Health Consultation

Public Health Evaluation of Environmental Data

LONG LOTS ELEMENTARY SCHOOL
(a/k/a 11-13 HYDE LANE)

WESTPORT, FAIRFIELD COUNTY, CONNECTICUT

NOVEMBER 18, 2004

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Public Health Service
Agency for Toxic Substances and Disease Registry
Division of Health Assessment and Consultation
Atlanta, Georgia 30333

Health Consultation: A Note of Explanation

An ATSDR health consultation is a verbal or written response from ATSDR 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 which, in the Agency's opinion, indicates a need to revise or append the conclusions previously issued.

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(a/k/a 11-13 HYDE LANE)

WESTPORT, FAIRFIELD COUNTY, CONNECTICUT

Prepared by:

Connecticut Department of Public Health
Under a Cooperative Agreement with the
Agency for Toxic Substances and Disease Registry

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The conclusions and recommendations in this health consultation are based on the data and information made available to the Connecticut Department of Public Health and the Agency for Toxic Substances and Disease Registry. The Connecticut Department of Public Health and the Agency for Toxic Substances and Disease Registry will review additional information when received. The review of additional data could change the conclusions and recommendations listed in this document.

BACKGROUND AND STATEMENT OF ISSUE

In May 2004, a resident of Westport, Connecticut, petitioned the Agency for Toxic Substances and Disease Registry (ATSDR) to evaluate environmental data and remediation work at 11 Hyde Lane (a former agricultural site) adjacent to 13 Hyde Lane (Long Lots Elementary School), in Westport.

The 11 Hyde Lane property comprises approximately 6.5 acres (Attachment A). It was operated as a commercial rose farm (Jaeger Nursery) from the 1920s until the late 1980s. The property contained several greenhouses, a furnace building, and a private residence on the northern portion of the property. The southern portion of the property is partially wooded and included a garden and small orchard.

Approximately nine greenhouses were located in the northwestern portion of the property. One greenhouse had a wooden floor, and each of the others had dirt floors. An inspection by a consultant for the Town of Westport in 2001 noted that the greenhouses were in some degree of disrepair but there was no pesticide or herbicide storage anywhere in the greenhouses or on the grounds. A large water storage area was noted beneath the greenhouse with the wooden floor. The furnace building floor was concrete and, during the 2001 inspection, was observed to have no large cracks or floor drains. A boiler room within the furnace building had a sump containing water, which appeared clean with no odors or sheen.

The greenhouses were heated with fuel oil stored in an 8,000-gallon underground storage tank (UST) and a 550-gallon above-ground storage tank. The residence was heated with fuel oil stored in a 275-gallon tank in the basement. The property is served by municipal water but had two septic systems on-site (one for the residence and one for the greenhouses). The southern portion of the property was used for agriculture, including gardens and a small orchard.

The 11 Hyde Lane site is bounded to the northwest by Long Lots Elementary School (13 Hyde Lane) and to the northeast by Hyde Lane. Residences bound the site in all other directions. Property of some of the residences is separated from the site by a fence, but no fencing is around the 11 Hyde Lane site. In addition, the residential dwelling formerly located on the 11 Hyde Lane property was not fenced from the site.

A small stream (Muddy Brook) is approximately 1,000 feet to the northwest of the property. Groundwater depth and flow has not been formally determined but visual observations estimate it flows northwest toward Muddy Brook (Environmental Risk Limited [ERL] 2001) (Attachment

A). Results of limited borings at the property suggest groundwater ranges from 7 to 10 feet below ground surface (bgs). Although municipal water serves the site, one well that was used for irrigation is in the northwest corner of the property. A dug cistern well, also used for irrigation, is located in the southern portion of the property.

In 2001, the Town of Westport hired an environmental consultant to sample soil and groundwater at 11 Hyde Lane because the Town was interested in buying the property. The consultant discovered pesticides, primarily beneath the footprint of the greenhouses at 11 Hyde Lane. The Town of Westport began remediation activities at the site in August 2003 by removing USTs and asbestos from the furnace building. In October and November 2003, the furnace building and greenhouses were demolished, and the debris were disposed of off-site. In December 2003, the upper foot of soil beneath the former greenhouses was removed and disposed of off-site. Several cubic yards of soil also were removed from an area within the former orchard and from a composting area near the southeastern corner of the site. A test pit near the northern corner of the property was excavated to approximately 5–6 feet bgs. Confirmatory soil samples were taken to demonstrate that elevated contaminant levels did not remain.

In May 2004, the Town of Westport began construction in the northern portion of the site (at the locations of the former greenhouses, furnace building, and residence) to build a parking lot for the Long Lots Elementary School (Attachment A). The parking lot was completed in fall 2004.

Site Visit

On July 22, 2004, the Connecticut Department of Public Health (CT DPH) visited the 11 Hyde Lane Property. CT DPH staff were accompanied by the citizen petitioner, a consultant assisting the petitioner, the director of health for the Westport Weston Health District and the director of public works for the Town of Weston. At the time of the site visit, construction activities were ongoing in the northwestern portion of the site. No evidence existed of any structures that had been on the property. CT DPH staff also walked through the southern portion of the site and observed the orchard, gardens, cistern well, and compost area where soil had been excavated. The entire southern portion of the site was overgrown with vegetation. Access was difficult, and no evidence existed that anyone used the area.

Demographics

Long Lots Elementary School has a total enrollment of 607 students in grades kindergarten through 5 (students aged approximately 5–10 years). The school employs approximately 74 staff (CT DOE, 2003). Approximately 10–12 residences are located along the boundary of the 11 Hyde Lane Property.

Environmental Contaminant Levels and Health Comparison Values

This section presents the key environmental data collected from the site. Table 1 (which can be found at the end of this section) contains a summary of the data discussed in this section.

In 2001, a Phase II Investigation was performed that included sampling soil and groundwater at the 11 Hyde Lane property. Phase II was conducted by consultants for the Town of Westport

because the town was interested in buying the property and several possible areas of concern were identified in the Phase I Environmental Site Assessment for the site.

As part of the Phase II work, subsurface soil samples were collected from four locations. One boring was located near the fuel oil UST; one, within the septic tank leach field for the greenhouses; and two, near the greenhouses. Soil samples were screened for organic vapors in 4-foot-deep increments to 12 feet bgs. Three subsurface soil samples (0–4 feet, 4–8 feet, and 8–12 feet bgs) from two locations were laboratory analyzed. Laboratory analyses included metals (including arsenic), volatile organic compounds (VOCs), extractable total petroleum hydrocarbons (ETPH), (constituents of fuels and oils), and pesticides/herbicides. Groundwater samples also were collected from each of the four boring locations. Groundwater samples were analyzed for the same constituents mentioned for soil. However, not all groundwater samples were analyzed for all constituents.

