

Final Report: Sustainable Mexican Municipalities Pilot Project *ProMuS 2001*

Environmental Management Systems for Mexican Municipalities

**Prepared by
The Environmental Law Institute®
November 2002**



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THE ENVIRONMENTAL LAW INSTITUTE
DECEMBER 2002

Acknowledgment

This project was made possible through support provided by the Environmental Protection Agency and the U.S. Agency for International Development under Grants No. EPA X-828504-01 and EPA X-979158-01. Further support was provided through a grant funded by the United Technologies Corporation. The views expressed herein should not be attributed to EPA, USAID, or UTC nor should any official endorsement be inferred.

At the Environmental Law Institute, staff contributing to the project were Susan Bass, Suellen Keiner, Kelly Mott, Verena Radulovic, and Nick Gayeski. Special thanks also to Elissa Parker and Erik Meyers for their guidance. The Environmental Law Institute would like to acknowledge the invaluable efforts of the municipal project teams from Piedras Negras, Coahuila; Nogales, Sonora; and Zapotlán el Grande, Jalisco in Mexico. ELI would like to thank the project consultants, Eduardo Guerra of the *Instituto en Sistemas de Administración y Conocimiento Holístico, D.C.* and *Instituto Tecnológico y de Estudios Superiores de Monterrey (ITESM)*, Foster Knight of The Lexington Group, and Lawrence Pratt of *EcoConsulta* and the Latin American Center for Competitiveness and Sustainable Development (CLACDS) at *INCAE* for the expertise and guidance they provided to the municipalities and for their contributions to the project. ELI also extends deep appreciation to James Horne and Bonnie Barkett of EPA and Regina Ostergaard-Klem, Simone Lawaetz, and Jill Pike of USAID for their support and contributions to this project.

The Sustainable Mexican Municipalities Pilot Project, ProMuS 2001

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ISBN No. 1-58576-050-1. ELI Project No. 001104, 020801.

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Executive Summary

The two-year *Proyecto de Municipios Sustentables ProMuS 2001* (Project for Sustainable Mexican Municipalities) was designed to provide practical and theoretical training on implementing an environmental management system (EMS) to three Mexican municipalities. The primary goal of the project was to implement an EMS at one or more facilities in each of the participating municipalities. The project also sought to develop EMS training materials that would facilitate the implementation of EMSs in other operations and in other Mexican municipalities.

EMSs are a promising approach to addressing the negative environmental impacts of an organization's operations. An EMS strives to integrate the use of measurable information to continually improve environmental performance at all levels of operation. At the local level, an EMS can provide municipal governments with a systematic method to identify and address the environmental impacts of solid waste generation and disposal, water use and discharge, transportation networks, and other operations.

Municipalities have many incentives to implement an EMS in their operations. An EMS can improve compliance with regulatory programs, overall environmental performance, and community relations. Areas of potential non-compliance and their possible root causes are identified through an EMS. It can be seen as a framework that, when implemented, helps the organization achieve environmental goals through constant control of its operations. An EMS can also strengthen relations with the community by generating greater public awareness and appreciation of local environmental issues. The organization implementing the EMS can consult with their community in setting and reporting on the achievement of environmental goals, thus demonstrating a commitment to achieving a healthier environment, while at the same time pursuing efficient, cost-saving strategies.

The *ProMuS 2001* project builds on the experience of the United States Environmental Protection Agency (EPA) and the United States Agency for International Development (USAID) in implementing EMSs at the local government level. EPA has worked in recent years to implement EMSs in municipalities in the United States. USAID has had experience with several projects strengthening the capacity of municipal agencies in Mexico, including pilot projects implementing EMSs. To extend these efforts, EPA and USAID jointly funded the Environmental Law Institute (ELI) to implement EMSs in three Mexican municipalities.

The project began in May 2000 with the recruitment of municipalities. Each potential participating municipality's application was examined and evaluated according to set criteria. Once the three municipalities – Nogales, Sonora; Piedras Negras, Coahuila; and Zapotlán El Grande, Jalisco – were chosen, they were each assigned an EMS expert from the ELI team who would lead them through the project. ELI's team consisted of leading international EMS training experts with extensive experience working in Mexico, the U.S., and other countries as well as local Mexican EMS experts. These experts provided training and guidance in implementing an EMS to the

municipalities. The training generally followed the International Organization for Standardizations (ISO) 14000 system for administering an EMS. ISO's 14000 family of international standards outlines a framework generic management system for addressing an organization's environmental issues.

The first phase of the project introduced the basic concepts of an EMS and tools for implementing an EMS through two workshops. The first workshop was held in Guadalajara, Mexico in May 2001, and the second workshop was held in San Diego, California in October 2001. The second phase of the project was designed to provide each municipality with individual assistance in designing and implementing their EMS through two site visits to each municipality by the team's EMS expert. The final phase of the project included a one-day evaluation session and graduation ceremony held in San Diego in June 2002. Training materials and resources for the project included: course books for each workshop containing detailed information on EMSs and EMS implementation; a web site where workshop course modules were posted for review by the teams, along with documentation for each team that could be reviewed by all the participants; and a mentor program designed to link the municipal teams with local corporations experienced in setting up an EMS.

All three municipalities have made progress towards incorporating an EMS into their operations. Although the municipalities are only in the beginning stages of implementing their EMSs, they have already experienced many benefits. These benefits include:

- **Improved internal communication.** All of the municipalities experienced an improvement in internal communication. Nogales' EMS enabled increased inter-departmental communication. Zapotlán's EMS enabled them to generate and use environmental information and indicators, as well as to retain this knowledge;
- **Improved public relations.** In designing and implementing their EMSs, the teams have found new ways to communicate with the public and to convey important information about the local environment and the municipalities' services;
- **Enhanced efficiency and reduced costs,** including reduced costs of materials, energy, and water usage, expected cost savings as a result of more efficient route designs and timetables for trash collection, and expected increased facility lifetimes;
- **Better knowledge of applicable environmental regulations.** The municipalities' teams have found that through implementing the EMS, they have not only acquired a better understanding of environmental regulations that they were already familiar with, but they have also identified new rules that are applicable to their facilities;

- **Improved understanding of negative environmental aspects.** Through implementing their EMSs, all teams have found that they are now more able to identify practices that generate negative environmental impacts;
- **The ability to replicate the system for other municipal operations.** One of the most important benefits noted by all three municipal teams is the ability to take the knowledge and experience gained through their year-long training and apply it more broadly, either in other aspects of municipal operations or to other municipalities in their jurisdictions;
- **An expanded network of resources.** The teams have had contact with many experts in the EMS field and access to reference materials on the website that will continue to be available after the project is complete.

While the municipalities have experienced these benefits already, they are only in the beginning stages of implementing their EMS and expect many of these benefits to increase in the coming year, especially in the area of cost savings and improved operating efficiency.

At the final project event in San Diego, the team participants and project faculty members made several recommendations for improving the training process and guaranteeing the long-term success of a municipal EMS. They also provided ideas for expanding and institutionalizing EMS training in Mexico and other regions of Latin America and the Caribbean. The recommendations to improve the training process and guarantee long-term success of the EMS are as follows:

- **Building Political Support for the EMS,** critical to both project approval and funding, by linking the EMS to broader municipal goals; providing a cost/benefit analysis of the EMS to justify its costs; arranging visits from EPA, USAID and other high-level officials; and engaging stakeholders at the municipal and state level;
- **Securing Long-Term Financing for EMS Development and Implementation,** by establishing the EMS as a budget item at the federal, state, or local level; identifying creative funding mechanisms, such as applying late tax payments to the EMS; and/or targeting matching funds from states for regional efforts;
- **Preparing Case Studies Relevant to Mexican Municipalities.** This project provides an opportunity to complete three municipal case studies that could be made possible through additional funding by EPA, USAID or other organizations;
- **Defining a realistic fence-line and then expanding the EMS** by focusing on defining a fence-line early in the training process, then explaining the process of expanding the EMS as the project progresses;

- **Strengthening Technical Assistance and Web-Based communication**, including making technical assistance and feedback available on a “just in time” basis and providing more Spanish speaking EMS experts to assist the teams.

The strong interest and demonstrated commitment of the municipalities in moving forward with implementing their EMSs and expanding them to similar facilities and other operations indicates the need for additional EMS training courses in the region. For example, the Nogales team has already indicated that they would like to extend EMSs to water operations in the border cities of Sonora and eventually to all municipalities in Sonora through the organizational structure of COAPES. ELI has also received requests for municipal EMS training courses to be delivered in a number of other Latin American countries. Recommendations to expand and institutionalize EMS training in Mexico and other regions of LAC are as follows:

- **Conducting “Train the Trainer” Type Courses** for other municipalities and officials of AMMAC, COAPES or other similar organizations with help from the municipal teams and the support of EPA, USAID, and/or other organizations;
- **Raising the Awareness of Public Officials in Mexico about EMSs** by disseminating information about the project to all three municipal associations in Mexico, and/or making presentations to regional and national organizations such as COAPES and ANEAS with representatives from EPA, USAID, ELI, the project experts, and the municipal teams;
- **Generating support from international institutions for EMS courses**, such as the Border Environment Cooperation Commission, the North American Development Bank, the Northern Border Regional Consulting Board, the International Development Bank and the World Bank;
- **Working with project teams on ideas for expanding the EMS.** Future project sponsors should capitalize on the visions of the project teams by supporting them to carry out the expansion of their EMSs.

At the final project event in San Diego, the general sentiment of the participants and faculty in the *ProMuS 2001* project was that environmental management systems are viable and valuable for municipalities in Mexico. By offering municipalities a way to identify, prioritize, systematize and economize in their responses to environmental problems, the EMS approach directly responds to the severe budgetary constraints and sustainable development challenges facing these communities.

The participants also demonstrated, and the faculty confirmed, that there is sufficient interest in, enthusiasm for, and at least a basic level of capacity at the municipal level for, developing an EMS. Notwithstanding a range of political, time, budgetary and resource constraints, the teams in this pilot project progressed as far if not farther in developing their respective EMS in a similar period of time as did U.S. municipalities in an earlier EMS training project.

A number of factors were identified by the participants and faculty as being critical to building municipal EMSs in Mexico over the long term:

- **Securing the time, people and resources necessary to develop and implement the EMS;**
- **Enlisting high level political support;**
- **Improving capacity not only in EMS development and implementation, but also in related fields (environmental law, pollution prevention, environmental technology, etc.).**

The *ProMuS 2001* project has set the stage for launching a broader EMS training effort for municipalities in Mexico and other parts of Latin America and the Caribbean. A solid set of training materials in Spanish has been developed. With a minimal effort, crucial case studies – with data on economic, environmental and social benefits – relevant to Latin America can be developed based on the experiences of the three municipalities. A team of enthusiastic trainees is now available to become future trainers and advocates for environmental management systems. A major association of municipalities, AMMAC, is committed to promoting EMS training for its members. Finally, international institutions such as the NAD Bank and IDB have been engaged in the process and demonstrated strong interest in supporting municipal EMS training initiatives in the future. Future organizers and sponsors of municipal EMS training programs in Mexico as well as other parts of the region can now build on and leverage these resources to improve the capacity of municipalities for environmental management.

INTRODUCTION

From May 2000 through September 2002 the Environmental Law Institute (ELI), with support from the U.S. Environmental Protection Agency, the U.S. Agency for International Development, and United Technology Corporation, conducted a pilot program to help three Mexican municipalities implement an environmental management system (EMS) at one or more local facilities. The three municipalities were: Nogales, Sonora; Piedras Negras, Coahuila; and Zapotlan El Grande, Jalisco. The *Proyecto de Municipios Sustentables ProMuS 2001* (Project for Sustainable Municipalities) also aimed to promote at the highest level of Mexican municipal governments a culture of understanding the value and feasibility of incorporating environmental management practices into day-to-day municipal operations. Finally, the project sought to build long-term interest and institutional support in Mexico for municipal EMS training.

To provide the municipal participants with the skills and tools necessary to implement an EMS, the pilot program combined several high-level, intensive training workshops with ongoing web-based and on-site technical assistance. ELI brought together leading international EMS training experts with extensive experience working in Mexico, the U.S., and other countries, and local Mexican EMS experts to conduct this effort. The experts (also referred to as project consultants or faculty) were as follows: Lawrence Pratt of the Latin American Center for Competitiveness and Sustainable Development (CLACDS) at INCAE, a business school in Costa Rica; Eduardo Guerra of the *Instituto Tecnológico y de Estudios Superiores de Monterrey ITESM* (Institute of Technology and Higher Education of Monterrey); and Foster Knight of the Lexington Group, a Massachusetts-based environmental consulting firm. (A brief description of their individual contributions is attached as Appendix A.)

ELI also worked with and engaged representatives from *La Asociación de Municipios de México, A.C.* (AMMAC) to assist in the recruitment of the municipalities, the delivery of the training program, and the building of political and institutional support for EMS training in Mexico.

This report provides an overview of the activities and results of the project. It first explains the need for municipality-focused EMS training. The project's methodology and activities are then described, followed by a discussion of the role of, and tasks completed by the participants. Next, the progress made by the participants during the project is reviewed and analyzed. The results of the project are then evaluated through a discussion of benefits, barriers, and keys to success. Finally, the report concludes with recommendations for future local government EMS training in Mexico.

I. WHY AN EMS PROJECT FOR LOCAL MEXICAN GOVERNMENT ENTITIES?

A. The Environment and Municipal Government in Mexico

Municipalities in Mexico are under increasing pressure to address the environmental impacts of their numerous operations, such as solid waste generation and disposal, water use and discharge, and transportation networks. Since these municipalities have very limited financial resources for supplying even basic services, reducing environmental impacts has been considered something of a luxury. Lack of attention to environmental issues, however, can prove to be very expensive for the short- and long-term well-being of a municipality and its residents. Pollution, poor management of water and energy resources, and uncontrolled residential and industrial development can have immediate and sometimes devastating health and environmental impacts, and can limit development options for generations to come.

The increasing decentralization of environmental management responsibilities in Mexico has also put additional pressures on communities to address environmental issues more effectively. The national development plan has set sustainability goals at the state and local levels. The federal government is delegating the protection of forests, lakes, ecological reserves and other natural resources to state and local governments, without the necessary resources to cover the cost of these activities. Natural areas close to cities play a critical role in supplying water and other resources to the local population.

Local governments are also under pressure to improve efficiency, openness, and accountability in their operations. Shrinking budgets combined with new environmental responsibilities, are forcing municipal leaders to explore innovative strategies such as an EMS for competently managing their resources. The presence of, and potential for, corruption in municipal government has led to demands for formalized systems providing openness and accountability.

In the Mexican town of Zapotlán el Grande, for example, the large lake in the valley is drying up and becoming contaminated. The local population is very aware of the links between wastewater water discharges, the absence of watershed management, and the deterioration quality of the lake. The population also has a growing awareness that the lake, if restored, could become a significant tourist attraction and improve local economic conditions. Aware of these strong sentiments, the current mayor ran and won on an environmental platform. Accordingly, the municipality now has a strong interest in water protection, wastewater treatment plant upgrades and environmental management.

B. The Role of an EMS

Environmental management systems (EMSs) are one of the most promising tools for organizations – private and public – to manage their environmental affairs. An EMS consists of standard procedures and practices for assessing organizational environmental performance and improving it over time. An EMS does not impose new technical requirements, nor does it act as a substitute for existing regulatory standards. An EMS simply provides a framework for an

organization to manage its environmental impacts more efficiently and to improve both its environmental and economic performance.

A strong EMS can help improve relations with the community and support for environmental programs by institutionalizing how the municipality consults with the community on environmental issues and by generating greater public awareness and appreciation of local environmental issues.

The key components of an EMS are:

- An Environmental Policy Statement actively promoted by senior management;
- A planning process oriented toward integration of environmental management with the organization's business and operations management;
- An organizational structure oriented toward placing environmental management responsibilities on people in operational jobs, *i.e.*, those closest to the significant environmental issues;
- Implementation processes, including operational controls oriented toward reducing risks of significant environmental impacts;
- Measurement and auditing mechanisms to monitor system performance and identify new opportunities for improvement; and
- A process for periodic top management review of the EMS to ensure continual improvement.

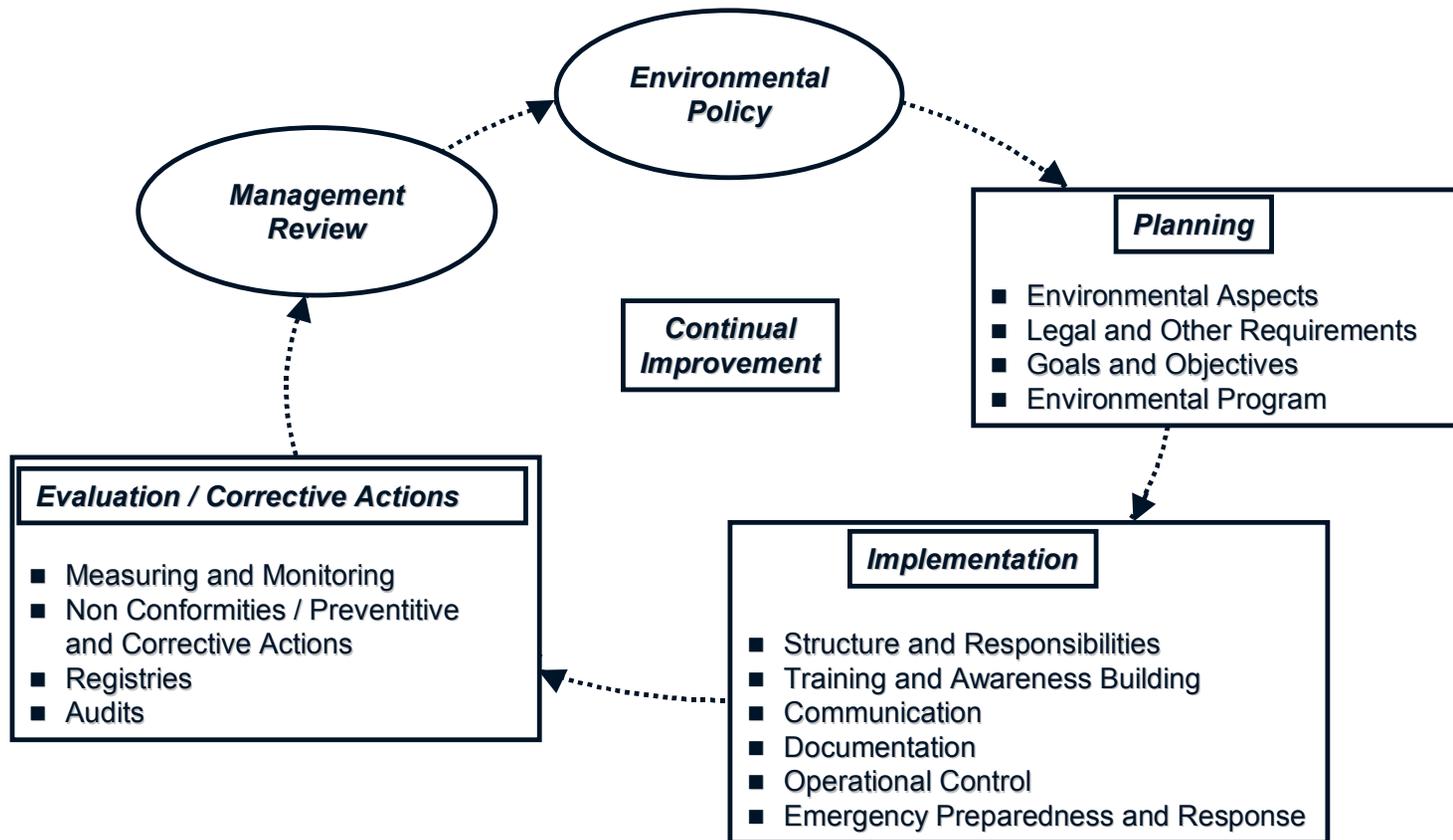
Diagram I demonstrates the interaction of the various EMS components. Key to the utility of an EMS is its ability to provide, through the integration of its components, measurable information that enables continual improvements in environmental performance. Ideally, the EMS is integrated at all levels of the operation, using a "systems" approach. Such an approach allows the operation's environmental management to avoid being dependent on just a few individuals, thereby allowing the operation to become more stable, yield more predictable outcomes, and utilize new information for continual improvement.

Many environmental management systems are based on the International Organization for Standardization (ISO) 14000 system for administration of an organization's environmental management system. The widely-used ISO 14001 standard describes the verifiable core elements of an organization's environmental management system, and defines an environmental management system as "[T]hat part of the overall management system which includes organization structure, planning activities, responsibilities, practices, procedures, processes, and resources for developing, implementing, achieving, reviewing, and maintaining the environmental policy."¹ The training materials for the *PROMUS* project generally followed the ISO 14001 requirements for designing a municipal EMS. This model was selected because of its general acceptance and recognition in the field.

¹ ISO 14001, Section 3.5

Diagram I

Environmental Management System Model



(E. Guerra / ABS Consulting)

For Mexico, an EMS offers municipal officials and local regulators a way to meet these challenges. A strong EMS can help them prioritize and effectively manage their growing number of responsibilities. By identifying economic efficiencies, an EMS can help allocate resources to a broader range of problems. An EMS can also help regulators bridge the policy gaps and changes resulting from the municipal elections every three years. EMS programs for municipalities in the U.S. have demonstrated that a wide range of municipal operations can improve their ability to address environmental impacts through the careful and systematic use of these tools.

C. EPA and USAID Local Government Initiatives

From August 1997 through July 1999, the United States Environmental Protection Agency (EPA) funded an EMS pilot program to test the benefits and applicability of an EMS on environmental performance, compliance, pollution prevention, and stakeholder involvement in local government operations. The participating local government entities experienced numerous benefits from the pilot program, including improved environmental awareness, improved efficiency, and better communication about environmental issues. The success of this initial municipal EMS pilot program led EPA to fund another program for an additional fourteen public agencies in the United States.²

USAID also has sponsored several EMS initiatives for municipalities in Mexico. USAID provided seven Mexico City agencies and a number of facilities within the Delegación Tlalpan with technical assistance in implementing an EMS. The assistance included implementation manuals, energy and water use assessments, and general procedures for installing, developing, and maintaining the EMS.

Building upon their success with the program in the U.S., EPA decided to look for appropriate ways to expand their domestic EMS training work to Mexican municipalities in the border region. At the same time, USAID was looking to broaden their EMS initiatives in Mexico. Together, they funded the Environmental Law Institute (ELI) through a cooperative agreement to implement the project.³ ELI brings to the project over ten years of experience in Mexico, including projects focused on capacity-building and federalism as well as EMS courses for corporate officials in Mexico.

D. EMS in Mexico

Mexico already has experience with the use of environmental management systems in the business sector. Under Mexican law, producers, businesses and business organizations may develop voluntary systems for self-regulation and environmental auditing that are consistent with applicable laws and regulations, and may commit to go beyond these measures. To date, there

² See www.peercenter.net for information on both of these programs.

³ The specific offices of EPA participating in the project were: EPA Headquarters (the Office of Wastewater Management and the Office of International Activities), and Region IX (the Merit Partnership for Pollution Prevention). From USAID, the Office of Energy, Environment and Technology and the Democracy and Government Program in the Mexico Mission participated.

have been no regulations defining these self-regulatory and environmental auditing systems. Since ISO 14001 was published in 1996, however, more than 300 business organizations in Mexico have been certified. PEMEX, for example, has already certified several refineries and petrochemical complexes, and is implementing EMSs for its oil-drilling operations (land and offshore) in 150 sites and expects to be certified in 2003.

Additionally, in 1998 Mexico published the Mexican Voluntary Standard NMX-001-SAA-IMNC-1998, which is the official translated version of ISO 14001. This is a voluntary standard, applicable to public and private entities. However, many government-related facilities, such as the Federal Commission for Electricity, *el Comisión Federal de Electricidad* (power generation), PEMEX (oil), Port Authorities (Gulf of Mexico, Caribbean), and Exportadora de Sal (co-investment Mexico/Mitsubishi) have developed and are expanding EMSs for their operations in conformance with the voluntary standard. As a result, suppliers to these entities are also seeking to become certified with the voluntary standard.

Earlier this year, the Mexican Environmental Law Enforcement Office, *Procuraduria Federal de Proteccion al Ambiente (PROFEPA)*, offered a new compliance award through their “*Programa de Excelencia*” that encourages the development of an EMS. Any organization that is in compliance with applicable environmental laws, as determined by a compliance audit, and that is implementing and in compliance with an EMS, as determined through third-party certification will be awarded a “*Certificado de Excelencia Ambiental*” (Certificate of Environmental Excellence).

At the time this project was launched, only a few municipalities in Mexico were known to have developed, or to be developing, an environmental management system. The municipality of Aguascalientes had implemented an EMS for its landfill and was working towards certification. As discussed above in Section I.C., USAID had funded several municipal EMS initiatives for the Mexico City government and delegación of Tlalpan.

II. PROJECT DESCRIPTION AND DESIGN

A. Recruitment and Selection of Municipalities

To recruit municipalities to participate in the *ProMuS 2001* project, ELI contacted a wide range of organizations and individuals working with municipalities in Mexico to determine which municipalities would be most interested and have the qualifications and capacity to participate in the project. Organizations consulted included AMMAC, the Border Environment Cooperation Commission (BECC), the Inter-American Development Bank (IDB), the World Bank, and the International City/County Management Association (ICMA). ELI then prepared and distributed an application package to the list of potentially interested municipalities.

The candidate selection process for the *ProMuS 2001* project was competitive, and encouraged only committed applicants. The application package required each municipality to provide:

1. A brief description of the municipal organization and its responsibilities;
2. The name of the person who would be given the responsibility *and* authority within the organization for leading the work to develop the EMS, as well as the names of the two additional employees who, along with the project leader, would form the core team to conduct the EMS project throughout its development and implementation;
3. A preliminary, non-binding indication of the facility or operation(s) within the municipality that would be developing the EMS (*i.e.*, wastewater treatment, water supply, transit operations, *etc.*);
4. A description of the reasons why the facility wished to participate and some of the benefits it anticipated receiving from the adoption of the EMS, including the potential to conserve the consumption of natural resources and/or protect the environment, and the potential to change the way the municipality addresses environmental issues;
5. The name of a high-level official from the municipality and a written commitment from this official to ensure that the necessary financial, technical, and other resources would be available throughout the entire two years to support the municipality's core team and the implementation of the EMS; and
6. Confirmation from the high-level municipal official that the core team members would have access to the appropriate computer technology for Internet web-based training and e-mail communication.

Each candidate team was then judged based on the following criteria:

- basic understanding of the principles of EMS;
- level of commitment demonstrated by senior management;
- technological resources for web-based training;
- capacity of municipal officers to be trained;
- reputation of the municipality for responsible management;
- environmental implications of the proposed pilot project and its relevance to improving the environmental management of the municipality;
- feasibility of designing and implementing an EMS within the year-long duration, as well as other practical constraints of this project;
- likelihood that the facility's EMS will be implemented and sustained;
- availability of environmental data for the proposed municipal facilities; and
- creativity of the project in solving meaningful issues.

A major criteria for the selection of the terms was the municipal election cycle. The project organizers sought to select municipalities that did not have an election scheduled until the end of the training period. In this way, they could avoid changes in the team membership that might result from a change in administration. They could also better guarantee that high level political support for the project would continue.

A member of the *ProMuS* 2001 project team provided assistance to the prospective participants in the preparation of the application, particularly with the selection of the municipal facility or operation for the subject of the EMS. To avoid any conflict of interest, this person did not participate in the selection process.

