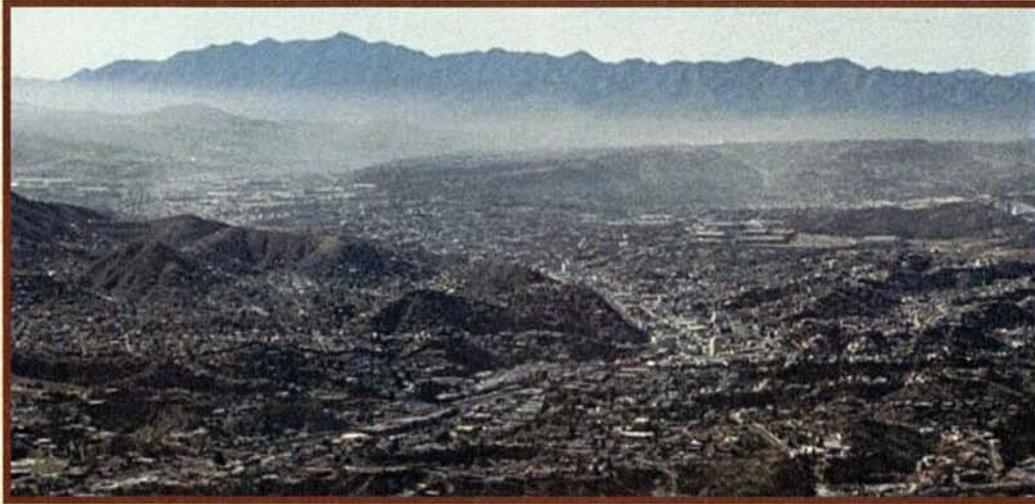


PLAN OF ACTION FOR IMPROVING AIR QUALITY IN AMBOS NOGALES



*Developed by the
**BORDER 2012 AMBOS NOGALES AIR
QUALITY TASK FORCE**
and the
**BORDER LIAISON MECHANISM ECONOMIC
AND SOCIAL DEVELOPMENT SUBGROUP***

*Adopted by the
Arizona Department of Environmental Quality
and the
State of Sonora's Secretariat for Urban Infrastructure and Ecology*

June 17, 2005



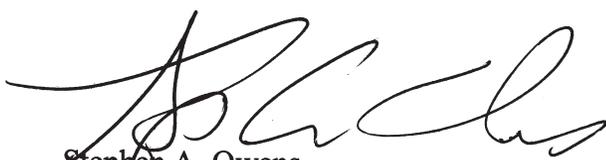
June 2005

At its Plenary Session in June 2000, the Arizona-Mexico Commission (AMC) Environmental Committee presented a conclusion directing a binational dialogue to occur with the objective of improving air quality in Ambos Nogales. As co-chairs of the AMC Environment Committee, we are pleased to present this Plan of Action for Improving Air Quality in Ambos Nogales. This work was largely conducted under the auspices of the Border Liaison Mechanism's Economic and Social Development Subgroup (BLM Subgroup) – a governmental forum of the U.S. State Department and the Mexican Secretaría de Relaciones Exteriores (Ministry of Foreign Affairs), chaired by each country's consul in Ambos Nogales. As of June 2003, the BLM Subgroup was joined by the Border 2012 Ambos Nogales Air Quality Task Force, which added the academic, business and community-based organization sectors, as well as members of the general public, and which works in conjunction with the BLM Subgroup to finalize this Plan of Action and begin implementation of the recommendations it presents. This report, then, represents the culmination of a great deal of work by many local, state and federal agencies and organizations in both countries. At the same time, the document is also a point of departure – a road map for future action. Although diverse in their missions, the agencies and organizations involved are united by a common goal: they are all committed to improving air quality in Ambos Nogales. This document points the way.

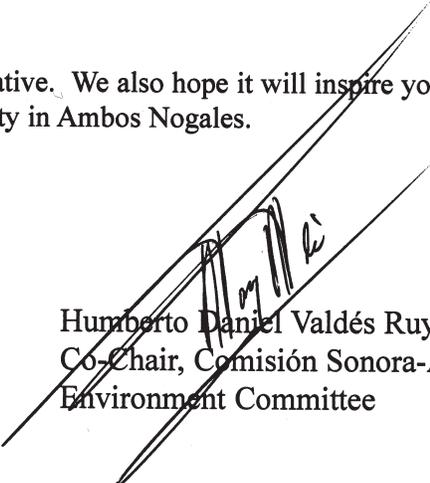
The Plan of Action presents recommendations for improving air quality in three levels of detail. Those who wish to learn the bare essence of what is being recommended will find it in the one-page Executive Summary. Those who wish to read a little more detail in bullet-list form will find it in the several-page Detailed Summary (Section I.B), which is also being produced under separate cover as a "Citizens' Summary." Finally, those who wish to get involved in the pursuit of these recommendations will find a wealth of information throughout the document, particularly in Section II. For more information, please contact the Border 2012 Ambos Nogales Air Quality Task Force facilitator/spokesperson at (520) 628-6717 or kimpelguzman.michele@azdeq.gov.

It is important to note that the recommendations described herein represent the consensus of the participants involved in developing them, although not necessarily the official policy positions of the participating agencies.

We hope readers will find this document informative. We also hope it will inspire you to think about how you can get involved in improving air quality in Ambos Nogales.



Stephen A. Owens,
Co-Chair, AMC Environment Committee



Humberto Daniel Valdés Ruy Sánchez,
Co-Chair, Comisión Sonora-Arizona,
Environment Committee

PLAN OF ACTION

**FOR IMPROVING AIR QUALITY
IN AMBOS NOGALES**

**BORDER LIAISON MECHANISM
ECONOMIC AND SOCIAL
DEVELOPMENT SUBGROUP**

AMBOS NOGALES AIR QUALITY TASK FORCE

June 2005





ACKNOWLEDGMENTS

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The various member agencies forming the BLM Subgroup (listed in Appendix C) for participation in the discussions leading to the development of this document. In particular, the city of Nogales, Ariz., the H. Ayuntamiento de Nogales, Sonora, and Santa Cruz County, for their substantial contributions regarding existing policies and practices, technical background information, and the recommended actions presented herein. Also the Arizona Department of Health Services and the Secretaría de Salud Pública for their logistical assistance and presentations of technical background information.

The many local organizations (listed in Appendices F and H) that opened their meetings for presentations and discussions regarding the deliberations of the subgroup.

The University of Arizona Bureau of Applied Research in Anthropology as well as all cooperating partners in the Ambos Nogales Revegetation Partnership (please see Appendix B), which set an example of how collaboration could work to implement air quality improvements in Ambos Nogales.

The Southeast Arizona Area Health Education Center, which provided valuable assistance in facilitating the translation of this report.



Outside cover photo: Cloud of haze in the valley of Ambos Nogales. Photo credit: James Barr; taken January 17, 2003 at about 10 a.m.

Inside cover photos: A major tree-lined boulevard in Nogales, Sonora, before (left) and after (right) paving

TABLE OF CONTENTS



EXECUTIVE SUMMARY

I.	INTRODUCTION	1
A.	PURPOSE	1
B.	DETAILED SUMMARY	2
C.	FUTURE DIRECTION	5
	1. Study Health Impacts of Diesel Emissions	5
	2. Become a Border 2012 Task Force	6
	3. Develop Action Plans for Each Recommendation	7
	4. Develop Measures of Progress	7
	5. Conduct Additional Public Education and Outreach	8
	6. Forming Ambos Nogales Clean Air Partnerships	9
	7. Collaborate With Border 2012 Children’s Environmental Health Task Force	10
II.	RECOMMENDATIONS FOR IMPROVING AIR QUALITY IN AMBOS NOGALES	13
A.	Ensure Adequate Stabilization of More Unpaved Roads and Parking Lots	15
B.	Speed up Individual and Commercial Border Crossings	18
C.	Address Vehicle Emissions	22
D.	Construct Major Transportation Corridors	25
E.	Reduce the Air Quality Impacts of the Train Route	27
F.	Eliminate Garbage Burning	29
G.	Promote More Effective Revegetation Efforts	31
H.	Reduce Wood Burning	35
I.	Implement Engineering Solutions to Soil Erosion	37
J.	Establish Recycling Programs	39
K.	Create or Improve Public Transit Services	41
L.	Improve Traffic Flow on Local Streets	43
M.	Financing Sources and Mechanisms	45
III.	WHAT ARE THE HEALTH IMPACTS OF AIR QUALITY IN AMBOS NOGALES?	69
A.	Overview of Health Effects Related to Particulate Matter Exposure	69
B.	Applicable Air Quality Standards and Related Data	69
C.	Results of Ambos Nogales Air Quality Study Risk Assessment	77
D.	Health Effects of Diesel Emissions Exposure	80
IV.	WHAT IS THE BORDER LIAISON MECHANISM?	83

V.	HOW WERE THE RECOMMENDATIONS DEVELOPED?	85
A.	Information Sessions	85
B.	Decision-making Sessions	87
VI.	WHAT AIR QUALITY ISSUES ARE ADDRESSED BY THE RECOMMENDATIONS?	91
A.	Residential Emissions	92
B.	Soil Erosion	94
C.	Unpaved Traffic Areas	96
D.	Traffic Congestion	97
E.	Vehicle Emissions	101
VII.	WHAT HAS BEEN ACCOMPLISHED SO FAR TO IMPROVE AIR QUALITY IN AMBOS NOGALES?	105
A.	Regulations, Policies and Practices Already in Place	105
1.	Residential Emissions	105
2.	Soil Erosion and Revegetation	106
3.	Unpaved Traffic Areas	107
4.	Traffic Congestion	109
5.	Vehicle Emissions	111
B.	BLM Subgroup Immediate Actions	112
	REFERENCES	117
	LIST OF ABBREVIATIONS USED IN THIS DOCUMENT	121
	APPENDICES (published under separate cover)	
A –	Ambos Nogales Binational Air Quality Study Citizen's Summary	
B –	Ambos Nogales Revegetation Partnership – Summary of Year One	
C –	BLM Subgroup Members List	
D –	Meeting Summaries and Sign-In Sheets for Each BLM Subgroup Meeting	
E –	List of Brainstormed Options for Improving Air Quality in Ambos Nogales	
F –	Summary of Public Outreach Activities	
G –	List of Abbreviations Used in This Document	
H –	Responsiveness Summary	



LIST OF TABLES

TABLE 1 –	Recommendations and Lead Agencies At-A-Glance	14
TABLE 2 –	Possible Funding Sources That Could Support Air Quality Improvement Actions	46
TABLE 3 –	Possible Funding Mechanisms That Could Support Air Quality Improvement Actions	59
TABLE 4 –	Cross Reference of BLM Subgroup Recommendations to Financing Sources and Mechanisms	66
TABLE 5 –	Estimated Percentage Increase in Health Effects Cases and Estimated Increase in Numbers of Premature Deaths in Ambos Nogales	78

LIST OF FIGURES

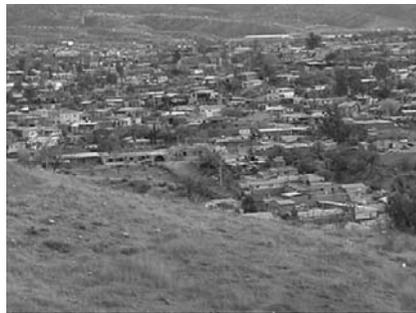
FIGURE 1 –	Nogales Non Attainment Area for Particulate Matter	71
FIGURE 2 –	Ambos Nogales PM10 Annual Average Concentrations ($\mu\text{g}/\text{m}^3$), 1994-2002	73
FIGURE 3 –	Ambos Nogales PM10 Maximum 24-hr. Concentrations ($\mu\text{g}/\text{m}^3$), 1994-2002	74
FIGURE 4 –	PM10 Monitoring at Lázaro Cárdenas Elementary School, Nogales, Sonora, 2001	76
FIGURE 5 –	Traffic Count Data Collection Locations	114



Recommendations to reduce dust from...



garbage and wood burning



soil erosion



unpaved roads and parking lots



vehicle emissions



traffic congestion



EXECUTIVE SUMMARY

This document presents a set of recommended actions to improve air quality in Ambos Nogales. The recommendations were developed through a binational intergovernmental dialogue that was directed to occur by the Arizona-Mexico Commission. The dialogue was co-chaired by the Mexican and U.S. Consuls in Nogales, Ariz., and Nogales, Sonora, who shared co-leadership with the Arizona Department of Environmental Quality and the Secretaría de Infraestructura Urbana y Ecología del Estado de Sonora (the Sonoran Secretariat for Urban Infrastructure and Ecology). This effort has been financially supported by the U.S. Environmental Protection Agency; related public outreach activities have also been supported by the National Oceanic and Atmospheric Administration. The recommendations presented in this document represent the consensus of the dialogue participants, although they do not necessarily represent the individual policy positions of the participant agencies. This document presents the recommendations as a road map for future action.

The development of these recommendations is important because air quality in Ambos Nogales is impaired by particulate matter (dust) contamination. This contamination has been estimated to have important health impacts for area residents. Rates of health impacts attributable to particulate matter are similar in the two communities because they share a common airshed and are thus exposed to similar levels of contamination. Nogales, Ariz., and portions of Santa Cruz County – primarily Rio Rico – have been designated as a “Non Attainment Area” for particulate matter.

The following is a brief list of the air quality improvement actions being recommended for implementation in Ambos Nogales.

High Priority Actions

- A. Ensure adequate stabilization of more unpaved roads and parking lots.
- B. Speed up individual and commercial border crossings.
- C. Address vehicle emissions.
- D. Construct major transportation corridors.
- E. Reduce the air quality impacts of the train route.

Additional Priority Actions

- F. Eliminate garbage burning.
- G. Promote more effective revegetation efforts.
- H. Reduce wood burning.
- I. Implement engineering solutions to soil erosion.
- J. Establish recycling programs.
- K. Create or improve public transit services.
- L. Improve traffic flow on local streets.



I. INTRODUCTION

A. *PURPOSE*

This document presents a set of recommended actions to improve air quality in Ambos Nogales. The recommendations were developed through a binational intergovernmental dialogue that was directed to occur by the Arizona-Mexico Commission. The dialogue was co-chaired by the Mexican and U.S. Consuls in Nogales, Ariz., and Nogales, Sonora, who shared co-leadership with the Arizona Department of Environmental Quality (ADEQ) and the Secretaría de Infraestructura Urbana y Ecología del Estado de Sonora (SIUE – the Sonoran Secretariat for Urban Infrastructure and Ecology). The dialogue forum was the Border Liaison Mechanism Economic and Social Development Subgroup (BLM Subgroup – please see Section IV for more details). This effort has been financially supported by the U.S. Environmental Protection Agency (EPA); related public outreach activities have also been supported by the National Oceanic and Atmospheric Administration (NOAA). The recommendations presented in this document represent the consensus of the dialogue participants, although they do not necessarily represent the individual policy positions of the participant agencies. The BLM Subgroup identified its goals as follows:

- to be effective;
- to result in real reductions in particulate matter concentrations in Ambos Nogales;
- to be highly cooperative, always taking a strongly binational/bilateral approach;
- to improve public understanding of local air quality issues; and
- to result in the actual implementation of additional control measures.

The development of these recommendations is important because air quality in Ambos Nogales is impaired by particulate matter (dust) contamination (please see Section VI and Appendix A for more details). This contamination has been estimated to have important health impacts for area residents, ranging from increased upper respiratory tract infections (for example, colds or the flu), to more frequent and severe asthma attacks among asthma sufferers, to increased levels of premature death among elderly people who already suffer from an underlying heart or lung condition (please see Section III and Appendix A for more details). Rates of health impacts attributable to particulate matter are similar in the two communities because they share a common airshed and are thus exposed to similar levels of contamination (ADEQ, August 1999). Air quality in Ambos Nogales occasionally exceeds federal standards that have been set for particulate matter in the United States and Mexico. For this reason, Nogales, Ariz., and portions of Santa Cruz County – primarily Rio Rico – have been designated as a “Non Attainment Area” for particulate matter. Local leaders also believe that air pollution in Ambos Nogales has had negative consequences for tourism and economic development.

Recognizing the importance of reducing these health problems as well as improving tourism and economic development opportunities, local leaders and representatives of various state and

federal agencies in the United States and Mexico engaged in a one-year effort to develop recommendations for how to improve air quality in Ambos Nogales. This document presents the recommendations (please see Section II) as a road map for future action (please see Section I.C).

B. DETAILED SUMMARY

The following is a brief list of the air quality improvement actions being recommended for implementation in Ambos Nogales.

High Priority Actions

- A. Ensure adequate stabilization of more unpaved roads and parking lots.**
 - 1. Evaluate life-cycle costs of various stabilization methods.
 - 2. Evaluate priority areas to be stabilized.
 - 3. Implement financing mechanisms to assist with stabilizing unpaved traffic areas.
 - 4. Develop minimal construction specifications.
 - 5. Begin actually stabilizing priority areas.
 - 6. Throughout all elements, seek opportunities for binational mutual assistance.

- B. Speed up individual and commercial border crossings.**
 - 1. Make capital improvements to the ports of entry.
 - 2. Make procedural changes to inspections at the ports of entry.
 - 3. Create features ancillary to the ports of entry to facilitate border crossing.
 - 4. Conduct public outreach to assist travelers in choosing less congested times for making trips involving crossing the border.

- C. Address vehicle emissions.**
 - 1. Conduct public education regarding vehicle emissions.
 - 2. Conduct key data collection efforts.
 - 3. Improve the fuels being used in Ambos Nogales.

- D. Construct major transportation corridors.**
 - 1. Construct the East Side Periférico in Nogales, Sonora.
 - 2. Construct the North-South Interconnector in Nogales, Ariz.
 - 3. Conduct a comprehensive study of cross-border traffic.

- E. Reduce the air quality impacts of the train route.**
 - 1. Re-route the train out of the center of the community.
 - 2. If the train cannot be re-routed, take a variety of actions to reduce the degree to which it blocks intersections when passing through.

Additional Priority Actions

F. Eliminate garbage burning.

1. Improve garbage collection services in Nogales, Sonora, by extending regular, weekly service to colonias not currently receiving such service.
2. Conduct extensive public education to raise community consciousness about the importance of not burning garbage.
3. Enforce laws against the burning of garbage more aggressively, including imposing fines.

G. Promote more effective revegetation efforts.

1. Conduct public outreach and pilot projects to involve students and local residents in revegetation efforts.
2. Increase maquiladora participation in revegetation efforts.
3. Promote the revegetation of road shoulders.
4. Make more plants, trees, green waste chippers, and donated lands available for revegetation projects and green space development.
5. Initiate (in Nogales, Sonora) or expand (in Nogales, Ariz., and Santa Cruz County) Adopt-a-Highway programs to include revegetation efforts adjacent to local streets.

H. Reduce wood burning.

1. Provide device subsidies.
2. Initiate thermally designed housing pilot projects.

I. Implement engineering solutions to soil erosion.

1. Map areas subject to soil erosion.
2. Investigate and promote the use of various engineering solutions to soil erosion.
3. Adopt an ordinance requiring the stabilization of cut faces.

J. Establish recycling programs.

1. Establish more recycling businesses.
2. Establish a school-based recycling program.
3. Provide recognition to stimulate individual participation.

K. Create or improve public transit services.

1. Conduct public outreach regarding public transit and alternative modes.
2. Conduct a feasibility study for expanding public transit services.
3. Make the capital improvements needed to facilitate expanded use of public transit services.

L. Improve traffic flow on local streets.

1. Install or upgrade signaling services at priority intersections, including the use of intelligent transportation system (ITS) signs to direct traffic around or away from blocked intersections.
2. Improve signage to help reduce unnecessary traffic circulation as drivers search for their destinations.
3. Improve access to parking, especially in the most congested areas.

The U.S. Consul in Nogales, Sonora, and the Mexican Consul in Nogales, Ariz., asked ADEQ and SIUE to assist them in forming the Nogales Border Liaison Mechanism's (BLM's) Economic and Social Development Subgroup, with the specific purpose of addressing the binational air quality problem in Ambos Nogales. The recommendations described in this document were developed through a series of working sessions of the BLM Subgroup. The first set of working sessions explored various aspects of the air quality problem in Ambos Nogales, including brainstorming possible solutions. The second set of working sessions comprised the group's decision-making process to select the air quality improvement actions that would be proposed for implementation.

Based on a study conducted by ADEQ and the Secretaría de Medio Ambiente y Recursos Naturales (SEMARNAT – the Mexican Secretariat for Environment and Natural Resources) (ADEQ, August, 1999), as well as knowledge of local conditions, the BLM Subgroup decided to focus on five primary contributors to particulate matter contamination in Ambos Nogales. These are: residential emissions (from the burning of wood and garbage), soil erosion, unpaved traffic areas, traffic congestion and vehicle emissions. Unpaved traffic areas (such as roads and parking lots) are the single largest source of particulate matter contamination in the air of Ambos Nogales. Vehicle emissions are the second most important source of particulate matter contamination in the air of Ambos Nogales. The BLM Subgroup considered vehicle emissions in two ways: as emissions from the local mix of vehicles, regardless of traffic conditions; and as a result of certain relatively unique sources of traffic congestion, regardless of the local vehicle mix. On the one hand, even if all sources of traffic congestion were eliminated, the local mix of vehicles would still contribute to elevated emission levels, resulting in poorer air quality. On the other hand, even if all local vehicles had relatively low emissions individually, the existence of special sources of traffic congestion results in an increased level of total emissions from all vehicles and correspondingly poorer air quality. The residential emissions issue primarily focuses on wood burning and garbage burning. Finally, eroded soils are often deposited on paved or unpaved roads, where they contribute to emissions associated with those roads.

A number of actions have been taken in Ambos Nogales to improve air quality. Some of these actions pre-date the BLM Subgroup's work, and may involve regulations, policies and practices. In addition, the BLM Subgroup identified and worked to implement a number of “immediate actions” to improve local air quality. The following is a brief list of those immediate actions:

1. An effort to promote revegetation activities among schools and neighborhoods, with the participation of maquiladoras, has been established.
2. The U.S. Department of Agriculture has worked on moving inspection activities for produce trucks from the commercial port of entry to warehouses.
3. A means of rewarding maquiladora participation in revegetation efforts through the Arizona-Mexico International Green Organization (AMIGO) Program has been established.
4. SIUE and the H. Ayuntamiento de Nogales, Sonora, have developed an accord with the maquiladora sector as a basis for increasing their involvement in revegetation activities.

5. A pilot project with schools to involve students in making and using solar ovens to demonstrate alternatives to burning wood for cooking has been initiated.
6. A pilot project to construct alternative building structures with techniques such as straw bale and rammed earth in used tires (“Earth Ships”) with the goal of eliminating the need to burn wood for home heating has been proposed.
7. The first phase of a project to deploy traffic counting devices in Nogales, Sonora, to determine traffic patterns that could help identify for which roads paving would be most beneficial to air quality, as well as which intersections are most in need of flow improvements, has recently been completed.
8. Working with local automotive repair shops to set up a “free tune-ups” event, thus promoting reduced vehicle emissions and providing repair shops with an opportunity to gain new customers, has been proposed.
9. Data collection efforts to assess the prevalence of smoking vehicles in Ambos Nogales have been proposed.
10. Developing a school-based recycling program as a means of simultaneously raising funds for schools' needs and providing an additional alternative to burning garbage has been proposed.
11. A dialogue has been proposed among Nogales, Ariz., Nogales, Sonora, and Santa Cruz County to identify opportunities to assist with increased road paving activity in Nogales, Sonora.
12. Conducting public education and outreach about peak traffic hours, alternative routes and transportation modes available, and encouraging drivers to avoid peak hour travel, has been proposed.

The BLM Subgroup is hopeful that actions based on the subgroup's process and this document will result in better air quality in Ambos Nogales.

C. FUTURE DIRECTION

Now that the decision-making phase of the BLM Subgroup's work (please see Section V.B) has concluded and this document has been finalized, several activities are envisioned for the future – either in direct support of implementing the recommended actions described herein, or complementary to them. These activities are described in this section.



1. Study Health Impacts of Diesel Emissions

As noted in Section III.D, the health impacts of diesel emissions have not been explicitly evaluated for the Ambos Nogales community. The BLM Subgroup proposes that an evaluation of diesel emissions and exposure levels, coupled with a human health risk assessment, be performed as soon as possible. The BLM Subgroup recognizes that in a community with such large volumes of truck traffic, and given recent findings by the California Air Resources Board and the Environmental Protection Agency regarding the cancer-causing potential of diesel exhaust, such a study is of paramount importance. Given children's special susceptibility to environmental pollution, elevated rates of asthma in Santa Cruz County, and the high percent-

age of children in Arizona who rely on diesel buses to get to and from school, the BLM Subgroup also recommends that this study include a component specifically evaluating the health impacts for children. ADEQ is actively seeking funding to support such an evaluation, and the BLM Subgroup hopes that this analysis will be undertaken at the earliest possible opportunity.



2. Become a Border 2012 Task Force

In June, 2003, the BLM Subgroup was designated as a Border 2012 Task Force under the Arizona-Sonora Regional Workgroup. Border 2012 is the binational plan to improve environmental conditions along the U.S.-Mexico border, designed as a sequel to Border XXI. One of the most important innovations of this plan as compared to its predecessors is the evolution of the former media-specific La Paz Workgroups (Air, Water, Waste, etc.) into coordinating bodies, including several with a regional geographic focus. One of these is the Arizona-Sonora Regional Workgroup, which is designed to address environmental concerns along the Arizona-Sonora border across all media. It is expected that state and local leadership in this workgroup will result in a more locally-driven identification of priorities as well as solutions that are more effectively designed and carried out – by those who are closest to the problems.

Within the Border 2012 framework, workgroups such as the Arizona-Sonora Regional Workgroup may form Task Forces – project-oriented groups designed to accomplish a specific purpose. In many ways, the BLM Subgroup already exemplifies how Task Forces are envisioned to function. For this reason, the BLM Subgroup wanted to become a Border 2012 Task Force, and the Arizona-Sonora Regional Workgroup concurred. In making this change, the Task Force will maintain a relationship with the BLM Subgroup, although the details of that relationship are yet to be determined, pending a review of the requirements of the treaty establishing the BLM (please see Section IV). Requirements for Task Forces that are already met by the BLM Subgroup include having co-chairs from each country, making decisions through a formal consensus process (please see Section V.A), and providing simultaneous interpretation services at each meeting. Additional current practices of the BLM Subgroup that will be maintained by the Task Force include developing agendas in advance of each meeting and distributing written summaries of each meeting, both of which are provided in English and Spanish.

Additional requirements for Task Forces that will be new for the BLM Subgroup include reporting annually to the Arizona-Sonora Regional Workgroup, notifying the public 14 to 30 days in advance of meetings, distributing meeting notices widely, making meetings open to the public, and including membership from various sectors in addition to government agencies (e.g., academia, business, non-governmental organizations and community-based organizations). Now in full operation, the Ambos Nogales Air Quality Task Force (ANAQTF) has invited new members, in accordance with the considerations described in the meeting summary for the May 28, 2003, meeting (please see Appendix D). As Action Plans for the implementation of each recommendation are developed and implemented (please see the following section), ANAQTF will also be acting on an evolving list of possible activities that was developed at the May 28, 2003, meeting and presented to the Arizona-Sonora Regional Workgroup on June 5, 2003. This list of possible activities represents logical, widely supported or non-controversial first steps that may

be taken to implement certain of the BLM Subgroup's recommendations; all of them are elements of one or another recommendation, as described in detail in Section II.

The contents of this document, including the recommendations, should be viewed just as much as a product of the Task Force as they are of the BLM Subgroup. However, in recognition that most of the work described herein and most of the development of this document were completed before the designation of the Task Force, the remainder of this document will refer primarily to the BLM Subgroup, rather than the Task Force.



3. Develop Action Plans for Each Recommendation

The BLM Subgroup has addressed various next steps that will be taken toward actually implementing the 12 recommended air quality improvement actions. One of these is to develop Action Plans for each recommendation. The Action Plans will describe how each of the following is going to be carried out:

- Lay out the step-wise process that needs to be carried out in order to determine whether full implementation of the recommendation is feasible.
- Estimate emissions reductions that could be achieved by implementing the recommendation (in terms of both current emissions eliminated and future emissions avoided).
- Estimate the cost of implementing the recommendation.
- Recommend sources and/or mechanisms of financing that could be pursued to support implementing the recommendation.
- Identify various partners who need to play a role or could provide assistance with implementation.
- Identify measures of progress that will be tracked in order to determine how effective the recommendation is toward improving air quality.
- Develop a time line for carrying out all of these tasks.

The goal in developing and carrying out each Action Plan will be to arrive at a clear determination as to whether the recommendation will be fully implemented, and if so, how. At the time that this document is being published, draft Action Plans have been developed for the following recommendations: A – ensure adequate stabilization of more unpaved roads and parking lots; F – eliminate garbage burning; G – promote more effective revegetation efforts; H – reduce wood burning; I – implement engineering solutions to soil erosion; and K – create or improve public transit services.



4. Develop Measures of Progress

In order to determine the efficacy of the various air quality improvement efforts, a series of indicators will be developed and tracked. As mentioned in Section I.C.3, at least one indicator will be developed specific to each of the recommendations described in this document. These measures will be designed to track the amount of current emissions reduced and future emissions avoided. They may also track other aspects of program implementation.

In addition, other measures of progress will be identified and tracked. At a minimum, air quality data trends over time will continue to be evaluated. Additional general measures of progress will also be considered. These could include regular reporting of Air Quality Index (AQI) and Índice Metropolitano de Calidad del Aire (IMECA – the Mexican equivalent of AQI) statistics, as well as the tracking of various health effects such as asthma (cases treated at medical facilities as well as school days lost), bronchitis, allergies and respiratory illnesses. ADEQ has recently acquired new monitoring equipment for installation in Ambos Nogales that could facilitate AQI/IMECA reporting.



5. Conduct Additional Public Education and Outreach

Public education and outreach are mentioned in various parts of this document (please see Appendices F and H, for example). Outreach is a specific component of several of the recommended actions, has figured in the implementation of some of the immediate actions (please see Section VII.B), and will be important in communicating the measures of progress described in Section I.C.4. The BLM Subgroup anticipates an increased level of public education and outreach in the future. In addition to disseminating the contents of this document, specific subjects for future outreach may also include encouraging people not to burn garbage, vehicle emissions issues, information about peak traffic hours at the ports of entry, encouraging the use of alternative modes of transit to reduce single occupant vehicle trips, participation in revegetation activities, participation in thermally designed housing training opportunities, and Ambos Nogales Clean Air Partnerships (please see the following section).

Future outreach will certainly include a continuation of certain key efforts that have already been established such as the Ambos Nogales Clean Air Calendar (based on student artwork and opinions selected in a contest) and the use of the character, Bordi el Ecoyote, in outreach materials and presentations such as puppet shows by and for children. Bordi el Ecoyote is a coyote character created by Nogales artist Esteban Michel for Platicamos Salud, the health promotion arm of the Mariposa Community Health Center in Nogales, Ariz. Because children are so directly involved in both of these activities, such outreach efforts are good examples of how air quality activities can be integrated with children’s environmental health concerns, the importance of which is described in more detail in Section I.C.7. Other kinds of air quality outreach being seriously considered in Ambos Nogales that could integrate with children’s environmental health include outreach by Teen Health Facilitators (trained annually by Platicamos Salud), community events based on air quality days noted in the Ambos Nogales Clean Air Calendar (such as International Walk to School Day, Inter-American Air Quality Day, or National Car Care Month), and regular Air Quality Index reporting. Finally, the possibility has been raised of revising an air quality curriculum developed by the Pima County Department of Environmental Quality to make it appropriate for use in Ambos Nogales, as well as to tie it to State of Arizona educational standards. Such an effort may be important for future participation in the calendar contest, as the academic standards are increasingly emphasized in this era of standardized testing. Whether through these and/or other activities, integrating air quality efforts and children’s environmental health will be an important element of future outreach and education activities related to the efforts of the BLM Subgroup and ANAQTF.



6. Forming Ambos Nogales Clean Air Partnerships

In total, the recommendations made in this document represent a substantial amount of proposed efforts, if all or even many of them are to be implemented. Although lead agencies have been identified for all of the recommendations, all of the activities proposed herein would require collaboration among many agencies and organizations in order to be successful.

The most successful collaboration to date to have grown out of the BLM Subgroup's work is that carrying out the Ambos Nogales Revegetation Partnership, which is described in more detail in Appendix B. This collaboration began with ADEQ asking the University of Arizona Bureau of Applied Research in Anthropology (BARA) to evaluate the potential for revegetation efforts to reduce soil erosion. ADEQ recognized that cultural change would need to be a part of any successful revegetation effort, and the assessment was of interest to ADEQ because it could help address soil erosion, one of the important contributors to air pollution in Ambos Nogales. BARA was interested in the project because it offered students in various disciplines the opportunity to do research fairly close to the university and because it could help the university work out many details of how to successfully conduct projects under the Community Environmental Leadership Program, which was a new approach that the university was developing. Through the assessment and subsequent pilot projects, BARA identified various community partners as well as resource institutions from outside the community who were willing to assist with the revegetation efforts. As additional needs and opportunities were identified, additional partners were added. As a result of this collaboration, partners are starting to see a real change in participants' understanding of issues related to revegetation and air quality. In turn, this improved understanding has led to changes in community practices at pilot project sites as well as ever-expanding participation by more pilot project sites. Although it is too soon for the partnership's efforts to have measurably reduced soil erosion, a solid foundation has been laid for achieving the level of revegetation efforts that would be needed in order to have a positive impact.

