



Development and Evaluation of Hazardous Materials Inventory Status and Action Plan

Final Report 509

Prepared by:

Michael A. Sussman, E.I.T.
AMEC Earth & Environmental, Inc.
3232 W. Virginia Ave.
Phoenix, Arizona 85009

July 2003

Prepared for:

Arizona Department of Transportation
in cooperation with
U.S. Department of Transportation
Federal Highway Administration

The contents of this report reflect the views of the authors who are responsible for the facts and the accuracy of the data presented herein. The contents do not necessarily reflect the official views or policies of the Arizona Department of Transportation or the Federal Highway Administration. This report does not constitute a standard, specification, or regulation. Trade or manufacturers' names which may appear herein are cited only because they are considered essential to the objectives of the report. The U.S. Government and the State of Arizona do not endorse products or manufacturers.

Technical Report Documentation Page

1. Report No. FHWA-AZ-01-509		2. Government Accession No.		3. Recipient's Catalog No.	
4. Title and Subtitle Development and Evaluation of a Hazardous Materials Inventory Status and Action Plan				5. Report Date July 2003	
				6. Performing Organization Code	
7. Author Michael A. Sussman, E.I.T.				8. Performing Organization Report No. 1-114-002042	
9. Performing Organization Name and Address AMEC Earth and Environmental, Inc. 3232 West Virginia Avenue Phoenix Arizona 85009				10. Work Unit No.	
				11. Contract or Grant No. SPR-PL-1-(59)-509	
12. Sponsoring Agency Name and Address ARIZONA DEPARTMENT OF TRANSPORTATION 206 S. 17TH AVENUE PHOENIX, ARIZONA 85007 Project Manager: Estomih Kombe				13. Type of Report & Period Covered Final Report - 2003	
				14. Sponsoring Agency Code	
15. Supplementary Notes Prepared in cooperation with the U.S. Department of Transportation, Federal Highway Administration					
16. Abstract AMEC Earth and Environmental (AMEC) has completed an effort to assist the Arizona Department of Transportation (ADOT) in complying with the requirements of Arizona Revised Statutes (A.R.S.) §49-961 through §49-973. These statutes require Arizona state agencies that generate certain quantities of hazardous waste or use certain amounts of toxic substances to develop a pollution prevention program and submit documentation regarding that program to the Arizona Department of Environmental Quality (ADEQ). Toxic substances are defined as those materials regulated under the United States Environmental Protection Agency's (US EPA) Toxic Release Inventory Program. AMEC determined ADOT's status with regards to the regulatory planning thresholds by collecting information about purchases of toxic substances and the generation of hazardous waste. The quantity of hazardous waste generated by ADOT during the 2000 calendar year was below the planning threshold. However, AMEC determined that ADOT used two toxic substances (methanol and ethylene glycol) in excess of the planning threshold during the 2000 fiscal year. Therefore, ADOT is required to submit a Pollution Prevention Plan to ADEQ. AMEC has developed an appropriate Pollution Prevention Plan for ADOT's submittal. In addition to the two materials used in excess of the planning threshold, the Plan addresses toxic substances for which the agency exceeds one half of the reporting threshold and chemicals identified as persistent, bioaccumulative, and toxic (PBT) by the US EPA that are used in excess of their Toxic Release Inventory reporting thresholds.					
17. Key Words Pollution Prevention Toxic Substances Hazardous Materials Inventory		18. Distribution Statement Document is available to the U.S. public through the National Technical Information Service, Springfield, Virginia 22161		23. Registrant's Seal	
19. Security Classification Unclassified	20. Security Classification Unclassified	21. No. of Pages 137	22. Price		

