



# **CERTIFICATION AND FINANCING PROPOSAL**

## **EQUIPMENT FOR SANITARY LANDFILL OPERATIONS MADERA, CHIHUAHUA**

*Submitted: May 20, 2016*

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## EXECUTIVE SUMMARY

### EQUIPMENT FOR SANITARY LANDFILL OPERATIONS MADERA, CHIHUAHUA

The proposed project consists of the acquisition of equipment for sanitary landfill operations in Madera, Chihuahua, Mexico (the “Project”). The Project complements a sanitary landfill construction project, which was completed in 2014 and is not included in the scope of this certification.

The purpose of the Project is to achieve proper solid waste management in Madera by providing the equipment necessary to adequately operate the new sanitary landfill, thereby allowing the community to comply with the applicable laws and regulations and helping reduce improper solid waste disposal and related risks for soil and groundwater contamination, as well as vector-related diseases and other harmful effects.

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

- a) Improved landfill operations for the disposal of up to 17 metric tons of solid waste per day.
- b) Full compliance with the applicable laws and regulations.
- c) Improved solid waste management system for approximately 4,145 households.

17,050 residents of Madera, Chihuahua.<sup>1</sup>

Municipality of Madera, Chihuahua.

\$4,672,000 pesos (US\$292,000).

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<sup>1</sup> Source: Mexican national statistical institute, INEGI, Mexican Census, 2010.

<sup>2</sup> Unless otherwise noted, all U.S. dollar figures are quoted at an exchange rate of \$16.00 pesos to the dollar.

Up to US\$300,000 from NADB's Community Assistance Program (CAP).<sup>3</sup>

Equipment*	\$292,000	\$4,672,000	100.0
NADB CAP Grant**	\$300,000	\$4,800,000	100.0
		\$4,800,000	

\* Includes a service agreement and value-added tax (VAT).

\*\* Grant amount in dollars includes contingency to cover possible exchange rate fluctuations since project costs will likely be paid in pesos.

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<sup>3</sup> Since the project costs will likely be paid in pesos, the Bank is requesting a grant amount in dollars that will allow for possible fluctuations in the exchange rate. As noted above, the Project complements a landfill construction project funded jointly by the Municipality and the Mexican federal government for a total investment of \$3,817,280.57 pesos (US\$238,580), as indicated in the certificate of completion dated June 24, 2014. This investment meets the minimum sponsor contribution required under CAP grant program.

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### **MADERA, CHIHUAHUA**

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#### **Project Type**

The Project falls within the eligible sector of solid waste.

#### **Project Location**

The Project is located in Madera in the state of Chihuahua, about 238 km (148 miles) south of the U.S.-Mexico border.

#### **Project Sponsor and Legal Authority**

The Project sponsor is the Municipality of Madera, Chihuahua (the “Sponsor” or the “Municipality”), through its Department of Public Services. The Sponsor is responsible for solid waste management and has the legal authority to acquire, own and operate landfill equipment.

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### **2.1.1. Project Description**

#### **Geographic Location**

The municipality of Madera is located in the Sierra Nevada Mountains in the western region of the state of Chihuahua. Its municipal seat, Ciudad Madera, is about 85 miles south of Nuevo Casas Grandes and 201 miles southwest of Ciudad Juarez, Chihuahua. The sanitary landfill is located about 4 km (2.5 miles) north of the city. Figure 1 shows the approximate location of the Project.



### **General Community Profile**

According to the 2010 Mexican census, the municipality of Madera has a population of 29,611 residents, 17,050 of which live in or near the city of Madera. The population of the entire municipality represents 0.9% of the state's population and contributes 0.13% to Chihuahua's gross domestic product (GDP). Manufacturing constitutes the most important commercial sector, representing 40% of the local GDP, followed by commerce with more than 25% of the local GDP. The mining industry is the next largest sector, providing 10% of the total GDP for the municipality.

Table 1 shows the status of basic public services and infrastructure in Madera.

