



CERTIFICATION AND FINANCING PROPOSAL

DRINKING WATER SYSTEM IMPROVEMENTS IN NACO, SONORA

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EXECUTIVE SUMMARY

DRINKING WATER SYSTEM IMPROVEMENTS IN NACO, SONORA

Project Summary

Project Name:	Drinking Water System Improvements.
Project Type (Sector):	Water.
Objective:	To improve the sustainability of the drinking water system by: (i) installing meters to determine actual water use, provide a reliable basis for billing and revenue generation, detect water losses and apply water conservation strategies, as appropriate; and (ii) achieving a fully operational renewable energy system (solar) to power three water wells, which will reduce energy costs, thus improving the overall financial health and institutional capacity of the utility.
Expected Outcomes:	<ul style="list-style-type: none">▪ Improve access to drinking water service for 2,326 existing connections.▪ Offset 100% of energy demand at production wells with a solar system that is expected to generate approximately 767.77 megawatt-hours (MWh) of electricity during the first year of operation and thus help prevent the emission of an estimated:<ul style="list-style-type: none">○ 352.47 metric tons/year of carbon dioxide (CO₂),○ 1.06 metric tons/year of nitrogen oxides (NO_x),○ 2.79 metric tons/year of sulfur dioxide (SO₂), and○ 0.17 metric tons/year of particulate matter (PM₁₀).▪ Strengthen institutional capacity of the utility by establishing the ability to measure the water consumption of 100% of existing water connections.
Population to Benefit:	6,150 residents.
Sponsor:	Local water utility, <i>Organismo Operador Municipal de Agua Potable, Alcantarillado y Saneamiento de Naco (OOMAPAS)</i> .
Project Cost:	US\$1,500,000.

Financial Summary

Program:	Community Assistance Program (CAP).
Grant Amount:	US\$500,000.
Grant Recipient:	OOMAPAS.
Other Funding Sources:	US\$700,000 in federal funds (CONAGUA); US\$296,000 from the Municipality of Naco; US\$4,000 from OOMAPAS.

CERTIFICATION AND FINANCING PROPOSAL

DRINKING WATER SYSTEM IMPROVEMENTS IN NACO, SONORA

1. PROJECT OBJECTIVE AND EXPECTED OUTCOMES

The proposed Project consists of installing meters for 2,326 registered water service connections and completing the installation and start-up of a solar panel system to power three drinking water production wells in the municipality of Naco, Sonora (the “Project”). The purpose of the Project is to improve the sustainability of the drinking water system by metering actual water use, which will provide a reliable basis for billing and revenue generation, detecting water losses, and applying water conservation strategies. Additionally, having a fully operational alternative energy system is expected to lower energy costs and improve the overall financial health and institutional capacity of the utility.

The entire community of approximately 6,150 residents is expected to benefit from the Project.¹

2. ELIGIBILITY

2.1. Project Type

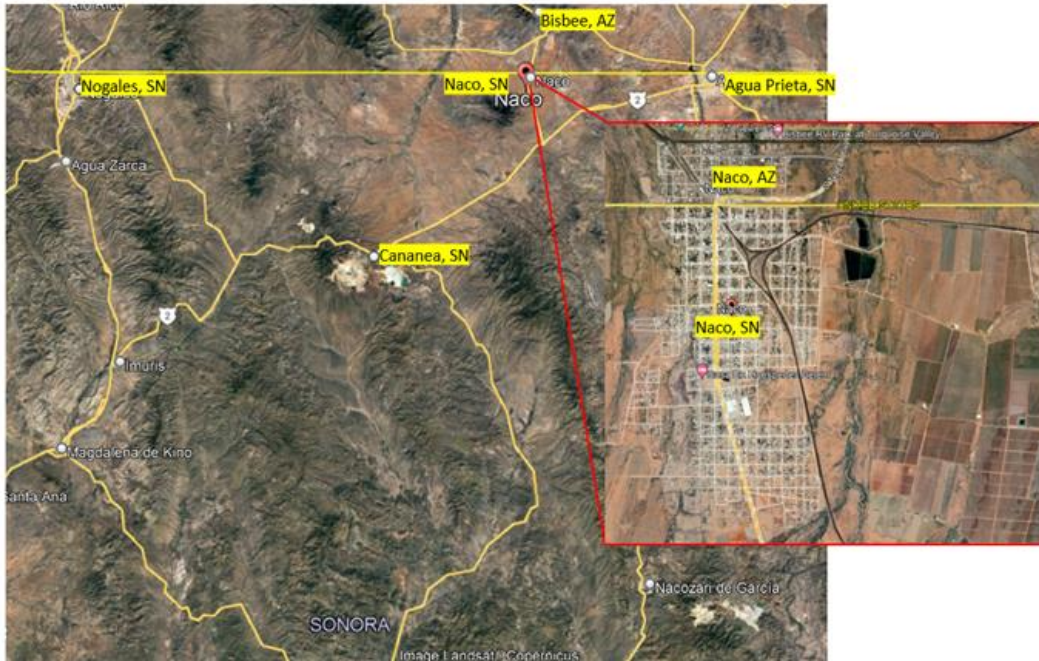
The Project falls within the eligible sector of water.

