	317	254	149.67	179.60	269.40	0.00	115.00	57.50	207.17	237.10	326.90
2030	51,517	100	51,517	317	254	151.21	181.45	272.18	0.00	115.00	57.50	208.71	238.95	329.68
2031	51,922	100	51,922	317	254	152.40	182.88	274.32	0.00	115.00	57.50	209.90	240.38	331.82
2032	52,330	100	52,330	317	254	153.60	184.32	276.48	0.00	115.00	57.50	211.10	241.82	333.98
2033	52,742	100	52,742	317	254	154.81	185.77	278.65	0.00	115.00	57.50	212.31	243.27	336.15
2034	53,159	100	53,159	317	254	156.03	187.24	280.86	0.00	115.00	57.50	213.53	244.74	338.36
2035	53,579	100	53,579	317	254	157.26	188.72	283.08	0.00	115.00	57.50	214.76	246.22	340.58
2036	53,903	100	53,903	317	254	158.22	189.86	284.79	0.00	115.00	57.50	215.72	247.36	342.29
2037	54,231	100	54,231	317	254	159.18	191.01	286.52	0.00	115.00	57.50	216.68	248.51	344.02
2038	54,560	100	54,560	317	254	160.14	192.17	288.26	0.00	115.00	57.50	217.64	249.67	345.76
2039	54,892	100	54,892	317	254	161.12	193.34	290.01	0.00	115.00	57.50	218.62	250.84	347.51

夏季の汚水量予測

年	世帯数	下水道接続率(%)	下水道接続世帯数	消費水量原単位(L/世帯/日)	汚水量原単位(L/世帯/日)	汚水量(地下水含まず)(L/秒) 日平均($Q_{média}$)	日最大($Q_{média}$)	時間最大($Q_{média}$)	工業からの排水(L/秒)	管路延長(km)	地下水浸透量(L/秒)	工業からの排水、地下水浸透量を含めた汚水量(L/秒) 日平均($Q_{média}$)	日最大($Q_{média}$)	時間最大($Q_{média}$)
2018	44,736	100	44,736	566	453	234.45	281.34	422.01	0.00	115.00	57.50	291.95	338.84	479.51
2019	45,370	100	45,370	566	453	237.77	285.33	427.99	0.00	115.00	57.50	295.27	342.83	485.49
2020	46,015	100	46,015	566	453	241.15	289.38	434.07	0.00	115.00	57.50	298.65	346.88	491.57
2021	46,583	100	46,583	566	453	244.13	292.96	439.43	0.00	115.00	57.50	301.63	350.46	496.93
2022	47,161	100	47,161	566	453	247.16	296.59	444.89	0.00	115.00	57.50	304.66	354.09	502.39
2023	47,747	100	47,747	566	453	250.23	300.28	450.41	0.00	115.00	57.50	307.73	357.78	507.91
2024	48,342	100	48,342	566	453	253.35	304.02	456.03	0.00	115.00	57.50	310.85	361.52	513.53
2025	48,947	100	48,947	566	453	256.52	307.82	461.73	0.00	115.00	57.50	314.02	365.32	519.23
2026	49,448	100	49,448	566	453	259.14	310.97	466.46	0.00	115.00	57.50	316.64	368.47	523.96
2027	49,956	100	49,956	566	453	261.81	314.17	471.25	0.00	115.00	57.50	319.31	371.67	528.75
2028	50,470	100	50,470	566	453	264.50	317.40	476.10	0.00	115.00	57.50	322.00	374.90	533.60
2029	50,990	100	50,990	566	453	267.23	320.67	481.01	0.00	115.00	57.50	324.73	378.17	538.51
2030	51,517	100	51,517	566	453	269.99	323.98	485.98	0.00	115.00	57.50	327.49	381.48	543.48
2031	51,922	100	51,922	566	453	272.11	326.53	489.80	0.00	115.00	57.50	329.61	384.03	547.30
2032	52,330	100	52,330	566	453	274.25	329.10	493.65	0.00	115.00	57.50	331.75	386.60	551.15
2033	52,742	100	52,742	566	453	276.41	331.69	497.53	0.00	115.00	57.50	333.91	389.19	555.03
2034	53,159	100	53,159	566	453	278.59	334.31	501.47	0.00	115.00	57.50	336.09	391.81	558.97
2035	53,579	100	53,579	566	453	280.79	336.95	505.43	0.00	115.00	57.50	338.29	394.45	562.93
2036	53,903	100	53,903	566	453	282.49	338.99	508.48	0.00	115.00	57.50	339.99	396.49	565.98
2037	54,231	100	54,231	566	453	284.21	341.05	511.58	0.00	115.00	57.50	341.71	398.55	569.08
2038	54,560	100	54,560	566	453	285.93	343.12	514.68	0.00	115.00	57.50	343.43	400.62	572.18
2039	54,892	100	54,892	566	453	287.67	345.21	517.81	0.00	115.00	57.50	345.17	402.71	575.31

ベルチオガ：Centro下水処理場

冬季の汚水量

年	世帯数	下水道接続率 (%)	下水道接続世帯数	消費水量原単位 (L/世帯/日)	汚水量原単位 (L/世帯/日)	汚水量(地下水含まず) (L/秒) 日平均 ($Q_{média}$)	日最大 ($Q_{média}$)	時間最大 ($Q_{média}$)	工業からの排水 (L/秒)	管路延長(km)	地下水浸透量 (L/秒)	工業からの排水、地下水浸透量を含めた汚水量 (L/秒) 日平均 ($Q_{média}$)	日最大 ($Q_{média}$)	時間最大 ($Q_{média}$)
2018	18,318	100	18,318	309	247	52.41	62.89	94.34	0.00	80.27	40.13	92.54	103.02	134.47
2019	19,027	100	19,027	309	247	54.44	65.33	97.99	0.00	80.27	40.13	94.57	105.46	138.12
2020	19,763	100	19,763	309	247	56.54	67.85	101.78	0.00	80.27	40.13	96.67	107.98	141.91
2021	20,218	100	20,218	309	247	57.85	69.42	104.12	0.00	80.27	40.13	97.98	109.55	144.25
2022	20,684	100	20,684	309	247	59.18	71.02	106.52	0.00	80.27	40.13	99.31	111.15	146.65
2023	21,161	100	21,161	309	247	60.54	72.65	108.98	0.00	80.27	40.13	100.67	112.78	149.11
2024	21,650	100	21,650	309	247	61.94	74.33	111.50	0.00	80.27	40.13	102.07	114.46	151.63
2025	22,152	100	22,152	309	247	63.38	76.06	114.08	0.00	80.27	40.13	103.51	116.19	154.21
2026	22,608	100	22,608	309	247	64.68	77.62	116.43	0.00	80.27	40.13	104.81	117.75	156.56
2027	23,075	100	23,075	309	247	66.02	79.22	118.84	0.00	80.27	40.13	106.15	119.35	158.97
2028	23,552	100	23,552	309	247	67.38	80.86	121.29	0.00	80.27	40.13	107.51	120.99	161.42
2029	24,039	100	24,039	309	247	68.78	82.53	123.80	0.00	80.27	40.13	108.91	122.66	163.93
2030	24,536	100	24,536	309	247	70.20	84.24	126.36	0.00	80.27	40.13	110.33	124.37	166.49
2031	24,879	100	24,879	309	247	71.18	85.42	128.13	0.00	80.27	40.13	111.31	125.55	168.26
2032	25,228	100	25,228	309	247	72.18	86.62	129.92	0.00	80.27	40.13	112.31	126.75	170.05
2033	25,582	100	25,582	309	247	73.19	87.83	131.75	0.00	80.27	40.13	113.32	127.96	171.88
2034	25,942	100	25,942	309	247	74.22	89.07	133.60	0.00	80.27	40.13	114.35	129.20	173.73
2035	26,308	100	26,308	309	247	75.27	90.32	135.49	0.00	80.27	40.13	115.40	130.45	175.62
2036	26,653	100	26,653	309	247	76.26	91.51	137.26	0.00	80.27	40.13	116.39	131.64	177.39
2037	27,002	100	27,002	309	247	77.26	92.71	139.06	0.00	80.27	40.13	117.39	132.84	179.19
2038	27,357	100	27,357	309	247	78.27	93.93	140.89	0.00	80.27	40.13	118.40	134.06	181.02
2039	27,716	100	27,716	309	247	79.30	95.16	142.74	0.00	80.27	40.13	119.43	135.29	182.87

夏季の汚水量予測

年	世帯数	下水道接続率 (%)	下水道接続世帯数	消費水量原単位 (L/世帯/日)	汚水量原単位 (L/世帯/日)	汚水量(地下水含まず) (L/秒) 日平均 ($Q_{média}$)	日最大 ($Q_{média}$)	時間最大 ($Q_{média}$)	工業からの排水 (L/秒)	管路延長(km)	地下水浸透量 (L/秒)	工業からの排水、地下水浸透量を含めた汚水量(L/秒) 日平均 ($Q_{média}$)	日最大 ($Q_{média}$)	時間最大 ($Q_{média}$)
2018	18,318	100	18,318	558	446	94.64	113.57	170.36	0.00	80.27	40.13	134.77	153.70	210.49
2019	19,027	100	19,027	558	446	98.31	117.97	176.95	0.00	80.27	40.13	138.44	158.10	217.08
2020	19,763	100	19,763	558	446	102.11	122.53	183.80	0.00	80.27	40.13	142.24	162.66	223.93
2021	20,218	100	20,218	558	446	104.46	125.35	188.03	0.00	80.27	40.13	144.59	165.48	228.16
2022	20,684	100	20,684	558	446	106.87	128.24	192.36	0.00	80.27	40.13	147.00	168.37	232.49
2023	21,161	100	21,161	558	446	109.33	131.20	196.80	0.00	80.27	40.13	149.46	171.33	236.93
2024	21,650	100	21,650	558	446	111.86	134.23	201.35	0.00	80.27	40.13	151.99	174.36	241.48
2025	22,152	100	22,152	558	446	114.45	137.34	206.01	0.00	80.27	40.13	154.58	177.47	246.14
2026	22,608	100	22,608	558	446	116.81	140.17	210.25	0.00	80.27	40.13	156.94	180.30	250.38
2027	23,075	100	23,075	558	446	119.22	143.07	214.60	0.00	80.27	40.13	159.35	183.20	254.73
2028	23,552	100	23,552	558	446	121.69	146.02	219.03	0.00	80.27	40.13	161.82	186.15	259.16
2029	24,039	100	24,039	558	446	124.20	149.04	223.56	0.00	80.27	40.13	164.33	189.17	263.69
2030	24,536	100	24,536	558	446	126.77	152.12	228.18	0.00	80.27	40.13	166.90	192.25	268.31
2031	24,879	100	24,879	558	446	128.54	154.25	231.37	0.00	80.27	40.13	168.67	194.38	271.50
2032	25,228	100	25,228	558	446	130.34	156.41	234.62	0.00	80.27	40.13	170.47	196.54	274.75
2033	25,582	100	25,582	558	446	132.17	158.61	237.91	0.00	80.27	40.13	172.30	198.74	278.04
2034	25,942	100	25,942	558	446	134.03	160.84	241.26	0.00	80.27	40.13	174.16	200.97	281.39
2035	26,308	100	26,308	558	446	135.92	163.11	244.66	0.00	80.27	40.13	176.05	203.24	284.79
2036	26,653	100	26,653	558	446	137.71	165.25	247.87	0.00	80.27	40.13	177.84	205.38	288.00
2037	27,002	100	27,002	558	446	139.51	167.41	251.12	0.00	80.27	40.13	179.64	207.54	291.25
2038	27,357	100	27,357	558	446	141.34	169.61	254.42	0.00	80.27	40.13	181.47	209.74	294.55
2039	27,716	100	27,716	558	446	143.20	171.84	257.76	0.00	80.27	40.13	183.33	211.97	297.89

ベルチオガ：Vista Linda下水処理場

冬季の汚水量

年	世帯数	下水道接続率 (%)	下水道接続世帯数	消費水量原単位 (L/世帯/日)	汚水量原単位 (L/世帯/日)	汚水量(地下水含まず) (L/秒) 日平均 ($Q_{média}$)	日最大 ($Q_{média}$)	時間最大 ($Q_{média}$)	工業からの排水 (L/秒)	管路延長(km)	地下水浸透量 (L/秒)	工業からの排水、地下水浸透量を含めた汚水量 (L/秒) 日平均 ($Q_{média}$)	日最大 ($Q_{média}$)	時間最大 ($Q_{média}$)
2018	10,515	100	10,515	309	247	30.12	36.14	54.21	0.00	134.66	67.33	97.45	103.47	121.54
2019	10,922	100	10,922	309	247	31.28	37.54	56.31	0.00	134.66	67.33	98.61	104.87	123.64
2020	11,344	100	11,344	309	247	32.49	38.99	58.49	0.00	134.66	67.33	99.82	106.32	125.82
2021	11,605	100	11,605	309	247	33.24	39.89	59.83	0.00	134.66	67.33	100.57	107.22	127.16
2022	11,873	100	11,873	309	247	34.01	40.81	61.21	0.00	134.66	67.33	101.34	108.14	128.54
2023	12,147	100	12,147	309	247	34.79	41.75	62.63	0.00	134.66	67.33	102.12	109.08	129.96
2024	12,427	100	12,427	309	247	35.60	42.71	64.07	0.00	134.66	67.33	102.93	110.04	131.40
2025	12,715	100	12,715	309	247	36.42	43.70	65.56	0.00	134.66	67.33	103.75	111.03	132.89
2026	12,977	100	12,977	309	247	37.17	44.60	66.91	0.00	134.66	67.33	104.50	111.93	134.24
2027	13,245	100	13,245	309	247	37.94	45.53	68.29	0.00	134.66	67.33	105.27	112.86	135.62
2028	13,519	100	13,519	309	247	38.72	46.47	69.70	0.00	134.66	67.33	106.05	113.80	137.03
2029	13,799	100	13,799	309	247	39.52	47.43	71.14	0.00	134.66	67.33	106.85	114.76	138.47
2030	14,084	100	14,084	309	247	40.34	48.41	72.61	0.00	134.66	67.33	107.67	115.74	139.94
2031	14,281	100	14,281	309	247	40.90	49.09	73.63	0.00	134.66	67.33	108.23	116.42	140.96
2032	14,481	100	14,481	309	247	41.48	49.77	74.66	0.00	134.66	67.33	108.81	117.10	141.99
2033	14,684	100	14,684	309	247	42.06	50.47	75.71	0.00	134.66	67.33	109.39	117.80	143.04
2034	14,891	100	14,891	309	247	42.65	51.18	76.77	0.00	134.66	67.33	109.98	118.51	144.10
2035	15,101	100	15,101	309	247	43.25	51.91	77.86	0.00	134.66	67.33	110.58	119.24	145.19
2036	15,299	100	15,299	309	247	43.82	52.58	78.88	0.00	134.66	67.33	111.15	119.91	146.21
2037	15,499	100	15,499	309	247	44.39	53.27	79.91	0.00	134.66	67.33	111.72	120.60	147.24
2038	15,703	100	15,703	309	247	44.98	53.97	80.96	0.00	134.66	67.33	112.31	121.30	148.29
2039	15,910	100	15,910	309	247	45.57	54.68	82.02	0.00	134.66	67.33	112.90	122.01	149.35
+Sao Lorenç									0.00	134.66	67.33	140.59	155.23	199.18

