

# Health Consultation

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WESTWIND INTERMEDIATE SCHOOL

PHOENIX, MARICOPA COUNTY, ARIZONA

**Prepared by the  
Arizona Department of Health Services**

JUNE 30, 2010

Prepared under a Cooperative Agreement with the  
U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES  
Agency for Toxic Substances and Disease Registry  
Division of Health Assessment and Consultation  
Atlanta, Georgia 30333

## **Health Consultation: A Note of Explanation**

A health consultation is a verbal or written response from ATSDR or ATSDR's Cooperative Agreement Partners to a specific request for information about health risks related to a specific site, a chemical release, or the presence of hazardous material. In order to prevent or mitigate exposures, a consultation may lead to specific actions, such as restricting use of or replacing water supplies; intensifying environmental sampling; restricting site access; or removing the contaminated material.

In addition, consultations may recommend additional public health actions, such as conducting health surveillance activities to evaluate exposure or trends in adverse health outcomes; conducting biological indicators of exposure studies to assess exposure; and providing health education for health care providers and community members. This concludes the health consultation process for this site, unless additional information is obtained by ATSDR or ATSDR's Cooperative Agreement Partner which, in the Agency's opinion, indicates a need to revise or append the conclusions previously issued.

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HEALTH CONSULTATION

WESTWIND INTERMEDIATE SCHOOL

PHOENIX, MARICOPA COUNTY, ARIZONA

Prepared By:

Arizona Department of Health Services  
Office of Environmental Health  
Environmental Health Consultation Services  
Under a Cooperative Agreement with the  
Agency for Toxic Substances and Disease Registry

## Summary

In the Westwind Intermediate School, the Arizona Department of Health Services' (ADHS') top priority is to ensure that the school students and staff have the best information possible to safeguard their health.

The Pendergast School District asked the ADHS to conduct this health consultation. The purpose of this health consultation is to evaluate the public health risk for school students and staff who may have come into contact with contaminants found in the soil.

The structures of the Westwind Intermediate School were originally built in 1974. The school district plans to tear down the intermediate school to make way for a new campus for Grade 5-8, capable of housing about 950 students. As a part of the permitting process, soil samples were collected from the school and the testing results indicated signs of historical use of pesticides, which pre-dated the District's ownership of the property. After investigation, it is found that the school buildings sit on an old crop-dusting airport used until the late 1960s. Until recently, state law did not require district to test the soil before building a school. Current site characterization and remediation activities for the entire site are being overseen by the Arizona Department of Environmental Quality (ADEQ) Voluntary Remediation Program.

All the data analyzed in this health consultation were collected by the Dominion Environmental from March to April 2009. In an attempt to characterize the nature and degree of the contamination that would impact the health of students and staff, ADHS reviewed all the data available from the Dominion Environmental.

ADHS reached the following conclusion about the Westwind Intermediate School in Phoenix, Arizona:

- The detected concentrations of most chemicals (except dieldrin and toxaphene) were below their respective health screening values for both cancer and noncancer adverse health effects. These chemicals are not expected to harm people's health. That includes students and staff at the Westwind Intermediate School.
- For dieldrin and toxaphene, the estimated theoretical cumulative excess lifetime cancer risks are well below the range of public health guidelines ( $10^{-6}$ ~ $10^{-4}$ ) for protection of human health as suggested by EPA. Therefore, they are not expected to harm people's health. That includes students and staff at the Westwind Intermediate School.

To ensure the health and safety of students and staff, ADHS recommend the Pendergast School District develops a safety and pollution control plan during the reconstruction process.

## **Purpose**

This report represents an assessment of human health risks from exposure to contaminated soil at Westwind Intermediate School, Phoenix, AZ. The school structures were built about 35 years ago. During the expansion and renovation process, preliminary soil sampling results showed that concentrations of organochlorine pesticides are above the Arizona Soil Remediation Level (SRL) for schools. Therefore, the Pendergast School District contacted the Arizona Department of Health Services (ADHS), and requested assistance in addressing concerns about contaminated soil at the Westwind Intermediate School. ADHS performed a health consultation to evaluate whether exposure to contaminants in soil could harm students' health.