Coverage	98%
Supply source**	3 water wells
Number of hookups	4,043 connections
Coverage	85%
Number of connections:	3,507 connections
Coverage	0%
Treatment facilities	None
Collection coverage	100%
Final disposal	Dumpsite
Coverage	22%

\* Source: Unless otherwise indicated, INEGI, Mexican Population Census, 2010.

\*\* Source: Municipality.

### **Solid Waste Management Profile**

The Sponsor currently provides waste collection services to all of the 17,050 residents in the city of Madera and the surrounding communities (100% coverage). For collection services, the Municipality has seven collection routes supported by four trucks in good operating condition. Trash is collected once a week along one route to nearby communities and six routes within the city, with the exception of a commercial route that is collected daily.

Currently, collected solid waste is disposed of in a controlled dumpsite. However, to improve waste management and comply with Mexican federal standard NOM-083 SEMARNAT-2003, the Sponsor has completed construction of a new landfill with federal funding through the Mexican Ministry of Environment and Natural Resources (SEMARNAT), as well as its own funds. The Sponsor is working with the State on the closure of the open dumpsite, which will take place once operations begins in the new landfill.

The new landfill is classified as Type C (10 to 50 tons per day) and is designed to include two cells with an overall expected useful life of 14 years, considering the estimated generation of 17 tons of waste/day. The first cell is already complete in 2014 and was designed to be 100 meters (328 ft.) wide, 150 meters (492 ft.) long, and three meters (9.8 ft.) deep with a 3:1 slope on the sides and a layer of impermeable compacted material at the bottom. The landfill also contains a pond for leachates and a perimeter fence will be constructed around each cell to catch blowing debris and to control entrance to the working front. Construction of the first cell included the bases required for biogas wells that will be extended and managed by the Municipality as waste

is accumulated. The new site is located two km (1.2 miles) from the existing dumpsite, on four hectares (10 acres), providing sufficient area for the second cell.

In an effort to extend the life of the landfill, a sector consultant recommended that the sides of the first cell be extended two meters (6.6 ft.) above grade for a total depth of five meters (16 ft.). The Municipality recently completed this improvement in preparation for initiating operations in the new landfill.

The Municipality currently rents equipment on a periodic basis, which does not allow for proper management of solid waste in accordance with NOM-083. The landfill requires equipment to manage solid waste properly, improve soil removal operations, cover waste and reduce dust emissions during compacting activities in compliance with the applicable regulations. Without the proposed equipment, the expected life of the landfill will be reduced.

### **Project Scope and Design**

The proposed Project consists of the acquisition of new equipment for landfill management and includes the following components:

- Mini-loader “skid steer”- John Deere 323E or similar. Specifications include an enclosed cabin, solid rubber tracks for added stability and greater surface area for more efficient waste compaction, along with the following attachments: dozer blade, backhoe, and landplane to facilitate landfill operations.
- Truck. Specifications include 3.5 or 4 ton capacity with a hydraulic dump to help transport personnel, equipment and materials in and around the landfill.
- Water tank truck. Specifications include 8,000





*Skid steer*



*Backhoe attachment*



*3.5- or 4-ton truck*



*Water tank truck*

To assure adequate maintenance of the new equipment, the procurement process will also include the purchase of a maintenance service package for a minimum of two years. It is estimated that once the notice of grant approval is received, the procurement process will take approximately three to four months. Table 2 shows the expected Project milestones.

Bidding process	Anticipated for the third quarter of 2016
Equipment delivery	4 months after notice to proceed
Landfill operations	Initiates upon receipt of the new equipment

The procurement process and purchase agreements will follow NADB Procurement Policies and Procedures.

### 2.1.2. Technical Feasibility

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The main objective of the proposed Project is to provide the tools necessary to carry out landfill operations in an orderly and efficient manner and in compliance with the Mexican standard NOM-083/SEMARNAT-2003. According to that standard, a sanitary landfill should provide for the final confinement of solid waste without harming or endangering the health and safety of the public.