夏季の汚水量予測

年	世帯数	下水道接続率 (%)	下水道接続世帯数	汚水量原単位 (L/世帯/日)	汚水量原単位 (L/世帯/日)	汚水量(地下水含まず) (L/秒) 日平均 ($Q_{média}$)	日最大 ($Q_{média}$)	時間最大 ($Q_{média}$)	工業からの排水 (L/秒)	管路延長(km)	地下水浸透量 (L/秒)	工業からの排水、地下水浸透量を含めた汚水量(L/秒) 日平均 ($Q_{média}$)	日最大 ($Q_{média}$)	時間最大 ($Q_{média}$)
2018	10,515	100	10,515	558	446	54.33	65.19	97.79	0.00	134.66	67.33	121.66	132.52	165.12
2019	10,922	100	10,922	558	446	56.43	67.72	101.57	0.00	134.66	67.33	123.76	135.05	168.90
2020	11,344	100	11,344	558	446	58.61	70.33	105.50	0.00	134.66	67.33	125.94	137.66	172.83
2021	11,605	100	11,605	558	446	59.96	71.95	107.93	0.00	134.66	67.33	127.29	139.28	175.26
2022	11,873	100	11,873	558	446	61.34	73.61	110.42	0.00	134.66	67.33	128.67	140.94	177.75
2023	12,147	100	12,147	558	446	62.76	75.31	112.97	0.00	134.66	67.33	130.09	142.64	180.30
2024	12,427	100	12,427	558	446	64.21	77.05	115.57	0.00	134.66	67.33	131.54	144.38	182.90
2025	12,715	100	12,715	558	446	65.69	78.83	118.25	0.00	134.66	67.33	133.02	146.16	185.58
2026	12,977	100	12,977	558	446	67.05	80.46	120.69	0.00	134.66	67.33	134.38	147.79	188.02
2027	13,245	100	13,245	558	446	68.43	82.12	123.18	0.00	134.66	67.33	135.76	149.45	190.51
2028	13,519	100	13,519	558	446	69.85	83.82	125.73	0.00	134.66	67.33	137.18	151.15	193.06
2029	13,799	100	13,799	558	446	71.29	85.55	128.33	0.00	134.66	67.33	138.62	152.88	195.66
2030	14,084	100	14,084	558	446	72.77	87.32	130.98	0.00	134.66	67.33	140.10	154.65	198.31
2031	14,281	100	14,281	558	446	73.79	88.54	132.81	0.00	134.66	67.33	141.12	155.87	200.14
2032	14,481	100	14,481	558	446	74.82	89.78	134.67	0.00	134.66	67.33	142.15	157.11	202.00
2033	14,684	100	14,684	558	446	75.87	91.04	136.56	0.00	134.66	67.33	143.20	158.37	203.89
2034	14,891	100	14,891	558	446	76.94	92.32	138.49	0.00	134.66	67.33	144.27	159.65	205.82
2035	15,101	100	15,101	558	446	78.02	93.63	140.44	0.00	134.66	67.33	145.35	160.96	207.77
2036	15,299	100	15,299	558	446	79.04	94.85	142.28	0.00	134.66	67.33	146.37	162.18	209.61
2037	15,499	100	15,499	558	446	80.08	96.09	144.14	0.00	134.66	67.33	147.41	163.42	211.47
2038	15,703	100	15,703	558	446	81.13	97.36	146.04	0.00	134.66	67.33	148.46	164.69	213.37
2039	15,910	100	15,910	558	446	82.20	98.64	147.96	0.00	134.66	67.33	149.53	165.97	215.29
+Sao Lorenç									0.00	134.66	67.33	177.22	199.19	265.12

添付資料 6.3
本邦技術の詳細情報

・本邦企業へのヒアリング

本文 6 章（1）で挙げた我が国が強みを持つテーマと本事業のスコープを踏まえ、調査団は、表 6.1 の技術を有する主要な企業（特に汚泥処理製品を有する企業）13 社にコンタクトした。そのうち関心を表明した 11 社に対しアンケートとインタビューによるヒアリングを行った。各社が推奨する技術／製品と中南米地域での販売実績を下表に示す。なお、この中で半分は SABESP に対するオンラインでのプレゼンテーションに積極的な関心を示し、残りも要請や現地の関心があればプレゼン可とのことだった。

表6.1 ヒアリングした本邦企業と推奨技術、販売実績（技術テーマ別）

No.	企業名	推奨技術／製品	販売実績		
			ﾌﾞﾗｼﾞﾙ	米州	海外
①循環型経済の理念に配慮した有効活用策（発電、肥料生産等）を含む汚泥処理方法（6.1.2 に対応）					
1	月島機械㈱	インクラインドディスク型汚泥乾燥機、円環式乾燥機、多段式乾燥機⇒乾燥汚泥有効利用	×	×	多数
2	日立造船㈱	固体酸化物型燃料電池（SOFC）	×	×	×
②下水道設備における固形廃棄物の対応策（6.1.4 に対応）					
3	新明和工業㈱	**スクリーン**、汚水ポンプ、ターボブロワ	○	多数	多数
(3)	前澤工業㈱	**ユニットピンラック式除塵機**	×	×	ﾍﾞﾄﾅﾑ
③サントス湾及びサントス市等河口港地域での水質モニタリングシステム（6.1.4 に対応）					
4	㈱堀場ｱﾄﾞﾊﾞﾝｽﾄﾞﾃｸﾉ	**自動水質測定装置**、有機性汚濁物質測定装置、工業用水質計各種	○	×	多数
5	横河ｿﾘｭｰｼｮﾝｻｰﾋﾞｽ㈱	DCS/SCADA、漏水管理システム、下水処理場曝気風量制御の最適化、**各種水質計測機器・システム**	○	多数	多数
④下水処理場省エネ機器					
6	三機工業㈱	**低圧損型メンブレンパネル式散気装置**、DHS システム	○	多数	多数
7	㈱電業社機械製作所	**多段ブロワ**（AM-Turbo）	×	×	多数
8	アムコン㈱	**ヴァルート式汚泥脱水機**	○	多数	多数
9	㈱石垣	**スクリュープレス式汚泥脱水機**	×	多数	多数
⑤その他（管路等）					
10	㈱イセキ開発工機	**長距離・曲線推進工法**（アンクルモール）	○	×	多数
11	㈱荏原製作所	汎用ポンプ、大型・高圧ポンプ	○	多数	多数

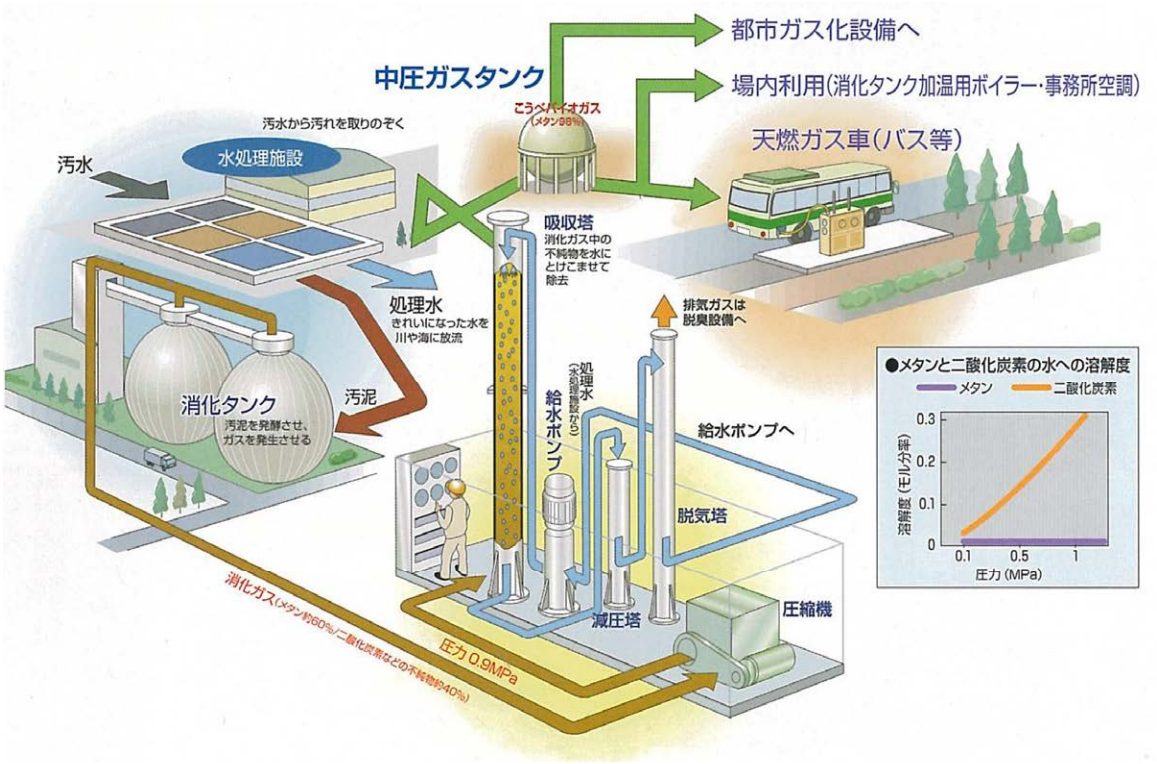
注：各テーマに特に沿った製品を太字で示した。業務計画書で示した栗田工業㈱: 汚泥発電「消化促進による汚泥減量・消化ガス発電」についてはコンタクトの結果、海外対応を行っていないことが判明した。販売実績の米州はブラジルを除く北米・中南米各国

出典: 調査団

・神戸市におけるバイオガスの精製及び都市ガス化の概要

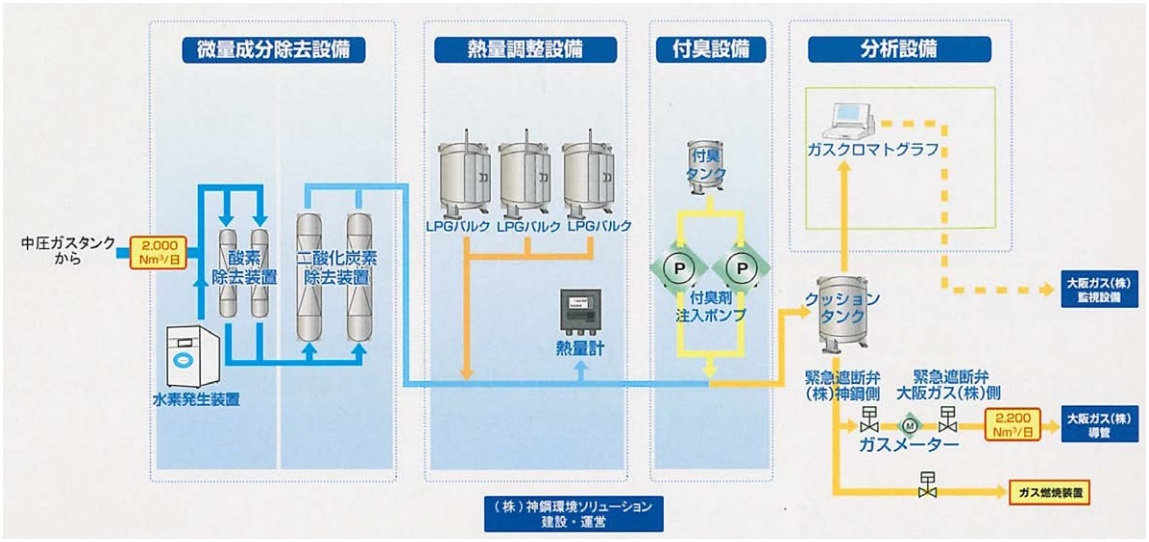
神戸市東灘処理場では従来、場内のボイラや空調で利用していたが、全量は利用できずに燃焼処分していた。この消化ガスの全量有効利用を目指し、効率的かつ安全にバイオガスを精製する設備を建設し、2008 年より天然ガス車へ供用開始している（こうべバイオガス）。フローを図 6.1 に示す。さらに 2010 年 9 月よりこうべバイオガスを更に都市ガス化設備で精製し、都市ガスと同等の水準にしてから、大阪ガスのガス導管に供給している。このガスは都市ガスとして家庭や工場等に供給されている。（図 6.2 参照）

ただし、このシステムを構築した企業はシステム自体が大変大がかりなことから、外国での建設は高コストとなるため、外国への本システムの輸出は困難としている。



出典: 神戸市パンフレット

図6.1　バイオガス精製設備のフロー

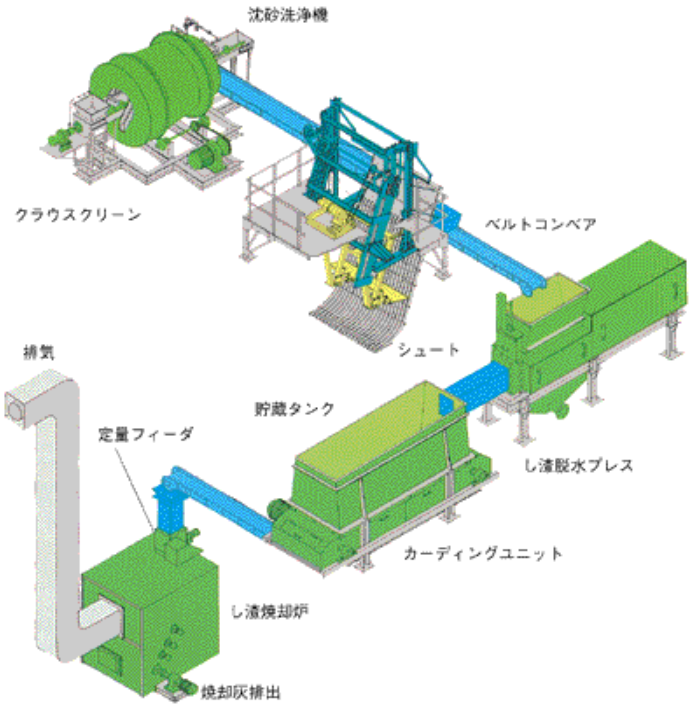


出典: 神戸市パンフレット

図6.2　都市ガス化設備フロー

・「し渣処理トータルシステム」(水道機工㈱)の概要

沈砂洗浄機およびクラウスクリーンで掻き上げられたし渣をベルトコンベアでし渣脱水機に搬送させる。含水率 80～90%のし渣を脱水プレスで含水率を 60%以下まで脱水し、体積を約 50%まで減少させる。脱水後、シュータを経てし渣分解機に搬送される。分解後は貯蔵機能も有し、定量フィーダで一定量焼却炉へ搬入する。し渣焼却炉の燃焼室は温度 800℃前後に保たれ、完全燃焼される。焼却灰は沈砂池へ搬送され、クローズドシステムとなる。(図 6.3)



出典: 水道機工㈱ウェブサイト

図6.3　しさ処理トータルシステムフロー

しかし本システムもバイオガス精製設備と同様に大がかりで高コストな施設となり現地への輸出や設置も困難となることから、取扱企業が海外対応をしていない。

従い、今回対象地域での対策としては、前処理工程での通常機器として①耐久性や機能性の高い機械式スクリーン（除塵機）の設置、②沈砂池の適宜追加と沈砂ポンプの導入、が考えられる。いずれも本邦企業がブラジルへの輸出や現地子会社による納入により対応可能な機器である。