## **Background and Statement of Issues**

The Westwind Intermediate School is located at 3802 N 91<sup>st</sup> Avenue, Phoenix, AZ. The school structures were originally built in 1974 by the Tolleson Union High School District. In 1980, the Pendergast School District purchased the buildings. Both Westwind Primary and Westwind Intermediate Schools were included in the acquisition. The school district plans to tear down the intermediate school to make way for a new campus for Grade 5-8, capable of housing about 950 students.

As a part of the permitting process, soil samples were collected from the Westwind Primary and Westwind Intermediate schools. The testing results indicated signs of historical use of pesticides, which pre-dated the District's ownership of the property. After investigation, it is found that the school buildings sit on an old crop-dusting airport used until the late 1960s. Until recently, state law did not require district to test the soil before building a school. Current site characterization and remediation activities for the entire site are being overseen by the Arizona Department of Environmental Quality (ADEQ) Voluntary Remediation Program.

For all those years, thousands of students, parents and teachers played baseball in the fields or dug in the sand around the slides. The school district and parents have concerns regarding the exposure and potential health risks. This health consultation will focus on the impact of organochlorine pesticides on the health of Westwind Intermediate School students and staff.

## **Discussion**

### *General Assessment Methodology*

ADHS generally follows a two-step methodology to comment on public health issues related to environmental exposures. First, ADHS obtains representative environmental data for the site of concern and compile a comprehensive list of site-related contaminants. Second, ADHS used health-based comparison values to identify those contaminants that do not have a realistic possibility of causing adverse health effects. For the remaining contaminants, ADHS reviews recent scientific studies to determine if the extent of environmental contamination indicates a public health hazard.

### *Available Environmental Data for the site*

Grab soil samples were collected at the surface, 6-inch below ground surface (bgs), 12-inch bgs, 18-inch bgs, 24-inch bgs, 36-inch bgs, and 48-inch bgs by Dominion Environmental and analyzed by Environmental Science Corporation between March and April in 2009. These samples were tested for organochlorine pesticides by using EPA Method 8081A. ADHS also reviewed information on Quality Assurance (QA)/Quality Control (QC) specifications for field data quality and laboratory data quality to verify the acceptability and adequacy of data. For example, ADHS reviewed available chain of custody sheets and laboratory certifications. The laboratory analysis methods and the QA/AC procedures were appropriate.

This health consultation evaluates the scenario in which students are most likely come into contact with chemicals. Therefore, focus will be placed on surface soil samples. See Appendix A for the sampling locations.

Note: Air samples were taken at the primary school because the student/staff still have access to the property when the school is prepared for demolition. No air samples were collected at the intermediate school because the campus has been fenced for the reconstruction, indicating that we do not expect air exposures.

### *Exposure Pathway Analysis*

Identifying exposure pathways is important in a health consultation, because presence of a contaminant in the environment does not necessarily mean that people are actually coming into contact with that contaminant, thereby allowing the contaminant to be a threat to public health. Exposure pathways have been divided into three categories: completed, potential, and eliminated. There are five elements considered in the evaluation of exposure pathways: (1) a source of contamination, (2) a media such as soil or ground water through which the contaminant is transported, (3) a point of exposure where people can contact the contaminant, (4) a route of exposure by which the contaminant enters or contacts the body, and (5) a receptor population.

Completed pathways exist when all five elements are present and indicate that exposure to a contaminant has occurred in the past and/or is occurring presently. In a potential exposure pathway, one or more elements of the pathway cannot be identified, but it is possible that the element might be present or might have been present. In eliminated pathways, at least one of the five elements is or was missing, and will never be present. Completed and potential pathways, however, may be eliminated when they are unlikely to be significant. Identifying an exposure pathway does not admit the presence or concentration of potential contaminants; it is simply a way of determining the possibility of exposure as if the contaminants were present in the medium.