SI* (MODERN METRIC) CONVERSION FACTORS

APPROXIMATE CONVERSIONS TO SI UNITS					APPROXIMATE CONVERSIONS FROM SI UNITS				
Symbol	When You Know	Multiply By	To Find	Symbol	Symbol	When You Know	Multiply By	To Find	Symbol
<u>LENGTH</u>					<u>LENGTH</u>				
in	inches	25.4	millimeters	mm	mm	millimeters	0.039	inches	in
ft	feet	0.305	meters	m	m	meters	3.28	feet	ft
yd	yards	0.914	meters	m	m	meters	1.09	yards	yd
mi	miles	1.61	kilometers	km	km	kilometers	0.621	miles	mi
<u>AREA</u>					<u>AREA</u>				
in ²	square inches	645.2	square millimeters	mm ²	mm ²	Square millimeters	0.0016	square inches	in ²
ft ²	square feet	0.093	square meters	m ²	m ²	Square meters	10.764	square feet	ft ²
yd ²	square yards	0.836	square meters	m ²	m ²	Square meters	1.195	square yards	yd ²
ac	acres	0.405	hectares	ha	ha	hectares	2.47	acres	ac
mi ²	square miles	2.59	square kilometers	km ²	km ²	Square kilometers	0.386	square miles	mi ²
<u>VOLUME</u>					<u>VOLUME</u>				
fl oz	fluid ounces	29.57	milliliters	mL	mL	milliliters	0.034	fluid ounces	fl oz
gal	gallons	3.785	liters	L	L	liters	0.264	gallons	gal
ft ³	cubic feet	0.028	cubic meters	m ³	m ³	Cubic meters	35.315	cubic feet	ft ³
yd ³	cubic yards	0.765	cubic meters	m ³	m ³	Cubic meters	1.308	cubic yards	yd ³
NOTE: Volumes greater than 1000L shall be shown in m ³ .									
<u>MASS</u>					<u>MASS</u>				
oz	ounces	28.35	grams	g	g	grams	0.035	ounces	oz
lb	pounds	0.454	kilograms	kg	kg	kilograms	2.205	pounds	lb
T	short tons (2000lb)	0.907	megagrams (or "metric ton")	mg (or "t")	Mg	megagrams (or "metric ton")	1.102	short tons (2000lb)	T
<u>TEMPERATURE (exact)</u>					<u>TEMPERATURE (exact)</u>				
°F	Fahrenheit temperature	5(F-32)/9 or (F-32)/1.8	Celsius temperature	°C	°C	Celsius temperature	1.8C + 32	Fahrenheit temperature	°F
<u>ILLUMINATION</u>					<u>ILLUMINATION</u>				
fc	foot candles	10.76	lux	lx	lx	lux	0.0929	foot-candles	fc
fl	foot-Lamberts	3.426	candela/m ²	cd/m ²	cd/m ²	candela/m ²	0.2919	foot-Lamberts	fl
<u>FORCE AND PRESSURE OR STRESS</u>					<u>FORCE AND PRESSURE OR STRESS</u>				
lbf	poundforce	4.45	newtons	N	N	newtons	0.225	poundforce	lbf
lbf/in ²	poundforce per square inch	6.89	kilopascals	kPa	kPa	kilopascals	0.145	poundforce per square inch	lbf/in ²

SI is the symbol for the International System of Units. Appropriate rounding should be made to comply with Section 4 of ASTM E380

TABLE OF CONTENTS

	Page
EXECUTIVE SUMMARY	1
1.0 INTRODUCTION.....	3
2.0 PROJECT DESCRIPTION	4
3.0 SUMMARY OF WORK COMPLETED	5
3.1. Prepare Work Plan.....	5
3.2. Review Prior ADOT P2 Filings and State Requirements.....	5
3.3. Meet with ADEQ P2 Unit	5
3.4. Toxic Use Data Collection	5
3.5. Toxic Use Data Analysis.....	7
3.6. Determine Hazardous Waste Generation	7
3.7. P2 Plan.....	7
3.8. Tracking Mechanisms	12
3.9. Training Documents	13
4.0 CONCLUSION	15
BIBLIOGRAPHY AND REFERENCES	16

LIST OF APPENDICES

APPENDIX A:	Commodity Codes Selected for Review	17
APPENDIX B:	Project Databases	21
APPENDIX C:	Purchase Records Removed from the Project Database Titled “Purchase Records Final”	67
APPENDIX D:	Toxic Chemical Usage Report	71
APPENDIX E:	Training Documents.....	77
APPENDIX E:	Additional Data for Pollution Prevention Opportunities.....	83

LIST OF TABLES

TABLE 1 -	Toxic Substances used by ADOT above the Regulatory Planning Threshold	7
TABLE 2 -	Toxic Substances Addressed in the ADOT P2 Plan	8

This page intentionally left blank

EXECUTIVE SUMMARY

AMEC Earth and Environmental (AMEC) has completed an effort to assist the Arizona Department of Transportation (ADOT) in complying with the requirements of Arizona Revised Statutes (A.R.S.) §49-961 through §49-973. These statutes require Arizona state agencies that generate certain quantities of hazardous waste or use certain amounts of toxic substances to develop a pollution prevention program and submit documentation regarding that program to the Arizona Department of Environmental Quality (ADEQ). Toxic substances are defined as those materials regulated under the United States Environmental Protection Agency's (US EPA) Toxic Release Inventory Program. AMEC determined ADOT's status with regards to the regulatory planning thresholds from information about purchases of toxic substances and the generation of hazardous waste.