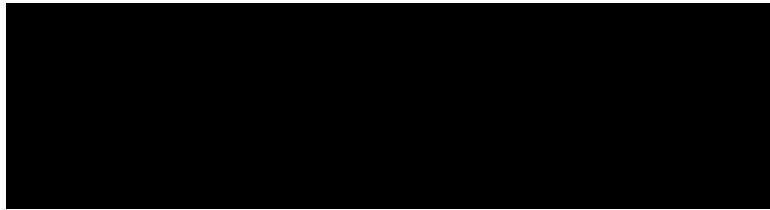
NOM-083 requires that every landfill have an operation manual and a program to monitor and control environmental impacts. It includes basic operation and closure requirements, but does not specify the equipment required for that purpose. The basic operation requirements for a Type C landfill include solid waste confinement and compaction, daily covering of waste, and controlling the unintended dispersion of light materials. It also stipulates that the separation of waste should not interfere with landfill activities. The basic landfill closure requirements include the capture of biogas and leachates, which then must be burned or recirculated back into the landfill, respectively. BECC contracted a consultant to recommend the equipment that will allow the Sponsor to operate the landfill in compliance with the requirements.

#### **Selected Technology**

Recommendations for appropriate equipment were prepared by a sector consultant taking into consideration landfill size, estimated waste volumes received, normal operating hours and local capacity to operate and maintain the equipment. The overall cost of all equipment necessary to operate the landfill in accordance with NOM-083 was also taken into account based on potential funding availability.

The equipment specifications were selected based on performing the solid waste management tasks required under NOM-083 within an eight-hour shift. These activities include: supplying, dispersing and compacting cover material, as illustrated in Figure 3 below. Historically the Municipality has used a rented bulldozer to perform these tasks. However, with the new operating method laid out in the manual, a mini-loader skid steer is considered large enough to handle the expected waste volumes over the life of the equipment (seven years). In addition to the principal waste management activities, the attachments available for the skid steer and truck will help supply the cover material needed on a daily basis, as well as support environmental impact control measures and maintenance around the site as required under NOM-083. The water truck will also be used to control environmental impacts, such as dust generated by landfill operations.

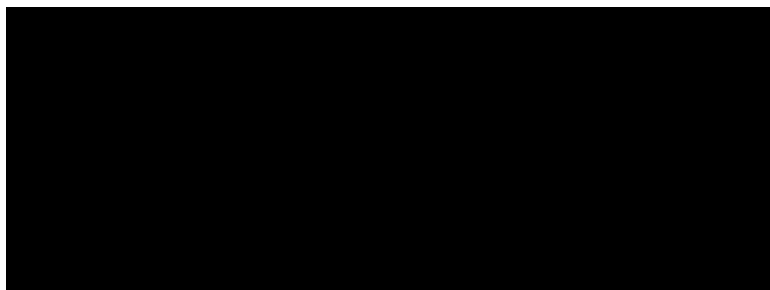
Deposit waste  
at the base of the  
working front.



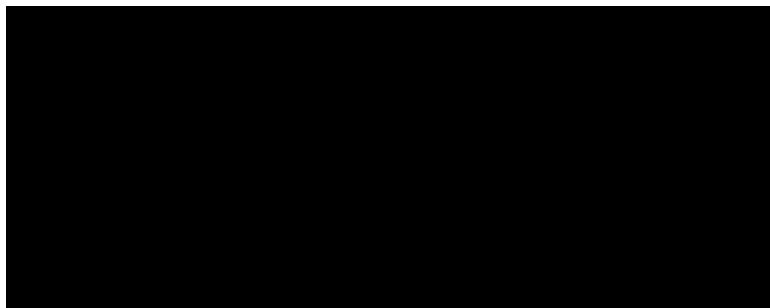
Disperse  
waste along the face of  
the inclined working  
front.



Compact  
dispersed waste against  
the face of the inclined  
work front.



Place and  
compact cover material  
over waste at the end of  
each day.



### **2.1.3. Land Acquisition and Right-of-way Requirements**

No land acquisition or rights-of-way are required for the Project. The Municipality owns the landfill property where the equipment will be used.