This kind of collaborative effort among many partners can serve as a model for how other air quality improvement actions recommended by the BLM Subgroup could be carried out. In addition to the recommendation about promoting more effective revegetation efforts, the following recommendations or elements of recommendations should be highly amenable to such an approach:

- Evaluate life-cycle costs of various stabilization methods for unpaved traffic areas (Section II.A).
- Implement financing mechanisms to assist with stabilizing unpaved traffic areas (Section II.A).
- Create features ancillary to the ports of entry that could facilitate border crossing (Section II.B).
- Improve the fuels being used in Ambos Nogales (Section II.C).
- Eliminate garbage burning (Section II.F).
- Reduce wood burning (Section II.H).
- Implement engineering solutions to soil erosion (Section II.I).
- Establish recycling programs (Section II.J).
- Conduct a feasibility study for improving public transit services (Section II.K).

Other recommendations or elements of recommendations may also be amenable to such an approach.

As part of serving as an implementation road map, this document presents an open invitation to groups within the Ambos Nogales community – or outside the community but with a demonstrated ability to work with local community partners – who may wish to develop partnership approaches, similar to the Ambos Nogales Revegetation Partnership, in order to carry out any element of the BLM Subgroup's recommendations. Such partnerships, if viable, will be recognized as Ambos Nogales Clean Air Partnerships.

The BLM Subgroup does not intend to approve or disapprove of the activities that community groups may carry out related to improving air quality in Ambos Nogales. Ambos Nogales Clean Air Partnerships, if formed, will not be subject to the BLM Subgroup's oversight. However, for the active duration of partnership activities, and as long as partnerships seek to implement some aspect of the BLM Subgroup's recommendations that clearly enjoys broad community support, the BLM Subgroup will provide assistance to such partnerships. The BLM Subgroup will work together with interested parties to determine how to develop an effective partnership, to identify resources needed to carry out the partnership's activities, and to assist partnerships in seeking necessary funding. Interested parties should contact any of the BLM Subgroup co-chairs listed in Appendix C; other members of the BLM Subgroup may be contacted as well.



7. Collaborate With Border 2012 Children's Environmental Health Task Force

At the same time that the Ambos Nogales Air Quality Task Force was designated, the Arizona-Sonora Regional Workgroup also decided to create the Border 2012 Children's Environmental Health Task Force (CEHTF). Addressing the entire Arizona-Sonora border, CEHTF focuses primarily on asthma, asthma triggers and air quality, in parallel with ADEQ's Children's Environmental Health Project. This Task Force is also working on integrated pest management in schools and other emerging issues. With the missions of CEHTF and ANAQTF so clearly linked by air quality, ANAQTF has decided to collaborate with CEHTF, incorporating children's environmental health (CEH) concerns into its activities wherever possible. These potential areas of collaboration are highlighted throughout this document.

One priority activity that touches on many potential areas of collaboration has to do with geographic priority setting. Resources for environmental activities along the U.S.-Mexico Border are not sufficient to fully meet the needs. Thus, strategic prioritization of resources is very important. Several possibilities may be considered for geographic prioritizing of air quality improvement activities to promote better children's environmental health. One approach would be to collect data regarding where disease incidences, such as asthma attacks, most frequently occur. However, asthma is a complex disease, in which air pollution can trigger attacks, but other diverse, non-environmental factors can also trigger attacks. In addition, each individual with asthma has an individualized set of triggers. Gathering data about the localized geographic prevalence of asthma episodes is also difficult because of a lack of data at the sub-county level. Nevertheless, because of the potential to focus on actual disease occurrences, such an approach merits further investigation.

Another approach to geographic priority setting would be to focus on areas of children’s activities, such as schools, playgrounds, parks, fast food restaurants with indoor recreation, and “hang outs.” In focusing on such “children’s areas,” one approach would be to identify places with higher concentrations of children’s areas, so as to put more emphasis on pollution reduction activities in those locales. Another geographic approach, one that focuses more on future development patterns, would be to steer children’s areas away from places such as highways, warehouse areas and ports of entry, where air pollution is likely to be higher on a localized basis. These two methods of geographic priority setting – which could be carried out in a manner complementary to each other – may be less specific regarding actual disease occurrences, but may also rely on more readily-available data that are less subject to individual variation.

Regardless of the specific approach chosen, some method of geographically prioritizing the limited resources available for air pollution reduction activities would clearly be beneficial. Given the various options that can be considered to implement a geographically prioritized approach to air pollution reduction efforts, ANAQTF looks to CEHTF to provide guidance regarding geographic priority setting. At the same time, in the spirit of improving children’s environment health, ANAQTF recommends that the leaders of any activities associated with implementing the 12 recommendations described in this document proactively consider geographic priority setting for children’s environmental health whenever possible.

Finally, it is important to mention that the Steps to a Healthier Arizona initiative (“Steps initiative”) is an important partner to ANAQTF and CEHTF in this collaboration. The Steps initiative is a major health promotion program funded by a U.S. Department of Health and Human Services grant to the Arizona Department of Health Services (ADHS). Working with implementing partners in Cochise, Santa Cruz and Yuma Counties as well as the Tohono O’odham Nation, ADHS provides support to Platicamos Salud of the Mariposa Community Health Center as the lead organization in Santa Cruz County. The Steps initiative focuses on reducing the frequency and severity of asthma attacks, as well as reducing the rates of diabetes and obesity (which may also have a relation to air quality, as recent research is starting to suggest). School districts are significant partners in the Steps initiative. As such, ANAQTF anticipates that the Steps initiative will provide an important venue for ANAQTF/CEHTF collaborative efforts to address asthma and air quality in Ambos Nogales.



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II. RECOMMENDATIONS FOR IMPROVING AIR QUALITY IN AMBOS NOGALES

Table 1 provides a brief list of the air quality improvement actions being recommended for implementation in Ambos Nogales. Each recommendation is lettered according to the order in which it is presented in this document. Each recommendation is described in more detail in this section. All of the recommendations would be implemented wherever feasible and appropriate throughout the study area (Nogales and Rio Rico, Ariz., and Nogales, Sonora). As described in Sections I.B and V, the BLM Subgroup divided the list of recommendations into “high priority” and “additional priority” actions; however, the order in which the recommendations are presented does not imply any particular ranking within these two categories.

Table 1 also indicates the lead agencies and primary partners for implementing each recommendation. “Lead agency” means that those agencies will review the feasibility of implementing the recommendation, will determine whether they endorse the recommendation as a matter of agency policy, and if so, will attempt to promote the implementation of the recommendation in partnership with other organizations. “Lead agency” does not mean that those agencies have primary authority for implementing the recommendation, that they have already endorsed it as a matter of agency policy, that they will guarantee implementation, or that they have already committed resources toward its implementation.

As discussed in Section I.C, the BLM Subgroup envisions that many of these recommendations, or elements thereof, will be implemented as collaborative efforts among various parties. For this reason, some “primary partners” are also identified in Table 1. It is important to note that the partners identified represent only a partial list of potentially collaborating organizations; additional partners are expected to be identified and brought into the process during the implementation phase. “Primary partner” means that the organization may have authority to implement some aspect of the recommendation, experience implementing some aspect of the recommendation, resources (human, material or financial) available to support implementation activities, a vested interest in the implementation of the recommendation, or any combination of these factors.

TABLE 1
RECOMMENDATIONS AND LEAD AGENCIES AT-A-GLANCE

<u>RECOMMENDATION</u>	<u>PRIORITY</u>	<u>LEAD AGENCIES</u>	<u>PRIMARY PARTNERS</u>
A. Ensure adequate stabilization of unpaved roads and parking lots	high	municipal and county governments	ADOT, ADEQ, SIUE
B. Speed up individual and commercial border crossings	high	BCBP, ADOT, Mexican Customs	ADEQ, SIUE, SCT, municipal and county governments
C. Address vehicle emissions	high	municipal and county governments	ADEQ, SIUE, MVD
D. Construct major transportation corridors	high	municipal and county governments	ADOT, SCT
E. Reduce air quality impacts of train route	high	municipal and county governments	FRA, ACC, SCT
F. Eliminate garbage burning	additional	ADEQ and SIUE	municipal and county governments, SEC, ADHS, SSP, community groups
G. Promote more effective revegetation efforts	additional	community groups	CONAFOR, SIUE, ADEQ, SEC, municipal and county governments
H. Reduce wood burning	additional	ADEQ and H. Ayuntamiento	CONAFOR, SIUE, municipal and county governments, community groups
I. Implement engineering solutions to soil erosion	additional	H. Ayuntamiento	municipal and county governments
J. Establish recycling programs	additional	municipal and county governments	ADEQ, SIUE, SEC, community groups
K. Create or improve public transit services	additional	municipal and county governments	ADOT, ADEQ, SIUE, Delegación de Transporte
L. Improve traffic flow on local streets	additional	municipal governments	ADOT, SCT

For an explanation of abbreviations used in this table, please see the list at the end of this document or Appendix G.

A. ENSURE ADEQUATE STABILIZATION OF MORE UNPAVED ROADS AND PARKING LOTS



Water truck keeping dust down on an unpaved road shoulder

1. Evaluate life cycle costs
2. Choose priority areas
3. Implement financing mechanisms
4. Develop minimal specifications
5. Begin with priority areas
6. Seek mutual binational assistance

Unpaved traffic areas are the single largest source of particulate matter contamination in the Air of Ambos Nogales (please see Section VI.C). “Unpaved traffic areas” primarily refers to unpaved roads and unpaved parking lots, although it is worth noting that soil erosion and track-out onto both unpaved and paved roads also contribute to particulate matter emissions from these sources.

Detailed Elements of Recommendation

The recommended action to reduce dust emissions from unpaved traffic areas is to ensure adequate stabilization of more unpaved roads and unpaved parking lots. This recommendation consists of the following six elements, each of which is described in more detail below:

1. Evaluate life-cycle costs of various stabilization methods.
2. Evaluate priority areas to be stabilized.
3. Implement financing mechanisms to assist with stabilizing unpaved traffic areas.
4. Develop minimal construction specifications.
5. Begin actually stabilizing priority areas.
6. Throughout all elements, seek opportunities for binational mutual assistance.

Recognizing the extent of unpaved traffic areas, and the limited resources available for paving projects, this recommendation begins with an evaluation of the relative life-cycle costs and appropriateness of various stabilization methods. Paving with concrete, while the most effective and long-lasting means of stabilizing unpaved traffic areas, is also the most costly in terms of initial capital outlay. If applied to too much land within a given area, it can also result in unintended consequences such as drainage problems, reduced ground water recharge and elevated urban temperatures in the summer.

Other stabilization techniques exist, such as paving with asphalt, chip sealing, gravel, chemical stabilizers, watering, and vegetative cover, which may be combined with imbedded cement block. Each of these methods requires less initial capital outlay than paving with concrete, and some of them may avoid some of the unintended consequences mentioned above (although they may introduce others). However, each of these methods is also shorter-lived than paving with concrete. As a result, they have to be re-applied more frequently, which means that their total cost over the same life cycle as one application of concrete may be less than, similar to or even more than paving with concrete. In addition, certain of these alternatives are simply not appropriate depending on the use of the road or other traffic area. For example, chip sealing is simply not strong enough to withstand the stresses of heavy commercial trucks as they turn around. Thus, chip sealing a parking lot in areas where heavy commercial trucks will be turning around could be a waste of money and may fail to reduce emissions effectively.

For all of these reasons, this recommendation begins with an evaluation of the appropriateness of different stabilization techniques for different types of traffic areas, and a comparison of their relative life-cycle costs.

The next element for this recommendation is to identify which unpaved roads and parking lots would be most beneficial to air quality if stabilized effectively. The municipality of Nogales, Sonora, has preliminarily identified the unpaved roads that are most in need of paving. These are: Boulevard Los Alamos, Calle Tercera in Colonia Solidaridad, Boulevard El Raquet, Calle Abraham Zaied in Colonia Luis Donaldo Colosio, Prolongación Avenida Instituto Tecnológico (to el Represo), Avenida Terrenate and Calle Torre Eiffel, Prolongación Avenida Los Maestros, and Calle General Mariano Monte Verde. These streets were chosen as the primary major arteries that are not yet paved. Collecting traffic count data for certain unpaved roads and parking lots could further identify and refine these priorities. An evaluation of the amount of land area used for unpaved parking lots, and possibly other factors, would also be helpful in assessing priorities. Geographic priority setting for children's environmental health is another factor worth considering as road and/or parking lot stabilization efforts are prioritized (please see Section I.C.7). Beyond evaluating priorities, the collection of such data would be extremely useful in quantitatively determining the emissions reductions that could be expected from various projects. Such estimates, in turn, can be vital in accessing certain funding sources that could be used to pay for these projects. Finally, such a data collection effort would also support actions proposed as part of the BLM Subgroup recommendation to improve traffic flow on local streets (please see Section II.L). As described in Section VII.B, ADEQ and the H. Ayuntamiento de Nogales, Sonora, have completed an initial traffic count study to support the selection of priority roads for paving.

In fact, the next element in this proposed recommendation would be to implement a mechanism to fund the stabilization of unpaved traffic areas. While such mechanisms are fairly straightforward for roads, which are typically publicly owned, they are more complicated for unpaved parking lots, which are primarily privately owned. Section II.M provides more detail regarding various mechanisms that could be considered; implementing and effectively using at least one of them is the third part of this recommendation.

The fourth element of this recommendation is to review and, if necessary, revise or develop certain minimum specifications for construction standards to be applied to stabilization projects carried out under the auspices of this recommendation. For example, it has been suggested that new roads should be constructed with lower slopes in an effort to reduce erosion. Also, some of the information generated in the evaluation of the life-cycle costs of various stabilization techniques could be used as a basis for developing flexible codes that allow a range of stabilization options when appropriate.

The fifth element of this recommendation is to carry out the identified priority stabilization projects, utilizing all of the information and tools generated by other elements of this recommendation. Toward this end, the Border Environment Cooperation Commission (BECC) certified a road paving project for Nogales, Sonora, in July 2004, thus clearing the way for financing from the North American Development Bank (NADBank). Once the priority stabilization projects are substantially underway, additional priority areas should also be identified in order to keep additional paving projects going.

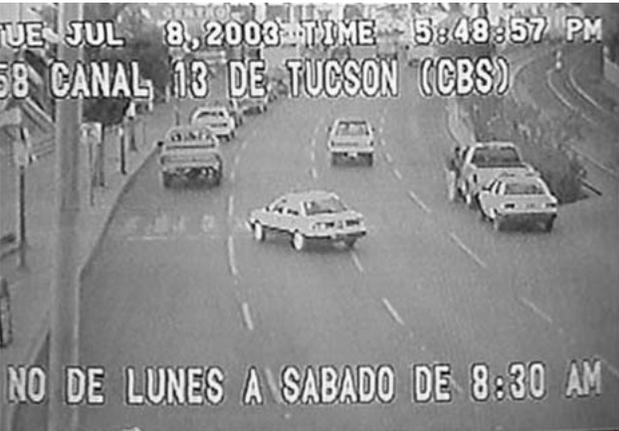
The sixth and final element of this recommendation is to seek opportunities for binational cooperation on stabilizing more traffic areas. Municipalities in Mexico do not receive a comparable level of assistance from state and federal governments in support of transportation projects as do municipalities in the United States. At the same time, rural communities in the United States – like the city of Nogales and Santa Cruz County – are often seriously lacking in resources, relative to their needs, in spite of what assistance they do receive from state and federal governments. Considering these factors, the purpose of this final element is for all participants to keep in mind the special needs associated with working binationally in a border community and to be ready to identify opportunities for mutual assistance. For example, Santa Cruz County has experience with a number of stabilization techniques. This experience could be quite helpful to Nogales, Sonora, as it considers which stabilization techniques will be most cost effective, given limited resources. In a similar vein, Nogales, Sonora, has experience in the area of micro loans that could be helpful to Nogales, Ariz., as it seeks to set up a funding mechanism to foster the stabilization of more unpaved parking lots. In another example, as binational institutions such as BECC and NADBank change, all participants in the effort to improve local air quality have the opportunity to advocate for changes that will benefit local air quality efforts.

Pros and Cons of Recommendation

The BLM Subgroup has identified several benefits or advantages of this recommendation. First and foremost, the potential for emissions reductions – and, as a result, improved public health – is very high, since unpaved traffic areas are the largest contributor to particulate matter pollution in Ambos Nogales. Another advantage is that paving unpaved roads can also improve social conditions, since paved roads are safer and more accessible, which would allow better access for garbage collection and emergency vehicles. Although more information is needed regarding the cost-effectiveness of various stabilization methods, the methods proposed for stabilizing unpaved traffic areas are not particularly new or unknown; thus, implementing them should be highly feasible. Finally, this recommendation can be readily carried out in a manner that is fair to all income brackets, if fairness is factored into the prioritization process.

The BLM Subgroup has also identified several potential disadvantages of this recommendation. Most importantly, the total cost of stabilizing a high percentage of unpaved traffic areas is likely to be quite high, even if the most cost-effective stabilization methods are chosen. Thus, completing enough of this work to result in measurable emissions reductions could take a long time. In addition, this recommendation does not directly address the problem of development by “invasion” in Nogales, Sonora, which is how most of the unpaved roads have been created. Depending on how this recommendation is implemented, it also might not encourage individuals to participate in improving air quality. Finally, again depending on how the recommendation is implemented, there is a potential to create conflict as questions arise as to why certain roads may be paved ahead of others.

B. SPEED UP INDIVIDUAL AND COMMERCIAL BORDER CROSSINGS



- 1. Capitol improvements
- 2. Procedural changes
- 3. Ancillary features
- 4. Public education on peak traffic hours

Nogales, Sonora, cable station broadcasting live footage of line to cross border

Vehicle emissions are the second most important source of particulate matter contamination in the air of Ambos Nogales (please see Section VI.E). Traffic congestion is a significant contributor to vehicle emissions (please see Section VI.D). The ports of entry are the most important points of traffic congestion in Ambos Nogales.

Detailed Elements of Recommendation

One of the recommendations for reducing traffic congestion is to speed up the process for individuals and commercial vehicles to cross the U.S./Mexico border, primarily as they enter the United States. This recommendation consists of the following elements, each of which is described in more detail below:

- 1. Make capital improvements to the ports of entry.
- 2. Make procedural changes to inspections at the ports of entry.
- 3. Create features ancillary to the ports of entry to facilitate border crossing.
- 4. Conduct public outreach to assist travelers in choosing less congested times for making trips involving crossing the border.

It should be noted that elements of this recommendation were developed either before September 11, 2001, or shortly thereafter, when the effects of the terrorist attacks on issues of border security and cross border traffic flows were largely unknown. The BLM Subgroup considers that any action carried out under the auspices of this recommendation should be taken with due sensitivity to border security, while recognizing that the needs of air quality and economic development may sometimes – but not necessarily – conflict with security concerns.

It should also be noted that, while the recommendations described in this document were being developed, another study, known as the Nogales CyberPort Project, was concurrently under development, administered by ADOT and conducted by the University of Arizona Office of Economic Development in partnership with several collaborators. ADEQ and several other BLM Subgroup participants (such as the Bureau of Customs and Border Protection, the city of Nogales and the State Department) also participated in the CyberPort Technical Advisory Committee. By this means, the BLM Subgroup's work was shared with the CyberPort project for its consideration. As described in a recent University of Arizona press release (no date), "CyberPort is based on the principle that safety, security and trade-flow efficiency can function as mutually reinforcing concepts. 'CyberPort is a new way of thinking about cross-border trade. CyberPort is not a place, but a system-wide process for the safe, secure and efficient movement of people, goods and information through the U.S.-Mexico border,'"

The BLM Subgroup agrees with this philosophy and commends the excellent work done on the Nogales CyberPort Project by the University of Arizona and its collaborating partners. Although the study is too extensive to summarize here, its conclusions and recommendations share many (although not all) of the elements of this BLM Subgroup recommendation, described in the following paragraphs. Interested readers may view the full CyberPort report at the following Web address: <http://oed.arizona.edu>. The study was released at the Arizona-Mexico Commission Plenary Session on June 6, 2003 (University of Arizona Office of Economic Development, 2003). At this point, the Governor's CANAMEX Task Force will be working with ADOT, the Arizona congressional delegation and federal agencies to secure funding for the further study and implementation of the CyberPort. For further information, please contact Scott Davis, the University of Arizona Project Director, at (520) 621-2377 or sgd@email.arizona.edu.

One element of this recommendation is to make various capital improvements to the ports of entry. This element may be the most long-term and costly feature of this recommendation, although border security legislation recently passed may provide previously unavailable resources for some of the improvements recommended. Several specific improvements have been proposed for the ports of entry by various organizations; these are supported by the BLM Subgroup. Proposed improvements include: constructing a Dedicated Commuter Lane for frequent crossers such as already exist in San Diego and El Paso; constructing additional commercial truck inspection lanes at the Mariposa Port of Entry (for a minimum of six commercial lanes); constructing additional inspection docks; providing a temperature controlled warehouse at the Mariposa Port of Entry; providing electrical connections for trucks sent into the inspection yard; and improving the route for commercial trucks returning to Mexico at the Mariposa Port of Entry. This element also includes an examination of the possible need for a third port of

entry, including possible locations. This examination should be closely coordinated with recommendation D to construct major transportation corridors (please see Section II.D).

Another element of this recommendation is to implement procedural changes to inspection practices in order to facilitate cross border flows. First, the BLM Subgroup recommends that inspection staffing be increased so that (1) more officers are on duty during commercial inspection hours and peak passenger vehicle hours; (2) the hours during which the Mariposa Port of Entry is open can be extended; (3) shift changes for inspection staff can be made outside of peak traffic hours; and (4) additional inspection lanes can be opened in a timely manner in response to traffic build-ups. In addition, the BLM Subgroup recommends that the currently inadequate inspection dock space be addressed in the short term through procedural changes. Currently, up to eight different agencies may inspect the same truck, and these inspections are conducted sequentially. Concurrent multi-agency inspections could immediately reduce wait times for these trucks. In addition, the agricultural inspection arm of U.S. Department of Agriculture (USDA; this unit is now part of the BCBP) is working to reduce inspection times through conducting some inspections at produce warehouses rather than at the port of entry, because the inspection dock space available to them is insufficient. Further implementation of this effort will help reduce bottlenecks.

Another element of this recommendation is to create ancillary features near the ports of entry to facilitate border crossing. The goal of this element would be to allow individuals to cross the border more quickly – on foot or by bicycle – independently of whether any capital improvements or procedural changes are made at the ports of entry. One suggestion is to build a high-volume parking structure near the border. Another is to develop a “Border Park-and-Ride” system, modeled after park-and-ride programs in the United States. Parking facilities would be provided away from the border, and then buses would take people to and from the border, where they would cross on foot. Another suggestion is to develop a mass transit system (buses or light rail) that crosses the border, such as is being proposed with buses in El Paso/Ciudad Juárez. In fact, any effort to encourage more people to cross the border on foot rather than in cars would likely need to be accompanied by viable, attractive mass transit options that will help people get to their actual destinations. For the majority of those who currently cross frequently in cars, these destinations are not within reasonable walking distance of the border. Finally, another suggestion is to encourage more bicycle traffic from points of origin in one country (possibly including Border Park-and-Ride parking lots) to destinations in the other. Bicycles entering the United States in Nogales are currently processed through the passenger vehicle lanes, but are allowed to move immediately to the front of the line, rather than having to wait. Any significant increase in bicycle traffic through the ports of entry would require adjustments at the ports (such as bicycle lanes that could be created with Jersey barriers) as well as within Ambos Nogales (such as bike racks, bicycle lanes on city streets and additional public education about the rules of bicycle/vehicle interaction).

The final element of this recommendation is public education. Specific educational themes identified by the BLM Subgroup include making information widely available about peak traffic hours on city streets as well as wait times and peak periods at the ports of entry. The USCS posts wait times for ports of entry on the Web at <http://apps.cbp.gov/bwt/>. Information about wait times could also be provided to and broadcast by local radio stations, and good signage

could be installed to help direct travelers to the least congested port of entry. Indeed, a cable television service provider in Nogales, Sonora, now continuously broadcasts live visual images of the vehicle lines at the two ports of entry so that residents can see which line is shorter before crossing (please see picture at the beginning of this section). Intelligent transportation system (ITS) signs could also be installed at key locations to provide information about wait times at the ports of entry as well as intersections that may be blocked (please see Section II.L regarding the BLM Subgroup's recommendation to address traffic flow on local streets). Another suggestion was to specifically provide information about port of entry wait times to tourism companies based in Arizona. A final suggestion on public education is to work with customs brokers to improve the paperwork that they must file with each imported load. Improper paperwork was cited by various inspectors as an additional cause of delays in the inspection process.

It should be noted that in 2004, the newly formed Department of Homeland Security began working with partners in the U.S. and Mexico to bring “SENTRI” and “FAST” lanes into existence at the Nogales ports of entry. It is hoped that these projects will be completed by the end of 2004 or early in 2005. A SENTRI lane, or “Secure Electronic Network for Travelers’ Rapid Inspection” lane, is a means of pre-registering low risk passenger vehicle travellers who have passed a background investigation so that they can proceed through an expedited inspection lane. In El Paso where such a lane has existed for several years, typical wait times in the SENTRI lane can be three to five minutes even when wait times in regular lanes are an hour or more. It is anticipated that implementation of the SENTRI lane in Nogales will reduce wait times – and associated idling and vehicle emissions – for some portion of the regularly traveling public. In a similar fashion, a FAST lane, or “Free and Secure Trade” lane, is a means of pre-registering commercial heavy duty trucks if a thorough investigation of the entire supply, production and transport chain for that product determines that it is low risk. Like pre-registered passengers, these trucks pass through an expedited inspection process at the border, thus reducing idling times and emissions. ANAQTF has identified the advent of the SENTRI lane as a possible area for collaboration with CEHTF. The idea would be to assist families that cross the border regularly, and who have a child with asthma, in applying for SENTRI lane access. Such assistance would probably need to be provided by a non-governmental entity.

Pros and Cons of Recommendation

The BLM Subgroup has identified several benefits or advantages of this recommendation. First, it has a strong potential to reduce emissions of particulate matter, thus improving public health. Depending on how it is implemented, it has the potential to result in some individual participation in improving air quality in Ambos Nogales. This recommendation is quite fair in a binational setting, as the benefits would be strongly felt in both communities. This recommendation would also improve social conditions in Ambos Nogales by re-invigorating cross-border communication and interaction in the public and private sectors, which have deteriorated since post-September 11 border security measures resulted in longer lines to cross the border. Finally, another advantage is that many elements of this recommendation are also included in the CyberPort study recommendations, which enjoy the strong support of Arizona’s governor.

The BLM Subgroup has also identified several potential disadvantages of this recommendation. First, although many elements of this recommendation are included in the CyberPort conclusions, several are not. Most notably, the CyberPort study did not evaluate passenger vehicle flows at the Denis DeConcini Port of Entry in depth, nor does it fully address the possible need for an additional port of entry (discussed in more detail in Section II.D). Furthermore, a number of elements of this recommendation would cost a great deal to implement. In turn, because of the need for large financing efforts, this recommendation could be slow to implement, in which case the potential emissions reductions would only be realized in the long term. Finally, because this recommendation includes a large number of potential elements, choosing among them may be difficult. Most of the proposed actions would be more effective if coordinated rather than being implemented piecemeal, yet border improvements have historically tended to be implemented in a piecemeal fashion.

C. ADDRESS VEHICLE EMISSIONS



1. Public education about emissions
2. Data collection
3. Alternative fuels

Compressed natural gas vehicle in Nogales, Arizona

As discussed in detail in Section VI.E, vehicle emissions are the second most important source of particulate matter contamination in the air of Ambos Nogales. The subgroup's next recommendation to reduce vehicle emissions is to address emissions from individual vehicles through a variety of measures.

Detailed Elements of Recommendation

This recommendation consists of the following elements, each of which is described in more detail below. The first two elements are considered essential to support the effective selection of vehicle emissions reduction actions and to ensure their success. The latter element presents various kinds of emissions reduction options that could be considered by the community.

1. Conduct public education regarding vehicle emissions.
2. Conduct key data collection efforts.
3. Improve the fuels being used in Ambos Nogales.

The first element of this recommendation is to conduct extensive public outreach regarding all aspects of vehicle emissions, such as why they are of concern, how individuals can reduce them voluntarily, and the health, economic and tourism benefits of vehicle emissions reduction actions. This step is seen as vital to addressing vehicle emissions issues. In addition, if such an education program results in individuals proactively taking simple actions that will reduce their vehicles' emissions, then this action will result in short-term air quality improvements.

Another important element of this recommendation is to conduct data collection efforts. As described in Section VI.E, there are a number of open questions about vehicle emissions in Ambos Nogales, including the prevalence and distribution of smoking vehicles, as well as their average vehicle age and maintenance condition. Data collection is proposed by the BLM Subgroup to provide information that could help identify which kinds of emissions reduction measures are likely to have the greatest impact.

The data collection method proposed is to deploy video cameras at key locations throughout the community for the collection of data on the prevalence of smoking vehicles. Video cameras record a reliable visual image of which vehicles have high emissions as well as their license plates. Such information could be used to determine the geographic distribution of smoking vehicles, as well as what percentage of such vehicles are registered in Arizona and Sonora. This information can then be used (if permitted) to establish vehicle age, which can then provide a clearer picture of the overall fleet condition, including the relative prevalence of smoking vehicles. Knowing the average age of smoking vehicles could shed light on whether the vehicles are smoking because they are very old, or because they have been poorly maintained even though they are not that old, or a combination of these factors. The information gathered in such an effort would quantify the magnitude of the smoking vehicle problem in Nogales, Ariz., and Nogales, Sonora.

The third element of this recommendation represents one kind of vehicle emissions reduction option that could be considered: improving the fuels being used in Ambos Nogales. A relatively simple way to do this would be to require the use of reformulated gasoline during winter months, such as is already done in Tucson and Phoenix. No installation of additional tanks or other infrastructure would be necessary, and the fuel is readily available.

A somewhat more difficult method of improving the fuels used – but potentially more effective at producing air quality benefits – would be to promote the use of alternative fuels in Ambos Nogales. As discussed in Section VII.A.5, local residents and some small business owners, primarily in Nogales, Sonora, have already voluntarily converted their passenger vehicles or buses to use alternative fuels because they find it economically attractive to do so. As also discussed in Section VII.A.5, there is a potential that if an alternative fuel refueling facility could be installed at the ADOT maintenance yard in Nogales, Ariz., then inter-governmental agreements for refueling alternative fuel vehicles could be set up with the General Services Administration (responsible for federal fleet vehicles used by several federal agencies with offices in Nogales), Santa Cruz County, the city of Nogales, and the various state agencies that have state fleet vehicles in Nogales. Such measures would enable these agencies to convert their fleets to alternative fuel vehicles, and would also create an increasing public awareness and acceptance of alter-

native fuel vehicles. Many communities have found that starting with government fleets can be a successful first step toward attracting privately owned, publicly accessible refueling stations, which would then allow members of the general public to convert their vehicles to alternative fuels. It is worth noting that the U.S. Department of Energy has an extensive program of grants available through the Clean Cities Program to assist with the installation of alternative fuel refueling stations and with fleet conversions. To access those funds, a community must form or join an existing “Clean Cities Coalition,” such as the coalition that already exists in Tucson. Indeed, members of the Tucson Clean Cities Coalition have expressed interest in working with the Nogales community.

Promoting the use of cleaner fuels as a targeted strategy to improve children’s environmental health is one area where ANAQTF and CEHTF have already begun collaboration. This collaboration has begun with a focus on school buses. Preliminary explorations have included the possible use of biodiesel (a mixture of diesel with used cooking oil that lowers emissions without engine modifications being necessary), the installation of engine retrofits that reduce emissions, and the early use of ultra low sulfur diesel fuel (ULSDF) before it becomes nationally mandated in the U.S. in 2006. In addition, ADEQ is disseminating a model no idling policy that local school districts may consider adopting. Many of these efforts are being coordinated through the Steps initiative, described in Section I.C.7.

Alternative fuels may also be worth considering for the Union Pacific/Grupo México train that passes through Nogales. Historically, the BLM Subgroup’s primary concern about the train has been the traffic congestion it causes, with vehicle emissions generated in larger quantities as cars wait in lines for the train to clear intersections. The recommendation described in the following section focuses on the train as a source of traffic congestion. However, if there is potential for train traffic through Nogales to increase, then it may be worth considering the use of biodiesel in the train engines as a lower emission alternative requiring no engine modification.

The BLM Subgroup discussed several variations of vehicle emissions reduction techniques, including voluntary programs, regulatory programs, and combinations of the two. However, based on considerable concerns about costs, public acceptance, and prior negative experience with vehicle emissions testing in the community of Nogales, Sonora, the implementation of such a program was not recommended.