The most likely exposures among students are occasional ingestion or infrequent dermal contact with contaminated surface soil. This exposure occurs when students have direct contact with soil in their environment. For instance, when students play outside contaminated soil or dust, particles cling to their hands. Students can then accidentally swallow the contaminants when they put their hands on or into their mouths, as children often do. Factors that affect whether or

not students have contact with contaminated soil include the amount of grass cover, weather conditions, the amount of time spent outside, and personal habits. While dermal and inhalation exposure can sometimes be a concern for soil and dust, the primary pathway of concern is ingestion. Table 1 summarizes the pathways for this site. If one or more of the exposure pathways are potential or complete, ADHS then considers whether exposure to the chemicals present may be harmful to people.

Table 1. Exposure pathway evaluation

Exposure Pathway Elements					Time Frame	Type of Exposure Pathway
Source	Media	Point of Exposure	Route of Exposure	Estimated Exposed Population		
Spills	Soil	On-site	Incidental ingestion, inhalation, skin contact	Students, Staff	Past	Completed
					Current	Completed
					Future	Potential

*Selection of Chemicals of Interest: Comparison to health-based comparison values*

The health-based comparison values are screening tools used with environmental data relevant to the exposure pathways. The health-based comparison values are concentrations of contaminants that the current public health literature suggest are “safe” or “harmless.” These comparison values are quite conservative, because they include ample safety factors that account for most sensitive populations. ADHS typically uses comparison values as follows: if a contaminant is never found at levels greater than its CV, ADHS concludes the levels of corresponding contamination are “safe” or “harmless.” If, however, a contaminant is found at levels at greater than its comparison value, ADHS designates the pollutant as a *contaminant of interest* and examines potential human exposures in greater detail. Comparison values are based on extremely conservative assumptions. Depending on site-specific environmental exposure factors (e.g. duration and amount of exposure) and individual human factors (e.g. personal habits, occupation, and/or overall health), exposure to levels greater than the comparison value may or may not lead to a health effect. Therefore, the comparison values should not be used to predict the occurrence of adverse health effects.

Many of the chemicals were detected at levels below their method reporting limits. The method reporting limit is the lowest amount of an analyte in a sample that can be quantitatively determined with acceptable precision and accuracy. Therefore, when laboratories report that a chemical was below its reporting limit in a sample that does not mean that the chemical was not present. Rather, it means that chemical was not present at levels that can be reliably measured by the analytical method, and the actual concentration is somewhere between 0 and the reporting limit. ADHS took a common approach by using one-half of the detection limits to represent the exposure concentration.

In addition, ADHS used averaged concentrations to evaluate the potential health effects because they are most representative of the concentration that would be contacted at a site, over time. For example, if we assume that an exposed individual moves randomly across an exposure area, the spatially averaged soil concentration can be used to estimate the true average concentration contacted over time. In this example, the average concentration contacted over time would equal the spatially averaged concentration over the exposure area. While an individual may not actually exhibit a truly random pattern of movement across an exposure area, the assumption of equal time spent in different parts of the area is a reasonable approach.

ADHS does not expect to see harmful health effects from exposure to a chemical with an average concentration below its health-based CV. As shown in Table 2, dieldrin and toxaphene are identified as chemical of interests because the averaged concentrations exceeded their respective CVs. These chemicals were kept for further evaluation.

Table 2. Summary of tested pesticide soil concentrations and their respective comparison values (CVs) in milligrams per kilogram (mg/kg)