In addition, surface soil samples (approximately 6 inches bgs) were collected from nine locations. All surface soil samples were analyzed for pesticides/herbicides and metals (including arsenic). Sample locations were chosen in the septic leach field adjacent to the greenhouses, near the greenhouses in areas where pesticides or herbicides may have been used, and near the UST.

Soil sampling results from the Phase II assessment showed elevated levels of the pesticides chlordane and dieldrin in surface soils in several locations (in the former greenhouses, in a compost area in the southeastern portion of the site, next to the furnace building, and in the former garden area). Pesticides were found at levels as high as 20 times above Connecticut's residential direct exposure criteria for soil (CT RDEC). The RDEC are state cleanup standards (Connecticut Remediation Standard Regulations [CT RSRs]) for soil developed to be protective of daily, long term exposure to soil by young children and adults. In addition, lead was detected in one surface soil location at a level slightly exceeding the CT RDEC.

Groundwater sampling results from the Phase II assessment showed one groundwater sample with lead and a trace amount of the herbicide 2,4-Dichlorophenoxyacetic acid (2,4-D). However, both groundwater results were below state and federal drinking water standards.

The same consultant conducted follow-up sampling (Phase III) on July 31–August 1, 2001, to further characterize the pesticide contamination discovered in the previous soil sampling event. Soil samples from 48 locations around the property were collected. Some samples were collected at 0–2 feet bgs and some at approximately 6–12 inches bgs. All samples were analyzed for pesticides, and some were analyzed for lead. As with the results of the previous soil sampling, chlordane and dieldrin were found at levels exceeding CT RDEC. The highest pesticide concentration found was chlordane at a concentration almost 10 times higher than the CT RDEC. Lead was detected at several locations, but only one location exceeded CT RDEC. During this sampling event, all of the exceedances of CT RDEC were within the footprint of the former greenhouses.

To define soil contamination for determining areas to be remediated, the Town of Westport conducted additional sampling in October 2002. Soil samples were collected from 40 locations,

most from discrete depth intervals (6, 18, and 36 inches bgs). Selected samples were analyzed for pesticides, ETPHs, VOCs, metals, and semivolatile organic compounds. Only two samples exceeded CT RDECs for pesticides and both were within the footprint of the former greenhouses. In addition, in two locations near the northwestern property boundary (where fill materials were suspected), arsenic was detected at levels almost two times above the CT RDEC of 10 ppm in soils 2–4 feet and 4–6 feet bgs.

To more accurately estimate costs of remediation, additional soil samples were collected at the 11 Hyde Lane Property in April 2003. Three composite surface soil samples (0–6 inches bgs) were collected from within the footprint of one of the former greenhouses. Two surface soil samples (0–6 inches bgs) also were collected from the boundary between 11 Hyde Lane and the Long Lots Elementary School. Chlordane was found at levels up to 20 times above CT RDEC within the greenhouse. Lead, chromium, and arsenic were present at elevated levels in one sample within the greenhouse. No pesticides were found along the boundary with the Long Lots Elementary School. In addition, groundwater was sampled from an existing irrigation well on the northwestern property boundary. No pesticides were detected in groundwater.

A final sampling effort occurred at the 11 Hyde Lane property in December 2003 after soils were remediated. Confirmatory soil samples were collected from approximately 104 locations where soil was removed (footprint of the former greenhouses, composting area, and small area within the former orchard). Where confirmatory samples showed pesticides at levels exceeding CT RDEC, additional soils were removed from the area, and additional confirmatory samples were collected until all samples were below CT RDEC.

In summary, soil sampling at 11 Hyde Lane (Table 1) indicated that the primary soil contaminants were chlordane, dieldrin, and lead. Arsenic also was elevated but very infrequently. Chlordane, dieldrin, and lead were found at elevated levels almost exclusively beneath the former greenhouses. The maximum concentrations of chlordane and dieldrin were approximately 20 times above CT RDEC, within the footprint of one of the former greenhouses. The maximum lead concentration was roughly three times above the CT RDEC. Pesticides and lead were located primarily within shallow soils (<2 feet bgs). Although fewer samples were collected at depth (>2 feet bgs) than in surface soils, the data indicate that contaminants were not present in soils >2 feet bgs. Remedial activities performed in 2003 appear to have removed the contaminated soils on the property.

Groundwater on the site was not thoroughly investigated. Groundwater depth and directional flow were not formally established. Although limited, groundwater data suggest the site does not appear to have adversely affected groundwater.

Table 1. Summary of soil samples collected from 11 Hyde Lane (former Jaeger Nursery), 2001–2003, before site remediation, Westport, Connecticut*

Contaminant	Sample Depth (below ground surface)	Concentration Range (mg/kg)	No. samples exceeding CT RDEC†	CT RDEC (mg/kg)
Pesticides				
Chlordane	0–6 inches	ND - 9.3	7/31	0.490
	6–12 inches	ND - 6.5	7/28	
	0–2 feet	ND - 6.0	1/36	
Dieldrin	0–6 inches	ND - 0.800	6/31	0.038
	6–12 inches	ND - 0.590	16/28	
	0–2 feet	ND - 0.35	5/36	
4,4-DDT^	0–2 feet	ND - 6.4	1/36	1.8
Metals				
Lead	0–6 inches	ND - 1310	4/12	400§
	6–12 inches	ND - 625	2/23	
Arsenic	0–6 inches	ND - 10.3	1/12	10
	>2 feet	ND - 19.8	2/4	
Chromium (unspeciated)	0–6 inches	30.6 - 189	1/3	100 (hexavalent) 3900 (trivalent)

*Data are included only for contaminants and depth intervals where CT RDEC was exceeded.
†CT RDEC = Connecticut Residential Direct Exposure Criteria for soil. The CT RDEC are state cleanup standards (Connecticut Remediation Standard Regulations; CT RSRs) for soil developed to protect against daily exposure to soil by young children and adults for many years.
§CT DEP site-specific cleanup criterion for lead. This criterion will eventually become part of the site cleanup regulations (CT RSRs) and will be used statewide.
^ 4,4-dichlorodiphenyltrichloroethane

DISCUSSION

Exposure Pathway Analysis

To evaluate potential exposures to contaminants at the 11-13 Hyde Lane site, CT DPH evaluated the environmental data and considered how people might contact contaminants. The only possible pathway of exposure is through contact with soil. To be exposed to contaminants in soil, a person must contact the soil by touching it (dermal contact), inhaling soil particles (inhalation), or eating soil adhered to fingers or food items (ingestion).