The quantity of hazardous waste generated by ADOT during the 2000 calendar year was below the planning threshold. However, AMEC determined that ADOT used two toxic substances (methanol and ethylene glycol) in excess of the planning threshold during the 2000 fiscal year. Therefore, ADOT is required to submit a Pollution Prevention Plan to ADEQ. AMEC has developed an appropriate Pollution Prevention Plan for ADOT's submittal. In addition to the two materials used in excess of the planning threshold, the Plan addresses toxic substances for which the agency exceeds one half of the planning threshold and chemicals identified as persistent, bioaccumulative, and toxic (PBT) by the US EPA that are used in excess of their federally mandated Toxic Release Inventory reporting thresholds.

This page intentionally left blank

1.0 INTRODUCTION

This report provides details of the work completed by AMEC Earth & Environmental, Inc. (AMEC) under the Arizona Department of Transportation (ADOT) Purchase Order No. PGKS0843. The project title is “Development and Evaluation of Hazardous Materials Inventory and Action Plan” and has the AMEC Project No. 1-114-002042. This work was completed in accordance with the terms and conditions listed in Arizona Department of Administration Contract No. A7-0098-032.

The purpose of this project was a determination of ADOT’s filing requirements under Arizona Revised Statutes (A.R.S.) §49-961 through §49-973, and the development of a Pollution Prevention Plan (P2 Plan) and associated documentation (as required by said regulations).

2.0 PROJECT DESCRIPTION

According to A.R.S. §49-972, any state agency that generates more than 12,000 kilograms (kg) of hazardous waste or 1.0 kg of acutely hazardous waste in a calendar year, or that uses more than a threshold amount (10,000 pounds) of a single toxic substance (defined as those materials regulated under the United States Environmental Protection Agency's Toxic Release Inventory Program) in a calendar year, must file a P2 Plan with the Arizona Department of Environmental Quality (ADEQ). Therefore, ADOT needed to determine its filing status with regards to these statutes, and if required, develop a comprehensive agency wide P2 Plan.

3.0 SUMMARY OF WORK COMPLETED

3.1. Prepare Work Plan

AMEC developed a work plan to guide further work on this project. The work plan was submitted to the Technical Advisory Committee on March 30, 2001, and was subsequently approved for implementation. The work plan stated that the work would proceed in three steps. First, AMEC would gather information necessary to determine ADOT's filing status with regards to Arizona P2 statutes. AMEC would then conduct a pollution prevention opportunity analysis at a representative selection of ADOT operations. Finally, the findings of this assessment would be organized into a formal or informal P2 Plan depending on ADOT's filing status.

3.2. Review Prior ADOT P2 Filings and State Requirements

As part of the development of the work plan AMEC received a copy of the ADEQ P2 Unit's file on ADOT. AMEC reviewed this file which holds all previously submitted reports, P2 Plans, P2 Plan Amendments and correspondence. AMEC also reviewed applicable regulations and the "Pollution Prevention Amendment Guidance Manual"[1], published in July 1999 by ADEQ. This information was used to assist in the development of the work plan and in the completion of the project.

3.3. Meet with ADEQ P2 Unit

AMEC was in continual communication with the ADEQ P2 Unit regarding specifics of this project. This consistent and free communication with the regulatory agency was undertaken to ensure that the project methods and results were acceptable to ADEQ.

3.4. Toxic Use Data Collection

AMEC collected state-wide purchasing information from the ADOT Procurement Group and then screened this data for commodities which contained toxic substances as defined by Arizona Revised Statute §49-961.9. AMEC then totaled ADOT's toxic purchases by chemical and compared those totals to the toxic use planning thresholds.

AMEC procured a copy of the "State of Arizona Numeric Table of Commodities" [2], and identified the commodity codes that appeared to describe materials that contain toxic substances. The list of selected commodity codes was entered into a spreadsheet and sent to the ADOT Procurement Group. The spreadsheet listing the selected commodity codes is presented in Appendix A.

The ADOT Procurement Group ran a query on the ADOT purchasing system and provided AMEC with a spreadsheet containing details from all purchase orders (POs) and invoices that were processed for the selected commodities during Fiscal Year 2000. It

was not possible to collect data for a calendar year as specified in the regulations so this review was conducted on a fiscal year basis.

AMEC developed Microsoft Access databases to hold and process the data for this project. A database was used for two main reasons: it allows for easy handling of large quantities of data; and it allows for the relationships (or links) between data to be built in the database records and to be utilized by users for better data interpretation. AMEC created three databases for this project, one containing the purchase records received from ADOT titled “Purchase Records Final”, a second titled “Chemical With Paint Final” which contains information from the Material Safety Data Sheets (MSDSs) associated with the materials purchased, and a third titled “TRI Chemicals” which contains the names and Chemical Abstract Service (CAS) numbers of the chemicals defined as “toxic” by ADEQ and the U.S. Environmental Protection Agency (US EPA). The databases are presented in Appendix B.

