Health Consultation

CARR CHINA SITE
CARR CHINA DRIVE AND POTTERY LANE
GRAFTON, TAYLOR COUNTY, WEST VIRGINIA

EPA FACILITY ID: WVN000306608

Prepared by the
West Virginia Department of Health and Human Resources

AUGUST 31, 2009

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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Foreword

The West Virginia Department of Health and Human Resources (WVDHHR) and the Agency for Toxic Substances and Disease Registry (ATSDR) prepared this public health consultation to evaluate potential adverse human health hazards related to exposure associated with the Carr China Site. This document summarizes the available environmental soil and sediment data, and reports the results of the evaluation of past, present and future exposure to environmental contaminants associated with the Site.

The steps taken in completing a public health consultation are as follows:

Evaluating exposure: WVDHHR starts by reviewing available information regarding environmental conditions at the site to determine the presence and location(s) of contamination, and assessing the likelihood of human exposure. Typically WVDHHR does not collect environmental samples, but rather relies on information provided by the West Virginia Department of Environmental Protection (WVDEP), U.S. Environmental Protection Agency (USEPA), other governmental agencies, businesses, and organizations for accurate and reliable information.

Evaluating health effects: If evidence indicates current or potential human exposure to contamination is likely, WVDHHR will take steps to determine whether such exposures could result in unacceptable impacts to human health. The evaluation is based on existing scientific information, and is reported in the form of a public health assessment. The assessment focuses on the health impact in the community.

Developing recommendations: In the public health assessment, WVDHHR sets forth its conclusions regarding any potential health hazard posed by the site and offers recommendations for reducing or eliminating human exposure to contaminants. The role of WVDHHR is primarily advisory. Acting in this capacity, the agency provides recommendations for implementation by other agencies, i.e., WVDEP and USEPA.

Soliciting community input: The evaluation process is interactive. WVDHHR starts by soliciting and evaluating information from various governmental agencies, and/or organizations responsible for clean up of the site, as well as from surrounding communities that may be impacted by on-site contaminants. Any conclusions about the site are shared with groups and organizations providing the information.

If you have questions or comments about this report, we encourage you to write:

Program Manager
ATSDR Cooperative Partners Program
Office of Environmental Health Services
Bureau for Public Health
West Virginia Department of Health and Human Resources
Capitol and Washington Streets
1 Davis Square, Suite 200
Charleston, West Virginia 25301-1798
or call: (304) 558-2981

Summary and Statement of Issues

U.S Environmental Protection Agency (USEPA) Region III On-Scene-Coordinator (OSC) requested the federal Agency for Toxic Substances and Disease Registry Region III (ATSDR Reg III) to review a recent data package regarding the Carr China Site, and provide technical assistance. On October 15, 2008, ATSDR Region III referred the EPA's request to the West Virginia Department of Health and Human Resources' (WVDHHR) ATSDR Program. The samples evaluated in this report were collected on May 28 - 29, 2008 by TechLaw, an EPA contractor.

Site Location and Description

The Carr China Site is located on the bank of the Tygart Valley River, south of Grafton, Taylor County, West Virginia. The site encompasses approximately nine acres of land. From 1916 through 1952, commercial grade China was produced at the site [1]. The factory burned in 1966 [2].

With trees and underbrush throughout, the site consists of eastern and western portions separated by an access road to a river gauging station. Remnants of the former Carr China facility buildings, foundations, and roadways remain on the western portion. Debris from the former manufacture of china ceramics are scattered throughout the eastern portion, along the steep river banks and in the river. The western boundary and part of the northern boundary of the site were enclosed with a dilapidated chain-link fence. The site is bordered to the north by the Tygart Valley River, to the south by a residential area, and to the east and west by wooded areas [3].

Discussion

This section will describe what is known, and what is not known, about environmental exposures to chemicals found at the Carr China site. An outline of possible health effects will be presented, and the risk of the contaminants causing cancer in people will be evaluated.

All analytes detected above their detection limits were compared to the ATSDR or USEPA health-based environmental guideline comparison values (CVs). CVs are chemical specific values derived for each environmental medium (air, soil, and groundwater). CVs are not used to predict adverse health effects; rather they are used to screen environmental contaminants for further evaluation for tendency to affect health in the population. In recognition of the increased sensitivity of children, ATSDR provides CVs for children for most chemicals and media, in addition to those developed for application to adult receptors. In this health consultation, whenever available, CVs for children are applied to screen the environmental contaminants detected in the media. It should be noted, however, the presence of contaminants at levels exceeding their respective CVs does not necessarily imply that the exposure to these levels would cause adverse health outcomes. CVs can be derived for acute, intermediate, and chronic duration exposures. Acute exposure is defined as exposure that occurs for 14 days or less. Intermediate exposure occurs for more than 14 days but less than 365 days. Chronic exposure occurs for more than 365 days.