・水質モニタリングシステム

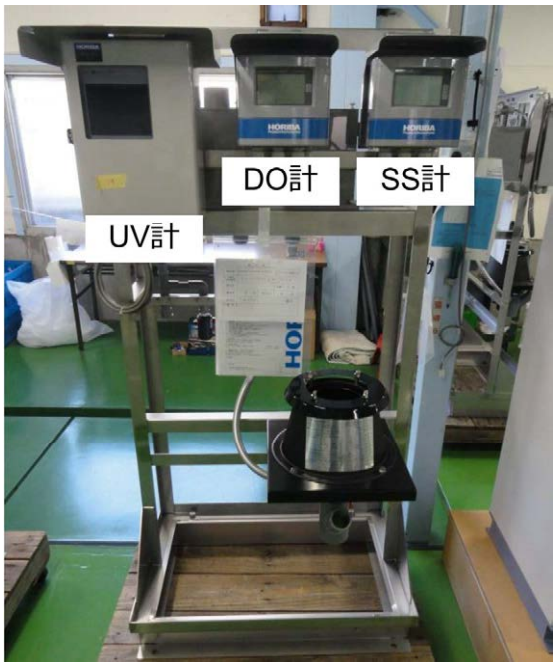
前段円借款事業の環境モニタリングコンポーネントには、①モニタリングセンターの建設、②水質自動観測機器の設置、③汚染源モニタリング装置の設置、などが含まれていたが、サンパウロ州環境公社（Companhia Ambiental do Estado de São Paulo、「CETESB」）との役割分担が明確でないことや、対象地域の下水処理場や SABESP の地域事務所に設置されている施設や機材で十分対応が可能であるという判断から、本事業のスコープから外すことが SABESP と合意された。一方、同地域の水質モニタリング計画は未整備であり、公共用水域の水質モニタリングの実施体制は脆弱であったことから、技術協力（2010～2013 年度「サンパウロ州沿岸部における環境モニタリングプロジェクト」（円借款附帯プロジェクト））を実施することとなった。円借款附帯プロジェクトの中で、①については、下水処理場内の簡易ラボやバイシャーダ・サンチスタ地域衛生管理課（「RSOC」）に代替の既存機能があることから、これらの能力強化を図り、②・③については、下水処理場のオペレーターや RSOC による定期的な定点モニタリングにより対応が可能であるとされた。

この円借款附帯プロジェクトは、専門家（10M/M）ならびに機材供与の投入がなされ、ベースライン調査、環境モニタリング計画の策定業務、環境モニタリングマニュアル作成などの活動は、2011 年 1 月までに実施された。2011 年 1 月以降、計画に基づき、環境モニタリング活動が、2013 年まで全 9 回実施された。活動内容は、バイシャーダ・サンチスタ地域の 23 カ所における、糞便性大腸菌の含有率と富栄養化のモニタリングであった。海や河川に直接下水が流れている箇所は、糞便性大腸菌の数が 10,000 個／100ml を超えていたのに対して、下水処理が施され放流されている箇所は、2,500 個／100ml 以下に抑えられていたことが確認された。他方、富栄養化を測る窒素については、推奨される制限値が、それぞれ、硝酸性窒素は 0.1mg/l、ケルダール窒素は 0.25mg/l であるのに対し、モニタリング箇所は、いずれも全窒素量が 0.2mg/l 程度に抑えられていた。リンは制限値（0.02mg/l）を超えている箇所もあったが、下水処理水の放流箇所については、富栄養化は抑えられていた。従い、下水処理水を放流している箇所について、大きな問題は確認されなかったと言える。

前段円借款事業事後報告によれば、さらに SABESP は CETESB と協力し、サンパウロ州沿岸地域 300 カ所の水質の定点モニタリングを実施している。

本調査業務の仕様書では「サントス湾及びサントス市/サン・ビセンテ市河口港地域の新規構築予定の水質モニタリングシステムで適用可能な技術を検討し、水質モニタリングシステム計画（パラメーターや観測地点の検討を含む）を立案する。」とある。

上記の円借款附帯プロジェクトでの 23 箇所、さらに 300 箇所の定点モニタリング地点とその継続状況、現状の関係機関の役割分担、新規構築予定の水質モニタリングシステムの内容を確認し、さらに今後の SABESP や適宜 CETESB、RSOC との協議を踏まえ、最適な水質モニタリングシステムを提案する。なお、SABESP に 2020 年 11 月から 2021 年 4 月にかけて水質モニタリング機器を納入した本邦企業（※㈱堀場アドバンスドテクノ）によれば、SABESP はサンパウロ市内等で「主要河川汚染除去プロジェクト」を自己資金で実施しており、主要河川に相関式により COD の換算濃度（精度は低いが BOD も参考値として換算可能）を測定できる有機性汚濁物質測定装置（UV 計）を設置し自動計測しており、さらにオプションとして溶存酸素（DO）計、懸濁物質（SS）計も合わせて設置している。この事例では自動計測したデータを下水処理場や SABESP 事務所に無線で送る機能は有していないため、その必要性等を今後 SABESP 等と協議する。そのようなシステム構築が可能であることは、中央監視システムに詳しい本邦企業（※横河ソリューションサービス㈱）に確認した。また、モニタリング地点に応じた設置方法や盗難対策についても重要事項として協議の必要がある。



出典: 取扱企業カタログ

図6.4　有機性汚濁物質測定装置（UV 計）イメージ

・RSOC が処理水を中心に実施している水質モニタリングの実施体制（2016 年時点）

表6.2 RS による水質モニタリングの実施体制概要

検査対象	主な検査項目	実施者	頻度
浄水場	濁度、色度、pH 値、残留塩素	浄水場内職員	毎日 2～4 時間ごとにサンプリング
下水処理場	流入 BOD 濃度、処理水 BOD 濃度、pH 値、大腸菌群、浮遊物質量	処理場内職員	毎日 2～4 時間ごとにサンプリング
下水ポンプ場での臭気濃度測定	臭気濃度測定、固形物の確認（必要に応じて除去）	管轄の RS 支局職員	3 日～1 週間のサイクルで担当設備を検査
放流先河川の水質検査	放流ポイントを基点に川上・川下の BOD 濃度、pH 値、大腸菌群、浮遊物質量	管轄の RS 支局職員	月に 2 回程度
1 次処理のみの下水処理場からの放流先（海岸から 2km 先）	溶存酸素、pH 値、塩分	管轄の RS 支局職員	2 カ月～3 カ月ごと

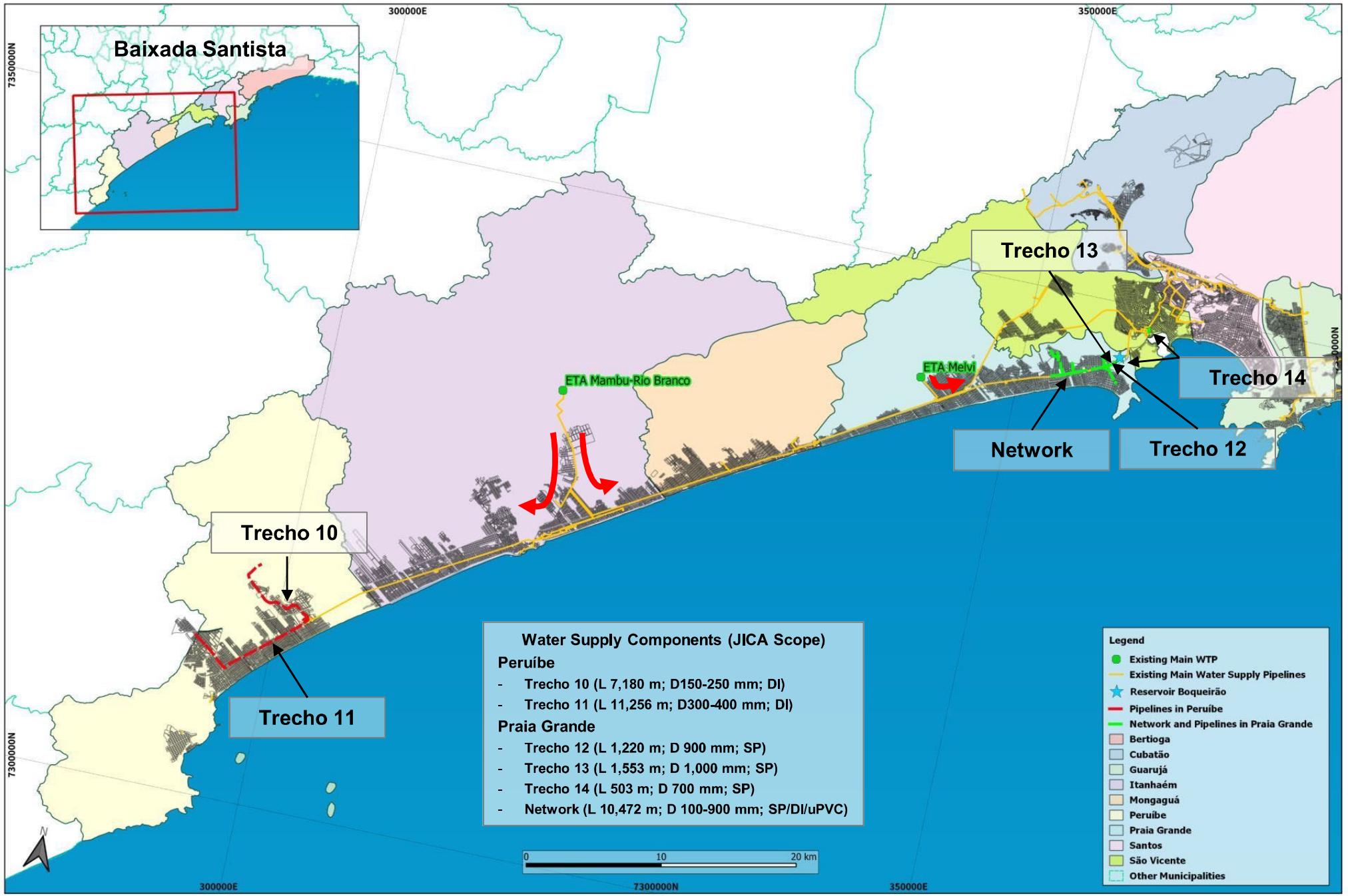
出典: 事後評価報告（実施機関提供等による）

サントス湾及びサントス市/サン・ビセンテ市河口港地域が対象であるため、対象の水質指標は「放流先河川の水質検査」、「1 次処理のみの下水処理場からの放流先」（海洋放流）より BOD、pH、大腸菌群数、浮遊物質量（SS）、溶存酸素から選択、またはその全てを対象とする可能性が高いと言える。

