Border Environment Cooperation Commission
Municipal Paving Project in Mexicali, Baja California

1. General Criteria

1.a Project Type

Project Name: Municipal Paving Project in Mexicali, Baja California.

Project Sector: Air Quality

1.b Project Category

Category: Community environmental infrastructure project – Community-wide impact

1.c Project Location and Community Profile

Communities: Mexicali

Location: Mexicali is located in the northern most part of the State of Baja California, adjacent to the US-Mexico boundary, directly south of Calexico, California.

Figure 1. Mexicali, Baja California.

Demographics	
Current population:	936,826
Growth rate:	2.1%
Reference:	INEGI Year: 2010
Economically active population:	287,208
Reference:	National Municipal Information System (*Sistema Nacional de Información Municipal*, SNIM)
Median per capita income:	$ 12,512 USD /year
Reference:	BECC estimations based on statistics by INEGI and the National Commission on Minimum Wages
Primary economic activities:	Manufacturing industry, fishing, and trade.
Marginalization Rate:	Very low (CONAPO)
Services	
Water System	
Water coverage:	98 %
Water supply source:	Deep wells and Colorado River
Wastewater Collection System	
Wastewater coverage:	83.5%
Domestic hookups:	282,067
Wastewater Treatment	
Wastewater treatment coverage:	100 %
Solid Waste	
Solid waste collection coverage:	100%
Street Paving	
Street paving coverage:	66%
Source:	Public Services Commission of Mexicali (CESPM for its initials in Spanish) 2011

1.d Legal Authority

Project applicant:	City of Mexicali, through the *Consejo de Urbanización Municipal de Mexicali* (CUMM, for its initials in Spanish)
Legal representative:	Francisco Pérez-Tejada
Legal instrument to demonstrate legal authority:	Municipal Code for the State of Baja California.
Compliance with Agreements:	• 1983 La Paz Agreement, or Border Environment Agreement

- 1990 Integrated Border Environmental Plan (IBEP)
- 1994 North American Free Trade Agreement (NAFTA)
- Border 2012 Program

1.e. Project Summary

Project Description and Scope: The project consists of paving existing unpaved roadways in Mexicali, Baja California, using asphalt pavement.

Components: The scope of the project is as follows:

- Paving 1,094,688 m^2 of roadways, equivalent to increasing street paving coverage from 66% to 70% in the city´s low income sub divisions.
- The proposal includes construction tasks required for the implementation of the project, including: rehabilitation of water and wastewater collection lines, construction of storm sewers as required, and other tasks related to the project purpose.
- The proposed paving layout will be 100% asphalt pavement.
- The project will be executed over a period of three years. The project initiated construction in the beginning of 2011

The road paving study identified 33 sub divisions with the most pressing road paving needs. The sectors with more significant street paving issues are located primarily in low income sub divisions, where approximately 50 percent of the streets are unpaved roadways.

Population Benefited: 59,881 residents

Project Cost: $ 631.6 million pesos

Project Map: The following figure shows the sub divisions of the city that have been included in the street paving program.