While many municipalities expressed interest in the project, only five submitted complete applications. ELI staff then prepared a fact sheet summarizing the application information and evaluating the applications based on the aforementioned criteria. The ELI team met with USAID and EPA to discuss the relative strengths of each applicant. The three municipalities chosen to participate in the *ProMuS* 2001 project were: Nogales, Sonora, with a team from the Sonoran State Commission for Potable Water and Sewage, *La Comisión de Agua Potable y Alcantarillado del Estado de Sonora* (or *COAPAES*); Piedras Negras, Coahuila, with a team from the Piedras Negras Department of Ecology and the local landfill; and Zapotlán El Grande, Jalisco, with a team from the municipality of Zapotlán El Grande. At the time of selection the teams chose the following fencelines⁴: wastewater collection system, Nogales; wastewater treatment plant, Zapotlán El Grande; and sanitary landfill, Piedras Negras.

B. Training Materials and Tools

The ELI team collaboratively produced a set of "just-in-time" EMS training materials in Spanish for use by the participants. These included a detailed set of materials covering Mexican

⁴ A fenceline is "the area in which an organization chooses to implement its environmental management system- a department, division, or specific operation." Source: U.S. Environmental Protection Agency. *Final Report: The U.S. EPA Environmental Management System Pilot Program for Local Government Entities*. January 28, 2000.

environmental legal requirements. The participants were also provided with an EMS Internal Audit training materials in Spanish as well as the "Best Practices Guide: Application of ISO 14001 Environmental Management Systems (EMS) for Municipalities". This guide provides a detailed, step-by-step description of how municipalities should proceed in the implementation of their EMSs.

As teaching aids, the participants also received an excel spreadsheet tool for classifying environmental aspects and identifying significant environmental aspects; and an EMS self-assessment (gap analysis) tool.

C. Workshops

The initial training methodology for the *ProMuS* 2001 project was to combine in-classroom skills training and practical exercises with web-based and on-site technical assistance. The on-line training, however, became less important, because the project was able to hold two in-classroom-training sessions instead of one as was initially anticipated. The web was also used to provide the Nogales team with technical assistance.

A "just-in-time" approach was used in the classroom training sessions. With the "just-in-time" approach, the instructional and technical part of the program was always directly relevant to the participants, walking with them as they designed and implemented a fully functional EMS. Accordingly, the municipal participants prepared in advance and worked with real facility data in the training sessions.

The first training workshop for the municipal teams took place May 7-10, 2001 in Guadalajara, Mexico at the facilities of ITESM Guadalajara. Representatives from EPA, USAID, ITESM, AMMAC, International City/County Management Association (ICMA), PROFEPA, and the National Institute of Ecology (*Instituto Nacional de Ecología* (INE)) also participated in the event.

In advance of the training, the participants were assigned several tasks to prepare them for their intensive "just-in-time" training experience. Participants completed a preliminary scoping exercise concerning their pilot facility. This exercise required them to prepare a brief presentation on the pilot project facility and proposed EMS, and to locate sources for, gather available data on, and present a review of, the environmental aspects of the pilot facility.

This initial skills training session provided the participants with a detailed introduction to the conceptual, legal, and policy framework of an EMS, as well as an overview of the tools, skills, and resources needed to develop and implement an EMS and advice on how to implement their EMSs. Topics included: i) the "Plan, Do, Act, Check" Model; ii) principles of environmental management; iii) a detailed review of ISO 14001; iv) purposes and uses of an EMS; v) examples of municipal application of EMSs; vi) process mapping to identify environmental aspects, pollution prevention, waste reduction and "cleaner production" opportunities; vii) identifying laws and regulations to include in the EMS; viii) performance measures for evaluating the effectiveness of an EMS; ix) community outreach in designing and operating an EMS; x) involving senior management in the design and implementation of an

EMS; xi) practicum on developing environmental policies; xii) practicum case study on determining significant environmental aspects; xiii) establishing meaningful goals and objective for an EMS; xiv) using the “self-evaluation tool”; and xv) a summary of the EMS internal audit program and process requirements.

During the interactive training sessions, the municipal teams worked with their assigned faculty member to identify their first approximations of environmental policies, significant environmental aspects, and some goals and objectives. They also practiced “process mapping” to identify environmental aspects, and outlined requirements for additional information gathering, environmental monitoring, technical support, management input, administrative support, employee and public outreach, and the approximate timing for meeting these needs. This approach enabled the teams to make realistic and meaningful assessments about the time and resources needed to develop their EMS, and helped them plan their own intermediate milestones for the pilot project. In the final session of the course, each team reported on its results, and received suggestions and critiques from the other groups and the course faculty. Prior to leaving the first initial skills training workshop, the ELI team presented a “roadmap” of the remainder of the EMS program, and an array of supporting materials including the project web site and information on how to use it. (For more information on the web training see Section E.). Each team was also given a set of implementation tasks to be completed over a scheduled period of time.

The second training course took place five months later, from October 16 – 18, 2001, in San Diego, California. The three-day session included two days of workshops and a day of site visits to two municipal facilities in San Diego that had developed and implemented an EMS: the wastewater treatment facility and the landfill. The same municipal team members that attended the first workshop participated in the second training event. Observers from EPA, USAID, the Border Environment Cooperation Commission, the North American Development Bank, and AMMAC also attended.

Key topics covered by the faculty during this workshop included: controlling environmental aspects; root cause analysis; programs for communication and coordination with stakeholders; environmental objectives, detailed goals, action plans and measuring operation discharges; contingency plans; documentation of the EMS; and identifying non-conformities, corrective and preventative actions, and the internal audit process. The ICMA representative presented a special lecture on city management and the environment. During the workshop, the municipal team participants also had an opportunity to share problems encountered and solutions identified in developing their respective EMSs. The second training workshop also provided the faculty and sponsors with an opportunity to identify the specific technical assistance needs of the different municipalities. At the end of the workshop, the faculty assigned and explained a set of follow-up tasks. These tasks were designed to carry the municipalities through performing a light audit of their system, the chosen marker for the end of training for the *ProMuS* 2001 pilot project.

D. Website

The project website (<http://www.ProMuSmex.net>) was designed to be a tool for further training and support for the teams, as well as a source of information for people interested in the project. The website is divided into public and password-protected domains, allowing the municipalities to post information on their progress without the pressure of public scrutiny. The municipal teams were provided access to each other's work in order to benefit from each other's experience. The information provided on the website includes: EMS diagnostics, environmental policies, and progress reports for assigned tasks. In addition to the documentation from each municipality, the website also contains all of the materials from the training modules from the workshops, the project tasks, and additional training modules not covered in the workshops.

E. Site Visits

The purpose of the site visits was to provide each municipality with individually tailored, on-site technical assistance in designing and implementing their respective EMS. The site visits provided a useful opportunity for the *ProMuS* faculty to see the extent of the challenges facing the municipalities, to provide guidance on local operational issues, and to help build political supports for EMS.

The first of the faculty site visits to the municipalities took place approximately two months after the second training workshop. The faculty found that their respective teams had great energy and desire to succeed, yet years of underfunding and lack of attention to many operational areas had created extraordinary challenges for the teams. Often, the organizations were under-staffed and lacked adequate computer and communications resources. In the case of Nogales, fixed assets and operating equipment in the wastewater collection system were old and in disrepair due to decades of under- or no funding. Not all of the municipalities had the same infrastructure problems. In Piedras Negras, for example, the waste collection, transportation, and disposal equipment was in good condition --not more than 3 to 5 years old-- and new trucks for waste transportation were scheduled to be purchased in December 2002.

During the site visit, the assigned faculty member visited and worked directly with the municipal team for up to five days to help resolve issues that required more specific knowledge or EMS experience; to review progress made to date, noting any areas that appeared to present special problems for each team and providing guidance on how to resolve them; and to accompany each team on briefings of senior managers if the team wished. For example, during the site visit to Nogales, Amos Bien of EcoConsulta participated in a number of short "awareness events," a required component of the EMS to make staff, managers, and others aware that the municipality has an environmental impact and that they are developing a system to help manage it. In this case, Amos and the team conducted short workshops for each department of COAPAES to explain the initiative and what was expected of the staff in developing and implementing the EMS. Foster Knight of the Lexington Group visited Zapotlán El Grande in May 2002 to train 20 municipal employees in EMS internal auditing.

The second round of four-day on-site technical assistance and training visits took place when two of the municipal teams (Piedras Negras and Zapotlan) were close to completing their EMS. A second round visit was not made to Nogales because the team had not yet progressed to the appropriate stage in developing their EMS. Through these visits the faculty sought to: provide basic training on EMS principles, operations, and maintenance to a much larger number of employees (assisting the multiplier effect); help the team put the finishing touches on its EMS; assist the team in achieving visibility and buy-in from peers, superiors, municipal leaders, and other interested stakeholders in the community; evaluate the EMS to ensure that it was functioning properly; and conduct a limited (“light”) audit of the EMS as a “final exam” to identify areas of the EMS design or implementation that require further attention (municipal team members participated in this audit to learn how to perform an internal audit); and gather appropriate data for ELI’s final project evaluation and report to EPA.

F. Graduation Ceremony

On June 13, 2002, the teams participated in a project evaluation session and graduation ceremony in San Diego, California. During the morning session each team gave an informal presentation on: the status of their EMS; benefits, barriers, keys to success; lessons learned; and future possibilities for EMSs in their municipality and beyond. The morning session was attended by the teams, and representatives from ELI, ICMA, EPA (headquarters and Region IX), and USAID (headquarters and Mexico Mission).

During the afternoon session which was open to the public, each team made a formal presentation on the development and implementation of their EMS and their experience with the *ProMuS* 2001 program. The session was then opened up for a discussion among all of the attendees concerning future opportunities and challenges for EMSs in Mexico. The event concluded with a formal graduation ceremony. Representatives from the City of San Diego Environmental Services Department, the City of Tijuana Department of Ecology, PROFEPA-Mexicali, and Otis Elevators joined the team members, faculty, and project sponsors for the afternoon session.

G. Mentors

In addition to the assigned faculty member, each municipal team was paired with a corporate mentor. The objective of the mentor program was to provide additional technical assistance to the municipal team, based on the mentor’s own experience with designing and implementing an EMS in the same geographical region. To identify the potential project mentors, the ELI team compiled a detailed list of every company with ISO 14001 certification located in the border region. ELI staff and faculty members then contacted the companies with whom they had previously worked and secured either a verbal or written commitment from the companies to provide guidance and technical support in EMS implementation. Otis Elevators agreed to be the corporate mentor for Nogales, Alcoa volunteered to help Piedras Negras, and IBM agreed to work with Zapotlán El Grande.

The mentor was responsible for initiating contact with the team leader of the assigned municipality and working out a mutually agreed upon plan of assistance that would clarify the

nature and timing of the assistance that the mentor would provide. The assistance plans varied according to the experience and availability of the mentor. The mentor was to schedule a regular time to be available by phone, e-mail or other means for questions concerning preparation and implementation of the EMS. Mentors participated in the project on a voluntary basis, and were not remunerated for the expenses involved. As will be discussed in greater detail in Section V.B. below, time constraints on both the municipal teams and mentors, combined with the voluntary nature of the program, resulted in a minimal level of assistance being provided through the mentor program.

H. Outreach and Institutional Linkages

A key objective of the *ProMuS* 2001 project was to create an institutional base in Mexico for future EMS training. To achieve this goal, the ELI team sought to educate a broad range of U.S., Mexican, binational, regional and international institutions about the project and engage them in the training and outreach process. Representatives from Mexico's environmental agencies (INE and PROFEPA) participated and spoke at the training workshops. Representatives from the BECC and NAD Bank were also contacted about the project and attended project events. The NAD Bank is now working with the ELI team to incorporate EMS training into its Utility Management Institute. The Association of Mexican Municipalities (AMMAC) helped recruit the municipalities for the project and participated in the workshops. In an effort to promote EMSs on a broader scale in Mexico, AMMAC published an article on the *ProMuS* 2001 pilot and its progress in their monthly newsletter. The article is attached as part of Appendix F.

III. PROMUS 2001: THE ROLE OF THE PARTICIPANTS

The outstanding efforts of the individual members of the municipal teams were critical to the success of this training program. Each member was required to make a substantial commitment of energy, time and resources. Their willingness to lead a cultural change not only contributed to the success of their respective work, but also demonstrated the viability of municipal EMS training in Mexico. Appendix G presents a summary of the activities for each task set and the completion dates for each of these activities.

A. First EMS Training Workshop (*Guadalajara, Mexico, May 7-10, 2001*)

To prepare for the first workshop, the participants completed a preliminary scoping exercise concerning their pilot facility. The exercise required participants to prepare a brief presentation on the pilot project facility, and to locate sources for, gather available data on, and present a review of the environmental impacts of the pilot facility. The municipalities were assigned this task in April 2001, and were asked to complete it by the May 2001 training in Guadalajara, Mexico.

The Nogales team compiled information on water consumption and discharge, pollution parameters, number of residences and businesses served, trends, and growth. The Piedras Negras team prepared a video about the City of Piedras Negras, with general information on the population, location, industrial and commercial activities and municipal services, and the municipality's waste management system. The Piedras Negras team also used a PowerPoint presentation. Zapotlán el Grande's preliminary scoping exercise focused on the technical operation of the municipal water treatment plant and related environmental issues. None of the teams experienced difficulties in completing this exercise.

The first EMS training workshop featured presentations by the faculty and a series of breakout sessions designed to engage the teams and provide a solid base for designing their EMS. The three faculty members gave presentations on the following topics: What is an Environmental Management System?; Identifying Environmental Aspects; Legal and Other Requirements; Significant Environmental Aspects; Creating the EMS Environmental Policy; Controlling the Significant Environmental Aspects; Determining Environmental Objectives and Targets; Non-Conformities, Auditing, and System Review; and Documentation of the EMS, Control of the Documentation, and Registries. Each of the faculty presentations was made via PowerPoint.

During the workshop, the municipal teams participated in a series of breakout sessions designed to jumpstart the design of their EMS. At the end of the first day of the workshop, following lectures on the principles of EMS, each municipal team and their assigned faculty leader started to identify environmental aspects of their operations and further determine which of those aspects were significant. They also began developing their policy goals. Using the data and information collected prior to the workshop, each team began to list and discuss their environmental aspects and potentially significant aspects. The teams began to create an environmental policy by examining their municipality's mission or vision and the municipality's values and beliefs. At the end of the first breakout session, each team made a presentation to the

faculty and other project teams describing the general scope of their EMS, what they believed to be their principal environmental aspects, why they determined certain environmental aspects to be significant, and a first approximation of their environmental policy.

All of the teams were successful in this exercise. At first the teams lacked an understanding of the big picture, which was expected at this stage of the training. The Piedras Negras team also experienced some initial problems, due to their lack of knowledge about previous environmental impacts and lack of familiarity with applicable environmental legislation and regulations. Yet the teams worked diligently and generated solid results, which became the basis for their set of "homework" tasks. The key challenge in the assigned tasks was to develop enough detail for the process mapping.

In the second breakout session, the teams analyzed the operational processes of the targeted municipal operation. They began "process mapping" their operations (as defined by their selected fenceline) to understand the environmental impact of each unitary process and the potential points of control for reducing the impact. This rather technical exercise is critical for understanding the whole picture of the system, and ensuring that all impacts are taken into consideration. By the end of the session, all of the teams understood the process mapping tool, and had used it effectively to identify many of their critical issues. Each team drew a conceptual map of all of the operational components of their EMS, and provided their first thoughts on how to design and implement it, *i.e.*, who, what, when, and how. The Zapotlán team used the "process mapping" technique that they learned in the workshop. In the case of Nogales, the team drew their map using a consultant-provided "process map" tool and with direct support from the faculty members. The tool was designed to get the team started, not to be the final version. The Piedras Negras team, in working with the faculty, was able to develop the process mapping after two trials. However, again the identification of environmental aspects presented a challenge for the Piedras Negras team because of their limited of knowledge environmental issues.

In the final breakout session of the first workshop, the participants were divided into groups and began to develop their detailed work plans. The work in previous breakout sessions provided participants with an idea of the issues that still needed to be addressed and what components their systems would need. The timeline-based work plan for each team included: a more concrete process mapping that linked the work plan to their components; a definition of human resource needs (including likely required topic experts or local "tutors" from the private sector); data collection and management needs; technical resource needs; and identification of likely obstacles and barriers, with first thoughts on strategies to overcome them. For the most part, the teams did not experience any difficulties with this task. The Nogales team produced a workplan with commitments and milestones. The Piedras Negras team also included in their workplan the following key points: identification of applicable legislation and regulations; development of an environmental policy draft; and meeting with the Mayor to appoint a management representative to the EMS.

B. First EMS Task Set

The faculty provided the municipal teams with three sets of tasks to complete in order to develop and implement their EMSs in a structured fashion. The first set of tasks was assigned to

the municipalities following the initial training session in Guadalajara, Mexico. The teams were given three months to complete this set of tasks; in reality, it took anywhere from the allotted three months to six months to complete. These tasks required the municipalities to establish their EMS implementation team, collect baseline information, identify significant environmental aspects and legal requirements, and establish an environmental policy. A summary of the first set of tasks is set forth below:

1. Establish The EMS Implementation Team

Establishing the EMS implementation team was the first of the tasks assigned. The implementation team plays an essential role in planning the EMS project, delegating tasks, establishing deadlines, collecting and evaluating work completed, and providing training, guidance, and assistance to the other members of the facility when needed. The team consisted of an EMS Management Representative, an EMS Committee Coordinator, and other team members as appropriate. The EMS Management Representative is the leader of the implementation team and has top management authority. The EMS Committee Coordinator is responsible for providing day-to-day EMS implementation support. He or she is responsible for communicating with senior management, directing staff resources, and pulling together the component pieces of the EMS. In addition to developing an implementation team, all participating municipalities also developed an EMS Implementation Committee, which consists of a more senior level team responsible for ensuring that the system is actually implemented.

Although most of the teams had in essence created their implementation teams by the time they arrived in Guadalajara for the first workshop, they still needed to formalize the team structure and responsibilities. All of the teams completed this task by July 2001. The Nogales team, however, changed their implementation team between the first and second sessions. The final Nogales team consisted of the COAPAES Director of Border Issues and Special Projects as the EMS Management Representative, and the Subdirector of Projects at the Nogales office as EMS Coordinator; a junior engineer was the third member of the team. Originally, the Director of Projects and Engineering at COAPAES headed the project; however, after the first meeting, he delegated responsibility to the Director of Border Issues and Special Projects. Additionally, the Director of Water Quality, the Director of the Department of Works and Projects, and the Director of Border Issues and Special Projects serve on the Nogales team's implementation committee. The implementation team from Zapotlán El Grande includes four people: their EMS Management Representative and Committee Coordinator is the Vice-President of the municipality, and the remainder of the team consists of the Director of Water and Sewer Services, the Director of Public Services, and the Wastewater Treatment Plant Manager. Zapotlán's implementation committee consists of a representative from upper management, the Director of the Drinking Water and Sewage System, the Director of Public Services, and a Chief from the first treatment plant. Piedras Negras designated its Director of Public Works as the EMS Management Representative and the Director of Ecology as the EMS Committee Coordinator. The other members of the team are the Director of Planning and the landfill manager, a subcontractor to the municipality. For Piedras Negras, the members of the implementation team and implementation committee are the same.

In an effective team structure, each member has their respective responsibilities and roles for implementation. When a person leaves the team, it sets back the entire project because the new person must be trained and brought up to speed on the project. The Nogales team had problems with team continuity that hurt their ability to move forward on their EMS implementation. Although change in the team structure may have hurt the team's progress, it also may have contributed to their success. The original Nogales team consisted of a very junior person and two very senior persons. The senior persons could not dedicate the time, and the junior person did not have the authority or institutional knowledge, to initiate and carry out the work. Fortunately, they recognized these limitations and assigned a mid-level person to the team who had the authority and experience to lead the project, which solved the problem and helped them move forward rapidly.

This new lead person, upon joining the project, recognized almost immediately that the chosen fence line would lead to internal problems within the organization's hierarchy. In consultation with the EMS Management Representative and the project consultant, he made the decision to switch the fence line from wastewater collection to drinking water extraction and distribution. While this change meant that most of the previously completed work would be made largely useless, it proved to be the right decision, and his leadership allowed the Nogales team to catch up with the other teams by early 2002.

2. Conduct GAP Analyses

In order to design an EMS, each team needed to understand what EMS elements they may have already had in place for their facility or the larger municipal structure. To make this determination, each team completed the Gap Analysis Tool. This questionnaire helped the teams to determine which EMS elements already existed in the organization, and which elements would need to be revised or developed. The questionnaire contained eighteen questions that asked the team to rate their preparedness on a scale of 0 to 20, with 0 meaning not prepared at all, 6 meaning partially prepared, and 20 meaning totally prepared, *i.e.*, ready to receive ISO 14001 certification. The questionnaire focused on the following areas: environmental policy, environmental planning, implementation and operation of systems, corrective actions, and management revision. The teams received the questionnaire in mid-May 2001. The Piedras Negras and Zapotlán teams completed it by July 2001, and the Nogales team completed it by January 2002.

Completing the questionnaire enabled each municipality to determine its exact starting point for the EMS process. All three municipalities found that they had some form of environmental policy operating in their municipality that was not formally documented. Furthermore, all of the municipalities found that they already had in place an informal process for identifying the environmental aspects of the activities, products, and services of the municipality. In evaluating its monitoring processes, one municipality noted that they already had a formal process measuring environmental discharges, but did not have a program for evaluating their compliance with applicable laws, regulations, and norms. The Zapotlán El Grande and Piedras Negras teams had no problems completing this task.

3. *Identify Significant Environmental Aspects*

This task required the teams to first identify the environmental aspects of the municipal facility, and then determine which of these environmental aspects were significant.

ENVIRONMENTAL ASPECTS

Environmental aspects are the actual or potential impacts of an organization's activities, products, and services on the environment. In the case of municipal facilities, many of the important environmental aspects are related to the services that the municipality provides, because these interact with the environment directly.⁵ To identify environmental aspects, each team employed the "process-mapping" tool. Process mapping breaks down operations into three to five components; each of these components may have sub-components. Through process mapping, each team examined the "inputs" and "outputs" of all of their components and sub-components. For example, energy use and lubricants may be some of the "inputs" to operating a large motor; outputs could be oil and oily rags (to be managed as hazardous waste) and noise. Although this task was assigned as homework, each of the teams began to identify the environmental aspects associated with their operation at the first workshop. The Piedras Negras team finished this task in July 2001, and their faculty member reviewed it in November 2001. The Zapotlán team completed this task in September 2001. The Nogales team completed this task in May 2002.

The Piedras Negras implementation team conducted the process mapping for the public lighting system and the municipal landfill (including waste recollection and transport). The scope of the EMS was defined as all of the waste management and public lighting activities of the municipality of Piedras Negras. During a site visit in November 2001, the faculty member found several weaknesses in the municipality's process mapping and its identification of environmental aspects due to the team's misunderstanding of EMS requirements. It was therefore necessary for them to rework part of this task. The Piedras Negras team attributed their misunderstanding to the lack of examples relevant to the municipal context, as well as not having the constant support of an EMS expert. After their faculty member re-explained the task, the team completed the identification of the environmental impacts without any further problems, incorporating the results into an Excel format, where the environmental aspects, impacts, relevant laws and regulations are examined for negative impacts and possible non-compliance. During the review, the Piedras Negras team realized that the initial scope of the EMS was too complex, and the team decided to reduce the scope of their fence line to include only the municipal waste management system.

The Zapotlán EMS Committee and key employees of the wastewater treatment plant conducted the process mapping of the wastewater treatment operations and activities. The scope of the EMS was defined as all wastewater treatment plant operations and activities inside the perimeter of the plant. The wastewater treatment plant manager completed the identification of the environmental impacts using the Excel format. The Zapotlán team did not have any significant problems with this task.

⁵ Best Practices Guide, pg. 28.

The Nogales team initially identified and documented environmental aspects for their sewage system. In October 2001, however, they decided that it would be too difficult at the present time to implement an EMS for their sewage system and switched their fenceline to the potable water system. For the potable water system, the team identified 15 environmental aspects, including leaking tanks, fecal coliform in the water, and a lack of security to prevent vandalism.

SIGNIFICANT ENVIRONMENTAL ASPECTS

Once the teams had determined their environmental aspects through process mapping, they were asked to determine the significant environmental aspects (SEAs) of the facility. An SEA is an aspect that poses a significant risk or could potentially have a significant environmental impact. Delineating significant environmental aspects is in essence a process of setting priorities. Ideally, a team would identify the 20% of environmental aspects that account for 80% of the facility’s actual or potential impacts as SEAs. This does not mean that each team was limited to only a few SEAs; the *ProMuS* municipalities eventually identified between five and twelve SEAs in their targeted operations.

To identify the environmental aspects and significant environmental aspects, each team used a matrix in which they listed their activities, aspects, impacts, legal or other applicable requirements, and criteria used to determine significance, including possible legal infraction, magnitude or frequency of impact, effect on natural resources, and effect on the community. The table below demonstrates an example of the format in which teams identified environmental impacts and SEAs:

Activity	Aspects	Impacts	Legal Recs.	Possible legal infractions	Magnitude of impact	Effect on Nat Res.	Effect on the Community	Significant?
Trash Recollection	Trash	Soil Contamination	Municipal Ecology Regulations				Yes	Yes
		Spills		Yes	Yes		Yes	
	Leachate	Odors	Municipal Ecology Regulations				Yes	

None of the municipalities were able to complete this task by the August 1, 2001 deadline. Zapotlán El Grande completed the task in October 2001, and Piedras Negras completed the task in November 2001. The Nogales team completed this task in March of 2002, based on their new fenceline.

The Piedras Negras team first determined the criteria of significance, which is a reference for evaluating if an environmental aspect is to be considered significant. Examples of such criteria are: compliance with applicable legislation and regulations; costs of pollution treatment and disposition; client’s environmental requirements; corporate environmental requirements;

generated environmental impact; community (neighbors') opinion; and potential emergency situations. Based on the criteria, the team designated five environmental aspects as SEAs: leachates, used oil, spare parts, fuel, and oil. The Zapotlán team determined the criteria of significance and, based on this criteria, designated seven environmental aspects as SEAs. These significant environmental aspects included influent sewage, compressor noise, generation, management and disposal of solid wastes, and the discharge of treated effluent. The Nogales team, using their criteria of significance, identified 12 significant environmental aspects: water with fecal coliform, leaks because of old primary piping, leaks from tanks, chlorine gas leaks, mud in the lines, water leakage due to blackouts, leaks where the pipes meet houses, drainage overflow into streams because of storms, suspended organic material, product spills in workshops, lack of security to prevent vandalism, and over-consumption of water in houses and commercial operations.

Determining the SEAs was the most difficult task for the teams, because it implied that any item not chosen would simply not be addressed by the system. Decisions required extensive analysis; teams needed to examine the issues, determine whether control would be feasible, technically and financially, in the context of the system, and then decide on a plan of action. At first, the teams had a difficult time grasping that ongoing efforts in other parts of the department or municipality "counted" as part of the EMS activities. Initially, the teams thought that only the activities *they* engaged in within *this* context were to be included. The discovery that they are trying to integrate activities across their entire organization was an important learning element.

4. Identify Legal Requirements

An essential component in developing an EMS is identifying the legal requirements that apply to the significant environmental aspects. For this task, each team prepared a list of the laws, regulations, and technical environmental standards on the federal, state, and local levels that apply to each of the identified SEAs. This list also included "other requirements," such as environmental commitments made voluntarily by the municipality. None of the municipalities were able to complete this task by the original August 2001 deadline. Piedras Negras completed this task in January 2002, Nogales completed this task in May 2002, and Zapotlán has largely completed this task and is working with the Jalisco State Department of Ecology to finalize applicable requirements.

While all of the municipalities had difficulty completing this task, they agreed that it was a valuable exercise. The current state of Mexican environmental and public health law presented the teams with a number of challenges. All of the teams were frustrated because frequently the legal requirements were not clear. The teams often confronted with laws lacking implementing regulations, regulations without technical norms, overlapping authorities, and contradictory legal mandates. However, the team from Nogales noted that the process of identifying the legal requirements was perhaps one of the most beneficial tasks of the implementation stage. The Nogales team analyzed the legal requirements that would apply to their facility, and then created a table that included accords and bilateral conventions, laws, regulations, and Mexican official norms. They then determined which standards applied to implementing an EMS, and examined whether or not they were in compliance. The team from Zapotlán El Grande struggled with this task and asked for support from the Jalisco Department of Ecology. The information that the

Jalisco Department of Ecology provided was useful to a certain degree; however, the Zapotlán team found that even the state environmental agency was unclear on what federal and state environmental requirements apply to the wastewater treatment plant. The Piedras Negras team had difficulty identifying the applicable legal requirements because they did not have any prior experience in this area. Their faculty member helped them to complete their list.