### **2.1.4. Management and Operation**

The Municipality has a Department of Public Services, which is responsible for the administration, operation and maintenance of all solid waste management services, including the landfill. The Department is assigned a specific budget by the Municipality, which allows it to carry out its responsibilities. The estimated annual budget for landfill operations is approximately \$1.6 million pesos (US\$100,000). Based on the Municipality's current budget

allocation for operation and maintenance activities, those funds should be sufficient to support the estimated costs of the landfill operations.

The Sponsor has operations and maintenance (O&M) manuals that include routine tasks, as well as procedures to address unexpected conditions and ensure the proper operation of the solid waste management system. The equipment purchased as part of the Project will include warranty and maintenance information that will be included in the Sponsor's O&M manual.

In addition to the manuals, a sector consultant provided on-site training in the nearby municipality of Nuevo Casas Grandes to review the correct method of managing waste in the landfill, as described in the new operational procedures. After reviewing these procedures, the landfill operators had the opportunity to drive and practice maneuvering equipment similar to the equipment they will be using to perform the tasks shown in Figure 3.

The Sponsor plans to operate the landfill with four people who will perform the following duties and responsibilities:

- Sanitary landfill manager (1): This person is responsible for performing technical and administrative tasks inherent to waste management, including overseeing landfill operations, vehicle maintenance and budget management, among other responsibilities.
- Equipment operator (1): This person is responsible for the working front, must be able to direct the work as required to perform waste confinement operations in an efficient and orderly manner, must be able to handle the equipment and have the knowledge to comply with solid waste compaction regulations and reporting requirements outlined in NOM-083.
- General laborer /scale operator (1 or 2, depending on workload): These workers support the manager and equipment operators and are responsible for collecting and organizing landfill operation and control information, including weighing vehicles and material disposed of in the landfill. These workers will also help organize and direct vehicles along the working front, in order to optimize the dumping of solid waste at the working front and to keep traffic moving smoothly.

The condition of the current dumpsite and the lack of equipment for proper solid waste management in Madera could cause groundwater and soil contamination, and creates an environment conducive to harmful fauna and vectors. Implementing the Project will help the Municipality improve solid waste management and disposal, as well as reduce environmental and human health risks related to the accumulation of improperly handled solid waste.

## 2.2.1. Compliance with Applicable Environmental Laws and Regulations

### Applicable Laws and Regulations

The Project does not require any environmental authorizations, as it consists of the acquisition of equipment. However, it is important to note that the construction of the new landfill by the municipal government is subject to applicable state and federal laws. The equipment acquired through the proposed Project will support the Sponsor's compliance with the following Mexican standards:

- General Law of Ecological Balance and Environmental Protection (LGEEPA), which establishes the environmental regulatory framework, expands the strategic vision and conveys specific powers and duties to the states and municipalities, so that environmental problems can be addressed directly.
- General Law for Waste Prevention and Comprehensive Waste Management (LGPGIRS), which seeks to identify the criteria that should be considered by various levels of government in the generation and comprehensive management of solid waste, in order to prevent and control environmental pollution and ensure the protection of human health.
- Mexican federal standard NOM-083-SEMARNAT-2003, which specifies the environmental protection requirements for selecting, designing, constructing, operating, monitoring and closing final disposal sites and complementary works for municipal solid waste and waste requiring special handling.
- General Law for Waste Prevention and Comprehensive Waste Management of the State of Chihuahua, which establishes provisions for solid waste collection and disposal and the procedures, techniques and technologies approved for proper solid waste management in the state of Chihuahua.
- General Law of Ecological Balance and Environmental Protection of the State Chihuahua, which specifies the responsibilities of the State for protecting and guaranteeing a healthy environment, as well as provisions for preserving the environment and natural resources, water, wildlife, etc., and for promoting sustainable development.

### Environmental Studies and Compliance Activities

No environmental studies or compliance activities exist related to the acquisition of vehicles. For the construction of the landfill the Sponsor developed an initial study (*informe preventivo*) to identify environmental impacts related to the landfill construction. The report was reviewed by the Chihuahua State Ministry of the Environment, which confirmed that the landfill is not located in a protected area and issued a resolution in August 2014 authorizing the construction of the facility. The resolution also specifies measures to prevent, control and comply with the environmental aspects of the landfill and requests State validation (certificate of completion), once construction activities have been completed.