Chemical	Number of Samples	Range of detected concentration (mg/kg)	Averaged concentration (mg/kg)	Health-based CVs <sup>a</sup> (mg/kg)	Type of CV	Is it a chemical of interest?
Aldrin	26	< 0.002 — < 0.04	0.006	0.032	RSRL <sup>b</sup>	No
$\alpha$ -BHC <sup>c</sup>	26	< 0.005 — < 0.1	0.016	0.1	RSRL	No
$\beta$ -BHC	26	< 0.005 — 0.083	0.019	0.36	RSRL	No
$\delta$ -BHC	26	< 0.01 — < 0.2	0.032	0.1 <sup>d</sup>	RSRL	No
$\gamma$ -BHC	26	< 0.005 — < 0.1	0.016	0.5	RSRL	No
Chlordane	26	< 0.03 — < 0.6	0.095	1.9	RSRL	No
DDD <sup>e</sup>	26	< 0.01 — 0.105	0.034	2.8	RSRL	No
DDE <sup>f</sup>	26	0.039 — 4.8	0.665	2.0	RSRL	No
DDT <sup>g</sup>	26	< 0.01 — 0.43	0.066	2.0	RSRL	No
Dieldrin	26	< 0.002 — 0.27	0.051	0.034	RSRL	<b>Yes</b>
Endosulfan I	26	< 0.01 — < 0.2	0.032	370	RSRL	No
Endosulfan II	26	< 0.005 — < 0.1	0.016	370	RSRL	No
Endrin	26	< 0.01 — < 0.2	0.032	18	RSRL	No
Heptachlor epoxide	26	< 0.005 — < 0.1	0.016	0.12	RSRL	No
Methoxychlor	26	< 0.15 — < 3	0.476	310	RSRL	No
Toxaphene	26	< 0.04 — 14	1.869	0.5	RSRL	<b>Yes</b>

<sup>a</sup> Note that the health-based CVs refer to an average concentration. Average soil concentrations are used for screening and dose assessment because exposure to soil occurs over a large area and duration of time.

<sup>b</sup> RSRL: Arizona Residential Soil Remediation Level

<sup>c</sup> BHC: Benzene hexachloride

<sup>d</sup>  $\alpha$ -BHC is used as a surrogate

<sup>e</sup> DDD: dichlorodiphenyldichloroethane

<sup>f</sup> DDE: dichlorodiphenyldichloroethylene

<sup>g</sup> DDT: dichlorodiphenyltrichloroethane

## *Public Health Implication*

### *Dieldrin*

Dieldrin is an organochlorine insecticide. From the 1950s until 1970, dieldrin was widely used as a pesticide for crops such as corn and cotton. Dieldrin was also used to control locusts and mosquitoes and as a wood preservative. Because of concerns about damage to the environment and potentially to human, US Environmental Protection Agency (EPA) banned all uses of dieldrin in 1974, except to control termites. In 1987, EPA banned all uses. EPA considers dieldrin to be a persistent, bioaccumulative, toxic pollutant. Sunlight and bacteria biodegrade the related pesticide, aldrin, to dieldrin. Both pesticides bind tightly to soil and evaporate slowly. In both soil and water, dieldrin breaks down very slowly. (ATSDR 2002)

The analytical results showed that the averaged dieldrin soil concentration is below the ATSDR's chronic Environmental Media Evaluation Guide (EMEG) for dieldrin (40 mg/kg). The EMEGs represent the concentrations of chemicals in air, soil or water to which people may be exposed during a lifetime without experiencing harmful noncancer health effects.

Dieldrin is a carcinogenic in animals, but this effect appears to be specific to the mouse liver. The International Agency for Research on Cancer (IARC) has categorized dieldrin as Group 3 (unclassifiable as to human carcinogenic potential) chemicals. Based on the finding of liver tumors in mice, US EPA classified dieldrin as B2, probable human carcinogens; however, current mechanistic data suggest that the mouse carcinogenicity data may not be highly relevant to humans (ATSDR 2002).

ADHS used mathematical model to estimate a theoretical opportunity of a person developing cancer from soil ingestion. Appendix B shows the formula and assumptions used to calculate the theoretical cancer risks due to soil ingestion. ADHS' calculations showed that the theoretical soil ingestion cancer risk is  $6.7 \times 10^{-9}$  for students, and  $2.7 \times 10^{-8}$  for staff (see Table 3). These cancer risks are considered to be very low based on the qualitative ranking of cancer risk estimates (see Appendix C)

### *Toxaphene*

Toxaphene was a widely used pesticide on cotton, other crops, and in livestock and poultry. In 1982, most of its uses were stopped, and in 1990, all uses were stopped in the US. At very high levels, long-term inhalation exposure to toxaphene in humans results in reversible respiratory toxicity. Studies in animals show that long-term exposure (1-2 years) to toxaphene can damage the liver, kidneys, adrenal glands, and immune system, and may cause minor changes in fetal development (ATSDR 1996). The average soil toxaphene concentration was below the ATSDR's EMEG of 700 mg/kg, therefore, noncancerous health effects are not likely to occur among the exposed population.