Exposure to Soil—Past Conditions

Surface soil (0–6 inches bgs) and shallow subsurface soil (6 inches to 2 feet to bgs) at the 11 Hyde Lane property had elevated levels of pesticides and lead, and to a lesser extent, elevated levels of arsenic and chromium. Contaminated soils have been cleaned up. However, employees of the former rose farm (greenhouse workers) at 11 Hyde Lane could have been exposed to contaminants in surface soil. In addition, youth trespassers on the site could have been exposed to contaminants in surface soils. Finally, residents (including young children) of the home formerly located in the northeastern portion of the site could have contacted contaminated soil at the former rose farm. Contact with subsurface soils also could have occurred during any activities that involved digging into the soil.

Evaluating potential exposures of greenhouse workers, youth trespassers or on-site residents to contaminated soil is difficult because CT DPH does not know what activities occurred, in what locations, and for how long. However, CT DPH believes that the exposure potential for youth trespassers and on-site residents probably was low because the vast majority of soil samples showed contamination only within the footprint of the former greenhouses. Contaminated soil within a greenhouse would not have been easily accessible to anyone other than greenhouse workers. Depending on the location of soil contamination within the greenhouse, it may not have been accessible even to workers.

Because soil exposure could have occurred in the past, CT DPH evaluated potential past exposures using conservative (health protective) exposure assumptions, in the Public Health Implications Section.

Exposure to Soil—Current Conditions

In 2003, soil contamination at the 11 Hyde Lane property was cleaned up by the Town of Westport. In the northern portion of the site, a parking lot is being constructed. Because contaminated soil was cleaned up before construction activities began, no potential existed for construction activities to result in exposure to contaminated soil by construction workers or nearby residents.

The southern portion of 11 Hyde Lane has had limited soil sampling. Two small areas with elevated pesticide levels were cleaned up in 2003. The limited amount of data precluded CT DPH from making a definitive determination regarding whether elevated levels of contaminants remain in surface-accessible soil. However, the entire area was overgrown with brush, weeds, and thorns, making access to the area difficult. During the site visit, CT DPH staff found no evidence that trespassers were accessing this portion of the site. The dense vegetation provides a natural barrier to access. In addition, the potential for elevated pesticide levels is low because greenhouses never had been located in the southern portion of the site. Pesticide contamination appears greatest in areas where greenhouses were located. Under current conditions, exposure to contaminated soil in the southern portion of 11 Hyde Lane is considered an incomplete exposure pathway and is not evaluated further.

The Long Lots Elementary School (13 Hyde Lane) is located next to the former rose farm. Two soil samples taken along the boundary between the two properties shows no contamination. No migration pathway exists that would have brought contaminated soil from the rose farm to the school. Therefore, exposure to contaminated soil at Long Lots Elementary School is considered an incomplete exposure pathway and is not evaluated further.

Exposure to Groundwater

Groundwater has not been studied extensively at the 11 Hyde Lane site. One groundwater sample contained lead and a trace amount of the herbicide 2,4-D. However, both contaminant levels were below state and federal drinking water standards. Furthermore, groundwater at the site is not used for drinking water or for bathing. Therefore, groundwater is considered to be an incomplete exposure pathway and is not evaluated further.

Public Health Implications for Adults and Children—Past Exposures

To evaluate public health implications from contamination, CT DPH first compared maximum concentrations of contaminants with health-based comparison values. As stated previously, CT DPH used the CT RDEC as comparison values in this evaluation. When concentrations exceed comparison values, they are evaluated further to determine the likelihood that exposures would be sufficient to cause health effects. At the 11 Hyde Lane site, pesticides (chlordane, dieldrin, and 4,4-DDT) and metals (lead, arsenic, and chromium) were found in soil at levels exceeding comparison values. CT DPH further evaluated chlordane, dieldrin, and lead to evaluate the likelihood that exposures would be sufficient to cause adverse health effects. These evaluations are discussed below. 4,4-DDT, arsenic, and chromium were not evaluated further; explanations are provided below.

4,4-DDT

Doses and risks were not calculated for exposure to 4,4-DDT because 4,4-DDT was found in only one location above the CT RDEC and not in surface accessible soils. Thus, 4,4-DDT in soil at 11 Hyde Lane is extremely unlikely to have posed a health risk.

Chromium

Doses and risks were not calculated for exposure to chromium either because chromium was not tested for widely, and only one sample had total chromium exceeding the CT RDEC. The chromium was not speciated, so whether the CT RDEC for hexavalent chromium actually was exceeded is not known. More importantly, chromium is not associated with agricultural pesticides that might reasonably have been used at the rose farm or orchard (ATSDR 2000). No reason was found to expect non-pesticide-related contamination at this site.

Arsenic

Risks for arsenic were not calculated because only one surface soil sample had arsenic above the CT RDEC of 10 mg/kg, and the exceedance was small (10.3 mg/kg). Therefore, exposure to arsenic in soil at 11 Hyde Lane is extremely unlikely to have posed a health risk.

Chlordane and Dieldrin

CT DPH calculated doses and risks for chlordane and dieldrin assuming that a child or adult is exposed to contaminated soil through the ingestion and dermal pathways, 7 days per week, 9 months of the year, for 30 years. This risk calculation is protective of a child resident, a youth trespasser, or a greenhouse worker. A child younger than age 7 years is assumed not to be exposed. The maximum concentrations of chlordane (9.3 mg/kg) and dieldrin (0.8 mg/kg) were used in the calculations. CT DPH believes these are conservative (health protective) assumptions for the following reasons.

- Soil contamination was located primarily within the footprint of the former greenhouses. Contaminated soil within a greenhouse would not have been easily accessible to anyone other than greenhouse workers. Depending on the location of soil contamination within the greenhouse, it may not have been accessible even to workers. A child younger than

age 7 years living in the onsite residence probably would not contact soil in the greenhouses. Instead, a young child would be much more likely to contact soil in the immediate vicinity of the onsite residence. No evidence exists to suggest contamination of soil immediately surrounding the on-site residence. A child younger than age 7 years who attended Long Lots Elementary School is not likely to have trespassed inside the former greenhouses on a regular and continuing basis.