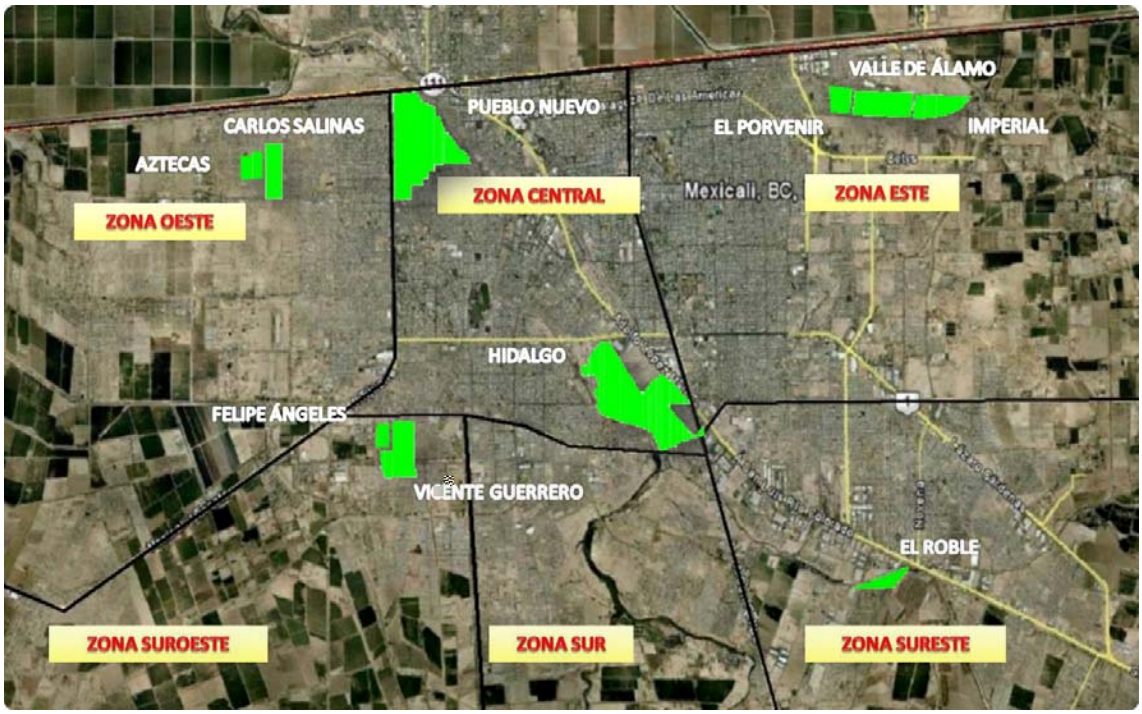


Figure 2. Location of targeted paving areas in Mexicali, Baja California

Project Justification:

- The project is needed to reduce the concentration of PM_{10} particles in Mexicali. The neighboring Imperial County, California is designated as non-attainment area for PM_{10} and the conditions are classified as serious. In addition, strategies to reduce these pollutant influences from Mexicali have been targeted by the Baja California/California Air Quality group, which include promotion of the increased paving coverage in the community.

- The proposed tasks will immediately reduce the amount of suspended particles released by vehicular traffic on unpaved surfaces and disturbed by the gusty winds that frequently batter the city. These improvements are expected to contribute to a reduction in respiratory illnesses and allergies, which are common in the region.

- During the rainy season, the lack of pavement results in rain water pools forming on the surface of local roadways, which create environmental and health risks related vector- or water-borne related illness, primarily due to potential direct human contact with contaminated water.

- The project will also have a secondary effect by reducing the time required for travel by the average vehicle in the urban area, which will reduce the emission of combustion particles.

Project Need or Consequences of the No Action Alternative:	- The City of Mexicali, Baja California, faces an air pollution problem caused by suspended particles associated to the use of vehicles on unpaved roadways, a condition that is exacerbated by the action of prevailing winds. - The no-action alternative means that the problem associated with dispersion of PM_{10} into the atmosphere will be aggravated, a situation that poses respiratory health problems to area residents. Sustained exposure to particulate matter that originates from vehicular fuel combustion and vehicular traffic circulating on unpaved roadways causes eye and nose irritation and an increase in respiratory problems. Street paving is a proven strategy to reduce particulate matter produced by vehicle traffic. - Additionally, the opportunity to improve the conditions influencing the non-attainment designation for PM_{10} in Imperial County will be affected as a consequence of the no action alternative.
Prioritization Process Category:	N/A

Pending Issues:

None.

Criterion Summary:

The project consists of paving roadways in Mexicali, Baja California using asphalt pavement, thus increasing street paving coverage from 66% to 70%. The project is defined as an air quality improvement effort. The project is located within the 100 km border area.

2. Human Health and Environment

2.a Compliance with Applicable Environmental and Cultural Resource Laws and Regulations

Environmental and Public Health Needs Addressed by the Proposed Project:

The effects on human health directly related to prolonged exposure to particulate matter (particles with a diameter of 10µm or less) are eyes and nose irritation, an increase in respiratory illnesses, aggravation of asthma, a decrease in lung performance, and an increase of symptoms related to respiratory problems. The effects on human health are determined by the size of the particles, according to their degree of penetration and their permanence in the respiratory system. Most of the particles with a diameter larger than 5 µm are deposited in the upper airways (nose), windpipe and bronchial tubes. Particles with a smaller diameter have a higher probability of being deposited in the bronchi and pulmonary alveoli; therefore, smaller particles are more harmful to human health.