With regards to cancerous health effects, a study by the National Toxicology Program reported an increase in liver tumors in mice and an increase in thyroid tumors in rats when fed toxaphene in the diet. Several human studies were unable to conclude the incidence of cancer associated with inhalation exposure to a number of pesticides, including toxaphene, due to lack of information on exposure levels and concurrent exposure to other pesticides. ADHS' calculations showed that the theoretical soil ingestion cancer risk is  $1.7 \times 10^{-8}$  for students, and  $6.9 \times 10^{-8}$  for staff. These cancer risks are considered to be very low (see Appendix C).

### *Cumulative Risk*

To addressing the potential for cumulative effects from multiple chemicals, ADHS assumed the adverse health effects are additive and calculated the theoretical cumulative risk by summing the theoretical cancer risk for each contaminant. For students, the estimated theoretical cumulative excess lifetime cancer risk is  $2.4 \times 10^{-8}$ . For staff, the estimated theoretical cumulative excess lifetime cancer risk is  $9.6 \times 10^{-8}$  (See Table 3). Both of the estimated theoretical cumulative excess lifetime cancer risks are considered to be very low (see Appendix C). In addition, they are well below the range of public health guidelines ( $10^{-6} \sim 10^{-4}$ ) for protection of human health as suggested by EPA. Therefore, ADHS determined it is unlikely that staff at the school would experience harmful effects from dieldrin and toxaphene in the soil. For students, the estimate childhood exposures are not expected to contribute to cancer effects at anytime later in life.

Table 3. Theoretical cancer risks due to incidental soil ingestion.

Chemical	Students	Staff
Dieldrin	$6.8 \times 10^{-9}$	$2.8 \times 10^{-8}$
Toxaphene	$1.7 \times 10^{-8}$	$6.9 \times 10^{-8}$
Total Cancer Risk	$2.4 \times 10^{-8}$	$9.6 \times 10^{-8}$

### **ATSDR Child Health Concern**

ADHS considers children in its evaluations of all exposures, and we use health guidelines that are protective of children. In general, ADHS assumes that children are more susceptible to chemical exposures than are adults. Children six years old or younger may be more sensitive to the effects of pollutants than adults. Children generally have lower body weights, breathe more air by body weight and air that is closer to the ground, and are more often in contact with the ground than adults. If toxic exposure levels are high enough during critical growth stages, the developing body systems of children can sustain permanent damage. The CVs used in this health consultation were developed to be protective of susceptible populations such as children.

### **Conclusions**

ADHS reached the following conclusion about the Westwind Intermediate School in Phoenix, Arizona:

- The detected levels of pesticides in the soil are not expected to harm the health of students and staff. The detected concentrations of most chemicals (except dieldrin and toxaphene) were below their respective health screening values for both cancer and noncancer adverse health effects.
- For dieldrin and toxaphene, the estimated theoretical cumulative excess lifetime cancer risks are well below the range of public health guidelines ( $10^{-6}$ ~ $10^{-4}$ ) for protection of human health as suggested by EPA. Therefore, they are not expected to harm people's health. That includes students and staff at the Westwind Intermediate School.

## **Recommendations**

- Develop a safety and pollution control plan to ensure the health and safety of the students and staff during the reconstruction process.

## **Public Health Action Plan**

- ADHS will continue to review and evaluate data provided for the site.
- ADHS will attend public meeting, make presentation, and develop handout literature as requested by the school.