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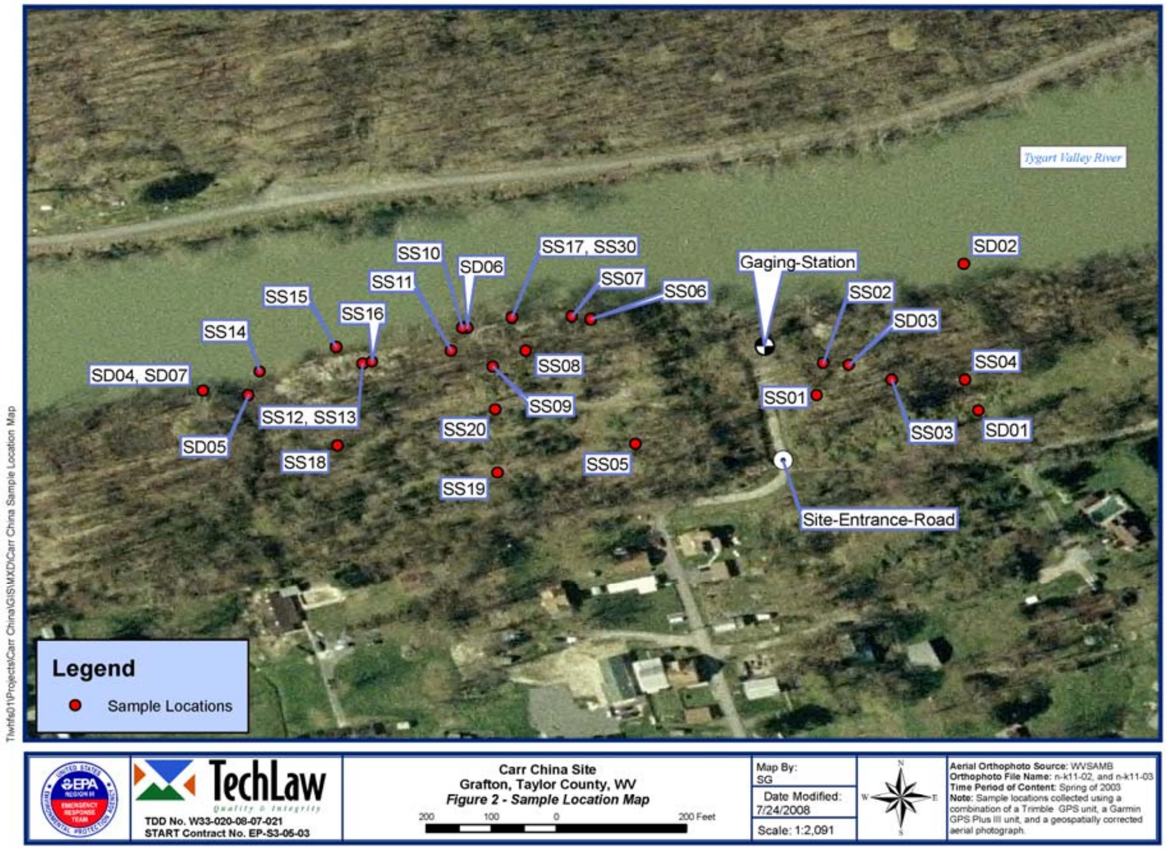
Sampling Data

EPA's historical sampling data indicated a high level of lead at the site [3]. On May 28 - 29, 2008, a total of 21 surface soil and 7 sediment samples were collected by TechLaw. Surface soil and sediment sampling locations are depicted in the sampling location map as following (courtesy of TechLaw, Inc.). All soil and sediment samples were analyzed for Target Analyte List (TAL) metals. Five of the soil samples were also analyzed for Target Compound List (TCL) semi-volatile organic compounds (SVOCs), pesticides and Aroclors (Polychlorinated Biphenyls, PCBs)



Soil Results

Most of the metals analyzed (a total of 23 metals) were detected consistently throughout the site. However, only a few metals were occasionally detected at a level above their corresponding CVs for residential soil screening. Antimony was detected with concentrations exceeding 20 mg/kg (ATSDR child Reference Dose Media Evaluation Guides, RMEG) in three of the 21 soil samples; Arsenic exceeded 20 mg/kg (ATSDR child chronic Environmental Media Evaluation Guides, EMEG) in one of the 21 samples; Cadmium exceeded 20 mg/kg (ATSDR child chronic EMEG) in one of the 21 samples; Iron exceeded 55,000 mg/kg (the USEPA Region III

Residential Soil Risk Based Concentration, RBC, for Residential Soil, September 2008) in one of the 21 samples; Lead exceeded 400 mg/kg (400 mg/kg in play areas or 1200 mg/kg in a vegetated yard, US EPA, 2001) in 10 of the 21 soil samples. See Table 1 in Appendix A for the metals results in soil samples.

SVOCs, pesticides and Aroclors (PCBs) were also analyzed in five soil samples. Of the SVOCs analyzed, only five compounds were detected above their corresponding CVs occasionally: Benzo(a)anthracene, Indeno(1,2,3-cd)pyrene, Benzo(g,h,i)perylene exceeded their CVs in one of the five samples; while Benzo(a)pyrene and Benzo(b)fluoranthene in two of the five samples. See Table 2 in Appendix A for the SVOCs results in soil samples. No PCBs were detected in any samples. Only a few pesticides were detected occasionally with concentrations significantly below the USEPA Region III Risk Based Concentration for residential soil.