- Assuming that contact with soil does not occur during the winter, when the ground is frozen and possibly snow-covered, is realistic. In the northeast, the ground is frozen or snow-covered for approximately 3 months per year. Therefore, CT DPH used 9 months of exposure rather than 12 months.
- A 30-year exposure duration represents an upper percentile estimate of the length of time a person lives in the same home (EPA 1997). This assumption greatly overestimates the exposure duration for a child trespasser.
- The maximum contaminant concentration is conservative because exposures probably would have occurred at much lower concentrations than the maximum.
- Seven days per week overestimates the likely exposure frequency for a greenhouse worker and a youth trespasser. It probably also overestimates the exposure frequency for a child resident because the exposure area (former greenhouses) is not in the immediate vicinity of the residence.

On the basis of the conservative exposure assumptions described above, the doses and risks from exposure to chlordane at its maximum concentration were insufficient to cause health effects. Doses and risks from exposure to dieldrin at its maximum concentration also are insufficient to cause health effects (Attachment B). Noncancer risks from exposure to chlordane and dieldrin were low, and noncancer health effects are not expected. In addition, excess lifetime cancer risks ranged from less than one in one million to three in one million. This represents a very low increased cancer risk. These risk calculations are for potential, not actual, exposures; whether people actually were exposed is unknown. Therefore, cancer and noncancer risks calculated here do not describe actual risks to people. In addition, only a small number of people had the potential for past exposure. Even if exposures occurred, measuring adverse health effects among so few exposed people would not be possible.

Lead

Lead also was found at concentrations above comparison values. Risks from exposure to lead are assessed in terms of the predicted elevated blood lead level, rather than a numerical cancer and noncancer risk estimate. CT DPH evaluated public health implications from lead exposure by calculating the predicted increase in blood lead levels among people who could have been exposed. ATSDR has a screening procedure for evaluating exposures to lead (ATSDR 1999), which uses a blood lead slope factor that predicts the increase in blood lead per unit lead concentration in soil. CT DPH's calculations (Attachment B) predict that exposure to lead at the maximum concentration detected at the site is unlikely to result in an incremental blood lead level in children or adults above the level of concern for potential adverse health impacts. Therefore, adverse health effects from past exposures to lead are not expected.

EVALUATION OF COMMUNITY HEALTH CONCERNS

Community concerns were collected from various correspondences with the petitioner and during the site visit in July 2004. Each question/concern is listed, followed by a response.

***Question*:** Were the septic systems at the site tested and remediated properly?
***Answer**:* According to documentation provided by the Town of Westport (DPW 2004), both the septic tank for the greenhouses and the septic tank for the residence at 11 Hyde Lane were pumped out before they were removed. This procedure is consistent with Weston Westport Health District guidelines. The town's consultant used the "as built" for the greenhouse septic tank to identify a representative soil sampling location to determine whether the leach field was contaminated. The sample results indicated the leach field was not contaminated. Therefore, soil was not remediated in that area. Soil was not sampled in the leach field for the residential septic tank. Contamination would not be expected because it is a residence. According to the documentation reviewed by CT DPH, the procedures followed to address the former septic systems at the site appear to be adequate.

***Question*:** Is it safe for the southern portion of the 11 Hyde Lane property to be used by the town for a community garden and/or athletic fields?
***Answer*:** It may be. However, not enough soil sampling has been conducted on the southern portion of the property to determine with confidence whether contaminants are present in soils at levels exceeding Connecticut cleanup standards. Before the southern portion of the property is developed, additional site characterization is needed.

***Question*:** What about the current condition of the southern portion of the 11 Hyde Lane property? There has not been much testing, and there are no fences or signs to keep people away.
***Answer*:** During the site visit in July 2004, CT DPH observed that the southern portion of the 11 Hyde Lane property is overgrown with vegetation. Access through the area was difficult, and no evidence existed to suggest the area was used regularly by anyone. Casual use of this area (for example, walking) is unlikely to result in much contact with soil. Repeated contact with contaminated soil is necessary for significant exposure. In addition, the potential for elevated pesticide levels in soil is low because no greenhouses were ever located in the southern portion of the site. Pesticide contamination appears to be greatest in areas where greenhouses were located.

***Question*:** During the process of constructing the parking lot, the town may have moved some soil to the southern portion of the site. Should that soil be tested to be sure it is safe?
***Answer*:** Before construction began on the parking lot, contaminated soils were removed and disposed of off-site. Confirmation samples were collected to verify removal of the contamination. Therefore, the soil that may have been moved during parking lot construction should be clean soil. Nevertheless, before the southern portion of the site is developed, additional

soil sampling will be necessary on the entire portion to be developed, including any soil that was moved from elsewhere on the site.

***Question*:** What if the town's contractor did not find all the contamination on the northern part of 11 Hyde Lane? Is it safe to be used as a parking lot?
***Answer*:** Yes, it is safe to be used as a parking lot. If the soil contains elevated levels of contamination that were missed, the parking lot will provide a barrier to contact with soil. Without contact with the soil, exposure and risk cannot occur. According to the Permitting Documents (Town of Westport, 2004), nearly all of the parking lot area will be paved, which eliminates the possibility of contact with soil. Small areas of the parking lot that are not paved will have lawns or trees/shrubs, which also provide a good barrier to soil contact.

***Question*:** During the soil remediation project, soil to be removed from the site was consolidated in an area within the footprint of one of the greenhouses. The stockpiled soil was uncovered at various points in time from December 2003 until February 2004, when the soil was removed. Is it possible that the contaminated soil could have spread to other areas, such as Long Lots School, where children could be exposed to it?
***Answer*:** If the stockpiled soil was uncovered and was not frozen or covered with ice or snow, some of the soil could have been blown by the wind around the site and possibly off-site. However, this would not be a health concern. CT DPH evaluated doses and risks resulting from exposure to maximum contaminant levels found in the soil. CT DPH's evaluation showed that doses and risks were not sufficient to cause health effects. Furthermore, results of several soil samples collected along the border between Long Lots Elementary School and 11 Hyde Lane showed no contamination.

***Question*:** What about the workers who remediated the site? Were they exposed?
***Answer*:** The Occupational Safety and Health Administration establishes regulations and guidelines for ensuring the health and safety of workers. This includes workers potentially exposed to hazardous waste during remediation activities. CT DPH did not observe the remediation activities so it cannot comment on whether appropriate procedures were followed for worker protection.