2.2. Project Location

The city of Naco is the municipal seat of the municipality of Naco in the northern area of the state of Sonora and is located approximately seven miles southwest of Bisbee, Arizona and 58 miles east of Nogales, Sonora. The Project is adjacent to Naco, Arizona on the U.S.-Mexico border at the following geographic coordinates: latitude 31°19'34.21” North and longitude 109°56'48.56” West. Figure 1 shows the location of Naco.

¹ Source: Mexican national institute of statistics, Instituto Nacional de Estadísticas y Geografía (INEGI), 2020.

Figure 1
PROJECT LOCATION MAP



2.3. Project Sponsor and Legal Authority

The Project sponsor is the local water utility, Organismo Operador Municipal de Agua Potable, Alcantarillado y Saneamiento de Naco, Sonora (OOMAPAS or the “Sponsor”). The State Congress of Sonora authorized the creation of OOMAPAS by a decree published on May 7, 1992. OOMAPAS is a decentralized entity of the municipality, with legal personality and its own assets, responsible for providing water and wastewater services to the communities located within the municipality. OOMAPAS is overseen by a Board of Governors, which is presided over by the mayor of Naco, and its members include a representative from the Mexican National Water Commission (CONAGUA) and a representative from the Sonora State Water Commission (CEA), among others.

3. CERTIFICATION CRITERIA

3.1. Technical Criteria

3.1.1. General Community Profile

The Project is expected to benefit the residents in the community of Naco, Sonora. As reported by the Mexican National Institute of Statistics (INEGI), the population of Naco was 6,150 in 2020, which represented approximately 0.2% of the state population. According to data from the 2020 Annual Report on the Status of Poverty and Unmet Social Needs issued by the

National Council for the Evaluation of Social Development Policy (CONEVAL), 58% of the population in Naco was living below poverty level, which is higher than the state average of 39%.

The following table summarizes the status of basic public services and infrastructure in Naco.

Table 1
BASIC PUBLIC SERVICES AND INFRASTRUCTURE IN NACO

Drinking water	
Coverage:	97%
Supply source:	5 wells (4 active)
Number of connections:	2,326 (2,177 residential, 146 commercial and 3 industrial)
Sewage	
Coverage:	97%
Number of connections:	2,326
Wastewater Treatment	
Coverage:	100% of wastewater collected
Treatment plant:	Oxidation lagoon with a design capacity of 27 lps (0.62 mgd)

Source: OOMAPAS

Local Water and Wastewater Systems

OOMAPAS provides water distribution and wastewater collection services to 2,177 households, as well as to 146 commercial and three industrial customers, covering nearly 100% of the community. The water infrastructure is composed of five deep wells, four of which are currently operating, and elevated storage tanks. Altogether, the wells provide an average daily flow of 47.6 liters per second (lps) or 754 gallons per minute (gpm). The water distribution system consists of 37.2 kilometers (km) (23.1 miles) of pipeline with diameters ranging from three to eight inches.