Pros and Cons of Recommendation

The BLM Subgroup has identified several benefits or advantages of this recommendation. First, it has a strong potential to reduce particulate matter emissions, thus improving public health. This recommendation also addresses a highly visible air quality problem. Finally, this recommendation would increase public awareness regarding the importance of individual actions for improving air quality in Ambos Nogales.

The BLM Subgroup has also identified several potential disadvantages of this recommendation. First, there are many possible elements that have been proposed for this recommendation. Choosing among them could be difficult, and implementation could be complicated.

D. CONSTRUCT MAJOR TRANSPORTATION CORRIDORS



1. East Side Periférico
2. North-South Interconnector
3. Comprehensive study of cross-border traffic

The new periférico in Nogales, Sonora, keeps commercial truck traffic off of local streets.

Another of the BLM Subgroup's recommendations to reduce vehicle emissions is to construct major corridors to reduce traffic congestion.

Detailed Elements of Recommendation

This recommendation consists of the following elements, each of which is described in more detail below.

1. Construct the East Side Periférico in Nogales, Sonora.
2. Construct the North-South Interconnector in Nogales, Ariz.
3. Conduct a comprehensive study of cross-border traffic.

The “East Side Periférico” is a peripheral major artery planned for the east side of Nogales, Sonora. It would travel north-south, starting close to the international boundary and extending south through several colonias. When constructed, it will allow large numbers of residents who live in those colonias to have another option, aside from the existing central arteries of Ruiz Cortínez and Elías Calles/Obregón, for travel from home to work (primarily in the maquiladoras) as well as to shopping destinations in the downtown area or in Nogales, Ariz. Currently, these existing arteries are often clogged with excessive traffic, and congestion relief is needed. At this time, the municipality of Nogales, Sonora, is seeking funding through NADBank to complete the final design and specifications, and then construct this artery.

The “North-South Interconnector” is one of many roadway elements proposed in the Unified Nogales/Santa Cruz County Transportation 2000 Plan (Kimley-Horn and Associates, Inc., December, 2000). Produce trucks enter the United States at the Mariposa Port of Entry, destined for local produce warehouses where the cargo is prepared for shipment to destinations all over the United States and Canada. Currently, these trucks must travel on local streets – primarily Mariposa Avenue and the northern part of Grand Avenue – to get from the port of entry to the warehouses. This places a huge traffic burden on streets that also serve major volumes of

local passenger vehicle traffic, because most of the commercial development in Nogales is also located along Mariposa Road and Grand Avenue. Mixing such large volumes of truck traffic with such large volumes of local passenger vehicle traffic causes significant problems of traffic congestion and safety. The North-South Interconnector would be a four-lane highway constructed from the Mariposa Port of Entry, routed north along the westernmost side of Nogales, and joining Highway I-19 where Grand Avenue currently joins Highway I-19, which is where most of the produce houses are located. This project would allow produce trucks to proceed to the warehouses without having to go through heavily traveled local streets. The project is proposed to be carried out in two phases, starting with a study to establish the alignment, specific interchange locations and connectivity, and preserve the right-of-way. The second phase would be to design, acquire the right-of-way, and construct the interconnector. The city of Nogales is seeking funding through NADBank to support this project.

These are two major corridor projects that would serve to alleviate traffic congestion in Ambos Nogales. Members of the BLM Subgroup have also proposed that their construction would be best accomplished within the context of a comprehensive study of all cross-border traffic – commercial, passenger vehicle, and pedestrian/bicycle. For example, the East Side Periférico may make the most sense if constructed in conjunction with a third port of entry on the east side in order to handle the discharge of northbound traffic. Likewise, the North-South Interconnector may be most effective if passenger vehicle traffic could be managed at the Denis DeConcini Port of Entry and a new eastern port of entry, while the Mariposa Port of Entry would be more strongly dedicated to commercial truck traffic. On the other hand, if a third port of entry is deemed necessary, then it might work better on the west side of Ambos Nogales. Locating it to the west could address concerns that have been raised about natural resource protection and private property interests on the eastern side; however, such a location may also leave the discharge of northbound traffic from the East Side Periférico unaddressed. In addition, changes to the Mariposa Port of Entry that have been proposed as part of the CyberPort project, which focuses on commercial truck traffic (please see Section II.B), could have a direct impact on measures to facilitate non-commercial cross-border flows, such as the possible routing and development of a dedicated commuter lane. Such inter-dependent questions could best be answered in the context of a comprehensive study of cross-border flows, which is the third element of this recommendation. Indeed, because cross-border flows include but transcend both environmental and transportation concerns, it has been proposed that such a study might be most appropriately addressed by the full Border Liaison Mechanism.

Finally, to the degree that these or other major corridors are build, ANAQTF recommends that such projects give consideration to the geographic priority-setting methods pertinent to children's environmental health that are described in Section I.C.7. This may be one type of activity where the most effective geographic priority-setting approach would be to plan for children's areas to be located in areas removed from corridor projects.

Pros and Cons of Recommendation

The BLM Subgroup has identified several benefits or advantages of this recommendation. First, this recommendation has a strong potential for reducing particulate matter emissions,

thereby improving public health. It is fair binationally and across all income brackets. It is not controversial, as the local governments involved have already endorsed the proposed construction projects. It would also improve social conditions by reducing the social costs of long commutes and incompatible traffic patterns.

The BLM Subgroup has also identified several potential disadvantages of this recommendation. First, the proposed construction projects are expected to be expensive, which in turn means that they may be difficult to implement and that the air quality benefits might not be realized for quite some time. In addition, unresolved issues regarding traffic discharge and capacity at the ports of entry could block forward progress. These comprehensive issues are not fully addressed by the Nogales CyberPort Project. Finally, this recommendation does not increase individual participation in improving air quality.

E. REDUCE THE AIR QUALITY IMPACTS OF THE TRAIN ROUTE



1. Reroute the train
2. Reduce blockage of intersections

BCBP conducting train inspection at new siding in Rio Rico, which does not block any intersections

The subgroup's final high priority recommendation to reduce vehicle emissions is to reduce congestion by reducing the impacts of the train route through the center of Ambos Nogales.

Detailed Elements of Recommendation

This recommendation consists of the following elements, each of which is described in more detail below.

1. Re-route the train out of the center of the community.
2. If the train cannot be re-routed, take a variety of actions to reduce the degree to which it blocks intersections when passing through.

Based on negotiations between Nogales, Sonora, Nogales, Ariz., and the train owners, there are two proposals that the train owners would be willing to consider. One is to build a new route removed from the center of the community, estimated to cost \$300 million (U.S.). The other is to implement measures to better isolate the train on its current route. The latter proposal (estimated to cost \$200 million U.S.) would entail, for example, constructing bridges, passing

through the community at a higher velocity, reducing the existing right-of-way to allow for another vehicle lane, and constructing a fence along the route through town so that pedestrians cannot cross the tracks just anywhere. Full financing of either proposal will be a significant challenge, as the train owners propose to provide 25 percent of the funding while expecting the remaining 75 percent to be made up by the federal, state and local governments. It is worth noting, however, that a set of five overpasses are currently being constructed in Nogales, Sonora, that will mitigate traffic congestion by allowing vehicles to use bridges to pass over the railroad tracks continually.

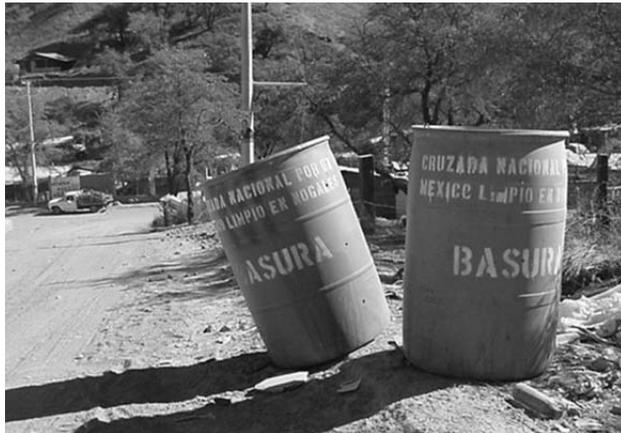
Regardless of which methods are chosen to reduce the traffic congestion impacts of the train, ANAQTF also recommends that the hours of train traffic be reviewed to determine whether reducing train circulation during hours when schools are in session would reduce children's exposure to passenger vehicle emissions from idling automobiles. Such a determination would need to take into account the relative proximity of schools versus residential areas to the train route, as well as the numbers of automobiles likely to wait idling based on the time of day of train runs. In addition, ANAQTF recommends that the feasibility of using biodiesel to power the train engines be explored. The BLM Subgroup has primarily focused on the train in terms of the traffic congestion and associated passenger vehicle idling it causes, rather than with regard to emissions from the train engines themselves. This emphasis is appropriate based on historical data. However, because train engines can run on biodiesel without modification, and because using biodiesel would result in lower emissions (especially if there is a potential for train traffic through Ambos Nogales to increase), ANAQTF recommends that the logistical feasibility of using biodiesel be pursued in the interest of improving children's environmental health.

Pros and Cons of Recommendation

The BLM Subgroup has identified several benefits or advantages of this recommendation. First, it has a good potential to reduce particulate matter emissions and improve public health. In addition, it is fair binationally and across all income brackets. It would improve social conditions in Ambos Nogales by addressing the manner in which the community is regularly divided into four parts, with all emergency services being located in the western half. Further study of both elements of this recommendation is also recommended in the Nogales CyberPort Project. Finally, it is not controversial, as local governments in both communities have enjoyed strong public support for the negotiations that have been held so far.

The BLM Subgroup has also identified several potential disadvantages of this recommendation. First, the train owners and operators have historically been reluctant to consider a number of the changes that the local governments have sought. This resistance likely stems from the fact that many of these changes are very costly. Thus, funding would be a significant challenge to implementing this recommendation. As a result, air quality benefits would not be realized for quite some time. Finally, this recommendation does not improve individual participation in improving air quality in Ambos Nogales.

F. ELIMINATE GARBAGE BURNING



1. Improve collection services
2. Public education to discourage burning
3. Enforce garbage burning laws

Trash cans distributed in Nogales, Sonora, as part of the "Crusade for a Clean Mexico"

Aside from unpaved traffic areas and vehicle emissions, the illegal burning of garbage is considered to be another important source of particulate matter contamination in the air of Ambos Nogales (please see Section VI.A). Garbage burning in Nogales, Sonora, primarily occurs due to lack of adequate collection services (in some colonias) and/or due to residents' frustration with the presence of large quantities of litter (even in colonias with considerable collection services). Garbage burning in Nogales, Ariz., primarily occurs due to vandalism. In addition, a substantial amount of green waste burning occurs in Rio Rico without the proper permit being obtained (please see Section VI.A). One of the BLM Subgroup's recommendations to reduce emissions from the burning of garbage is to eliminate such burning through better service, public education and fines.

Detailed Elements of Recommendation

This recommendation consists of the following elements, described in more detail below.

1. Improve garbage collection services in Nogales, Sonora, by extending regular, weekly service to colonias not currently receiving such service.
2. Conduct extensive public education to raise community consciousness about the importance of not burning garbage.
3. Enforce laws against the burning of garbage more aggressively, including imposing fines.

The first element of this recommendation is to extend regular, weekly garbage collection services to colonias in Nogales, Sonora, that do not currently receive this level of service. While it is true that some garbage collection service is provided in almost all colonias in Nogales, Sonora, there are a number of colonias where such service is quite unpredictable. These colonias are not considered to be a part of the municipality's regular service area because they have been created by "invasions," and are not officially a part of the city yet – and do not pay taxes. Collection in these colonias is quite sporadic, for example, occurring one week, and then two weeks later, and then three days later, and so on. The municipality would be in a better position

to extend these services if it had more large collection trucks, more pick-up trucks (for better access in areas with marginal roads), and more staff. It is not clear whether collection services could be extended to these areas by a simple change in municipal policy or whether their formal incorporation into the city would be necessary first.

The next element of this recommendation is to undertake an extensive public education campaign regarding the importance of not burning garbage. The BLM Subgroup recognizes that this is a difficult issue. On the one hand, many residents of Nogales, Sonora, complain about how ‘ugly and full of trash’ their community is. On the other hand, many residents of Nogales, Sonora, also take strong umbrage at the suggestion that they may share any culpability for these problems. While the BLM Subgroup understands that collection services must be improved, it is also aware that some garbage burning occurs in colonias receiving regular, reliable collection services three times a week. In addition, as mentioned above, garbage burning in Nogales, Ariz., commonly happens as a form of vandalism. Also as mentioned above, the illegal burning of green waste (illegal because proper permits have not been obtained) is also fairly common in Rio Rico. Thus, it is evident that binational public education is needed to reinforce the fact that burning garbage is not appropriate, even as a response to serious litter problems.

The third element of this recommendation, proposed for implementation in the long term, is to enforce laws against the burning of garbage more aggressively, including imposing fines. Members of the BLM Subgroup feel that, after appropriate efforts have been made to ensure adequate garbage collection services and promote public awareness, fining these clearly illegal activities could play an important role in curtailing them.

Finally, there are a number of ways in which implementation of this recommendation could promote children’s environmental health. First, it is possible that emissions reduction activities could be geographically prioritized by one of the means discussed in Section I.C.7. Second, children of some ages can be directly involved in activities designed to reduce garbage burning, such as data collection and evaluation regarding current and future practices in neighborhoods. Finally, children of some ages can also be directly involved in education efforts to raise consciousness about the problem of garbage burning and appropriate alternatives, including presentation of the data collection and evaluation results.

Pros and Cons of Recommendation

The BLM Subgroup has identified several benefits or advantages of this recommendation. First, this recommendation has a strong potential to reduce particulate matter emissions, thus improving public health. It is low in cost relative to many of the other recommendations, and it could be implemented in the short term. This recommendation could potentially improve social conditions by reducing the amount of litter and loose garbage present on local streets. It also has the potential to improve fairness across income brackets by improving collection services in low-income areas. This recommendation addresses a very visible problem, which many members of the general public strongly wish to see resolved. This recommendation relies on simple actions that do not require new or unfamiliar technologies. Finally, it has a strong potential to increase individual participation in improving air quality.

The BLM Subgroup has also identified several potential disadvantages of this recommendation. As stated above, this issue is very sensitive for the public; thus, implementation would require a challenging degree of sophistication. Implementing this recommendation could raise questions regarding the fairness of providing regular collection services to areas that do not pay taxes to the municipality of Nogales, Sonora. Aspects of this recommendation may also raise concerns about feasibility. First, eliminating garbage burning may be difficult without more comprehensively addressing issues of littering and garbage management. Second, although the imposition of fines is recommended, such actions would be impractical in the short term in Nogales, Sonora, because currently, most such fines simply go unpaid, and there are no consequences for the remiss party.

G. PROMOTE MORE EFFECTIVE REVEGETATION EFFORTS



1. Public outreach and pilot projects
2. Maquiladora participation
3. Road shoulder revegetation
4. Make more land and materials available for projects
5. Include revegetation in Adopt-a-Highway

Fully vegetated yard in a marginal colonia in Nogales, Sonora; photo credit: Michèle Kimpel Guzmán

As described in Section VI.B, soil erosion is another important source of particulate matter contamination in the air of Ambos Nogales. One of the BLM Subgroup's recommendations for reducing soil erosion is to promote more effective revegetation efforts.

It is important to make a note about language when discussing “revegetation” and “reforestation.” In English, these two terms are understood to have different meanings. “Reforestation” specifically refers to the planting of trees, while “revegetation” specifically refers to the planting of other, typically smaller, ground-covering plants – not trees. In Spanish, however, the same word – “reforestación” – is used collectively to refer to both the planting of trees and the planting of smaller, ground-covering plants. “Revegetación” is not a word in Spanish, and there is no Spanish word that signifies specifically the planting of smaller plants, without referring to trees. This distinction is important because although trees are generally very good for the environment, they often cannot effectively stabilize soil on their own, in the absence of other ground cover plants. This recommendation specifically focuses on revegetation, since this is what can effectively stabilize soils, while recognizing that the community may also choose to include reforestation activities among its revegetation efforts, since planting trees may make such activities more attractive to community residents. Thus, it should be understood that

“reforestación” in the Spanish version of this document is intended to emphasize activities involving ground-covering plants, while also supporting the inclusion of trees in such efforts. It is not meant to refer to the planting of trees without attention to smaller, soil-stabilizing plants.

Detailed Elements of Recommendation

Due to their already-established role and success, community groups would be the lead organizations ensuring implementation of this recommendation (please see Appendix B for details). This recommendation consists of the following elements, each of which is described in more detail below.

1. Conduct public outreach and pilot projects to involve students and local residents in revegetation efforts.
2. Increase maquiladora participation in revegetation efforts.
3. Promote the revegetation of road shoulders.
4. Make more plants, trees, green waste chippers, and donated lands available for revegetation projects and green space development.
5. Initiate (in Nogales, Sonora) or expand (in Nogales, Ariz., and Santa Cruz County) Adopt-a-Highway programs to include revegetation efforts adjacent to local streets.

The first element of this recommendation is to conduct public outreach and pilot projects to involve students and local residents in community-based revegetation efforts. This element is a continuation of the efforts described in Section VII.B, wherein the University of Arizona and the Instituto Tecnológico de Nogales, together with a number of community partners, have created the Ambos Nogales Revegetation Partnership (ARAN, according to the Spanish abbreviation). ARAN has identified three issues needing to be addressed in order to promote increased revegetation activity. This recommendation supports addressing those issues. First among them is the need to map green areas officially set aside as part of developments in Nogales, Sonora. The next is to address road blocks that have arisen to importing compost to Nogales, Sonora. Given the arid climate in Nogales, and the typically low organic content of local soils, the use of compost can be an important factor in successful revegetation efforts. It brings a greater organic content to soils and helps retain soil moisture, reducing the need for irrigation. However, compost is rarely available in Nogales, Sonora. Although it is available from Nogales, Ariz., Mexican import regulations view it as a waste material, thus restricting the feasibility of its importation. Finally, the third issue is the need to construct a Sonoran Desert native plant nursery, which is discussed in more detail below.

The second element of this recommendation is to increase maquiladora participation in revegetation efforts. This element is a continuation of the efforts described in Section VII.B, wherein SIUE is working with the H. Ayuntamiento de Nogales, Sonora, to develop an accord promoting further maquiladora participation, and ADEQ has made awards given through the Arizona-Mexico International Green Organization (AMIGO) Program available to maquiladoras participating in revegetation efforts. This element could also include other suggested activities, such as maquiladora sponsorship of inter-neighborhood revegetation contests.

The third element of this recommendation is to promote the revegetation of road shoulders. Successful revegetation of road shoulders could help to keep eroded soils off of paved or unpaved streets – a significant problem as described in Section VI.B. Such activities can be supported by Transportation Enhancement Program grants, available through ADOT to cities, towns and counties in Arizona. Such activities should be coordinated with closely related activities proposed in Section II.I, which describes the BLM Subgroup's recommendation regarding engineering solutions to erosion.



Slope successfully hydroseeded after construction of warehouse, Nogales, Arizona

The fourth element of this recommendation is to make more materials and areas available to support revegetation projects. First, ARAN has found that there are no commercial sources of tree seedlings and plants native to the Sonoran Desert anywhere in Mexico. Although plants and tree seedlings are available commercially in the United States, they can be expensive for large scale, community-based project budgets, and they also cannot be imported to Mexico without proper permits. Thus, one aspect of this element is to make more native tree seedlings and plants available in Ambos Nogales, but especially in

Nogales, Sonora. This effort would include building a nursery dedicated to supplying native plants. The “2,000 By 2000” Project in Nogales, Ariz. – which is an effort through the Nogales High School, University of Arizona Cooperative Extension Service, and other community partners to plant 2,000 trees by the year 2000 and beyond – can be one source of trees for planting in Nogales, Ariz., and Santa Cruz County.

In addition, it has been suggested that making green waste chippers available to community users could help revegetation efforts by encouraging the generation of mulch materials. Judicious use of mulch can aid in the success of revegetation projects. Turning green wastes into mulch can also reduce the degree to which these are burned, thus also helping air quality (please see Section VI.A).

Making more land available for green space development would also help support revegetation in Ambos Nogales. Because land acquisition is often beyond the budget of community-based revegetation projects, the setting aside of green areas would be helpful. Development projects in Nogales, Sonora, are required to identify and set aside a certain amount of land for green space purposes. This land usually becomes municipal property; however, there has been a history of such lands being sold as a means of augmenting limited municipal budgets.

The fifth element of this recommendation is modeled after the Adopt-A-Highway programs that are well-known in the United States. The idea would be to expand this program (in Nogales, Ariz. and Rio Rico) or establish this program (in Nogales, Sonora) to focus on local streets as well as those highways that are part of the state or federal system. As local streets are included,

the program would go beyond the traditional focus of litter removal to include revegetation efforts, particularly on road shoulders or other lands immediately adjacent to the streets. Because such revegetation projects would be visible and would provide much-desired community beautification, they could have a great appeal to a wide variety of community groups.

On a final note, ARAN's efforts have provided a robust model of how children's environmental health concerns can be integrated into air quality improvement efforts. First, because many of ARAN's pilot projects focus on schools and neighborhood green areas (where children play), a certain kind of geographic prioritizing, focusing activities on areas where children spend more time, has occurred. While this may or may not have been ARAN's intent, it has nevertheless lead ARAN to work on children's environmental health in other ways. For example, students from several participating schools have conducted various kinds of outreach efforts to educate students, neighborhood residents, and even gatherings of professionals about revegetation techniques and the importance of revegetation for soil stabilization and improved air quality. In addition, students have implemented a wide variety of revegetation activities that have the potential to directly reduce PM emissions, especially when implemented at a larger scale. These include building, stocking and maintaining nurseries; tree planting events; community gardens; green area protection efforts; and ancillary activities such as composting, worm farming and building water harvesting systems. ANAQTF commends ARAN for its work on children's environmental health, and hopes that ARAN will continue to keep children central in its efforts. ANAQTF also suggests that as ARAN shifts its emphasis from pilot scale to larger scale projects, it consider geographic priority setting in relation to children's environmental health as one of its guiding factors.

Pros and Cons of Recommendation

The BLM Subgroup has identified several benefits or advantages of this recommendation. First, this recommendation is highly feasible, as the pilot projects already established by ARAN provide prior experience and a solid foundation for future efforts. Implementation is already underway, and additional projects are already expected to be initiated in the short term. This recommendation is also low cost. It has a strong potential to increase individual participation in improving air quality. It improves social conditions in Ambos Nogales by addressing residents' strong desire to see their community look better. This recommendation is also fair in a binational context and fair across all income brackets.

The BLM Subgroup has also identified several potential disadvantages of this recommendation. The Ambos Nogales Revegetation Partnership has identified challenges related to high participant turn-over (students and teachers move on to other schools) and funding uncertainties. In addition, this recommendation requires a large investment of time in public education not only about revegetation itself, but also about fundamental environmental and ecological concepts. Finally, it is anticipated that implementing a sufficient level of effort to produce measurable results for improving air quality could take a long time.

H. REDUCE WOOD BURNING



1. Provide device subsidies
2. Thermally designed housing pilot projects

Straw bale house, with straw bale wall in foreground, in Tucson, Arizona

As described in Section VI.A, the burning of wood for home heating and cooking is considered to be another important source of particulate matter contamination in the air of Ambos Nogales, especially on a seasonal basis. The BLM Subgroup's recommendation to reduce wood burning focuses on device subsidies and pilot projects.

Detailed Elements of Recommendation

This recommendation consists of the following elements, each of which is described in more detail below.

1. Provide device subsidies.
2. Initiate thermally designed housing pilot projects.

The first element of this recommendation is to provide subsidies for devices that can substitute for wood burning as a means of home heating and/or cooking. It is believed that most households relying on wood burning as a sole means of heating or cooking, especially in Nogales, Sonora, are low-income households. In these homes, wood may be the fuel of choice because it can be obtained for free or at very little cost. This element would provide subsidies for heating and cooking devices that create much less emissions than burning wood in an open fire pit or a conventional wood-burning stove. In particular, heaters and stoves are commonly available that run on natural gas or liquid petroleum gas, both of which are low emission fuels. Low emission wood-burning stoves are also available and have been used in numerous communities in the United States where particulate matter emissions from conventional wood-burning stoves are a problem. A subsidy would be provided to assist families in acquiring and installing such devices, including installing gas services such as storage tanks or fuel lines, where necessary. Once installed, the family would only need to pay for on-going fuel costs. Solar ovens may also help address this problem; they, too, could be offered on a subsidized basis. Solar ovens require no on-going fuel costs, and they generate no emissions. However, they cook more slowly and in a different manner from conventional ovens or fire pits, which means that they cannot be simply substituted for cooking methods that are commonly being used now. As dis-

cussed in Section VII.B, several teachers in Ambos Nogales have decided to experiment with solar oven cooking in their classes. These efforts could lay the foundation for further use of solar ovens in the community.

The second element of this recommendation is to initiate pilot projects regarding the construction of thermally designed housing. In particular, there are at least three methods of housing construction that have the potential to provide sufficient insulation so as to eliminate the need for heating in the winter (and eliminate the need for cooling in the summer), and which are sufficiently inexpensive and simple that they could be financially and technically accessible to low-income families. Each of these methods relies on a particular material with very strong insulation properties: straw bales, adobe, or rammed earth in used tires – known as “Earth Ships.” Construction methods vary for each of these materials, and proper construction, while not highly complicated, is important if the insulation potential is to be achieved. It is worth mentioning that such home structures can also be constructed in conjunction with a number of “off grid systems.” Examples include water harvesting coupled with a cistern and a passive solar-powered water pasteurizing unit to meet drinking water needs, a solar composting toilet and grey water reuse system to meet sanitary needs, and a solar panel to meet remaining electricity needs. Although not all of these systems would directly benefit air quality, their collective benefits for environmental health significantly enhance the benefits of using this kind of housing in low-income areas that do not receive public services.

As mentioned in Section VII.B, the University of Arizona's Bureau of Applied Research in Anthropology and the Instituto Tecnológico de Nogales have agreed that they would like to take on this project as a collaborative effort, once the revegetation program is more established (please see Section II.G). The proposed pilot projects would assemble teams of local residents, including some with construction experience and expertise, to train them in how to construct such homes successfully. The municipality of Nogales, Sonora, has recommended starting with several small community centers so that no individual is concerned about risking his or her property, yet many families are exposed to the advantages of such construction methods. Once several training buildings are constructed, these teams would then work with residents to assist them with constructing homes according to one of these methods. It is anticipated that once a few homes have been built, the community could start working with the maquiladora sector and organizations such as Habitat for Humanity to start employing these techniques on a larger scale. Although these pilot projects would focus on accessibility for low-income residents – because it is believed that this is where most of the wood-burning emissions originate – these construction techniques are equally appropriate for high-end housing, and have been used to build multi-million dollar homes in the United States. It is important to communicate this fact to overcome the potential suspicion that these “new” methods may be somehow lesser, if they are being targeted to low-income families.

ANAQTF recommends that children’s environmental health considerations be incorporated into efforts to implement this recommendation in much the same way as ARAN has done (please see Section II.G). Specifically, implementation activities could be carried out with some type of geographic priority setting as described in Section I.C.7. In addition, students can be involved in not only outreach and education efforts related to wood burning and alternatives,

but also actual pilot projects to construct thermally designed housing and/or use alternative heating and cooking devices.

Pros and Cons of Recommendation

The BLM Subgroup has identified several benefits or advantages of this recommendation. First, it has a strong potential to reduce particulate matter emissions, thereby improving public health. In addition, it could improve social conditions by providing home heating in the winter even for families that currently have none, and in the case of thermally designed housing, by providing several other benefits for families living in areas that do not have public services. It is fair across all income brackets. It is also low cost. This recommendation could be started in the short term, and it would increase individual participation in improving air quality in Ambos Nogales.

The BLM Subgroup has also identified several potential disadvantages of this recommendation. First, achieving sufficient implementation to produce measurable improvements in air quality might take a long time. In addition, several implementation issues could arise. Some of the technologies proposed are new to the community, and may be met with distrust at first. Aside from overcoming distrust, there would also be a need to train local residents in how to utilize some of the proposed technologies. Although several potential sources of funding have been identified, they may be difficult to access, especially when the effort is still new. Finally, this recommendation only partially addresses the fact that even with subsidized devices, some families cannot afford fuels at all.

I. IMPLEMENT ENGINEERING SOLUTIONS TO SOIL EROSION



1. Map areas subject to erosion
2. Investigate and promote use
3. Ordinance for stabilizing cut faces

Decorative river rock substantially reduced erosion from this unpaved parking lot.

As described in Section VI.B, soil erosion is another important source of particulate matter contamination in the air of Ambos Nogales. The BLM Subgroup's second recommendation for reducing soil erosion is to implement engineering solutions to soil erosion. Ideally, these activities should be coordinated with the revegetation efforts described in Section II.G.

Detailed Elements of Recommendation

This recommendation consists of the following elements, each of which is described in more detail below.

1. Map areas subject to soil erosion.
2. Investigate and promote the use of various engineering solutions to soil erosion.
3. Adopt an ordinance requiring the stabilization of cut faces.

As discussed in Section VI.B, the University of Arizona found that increasing vegetative cover by as much as 10 percent could potentially reduce erosion by up to 70 percent (based on modeling results). While revegetation is clearly important for reducing erosion, the BLM Subgroup also recognizes that these efforts have a much higher potential for effectiveness if implemented in combination or coordination with certain engineering methods that could also reduce erosion.

The first element of this recommendation is to map areas subject to soil erosion. As described in Section VI.B, soil erosion is an issue in Ambos Nogales, and can be severe in certain areas of Nogales, Sonora. However, the municipality of Nogales, Sonora, has little data on the locations or extent of these areas, which significantly limits its ability to plan a program for stabilizing such areas. Mapping areas subject to soil erosion would greatly improve the municipality's ability to address this issue.

The next element of this recommendation is to investigate and promote the use of various engineering techniques. This section includes several suggested methods; other engineering methods to address drainage and erosion may also be equally appropriate. The University of Arizona research team found that strategic placement of cobblestones could reduce soil erosion, and form a complementary element in revegetation-oriented landscaping plans. Members of the BLM Subgroup have suggested promoting the construction of more retaining walls, using rammed earth in used tires as the wall material. Such materials are readily available, and their use for this purpose would reduce other environmental hazards created by open stockpiles of used tires. Another suggestion is to promote the more frequent use of gutters or other drainage controls along road sides in order to keep sediments off of roads.

The third element of this recommendation is to adopt local ordinances that require cut faces to be stabilized. This has already been done in Santa Cruz County, but may be useful for Nogales, Sonora. Resources available for enforcement of this measure would need to be addressed.

Finally, ANAQTF recommends that activities carried out to implement this recommendation consider some type of geographic priority setting to promote children's environmental health, as discussed in Section I.C.7.

Pros and Cons of Recommendation

The BLM Subgroup has identified several benefits or advantages of this recommendation. It has a strong potential for reducing particulate matter emissions, thereby improving public

health. It is fair across all income brackets and generally in a binational context. It could be implemented in the short term, and would be of moderate cost. This recommendation may require less maintenance than promoting more effective revegetation, which is the BLM Subgroup's other recommendation to reduce soil erosion.

The BLM Subgroup has also identified several potential disadvantages of this recommendation. Some residents may find it less attractive than revegetation, which could make public support harder to gain. To the degree that new regulations are imposed on development projects in Nogales, Sonora, this recommendation could be viewed as unfair in a binational context. (On the other hand, to the degree that similar requirements to those already in place in Arizona would be implemented, this recommendation could be viewed as leading to greater fairness.) Finally, a relative lack of local experience with some of the suggested methods could require training to be conducted.

J. ESTABLISH RECYCLING PROGRAMS



1. More recycling businesses
2. School-based program
3. Recognition to stimulate participation

A recycling facility on the western periphery of Nogales, Sonora, collecting cardboard for recycling

Another of the BLM Subgroup's recommendations to reduce emissions from garbage burning is to establish recycling programs.

Detailed Elements of Recommendation

This recommendation consists of the following elements, each of which is described in more detail below.

1. Establish more recycling businesses.
2. Establish a school-based recycling program.
3. Provide recognition to stimulate individual participation.

The first element of this recommendation is to establish more recycling businesses in Ambos Nogales. Some recycling businesses already exist in Ambos Nogales. However, the fact that some wood and cardboard are still being burned (please see Section VI.A) demonstrates that there is capacity for more recycling to be done. In addition, compost production has the poten-

tial to produce sizeable quantities of commercial product, given that plenty of material is available. Redirecting green waste into a commercial composting enterprise would significantly reduce the amount of illegal garbage burning that occurs in Nogales, Sonora. It would also provide a viable, air-quality-friendly alternative for green waste management in Nogales and Rio Rico, Ariz., where a number of public complaints have recently been made about the permitted burning of green wastes. One such business already exists in Rio Rico, Ariz.; there are no commercial composting and mulch production businesses in Nogales, Sonora.