Beneficial environmental impacts that will result from the project's implementation include a reduction in the concentration of PM_{10} particles in the Mexicali, with anticipated benefits to communities in the neighboring Imperial County, California. Failure to implement the project will continue aggravating the problem of PM_{10} particles being dispersed into the atmosphere.

The Project Meets the Following Applicable Environmental Laws and Regulations:

Official Mexican Norm NOM-025-SSA1-1993 establishes the maximum limits of PM_{10} concentration in the environment, necessary to protect public health. These limits are 50 $\mu g/m^3$ as the annual average for chronic exposure, and 120 $\mu g/m^3$ over 24 hours once a year, in case of acute exposure. The proposed project supports the ability to meet this air quality requirement.

Since these projects will be carried out within existing urban areas and roadways, a consultation with the National Anthropology and History Institute (INAH, in Spanish) is not required. Disturbances of any cultural or historical resources are not anticipated; however, should any cultural resources be found, construction tasks will be deferred until an assessment is performed by the INAH.

2.b Human Health and Environmental Impacts

Human Health Impacts

Direct and Indirect Benefits to Human Health:

- The project will reduce air pollution.
- The project will help reduce respiratory illnesses.

In 1996, the US Environmental Protection Agency (EPA) published a document titled "*Air Quality Criteria for Particulate*

Matter" (AQC PM) that discusses, among other aspects related to air pollution caused by suspended particles, various studies regarding the effects of said pollutants on human health. This document concludes that the vast majority of available epidemiological evidence suggests an increment in human mortality caused by short and long term exposure to particulate matter (PM) in the environment.

The document published by the EPA recognizes that the complexity of synergetic effects (association with other pollutants, particle size, source of the particulate matter, age and susceptibility of the exposed population, etc.) results in significant variations between the different studies on human exposure to atmospheric pollutants, including particulate matter. However, it concludes that said studies provide enough reasons to worry about the detectable effects on human health caused by the exposure to PM_{10} in the environment, even at levels below those established by the official norms.

Health Statistics:

Although human health statistics for Baja California are limited, pursuant to information provided by Health Jurisdiction of the State of Baja California through the Epidemiological Services Coordinating Office, the agency is aware of a high incidence of diseases caused by acute respiratory infections.

Health Jurisdiction of Baja California has reported the most frequent diseases identified in the State. Yearly incidence rates for respiratory diseases and intestinal infections have been prepared, based on a total of 936,826 residents in Mexicali and information generated by the epidemiological surveillance system during a three-year period (see table below). Said disorders are among the 10 main causes of disease in the municipality.

Rate	2008	2009	2010
Incidence rate for respiratory diseases	171 x 1,000 residents	232 x 1,000 residents	124 x 1,000 residents
Incidence rate for intestinal diseases	38 x 1,000 residents	34 x 1,000 residents	33 x 1,000 residents

Source: Health Jurisdiction of the State of Baja California, Secretariat of Health

Mexican Standard NOM-020-SSA1-1993 establishes that health risks associated to air pollutants are correlated to the time elapsed between the exposure and the onset of adverse effects in exposed individuals, and cause changes in pulmonary function that render affected individuals more susceptible to respiratory diseases and infections.

Environmental Impacts

Direct and Indirect Benefits:

Environmental Impacts:

The proposed tasks will immediately reduce the amount of suspended particles released by vehicular traffic on unpaved surfaces and disturbed by the gusty winds that frequently batter the city. These improvements will help reduce respiratory system illnesses and allergies, which are rather common in the region.

The project will also have a secondary effect by reducing the time required for travel by the average vehicle in the urban area, which will reduce the emission of combustion particles.

The project's anticipated negative impacts are temporary and will occur during the development of paving tasks, due to the use of heavy machinery, which may cause considerable dispersion of PM_{10} particles in the atmosphere, and other traffic control effects causing interruptions in normal travel times or routes and could cause increased vehicle idling times and related emissions. These impacts are expected to be temporary. Once the streets are paved a reduction of airborne PM_{10} particles will be achieved.

It is important to mention that the area affected by the project is located within the urban zone and therefore, no significant biotic impacts are anticipated, as there are no sensible habitats or ecosystems within the project area.

