TÉRMINOS DE REFERENCIA

Ejemplos de TdeR a utilizarse en la CT
Detección de fugas de agua potable en la red distribuidora
(ejemplo usado bajo la CT RG-T3298 en Mexico, replicable en otros operadores)

1. Antecedentes y Justificación

1.1 Establecido en 1959, el Banco Interamericano de Desarrollo ("BID" o "Banco") es la principal fuente de financiamiento multilateral para el desarrollo económico, social e institucional en América Latina y el Caribe. Brinda préstamos, subvenciones, garantías, asesoramiento sobre políticas y asistencia técnica a los sectores público y privado de sus países prestatarios.

1.2 El BID, a través de su División de Agua y Saneamiento (WSA) dentro del Sector de Infraestructura y Energía (INE), brinda apoyo técnico a los países miembros del BID en la conceptualización, preparación y ejecución de programas y proyectos financieros y no financieros en el agua y sector de saneamiento. Las actividades de la WSA cubren temas relacionados con el suministro de agua potable (incluida la gestión de los recursos hídricos) y las aguas residuales, el drenaje urbano y la gestión de residuos sólidos. En línea con las estrategias del Banco, WSA busca ayudar a los países en sus esfuerzos para garantizar el acceso universal a servicios sostenibles y de alta calidad.

1.3 El BID y el Gobierno de Israel han establecido un programa de colaboración técnica para ayudar a los países miembros prestatarios del BID a mejorar sus conocimientos y fortalecer su capacidad para el desarrollo y la adopción de tecnologías innovadoras en la provisión de servicios de agua y saneamiento. La Cooperación Técnica (CT) RG-T3298 (Colaboración BID-Israel: Mejorando las capacidades en tecnologías de recursos hídricos) se centra en tres tecnologías, a saber: (i) desalinización; (ii) tecnologías inteligentes para infraestructuras de agua (Smart water infrastructure technology-SWIT) y (iii) tratamiento / reutilización de aguas residuales.

1.4 El actual Gobierno del Estado de Nuevo León ha definido el fortalecimiento institucional y la modernización del sector de agua y saneamiento como una de sus prioridades, por eso, en el Plan de Agua 2030, se ha comprometido a enfrentar las barreras que limitan la calidad y la sostenibilidad. de la provisión y garantía del suministro de agua para la población de Monterrey y su área metropolitana durante los próximos 13 años.

1.5 La empresa SADM es el único operador de agua en el estado de Nuevo León. Fue creada en 1956 con el carácter de una institución pública descentralizada. Con un 30% de pérdidas de agua en el sistema, SADM está buscando soluciones tecnológicas para reducir las fugas y, como resultado, mejorar el servicio. Con esta finalidad ha solicitado al BID apoyo a través de la Cooperación técnica RG-T3298, para contratar el estudio por parte de una empresa consultora especializada en la detección de fugas en forma remota, que permita a la compañía mejorar la eficacia y eficiencia de su trabajo de localización y reparación de fugas en campo. A tales efectos, se considera apropiado la realización del estudio en un área piloto y evaluar sus resultados para posteriormente definir la conveniencia de su aplicación a otras áreas de la red de distribución.

2. Objetivos

2. Detección y reducción de fugas en la red de distribución

3. Alcance de los Servicios

3.1 Se aplicará tele-detección con radares de apertura sintética SAR montados en un satélite e interferometría diferencial.

3.2 Se aplicará en la red de distribución dentro de los límites de un área a ser definida por SADM con el apoyo de la empresa consultora, que abarque como máximo 2.500 m de longitud de red y esté contenida en una misma imagen satelital.

3.3 Se brindará a SADM la localización de los puntos identificados como “de interés” para que SADM realice la detección en campo y la reparación de las fugas de la red en un área de muestra contenida en el área evaluada por la empresa consultora.

3.4 Se apoyará a SADM en la evaluación de los resultados del piloto y de la potencialidad de la herramienta para reducir las pérdidas físicas.

4. Actividades Clave

4.1 Las siguientes actividades están orientadas al cumplimiento de los objetivos, siendo las mismas enunciativas y debiendo, para su ejecución, trabajar en forma coordinada con los equipos de proyecto de SADM y del Banco.

4.2 Apoyo a SADM en la definición del área a estudiar, para lo cual SADM proporcionará los trazados de las redes de las tuberías de agua potable. Informe de localización del área de estudio seleccionada, conteniendo metrajes de los elementos de redes incluidos, así como observaciones y recomendaciones.

4.3 Análisis imágenes satelitales, algorítmico y correcciones radiométricas. Superposición de tuberías y geoposicionamiento de las fugas (puntos de interés) de acuerdo al resultado obtenido.

4.4 Elaboración del informe de fugas, gráficamente en aplicaciones basadas en web, hojas de fugas en formato pdf y en formato de archivo SHP para cargar en el sistema GIS de los SADM.

4.5 Coordinación con SADM en la selección de área/s de muestra para validar la técnica en campo y en la definición de la metodología para medir el impacto (en función de la información proporcionada por SADM y otra información relevante) de las intervenciones en el área piloto.

4.6 Apoyo especializado al SADM en las tareas de campo en forma remota.

4.7 Análisis de los resultados obtenidos en términos de reducción efectiva de fugas, incluyendo recomendaciones para la proyección para el resto del área de servicio de SADM.

5. Resultado esperado y entregables

5.1 Resultados:

- Detección de fugas en el área de interés definido,
- Estimación del ahorro de agua en el área de interés como resultado de la tecnología de detección de fugas.

5.2 Entregables:

- Entregable 1: Informe con la identificación y límites definidos del área de estudio geolocalizada. Se superpondrán los trazados y otros elementos de las redes que proporcione SADM. (Actividad 4.2)
- Entregable 2: Informe de fugas: contendrá el procesamiento del área de interés presentando los resultados en formato gráfico y hojas de prueba y en formato SHP para cargar en el sistema SIG. Metodología de medición del impacto de las intervenciones en el área piloto acordada con SADM, (actividades 4.3, 4.4 y 4.5).
- Entregable 3: Informe de verificación: el informe contendrá todos los resultados encontrados de la verificación en el campo (actividades 4.6 y 4.7).

6. Calendario del Proyecto e Hitos

6.1 Entregable 1: a los 15 días de la firma del contrato.
6.2 Entregable 2: a los 60 días de la firma del contrato.
6.3 Entregable 3: a los 180 días de la firma del contrato.
6.4 La duración del contrato será de 8 meses.