The sanitary sewer system extends approximately 40 km (25 miles) and conveys wastewater through a gravity outfall to the wastewater treatment plant (WWTP), which has a design capacity of 27 lps (0.62 mgd). The City has been experiencing a series of problems in its wastewater system, including obstructions in the sewer system and pipeline breaks resulting in sewage spills onto local streets and transboundary flows into the U.S., as well as an overstressed treatment plant. These ongoing problems prompted the City and the States of Sonora and Arizona, in coordination with NADBank, EPA and CONAGUA, to evaluate the conditions that might be generating the wastewater infrastructure issues. Among the causes identified was the significant inflow and infiltration of water into the sewer system due to leaking distribution lines.

To further investigate the situation, in 2022, NADBank provided technical assistance to assess both the water and wastewater systems. The study results confirmed that the volume

of water extracted from the local aquifers and distributed by OOMAPAS was equal to approximately 580 liters/person/day, which is more than twice the national per capita average established by CONAGUA. According to CONAGUA's estimates, water deliveries in the city of Naco should be about 217 liters/person/day.² The study also concluded that most of this water is being lost in distribution, creating infiltration problems in the sewer system.

In addition to the investments required to improve the wastewater infrastructure in Naco, OOMAPAS is proposing to implement several actions to address the issues with its water system, including the installation of meters. The implementation of a metering system for its customers will provide more accurate data related to water use per connection and allow OOMAPAS to compare the amount of water delivered from each supply point and the amount metered at each connection in that sector. With this information, the utility will be able to better determine per capita water use, quantify the water lost in the system and pinpoint the location of those losses. Armed with this knowledge, the utility will also be in a better position to take actions aimed at promoting water conservation among its users. Finally, metering will improve the overall financial health of the utility by eliminating the costs associated with over-pumping.

Another major operating expense for OOMAPAS is electricity. To offset the energy needed to operate its water pumping facilities, the State of Sonora committed to providing an alternative energy source to generate renewable energy. The solar panels were installed in 2018 but, due to insufficient funds, the system was never connected to the local power grid.³ Therefore, OOMAPAS has requested NADBank's support to complete the connection and start-up of the solar panel system.

The proposed Project complements a parallel project to improve the wastewater collection and treatment infrastructure in Naco, which was selected for funding through the Border Environment Infrastructure Fund (BEIF). The study conducted in 2022 primarily focused on recommendations to rehabilitate the wastewater collection and treatment systems, including upgrades to the WWTP to bring it into compliance with the new Mexican standard NOM-001-SEMARNAT-2021. NADBank is working with OOMAPAS, CONAGUA, the State of Sonora, EPA and both sections of the International Boundary and Water Commission (CILA/IBWC) to complete development tasks for those critical investments, which will be submitted as an independent project for certification.

3.1.2. Project Scope

The Project consists of installing water meters and completing the connection and startup of the existing solar panel system for three water production wells. The Project component specifications are presented below:

- *Metering (pending implementation with CAP funds).* Purchase of up to 2,400 remote reading water meters and installation of 2,326 meters for existing water accounts.

² Source: CONAGUA, Manual of Drinking Water, Sewerage and Sanitation (MAPAS), Book 4, 2015.

³ Information regarding the current condition of the solar panels and inverters is provided in Section 3.1.3. Technical Feasibility.

- Solar panel system (completed with CONAGUA/local funds). The system includes 1,451 photovoltaic (PV) modules with a nominal capacity of 250-255 watts and is designed for easy maintenance with modules mounted on fixed arrays consisting of galvanized steel foundations and stainless steel and aluminum framing set at a 120-degree angle. The system has a total of 16 inverters to transform the direct current from the modules into alternating current with 80% efficiency. The inverters will be directly coupled to three transformers, which will transform the electricity to 600 volts. The system is expected to generate 2,103,479 watt-hours (Wh) a day or 767.77 MWh annually.
- Solar system connection and start-up (pending implementation with CAP). Acquire and install cables to connect panels to the electric grid, reinstall panels removed and stored by OOMAPAS, and start up and test the new energy source.

Figure 2 shows the five zones where the water meters will be installed.