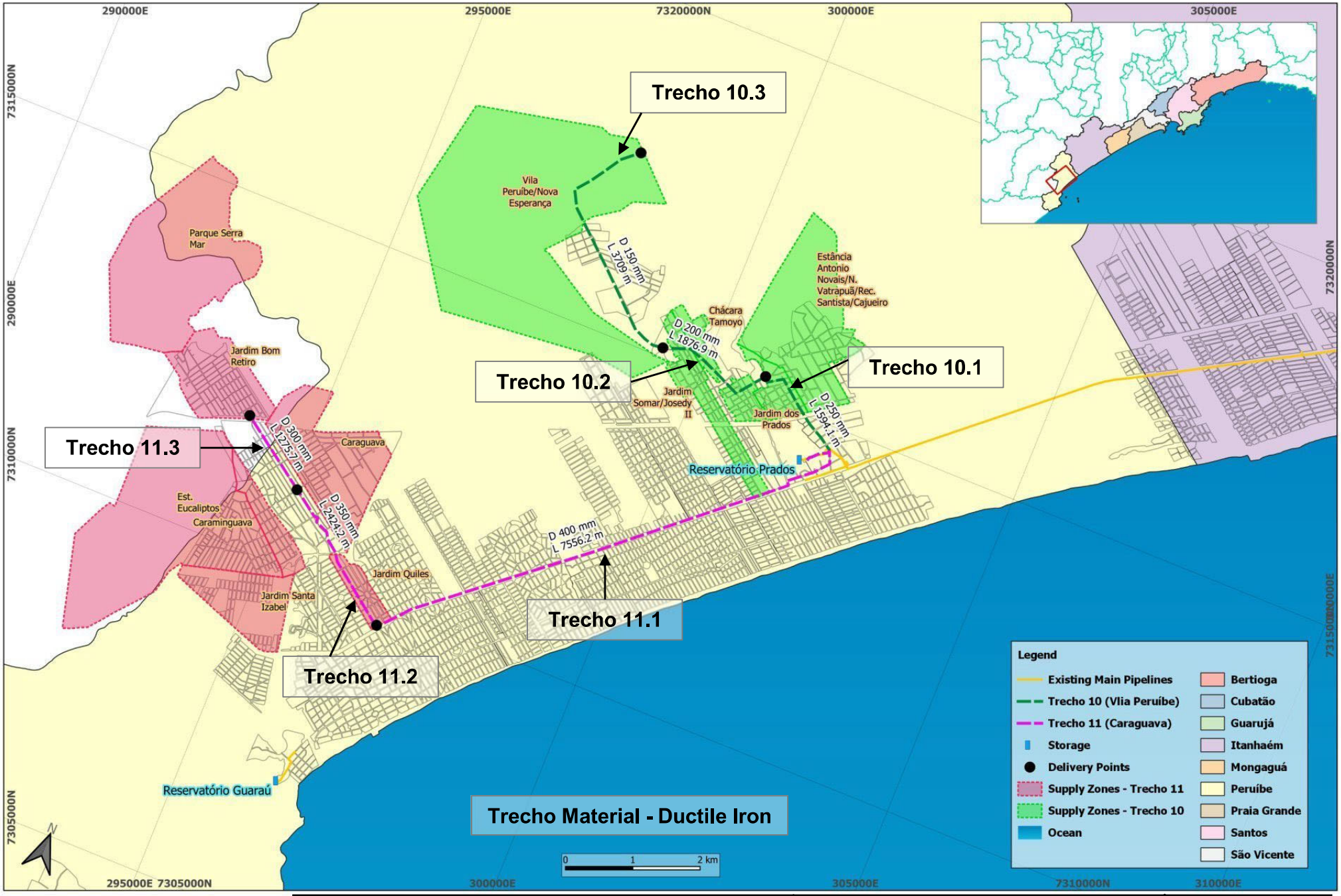
添付資料 7.1
概略設計図面
（上水送配水管、配水池・ポンプ場）

水道施設図面リスト

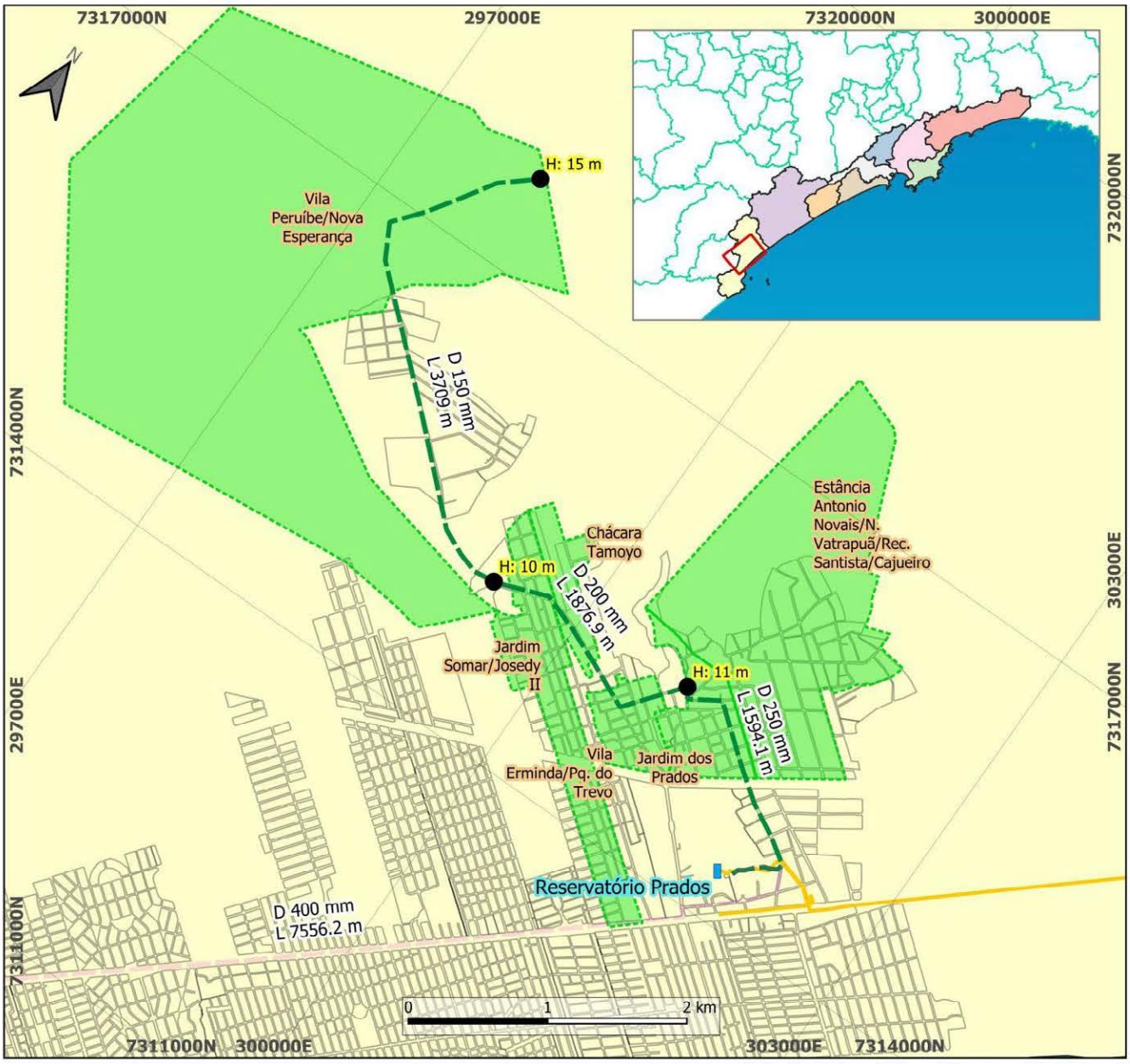
図番号	図面名
1. 全体平面図	
1-1	事業全体平面図
2. ペルイベ配水拡張本管	
2-1	全体平面図
2-2	配水本管 Trecho 10 平面・縦断図(1/2)
2-3	配水本管 Trecho 10 平面・縦断図(2/2)
2-4	配水本管 Trecho 11 平面・縦断図(1/2)
2-5	配水本管 Trecho 11 平面・縦断図(2/2)
2-6	配水本管 Trecho10 および Trecho11 分岐部バルブ室平面図
3. プライア・グランデ送配水増強施設	
3-1	全体平面図
3-2	送水管 Trecho 12 平面・縦断図
3-3	配水本管 Trecho 13 平面・縦断図
3-4	緊急送水管 Trecho 14 平面・縦断図
3-5	Boqueirao 配水区配水管平面図
3-6	Boqueirao 配水池・ポンプ場一般平面図
3-7	Boqueirao 配水池一般構造図
3-8	Boqueirao ポンプ場一般構造図・設備配置図



Project Name	Drawing Name	Scale	1/250,000
ブラジル国サンパウロ州沿岸部衛生・環境改善事業準備調査	事業全体平面図	No.	1-1



Project Name	Drawing Name	Scale	1/50,000
ブラジル国サンパウロ州沿岸部衛生・環境改善事業準備調査	全体平面図	No.	2-1



Projection System: Universal Transverse Mercator
Datum: Sirgas 2000
Scale: 1:40.000

Peruíbe - Trecho 10 - Plan & Profile

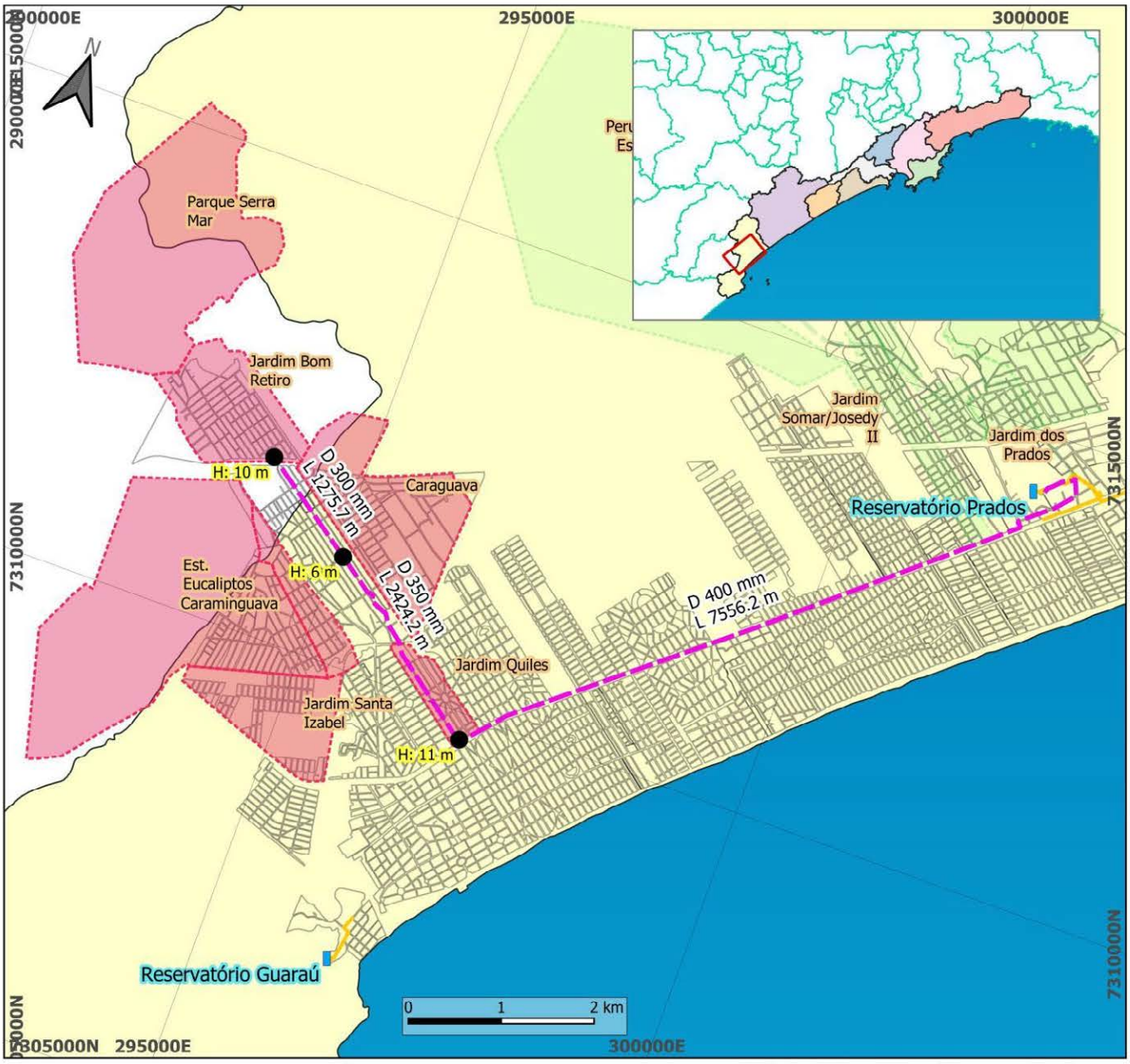
Legend

- Existing Main Pipelines
- Trecho 10 (Vlia Peruíbe)
- Storage
- Delivery Points
- Supply Zones - Trecho 10
- Ocean
- Bertioga
- Cubatão
- Guarujá
- Itanhaém
- Mongaguá
- Peruíbe
- Praia Grande
- Santos
- São Vicente

Scale 1/40,000
No. 2-2

Drawing Name
配水本管Trecho10平面・縦断図(1/2)

Project Name
ブラジル国サンパウロ州沿岸部衛生・環境改善事業準備調査



Projection System: Universal Transverse Mercator
Datum: Sirgas 2000
Scale: 1:60.000

Peruíbe - Trecho 11 - Plan & Profile

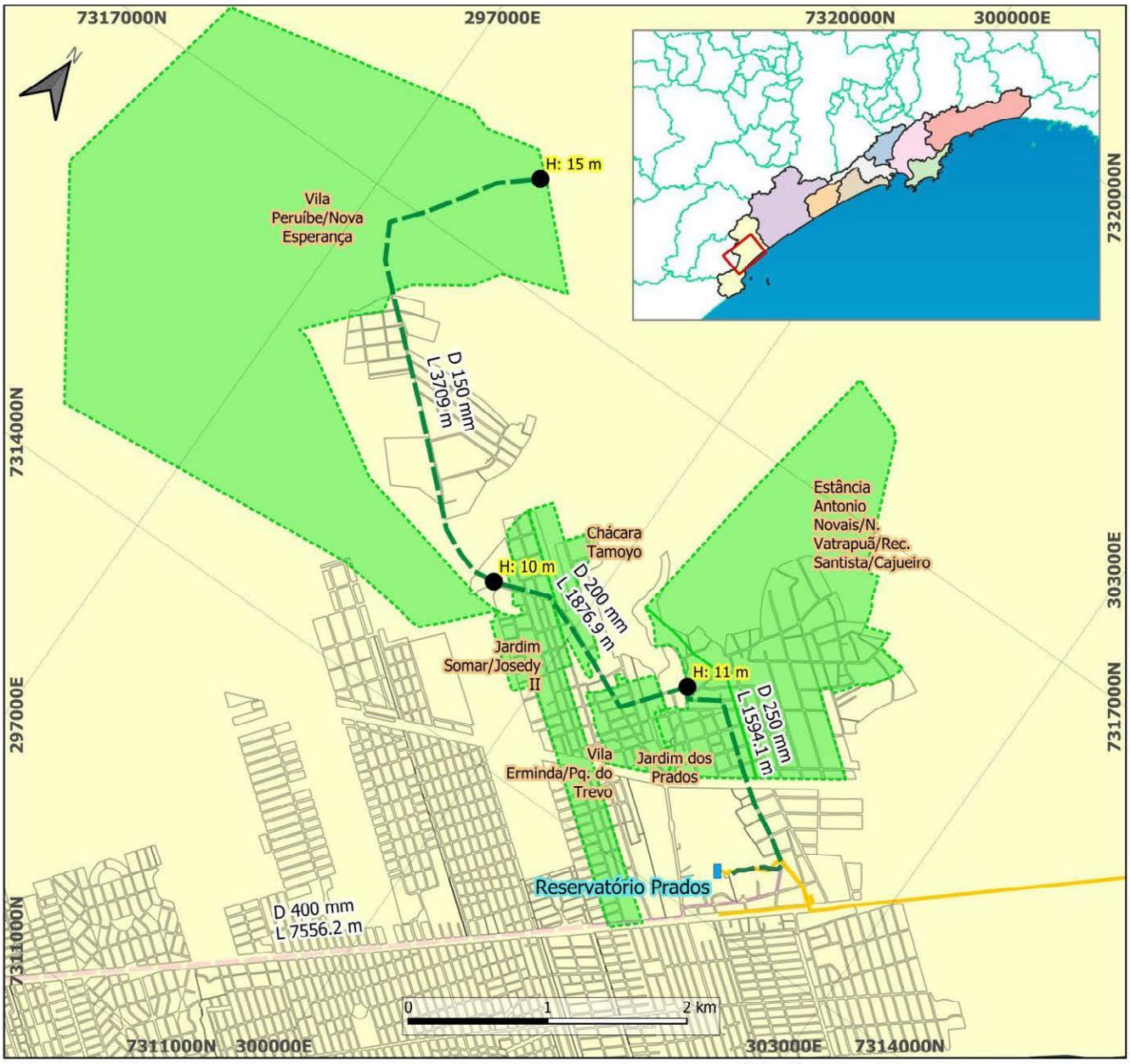
Legend

- Existing Main Pipelines
- Trecho 11 (Caraguava)
- Storage
- Delivery Points
- Supply Zones - Trecho 11
- Ocean
- Bertioga
- Cubatão
- Guarujá
- Itanhaém
- Mongaguá
- Peruíbe
- Praia Grande
- Santos
- São Vicente

Scale 1/60,000
No. 2-3

Drawing Name
配水本管Trecho10平面・縦断図(2/2)

Project Name
ブラジル国サンパウロ州沿岸部衛生・環境改善事業準備調査



Projection System: Universal Transverse Mercator
Datum: Sirgas 2000
Scale: 1:40.000

Peruíbe - Trecho 10 - Plan & Profile

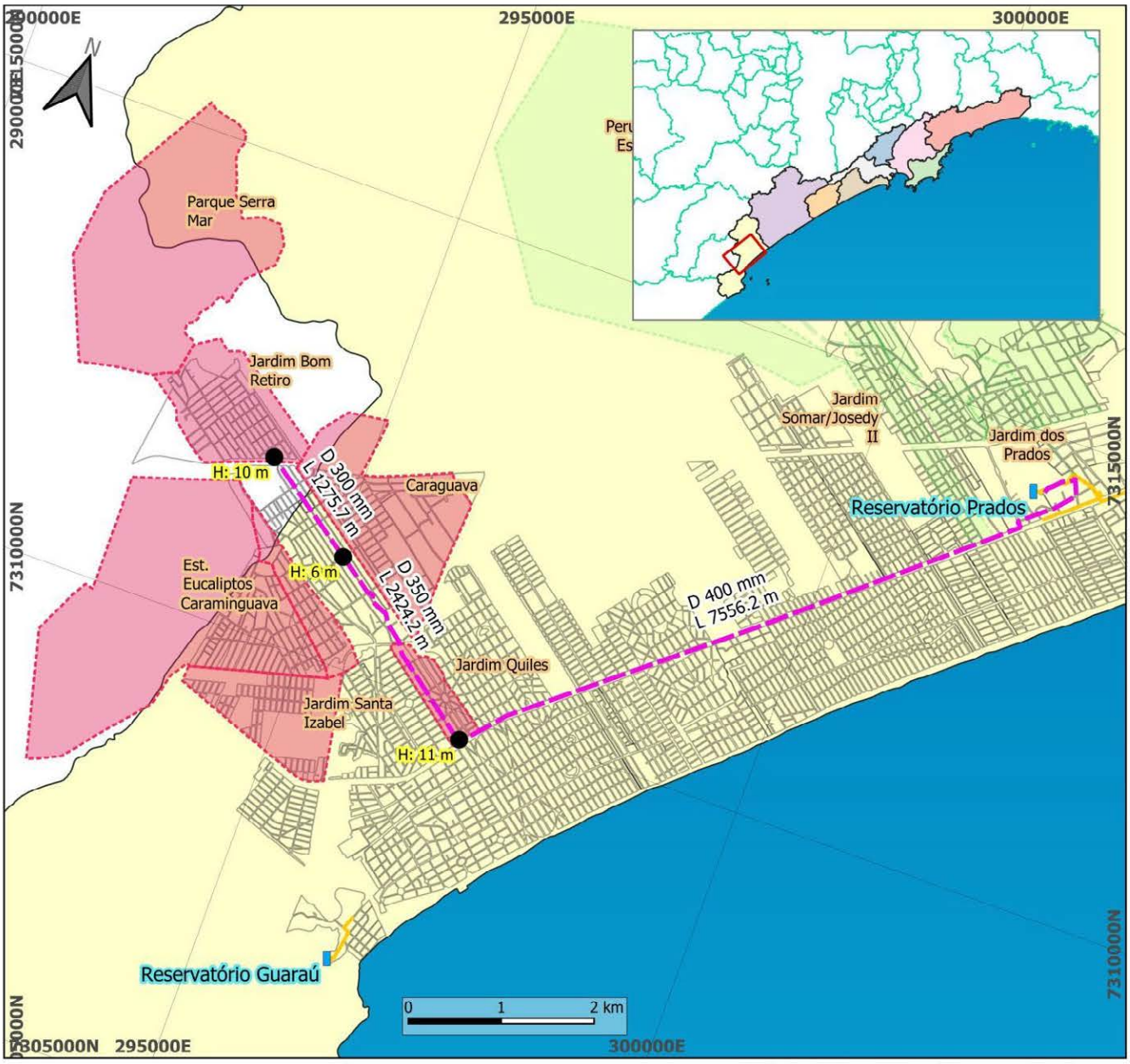
Legend

- Existing Main Pipelines
- Trecho 10 (Vlia Peruíbe)
- Storage
- Delivery Points
- Supply Zones - Trecho 10
- Ocean
- Bertioga
- Cubatão
- Guarujá
- Itanhaém
- Mongaguá
- Peruíbe
- Praia Grande
- Santos
- São Vicente