7. Requisitos de los Informes

7.1 Los productos deben presentarse en inglés y español. Todos los informes se presentarán de la siguiente manera: (i) los archivos electrónicos relevantes en MS Word, Excel u otra aplicación aceptable para el BID (debe incluir todos los anexos y apéndices); (ii) un archivo PDF electrónico para cada informe completo. Estos informes y archivos electrónicos deben presentarse dentro de los plazos mencionados anteriormente.

7.2 La firma consultora debe proporcionar copias de trabajo verificadas de todos los archivos ejecutables, modelos, bases de datos y otros archivos creados durante la consultoría.

8. Criterios de aceptación

8.1 Los informes deberán ser aprobados por el equipo designado de la División de agua y saneamiento del BID, en coordinación con el equipo designado por SADM.

9. Otros requisitos

9.1 Director del Proyecto, quien tendrá a cargo la elaboración de los informes y la supervisión de todas las tareas asociadas a las actividades de la contratación: Debe acreditar experiencia mínima de 5 años en gerenciamiento de proyectos de agua, saneamiento y demostrar experiencia en la implementación y uso de herramientas de detección de fuga en redes de agua potable mediante imagen satelital.

9.2 Ingeniero certificado en detección de fugas para el apoyo online de los trabajos de campo.

10. Supervisión e Informes

10.1 La supervisión de los trabajos y entregables será realizada por el especialista de WSA Alejandra Perroni, (+12026233376, mperroni@iadb.org), El equipo coordinador del BID estará integrado por Rodrigo Riquelme (RODRIGOR@iadb.org), Hila Cohen (hilac@iadb.org) con el apoyo de los técnicos del SADM.

10.2 Se mantendrán reuniones de seguimiento periódicas, en las que participarán los responsables del trabajo de la empresa, personal designado de SADM y el equipo del BID.

11. Calendario de Pagos

11.1 Las condiciones de pago se basarán en los hitos o entregables del proyecto. El Banco no espera hacer pagos por adelantado en virtud de contratos de consultoría a menos que se requiera una cantidad significativa de viajes. El Banco desea recibir la propuesta de costos más competitiva para los servicios descritos en el presente documento.

Plan de Pagos	
Entregables	%
1. Informe de definición de área	30%
2. Informe de fugas	35%
3. Informe de verificación y	35%

guardado	
TOTAL	100%

TERMS OF REFERENCE

Ejemplos de TdeR a utilizarse en la CT
Technical assistance in improving the operation efficiency of a water distribution system in a pilot area through the application of smart data analysis system
(example used under the previous CT RG-T3298 in Companhia Águas de Joinville)

1. Background and Justification

1. Established in 1959, the Inter-American Development Bank ("IDB" or "Bank") is the main source of multilateral financing for economic, social, and institutional development in Latin America and the Caribbean. It provides loans, grants, guarantees, policy advice, and technical assistance to the public and private sectors of its borrowing countries. The IDB, through its Water and Sanitation Division (WSA) within the Infrastructure and Energy Sector (INE), provides technical support to IDB member countries in the conceptualization, preparation, and execution of financial and non-financial programs and projects in the water and sanitation sector. WSA activities cover topics related to drinking water supply (including water resources management), and wastewater, urban drainage, and solid waste management. In line with the Bank strategies, WSA seeks to assist countries in their efforts to ensure universal access to sustainable, high-quality services.
2. The IDB and the Government of Israel have established a technical collaboration program to assist IDB´s borrowing member countries in improving their knowledge and strengthening their capacity for the development and adoption of innovative technologies in the provision of water and sanitation services. Within this framework, the Technical Cooperation (TC) RG-T3298 (IDB-Israel Collaboration: Improving Capacities in Water Resource Technologies) focuses on three main fields: (i) Desalination; (ii) Smart Water Infrastructure Technology (SWIT), and (iii) wastewater treatment/reuse.
3. The Companhia Águas de Joinville (CAJ) supplies potable water to 228,342 customers, (population of around 600,000 people), treating near 2,100 l/s in two water treatment plants. The distribution system includes 13 reservoirs, 2,252 km of pipelines, 156,000 connections, and 108 pumping stations. Although the company has been investing in reducing physical water losses to contribute to the preservation of the system sources, more is needed to reduce the current rate of 500 l/connection/day. The energy consumption required to produce 1m³ of drinking water is around 0.6 to 0.7 kWh. The physical and commercial losses translate into unnecessary expenses, as well as increasing production and distribution costs. Additionally, the government has gradually been reducing subsidies on electricity tariffs, which has resulted in a considerable increase in energy operating costs.
4. CAJ has requested support from IDB to assess the applicability of smart technologies on a pilot area to improve the management of the service network, contribute to the detection and control of water leaks and achieve the utility efficiency objectives.

2. Objectives

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1. The objective of this project is to assist CAJ in assessing, in a pilot area of its distribution network in Joinville, and in a selected pumping equipment, the applicability of smart data analysis to improve its operation efficiency and in optimizing its monitoring and control system. Analysis of water quality data in selected points will be included.

3. **Scope of Services**

1. **Project selected components**

1. The proposed distribution network area for performing this study is the one named R7, that is supplied by gravity from the reservoir with the R7 (5,000 m³ capacity).
2. A pumping equipment (selected in agreement with CAJ) working conditions online data will be collected and assessed
3. Water quality data will be collected and assessed in selected points to be defined with CAJ.