Mitigation Measures:

During the implementation of the project, measures will be taken to mitigate these temporary effects by introducing the preventive actions required by law, such as:

Air and Noise

- **Site Preparation of the Areas to be Paved.**
  - Minimize the emission of dust generated by vehicular traffic by irrigating the area where work will be performed.
  - To comply with regulations regarding atmospheric emissions caused by motor vehicles, all vehicles used in the project will adhere to a scheduled maintenance program.

- **Noise emission caused by the circulation of motor vehicles and the use of heavy machinery**
  - All vehicles operating must close their exhausts and operate at a low speed around the work area.
  - All machinery and equipment must comply with **NOM-080-STPS-1993,** which establishes the maximum levels of noise exposure for project workers.

- Avoid having more than two teams working simultaneously, work during the day, provide audio protection and persuade personnel exposed to noise to use protective equipment

Water

- **Site Preparation and Construction**
  - Wastewater collected in portable containers will be disposed of by an authorized company.
  - The use of water should be optimized during the duration of the project. Potable water will be obtained in containers from local suppliers.
  - Only raw water will be used for the different activities related to the project.
  - The water required during the construction stage should be obtained from a water tap provided by the Water and Wastewater Utility (CEPSM, in Spanish) or from any other source authorized by the National Water Commission (CONAGUA, in Spanish)

Soils

- **Construction**
  - Stone materials required for construction should be obtained, preferably, from authorized source providers.
  - Excavations will only be performed in areas previously defined by the project.
  - In-fill activities will be performed, preferably, with the material from the excavations whenever appropriate.
  - If it is necessary to extract any material for filling or any other activity from an area outside of the project, this location will be restored to avoid erosion and changes to drainage patterns, as well as to restore the cover of native plant species.

- **Handling Wastes**
  - All non-recyclable solid wastes must be disposed of according to applicable procedures and in facilities designated by the authorities for this purpose.
  - The work area will be cleaned periodically.
  - Bedding and compacting materials should be free of hazardous and non-hazardous wastes.
  - In order to avoid ground contamination generated by vehicles, machinery and equipment maintenance and oil

	change, these activities will be carried out in maintenance shops or in authorized facilities.
Impacts:	The environmental impact resulting from the project will be positive overall. Street paving coverage will be increased, reducing thus environmental contamination and improving the quality of life of local residents by reducing the emission of airborne PM_{10} particles.
Transboundary Impacts:	Negative transboundary impacts are not anticipated by the implementation this project. In fact, positive environmental impacts in the neighboring Imperial County are anticipated from the project related to the pollutant reduction expected from the project. Reduction in PM_{10} occurrences may assist Imperial County to improve the conditions influencing its designation as a non-attainment area for this pollutant.

Formal Environmental Authorization

Environmental Authorization:

- Pursuant Chapter II, Article 5, Sections A through V of the General Law on Ecological Equilibrium and Environmental Protection regarding Environmental Impact Assessments, which is applicable to the national territory and is regulated by the Executive Branch Power through the Secretariat of the Environment and Natural Resources (SEMARNAT), the proposed project is not required to obtain previous authorization from SEMARNAT with regard to its environmental impact.

- Paving projects will be conducted in Subdivisions of the city of Mexicali. No significant environmental impacts or imbalances are anticipated. The project will not impact environmental components in an irreversible or relevant manner, inasmuch as the project does not require the removal of vegetation for the completion of road paving tasks, and the proposed construction area has already been impacted by anthropogenic activities

- The Secretariat of Urban Development, through its Office of Environmental Protection in Mexicali, issued Official Communication DEM/JI/1231/2011 to establish that the type of tasks proposed by this project do not require the submission of an environmental impact study.

Assessment of Project Benefits: Project Results Matrix

Measurement of Project Results:

1. Reduced harmful emissions	**Objectives and Indicators** Reduction of PM_{10} particles (Objective ≥ 15,587 Ton/yr) **Current Conditions** Emission of PM_{10} particles = 16,808 Ton/yr

	(AP-42 Calculation)
2. Reduced respiratory disease incidence rates	**Objectives and Indicators** Reduction in incidence of acute respiratory diseases (Objective ≤ 2010 baseline) **Current Conditions** Acute respiratory infections=12,446 cases per year
3. Increased number of residents with direct access to paved roads:	**Objectives and Indicators** Increased number of residents with direct access to paved roads (Objective= 59,881 residents) **Current Conditions** Residents with direct access to paved roads =0

Pending Issues:

None.