AMEC pared down the “Purchase Records Final” database by removing records for the purchase of items that clearly do not contain toxic chemicals or whose use does not meet the definition of toxic chemical use (*i.e.*, tires, gloves). A large number of duplicate records were also removed. Approximately 70% of the records in the spreadsheet supplied by ADOT did not contain all of the information that was required for this study such as manufacturer’s name or quantity of material purchased given in pounds or in gallons.

For each record that did not contain all of the needed information, AMEC reviewed the invoice or PO for the purchase. In about half the cases the necessary information was provided on this paperwork. For the remaining records that were still incomplete, AMEC contacted the product suppliers directly. A small number of records still remain incomplete. Since the remaining incomplete records are small in number and often represent small quantity purchases they have been removed from the final project database. A list of the excluded records is presented in Appendix C.

AMEC collected material safety data sheets (MSDSs) for the materials listed in the project database. MSDSs were collected from the ADOT Safety Department, the internet and the manufacturers or suppliers of some of the materials. Some generic MSDSs have been used when specific brand names were not specified in the ADOT records or when brand specific MSDSs were unavailable.

AMEC recorded the following data from the MSDSs: CAS numbers of toxic constituents, weight or volume fraction of each toxic constituent, specific gravity of the material and NFPA hazard classification of the material (if available). This data was entered into the “Chemical With Paint Final” database which links the toxic chemical information collected with ADOT purchasing information (“Purchase Records Final”) and the list of toxic substances contained in the “TRI Chemicals” database. All of the project databases are presented in Appendix B.

3.5. Toxic Use Data Analysis

AMEC used the databases developed in the prior step in conjunction with the Microsoft Access report creating function to calculate the amount of each toxic substance used by ADOT during the 2000 fiscal year. Where purchased material quantities were in units other than weight, the weight of the material was calculated (in pounds) using the appropriate conversion factors and the densities of the materials. The weight of each material purchased was multiplied by the weight fraction of each toxic substance contained in the material to determine the weight of each toxic substance purchased. The assumption was made that the amount of toxic substance purchased equals the amount of toxic substance used during the same time period. The amount of each toxic substance used was compared to the thresholds adopted by ADEQ for P2 Planning (10,000 pounds of a single toxic substance used).

The calculations show that ADOT used two toxic chemicals in excess of the above thresholds. Details of these two materials are presented in Table 1. ADOT is required to file a P2 Plan for at least these two chemicals. A complete Microsoft Access report of toxic chemical use during the fiscal year is presented in Appendix D.

TABLE 1: Toxic Substances Used by ADOT above the Regulatory Planning Threshold

Toxic Substance	CAS Number	Major Source	Planning Threshold (lbs.)	Quantity Used by ADOT (lbs.)
Ethylene Glycol	107-21-1	Antifreeze	10,000	23,412.70
Methanol	67-56-1	Paint	10,000	18,080.40

3.6. Determine Hazardous Waste Generation

The aggregate quantity of hazardous waste shipped off-site for disposal by ADOT during the calendar year 2000 was determined by reviewing hazardous waste manifests submitted to ADEQ as recorded in the ADEQ Waste Shipment Database. According to the information received by ADEQ, ADOT generated and shipped offsite a total of 6,721.2 pounds of hazardous waste during the 2000 calendar year. Comparing this total quantity of waste generated to the statutory P2 planning threshold of 12,000 kg (26,400 lbs.) shows that ADOT is below the planning threshold for hazardous waste.

3.7. P2 Plan

The information gathered showed that due to the use of toxic substances ADOT is required to file a formal P2 Plan per A.R.S. §49-972 and the July 1999 "Pollution Prevention Plan Guidance Manual" published by ADEQ.

The ADEQ Guidance Manual states that a P2 Plan should at least address all toxic substances and wastes for which the facility exceeds planning thresholds. ADOT exceeds these thresholds for only two toxic substances. However, ADOT recognizes that

it has a responsibility to set a positive example. The agency will exceed these minimum standards by monitoring toxic substances for which the agency exceeds one half of the planning threshold and chemicals identified as persistent, bioaccumulative, and toxic (PBT) by the US EPA that are used in excess of their federally mandated Toxic Release Inventory reporting thresholds. Table 2 summarizes the materials addressed by the P2 plan.

TABLE 2: Toxic Substances Addressed in the ADOT P2 Plan

Toxic Substance	CAS Number	Major Source	Quantity Used by ADOT (lbs.)	Reason for inclusion
Ethylene Glycol	107-21-1	Antifreeze	23,412.70	1
Methanol	67-56-1	Paint	18,080.40	1
Dicamba	1918-00-9	Herbicide	6,560	2
Naphthalene	91-20-3	Herbicide	5,825	2
2, 4-dicchlorophenoxyacetic acid	94-75-7	Herbicide	6,238	2
Pendimethalin	40487-42-1	Herbicide	840	3

- 1 - Toxic substances for which ADOT exceeds the planning threshold.
- 2 - Toxic substances for which ADOT exceeds one half of the planning threshold.
- 3 - PBT chemicals used in excess of their Toxic Release Inventory reporting thresholds.