Sampling data indicates that the primary contaminant in the soil was lead. Lead was consistently detected throughout the site, with concentrations ranging from 30.7 mg/kg – 21,600 mg/kg. In 10 of the 21 soil samples, lead was detected exceeding 400 mg/kg (400 mg/kg in play areas or 1200 mg/kg a vegetated yard, US EPA, 2001) as presented in the following.

Soil Sample ID	SS-01	SS -03	SS-04	SS-05	SS-06	SS-10	SS-11	SS-15	SS-16	SS-20
Lead Concentration (mg/kg)	968	865	1,390	1,850	1,100	4,710	703	21,600	592	645

Sediment Results

All metals analyzed were consistently detected in seven sediment samples at low levels, except for the antimony, which was not detected in all sediment samples. Of all the metals detected, iron and manganese were the only metals exceeding their respective CVs in one of the seven samples, and the rest were below their respective CVs in all samples. See Table 3 in Appendix A for sediment samples result. Note that the CVs used to screen the sediment samples are CVs for residential soil screening. The CVs might not directly apply for sediment sample evaluation. However, they provided good, conservative guidelines.

Exposure Pathway Analysis

WVDHHR evaluated whether the community has been, is, or could be exposed to harmful levels of contaminants in the environment by identifying the human exposure pathways. An exposure pathway is the route by which a contaminant travels from its source to the human body. It consists of five components:

- a source of contamination
- an environmental media through which the contaminants transport
- a point of exposure

- a route of human exposure, and ultimately
- the exposed population

To determine whether nearby residents are exposed to contaminants at the site, or contaminants migrating from the site, WVDHHR evaluated the environmental and human components that lead to human exposure. Exposure may occur by breathing, eating or drinking the contaminants, or by skin (dermal) contact with the substance. WVDHHR identifies exposure pathways as completed, potential, or incomplete. Completed pathways are those that meet the five elements listed above. A potential pathway exists when one of the above listed five elements is missing, but could exist. Potential pathways indicate exposure to a contaminant may have occurred, may be occurring, or may occur in the future. An incomplete pathway occurs when at least one of the five elements is missing and never possibly be present.

According to the "Final Trip Report" produced by TechLaw dated October 7, 2008:

"The site can be easily accessed by pedestrians and vehicles from the road to the gauging station. Trespassers accessed the site during the sampling event on all terrain vehicles (ATV) and a pick up truck. The roadways and paths across the western portion of the site appeared to have frequent traffic".

Apparently, human exposure to the contaminants at the site has occurred, is occurring and will occur in the future. So, a completed human exposure pathway via surface soil exists.

Toxicological Evaluation

Non-Cancer Health Effects

Lead is a naturally occurring metal found in the earth's crust, and has no characteristic taste or smell [4]. Lead is commonly used in batteries, ammunition, ceramic glazes, medical equipment, scientific equipment, and military equipment [4]. An individual can be exposed to lead through additional sources such as drinking water, lead paint, and other items containing lead including certain toys, jewelry, herbal remedies, Mexican candies, water hoses, and others. At one time, lead was used as an additive in gasoline and in paint. Lead from gasoline was released into the air in automotive exhaust and deposited along roadways [4]. Houses built before 1978 may contain lead based paint. Lead in the soils in the inner cities is often attributable to lead based paint and leaded gasoline [4].

Exposure to lead can occur by inhalation or ingestion. Lead is not readily absorbed through the skin, so dermal contact is not an important route of exposure [4]. Studies have shown that there is a definite correlation between concentrations of lead in soils and blood lead levels in children. In general, blood lead levels increase as the lead concentrations in soil and dust increase. As blood lead levels increase, the likelihood of adverse health effects also increases. Lead has the greatest effect on the nervous system, especially in children. Examples of adverse health effects of children exposed to lead include learning difficulties and behavioral problems. Pregnant women can experience complications with their pregnancy ranging from low birth rate to miscarriage if exposed to high concentrations of lead [4].

Estimation of Blood Lead Levels in Children

ATSDR and EPA have not developed a CV for ingestion of lead through soil. The usual approach of estimating human exposure to an environmental contaminant and then comparing this dose to a health guideline, or CV, cannot be used. Instead, exposure to lead is evaluated by using a biological model that predicts a blood lead level that would result from exposure to the environmental lead contamination. The modeled blood lead level is then compared to the level of concern for blood lead in children as recommended by the Centers for Disease Control and Prevention (CDC). CDC's current level of concern is10 micrograms of lead per deciliter of blood (10 µg/dL) [5]. Using this model, EPA has established a standard cleanup value of 400 parts per million (ppm) for lead concentrations in children's play areas, high traffic areas, and exposed soil areas using the default parameters in this model [6]. The default parameters in the model include many estimated values such as the amount of soil ingested and time spent outdoors. If the default parameters are found not to be accurate in an area being investigated, the cleanup value used at that site may be different.