5. *Establish an Environmental Policy*

The environmental policy serves as the core of the EMS and states the environmental values and commitments of the organization. The policy statement establishes the overall level of environmental responsibility and performance that the municipality seeks. To be effective, top management of the municipality must ensure that the environmental policy: is appropriate to the scale and nature of the municipality's environmental impacts; is in line with the municipality's plans and operations; provides the framework for setting and reviewing environmental objectives and targets; is documented, implemented, maintained, and communicated to all employees; and is available to the public.⁶ The policy must also include a commitment to continual improvement, the prevention of pollution, and compliance with applicable environmental standards, regulations, voluntary codes, and principles to which the municipality subscribes.

Each of the teams began working on their environmental policy at the initial training in Guadalajara. Zapotlán El Grande and Piedras Negras prepared their environmental policies in June 2001. Zapotlán El Grande's policy was first discussed with an Advisory Group to the City Council, and then submitted to the Council and the Mayor. It was approved as an Official Act in July 2001. In addition to promoting sustainable development of urban areas, preserving a large lagoon situated in the municipality, and protecting local flora and fauna, Zapotlán's environmental policy promotes source reduction of solid waste entering the municipal sewage system, a reduction in noise pollution, and the rehabilitation and improvement of the sewage treatment system. The Piedras Negras team prepared a draft of their environmental policy in July 2001. Their consultant reviewed the draft policy and proposed several changes because the team had included too many broad issues such as the "sustainable development of the region." After some corrections, the policy was submitted to the Mayor and City Council for approval. The Piedras Negras environmental policy was approved as an Act of the Piedras Negras Municipal Council in December 2001. The Piedras Negras policy contains an overarching statement of purpose and specific goals including improvement and protection of the environment, sustainable use of natural resources, efficient energy use, and legal compliance. The General Administrator of COAPAES Nogales approved the Nogales environmental policy in February 2002, based on the team's policy effort completed in November 2001. The commitments made in the COAPAES Nogales environmental policy include: assuring the highest quality water for their clients; implementing programs that reduce the risk of accidents; and promoting the efficient use of resources in Nogales.

⁶ Best Practices Guide, pg. 27.

C. Second EMS Training Workshop (*San Diego, California; October 16–18, 2001*)

Two of the three teams (Zapotlán and Nogales) traveled to San Diego, California for the second EMS training workshop. The team from Piedras Negras had planned to attend, but political constraints kept them from traveling to the workshop. The Piedras Negras team was able to participate in the exercises for the workshop via teleconferencing and e-mail. In an effort to make up for the absence of the team at the workshop, an extra site visit was made to the municipality in November 2001.

On the first day of this workshop, the participants toured and visited with the EMS implementation teams from the San Diego BioSolids Center and the city landfill. The goal of these visits was to show the municipalities what a municipal level EMS “looks like,” as well as to provide them with the opportunity to ask questions about the process that the San Diego implementation teams went through in developing and implementing their EMS. The team from the BioSolids Center has already implemented their EMS, so they were able to provide the *ProMuS* teams with thorough information about their facility and EMS, and advice on implementation. The BioSolids Center team also explained and allowed the teams to view their EMS manual and other documentation for their system. Implementation of the EMS at the city landfill, on the other hand, was still in progress. The team from the landfill provided the *ProMuS* teams with information about their operation and EMS, and their implementation activities to date. Seeing two facilities at different stages in the implementation process provided the *ProMuS* teams valuable information and perspectives on implementing an EMS.

On the second day of the San Diego workshop, each team delivered a report on their progress in completing the set of implementation tasks assigned at the end of the first workshop. The Piedras Negras team provided their report via PowerPoint over the phone. The faculty then delivered presentations on the following topics: controlling environmental aspects; root cause analysis; programs for communication and coordination with stakeholders; environmental objectives, detailed goals, action plans and measuring operation discharges; contingency plans; documentation of the EMS; and identifying non-conformities, corrective and preventive actions, and the internal audit process. A representative from the International City/County Management Association presented a special lecture on city management and the environment in the current Mexican political and economic context.

During the first group activity of the workshop, the municipal teams applied the "root cause analysis tool" to at least one of their SEAs to help identify appropriate operational controls. The objective of applying this tool was to understand the underlying, rather than obvious or proximate, causes of the significant environmental impacts. The teams did not experience any problems applying the tool. The difficult issue was, and continued to be, identifying the points where the organization could reasonably assert control over the aspect. For example, the Nogales team constantly arrived at the conclusion that the root cause of many of their significant environmental aspects was a "lack of culture and education" regarding the importance of rational water use. While true, it is hard to correct a societal problem, so

intermediate solutions were identified which would allow the organization to actually exert control.

In the second group activity, the municipal teams worked on developing a work instruction that provides operational control for one of its SEAs. Each municipality chose the same SEA that they used for the root cause analysis. The teams did not experience many challenges in this breakout session, but determining the exact steps to be taken proved more difficult than they anticipated. Most teams tried to define the entire task, rather than only the piece relating to the environmental aspect. Once the activity was completed and discussed, the teams understood the concept well.

D. Second EMS Task Set

At the end of the second workshop in San Diego, the faculty assigned a second set of EMS tasks to the teams. The tasks required the municipalities to describe and analyze each SEA, create operational controls, establish internal and external communication systems, plan and conduct employee training, and establish objectives and targets. The municipalities were given three to six months to complete these tasks, depending on the task. The actual timeline, however, for completion of this set of tasks varied by municipality.

1. Describe and Analyze Each Significant Environmental Aspect

This task was initially assigned as part of the first set of tasks, and was to have been completed by August 1, 2001. The municipal teams were unable to complete the task by the original deadline due to lack of time. Consequently, it was reassigned as part of the second set of tasks. The faculty also worked with the teams on the process for describing and analyzing each SEA during the October 2001 workshop. Each team had to undertake four separate subtasks. First, they needed to examine and describe all of the SEAs identified for their operation. Second, they needed to apply the root cause analysis tool to each SEA. Third, they needed to list the critical activities related to each SEA. Fourth, they needed to determine which key characteristics of the SEA would need to be monitored.

For the first sub-task, each team was asked to prepare a plain-language description of each significant environmental aspect. The purpose of this assignment was to ensure that EMS Committee members understood each SEA, and to make it easier for them to conduct the root cause analysis and identify optimum control points in the targeted operation. The plain-language descriptions of the SEA were also intended to facilitate environmental awareness training of a broader group of employees and affected contractors. The teams began this task during the first breakout session of the October 2001 workshop. Piedras Negras completed describing their significant environmental aspects in January 2002, the Nogales team completed this task in April 2002, and Zapotlán completed it in January 2002.

Initially, two of the teams experienced difficulty in completing the task accurately. At first, the team from Zapotlán prepared brief descriptions of three of their seven SEAs. Although the task required each team to prepare descriptions of all of the significant environmental aspects, the Zapotlán team assumed that they only needed to prepare descriptions for the SEAs

for which they planned to establish Environmental Objectives and Targets. Describing all of the SEAs helps the teams to understand better what they need to control and what training requirements related to each SEA. The Nogales team members struggled with a technical point that delayed them unnecessarily. They discovered that several of their SEAs did not lend themselves to establishing measurable goals and objectives. Rather they were items that were discrete -- the problem was either fixed or it wasn't. For example, the solution to a potential electrocution hazard was to place a sign, enclose exposed wires and connections, and place a lock on it. They struggled to find measurable goals towards the solution because they did not realize that solving a problem through concrete action was an equivalent response with an EMS.

Root cause analysis tool. The root cause analysis tool helps organizations implementing an EMS to identify critical activities, their key characteristics, and personnel positions related to the significant environmental aspects. Applying the root cause analysis tool also helps the organization develop the operative controls for SEAs. For the purposes of applying the root cause analysis tool, critical activities are the conditions, characteristics, or activities that can or do have a significant environmental impact. Once the team members identify their critical activities, they must then identify the job positions associated with each activity. This includes indirectly associated job positions where there exist the possibility of indirect control, *i.e.*, purchasing.

The second module from the San Diego Workshop covered the issue of how to conduct a root cause analysis. For every SEA, it is necessary to analyze root cause analysis through a “fish bone diagram” and the four “Ms” questions (machine, maintenance, material and man-hours). Using this diagram, the root causes are determined by finding the first level of causes, investigating what causes those root causes, then applying the same procedure to subsequent levels.

The teams began this task at the October 2001 workshop during the first breakout session. The Piedras Negras team completed this task in March 2002; the Nogales and Zapotlán teams completed this task in May 2002.

All of the teams experienced challenges in applying the root cause analysis tool. The team from Piedras Negras had difficulty applying the tool, possibly because they were unable to fully participate at the San Diego workshop. A visit from the junior consultant in January 2002, however, helped the team understand the exercise and complete the task. The Zapotlán El Grande team had difficulty with this task. During the January site visit, their faculty member re-explained the task to the team; however, the analysis had only been partially completed as of the final site visit in May 2002. The Zapotlán team noted that they understood the basic root causes for each SEA; however, the team had difficulty applying the root cause analysis methodology. To reach those results, the Nogales team conducted a good analysis of the root causes, but had problems figuring out the right place in the roots to apply solutions. The consultant spent an entire day working with the team to make the critical decisions.

Critical activities. As described above, critical activities are the conditions, characteristics, or activities that can or do have a significant environmental impact. The Piedras Negras team finished identifying their critical activities by applying the root cause analysis in

March 2002. The Zapotlán team was able to substantially complete this task. The Nogales team had difficulty determining which specific activities (or positions) were the right points to exercise control over the SEA, but managed to use the root cause analysis tools successfully to specify acceptable control points.

Monitoring of key characteristics. An EMS must include a monitoring and measurement component, with procedures for regularly documenting, monitoring, and measuring the key characteristics of the facility's operations and activities that can have significant environmental impacts. Each team began this task according to their time schedules and individual progress following the October 2001 workshop. The Zapotlán El Grande team made significant progress on this task, but had not finished as of September 2002. The Piedras Negras team finished this task in March 2002. Nogales completed this task in May 2002.

Each team used a different approach to determine what operational impacts to monitor and how to monitor them. The Zapotlán El Grande team struggled with identifying the monitoring requirements for their key characteristics. Their faculty member worked through additional examples of monitoring requirements with the team during a January 2002 site visit. By the time of the second site visit in May 2002, the team had made progress, but had not yet finished. The municipality had difficulty devoting the time necessary to carry out this task. The Piedras Negras team completed this task without any problems using the root cause analysis tool. The Nogales team was frustrated initially because they did not understand that the key characteristic can include the definitive solution to, and elimination of, the SEA. Once they understood that the critical issue was operational control and how progress is measured in terms of that control, they quickly completed this task. The Piedras Negras team, with the assigned junior consultant, went through the following process to define the key characteristics: they defined the SEA; defined root cause analysis; defined critical activities; defined operational controls; and lastly, defined key characteristics to evaluate if the operational control worked.

2. Create Operational Controls

An EMS must provide for documented operational controls or procedures for minimizing and controlling each significant environmental aspect. The operational controls for each SEA describe: the responsible person, what will be monitored and the monitoring frequency, the format for documenting monitoring results, and monitoring equipment if applicable. In addition to containing these elements, operational controls must ensure that operations and activities proceed according to the municipality's environmental policy, objectives and targets as closely as possible. The nature of operational controls will often depend on the scope and purpose of the EMS.⁷

The teams began designing their operational controls in mid-November 2001, and were unable to complete the operational controls for all of the significant environmental aspects during the timeframe of the project. As of September 2002, Zapotlán had finished three of their four operational controls; Piedras Negras had completed a draft of their operational controls for the landfill and maintenance operations, with the work instructions related to waste collection

⁷ Best Practices Guide, pg. 37.

and transport still in development; and Nogales completed draft operational controls for nine of their twelve significant environmental aspects.

Each team experienced different degrees of difficulty with this task. The Piedras Negras team had difficulty completing the task because key team members did not have enough time to devote to the effort. The Piedras Negras team experienced difficulty in resolving the differences between the operational controls developed by the landfill manager and those developed by the other team members. The Zapotlán team also had difficulty completing this task because of time constraints and having only one team member working on the implementation. In contrast, the Nogales team did not experience significant problems because they understood that progress is measured in how well the operational controls eliminate, or mitigate, significant environmental aspects .

3. *Establish Internal and External Communication Systems*

In an EMS, the internal communication program allows regular communication concerning environmental issues and opportunities throughout all levels of the organization, from the top down and from the bottom up as well as horizontally across operating units. The external communication program must provide (at a minimum) a formal process for receiving, documenting, and responding to complaints or inquiries from interested parties (*i.e.*, community residents, government agencies, customers, or suppliers) concerning the facility's environmental aspects and its EMS.⁸ For this task, each team first had to identify the data or information that will be communicated internally and externally, and then draft an outline of the process for communication. The task was assigned in October 2001 and all of the municipalities had completed the task by the January 2002 deadline.

Internal Communications. The team from Zapotlán El Grande had no problems identifying the information to convey internally and outlining how to convey this information. Their internal EMS communications process is limited to relying on the preparation of existing management reports and “incident” reporting. The task was very straightforward for the team because there are only six employees at the wastewater treatment plant. The Nogales team separated their internal communication needs into four categories: items to be communicated to all employees; items to be communicated between departments; items to be communicated to management; and items to be communicated to the general director. The category of items to be communicated to the management, for example, includes general information about the implementation process; achievements, savings, and achieved goals of the EMS; and reports of accidents and non-conformities. The Piedras Negras team also had no problems completing this task.

External Communications. To establish their external communications program, the team from Zapotlán decided to integrate the EMS requirements into the already existing SERVITEL communication program. SERVITEL is the official municipal process for managing public communications, complaints, *etc.* Through this system, all calls are logged and acknowledged on the same date that they are received, and there is a set follow-up process for replying to these communications. The municipality publishes the total number of external

⁸ Best Practices Guide, pg. 19.

communications received and publishes this information in the municipality's annual report to the community. The Nogales team organized their external communication process according to who should receive what information. The team separated their external communication process into the following categories: municipality, user association, educational institutions, college of engineers, press, and "consultative advice." Once the team identified and categorized the different types of information that would be conveyed to the different groups, they designed a system for documenting the information they received from external communications. Nogales is still determining how, and to whom, information will be communicated. Nogales easily drafted a communications plan, but is experiencing difficulty getting it started. The team decided to communicate through standing stakeholder organizations, but is not certain if these organizations should be the primary or only mechanisms for communication. Given internal "turf" considerations, Nogales is still determining how, and to whom, information will be communicated.

4. Plan and Conduct Employee Training

For purposes of implementing an EMS, each team must provide environmental awareness training to all employees. The environmental awareness training is aimed at educating employees on how they can make a contribution to the EMS and at improving the municipality's environmental performance. The training must cover the importance of the environmental policy, the general requirements of the EMS, roles and responsibilities in carrying out the EMS, and the potential consequences of not following operating procedures.

As of September 2002, two of the three implementation teams had begun the employee training process; however, none of the teams had begun the actual training. The Piedras Negras team drafted its employee awareness-training program in January 2002. Their faculty member reviewed the program and, although they had planned to begin implementing the program in July and August of 2002, as of late August 2002, they still had not initiated the training program. The program calls for training machine operators, truck operators, landfill inspectors, route inspectors, warehouse mechanics, and warehouse employees. Each of these groups will be trained in the following areas: emergency planning, introduction to ISO 14001, the EMS manual and procedures, and managing hazardous waste and hazardous substances. Trainers for these subjects will include the Director of Ecology, the Director of Civil Protection, as well as staff from PROFEPA.

The Nogales team has also drafted their employee training program, and plans to begin training the employees in August and September of 2002. Topics to be covered in the Nogales training program include: emergency planning, managing chlorine, administering cardiopulmonary resuscitation (CPR), emergencies with high voltage, EMS work instructions, and maintenance of tanks. To complete this task, the Nogales team outlined what type of training each employee will need in these areas. For example, the Head of Maintenance will receive training in the maintenance of tanks, selection and use of impermeable lining, use of the system for comments and complaints, and positioning of covers on tanks.

Zapotlán El Grande did not have sufficient time to complete this task.

5. *Establish Objectives and Targets*

Environmental objectives are broadly stated goals that are quantified whenever practical. For example, the Nogales team identified eliminating the water leaks in primary pipes that have exceeded their life span as one of their environmental objectives. An environmental target is a detailed performance requirement, quantified whenever practical, that needs to be met in order to achieve an environmental objective. For example, the target set for the aforementioned objective is to replace the Santa Barbara and Malvinas piping system before January 2003.

Although the initial steps for completing this task were assigned as part of the second set of tasks, the municipal teams had to proceed through a number of additional stages, some of which were part of the third set of tasks. To complete this task, each team had to: 1) establish between one and three environmental objectives based on one of the significant environmental aspects; 2) establish one or more targets for each objective; 3) define the measurable indicators for measuring progress towards targets; and 4) develop action plans for each target. The municipalities began this task in November 2001 and continued to work at the various stages of finishing the overall task until the end of the project in June 2002.

The Piedras Negras team prepared three draft objectives and established several targets in January 2002. The junior consultant reviewed these objectives and targets and recommended changes. In January 2002, the Piedras Negras team defined their measurable indicators as "milestones" toward completion of the targets. The EMS team prepared action plans for three of their objectives and some targets in April 2002. Once the team had prepared their objectives, targets, and action plans, they submitted them to the Mayor and the City Council in June 2002; the council formally approved them later that same month.

One of the Piedras Negras team's objectives is to reduce the atmospheric emissions from the vehicular park. The municipality set compliance with the regulation for air emissions as the target for this objective. The municipality chose to use the percentage of trucks complying with the regulation as their indicator. The action plan for meeting this target was to measure gases emitted from the trucks, perform repairs to the trucks with emissions above the acceptable levels, and measure the gas emissions again.

The Zapotlán team prepared their draft objectives and established several targets in April 2002. Their faculty member reviewed the draft and recommended changes to identify the baseline and expected improvements, and set completion dates. The team sent their objectives and targets to the City Council and the Mayor in June 2002, which were approved the second week in June. One of Zapotlán's objectives is to reduce the generation, and improve the control of, the solid waste entering Plant Number One before June 30, 2003. The municipality set the following targets for this objective: to reduce the amount of solid waste passing to the aerator tank by 20% (as compared to the quantities entering the aerator tank in December 2001) before December 31, 2002, and to formalize and communicate to the public an awareness education program on the importance of not dumping solid waste into the sewer system before January 31, 2003.

The Nogales team completed this task in May 2002. One of this team's objectives is to reduce the risk of accident, theft, and contamination of the water from trespassing. The team established four targets for this task: 1) rapid evaluation of deficiencies in security ; 2) preparation of a proposal that includes the equipment and personnel needed to improve security based on the results from this evaluation ; 3) review by the technical management ; 4) implementation of the program for accident, theft, and contamination reduction.

E. Third EMS Task Set

The faculty provided the third and final task set to the teams at the October 2001 San Diego training event. The tasks included creating a contingency plan, establishing procedures for corrective actions, and creating the EMS manual. The final task for this set is an internal audit of the EMS, the established goal marking the end of the *ProMuS* 2001 project training. The teams were expected to complete these tasks within a three-month time frame; however none of the municipalities were able to complete all of the tasks in this time.

1. Create the Contingency Plan

Preparation of the Emergency Preparedness and Response component (contingency plan) for each EMS requires the design of procedures for identifying potential accidents and emergency situations, including oil or hazardous material spills. The teams completed this task between January 2002 and May 2002.

In May 2002, the Zapotlán El Grande team enlisted the support of the municipality's Emergency Preparedness and Response group to help them develop an appropriate contingency plan for the wastewater treatment plant. The most important emergency issue for the plant is how to handle incoming sewage during power failures or other events that paralyze plant operations. The team did not have enough time during the project to conduct a test of their system. The Piedras Negras team developed their emergency preparedness and response plan in January 2002. They used the city's contingency plan as a reference and model to create their plan. The city's contingency plan includes scenarios and action plans for fire, spills, and natural catastrophes. The Nogales team finished their contingency plan in March 2002. Examples of plan topics include: dangerous substances used in operation, scenarios for potential emergencies, personnel designated to coordinate emergency situations, information to report, and training requirements. All of the teams experienced difficulty in setting aside time to complete this activity.

2. Establish Procedures for Corrective Actions

An EMS must include systems for measuring progress towards the environmental objectives and targets, verifying if operations are in compliance with applicable environmental regulatory requirements, and periodically auditing the EMS's conformity with the municipality's own standards. Deficiencies noted during the checking or evaluation process are called non-conformities. The EMS needs a process for identifying and correcting non-conformities and for taking appropriate preventive actions. As of September 2002, two of the three teams had established procedures for corrective actions.

The Nogales team completed this task in May 2002. Their procedures identified potential areas for non-conformities, corrective actions, and actions that can be taken to prevent non-conformities. An example of non-conformity identified by the Nogales team is an outbreak of illness attributable to insufficient chlorine in drinking water (chlorine eliminates fecal coliform). The corrective action for this non-conformity is to identify the affected area and monitor it according to the work instruction for measurement of coliforms. However, this procedure was not tested in Nogales as part of their light audit.

The Zapotlán El Grande team had not yet completed this task as of September 2002.

3. *Create the EMS Manual*

The EMS manual outlines the facility's EMS and contains all of the information for each task that the teams need to complete in order to develop and implement an EMS. The EMS manual is a dynamic document that is constantly being updated and changed as the EMS develops. The core sections of the manual cover: general requirements, the environmental policy, planning information (*i.e.*, environmental aspects and objects and targets), implementation and operation information (*i.e.*, operational controls and employee training), and verification and corrective action information (*i.e.*, non-conformities and corrective actions and auditing systems for the EMS). The EMS manual also describes the system fence line, reference definitions and the requirements for the EMS. The teams began this task in November 2002. All three of the teams have completed at least a draft of their EMS Manual.

Two of the teams experienced obstacles in completing this task. The Nogales team was unsure of how to structure the document and needed to examine another manual, which their consultant showed them, to see what it looked like and how it was assembled. The Piedras Negras team had no previous experience developing EMS documentation. Thus, it was difficult for the team to understand how to write the manual until they saw examples. With the references, it was easier for them to develop a draft EMS Manual to be reviewed and later adjusted based on suggestions from the assigned faculty member.

4. *Conduct System Reviews and Establish an Internal Audit Program*

The overall purpose of the EMS audit is to determine whether the EMS is properly designed to meet the municipality's EMS standards and whether the EMS is being properly implemented and maintained. The audit procedures must cover: 1) the scope of the EMS audit, 2) the frequency/schedule of audits, 3) the audit methodology, and 4) the responsibilities and requirements for conducting the EMS audit and for reporting the results to the municipality's management. The EMS audit must focus on priorities such as the degree of risk of specific operations and activities and the results of previous audits.⁹

In addition to an internal auditing system, the EMS must contain provisions for periodic review of the EMS by top management (mayor, city manager, facility manager, plant manager, general manager or general director). The EMS management review uses the results of the EMS audits, performance data gathered through the monitoring and measurement system, and other

⁹ Best Practices Guide, pg. 43.

information on internal or external factors that pertain to the municipality's environmental performance to ensure the continuing suitability, adequacy, and effectiveness of the EMS. It serves as the "conscience" of the municipality's environmental policy commitment to continual improvement. The EMS management review determines whether there is a need to revise or establish new environmental objectives and targets, to modify the environmental policy, or to reorient the EMS towards new opportunities for environmental performance improvements aligned with economic and other benefits.¹⁰

Both of these tasks were assigned in January 2002. The teams were unable to complete these tasks by June 2002 due to a lack of time and resources.

¹⁰ Best Practices Guide, pg. 43.

IV. IMPLEMENTATION STATUS AND RESOURCE COMMITMENT

The three municipal teams were expected to complete all three sets of tasks during the 13-month period of the project remaining after the selection process. Due to a variety of circumstances, none of the teams were able to complete all three task sets in their entirety within this timeframe. However, all three teams have completed their EMS manuals and all of the tasks associated with task sets one and two. The following is a brief summary of the implementation status for each participating team.

A. Nogales, Sonora

Implementation status. In November 2002, the Nogales team decided to change their fenceline from the sewage system to the drinking water system. The team made this change because they realized that implementing an EMS for their sewage system would be a complex process that they could not complete within the *ProMuS* project deadline. Although switching the fenceline delayed their progress, it became much easier for them to control and design an EMS for the drinking water system. Regardless of the delay, the team finished their manual and most of the three sets of tasks. Key elements of the Nogales EMS that have not been implemented are training key employees, the EMS audit program and the management review process, and the emergency planning drill.

The Nogales team's implementation would have progressed further if the high-level managers would have been more involved in the process. The managers were very good about freeing up resources, but then did not pay attention to the process. It would have been beneficial to the team to have a local EMS consultant available to provide more month-to-month guidance. Progress on the Nogales EMS also was delayed because of the change in implementation team members during the project. The change, however, helped the project to move forward because the original team consisted of a very senior person who did not have time to review the process advances, solve conflicts between departments, and provide timely information on resources available to address SEAs, and a very junior person who did not have sufficient authority. To remedy this, the team assigned a mid-level person, the Director of Border Issues and Special Projects, to lead the team.

The Nogales team is now providing training to other employees that will allow them to carry out their responsibilities under the EMS.

Resource commitment. Human resources are spread extremely thin in COAPAES, the agency where the EMS team was located. The EMS coordinator continued to be responsible for all of his regular work even after he was assigned to the EMS team because there was no one else in the organization to carry his work load. Much of the work was done in evenings, weekends and lunch hours. The following table demonstrates the approximate costs incurred from May 2000 to June 2002 in developing, planning, and implementing the EMS. The currency is in U.S. dollars.

Labor	Consultant Fees	Travel	Materials
\$13,200	\$800	\$2,500	\$500

B. Piedras Negras, Coahuila

Implementation Status. The Piedras Negras team developed a solid EMS between the first workshop in May 2001 and the graduation ceremony in June 2002. They began implementing the system in August 2002. The Piedras Negras team completed their EMS manual and the procedures corresponding to monitoring, checking, and corrective action. Key EMS elements that have not been implemented include training key employees, monitoring the significant environmental aspects, the EMS audit program and the management review process.

The Piedras Negras team attributed the delay in their progress to the following factors: lack of a local EMS consultant to provide more month-to-month guidance; lack of personnel resources and time to devote to the project; absence of a guide or handbook of “how to do it” with examples relevant to Mexican municipalities; absence of a proactive political environment; and the need for a more consistent commitment from the Mayor to allocate resources and provide political support. Due to the mentor’s (Rassini Corporation’s) time constraints and municipal confidentiality issues, it was not possible to arrange local mentor support for the team.

Promotora Ambiental de la Laguna, S.A. de C.V. (PASA), the subcontractor for the landfill operation, intends to finish the EMS implementation and the certification process for ISO 14001 by the end of 2002 or the beginning of 2003. The current municipal government will change in September 2002, and it is expected, but not certain, that the new Mayor will continue with implementation of the EMS.

Resource Commitment. Four people were directly involved in the Piedras Negras EMS implementation process as part of the implementation committee: the Director of Public Works (management representative); Director of Ecology (EMS coordinator); the Director of Planning (EMS committee); and the landfill general manager (EMS committee).

The man-hours required from landfill workers and municipality employees were not included because Piedras Negras has still not begun the required EMS training. The estimated total cost for 1,536 man-hours dedicated to the project are listed below in the following table in U.S. dollars.