***Question*:** Groundwater at the site may be flowing beneath Long Lots Elementary school. Could flooding at the school bring contamination from the site into the basement of the school where children could be exposed?
***Answer*:** Groundwater depth and flow at the 11 Hyde Lane site has not been formally determined but visual observations of the site suggest it flows northwest toward Muddy Brook and Long Lots School. Groundwater has not been sampled extensively either, but limited sample results indicate very low levels (below state and federal drinking water standards) of lead and the herbicide 2,4-D. If extensive flooding of the school involved infiltration of groundwater, that groundwater is unlikely to pose a health risk. Pesticides tend to bind strongly to soil, especially organic matter in soil, resulting in a low potential for groundwater contamination (ATSDR 1994, Health Canada 1994).

***Question*:** It is concerning that the town did not develop any overall strategy for investigating and remediating the 11 Hyde Lane site. In addition, the town supervised themselves during the demolition and remediation work at the site, rather than hire an environmental specialist to do the work, with oversight from the CT DEP.
***Answer*:** The Town of Westport hired an environmental consulting firm (ERL) to perform several environmental investigations at the 11 Hyde Lane site and to make recommendations regarding remediation. According to the reports CT DPH reviewed, ERL appears to have followed a logical approach to investigating the site. The town implemented each of ERL's recommendations regarding remediation. According to the documentation CT DPH reviewed, remediation was performed under the guidance and direction of ERL. ERL also collected the confirmatory soil samples to ensure that contamination was removed. The investigation and remediation work was done without CT DEP oversight, either directly or through a Licensed Environmental Professional (LEP), who acts on behalf of CT DEP. Under CT law, this type of site investigation and remediation work can be done without CT DEP or LEP oversight.

***Question*:** How deep were soil samples taken on the site? Were the samples deep enough to find all the contamination?
***Answer*:** Soil samples were collected as deep as 12 feet bgs in the area of the fuel UST and the septic leach field. In the test pit area, where fill reportedly had been placed, samples were collected as deep as 6 feet bgs. Within the footprint of the greenhouses, soil samples were taken as deep as 3 feet bgs. However, virtually all of the contamination was found at depths of one foot bgs or less. As stated previously, chlordane and dieldrin bind strongly to organic material in soil and do not leach significantly. They tend to remain in the top 7–8 inches of most soils (ATSDR 1994).

***Question*:** The town did not test the soil or groundwater for copper sulfate. Is this a problem?
***Answer*:** One of the many uses of copper sulfate is as a fungicide to control bacterial and fungal diseases of fruit, vegetable, nut, and field crops (ATSDR 2002). The former rose farm may have used copper sulfate in its orchard and other agricultural lands in the southern portion of the site. Copper sulfate is less likely to have been used on the greenhouse plants. When the southern portion of the site is fully characterized, soil and groundwater sampling should include copper analyses.

CONCLUSIONS

Environmental sampling at the 11 Hyde Lane property showed chlordane, dieldrin, and lead at elevated levels in shallow soils (<2 feet bgs) in a number of locations at the site (primarily in the northern portion of the site, within the footprint of former greenhouses). Elevated levels of pesticides also were found in a composting area and orchard area in the southern portion of the site. Elevated levels of arsenic and chromium were found as well, but very infrequently and not at significantly elevated levels. Remediation was performed in 2003 by the Town of Westport to remove the contaminated soils. A parking lot has been built on the northern portion of the site.

The southern portion of the 11 Hyde Lane site (which has not been developed into a parking lot) has received limited soil sampling. Because of the limited sampling data, it is not possible to conclude whether elevated levels of contaminants are present in surface accessible soils. However, the vegetation provides a natural barrier to access.

Groundwater has not been extensively studied, but limited sampling indicates the site does not appear to have contaminated the groundwater. Groundwater is not used for drinking or bathing. Two soil samples taken at the Long Lots Elementary School (13 Hyde Lane) show no contamination. Moreover, no migration pathway exists that would have brought contamination from the 11 Hyde Lane site to the school.

CT DPH has concluded that, under current site conditions, no exposure occurs at the site, and therefore, adverse health effects are not expected.

Before soil remediation, children and adults could have been exposed to contaminants in soil at the 11 Hyde Lane site. Greenhouse workers, trespassers, or on-site residents could have contacted contaminated soil. CT DPH calculated doses and risks from exposure to pesticides and lead in soil, using conservative assumptions. Even at the maximum concentrations, adverse health effects are unlikely.

Potential future exposures and risks in the southern portion of the 11 Hyde Lane site could not be evaluated because of the lack of soil data and because how that portion of the site will be developed is not known. Until these data gaps are filled, future risks cannot be determined.

ATSDR has a categorization scheme whereby the level of public health hazard at a site is assigned to one of five conclusion categories (Attachment C). CT DPH has concluded that under current conditions, the site poses *no public health hazard* because no potential exists for exposure. Under past conditions, *no apparent public health hazard* exists because potential exposure doses and risks are not significant enough to cause health effects.

RECOMMENDATIONS

1. The Town of Westport should collect sufficient samples from the southern portion of the 11 Hyde Lane site to fully characterize surface and subsurface soils and groundwater. This characterization should be completed before the area is developed and should include any soils moved from the northern portion of the site during parking lot construction. In addition, the history of the southern portion of the site should be researched to identify pesticides, herbicides, or fungicides that reasonably can be expected to have been used. Chemical analyses for soil and groundwater should include all contaminants that reasonably could have been applied. For example, analyses should include copper because copper sulfate may have been used in the former orchard.

2. The Town of Westport should consider entering the site into the voluntary remediation program (Section 22a-133x of the Connecticut General Statutes). This would authorize an LEP

to verify that investigation and cleanup of the southern portion of the site complies with all aspects of the CT Remediation Standard Regulations. Alternatively, the town should consider following the CT DEP Guidance on Development of Former Agricultural Properties (CT DEP 1999). This guidance recommends an approach for development of former agricultural lands that is feasible, yet protective of public health. Following this recommendation will help ensure that the future use of the southern portion of 11 Hyde Lane will not increase exposures or risks.

3. The Town of Westport should monitor groundwater at 11 Hyde Lane to ensure the effectiveness of soil remediation.

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CERTIFICATION

The Health Consultation for Evaluation of Environmental Data, Long Lots Elementary School (a.k.a. 11-13 Hyde Lane) was prepared by the Connecticut Department of Public Health 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 assessment was initiated.