In this public health consultation, USEPA's Integrated Exposure Uptake Biokinetic Model (IEUBK) was used to predict blood lead levels of young children (under 7 years of age) exposed to various levels of lead in the environment. The model assumes that children will be exposed to lead from a variety of sources, including outdoor soil, dust in the home, air, drinking water, and in their diet. Exposures to lead-based paint are not considered in this Model. The average soil lead concentration of 1752.5ppm and the default Soil/Dust Ingestion Weighting Factor of 45% soil and 55% dust (USEPA 1994) were entered into the model to estimate the blood lead concentration of a child. As a result, the predicted blood lead level in children under 7 years of age exceeded the CDC's current level of concern of 10 µg/dL. Information about this model and the assumptions used to generate the blood lead level estimates can be found in http://www.epa.gov/superfund/lead/products.htm#ieubk.

USEPA has been planning to remediate Carr China Site, especially the "hot spots" where high levels of lead were found, to prevent possible future exposures, to prevent contamination of Tygert River, and to protect the environment. Confirmatory samples have been planned by USEPA after remediation to determine post-removal lead concentrations in Carr China Site. It is expected that lead concentrations in Carr China Site will be greatly reduced by USEPA's remediation action.

Cancer Health Effects

While the USEPA considers lead to be a probable human carcinogen and the National Toxicity Program (NTP) has determined that lead and lead compounds are reasonably anticipated to be human carcinogens, there have been no studies linking residential ingestion of lead contaminated soil or drinking water with an increase cancer risk [4, 7]. Although the American Cancer Society estimates less than half of men and slightly more than a third of women in the United States will develop some form of cancer in their lifetime, the primary health concern for lead in Carr China Site is not cancer; instead, the primary concern from exposure to lead at the Carr China Site is the effects that lead has on the nervous system, especially in children less than 72 months of age [8].

Children's Health Consideration

ATSDR/WVDHHR considers children in the evaluation of all exposures, and uses health guidelines that are protective for children. In general, children are assumed to be more susceptible to chemical exposures and particularly lead. In evaluating health effects from the site-specific environmental exposures, children were considered as a special population because:

- Children weigh less than adults, resulting in higher doses of chemical exposures
- Children have higher rates of respiration and metablism
- Metabolism and detoxification mechanisms differ in both the very young and very old and may increase or decrease susceptibility
- A child's developing body systems can sustain permanent damage if toxic exposures occur during critical growth stages
- Outdoor playing and hand-to-mouth habits increase children's exposure potential. The fact that children are shorter than adults makes them more susceptible to the dust, soil, and vapors that are close to the ground

Children are know to be more susceptible to lead poisoning than adults, and also are more likely to be exposed to lead contaminated materials. Infants and young children can be exposed to lead by playing with lead containing toys, swallowing and breathing lead in dirt, dust, or sand while they play on the floor or ground. Also, compared to adults, a larger proportion of the amount of lead swallowed will enter the blood in children [4]. While about 99% of the amount of lead taken into the body of an adult is excreted as waste within a few weeks, only about 32% of lead taken into the body of a child is excreted [4]. All of these factors result in children being more susceptible to toxic effects from lead than adults when the children have similar lead concentrations in their environment.

When children are exposed to lead contaminated materials, a variety of adverse health effects can occur depending on the amount of lead to which they are exposed and the duration of exposure. These effects include learning disabilities, slowed growth rate, hyperactivity, impaired hearing, and at very high exposure levels, even brain damage [4]. Lead has the greatest effect on the nervous system, especially in children. In children, low levels of lead can cause weakness in fingers, wrists, or ankles. Unborn children can also be exposed to lead through the placental barrier of the mother, and the fetuses are at increased risk of premature births, low birth weight, decreased ultimate mental ability, learning difficulties, and reduced growth rate as young children [4].

Yearly blood-lead testing before a child is 72 months old is key to determine if the child has been exposed to lead. Eliminating exposure pathways by controlling contamination sources, practicing good hygiene, and eating a proper diet high in calcium can all reduce the risk of lead poisoning in children.

Children who exhibit pica behaviors may be at an even greater risk of exposure to contaminants of lead in soil than other children. Individuals who exhibit pica behaviors have a craving or "drive" to put non-food items in their mouth or eat non-food items, such as dirt, paint chips, sand, etc. Children exhibiting pica behavior may be more likely to experience adverse health effects from lead found in the soil.

Conclusion

The pathway of concern at the Carr China Site is incidental ingestion of lead-contaminated soil by trespassing residents and visitors, especially children. Due to its easy accessibility to the public, and the evidence of frequent traffic at the site [3], individuals could have been exposed to lead contamination on site in the past, may be presently and will be in the future.

The highest soil lead concentration of 21,600 ppm was found along the Tygart River bank north of the site. Individuals who like to boat or fish are expected to be more likely to be exposed through the bank soil. In addition, 968 ppm lead concentration (SS-01) was found next to the site entrance road, the road leading to the “Gauging Station” that should be easily accessible; and the 1850 ppm of lead (SS-05) was found in the area relatively near the residential houses. Trespassers are less likely to be exposed to lead in soil at just one location, or to spend as much time on the site as in their own backyard; however, the locations of those hot spots do raise public health concerns for lead exposure.