The certificate of completion was signed by the contractor, the State, and the Municipality on June 24, 2014.

**Pending Environmental Tasks and Authorizations**

There are no environmental authorizations pending.

**Compliance Documentation**

There is no compliance document required related to the Project.

## **2.2.2. Environmental Effects/Impacts**

**Existing Conditions and Project Impact – Environment**

Improperly managed urban solid waste poses a risk to human health and the environment. Uncontrolled dumping and improper waste collection causes a variety of problems, including water pollution, the proliferation of insects and rodents, and increased flooding due to blocked drainage canals or gullies. In addition, it may result in safety hazards from fires or explosions.<sup>4</sup> Proper waste management also supports better control of related greenhouse gas (GHG) emissions that contribute to climate change, by facilitating methane capture.

Project implementation will allow solid waste materials to be processed in a confined structure, preventing their release into the surrounding environment. The Project is expected to generate environmental and human health benefits related to the following Project outcomes:

- Improved landfill operations for the disposal of up to 17 metric tons of solid waste per day;
- Full compliance with applicable laws and regulations; and
- Improved solid waste management system for approximately 4,145 households.

There are environmental impacts associated with the daily operation of heavy equipment, such as emission of dust, air pollutants and noise, for which mitigation measures are required. However, when vehicles are operated and maintained properly, the environmental benefits of the Project outweigh the potential negative impacts, which in the long run are expected to be minimal when compared to the positive environmental impact of improving solid waste management and reducing soil and air contamination and risks to human health. Therefore, the environmental impacts resulting from Project implementation will be positive overall.

**Mitigation of Risks**

Equipment warranties and specifications call for regular maintenance to prolong the useful life and efficiency of the equipment. Specific instruction on how to mitigate the risks related to the operation of the equipment was included as part of the training provided by the consultant. A

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<sup>4</sup> Source: U.S. Environmental Protection Agency (EPA), EPA530-F-02-026a (5306W) Solid Waste and Emergency Response, May 2002, ([www.epa.gov/globalwarming](http://www.epa.gov/globalwarming)).

maintenance service contract will also be acquired with the equipment to ensure the establishment of proper maintenance practices.

Moreover, the equipment purchased through the Project will be used to carry out activities that are inherently mitigation measures in and of themselves, as required by the solid waste management regulations. Specific mitigation measures using the new equipment are referenced in the landfill O&M manual, including: maintenance and repairs to access ways, cells and terminated areas; dust control; and capture of biogas and leachates.

Project implementation will have no significant adverse impacts on the environment. The use of best management practices and compliance with local ordinances will address any potential temporary and minor adverse impacts.

#### *Natural Resource Conservation*

The Project contributes to the reduction of environmental degradation by improving solid waste management in the area. Solid waste will be collected and conveyed to the new landfill, where it will be properly and efficiently confined to reduce the risk of soil and water contamination and health hazards resulting from inadequately confined waste material. Additionally, the implementation of new operation practices identified during the planning and training phase support efficient use of the land by minimizing the space required for waste confinement in the landfill.

#### *No-Action Alternative*

The no-action alternative was not considered viable, since the community does not have the equipment necessary for the adequate confinement of waste, which could shorten the life of the landfill, prolong the use of improper practices for waste containment and generate significant health and safety hazards for the public. The new equipment will eliminate inadequate waste confinement practices, preventing the impacts associated with air quality and public health.

#### *Existing Conditions and Project Impact – Health*

The inadequate management of solid waste produces multiple negative impacts on human health and the environment. Even with the lack of epidemiological studies corroborating a direct link, it is widely recognized that agents exist in garbage that affect human health. Uncollected or inadequately confined waste can cause an increase in the number of registered cases of diseases such as: dengue, leptospirosis, gastrointestinal problems, breathing problems, skin infections, and other problems that are worsened when the population lacks basic sanitary services. These same conditions may provoke frequent diarrhea that can lead to episodes of childhood malnutrition.