## **References**

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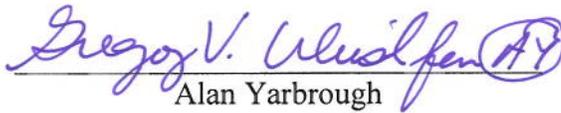
## Certification

This Health Consultation entitled *Westwind Intermediate School, Maricopa County, Arizona* was prepared by the Arizona Department of Health Services under a cooperative agreement with the Agency for Toxic Substances and Disease Registry (ATSDR). It is in accordance with approved methodology and procedures existing at the time the health consultation was initiated. Editorial review was completed by the cooperative agreement partner.



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The Division of Health Assessment and Consultation, Agency for Toxic Substance and Disease Registry, has reviewed this health consultation and concurs with its findings.



Alan Yarbrough  
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# Appendix A



Figure 1. Westwind Intermediate School Surface Soil sampling location map.

## Appendix B

Formula and assumptions used to calculate cancer risk from accidental soil ingestion:

$$\text{Chronic Daily Intake (mg/kg/day)} = \frac{\text{CS} \times \text{CF} \times \text{IR} \times \text{EF} \times \text{ED}}{\text{BW} \times \text{AT}}; \text{ Cancer Risk} = \text{Chronic Daily Intake} \times \text{SF}$$

Variable			Dieldrin		Toxaphene	
			Student	Staff	Student	Staff
CS	Chemical concentration in soil	mg/kg	0.051	0.051	1.869	1.869
CF	Conversion factor	kg/mg	1/10 <sup>6</sup>	1/10 <sup>6</sup>	1/10 <sup>6</sup>	1/10 <sup>6</sup>
IR	Ingestion rate	mg/day	100 <sup>a</sup>	50	100	50
EF	Exposure frequency	days/year	40 <sup>b</sup>	40	40	40
ED	Exposure duration	years	3 <sup>c</sup>	30	3	30
BW	Body weight	kg	56.8 <sup>d</sup>	70	56.8	70
AT	Averaging time	days	25,550	25,550	25,550	25,550
SF	Slope Factor	(mg/kg/day) <sup>-1</sup>	16	16	1.1	1.1

<sup>a</sup>. Adapted from “Child-Specific Exposure Factors Handbook. EPA (2008)”

<sup>b</sup>. 40 days = 238 days/year (days attending school per year) × 4 hours/day (the amount of time spend outdoor while at school)

<sup>c</sup>. From age 11 to 14

<sup>d</sup>. Adapted from “Child-Specific Exposure Factors Handbook. EPA (2008)”

## Appendix C

### *Qualitative Descriptors for Excess Lifetime Cancer Risk*

Cancer Risk	Qualitative Descriptor
Equal to or less than one per million (Cancer Risk $\leq 10^{-6}$ )	Very Low
Greater than one per million to less than one per ten thousand ( $10^{-6} < \text{Cancer Risk} \leq 10^{-5}$ )	Low
Greater than one per ten thousand to less than one per thousand ( $10^{-5} < \text{Cancer Risk} \leq 10^{-4}$ )	Moderate
Greater than one per thousand to less than one per ten ( $10^{-4} < \text{Cancer Risk} < 10^{-1}$ )	High
Equal to or greater than one per ten (Cancer Risk $\geq 10^{-1}$ )	Very High

An estimated increased excess lifetime cancer risk is not a specific estimate of expected cancers. Rather, it is a plausible upper-bound estimate of the probability that a person may develop cancer sometime in his or her lifetime following exposure to that contaminant.

There is insufficient knowledge of cancer mechanisms to decide if there exists a level of exposure to a cancer-causing agent below which there is no risk of getting cancer, namely, a threshold level. Therefore, every exposure, no matter how low, to a cancer-causing compound is assumed to be associated with some increased risk. As the dose of a carcinogen decreases, the chance of developing cancer decreases, but each exposure is accompanied by some increased risk.

There is general consensus among the scientific and regulatory communities on what level of estimated excess cancer risk is acceptable. The EPA considers an acceptable cancer risk range from  $10^{-6}$  to  $10^{-4}$ .