Labor	Consultant Fees	Travel	Materials
\$14,400	N/A	N/A	N/A

The total cost does not include materials and travel expenses; however, the Piedras Negras team determined that they were so small that it was unnecessary to include them in the cost tracking.

C. Zapotlán El Grande, Jalisco

Implementation status. Zapotlán El Grande made significant progress between May 2001 and June 2002 in implementing its EMS. The team substantially completed the EMS design and documentation, but implemented only a few of the defined EMS processes. Key EMS elements that have not been implemented include: training key employees, the awareness training

program, monitoring the significant environmental aspects, the process for managing non-conformities, the EMS audit program and the management review process.

Zapotlán El Grande's EMS implementation could have progressed much faster if the team had a local EMS consultant and/or a local mentor available to provide more month-to-month guidance and if they had more people, resources, and time to devote to the project.

The Mayor of Zapotlán El Grande provided visible support for the EMS from the outset of the project. Implementation of the EMS was delayed because the EMS team members lacked sufficient time to complete the work. Another important factor that caused delays for Zapotlán El Grande was that EMS Committee members were also working directly on preparing the specifications and contract bidding process for the new wastewater treatment plant. In May 2002 the Mayor said that he would clarify priorities, giving more emphasis to the EMS implementation effort. Shortly thereafter, the Council approved the environmental objectives and targets and action plans, and initiated action on a proposed US\$20,000 budget to carry out the action plans.

Resource Commitment. The total costs for 760 man hours are listed below in U.S. dollars.

Labor	Consultant Fees	Trips and Travel Allowance	Materials
\$6,583	N/A	\$1,504	\$752

V. BENEFITS, BARRIERS, AND KEYS TO SUCCESS

A. Benefits

Although the municipal teams are only in the beginning stages of implementing their EMS, they have already begun to experience and see some of the benefits of having an EMS. All of the municipalities expect the benefits to increase in the coming year, especially in the area of cost savings from improved operating efficiency. At the San Diego graduation event, preliminary information on the benefits experienced to date was compiled from informal presentations by the teams and open discussions with the faculty members and sponsors. The following are examples of the benefits that the municipalities have seen to date:

1. Improved internal communication

One of the most significant benefits experienced to date by all of the municipalities has been an improvement in internal communication. An improved internal communication system allows the EMS implementation team to better convey important environmental data and to ensure that pertinent information is easily shared within and between departments.

The Nogales team commented that communication between different project departments, as well as between the employees in the field and those in the office, is often sparse. In the past, the different departments would create and gather information, but not to distribute it amongst the various departments, even though the information could be useful to a broader audience. The Nogales EMS, however, requires the creation of a place where all of the information gathered would be available for review by the different departments. The team also noted that a significant amount of the institutional knowledge that they would generate would be lost over time if it was not properly documented. Their EMS, however, creates a way to track such valuable information.

The Zapotlán El Grande team found that implementation of the EMS has provided a valuable organizational tool for the municipality to provide information and indicators about their environmental activities, both internally and externally.

2. Improved public relations

In designing and implementing their EMSs, the teams have found new ways to communicate with the public and to convey important information about the local environment and the municipality's services. These changes have helped the municipalities improve their public image. The Piedras Negras team noted that they are developing a very different attitude towards municipality-community relations. Implementing the EMS has helped them understand that they are working for everyone in the community just as much as they are working for the municipality itself. The Piedras Negras team said that over the past year, the municipality has initiated outreach and environmental education efforts with community groups. Increasing the community's awareness of, and involvement in, municipal actions can improve the municipality's understanding of how it can better serve the community and what the community thinks of changes the municipality makes.

Another aspect of improving public relations is informing the public about the importance of environmental issues. A community that is aware of the environmental challenges facing the municipal facility will better appreciate the efforts and progress made by the facility in addressing these challenges. One team member noted, “People in the community do not pay much attention to environmental issues. Through informing the public about projects like their EMS, the people start to understand, and a seed is planted; they become more curious in what we are doing.”

3. *Enhanced efficiency and reduced costs*

Although it often takes two years or more for an organization to see the economic benefits of an EMS, Nogales noted that they are already noticing a reduction in the costs of materials, energy, and water usage. Piedras Negras expects cost savings as a result of more efficient route designs and timetables for trash collection. Team members noted that the establishment of the EMS will cut down the operational cost of the sanitary landfill as well as add an additional three to five years to its life. Although the Piedras Negras team has not yet formally monitored savings in these areas, they have predicted greater efficiencies based on a reduction in the number of public complaints related to the waste collection service, less environmental impacts from runoff generated during waste collection, less hazardous waste generated during truck maintenance, and less fuel and oil consumption.

The team from Zapotlán El Grande is using common-sense solutions with low costs to address identified environmental aspects. For example, they are lining the inside of the compressor room with used mattresses and planting bamboo around the outside to reduce the noise from the facility operations.

4. *Better knowledge of applicable environmental regulations*

The teams have found that through implementing the EMS, they were not only able to acquire a better understanding of environmental regulations that they were already aware of, but were also able to identify new rules applicable to their facilities. By systematically identifying all of the laws and regulations to which they must adhere, the EMS is helping them ensure that they are in compliance. For example, in developing their EMS Piedras Negras was able to identify regulations related to landfill operations, vehicle air emissions, and hazardous waste that were applicable to their facility.

5. *Improved understanding of negative environmental aspects*

All of the teams found that as a result of developing and implementing an EMS they are better able to identify practices that generate negative environmental impacts. For example, the Piedras Negras team was able to determine that the leachates produced when collected wastes are compressed in the transportation trucks have a negative environmental impact.

The Nogales team has been able to reduce the risk of accidents or contamination in potentially hazardous situations. First, by placing signs around their facility, making simple

repairs, and installing a simple lock on a high tension junction box, the team avoided life-threatening risk to electric shock. Second, in changing the method by which chlorine is added to well water storage tanks, the team virtually eliminated the risk of accidental chlorine inhalation. In addition, the team improved a simple water level reading system in their storage tanks that allows operators to monitor water levels more accurately. Having better information enables employees to apply a more precise amount of chlorine at the correct time, which in turn saves the municipality money on chlorine and ensures that the correct concentration is present. The new water level reading system reduces a user's exposure to unnecessarily high levels of chlorine or to biological contamination due to unusually low levels of chlorine.

6. *Ability to replicate system for other municipal operations*

One of the most important benefits noted by all three of the municipal teams is the ability to take the knowledge and experience gained through their year-long training, apply it to other municipal operations, and share it with other municipalities.

Zapotlán El Grande plans to expand the EMS for its first water treatment plant to the second plant that is currently under construction. In Zapotlán, EMS concepts such as process mapping are already showing up in other programs (*i.e.*, waste management) as if by osmosis. With an architect and an engineer on the team, the concepts of quality management were already familiar and in place, establishing the conditions that would allow for expanding the EMS concepts to other programs. Additionally, they have already begun to design an EMS for their landfill and trash collection operations.

The Nogales team, through COAPAES, plans to extend the knowledge and skills they have learned through the *ProMuS* project to other municipalities in Sonora. The Nogales team believes that their relative expertise in EMSs will allow them to help other organizations develop and implement an EMS. Through the organizational structure of COAPAES, the team intends first to expand EMSs to the water operations in the border cities of Sonora. They have begun conversations about EMS implementation with water operations in other border cities, including Aguas Prietas and Rio Colorado. COAPAES has already provided other border municipalities in Sonora with copies of the *ProMuS* training materials to familiarize them with the concept. Eventually, COAPAES would like to implement EMSs in all of the municipalities in Sonora.

The team from Piedras Negras plans to expand the EMS to the municipal water treatment plant because the plant operates under a similar situation as the landfill, *i.e.*, the municipality owns the facility and a private contractor operates it. The similarity in the operation conditions between the landfill and the water treatment plant will help facilitate the EMS implementation.

7. *Expanded Network of Resources*

The *ProMuS* project linked the team members with many individuals and institutions with expertise in the fields of EMS and municipal management, including the project faculty, the EMS teams from San Diego, Oscar Rivas from AMMAC, representatives from ICMA, staff at Monterrey Tech in Mexico, and the mentors. The project website also provided the teams with

access to EMS reference materials from sources around the world. The teams will be able to draw upon these resources even after the project is complete.

Over the two year project, the teams also benefited from sharing experiences with each other and established working relationships that will continue after the project ends. The Piedras Negras team has invited the Zapotlán El Grande team to visit Piedras Negras and see their landfill and waste transportation system so that the Zapotlán team, which plans to implement an EMS for their waste collection system, can benefit from the Piedras Negras team's experience.

B. Barriers

This project required an extraordinary commitment and effort from each of the team members in the different municipalities. All of the team members had to carry out their regular job assignments in addition to developing and implementing the EMS. Nearly all of the municipalities lacked sufficient data systems and technical resources. Finally, none of the municipal teams had any familiarity with the basic principles of an EMS at the start of the project. Nonetheless, while these obstacles hampered the teams' efforts, they were able to substantially complete the tasks.

From the perspective of EPA and USAID, two of the major challenges encountered by the Mexican municipal teams were virtually the same as two of the major challenges encountered by the U.S. municipal teams in the previous EPA-funded pilot EMS project, namely time and resources. Nonetheless, the three municipalities in Mexico were able to develop their EMSs over the first 12 months of the *ProMuS* project at least as far, if not further, than their U.S. counterparts during the same initial 12-month implementation period.

1. Time

The principal barrier cited by all three of the municipalities was a lack of time. Each team member found it difficult to set aside a regular amount of time to work on the project because they already had full workloads when the project began. The problem with availability of time during regular working hours for the project can be traced to a lack of commitment to the project in the higher echelons of the municipality. If the mayor or other high-ranking employee does not fully understand the benefit of working on an EMS, then they will not make a concerted effort to schedule or allow time for the team to work on the EMS. Because of time constraints, the implementation coordinator in Zapotlán El Grande was forced to work on the requirements for the EMS outside of normal work hours. Additionally, the director of the Potable Water and Sewer systems in Zapotlán El Grande was not able to set aside much time for the EMS because of multiple time commitments and constraints. Finally, the preparations for the construction of the second water treatment plant in the city also added to the difficulty in setting aside enough time for the project. Both the Piedras Negras and Nogales teams noted that when they began to work on the system they already had extensive responsibilities and daily activities. These prior commitments made it very difficult to find time to work on the EMS.

Opportunities for working on the EMS were, more often than not, sporadic. This meant that the teams would have to accomplish significant tasks in a short period of intense work and

then be forced to leave the EMS work for as long as two weeks. Then, when the team would return to working on the EMS, members needed to backtrack in order to refamiliarize themselves with the subject matter. This process was very costly in terms of efficiency, and caused the teams to lose even more time. Another complicating factor was that even when the teams had the time to work, they would often run into a problem they could not solve on their own, or have a question that could not be clarified unless they consulted an EMS expert. If an EMS technical expert was not readily available, their work would come to a halt or proceed in an incorrect direction.

2. *Technical support and information*

The Zapotlán El Grande team felt that they did not have frequent enough technical support from an EMS expert in developing their EMS. The team mentioned that although the two workshops were useful, they also created many questions. They also found that concepts that seemed very clear during the training session would become confusing once they tried to implement them back at home. The Zapotlán team also commented that although their faculty member was an effective resource, communicating with him via e-mail was difficult because they were not able to maintain a dialogue, and therefore could not easily clarify areas where they had questions. Finally, the Zapotlán team had trouble using and accessing the *ProMuS* website, and communicating with their faculty member via the website. They were not very accustomed to using email and found telephone communications difficult to schedule with their faculty member.

The team from Piedras Negras noted that the lack of background information on EMSs for municipalities in Latin America contributed to their difficulties in developing an EMS. The information available through the project that the team could find focused on primarily private industry. This information was not very useful to them in the municipal context, because it did not consider relevant resource constraints and political factors. Another problem the team noted was a general lack of materials written in Spanish related to EMS implementation.

All three municipalities commented that the mentor program did not function adequately. Each team was unable to maintain regular contact with their mentor or to have the mentor available when needed to answer questions or provide clarification. Difficulties on both sides of the mentor relationship contributed to these problems. Mentors often did not have the adequate time to contribute to the project. One municipality had concerns with sharing confidential information with the mentor.

3. *Internal Capacity and Buy-in*

One of the essential components of a functional EMS is to have all members of the organization, from the field employees to the managers to the mayor, committed to and working on various components of the EMS. It is impossible for a team of four individuals alone to make an EMS “work.” The Nogales team found that it was, at times, difficult to involve people in other parts of the organization who were necessary for the implementation of the project. Part of this problem stemmed from not involving them in the project at an earlier stage; however, at the earlier stage the team did not know that these people or departments would need to be involved.

The teams also encountered problems in trying to explain to employees what an EMS is and how and why they needed to change their daily operations. In various instances, the teams found that workers would get upset about having to change what they are doing or the way they are doing something. Many of the employees have been working at the operation for five to ten years and do not appreciate having a person who is relatively new to the organization tell them that they have to change what they are doing or the way they conduct certain tasks. One participant noted that a way to avoid this situation is to suggest how the employees could perform the task better, rather than criticize the current performance.

Buy-in is also important for the project to build the solid roots it needs in order to survive a change in political administration. Selling the importance of the project to operational employees is also key to the long-term survival of the EMS. One team noted that while U.S. municipalities have an incentive to create an EMS in order to avoid privatization of service; the municipalities in Mexico do not feel such pressure. Another problem that a few of the municipal teams faced was building bridges with other agencies whose support was needed to design and implement the EMS.

C. Keys to Success

1. *High level political support*

All of the teams confirmed the importance of having high level political support for the EMS. Building the support of state and federal officials enables a municipal EMS to survive political change and obtain resources. The Zapotlán El Grande team stressed that support from the mayor and the municipality was essential to their success. Even technical decisions have political aspects. The support of the mayor provided them with more flexibility to work on the project and to secure necessary resources. In large part, the Zapotlán team was able to achieve a high level of political support because the goals of the EMS were consistent with the municipality's priorities: the current Mayor of Zapotlán ran on an environmental platform. The team also dedicated substantial time to briefing and convincing the Mayor of the need for the project. Having a team member who was the Vice-Mayor also helped the team establish closer political ties. In addition, the project consultant, Foster Knight, met with the Mayor on both of his visits and provided candid feedback on implementation issues. As a result of those meetings, the Mayor reinvigorated the EMS implementation effort in the spring of 2002.

The team from Piedras Negras stressed that one key to success is to keep people at the high levels informed about the EMS process and progress. They found that it is very difficult to implement a system from the bottom up, it must be done from the top down. The Nogales team also stressed the need to involve high-level officials. This is critical, for example, in securing approval for field people to spend time on the project.

2. *Project workshops and follow-up task assignments*

All teams mentioned the utility of the project workshops and follow-up task assignments, and the Zapotlán team noted the workshops as one of the keys to their success. The Zapotlán team commented that the interactive nature of the workshops allowed them to ask questions and

gain clarification on difficult concepts and procedures. The task assignments were very useful because of the structure they provided.

3. *Faculty Member Support*

The Piedras Negras team members believed that the support from their faculty member, Eduardo Guerra, was critical to their success. Mr. Guerra provided the team with useful suggestions and comments on their homework assignments, and was often available for clarification when needed. The team often had doubts about how to approach the implementation and about whether they were completing their tasks correctly. The team stressed that the ability to go to their consultant to answer questions about the specifics of implementation became an invaluable resource and aid to their progress.

4. *Keeping staff at all levels informed of the project and project status*

All of the teams noted that it is essential to prepare and present the project's resource needs as soon as they are identified in order to facilitate receiving these resources. It is also important to communicate to everyone in the organization, from administrators to the field employees, about the EMS, its goals and how people can be involved in the project. An EMS cannot be implemented single-handedly by the team; it is imperative to involve employees at all levels of the organization.

5. *Defining a realistic fenceline*

Although all teams adjusted their fenceline during the project, the team from Nogales recognized their decision to change their fenceline entirely as one of their keys to success. They found that changing their fenceline to be more realistic allowed them to have a more focused and better implemented EMS. The Nogales team changed the focus of their EMS from the sewage system to the potable water system. Completing an EMS for the sewage system would have been more work and more difficult for the team. Once they have finished the EMS for the potable water system, they expect to apply their expertise to the potable water system.

6. *Team work*

All of the participants found that working together as a team was essential to their success in the project. One participant noted "always have a team; one person working alone, even if they have full support of the administrator, will not be able to implement a system effectively, it takes a team." The Nogales team found that it was particularly important to define clearly each team member's role and their responsibilities in designing and implementing the EMS. The team from Zapotlán El Grande felt that their weekly implementation committee meetings were an important part of their success. The prescheduled weekly meetings allowed the team members to come together and check each other's progress, as well as to provide a structured time in which everyone was able to work on the various components of the EMS. Finally, a participant emphasized that "even though there is one person in the team who is in charge of organizing and motivating, implementation always has to be a team project."

7. *Community Support*

From the perspective of one municipal team, having the support of the local community is very important to the success of an EMS; members of a community will consistently criticize municipal officials unless they inform the community about their activities. The consultative process with the community is also critical. Zapotlán El Grande, for example, has an advisory board in place, with representatives from the government and the public. Using an outlet such as this to inform the public of the EMS components and its progress can greatly benefit the overall success of an EMS.

8. *Cooperation of Co-Implementers*

The team from Piedras Negras communicated with the staff of the landfill operation at the beginning of the process, and convinced them that an EMS and ISO 14001 certification could be a win-win situation for both the municipality and the landfill operator. This effort allowed them to share the costs of the EMS and certification process and to ensure continuity over a long period of time.

VI. RECOMMENDATIONS

At the final project event in San Diego, the team participants and project faculty members made several recommendations for improving the training process and guaranteeing the long-term success of a municipal EMS. They also provided ideas for expanding and institutionalizing EMS training in Mexico and other regions of Latin America and the Caribbean. The following two sections summarize the recommendations in these areas.

A. Improving the Training Process and Guaranteeing Long-Term Success of the EMS

1. *Build Political Support for the EMS*

The need for high level political support was universally acknowledged by the teams as critical to the ultimate success of their EMS. In some cases this involves not only gaining the support of the local council and Mayor but also that of the state officials. The teams also emphasized the need to gain support for financing the actual costs of the EMS, not just approval of the project. They also highlighted the need to obtain approval in advance of their committing to a specific amount of time to preparing the EMS.

There were a number of suggestions on how to gain this support. These ideas included:

- Linking the EMS with broader municipal goals set by high-level officials.
- Developing and providing data on costs and benefits of an EMS.
- Arranging in-person visits from high-level U.S. government officials from EPA, USAID, among others, to discuss the value of an EMS.
- Working through consultative bodies, such as the *consejo consultiva*, to engage stakeholders at the municipal and state level in supporting the EMS.
- Demonstrating cost justification/economic sustainability of EMS.

2. *Secure Long-Term Financing for EMS Development and Implementation*

The teams had several thoughts about how to secure long-term financial support for their EMS. One idea was to attempt to establish the costs for the EMS as a budget item at the federal state or local level. An alternative suggestion was to identify creative funding mechanisms for the design and implementation of the EMS. One idea would be to apply late tax payments to the funding of the EMS. Another suggestion was to target matching funds from states for regional efforts as a source of funds.

3. *Prepare Case Studies Relevant to Mexican Municipalities*

All of the teams were united in commenting that the lack of case studies and other materials relevant to municipalities, especially those in Latin America, hampered their progress. They pointed out that municipalities face different challenges than private sector companies, including resource and political constraints. Moreover, municipalities in Latin America face far

greater resource constraints and other challenges than their Northern counterparts. While the ELI team had attempted to locate relevant materials in advance of the course, an exhaustive search of EMS materials on the web and in print did not produce sufficient material.

This project presents a unique opportunity for relevant case studies to be prepared. The teams and faculty have already gathered significant data on the baseline conditions and development of each municipality's EMS. Unfortunately due to the time constraints of the project, it was not possible to gather significant data on EMS implementation, especially in terms of actual benefits to the municipality.

The production of these case studies is important not only for assisting future municipal efforts to develop an EMS, but also for educating and convincing mayors and other officials as well as potential funders of EMS training programs about the advantages of having an EMS in operation. To fill this information gap, USAID, EPA and other funders could provide support for the ELI team and others to compile, develop and analyze any additional data necessary to complete the three municipal case studies, focusing on actual benefits and costs through the implementation phase.

4. Define a realistic fenceline and then expand EMS

The experience of the three municipal teams demonstrated the need for defining a realistic fenceline for the initial EMS and then expanding it to other similar facilities or operations. The Nogales team early on experienced difficulty in preparing an EMS for their sewage system. They were able to make faster progress when they switched the fenceline for their EMS to the drinking water system. The Zapotlán team chose to limit the focus of their EMS initially by including only the water treatment plant in operation and not the water treatment plant under construction. This allowed them to progress more quickly and have a simpler experience developing an EMS. Having successfully gone through that experience, the Zapotlán team is now planning to expand the EMS for its first water treatment plant to the second plant under construction. EMS concepts such as process mapping are already showing up in other programs such as waste management. Piedras Negras also has plans to expand its EMS, in this case to the municipal water treatment plan.

To help the municipalities develop a realistic fenceline, it was suggested that the sponsors, organizers and faculty for future EMS training courses for municipal facilities work from the early stages of these courses. Then in the course of developing and implementing the EMS, the faculty can begin to explain the process of expanding the EMS to similar facilities and operations. It would also be useful to identify sources of technical support for municipalities that intend to expand their EMS.

5. Strengthen Training Components (Workshops, Technical Assistance and Web-Based communication)

The faculty all suggested lengthening the time of the overall training program to 18 months to two years. Two of the faculty members suggested increasing the number of workshops to three, and the other faculty member recommended three to five workshops. If the

program was expanded to three workshops, the first would cover planning and determining significant environment aspects, the second would cover core implementation activities, and the third would train the teams on building the internal audit and program and practicing internal EMS audits. One faculty member proposed having the second workshop on site.

The municipal teams had a number of suggestions concerning how to strengthen the technical assistance provided outside of the workshops. First, the teams recommended that the project organizers make technical assistance and feedback available on a “just-in-time” basis to avoid delays resulting from participants being afraid of making mistakes. One faculty member suggested monthly follow-up visits, while another suggested adding an audit after the system was up and running. To identify Spanish -speaking mentors, it was suggested that the project organizers identify border cities in the U.S. that have EMSs in place. One faculty member suggested having local consultants make up to 15 site visits to provide help during the implementation stage. The faculty could supervise the local consultants via email and telephone.

Regarding use of the web, the teams recommended that future training efforts provide follow-up training on web-based communication. They also suggested that the web-based communication system be more proactive

B. Expanding and Institutionalizing the EMS Training in Mexico and Other Regions of LAC

The strong interest and demonstrated commitment of the municipalities in moving forward with implementing their EMSs and expanding them to similar facilities and other operations indicates the need for additional EMS training courses in the region. For example, the Nogales team has already indicated that they would like extend EMSs to water operations in the border cities of Sonora and eventually to all municipalities in Sonora through the organizational structure of COAPES. ELI has also received requests for municipal EMS training courses to be delivered in a number of other Latin American countries.

1. Develop a Cadre of Local Experts on EMS for Municipalities through “Train the Trainer”- Type Courses

In a “train the trainers” course, the goal is not only to teach the participants how to develop and implement an EMS, but also to instruct them on how to deliver the course themselves. Many of the team members indicated that they had an interest in being involved in educating other municipal officials about EMSs. EPA, USAID, the North American Development Bank, the Inter-American Development Bank and other potential EMS project sponsors could capitalize on this interest by sponsoring a “train the trainers” course in Mexico involving representatives from the municipal teams. It would also be useful to provide “train the trainers” courses for the staff of major institutions such as AMMAC, COAPES, and others whose membership includes municipal officials with environmental responsibilities. Universities were identified as a potential source for trainers.

2. *Raise Awareness of Public Officials in Mexico about EMS*

There were several suggestions concerning how to generate interest among municipal, state and federal officials for the development of EMSs for municipal facilities. One recommendation was to disseminate information about the project to all three municipal associations in Mexico. Another suggestions was to have representatives from EPA, USAID, ELI, the project faculty and the municipal teams participate in and make presentations on EMS at the meetings of regional and national organizations such as COAPAES and ANEAS.

3. *Generate support from international institutions for EMS courses*

To expand the financial and technical resources available for EMS training, coordination with border organizations, including the BECC, NAD Bank (particularly the Utility Management Institute which provides managerial level training for NAD Bank recipients) and the Northern Border Regional Consulting Board, was suggested. The participants also recommended involving international organizations, such as the IDB and World Bank, in supporting EMS courses. Initial conversations and meetings with the NAD Bank have resulted in the development of a three hour pilot EMS module to be presented as part of the general Utility Management Institute program. ELI's project manager Susan Bass, as well as representatives from USAID and USEPA participated in a seminar in October 2002, sponsored by IDB to educate their staff about the potential for municipal environmental management systems in Latin America.

4. *Work with project teams on ideas for expanding the EMS*

As noted previously, the teams participating in this pilot project already have a vision as to how to expand their EMS to other operations within the municipality as well as to operations in other municipalities in their state or region. Future project sponsors should capitalize on these visions by supporting the teams in carrying out these efforts.

VII. CONCLUSION

At the final project event in San Diego, the general sentiment of the participants and faculty in the *ProMuS 2001* project was that environmental management systems are viable and valuable for municipalities in Mexico. By offering municipalities a way to identify, prioritize, systematize and economize in their responses to environmental problems, the EMS approach directly responds to the severe budgetary constraints and sustainable development challenges facing these communities.

The participants also demonstrated, and the faculty confirmed, that there is sufficient interest in, enthusiasm for, and at least a basic level of capacity at the municipal level for, developing an EMS. Notwithstanding a range of political, time, budgetary and resource constraints, the teams in this pilot project progressed as far if not farther than in developing their respective EMS in a similar period of time as did U.S. municipalities in an earlier EMS training project.

A number of factors were identified by the participants and faculty as being critical to building municipal EMS in Mexico over the long term:

- Securing the time, people and resources necessary to develop and implement the EMS;
- Enlisting high level political support;
- Improving capacity not only in EMS development and implementation, but also in related fields (environmental law, pollution prevention, environmental technology, *etc.*).

The *ProMuS 2001* project has set the stage for launching a broader EMS training effort for municipalities in Mexico and other parts of Latin America and the Caribbean. A solid set of training materials in Spanish has been developed. With a minimal effort, crucial case studies – with data on economic, environmental and social benefits relevant to Latin America -- can be developed based on the experiences of the three municipalities. A team of enthusiastic trainees is now available to become future trainers and advocates for environmental management systems. A major association of municipalities, AMMAC, is committed to promoting EMS training for its members. Finally, international institutions such as the NAD Bank and IDB have been engaged in the process and demonstrated strong interest in supporting municipal EMS training initiatives in the future. Future organizers and sponsors of municipal EMS training programs in Mexico as well as other parts of the region can now build on and leverage these resources to improve the capacity of municipalities for environmental management.

Appendix A

Consultant Contributions

Consultant Contributions

Foster Knight of the Lexington Group, a Massachusetts-based environmental consulting firm, was the project consultant for the municipality of Zapotlan El Grande, Jalisco. The Lexington Group's contributions to the project are as follows:

- Translating the EMS Best Practices Guide into Spanish for the *ProMuS* participants
- Translating the EPA Municipal EMS Summaries into Spanish for the *ProMuS* participants
- Preparing EMS Internal Audit Slides for use by the municipal teams
- Modifying the Lexington Group's Gap Analysis tool for Mexican municipalities and providing interpretive results
- Modifying other Lexington Group EMS tools for use by the municipalities
- Donating intellectual property in the form of the EMS training materials, Gap Analysis tool, and other tools to the *ProMuS* participants.