Figure 1 R7 area localization

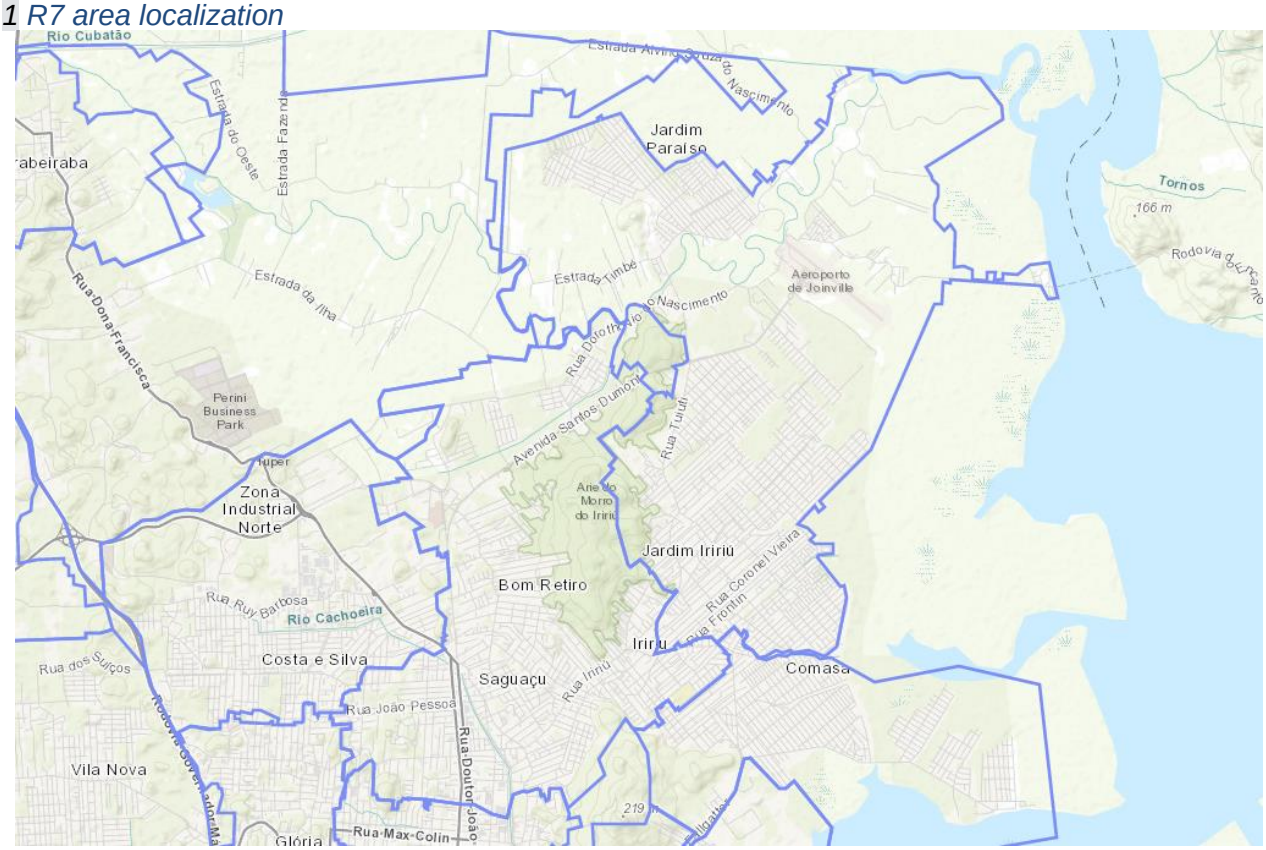


Table 1- Main characteristics of R7 network area

Water Service Customers	27,848 water connections ~ 98.900 people
Production (m³/year)	8,109,578 m³ (2020)

Source	Cubatão water treatment plant
Estimated NRW	36% water loss in distribution
GIS status	Distribution network, enrolment, service orders for water outages, leakages.
Hydraulic model status	Under development
Actives DMAs	3 DMAs + 3 Boosters
Metered Coverage	51,58% in DMC/Booster (14,363 water connections)
App – Meter Installation	Bulk water meter at Nelson Brandão street
App – Meter Reading	27.848 water connections – monthly reading. 105 water connections with telemetry reading
Pressure gauges	7 (minute per minute)
Flow meters	9 (minute per minute) + entry and exit reservoir
Telemetry in instrumentation	Boosters: 3, bulk water Meter: 5 + 105 water meters with telemetry
Customer data base status	27.848 Clients with historic and 7 DMC/Boosters (2 years minimum)
Hours of Service	24/7

Note: information provided by CAJ

2. **Services that will be provided by the firm.**

1. The firm gather and review all available information necessary to perform the activities included in this project and to attain its objectives.
2. Information to be analyzed for the selected pilot area, include: characteristics, layout and location of main components of the distribution, monitoring and control systems; operation procedures; hydraulic modelling; historical data on: costumers' metering and consumption (related to information from main meters, and associated in zones, with possibly identification of major consumers), billing, operating variables (pressure, flowrates, energy consumption), operating events such as pipeline bursts, leaks and outages, online real time data (vibrations, energy, temperature) of a selected pumping equipment and water quality data of selected points in the supply system.
3. The analysis to be performed will include water balance and calculation of baseline performance indicators, such as leakage, energy consumption, pressure management and recommendations to improve those performance indicators.
4. The firm will install, integrate and implement, during the period indicated in this TORs, an event management system that will process data in real-time, monitor a variety of patterns and events, - including water loss, water pressure, energy consumption- and apply data intelligence analysis on the data collected, for CAJ to gain insights, dashboards, and decision support tools (e.g., real-time alerts) related to water loss, water pressure and energy consumption, and other information described in 3.2.2.
5. The firm will facilitate the interaction of CAJ's managers and operators with the application information and results and will provide training via web-based interphase.
6. The firm will establish lessons learned with results from the pilot, including assessment of challenges, impact on key parameters and improvements from the use of the platform.

4. **<u>Key Activities and duration</u>**

1. **Activity 1:** The firm will conduct working sessions with CAJ personnel and IDB team to define with precision the limits of the pilot area and 3 DMCs that will be included; will request and gather the necessary information to be analyzed for the baseline definition. The firm will request from CAJ the assignment of a project manager and a minimum team to participate in the project follow up of this project.
2. **Activity 2: Analysis of the selected pilot data, baseline estimation of key parameters and recommendations.**
    1. Review of DMCs structure: pipes layout and location of hydraulic facilities: pumps, VRPs, reservoirs, etc. Analysis of historic data: flows (including minimum night flow), pressures, power consumption and costs, using at least 3-6 months historical available information.
    2. Review of operation key control parameters, location, number and type of control devices, and operating procedures.
    3. Analysis of historical data on leakage bursts and customers consumption.
    4. NRW water analysis, including performing a water balance, calculating baseline NRW value and components, and current performance Indicators.
    5. Hydraulic analysis using existing hydraulic model if suitable.
    6. Definition of leakage baseline: daily profile and minimum night flow.
    7. Recommendations on improvements for pressure modulation, energy consumption and costs savings, including location and number of monitoring points and devices. Recommendations on actions to reduce leakages.
3. **Activity 3: Event management system configuration.**

Includes process tree design, definition of the relevant project assets and processes, detailed definition of interfaces, detailed definition of designated I/O's / data tags from the SCADA systems and other external data sources; aggregation of historical data provided by CAJ; definition of reports and real time views, distribution list and access authorizations for reports and alerts, and dashboards and access authorizations.

4. **Activity 4: System installation, integration and implementation.**

The firm will install the system on the servers, integrate it and set it to work. This activity will include tests and running algorithms on historical and collected data, validation and supervision and control over results.