AMEC reviewed how these materials are used by ADOT and then researched potential pollution prevention opportunities for those activities. AMEC collected information regarding potential pollution prevention opportunities from previous site visits, through consultations with ADOT personnel, from interviews with chemical manufacturers/suppliers and industry associations, as well as from state and federal government websites. Each opportunity is discussed in detail in the next section.

AMEC has completed a Pollution Prevention Amendment Form per ADEQ guidance that discusses the locations that use the identified toxic substances, how those toxic substances are used, what opportunities exist for reduction of the usage of those toxic substances and goals that ADOT can set for the reduction of the usage of those toxic substances.

The P2 Amendment Form was initiated by the project consultant and completed by relevant agency staff, signed by a senior ADOT official, and submitted to ADEQ. Before the Amendment form was submitted to ADEQ, ADOT determined the feasibility of each opportunity that was identified and set goals based on those opportunities. For each opportunity that was not selected an explanation was provided in Section 6, Subpart 5 of the Amendment Form.

Pollution Prevention Opportunities

Ethylene glycol

ADOT currently uses ethylene glycol based coolant (antifreeze) in all state owned equipment, including automobile engines. Antifreeze is used in the engines to provide freeze protection and to act as a heat transfer medium to prevent engine overheating. Antifreeze also provides corrosion protection to certain engine components. Antifreeze generally consists of a chemical material dissolved in water. The presence of the chemical increases the boiling point and depresses the freezing point of the water thereby increasing the effective temperature range of the coolant. Ethylene glycol is the industry standard chemical additive that is used for the majority of coolant applications. Antifreeze will, over a period of time, become contaminated with oils, fuel and dissolved metals that are picked up from the engine. Because of this contamination, it is standard practice to replace used antifreeze in engines with uncontaminated antifreeze. Currently ADOT removes antifreeze from state vehicles and equipment on a regular time- and/or mileage-based schedule. The used antifreeze is collected and transported off-site for recycling by an outside contractor. AMEC recommended four opportunities for consideration by ADOT. These opportunities are described below. Additional information is supplied in Appendix E.

Opportunity A: Reduce ratio of ethylene glycol to water used

ADOT currently purchases antifreeze that consists of 50% ethylene glycol and 50% water (50/50). The ratio of ethylene glycol to water determines the recommended minimum and maximum temperature for the antifreeze. A ratio of 50/50 is a standard ratio that suppliers use. However, this ratio could be altered so that less ethylene glycol is used per vehicle filling. ADOT would need to determine how low this ratio can be set, considering the conditions and demands of equipment use.

Opportunity B: Recycle used coolant on site.

ADOT currently sends used antifreeze off-site for recycling, refilling the engines with virgin antifreeze. ADOT could recycle the antifreeze on site and put the recycled antifreeze back into the vehicles. Antifreeze recycling is a common practice in the private sector and public sector, particularly the Department of Defense. Three technologies are currently used for ethylene glycol recycling; ultrafiltration, distillation and deionization. Antifreeze can either be recycled directly from the vehicle and back into the same vehicle or it can be collected and recycled in bulk.

Opportunity C: Substitute propylene glycol based coolant for current material

Propylene glycol has similar thermal properties as ethylene glycol however propylene glycol is much less toxic. Propylene glycol can be substituted directly for ethylene glycol with no performance problems. Propylene glycol usually costs more to purchase but the disposal costs may be less than for ethylene glycol. Glycol substitution has been

commonly used across the country both for fleet and private vehicles as a way to minimize environmental impact and regulatory burden.

Opportunity D: Reduce frequency of antifreeze changes

Currently antifreeze is changed on a time or mileage-based schedule, however, antifreeze does not need to be changed unless it is contaminated. By regularly testing in-use antifreeze, ADOT could determine the extent of contamination and therefore make a more informed decision regarding when to replace it. Testing is usually conducted for one or more of the following parameters: pH, freezing point depression, total dissolved solids, density and viscosity. The exact parameters and tests along with the parameter tolerance would need to be determined by ADOT.

Methanol

Small amounts of methanol are in the latex paint used by ADOT for roadway signing and striping. The paint manufacturer adds methanol to the paint to provide freeze protection to the paint during storage. To reduce methanol usage, ADOT can either reduce the amount of methanol in the paint or reduce the amount of paint used. AMEC has recommended three potential opportunities for ADOT's consideration. Each of these is described below and additional information is supplied in Appendix E.