The second element of this recommendation is to establish a school-based recycling program, such as that described in Section VII.A.1, where the schools also enjoy some economic benefit for their actions. Involving students in recycling creates the potential for large-scale diversions of certain elements of the waste stream so that they are no longer burned. It also creates an opportunity for public education and consciousness raising regarding the inappropriateness of garbage burning. By working together to collect large volumes of recyclable material, schools could also become efficient suppliers of input materials to recycling businesses, as more are established. Such an approach would clearly involve children directly in PM emissions reduction activities, which is one way of integrating air quality activities with children's environmental health concerns.

The third element of this recommendation is to provide various forms of recognition for participation in recycling efforts. The purpose of this element of the recommendation is to provide incentives to individuals to collect and turn in garbage rather than burning it. The recognition could take many forms, such as awards and public announcements.

Finally, ANAQTF recommends that activities carried out to implement this recommendation additionally address children's environmental health by involving students in outreach activities promoting community participation in recycling as a means of reducing the burning of garbage.

Pros and Cons of Recommendation

The BLM Subgroup has identified several benefits or advantages of this recommendation. First, it could improve social conditions by providing economic development and/or greater economic resources available to schools. It would also increase individual participation in improving air quality. It is low cost, and implementation could be started in the short term. It is fair across all income brackets and in a binational context. It is not likely to be controversial, depending on how it is implemented.

The BLM Subgroup has also identified several potential disadvantages of this recommendation. The potential emissions reductions may be limited. Implementation may be complicated because of a need for extensive coordination among many parties; thus, completing implementation could take some time. In addition, there is a relative lack of local experience with the development and implementation of recycling programs.

K. CREATE OR IMPROVE PUBLIC TRANSIT SERVICES



1. Public education to encourage use
2. Improvements feasibility study
3. Capital improvements

Marked bus shelter in Nogales, Arizona

The importance of reducing traffic congestion and vehicle emissions was mentioned in relation to several of the BLM Subgroup's high priority recommendations. An additional priority recommendation is to create or improve public transit services, with the goal of reducing vehicle miles traveled in single passenger vehicles. A fairly extensive network of bus routes already exists in Nogales, Sonora, although improvements need to be made to increase ridership. In Nogales and Rio Rico, Ariz., there are very few bus routes available. No other form of public transit exists in Ambos Nogales.

Detailed Elements of Recommendation

This recommendation consists of the following elements, each of which is described in more detail below.

1. Conduct public outreach regarding public transit and alternative modes.
2. Conduct a feasibility study for expanding public transit services.
3. Make the capital improvements needed to facilitate expanded use of public transit services.

The first element of this recommendation is to conduct public outreach regarding various aspects of public transit and alternative modes of transportation (such as carpooling): air quality, economic and public health benefits of public transit; existing forms of public transportation; ridership promotion; and possible options for improving or expanding public transit in Ambos Nogales. This outreach would have the dual goals of increasing the use of public transit (thereby reducing emissions from single passenger vehicles) and of creating a base of support for various improvements that could be made to public transit services.

The second element of this recommendation is to conduct a feasibility study for expanding public transit services and increasing ridership. Public input to this process would be important. The feasibility study should include a survey to determine the primary destinations of daily and weekend commuters, both domestic and cross-border. The study should examine how to make

existing bus services more attractive, logical areas for expanding bus services, and the possibility of installing light rail service. Consideration should also be given to whether constructing additional outlying (removed from the international boundary) parking facilities would be a helpful component of efforts to increase public transit ridership.

Based on the outcomes of the feasibility study, the third element of this recommendation is to actually make the capital improvements – and possibly other improvements – that are recommended. Implementation of such improvements could also assist in the implementation of recommendation L to improve traffic flow on local streets (please see the following section). It should be noted that two implementation activities have been proposed to start this recommendation in advance of a feasibility study. One is an employer-sponsored car pooling contest, in which a weekly certificate subsidizing lunch would be awarded to the group of employees fitting the largest number of people in one carpool (all wearing seat belts) on the day of the contest. This program is proposed to begin with the local governments (Santa Cruz County, City of Nogales, Ariz., and H. Ayuntamiento de Nogales, Sonora); as currently envisioned, school districts would be added next. The other proposed implementation activity is to develop a walk-to-school and/or “walking school bus” program. Each October, there is an International Walk to School event in which Ambos Nogales could participate. “Walking school buses” involve an adult leading the walking group and children carrying, for example, toy windows and other trappings to make the group resemble a school bus. Such an approach would likely appeal to young students. To integrate with children’s environmental health issues, ANAQTF recommends that student participation be considered in the development and implementation of both of these activities, including associated outreach efforts.

Pros and Cons of Recommendation

The BLM Subgroup has identified several benefits or advantages of this recommendation. First, it has a high potential to reduce particulate matter emissions, thereby improving public health. It could also improve social conditions by providing better access to job sites and shopping centers. It could be started in the short term. It is fair across all income brackets and in a binational context. Finally, this recommendation would increase individual participation in improving air quality.

The BLM Subgroup has also identified several potential disadvantages of this recommendation. Some elements could be very costly to implement. Thus, achieving the potential air quality benefits could take a long time.

L. IMPROVE TRAFFIC FLOW ON LOCAL STREETS



1. Improve traffic signaling
2. Improve signage
3. Improve access to parking

This car takes advantage of the new street markings that guide traffic around stopped buses on Avenida Ruiz Cortinez in Nogales, Sonora.

The BLM Subgroup's final additional priority recommendation to address traffic congestion is to improve traffic flow on local streets. As described in Section VI.D, many major intersections in Ambos Nogales do not have adequate capacity to process the volumes of traffic passing through them. Improved traffic signaling is one way to increase their capacity. In addition, a fair amount of “extra” driving takes place as drivers search for destinations that are difficult to find or parking spaces that are at a premium in congested areas of Ambos Nogales.

Detailed Elements of Recommendation

This recommendation consists of the following elements, described in more detail below.

1. Install or upgrade signaling services at priority intersections, including the use of ITS signs to direct traffic around or away from blocked intersections.
2. Improve signage to help reduce unnecessary traffic circulation as drivers search for their destinations.
3. Improve access to parking, especially in the most congested areas.

The first element of this recommendation focuses on under-designed intersections. First, traffic count data can be used to prioritize intersections in need of signaling improvements. One of the elements of the BLM Subgroup's recommendation to ensure adequate stabilization of more unpaved roads and parking lots (please see Section II.A) involves using traffic counters to collect data. Initial traffic count studies have focused on identifying priority streets for paving (please see Section VII.B); additional data collection could focus on identifying priority intersections. Once priority intersections are identified, the next step would be to install or upgrade signaling services at these intersections. In addition, ITS signs could be used at strategic locations to assist drivers in avoiding blocked intersections. Such signs would probably be most effective if focused on information about intersections blocked by the passage of the train and about wait times at the ports of entry. These signs could be used to direct traffic toward the most time-efficient routes.

The second element of this recommendation focuses on the lack of adequate signage. To make it easier for drivers to find their destinations, a uniform address numbering system could be implemented. In addition, a goal could be set of providing street name signs at all intersections. Finally, it has been suggested that major commercial routes could include signs at the beginning of each block indicating which establishments can be found in the next block. Businesses could be encouraged to participate in this effort by putting up clearer signs showing their business name and street address.

The final element of this recommendation is to address the very limited parking in the downtown centers of Ambos Nogales. Several options could be considered for accomplishing this goal. Parking structures could be constructed downtown to provide significantly more parking. New development and/or new businesses within existing development could be required to provide minimum numbers of additional parking spaces (based on business size and anticipated trips generated), either through direct construction or via fees paid into a fund used to finance the construction of parking structures. Another approach could be to reduce the demand for parking via improved public transit service to the downtown centers, as well as improved access through walking paths and bicycle paths. This approach would need to be coordinated with recommendation K to create or improve public transit services (please see Section II.K).

ANAQTF suggests that one creative way to integrate this recommendation's implementation activities with children's environmental health would be to involve older students in an educational entrepreneurship project, endeavoring to develop a business for posting street and business signs wherever they are lacking. Geographic priority setting as described in Section I.C.7 could also be considered.

Pros and Cons of Recommendation

The BLM Subgroup has identified several benefits or advantages of this recommendation. First, it has some potential to reduce particulate matter emissions, thus improving public health. If implementation were to emphasize walking and bicycling, then greater exercise would provide additional public health benefits. Furthermore, it could improve social conditions by making various intersections safer and more efficient, as well as by making local travel more convenient and less time-consuming. It is fair across all income brackets and in a binational context. It could also improve business conditions by promoting more customers through easier business access, while at the same time increasing business participation in improving air quality. Finally, the methods proposed are well-known, using established technologies.

The BLM Subgroup has also identified several potential disadvantages of this recommendation. First, improved signaling is often slow in coming, even where strongly desired. Thus, air quality improvements may take time to be achieved. In addition, some of the methods suggested may be costly. Even some of the lower cost options may be challenging for the local governments and small businesses, which are currently highly affected by the economic downturn.

M. FINANCING SOURCES AND MECHANISMS

The BLM Subgroup recognizes that resources must be identified in order for many of the air quality improvement recommendations to be carried out. This section presents the results of some preliminary research that has been done to begin to identify potentially available resources.

First, Table 2 lists 32 different sources of funding for which at least one element of one of the recommendations may be eligible. The sources include traditional government grant and loan programs as well as a number of private foundations. Among the foundations, trends for funding priorities tend to cluster around resource conservation issues and issues related to global warming, energy and alternative fuels. The listing of any funding source in this table is not a guarantee or commitment on the part of the fund sponsor that monies would be made available for air quality improvement activities in Ambos Nogales. However, a review of the guidance or guidelines published for each source suggests that certain proposed activities may be eligible. In addition, it is worth mentioning two sources of information not summarized in this table that could provide funding and/or incentives specifically relevant to thermally designed housing, if such housing is designed to include the use of solar energy. They are *The Borrower's Guide to Financing Solar Energy Systems: A Federal Overview* (U.S. DOE, March 1999), and the on-line *Database of State Incentives for Renewable Energy* (IREC, July 2, 2002).

Next, Table 3 lists 20 different kinds of funding mechanisms that could be developed or utilized in order to finance various air quality improvement activities. Some of these mechanisms already exist; among these, a few could be used in Ambos Nogales with relatively minor modifications, while most would require more significant changes. Other mechanisms would need to be developed from scratch in order to be utilized in Ambos Nogales. The listing of a particular mechanism in Table 3 does not constitute the BLM Subgroup's endorsement. In the future, the BLM Subgroup anticipates that it may recommend the development and use of one or more financing mechanisms; however, the subgroup members feel that such an effort would be more effective in the specific context of implementing a recommendation.

Finally, Table 4 presents a cross reference showing each of the 12 recommendations and those sources of funding (from Table 2) that may be used for some element of the recommendation, as well as those funding mechanisms (from Table 3) that would likely work best for some element of the recommendation. At a minimum, two potential sources of funding have been identified for every recommendation; in most cases, several more potential sources of funding have been identified. Also, at a minimum, three mechanisms have been identified that could be used in conjunction with each recommendation; in most cases, several more have been identified.

TABLE 2

POSSIBLE FUNDING SOURCES THAT COULD SUPPORT AIR QUALITY IMPROVEMENT ACTIONS

SOURCE AND SPONSOR	ELIGIBLE ACTIVITIES	GRANT/LOAN? AMOUNTS AVAILABLE? MATCH REQUIRED?	ELIGIBLE APPLICANTS	CAN SOURCE BE USED BINATIONALLY?	APPLICATION PROCESS AND TIME FRAME	ISSUES
4H Community Tree Planting Grants Program (National 4H Council)	tree-planting and/or reforestation projects	grants \$200 to \$1,000; 50% match required		no	applications were due at the end of May for 2002	
American Greenways Grants (Eastman Kodak Conservation Fund, National Geographic Society)	planning and design of greenways, ecological assessments, design, outreach materials, incorporating land trusts, building bike paths, etc.	small grants \$2,500 max w/ most ranging from \$500 to \$1,000			applications were due in early June for 2002	
Arizona Lottery	LTAf - local transportation needs not including highway construction - for example, paving, sidewalks, curbing, shoulder work, public transit CAF - general use Mass Transit - local public transit needs - for example, meals on wheels if match LTAf funds, may also use for broad range of arts, education, historical preservation projects	funds distributed to Local Transportation Assistance Fund (\$23 million in FY01), County Assistance Fund (\$7.65 million in FY01) and for Mass Transit support (\$3.7+ million in FY01) FY01 distributions to Nogales: \$127,502 LTAf, \$15,068 Mass Transit FY01 distribution to Santa Cruz County: \$550,035	depends on city and county policies on distribution of funds	may depend on city and county policies on distribution of funds	according to state fiscal year?	funds probably already earmarked for specific local needs historically, some funds distributed to Clean Air Fund when revenues have been high enough future distribution of funds uncertain due to state budget crisis cities and towns receiving more than \$2,500 in LTAf funds must use funds for public transit?

SOURCE AND SPONSOR	ELIGIBLE ACTIVITIES	GRANT/LOAN? AMOUNTS AVAILABLE? MATCH REQUIRED?	ELIGIBLE APPLICANTS	CAN SOURCE BE USED BINATIONALLY?	APPLICATION PROCESS AND TIME FRAME	ISSUES
Border Environment Cooperation Commission/ North American Development Bank	recent changes authorize air quality projects, most particularly road paving	loans — potentially significant amounts available Project Development Program makes grants up to \$200,000 for design and permitting; cost rolled into final loan amount	cities and countries	yes	on-going, requires application to be reviewed and approved by BECC board including extensive public participation process	NADBank loan interest rates not competitive in U.S., although very competitive in Mexico; communities often do not have much debt capacity; no technical assistance program for project design and application phase in place yet
Border Health Commission	projects related to environmental health, especially for locally identified Healthy Gente priorities	commission has sought \$26 million appropriation; grants expected to be used as seed monies		yes		
Canadian International Development Agency Canada Fund For Local Initiatives	wide variety of sustainable development projects; priorities include education, health, employment and rural development; priority given to projects that promote gender equality and environmental protection	grants of up to \$100,000 pesos; additional financing potentially available through Canadian International Development Agency (parent organization)	primarily NGOs, although community partnerships appear to have a place in the program	not available for use in the U.S.	applications accepted on an on-going basis at Canadian Embassy in Mexico City; next meeting to select projects scheduled for fall, 2004	NADBank working with Canadian International Development Agency (parent organization for the Canada Fund For Local Initiatives) to leverage financing for infrastructure projects; Canadian firms can apply for assistance and must be able to bid on construction
Clean Air Transportation Communities (EPA)	Reduce vehicle miles traveled, greenhouse gas emissions, criteria pollutant emissions (including PM10); focus on smart growth efforts, commuter choice, and cleaner vehicles/green fleets	grants - cooperative agreements amount available: \$50,000 to \$300,000 in FY01	tribal, state, local, and multi-state agencies	unknown	FY01 application deadline was April 24, 2001; optional letter of intent to be submitted by March 14, 2001	has program been renewed for FY02? need to research eligibility of activities in Mexico

SOURCE AND SPONSOR	ELIGIBLE ACTIVITIES	GRANT/LOAN? AMOUNTS AVAILABLE? MATCH REQUIRED?	ELIGIBLE APPLICANTS	CAN SOURCE BE USED BINATIONALLY?	APPLICATION PROCESS AND TIME FRAME	ISSUES
Clean Cities/Alternative Fuels Program - Department of Energy	<p>alternative fuel conferences, demonstration projects, Energy Smart Schools Initiative, use of shuttles to reduce traffic congestion, education programs, refueling stations, vehicle conversions, purchasing or buying down price differential on new vehicles, supporting program coordinator, Interstate Clean Transportation Corridors</p>	<p>grants funding available - significant, varies by program or funding source</p>	<p>coalition members in communities where coalition has been formed</p>	<p>possibly; U.S. DOE program includes at least one or two international coalitions</p>	<p>varies by program or funding source</p>	<p>joining existing Tucson coalition may be easier than forming separate Nogales coalition</p>
Congestion Mitigation and Air Quality Program (ADOT)	<p>transportation control measures; public transportation; biking or pedestrian facilities; travel demand management (such as carpooling); traffic flow improvements; alternative fuel efforts; inspection and maintenance facilities; outreach and rideshare promotion; fare/fee subsidy programs</p>	<p>grants for capital investment; some O&M may qualify amount available: over \$20.8M in Ariz. in FY98; all states received a minimum allotment of about \$5.7M even if they had no O₃ or CO non attainment areas match: typically up to 20%, but depends on project and state policy</p>	<p>cities, counties, councils of governments, municipal planning organizations, regional transportation authorities - MUST be in an O₃, CO or PM10 non attainment area - OR adjacent to such area where the project would reduce emissions WITHIN that area - unless the state has no non attainment areas</p>	<p>unclear; USDOT statutory authorities may allow (or at least not prohibit) use in Mexico IF the area is adjacent to an O₃, CO or PM-10 non attainment area AND the project would reduce emissions WITHIN that non attainment area</p>	<p>projects submitted to COG, which then forwards to ADOT as part of Transportation Improvement Plan; projects are ranked and then funded in rank order until all available funds are used emissions reductions must be estimated, although level of rigor is flexible; evaluation may be qualitative rather than quantitative</p>	<p>helps if measures are included in applicable SIP; EPA prefers use for demand management/reduction over traffic flow improvements; all Ariz. funds have historically been restricted to use in Phoenix area; not clear that funds may be used to pave roads if result in single occupancy vehicle lanes</p>

SOURCE AND SPONSOR	ELIGIBLE ACTIVITIES	GRANT/LOAN? AMOUNTS AVAILABLE? MATCH REQUIRED?	ELIGIBLE APPLICANTS	CAN SOURCE BE USED BINATIONALLY?	APPLICATION PROCESS AND TIME FRAME	ISSUES
David and Lucile Packard Foundation	biodiversity preservation and biodiversity loss; specific program areas for activities in Mexico as well as activities related to energy issues, population and environment	grants amount available: \$250 million for all program areas in 2002; median award for 2000 was \$85,000	NGOs (501(c)(3) non-profit corporations) and universities	yes - conservation efforts in Mexico are a specific focus area for foundation	may start with letter of inquiry or full proposal; reviewed by staff for fit with foundation priorities; staff meet with applicant before making recommendation to Board	all program areas should be reviewed before preparing proposal - possible BLM Subgroup options may fit a variety of different program areas 2002 grant amount available is significant reduction from 2001 due to economic downturn
Energy Foundation	Program areas include a transportation initiative, aimed at reducing energy consumption in the transportation sector and promoting greater use of alternative fuel vehicles; outreach, education, policy formation tend to be focus, although some facilities installation has also been funded	grants amount available: recent grants ranged from \$15,000 to \$200,000	NGOs (501(c)(3) non-profit corporations) local projects not funded unless designed for replication or having broad regional or national implications	geographic focus is U.S.	on-going; suggest starting with letter of inquiry, which are responded to within about 4 weeks; applications must be submitted at least 12 weeks in advance of board meeting; board meets three times a year	letter of inquiry not required but probably necessary due to lack of detail on web site; other program areas may also be worth exploring (such as Integrated Issues, Renewable Energy, U.S. Clean Energy Initiative) demonstration projects (such as model solar homes) are not funded

SOURCE AND SPONSOR	ELIGIBLE ACTIVITIES	GRANT/LOAN? AMOUNTS AVAILABLE? MATCH REQUIRED?	ELIGIBLE APPLICANTS	CAN SOURCE BE USED BINATIONALLY?	APPLICATION PROCESS AND TIME FRAME	ISSUES
Environmental Education Grants - EPA	environmental curricula, field methods, teacher training, international cooperation	grants ; 25% percent match (cash or in-kind) required	local education agencies, universities, state educational or environmental agencies, NGOs (501(c)(3) non-profit corporations)	yes	one-year project period; applications due in early winter (November 15 postmark for FY02 projects); projects for \$25,000 or less reviewed by Regional office; project for more than \$25,000 reviewed by headquarters; award decisions anticipated within 6 months	
Environmental Justice Through Pollution Prevention Grants Program - EPA	includes education, training, demonstration projects, public-private partnerships, non-regulatory strategies and technologies where pollution prevention chosen as primary strategy to address environmental justice	grants available funds for FY01 \$750,000; grants range from \$7,000 to \$210,000; average \$100,000	local agencies; NGOs (501(c)(3) non-profit corporations)	unknown	applications usually due in April	program cut back significantly from FY00 (funding was \$4 million) to FY01

SOURCE AND SPONSOR	ELIGIBLE ACTIVITIES	GRANT/LOAN? AMOUNTS AVAILABLE? MATCH REQUIRED?	ELIGIBLE APPLICANTS	CAN SOURCE BE USED BINATIONALLY?	APPLICATION PROCESS AND TIME FRAME	ISSUES
Environmental Justice: Partnerships for Communication (National Institutes for Health/National Institute for Environmental Health Sciences - NIH/NIEHS)	stimulate community outreach, training, research and education efforts that will become the catalyst for reducing exposure to environmental pollutants in underserved populations; includes education programs, risk communication, community participation efforts	grants - contract mechanism in FY00, \$1.5 million available, anticipated to be awarded in seven grants of up to \$200,000 each	NGOs (501(c)(3) non-profit corporations); project team must include one of each of the following: an environmental health research scientist, a primary health care provider in a community affected by an environmental pollutant, or a community organization member in an under-served community affected by an environmental pollutant	unknown	for FY01, letter of intent requested but not required by June 30, 2000; applications to be received by NIEHS by August 18, 2000; applications critiqued with high quality applications sent to NIEHS National Advisory Council for further consideration; selections and awards anticipated by April 1, 2001	may help that air quality is one of Ambos Nogales' Healthy Gente priorities, related to the Public Health Service's Healthy People 2010 initiative
Fondo Mixto de Fomento a la Investigación Científica y Tecnológica CONACYT-Gobierno del Estado de Sonora ("Mixed Fund to Promote Scientific and Technological Research" sponsored by CONACYT and the State of Sonora)	programs that address problems, needs or opportunities creation or growth of businesses that have high value added and are of a strategic nature for the sector			Mexican source designed for use in Mexico	submit a proposal, if selected for funding, develop a detailed and binding scope of work	

SOURCE AND SPONSOR	ELIGIBLE ACTIVITIES	GRANT/LOAN? AMOUNTS AVAILABLE? MATCH REQUIRED?	ELIGIBLE APPLICANTS	CAN SOURCE BE USED BINATIONALLY?	APPLICATION PROCESS AND TIME FRAME	ISSUES
Ford Foundation	Program areas include Environment and Development as well as a U.S.-Mexico Border Initiative	grants amount available: \$715 million in FY00 for all programs worldwide in 2000, about 6 percent of inquiries were funded; about 25 percent of projects funded were to first-time recipients	organizations and (under limited circumstances) individuals	grant recipients and project activities come from many countries, including Mexico	on-going; begin by submitting letter of inquiry to see if project fits foundation's program areas; submit full application if invited	many projects of interest to BLM Subgroup may be eligible; requires further research as web site was not very specific
Highway Expansion Loan Program (ADOT)	building highways	loans	incorporated cities and towns, county governments	unclear	through SEAGO and by inclusion in the Transportation Improvement Plan	amounts available have decreased because of state and federal budget constraints
Highway Users Revenue Funds	road paving and other similar projects	grants	incorporated cities and towns, county governments	no	funds provided directly to communities	funds have been significantly reduced due to state budget constraints and less revenues coming into the fund
Homeland Security Grants (Environment Systems Research Institute)	GIS software, data, on-line training in Critical Data Infrastructure Support Program	grants \$2.3M available for FY02			applications accepted from April 1 to November 1, 2002	

SOURCE AND SPONSOR	ELIGIBLE ACTIVITIES	GRANT/LOAN? AMOUNTS AVAILABLE? MATCH REQUIRED?	ELIGIBLE APPLICANTS	CAN SOURCE BE USED BINATIONALLY?	APPLICATION PROCESS AND TIME FRAME	ISSUES
National Corridor Planning & Development Program/ Coordinated Border Infrastructure Program (USDOT) ("Corridors and Borders Program")	NCFD: feasibility planning, multi-state coordination, environmental review, construction; CBI: infrastructure improvements (transportation and safety), operation and regulatory improvements, coordination and safety inspections improvements in border region	grants \$140M yearly authorized from FY99-FY03 federal share generally 80% \$1.55M awarded to Ariz. in FY01 for work at Nogales POE (not earmarked), and \$5.175M awarded to Ariz., in FY00 for 3 projects, 1 being the Nogales POE expansion	states and MPOs	yes, to a limited degree - projects in Mexico must be integral to success of a project in the U.S.	solicit statements of intent, then see what Congress earmarks, then prioritize remaining funds; competitive; ranking according to selection criteria statements of intent due July 6, 2001 for FY02 funds	Congress tends to earmark over 60% of funds
Pew Charitable Trusts	Pew Global Climate Change Program - reduce emissions of CO ₂ and other greenhouse gases - directly or through development and implementation of government policies and business practices	grants ; by invitation only in global climate change program; however, Venture Trust may review innovative efforts that do not fit adequately in other program areas amount available: over \$52 million for environment grants in 2000, including global climate change funding area; median grant size \$200,000	NGOs (501(c)(3) non-profit corporations) and universities	90 percent of grants are made to U.S. institutions; unclear whether project work must also be limited to a domestic geographic focus	rolling application process beginning with letter of inquiry; response usually made within 4-6 weeks; if deemed appropriate for program area, invited to make full application; applications reviewed by board which meets quarterly; can take 6-8 months for project to go through all review steps	may be a long-shot; Venture Trust funding worth inquiring about

SOURCE AND SPONSOR	ELIGIBLE ACTIVITIES	GRANT/LOAN? AMOUNTS AVAILABLE? MATCH REQUIRED?	ELIGIBLE APPLICANTS	CAN SOURCE BE USED BINATIONALLY?	APPLICATION PROCESS AND TIME FRAME	ISSUES
Pollution Prevention Grants Program, including Pollution Prevention Incentives for States - EPA	includes technical assistance; outreach, training, technology transfer; demonstration projects	grants available funds for FY02 estimated at \$5 million; grants range from \$20,000 to \$200,000; average grant \$80,000; 50% match required	state agencies	unknown	deadlines and process details vary by region	state priorities may already be programmed
Programa de Mejoras Ambientales Financiera Nacional ("National Environmental Improvements Financing Program" sponsored by Japan Bank for International Cooperation)	pollution control equipment and accessories; renewable energy generation	loans amount available tied to World Bank funds provided in U.S. dollars; will cover up to 80% of project costs with a maximum interest rate of LIBOR+5.9%	businesses; state and local governments only if work with banks or other institutions that can receive U.S. dollars and lend in Mexican pesos	no - for use in Mexico; if business is part foreign-owned, will receive amount proportional to Mexican ownership	must show project approval by corresponding local, state or federal environmental authority, sign an agreement if project approved for funding	if business applicant exports to country not participating in Montreal Protocol Article 5, amount awarded is proportionally reduced
Rockefeller Brothers Fund	Sustainable Resource Use Program advances international discussions on climate change by supporting and publicizing practical, cost-effective models that can contribute to international agreements on these issues, including utility-based energy efficiency, renewable energy, transportation, and green taxes	grants about 35 grants in 2001 ranged from \$4,000 to \$400,000	NGOs (501(c)(3) non-profit corporations) including universities	specifically not active in Latin America; however, U.S. projects that promote fund's global strategies are awarded		

SOURCE AND SPONSOR	ELIGIBLE ACTIVITIES	GRANT/LOAN? AMOUNTS AVAILABLE? MATCH REQUIRED?	ELIGIBLE APPLICANTS	CAN SOURCE BE USED BINATIONALLY?	APPLICATION PROCESS AND TIME FRAME	ISSUES
Slate Energy Program Special Projects, Department of Energy (U.S. DOE)	programs/projects include Clean Cities/Alternative Fuels, Building Technologies (codes and standards), Rebuild America, Million Solar Roofs, Building America and Power Technologies (advancement of photovoltaic balance of system components); 15 categories	grants funds available - \$14 million in FY00 matching requirements vary	varies by funding category	unknown	applications made through Ariz. Dept. of Commerce Energy Office; ranked and selected by U.S. DOE competitive process; for FY00, applications due February 22, 2000, with selections announced in May, 2000 and awards made in July, 2000 24-month maximum project period	
Surface Transportation Program (ADOT)	wide variety of transportation-related projects	grants in FY02, \$10.4M available to communities <200,000 but >5,000 population; out of a total of \$71.5M available based on population; additional \$42.95M available to any area regardless of population	incorporated cities and towns, county governments	unclear	through SEAGO and by inclusion in the Transportation Improvement Plan	

SOURCE AND SPONSOR	ELIGIBLE ACTIVITIES	GRANT/LOAN? AMOUNTS AVAILABLE? MATCH REQUIRED?	ELIGIBLE APPLICANTS	CAN SOURCE BE USED BINATIONALLY?	APPLICATION PROCESS AND TIME FRAME	ISSUES
Transportation Enhancement Program (ADOT)	non-roadway improvements, such as facilities and education for pedestrians & bikes; tourist facilities; landscaping (NOT including maintenance)	grants; reimbursement program amount available: expect \$11M per year over term of program (1998-2003); max \$500K for local projects or \$1.5M for state projects; \$14.3M available in FY02	member entities of Councils of Governments; interested NGOs may work with local governments as sponsors	unclear; USDOT statutory authorities may allow (or at least not prohibit) use in Mexico	local governments submit projects to COGs; are forwarded to the Transportation Enhancement Review Committee for competitive ranking; projects funded in rank order until funds used up; projects should anticipate construction within 24 to 36 months	"local" project = one that does not touch or take place on state highway system; "state" project either entirely on state system or includes local systems where they touch state system process is complicated; coordination with District Engineer highly advisable
Turner Foundation	Improved air quality through promotion of energy efficiency and renewables and improved transportation policies and practices; to defend biodiversity by protecting habitats	grants in 2000, about 75 Air Quality, Energy and Transportation grants ranged from \$10,000 to \$300,000 in 2000, about 180 Habitat grants ranged from \$5,000 to \$350,000	NGOs (501(c)(3) non-profit corporations), including some university-based research foundations	Air Quality, Energy and Transportation program: most funding goes to national programs, but some international programs considered Habitat program: Mexico specifically included among geographic target areas	full proposals required; letters of inquiry not accepted Board meets four times annually; to target specific Board meetings, must submit by: March/April mtg - 12/15 of previous year; July mtg - March 15; September - June 15; December - September 15	funding not provided for buildings, land acquisition, endowments, start-up funds or media projects (films, etc.)
U.S.-Mexico Border Grants Program - EPA	sustainable development, capacity-building, coordination and collaboration; projects should address a Border XXI program priority	grants; 5% match required (cash or in-kind) available funds for FY01 \$300,000; awards range from \$35,000 to \$40,000	local agencies; NGOs (501(c)(3) non-profit corporations), educational institutions	yes	must submit pre-proposal followed by proposal if invited; deadlines vary	projects that leverage funds from other sources have better chance of being funded

SOURCE AND SPONSOR	ELIGIBLE ACTIVITIES	GRANT/LOAN? AMOUNTS AVAILABLE? MATCH REQUIRED?	ELIGIBLE APPLICANTS	CAN SOURCE BE USED BINATIONALLY?	APPLICATION PROCESS AND TIME FRAME	ISSUES
United Nations Foundations	Environment Program focus areas on sustainable energy/climate change (including encouraging the wider use of renewable and highly efficient energy technologies) and ecosystem conservation/ biological diversity (including employing best practice models of conservation)	grants amounts in recent years have ranged from \$70,000 to \$4.7 million	only UN agencies; unsolicited proposals not accepted	no - Mexican projects eligible, but U.S. projects not eligible	must work through the UN and its member agencies	national support, at least in Mexico, would need to be sought
W. Alton Jones Foundation	"Sustainable World Program" goals include: Promote sustainable trade policies through international agreements, with an emphasis on the Western Hemisphere; Promote renewable energy in developing countries; and Eliminate Systemic Contamination in three areas affecting the health of children: Pesticides and endocrine disrupters, Air pollution, Lead poisoning	grants amount available: range from \$1,000 to \$200,000; some 1998 projects up to \$400,000 can be used as seed money, matching funds, for program development, publications and research	NGOs (501(c)(3) non-profit corporations)	projects are funded in many nations; Mexico not specifically mentioned	on-going; begin by submitting letter of inquiry to see if project fits foundation's program areas; submit full application if invited; Board meets quarterly	funding for building construction/renovation specifically excluded review of projects funded in 1998 indicates this foundation is highly worth approaching, if appropriate applicant found

SOURCE AND SPONSOR	ELIGIBLE ACTIVITIES	GRANT/LOAN? AMOUNTS AVAILABLE? MATCH REQUIRED?	ELIGIBLE APPLICANTS	CAN SOURCE BE USED BINATIONALLY?	APPLICATION PROCESS AND TIME FRAME	ISSUES
Wal-Mart Environmental Grants	local environmental projects	grants \$1,000 per recipient per year, no match required; one environmental grant awarded per store per year	NGOs, schools	no	submit application form by April 21 for FY03 grants; applications collected nationally with grantees selected by Arkansas headquarters award recipients receive funds within about one month	