5. **Activity 5: Data validation**
    1. Testing the reliably of the system: collected tags and their tag addresses, data, reports and dashboards' formulas, including relevant dashboards regarding pump performance and alerts regarding water quality indicators. .
    2. The parties will conduct a weekly procedure of exporting tables of raw data for review by CAJ engineers (it is recommended that the test will be performed based on an equivalent data to be pulled from the utility's data sources (SCADA, Telemetry system).
6. **Activity 6: Training of key users of the system, continued monitoring of the system and conclusions –**
    1. The firm will train the key users of the system (operators, project manager and administrators). During at least 10 weeks, the CF will continue remotely monitoring the system and provide support as needed, including algorithms update and adjustments.
    2. Assessment of challenges, impacts and improvements from the use of the platform (e.g., impact on key indicators, network performance, etc.)
    3. Preparation of the final report.

5. **Expected Outcomes and Deliverables**

1. **Outcomes:**
   1. Recommendations to CAJ to optimize its monitoring and control system in the pilot area and other elements analyzed.
   2. Enabling CAJ to assess benefits and challenges of the implementation of a smart event management system in improving the efficiency of its water supply operation.
2. **Deliverables:**
   1. **Deliverable 1:** Inception report. (Activity 1).
   2. **Deliverable 2:** Report on results of the analysis of the DMCs in the pilot area, baseline estimation of key parameters and recommendations, and analysis of other pilot elements. (Activity 2).
   3. **Deliverable 3:** Report on system configuration design (Activity 3).
   4. **Deliverable 4:** Report on system installation and integration (Activities 4 and 5).
   5. **Deliverable 5:** training performed for CAJ and final report that will include the impact and improvements from the use of the platform (e.g., impact on key indicators, network performance, etc. (Activity 6).

6. **Project Schedule and Milestones**

Deliverable	Name	Delivery schedule (weeks after contract signature)
Report 1	Inception report	3
Report 2	DMC analysis, key parameters and recommendations	9
Report 3	Report on system configuration design	14
Report 4	Report on system installation and integration	22
Report 5	Final report	28

The duration of the contract is 6,5 months.

7. **Reporting Requirements**

1. The products must be presented in English and Portuguese. All reports shall be submitted as follows: (i) the relevant electronic files in MS Word, Excel or other application acceptable to the IDB (must include all annexes and appendices); (ii) an electronic PDF file for each full report. These reports and electronic files must be submitted within the time limits mentioned above.

8. **Acceptance Criteria**

1. The Water and Sanitation Division of the IDB office in Washington (INE/WSA) and Brazil will have the technical responsibility for the execution of this contract with the support of CAJ, as well as the approval of the deliverables prepared by the firm, that should describe the activities performed and the results attained all in accordance with these terms of reference.

9. **Other Requirements**

1. The firm shall provide Portuguese speaker personnel to manage all the communications and coordination of all the activities throughout the project.

2. Project director: professional with experience in direction of at least 2 similar projects as this one.
3. The firm shall include at least one professional with experience in drinking water network control operation or design.

10. **Supervision and Reporting**

1. The Water and Sanitation Division (INE/WSA) will be in charge of the supervision of this contract and the approval of the reports, in coordination with CAJ. On behalf of the IDB, the technical coordination of this service pilot project is the responsibility of Alejandra Perroni, (mperroni@iadb.org) and Tiago Pereira (tiagop@iadb.org). The IDB coordinating team will also be integrated by Hila Cohen (hilac@iadb.org), Claudia Nery (claudiabo@iadb.org) and Gustavo Mendez (gmendez@iadb.org) .

11. **Schedule of Payments**

1. Payment terms will be based on project milestones or deliverables. The Bank does not expect to make advance payments under consulting contracts unless a significant amount of travel is required. The Bank wishes to receive the most competitive cost proposal for the services described herein.
2. The IDB Official Exchange Rate indicated in the RFP will be applied for necessary conversions of local currency payments.

Payment Schedule	
Deliverable	**%**
Deliverable 1: Inception report	15%
Deliverable 2: Report 2	25%
Deliverable 3: Report 3	20%
Deliverable 4: Report 5	20%
Deliverable 5: Final report	20%
TOTAL	100%

TERMS OF REFERENCE

Ejemplos de TdeR a utilizarse en la CT
Water Event Management Service
(ejemplo usado bajo la CT RG-T3298 en SEDAPAL, Peru, replicable en otros operadores)

1. Background and Justification

1. Established in 1959, the Inter-American Development Bank ("IDB" or "Bank") is the main source of multilateral financing for economic, social, and institutional development in Latin America and the Caribbean. It provides loans, grants, guarantees, policy advice, and technical assistance to the public and private sectors of its borrowing countries.
2. The IDB, through its Water and Sanitation Division (WSA) within the Infrastructure and Energy Sector (INE), provides technical support to IDB member countries in the conceptualization, preparation, and execution of financial and non-financial programs and projects in the water and sanitation sector. WSA activities cover topics related to drinking water supply (including water resources management), and wastewater, urban drainage, and solid waste management. In line with the Bank strategies, WSA seeks to assist countries in their efforts to ensure universal access to sustainable, high-quality services.
3. The IDB and the Government of Israel have established a technical collaboration program to assist IDB´s borrowing member countries in improving their knowledge and strengthening their capacity for the development and adoption of innovative technologies in the provision of water and sanitation services. The Technical Cooperation (TC) RG-T3298 (IDB-Israel Collaboration: Improving Capacities in Water Resource Technologies) focuses on: (i) Desalination, as a viable technology to increase water supply for various uses, especially in areas with water supply limitation due to water imbalances caused by over-extraction and climate change impacts; (ii) Smart Water Infrastructure Technology (SWIT), and (iii) wastewater treatment/reuse, to increase supply of water of various qualities for reuse in agricultural, industrial, residential and service sectors, thus improving water security.
4. SEDAPAL, a state-owned water and sanitation utility, serves most of the Metropolitan Area of Lima, Peru's capital, with a population of around 10 million people in an area of 279,860 Ha. With low precipitation and a fast-growing population, the demand for water is expected to significantly increase in the coming decades in the area.
5. SEDAPAL aims to achieve 100% and 24-hour coverage of drinking water and sewerage service for the city of Lima and Callao and had initiated projects that has expanded the coverage in the last decade.
6. This service is aimed to allow SEDAPAL to analyze and identify anomalies in distribution and operation systems and therefore expend their service of water supply in the defined areas under scope mentioned below.

2. Objectives

1. The objective of this pilot project is the implementation of a proprietary cloud based Event Management product in SEDAPAL (in Spanish) for the analysis, identification, and management of anomalies in the operation of the water distribution system aimed at improving its efficiency.