The five public health hazard categories used by ATSDR are: (1) no public health hazard, (2) no apparent public health hazard, (3) indeterminate public health hazard, (4) public health hazard, and (5) urgent public health hazard.

Based upon the observed evidence of human exposure and the existing environmental information pertaining to the site, WVDHHR/ATSDR concludes that *there is a public health hazard at the site.*

To protect public health, WVDHHR/ATSDR support USEPA’s removal plan to mitigate/eliminate human exposures.

Recommendation

WVDHHR/ATSDR recommends that USEPA follow through with their plans to collect soil samples after remediation efforts to confirm that lead contamination has been removed or reduced below a level of health concern. In addition, to collect conformational soil samples to ensure that lead concentration in the fill soil is below a level of health concern.

Public health Action Plan

This Public Health Action Plan for Carr China Site is to ensure that this public health consultation not only identifies public health hazards, but provides an action plan to mitigate and prevent adverse human health effects resulting from past, present, and future exposures to hazardous substances at or near the site. Below is a list of public health actions to be implemented by WVDHHR/ATSDR, or other stakeholders at the site:

1. WVDHHR/ATSDR will review additional sampling data as it becomes available and provide guidance regarding possible health risk if necessary.

2. WVDHHR/ATSDR will address community health concerns and questions as they arise.

3. WVDHHR/ATSDR will provide health education and literature when requested.

Preparer of Report

Bin Z. Schmitz, M.S., Environmental Toxicologist

Radiation, Toxics and Indoor Air Division
Office of Environmental Health Services
Bureau for Public Health, WVDHHR

Reviewers of Report

Randy C. Curtis, P.E., Director
Anthony Turner, M.S., R.S., Assistant Director

Radiation, Toxics and Indoor Air Division
Office of Environmental Health Services
Bureau for Public Health, WVDHHR

ATSDR Technical Project Officer

CDR Alan G. Parham, REHS, MPH
Technical Project Officer

Agency for Toxic Substances and Disease Registry
1600 Clifton Road, N.E. MS-E29
Atlanta, Georgia 30333

ATSDR Regional Representatives

Lora Siegmann-Werner, MPH, Senior Regional Representative
Robert H. Helverson, Regional Representative

ATSDR Region III
1650 Arch Street Mail Stop 3HS00
Philadelphia, Pennsylvania 19103

Certification

This Carr China Site Public Health Consultation was prepared by the West Virginia Department of Health and Human Resources (WVDHHR) under a cooperative agreement with the federal Agency for Toxic Substances and Disease Registry (ATSDR). It was completed in accordance with approved methodologies and procedures existing at the time the Public Health Consultation was initiated. Editorial review was completed by the Cooperative Agreement partner.

Alan G. Parham, REHS, MPH

Technical Project Officer
Division of Health Assessment and Consultation (DHAC), ATSDR

The Division of Health Assessment and Consultation of ATSDR has reviewed this public health assessment and concurred with its findings.

Alan Yarbrough
Team Lead, SPAB, DHAC, ATSDR

References

1. OTC, 2008. Olde Tyme Collectibles, Available from URL: http://oldetymecollectiblespottery.com/histories/carrchina.html, September 1, 2008

2. CCCC, 2008. Carr China Collector's Club, Available from URL: http://carrchina.com/wsn/page11.html, September, 2008

3. TechLaw, Inc., Final Trip Report Removal Site Evaluation, Carr China Site, Grafton, Taylor County, West Virginia, October 7, 2008

4. Agency for Toxic Substances and Disease Registry. Toxicological profile for lead, update. Atlanta: US Department of Health and Human Services; 1999 July.

5. Agency for Toxic Substances and Disease Registry. DHAC Guidance for Evaluating Cleanup Levels for Lead in Soil. Atlanta: US Department of Health and Human Services.

6. U.S. Environmental Protection Agency. Superfund Lead-Contaminated Residential Sites Handbook. 2003 August.

7. National Toxicology Program. Lead (CAS No. 7439-92-1) and Lead Compounds Substance Profiles. Report on Carcinogens, Eleventh Edition; 2004.

8. American Cancer Society. Cancer facts and figures, 2007. Atlanta: American Cancer Society, Inc.; 2007.

Appendix A Tables

Table 1. Metals – Carr China Site Surface Soil Results (May, 28 & 29, 2008 by TechLaw)