Project implementation is expected to help reduce the health risks associated with inadequately confined solid waste by reducing the possibility of human exposure to decaying garbage, as well as eliminating the breeding grounds for disease-carrying vectors, such as flies and mosquitos. Table 3 shows the health statistics in 2010 for the state of Chihuahua.

1	Acute respiratory infections	940,717	60.4
2	Intestinal infections by other organisms and poorly defined	205,126	13.2
3	Urinary tract infections	146,829	9.4
4	ulcers, gastritis and duodenal	53,376	3.4
5	Arterial Hypertension	31,626	2.0
6	Gingivitis y periodontal disease	24,664	1.6
7	Diabetes mellitus non Insulin dependent (Type II)	19,032	1.2
8	Acute otitis media	18,883	1.2
9	Asthma and status asthmaticus	16,475	1.1
10	Chicken pox	10,631	0.7
11	Pneumonia and bronchopneumonia	8,984	0.6
12	Intestinal amebiasis	6,701	0.4

Source: Mexican Ministry of Health, Center for Disease Control (*Sistema Único de Vigilancia Epidemiológica*).

### **Transboundary Effects**

Transboundary environmental impacts are not anticipated since the location of the landfill is not adjacent to the United States. However, indirect benefits are expected in the region due to the reduction of transmissible diseases related to the inadequate disposal of solid waste in the area.

### **Other Local Benefits**

Equipment acquisition and training strengthen the institutional capacity of the Municipality and promote sustainable development within the community, which will improve the quality of life of the community at large.

## **2.3.1. Uses and Sources of Funds**

The total estimated cost of the Project is US\$292,000, including the cost of the equipment, value-added tax and a service agreement. The Project Sponsor requested a US\$292,000 grant from NADB through its Community Assistance Program (CAP) to cover the financing of the Project. Table 4 presents a summary of total Project costs and the sources of funds.



Equipment*	\$292,000	\$4,672,000	100.0
NADB CAP Grant	\$292,000	\$4,672,000	100.0

\*Includes a service agreement and value-added tax (VAT).

Since the equipment costs will likely be paid in pesos, the Bank is proposing that the Board approve a CAP grant for up to US\$300,000, to cover any possible variation in the dollar amount based on fluctuations in the exchange rate. The Project Sponsor has agreed to cover any cost in excess of the proposed grant amount.

### 2.3.2. Program Criteria Compliance

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

As explained previously, the Project complements a landfill construction project funded jointly by the Municipality and the Mexican federal government, as the equipment purchased under the Project will be used to operate the landfill. The total investment in the landfill infrastructure project was \$3,817,280.57 pesos (US\$238,580), as indicated in the certificate of completion dated June 24, 2014. This investment meets the minimum sponsor contribution required under the CAP program.

Finally, there are no permits or authorizations required for the implementation of the Project. Construction of the new landfill is complete, and the Project Sponsor is ready to initiate bidding for equipment acquisition once funding has been approved.

### 2.3.3. Conclusion

For the above reasons, NADB proposes providing a CAP grant for up to US\$300,000 to the Municipality of Madera, Chihuahua, for the Project.

BECC published the draft certification and financing proposal for a 14-day public comment period beginning May 3, 2016. The following Project documentation was made available upon request:

- Resolution of the initial study for the construction of the landfill (*resolución del informe preventivo*)
- Operations and Maintenance Manual

The public comment period ended on May 17, 2016, with no comments received.

The Project is not required to conduct any public outreach activities pursuant to legal, regulatory or funding requirements. Since the Project does not require any environmental permits, no official notice was published in the local media.

BECC conducted a media search to identify potential public input or opposition to the Project. Articles related to solid waste management in Madera include:

- *La Opción de Chihuahua* (June 24, 2015) “*Capacitan a 20 municipios en gestión de residuos sólidos urbanos*” (Waste management training provided to 20 municipalities) <http://laopcion.com.mx/noticia/97922>
- *Akro Noticias* (July 8, 2015) “*Capacitará Cocef a encargados de rellenos sanitarios*” (BECC trains landfill operators) <http://www.akronoticias.com/2015/07/9808-42380.htm>

The information identified in the articles describes various training courses held on solid waste management. No opposition was detected in the media search for the Project.