TABLE 3

POSSIBLE FUNDING MECHANISMS THAT COULD SUPPORT AIR QUALITY IMPROVEMENT ACTIONS

DESCRIPTIVE NAME	HOW IT WORKS/ WHAT IT'S FOR	SOURCE(S) OF INCOMING FUNDS	RECIPIENTS AND MECHANISMS FOR OUTGOING FUNDS	CURRENT EXAMPLE? LOCAL OR STATE LAW REQUIRED?	CAN MECHANISM BE MANAGED OR USED BINATIONALLY?
Air Quality Fee Fund	existing program; activities funded specified in great detail by legislature; includes funding for voluntary vehicle repair program in specified areas	\$1.50 fee on registration of all vehicles in state of Arizona	specified in great detail by legislature	would need change in state law for funds to be used in Nogales area; some may already be used here through funding of FTEs	no
Ambos Nogales Expatriates Foundation	people with roots in Ambos Nogales who have left the area could set up a private foundation for funding air quality projects; could also be designed to address many other community needs, aside from air quality	individual and business donations; attractive as tax write-off; may be possible to attract maquiladora donations, too	depends on project	several Mexican communities with expatriate populations in the U.S. have set up such funds; some have web sites; this would be first binational example along border; officially supported and facilitated through "Partners in Prosperity" (Padrinos Project) within Presidential Office for Mexicans Abroad	would be designed that way

DESCRIPTIVE NAME	HOW IT WORKS/ WHAT IT'S FOR	SOURCE(S) OF INCOMING FUNDS	RECIPIENTS AND MECHANISMS FOR OUTGOING FUNDS	CURRENT EXAMPLE? LOCAL OR STATE LAW REQUIRED?	CAN MECHANISM BE MANAGED OR USED BINATIONALLY?
Clean Air Investment Fund (CAIF)	flexible means of funding a variety of air quality improvement actions; emitters pay fee into fund in lieu of reducing emissions; fund then used for grants and/or revolving loans that pay for emissions reductions activities; attractive IF fee in lieu of costs less than required to pay for emissions reductions	PM10 emitters, potentially including unpaved parking lot owners, unpaved road owners, car and truck owners, developers, Union Pacific/Ferromex; could incorporate development impact fee concepts	likely should involve an advisory board of diverse composition; board could determine priority uses and mechanisms for outgoing funds	authorizing legislation may be required; Paso del Norte Air Basin currently examining implementation of a CAIF	unknown whether authority for similar mechanism exists in Mexico; U.S. authorizing legislation should address this issue clearly
Clean Air Fund	existing program; activities funded specified in great detail by legislature; primary focus is alternative fuels and air quality activities in Phoenix and Tucson areas	\$16.80 fee in lieu of inspection on vehicles younger than a certain age in areas where emissions inspections required	specified in great detail by legislature	would need change in state law for funds to be used in Nogales area	no
Congestion Pricing	implement system of tolls (or higher tolls where general tolls already exist) applied during peak traffic hours	user tolls	INS and/or USCS, public transit system owners and/or operators; funds could be used by recipients for capital investments and/or operation and maintenance costs	possibly requires local, state, and/or federal law	unknown; authorizing legislation would need to address issue clearly

DESCRIPTIVE NAME	HOW IT WORKS/ WHAT IT'S FOR	SOURCE(S) OF INCOMING FUNDS	RECIPIENTS AND MECHANISMS FOR OUTGOING FUNDS	CURRENT EXAMPLE? LOCAL OR STATE LAW REQUIRED?	CAN MECHANISM BE MANAGED OR USED BINATIONALLY?
Emissions Trading	regulated community expands ability to generate emissions by funding external projects that will reduce emissions; reductions must generally be greater than would be achieved through internal projects; international trading poorly developed; inter-pollutant trading not yet worked out	regulated community seeking to expand emissions capacity or avoid emissions reduction requirements	depends on project	several U.S. domestic single-pollutant banking systems already exist; banked emission credits are traded on the Chicago Stock Exchange and in other exchange markets; several northeastern states and eastern Canadian provinces working on international system	preliminary work on how to set up international trading is primarily driven by Kyoto Accord
Empowerment Zone-related tax breaks	private, for-profit businesses using technology to reduce pollution	clients and customers	company owners	IdleAire Technologies of Knoxville, Tenn. - heating and cooling units at truck stops also offer electricity, digital TV and high-speed Internet service; eliminate the need for idling at truck stops	yes, to the degree businesses are licensed and allowed to operate binationally
International Memoranda of Understanding among NGOs	sets up mechanism for cooperative binational efforts	typically grants	depends on nature of projects	has been done between TX Center for Policy Studies, Pronatura Noreste AC, Cross-Border Institute for Regional Development at UT Brownsville; being discussed by UofA and Instituto Tecnológico de Nogales; local/state law not required	expressly designed for this purpose; incoming funding sources need to be examined carefully on this issue

DESCRIPTIVE NAME	HOW IT WORKS/ WHAT IT'S FOR	SOURCE(S) OF INCOMING FUNDS	RECIPIENTS AND MECHANISMS FOR OUTGOING FUNDS	CURRENT EXAMPLE? LOCAL OR STATE LAW REQUIRED?	CAN MECHANISM BE MANAGED OR USED BINATIONALLY?
Kyoto Accord carbon dioxide emission reduction financing mechanisms	various sectors must reduce emissions either directly or by funding other projects and banking the reductions	entities required to reduce emissions	funds may be spent internally or provided to organizations implementing external projects	methods and requirements being worked out internationally by parties to Accord	U.S. has opted out; unknown whether funds generated in Mexico could be used in the U.S.
Mexican Municipal Bonds	municipal bonding authority recently approved in Mexico; federal government working on ability to sell in U.S. bond markets	bond issues; would be re-paid through any of the classic methods (e.g., general fund revenues, dedicated fund revenues, user fees, etc.)	owners of constructed facilities	agreement being developed with State of California to allow sales in CA bond markets	managed – yes; used - unknown
Net Metering	allows customers to install own power generation systems and feed excess power back into the grid	provides promise of reduced bills as incentive to install renewable energy technologies	homeowner benefits from reduced bills; power company benefits from low or no emission energy	already authorized in Ariz. and done by Tucson Electric Power	unknown whether authority for similar mechanism exists in Mexico
Revenue Aligned Budget Authority (USDOT)	provides additional funds to many of USDOT's statutory budget authorities when actual revenues exceed projections; includes Borders and Corridors, CMAQ, STP and others	revenues that exceed projections	state departments of transportation	already exists; authorization for use of funds specifies how much goes into each program in each state	yes in case of Corridors and Borders Program
Revolving Loan Program	classic method of funding capital improvements for construction projects	would need to seek initial capitalization grants through federal, state, local appropriations, possibly foundation sources as well	construction project owners receive loans; repayment finances future projects	many exist, but none known for air quality projects; CEC has used for P2 projects possibly requires both local and state law to authorize	could possibly be designed for this

DESCRIPTIVE NAME	HOW IT WORKS/ WHAT IT'S FOR	SOURCE(S) OF INCOMING FUNDS	RECIPIENTS AND MECHANISMS FOR OUTGOING FUNDS	CURRENT EXAMPLE? LOCAL OR STATE LAW REQUIRED?	CAN MECHANISM BE MANAGED OR USED BINATIONALLY?
Shadow Tolls	per-vehicle toll paid to facility operator by third party or parties, rather than by facility user; can be used to promote objectives like High Occupancy Vehicle lane usage	many types of sources possible, including TIFIA line of credit	INS and/or USCS, public transit system owners and/or operators; funds could be used by recipients for capital investments and/or operation and maintenance costs	has been implemented in Great Britain possibly requires local, state, and/or federal law	unknown; authorizing legislation would need to address issue clearly
State Bond Issue	classic method of funding capital improvements for construction projects	bond issues; would be re-paid through any of the classic methods (e.g., general fund revenues, dedicated fund revenues, user fees, etc.)	owners of constructed facilities	TX voters approved in November 2001 Border Colonia Access Program, a \$175 million bond issue to support road paving projects in TX colonias, primarily located near the international border; approximately 25% of unpaved roads may be paved; once paved, road must be added to county system and maintained; funds being managed by TXDOT	unknown whether State of Sonora has such authority; unknown whether special legislation would be needed to allow Ariz. bond issue to be used in Nogales, Sonora
State Infrastructure Banks	revolving loan program for transportation projects	capitalized by grants from USDOT to participating states; funds renewed by repayment of loans	transportation project sponsors	requires voter approval 38 states participate; Ariz. included	unclear

DESCRIPTIVE NAME	HOW IT WORKS/ WHAT IT'S FOR	SOURCE(S) OF INCOMING FUNDS	RECIPIENTS AND MECHANISMS FOR OUTGOING FUNDS	CURRENT EXAMPLE? LOCAL OR STATE LAW REQUIRED?	CAN MECHANISM BE MANAGED OR USED BINATIONALLY?
Supplemental Environmental Projects (SEPs)	fines and penalties in state or federal environmental enforcement cases reduced through convicted party paying for environmental projects; projects should be related to nature of violation	environmental enforcement action resulting in fines or penalties; unclear whether enforcement actions against firms located in Tucson or Phoenix could result in projects in Nogales	typically funds paid to project implementor	many available in U.S.; for example, North Star Steel in Kingman, Ariz., being required to pay for several road-paving projects in compensation for air quality violations at plant currently authorized in U.S. change in local law could allow local enforcement actions to result in SEPs	unknown whether similar practice exists in Mexico; state or federal law may be required for U.S. supplemental environmental projects to be conducted in Mexico
Swopping Program	seek opportunities for binational swopping of materials, equipment, supplies, services	wouldn't necessarily involve money; depends on nature of project	depends on nature of project; exchanges may or may not be even	could possibly be done as a matter of policy without legislation	yes, by design

DESCRIPTIVE NAME	HOW IT WORKS/ WHAT IT'S FOR	SOURCE(S) OF INCOMING FUNDS	RECIPIENTS AND MECHANISMS FOR OUTGOING FUNDS	CURRENT EXAMPLE? LOCAL OR STATE LAW REQUIRED?	CAN MECHANISM BE MANAGED OR USED BINATIONALLY?
Transportation Infrastructure Finance and Innovation Act of 1998 (TIFIA) - USDOT	intermodal facilities, border crossing infrastructure, highway trade corridors, transit and passenger rail facilities with regional/national benefits	USDOT capitalization grants to provide loans, loan guarantees, stand-by lines of credit during first 10 years of operation funded projects must be supported in whole or part by user fees or other non-federal dedicated funding sources projects must be included in state's Transportation Improvement Program	public facility owners	existing program	unclear; border crossing infrastructure specifically supported

TABLE 4
CROSS REFERENCE OF BLM SUBGROUP RECOMMENDATIONS TO
FINANCING SOURCES AND MECHANISMS

RECOMMENDATION	POSSIBLE FINANCING SOURCES	POSSIBLE FINANCING MECHANISMS
A. Ensure adequate stabilization of unpaved roads and parking lots	Arizona Lottery, Highway Expansion Loan Program, Surface Transportation Program, Highway Users Revenue Funds, BECC/NADBank, Congestion Mitigation and Air Quality Program, Canada Fund for Local Initiatives, Pollution Prevention Grants Program, Programa de Mejoras Ambientales Financiera Nacional	Ambos Nogales Expatriates Foundation, Clean Air Investment Fund, Emissions Trading, State Infrastructure Bank, Mexican Municipal Bonds, Revolving Loan Program, State Bond Issue, Supplemental Environmental Projects, TIFIA, Revenue Aligned Budget Authority
B. Speed up individual and commercial border crossings	National Corridor Planning & Development Program/Coordinated Border Infrastructure Program, Arizona Lottery, Clean Air Transportation Communities, Highway Expansion Loan Program, Surface Transportation Program, Highway Users Revenue Funds, BECC/NADBank, Congestion Mitigation and Air Quality Program, Homeland Security Grants, Environmental Education Grants, Rockefeller Brothers Fund, Transportation Enhancement Program, Turner Foundation, U.S. Mexico Border Grants Program, W. Alton Jones Foundation	Ambos Nogales Expatriates Foundation, Clean Air Investment Fund, Congestion Pricing, Emissions Trading, State Infrastructure Bank, Mexican Municipal Bonds, Revolving Loan Program, Shadow Tolls, State Bond Issue, Supplemental Environmental Projects, Revenue Aligned Budget Authority, TIFIA
C. Address vehicle emissions	BECC/NADBank, Clean Cities Program, Congestion Mitigation and Air Quality Program, Energy Foundation, Environmental Justice Through Pollution Prevention Grants, Environmental Justice: Partnerships for Communication Grants, Clean Air Transportation Communities, Pollution Prevention Grants Program, Rockefeller Brothers Fund, State Energy Program Special Projects, Turner Foundation, U.S. Mexico Border Grants Program, United Nations Foundations, W. Alton Jones Foundation, Programa de Mejoras Ambientales Financiera Nacional, Fondo Mixto de Fomento a la Investigación Científica y Tecnológica CONACYT-Gobierno del Estado de Sonora	Ambos Nogales Expatriates Foundation, Clean Air Investment Fund, Emissions Trading, Clean Air Fund*, Air Quality Fee Fund*, International Memoranda of Understanding among NGOs, Kyoto Accord carbon dioxide emission reduction financing mechanisms, Supplemental Environmental Projects, Swopping Program

RECOMMENDATION	POSSIBLE FINANCING SOURCES	POSSIBLE FINANCING MECHANISMS
D. Construct major transportation corridors	BECC/NADBank, Congestion Mitigation and Air Quality Program, National Corridor Planning & Development Program/Coordinated Border Infrastructure Program, Highway Expansion Loan Program, Surface Transportation Program	Ambos Nogales Expatriates Foundation, Clean Air Investment Fund, Mexican Municipal Bonds, Revolving Loan Program, Shadow Tolls, State Bond Issue, State Infrastructure Bank, Revenue Aligned Budget Authority, TIFIA
E. Reduce air quality impacts of train route	BECC/NADBank, Congestion Mitigation and Air Quality Program, National Corridor Planning & Development Program/Coordinated Border Infrastructure Program	Ambos Nogales Expatriates Foundation, Clean Air Investment Fund, Mexican Municipal Bonds, Revolving Loan Program, State Bond Issue, State Infrastructure Bank, Revenue Aligned Budget Authority, TIFIA
F. Eliminate garbage burning	Environmental Education Grants, U.S. Mexico Border Grants Program, W. Alton Jones Foundation, BECC/NADBank, Border Health Commission, Canada Fund for Local Initiatives, Programa de Mejoras Ambientales Financiera Nacional, Fondo Mixto de Fomento a la Investigación Científica y Tecnológica CONACYT-Gobierno del Estado de Sonora	Ambos Nogales Expatriates Foundation, Clean Air Investment Fund, Green Gazelles
G. Promote more effective revegetation efforts	American Greenways Grants, Arizona Lottery, Canada Fund for Local Initiatives, David and Lucile Packard Foundation, Environmental Education Grants, Environmental Justice Through Pollution Prevention Program, Environmental Justice Partnerships for Communication, Ford Foundation, Transportation Enhancement Program, Turner Foundation, U.S. Mexico Border Grants Program, United Nations Foundations, W. Alton Jones Foundation, Border Health Commission	Ambos Nogales Expatriates Foundation, Clean Air Investment Fund, Emissions Trading, Green Gazelles, International Memoranda of Understanding among NGOs, Kyoto Accord carbon dioxide emission reduction financing mechanisms
H. Reduce wood burning	Canada Fund for Local Initiatives, David and Lucile Packard Foundation, Environmental Justice Through Pollution Prevention Program, Ford Foundation, Pew Charitable Trusts, Pollution Prevention Grants Program, Rockefeller Brothers Fund, State Energy Program Special Projects, Turner Foundation, U.S. Mexico Border Grants Program, United Nations Foundations, W. Alton Jones Foundation, Border Health Commission, Programa de Mejoras Ambientales Financiera Nacional, Fondo Mixto de Fomento a la Investigación Científica y Tecnológica CONACYT-Gobierno del Estado de Sonora	Ambos Nogales Expatriates Foundation, Clean Air Investment Fund, Emissions Trading, Green Gazelles, International Memoranda of Understanding among NGOs, Kyoto Accord carbon dioxide emission reduction financing mechanisms, Net Metering, Supplemental Environmental Projects

RECOMMENDATION	POSSIBLE FINANCING SOURCES	POSSIBLE FINANCING MECHANISMS
I. Implement engineering solutions to soil erosion	Arizona Lottery, U.S. Mexico Border Grants Program, Programa de Mejoras Ambientales Financiera Nacional	Ambos Nogales Expatriates Foundation, Clean Air Investment Fund, Supplemental Environmental Projects
J. Establish recycling programs	Canada Fund for Local Initiatives, Environmental Education Grants, Environmental Justice Through Pollution Prevention Program, Pollution Prevention Grants Program, U.S. Mexico Border Grants Program, Programa de Mejoras Ambientales Financiera Nacional, Fondo Mixto de Fomento a la Investigación Científica y Tecnológica CONACYT-Gobierno del Estado de Sonora	Ambos Nogales Expatriates Foundation, Clean Air Investment Fund, Supplemental Environmental Projects, Kyoto Accord carbon dioxide emission reduction financing mechanisms, Green Gazelles
K. Create or improve public transit services	Arizona Lottery, Surface Transportation Program, Canada Fund for Local Initiatives, Clean Air Transportation Communities, American Greenways Grants, Clean Cities Program, Congestion Mitigation and Air Quality Program, Environmental Justice Through Pollution Prevention Program, Environmental Justice Partnerships for Communication, Pollution Prevention Grants Program, Rockefeller Brothers Fund, Transportation Enhancement Program, Turner Foundation, U.S. Mexico Border Grants Program, W. Alton Jones Foundation, Programa de Mejoras Ambientales Financiera Nacional	Ambos Nogales Expatriates Foundation, Clean Air Investment Fund, Congestion Pricing, Revolving Loan Program, Emissions Trading, International Memoranda of Understanding among NGOs, Kyoto Accord carbon dioxide emission reduction financing mechanisms, Mexican Municipal Bonds, State Infrastructure Bank, Supplemental Environmental Projects, Green Gazelles, Revenue Aligned Budget Authority, TIFIA
L. Improve traffic flow on local streets	Arizona Lottery, Congestion Mitigation and Air Quality Program, Rockefeller Brothers Fund, Transportation Enhancement Program, Turner Foundation, U.S. Mexico Border Grants Program, Programa de Mejoras Ambientales Financiera Nacional	Ambos Nogales Expatriates Foundation, Clean Air Investment Fund, Revolving Loan Program, State Infrastructure Bank, Mexican Municipal Bonds, Revenue Aligned Budget Authority

*Not available under their current structure.





III. WHAT ARE THE HEALTH IMPACTS OF AIR QUALITY IN AMBOS NOGALES?

A. OVERVIEW OF HEALTH EFFECTS RELATED TO PARTICULATE MATTER EXPOSURE

According to ADHS, health problems that can arise from exposure to particulate matter (dust) in the air can be as mild as irritated eyes, nose and throat, or as severe as a higher tendency to get sick with respiratory illnesses, breathing difficulties, asthma attacks, and heart and lung damage. After a lifetime of exposure, this kind of pollution can cause cancer. Among elderly people who already suffer from a heart or lung problem, exposure to particulate matter can lead to premature death. Children, the elderly, athletes and others who exercise, people of any age who already have lung or heart problems and smokers are all more sensitive to the effects of particulate matter than the general population.

Dust that is larger than 10 microns in diameter (about one-seventh the thickness of a human hair) can get stuck in your nose and throat, but it does not cause serious health problems (ADHS, September, 2000). The dust that causes problems is very small. Dust that is less than 2.5 microns in diameter (PM2.5) is the most harmful because it can be breathed most deeply into the lungs. Dust that is larger, but still less than 10 microns in diameter (PM10), can also be breathed into the lungs where it can get stuck and cause health problems.

B. APPLICABLE AIR QUALITY STANDARDS AND RELATED DATA



PM10 and PM2.5 monitoring equipment on the Post Office roof, Nogales, Arizona

EPA has set several National Ambient Air Quality Standards (NAAQS) in order to protect air quality and human health. As long as a pollutant stays below its NAAQS, then EPA considers the air to be safe and healthy to breathe. EPA has set two NAAQS for PM10; one is the 50 micrograms per cubic meter ($\mu\text{g}/\text{m}^3$) *annual* standard, and the other is the *24-hour* standard of 150 $\mu\text{g}/\text{m}^3$. A $\mu\text{g}/\text{m}^3$ is about the same as a part per million (ppm); one ppm is like one inch in 15.8 miles or one turn of a street bicycle's wheels in a 1,338-mile trip. EPA is also working to set two NAAQS for PM2.5. The standards are

15 $\mu\text{g}/\text{m}^3$ for the *annual* standard and 65 $\mu\text{g}/\text{m}^3$ for the *24-hour* standard. EPA and the states are currently working to determine which geographic locations are the problem areas; EPA is also developing guidance to assist the states on how to address problem areas.

Similarly, SEMARNAT has also set federal air quality standards – “Allowable Limits” – in Mexico for various pollutants. As long as a pollutant stays below its Allowable Limit, SEMARNAT considers the air to be safe and healthy to breathe by “at risk” populations. Numerically, the Mexican PM10 standards are the same as those set by EPA for the United States – 50 $\mu\text{g}/\text{m}^3$ as an *annual* average, and 150 $\mu\text{g}/\text{m}^3$ as a *24-hour* average. Mexico does not have PM2.5 standards at this time.

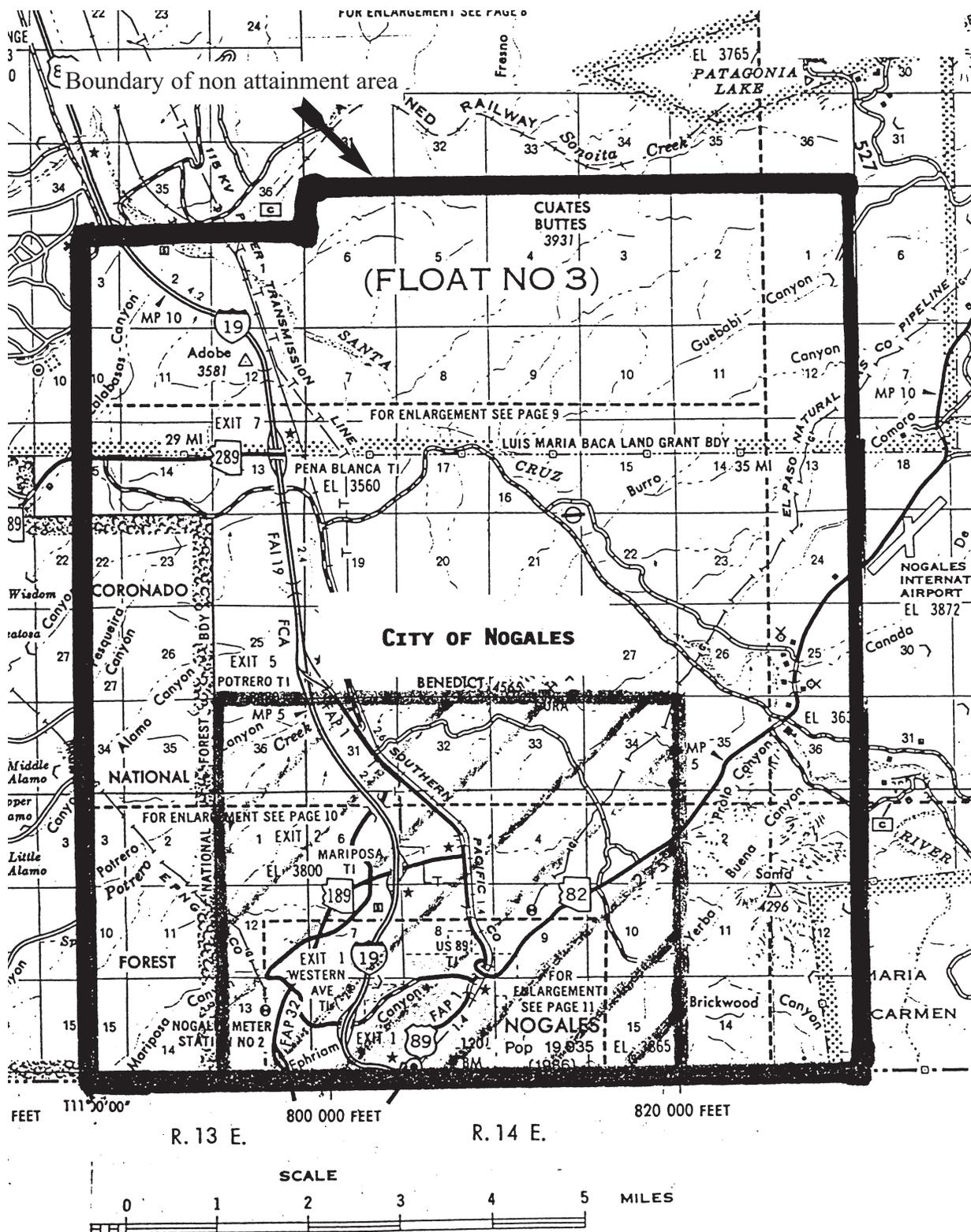
In addition to the NAAQS, certain other levels have been designated primarily for determining the severity of an air quality problem that arises due to emergencies like fires. Specific responses are associated with these levels. For example, ADEQ (AAC R-18-2-220) is required to issue an *alert* when PM10 levels reach 350 $\mu\text{g}/\text{m}^3$ on a 24-hour average basis; to issue a *warning* when PM10 levels reach 420 $\mu\text{g}/\text{m}^3$ on a 24-hour average basis; and to declare an *emergency* when PM10 levels reach 500 $\mu\text{g}/\text{m}^3$ on a 24-hour average basis. The procedures and actions required are described in ADEQ's Procedures for Prevention of Emergency Episodes (ADEQ, October 18, 1988).

Different standards are set for various time periods because being exposed to something on a short-term basis is not the same as repeated exposure over the long term. Being exposed to something potentially unhealthy for a very short period requires more of that substance to do harm. On the other hand, repeated exposures to the substance over a long period requires less of the substance to do harm. This is the basis for the annual and 24-hour PM10 and PM2.5 standards.

In the United States, violations of the NAAQS result in an area being declared a “non attainment area.” A violation of the PM NAAQS occurs when a community exceeds the standard multiple times over a given period of time. During the 1980s and early 1990s, violations of the PM10 NAAQS were recorded in Nogales, Ariz. For that reason, the city of Nogales and portions of Santa Cruz County (primarily the southern part of Rio Rico) were designated as the “Nogales Non Attainment Area for PM10.” Figure 1 shows a map of the Nogales Non Attainment Area. The designation as a non attainment area means that a variety of local, state, and federal agencies need to take actions to reduce particulate matter pollution in the Nogales area. Some actions were taken in accordance with the State Implementation Plan (SIP) that was developed to describe how the goal of clean air would be accomplished (ADEQ, June, 1993).

Recorded exceedences of the Allowable Limits are interpreted more strictly in Mexico than exceedences in the United States: exceeding the Mexican standard even a single time is considered to be a violation. Both of the Allowable Limits for PM10 are violated regularly. When an Allowable Limit is violated, federal law requires the federal, state and local governments to share the responsibility for taking actions that will improve air quality. Toward that end, SEMARNAT and SIUE have provided additional monitoring equipment, technical assistance

FIGURE 1
NOGALES NON ATTAINMENT AREA FOR PARTICULATE MATTER



and training to the municipality of Nogales, Sonora, which has in turn implemented additional monitoring efforts. In addition, as discussed in Sections II.G and VII.B, SIUE has worked with the municipality to develop an accord promoting greater maquiladora participation in revegetation efforts. Finally, all three entities further fulfill their shared responsibilities through participation in the BLM Subgroup's efforts.

In 1994 and 1995, ADEQ and SEMARNAT undertook a joint, binational air quality monitoring effort in Ambos Nogales. The results of that binational study are described in Section III.C. ADEQ has prepared an update of PM10 data collected in Nogales, Ariz., and Nogales, Sonora, from 1995 through 2002, subsequent to the study's data collection period. Figure 2 shows trends over time in annual average PM10 concentrations. Figure 3 shows the dates and concentrations of the highest PM10 24-hour average concentrations each year for the same time period. Data for Nogales, Ariz., were collected at the Post Office monitoring station, and data for Nogales, Sonora, were collected at the Bomberos (Fire Station) monitoring station in the city center. It should be noted that the graphs do not include U.S. data for 1996 because technical problems with the data collection and measurement resulted in insufficient data recovery to generate valid statistics for that year. At this time, ADEQ is reviewing its PM2.5 data in light of new data collection procedures established by EPA; updated information on PM2.5 trends in Nogales will be available in the future.

In reviewing the data in these graphs, the first thing to note is that Nogales, Ariz., is currently attaining the annual PM10 standard. However, the NAAQS was violated for the period of 1999, 2000 and 2001, and the current three-year average is very close to the limit: the limit is 50 $\mu\text{g}/\text{m}^3$, and the 2000-2002 three-year average is 49 $\mu\text{g}/\text{m}^3$. In addition, the 24-hr PM10 standard has been violated consistently since 1998 (based on the number of times that the standard was exceeded in three-year intervals). Indeed, although there is some variation in the data, both the annual average PM10 concentrations and the yearly maximum 24-hr PM10 concentrations have been gradually increasing during the last decade. With regard to PM10 concentrations in Nogales, Sonora, both the 24-hr concentrations and the annual averages are generally slightly higher than those in Nogales, Ariz., with the Allowable Limits regularly being violated.

There are various possible explanations for these data trends. First, in the period shortly after the data collection effort for the binational study, both the annual average and 24-hr PM10 concentrations were down as compared to earlier years when recorded violations resulted in the designation of the non attainment area. This reduction may be a result of actions taken on the basis of the SIP. They may also reflect the closure of the old landfill in Nogales, Sonora – and the cessation of garbage burning activities that used to occur there regularly. However, during the past decade, the population of Ambos Nogales has grown rapidly. This growth has likely contributed to increased emissions levels from more unpaved roads, more cars, more soil erosion, and more wood and garbage burning. In fact, most of the PM10 24-hr highest values have occurred during the winter months, which may reflect a combination of higher wood burning rates for home heating and atmospheric inversion layers that trap emissions in the Ambos Nogales valley. Although the data are still under review, most PM2.5 24-hour highest values are also thought to occur in the winter months, lending further credence to the possible role of wood burning in creating higher pollution levels on a seasonal basis.