Opportunity A: Reformulate paint without methanol.

The manufacturer of the paint stated that the paint could be reformulated without the methanol. The methanol would be replaced with propylene glycol to provide freeze protection. Arkansas, New Hampshire and New Mexico currently purchase and use methanol free road paint from this supplier.

Opportunity B: Delineate lanes with plastic reflectors instead of paint.

Plastic reflectors are used on many roadway construction and resurfacing projects to delineate lanes. They increase visibility and provide a tactile warning to drivers if they cross over the lines. Usually both paint and reflectors are used but ADOT could eliminate the paint and rely solely on the reflectors.

Opportunity (C): Eliminate painting by inserting dry pigment into pavement when pavement is originally laid.

This opportunity was previously selected for development as a goal by ADOT for the P2 Amendment submitted in 2000 which applied to the ADOT District II Grant Road facility only. If this is still a viable goal it should be expanded agency wide. This is a research opportunity for ADOT to determine if it is feasible to place the striping directly into the road surface thereby eliminating the use of paints and reducing or eliminating the need to repaint the roads over time.

Herbicides

ADOT uses herbicides to control plant growth in the right-of-ways along state owned roads. Vegetation is controlled in these areas to increase visibility for drivers and to reduce the chances of vehicles striking animals. Herbicides are by their nature toxic chemicals, they not only affect the target weeds but also have various effects on non-target plant species, animals and humans. By reducing the usage of herbicides or by reducing the potential exposure of non-target resources to the herbicides, ADOT can decrease their impact on the environment and human health. Opportunities A - C were previously selected for development as goals by ADOT for the P2 amendment submitted in 2000 which applied to the ADOT District II Grant Road facility only. They should be expanded agency wide.

Opportunity A: Post notifications of spray application on roadways during use to reduce the risk of human exposure.

By posting notifications in the area in advance of herbicide applications and for a period of time afterwards, human exposure could be reduced. People who use the area that is sprayed and the surrounding area may be exposed to airborne herbicide particles or droplets during the application. These same people may be exposed to herbicides after the application if they come in contact with the foliage that the herbicide was applied to.

Opportunity B: In areas where high risk of human contact exists (i.e. where camping occurs within ¼ mile of the roadway), use physical means to remove unwanted plants (mowing, tilling, mulching, paving, planting short stature competitive ground cover).

ADOT can eliminate the usage of herbicides in areas of high risk by using physical plant management methods. Established plants can be physically removed by mowing the plants to a desired height or tilling the plants into the soil. These techniques will control existing plants but will require repeated applications to continue control. Tilling can be followed by covering the right-of-way area with some form of ground cover (mulch, gravel, pavement) to restrict the future growth of plants in the area. Tilling can also be followed up with seeding the right-of-way with native short stature plants that will out compete the taller plants. Short plants do not pose the risk to drivers that tall plants do since they do not obstruct the drivers' view.

Opportunity C: Ensure materials are not spilled when trucks are filled with water by installing an automatic shut off valve or requiring an attendant to monitor the operation.

When ADOT herbicide application vehicles are filled, herbicide is placed in the tank and then dilution water is added. Tanks can be overfilled resulting in a spill of herbicide solution. By installing float valves or some other automatic shutoff device to the water fill lines this problem can be eliminated. Another way to address this issue is to require someone to watch the filling process to ensure overfilling does not occur.

Opportunity D: Replace dicamba and 2,4-D with imazapyr (Trade names Arsenal or Chopper)

The herbicides dicamba and 2,4-D are highly toxic chemicals that can have serious impacts on animals and humans. Both herbicides are used to control a broad spectrum of broadleaf weeds and woody plants. The herbicide imazapyr (CAS# 81334-34-1) is used for pre- and post-emergent control of grasses, broadleaf weeds, and woody plants and poses much less risk to animal and human populations. Imazapyr is also not listed as a “toxic substance” under the Arizona statutes. Information sheets on these three herbicides are presented in Appendix E.

General grounds/storage

Opportunity A: Use secondary containment. Implement regular storage area inspections, and be sure that a spill containment kit is available to employees.

Toxic materials can be accidentally released into the environment during the loading and unloading of storage containers. Secondary containment should be provided for areas that could pose a substantial risk of releasing toxics into the environment in the case of an accident. For example, an underground "catch" can be built into a service bay where large such transfers take place. Following a spill, recovery is made considerably easier. Secondary containment not only keeps materials from entering the environment but may also allow for the recovery and reuse of the materials.