Analyte	Sample Results (mg/kg)													
	SS-01	SS-02	SS-03	SS-04	SS-05	SS-06	SS-07	SS-08	SS-09	SS-10	SS-11	SS-12(dup of ss13)	SS-13(dup 0f SS12)	SS-14
Aluminum	917	2880	1930	2320	4390	1170	1140	1750	127	1620	5660	5800	5350	6730
Antimony	0.62		1.1	1.8	64.2	3	1.9	69.5			31.3			
Arsenic	1.7	3.5	1.3	2.5	2.9		0.9	4.5		22.6	6.8	4.1	4.3	4.8
Barium	65.1	62.4	52.3	86.8	448	91.3	87.5	144	22	114	214	285	232	122
Beryllium	0.086	0.37	0.13	0.2	0.27	0.09	0.11	0.16			0.81	0.7	0.6	1
Cadmium	0.92	0.79	0.85	0.87	1.6	3.5	0.83	2.6	0.042	77.1	2.2	0.26	0.18	0.82
Calcium	5000	3050	4280	2980	19800	16600	12600	11300	63.6	12800	17600	3140	2810	1540
Chromium	4.9	5.8	12.7	4	8.8	4.1	3.6	6.3	4.1	72.6	9.5	4.2	3.1	10.2
Cobalt	6.5	8.8	21.9	36.7	28.4	5.5	2.9	2.8		14.6	2.3	4	2.7	23.6
Copper	47.5	21.9	34.2	56.9	46.1	46.8	22.8	78.4	1.7	260	20.1	49.8	36.2	21.4
Iron	4390	10300	1200	2730	5880	4130	6140	15800	1520	283000+	26300	13100	6590	15900
Lead	968	303	865	1390	1850	1100	291	395	35.6	4710	703	247	161	43.6
Magnesium	255	347	271	1220	1910	639	649	588		795	2210	258	221	848
Manganese	294	418	160	164	299	165	211	271	4.1	1310	592	46.5	37.4	1730
Mercury	0.16	0.15	0.085	0.046	0.11	0.18	0.14	0.12		0.24	0.074			0.047
Nickel	4	7.6	2.1	4.8	7.3	4.7	4.7	6.6	2.8	56.6	7.9	7.6	5.5	26.6
Potassium	144	244	197	197	953	393	359	290	24.4	681	554	235	190	517
Selenium	1.2	0.74	0.41		2.5	2.3	2.2	2		9.2	2.1	1.1	0.44	
Silver	0.19			0.087	0.35					4.7	0.9	0.24		0.17
Sodium	37	36.7	53.8	52.2	204	79.5	58.7	51.4	27.1	166	138	199	178	45.2
Thallium		0.49									0.73	0.65	0.49	0.63
Vanadium	2.5	4.8	2.5	8.3	11.5	2.4	2.2	3.7	0.2		4.9	15.8	14.8	10.3
Zinc	134	145	139	156	805	486	231	553	5.6	16000+	326	22.7	16	110

Table 1. Continued

Analyte	Sample Results (mg/kg)							Detection Frequency	Frequency above CVs	Maximum Detected Conc. (mg/kg)	Comparison Values (mg/kg)	
	SS-15	SS-16	SS-17(dup of SS30)	SS-30(dup of 17)	SS-18	SS-19	SS-20					
Aluminum	8270	675	5810	5160	3730	6870	3130	21/21	0/21	8270	50000	1
Antimony	1.3	2.9			1.6		6.5	12/21	3/21	69.5	20	2
Arsenic	4.6	0.54	3.5	3.5	3.8	3.8	2.3	18/21	1/21	22.6	20	1
Barium	581	30.1	87.7	87.5	90.1	71.7	123	21/21	0/21	581	10000	1
Beryllium	0.83	0.049	0.81	0.86	0.43	0.71	0.29	19/21	0/21	0.86	100	1
Cadmium	0.95	0.95	0.82	0.78	2.1	0.32	3.3	20/21	1/21	77.1	10	1
Calcium	4740	2020	1390	1340	12400	3040	10400	21/21		19800	NA	5
Chromium	8.6	8.9	9.2	9.4	7.7	9.1	7.4	21/21	0/21	72.6	200	2
Cobalt	26.6	17.1	28.5	30.3	8.6	7.6	5.3	20/21	0/21	36.7	500	3
Copper	113	22.7	15.3	15.5	108	9.4	84	21/21	0/21	260	500	3
Iron	11100	2040	11400	11800	8880	15100	5860	21/21	1/21	283000	55000	4
Lead	21600 +	592	342	341	189	30.7	645	20/21	10/21	21600	400	6
Magnesium	605	162	523	500	1350	844	1120	20/21		2210	NA	2
Manganese	1660	74.4	1870	2110	308	439	335	21/21	0/21	2110	3000	2
Mercury	0.044	0.021	0.044	0.051	0.066	0.046	0.076	17/21	0/21	0.24	23	4
Nickel	34.1	3.5	32	34.3	12.7	10.6	7	21/21	0/21	56.6	1000	2
Potassium	1100	111	488	413	326	556	462	21/21		1100	NA	5
Selenium					0.71	0.58	1.3	12/21	0/21	9.2	300	1
Silver	0.51			0.48	1.1	0.69	0.63	12/21	0/21	4.7	300	2
Sodium	2110	45.2	64.6	37.1	84.7	60.5	86.9	21/21		2110	NA	5
Thallium	1.2		0.37	0.7	0.48	1	0.22	11/21	0/21	1.2	5.5	4
Vanadium	29.4	6.5	7.5	7.2	10.3	11.5	7.7	20/21	0/21	29.4	200	3
Zinc	144	598	158	167	664	45	798	20/21	0/21	16000	20000	1

Note

NA - Not Applicable or available. *Blank Cells - Not detected or unreliable results*

1 - ATSDR Chronic Environmental Media Evaluation Guides(EMEG) for child

2 - ATSDR Reference Dose Media Evaluation Guide (RMEG) for child

3 - ATSDR Intermediate Environmental Media Evaluation Guides (Int. EMEG) for child

4 - USEPA Region III Residential Soil Risk Based Concentration, for Residential Soil, October 2007.