FIGURE 2
AMBOS NOGALES PM10 ANNUAL AVERAGE CONCENTRATIONS ($\mu\text{g}/\text{m}^3$), 1994-2002

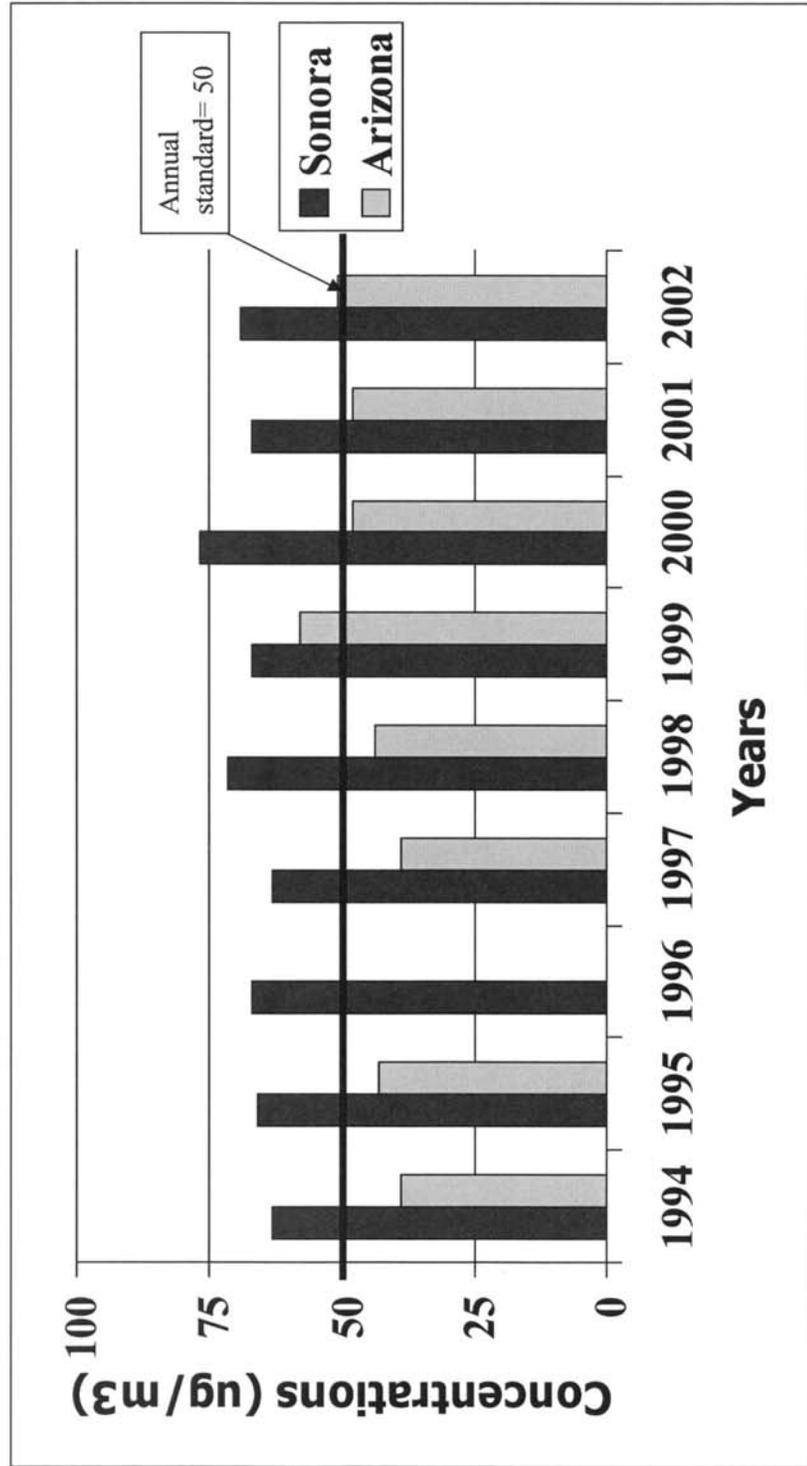
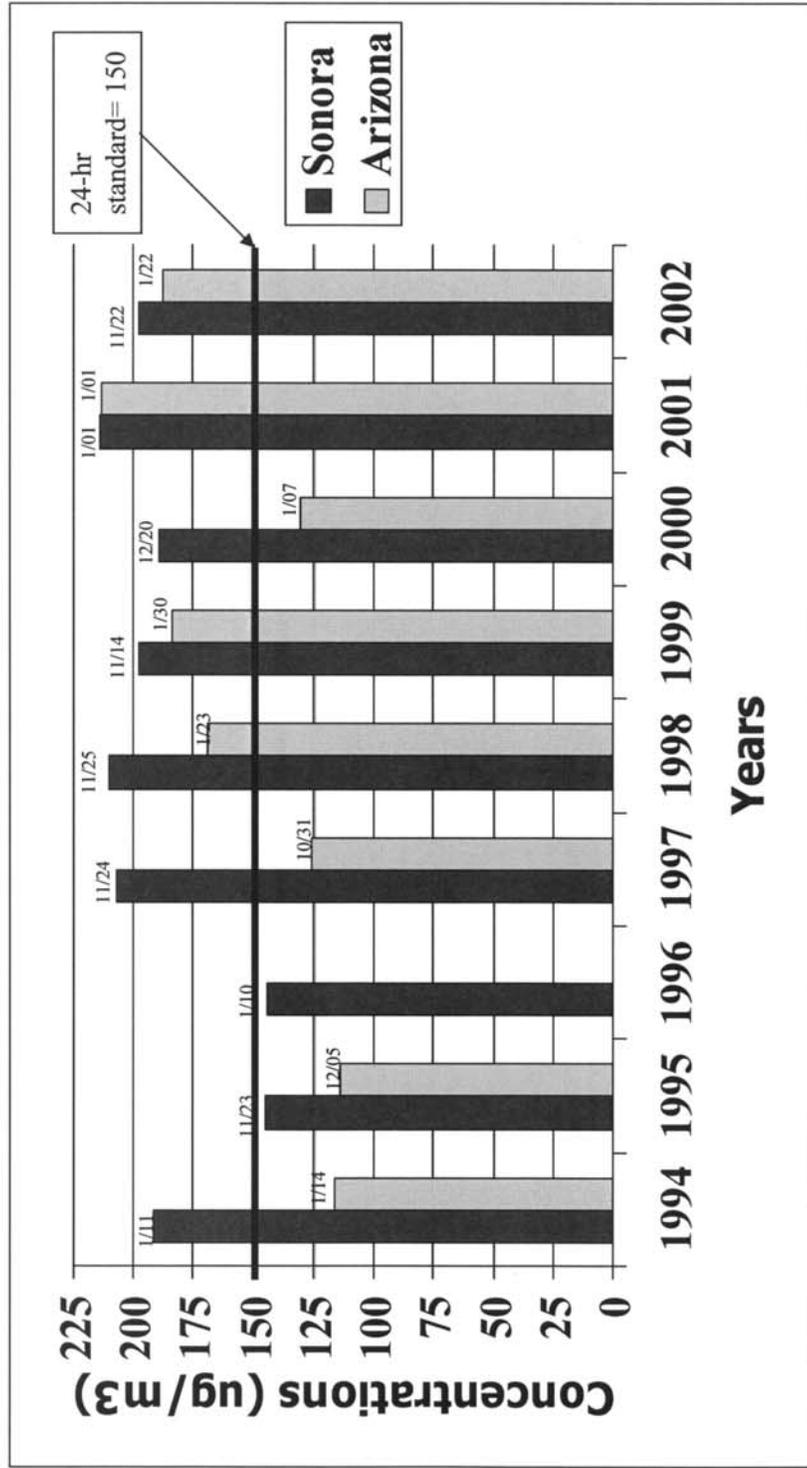


FIGURE 3
AMBOS NOGALES PM10 MAXIMUM 24-HR. CONCENTRATIONS ($\mu\text{g}/\text{m}^3$), 1994-2002



The municipality of Nogales, Sonora, has started to monitor air quality in recent years. Having used EPA methods to select the site, the municipality maintains a regular data collection station at the Lázaro Cárdenas Elementary School in the south central part of the city near the Monument of Benito Juárez (which is removed from the location of ADEQ's monitor at Bomberos). Based on data collected at this location, the municipality's Ecology Department issued its first Ambient Air Quality Monitoring Report for PM₁₀ in January, 2002 (H. Ayuntamiento de Nogales, Sonora, Enero, 2002); the report covered the period from February to December of 2001. The report shows that air quality during that period slightly exceeded both of the PM₁₀ Allowable Limits. Specifically, the 24-hour standard was exceeded three times, with the highest measure being 162 µg/m³, and the annual average "to date" was 54.42 µg/m³. A conclusive annual average is not given in the report, since no data were collected for the first several weeks of the year, while the new monitoring station was being established. In the report, the municipality states that although the PM₁₀ concentrations measured are not alarming, various actions should be taken to improve air quality. In discussing air quality data at the BLM Subgroup's July 24, 2002 meeting, the municipality of Nogales, Sonora, indicated that as of July, 2002, neither of the PM₁₀ standards had been exceeded during 2002 at the Lázaro Cárdenas Elementary School monitoring station. The municipality also pointed out that measured PM₁₀ concentrations seem to peak regularly on Fridays, Saturdays and Sundays, which may be related to increased weekend movement of people and/or longer lines at the ports of entry. In fact, some of the highest air quality readings occurred in October, 2001 (please see Figure 4). These readings may be attributed to increased holiday activities, the start of the inversion layer season, the start of the produce season, or the very long lines to cross the border as a result of security measures implemented in the wake of the September 11 terrorist attacks.

Finally, it should be noted that the BLM Subgroup's efforts have focused entirely on reducing PM emissions. However, the question has been raised as to whether Ambos Nogales may be having any problems with other air pollutants for which NAAQS have been established. The ADEQ/SEMARNAT study (described in detail in the following section) did not identify a problem with lead concentrations. Sulfur dioxide is not expected to be an issue because there are no smelters or other important sources of sulfur dioxide emissions in Ambos Nogales. The other pollutants for which NAAQS have been established – ozone, nitrogen oxides and carbon monoxide, have not been adequately monitored in Ambos Nogales, however. ADEQ is currently working to install a monitor capable of measuring these three pollutants in Ambos Nogales' air, to make a preliminary determination of whether there seems to be an issue and whether more detailed monitoring is warranted. ANAQTF recommends that the results of this effort be integrated with children's environmental health concerns by involving students in outreach to disseminate the results of this monitoring. In addition, if an air quality issue for any of these parameters is identified, then ANAQTF recommends that more detailed air quality assessments for that parameter evaluate the degree to which spatial variations in pollutant concentrations coincide or differ from geographic areas of importance to children (please see Section I.C.7).

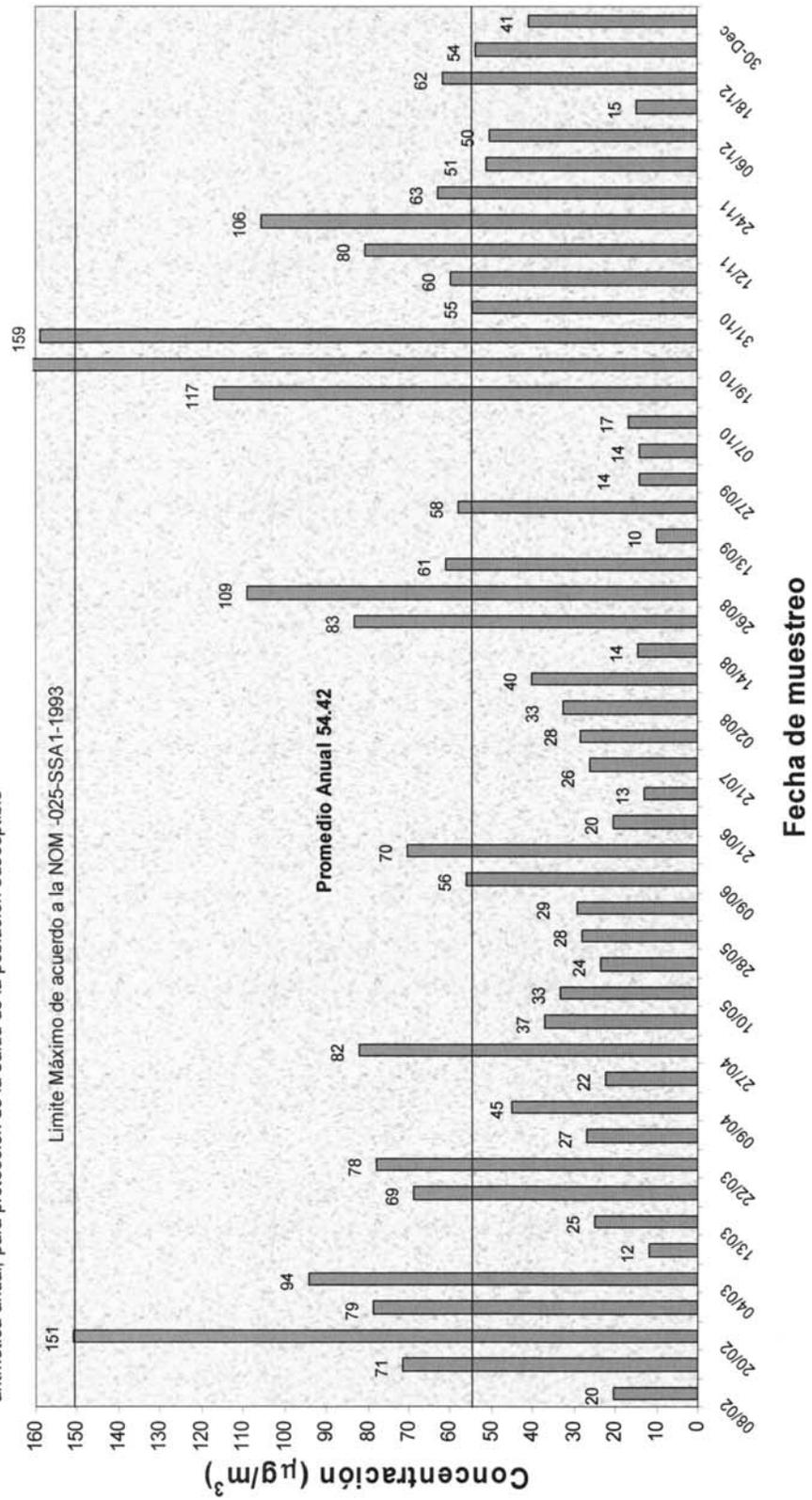
All in all, the data from both Nogales, Ariz., and Nogales, Sonora, indicate that particulate matter pollution is still a health problem for the public. The following section explores the possible health consequences of local air quality conditions.

FIGURE 4

PM10 MONITORING AT ESCUELA LAZARO CARDENAS, NOGALES, SONORA - 2001

Concentración de PM10 del año 2001

La concentración de partículas menores a 10 micras, como contaminantes atmosféricos, no debe rebasar el límite permisible de 150 $\mu\text{g}/\text{m}^3$, en 24 horas una vez al ar aritmética anual, para protección de la salud de la población susceptible



C. RESULTS OF AMBOS NOGALES AIR QUALITY STUDY RISK ASSESSMENT

In 1999, ADEQ and SEMARNAT released the results of an air quality study for Ambos Nogales. The study was designed to address the effects on human health of emissions and atmospheric transport of particulate matter and hazardous air pollutants (HAPs). The following summary of the study is based on the Ambos Nogales Binational Air Quality Study Citizen's Summary (ADEQ, August, 1999).

The study included the following components:

1. A measurement program to determine particulate matter and HAPs ambient concentrations and meteorological (wind and temperature) conditions in the study area. Samples were collected in 1994 and 1995.
2. Development of an emissions inventory to determine the sources of particulate matter and HAPs in the area, and their distribution in time and space.
3. Identification of the HAPs that pose the greatest risks to human health in the area. The risk assessment focused on these selected HAPs.
4. Atmospheric simulation modeling to estimate the dispersion of particulate matter and HAPs throughout the study area.
5. Risk assessment to estimate the potential risks to human health resulting from the particulate matter and HAP ambient concentrations determined from the atmospheric simulation modeling.

Adverse health effects were evaluated for two types of “receptor” individuals that were selected as representative examples of the general population on each side of the border. In the first case, a “reasonable maximal exposure (RME) receptor” was designed to represent people who have relatively high exposures to the selected HAPs – essentially a “worst case” scenario. Secondly, a “central tendency case (CTC) receptor” was designed to represent people who have just average exposures. The results of these two cases provide a realistic range of exposures and the associated human health risks. It should be noted that the estimates presented in the study represent risks to the general population and may not apply to individuals who live or work near major sources of pollution and who may, therefore, be exposed to higher concentrations than the general population. The scope of the study did not address such localized “hot spots,” nor did it address indoor air quality.

Risks due to particulate matter exposure were estimated by using actual human health statistics derived from epidemiological studies and applying them to the concentrations to which RME and CTC receptors are expected to be exposed. The percentage of increase in cases of health problems related to particulate matter pollution was estimated. In addition, the expected increase in numbers of premature respiratory and cardiovascular deaths among elderly people who already have lung or heart problems was estimated. These estimates are provided in Table 5.

TABLE 5
ESTIMATED PERCENTAGE INCREASE IN HEALTH EFFECTS CASES AND
ESTIMATED INCREASE IN NUMBERS OF PREMATURE DEATHS IN AMBOS NOGALES

<u>Location</u>	<u>Exposure Scenario</u>	<u>Hospital Admissions</u>	<u>Asthma Episodes</u>	<u>Lower Respiratory Illnesses</u>	<u>Coughs</u>	<u>Premature Respiratory Deaths</u>	<u>Premature Cardiovascular Deaths</u>
Nogales, Ariz.	CTC	2%	8%	8%	3%	2	3
Nogales, Ariz.	RME	3%	13%	13%	5%	3	5
Nogales, Sonora	CTC	2%	8%	8%	3%	16	26
Nogales, Sonora	RME	4%	14%	14%	6%	28	44

The increased percentages of health problem cases were generally the same in Nogales, Ariz., and Nogales, Sonora, because residents of both communities are exposed to similar concentrations of particulate matter. The numbers of premature deaths that may be attributed to particulate matter exposure are higher in Nogales, Sonora, because the population is larger – by as much as tenfold or more – than that of Nogales, Ariz. Based on a comparison of ambient air concentrations in the same year as the study samples were taken (1994), the study found that risks from PM10 exposures in Ambos Nogales may be generally somewhat lower than in Phoenix, while somewhat higher than in Tucson.

The health risks for exposure to HAPs were estimated based on standard risk assessment procedures for carcinogenic (cancer-causing) and non-carcinogenic effects. These methods are based in part on the assumption that any level of exposure to carcinogens, no matter how small, has a finite probability of causing an adverse effect. Cancer risks are calculated as probabilities of contracting (not necessarily dying from) cancer, over and above the cases of cancer that would normally occur anyway, during the lifetimes of a million people. On the other hand, it is also assumed that the non-carcinogenic health effects of exposure to HAPs do not occur for exposures below a certain threshold level. Non-carcinogenic health effects were estimated for each exposure scenario (RME and CTC) and each selected HAP by comparing the average amount inhaled each day with the “Reference Dose” for that compound. The resulting ratio, known as the Hazard Quotient (HQ) for an individual chemical, is an indication of the possibility of risk. An HQ below 1.0 represents no risk, while an HQ larger than 1.0 indicates the possible presence of risk. “Hazard Indices” (HI) for a mixture of HAPs producing the same effect (e.g., respiratory problems) were calculated by adding the individual HQs together. (It must be emphasized that the HI/HQ approach leads to only very approximate estimates of relative risks.)

The study estimated the excess lifetime cancer risks for the CTC and RME exposure scenarios to be 141 in a million and 830 in a million, respectively, in Nogales, Ariz. Similarly, the study estimated the excess lifetime cancer risks for the CTC and RME exposure scenarios to be 110 in a million and 996 in a million, respectively, in Nogales, Sonora. As in the case of particulate matter, these risk rates are similar in both communities because the concentrations to which residents are exposed are similar. Adjusting these figures according to the actual populations at the time of the study (estimated to be 20,400 in Nogales, Ariz., and 180,000 in Nogales, Sonora) results in lifetime excess risk figures of 3 and 17 in Nogales, Ariz. (respectively for the CTC and RME scenarios), and of 20 and 174 in Nogales, Sonora. Assuming these cases occur evenly over a 70-year life expectancy, they would correspond to yearly average cancer risks of 0.04 and 0.24 (CTC and RME) in Nogales, Ariz., and 0.3 and 2.5 (CTC and RME) in Nogales, Sonora. Thus, excess cancer risks are generally quite small for the typical individual resident.

EPA generally considers a cancer risk of one in a million or greater as a matter of concern, although such levels do not necessarily result in regulatory actions. The study compared the risk levels reported above to risk levels calculated in a comparable manner for Phoenix, Tucson, Casa Grande and Payson. The study found that the cancer risks for the RME exposure scenario in Ambos Nogales were higher than in the other four regions, while the cancer risks for the CTC exposure scenario in Ambos Nogales were about the same as in Phoenix, but higher than in the other three regions.

Regarding non-carcinogenic risks, the study found that the total Hazard Indices (HI) for non-cancer risks from the selected HAPs for young children, who are the most sensitive, were highest for the selected HAPs that have adverse respiratory effects. The study estimated HI for the CTC and RME exposure scenarios in Nogales, Ariz., to be 15 and 45, respectively. The HI estimated for the CTC and RME exposure scenarios in Nogales, Sonora, were 9 and 39, respectively. Although the HI associated with respiratory effects were the highest, the HI for the selected HAPs that cause neurological, liver and blood effects also exceeded 1.0. The study compared these HI to HI calculated in a comparable manner for Phoenix, Tucson, Casa Grande and Payson, and found that the HI for the RME exposure scenario in Ambos Nogales are much higher than in any of the other four regions, while the HI for the CTC exposure scenario in Ambos Nogales are somewhat higher than in the other four regions. The overwhelmingly dominant cause of both cancer and non-cancer risks from HAPs on both sides of the border was found to be inhalation of organic compounds that result from the operation of motor vehicles.

D. HEALTH EFFECTS OF DIESEL EMISSIONS EXPOSURE



Line of trucks waiting to enter the U.S. at the Mariposa Port of Entry

One important subject that was not evaluated in the ADEQ/SEMARNAT study is the degree of exposure to diesel emissions and the associated community health risks. Although such study is proposed for the future, information specific to the Nogales community is not available at this time. This section presents general information about diesel emissions and their health impacts; it is based on the Executive Summary of the Proposed Identification of Diesel Exhaust as a Toxic Contaminant (CARB and OEHHA, April 22, 1998).

Diesel exhaust, or the emissions from diesel-fueled engines, is a mixture of thousands of gases and fine particles. Some of the gases are known or suspected to cause cancer in humans. Several (nitrogen oxides, sulfur dioxide and carbon monoxide) are regulated by EPA, and NAAQSs have been established for them. The particles typically range from 0.01 to 0.08 microns in diameter; about 94 percent of the particles are smaller than 2.5 microns in diameter, and about 92 percent are smaller than 1 micron in diameter. The particles consist primarily of clumped, spherical elemental carbon particles coated with various organic and inorganic substances. Some of the organic substances are considered to be potent mutagens and carcinogens. The inorganic substances include various toxic metals. These particles can remain in the air up to ten days in dry weather.

Based on a 1995 emissions inventory, the California Air Resources Board (CARB) has estimated that 27,000 tons of PM10 from diesel exhaust are emitted to California's air each year, with

the bulk of these emissions (about 25,500 tons per year) coming from mobile sources such as heavy-duty trucks, buses and mobile equipment (for example, backhoes). CARB also estimated that for 1995, the average Californian was exposed to an average outdoor air concentration of 2.2 $\mu\text{g}/\text{m}^3$ of diesel exhaust. Combining this estimate with estimates of indoor exposure, CARB estimated a 1995 average total exposure of about 1.5 $\mu\text{g}/\text{m}^3$, which is thought to be an underestimate due to certain emissions data gaps. CARB also estimated that exposures near sources such as heavily traveled intersections may range up to 10 $\mu\text{g}/\text{m}^3$ for a 24-hour period. All of these concentrations are expected to go down in the future as emissions controls are implemented.

According to the published literature reviewed in CARB and OEHHA, the health effects that may be caused by exposure to diesel exhaust include impaired lung function, impaired immune system function, aggravated asthma, development of asthma, chronic respiratory disease, decreased resistance to infection, enhanced allergic reactions to various allergens, lung cancer and possibly bladder cancer. Extrapolating from studies published on human exposures, the California Office of Environmental Health Hazard Assessment (OEHHA) estimated a range of upper limit cancer risks per $\mu\text{g}/\text{m}^3$ to which the California population may be exposed over a 70-year lifetime. Depending on the exposure scenario used, these risks ranged from 120 to 2,400 cancers per million people, per $\mu\text{g}/\text{m}^3$ of diesel exhaust particulate matter.



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IV. WHAT IS THE BORDER LIAISON MECHANISM?

The U.S. State Department's web site (U.S. Department of State, August, 1999) describes the Border Liaison Mechanism as follows:

Cooperation between the United States and Mexico along our 2,000-mile common border includes state and local problem-solving mechanisms, transportation planning, and institutions to address resource and environment issues. In 1993, the Border Liaison Mechanism (BLM) was established, and now nine BLMs chaired by U.S. and Mexican consuls operate in “border pair” cities. BLMs have proven to be effective means of dealing with a variety of local issues ranging from accidental violation of sovereignty by law enforcement officials and charges of mistreatment of foreign nationals to coordination of port security and cooperation in public health matters such as tuberculosis. In conjunction with the 1998 New Border Vision, the United States and Mexico agreed that each BLM would establish three working subgroups: Economic and Social Development, Protection/Migration and Border Crossing Facilitation, and Border Public Safety.

The Arizona/Sonora BLM addresses issues of interest to the Ambos Nogales, Ambos Nacos, Douglas/Agua Prieta and Yuma/San Luis/San Luis Río Colorado areas; meetings are most commonly held in Nogales. Because of the travel distances involved, a geographic subgroup was recently established to address local issues arising in the Yuma/San Luis/San Luis Río Colorado area. The Arizona/Sonora BLM is co-chaired by the U.S. and Mexican consuls serving in Ambos Nogales.

The subgroups are also chaired by the U.S. and Mexican Consuls, although they may delegate chairmanship responsibilities to other appropriate agency representatives. With respect to improving air quality in Ambos Nogales, the U.S. Consul in Nogales, Sonora, and the Mexican Consul in Nogales, Ariz., asked ADEQ and SIUE to assist them in forming the Nogales BLM's Economic and Social Development Subgroup, with the specific purpose of addressing the binational air quality problem in Ambos Nogales. ADEQ and SIUE have co-chaired this subgroup together with the two consuls. The member agencies participating in this subgroup include the following:

United States

Mexico

State Department (Consular Co-Chair)

Secretaría de Relaciones Exteriores (Consular Co-Chair)

ADEQ (Co-Chair)

SIUE (Co-Chair)

City of Nogales
Santa Cruz County
SouthEastern Arizona Governments
Organization

H. Ayuntamiento de Nogales
Protección Civil
Tránsito

Arizona Corporation Commission
Arizona Department of Health Services
Arizona Department of Transportation*
ADOT Motor Vehicle Division*

Secretaría de Salud Pública de Sonora
Delegación de Transporte

Environmental Protection Agency
U.S. Customs Service**
Immigration and Naturalization Service**
U.S. Department of Agriculture**
Border Patrol**
International Boundary and Water
Commission

Secretaría de Medio Ambiente y Recursos
Naturales
Procuraduría Federal de Protección al
Ambiente
Aduana Mexicana
Policía Federal Preventiva
Secretaría de Educación y Cultura
Secretaría de Transportes y Comunicación
Comisión de Abalúos de Bienes Nacionales
Comisión Internacional de Límites y Agua

Throughout this document, “BLM Subgroup” refers to this group working on air quality in Ambos Nogales. For a complete listing of all participants, please see Appendix C. Please note that Appendix C includes representatives of the University of Arizona Bureau of Applied Research in Anthropology and SUMEX, a maquiladora in Nogales, Sonora. They are the first participants who have been added in the process of this group becoming a Border 2012 Task Force.

*It should be noted that ADOT suspended its participation in this process shortly after the start of the decision-making phase (please see Section V.B) due to a difference in focus and direction and a lack of sufficient staff to continue its participation. However, recent staff additions have allowed ADOT to resume participation within the new Task Force structure for implementation (please see Section I.C.2), as of the time this report goes to press.

**It should also be noted that shortly before the completion of this report, the U.S. Customs Service, Immigration and Naturalization Service, Border Patrol, and the produce inspection arm of the U.S. Department of Agriculture were reorganized as part of the new Department of Homeland Security. Several of them have been integrated into the new Bureau of Customs and Border Protection (BCBP), while some are part of the new Bureau of Citizenship and Immigration Services. Table 1 and Appendix C list these participants according to their new agencies; in the rest of this document, these agencies are generally referred to by their old names, to provide continuity with their historical participation in these and related efforts.





V. HOW WERE THE RECOMMENDATIONS DEVELOPED?

The recommendations described in this document were developed through a series of working sessions of the BLM Subgroup. The first set of working sessions explored various aspects of the air quality problem in Ambos Nogales, including brainstorming possible solutions. The second set of working sessions comprised the group's decision-making process to select the air quality improvement actions that would be proposed for implementation. The following list shows meeting dates and overall topics; a more detailed description of the process follows.

Information Sessions

March 15, 2001	Introduction
April 25, 2001	Residential Emissions
June 27, 2001	Erosion/Reforestation
July 25, 2001	Topics Review and Decision Criteria
August 22, 2001	Unpaved Traffic Areas
September 19, 2001	Traffic Congestion
October 24, 2001	Vehicle Emissions

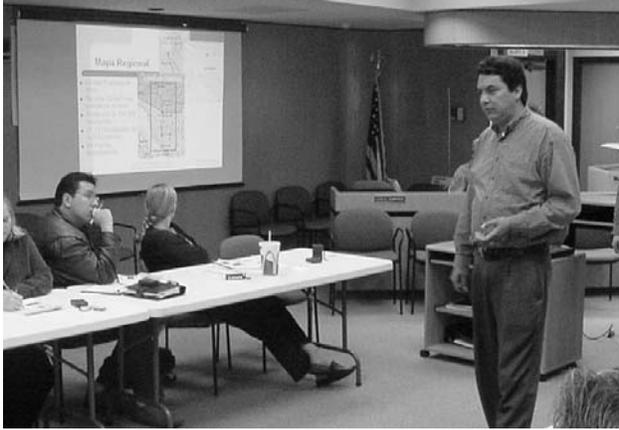
Decision-Making Sessions

January 9, 2002	Visioning Session #1
February 7, 2002	Financing Sources and Mechanisms
March 20, 2002	Review and Revise Priorities (Visioning Session #2)
July 24, 2002	Review and Approve Draft Plan
July and August, 2002	Seek Public Input
August 28, 2002	Approve Final Plan
May 28, 2003	Transition Session

Copies of all meeting summaries and sign-in sheets can be found in Appendix D.

A. INFORMATION SESSIONS

The first phase of the BLM Subgroup's work entailed a series of informational sessions, as listed above. These sessions focused primarily on five aspects of the air quality problem in Ambos Nogales: residential emissions (primarily from wood burning and garbage burning), soil erosion, unpaved traffic areas, traffic congestion and vehicle emissions. Each session featured a presentation regarding the nature and extent of that specific source of particulate matter emissions; a round table discussion identifying existing regulations, policies and practices that already serve to manage emissions from that source; the brainstorming of various possible addi-



*Presentation by municipality of Nogales, Sonora,
about proposed East Side Periférico*

tional actions that could be taken to reduce emissions from that source; and the selection of “immediate actions” that could be taken to improve air quality in the short term and with limited difficulty. A total of 78 options for air quality improvement resulted from the brainstorming exercises; of these, 12 were selected as immediate actions. In addition, at ADOT's request, a session was held midway through this phase to review the air quality topics being considered and identify whether additional topics needed to be covered, as well as to identify possible criteria that could be considered by the group as it worked on prioritiz-

ing possible air quality improvement actions. The outcomes of this session were used to help guide an ADOT contractor that provided technical support for the following sessions.

Information about the nature and extent of each source is given in Section VI of this document. Information about existing regulations, policies and practices is given in Section VII of this document. A list of all brainstormed options for improving air quality is given in Appendix E. A description of the immediate actions and their status is also given in Section VII.

An important guide for all of the BLM Subgroup's work was proposed and accepted at the introductory meeting: a set of operational ground rules and a method for making all of the group's decisions by formal consensus. A “state of consensus” would be considered to have been achieved when – and *only* when – all members could be at least as supportive of a decision as described in the following statement:

I understand what most of you would like to do. It is not my first choice, but I feel you understand what my alternative would be. I have had sufficient opportunity to sway you to my point of view, but clearly have not done so. Therefore, I can live with and support what I consider to be an acceptable solution.

Decisions would be considered to have been accepted by unanimous, formal consensus when – and *only* when – all members had indicated their level of support for the decision under consideration according to the following “consensus gauge,” (Take Charge Consultants, Inc. www.takechargeinc.com) with no one indicating a five or a six:

- 1 – YES!
- 2 – Acceptable
- 3 – Can Live With It
- 4 – Willing to Step Aside and Support (most closely corresponds to the state of consensus statement given above)
- 5 – Blocking, and my proposal to un-block is....
- 6 – Need More Information, which is....

The ground rules used to guide the group's deliberations and decision-making process were the following:

1. We will maintain mutual respect. This means we disagree with ideas, not with people. It also means we provide amnesty to any and all suggestions or ideas offered, no matter how odd they may seem to us.
2. Disagreement will be viewed as an opportunity to identify many possible solutions, which enhances our decision-making process by offering a greater degree of choice.
3. We will not seek conflict-reducing techniques, such as going along just to get along.
4. A member's silence will be interpreted as showing his or her agreement with what is being discussed or proposed.
5. Any move to block a decision must be accompanied by the reason(s) why the member feels the need to block the decision as well as a proposal for how to unblock the decision.
6. All members agree not to withhold information that is vital to a decision-making process.
7. All members are obliged not to compromise their own personal integrity.
8. Members recognize that most decisions can always be recalled, revised or revoked when presented with new information that makes such a change necessary or desirable.

B. DECISION-MAKING SESSIONS



*Small group decision-making at
"Visioning Session #1"*

The decision-making phase of the BLM Subgroup's work began with a "Visioning Session." The goal of this session was to review the entire list of possible options for improving air quality in Ambos Nogales, and select certain of these options for further analysis. This review and selection process began with a multi-voting exercise. Each participant was given ten dots and instructed to select the ten brainstormed options that were of highest importance to that individual – a different option for each dot. Participants were constrained to ensure that they selected at least one option from each of the five topic

areas covered in the information phase of the BLM Subgroup's work. The remaining five selections could come from any topic area. Each participant was asked to make his or her selections independently, without discussing them with other participants. Once the selections were made, the dots were placed on flip chart sheets listing each of the options, and all options were ranked according to the results. This is the order in which the 78 options are listed in Appendix E.

Due to time constraints, no further discussion of the list was held at the visioning session.

The next step in the decision-making process was to review the results of the visioning session. This discussion occurred as part of the meeting regarding financing sources and mechanisms. The BLM Subgroup concluded that, while the rank-ordering of the 78 brainstormed options had been a good start to the group's decision process, additional work needed to be done to ensure that the group's final recommendations focus on well-defined options likely to have greater impacts in the short and medium term. Some of the actions ranking highly after the preliminary work at the visioning session would have met this focus; others would not.