Figure 2
DRINKING WATER ZONES

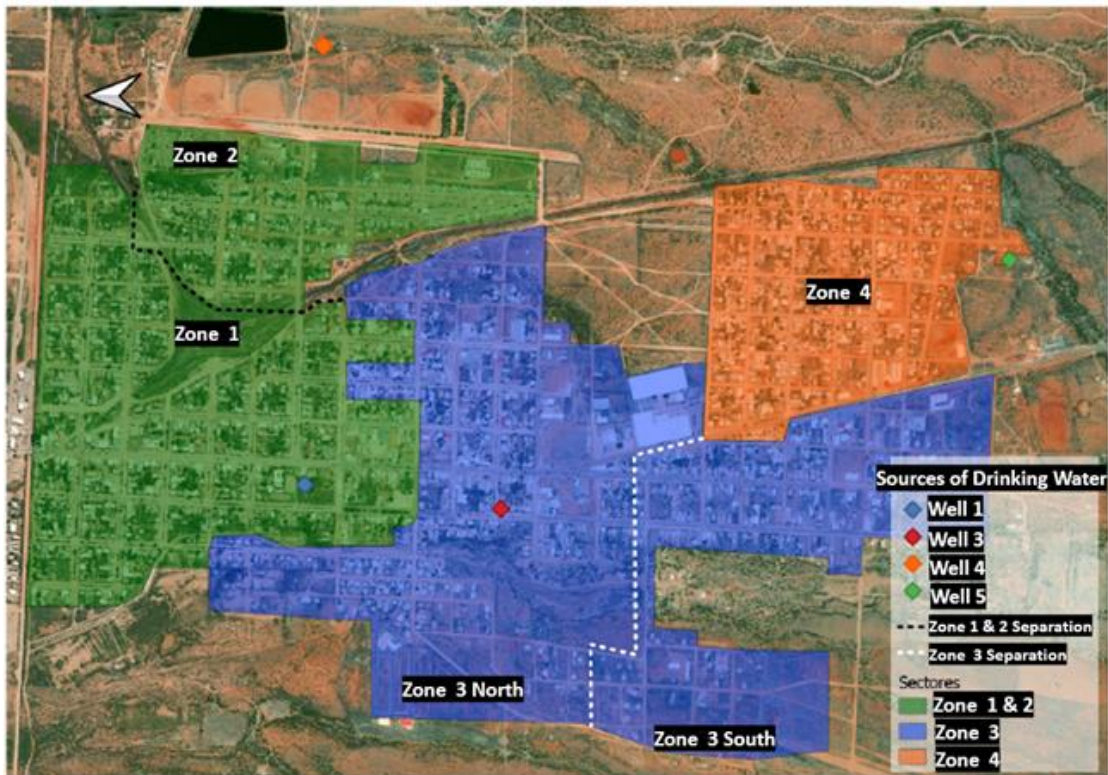


Figure 3 shows the solar panels installed with federal and local funds.

Figure 3
SOLAR PANEL SYSTEM



Although the solar panels and related components were installed in 2018, the system is not operational and requires additional investments to be connected to the grid. OOMAPAS also removed and stored some of the panels to protect them from vandalism or other threats. Additional information regarding the current condition of these components is provided in Section 3.1.3. below.

3.1.3. Technical Feasibility

Water Meters

Meters can be mechanically or electronically operated to measure and record the volume of water delivered. A meter may determine flow based on a volumetric or velocity mechanism. In Mexican standard NOM-012-SCFI-1994, meters are classified according to their operating mechanism. The meters used in drinking water systems for residential and commercial connections vary by manufacturer in terms of design and combination of parts.

The Project proposes to use a multiple jet meter, which uses a velocity type mechanism. The entry of water into the measuring chamber is made by several inputs, which produce “a multiple jet” effect (see Figure 4). Its solid and robust design allows the meter to operate in the most adverse conditions. In this case, the meters will also be pre-equipped for pulse emission for remote reading, which will be implemented upon completion of the new user registry and commercial system funded with technical assistance.