Gregory V. Ulirsch
Technical Project Officer
Superfund Site Assessment Branch (SSAB)
Division of Health Assessment and Consultation (DHAC)
Agency for Toxic Substances and Disease Registry (ATSDR)

The Division of Health Assessment and Consultation (DHAC), ATSDR, has reviewed this Health Assessment and concurs with its findings.

Roberta Erlwein
Team Leader, SSAB,DHAC,ATSDR

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Preparer of Health Consultation

Margaret L. Harvey, MPH
Epidemiologist
Environmental and Occupational Health Program
Connecticut Department of Public Health

ATSDR Regional Representative:

William Sweet
EPA/New England

ATSDR Technical Project Officer:

Greg V. Ulirsch
Superfund Site Assessment Branch
Division of Health Assessment and Consultation
Agency for Toxic Substances and Disease Registry

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ATTACHMENT A

Site Map

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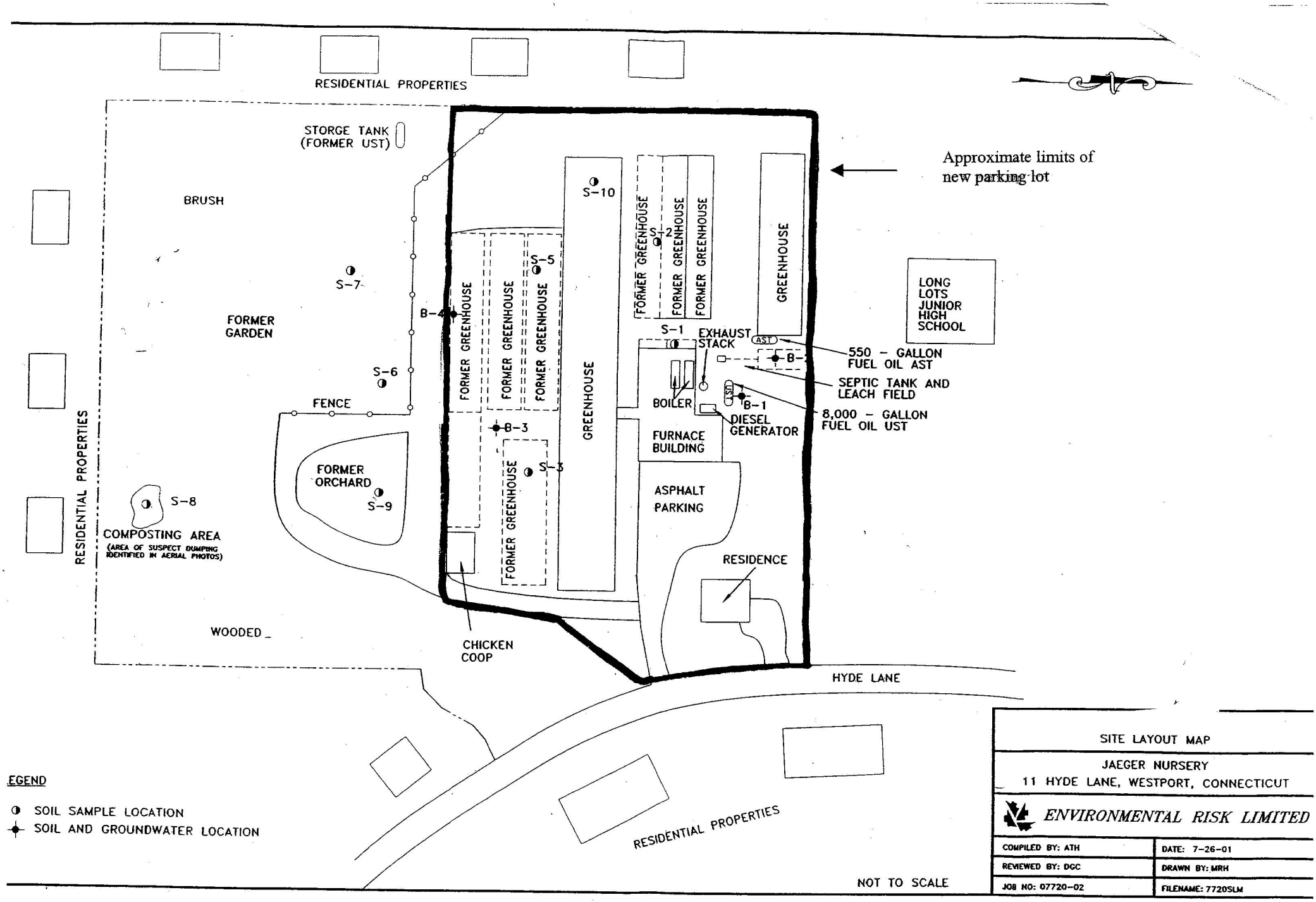

SITE LAYOUT MAP

JAEGER NURSERY
11 HYDE LANE, WESTPORT, CONNECTICUT

ENVIRONMENTAL RISK LIMITED

COMPILED BY: ATH	DATE: 7-26-01
REVIEWED BY: DGC	DRAWN BY: MRH
JOB NO: 07720-02	FILENAME: 7720SLM

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ATTACHMENT B

Dose and Theoretical Risk Calculations

The exposure assumptions made in these risk calculations are realistic, yet health protective. These risk calculations are done to assess the magnitude of doses and theoretical cancer and noncancer risks.

Chlordane

A. Noncancer risks, child aged 7-12 years

Ingestion Dose

This calculation estimates the average daily dose of chlordane a child, age 7-12 years would receive from incidental ingestion of soil.

ADD_i =IR*[Soil]*EF*ED*C1*C2* 1/BW*1/AT

ADD_i = 50 mg/d * 9.3 mg/kg*7 d/w*39w/y*6 y*10^{-6} kg/mg*y/365 d*1/33.5 kg*1/6 yr
= 1 E-5 mg/kg/ day

Dermal Dose

This calculation estimates the average daily dose of chlordane a child, aged 7-12 years would receive from dermal contact with soil.