As directed according to the unanimous, formal consensus of the BLM Subgroup, ADEQ and SIUE worked together to revise the list of options and propose a refined set of recommendations for the group to discuss and modify. This revision consisted of the following steps:

1. Each of the 78 options was given a score (from one to three, where one was good and three was poor) for each of three criteria: emissions reductions potential, cost and feasibility. These scores were then added for an overall score. It was found that these scores were not particularly helpful in revising the list in accordance with the BLM Subgroup's direction.
2. The full list of 78 options was then reviewed to remove those options that did not merit further consideration for one or more of the following reasons: (a) they are already substantially completed; (b) the likelihood of obtaining results is questionable, even in the long term; or (c) they are well beyond the feasible influence of the BLM Subgroup.
3. Next, the remaining options were grouped together in a logical manner. In other words, if a certain action is to be implemented (such as public education to promote more participation in revegetation efforts), then it would also make sense to implement other logically related actions (such as making more trees available for planting). Not all actions could be logically grouped with other actions. After the screening in step 2 and the grouping in step 3, 22 options remained for further consideration.
4. The 22 regrouped options were ranked in two ways. First, they were ranked according to the highest number of votes given to any of the original sub-options by the BLM Subgroup at Visioning Session #1. In addition, each of the 22 regrouped options was rated according to the same three criteria and the same method described in step 1. The second ranking of the regrouped options consisted of using these ratings to sort among options that received the same number of votes in Visioning Session #1. In this manner, the list was reordered in a manner faithful to the voting done at Visioning Session #1, but with results that are expected to have greater utility for the BLM Subgroup.

5. Meetings were held between ADEQ and the municipalities of Nogales, Arizona, and Nogales, Sonora, as well as Santa Cruz County, to determine which types of actions were truly of highest priority to each local government. As a result, various modifications were made to the content of each of the 22 options, and one of these was eliminated because getting results would be too problematic, leaving a total of 21 options. The rank ordering was not changed based on these interviews because it was felt that additional changes in the rank-ordering, if any, should be a group effort of the BLM Subgroup.

This revised list of air quality improvement options was presented to the BLM Subgroup at its “Review and Revise Priorities” session, which was effectively Visioning Session #2. First, members discussed whether any of the options that had been eliminated in the revision process should be brought back into consideration. As a result, two options were added back to the list. Then, members discussed whether any of the remaining options should be consolidated. As a result, the 24 options then under consideration were grouped among 13 revised options. Finally, members were asked to undertake another multi-voting exercise, where each member was given three votes to distribute among the various options. As a result of the voting and the discussion that ensued, one more consolidation of options was made and the resulting 12 options were divided into the “high priority” and “additional priority” proposed actions described in Section II.

Using the consensus gauge, the group indicated its unanimous, formal consensus to approve this list of air quality improvement recommendations to be presented for public input. The group decided to place its primary emphasis on the high priority recommendations; however, it indicated that the additional priority recommendations are also important and merit being pursued. It was recognized that some recommendations on the high priority list may take quite some time to implement, while some recommendations on the additional priority list may be much easier and quicker to implement, for example.

Next, the results of the public input (please see Appendices F and H for more details on this process) were presented to the BLM Subgroup at its “Approve Final Plan” session. Based on the public comments made, the members decided to make a few revisions to the list of recommendations. This finalized list was approved by unanimous, formal consensus, using the consensus gauge. These are the recommendations described in this report and proposed for implementation in Ambos Nogales.

Finally, the BLM Subgroup met once again at its “Transition” session to begin the implementation phase of its work, and to take steps toward becoming a Border 2012 Task Force, as described in Section I.C.2. At that meeting, and based on progress made toward implementing some of the recommendations subsequent to the BLM Subgroup’s previous meeting, a few final changes were made to the recommendations. Those changes are also reflected in this report.



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VI. WHAT AIR QUALITY ISSUES ARE ADDRESSED BY THE RECOMMENDATIONS?

Section III described the health impacts of air quality in Ambos Nogales. This section describes the primary sources of particulate matter (dust) contamination and states which recommended actions would address each source.

The 1999 ADEQ/SEMARNAT air quality study demonstrated that unpaved roads and other unpaved traffic areas (such as unpaved parking lots) are the most important source of particulate matter contamination in Ambos Nogales. According to the study, 71 percent of the PM10 and 65 percent of the PM2.5 generated in Nogales, Sonora, are estimated to come from unpaved roads. In addition, 26 percent of the PM10 and 31 percent of the PM2.5 generated in Nogales, Sonora, is estimated to come from paved roads. The source of dust from these roads is erosion and track-out from adjacent or upstream unpaved traffic areas and other disturbed lands (please see Section VI.C). The ADEQ/ SEMARNAT study estimates that 3 percent of PM10 and 1 percent of PM2.5 generated in Nogales, Ariz., comes from unpaved roads; this low percentage reflects the fact that most roads have been paved. The study also estimates that 75 percent of PM10 and 61 percent of PM2.5 generated in Nogales, Ariz., comes from paved roads, which underscores the importance of erosion onto paved roads from unpaved parking lots and other disturbed areas.

The ADEQ/SEMARNAT study estimates that 13 to 18 percent of PM10 emissions and 31 to 34 percent of PM2.5 emissions generated in Nogales, Ariz., originate from vehicles (primarily on-road). Less than 5 percent of PM10 and PM2.5 emissions generated in Nogales, Sonora, were estimated to originate from vehicles.

The percentages given above provide one indication of the important air quality issues needing to be addressed in Ambos Nogales. They are based on an emissions inventory and related computer modeling, both of which are subject to inaccuracies. Another indication of the important air quality issues that should be addressed can be understood by examining air quality monitoring data. According to the data reported in the ADEQ/ SEMARNAT study, approximately one third of the particulate matter measured falls into the PM2.5 size fraction, while the remainder falls into the PM10 size fraction. Any source of particulate matter can produce dust in any size fraction. However, there is a tendency for earthen sources (e.g., unpaved roads and parking lots) to produce primarily PM10, and a tendency for combustion sources (e.g., vehicles and the burning of wood or garbage) to produce primarily PM2.5. Thus, the fact that approximately one third of the measured particulate matter falls into the PM2.5 size fraction indicates that vehicles and other combustion sources may be a more important secondary source of concern than suggested by the emissions estimates given above.

Finally, the ADEQ/SEMARNAT study estimated that approximately 85 percent of all particulate matter emissions in the area originate in Nogales, Sonora, with the remainder originating in Nogales and Rio Rico, Ariz. This apportionment is not surprising, given that the population of Nogales, Sonora, is at least ten times greater than that of Nogales, Ariz.

Based on the ADEQ/SEMARNAT study as well as knowledge of local conditions, the BLM Subgroup decided to focus on five primary contributors to particulate matter contamination in Ambos Nogales. These are: residential emissions (from the burning of wood and garbage), soil erosion, unpaved traffic areas, traffic congestion and vehicle emissions. These issues are described in greater detail in this section.

A. RESIDENTIAL EMISSIONS



Stream of burned garbage along wash bottom in a Nogales, Sonora, colonia

The residential emissions issue primarily focuses on wood burning and garbage burning. Both of these activities occur in Ambos Nogales, although their specific nature in Arizona is different from that in Sonora. All garbage burning – including the burning of green waste – is illegal in Nogales, Sonora. Garbage burning is also illegal in Arizona; however, the burning of green waste may be permitted under certain circumstances. These activities were poorly understood at the time of the ADEQ/SEMARNAT study; thus, reliable, specific information about their extent is not available from that report. However, local experience and observations suggest that both activities may be significant during certain seasons or in certain geographic areas.



As part of the BLM process, ADEQ conducted a survey of 100 residences in a Nogales, Sonora, colonia known to have difficulties with garbage collection, due to inadequate roads and other issues (ADEQ, 2001). The survey was conducted with assistance from the Public Services and Ecology Departments of the municipality of Nogales, Sonora, and focused on domestic garbage management practices. In the survey area, 47 percent of those interviewed said they did not

burn garbage, and 53 percent indicated that they do. Of the 53 percent who do burn, 39 percent burn once a week, and 13 percent burn twice a week. ADEQ also found that, in addition to garbage, a substantial amount of wood is also burned as cooking and heating fuel. Based on information provided by interviewees, ADEQ estimated that the garbage being burned is 42 percent yard waste (green waste), 33 percent food waste, 8 percent paper, 7 percent cardboard, 5 percent diapers and 5 percent plastic. ADEQ further estimated that 6,515 kilograms (kg) of wood and 4,731 kg of garbage from the 100 homes surveyed are burned monthly. Finally, ADEQ estimated that neighborhood residents heat their homes in winter as follows: 39 percent through burning wood, 28 percent through some form of gas, 1 percent through electricity, and 2 percent through some other means; 30 percent of the residents reported that they had no heating at all. These data suggest that wood burning is likely a seasonally significant contributor to particulate matter contamination in Ambos Nogales.

The data for wood burning in relation to home heating are likely representative of many colonias in Nogales, Sonora – especially marginalized colonias. The data for garbage burning are not necessarily representative of the overall community, as they come from a neighborhood with known garbage collection problems; however, they are likely to be representative of other neighborhoods with similar garbage collection problems. Various colonias in Nogales, Sonora, do not receive a regular, predictable garbage collection service. This lack of service may have to do with road conditions in some cases, but is primarily a result of the fact that these colonias have not been officially incorporated into the municipality and do not pay taxes. Arizona State University's Southwest Center for Environmental Study also did a study of the overall Nogales, Sonora, community, and found that 23 percent of the city burned both wood and garbage. By comparison, ADEQ found that 39 percent of residents in the neighborhood studied burned just wood and 53 percent burned just garbage. Some garbage burning is known to occur even in colonias that receive reliable collection services three times a week; such burning is often driven by residents' frustration over the presence of large quantities of litter. This litter is, in turn, present due to a combination of loose dogs ravaging the bags of trash that have been put out the night before collection day and individuals acting as litterbugs.

With regard to wood and garbage burning in Arizona, illegal garbage burning, sometimes including vandalism or un-permitted burning, does occur on the U.S. side of the study area. All U.S. portions of the study area are served by regular garbage collection services. ADEQ issued no permits in calendar year 2000, one permit in calendar year 2001 and two permits in calendar year 2002 for burning green waste in Nogales, Ariz. These permits were issued to government and commercial entities for purposes of construction site preparation and ground clearing. The Rio Rico Fire Department (the delegated permitting authority for most of Rio Rico) issued 100 permits for burning green waste in Rio Rico during calendar year 2001. Of these, the vast majority were issued for individual residences. The Rio Rico Fire Department estimates that approximately 300 to 400 green waste burns occur annually in Rio Rico without the proper permits being obtained (ADEQ, June 19, 2002).

Finally, with regard to wood burning, the Santa Cruz County Assessor has indicated that to his knowledge, there are no homes in the U.S. portion of the study area that rely on wood burning as a sole source of heating in the winter. There are approximately 3,600 fire places in Nogales

and Rio Rico, Ariz., residences, representing about 32 percent of all homes. The County Assessor believes that fire place usage is low, due to the difficulty of obtaining low-cost wood (ADEQ, June 25, 2002).

BLM Subgroup recommendations to address residential emissions are to eliminate garbage burning (please see Section II.F), reduce wood burning (please see Section II.H) and establish recycling programs (please see Section II.J).

B. SOIL EROSION



Vacant lot with vegetative cover removed

Soil erosion is a significant contributor to particulate matter emissions in Ambos Nogales. This issue was not evaluated in the ADEQ/SEMARNAT study; however, several aspects of the local causes and impacts of erosion are known.

Soil erosion occurs when soils are blown off of disturbed lands by wind, when soils are washed off of disturbed lands by flowing water (primarily from rain events and rarely from the run-off of melting snow), and as a result of vehicle track out from disturbed lands. “Track-out” refers to soil carried on

vehicle tires onto paved or unpaved roads. Track-out is heaviest when the soils are wet, but also occurs when soils are dry.

“Disturbed land” refers to land areas where the natural vegetative cover has been significantly reduced or removed for any reason, and where the soils have not been promptly re-stabilized. This removal process can also be referred to as “deforestation.” The loss of plants and their stabilizing root structures results in soils so loose that they are easily moved by wind and water forces. In Nogales, Sonora, the most common causes of deforestation are wood collection for heating and cooking purposes (discussed in Section VI.A) and clearing activities in relation to home and business construction. In Nogales and Rio Rico, Ariz., a common cause of deforestation without the prompt re-stabilization of soils has been the construction of unpaved parking lots. Throughout Ambos Nogales, road shoulders and other areas adjacent to construction sites – where the soils are disturbed during construction but not stabilized as part of the on-site development – are also often subject to erosion.

As discussed in Section VI.C, eroded soils are often deposited on paved or unpaved roads, where they contribute to emissions associated with those roads. However, even when eroded soils are deposited elsewhere, they can become emission sources due to wind and possible off-road traffic. In addition, the volume of soils commonly eroded in rain events – especially during the summer monsoons – is so great that even if all roads in Ambos Nogales were paved,

there would still be a significant amount of emissions from those roads because of soil erosion. There are areas of Nogales, Sonora, where soil erosion is so significant that it can partially bury major roads for several months, and where some homes are slowly being buried. For all of these reasons, the BLM Subgroup considered soil erosion as an issue apart from emissions from unpaved traffic areas.

In support of the BLM Subgroup's efforts, the University of Arizona evaluated the nature of deforestation and the potential for the success of revegetation efforts in reducing erosion in Ambos Nogales (University of Arizona, June 27, 2001). The University's Bureau of Applied Research in Anthropology lead this evaluation in collaboration with the Departments of Geography, Renewable Resources and Environmental Sciences. This analysis included three primary components: (1) group meetings and individual interviews with organizations already involved in reforestation/revegetation efforts in Ambos Nogales, in order to determine the existing resources available to help promote reforestation/revegetation; (2) field studies combined with preliminary modeling efforts to identify the relative degree of erosion occurring in four different colonias of Nogales, Sonora, as well as the reductions in erosion that could be realized through a reforestation/revegetation effort; and (3) community interviews of residents in these four colonias and various neighborhoods in Nogales, Ariz., to determine resident attitudes toward plants and the environment, as well as the kinds of factors that might motivate residents to become more involved in revegetation/reforestation efforts.

Their findings included the following:

- In theory, it is possible that a 10 percent increase in vegetative cover could result in as much as a 70 percent decrease in erosion. It was noted that geotechnical solutions, such as the placement of river rock, could achieve even higher reductions.
- Existing resources that could help promote increased revegetation/reforestation efforts include not only the various local organizations already involved in such efforts, but also past experiences in neighborhood cooperation in various areas of both communities.
- Natural resource-oriented obstacles to successful revegetation/reforestation efforts include a lack of water, steep slopes, very loose soil (commonly already eroded from further uphill), and current experiences with poorly chosen or placed trees that are breaking up sidewalks and streets.
- Human resource-oriented obstacles to successful revegetation/reforestation efforts include a lack of time, a certain degree of factionalism sometimes present among the many newcomers to the border community, a lack of sufficient local codes and/or enforcement of those codes, and the fact that many residents do not have a strong history of caring for young trees over a long period of time, resulting in a loss of the trees and a consequent loss of public interest.

Primary factors that would contribute to improving the extent and success of future reforestation/revegetation efforts were identified as (1) extensive public education efforts, and (2) a linking of such efforts to public gardens, recreational areas, and general community beautification, which would provide a strong motivation to residents.

BLM Subgroup recommendations to address soil erosion are to promote more effective revegetation efforts (please see Section II.G) and implement engineering solutions to soil erosion (please see Section II.I).

C. UNPAVED TRAFFIC AREAS



*Trucks parking on an unpaved parking lot –
Nogales, Arizona*



*Dust kicked up by a passing vehicle on an
unpaved road – Nogales, Sonora*

Unpaved traffic areas are the single largest source of particulate matter contamination in the air of Ambos Nogales. “Unpaved traffic areas” primarily refers to unpaved roads and unpaved parking lots, where wind and traffic can stir up dust into the lower atmosphere. Un-stabilized road shoulders can also contribute to this problem. As mentioned in Section VI.B, there is a direct relationship between the erosion and track-out of soils from disturbed lands (including un-stabilized parking lots) onto roadways and particulate matter generated from roads. Soil erosion and track-out onto unpaved roads prevents the development of a hard pan that would otherwise form in time as vehicles pass over the road, compacting it. As a result, emissions from such roads are higher than they would be in the absence of eroded soils. In addition, erosion and track out onto paved roads also results in more particulate matter emissions than would come from paved roads in the absence of eroded soils. Without erosion and track-out, the primary cause of emissions from paved roads would be the gradual accumulation of very small bits of tire, worn from the tires of passing cars.

In Nogales, Sonora, there are approximately 176 miles (about 284 kilometers – km) of unpaved roads, representing approximately 53 percent of all roads. Most unpaved and paved roads also receive substantial amounts of erosion from adjacent and upstream disturbed lands. Not all paved roads have shoulders; most shoulders are not stabilized.

In the city of Nogales, Ariz., there are approximately 4 miles (about 6 km) of unpaved roads, representing approximately 5 percent of all roads. In Rio Rico, there are about 200 miles (about 323 km) of unpaved roads, representing 40 percent of all roads. Localized portions of some paved roads receive erosion from unpaved parking lots or other disturbed lands located adjacent or upstream. Most of the paved roads have shoulders; approximately 70 to 75 percent of the shoulders in Rio Rico are stabilized.

The BLM Subgroup recommendation to address unpaved traffic areas is to ensure adequate stabilization of unpaved roads and unpaved parking lots (please see Section II.A).

D. TRAFFIC CONGESTION

Vehicle emissions are the second most important source of particulate matter contamination in the air of Ambos Nogales. The BLM Subgroup considered vehicle emissions in two ways: as emissions from the local mix of vehicles, regardless of traffic conditions; and as a result of certain relatively unique sources of traffic congestion, regardless of the local vehicle mix. On the one hand, even if all sources of traffic congestion were eliminated, the local mix of vehicles would still contribute to elevated emission levels, resulting in poorer air quality. The local mix of vehicles is discussed in more detail in Section VI.E. On the other hand, even if all local vehicles had relatively low emissions individually, the existence of special sources of traffic congestion results in an increased level of total emissions from all vehicles and correspondingly poorer air quality. This section focuses on these sources of traffic congestion.



Line of passenger vehicles waiting at the Denis DeConcini Port of Entry

There are three particular sources of traffic congestion in Ambos Nogales. Unique to border communities, one source is the ports of entry. According to the USCS, approximately 2,228,603 passenger vehicles per year enter the United States through the Denis DeConcini (downtown) Port of Entry, where there are eight inspection lanes, and approximately 1,363,479 per year enter through the Mariposa Port of Entry, where there are four inspection lanes. These figures work out to an average of 6,106 and 3,736 vehicles per day at the two ports, respectively. Actual volumes can vary from day to day and month to

month. On typical peak traffic days, as many as 8,304 and 5,413 passenger vehicles may pass through the two ports, respectively. Peak days for passenger vehicles typically occur in relation to the Christmas and Easter holidays. In the aftermath of the September 11, 2001, terrorist attacks, wait times at the ports of entry are longer than they were before, due to changes in inspection procedures to provide greater security. One effect of those security measures is that for some time there were generally no more than five inspection lanes in use at any given time at the Denis DeConcini Port of Entry; the number of open lanes has increased as of 2004.

In addition, a pre-September 11 law passed by the U.S. Congress will require “exit controls” to be implemented soon. Exit controls will mean that in addition to inspecting vehicles entering the United States, there will also be inspection of vehicles leaving the United States. Other than holiday traffic, it is believed that most passenger vehicles entering at the Nogales ports of entry also leave the same day; thus, in theory the number of vehicles waiting for exit inspection could be substantial. Arizona streets approaching both Nogales ports of entry have no capacity to handle high volumes of traffic. Implementing exit controls as required by the law could create traffic congestion and safety concerns, and concomitantly significant air quality and public health impacts. The U.S. Department of Homeland Security has recognized the potential problems that could be created by such a situation. For this reason, it is exploring a variety of technologies that could accomplish the goal of exit controls (part of what is now called, “US-VISIT”) while minimizing the impacts on border communities. Indeed, a 2004 DHS Fact Sheet (DHS, April 21, 2004) states the following: “The land border solution will be designed to be fast and easy, but also secure. Both the President of the United States and the United States Congress mandated that border security enhancements not adversely affect legitimate travel and trade. The Department of Homeland Security is committed to meeting that mandate.” Because of these concerns, and because Mexican applicants for laser visas to be used as Border Crossing Cards already go through the same biometric data collection process as is required under US-VISIT, Mexican laser visa holders using their laser visas as Border Crossing Cards will not be subject to US-VISIT processing in the immediate future. DHS considers this to be an interim solution while long term solutions are sought. As long as the US-VISIT program continues to follow these principals, then its impacts on border air quality are anticipated to be minimal or negligible. Those interested in more information about the US-VISIT program are encouraged to visit the Web site, www.dhs.gov/us-visit.

With regard to commercial trucks, the USCS indicates that approximately 210,914 trucks per year (or 578 per day on average) enter the United States through the Mariposa Port of Entry, where there are two commercial truck inspection lanes. Commercial truck traffic peaks seasonally in relation to the produce season. Approximately 70 percent of all fresh produce consumed in the United States and Canada during winter months is grown in Mexico and imported through Ambos Nogales. The produce season generally runs from November through March, with the heaviest months being January and February. During these months, approximately 1,100 produce trucks enter the United States daily, on average; peaks can be as high as 1,300 produce trucks per day. Depending on a variety of issues, up to eight different federal and state agencies may inspect a given truck; generally, these inspections are conducted sequentially, rather than simultaneously. Various produce importers have recently reported wait times of four to ten hours while waiting in line to enter the inspection area. The inspections themselves are generally a few minutes for those trucks receiving minimal inspections (for low-risk produce – see below), while they can be as long as 1½ to two hours for trucks requiring extensive inspections.

Because approximately 80 percent of the commercial trucks entering the U.S. at the Mariposa Port of Entry carry agricultural products, USDA's role is particularly important. USDA inspects up to 1,300 trucks per day with only 17 staff members. This is accomplished by assigning “pest risk” to commodities, where 80 percent of the trucks are considered “low risk” and

released without inspection – resulting in faster processing for them than at any other Port of Entry on the U.S.-Mexico border. Nevertheless, the remaining 20 percent of produce trucks still represents 250 to 300 trucks per day that must be inspected. The USDA inspections often require one full side of the truck's load to be off-loaded in order to check adequately for pests. Because available dock space at the commercial port of entry is inadequate (USDA only has access to one of the four inspection docks), this contributes to the bottleneck at the border.



Traffic building up waiting for a passing train to clear the intersection

Another special source of traffic congestion in Ambos Nogales is the Union Pacific/ Grupo México Railroad, which passes north/south directly through the center of the community, blocking several key intersections. It is commonly said that when the train passes through, it divides the community into four parts: one on each side of the train and on each side of the international boundary. In Nogales, Ariz., there is only one vehicle bridge crossing over the train route. In Nogales, Sonora, the first vehicle bridge crossing the tracks was built in 2005.

The community has many concerns about the train route and its impacts on traffic flow. Peak street traffic times in Nogales, Sonora, are 6 to 9 a.m., when workers enter the maquiladoras and children enter school; from 12 noon to 2 p.m., when parents pick children up from school; and from 4:30 to 6 p.m., when maquiladora workers go home. The train typically passes through town to cross the international border five times a day, with an average of 70 cars per train and blocking up to five railroad crossing access points at a time, dividing Ambos Nogales into four parts as mentioned above. These passages typically occur at about 9 a.m., 11 a.m., 1:30 p.m., 3:30 p.m. and 5 p.m.; three of these times typically coincide with peak traffic times on local streets. Historically, the length of time during which key intersections were typically blocked was influenced not only by the train's length and traveling velocity, but also by crew changes, inspections and brake testing requirements associated with crossing the international boundary. The municipalities of Nogales, Ariz., and Nogales, Sonora, have jointly conducted a series of negotiations with the train owners. As a result, these issues have been improved and better managed; no intersection is supposed to be blocked for longer than 15 minutes. However, both municipalities still feel that further progress toward minimizing the traffic congestion caused by the passage of the train is necessary.

Finally, the third special source of traffic congestion in Ambos Nogales is related to the design of local streets. Both communities have various intersections that lack sufficient physical capacity, or that do not have adequate signaling, to efficiently process the volume of traffic passing through them. As a result, lines of traffic waiting to get through the intersection build up, creating an increase in emissions as vehicles idle. Most such intersections are located along the major arteries in both communities. In addition, the downtown areas of Nogales, Ariz., and Nogales, Sonora, are highly congested, with very limited parking available. Consequently,

drivers commonly circulate for longer than necessary to reach their destination because they spend quite some time searching for parking. Finally, there is no consistent street numbering system in Nogales, Sonora, and many streets and business establishments lack clear signs. As a result, many drivers end up circulating in excess as they search for destinations that are hard to find because of a lack of clear signs and directions.



Line of commercial trucks overshadowing a line of passenger vehicles on street in a commercial area

It is possible that all three sources of traffic congestion described above will be further complicated by a recent development having to do with certain provisions of the transportation chapter of the North American Free Trade Agreement (NAFTA). These provisions would allow Mexican heavy duty trucks the same travel privileges and access as U.S. trucks have on U.S. highways. A recent U.S. Supreme Court decision held that an environmental assessment conducted by the Federal Motor Carrier Safety Administration (FMCSA) regarding the potential impacts of these provisions was sufficient and that a

more detailed environmental impact statement (EIS) and a full Clean Air Act conformity determination (which had been sought by various plaintiffs in a law suit) were not required under federal law. Because FMCSA was unsure how the Supreme Court would rule, substantial work on an EIS had been completed at the time of the ruling; however, as an EIS is no longer required, there is currently no plan to release the preliminary information that had been gathered. As a result, quantitative data are lacking on the potential changes in truck traffic patterns and volume, and associated potential increased air pollution resulting from the lifting of the moratorium on Mexican motor carriers in the U.S. Absent these studies, ADEQ is developing a strategy to estimate the impact in order to implement effective mitigation efforts.

Because so much is still unknown about the potential impacts of lifting the moratorium on Mexican trucks, the BLM Subgroup and ANAQTF have not yet developed specific recommendations for addressing this issue. However, various of their members are working on evaluating impacts and developing response strategies that support economic benefits while still working to improve air quality in Ambos Nogales.

BLM Subgroup recommendations to reduce traffic congestion are to speed up individual and commercial border crossings (please see Section II.B), construct major transportation corridors (please see Section II.D), reduce the air quality impacts of the train route (please see Section II.E), create or improve public transit services (please see Section II.K) and improve traffic flow on local streets (please see Section II.L).

E. VEHICLE EMISSIONS

As stated in the previous section, vehicle emissions constitute the second most important source of particulate matter contamination in the air of Ambos Nogales. Even in the absence of the traffic congestion concerns discussed in Section VI.D, the local mix of vehicles would still contribute substantially to particulate matter contamination. Vehicle emissions come from all vehicle types, including passenger vehicles, buses and commercial trucks. The amount of emissions from a given vehicle depends on several factors, including how well the vehicle has been maintained, the type of fuel burned and vehicle age. Although the maintenance status and age of typical vehicles in Ambos Nogales is difficult to assess, some general observations can be made.



Smoking passenger vehicle with Arizona license plate; photo credit: Michèle Kimpel Guzmán

There are approximately 39,882 passenger vehicles registered in Santa Cruz County, most of which are probably garaged in Nogales and Rio Rico. There are approximately 41,073 passenger vehicles officially registered in Nogales, Sonora, and authorities believe that there are an additional 15,000 vehicles garaged in Nogales, Sonora, without being legally registered there. Anecdotally, it is strongly believed that the overall mix of passenger vehicles in Ambos Nogales is older and more poorly maintained than would be the average in many U.S. communities of comparable size, although data are not available to confirm this belief. Smoking vehicles

are certainly visible in Rio Rico, Nogales, Ariz., and Nogales, Sonora. It is well known that many older U.S. vehicles, once they have lost their marketability in the U.S., are exported for sale in Mexico. It is also known that many of the vehicles garaged in Nogales, Sonora, without being legally registered there are registered in and imported from Arizona. In the absence of a well-organized data collection effort, these factors all make it difficult to determine the overall prevalence of smoking vehicles, where they are housed, or how they could be managed.

There are approximately 160 buses registered in Santa Cruz County. There are approximately 16,015 buses and light trucks registered in Nogales, Sonora. A small percentage of these vehicles are buses that serve commercial passenger routes; it is unclear how many of these vehicles are buses contracted by maquiladoras for transporting their employees. As in the case of passenger vehicles, many of the buses used in Nogales, Sonora, are older vehicles exported from the U.S., once they are no longer marketable domestically.

The number of commercial trucks passing through the Mariposa Port of Entry was discussed above. Approximately 3,091 commercial trucks are registered in Santa Cruz County, and approximately 1,072 heavy commercial trucks are registered in Nogales, Sonora. Long distance



Diesel truck emissions

haul trucks typically used in both the U.S. and Mexico are usually not registered to cross the international boundary, although this is expected to change soon due to the recent U.S. Supreme Court decision regarding some of the requirements of NAFTA (please see Section VI.D). Because of this, there is a local fleet of short haul trucks that are registered to cross the international boundary; these trucks are used to move most produce across the border. Produce grown in Mexico for export to the United States is typically brought to the border area on Mexican long

haul trucks, off-loaded and re-loaded onto local short haul trucks, imported across the border and taken to a warehouse. At that warehouse, the produce is once again off-loaded, may be re-packaged, and is re-loaded onto U.S. long haul trucks. Many of these short haul trucks are older and in poorer condition than typical long haul trucks in either the U.S. or Mexico. As a result, their emissions may be expected to be relatively higher.

Regarding the fuels used by the local mix of vehicles, the vast majority of passenger vehicles and commercial trucks use traditional fuels – either gasoline or diesel. Leaded gasoline is no longer available in either community (although a question has been raised as to whether or not some car owners separately purchase lead-based additives and add those to their gas tanks). Most buses also use diesel fuel; however, some buses in Nogales, Sonora, have been voluntarily converted to liquid petroleum gas (LPG) because the conversions are inexpensive and operation and maintenance costs with LPG are lower than with diesel. A few passenger vehicles in Nogales, Sonora, may also have been converted to LPG for the same reasons. A very small number of alternative fuel vehicles (AFVs) are used in Santa Cruz County; however, the lack of available refueling stations for such vehicles makes their use quite limited.

In general, traditional gasoline and diesel fuel available in the United States is cleaner – and thus produces less emissions, all else being equal – than the corresponding fuels available in Mexico. It is widely known that both gasoline and diesel in the United States is less costly and provides better mileage than the Mexican fuels. As a result, residents of Nogales, Sonora, often cross the border to refuel in the United States. Recently, gasoline prices in Nogales, Sonora, were brought in line with Nogales, Ariz., prices. Because the mileage from U.S. gasoline is still better, it is unclear what effect this change has had on consumption patterns.

As described in Section VI.D, the BLM Subgroup and ANAQTF have a growing concern about the potential air quality impacts of the recent Supreme Court decision lifting the moratorium on Mexican heavy duty trucks travelling throughout the U.S. The previous section details these concerns in relation to the numbers of trucks and volume of train traffic crossing the border. However, another aspect of this concern relates to engine design and fuel quality. In 2006, ULSDF will become the only “traditional” diesel fuel available in the U.S. (as described in Section II.C, biodiesel is already available and will continue to be available in the future).

ULSDF results in lower emissions, as do more modern engine designs that are also being required for U.S. trucks. However, most heavy duty truck engines need to be retrofitted in order to fully take advantage of the emissions reduction potential offered by this cleaner fuel. Retrofitting is not required even for U.S. trucks. In addition, some retrofit units – as well as newer engines meeting stricter design requirements – are damaged by the use of today’s standard U.S. diesel fuel, thus impairing their emissions reduction capabilities. Thus, one aspect of the concern about fuels has to do with the potential for U.S. trucks to travel in Mexico (which will also now be allowed), refuel with lower quality Mexican diesel fuel, and damage their emissions reduction capabilities. This raises questions about the enforcement of various U.S. diesel emission reduction requirements among the U.S. heavy duty motor carrier fleet.

A likely more significant concern has to do with larger numbers of Mexican heavy duty trucks travelling into the U.S. using Mexican diesel fuel. The kinds of requirements for higher quality fuel and better engine design that exist in the U.S. do not exist in Mexico. Thus, even the newest Mexican long haul trucks will have engines not designed to burn as cleanly as their U.S. counterparts. In addition, even when ULSDF becomes the standard nationwide in the U.S., its benefits may not fully reach border communities because, even if Mexican trucks use this fuel, the emissions benefits will not be realized with engines not meeting U.S. design requirements and/or without retrofits. Indeed, the lack of ULSDF in Mexico makes it impractical for Mexican motor carriers to install retrofits. There is some potential for the lifting of the moratorium on Mexican trucks to result in reduced (or even eventually eliminated) usage of short haul drayage vehicles, which could mean that the heavy duty diesel fleet circulating in border communities could improve. However, the balance of information available would seem to indicate cause for concern.

One positive step that has been taken on this issue is that the Border Governors’ Conference, representing the governors of all ten U.S. and Mexican border states, recently recommended the initiation of a binational dialogue on ULSDF being made available in Mexico. ANAQTF recognizes that doing so will be a long-term effort. It also recognizes that making ULSDF available in Mexico is likely key to border communities realizing the air quality benefits it offers. It has the potential to be a first step, with improved engine design standards for new trucks in Mexico, and then retrofits being promoted for existing trucks, to follow. ANAQTF will take a keen interest in the progress of this recommendation, as its members develop a strategy for addressing the impacts of the Supreme Court decision on Mexican trucks.