Lawrence Pratt from EcoConsulta was the project consultant for the municipality of Nogales, Sonora. He is also a faculty member at the Latin American Center for Competitiveness and Sustainable Development (CLACDS) at INCAE, a business school in Costa Rica. His contributions to the project are as follows:

- Guidance and oversight of the website development process
- Maintaining the project website
- Relationship building with the North American Development Bank (NAD Bank) and future collaborative members
- Development of course materials for seminars and follow-up events
- Donating intellectual property in the form of analytical EMS tools

Eduardo Guerra, Professor of Environmental Management at *El Instituto Tecnológico y de Estudios Superiores de Monterrey* (Institute of Technology and Higher Education of Monterrey, ITESM) was the project consultant for Piedras Negras, Coahuila. His contributions to the project are as follows:

- Contacting municipalities to participate in the project
- Explaining the projects goals, participants and sponsors to interested municipalities
- Reviewing the Spanish translations of invitations and sending information to the municipalities
- Answering questions related to compromises made, the scope and time of the project
- Helping municipalities fill out applications to participate in the project and reviewing submitted applications
- Defining the logistics of the workshop in Guadalajara, Mexico, May 7-10, 2001 with ITESM and the Environmental Law Institute
- Verifying the resources needed at the Guadalajara workshop
- Developing training materials related to Mexican environmental laws and regulations for the Guadalajara workshop
- Reviewing all training materials prepared by the Lexington Group for the Guadalajara workshop

- Purchasing copies of the Mexican standard ISO 14001 to be used during the workshop

Appendix B

Glossary of Terms

List of Acronyms

GLOSSARY OF TERMS

Audit - A planned, independent, and documented assessment to determine whether agreed-upon requirements are being met.

Certification – A procedure by which a third party gives written assurance that a product, process, or service conforms to specified requirements.

Certification Body - An entity that conducts certification of conformity with specified requirements.

Certify - To provide written assurance that a product, process, or service conforms to specified requirements.

Certified - The EMS of a company, location, or plant is certified for conformance with ISO 14001 after it has demonstrated such conformance through the audit process. When used to indicate EMS certification, it has the same meaning as registration.

Compliance - An affirmative indication or judgment that the supplier of a product or service has met the requirements of the relevant regulation; also the state of meeting the requirements.

Compliance Audit - A systematic, documented, periodic, and objective review by regulated entities of facility operations and practices related to meeting environmental requirements.

Conformance - An affirmative indication or judgment that a product or service has met the requirements of the relevant specifications; also the state of meeting the requirements. Usually refers to meeting requirements of the ISO 14000 management standards.

Continual Improvement – The process of enhancing the environmental management system to achieve improvements in overall environmental performance, in line with the organization's environmental policy. The process need not take place in all areas of activity simultaneously. (ISO 14001)

Environmental Performance - The measurable results of the environmental management system, related to an organization's control of its environmental aspects, based on its environmental policy, objectives, and targets. (ISO 14001)

Environment – The surroundings in which an organization operates, including air, water, land, natural resources, flora, fauna, humans, and their interrelation. The surroundings in this context extend from within an organization to the global system. (ISO 14001)

Environmental Aspect – The element of an organization's activities, products, and services that can interact with the environment. (ISO 14001)

Environmental Audit – A systematic, documented verification process of objectively obtaining and evaluating audit evidence to determine whether specified environmental activities, events, conditions, management systems, or information about these matters conform with audit criteria, and communicating the results of this process to the client. (ISO 14010)

Environmental Impact - Any change to the environment, whether adverse or beneficial, wholly or partially resulting from an organization's activities, products, or services. (ISO 14001)

Environmental Management System (EMS) – The organizational structure, responsibilities, practices, procedures, process, and resources for developing, implementing, achieving, reviewing, and maintaining the environmental policy. (ISO 14001)

EMS Audit - A systematic and documented verification process to objectively obtain and evaluate evidence to determine whether an organization's environmental management system conforms to the EMS audit criteria set by the organization, and to communicate the results of this process to management. (ISO 14001)

EMS Audit Criteria – The policies, practices, procedures, or requirements, such as those covered by ISO 14001; and, if applicable, any additional EMS requirements against which the auditor compares collected evidence about an organization's EMS. (ISO 14011)

Environmental Performance Evaluation – A process to measure, analyze, assess, report, and communicate an organization's environmental performance against criteria set by management. (ISO 14031 WD4)

Environmental Policy – A statement by the organization of its intentions and principles in relation to its overall environmental performance, which provides a framework for action and for setting its environmental objectives and targets. (ISO 14001)

Environmental Target – A detailed performance requirement, quantified wherever practicable, applicable to the organization or parts thereof, that arises from the environmental objectives and that needs to be set and met in order to achieve those objectives. (ISO 14001)

Fenceline – The area in which an organization chooses to implement its environmental management system – a department, division or specific operation.

Gap Analysis – A comparison of an organization's existing management structure for environmental aspects against the elements of an environmental management system. Used to identify what EMS elements are missing.

Interested Party – Any individual or group concerned with or affected by the environmental performance of an organization.

Quality System – The organizational structure, procedures, processes, and resources needed to implement quality management. (ISO 8402)

Stakeholders - Those groups and organizations having an interest or stake in a company's EMS program (*i.e.*, regulators, shareholders, customers, suppliers, special interest groups, residents, competitors, investors, bankers, media, lawyers, insurance companies, trade groups, unions,

ecosystems, cultural heritage, and geology).

Standard - A recognized unit of comparison that provides a gauge of the "correctness" of those things we are comparing.

System – A collection of unit processes that, when acting together, perform some defined function; what an organization will do, who will do it, and how it will be done. (ISO 14004)

Verification - Process of authenticating evidence. (ISO 14010) The act of reviewing, inspecting, testing, checking, auditing, or otherwise establishing and documenting whether items, processes, services, or documents conform to specified requirements. (ANSI/ASQC A3)

Source: U.S Environmental Protection Agency. *Final Report: the U.S. EPA Environmental Management System Pilot Program for Local Government Entities*. January 28, 2000.

LIST OF ACRONYMS

AMMAC	<i>Asociación de Municipios de México</i> (Association of Mexican Municipalities)
ANEAS	<i>Asociación Nacional de Empresas de Agua y Saneamiento de Mexico</i> (National Association of Water and Sanitation Businesses of Mexico)
ANSI	American National Standards Institute
BECC	Border Environment Cooperation Commission
CLACDS	Latin American Center for Competitiveness and Sustainable Development
COAPAES	<i>Comisión de Agua Potable y Alcantarillado del Estado de Sonora</i>
COPLADEMUN	Representative of the Committee of Municipal Planning and Development (for the Zapotlán team)
ELI	Environmental Law Institute
EMA	<i>Entidad Mexicana de Acreditación</i> (Mexican Organization for Accreditation)
EMS	Environmental Management System
EPA	Environmental Protection Agency (United States)
ICMA	International City/County Management Association
IDB	Inter-American Development Bank
INCAE	<i>Centro Latinoamericano para la Competitividad y el Desarrollo Sostenible</i>
INE	<i>Instituto Nacional de Ecología</i> (National Institute of Ecology of Mexico)
ISO	International Standards Organization
ITESM	<i>Instituto Tecnológico y de Estudios Superiores de Monterrey</i> (Institute of Technology and Higher Education of Monterrey)
NAD Bank	North American Development Bank
NOM	<i>Normas Oficiales Mexicanas</i> (Official Mexican Standards)
PROFEPA	<i>Procuraduría Federal de Protección al Ambiente</i> (Mexican Environmental Law Enforcement Office)
ProMuS	<i>Proyecto de Municipios Sustentables</i> (Sustainable Municipalities Project)

SAPACG	<i>Sistema de Agua Potable y Alcantarillado of Ciudad Guzmán</i> (Potable Water and Wastewater Treatment System of the City of Guzmán, Mexico)
SEA	Significant Environmental Aspect
SEMADES	<i>Secretaria de Medio Ambiente para el Desarrollo Sustentable</i> (Secretariat of the Environment for Sustainable Development)
SERVITEL	<i>Sociedad Europea de Redes Virtuales e Ingenieria</i>
USAID	United States Agency for International Development

Appendix C

Participant Case Studies

CASE STUDY: NOGALES, SONORA

I. BRIEF DESCRIPTION OF THE MUNICIPALITY

The municipality is located in the northern part of the state of Sonora. Its main city, Nogales, is located at the 31°18' parallel in the northern latitude and has an altitude of 1,200 above sea level. The municipality is situated at the border between the U.S. and Mexico and next to the following municipalities: to the east Santa Cruz, to the south Imuris and Magdalena, and to the west Saric. It contains 1,654.76 square kilometers, which represent 89 percent of the total state and eight percent of the total land in Mexico. In addition, approximately 159,103 people live in Nogales, where the annual growth rate is 3.9 percent and the population density is 80.7 people per square kilometer.

Nogales was established after it obtained authorization in 1880 from the railroad company of Sonora, which was looking for a station at the international border of the Magdalena district. Later, the federal government authorized an office for the border to be built in the place designated for the railroad station. In November 1882, the government verified the inauguration of the railroad in Sonora. Shortly thereafter, Governor Torres ordered the formation of a plan to create a new town. The municipality was formally established by local law on July 9, 1884. The title of the village was given by legislative decree on July 13, 1889, and the title of the city in 1920. Its head is the city of Nogales.

Generally, the municipality's landscape is diverse. Its terrain is mountainous, having as its main mountain areas those of Custodio, Pajarito, Promontorios, Plomosa, Planchas de Planta, Guajolote, Pedregosa, Santa Bárbara, Pinitos, Oculta, Piritas, San Antonio which ends with Santa Cruz and the mountains of Arizona. The municipality is surrounded by two rivers: one born to the south in the Alisos gorge, where the Rio Magdalena begins, and in whose watershed the Bambuto, Santa Bárbara y Planchas de Plata are found. The Magdalena river forms part of the Asunción watershed, that crosses the Altar desert region and the Nogales creek, that joins the Santa Cruz river, whose waters flow into the United States to form part of the Gila river watershed. The Nogales creek forms without help of ponds, flowing violently in times of rain and keeping dry the rest of the year. In the past, Nogales provided itself with drinking water from the underground waters of the Nogales creek. But when the population expanded, it was necessary to collect water from the Santa Cruz river, which forms in the United States, and flows into Mexican territory joining the Terrenate and Cuitaca creeks, crossing the frontier at a place close to Nogales; and goes back to Arizona, where it joins the San Pedro, as an effluent to the Gila river.

Its climate is semiarid, with an average temperature of 27°C in July and August, and 8.7°C in December and January. The annual average is 17.8°C. The rainy season comes in the summer, during July and August, with an average annual rainfall of 460.8 millimeters. During winter, snow and hail are frequent.

Nogales has 30 kilometers of paved federal roads, and 129 kilometers of improved ways. It has also one landing site of 1,800 meters long. Likewise, it has stations for AM, FM and TV, besides telephone, post, and telegraph.

The most important employment activity in the municipality of Nogales is the maquiladora industry, which exports goods abroad. There are 78 established maquiladora operations which employ almost 50 percent of the municipality's population.

The educational services provided by the municipality range from pre-kindergarten through secondary (high) school. The educational infrastructure includes 40 kindergartens, 57 primary schools, 13 secondary schools, and 5 centers for special education.

The public health institutions provide first aid and secondary assistance. Nogales has two hospitals, and some clinics also. While the population's access to health services reaches almost 100%, many agree that the quality of service needs improvement.

Drinking water is provided to all the communities in the municipality, to the benefit of 120,142 inhabitants, thus reaching about 90 percent of the population. Drainage services are only provided in the municipal head town, to the benefit of 106,793 inhabitants, covering only 80% of the population. The conditions of the water networks are generally acceptable, although they demand the usual preventive maintenance for efficient disposal of residual waters. The treatment of contaminated waters occurs in a bi-national water sewage treatment plant, located in the United States.

The electric energy service covers 93 percent of the urban and rural zones, benefiting 124,146 persons. This network needs to expand in order to reach new settlements.

COAPAES: The Commission of Potable Water and Sewage Treatment in the State of Sonora

- Composition: COAPAES is composed of a government body, an advisory council, a General Director, and a public commission. The governing body is composed of the governor of the state, five representatives of the State public offices, two representatives of the Municipal and Intermunicipal Operators, two representatives (in this case, of the city council of the municipalities where drinking water and sewage services are provided directly), one representative of the CAN, and the President of the advisory council of the Commission. There is no specific organizational chart, as this is constantly changing. The same also applies to the hierarchy of operating entities. The number of employees in COAPAES, at the state level, is 1,952 people, accounting for the General Directorship and the operating entities of Agua Prieta, Guaymas, Empalme, San Ignacio Río Muerto, Benito Juárez, Cananea, Nogales, Benjamín Hill, Fronteras, Nacozari, and San Carlos in the state of Sonora.
- Description: The General Director of COAPAES-Sonora is Ing. Cesar Alfonso Lagarda. COAPAES is a public agency that is decentralized from the State, with its own legal personality and patrimony, located in the state capital. Its objectives are to intervene in the planning and budgeting of the state's hydraulic power sector; execute, in this case, the policies of the state governor in coordinating the State Potable Water and Sewage System; assess, assist, and lend support services and technical assistance to the Agency for Municipal and Intermunicipal Operators; and carry out, with permission from the respective council, transitionally the potable water and sewage services in those municipalities where there are no operators to provide them, or in the municipalities that still do not possess the administrative capacities, according to the exercise of the powers granted by the law.
- Legal considerations: Administering the public services to provide potable water and sewage treatment is the responsibility of the municipalities, with the State's

assistance. The services are provided by law, through the operating organizations, inter-municipal organizations, the Commission of Potable Water of the State of Sonora, or otherwise by private parties that hold a concession, or have been contracted to provide these services. The specific uses attached to the service of drinking water delivery are: domestic, public, industrial, commercial, and other services. Except for the domestic use, the order of importance will be determined by the corresponding municipality.

The Municipality is also responsible for promoting the development and self-sufficiency of the administrative, technical and financial sectors of the operators, in accordance with current law, overseeing that they comply with technical and administrative norms established in coordination by competent authorities. It is also in charge of training of the operating entity personnel, especially those with responsibilities for collecting water, channeling, cleaning, conduction, storage, and distribution of drinking water and sewage treatment.

The budget of the municipal operating entity is made up of: assets; federal, state, and municipal contributions; income; donations, subsidies, and adjudications in favor of the entity; contributions by private parties, remnants, profits, interests and sales from its own holdings, and other goods and services that form part of its holdings on any legal title. The budget is managed directly by the corresponding operating entities in each municipality; the General Director does not take responsibility over such budgets.

II. SCOPE OF THE EMS

The scope of the environmental management system of the Commission of Potable Water and Sewage Treatment in the State of Sonora-Unit Nogales is limited strictly to the Division of Potable Water and its activities.

III. IMPLEMENTATION TEAM

The Administrator of COAPAES-NOGALES is C.P. Jose Arreola Ortega, and the Technical Director is Ing. Martin Ramos Villela.

IV. EMS IMPLEMENTATION COMMITTEE

The Committee is composed of the following individuals: Q. B. Gastón Leyva Alcado, Chief of Water Quality, Ing. Cesar A. Espinoza Rodríguez, Chief of the Department of Works and Projects and Ing. Carlos Gonzalez de la Vega, Director of Border Issues.

V. WHY AN EMS?

COAPAES- NOGALES believes that an EMS will enable us to:

- Assure that we bring the highest quality of water to our customers.
- Reduce the breaches of applicable standards and institutional environmental commitments (national, binational, and others).
- Promote the most efficient use of water resources in Nogales.
- Protect our employers by implementing programs that reduce the risk of accidents.
- Diminish solid waste contamination and other components that generate corrosion or obstruction in tanks, as well as in the distribution channels, namely tubing.
- Assess, assist, and lend support services and technical assistance to Entities of Municipal and Intermunicipal Operators; and provide services in municipalities where there are no operating agencies to provide them, or in the municipality that still does not have the capacity to provide them.
- Improve communications to communicate more effectively our plans, advancements, situation, actions, and goals to the consumer and the personnel where necessary.
- Protect potable water.
- Improve relations with the community.

VI. OBJECTIVES AND GOALS

COAPAES has developed objectives and goals which focus mainly on the quality and quantity of water that it brings to the community

OBJECTIVES	GOALS
Eliminate leaks in primary tubing	Replace the tubing of Santa Bárbara-Malvinas
Eliminate leaks in storage tanks	Rehabilitate tanks
Comply with Procedure AA4.1 (Ensure the absence of chlorine gas leaks)	Inform those involved in this activity of the procedures for transfer, installation and normal operation of the equipment
Study the cost benefit of installing water hammer arresters and pressure relief valves.	Complete this activity before October 2002
Correctly apply Procedure AA7.1 (Leaks caused by clandestine connections of poor quality)	Perform monitoring rounds prior to December 2002
Correctly apply Procedure AA7.2 (Leaks caused by poor quality in new developments)	Supervise the suitable installation and the materials
Undertake feasibility studies for the relocation or encasing of existing tubing in creeks.	Supervise the installations of existing tubing before October 2002
Comply with the instruction AA9.1 (Dissolved Organic Material)	Install lids on pressure-relieving boxes, as well as tanks, before October 2002

OBJECTIVES	GOALS
Adequately place mesh in the tank vents and drains to avoid water contamination	Maintain closed lids on all tanks and drains before October 2002
Comply the established procedure AA9.2. (Cleaning of tanks and drains)	Complete cleanliness in all tanks and drains before October 2002
Reduce the risk of accidents, thefts, and water contamination due to intruders	<ul style="list-style-type: none"> • Ensure rapid evaluation of deficiencies in security • Prepare budget and requirements for equipment and personnel • Ensure that plan is reviewed by technical management • Execute program
Reduce customers' water consumption, in order to avoid its loss and the exhaustion of the aquifer	<ul style="list-style-type: none"> • Conclude with awareness programs for elementary children before December 2003 • Inform about permanent conservation means • Promote incentives for the consumer to conserve water by install measuring devices • Initiate the program to install micro-measurers by December 2002 • Promote and disseminate a permanent water culture

VII. STATUS OF THE EMS

The Nogales team has developed an EMS program according to its defined goals and objectives, as well as the manuals and instructions that explain each activity involved, such as the assigning of appropriate staff members to certain processes. Although the manuals have been written, they continue to be revised by the people implementing the EMS in order to make the task more functional. The team is at the stage of training the staff involved in the project and revising presentations to clarify the procedures for implementing an EMS. A more thorough presentation is being prepared for staff with the greatest responsibilities within the system in order to explain to them the basis of an EMS, as well as who will review the program's accomplishments.

VIII. KEYS TO SUCCESS

The keys to success that the team identified for this program, after assembling the manual, are:

- Determine the scope of the EMS so that the objectives and goals can be met realistically and are able to be completed by using existing resources (time and money).
- Raise consciousness among staff and involve all collaborators on the EMS, from the highest levels to the coordinators, before implementing the program.
- In order to develop the EMS, convene a working group that has knowledge and experience in how the organization operates. This knowledge should include, to the extent possible, the internal and external laws and regulations with which the organization must comply, as well as the technical expertise to evaluate each goal for each process or activity.
- Obtain the support of higher management is critical to this project.
- Clearly define the roles and responsibilities of staff member, as well as the project timeline.
- Immediately assign one person that has the support, resources, and authority to implement an action plan.
- Communicate the successes in implementing the program to the employees, the community, and all interested groups.

IX. BARRIERS

- The time required of team members to dedicate themselves to this project was problematic, as many of those involved in the EMS already held established responsibilities and functions in other distinct departments in COAPAES. The team members needed to organize their days and weeks in such a way that they could still advance the implementation of the EMS, in spite of their other responsibilities. The team hopes that once the system is fully implemented it will become easier and more systematic to manage it.
- Determining the necessary components of training, and then completing the training, has been problematic. The management in charge of implementing the project needed to spend an extensive amount of time learning how to structure an EMS, and more generally, understand the basis of ISO 14001.
- Finding time to schedule a training session for different staffers was difficult because it meant taking time away from their established work schedules.

- Developing informative training materials and distributing them to all staffers has been complicated by the volume of materials that needed to be prepared. In addition, the team received numerous verbal requests for information, which also demanded time from the team.
- Determining the goals, objectives, and scope of the system was complicated. The team realized, when designing the system, that the scope of the EMS was quite broad, and that they needed to narrow the concepts to be more specific in designing and meeting their goals.
- The direction of the EMS and the understanding among members of the first, more involved, group has increased however, the actual implementation of the EMS has been difficult. Communication between employees and explaining an EMS has been difficult. Work according to the manuals and guidelines provokes resistance in the staff.
- The team has developed definitive goals, which have been well formulated but not sufficiently defined, in order to comply with the deadline. Since the team has not yet completed training, the system could be interrupted and accomplishments could be delayed. In addition, delegating responsibility to alternate staffers complicated matters because the new staffers initially did not understand the concept of an EMS.

X. BENEFITS

- The benefits of an EMS to the organization are, overall, positive. The organization already gathered much of the information on environmental impacts required by the EMS, however the system itself assembled the information in a cohesive and comprehensible fashion.
- An EMS reduces costs in materials, energy, and water.
- The EMS has created awareness among employees that small activities can have a large impact on the environment, in this case, water. The program has improved the team's understanding of environmental issues, as well as how the municipality can be in better compliance with environmental regulations and laws that apply to the appropriate agency. Although the team acknowledges that it has been difficult to devise and implement an EMS, members recognize the short and long-term benefits that an EMS brings.
- Although the high-level officers from COAPAES were not able to participate in the EMS, they remain interested in its establishment and remain informed through reports and updates. Sharing this information with them prepares them to implement their own system in the future.
- The municipality has had the opportunity to improve its public image by effectively communicating project advancements and benefits with the community.

XI. LESSONS LEARNED

- Try to design the EMS so that it fits with what is already being done in the organization. One should use the organization's existing system to assist the team in designing the EMS and formalizing its development. Over time, once the system is established, the team will be able to expand it to include objectives and goals that are perceived as necessary.
- Distribute responsibility, because it is difficult for just one person to launch an EMS. Designing and implementing an EMS requires the cooperation of staff at all levels; only then will it be fully functional. Assign roles and responsibilities clearly to those who will be involved in the project.
- Ask those involved for their opinions, particularly those who possess expertise in areas or terminology with which one is unfamiliar.

XII. CONTACTS

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XIII. TOTAL COSTS DURING THE PROJECT

The following table demonstrates the approximate costs incurred from May 2001 to June 2002 in developing, planning, and implementing the EMS. The currency is in U.S. dollars.

Labor	Consultant Fees	Travel	Materials
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\$13,200	\$800	\$2,500	\$500
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XIV. FUTURE PLANS FOR AN EMS

The General Director of COAPAES has expressed an interest in having the Nogales team document its experience and lessons learned, in order to share it with other agencies, with the premise that the team would probably help other departments develop their own environmental management systems.

CASE STUDY: PIEDRAS NEGRAS, COAHUILA

I. BRIEF DESCRIPTION OF THE MUNICIPALITY

Piedras Negras is located in the north-east part of the state of Coahuila, at an altitude of 220 meters above sea level. Piedras Negras' neighbors include Texas to the north and east, the municipalities of Nava and Zaragoza to the south, and the municipality of Jimenez to the west. The municipality has a population of 180,000 and a growth rate of 2.72% per year.

The Coahuila region, which is 26,534.8 km², consists of the municipalities of Piedras Negras, Acuña, Guerrero, Hidalgo, Jimenez, Nava, and Zaragoza. The closest neighbor on the U.S. side is the city of Eagle Pass, Texas, a sister city to Piedras Negras. Principal economic activities include: industry, commerce, general services, cattle ranching, agriculture, and coal mining.

II. SCOPE OF THE EMS

For a fenceline, the Piedras Negras municipality chose to focus on its sanitary landfill. Because the landfill is in the early stages of development, the municipality will use an EMS as a way to prevent environmental impacts before they become serious concerns. This sanitary landfill is located on Highway 2, kilometer 8.3. It will operate for approximately 20 years and is currently in its sixth year of operation. To date the municipality has filled three cells, each with a 150,000 ton capacity.

III. IMPLEMENTATION TEAM

Piedras Negras designated the Director of Public Works as the EMS Management Representative and the Director of Ecology as the EMS Committee Coordinator. The remainder of the team is composed of the Director of Planning and the Manager of the Landfill, who is a subcontractor to the municipality.

The Ecology Department determines environmental impacts, compliance with municipal, state, and federal legislation, and the design of corrective actions. The Planning Department

establishes improvement goals, deadlines, training courses, and interior and exterior communication systems. Management of the sanitary landfill is responsible for implementing and promoting the actions necessary to achieve the goals set by the Ecology Department and the Planning Department. The Sanitary landfill management also provides feedback to the Ecology and Planning Departments about how to make necessary changes and adjustments.

IV. EMS IMPLEMENTATION COMMITTEE

The Implementation Committee is the same as the Implementation Team.

V. WHY AN EMS?

Designing and implementing an EMS helps the municipality to identify areas of non-compliance with the state and federal laws. Through implementing an EMS, the team has also discovered ways to use their equipment more efficiently. The municipality had never before conducted an in-depth analysis of its trash collection and landfill operations. By doing so, it found many areas for improvement and change, from the way trash collection routes are designed to exercising preventive maintenance of equipment. Finally, through the creation of an environmental policy, the EMS helps the municipality assure the public that they are meeting set environmental standards.

VI. OBJECTIVES AND GOALS

The team's goals and objectives include eliminating leachate spills from waste collection trucks, maintaining truck equipment in order to reduce atmospheric emissions by equipment, and optimizing operational controls in order to manage and reduce waste residues.

VII. STATUS OF THE EMS

The Piedras Negras team completed and documented the EMS manual and all of the necessary procedures. They began implementation in August 2002.

VIII. KEYS TO SUCCESS

- The team felt that key to success of any EMS in Mexican municipalities would be to try to involve high-level officials, particularly the Mayor and the state officials. This would be useful because there are a lot of needs for an EMS that fall outside of a municipal team's jurisdiction and control.
- The integration of a local mentor would be of great help, since most municipalities do not have the experience to deal with all the challenges that arise in implementing an EMS.
- Frequent contact and follow-up from the team's senior consultant, site visits from the senior and junior consultants, training received at the two workshops, and supporting

reference materials supplied by the consultants, such as the EMS manual, EMS procedures and work instructions, greatly contributed to the team's success in the program.

IX. BARRIERS

The Piedras Negras team encountered the following barriers in implementing their EMS:

- The team felt that there was lack of sufficient and effective communication between state officials and the Mayor in order for them to have a better understanding of what the team is trying to accomplish. Overall, the team felt that the Mayor was not committed to the project. It would also have been beneficial to have more communication with, and support from, a local EMS expert or mentor. The team's communication with its faculty member was effective; however the fact that he was in another city and at a distance proved to be a problem.
- The team worked under tight schedules, and did not have enough time to complete the tasks as the members originally planned. Since the team was not working full-time on the EMS design and implementation, many tasks were easily misunderstood and not completed correctly.
- The team felt that the reference material was inadequate as there was not enough literature or examples that members found useful to help them in implementing the EMS. They also felt that not enough resources had been allocated to the project.

X. BENEFITS

- More efficient use of the equipment.
- Better, more efficient, design of the municipality's truck routes.
- Better, more efficient, schedules.
- Better service to the community.
- Improved relationship between the municipality and its community, due to increased communication.
- Greater awareness of environmental issues within the community.

XI. LESSONS LEARNED

Distance and availability of an EMS expert is a key factor in designing an EMS. It is also critically important to have the constant involvement of high ranking municipal officials, because they can appoint people to a specific task, saving the team time and making it much easier for members to advance their work on the EMS. Involvement of this level of personnel could have counterbalanced some of the political barriers that the team encountered during the project.

XII. Resource Commitment

<i>People PN team</i>	<i>Man hours</i>	<i>Man hour cost</i>	<i>Total Cost</i>
4	1,536	\$93.75 pesos	\$ (Mex.)144,000.00
			\$ (US) 14,400

XIII. Future EMS Plans

The operator of the landfill plans to achieve ISO 14001 certification for the landfill. The municipality would also like to replicate this approach in other areas of the municipality, such as the public lighting system and the water treatment plant.