The meter assembly installation will comply with NOM-001-CONAGUA-2011. The proposed meter components are metallic (piping); however, the meter itself will be plastic per the final design specifications.

Figure 4
MULTIPLE JET VELOCITY METER



Velocity meters have a lid for maintenance, allowing for easy access to replace any parts. Remote reading provides real-time meter measurements and information about water use without the need for a home or site visit. The automated meter reading module receives a magnetic transmission of the volume of water delivered to each dwelling. The information is sent via radio frequency to the registration and data system. OOMAPAS staff will be trained in the use of the equipment once the new commercial system is available and as specified in either the purchase or installation agreement.

The final designs for installation of the proposed meters were completed in accordance with the recommendations provided in the Water and Wastewater Manuals developed by CONAGUA. The final design documents were reviewed by CONAGUA and NADBank. The CONAGUA regional office in the State of Sonora validated the technical specifications of the Project through official correspondence BOO.803.06.-33 dated July 31, 2023.

Solar Panel System Improvements

According to a study completed in 2022, the 1,451 installed modules and 16 inverters acquired for the solar panel system are not operating because they were never connected to the local grid. The 68 modules in storage appear to be in good condition. The study concluded that the 1,451 installed modules have the capacity to offset 100% of the energy demand to operate the production wells. The study also recommended that additional testing be done once the Project is ready for implementation, which has been included in the Project cost.

Therefore, to complete the solar energy system and initiate operations, every panel will again be tested to determine if it will still operate properly, including the 68 panels in storage, which are available to substitute inoperable panels or to install and supplement the energy generation. Likewise, Project implementation will entail disconnecting each panel from its junction box and checking that the relay switches, fuse connectors and cables are all in good working order. If a panel is not operational or a connector is damaged or a cable is in poor condition, the damaged parts must be replaced by components with the same characteristics and quality as the original items. Once each circuit is verified, the panels will be connected to the corresponding inverter. Stored modules may be used to substitute inoperable panels or to supplement energy generation capacity.

The solar energy system must comply with Mexican standard NOM-001-SEDE-2012 for electrical installations and will have to be inspected and validated by the Mexican Federal Electricity Commission (CFE) prior to start-up.

3.1.4. Land Acquisition and Right-of-Way Requirements

Construction will take place on public rights of way and property owned by the Municipality of Naco and OOMAPAS. No land or rights of way need to be acquired for the Project. No traffic disruptions are anticipated.

3.1.5. Project Milestones

Since the capacity of the solar energy system will be less than 500 kilowatts (kW), it is considered distributed generation and does not require an interconnection permit from CFE. Nevertheless, OOMAPAS will have to sign an interconnection agreement with CFE prior to Project commissioning.

It is estimated that once the notice to proceed is issued, construction will take approximately six months. The factors that may affect the Project completion date, such as weather conditions or the delivery of materials, have been taken into consideration. Table 2 summarizes the Project milestones and their respective status.

Table 2
PROJECT MILESTONES

Key Milestone	Status
Partial solar panel installation	Completed December 2018
Final designs for meter installation	Completed November 17, 2022
Procurement - solar system	Anticipated 2nd quarter of 2024
Procurement - Metering	Anticipated 2nd quarter of 2024
Construction period CAP grant	Estimated duration of 6 months
Solar panel system commissioning	To be determined once construction is completed

3.1.6. Management and Operation

Management and operation of the proposed Project will be the responsibility of OOMAPAS. OOMAPAS has a technical team of ten employees, which have experience in managing and operating the local drinking water and wastewater systems. Nevertheless, the utility has limited financial and institutional capacity, which is reflected in the ongoing challenges of adequately operating both systems, as well as affects its ability to generate sufficient revenue to improve its operations. However, the proposed Project along with other complimentary efforts are intended to improve this situation.

To support the implementation of this Project, NADBank will provide additional technical assistance for a user registry and commercial system that is compatible with the new

electronic meter reading system. Currently OOMAPAS does not have meters to measure user consumption and, therefore, no staff are assigned for meter reading. Once the meters are installed and the user registry and commercial system are implemented, OOMAPAS will assign personnel to read meters monthly via remote sensors, which will require minimal time or sophistication to read. In the interim, OOMAPAS has administrative staff that are capable of manually reading the meters.