2. Expected benefits include reduction of SEDAPAL's network analysis time by using water supply system behavioral machine learning and reduction of water leakage awareness time.

3. **Scope of services**

1. **Project Areas**

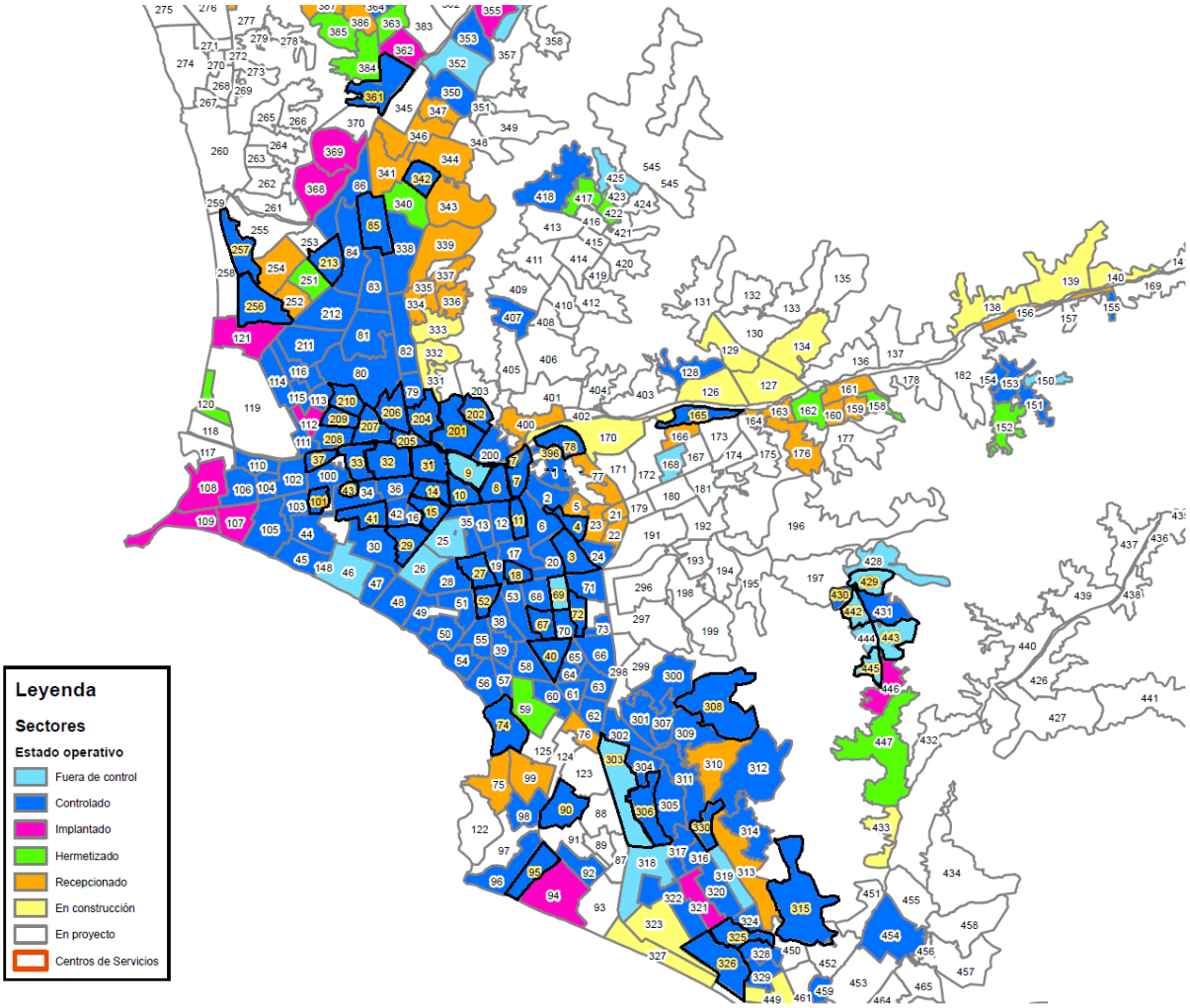
1. The service areas to be considered in the project are fifty-eight (58) sectors, which belong to the service centers of the North, Central and South Service Management, see Graph No. 02; however, the number of sectors would not be limiting, as it could reach up to sixty (60) sectors and/or could be modified by other sectors of similar hydraulic characteristics, depending on the need of the operational user area.

Graph No. 02: **Sectors considered for the project**

Managements	**Service Centers**	**Sector No.**	**Sectors**	**No Connections**	**Area (km2)**
Northern Service Management	Callao	4	37, 101, 256, 257	12,173	34
	Comas	13	85, 201, 202, 204, 205, 206, 207, 208, 209, 210, 213, 342, 361	72,902	110.5
Service Management Center	Ate Vitarte	5	3, 4, 78, 165 and 396	16,374	42.5
	Breña	15	7, 8, 9, 10, 11, 14, 15, 18, 29, 31, 32, 33, 41, 42, 43	65,098	127.5
Southern Service Management	Surquillo	9	27, 40, 52, 67, 69, 72, 74, 90, 95	35,603	76.5
	Villa El Salvador	12	303, 306, 308, 315, 325, 326, 330, 429, 430, 442, 443, 445	57,217	102

Elaborated by Research, Innovation and Standardization Team, SEDAPAL – Source: Leak Control and Reduction Team,
January 2018 data.

Graph No. 03: **Map of sectors considered for the project**



Source: Leak Control and Reduction Team, SEDAPAL January 2018

2. **Services that will be provided by the firm.** The firm will assist SEDAPAL to use its cloud based proprietary product for the following purposes:

1. Detection of events that are related to faulty assets that may require calibration or configuration.
2. Detection of telemetry failures.
3. Manage consumption/usage patterns, DMA breach, pressure issues by learning the behavior of the drinking water supply system.
4. Manage multiple events in the, distribution network, and commercial system, using AI algorithms (Artificial Intelligence).
5. Prioritization of actions in the network.
6. Ongoing and automatic analysis of the events.
7. Detection of leak events within the geographical boundaries of the DMAs
8. Process the data extracts by SEDAPAL and uploads to the cloud of the selected system.