ADD_d= [Soil]*AF*ABS*F*SA*EF*ED*C1*C2*1/BW*1/AT

ADD_d = 9.3 mg/kg*0.01mg/cm^2/-ev*0.04*1 ev/d*3254 cm^2* 7d/w*39w/y*6 y*10^{-6} kg/mg*y/365 d*1/33.5 kg*1/6y

ADD_d = 2.7 E-7 mg/kg/day

Noncancer Hazard Index - Chlordane

HI=ADD_i +ADD_d/RfD
HI= (1 E-5 + 2.7 E-7) / 5E-4

HI= 0.02

A Hazard Index of 1 means that the estimated dose is equal to the safe dose. A Hazard Index less than 1 indicates that the estimated dose is below the safe dose and noncancer health impacts are unlikely. A Hazard Index greater than 1 indicates that the estimated dose is above the safe dose and noncancer health impacts cannot be ruled out. In this case, Hazard Index is well below 1. This indicates that noncancer health impacts from chlordane are unlikely.

B. Cancer Risks, child/adult age 7-30

Ingestion Dose

This calculation estimates the lifetime average daily dose of chlordane a child/adult, age 7-30 years would receive from ingestion of soil.

$LADD_i$ =IR*[Soil]*EF*ED*C1*C2* 1/BW*1/AT

$LADD_i$ =50mg/d * 9.3 mg/kg * 7d/w * 39w/y * 24 yr * 10^{-6} kg/mg * y/365d * 1/50.5 kg * 1/70 yr
= 2.3 E-6 mg/kg/ day

Dermal Dose

This calculation estimates the lifetime average daily dose of of chlordane a child/adult, age 7-30 years would receive from dermal contact.

$LADD_d$= [Soil]*AF*ABS*F*SA*EF*ED*C1*C2*1/BW*1/AT

$LADD_d$ =
9.3 mg/kg*0.01mg/cm^2/-ev*0.04*1ev/d * 4499 cm^2 * 7d/w * 39w/y * 24 y * 10^{-6} kg/mg * y/365 d * 1/50.5 kg*1/6y
= 8.5E-8 mg/kg/day

Cancer Risk - Chlordane

ELCR = ($LADD_i$ + $LADD_d$) * CSF
ELCR = 2.4E-6 mg/kg/day * 0.35 $(mg/kg/day)^{-1}$
ELCR = 8.3 E-7

The Estimated Lifetime Risk for chlordane is 8 E-7 (8 in 10 million). This means that if 10 million people were exposed to chlordane in soil at the concentration, frequency and duration of exposure assumed in the calculations detailed above, there would be a theoretical increase of 8 cancers above the number of cancers that would normally be expected to occur in the population of 10 million. Background rates of cancer in the U.S. are one in 2 or 3 (National Cancer Institute 2001). This means that in a population of 10 million, background numbers of cancer cases would be approximately 3-5 million. Chlordane exposures from the site could result in a theoretical increase of 8 cancer cases above this background number. This represents an extremely low increased cancer risk.

Dieldrin

A. Noncancer risks, child aged 7-12 years

Ingestion Dose

This calculation estimates the average daily dose of dieldrin a child, age 7-12 years would receive from incidental ingestion of soil.

ADD_i =IR*[Soil]*EF*ED*C1*C2* 1/BW*1/AT

ADD_i = 50 mg/d * 0.8 mg/kg* 7d/w* 39w/y*6 y*10^{-6} kg/mg*y/365 d*1/33.5 kg*1/6 yr
= 8.9 E-7 mg/kg/day

Dermal Dose

This calculation estimates the average daily dose of dieldrin a child, aged 7-12 years would receive from dermal contact with soil.

ADD_d= [Soil]*AF*ABS*F*SA*EF*ED*C1*C2*1/BW*1/AT

ADD_d = 0.8 mg/kg*0.01mg/cm^2/-ev*0.04*1 ev/d*3254 cm^2* 7d/w*39w/y*6 y*10^{-6} kg/mg*y/365 d*1/33.5 kg*1/6y

ADD_d = 2.3 E-8 mg/kg/day

Noncancer Hazard Index-Dieldrin

$HI=ADD_i + ADD_d/RfD$
HI= (8.9 E-7 + 2.3 E-8) / 5E-5

HI= 0.01

A Hazard Index of 1 means that the estimated dose is equal to the safe dose. A Hazard Index less than 1 indicates that the estimated dose is below the safe dose and noncancer health impacts are unlikely. A Hazard Index greater than 1 indicates that the estimated dose is above the safe dose and noncancer health impacts cannot be ruled out. In this case, Hazard Index is well below 1. This indicates that noncancer health impacts from dieldrin are unlikely.

C. Cancer Risks, child/adult age 7-30

Ingestion Dose

This calculation estimates the lifetime average daily dose of dieldrin a child/adult, age 7-30 years would receive from ingestion of soil.

$LADD_i$ =IR*[Soil]*EF*ED*C1*C2* 1/BW*1/AT

$LADD_i$ =50mg/d * 0.8 mg/kg * 7d/w * 39w/y * 24 yr * 10^{-6} kg/mg * y/365d * 1/50.5 kg * 1/70 yr
= 2 E-7 mg/kg/ day

Dermal Dose

This calculation estimaes the lifetime average daily dose of of dieldrin a child/adult, age 7-30 years would receive from dermal contact.

$LADD_d$= [Soil]*AF*ABS*F*SA*EF*ED*C1*C2*1/BW*1/AT

$LADD_d$ =
0.8 mg/kg*0.01mg/cm^2/-ev*0.04*1ev/d * 4499 cm^2 * 7d/w * 39w/y * 24 y * 10^{-6} kg/mg * y/365 d * 1/50.5 kg*1/6y
= 7.3 E-9 mg/kg/day

Cancer Risk - Dieldrin

ELCR = ($LADD_i$ + $LADD_d$) * CSF
ELCR = 2 E-7 mg/kg/day * 16 $(mg/kg/day)^{-1}$
ELCR = 3 E-6

The Estimated Lifetime Risk for chlordane is 3 E-6 (3 in one million). This means that if one million people were exposed to chlordane in soil at the concentration, frequency and duration of exposure assumed in the calculations detailed above, there would be a theoretical increase of 3 cancers above the number of cancers that would normally be expected to occur in the population of one million. Background rates of cancer in the U.S. are one in 2 or 3 (National Cancer Institute 2001). This means that in a population of one million, background numbers of cancer cases would be approximately 330,000-500,000. Chlordane exposures from the site could result in a theoretical increase of 3 cancer cases above this background number. This represents an very low increased cancer risk.