Scale 1/40,000
No. 2-4

Drawing Name
配水本管Trecho11平面・縦断図(1/2)

Project Name
ブラジル国サンパウロ州沿岸部衛生・環境改善事業準備調査



Projection System: Universal Transverse Mercator
Datum: Sirgas 2000
Scale: 1:60.000

Peruíbe - Trecho 11 - Plan & Profile

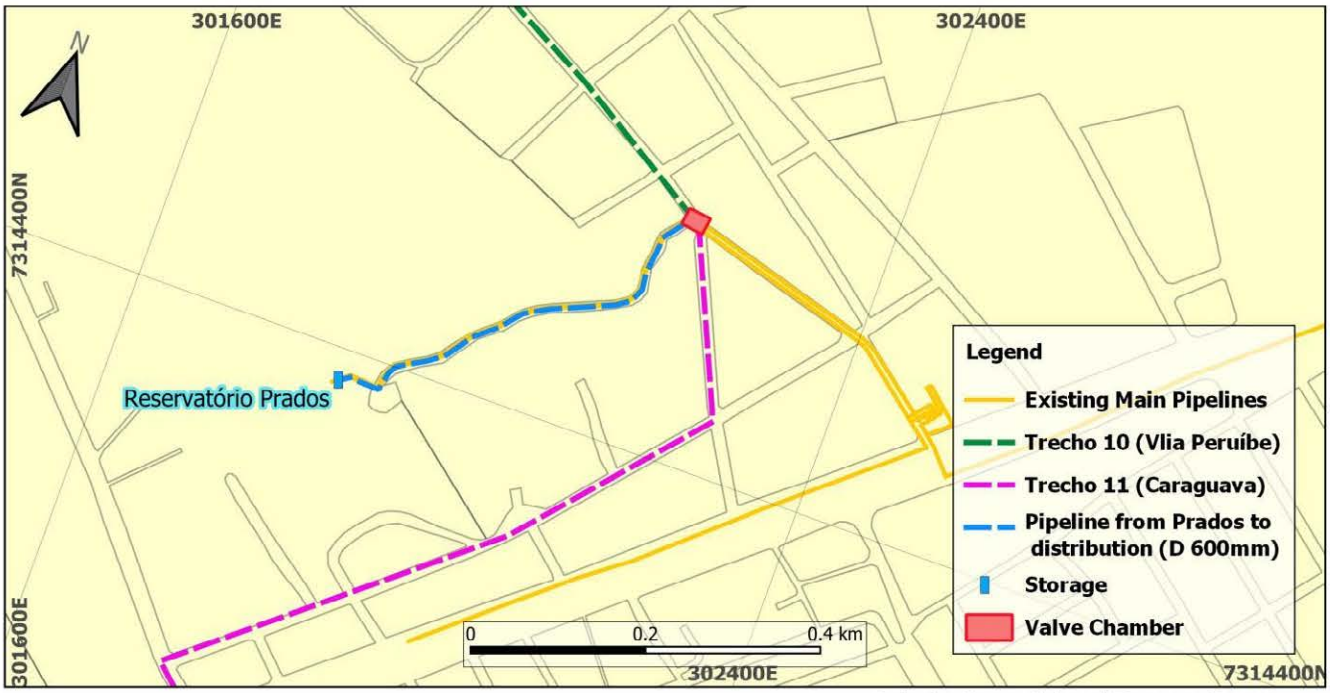
Legend

- Existing Main Pipelines
- Trecho 11 (Caraguava)
- Storage
- Delivery Points
- Supply Zones - Trecho 11
- Ocean
- Bertioga
- Cubatão
- Guarujá
- Itanhaém
- Mongaguá
- Peruíbe
- Praia Grande
- Santos
- São Vicente

Scale 1/60,000
No. 2-5

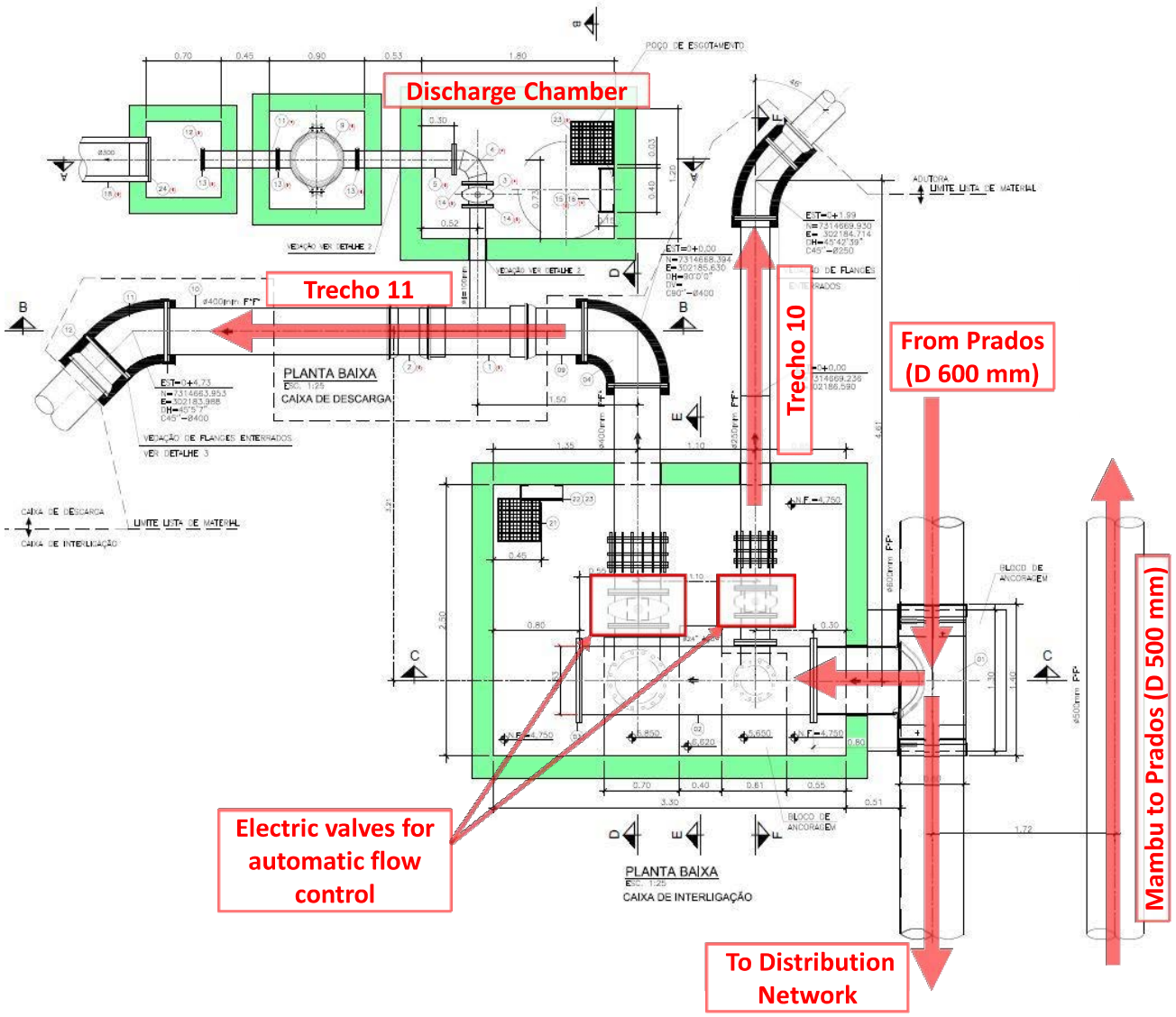
Drawing Name
配水本管Trecho11平面・縦断図(2/2)

Project Name
ブラジル国サンパウロ州沿岸部衛生・環境改善事業準備調査



Peruíbe - Trecho 10 and 11 - Valve Chamber

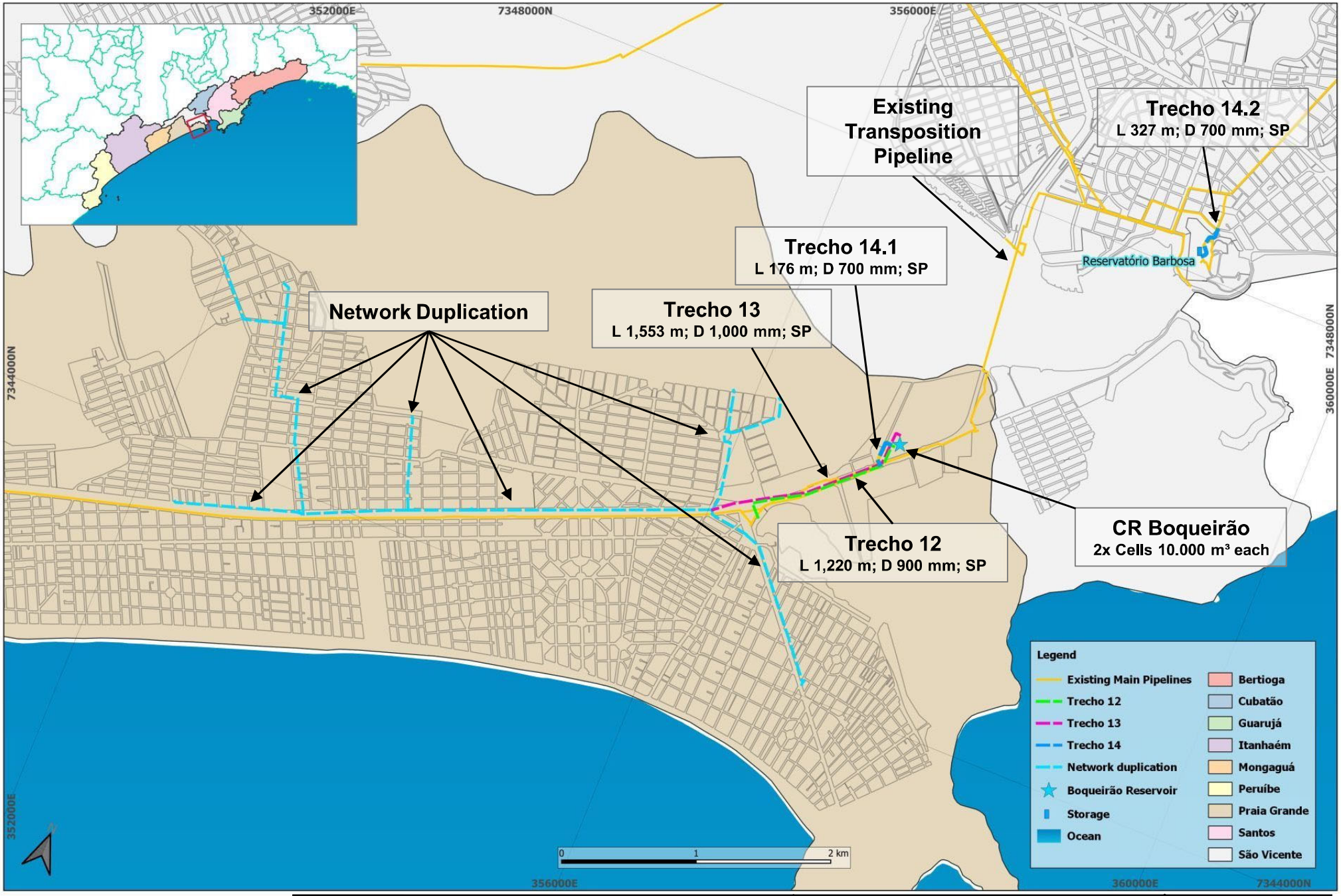
Projection System: Universal Transverse Mercator
Datum: Sirgas 2000
Scale: 1:7.500



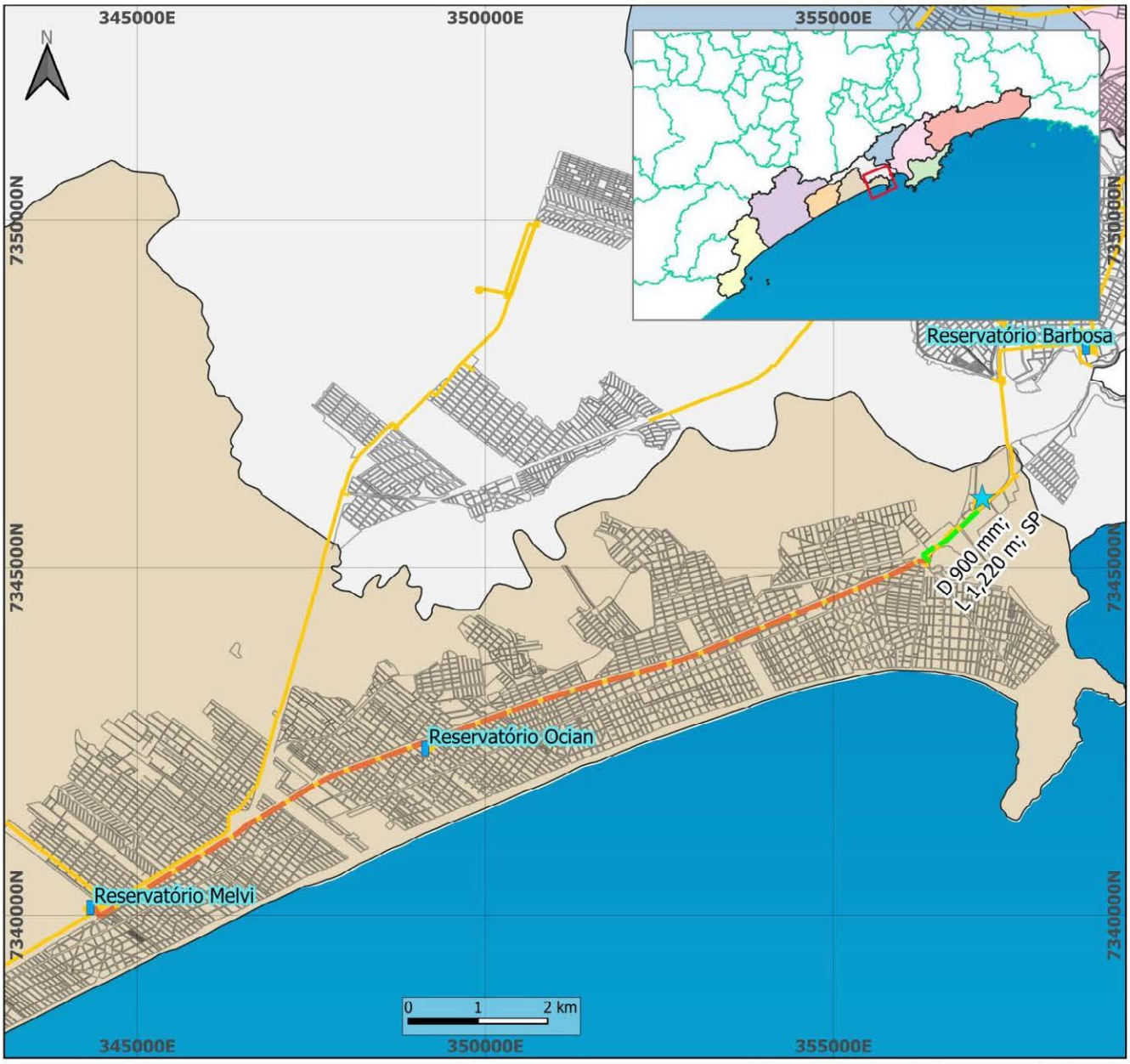
Scale 1/7,500
No. 2-6

Drawing Name
配水本管Trecho10および
Trecho11分岐部バルブ室平面図

Project Name
ブラジル国サンパウロ州沿岸部衛生・環境改善事業準備調査

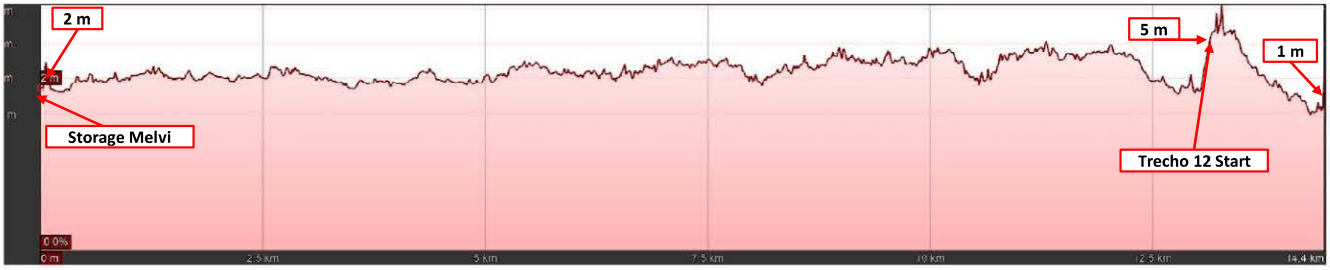


Project Name	Drawing Name	Scale	1/50,000
ブラジル国サンパウロ州沿岸部衛生・環境改善事業準備調査	全体平面図	No.	3-1