3. **The solution of the firm may use some or all the data provided by the following information systems used by SEDAPAL to run its operations:**

1. Commercial Management System (OPEN SGC): Is a computer system that integrates all the activities related with the commercialization of the SEDAPAL Drinking Water Service.
2. Production and distribution management systems:
   - Production Management System
   - Water Intake Control (SCCA)
   - Operational Management (SGO)
   - Water Quality Management (SCAL)

3. Operational incident management systems:
   - Operational Occurrence/Emergency Management System (SGIO)
   - Integrated Administrative Management System (SAP)
   - SCADA system
   - Production Plant Maintenance System (Maximum)

4. **Key Activities**

1. Activity 1: Project kick off: remote presentation to the team assigned from SEDAPAL and IDB to the project in order to share information and establish expectations about activities and duration, data requirements to be prepared by SEDAPAL, information on parameters needed to configure the application, integration and connectivity to SCADA or other sources, roles and responsibilities between the parties and communication channels throughout the project.
2. Activity 2: System configuration.
3. Activity 3: Network structure- Upload the data SEDAPAL will provide in a predefined structure according to the guidance of the firm about the network areas and subareas, sensors (flow, pressure, quality, level) and the connections between sensors and areas.
4. Activity 4: Upload up to 1 year of historical data from each sensor. SEDAPAL will collect the historical data and share it with the firm.
5. Activity 5: Online data- SEDAPAL will develop the relevant scripts to extract in a predefined schedule the data from one or more of its data sources (e.g. SCADA), zip and upload the data to a dedicated FTP site the firm will allocate for SEDAPAL to continuously transfer the latest data from all relevant sensors
6. Activity 6: Complement historical sensor data series between the initial loading of historical records and the connection to the online data sources. SEDAPAL will collect the additional historical data and share it with the firm.
7. Activity 7: GIS data- Upload network assets, including pipes, polygons (DMA perimeters), sensors, valves, fire hydrants, etc. SEDAPAL will collect the GIS data and share it with the firm.
8. Activity 8: Soft launch- run internal tests.
9. Activity 9: Put the system into operation (go live): enable SEDAPAL end users to access the application.
10. Activity 10: Training: Remote training of key system users in Spanish.
11. Activity 11: Best Practices workshop: 2-4 weeks following the "go live" activity, perform a thorough user training workshop in Spanish including all the activities and

processes they need to perform during their daily routines. This training course will be delivered remotely.

12. Activity 12: Assist SEDAPAL in the use of the product during the 12 months from the agreement date between IDB and the firm.

5. **Expected Outcome and Deliverables**

5.1 Outcomes:

1. Network structure in place- uploading the network areas and sub-areas (DMAs in hierarchical structure of the network), the sensors (flow, pressure, quality, level), and the connection between the sensors and the areas (Deliverable 1: Activities 1 and 3).
2. Integration of SEDAPAL systems- uploading the historical reading of each sensor, integrating one or more sources of data, such as SCADA. using FTP, and complementing the historical data. (Deliverable 2: Activities 4, 5, and 6).
3. Enabling the users of SEDAPAL to access and use the solution , remote training of selected staff at SEDAPAL- The firm will deliver an online training session and provide written training material in Spanish to all relevant parties (Deliverable 3: Activities 2, 7, 8, 9, 10 and 11)
4. Concluding document to show events detected in the system during the pilot execution, recommendation for the possibility of future use the system (scale up possibilities)

5.2 Deliverables

5.2.1 Deliverable 1: Network Structure Data Report from the system that includes DMA's, sensors, and connection between the sensors and the areas to the system.

5.2.2 Deliverable 2: Integration system report.

5.2.3 Deliverable 3: Training document describing the trainings that took place, participants and other relevant documents.

5.2.4 Deliverable 4: Conclusion and recommendation report

6. **Project Schedule and Milestones**

1. Deliverable 1: Should be submitted up to 30 days after receiving all relevant information from SEDAPAL. IDB and SEDAPAL will approve or send comments on Deliverable 1 up to 10 days following the firm's submission.
2. Deliverable 2: Should be submitted up to a week after completion of activities 4, 5, and 6. IDB and SEDAPAL will approve or send comments on Deliverable 2 up to a week following the firm's submission.
3. Deliverable 3: Should be submitted up to a week after completion of activities 2, 7, 8, 9, 10, and 11. IDB and SEDAPAL will approve or send comments on Deliverable 3 up to a week following the firm's submission.
4. Deliverable 4: Should be submitted during the last month of the pilot and at least 12 days before closing of the contract. IDB and SEDAPAL will approve or send comments on Deliverable 4 up to 10 days following the firm's submission.
5. The duration of the contract is one year.

7. **Reporting Requirements**

1. The products must be presented in English and Spanish. All reports shall be submitted as follows: (i) the relevant electronic files in MS Word, Excel or other application acceptable to the IDB (must include all annexes and appendices); (ii) an electronic PDF

file for each full report. These reports and electronic files must be submitted within the time limits mentioned above.

8. **Acceptance Criteria**

1. The Water and Sanitation Division of the IDB office in Washington (INE/WSA) and Peru will have the technical responsibility for the execution of this contract with the support of SEDAPAL, as well as the approval of the deliverables prepared by the firm. On behalf of the IDB, the technical coordination of this service pilot project is the responsibility of Alejandra Perroni, Lead Water and Sanitation Specialist (email: mperroni@iadb.org). The IDB coordinating team will be integrated by Tania Paez (taniap@iadb.org), Hila Cohen (hilac@iadb.org) and Alejandra Perroni (mperroni@iadb.org).

9. **Other Requirements**

The firm shall provide Spanish speaker personnel to manage all the communication and coordination of all the activities throughout the project.

10. **Supervision and Reporting**

The Water and Sanitation Division (INE/WSA) will be in charge of the supervision of this contract and the approval of the reports, in coordination with SEDAPAL.
On behalf of the IDB, the technical coordination of this service pilot project is the responsibility of Alejandra Perroni, Lead Water and Sanitation Specialist (email: mperroni@iadb.org). The IDB coordinating team will be integrated by Tania Paez (taniap@iadb.org), Hila Cohen (hilac@iadb.org) and Alejandra Perroni (mperroni@iadb.org).

11. **Schedule of Payments**

1. Payment terms will be based on project deliverables. The Bank does not expect to make advance payments under cloud based software service contracts unless a significant amount of travel is required. The Bank wishes to receive the most competitive cost proposal for the services described herein.
2. The IDB Official Exchange Rate indicated in the RFP will be applied for necessary conversions of local currency payments.