WHERE:

ADD_i = average daily dose from ingestion
ADD_d = average daily dose from dermal contact
$LADD_i$ = lifetime average daily dose from ingestion
$LADD_d$ = lifetime average daily dose from dermal contact
IR = soil ingestion rate; 50 mg/day (EPA 1997)*
AF = skin-soil adherence factor for central tendency adult resident; 0.01 mg/cm^2-ev (EPA 2001)
ABS = Soil dermal absorption fraction; 0.04 (EPA 2001)
SA = Skin surface area, 50th %ile legs, feet, hands- 3254 cm^2, 7-12 yrs; 4499 cm^2, 7-30 yrs (EPA 2001)
[Soil] = soil concentration; chlordane 9.3 mg/kg; dieldrin 0.8 mg/kg
EF = exposure frequency; 7 d/w, 39 w/yr
F = event frequency; 1 ev/day
ED = exposure duration; 6 years for noncancer calculations, 24 years for cancer calculations
C1 = conversion factor; 10^{-6} kg/mg
C2 = conversion factor; 1 year/365 days
BW = 50th %tile body weight; 33.5 kg (age 7-12 yrs); 50.5 kg (7-30 yrs); (EPA 1997)
AT = averaging time; 6 yrs (noncancer calculations); 24 yrs (cancer calculations)
RfD = EPA oral Reference Dose; chlordane: 5E-4 mg/kg/day; dieldrin: 5 E-5 mg/kg/day (IRIS)
CSF = Cancer Slope Factor; chlordane: 0.35 (mg/kg/day)$^{-1}$; dieldrin: 16 (mg/kg/day)$^{-1}$ (IRIS)
HI = Hazard Index
CSF = Cancer Slope Factor

** EPA (1997) recommends using a soil ingestion rate of 50 mg/day for a child/adult ≥6 years. EPA states that this value represents a best estimate of the average soil ingestion rate. EPA programs have used 100 mg/day as a conservative estimate of average soil intake for a child/adult ≥6 years. CT DPH opted to use the best estimate average value of 50 mg/day rather than the more conservative estimate for the sake of consistency with other parameters describing the receptor which are also central estimates (for example, body weight, skin surface area and skin-soil adherence).*

Lead

Estimated Incremental Blood Lead Burden from Exposure to Lead, 11 Hyde Lane, Westport, CT (using ATSDR's Screening Procedure, July 1999).

Exposed Person	Soil Lead Concentration* (mg/kg)	Soil Slope Factor (µg/dL blood lead per mg/kg soil lead)	Fraction of play or work time spent in one's own yard	Estimated Incremental Blood Lead Burden (µg/dL)
Child	1310	0.0068	0.5 (50%)	4

*The maximum soil lead concentration detected.

The ATSDR screening procedure involves multiplying the lead level in soil by the percentage of outside time a person spends in contact with contaminated soil. This is then multiplied by the blood lead-to-soil lead slope factor. CT DPH used a blood lead slope factor for U.S. children of 0.0068, which is derived from a study of U.S. children from 1–18 years of age (Angle et al. 1984). This slope factor is protective for adults as well. For the percentage of outside time spent in contact with contaminated soil, CT DPH used 50% (rather than 100%, which would typically be used for a residential yard). CT DPH believes that 50% is a reasonable assumption because the exposure scenario is not residential, but rather a trespasser or worker scenario. The estimated incremental blood lead level of 4 µg/dL is well below the level of concern for adverse health effects. The Centers for Disease Control and Prevention (CDC) considers 10 micrograms per deciliter (10 µg/dL) of lead in children's blood to be a level of concern for possible adverse health effects. CT DPH considers 20 µg/dL to be a level of concern for adults.

ATTACHMENT C
ATSDR INTERIM PUBLIC HEALTH HAZARD CATEGORIES

CATEGORY / DEFINITION	*DATA SUFFICIENCY*	*CRITERIA*
A. Urgent Public Health Hazard *This category is used for sites where short-term exposures (< 1 yr) to hazardous substances or conditions could result in adverse health effects that require rapid intervention.*	*This determination represents a professional judegment based on critical data which ATSDR has judged sufficient to support a decision. This does not necessarily imply that the available data are complete; in some cases additional data may be required to confirm or further support the decision made.*	*Evaluation of available relevant information* indicates that site-specific conditions o likely exposures have had, are having, or are likely to have in the future, an adverse impact on human health that requires immediate action or intervention. Such site-specific conditions or exposures may include the presence of serious physical or safe hazards*
B. Public Health Hazard *This category is used for sites that pose a public health hazard due to the existence of long-term exposures (> 1 yr) to hazardous substance or conditions that could result in adverse health effects.*	*This determination represents a professional judgement based on critical data which ATSDR has judged sufficient to support a decision. This does not necessarily imply that the available data are complete; in some cases additional data may be required to confirm or further support the decision made.*	*Evaluation of available relevant information* suggests that, under site-specific conditions of exposure, long-term exposures to site-specific contaminants (including radionuclides) have had, are having, or are likely to have in the future, an adverse impact on human health that requires one or more public health interventions. Such site-specific exposures may include the presence of serious physical or safety hazard*
C. Indeterminate Public Health Hazard *This category is used for sites in which "critical" data are insufficient with regard to extent of exposure and/or toxicologic properties at estimated exposure levels.*	*This determination represents a professional judgement that critical data are missing and ATSDR has judged the data are insufficient to support a decision. This does not necessarily imply all data are incomplete; but that some additional data are required to support a decision.*	*The health assessor must determine, using professional judgement, the "criticality" o such data and the likelihood that the data can be obtained and will be obtained in a timely manner. Where some data are available, even limited data, the health assesso is encouraged to the extent possible to select other hazard categories and to support their decision with clear narrative that explains the limits of the data and the rationa for the decision.*
D. No Apparent Public Health Hazard *This category is used for sites where human exposure to contaminated media may be occurring, may have occurred in the past, and/or may occur in the future, but the exposure is not expected to cause any adverse health effects.*	*This determination represents a professional judgement based on critical data which ATSDR considers sufficient to support a decision. This does not necessarily imply that the available data are complete; in some cases additional data may be required to confirm or further support the decision made.*	*Evaluation of available relevant information* indicates that, under site-specific conditions of exposure, exposures to site-specific contaminants in the past, present, o future are not likely to result in any adverse impact on human health.*
E: No Public Health Hazard *This category is used for sites that, because of the absence of exposure, do NOT pose a public health hazard.*	*Sufficient evidence indicates that no human exposures to contaminated media have occurred, none are now occurring, and none are likely to occur in the future*	

**Such as environmental and demographic data; health outcome data; exposure data; community health concerns information; toxicologic, medical, and epidemiologic data; monitoring and management plans*