Projection System: Universal Transverse Mercator
Datum: Sirgas 2000
Scale: 1:80.000

Praia Grande - Trecho 12 - Plan & Profile



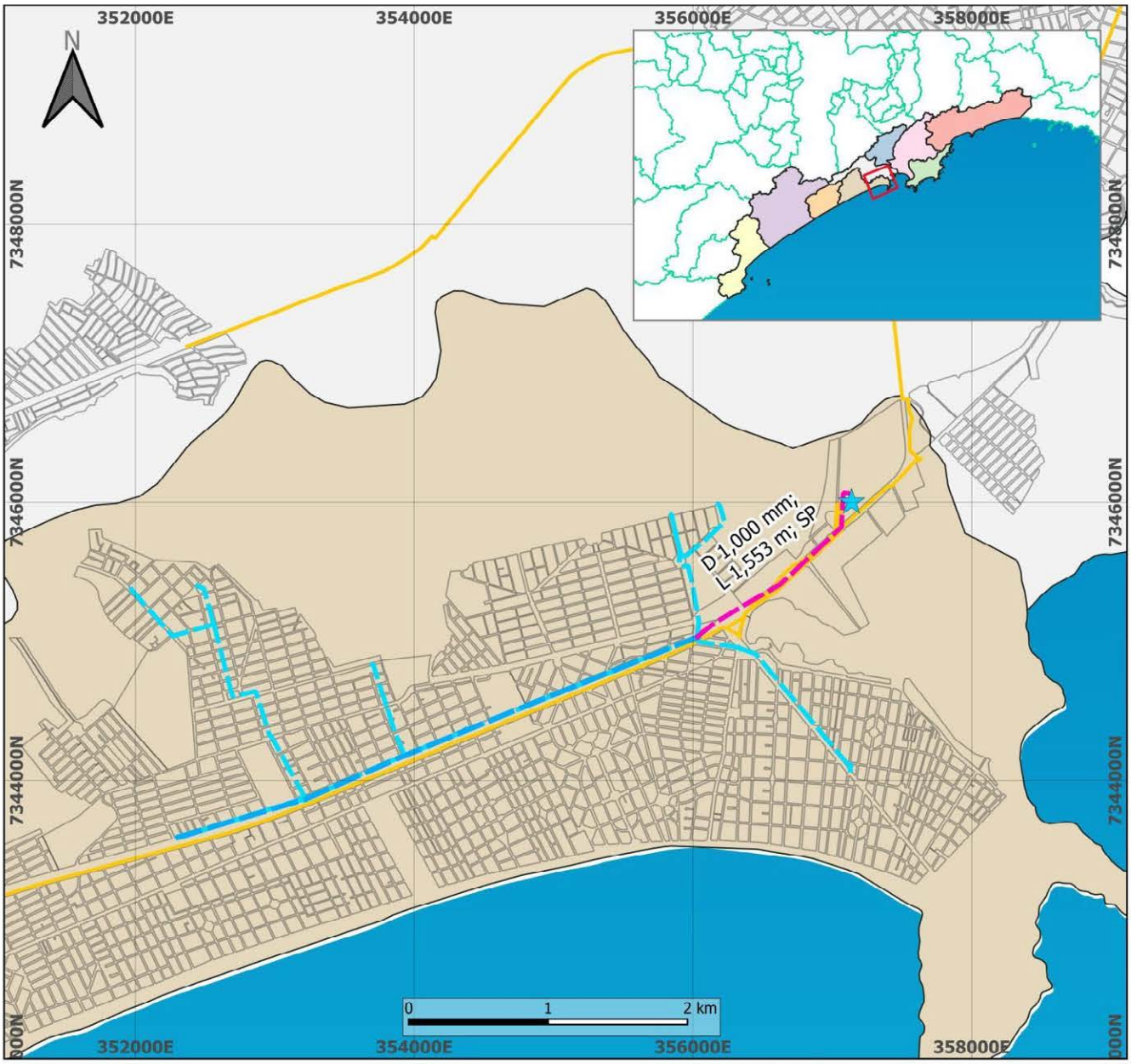
Legend

- Existing Main Pipelines
- Trecho 12
- Existing pipeline from Melvi (D1,200 - 900 mm)
- Storage_PG_Baixada
- CR Boqueirão
- Ocean
- Bertioga
- Cubatão
- Guarujá
- Itanhaém
- Mongaguá
- Peruíbe
- Praia Grande
- Santos
- São Vicente

Scale 1/80,000
No. 3-2

Drawing Name 送水管Trecho12平面・縦断図

Project Name ブラジル国サンパウロ州沿岸部衛生・環境改善事業準備調査



Praia Grande - Trecho 13 - Plan & Profile

Projection System: Universal Transverse Mercator
Datum: Sirgas 2000
Scale: 1:20.000

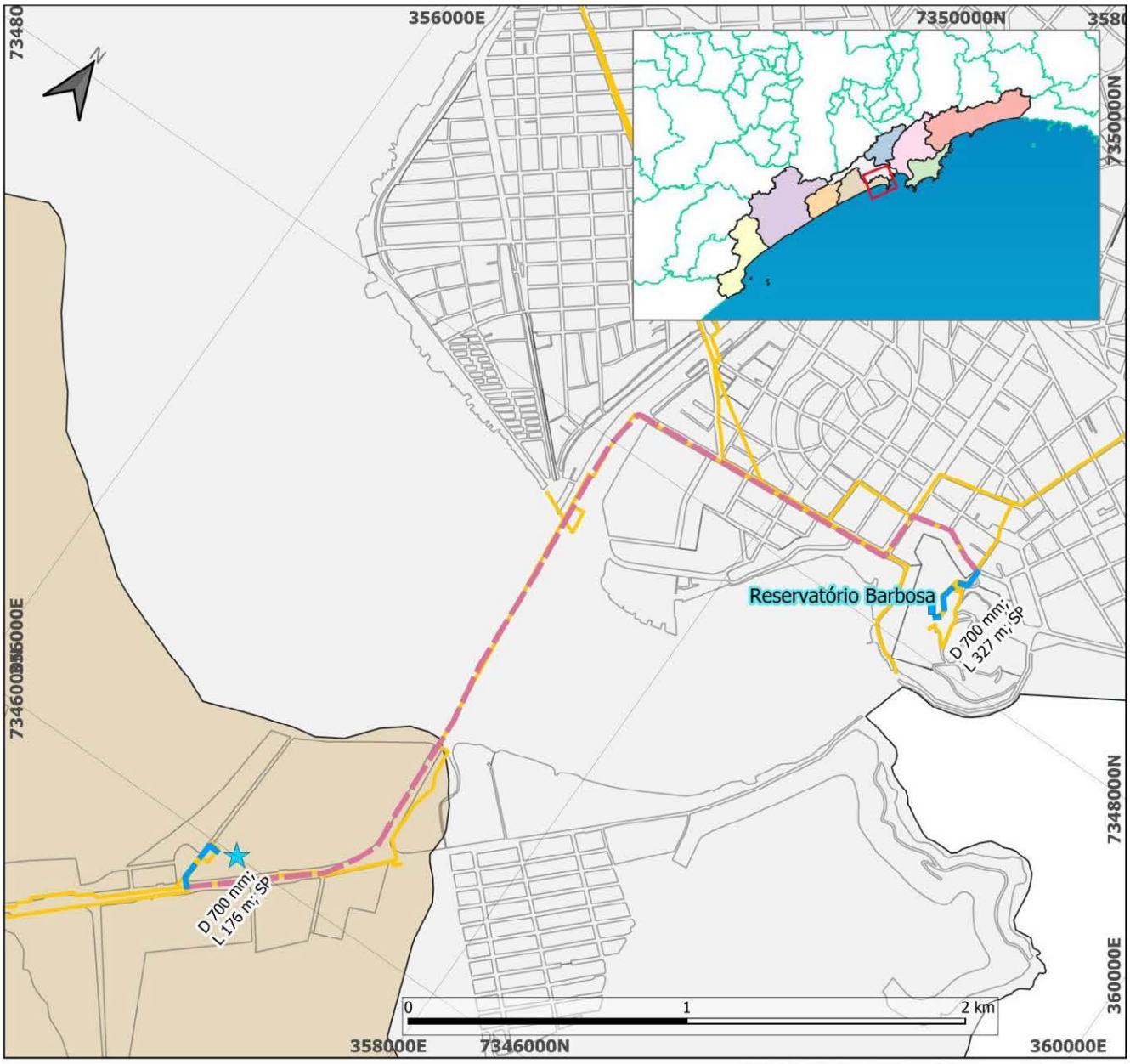
Legend

- Existing Main Pipelines
- Trecho 13
- Distribution Network Main Pipeline
- Distribution Network Main Branches
- CR Boqueirão
- Ocean
- Bertioga
- Cubatão
- Guarujá
- Itanhaém
- Mongaguá
- Peruíbe
- Praia Grande
- Santos
- São Vicente

Scale 1/20,000
No. 3-3

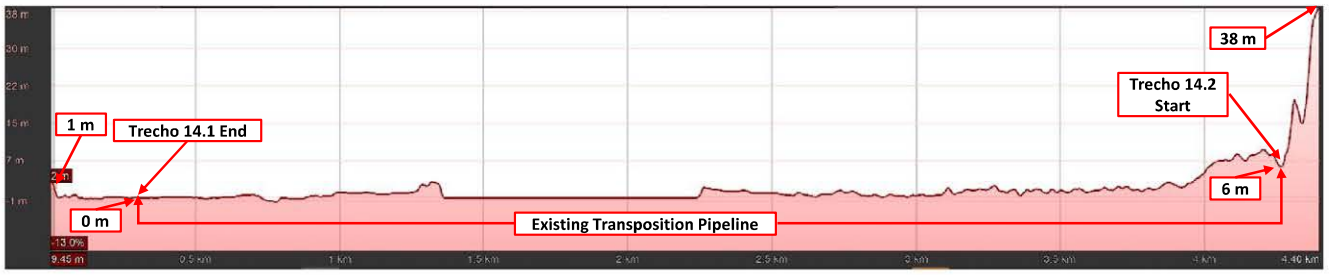
Drawing Name
配水本管Trecho13平面・縦断図

Project Name
ブラジル国サンパウロ州沿岸部衛生・環境改善事業準備調査



Praia Grande - Trecho 14 - Plan & Profile

Projection System: Universal Transverse Mercator
Datum: Sirgas 2000
Scale: 1:20.000



Legend

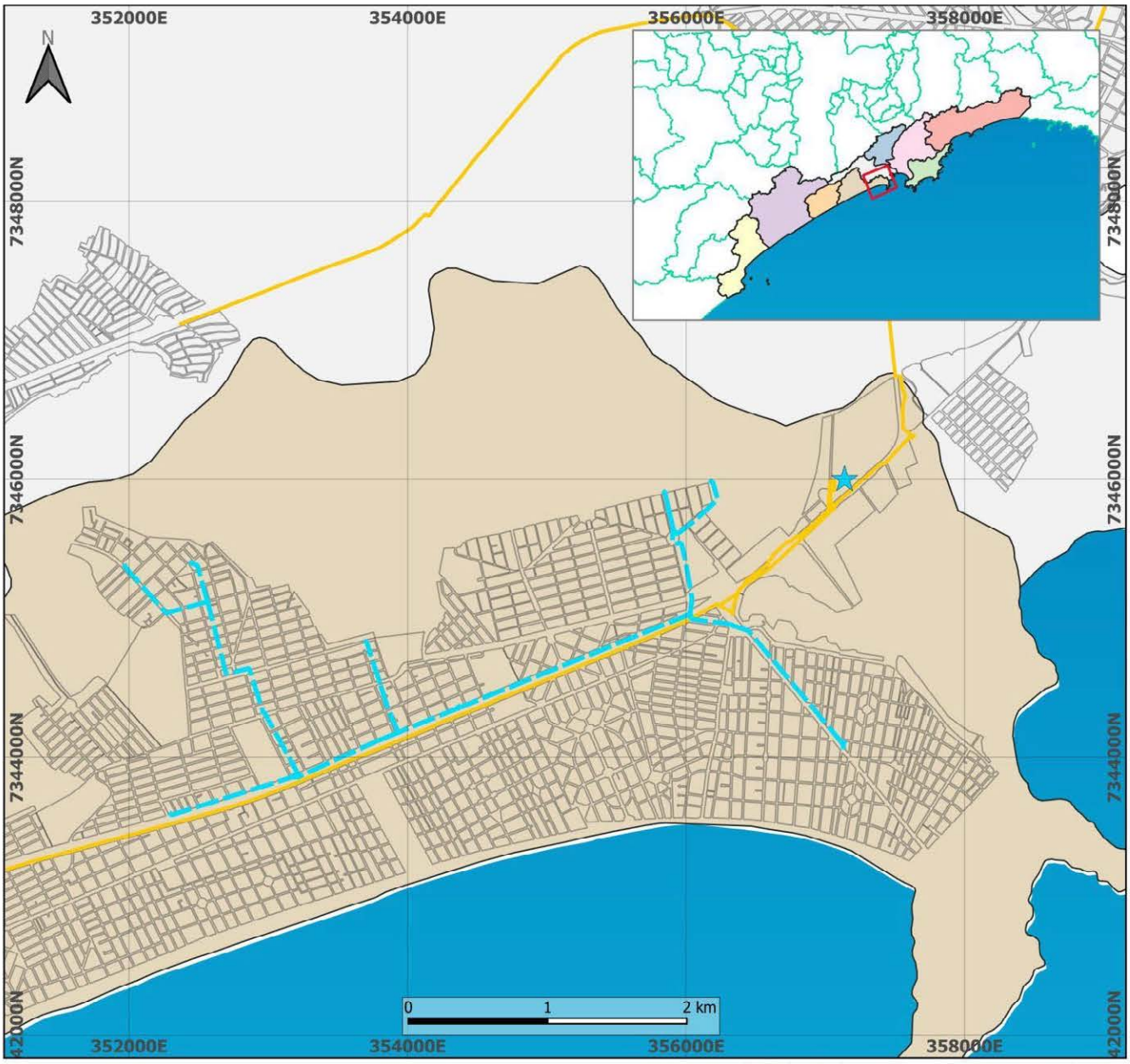
- Existing Main Pipelines
- Trecho 14
- Existing Transposition Pipeline
- CR Boqueirão
- Storage
- Ocean
- Bertioga
- Cubatão
- Guarujá
- Itanhaém
- Mongaguá
- Peruíbe
- Praia Grande
- Santos
- São Vicente