5 - Essential Nutrient. Eliminated from consideration as COC.

6 - Memorandum: OSWER Directive: Revised Interim Soil Lead Guidance for CERCLA Sites and RCRA Corrective Action Facilities. United States Environmental Protection Agency, August 1994. Office of Solid Waste and Emergency Response. Directive 9355.4-12.

Table 2. SVOCs – Carr China Surface Soil Results (May, 28 & 29, 2008 by TechLaw)

Semi-Volatile Organic Compounds Analyte	Results (ug/kg)					Detection Frequency	Frequency above CV	Maximum Detected Conc. (ug/kg)	Comparison Values (ug/kg)	
	SS-02	SS-08	SS-17	SS-30	SS-12					
Benzaldehyde						0 / 5				
Phenol						0 / 5				
Bis(2-chloroethyl)ether						0 / 5				
2-Chlorophenol						0 / 5				
2-Methylphenol						0 / 5				
2,2'-Oxybis(1-chloropropane)						0 / 5				
Acetophenone						0 / 5				
4-Methylphenol						0 / 5				
N-Nitroso-di-n-propylamine						0 / 5				
Hexachloroethane						0 / 5				
Nitrobenzene						0 / 5				
Isophorone						0 / 5				
2-Nitrophenol						0 / 5				
2,4-Dimethylphenol						0 / 5				
Bis(2-chloroethoxy)methane						0 / 5				
2,4-Dichlorophenol						0 / 5				
Naphthalene		130			46	2/5	0/5	130	1,000,000	1
4-Chloroaniline						0 / 5				
Hexachlorobutadiene						0 / 5				
Caprolactam						0 / 5				
4-Chloro-3-methylphenol						0 / 5				
2-Methylnaphthalene	30	250	23		96	4/5	0/5	250	2,000,000	2
Hexachlorocyclopentadiene						0 / 5				
2,4,6-Trichlorophenol						0 / 5				
2,4,5-Trichlorophenol						0 / 5				
1,1'-Biphenyl						0 / 5				
2-Chloronaphthalene						0 / 5				

Table 2. Continued

Semi-Volatile Organic Compounds	Sample Results (µg/kg, ppb)					Detection Frequency	Frequency above CV	Maximum Detected Concentrations (µg/kg)	Comparison Value (CVs) (µg/kg)	
	SS-2	SS-8	SS-17	SS-30	SS-12					
2-Nitroaniline						0 / 5				
Dimethylphthalate						0 / 5				
2,6-Dinitrotoluene						0 / 5				
Acenaphthylene						0 / 5			3,800,000	6
3-Nitroaniline						0 / 5				
Acenaphthene						0 / 5			3.00E+07	3
2,4-Dinitrophenol						0 / 5				
4-Nitrophenol						0 / 5				
Dibenzofuran		95			30	2 / 5	0 / 5	95	78,000	4
2,4-Dinitrotoluene						0 / 5				
Diethylphthalate						0 / 5				
Fluorene						0 / 5			2,000,000	1
4-Chlorophenyl-phenylether						0 / 5				
4-Nitroaniline						0 / 5				
4,6-Dinitro-2-methylphenol						0 / 5				
N-Nitrosodiphenylamine						0 / 5				
1,2,4,5-Tetrachlorobenzene						0 / 5				
4-Bromophenyl-phenylether						0 / 5				
Hexachlorobenzene						0 / 5				
Atrazine						0 / 5				
Pentachlorophenol						0 / 5				
Phenanthrene	44	860	60	230	170	5 / 5	0 / 5	860	22,000,000	6
Anthracene		170		41		2 / 5	0 / 5	170	20,000,000	1
Carbazole		150		41		2 / 5	0 / 5	150	32,000	4
Di-n-butylphthalate						0 / 5			5,000,000	1
Fluoranthene	50	2000	110	390	81	5 / 5	0 / 5	2000	2,000,000	1
Pyrene	63	2900	130	380	80	5 / 5	0 / 5	2900	2,000,000	1