CASE STUDY: ZAPOTLAN EL GRANDE, JALISCO

I. BRIEF DESCRIPTION OF THE MUNICIPALITY

The municipality of Zapotlán El Grande is located in the southeast section of the state of Jalisco, approximately 125 kilometers south of Guadalajara. Zapotlán El Grande is one of the smallest municipalities of the state, with its territory extending only 967 square kilometers. The main city, where approximately 95% of the population of the municipality lives, is Ciudad Guzmán, with approximately 95,000 inhabitants. The economy of the area depends mainly on agriculture, the management and exploitation of forestry resources, and regional services (hospitals, schools and universities, markets, banks, and other commercial services). There is a small industrial sector, as well as a growing tourism sector. The municipality is responsible for providing public services, like drinking water, sewage treatment, waste collection, electricity, public safety, and rural development (including parks and reforestation).

Many years ago, indigenous communities inhabited the area. The Spaniards colonized the area in 1533, establishing the town of Tlayolán. The pueblo changed names several times, but since the 1800s it has been known as Zapotlán El Grande. The main city, since 1856, is called Ciudad Guzmán. The municipality (before called Ciudad Guzmán also) recovered its historical name Zapotlán El Grande in 1997.

Zapotlán El Grande is located on an isolated watershed, surrounded by the high mountains of the Nevado of Colima Volcano. At one point in time, the valley held a large lake that now diminished and covers 1,284 hectares in the north valley. The municipality's location in the watershed has contributed to the town's awareness that the sustainability of its future depends, to a great extent, on the valley's natural resources, particularly Zapotlán Lagoon and the biodiversity of flora and fauna in the mountains that surround the valley. During the last five years, the city of Zapotlán has arrived at a consensus that the preservation of the Lagoon is a high priority for the municipality. With the assistance of the University of Guadalajara, the municipality of Zapotlán El Grande prepared the Urban Master Plan Zapotlán El Grande 2020, which consists of the Partial Plan for the Integral Management of the Lagoon, with an Action Plan until the year 2020. The implementation of the Plan Zapotlán 2020, particularly the improvement of the Lagoon, promotes environmentally sustainable development of urban areas and aims to preserve forest and agricultural areas, improve the tourism sector, augment drinking water reserves for the municipality, and generate welfare improvements.

The municipality reconsidered its initial mission to include the environmental preservation and restoration as central concepts of its environmental policy. The mission of the municipality according to the First Government Report (2002) is:

“To satisfy the development needs and aspirations of the population, providing services that will improve the quality of life, strengthening the participatory culture between society and government, and collaborating in the preservation and restoration of the environment.”

The participation of the municipality in the Project *ProMuS* 2001 began in February 2001, a month after the administration of Mayor Luis Carlos Leguer Retolaza took office. The strengthening of the municipality's environmental performance, particularly in the restoration of the Lagoon, was a

strong component of Mr. Leguer's campaign, and therefore the opportunity to participate in Project *ProMuS* appealed to the municipality. When the municipality received the invitation to participate in Project *ProMuS*, it decided to focus its efforts on the operations of the sewage water treatment facilities, with the intent of expanding the project to other municipal operations.

It is important to view the municipality's participation in the Project *ProMuS* 2001 as part of its broader strategy to generate environmental improvements within the municipality. Currently, the administration of Luis Carlos Leguer has a series of environmental initiatives and programs that encompass improvements in waste collection and treatment, park improvements, the culture of water, programs that address forest restoration and erosion control, programs for saving energy in public lights, etc. The implementation of an EMS in the sewage water treatment facility forms a vital component of this strategy, because it reduces contamination in the discharges of the plant that have an impact on the Lagoon. Although the scope of the EMS is initially limited to the treatment facility, the municipality hopes to expand the system, first to the Enlargement Project of Treatment Facility No.2 to cover 100 percent of the sewage waters, and later to other municipal operations, such as waste management, thereby complementing and reinforcing the new environmental initiatives and management programs of the municipality.

The environmental initiatives and programs of the municipality currently include the following:

- Plan Zapotlán 2020 (Partial Plan for the integral management of the Lagoon)
- Program for the Collection, Recycling, and Treatment of Solid Waste.
- Programs of Awareness Building (Water Culture, Custodian Children)
- Program Zapotlán Clean Municipality (with your help say goodbye to trash)
- Department of Ecology (parks and forests in the urban zone)
- Program of alternative crops (malt, sunflower)
- Environmental Impact Study (compliance with norms) in industrial zoning.
- Cleaning Campaign (empty sites, old cars)
- Substitution of gasoline cars for liquid gas cars
- Program of *Sabatón* (with the participation of the Government and the citizens, "hands on work").

II. SCOPE OF THE EMS

The Mayor decided to begin with implementation of the EMS in the operations and activities of Sewage Water Treatment Facility #1. Plant #1 was constructed in the year 2000 with a design capacity of 68 liters/second, which represents approximately 30 percent of the current needs of the sewage network. In the summer of 2002, the construction of Plant #2 will begin with a capacity of 153 liters/second, financed by funds provided by the State of Jalisco. Once facility #2 is completed, Ciudad Guzmán will have sewage water treatment for 100 percent of its needs, with a reserve capacity for extreme conditions and for the future growth of the city.

III. IMPLEMENTATION TEAM

The implementation of an EMS based on the ISO 14001 model requires that a groups within the municipality's management be designated as "Upper Management" to lead the project's efforts and to periodically revise its effectiveness and introduce, as appropriate, necessary changes..

For this project, the Upper Management is composed of the following officers:

- President of the Municipality (Mayor)
- Vice-president of the Municipality (Representative of the President of the High Direction)
- Director of the city's Drinking Water and Sewage System (*Sistema de Agua Potable y Alcantarillado of Ciudad Guzmán* (SAPACG))
- Director of Public Services

The Representative of the Upper Management has invited a group of high officers of the Municipality and of other institutions to support the implementation of Project *ProMuS*.

These officers are the following:

- Governor of the Municipality for Water
- Governor of the Municipality for Ecology
- Chief of the Department of Ecology (Rural Development, Tourism and Ecology)
- Representative of the Committee of Municipal Planning and Development (COPLADEMUN)
- Representative of the State Delegation of the Secretariat of the Environment for Sustainable Development, *Secretaria de Medio Ambiente para el Desarrollo Sustentable* (SEMADES).

IV. EMS IMPLEMENTATION COMMITTEE

The Representative of the Upper Management of the EMS has formed an Implementation Committee for the EMS. The Committee meets every Tuesday from 1:00 to 2:00 p.m. to review the advances in the implementation of the EMS and to resolve problems. The Committee consists of the following officers:

- Representative of the Upper Management
- Director of the SAPACG
- Director of Public Services
- Chief of Plant #1

V. WHY AN EMS?

The Mayor and the Vice-president of the municipality believe that participation in Project *ProMuS* 2001 and the implementation of an environmental management system will have the following benefits:

- Introduce the concept of “systems” to the administration of the operations and activities of the municipality.
- Strengthen initiatives for improvement in the public administration of the municipality, such as the initiative pertaining to the “high performance of staff” and improvement of the quality of public services.
- Gain experience in the implementation of an EMS in a pilot project -- Sewage Water Treatment Plant #1 -- in order to expand its implementation to Plant #2 and other programs and operations of the municipality.
- Make the operations of Plant #1, and Plant #2 once constructed, more efficient.
- Minimize the most important environmental impacts of the operations of Plant #1, and Plant #2 once it is constructed.
- Improve the participation of the public in resolving environmental problems, particularly the treatment of sewage water and solid waste management.

VI. OBJECTIVES AND GOALS

The Implementation Committee, which met on June 4, 2002, approved the following objectives and detailed goals for the EMS, as applicable to the operations of Sewage Water Treatment Plant #1:

Objectives	Goals
Before December 31, 2002, significantly reduce the dispersion of noise from the Machines and Controls Chambers to comply with the parameters of the standard, NOM 081 and to reduce the number of citizens' complaints.	<ul style="list-style-type: none"> • Before September 30, 2002, install a vacuum insulator in the Machines and Controls Chambers, utilizing absorbent materials in order to reduce noise generated by the blowers. • Before July 31, 2002, establish an

Objectives	Goals
	<p>external fence utilizing bamboo around the perimeter of the Machines and Controls Chambers.</p> <ul style="list-style-type: none"> • Before December 31, 2002, establish an exterior fence utilizing vegetation in the perimeter of Plant #1
<p>Before June 30, 2003, reduce the generation of solid wastes entering Plant #1 and improve their control.</p>	<ul style="list-style-type: none"> • Before December 31, 2002, reduce by 20 percent the passage of solids to the blower tank (in comparison with the quantities entering the tank in December 2001) • Before January 31, 2003, formalize and communicate to the population the awareness program to avoid releasing solid waste to the sewers.
<p>Before September 30, 2003, rehabilitate and improve the sludge treatment system for adequate final disposal into agriculture uses.</p>	<ul style="list-style-type: none"> • Before March 31, 2003, repair the 10 drying beds, in stages. • Before December 31, 2002, finalize a plan for the control and disposal of sludge.

VII. STATUS OF THE EMS

In May 2001, the municipality of Zapotlán El Grande initiated its efforts to implement an EMS for Water Sewage Treatment Plant #1. After a year, the municipality has completed 70 percent of the EMS implementation.

The organizational structure of the EMS and the principal responsibilities have been established. The environmental aspects have been identified, and the team has formally determined seven (7) Significant Environmental Aspects (SEAs). Half of the operative control for these SEAs has been documented. The full documentation of the EMS has been completed by approximately 80 percent, however, several documents have not yet been officially approved. Three (3) Environmental Objectives, supported by the Detailed Goals, have been established (see Section VI). Plans of Action have been prepared for the Detailed Goals, including responsible officers, dates, measures, and budget. Additionally, the program (SERVITEL) will be used to receive communications and feedback from interested parties, as well as for handling responses and preventive/remedial action where necessary.

Some elements of the EMS are still lacking implementation, particularly:

- Dissemination of the Environmental Policy (2nd Municipal Session 19/06/02)
- Training and Awareness of Staff
- Emergency Preparedness and Response
- Monitoring and Quantification Process
- Process for the identification and handling of complaints (*No Conformidades*)
- Program of Internal Audit (Training received on May 16, 2002)
- EMS Revision Process by the Upper Management.

The municipality hopes to complete implementation of the EMS before the end of 2002. Once the construction of Plant #2 is finalized (June 2003), the municipality will expand the scope of the EMS to cover Plant #2.

VIII. KEYS TO SUCCESS

The Zapotlán team identified the following as keys to success in implementing an EMS:

- Assure commitment and support from the Upper Management. For a municipality, this is a process that may take several months, as it involves personal visits by the Mayor, the Governors, and other managers that influence the priorities of the Municipality. The Municipality must also present the EMS proposal to the City Council in order for the project to obtain its approval (Minutes, 2nd Session of the municipality, June 19, 2002).
- The scope of the EMS is consistent with the highest ecological priorities of the municipality. For example, one of the highest priorities for the municipality of Zapotlán El Grande is the restoration and preservation of the Lagoon of Zapotlán. Thus, the municipality defined, as the scope of its EMS, all the activities and operations of Treatment Plant #1, since its treated waters are finally discharged to the lagoon.
- To maintain the impetus and rhythm of the EMS implementation, the Implementation Committee meets two hours each week, under the leadership of the Representative of the Upper Management.
- The training workshops and the tasks assigned after each workshop are essential for guiding the Committee of Implementation of the municipality.
- To ensure that the EMS operation remains consistent with ISO 14001 standards.

IX. BARRIERS

The Zapotlán team experienced the following barriers to implementing their EMS:

- The lack of time was the greatest obstacle. The Coordinator of Implementation had to work on the EMS beyond his normal work-hours. The Director of the Drinking Water and Sewage System (*Sistema of Agua Potable and Alcantarillado* (SAPACG)) was not able to devote enough time due to his multiple priorities. In addition, preparations for the bidding and construction of Plant #2 interfered with the implementation of the EMS.
- The team lacked direct support from a specialized consultant on EMS ISO 14001. The two workshops of Project *ProMuS* were helpful, but the team has found that the preparation of the documentation of the EMS generated, instead of clarified, many questions. The communication with the consultant through e-mail was not satisfactory because there were not enough opportunities for dialogue and clarification. The plan of assigning a mentor as local consultant was also not successful.
- The team did not have easy access to the training materials located on the *ProMuS* webpage, particularly the materials of the second workshop.

X. BENEFITS

- The principal benefit thus far has been the increased awareness within the High Direction, where upper management recognized the benefits of implementing EMS and hopes to apply more EMSs to other programs in the municipality.
- The experience in developing the Environmental Policy of the municipality in a way that encompasses the main commitments of the municipality in the environmental sphere is also an important benefit. This will facilitate the expansion of the EMS to other operations of the municipality, such as the collection, treatment, and disposal of garbage, public works, street cleaning, and the administration of parks and greenfields.
- Several basic concepts of the EMS have been introduced in a new initiative at the municipality for improving the waste collection services through the separation of different wastes in special containers. The municipality now has greater confidence in the feasibility of extending the EMS to other programs.
- The municipality had considered implementing a quality-control system for the treatment plant, but the team now believes that the implementation of an EMS will provide benefits in improved environmental quality and performance.
- There is greater awareness of what a "system" is, and how it will help in the administration of the municipality. For example, the municipality's program for

handling citizens' complaints (SERVITEL) was established before the team began constructing the EMS. Now the team recognizes how SERVITEL can be integrated into the EMS to improve its efficiency and coordination with other elements of the "system."

- As the team has not yet completed implementation of the EMS, we have not yet perceived economic benefits or improvement in our environmental performance. However, we have established three Environmental Objectives with Detailed Goals, and we clearly see the benefits that we may achieve.

XI. LESSONS LEARNED

- A formal process for approving the EMS, including approval by the Mayor and the City Council, is important for assuring its implementation.
- It is not advisable to try to implement the system in various municipal operations simultaneously. It is preferable to begin with one operation, such as the treatment plant, and later extend it to other activities.
- The Director of the Drinking Water and Sewage System (*Sistema of Agua Potable and Alcantarillado* (SAPACG)) plays a fundamental role in leading the implementation of the EMS, as applied to the sewage water treatment plant.
- The efforts in the implementation of the EMS may be temporarily halted due to the lack of time and other priorities of the Municipality. However, the High Direction (particularly the Mayor) plays a critical role in renewing and mobilizing efforts.

XII. CONTACTS

Vice-president and Governor
Municipality of Zapotlán El Grande
Plaza Central
Ciudad Guzmán, Jalisco, México

Director
Servicio of Agua Potable and Alcantarillado
(SAPACG)
Ciudad Guzmán, Jalisco, México

Contact:

Arq. Rubén Medina Reyes
Vicepresidente and Regidor
Tel: 01(341) 413-5311/13
Email: rubenmr89@hotmail.com

Arq. Marco Antonio Flores
Director, SAPACG
Tel: 01 (341) 413 –5311/13

XIII. TOTAL INVESTMENT IN THE PROJECT

The Table indicates the investment of the Municipality of Zapotlán El Grande in the planning and implementation of the EMS during the first year (May 2001 until May 2002). The cost of labor is the average of the salaries of the members of the Committee of Implementation, expressed in U.S. dollars in terms of hours/person working on the Project.

Labor	Equipment	Travel and Expenses	Materials
\$6,583	N/A	\$1,504	\$ 752

XIV. FUTURE PLANS FOR THE EMS

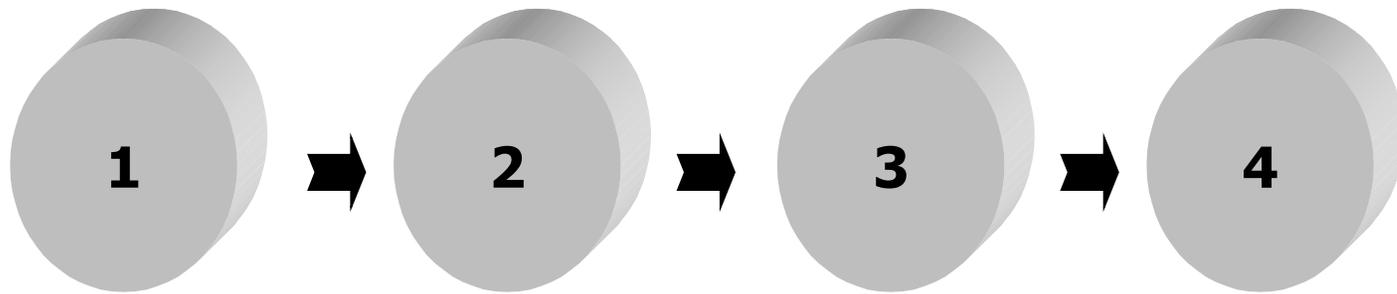
The municipality hopes to complete implementation of the EMS in Plant #1 before December 31, 2002. The construction of Plant #2 begins in July or August 2002, and ends approximately in June or July 2003. Once Plant #2 is finished, the EMS will expand to cover the activities and operations of the new plant.

The municipality has considered the expansion of the EMS to its other operations, particularly Public Services, including the collection, handling, and disposal of garbage.

Appendix D
Sample Documentation

Example of Process Map from
Piedras Negras

Example of Identification of Significant
Environmental Aspects from
Piedras Negras



- 1.- Collect
- 2.- Transport
- 3.- Dispose
- 4.- Confine

1
COLLECT

BAGS

WASTE

BAG WITH
WASTE

2

TRANSPORT

**BAGS WITH
WASTE**

**FUELS
LUBRICANTS
SPARE PARTS**

**WATER
DETERGENT
ELECT. ENERGY**

**LEACHATES
WASTE**

**AIR EMISSIONS
SPILLS
LUBRICANTS
TIRES
INDUSTRIAL
WASTE**

**WASTE WATER
HEAT**

3

DISPOSE

**BAGS WITH
WASTE**

**FUELS
LUBRICANTS
SPARE PARTS**

**LANDFILL
COVER
MATERIAL**

**ENVIRONMENTAL
IMPACTS TO
SOIL,
PLANTS AND
ANIMALS**

AIR EMISSIONS

4

CONFINE

**LANDFILL
COVER
MATERIAL**

**FUELS
LUBRICANTS
SPARE PARTS**

**CONFINED
WASTE**

**AIR
EMISSIONS
HAZARDOUS
WASTE**

LEACHATES

SIGNIFICANT ENVIRONMENTAL ASPECTS OF THE PIEDRAS NEGRAS MUNICIPALITY, MUNICIPAL LANDFILL									
---	--	--	--	--	--	--	--	--	--

Area/Activity:	MUNICIPAL LANDFILL	Date of Application: Nov/28/2001
Responsible Party:	Ing. Martinez, Ing De la O, Ing. Cardozo	Responsible for review:
Participants:	SANITARY LANDFILL DIVISION	R.E. Martínez
	PLANNING DEPARTMENT	Reference Maps: (left blank)
	ENVIRONMENTAL DEPARTMENT	

Activity or Stage	Aspects	Impacts	Legal or Other Applicable Requirements	1	2	3	4	5
Collect	Garbage	* Soil Contamination	Municipal Ecological Regulation				x	
Press	Leachate	Spillage in Soil	Municipal Ecological Regulation	x	x		x	Yes
		Odors					x	
		Harmful Fauna					x	
Transport	Fuels	Atmospheric Emissions	LGPA, Ecological Regulation	x		x		Yes
			NOM-CCAT-010-ECOL-993					
	Lubricants	Soil Contamination	Dangerous Waste Regulation	x	x			Yes
	Spare Parts	Industrial Waste				x		
	Used Lubricants	Dangerous Waste	NOM-052-ECOL-1993	x		x		Yes
	Cleaning Waste	Soil Contamination	Dangerous Waste Regulation	x				Yes
Dispose	Fuels	Atmospheric Emissions	LGPA, Ecological Regulation	x	x			Yes
	Lubricants	Soil Contamination	Dangerous Waste Regulation	x	x			Yes
	Spare Parts	Industrial Waste				x		
	Used Lubricants	Dangerous Waste	NOM-052-ECOL-1993	x		x		Yes
	Cleaning Waste	Soil Contamination	Dangerous Waste Regulation	x				Yes
	Bank Material	Flora, Fauna			x	x		
Confine	Cover Material	Dust emission into atmosphere			x			
	Confined Garbage	Generation of Leachates			x	x	x	Yes
	Fuels	Atmospheric Emissions	LGPA, Ecological Regulation	x	x	x		Yes
			NOM-CCAT-010-ECOL-993					
	Used Lubricants	Dangerous Waste	NOM-052-ECOL-1993	x		x		Yes
	Spare Parts	Industrial Waste				x		
	Cleaning Waste	Soil Contamination	Dangerous Waste Regulation	x				Yes
	Operating Equipment	Noise			x			

* Source of foul odors, harmful fauna, urban image

- | | |
|--|--|
| 1 Possible Legal Non-compliance | |
| 2 Magnitude or Frequency of Impact | |
| 3 Effect on natural resources (water, energy) | |
| 4 Effect of the community | |
| 5 Significant ? | |

Appendix E

Sample Letter of Commitment

[TITLE of PROJECT DIRECTOR]

[NAME OF MUNICIPALITY/OFFICE]
[ADDRESS]

DATE

[REGIONAL OFFICER IN CHARGE OF PROJECT]
[U.S. Environmental Protection Agency or USAID]
[ADDRESS]

Dear [NAME OF REGIONAL OFFICER]:

I am pleased to inform you that our municipality is committed to participating in the capacity building and technical assistance program to design and implement an environmental management system (EMS), led by the United States Environmental Protection Agency and the United States Agency for International Development. At present, engineers [NAMES] have been assigned to develop and implement an EMS in the [OPERATING FACILITY] of the City of [NAME OF MUNICIPALITY].

In addition, per your request, all assignees for this project have access to the Internet and e-mail communications. We will also include all the financial, technical, and other necessary materials required for the development and implementation of the EMS in the Annual Budget for [YEAR(S)], the time period for this project.

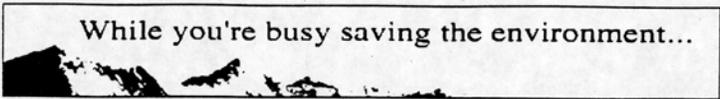
Thank you very much for your assistance.

Sincerely,

[NAME]
[TITLE of PROJECT DIRECTOR]

Appendix F

***ProMuS* Project Press**



AD INFO

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Environmental institute teams with Mexican cities to cut pollution

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Thursday, June 21, 2001
By Environmental News Network

Three Mexican municipalities are taking steps to reduce pollution through a new two year cooperative program with the Washington, D.C. based non-profit Environmental Law Institute. They will put environmental management systems in place to improve overall environmental performance and compliance.



Courtesy Comisión Federal de Electricidad
Electricity generating station in Piedras Negras, Coahuila, México.

The three municipalities - Nogales, Sonora; Piedras Negras, Coahuila; and Zapotlán El Grande, Jalisco - participated in a four day Environmental Law Institute training course in Guadalajara, Mexico in May. The focus was on the development and implementation of an environmental management system for their facilities based on international standards.

The venture is known as the Project of Sustainable Municipalities (ProMuS). The U.S. Environmental Protection Agency (EPA) and the U.S. Agency for International Development are co-sponsors of the project and attended the initial training course.

"Mexico's municipalities are on the front lines of the war against pollution, confronting complex environmental challenges every day. Building an effective environmental management system is a vital part of their strategy to protect the health and welfare of their communities," said Susan Bass, an Environmental Law Institute senior attorney and head of the ProMuS project.

Over the next two years, the Environmental Law Institute team will provide additional training through interactive web activities and on-site training.

In recent years, the voluntary use of environmental management systems has increased as public and private facilities seek to integrate environmental protection into their daily operations, says Bass.

"This project is an important part of EPA's overall effort to develop common sense solutions to environmental problems in partnership with our colleagues in Mexico. We look forward to working with the three municipalities and supporting their efforts for the remainder of the project," said Jim Horne of the EPA.

Two billion people worldwide live without electricity.
But it's no use just talking about it.

All three municipalities are located in highly industrialized regions. Nogales, Sonora is right across the border from Nogales, Arizona. Since 1980, more than 100 maquiladoras - electronics and contract manufacturing plants - have located in the city. Thousands of people from across Mexico have flocked to the area in the hope of jobs, and the city's services and housing have been stretched beyond the limits.

Piedras Negras, Coahuila is just across the U.S. border from Eagle Pass, Texas and about two hours drive south of San Antonio. It is home to industrial parks accomodating textile, graphics and electronics industries, and offering easy shipments to markets in the United States combined with inexpensive labor at Mexican rates.

Zapotlán El Grande in the southwestern state of Jalisco, Mexico, has an economy based on handicrafts such as ceramics, saddlery, bricks, tiles, wrought iron and the manufacture of dental instruments. It is working to decrease the negative environmental impact made by the municipal garbage dump.

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Let us know what you think at
[ENN's Forum Discussion A](#)

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World Wide Web Edition

CNNfn (NY, NY)

Date of Publication: 06/22/2001

Account Number: 2050



Headline: Environmental Institute to Team with Mexican Cities to Cut Pollution

Source Website: <http://www.cnnfn.com>

Source: Environmental News Network

Jun. 21--Three Mexican municipalities are taking steps to reduce pollution through a new two-year cooperative program with the Washington, D.C. based non-profit Environmental Law Institute. They will put environmental management systems in place to improve overall environmental performance and compliance.

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World Wide Web Edition

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“LA NUEVA HACIENDA DISTRIBUTIVA Y EL MUNICIPIO”

- * "México requiere una reforma profunda que de lugar a una verdadera salud y estabilidad financiera"
- * La reforma no parece perseguir el objetivo redistributivo para fortalecer las capacidades y potestades fiscales de los municipios.

México requiere sin duda, una reforma profunda que de lugar a una verdadera salud y estabilidad financiera que hagan posible la puesta en marcha de políticas públicas de corto, mediano y largo plazo, para el bien común. En esa tarea no sólo son corresponsables los tres poderes de la Unión, sino los tres órdenes de gobierno, es decir el Federal, Estatal y Municipal".

Estas fueron las palabras del Presidente Municipal de Tlalnepantla de Baz, Lic. Rubén Mendoza Ayala, socio y representante de nuestra Asociación de Municipios de México durante el "Foro Hacia un Sistema Nacional de Coordinación Hacendaria", organizado por el Centro de Desarrollo Municipal (CEDEMUN) de la Secretaria de Gobernación, el pasado 25 de abril.

"Los municipios asociados a AMMAC hemos asumido esta visión desde la concepción misma del organismo que representamos.

Pensamos que las políticas públicas tienen su mejor derrotero cuando se fincan en el conocimiento real y profundo de los problemas que aquejan al ciudadano. Nada como el Municipio para ubicar los problemas y sobre todo generar una solución".



Lic. Rubén Mendoza Ayala, Presidente Municipal de Tlalnepantla de Baz, durante la exposición de propuestas de AMMAC sobre la Reforma Hacendaria en la reunión con CEDEMUN.

Afirmó que el problema principal subsiste cuando la insuficiencia de recursos para atender la problemática claramente diagnosticada y la ejecución de los programas para resolverla, se enfrentan a la falta de recursos no ocasional sino permanente; no coyuntural sino estructural.

El Presidente Municipal afirmó que si bien el crecimiento en la recaudación federal participable sería

continúa pag. 3.

AMBIENTE MUNICIPAL

Por Oscar Rivas

ORConsultores
Orivas@avantel.net

Esta columna "AMBIENTE MUNICIPAL" tiene como objetivo ser un foro de experiencias de prácticas exitosas desarrolladas en los municipios de México, abarcando los diversos campos de la gestión municipal, como son los servicios públicos, las obras públicas, el desarrollo regional, el desarrollo urbano sustentable, la ecología, la medición del desempeño y todos aquellos temas que sean de interés Municipalista.