Criterion Summary:

The project addresses a major human health and environmental issue by reducing the amount of suspended particles released by vehicular traffic traveling on unpaved surfaces, a condition that has an impact on the increased rate of respiratory illnesses among the population.

3. Technical Feasibility

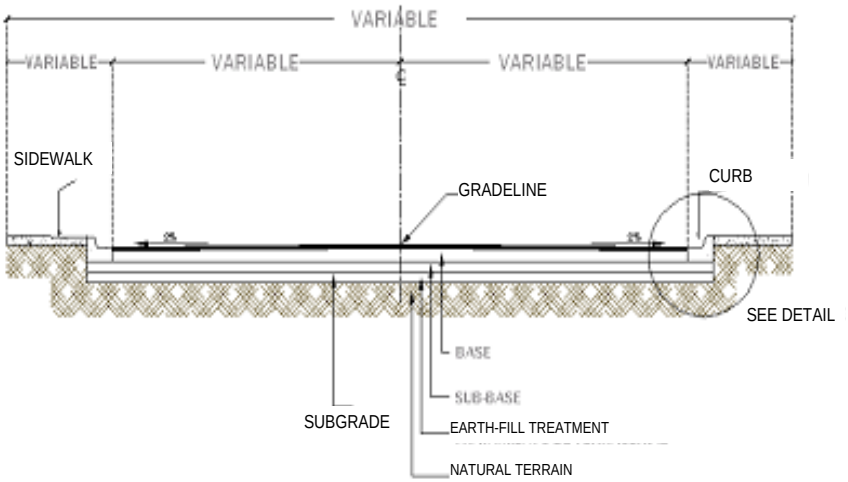
3.a Technical Aspects

Project Development Criteria

Design Criteria: The project was designed following standard engineering practices and complies with the applicable Municipal Code. There are standard street paving designs available that will be used as the basis for developing the final designs for selected streets.

Project Components: Asphalt Pavement

The pavement will consists of a subgrade layer compacted at 95% (Proctor Test) of its maximum dry density (MDD), finished to the established design elevation. Over this layer, a 20-cm thick granular base compacted at 100% (Proctor) of its MDD will be installed; the above will be covered by a prime coat layer with a type MC-70 asphalt emulsion at a rate of 1.3 L/m². Before placing the flexible pavement layer over the compacted base layer, a tack coating of asphaltic emulsion MC-800 will be sprayed at a rate of 0.5 L /m² with a minimal penetration of 5 mm. Next an asphalt concrete layer with a minimum thickness of 5 cm will be placed. The mix used for this layer will be plant produced and have a minimum compaction of 100% with a minimum stability of 800 Kg. and a flow not larger than 4 mm. (Marshall Test). The asphalt mix must meet the volumetric rate established by the Secretariat of Communication and Transportation, and contain the least amount of impurities in order to satisfy spatial specifications. The project also includes construction of curbs and gutters type “S”. The curb will be constructed of hydraulic concrete with a minimum compressive strength of 180 Kg/cm² and placed over the compacted base before the asphalt layer is applied, as shown in the following figure.



Other Design Criteria:

The project also includes trace and leveling of curbs and the manufacturing of hydraulic concrete curbs, as well as all the construction tasks required for the implementation of the proposed project, including: rehabilitation of water and wastewater collection lines, construction of curb and gutter, as required, and other tasks related to the project purpose.

The geometric design of roadways will incorporate the installation of a minimum 2% transverse slope (crown) towards the center of the street that will convey runoffs to the shoulders, Manholes will be built above the runoff level to prevent water from infiltrating the sewage system. Manholes that are not located at the pavement crown will need to be elevated at the runoff level and sealed to prevent infiltration of rainwater. The design will incorporate slope and surface runoff control measures.

Appropriate Technology

Assessment of Alternatives:

Roadways to be paved were selected according to the following criteria:

- Roadways that provide access to low income subdivisions (*colonias*)
- Roadways with secondary traffic
- Roadways that were approved by the neighborhood associations.