3.8. Tracking Mechanisms

Certain data must be tracked over a period of time to allow for the determination of ADOT reporting requirements with regards to the Pollution Prevention Statutes. The data required to determine if an agency has used more than the threshold amount of a toxic substance include; (1) a list of items purchased, (2) the quantity and corresponding units of the items purchased, (3) details regarding the composition of those items, (4) a list of statutorily defined toxic substances, and (5) the individual allowed thresholds. To allow for easy threshold calculations a data collection and management system must be in place. An ideal system would first evaluate if a purchased item contained a toxic substance and if so would then record the information necessary to determine the amount of toxic substance purchased (number of items, size of items, content of toxic substances in each item). At the end of a specified timeframe (one year) the system would sum the purchases of each toxic substance to give a total purchase quantity for each toxic substance.

ADOT currently records some information regarding all purchases made by the agency. Paper copies of purchase requests and invoices are submitted to a central processing location. Data from these sources are recorded in a computer database and the original hard copies are filed. This system is effective in tracking financial information, but does not easily support the collection of the information required to determine the amounts of toxic substances used by ADOT. The system does not necessarily have enough information to calculate total quantity purchased, nor does it record information regarding the composition or toxicity of the materials. The system currently does not provide for

unique identifiers for either materials or vendors; it allows multiple names for one vendor (i.e., prior names, full and shortened names) and allows multiple formats for the name of one material. In some instances this has led to a single purchase being given multiple records each with a different material or vendor name. Additionally a review of paper invoices revealed many cases where only the first of multiple items on an invoice was recorded in the database.

Several things could be done to allow for easier extraction of the toxic use data from ADOT's system. The first changes relate to the collection and entry of purchase data. These would require training data entry personnel to collect and enter the data properly and making modifications to the structure of the database:

- Require purchased quantities to be entered in a standard unit (i.e., pounds).
- Require the total quantity of material to be entered rather than the number of units.
- Restrict the unit of measure database field with the use of a pull down menu.
- Restrict the description field with a look-up table so that multiple descriptions are not used for a single material.
- Change the database linkages so that only one name is used for a vendor and only one record is generated for each purchase.
- Require that all items on an invoice or purchase order be entered into the system

The second set of system reforms relate to collecting and recording information regarding the composition of the materials purchased. There are several options for collecting and tracking this data. All of the options require that MSDSs be collected for each material purchased. These MSDSs should be collected and filed in a central location. The following options are available:

- Collect and enter information from MSDSs for each purchase. This requires an MSDS to be submitted with all invoices or purchase orders and for the data entry personnel to be able to locate the required data on the MSDS.
- Enter and link purchase names to MSDS data each time a new unique material is purchased. This would require a one time set up and then the required data would be automatically linked to the material. This would only require one person to be trained in MSDSs but would restrict data entry to a previously set up list.
- Purchase data can be collated with MSDS data off-line whenever a threshold determination is required.

3.9. Training Documents

AMEC has developed two training documents for use by ADOT as part of the statutory pollution prevention - training program. The first is a graphic poster that is designed to remind employees that they are responsible for preventing pollution and waste and to encourage them to evaluate their current work habits. The second is an article that could be printed in the ADOT newsletter or disseminated in some other way on a regular basis. The article discusses the topics required by ADEQ: Definition of P2, the waste

management hierarchy, benefits of P2, and ADOT's P2 Plan. Both documents are included in Appendix F.

4.0 CONCLUSION

AMEC has completed the work under the Arizona Department of Transportation (ADOT) Purchase Order No. PGKS0843 for the project titled “Development and Evaluation of Hazardous Materials Inventory and Action Plan.”

AMEC has determined that ADOT is required to file a Pollution Prevention Plan and associated documentation under Arizona Revised Statutes (A.R.S.) §49-961 through §49-973, because ADOT is a state agency that did use more than 10,000 lbs. of a single toxic substance in a calendar year. AMEC has reviewed ADOT practices with regards to the use of the toxic substances that exceed one half of this 10,000 lbs. threshold and substances that are classified as PBT chemicals. AMEC has generated P2 opportunities for these materials and summarized them in a Pollution Prevention Plan Amendment. AMEC has also developed P2 training documents for ADOT’s use and recommended tracking mechanisms that ADOT could use to simplify the P2 filing requirement determination process.

BIBLIOGRAPHY AND REFERENCES

1. *Pollution Prevention Amendment Guidance Manual*. Arizona Department of Environmental Quality (ADEQ), 1999. [cited 15 February 2003]; Also available from the World Wide Web at:
<http://www.adeq.state.az.us/environ/waste/hazwaste/p2/plan.html>
2. *State of Arizona Numeric Table of Commodities*. Arizona Department of Administration, State Procurement Office, 25 May 1999 [cited 15 February 2003]; Available from World Wide Web at:
<http://sporas.ad.state.az.us/download/docs/commodity.pdf>

APPENDIX A

Commodity Codes Selected for Review

Due to size, a .pdf version of this file is not loaded on the Internet

Link here to a WinZip file of [Appendix A](#)

APPENDIX B

Project Databases

Due to size, a .pdf copy of this appendix is not loaded on the Internet.