En esta primera ocasión nuestro tema es sobre la "**Administración Ambiental**"

AMMAC, a través de sus vinculaciones internacionales firmó un Convenio de Colaboración con un proyecto patrocinado por la USEPA (United States Environmental Protection Agency, Agencia de Protección Ambiental de los Estados Unidos) y la USAID (United States Agency for International Development, Agencia para el Desarrollo Internacional de los Estados Unidos) y bajo la conducción de ELI (Environmental Law Institute, Instituto de Ley Ambiental) y con la participación del ITESM (Instituto Tecnológico de Estudios Superiores de Monterrey, campus Guadalajara), denominado "**PROYECTO DE MUNICIPIOS SUSTENTABLES** (ProMus 2001), con el objetivo de llevar a cabo un proyecto piloto donde se desarrolle la tecnología EMS (Environmental Management Systems, Sistemas de Administración Ambiental) en tres municipios mexicanos, de tal forma que se obtenga la experiencia de buenos resultados que se puedan replicar en el resto de los municipios mexicanos.

Este es un proyecto de dos años de duración y tiene como fin ofrecer asistencia a un grupo reducido de organismos prestadores de servicios públicos locales, brindándoles capacitación y asistencia técnica para que la prestación de dichos servicios incorpore el diseño y ejecución de Sistemas de Administración Ambiental (S.A.A.), basados en el estándar ISO 14001.

En este proyecto participarán dos municipios fronterizos y uno del interior del país, como condición específica del convenio, Nogales, Sonora, Piedras Negras, Coahuila y Zapotlán El Grande, Jalisco.

En la primera etapa de este proyecto se desarrolló un Taller Inicial que tuvo lugar en el Campus Guadalajara del ITESM del 7 al 10 de Mayo del presente año. Al término del mismo se obtuvieron los proyectos preliminares a desarrollar en cada uno de los municipios y, durante los dos años siguientes, se le dará seguimiento a los resultados obtenidos de tal manera que se pueda ir archivando la experiencia obtenida y replicarla en otros municipios de México.

Este proyecto es financiado por recursos proporcionados por las Agencias EPA y AID, con los cuales se financiarán los gastos de los consultores especialistas que participan, los gastos de capacitación, y de asesoría durante los siguientes meses del desarrollo de cada uno de los proyectos.

En AMMAC estamos muy interesados en este tipo de proyectos y en recabar y administrar la información significativa que podamos compartir con nuestros miembros asociados.

He invitado a participar en esta columna AMBIENTE MUNICIPAL, al Sr. Jim Horne, Assitant to the Director, Office of Wastewater Management de la EPA, así como también a Regina Ostergaard-Klem de la USAID y a los responsables de cada uno de los proyectos municipales, para que compartan sus puntos de vista sobre este proyecto y los resultados que se obtengan del mismo.

Por mi parte, estaré en constante contacto con los actores de este proyecto, para seguir informando a través de esta columna, en siguientes números.

Por ahora termino este primer artículo esperando recibir sus observaciones y contribuciones para enriquecer este espacio de reflexión que tiene como pretensión ser un foro donde puedan participar todos los miembros de AMMAC. Saludos.

ooo000ooo



1616 P STREET, N.W., SUITE 200 • WASHINGTON, D.C. 20036
PHONE: 202-939-3800 • FAX: 202-939-3868

Media Advisory

For Immediate Release: June 13, 2001

ELI and Mexican Municipalities Launch Program to Reduce Pollution

The Environmental Law Institute® (ELI) and officials from three Mexican municipalities met recently in Guadalajara, Mexico to launch a two-year project aimed at improving environmental performance at municipal facilities (ProMuS 2000). Over the next two years, the ELI team, which includes EMS experts from the Lexington Group in Boston, MA; Eco-Consulta in San Jose, Costa Rica; and Monterrey Tech in Monterrey, Mexico, will provide additional training through interactive web activities and on-site training. Corporate mentors located in each of the municipalities will also provide technical assistance to the municipalities.

From May 7-10, 2001 the three municipalities, Piedras Negras, Coahuila; Nogales, Sonora; and Zapotlán El Grande, Jalisco participated in a four-day ELI training course on the development and implementation of an environmental management system (or EMS) for their facilities. The US Environmental Protection Agency and the US Agency for International Development are co-sponsors of the project and attended the initial training course.

"Mexico's municipalities are on the front lines of the war against pollution, confronting complex environmental challenges every day. Building an effective environmental management system is a vital part of their strategy to protect the health and welfare of their communities," said Susan Bass, an ELI Senior Attorney and head of the ProMus project.

In recent years, the voluntary use of EMSs has increased as public and private facilities seek to integrate environmental protection into their day-to-day operations. The goal of an EMS is to improve overall environmental performance and compliance. Implementing an EMS will help municipalities to control and minimize environmental risks, reduce operation costs, assure legal compliance, and open or improve channels of communication with the public.

"We were very pleased with the enthusiasm and receptivity to the concept of environmental management systems shown by the participants at the workshop in Guadalajara. This project is an important part of EPA's overall effort to develop common sense solutions to environmental problems in partnership with our colleagues in Mexico. We look forward to working with the three municipalities and supporting their efforts for the remainder of the project," said Jim Horne of the U.S. Environmental Protection Agency.

Representatives from the Mexican Federal Environmental organizations Procuraduría Federal de Protección al Ambiente and the Instituto Nacional de Ecología as well as a representatives from the Mexican Municipalities Association and the International Counties and Municipalities Association, Mexico also attended the four day meeting..

Parts of the project's web page <http://www.promusmex.net/principal.htm> are accessible to the public and will be frequently updated as to the progress of the project.

For more information, contact Susan Bass at ELI, (202) 939-3809 or <bass@eli.org>. The Environmental Law Institute is an independent, non-profit research and educational organization based in Washington, D.C. The Institute serves the environmental profession in business, government, the private bar, public interest organizations, academia, and the press. For more information about ELI visit the website at www.eli.org

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Agency

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Region 9
Arizona, California,
Hawaii, Nevada
Pacific Islands

Environmental News



For Immediate Release: June 12, 2002
Contact: Wendy L. Chavez, 415/760-5422
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MEDIA ADVISORY

MEXICAN MUNICIPALITIES TO BE HONORED FOR ENVIRONMENTAL PERFORMANCE AT MUNICIPAL FACILITIES

SAN FRANCISCO – The U.S. Environmental Protection Agency, the U.S. Agency for International Development and the Environmental Law Institute will honor three Mexican municipalities for completing a two-year pilot project aimed at improving environmental performance at municipal facilities.

Managed by ELI, the ProMuS 2001 project trained teams from Piedras Negras, Coahuila; Nogales, Sonora; and Zapotlán El Grande, Jalisco on implementing an environmental management system. The targeted municipal operations included a landfill operation and a waste transport system in Piedras Negras, a potable water supply system in Nogales and a wastewater treatment plant in Zapotlán El Grande.

The municipalities will also present at the event their achievements and future plans for their environmental management systems.

WHAT: Ceremony and presentations

WHERE: Hyatt Regency Islandia on San Diego's Mission Bay
1441 Quivira Road
San Diego, Calif.

WHEN: 2:30 p.m. – 5:30 p.m.
5:30 p.m. - 7:30 p.m. (reception)

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VISIT OUR HOME PAGE FOR UP-TO-DATE ENVIRONMENTAL NEWS & INFORMATION:
<http://www.epa.gov/region09>

Environmental News



For Immediate Release: June 12, 2002
Contact: Wendy L. Chavez, 415/760-5422
chavez.wendy@epa.gov

MEXICAN MUNICIPALITIES IMPROVE ENVIRONMENTAL PERFORMANCE AT MUNICIPAL FACILITIES

SAN FRANCISCO – At a ceremony today, the U.S. Environmental Protection Agency, the U.S. Agency for International Development and the Environmental Law Institute honored three Mexican municipalities for completing a two-year pilot project aimed at improving environmental performance at municipal facilities.

Managed by ELI, the ProMuS 2001 project trained teams from Piedras Negras, Coahuila; Nogales, Sonora; and Zapotlán El Grande, Jalisco on implementing an environmental management system. The targeted municipal operations included a landfill operation and a waste transport system in Piedras Negras, a potable water supply system in Nogales and a wastewater treatment plant in Zapotlán El Grande.

“This project is a great example of how the U.S. and Mexico can work together to improve environmental conditions along the border,” said Bonnie Barkett of the EPA’s Partnership for Sustainability program for the Pacific Southwest region. “The lessons learned from this effort will be useful to Mexico and the U.S. as we continue to tackle serious environmental and public health issues that face our nations.”

“The project has helped us to identify the areas where we are not complying with state and federal laws as well as to make more efficient use of the equipment,” said Rafael Martinez, the director of ecology at the Municipality of Piedras Negras. “Basically, because we had never before made an in depth analysis of our operation, we have found that there are a lot of things that we are and will continue to change about our operation -- from the path of our disposal routes to our schedules, all the way to preventative maintenance of the trucks.”

Each municipality was paired with a bilingual EMS expert and a local corporate mentor. During the initial eight months of the project, the participants attended two intensive ELI training workshops in Guadalajara and San Diego to learn how to design and implement an EMS.

The ELI team, which includes EMS experts from the Lexington Group in Boston, Mass., Eco-Consulta in San Jose, Costa Rica, and Monterrey Tech in Monterrey, Mexico, provided training through interactive web activities and on-site visits. Corporate mentors located in each of the municipalities provided technical assistance.

For more information on the Promus 2001 pilot project, visit www.promusmex.net/principal.htm or contact Bonnie Barkett at (415) 947-4162 or email at barkett.bonnie@epa.gov.

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**VISIT OUR HOME PAGE FOR UP-TO-DATE ENVIRONMENTAL NEWS & INFORMATION:
<http://www.epa.gov/region09>**

Appendix G

Task Sets and Timelines

ProMuS 2000 -- EMS Implementation Issues (by Task) for COAPAES-Nogales	
First set of Tasks (assigned in May 2001 and due to be completed by August 1, 2001)	The EMS implementation effort got off to a complicated start. At the first workshop, COAPAES was represented by a very senior manager of the State organization, the organization's chief of border cooperation (also quite senior) and a very junior person -- the only one physically based in Nogales. Nonetheless, they were able to complete most of the first set of tasks prior to the October workshop. At the October workshop, a reconfigured team, led by a more senior Nogales-based manager, participated and made the decision to change the EMS fenceline. The change from wastewater operations to water supply was considered necessary and desirable, due to internal organizational issues. Further assessment showed that that side of COAPAES operations was in particular need of improvement and management control. Most of the tasks were completed in September, and much of the work was directly transferable to the new fenceline.
1. Designate the EMS Management Representative and EMS Coordinator (can be the same person) and establish the EMS Implementation Committee	COAPAES designated Carlos Hernandez (Director of Border Cooperation) as the EMS Management Representative. The EMS implementing committee was established and included Jaime Davila (Director of Project Planning), Carlos Hernandez, Cesar Espinoza (Manager of Projects at the Nogales office), and Issa Yolanda Gutierrez (junior engineer in the Nogales office). At the October 2001 training session, Cesar Espinoza was designated project coordinator.
2. Complete the EMS Readiness Self-Assessment (Gap Analysis) Questionnaire (sent by electronic mail on May 14, 2001)	The self-assessment was completed in July 2001 and results sent to ELI. It is important to note, however, that COAPAES-Nogales changed the fenceline for their EMS in October 2001. The new relevant self-assessment was completed in November 2001, but included most of the same elements
3. Conduct process mapping of activities and operations (within EMS scope), including auxiliary services and identification of environmental aspects in areas not directly related to production	The process mapping of the wastewater operations was completed in August 2001. The new process mapping for the water supply system was completed in November 2001. The scope of the EMS was finally defined in October 2001 as all water supply operations from well-head to residential hook-up and all direct supporting operations.
4. Prepare a diagram of the inputs and outputs of area/site within the scope of the EMS	This was done at the same time as the process mapping activity (both for the wastewater operations, August, and for the water operation, December)

<p>5. Identify the environmental aspects and briefly describe the <i>environmental impacts</i> of each (use the excel format)</p>	<p>Completed by Cesar Espinoza in January 2002</p>
<p>6. Finalize criteria of significance</p>	<p>The EMS Committee determined the criteria of significance in September 2001</p>
<p>7. Evaluate the significance of the identified environmental aspects (document this process in the same excel format).</p>	<p>The EMS Committee applied the criteria of significance to the identified environmental aspects and determined that 11 environmental aspects are "Significant Environmental Aspects". Preliminary version was completed in January 2002, the final version was completed in March 2002.</p>
<p>8. Determine the Significant Environmental Aspects (SEAs)</p>	<p>The EMS Committee applied the criteria of significance to the identified environmental aspects and determined that 7 environmental aspects are "Significant Environmental Aspects". This was completed in October 2001 before the San Diego workshop.</p>
<p>9. Apply the root cause analysis tool (if applicable) to prepare an outline of optimal feasible operational controls for each SEA</p>	<p>The root cause analysis for the water supply system was conducted by Cesar Espinoza and Issa Gutierrez. The task proved to be rather complex, and required extensive consultation and input from a number of departments within COAPAES. There was difficulty making a clear distinction between root causes and the absence of controls (effect versus cause). Consultant support helped define potential effects to a narrow group -- loss of water, reduction of water quality, and worker/resident safety. This clarified the issue substantially, and permitted a clearer understanding of operational controls. It required an on-site visit by a member of the consulting team (March 2002) to sufficiently refine operational controls to address significant aspects.</p>
<p>10. Identify the "key positions" of employees, contractors/suppliers whose jobs/tasks are related to the Significant Environmental Aspects.</p>	<p>The geographically and departmentally diverse nature of the fenceline means that a rather large number of positions need to be addressed. Wellhead operations require a number of security and measurement tasks, pipe operations and maintenance require procedures. The key positions were documented in January 2002 and refined in April 2002.</p>
<p>11. Prepare a list of legal requirements (laws, regulations and technical environmental standards, federal, state and local) and "other</p>	<p>This task turned out to be unexpectedly difficult. The COAPAES-Nogales legal person was not familiar with many environmental issues. His effort was a rather lengthy learning process that required a lot of support from the main office. Initial efforts focusing on the wastewater operations were nearly impossible to close. The consensus of the local and state teams were</p>

<p>requirements” (such as environmental commitments voluntarily made by the Municipality) that apply to the identified environmental aspects. (With the help of the assigned Mentor)</p>	<p>that many of the legal requirements were so unclear as to make compliance relatively meaningless.</p> <p>With the water supply fenceline, legal issues were simplified. The regulatory system in this area is more clear. Additional areas included worker health and safety and electrical safety.</p> <p>As of May 2002, the team was confident that they had identified all relevant regulatory requirements. There were a few remaining interpretation issues necessary to guide response.</p>
<p>12. Prepare a draft of the Environmental Policy and initiate the review and comment process at the level of the Municipality’s Council and Mayor.</p>	<p>The EMS team prepared a draft of the Environmental Policy in July 2001 and submitted it to COAPAES senior management where it was approved in September 2001.</p>
<p>Second set of Tasks (assigned in October 2001 and due to be completed by January 15, 2002)</p>	
<p>1. Prepare a brief description of each Significant Environmental Aspect (SEA)</p>	<p>Espinoza and Gutierrez completed the descriptions of 8 previously identified SAAs in February 2002. Three SAA's were added and two were changed as a result of consultant visit in March 2002. The remaining descriptions were complete in March 2002. The team had some difficulty with the specific descriptions. We had hoped that the mentor organization (Otis Elevators de Mexico) would have helped. However, they were unable to actively maintain their participation after their presence in the October 2001 seminar.</p>
<p>2. Conduct a root cause analysis of each SEA</p>	<p>This is a repeat of #9 in the first set of Tasks. We repeated it because none of the municipalities had done the root cause analysis (or none did it correctly) as of the October workshop. The local team was unable to correctly and sufficiently define this set of tasks, even after the second workshop. The team achieved about 75% of what was necessary by February 2002. Not until the consultant visit in March 2002 was the team able to nail down this issue.</p>
<p>3. Prepare a list of the “critical activities” related to each SEA</p>	<p>The geographically and departmentally diverse nature of the fenceline means that a rather large number of positions need to be addressed. Wellhead operations require a number of security and measurement tasks, pipe operations and maintenance require procedures. The key positions were documented in January 2002 and refined in April 2002. As of June 2002, the procedures were awaiting attention by the human resources department for future inclusion in job</p>

	descriptions.
4. Identify the job positions associated with each "critical activity" (including indirectly associated job positions donde where there exists the possibility of indirect control e.g. Purchasing)	Same as above.
5. Determine what will be monitored with respect to each SEA ("key characteristic") and the operational indicator for measuring what is monitored.	<p>The EMS team had some difficulty here. There was a lack of understanding regarding what constituted a monitoring requirement. Consequently, the team did well on those items that required monitoring in the traditional sense (water parameters and other quantitative measures). They did not understand that for discrete items (electrical connection boxes to be correctly encased and signed) that monitoring could include presence of boxes and signs. This probably requires some additional clarification in the course materials. Only after the consultant visit in March 2002 were these issues clarified and monitoring parameters correctly established.</p> <p>It required a rather creative effort by the consultant (Bien, not Pratt, to give appropriate credit) to explain the different options and identify monitoring parameters for a number of discrete SAAs.</p>
<p>6. Draft Work Instructions (or operational control procedures) for each SEA that include:</p> <ul style="list-style-type: none"> • The responsible person (responsible persons) • What will be monitored and monitoring frequency • The format (record) for documenting monitoring results • Monitoring equipment (if applicable) NOTE: determine whether monitoring will be done by 	<p>As of January 15, 2002, this item had not been completed.</p> <p>As of May 2002, the team had completed drafts for all control points identified in the analysis of the SAAs. They had been submitted for senior management review and subsequent incorporation by human resources department.</p> <p>This effort proved to be unclear to the program participants. It also turned out to be much harder to develop than previously thought, due to lack of an updated format for job descriptions. In addition, the team found that most of the critical positions did not have detailed job descriptions (or where they existed were out of date or not directly on point).</p>

<p>employees or by external parties (contractors)</p>	
<p>7. Identify the data or information that will be communicated internally and externally. Draft an outline (brief plan) of the process for such communication</p>	<p>A general plan was adopted at COAPAES-Nogales. COAPAES-Nogales was found to have few existing mechanisms for communicating with stakeholders. The existence of the program and its broad goals was communicated internally to all departments through meetings. Externally, the organization plans to use a standing citizens committee. This committee includes community representatives, NGO's and media organizations.</p> <p>As of May 2002, there was evidence of at least limited communication according to the plan.</p>
<p>8. Draft the Awareness Training Program (for all employees and contractors working on site)</p>	<p>Plan completed as of May 2002. First round of training for department heads completed. Additional training is planned. I suspect that the team has made this a lower priority in an effort to complete the more technical tasks.</p>
<p>9. Complete the Matrix Tool for identifying training needs for the job positions related to the Significant Environmental Aspects.</p>	<p>This item had not been completed as of May 2002.</p>
<p>10. Schedule the training identified in #9 (<i>to be completed before April 1, 2002</i>)</p>	<p>This item had not been completed as of May 2002.</p>
<p>11. Establish between 1 and 3 Environmental Objectives (each Objective must be based on one of the SEAs)</p>	<p>Draft objectives were completed in April 2002. As of May 2002, they had not been formally approved.</p>
<p>12. Establish one or more Targets for each Objective</p>	<p>Draft targets were completed in April 2002. As of May 2002, they had not been formally approved.</p> <p>Objectives and targets are pending formal approval by the head of COAPAES's Nogales operations.</p>

13. Define the measureable indicators for measuring progress towards Targets(one or more indicators for each Target)	Established in May 2002. Interesting for Nogales' system. For several of the SEAs, the indicator is the same as the objective (signage, enclosure, <i>etc.</i>).
14. Continue developing the EMS Manual and procedures corresponding to operational control, training, and internal/external communication.	By May 2002, the EMS Committee had prepared a good draft EMS Manual and procedures covering most of the EMS elements. The team will need additional time to complete all the details of the manual, but I believe it is currently more than sufficient to direct operations.
Third set of Tasks (assigned in October 2001 and due to be completed by April 30, 2002)	
1. Develop Action Plans for each Target (Environmental Management Programs required by Section 4.3.4, ISO 14001)	Action plans completed in April 2002. Pending management approval (COAPAES-Nogales director)
2. Complete the Matrix Tool – Monitoring Significant Environmental Aspects and related information <i>(Matrix attached)</i>	<p>SAME ANSWER AS #5, Second Set of Tasks: The EMS team had some difficulty here. There was a lack of understanding regarding what constituted a monitoring requirement. Consequently, the team did well on those items that required monitoring in the traditional sense (water parameters and other quantitative measures). They did not understand that for discrete items (electrical connection boxes to be correctly encased and signed) that monitoring could include presence of boxes and signs. This probably requires some additional clarification in the course materials. Only after the consultant visit in March 2002 were these issues clarified and monitoring parameters correctly established.</p> <p>It required a rather creative effort by the consultant (Bien, not Pratt, to give appropriate credit) to explain the different options and identify monitoring parameters for a number of discrete SAAs.</p>
3. Prepare the format (record) for documenting communications from external stakeholders (Receipt and management of complaints, <i>etc.</i>)	COAPAES intends to use the existing system of "complaints and anomalies" to monitor stakeholder input. The exact mechanisms to do so have not yet been defined.

4. Draft the Emergency Preparedness and Response Plan and procedure (Contingency Plan)	The team did not complete this task
5. Develop a process for identifying and managing "non conformities" and for taking corrective and preventive actions	The team did not complete this task
6. Conduct a compliance review to determine the compliance status with respect to applicable environmental regulations and other requirements	The team has not yet had time to enter into this level of review (as of August 2002).
7. Conduct an EMS Management Review (oriented to review progress towards completing the EMS implementation effort)	The team has not yet had time to enter into this level of review (as of August 2002).
8. Conduct a test of the Emergency Preparedness and Response Plan	This had not been done as of May 2002.
9. Establish the Internal EMS Audit Program <i>(with assistance of the consultant and/or mentor)</i>	As of June 2002, the EMS Audit Program had not yet been developed.
10. Complete the EMS Manual and the procedures corresponding to monitoring, checking and corrective action, internal EMS audits, and Management Review.	As of June 2002, the EMS Manual has been completed. Most of the Procedures have been completed.
11. Conduct at least one internal audit of the EMS	This had not been done as of June 2002.

General Comments:

Nogales has made significant progress between May 2001 and June 2002 in implementing its EMS. Most U.S. municipalities participating in EPA's public entity EMS projects have not completed their EMS implementation within 12 months of startup. Nogales has substantially completed the EMS design and documentation and has begun to implement a few of the defined EMS processes. Key EMS elements that have not been implemented include training key employees, the awareness training program, monitoring the SEAs, the process for managing non-conformities, the EMS Audit Program and the Management Review process.

The process of implementing the EMS was slower and less efficient than it could have been due to a number of factors. First, COAPAES underestimated the level of experience needed by the local coordinator, and overestimated the amount of time and oversight that the capital based senior staff would have available to support the effort. Consequently, a very junior person struggled for several months without the necessary guidance or assistance. Also due to the miscalculation, the initial course was attended by two people not directly involved in the implementation (they are in an oversight role). This situation was corrected in October with the assignment of Cesar Espinoza, a mid level manager with appropriate experience and training, as project coordinator. Cesar familiarized himself with the project and its goals very quickly, and with support from Issa, was able to make rapid and solid progress. With two trained staff, the project accelerated exponentially. In a span of less than three months, nearly all of the first two sets of tasks were completed, in spite of a change of project fenceline.

The process would have advanced more effectively and with less frustration had there been a local consultant around to advise on a more regular basis. For unknown reasons, the Nogales team made only very little use of the local consultant team (either through email or the online capacities). There were also problems with the mentor program. Two mentors attended the San Diego session, committed to help but were unavailable subsequently despite undisputed commitment from the highest management levels of United Technologies.

There is a clear and important commitment from COAPAES management for this project. As the State water authority, COAPAES is looking to replicate this effort in a number of municipalities in the coming years. Given the severe resource constraints of public organizations in Mexico, the assignment of resources to this project reflects a good (though not overwhelming) commitment to the project. At the local level (COAPAES-Nogales), it is not clear how much support the program has in operations. There is evidence of support, but true commitment will only become evident in the coming months as the EMS plans begin to be implemented.