Asphalt concrete was considered as options for roadway paving. Asphalt pavement was considered for secondary streets with less vehicular traffic. Additionally, based on the cost of the pavement, the city chose to use flexible pavement (asphalt pavement), as established by the roadway study conducted by the City.

The project applicant has established coordination with the

Municipal Water and Wastewater Commission (CESPM) to ensure that water and wastewater collection services have been introduced in streets selected for paving. A design plan that outlines the proposed construction schedule is available.

Property and Right-of-Way Requirements

Requirements: The proposed street paving project will be developed within the urban area and existing rights-of-way; therefore, no additional land or rights-of-way need to be purchased by the City, which has municipal jurisdiction over the project. Additionally, no land use changes will be made in the areas required for the project.

During the project's implementation, the City of Mexicali, through its Department of Public Works, will oversee the execution of the proposed construction tasks.

Project Tasks and Timelines

Project Timeline: The city anticipates completing the construction of the proposed project in three years, with tasks initiated in 2011.

Year	Sub divisions	Quantity Paved m2
2011	10	331,687
2012	15	446,490
2013	8	316,511

3.b Management and Operations

Project Management

Resources: The Project will be managed by the Municipality of Mexicali through the *Consejo de Urbanización Municipal de Mexicali* (CUMM), which is the municipal entity that participates in the development and implementation of plans and projects for urbanization and growth, and is responsible to coordinate the participation of federal, state, private and public agencies in the development and improvement of urban areas in Mexicali. Once the project is completed, the Municipality, through its Public Works Department, will be in charge of the operation and maintenance of the paved areas.

Operation and Maintenance

Organization: The Mexicali Department of Public Works has a Director, Assistant Director, Unit Managers and trained personnel to operate and maintain the system. Additionally, the city has available specialized personnel to provide technical support.

Operation Plan: The Services and Public Works Law requires the Department of Public Works to have an Operations Manual to provide maintenance to existing and future paved streets. A specific Operation and Maintenance Plan will be developed prior to the completion of paving tasks.

Permits, licenses, and other regulatory requirements:	The project was designed following standard engineering practices and complies with the applicable Municipal Code. There are standard street paving designs available that will be used as the basis for developing the final designs for selected streets. As previously mentioned, only asphalt will be used for the project.
Reviewing Agencies:	Municipal administration of Mexicali 2010-2013

Pending Issues:

None.

Criterion Summary:

A review of alternatives was developed to determine which roadways would be paved. Asphalt pavement was considered for secondary streets with less traffic. The project was designed following standard engineering practices. The project applicant has established coordination with the Municipal Water and Wastewater Commission (CESPM, in Spanish) to ensure that water and wastewater collection services have been introduced in streets selected for paving.

4. Financial Feasibility

4.a Proof of Financial Feasibility

Financial Conditions

Information submitted: CUMM's 2006-2010 financial statements.

Financial Analysis Results: CUMM's financial statements show a reasonable financial position and, based on NADB conservative assumptions should be able to generate the sufficient net operating cash to cover current debt, and the projected obligations under this proposed loan. The Municipality of Mexicali will guaranty CUMM's financial obligations under this loan in case the entity fails to reach the revenue required, pledging its Federal tax revenues.

Project Costs, Financial Structure and other plans for Capital Investments

Item: Pavement of 1,094,688 m^2 of dirt roads to improve air quality, increase paving coverage in low income subdivisions.

Final Cost: **MX $631.6 million**

Financial Structure:

Source	Type	Amount (Million MX pesos)	%
NADB	Loan	$150.0	23.8
Municipality of Mexicali	Budgetary revenue	$160.5	25.4
State of Baja California	Subsidies	$321.1	50.8
Total:		$631.6	100.0

Primary Source of Revenue:

Source of Revenue: CUMM's revenues and Mexicali's Federal tax revenue as an alternative source of payment.

4.b Legal Considerations:

Project Management: The project will be managed directly by the CUMM, which has the legal and technical capacity to implement the Project.

Pending Issues:

None.

Criterion Summary:

None.

5. Public Participation

5.a Community Environmental Infrastructure Projects – Community-wide impact

Steering Committee

Date of Establishment:

The project sponsor, as an existing practice, established a neighborhood committee for projects to be completed with this paving program. To date, the Secretariat of Social Development has established 6 of such committees related to the investments proposed with this project, which have been formally installed. These committees have available their bylaws, records of attendance and administration of oath to committee members, agreements, and comments.