Likewise, once the solar panel system is operational, it will reduce the utility's operating costs. The system will generate sufficient energy to offset the energy required to operate the pumps at three of the water wells. Due to the characteristics of the solar panel system (fixed tilt), its operation will require minimum interaction and maintenance from OOMAPAS. The utility will create a reserve account to cover the cost of replacing the inverters.

The expected increase in revenue generation, coupled with lower energy costs, will improve the financial health and operational sustainability of OOMAPAS. To further strengthen its institutional capacity, OOMAPAS shall designate staff to attend the NADBank Utility Management Institute (UMI) and similar ongoing training offered by or in partnership with NADBank. Finally, OOMAPAS shall commit to identify, implement, and report on specific operational improvements achieved during the CAP Project time period.

This CAP Project, along with the technical assistance and UMI training, are the first steps of a comprehensive approach to provide the utility with the resources needed to address its water and wastewater infrastructure needs.

3.2. Environmental Criteria

3.2.1. Environmental and Health Effects/Impacts

A. Existing conditions

Naco does not have any water metering. Customers are charged a flat rate regardless of water consumption, which makes it difficult to promote or enforce water conservation practices. Per capita water usage in Naco is more than twice that amount expected of a similar Mexican community. Due to this high-water consumption, the shared aquifer with Naco, Arizona, is vulnerable to over pumping and an accelerated depletion rate.

The lack of metering, in conjunction with over pumping and excessive water losses, also limits OOMAPAS' ability to generate revenue and properly operate and maintain its water and wastewater systems, compromising its sustainability.

B. Project Impacts

The Project is expected to generate environmental and human health benefits related to the following Project outcomes:

- Improve drinking water services for 2,326 existing water connections.

- Offset 100% of energy demand at production wells with a solar system that is expected to generate approximately 767.77 MWh of electricity during the first year of operation and thus help prevent the emission of an estimated:⁴
 - 352.47 metric tons/year of CO₂,
 - 1.06 metric tons/year of NO_x,
 - 2.79 metric tons/year of SO₂, and
 - 0.17 metric tons/year of PM₁₀.
- Strengthen institutional capacity by establishing the ability to measure water consumption with the installation of meters for 100% of existing water connections.

The Project will also help improve water resource management and conservation. Water metering allows the utility to set rates based on usage, perform water audits, detect leaks and evaluate the effectiveness of water conservation programs. Based on data collected from the new meters, OOMAPAS will be able to implement a water conservation rate structure and an improved leak detection program, which is anticipated to reduce unaccounted water losses and preserve water resources.

C. Transboundary Impacts

No negative transboundary impacts are anticipated due to Project implementation. On the contrary, a positive transboundary impact is expected due to the reduction in water pumped from the aquifer shared with Naco, Arizona.

3.2.2. Compliance with Applicable Environmental Laws and Regulations

The Project will comply with the following official Mexican standards and regulations:

- Official Mexican Standard NOM-001-CONAGUA-2011, which establishes the specifications for hermeticity in water distribution systems, residential water connections and wastewater collection systems, as well as testing methods.
- Official Mexican Standard NOM-012-SCFI-1994, which establishes the specifications for measuring water flows in closed conduits of cold drinking water systems.
- Official Mexican Standard NOM-001-SEDE-2012, which establishes the specifications and guidelines for electrical installations.

A. Environmental Clearance

The Project will be built on street medians and in previously disturbed or graded areas. No environmental risks or impacts to flora or fauna are anticipated from the implementation or

⁴ CO₂, NO_x, SO₂ and PM₁₀ calculations are based on the potential emissions avoided as a result of reducing future demand on fossil fuel-based electricity through the use of solar energy equivalent to 767.77 MWh/year and the emission factors for the state of Sonora. The emission factors are calculated by NADBank based on the power generation portfolio of the state of Sonora and the factors reported per technology in the Mexican National Power System Development Program (PRODESEN) 2018 (emission factors for cogeneration are not reported). The resulting emission factors are: 0.45909 metric tons/MWh for CO₂; 0.00138 metric tons/MWh for NO_x, 0.00363 metric tons/MWh for SO₂ and 0.00022 metric tons/MWh for PM₁₀.

operation of this Project. Therefore, no environmental clearance is needed for Project implementation.

