

**BINATIONAL NOGALES WASH UNITED STATES/MEXICO
GROUNDWATER MONITORING PROGRAM**

FINAL REPORT, AUGUST 2001

**PROGRAMA BINACIONAL DE MONITOREO DE
AGUAS SUBTERRANEAS SOBRE EL ARROYO LOS NOGALES**

INFORME FINAL, AGOSTO 2001

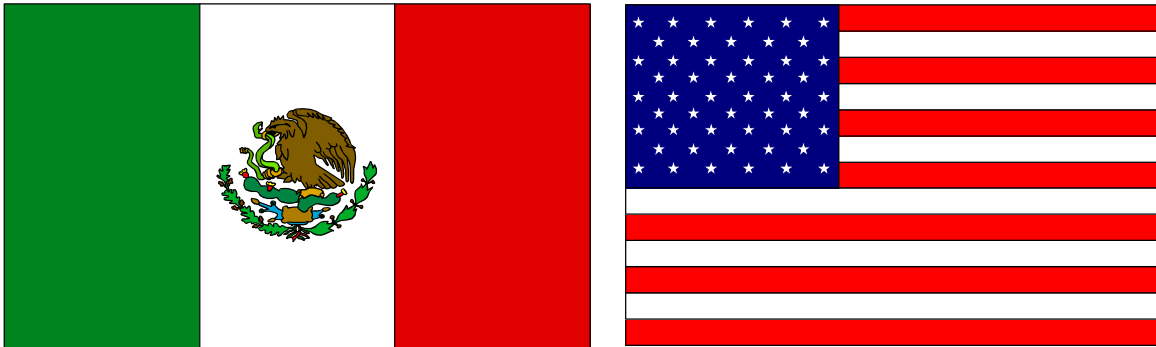


TABLE OF CONTENTS

LIST OF TABLES	i
LIST OF FIGURES	ii
I. AUTHORITY, JUSTIFICATION AND PARTICIPANTS	1
A. Authority	1
B. List of Participating Agencies	1
C. List of Participating Personnel	2
D. Justification	3
II. EXECUTIVE SUMMARY	4
III. DESCRIPTION OF THE STUDY AREA	5
A. Aquifer Characteristics	5
B. Sampling Sites	6
IV. DESCRIPTION OF THE STUDY	7
A. Soil Sampling	8
B. Groundwater Sampling	8
C. Quality Assurance/Quality Control (QA/QC)	9
V. RESULTS	10
A. June 1997	11
B. September 1997	12
C. February 1998	13
D. Quality Control/Quality Assurance Results	15
VI. OBSERVATIONS AND COMMENTS	15
VII. CONCLUSIONS AND RECOMMENDATIONS	19
BIBLIOGRAPHY	67
APPENDIX A - DATA VALIDATION REVIEW	A - 1
APPENDIX B - METHOD DETECTION LIMITS	B - 1
LIST OF ACRONYMS	C - 1

LIST OF TABLES

Table 1 - Well Construction Details for the Monitoring Wells in Nogales, Sonora	22
Table 2- Well Construction Details for the Monitoring Wells in Nogales, Arizona	23
Table 3a - Mexican Laboratory Results for Metal Analyses from Soil Samples Collected at Specific Depths	24
Table 3b- Mexican Laboratory Results for Organic Compounds from Soil Samples Collected at Specific Depths	25
Table 4a- U.S. Data Summary for VOCs from Soil Samples Collected at Specific Depths	26
Table 4b- U.S. Data Summary for Trace Metals from Soil Samples Collected at Specific Depths	27
Table 5 - Field Parameters Collected by The Binational Team	28
Table 6 - Data Summary for June 1997	32
Table 7 - Data Summary for September 1997	36
Table 8 - Data Summary for February 1998	40
Table 9 - Data Summary for the International Collector (2/98)	43
Table 10 - Arizona Aquifer Water Quality Standards	44
Table 11 - Mexican Water Quality Standards	46
Table A1 - Evaluation of the Analytical Lot of Samples for VOCs for July 1996 through February 1998 (U.S. Laboratory)	A - 4
Table A2 - Evaluation of the Analytical Lot of Samples for VOCs for July 1996 through February 1998 (Mexican Laboratory)	A - 8
Table B1 - Detection Limits for Volatile Organic Compounds in Soils (Mexican Laboratory)	B - 1
Table B2 - Detection Limits for Metals in Soil (Mexican Laboratory)	B - 2
Table B3 - Detection Limits for VOCs in Soils (U.S. Laboratory)	B - 3
Table B4 - Detection Limits for Trace Metals in Soils (U.S. Laboratory)	B - 4
Table B5 - U.S. and Mexico Groundwater Sample Containers and Preservation	B - 5
Table B6 - Detection Limits for VOCs in Groundwater (U.S. Laboratory)	B - 6
Table B7 - Detection Limits for VOCs in Groundwater (Mexican Laboratory)	B - 7
Table B8- Detection Limits for Major Cations & Anions in Groundwater (U.S. Laboratory)	B - 8
Table B9 -Detection Limits for Conventional Parameters and Coliforms in Groundwater (Mexican Laboratory)	B - 9

Table B10 - Detection Limits for Trace Metals in Groundwater (U.S. Laboratory)	B - 10
Table B11 - Detection Limits for Metals in Groundwater (Mexican Laboratory)	B - 11

LIST OF FIGURES

Figure 1 - Well Location Map	21
Figure 2 -U.S.-Mexico Data Comparison for Selected Parameters - April 1997	48
Figure 3 -U.S.-Mexico Data Comparison for Selected Parameters - June 1997	51
Figure 4 -U.S.-Mexico Data Comparison for Selected Parameters - September 1997	54
Figure 5 -U.S.-Mexico Data Comparison for Selected Parameters - February 1998	57
Figure 6 - Piper Groundwater Chemistry Diagram- April 1997	60
Figure 7 - Piper Groundwater Chemistry Diagram- June 1997	61
Figure 8 - Piper Groundwater Chemistry Diagram- September 1997	62
Figure 9 - Piper Groundwater Chemistry Diagram- February 1998	63
Figure 10 - Evolution of PCE Concentrations with Time (Mexican Laboratory)	64
Figure 11 - Evolution of PCE Concentrations with Time (U.S. Laboratory)	64
Figure 12 - Evolution of Nitrate Concentrations with Time (Mexican Laboratory)	65
Figure 13 - Evolution of Nitrate Concentrations with Time (U.S. Laboratory)	65
Figure 14 - Evolution of Arsenic Concentrations with Time (Mexican Laboratory)	66
Figure 15 - Evolution of Arsenic Concentrations with Time (U.S. Laboratory)	66