Scale 1/20,000

No. 3-4

Drawing Name 緊急送水管Trecho 14平面・縦断図

Project Name ブラジル国サンパウロ州沿岸部衛生・環境改善事業準備調査



Praia Grande - Distribution Network Duplication

Projection System: Universal Transverse Mercator
Datum: Sirgas 2000
Scale: 1:40.000

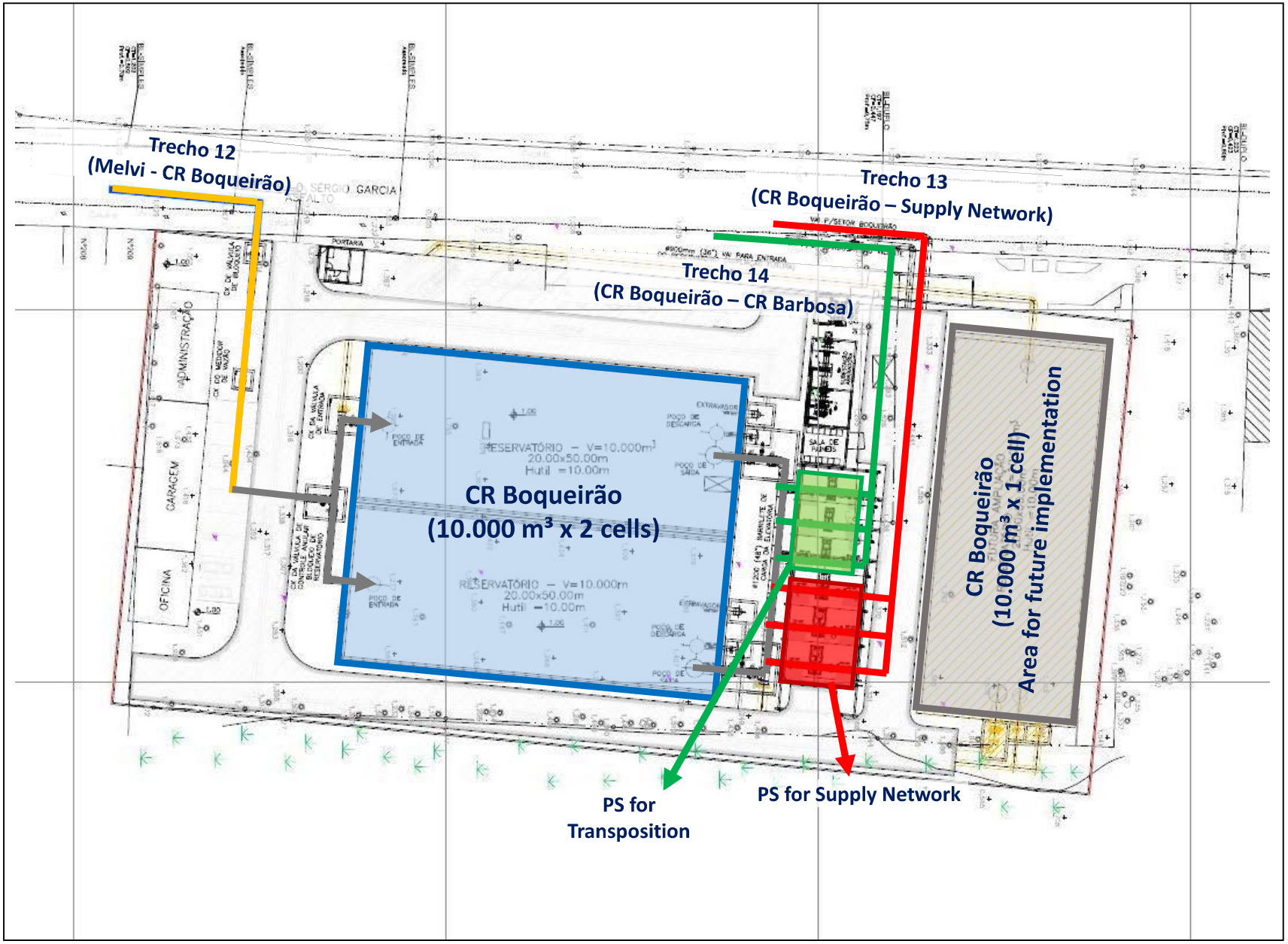
Legend

- Existing Main Pipelines
- Distribution Network Duplication
- CR Boqueirão
- Ocean
- Bertioga
- Cubatão
- Guarujá
- Itanhaém
- Mongaguá
- Peruíbe
- Praia Grande
- Santos
- São Vicente

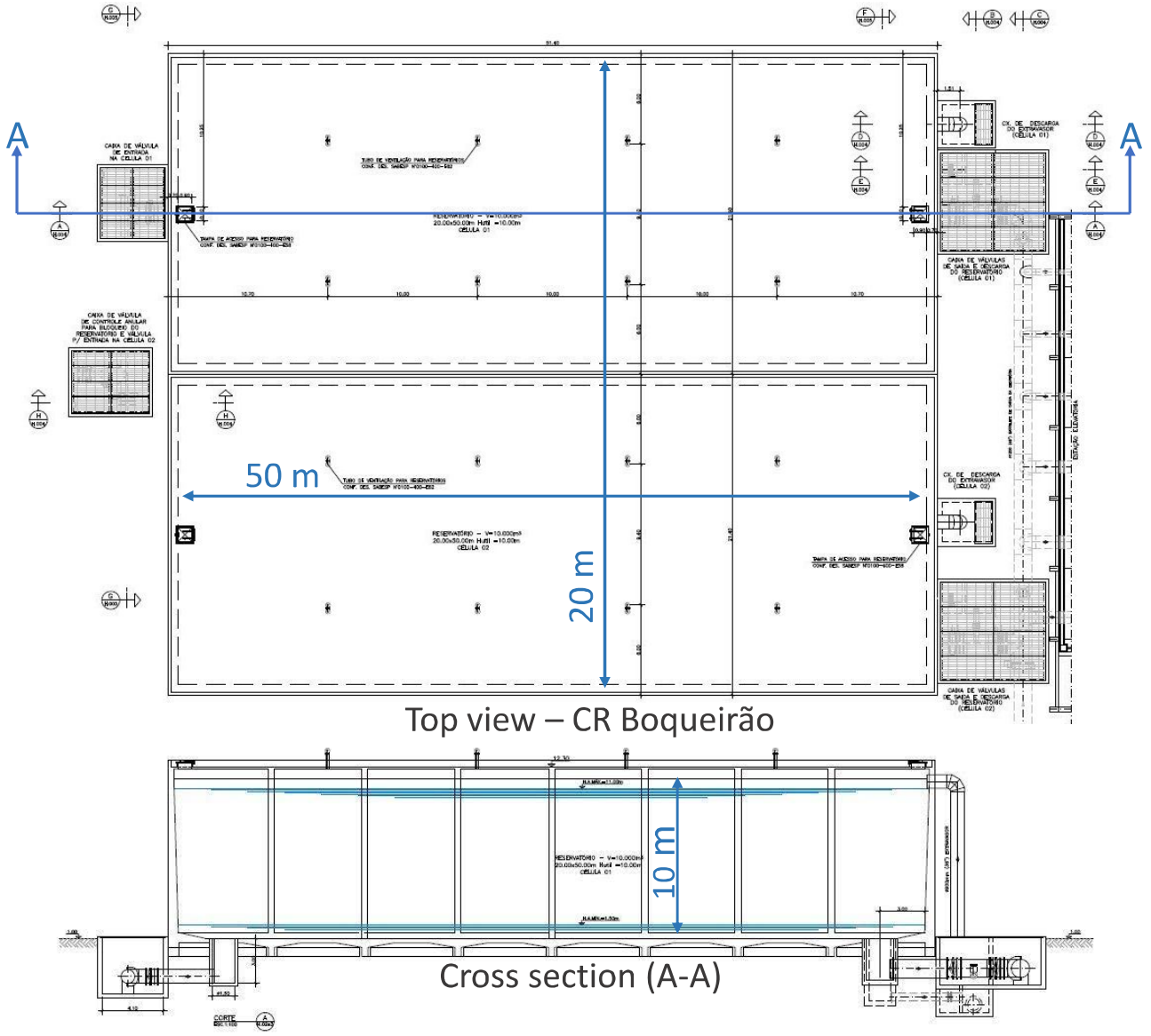
Scale 1/40,000
No. 3-5

Drawing Name
Boqueirao配水区配水管平面図

Project Name
ブラジル国サンパウロ州沿岸部衛生・環境改善事業準備調査

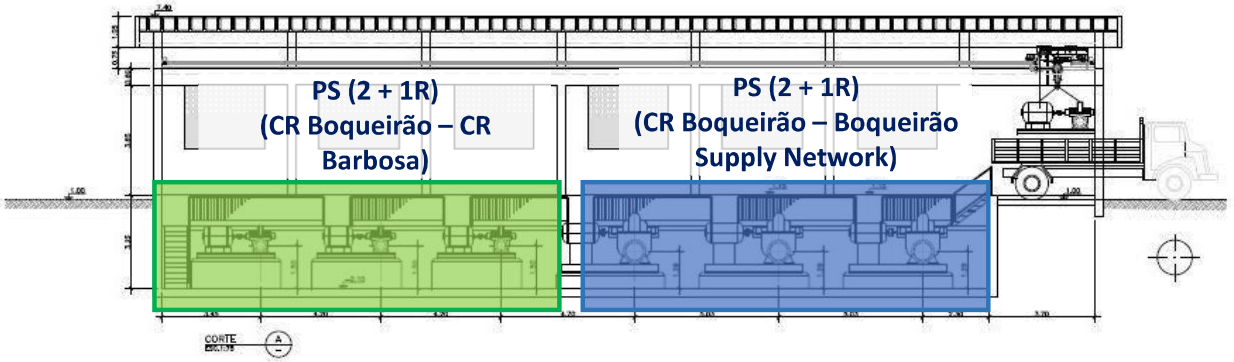


Project Name	Drawing Name	Scale
ブラジル国サンパウロ州沿岸部衛生・環境改善事業準備調査	Boqueirao配水池・ポンプ場一般平面図	No. 3-6



Project Name	Drawing Name	Scale
ブラジル国サンパウロ州沿岸部衛生・環境改善事業準備調査	Boqueirao配水池一般構造図	No. 3-7

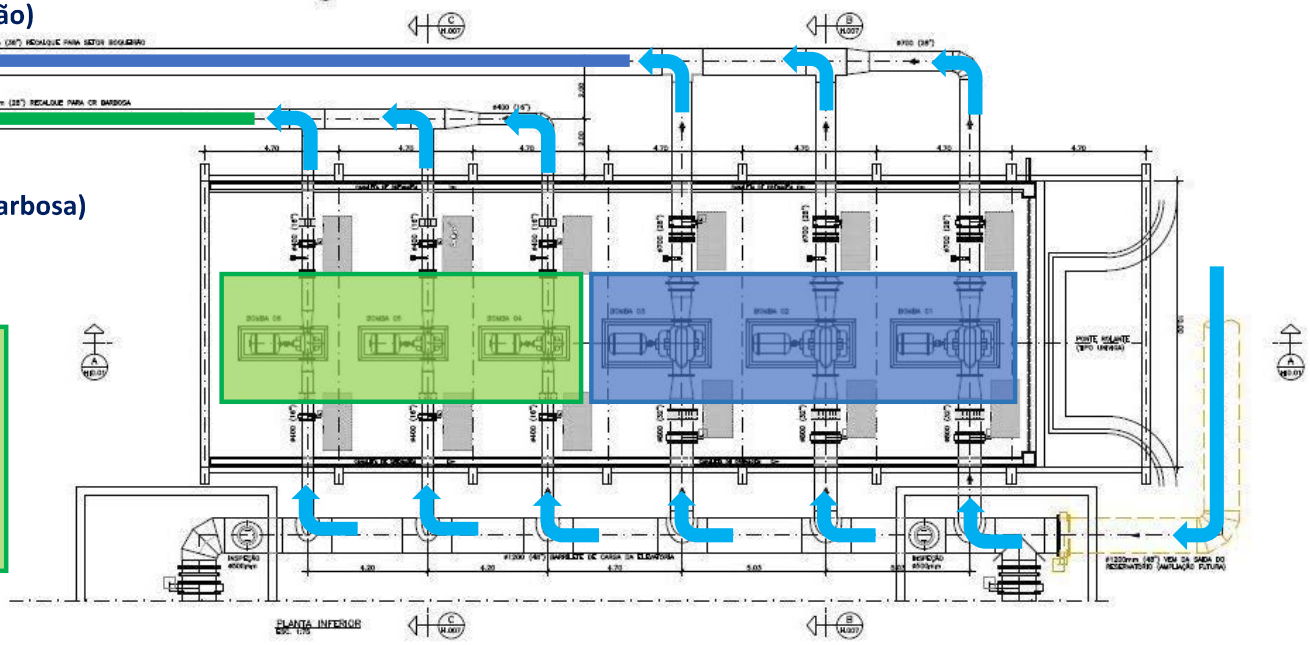
PS (2 + 1R)
(CR Boqueirão – CR Barbosa)
Flow: 860 L/s (each)
Head: 30 m
Power: 410 cv (each)



Trecho 13
(CR Boqueirão – Distribuição)

Trecho 14
(CR Boqueirão – CR Barbosa)

PS (2 + 1R)
(CR Boqueirão – Supply Network)
Flow: 250 L/s (each)
Head: 65 m
Power: 260 cv (each)

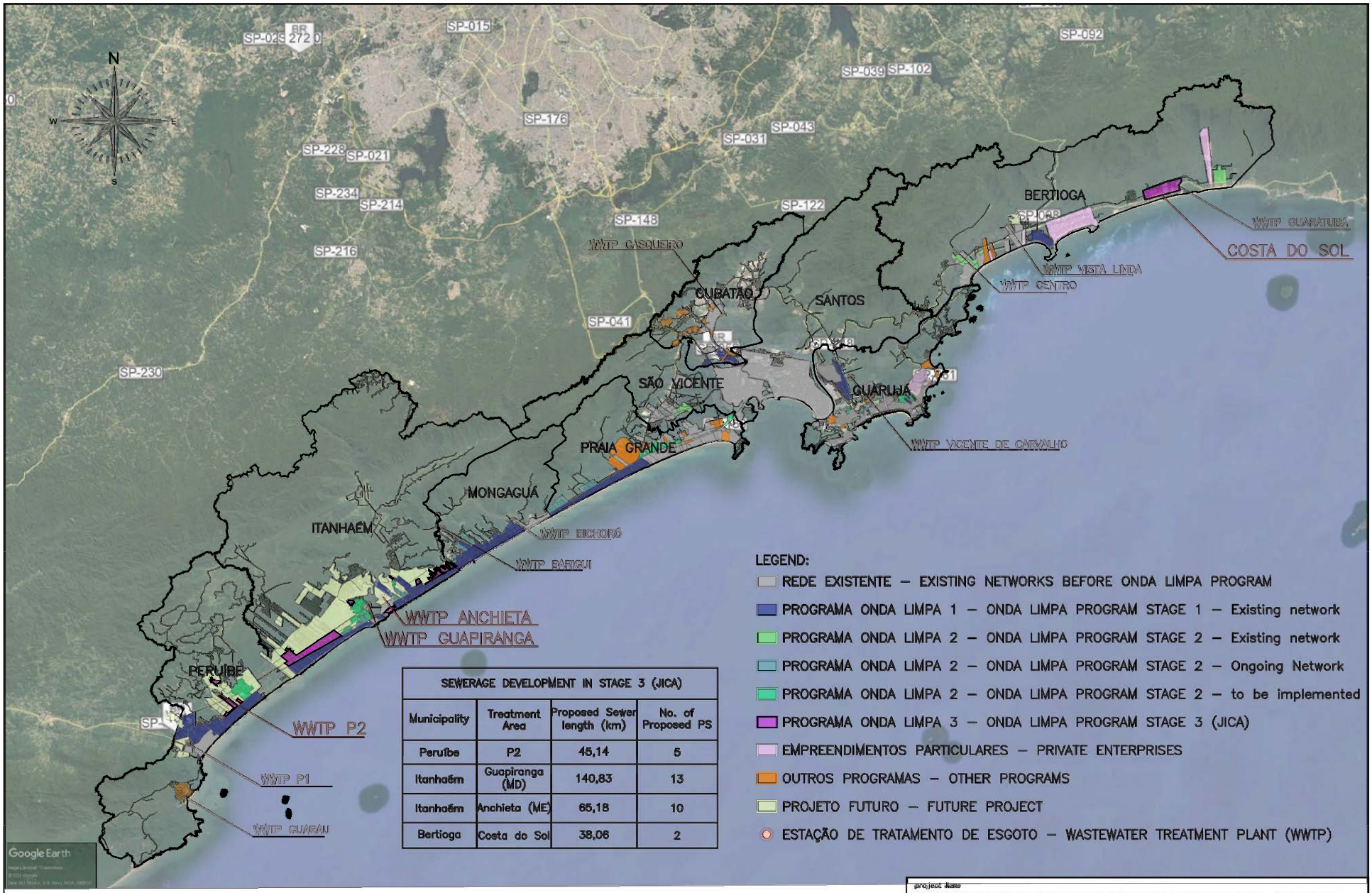


Project Name	Drawing Name	Scale
ブラジル国サンパウロ州沿岸部衛生・環境改善事業準備調査	Boqueiraoポンプ場一般構造図・設備配置図	No. 3-8