Steering Committee Members:

Steering Committees have been established according to the following structure:

-Chairperson
-Secretary
-Treasurer
-Deputy Chairperson
-Deputy Secretary
-Deputy Treasurer

Date of Approval of Public Participation Plan :

BECC closely reviewed and validated the existing public outreach practices and activities specific to the project with the Secretariat of Social Development and concluded that the efforts met the intent of a public participation plan.

Public Access to Project Information:

Technical and financial information on each of the proposed projects is made available to the public for review through the neighborhood committees, workshops, bus stops, community centers, etc. The committees, with assistance from the project sponsor prepared a project fact sheet. In addition, project information is available at :

Site/Hours	Contact /Tel.	Address/Municipality
Mexicali Municipal Council of Urbanization (CUMM)	(686) 551-9575	Plaza Azteca, Calz. Justo Sierra 1700-7 Mexicali, BC

Additional Outreach Activities:

A local media outlet published a feature on paving service coverage. The launching of the "Urbanization of Roads" program was published on February 11 in three major

	newspapers of regional distribution, which is also posted on the municipality's website.
Public Meeting:	To date, 10 public meetings have been held in the *colonias* served by the program. The launching ceremony was held in Calle Encinas Este in the municipality of Mexicali. The meeting was used to present the project's technical, financial, and environmental aspects. Approximately 120 residents of the project area and other communities attended the meeting, which was directed by the Mayor. Media features and the minutes of neighborhood meetings reflect that the community has shown support for the project. Additionally, neighborhood meetings received good attendance with as high as 132 participants in one of the ten meetings held in the areas impacted by the project. In the meeting documentation provided to BECC, there were no negative comments recorded. Because the project will bring first time paving services, and in some cases improved access or new access to water services, the general response of the public was positive.
Final Public Participation Report	
Final Report:	Documentation gathered during BECC's review of outreach efforts for the project has been archived in the project file and is considered appropriate to represent a Final Public Participation Report.

Pending Issues:

None.

Criterion Summary:

The project meets the BECC's Public Participation criterion.

6. Sustainable Development

6.a Human and Institutional Capacity Building

Project Operation and Maintenance:

The project applicant will be the agency responsible for operating and maintaining the system through:

- The Directorate of Public Works.

The applicant has the basic institutional and human capacity to operate and maintain the project through the use of:

- Trained personnel
- Training program
- Operations Manual for roadway maintenance

Human and Institutional Capacity Building:

Actions considered by the project will strengthen the City of Mexicali by increasing its capacity to provide street paving services and coverage.

6.b Conformance to applicable Local, State, and Regional Regulations and Conservation and Development Plans

Local and Regional Plans Addressed by the Project:

The proposed project conforms to applicable plans and actions described in the following documents:

- 2007- 2013 State Development Plan
- 2010- 2013 Municipal Development Plan
- The project adheres to the U.S.-Mexico Border 2012 Environmental Program by meeting Goal 2 –Reduce air emissions as much as possible, towards the attainment of each country's national ambient air quality standards, and reduces exposure to contaminants in the border region.

Laws and Regulations Addressed by the Project:

The project meets applicable municipal regulations pursuant to roadway paving within the city.

6.c Natural Resource Conservation

- The final design includes the implementation of green building practices as part of the technical construction specifications.
- The purpose of the project is to improve the quality of air in Mexicali, and benefit the health of residents of the border region without deteriorating the environment. The project does not interfere in any way with the conservation of natural resources in the area, as it will be carried out in an urban area and over existing roadways, and will not require any changes regarding land use patterns.

- The project contributes to reduce environmental deterioration by expanding the existing roadway system from 66% to 70%.

6.d Community Development

This project promotes the creation of neighborhood committees, linking residents with activities that are taking place in the neighborhood. In addition, the project provides an opportunity to improve general mobility in the community.

Pending Issues:

None.

Criterion Summary:

The project complies with all sustainable development principles.

Available Project Documentation (only in Spanish):

- Preliminary Design of Roadway Paving project, developed by the Municipality of Mexicali through the Consejo de Urbanización Municipal de Mexicali CUMM, 2011.

- Final Public Participation File.