Payment Schedule	
Deliverable	**%**
Deliverable 1: Network Structure Data Report	30%
Deliverable 2: Integration system report	30%
Deliverable 3: Training concluding document	35%
Deliverable 4: conclusion and recommendation report	5%
TOTAL	100%

TERMS OF REFERENCE

Ejemplos de TdeR a utilizarse en la CT
Evaluation of industrial effluents in a pilot area of the sewage system
(ejemplo usado bajo la CT RG-T3298 en Bogotá, Colombia, replicable en otros operadores)

1. Background and justification

1.1. Established in 1959, the Inter-American Development Bank ("IDB" or "Bank") is the principal source of multilateral financing for economic, social and institutional development in Latin America and the Caribbean. It provides loans, grants, guarantees, policy advice and technical assistance to the public and private sectors of its borrowing countries. The IDB, through its Water and Sanitation Division (WSA) within the Infrastructure and Energy Sector (INE), provides technical support to IDB member countries in the conceptualization, preparation and execution of financial and non- financial programs and projects in the water and sanitation sector. WSA's activities cover issues related to drinking water supply (including water resources management) and wastewater, urban drainage, and solid waste management. In line with the Bank's strategies, WSA seeks to assist countries in their efforts to ensure universal access to sustainable, high-quality services.

1.2. The IDB and the Government of Israel have established a technical collaboration program to help IDB borrowing member countries improve their knowledge and strengthen their capacity for the development and adoption of innovative technologies in the provision of water and sanitation services. Within this framework, Technical Cooperation (TC) RG- T3298 (IDB-Israel Collaboration: Improving Capacities in Water Resource Technologies) focuses on three main areas: (i) Desalination; (ii) Smart Water Infrastructure Technology (SWIT) and (iii) wastewater treatment / reuse.

1.3. Empresa de Acueducto y Alcantarillado de Bogotá (EAAB-ESP) operates the sewerage network of the city of Bogotá, which receives wastewater discharges from 158,000 non- residential users. These discharges often contain components that cause damage to the sewer system.

1.4. Despite the pollution control regulations established in Decree 1076 of 2015 and Resolution 0631 of the same year, compliance and reporting by utilities on key water quality parameters is poor. By applying effective monitoring technology, the utility could characterize key parameters throughout the system and identify the source of discharges in order to mitigate these negative impacts. In response to this problem, EAAB-ESP implemented its Industrial Effluent Program, which allowed the utility to focus on critical areas of the city. Specifically, the Montevideo area, between Avenues 68 and Boyacá, and between 13th and 22nd streets, stood out as critical given the high industrial density, and the impact of effluent quality on the deterioration and incremental costs of operation and maintenance of wastewater collection and treatment infrastructure.

1.5. EAAB has requested IDB support to evaluate the use of smart technologies in a pilot area to improve its ability to identify and respond to non-compliant industrial effluent discharges in the utility's sewer network.

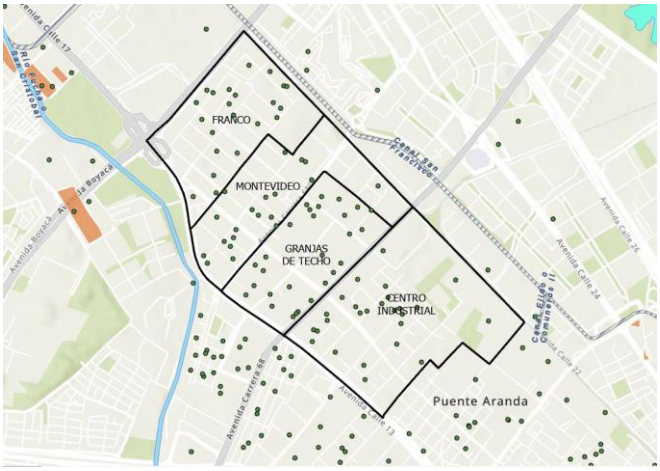
2. Objectives

2.1 The objective of this project is to evaluate the applicability of an intelligent predictive system that includes continuous monitoring of wastewater quality and intelligent data analysis for the identification of non-compliant sewerage network discharges in a pilot area in Bogota, to assist utility managers and network operators in taking corrective actions and, therefore, in improving the efficiency and sustainability of operations over time.

3. Scope of services

3.1. Project area

3.1.1. The area where the pilot will be carried out is called Montevideo industrial area, in Bogotá, it includes the neighborhoods De Montevideo, Granjas Techo, Franco and Centro Industrial in Colombia. In total there are approximately 307 industries according to the user database of EAAB -ESP.



FOOD PROCESSING	11
CONSTRUCTION	7
TANNING AND PREPARATION OF LEATHER	3
CHEMICAL INDUSTRY	5
TEXTILE INDUSTRY AND ASSOCIATES	15
OTHER MANUFACTURING INDUSTRIES	266
TOTAL	**307**

3.2. Services to be provided by the firm.

3.2.1. The firm will provide an "end-to-end" service that will allow the detection of contamination events within the pilot area of the sewer network. The services include all planning and design of the monitoring system location based on the firm's expertise, collection and analysis of existing project-related data, provision and installation of the necessary devices to collect and transmit quality data during the execution of the pilot project, use of data intelligence analysis on the collected data to identify key pollutants and predict abnormal events due to pollutant discharges, and performance evaluations and recommendations.

3.2.2. The solution will support utility managers and network operators with:

- Provide a real-time automated system for Wastewater Network Management and Quality Control (WNM-QC).
- Continuous collection and analysis of wastewater quality data from the network.
- Provide alerts and event detection.
- Identification of abnormal events in the network.
- Identify the sources of these events and visualize the impacts of the event.

3.2.3. The company will facilitate the interaction of EAAB-ESP planners and operators with the information and results of the application and provide training through a web-based interface.

3.2.4. The devices supplied and installed, and the software installed by the company, will be removed the end of the contract.

3.2.5. Once the pilot has finished, the firm must request and obtain from EAAB-ES the permits for the installation and removal, of the devices to be supplied for this project.

3.2.6. No software will be developed under this agreement,

3.2.7. The firm will perform verification samples during the execution of the test while EAAB

- ESP will perform the corresponding analysis in the water laboratory of the “Dirección de servicios técnicos”, which is accredited. The samples taken by the firm must be delivered directly to the laboratory at the headquarters of EAAB-ESP. The firm will present in its technical proposal the number of samples that, according to its experience, will be taken for this study and that will be included in its proposal. Notwithstanding the above, EAAB-ESP may take samples and perform the analyses it deems necessary for its own verification or that are agreed as complementary to improve the accuracy of the study.

In its technical offer, the company will present a preliminary roadmap of samples and components to be analyzed, which will be adjusted in meetings with EAAB-ESP and will be defined according to the laboratory's portfolio of services, during the elaboration of the detailed plan.