Finally, regarding the availability of public transportation as an alternative to single passenger vehicles, several issues were identified by the BLM Subgroup. First, all available bus transit in Ambos Nogales is through privately owned bus companies, over which governmental authorities have less control than would be the case with publicly owned transit systems. In Nogales, Sonora, unpaved and poorly constructed paved streets, as well as the presence of a high volume of passenger vehicles as compared to road capacity, make the circulation of buses difficult. Better roads would help to make bus transportation more attractive. Maquiladoras contract with bus companies to provide transportation for their employees; however, the fact that most of them schedule the same work hours makes overall traffic problems worse, thus also contributing to the difficulty of bus circulation. Additional issues identified include the fact that bus

stops are often inadequate due to little marking and parked vehicles that take up the stop space. Such improperly parked vehicles rarely receive tickets. Also, the transit time assigned to many routes is often too long. While it may match what is possible during peak traffic periods, it also results in buses traveling unnecessarily slowly at other times – delaying surrounding traffic and further discouraging additional ridership. Bus trip times are further slowed by the manner in which drivers are paid. They pay a daily rental fee to the bus owner and then collect and keep all passenger fares. Most drivers perceive that they collect more fares – and make more money – by traveling slowly so that they have a better chance of picking up riders at each stop.

The BLM Subgroup recommendation to reduce vehicle emissions is to address vehicle emissions (please see Section II.C).





VII. WHAT HAS BEEN ACCOMPLISHED SO FAR TO IMPROVE AIR QUALITY IN AMBOS NOGALES?

A number of actions have been taken in Ambos Nogales to improve air quality. Some of these actions pre-date the BLM Subgroup's work, and may involve regulations, policies and practices. In addition, as mentioned in Section V.A, the BLM Subgroup identified and worked to implement a number of "immediate actions" to improve local air quality. This section describes all of these actions, with Section VII.A. focusing on historical activities and Section VII.B focusing on the BLM Subgroup's immediate actions.

A. *REGULATIONS, POLICIES AND PRACTICES ALREADY IN PLACE*



1. Residential Emissions

The BLM Subgroup found that few regulations, policies and practices are already in place to address residential emissions of particulate matter.

From an air quality point of view, there are no regulations regarding the burning of wood in indoor fireplaces in Nogales, Ariz., Santa Cruz County, or Nogales, Sonora. As mentioned in Section VI.A, the outdoor burning of all forms of garbage, including green waste, is prohibited in Nogales, Sonora. In Nogales, Ariz., and Santa Cruz County, the burning of garbage is also prohibited. However, the burning of green wastes is permitted under certain conditions. Permits can be obtained for open burning in relation to weed control, land clearing, fire control, and fire training. Outdoor open fires involving clean, appropriate fuels (such as charcoal or clean, dry wood) are allowed for cooking, heating, recreation, branding or in orchard heaters without a permit.

The Public Services Department of the municipality of Nogales, Sonora, has a school-based public education campaign to promote better awareness and community responsibility regarding garbage management. Recycling, as well as being sure to bag garbage for collection, are promoted.

SIUE assists municipalities in developing school-based recycling programs. In two years of implementing SIUE's program, the agency has worked with five communities in southern Sonora, which have had great success. Students are instructed that on each day of the week, a different type of recyclable material (for example, glass on Mondays, paper on Tuesdays, etc.) is to be brought in from home. The collected materials are sold for recycling, and the benefits

to the schools are paid in the form of in-kind services, rather than actual cash. The program can generate worthwhile benefits only when large volumes are collected, which precludes doing pilot programs. SIUE works with the municipality, which brings local businesses into the program. The business sector provides financial or material donations in order to supply schools and municipalities with what they need to participate in the program.



2. Soil Erosion and Revegetation

The BLM Subgroup found that a number of regulations, policies and practices are already in place to control soil erosion and/or promote revegetation activities.

At the local level, the municipality of Nogales, Sonora, has regulations that focus on preventing deforestation. Trees may only be removed if (1) they pose a danger to people or property, (2) they are already dead and dried out or (3) the roots are adversely affecting buildings, homes, water and sewer pipes, or other similar installations. A permit is required even if the tree is dead. After an application has been filed, the proper authorities investigate the site and take pictures, and then issue an order as to whether the tree may be cut down. If permission is granted to do so, then three more trees must be planted and maintained by the applicant. The municipality prefers varieties of oak, mesquite and pine, and considers eucalyptus and cottonwood trees to be problematic. In addition, construction companies that are creating new subdivisions must do an Environmental Impact Summary. In this process, the highest number of trees possible must remain in place or be replanted in the same area; a revegetation plan must be included, and green areas must be included. Although this progressive law has been in place for quite some time, many residents are unaware of it, and a lack of resources results in limited enforcement of the law.

Santa Cruz County has adopted a new Excavation and Grading Ordinance. The ordinance requires hydro-seeding (a combination of seed and mulch, congealed together to form a mat or sealed layer) within 30 days of clearing land. The ordinance also requires more re-seeding in comparison to previous regulations: flat areas must be re-seeded as well as slopes. In addition, if tumble weed grows as a result of waiting too long to hydro-seed after grading, then the area must be cleared and re-seeded. The ordinance also includes visual impact provisions in which a disturbed area that is not either paved or hydro-seeded is considered to be an eyesore. There are no areas exempted from the ordinance on the basis of size. The ordinance's requirements are less stringent when a grading permit is sought in conjunction with a building permit; however, if a lot is to be graded simply to sell it, then the entire lot must be re-seeded. Regarding the types of vegetation required, the county's Planning and Zoning Department requires landscape packages to be submitted for approval, and within these landscape packages there must be evidence of returning trees to the area. Enforcement of the ordinance is time consuming and difficult.

Santa Cruz County is also working on some drainage projects that are expected to have a positive effect on issues of soil erosion. The county has hired a consultant to examine the problem of a large amount of undefined drainage occurring in the vicinity of North River Road; solutions are to focus on getting run-off water to the Santa Cruz River without going through resi-

dential areas. The county also has several on-going flood mitigation projects in the vicinity of Old Tucson Road to address past flood damage; money from the Federal Emergency Management Agency (FEMA) and State Emergency Mitigation Funding is being used for these projects.

The city of Nogales, Ariz., requires vegetation plans for developments over one acre. Drainage and erosion controls are also required for lots over one acre.

At the state level, SIUE has a State Reforestation Program, which is conducted in cooperation with the federal government and has been in place for about 10 to 12 years. Interested municipalities may set up an agreement through the mayor and join the Reforestation Committee; approximately 40 percent of the municipalities in Sonora are participating. This committee sponsors 17 nurseries that give away free trees to any citizen who wants them. The program also works with maquiladoras, which are required to engage in reforestation efforts both at their plant sites and in neighborhoods. SIUE works with municipalities to promote reforestation efforts in colonias. Such efforts begin with a diagnostic visit to the colonia, including coordination with colonia leaders, to launch a reforestation campaign. The campaign includes education programs targeted from pre-school to adults, information about native species, and visits to local hospitals to establish a link between health and reforestation. SIUE will work with any interested community, and they are interested in finding additional partners to participate in and expand the program. SIUE as well as PROFEPA have sanctions for the illegal cutting of trees, established through the Forest, Ecology, and Development codes. Fines are based on minimum salaries, the species involved, and the magnitude of the cutting. In extreme cases, jail sentences may be applied.

In Arizona, the Nogales Non Attainment Area SIP for particulate matter was developed in the early 1990s, as mandated by the federal Clean Air Act. The SIP includes a number of actions that various government agencies in the United States, at all levels of government, have committed to take in order to improve air quality in the Nogales Non Attainment Area. It has several provision related to soil erosion. Dirt lots over ten acres must be watered down. Trucks that enter or exit from county-maintained roads must have a “track-out” area, and all trucks must be covered during transportation of loose dirt. Revegetation is required in association with building a road or development, and ADOT has required specifications for revegetation that are included in their road work contracts. Also, public access to construction sites must be restricted (for example, through fencing) to prevent unauthorized recreational use of those sites.

With regard to additional state and federal regulations, the Army Corps of Engineers 404 permit program attempts to preserve the structural aspects of water courses; however, this program has had limited effectiveness. As a result, sediment runoff into water bodies is the largest source of water quality violations throughout the state of Arizona.



3. Unpaved Traffic Areas

The BLM Subgroup found that a number of regulations, policies and practices are already in place to address unpaved traffic areas.

The Nogales Non Attainment Area SIP includes many commitments that are relevant to unpaved traffic areas, including:

- Access points where unpaved parking lots or roads meet paved roads must be paved, vegetated or chemically stabilized.
- Dust abatement activities must be implemented during construction, including obtaining a permit from the city of Nogales or Santa Cruz County.
- Trucks hauling earthen materials or loose materials must be covered.
- Soil erosion that makes its way onto paved local streets must be cleaned up within 24 hours after the erosion event.
- No permanent unpaved haul roads will be built.
- Traffic will be discouraged and speed limits will be lowered on unpaved roads.
- Recreational vehicles will be limited from accessing open land (e.g., through the use of fencing).
- Road shoulders must be curbed or paved.
- Unpaved roads and parking lots must be paved.
- Stock piles must be covered.
- Adequate drainage must be incorporated into construction projects so as to prevent soil erosion.

Several members of the BLM Subgroup acknowledged that significant portions of these requirements are not being met due to a local lack of resources. Questions were also raised as to whether ADOT contracts include some of these requirements in their specifications, and if so, whether contractors are actually complying with such specifications.

At the local level, the SouthEastern Arizona Governments Organization's (SEAGO's) role with regard to unpaved traffic areas is primarily to assist its member entities (incorporated cities and counties in southeastern Arizona) to obtain and use federal transportation funds. One source of such funds, the Highway Users Revenue Fund (HURF), is provided directly to cities and counties. However, most other federal transportation funds are provided through the councils of governments. Congestion Mitigation and Air Quality (CMAQ) and Surface Transportation Program (STP) funds are two examples. Another is Transportation Enhancement Program (TEP) funds, which could be used, for example, in soil erosion control projects; these funds typically require a six to seven percent match and are awarded competitively. Applications must originate from a SEAGO member entity. STP funds must be used on "functionally classified roads," which would preclude, for example, privately owned parking lots.

Santa Cruz County is engaged in several dust mitigation projects. Most notably, the county recently completed the paving of South River Road, taking care of the last of the county-owned unpaved roads within the non attainment area. Part of this project also involved constructing 30 drainage structures so that water can reach the river without having to cross dirt roads. In addition, in its detailed operational plan for the Santa Cruz County Landfill, the county included provisions for enhanced fees for loads brought to the landfill without proper covering; the fees appear to be rather effective in discouraging uncovered loads, although enforcement on Highway I-19 of requirements for covering loads is limited by a lack of sufficient resources.

The city of Nogales Department of Public Works is engaged in a number of road-paving activities. The city stockpiles millings, such as those generated by ADOT in the resurfacing of Grand Avenue and I-19, in exchange for being able to use those millings in chip sealing unpaved roads. The city recently completed placing millings on most unpaved roads at the cemetery as well as in the Vista del Cielo area. Other departmental activities to reduce dust include paving shoulders according to Maricopa County standards, improving drainage and creating sidewalks. All of these activities are limited due to the scarcity of available funds. In addition, Department of Public Works crews do clean up soil erosion that deposits on city streets; however, once again, resource limitations have meant that this is rarely accomplished within 24 hours of the erosion event.

Regarding unpaved parking lots, the city of Nogales, Ariz., had attempted to take an enforcement action requiring the owners of such lots to come into compliance with city requirements to pave all parking lots. This action was met with strong opposition amid concerns of fairness, funding, and the relative lack of flexibility in the city's existing ordinance. As a result, the city refocused its efforts toward assisting lot owners by exploring options for financing mechanisms, as discussed in Sections II.A. and II.M.

By law, the paving of streets is required in Nogales, Sonora. The process of paving roads requires funding to be shared among three parties: the residents of that area, the municipality, and the state government. In effect, those streets where the area residents are able to organize and raise their required portion of the funds most quickly are the streets that get paved first. There is only one major unpaved road in Nogales, Sonora, (the Nogales-Cananea road) that would be the clear responsibility of a state agency to pave. All other unpaved roads are the exclusive responsibility of the municipality, with very little assistance of any kind available from state or federal agencies. This is very different from the situation in the U.S., where cities and counties rely on significant financial assistance from state and federal agencies for road-paving projects.



4. Traffic Congestion

The BLM Subgroup found that some regulations, policies and practices are already in place to reduce traffic congestion.

The Nogales Non Attainment Area SIP includes two commitments regarding traffic congestion, both of which focus on the ports of entry. One commitment was to make improvements at the Mariposa and Grand Avenue POEs; this work was completed several years ago. The other commitment was for the USCS to establish a “Line Release Program,” which would allow repeat haulers with good records faster entry into the U.S. Since the SIP was developed, this program has been renamed the “Rapid Enforcement Lane” program. Under this approach, trucks that have all of their paperwork in order, and give no cause for suspicion or the need for further inspection to the several agencies conducting inspections, only need to pass through the preliminary drug screening area before being approved to proceed out of the inspection compound. For those trucks that cannot be processed through the Rapid Enforcement Lanes, two pieces of equipment – a mobile x-ray unit and a fixed x-ray unit – are used as contraband

screening tools to make a determination as to whether to conduct a more lengthy manual inspection. These inspection approaches have helped to speed up the inspection process to some degree.

At the local level, Tránsito – the municipal police force in Nogales, Sonora, which is responsible for traffic enforcement – encourages passenger vehicles to consider crossing into the U.S. at the Mariposa Port of Entry in order to reduce congestion at the Denis DeConcini (downtown) Port of Entry. In addition, Tránsito officers try to maintain open routes through intersections that can become blocked – especially in the downtown areas – when lines to enter the U.S. are particularly long.

The Mexican Aduana conducts its inspections of traffic entering Mexico in accordance with the law and in a manner designed to minimize traffic congestion at the ports of entry. Passenger vehicles and commercial trucks entering México are separated to promote a smoother flow of traffic. Aduana inspectors also try to prevent the build-up of vehicles parked in the right-hand (Mexico-bound) traffic lane at the entrance to the Mariposa Port of Entry inspection station, including occasionally requesting the USCS to tow vehicles parked in that lane on the U.S. side.

With regard to under-designed intersections, in order for an intersection improvement project to be funded with ADOT assistance, the intersection must touch some part of the ADOT system. In such cases, ADOT pays only for its portion of the work, which usually does not include the entire project. Proposed projects must meet ADOT “warrants,” which are design and performance standards that indicate formally when an intersection is under-designed. If a proposed project does meet the warrants, then it must enter the five-year Transportation Improvement Plan (TIP) process in order to be considered for funding; this process is managed by the ADOT District Engineer with assistance from the area council of government (please see the discussion of SEAGO's role in Section VII.A.3).

In addition, the municipality of Nogales, Sonora, recently added road markings at bus stops along the major north-south artery Avenida Ruiz Cortínez, making it clearer where bus stops are located and making it easier for other traffic to move around stopped buses, thus reducing traffic congestion.

Finally, in relation to traffic congestion associated with the train, the Arizona Corporation Commission (ACC) oversees the train's operations; however, Union Pacific is primarily responsible for setting and carrying out procedures. As a result of negotiations between Union Pacific, Grupo México (the train owners in Mexico), and the municipalities of Nogales, Ariz., and Nogales, Sonora, as of early September, 2001, Union Pacific has put in place several new procedures to improve traffic flow. Through-trains (traveling from Tucson, through Nogales to destinations south of the border) usually stop at the Mariposa/Grand Avenue intersection, although they sometimes stop at the Post Office intersection or at the port of entry itself. During these stops, the U.S. and Mexican crews switch, the engines are then switched, and finally the crews switch again. North-bound trains are given an air brake test before continuing on to Rio Rico. These procedures are new and still being ironed out. Other changes that have

been made as a result of negotiations between the municipalities and the train owners include completing the special siding in Rio Rico for USCS inspections, improving coordination between the train owners and the USCS, and improving the hours at which the train passes through the community to better avoid peak traffic hours.



5. Vehicle Emissions

The BLM Subgroup found that few regulations, policies and practices are already in place to reduce vehicle emissions.

With regard to state agency roles, it was noted that there are no agreements in the Nogales Non Attainment Area SIP pertaining to vehicle emissions. Vehicle emissions inspections are currently legally required throughout Sonora. However, implementation of this program was discontinued due to significant public protest.

Some positive practices for air quality regarding fuel choice are being carried out by local residents and business owners because they are economically attractive. As noted in Section VI.E, almost everyone from Nogales, Sonora, who can do so crosses to the United States in order to refuel. This is true for passenger vehicles as well as commercial trucks using diesel fuel. This trend is due to the fact that traditional gasoline and diesel fuel cost less (until recently) in the United States and provide better mileage, in comparison to the equivalent products in México; the U.S. fuels burn more cleanly, too. In addition, passenger vehicles as well as buses in Nogales, Sonora, are voluntarily converted to alternative fuels (liquid petroleum gas, for example) with some regularity. This decision is driven by economics, recognizing the lower fuel and maintenance costs with alternative fuels and further assisted by the fact that conversion costs are lower – sometimes significantly – than in the United States.

Although no alternative fuel refueling stations are currently available in Nogales, Ariz., there are several regulations and policies in place that could promote their use, should they become available. According to federal law, wherever a refueling station is accessible, the federal General Services Administration's fleet vehicles must be converted to alternative fuel vehicles – although there are specific exceptions to this law, based on the type and use of the vehicle. In addition, once ADOT has an alternative fuels refueling station available at one of its maintenance yards, it commonly develops intergovernmental agreements with other state, federal, and local agencies in the area to provide such fuels to their fleet vehicles.

Regarding promoting the use of public transportation as an alternative to single passenger vehicles, the Delegación de Transporte is nearing the completion of a process to regularize the practices of the many privately owned bus companies in Nogales, Sonora, which pay a fee for the use of routes. The completion of this process will make it possible to consider, for the first time, formalizing routes, publishing maps, and taking other similar actions that could make public transit more attractive to residents.

B. BLM SUBGROUP IMMEDIATE ACTIONS

As mentioned in Section V.A, the BLM Subgroup selected 12 of its 78 brainstormed ideas for how to improve air quality in Ambos Nogales as immediate actions. What these immediate actions have in common – and what sets them apart from the other possible air quality improvement actions that have been identified – is the fact that these actions could be set in motion relatively easily in the short term, and the fact that at least one participating agency was willing to help move the effort forward. These immediate actions, which are in various stages of development, are as follows.

1. An effort to promote revegetation activities among schools and neighborhoods, with the participation of maquiladoras, has been established. The Ambos Nogales Revegetation Partnership (ARAN), jointly lead by the University of Arizona and the Instituto Tecnológico de Nogales (Sonora) with the participation of several BLM Subgroup member entities, schools, and community organizations, has established pilot projects at several schools and colonias. This project has generated a significantly improved understanding of many aspects of the local erosion and revegetation issue, including a guide to native plants that grow well in Ambos Nogales. Several other schools and colonias are now being brought into the program as it moves forward. Continuation of this effort is part of the BLM Subgroup's additional priority recommendation described in Section II.G. A more extensive summary of the partnership's accomplishments and future direction is found in Appendix B.
2. USDA has worked on moving inspection activities for produce trucks from the commercial port of entry to warehouses. USDA has succeeded in working with several produce houses and customs brokers to move the inspections of some trucks to warehouses, which have more space available, rather than at the port of entry. The project began as a small pilot with three warehouses participating in the program. Continuation of this effort is part of the BLM Subgroup's high priority recommendation described in Section II.B.
3. Establishing a means of rewarding maquiladora participation in revegetation efforts through the AMIGO Program was proposed. This has been accomplished through allowing such efforts to be entered into the pollution prevention promotion award category. Continuation of this effort is part of the BLM Subgroup's additional priority recommendation described in Section II.G.
4. As part of the Reforestation/Green Zone Program for Nogales, SIUE, the H. Ayuntamiento de Nogales, Sonora, and the maquiladora Sonitronies developed an accord with the maquiladora sector to define roles and responsibilities and formalize various efforts that are already underway. These efforts include a joint tree-planting event that was carried out on the weekend of June 2 and 3, 2002, as part of the observations of World Environment Day (June 5 of every year).

Several additional tree planting events have been held since then. Education, Outreach, Coordination and Follow-Up/Evaluation Committees have already been formed. The accord includes other parties such as the Comisión Nacional Forestal (CONAFOR – the National Forestry Commission), the education sector and other maquiladoras. The accord also includes the development of a list of preferred species and will provide for the on-going supply of trees to the municipal nursery. Continuation of this effort is part of the BLM Subgroup's additional priority recommendation described in Section II.G.

5. A pilot project with schools to involve students in making and using solar ovens to demonstrate alternatives to burning wood for cooking has been initiated. A teacher at the A.J. Mitchell Elementary School in Nogales, Ariz., has identified a group of teachers who are going to try some solar oven activities in the classroom. Continuation of this effort is part of the BLM Subgroup's additional priority recommendation described in Section II.H.
6. A pilot project to construct alternative building structures with techniques such as straw bale and rammed earth in used tires (“Earth Ships”) with the goal of eliminating the need to burn wood for home heating has been proposed. The University of Arizona and the Instituto Tecnológico de Nogales have agreed that they would like to pursue this effort as a cooperative activity. Some preliminary research has been conducted by ADEQ. Continuation of this effort is part of the BLM Subgroup's additional priority recommendation described in Section II.H.
7. The first phase of a project to deploy traffic counting devices in Nogales, Sonora, to determine traffic patterns that could help identify for which roads paving would be most beneficial to air quality, as well as which intersections are most in need of flow improvements, has been completed. During July and August, 2002, a five-week traffic count study was carried out in Nogales, Sonora, with the objective of identifying high-priority unpaved roads. This study collected data at 22 locations shown on the map in Figure 5. Additional studies of this sort may be performed in the future. Carrying out this effort is part of the BLM Subgroup's high priority recommendation described in Section II.A and additional priority recommendation described in Section II.L.
8. Working with local automotive repair shops to set up a “free tune-ups” event, thus promoting reduced vehicle emissions and providing repair shops with an opportunity to gain new customers, has been proposed. There has been no progress to date on this activity. Carrying out this effort is part of the BLM Subgroup's high priority recommendation described in Section II.C.
9. Deployment of video cameras to collect additional data about the prevalence of smoking vehicles has been proposed. There has been no progress to date on this activity. Carrying out this effort is part of the BLM Subgroup's high priority recommendation described in Section II.C.

FIGURE 5

**TRAFFIC COUNT
DATA COLLECTION
LOCATIONS**



10. Developing a school-based recycling program as a means of simultaneously raising funds for schools' needs and providing an additional alternative to burning garbage has been proposed. There has been no progress to date on this activity. Carrying out this effort is part of the BLM Subgroup's additional priority recommendation described in Section II.J.
11. A dialogue has been proposed among Nogales, Ariz., Nogales, Sonora, and Santa Cruz County to identify opportunities to assist with increased road paving activity in Nogales, Sonora. This effort would be modeled after similar efforts in Douglas/Agua Prieta. There has been no progress to date on this activity. Carrying out this effort is part of the BLM Subgroup's high priority recommendation described in Section II.A.
12. Conducting public education and outreach about peak traffic hours, alternative routes and transportation modes available, and encouraging drivers to avoid peak hour travel has been proposed. There has been no progress to date on this activity. Carrying out this effort is part of the BLM Subgroup's high priority recommendations described in Sections II.B and II.C and additional priority recommendation described in Section II.K.



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LIST OF ABBREVIATIONS USED IN THIS DOCUMENT

AAC – Arizona Administrative Code (Código Administrativo de Arizona)

AC – asociación civil (non-profit organization)

ACC – Arizona Corporation Commission (Comisión Corporativa de Arizona)

ADEQ – Arizona Department of Environmental Quality (Departamento de Calidad Ambiental de Arizona)

ADHS – Arizona Department of Health Services (Departamento de Servicios de Salud de Arizona)

ADOT – Arizona Department of Transportation (Departamento de Transporte de Arizona)

AFV – alternative fuel vehicle (vehículo de combustible alterno)

ALIS – Arizona Legislative Information Service (Servicio de Información de la Cámara de Diputados de Arizona)

AMC – Arizona-Mexico Commission (Comisión Arizona-México)

AMIGO – Arizona-Mexico International Green Organization (Organización Internacional Verde de Arizona-México)

ANAQTF – Border 2012 Ambos Nogales Air Quality Task Force (Grupo de Trabajo Frontera 2012 Calidad del Aire en Ambos Nogales)

AQI – Air Quality Index (Indice de la Calidad del Aire)

ARAN – Asociación de Reforestación de Ambos Nogales (Ambos Nogales Revegetation Partnership)

Ariz. – Arizona

ARS – Arizona Revised Statutes (Ley Estatal de Arizona)

AZ – Arizona

BANDAN – Banco de Desarrollo de América del Norte (North American Development Bank)

BARA – Bureau of Applied Research in Anthropology (Departamento de Investigaciones Aplicadas en Antropología)

BCBP – Bureau of Customs and Border Protection (Departamento de Aduana y Protección de la Frontera)

BECC – Border Environment Cooperation Commission (Comisión de Cooperación Ecológica Fronteriza)

BEIF – Border Environment Infrastructure Fund (Fondo de Infraestructura Ambiental Fronteriza)

BLM – Border Liaison Mechanism (Mecanismo de Enlace Federal para Asuntos Fronterizos)

CA – California

CAF – County Assistance Fund (Fondo de Asistencia para los Condados)

CAIF – Clean Air Investment Fund (Fondo Para la Inversión en Aire Limpio)

CANAMEX – Canada-America-Mexico Corridor (Corredor Canadá-Estados Unidos-México)

CARB – California Air Resources Board (Consejo de Recursos de Aire de California)

CBI – Coordinated Border Infrastructure Program (Programa de Infraestructura Fronteriza Coordinada)

CEC – Commission for Environmental Cooperation (Comisión para la Cooperación Ambiental)

CEH – children’s environmental health (salud ambiental de los niños)

CEHTF – Border 2012 Children’s Environmental Health Task Force (Grupo de Trabajo Frontera 2012 Salud Ambiental Infantil)

CETis – Centro de Estudios Técnicos, Industriales y Sociales (Technical, Industrial and Social Studies Center)

CMAQ – Congestion Mitigation and Air Quality Fund (Fondo para Mitigación del Congestionamiento y Calidad del Aire)

CO – carbon monoxide (monóxido de carbono)

CO₂ – carbon dioxide (dióxido de carbono)

COCEF – Comisión de Cooperación Ecológica Fronteriza (Border Environment Cooperation Commission)

COG – council of government (consejo de gobierno)

CONACYT – Consejo Nacional de Ciencia y Tecnología (National Science and Technology Council)

CONAFOR – Comisión Nacional Forestal (National Forestry Commission)

CONALEP – Colegio Nacional de Educación Profesional Técnica (National Professional Technical Education College)

COPLADES – Comité Estatal de Planeación para el Desarrollo (State Development Planning Committee)

CP – cociente de peligro (hazard quotient)

CTC – central tendency case (caso de tendencia central)

DHS – Department of Homeland Security (Departamento de Seguridad de la Patria)

EE.UU. – Estados Unidos de América (United States of America)

EIS – environmental impact statement (declaración de impacto ambiental)

EMR – exposición máxima razonable (reasonable maximal exposure)

EPA – Environmental Protection Agency (Agencia de Protección Ambiental)

FEMA – Federal Emergency Management Agency (Agencia Federal para el Manejo de Contingencias)

FMCSA – Federal Motor Carrier Safety Administration (Administración Federal de Seguridad de Transportes Motorizados)

FPAA – Fresh Produce Association of the Americas (Asociación de Frutas y Verduras de las Américas)

FRA – Federal Railroad Administration (Administración Federal de Ferrocarriles)

FTE – full time equivalent (posición de turno completo)

FYxx – fiscal year xx (ciclo fiscal del año xx)

GIS – geographic information system (sistema de información geográfica)

HAP – hazardous air pollutant (contaminantes peligrosos en el aire)

HI – hazard index (índice de peligro)

HQ – hazard quotient (cociente de peligro)

HURF – Highway Users Revenue Fund (Fondo de Ingresos de Usuarios de Carreteras)

IMECA – Índice Metropolitano de la Calidad del Aire (Air Quality Index)

INS – Immigration and Naturalization Service (Servicio de Inmigración y Naturalización)

IP – índice de peligro (hazard index)

IREC – Interstate Renewable Energy Council (Consejo Interestatal de Energía Renovable)

ITS – intelligent transportation system (sistema inteligente de transporte)

kg – kilogram (kilogramo)

km – kilometer (kilómetro)

LIBOR – London InterBank Offered Rate (Taza Interbancaria de Londres)

LPG – liquid petroleum gas (gas líquido de petróleo)

LTAF – Local Transportation Assistance Fund (Fondo de Asistencia para el Transporte Local)

MPO – municipal planning organization (organización de planeación municipal)

MVD – Motor Vehicle Division (División de Vehículos Motorizados)

NAAQS – National Ambient Air Quality Standard (Norma Nacional para la Calidad del Aire Ambiental)

NADBank – North American Development Bank (Banco de Desarrollo de América del Norte)

NAFTA – North American Free Trade Agreement (Tratado de Libre Comercio de América del Norte)

NCPD – National Corridor Planning & Development Program (Programa Nacional de Planeación y Desarrollo de Periféricos)

NGO – non-governmental organization (organización no gubernamental)

NIEHS – National Institute for Environmental Health Sciences (Instituto Nacional de Ciencias de Salud Ambiental)

NIH – National Institutes for Health (Institutos Nacionales de Salud)

NOAA – National Oceanic and Atmospheric Administration (Administración Nacional Oceanográfica y Atmosférica)

O₃ – ozone (ozono)

OEHHA – Office of Environmental Health Hazard Assessment (Oficina de Evaluación de Riesgos a la Salud Ambiental)

P2 – pollution prevention (prevención de la contaminación)

PAHs – polynuclear aromatic hydrocarbons (hidrocarburos aromáticos polinucleares)

PM – particulate matter (partículas)

PM10 – particulate matter smaller than 10 microns (partículas menores a 10 micras)

PM2.5 – particulate matter smaller than 2.5 microns (partículas menores a 2.5 micras)

POE – port of entry (puerto de entrada)

ppm – parts per million (unidades por millón)

RME – reasonable maximal exposure (exposición máximo razonable)

SAHRA – Sustainability of semi-Arid Hydrology and Riparian Areas (Sustentabilidad de Hidrología y Areas Ribereñas semi-Aridas)

SCT – Secretaría de Comunicación y Transporte (Secretariat for Communication and Transportation)

SEAGO – SouthEastern Arizona Governments Organization (Organización de Gobiernos del Sureste de Arizona)

SEAHEC – Southeast Arizona Area Health Education Center (Centro de Educación sobre la Salud de la Zona Sureste de Arizona)

SEC – Secretaría de Educación y Cultura (Secretariat for Education and Culture)

SEMARNAT – Secretaría de Medio Ambiente y Recursos Naturales (Secretariat for Environment and Natural Resources)

SEP – supplemental environmental project (proyecto ambiental suplementario)

SIG – sistema de información geográfica (geographic information system)

SIP – State Implementation Plan (Plan de Implementación Estatal)

SIUE – Secretaría de Infraestructura Urbana y Ecología (Secretariat for Urban Infrastructure and Ecology)

SSP – Secretaría de Salud Pública (Secretariat for Public Health)

STP – Surface Transportation Program (Programa de Transporte Terrenal)

TEA-21– Transportation Enhancement Act for the 21st Century (Acta de Mejoramiento en Transporte para el Siglo 21)

TEP – Transportation Enhancement Program (Programa para Realzar el Transporte)

TIFIA – Transportation Infrastructure Finance and Innovation Act of 1998 (Ley de Financiamiento e Innovación para Infraestructura del Transporte del 1998)

TIP – Transportation Improvement Plan (Plan para el Mejoramiento del Transporte)

TLCAN – Tratado de Libre Comercio de América del Norte (North American Free Trade Agreement)

TV – television (televisión)

TX – Texas

TXDOT – Texas Department of Transportation (Departamento de Transporte de Texas)

$\mu\text{g}/\text{m}^3$ – micrograms per cubic meter (microgramas por metro cúbico)

ULSDF – ultra low sulfur diesel fuel (combustible diesel con contenido ultra bajo en azufre)

UN – United Nations (Naciones Unidas)

UofA – University of Arizona (Universidad de Arizona)

UP – Union Pacific Railroad (Ferrocarril Unión Pacífica)

USCS – United States Customs Service (Servicio Aduanal de los Estados Unidos)

USDA – United States Department of Agriculture (Departamento de Agricultura de los Estados Unidos)

U.S. DOE – Department of Energy (Departamento de Energía)

USDOT – United States Department of Transportation (Departamento de Transporte de los Estados Unidos)

UT – University of Texas (Universidad de Texas)



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