B. Mitigation Measures

Although Project implementation will have no significant adverse effect on the environment, mitigation measures have been established to address temporary and minor adverse impacts during construction and operation of the Project. Potential impacts during the meter installation phase include:

- Sidewalk closures while meters are installed;
- Emissions from vehicles used during the installation phase; and
- Temporary water outages (typically less than one hour) as meters are installed at each connection.

Typical mitigation measures to be implemented include:

- Placement of warning signs to prevent potentially hazardous situations;
- Emission reduction through vehicle tune ups; and
- Mailings and/or flyers warning of anticipated water outages.

By following best management practices, the temporary impacts due to construction will be minimized. In addition, OOMAPAS will be responsible for maintaining continuous coordination with the applicable environmental protection agencies and must comply with any water quality requirements, authorization procedures or recommendations that such agencies may issue throughout the life of the Project. Moreover, the long-term results from the implementation of the proposed Project will be positive overall.

C. Pending Environmental Tasks and Authorizations

There are no environmental authorizations pending.

3.3. Financial Criteria

The total estimated cost of the Project is US\$1,500,000, including construction, supervision and contingencies related to the installation of the water meters and the solar energy system. In 2018, federal and local funding was invested to build the solar energy system but was insufficient to complete the connection to the power grid. OOMAPAS requested a US\$500,000 CAP grant from NADBank to help finance the installation of the meters and complete the solar energy system. Table 3 presents a breakdown of total Project costs and the proposed sources of funding.

Table 3
PROJECT INVESTMENT & FINANCING PLAN
 (USD)

Uses		Amount	%
Construction*		\$ 1,440,000	96.0
Supervision & contingencies		60,000	4.0
TOTAL		\$ 1,500,000	100.0
Sources	Instrument	Amount	%
NADBank CAP	Grant	\$ 500,000	33.3
CONAGUA	Direct Investment	700,000	46.7
Municipality of Naco	Direct Investment	296,000	19.7
OOMAPAS	Direct Investment	4,000	0.3
TOTAL		\$ 1,500,000	100.0

* Includes approximately US\$315,000 for meters and installation; US\$125,000 for solar system connection and start-up; and, US\$1,000,000 for solar panel system.

The proposed Project complies with all CAP criteria.⁵ It is located within the U.S.-Mexico border region served by NADBank, is being sponsored by a public-sector entity and is in an environmental sector eligible for NADBank financing. Additionally, as a drinking water project, it is considered a priority under the CAP program.

Based on the financial analysis conducted by NADBank, the Sponsor and the Municipality of Naco lack the administrative and financial capacity to comply with all legal and regulatory requirements to access debt. Given the limited financial capacity of the utility and its additional infrastructure needs, the CAP grant is required to make the Project affordable. However, as shown in the table above, the investments already made by the Municipality and utility in the construction of the solar energy system represent about 20% of the project cost, exceeding the 10% minimum contribution required under the CAP guidelines.

4. PUBLIC ACCESS TO INFORMATION

4.1. Public Consultation

NADBank published the draft certification and financing proposal for a 14-day public comment period beginning on February 28, 2024. The following Project documentation is available upon request:

- Technical validation issued by CONAGUA for the installation of water meters and for the existing solar panel system improvements, through official letter number BOO.803.06-080 dated July 31, 2023.

⁵ The Sponsor applied for CAP funding and the Project was developed under the previous program guidelines dated April 2020.

4.2. Outreach Activities

The Sponsor reported on Project progress at several monthly meetings of its Board. Those meetings were open to the public, and their agendas were published in advance.

NADBank conducted a media search to identify potential public opinion about the Project. No reference to the Project was found.

The activities carried out by the Project Sponsor demonstrate that the public has received periodic information regarding Project implementation. The Project Sponsor informed NADBank that no comments expressing concern about the Project have been received, and there has been no public opposition to the Project.