4. Key activities

4.1. **Activity 1: Project initiation and detailed work plan. Will include (via remote**): Discussion with EAAB-ESP on the pilot process, information sharing and expectations, activities and duration; requirements for data to be prepared by the utility; roles and responsibilities between the parties (including water quality laboratory testing under the responsibility of EAAB-ESP); definition of sites for *hardware* and *software* deployment; communication channels and routines and data management (including visualization through dashboards) that will be available during the life of the contract. Review of technical requirements for equipment installation and required permits (1 month).

4.2. **Activity 2: Information/data collection.** The firm will collect available information on: industrial censuses / records for the pilot area; industrial discharge quality (from EAAB- ESP or self-report from industries); pollution parameters in the network, in the catchment and outlets / discharges of the WWTPs;; available historical / time series data of pollution events; and cases of sever contamination that required government intervention (i.e. environmental compliance, sanctions, health emergencies, etc.) (1 month).

4.3. **Activity 3: System planning and configuration.** Includes definition of location and number of devices; time/frequency of data collection; theoretical characterization of pollution events (pollution footprints) and predictive routines; extrapolation routines based on expected industrial type, water consumption and effluent quality; laboratory testing of water quality in samples to be collected (EAAB's responsibility); specification of KPIs for the pilot; proposal of EAAB-ESP's operational structure and strategic use of monitoring results, interfacing with existing information systems used in EAAB-ESP and user interface routines (1 month).

4.4. **Activity 4: Installation of monitoring devices** (controllers and automatic samples) in the locations agreed with EAAB-ESP, and all analytical and communication means for data collection, processing and reporting of results (2 months).

4.5. **Activity 5. Activation, testing and calibration.** Testing / calibration of analytical routines and output samples for discussion with EAAB-ESP. Includes: Fingerprint mapping, sample event profiling, display routines, *upstream* parameter analysis and verification of sample results, predictive routines, etc. Agreement on data and format for obtaining results, based on EAAB-ESP's needs for environmental compliance and implementation of pollution control measures at industrial level. (1 month)

4.6. **Activity 6. Complete analysis of the monitoring network, with analytics and visualization routines** (2 months)**.**

4.7. **Activity 7. Training workshop for EAAB staff,** including: specific technical needs for continuous monitoring of contamination events, data collection and updating, interfacing with the monitoring system and reporting of results (This activity will be developed in parallel / as part of activities 2-5).

4.8. **Activity 8. Demobilization of the monitoring systems and preparation of the final report,** with conclusions and recommendations of the pilot. This includes a program to expand / complete pollution monitoring within the industrial area of Montevideo and other areas identified by EAAB-ESP as priority (scaled up) (1 month).

4.9. **Activity 9. Knowledge exchange:** biweekly meetings will be held to learn about the progress of the project and exchange knowledge between the parties.

5. Expected results and outputs

5.1. **Results:**

5.1.1. Enable EAAB-ES to evaluate the benefits and challenges of implementing an intelligent monitoring and event management system in improving the detection and control of non-compliant industrial discharges to its sewer network, and compile lessons learned to assist in decision making and planning to respond to these events.

5.1.2. Enable EAAB-ESP to increase the efficiency of its wastewater monitoring and network operation.

5.2. **Deliverables:**

5.2.1. Expected output 1: Initial report (Activity 1).

5.2.2. Deliverable 2: Report 2: Analysis of the information collected and design of the monitoring system (Activities 2 and 3).

5.2.3. Deliverable 3: Report 3: Results of the activation and testing of the monitoring, communication and data analysis systems. (Activities 4 and 5).

5.2.4. Deliverable 4: Final report. The report will include description of the activities carried out during the period in which the pilot will be carried out with all its functionalities fully implemented (installation, start-up, operation, maintenance, calibration, communication), events detected, results obtained, challenges, drawbacks, lessons learned, conclusions and recommendations. (Activities 6 and 8)

5.2.5. The description of the training activities (activity 7) will be included in the report following each training activity.

5.2.6. Presentation of results

6. Project schedule and milestones

6.1. Deliverable 1: To be submitted 1 month after contract signature date, includes initial presentation.

6.2. Deliverable 2: To be submitted 3 months after the contract signing date.

6.3. Deliverable 3: To be submitted 5 months after the contract signing date.

6.4. Deliverable 4: To be submitted 1 month prior to contract completion, includes final presentation of results.

6.5. The duration of the contract is 9 months.

7. Reporting requirements

7.1. Reports must be submitted in English and Spanish. All reports shall be submitted as follows: (i) relevant electronic files in MS Word, Excel or other application acceptable to the IDB (must include all annexes and appendices); (ii) an electronic PDF file for each complete report. These reports and electronic files must be submitted within the deadlines mentioned above.

8. Acceptance criteria

8.1. The Water and Sanitation Division of the IDB Washington Office (INE / WSA) and EAAB- ES will have the technical responsibility for the execution of this contract with the support of EAAB-ES, as well as the approval of the deliverables prepared by the firm, which shall describe the activities performed and the results obtained, all in accordance with these terms of reference.

9. Other requirements

9.1. The firm will provide Spanish-speaking staff to manage communication and coordination of activities throughout the project.
9.2. The installation and operation of the devices in Bogota will be performed by local personnel. All other activities will be performed from the consultant's country of residence.
9.3. Project Manager: professional with experience in managing at least 2 projects similar to this one.
9.4. The firm shall include at least one professional with experience in operation or design of sewage systems and characterization of industrial wastewater.
9.5. EAAB-ESP. will provide support during the different stages of the project.

10. Monitoring and reporting

10.1. The Water and Sanitation Division (INE / WSA) will be in charge of the supervision of this contract and the approval of the reports, in coordination with EAAB-ES. On behalf of the IDB, the technical coordination of this pilot service project is in charge of Alejandra Perroni, Lead Water and Sanitation Specialist (email: mperroni@iadb.org) and Maria del Rosario Navia, Senior Water and Sanitation Specialist in Bogota (email: mnavia@iadb.org). The IDB coordination team will also include Hila Cohen (e-mail: hilac@iadb.org).

11. Payment Schedule

11.1. Payment terms will be based on project milestones or deliverables. The Bank does not expect to make advance payments under consulting contracts unless a significant amount of travel is required. The Bank desires to receive the most competitive cost proposal for the services described herein.

11.2. The official IDB exchange rate indicated in the RFP will be applied for necessary conversions of payments in local currency.

PAYMENT SCHEDULE	
Deliverable	**%**
Expected output 1: Initial report	20%
Deliverable 2: Report 2	25%
Deliverable 3: Report 3	35%
Expected output 4: Final report	20%
TOTAL	**100%**