Table 2. Continued

Semi-Volatile Organic Compounds	Sample Results (µg/kg, ppb)					Detection Frequency	Frequency above CVs	Maximum Detected Concentrations (µg/kg)	Comparison Values (CVs) (µg/kg)	
	SS-2	SS-8	SS-17	SS-30	SS-12					
Butylbenzylphthalate						0 / 5				
3,3'-Dichlorobenzidine						0 / 5				
Benzo(a)anthracene	32	1400	67	190	56	5 / 5	1 / 5	1400	220	4
Chrysene	51	1500	85	180	88	5 / 5	0 / 5	1500	22,000	4
Bis(2-ethylhexyl)phthalate	63	71	290	58	46	5 / 5	0 / 5	290	46,000	4
Di-n-octylphthalate						0 / 5				
Benzo(b)fluoranthene	80	2400	120	280	100	5 / 5	2 / 5	2400	220	4
Benzo(k)fluoranthene	33	1000	52	130	31	5 / 5	0 / 5	1000	2,200	4
Benzo(a)pyrene	33	1200	63	150	35	5 / 5	2 / 5	1200	100	5
Indeno(1,2,3-cd)pyrene		530	34	60		3 / 5	1 / 5	530	220	4
Dibenzo(a,h)anthracene		170				1 / 5		170		
Benzo(g,h,i)perylene		370	31	47		3 / 5	1 / 5	370	100	5
2,3,4,6-Tetrachlorophenol						0 / 5				

NOTES:

Blank cells indicate either non-detect or unreliable results

NA - Not applicable

1 - ATSDR's Child RMEG, Reference Dose Media Evaluation Guides, Feb 12, 2008

2 - ATSDR's Child EMEG, Environmental Media Evaluation Guides, Feb 28, 2008

3 - ATSDR's int. child EMEG, Intermediate child Environmental Evaluation Guides

4 - USEPA's Reg III RBC, Region III Risk Based Concentrations

5 - ATSDR's CREG, Cancer Reference Dose Evaluation Guides

6 - West Virginia Department of Environmental Protection, Supplemental Guidance, Polycyclic Aromatic Hydrocarbon (PAHs) Deminimis Standards, Revised draft, 12/2007

Table 3. Metals - Carr China Site Sediment Results (May 28 & 29, 2008 by TechLaw)

Metals	Sample Results (mg/kg or ppm)							Detection Frequency	Frequency above CVs	Maximum Detected Concentrations (mg/kg)	Comparison Values (CVs) (mg/kg)	
	SD-01	SD-02	SD-03	SD-04	SD-05	SD-06	SD-07					
Aluminum	7680	3070	5820	11300	4900	4110	9660	7/7	0/7	11300	50000	1
Antimony								0/7	0/7	NA	20	2
Arsenic	11.2	1.8	2.1	9.2	4.3	4	8.3	7/7	0/7	11.2	20	1
Barium	1610	33.5	60	89	130	63.4	84.6	7/7	0/7	1610	10000	1
Beryllium	0.76	0.39	0.57	2.2	0.6	0.71	2.1	7/7	0/7	2.2	100	1
Cadmium	3.5	0.17	0.33	0.78	0.52	0.87	0.71	7/7	0/7	3.5	10	1
Calcium	12500	117	821	358	3140	826	373	7/7	NA	12500	NA	5
Chromium	12.8	4.8	8.5	14.2	11.4	7.8	12.3	7/7	0/7	14.2	200	2
Cobalt	93.8	7.9	7.8	14.6	9	18	14.1	7/7	0/7	93.8	500	3
Copper	48.5	4.7	9.5	38.4	13.6	11.8	37.5	7/7	0/7	48.5	500	3
Iron	77300	7740	9380	28400	19500	17400	26300	7/7	1/7	77300	55000	4
Lead	294	8.2	17.4	29.9	39.3	74.5	29	7/7	0/7	294	400	6
Magnesium	1120	399	724	813	888	459	696	7/7	NA	1120	NA	2
Manganese	59800 +	339	296	431	443	1450	520	7/7	1/7	59800	3000	2
Mercury	0.16		0.028	0.12	0.031	0.025	0.15	7/7	0/7	0.16	23	4
Nickel	43.7	5.8	9.4	27.1	11.9	24.2	27.1	7/7	0/7	43.7	1000	2
Potassium	1060	356	551	811	581	474	567	7/7	NA	1060	NA	5
Selenium			0.72	1.5	0.6	0.58	1.2	5/5	0/7	0.72	300	1
Silver	4		0.18	0.6	0.62	0.29	0.69	6/7	0/7	4	300	2
Sodium	181	22.8	62	38.9	52.5	35.9	37	7/7	NA	181	NA	5
Thallium	3.5	0.36	0.5	1.4	0.97	0.79	1.3	7/7	0/7	3.5	5.5	4
Vanadium		5	9.3	14	10.6	6.5	11.6	6/7	0/7	11.6	200	3
Zinc	443	21.2	51.9	169	95.8	146	167	7/7	0/7	443	20000	1

NOTES:

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Appendix B Glossary of Terms

Glossary of Terms

ATSDR	federal Agency for Toxic Substances and Disease Registry
CVs	Comparison Values
EMEG	Environmental Media Evaluation Guides
EPA	United State Environmental Protection Agency
EPA Reg III RBCs	EPA Region III Risk Based Concentrations
OSC	On-Scene Coordinator
PCBs	Polychlorinated Biphenyls
ppb	Parts per billion, equivalent to microgram/kilogram (µg/kg)
ppm	Parts per million, equivalent to milligram/kilogram (mg/kg)
RMEG	Reference Dose Media Evaluation Guides
SVOCs	Semi-Volatile Organic Compounds
TAL	Target Analyte List
TCL	Target Compounds List