添付資料 7.2
概略設計図面（下水収集施設）

下水収集施設図面リスト

図番号	図面名
1. 下水道管路計画図	
1-1	管路計画全体図
1-2	ペルイベ市管路計画図
1-3	イタニャエン市 Guapiranga 処理区管路計画図
1-4	イタニャエン市 Anchieta 処理区管路計画図
1-5	ベルチオガ市管路計画図（西側）
1-6	ベルチオガ市管路計画図（東側）
2. 下水道管路一般図	
2-1	管路布設断面図
2-2	管路基礎構造図 1（プレキャストコンクリート）
2-3	管路基礎構造図 2（杭基礎）
2-4	戸別接続一般図
2-5	マンホール一般図
2-6	推進工法路線一般図
3. 下水ポンプ場一般図	
3-1	大型ポンプ場一般図
3-2	マンホールポンプ場一般平面図
3-3	マンホールポンプ場構造図（平面図）
3-4	マンホールポンプ場構造図（断面図）



SEWERAGE DEVELOPMENT IN STAGE 3 (JICA)			
Municipality	Treatment Area	Proposed Sewer length (km)	No. of Proposed PS
Peruíbe	P2	45,14	5
Itanhaém	Guapiranga (MD)	140,83	13
Itanhaém	Anchieta (ME)	65,18	10
Bertioga	Costa do Sol	38,06	2

LEGEND:

- REDE EXISTENTE – EXISTING NETWORKS BEFORE ONDA LIMPA PROGRAM
- PROGRAMA ONDA LIMPA 1 – ONDA LIMPA PROGRAM STAGE 1 – Existing network
- PROGRAMA ONDA LIMPA 2 – ONDA LIMPA PROGRAM STAGE 2 – Existing network
- PROGRAMA ONDA LIMPA 2 – ONDA LIMPA PROGRAM STAGE 2 – Ongoing Network
- PROGRAMA ONDA LIMPA 2 – ONDA LIMPA PROGRAM STAGE 2 – to be implemented
- PROGRAMA ONDA LIMPA 3 – ONDA LIMPA PROGRAM STAGE 3 (JICA)
- EMPREENDIMENTOS PARTICULARES – PRIVATE ENTERPRISES
- OUTROS PROGRAMAS – OTHER PROGRAMS
- PROJETO FUTURO – FUTURE PROJECT
- ESTAÇÃO DE TRATAMENTO DE ESGOTO – WASTEWATER TREATMENT PLANT (WWTP)

0 1 2 5 10 20km

SCALE

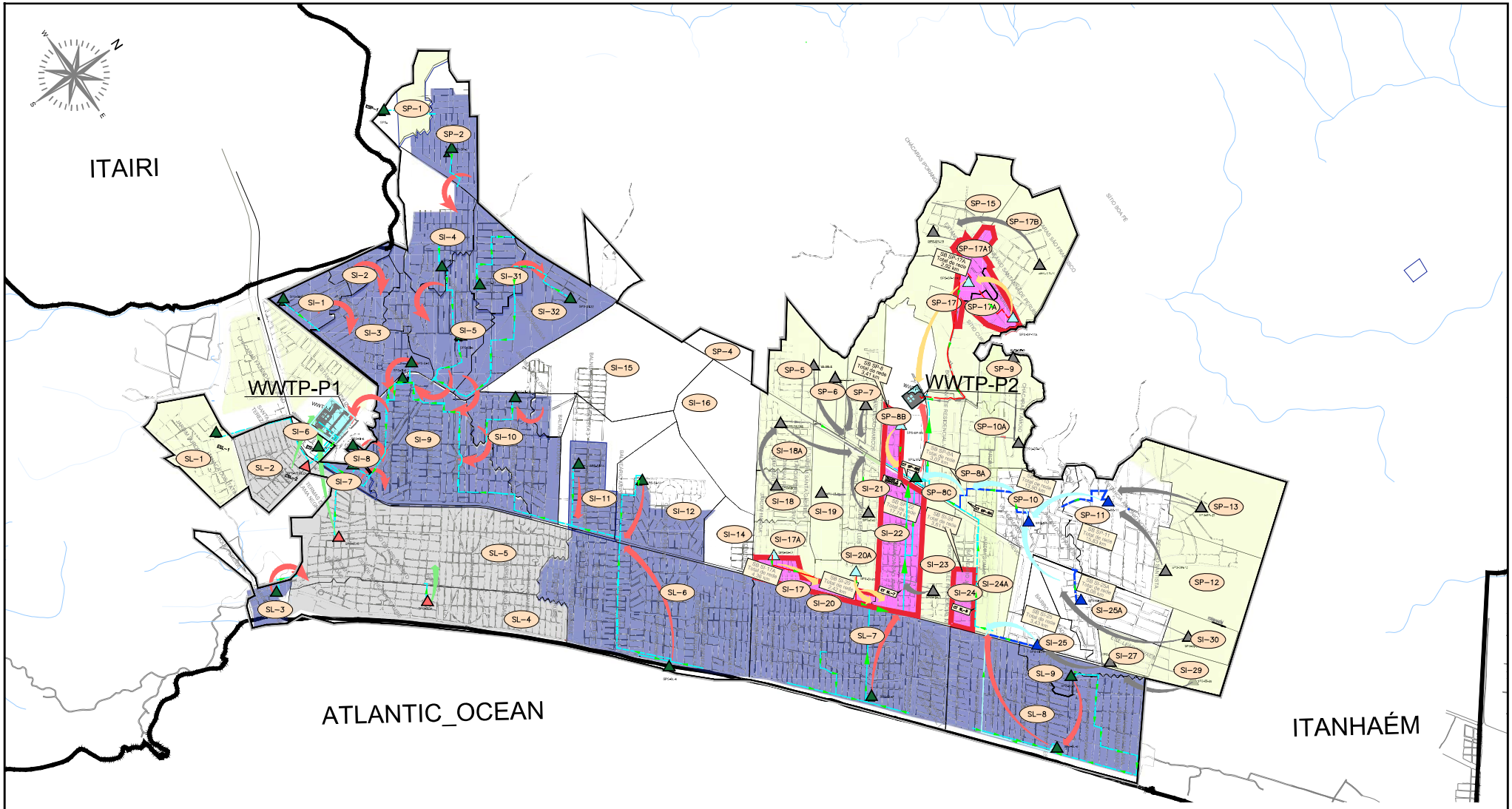
SEWERAGE DEVELOPMENT AREA IN ONDA LIMPA SCOPE

project Name
PREPARATORY SURVEY ON PROJECT FOR SANITATION AND ENVIRONMENTAL IMPROVEMENT OF BAIXADA SANTISTA METROPOLITAN REGION
ブラジル国サンパウロ州沿岸部衛生・環境改善事業準備調査

Drawing Name
管路計画全体図

Scale:

Drawing No: 1-1



LEGEND:

- EXISTING NETWORK
- EXISTING NETWORK - ONDA LIMPA PROGRAM -STAGE 1
- NETWORK FOR IMPLEMENTATION - ONDA LIMPA PROGRAM- STAGE 2
- NETWORK - ONDA LIMPA PROGRAM STAGE 3(JICA SCOPE)
- EXPANSION AREA
- FLOW DIRECTION
- EXISTING SEWAGE PUMPING STATION
- EXISTING SEWAGE PUMPING STATION ONDA LIMPA PROGRAM - STAGE 1
- SEWAGE PUMPING STATION FOR IMPLEMENTATION ONDA LIMPA PROGRAM - STAGE 2
- SEWAGE PUMPING STATION - ONDA LIMPA PROGRAM - STAGE 3(JICA SCOPE)
- SEWAGE PUMPING STATION - EXPANSION AREA
- ENLARGEMENT OF WWTP 1 AND 2 AND GUARAÚ WWTP IMPLEMENTATION - ONDA LIMPA PROGRAM - STAGE 3
- WASTEWATER TREATMENT PLANT
- EXISTING NETWORK
- NETWORK TO BE IMPLEMENTED
- EXISTING PRESSURE MAIN
- PRESSURE MAIN TO BE IMPLEMENTED ONDA LIMPA PROGRAM -STAGE 2
- PRESSURE MAIN - ONDA LIMPA PROGRAM STAGE 3(JICA SCOPE)
- PRESSURE MAIN - EXPANSION AREA
- PROJECT AREA NUMBER AND EXPECTED NETWORK EXTENSION
- SP-8 SUB-BASIN
- SUB-BASIN BOUNDARY
- PROJECT BOUNDARY
- RAILWAY
- MUNICIPAL BOUNDARY
- EXISTING TRUNK SEWER BY GRAVITY
- TRUNK SEWER BY GRAVITY FOR IMPLEMENTATION ONDA LIMPA PROGRAM STAGE 2
- TRUNK SEWER BY GRAVITY - ONDA LIMPA PROGRAM - STAGE 3
- TRUNK SEWER BY GRAVITY - EXPANSION AREA
- EXISTING DESTINATION OF SEWAGE
- SEWAGE DESTINATION - ONDA LIMPA PROGRAM - STAGE
- SEWAGE DESTINATION FOR IMPLEMENTATION ONDA LIMPA PROGRAM - STAGE 2
- SEWAGE DESTINATION - ONDA LIMPA - STAGE 3
- SEWAGE DESTINATION - EXPANSION AREA

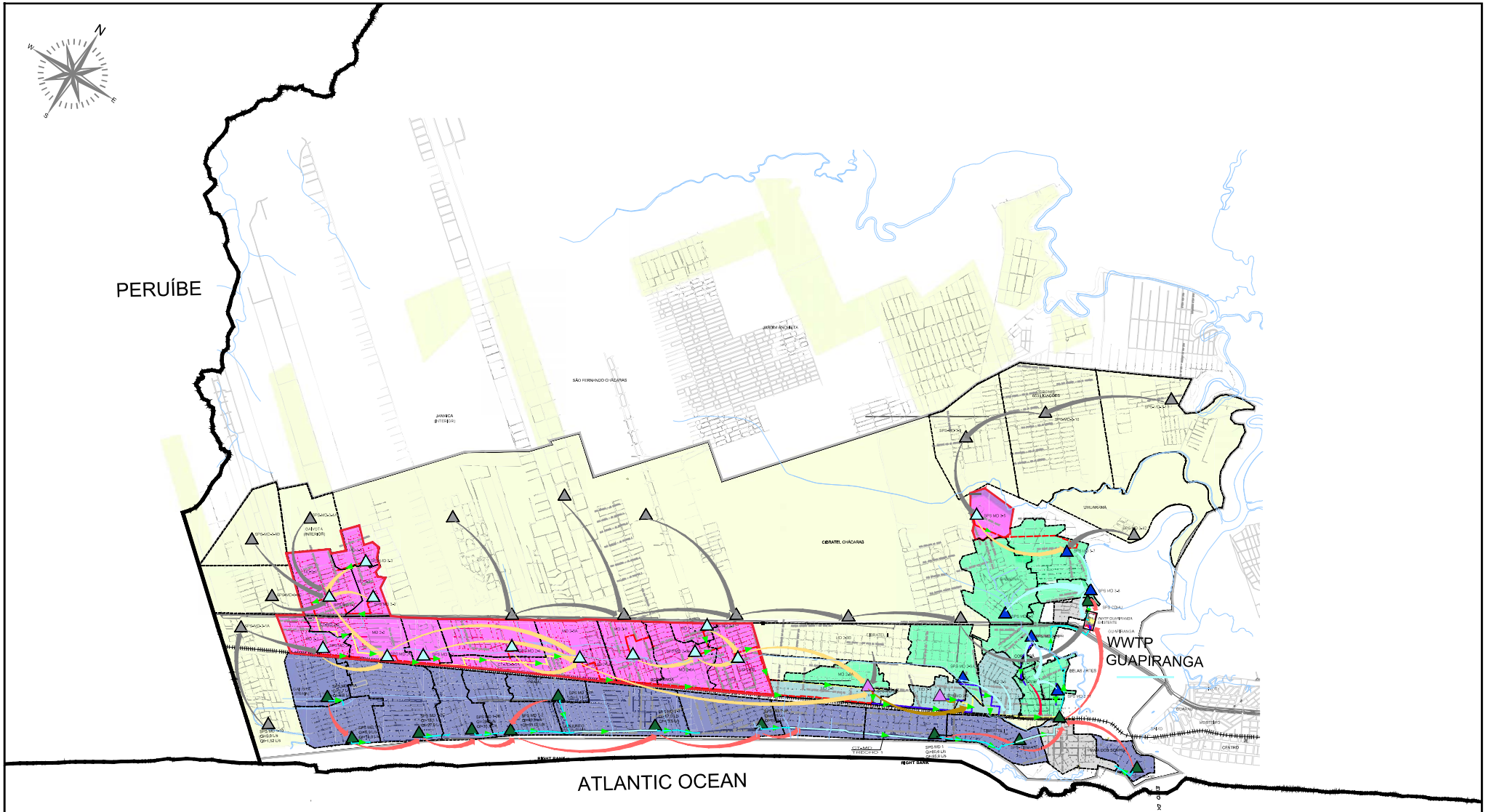
SCALE
0 0.5 1 2 3KM

project Name
PREPARATORY SURVEY ON PROJECT FOR SANITATION AND ENVIRONMENTAL IMPROVEMENT OF BAIXADA SANTISTA METROPOLITAN REGION
ブラジル国サンパウロ州沿岸部衛生・環境改善事業準備調査

Drawing Name
ペルイベ市管路計画図

Scale: 1/60 as A4

Drawin. No: 1-2



project Name

PREPARATORY SURVEY ON PROJECT FOR SANITATION AND ENVIRONMENTAL IMPROVEMENT OF BAIXADA SANTISTA METROPOLITAN REGION

ブラジル国サンパウロ州沿岸部衛生・環境改善事業準備調査

Drawing Name

イタニャエン市Guapiranga処理区管路計画図

Scale: 1/75 as A4

Drawing No: 1-3