Link here to a WinZip file of [Appendix B](#).

APPENDIX C

Purchase Records Removed from the Project Database Titled “Purchase Records Final”

This page intentionally left blank

PURCHASE RECORDS REMOVED FROM PROJECT DATABASE

CLASS	SUB CLASS	DESCRIPTION	QUANTITY	UNIT	VENDOR	INVOICE	DATE
075	66	OUT LAST BLK DA 6801	24	EA	DRUMMOND AMERICAN CORP	VI55145561	20010215
075	66	FLOOR CLEANER FOR SHOP AS PER TERRY SLUDER 7210	176.250	EA	NATIONAL CHEMICAL	RC5MC69403459	20010705
075	66	INVOICE NUMBER 02676883001	261.500	EA	CURTIS INDUSTRIES	VI50276883001	20000323
075	66	INVOICE # 0071903002.	740.210	EA	CURTIS INDUSTRIES	VI50071903002	19991123
075	66	FOR INVOICE # 0452485001, WAS SENT TO WRONG ADDRESS AND JUST	946.150	EA	CURTIS INDUSTRIES	VI50452485001	20000629
075	66	CML WASHER SOLVENT FOX WWS32	36	GL	FACTORY MOTOR PARTS COMPANY	VI520-023627	20010524
175	13	SPEEDY REAGENT (E-8801)	2	CS	L R KEROFKY INC	VI5925	20000925
175	13	CHEMICALS, LABORATORY (ACS, CP, PRACTICAL, REAGENT GRADE, ET	6.000	EA	NU-TECH DIVERSIFIED	VI59774	20010314
190	90	SOLVENTS (NOT OTHERWISE ITEMIZED)	1.000	GL	BORDER PRODUCTS CORPORATION	RC5OV000001024	20001120
190	90	SAXARR795-01 WINDSHIELD WASHER SOLVENT	16	GL	FASTENERS PLUS INC DBA VANCO	VI53998	20001208
190	90	SAXARR795-01 WINDSHIELD WASHER SOLVENT	12	GL	FASTENERS PLUS INC DBA VANCO	VI54016	20001212
190	90	ARR795-01 WINDSHIELD WASHER SOLVENT	20	GL	FASTENERS PLUS INC DBA VANCO	VI52977	20000718
190	90	ARR795-01 WINDSHIELD WASHER SOLVENT	12	GL	FASTENERS PLUS INC DBA VANCO	VI53727	20001030
315	20	ADHESIVE, GENERAL PURPOSE (795A OR 130244)	100.000	EA	BUNZL EXTRUSION TACOMA INC	VI50000035515	20010613

CLASS	SUB CLASS	DESCRIPTION	QUANTITY	UNIT	VENDOR	INVOICE	DATE
630	48	17456/SPRY MARKING GREEN 12 OZ	1	LB	WOODLAND BUILDING CENTER INC	VI5A400011150	20000830
630	48	17459/SPRY MARKING WHITE	1	LB	WOODLAND BUILDING CENTER INC	VI5A600012541	20000829
630	48	CANS OF PAINT	2.000	GL	TRUE VALUE HARDWARE	VI5093644	20010406
630	48	SEAL SPRAY COATING	20.280	AB	AIRCOOL PAD	VI547050	20010423
630	57	PAINTS (NOT ITEMIZED HEREIN) (ACOUSTIC CEILING PAINT)	36.000	GL	SUNLIFE INC	RC5DD000003174	20010117
885	46	U17950 ALLSTAR ODOR GUARD (40J1147)	16	GL	UNISOURCE CORP/TUCSON DIVISION	VI543608485	20010406
885	46	U17950 ALLSTAR ODOR GUARD (40J1147)	20	GL	UNISOURCE CORP/TUCSON DIVISION	RC5OV000001176	20010514
885	46	U17950 ALLSTAR ODOR GUARD (40J1147)	4	GL	UNISOURCE CORP/TUCSON DIVISION	VI543693595	20010430

APPENDIX D

Toxic Chemical Usage Report

Due to size, a .pdf copy of this appendix is not loaded on the Internet.

Link here to a WinZip file of [Appendix D](#).

APPENDIX E Training Documents

Due to size, a .pdf copy of this appendix is not loaded on the Internet.

Link here to a WinZip file of [Appendix E](#).

APPENDIX F

Additional Data for Pollution Prevention Opportunities

Due to size, a .pdf copy of this appendix is not loaded on the Internet.

Link here to a WinZip file of [Appendix F](#).