ProMuS 2000 -- EMS Implementation Issues (by Task) for Piedras Negras Municipality	
First set of Tasks (assigned in May 2001 and due to be completed by July , 2001)	The three member implementation team at Piedras Negras (PN) started the process with a very good “tempo” doing the following tasks by the second week of July: Gap Analysis, Environmental Aspects and Impacts identification through process mapping, draft of the Environmental Policy. They made a very good effort but a reworking of the tasks was necessary.
1. Designate the EMS Management Representative and EMS Coordinator (can be the same person) and establish the EMS Implementation Committee	PN designated Ing. Arturo Garza, Director of Public Works Area, as the EMS Management Representative. Ing. Rafael Enrique Martinez was designated as EMS coordinator and Ing. Juan Francisco de la O Gutierrez, Director of Planning, was ratified as part of the PN implementation team. Additionally, Ing. Marco Antonio Cardozo, the landfill manager (subcontractor) was considered part of the team.
2. Complete the EMS Readiness Self-Assessment (Gap Analysis) Questionnaire (sent by electronic mail on November, 2001)	The self-assessment was completed by PNM in July and reviewed by the assigned consultant until November 2001 with the results sent to ELI.
3. Conduct process mapping of activities and operations (within EMS scope), including auxiliary services and identification of environmental aspects in areas not directly related to production (<i>e.g.</i> , outside wastewater treatment plant but within EMS scope)	<p>The PN team conducted the process mapping of the “alumbrado público” (public lighting) and the landfill, including waste recollection and transport. The scope of the EMS was defined as all PN waste management and public lighting activities.</p> <p>Unfortunately the assigned consultant, at site visit from November 2001, found several weaknesses in these tasks due false concepts and misunderstandings about the ISO 14001 requirements. It was necessary to rework part of this task. The PN team attributed the results to the lack of examples related to municipality’s from the Guadalajara workshop and also to the lack of monthly on-site follow-up from the consultant.</p>
4. Prepare a diagram of wastewater piping/channels and stormwater discharge points for the area/site within the scope of the EMS	Not applicable to PN. Instead waste recollection, transport and disposition were described in flow diagrams.
5. Identify the environmental aspects and briefly describe the <i>environmental impacts</i>	The PN team completed the identification of the environmental impacts using the excel format. This task was completed around July 2001 and reviewed in November 2001. During the review

of each (use the excel format)	it was clear to the PN team that the scope of the EMS was too complex. As a result, the team decided to focus only on waste management in the PN EMS.
6. Finalize criteria of significance	The EMS Committee determined the criteria of significance in November 2001.
7. Evaluate the significance of the identified environmental aspects (document this process in the same excel format).	The PN team applied the criteria of significance to the identified environmental aspects and determined that 5 environmental aspects are "Significant Environmental Aspects". This was completed in November 2001.
8. Determine the Significant Environmental Aspects (SEAs)	The PN team applied the criteria of significance to the identified environmental aspects and determined that 5 environmental aspects are "Significant Environmental Aspects", such as: leachates, used oil, spare parts, fuel and oil.
9. Apply the root cause analysis tool (if applicable) to prepare an outline of optimal feasible operational controls for each SEA	This task was completed later. See second set of tasks.
10. Identify the "key positions" of employees, contractors/suppliers whose jobs/tasks are related to the Significant Environmental Aspects.	This task was completed later. See second set of tasks.
11. Prepare a list of legal requirements (laws, regulations and technical environmental standards, federal, state and local) and "other requirements" (such as environmental commitments voluntarily made by the municipality) that apply to the identified environmental aspects. (With the help of the assigned Mentor)	The PN made a review of applicable legislation and regulations, but they did not have experience in, nor previous knowledge of, this theme. The consultant completed the list but it was not enough because the environmental aspects identification was incomplete. Later on (January 2001) the final version of the legal requirements list was completed.
12. Prepare a draft of the Environmental Policy and initiate the review and	The PN team prepared a draft of the Environmental Policy in July 2001. The consultant reviewed it and proposed several changes because too many different environmental issues

comment process at the level of the municipality's Council and Mayor.	were addressed and the document lacked focus. After some corrections (via email and telephone calls); it was submitted to the Mayor and City Council for approval. An "Acta" of the PN Municipal Council formally approved the Policy in December 2001.
Second set of Tasks (assigned in October 2001 and due to be completed by January 15, 2002)	The EMS implementation process suffered several delays due to a lack of resource allocation and political support for the project. The mayor was not completely involved during the process and delegated all responsibility to the implementation team. Due to organizational changes, the team was reduced to just one person (Ecology Department Director) with some help from the PN landfill manager (subcontractor). The PN team was not allowed to participate in the San Diego Workshop in October due to political circumstances in PN.
1. Prepare a brief description of each Significant Environmental Aspect (SEA)	The PN team prepared brief descriptions of five (5) SEAs by January 2002.
2. Conduct a root cause analysis of each SEA	Since the team was unable to participate in the San Diego workshop, the PN team had difficulty developing the root cause analysis for the SEAs. After the second site visit in January 2002, with explanations from the junior consultant, the team was able to complete the task. The team decided to work with just one of the SEAs first, and later would cover all 5 SEAs to finish the task by March 2002.
3. Prepare a list of the "critical activities" related to each SEA	Following the example of root cause analysis as mentioned in 2. The task was finished in March 2002.
4. Identify the job positions associated with each "critical activity" (including indirectly associated job positions donde where there exists the possibility of indirect control e.g. Purchasing)	Following the example of root cause analysis as mentioned in 2. The task was finished in March 2002.
5. Determine what will be monitored with respect to each SEA ("key characteristic") and the operational indicator for measuring what is monitored.	Following the example of root cause analysis as mentioned in 2. The task was finished in March 2002.
6. Draft Work Instructions (or operational control procedures) for each SEA that	As of June 2002, the PN team had completed only a draft of the Work Instructions, which were all related to landfill operations and maintenance operations. The work instruction related to

<p>include:</p> <ul style="list-style-type: none"> • The responsible person (responsible persons) • What will be monitored and monitoring frequency • The format (record) for documenting monitoring results • Monitoring equipment (if applicable) NOTE: determine whether monitoring will be done by employees or by external parties (contractors) 	<p>waste recollection and transport were in development.</p> <p>The ecology director, EMS coordinator, was alone in carrying the burden of developing the documentation since January 2002 and has not had much time to devote to the effort. The landfill manager also provided assistance, however the two had different opinions on the functions of the documentation formats and what information would be included in the documentation.</p>
<p>7. Identify the data or information that will be communicated internally and externally. Draft an outline (brief plan) of the process for such communication</p>	<p>This item was completed in January 2002.</p>
<p>8. Draft the Awareness Training Program (for all employees and contractors working on site)</p>	<p>This item was completed in January 2002.</p>
<p>9. Complete the Matrix Tool for identifying training needs for the job positions related to the Significant Environmental Aspects.</p>	<p>This item was completed in January 2002 and reviewed in June 2002.</p>
<p>10. Schedule the training identified in #9 (<i>to be completed before April 1, 2002</i>)</p>	<p>This item was completed in January 2002 and reviewed in June 2002. The training program is scheduled to occur between July, August and September 2002</p>
<p>11. Establish between 1 and 3 Environmental Objectives (each Objective must be based on one of the SEAs)</p>	<p>The PN team prepared 3 draft Objectives and some Targets in January 2002. The junior consultant reviewed these and recommended changes.</p>

12. Establish one or more Targets for each Objective	The PN team prepared 3 draft Objectives and some Targets in January 2002. The junior consultant reviewed these and recommended changes.
13. Define the measurable indicators for measuring progress towards Targets (one or more indicators for each Target)	The measurable indicators have been defined as "milestones" toward completion of the Targets. This was completed in January 2002.
14. Continue developing the EMS Manual and procedures corresponding to operational control, training, and internal/external communication.	A draft of the manual and procedures was finished in January 2002 and reviewed during the site visit. By June 2002, a final "draft" version of the manual was completed, and all EMS procedures were finished. Only the e specific environmental procedures were still in development.
Third set of Tasks (assigned in October 2001 and due to be completed by April 30, 2002)	
1. Develop Action Plans for each Target (Environmental Management Programs required by Section 4.3.4, ISO 14001)	<p>The EMS Committee prepared draft Action Plans for the 3 Objectives and some Targets in April 2002. During the senior consultant's May 2002 visit, these changes were reviewed and recommended were made.</p> <p>The EMS Committee sent revised Action Plans together with the proposed Objectives and Targets to the Mayor and Council in early June 2002, and the Council formally approved the Objectives and Targets and Action Plans during the week before the June San Diego event.</p>
2. Complete the Matrix Tool – Monitoring Significant Environmental Aspects and related information <i>(Matrix attached)</i>	<p>SAME ANSWER AS #5, Second Set of Tasks: The EMS Committee has struggled with identifying the monitoring requirements. The senior consultant worked through some more examples with them during my January 2002 visit. By the time of my May 2002 visit, they had made some progress but have not finished. Here is another example of where local EMS consultant could have speeded up the process.</p> <p>This requires some thought and time to work through. The plant manager has been doing most of the EMS implementation work since the October workshop, and has not had much time to devote to the effort.</p> <p>This is a "lack of time" issue.</p>

3. Prepare the format (record) for documenting communications from external stakeholders (Receipt and management of complaints etc.)	This item was completed in January 2002 and reviewed in September 2002.
4. Draft the Emergency Preparedness and Response Plan and procedure (Contingency Plan)	This item was completed in January 2002 and reviewed in September 2002. As a reference to the EMS PNM is using the city's contingency plan. It includes scenarios and action plans for fire, spills and nature catastrophes.
5. Develop a process for identifying and managing "non conformities" and for taking corrective and preventive actions	This item was completed in January 2002 and reviewed in September 2002.
6. Conduct a compliance review to determine the compliance status with respect to applicable environmental regulations and other requirements	This had not been completed as of September 2002. This is a "lack of time" issue.
7. Conduct an EMS Management Review (oriented to review progress towards completing the EMS implementation effort)	This had not been completed as of September 2002. This is a "lack of time" issue.
8. Conduct a test of the Emergency Preparedness and Response Plan	This had not been completed as of September 2002. This is a "lack of time" issue.
9. Establish the Internal EMS Audit Program (<i>with assistance of the consultant and/or mentor</i>)	This had not been completed as of September 2002. This is a "lack of time" issue.

10. Complete the EMS Manual and the procedures corresponding to monitoring, checking and corrective action, internal EMS audits, and Management Review.	As of September 2002, the EMS Manual was completed. Approximately 80 percent of the Procedures were also completed.
11. Conduct at least one internal audit of the EMS	This had not been done as of September 2002. This is a "lack of time" issue.
<p>General Comments:</p> <p>PN has developed and begun to implement a sound EMS between July 2001 and September 2002. Key EMS elements that have not been implemented include training key employees, monitoring the SEAs, the EMS Audit Program and the Management Review process.</p> <p>PN EMS implementation could have progressed more quickly, with more success, if the team had:</p> <ul style="list-style-type: none"> - A local EMS consultant to provide more month-to-month guidance - More people resources and time to devote to the project. - A guide or handbook of "how to do it" with examples related to Municipalities situations - A proactive political environment and a more consistent commitment from the Mayor for the resources allocation and political support. <p>Due mentor's agenda and confidentially issues on the part of the municipality, it was not possible to arrange local support for the PN implementation team. The idea to use a local mentor instead of the faculty was good but not feasible to be implemented.</p> <p>The EMS representative, Director of the Public Works area, showed no leadership during the implementation process and this situation is related to the Mayor's lack of firm commitment. Possible reasons for this situation could be:</p> <ul style="list-style-type: none"> - No EMS project sale at "top management level" - No quick results to show to the public and the municipality council - No understanding of the scope of the project and resources needed from upper management - No immediate visible political and economic gain from project results 	

Promotora Ambiental de la Laguna, S.A. de C.V. (PASA), the subcontractor for the landfill operation, is planing to finish the EMS implementation and is trying to become certified by the end of 2002 or beginning of 2003. The actual municipality government will change in September 2002 and it is expected that the new Mayor would like to continue with the EMS implementation but this is not certain.

ProMuS 2000 -- EMS Implementation Issues (by Task) for Zapotlán El Grande	
First set of Tasks (assigned in May 2001 and due to be completed by August 1, 2001)	In general, the EMS implementation effort got off to a successful start, particularly in terms of establishing the EMS "organizational structure," environmental aspect/impact identification via process mapping. Most of the tasks were actually completed in September (most likely in anticipation of the October workshop).
1. Designate the EMS Management Representative and EMS Coordinator (can be the same person) and establish the EMS Implementation Committee	The Zapotlán El Grande (Zapotlán) team designated Arq. Rubén Medina as the EMS Management Representative. Rubén is a member of the Council and is Vice-Mayor. His appointment was made by the Mayor sometime in June 2001. The EMS Committee was established at the same time, consisting of Rubén, Marco Antonio Flores (Director of Water and Sewer Services or SAPACG), Arq. Miguel Frías (Director of Public Services, including solid waste management), and Ing. Oscar Barragán (Wastewater Treatment Plant Manager). The EMS Committee Coordinator is also the Management Rep. (Rubén).
2. Complete the EMS Readiness Self-Assessment (Gap Analysis) Questionnaire (sent by electronic mail on May 14, 2001)	The self-assessment was completed in July 2001 and results sent to ELI. The team completed this without any difficulty.
3. Conduct process mapping of activities and operations (within EMS scope), including auxiliary services and identification of environmental aspects in areas not directly related to production (e.g., outside wastewater treatment plant but within EMS scope)	<p>The EMS Committee and key employees of the wastewater treatment plant conducted the process mapping of the wastewater treatment operations and activities during July, August and September, 2001.</p> <p>The scope of the EMS was defined as all wastewater treatment plant activities and operations inside the perimeter of the plant.</p>
4. Prepare a diagram of wastewater piping/channels and stormwater discharge points for the area/site within the scope of the EMS	This was done at the same time as the process mapping activity.
5. Identify the environmental aspects and briefly describe the <i>environmental impacts</i> of each	The wastewater treatment plant manager completed the identification of the environmental impacts using the excel format. Completion approximately September 2001.

(use the excel format)	
6. Finalize criteria of significance	The EMS Committee determined the criteria of significance in September 2001
7. Evaluate the significance of the identified environmental aspects (document this process in the same excel format).	The EMS Committee applied the criteria of significance to the identified environmental aspects and determined that 7 environmental aspects are "Significant Environmental Aspects". This was completed in October 2001 before the San Diego workshop.
8. Determine the Significant Environmental Aspects (SEAs)	The EMS Committee applied the criteria of significance to the identified environmental aspects and determined that 7 environmental aspects are "Significant Environmental Aspects". This was completed in October 2001 before the San Diego workshop.
9. Apply the root cause analysis tool (if applicable) to prepare an outline of optimal feasible operational controls for each SEA	Most of the root cause analysis work was done by the plant manager, although root cause analysis (and how to do it) was discussed in the regular weekly meetings of the EMS Committee. It appears that the EMS Committee was having some difficulty understanding how to apply the root cause analysis. The Committee tended to identify corrective actions or controls rather than underlying "causes", so the results were somewhat inaccurate. The senior consultant reviewed this with the EMS Committee in January 2002 when he made his first visit to Zapotlán. Here is a good example of why more local EMS support is necessary. It is very difficult to work through root cause analysis in a long distance telephone conversation or via email.
10. Identify the "key positions" of employees, contractors/suppliers whose jobs/tasks are related to the Significant Environmental Aspects.	This was a relatively straightforward process because there are only 6 employees. The plant manager correctly named the positions when the senior consultant visited Zapotlán in January 2002. However, the plant manager still had not documented these key positions by the time of the senior consultant's second visit in May 2002.
11. Prepare a list of legal requirements (laws, regulations and technical environmental standards, federal, state and local) and "other requirements" (such as environmental commitments voluntarily made by the Municipality) that apply to the identified environmental aspects. (With the help of the	<p>The EMS Committee has struggled with this part and has asked for support from the State of Jalisco's Dept. of Ecology, with somewhat mixed results. It appears that even the state environmental agency is unclear on just what federal and state environmental requirements apply to the wastewater treatment plant.</p> <p>The senior consultant reviewed this in January 2002 and made some suggestions. But this part of the EMS is still a "work in progress".</p>

assigned Mentor)	
12. Prepare a draft of the Environmental Policy and initiate the review and comment process at the level of the Municipality's Council and Mayor.	The EMS Committee prepared a draft of the Environmental Policy in June 2001 and submitted it to the Mayor and City Council for approval (after first vetting it with an Advisory Group to the Council). The Policy was formally approved by an "Acta" of the Zapotlán Municipal Council in July 2001.
Second set of Tasks (assigned in October 2001 and due to be completed by January 15, 2002)	
1. Prepare a brief description of each Significant Environmental Aspect (SEA)	The EMS Committee (but mainly the plant manager) prepared brief descriptions of 3 SEAs (out of a total of 7). They had not prepared descriptions for the other 4 SEAs as of January 2002 when the senior consultant visited Zapotlán because they had assumed they only needed to prepare these descriptions for those SEAs for which they were planning to establish Environmental Objectives and Targets. Even though the faculty explained in the October San Diego workshop that this task applied to all the SEAs, and that the purpose was to clarify for team members what they needed to control (EMS operational controls requirement) and to help them understand the training requirements related to each SEA, it appears that these lessons did not resonate with them. Here is another example of where a local EMS consultant would have helped them through the process.
2. Conduct a root cause analysis of each SEA	This is a repeat of #9 in the first set of Tasks. None of the Municipalities had done the root cause analysis (or none did it correctly) as of the October workshop. The EMS Committee continued to have trouble with this task and it still had not been completed by the time of my January 2002 visit. Even after the senior consultant went over it again in January with the plant manager, the root cause analysis had only been partially completed as of the May 2002 visit. The EMS Committee understands what the basic root causes are for each SEA, but they have had trouble reaching those results via the root cause analysis methodology. Note: the scores of Mexican company managers that the senior consultant has worked with on EMS have had no trouble doing the root cause analysis. Maybe the problem is that public employees are wholly unused to this way of looking at issues.

<p>3. Prepare a list of the “critical activities” related to each SEA</p>	<p>SAME ANSWER AS #10 in first set of Tasks: This was a relatively straightforward process because there are only 6 employees. The plant manager correctly named the positions when the senior consultant visited Zapotlán in January 2002. However, the plant manager still had not documented these key positions by the time of my second visit in May 2002.</p>
<p>4. Identify the job positions associated with each "critical activity" (including indirectly associated job positions donde where there exists the possibility of indirect control e.g. Purchasing)</p>	<p>SAME ANSWER AS #10 in first set of Tasks: This was a relatively straightforward process because there are only 6 employees. The plant manager correctly named the positions when I visited Z in January 2002. However, the plant manager still had not documented these key positions by the time of my second visit in May 2002.</p>
<p>5. Determine what will be monitored with respect to each SEA (“key characteristic”) and the operational indicator for measuring what is monitored.</p>	<p>The EMS Committee has struggled with identifying the monitoring requirements. I worked through some more examples for them during the January 2002 visit. By the time of the May 2002 visit, they had made some progress but have not finished. Here is another example of where local EMS consultant could have speeded up the process.</p> <p>This effort requires some thought and time to work through. The plant manager has been doing most of the EMS implementation work since the October workshop, and has not had much time to devote to the effort.</p>
<p>6. Draft Work Instructions (or operational control procedures) for each SEA that include:</p> <ul style="list-style-type: none"> • The responsible person (responsible persons) • What will be monitored and monitoring frequency • The format (record) for documenting monitoring results • Monitoring equipment (if applicable) <p>NOTE: determine whether</p>	<p>As of January 15, 2002, this item had not been completed.</p> <p>As of May 2002, the EMS Committee (mainly the plant manager) had completed 3 of the Work Instructions.</p> <p>This effort requires some thought and time to work through. The plant manager has been doing most of the EMS implementation work since the October workshop, and has not had much time to devote to the effort.</p>

<p>monitoring will be done by employees or by external parties (contractors)</p>	
<p>7. Identify the data or information that will be communicated internally and externally. Draft an outline (brief plan) of the process for such communication</p>	<p>With respect to external communication, the EMS Committee has determined to incorporate the existing SERVITEL process. SERVITEL is the official Municipal process for managing public communications (complaints, <i>etc.</i>). All calls are logged and acknowledged on the same date received. There is a follow-up process for replying to these communications. The municipality publishes the total number of "external communications" received and their disposition in its annual report to the community.</p> <p>Internal communications process for the EMS is currently limited to existing management reports and "incident" reporting. This is essentially very straightforward because there are only 6 employees in the wastewater treatment plant.</p> <p>The EMS Committee has had no difficulty with this task.</p>
<p>8. Draft the Awareness Training Program (for all employees and contractors working on site)</p>	<p>This item had not been completed as of May 2002.</p> <p>This a "lack of time" issue.</p>
<p>9. Complete the Matrix Tool for identifying training needs for the job positions related to the Significant Environmental Aspects.</p>	<p>This item had not been completed as of May 2002.</p> <p>This a "lack of time" issue.</p>
<p>10. Schedule the training identified in #9 (<i>to be completed before April 1, 2002</i>)</p>	<p>This item had not been completed as of May 2002.</p> <p>This a "lack of time" issue.</p>
<p>11. Establish between 1 and 3 Environmental Objectives (each Objective must be based on one of the SEAs)</p>	<p>The EMS Committee prepared 3 draft Objectives and some Targets in April 2002. During my May 2002 visit, the senior consultant reviewed these and recommended changes.</p> <p>The EMS Committee sent revised Objectives and Targets to the Mayor and Council in early June 2002, and the Council formally approved the Objectives and Targets during the week before the June San Diego event.</p>

<p>12. Establish one or more Targets for each Objective</p>	<p>The EMS Committee prepared 3 draft Objectives and some Targets in April 2002. During the May 2002 visit, the senior consultant reviewed these and recommended changes.</p> <p>The EMS Committee sent revised Objectives and Targets to the Mayor and Council in early June 2002, and the Council formally approved the Objectives and Targets during the week before the June San Diego event.</p>
<p>13. Define the measurable indicators for measuring progress towards Targets (one or more indicators for each Target)</p>	<p>The measurable indicators have been defined as "milestones" toward completion of the Targets. This was completed and approved during the week before the June San Diego event.</p>
<p>14. Continue developing the EMS Manual and procedures corresponding to operational control, training, and internal/external communication.</p>	<p>Not much work had been done on the Manual and procedures by the time the senior consultant visited Zapotlán in January 2002.</p> <p>By May 2002, the EMS Committee had prepared a decent draft EMS Manual and procedures covering about 70% of the EMS elements.</p> <p>This is a "lack of time" issue.</p>
<p>Third set of Tasks (assigned in October 2001 and due to be completed by April 30, 2002)</p>	
<p>1. Develop Action Plans for each Target (Environmental Management Programs required by Section 4.3.4, ISO 14001)</p>	<p>The EMS Committee prepared draft Action Plans for the 3 Objectives and some Targets in April 2002. During the May 2002 visit, the senior consultant reviewed these and recommended changes.</p> <p>The EMS Committee sent revised Action Plans together with the proposed Objectives and Targets to the Mayor and Council in early June 2002, and the Council formally approved the Objectives and Targets and Action Plans during the week before the June San Diego event.</p>
<p>2. Complete the Matrix Tool – Monitoring Significant Environmental Aspects and related information</p>	<p>SAME ANSWER AS #5, Second Set of Tasks: The EMS Committee has struggled with identifying the monitoring requirements. The senior consultant worked through some more examples for them during my January 2002 visit. By the time of the May 2002 visit, they had made some progress but have not finished. Here is another example of where local EMS</p>

<p><i>(Matrix attached)</i></p>	<p>consultant could have speeded up the process.</p> <p>This effort requires some thought and time to work through. The plant manager has been doing most of the EMS implementation work since the October workshop, and has not had much time to devote to the effort.</p> <p>This is a "lack of time" issue.</p>
<p>3. Prepare the format (record) for documenting communications from external stakeholders (Receipt and management of complaints etc.)</p>	<p>SAME ANSWER as #7, Second Set of Tasks: With respect to external communication, the EMS Committee has determined to incorporate the existing SERVITEL process. SERVITEL is the official Municipal process for managing public communications (complaints, <i>etc.</i>). All calls are logged and acknowledged on the same date received. There is a follow-up process for replying to these communications. The municipality publishes the total number of "external communications" received and their disposition in its annual report to the community.</p>
<p>4. Draft the Emergency Preparedness and Response Plan and procedure (Contingency Plan)</p>	<p>In May 2002, the EMS Committee enlisted the support of the Municipality's Emergency Preparedness and Response group, to help develop an appropriate contingency plan for the wastewater treatment plant. For the wastewater treatment plant, the most important "emergency" issue is how to handle incoming sewage during power failures or other events which paralyze plant operations.</p>
<p>5. Develop a process for identifying and managing "non conformities" and for taking corrective and preventive actions</p>	<p>This had not been done as of May 2002.</p> <p>This is a "lack of time" issue.</p>
<p>6. Conduct a compliance review to determine the compliance status with respect to applicable environmental regulations and other requirements</p>	<p>This had not been done as of May 2002.</p> <p>This is a "lack of time" issue.</p>
<p>7. Conduct an EMS Management Review (oriented to review progress towards completing the EMS implementation effort)</p>	<p>The EMS Committee had initially determined it was the "Management" for purposes of Management Review, and therefore thought it was already doing this task on an ongoing basis, during its weekly meetings.</p> <p>During my May 2002 visit, the senior consultant recommended a higher level of "Management" to include the Mayor.</p>

8. Conduct a test of the Emergency Preparedness and Response Plan	<p>This had not been done as of May 2002.</p> <p>This is a "lack of time" issue.</p>
9. Establish the Internal EMS Audit Program <i>(with assistance of the consultant and/or mentor)</i>	<p>During my May 2002 visit, for the EMS Committee and an additional group of 15 municipal employees in the municipality's Audit and Public Safety Groups, I conducted a 1 day training session on EMS Internal Auditing, including an outline and components of the EMS Audit Program.</p> <p>As of June 2002, the EMS Audit Program had not yet been developed.</p> <p>This is a "lack of time" issue.</p>
10. Complete the EMS Manual and the procedures corresponding to monitoring, checking and corrective action, internal EMS audits, and Management Review.	<p>As of June 2002, the EMS Manual has been completed. Some 70% of the Procedures have been completed.</p>
11. Conduct at least one internal audit of the EMS	<p>This had not been done as of June 2002.</p> <p>This is a "lack of time" issue.</p>

General Comments:

Zapotlán has made significant progress between May 2001 and June 2002 in implementing its EMS. Most U.S. municipalities participating in EPA's public entity EMS projects have not completed their EMS implementation within 12 months of startup. Zapotlán has substantially completed the EMS design and documentation but has only actually implemented only a few of the defined EMS processes. Key EMS elements that have not been implemented include training key employees, the awareness training program, monitoring the SEAs, the process for managing non-conformities, the EMS Audit Program and the Management Review process.

Zapotlán's EMS implementation could have progressed much faster if a) they had had a local EMS consultant to provide more month-to-month guidance, and b) if they had more people, resources and time to devote to the project. Our efforts to recruit IBM Guadalajara's Environmental Manager, Diego Gómez, to provide Mentoring support have not worked out. Diego, for unknown reasons, was unable to do what he said he would do at the outset.

The Mayor has provided visible support for the EMS since the outset. However, the Mayor assumed all was going well when, in fact, EMS implementation was suffering because the EMS Committee members, and especially the plant manager, lacked sufficient time to do the work. During the May 2002 visit, the senior consultant concluded that the Director of Public Water and Wastewater Treatment was not playing a sufficiently strong leadership role in supporting the plant manager do more EMS implementation work. The senior consultant spoke with the Mayor directly about this (the Director reports directly to the Mayor) and suggested that the Director may have too many "priorities", and that he clarify the importance of the EMS implementation as one of the Director's highest priorities. Another important factor in EMS implementation delays at Zapotlán is the fact that the EMS Committee members have also been working directly on preparing the specs and contract bidding process for the new wastewater treatment plant.

The Mayor told the senior consultant in May 2002 that he would clarify priorities, giving more emphasis to the EMS implementation effort. There is some evidence that he is sincere because the Council, shortly thereafter approved the Environmental Objectives and Targets and Action Plans, and are in the process of taking action on a proposed US\$20,000 budget to carry out the Action Plans. It remains to be seen how this will play out.

Task Sets

<p align="center">Task Set 1</p> <p>Assigned: May 2001</p> <p>Due: August 2001</p> <p>Actual Completion: Ranged from August 2001 - November 2001</p>	<p align="center">Task Set 2</p> <p>Assigned: October 2001</p> <p>Due: Between January 2002 and April 2002</p> <p>Actual Completion: Ranged from January 2002 - April 2002</p>	<p align="center">Task Set 3</p> <p>Assigned: October 2001</p> <p>Due: Between April 2002 and August 2002</p> <p>Actual Completion: Ranged from March 2002 - In Progress</p>
<p>Tasks:</p> <ol style="list-style-type: none"> 1. Establish the EMS Implementation Team 2. Gap Analysis 3. Identify Significant Environmental Aspects 4. Identify Legal Requirements 5. Establish and Environmental Policy 	<p>Tasks:</p> <ol style="list-style-type: none"> 1. Describe and Analyze Each Significant Environmental Aspect 2. Create Operational Controls 3. Establish Internal and External Communication Systems 4. Plan and Conduct Employee Training 5. Establish Objectives and Targets 	<p>Tasks:</p> <ol style="list-style-type: none"> 1. Create the Contingency Plan 2. Establish Procedures for Corrective Actions 3. Create the EMS Manual 4. Conduct System Reviews and Establish an Internal Audit Program

Task Set 1

Task	Completion Date		
	Nogales	Zapotlan	Piedras Negras
1. Establish the EMS Implementation Team	July 2001 (ALL TEAMS)		
2. Gap Analysis	Jan. 2002	July 2001	July 2001
3. Identify Significant Environmental Aspects	May 2002	Sept 2001	July 2001
4. Identify Legal Requirements	May 2002	In Progress	Jan. 2002
5. Establish and Environmental Policy	Nov 2001	June 2001	June 2001

Task Set 2

Task	Completion Date
<p>1. Describe and Analyze Each SEA</p> <p>2. Create Operational Controls</p> <p>3. Establish Internal and External Communication Systems</p> <p>4. Plan and Conduct Employee Training</p> <p>5. Establish Objectives and Targets</p>	<p>Nogales Zapotlan Piedras Negras</p> <p>April 2002 Jan 2002 Jan 2002</p> <p>As of September 2002 all three teams had completed at least half of this task</p> <p>January 2002 (ALL TEAMS)</p> <p>As of September 2002, Nogales and Piedras Negras had drafted an employee training program and planned to implement the program soon. Zapotlan did not have time to complete this task.</p> <p>May 2002 June 2002 June 2002</p>

Task Set 3

Task	Completion Date
	<p>Nogales Zapotlan Piedras Negras</p>
<p>1. Create the Contingency Plan</p>	<p>March 2002 May 2002 Jan 2002</p>
<p>2. Establish Procedures for Corrective Actions</p>	<p>May 2002 Incomplete* Sept 2002 * Zapotlan lacked the time to complete this task</p>
<p>3. Create the EMS Manual</p>	<p>As of November 2002, all three teams completed a draft EMS Manual</p>
<p>4. Conduct System Reviews and Establish an Internal Audit Program</p>	<p>None of the teams had enough time to begin this task</p>



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ISBN#: 1-58576-050-1