# Health Consultation

CAM-OR INCORPORATED

CITY OF WESTVILLE, LAPORTE COUNTY, INDIANA

EPA FACILITY ID: IND005480462

MARCH 29, 2005

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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Prepared by:
Indiana State Department of Health
Under Cooperative Agreement with the
U.S. Department of Health and Human Services
Agency for Toxic Substances and Disease Registry

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**March 18, 2005**

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## Background and Statement of Issues

In a response to a request from the Agency for Toxic Substances and Disease Registry (ATSDR), the Indiana State Department of Health (ISDH) completed this public health consultation to determine whether private wells in the area of the CAM-OR site are being impacted by 1, 4-dioxane in the groundwater.

The CAM-OR site is a former waste-oil refinery on the north side of Westville in LaPorte County, Indiana (Figure 1). The site consists of approximately 15 acres west of the intersection of U.S. Highway 421 and State Highway 2. The onsite buildings and tanks were removed in 1998. The United States Environmental Protection Agency (U.S. EPA) is still conducting remedial activities regarding the 1, 4-dioxane groundwater contamination plume. The pattern of 1, 4-dioxane concentrations in the groundwater defines a plume that extends from 3,000 feet southwest of the CAM-OR site at a depth of 150 feet along State Road 2 approximately 0.8 miles (1).

In 1999, the CAM-OR Site Extended Potentially Responsible Party (PRP) Group conducted a private well survey in the Coulter Road Loop area of the 1,4 –dioxane contamination. A total of 20 private wells were documented from the survey. Also, during 1999, the CAM-OR Site Extended Potentially Responsible Party (PRP) Group, in cooperation with the town of Westville completed installation of a municipal water supply system extension to the Coulter Road Loop area (2).

Between June and July 2000, a total of 14 private water wells in the Coulter Road Loop area were identified. Eleven residences and businesses agreed to connect to the municipal water system and to abandon their existing private water supply wells, the remaining wells had been abandoned previously. (3, 4).

Although land use surrounding Westville is principally agricultural, local industries include automobile salvage, trucking, package shipping, and delivery. Agricultural land use predominates immediately to the north and west of the site; residential areas are immediately south and east. An abandoned railroad grade runs along the western edge of the site. The Westville Correctional Facility, operated by the Indiana Department of Correction, is approximately 1 mile south from the center of town (1).

As per the 2000 census, the population in Westville was 2,116, with 897 occupied housing units. Westville resides in New Durham Township (5).

In the past, the town of Westville had two water supply wells (Municipal-1 and Municipal- 2); however currently only Municipal well-1 is pumped on a regular basis. In February 2000, a new well field was installed. It operates 0.5 miles east and upgradient of the CAM-OR site. Groundwater flow is believed to be southwest (1).

The town of Westville has a total of 385 customers that are connected to municipal water. In the Coulter Road Loop area, there are approximately 50 customers that are connected and approximately ten residents are not connected to municipal water. (Bart Frank, Town of Westville Utility, personal communication 2004).

**Current Conditions**

The CAM-OR Site Extended PRP Group, with the oversight of EPA, is conducting a Remedial Investigation/Feasibility Study (RI/FS) of the CAM-OR site and surrounding area to determine the source of the 1,4-dioxane contamination. EPA and the CAM-OR Site Extended PRP Group have monitoring well locations offsite that are situated between some of the private wells in the area and the contamination plume. These monitoring wells should provide information that will assist in determining the impact of 1,4-dioxane on private wells. The RI/FS is expected to be available in early 2006 (Pam Molitor, EPA, Region 5, personal communication, 2004).

**Discussion of Environmental Sampling**

Between April and December 1997, the Cam-OR Site Extended PRP Group and EPA sampled twenty-seven private wells for 1,4-dioxane. The wells sampled were located southwest and downgradient of the site, primarily along state routes 2 and 6, and County Road 1100 West.

The highest concentrations were 34 parts per billion (ppb) found in RW-2 (April 1997), 9 ppb in RW-3 (April 1997), and 14 ppb in RW-6 (June 1997). Private well RW-2 is outside of the area where the 1,4-dioxane has been mapped. Dioxane has not been detected in samples from monitoring wells which are all between RW-2 and the dioxane plume originating from the CAM-OR site. EPA has not determined the source of the 1, 4-dioxane in the private wells (See Table 1).

Private wells RW-3 and RW-6 are in the area of the 1, 4-dioxane plume. A re-sample of RW-2 (in June and August 1997) and RW-6 (September 1997) showed the private wells to be non-detect. Private well RW-2 was abandoned in June 2000. In June 2002, private well RW-3 was abandoned (1, 6). Private well RW-6 was connected to municipal water during 2000 (Pam Molitor, EPA, Region 5, personal communication, 2005).

**Table 1. Private Well Sampling Results**

| Private Well | June 1997 sampling (ppb) | Aug/Sept 1997 confirmation | Abandoned or connected |
|---|---|---|---|
| RW-2 | 34 | Non-detect | June2000 |
| RW-3 | 9 | Non-detect | June 2002 |
| RW-6 | 14 | Non-detect | 2000 |

**Human Exposure Pathways**

The available data are insufficient to allow a definitive evaluation of past exposures. IDHS assumed that the maximum levels reported for each well were reflective of historic levels. It is possible that past exposures could have been higher or lower than the available data suggest.

Exposure pathways can exist for the past, present and future. The elements of an exposure pathway are: source, mechanism of transport (media), exposure point, exposure route, and receptor population. An exposure pathway is complete when all elements are present. A potential exposure pathway is when at least one of the elements is not present. In the past, there was a completed exposure pathway due to the detection of 1, 4-dioxane in three private wells. Potential exposure could occur in the future from other private wells in the area of the 1, 4-dioxane plume. The source of the 1, 4-dioxane in the private wells has not been identified. It is possible that contamination could spread in the future and impact other wells, therefore, ISDH and ATSDR considers the exposure pathway as potential for future exposure.

See Table 2 for completed exposure pathway and Table 3 for potential exposure pathway summaries.

**Table 2. Completed Exposure Pathway**

| Source | Media | Exposure Point | Exposure Route | Receptor Population | Time of Exposure | Contaminant of Concern |
|---|---|---|---|---|---|---|
| Groundwater Contamination | Groundwater | Private Wells- Tap, Bathing, Showering | Ingestion Inhalation Dermal Contact | Residents | Past | 1, 4 –Dioxane |

**Table 3. Potential Exposure Pathway**

| Source | Media | Exposure Point | Exposure Route | Receptor Population | Time of Exposure | Contaminant of Concern |
|---|---|---|---|---|---|---|
| Groundwater Contamination | Groundwater | Private Wells- Tap, Bathing, Showering | Ingestion Inhalation Dermal Contact | Residents | Present Future | 1-4 –Dioxane |

## Public Health Implications

1, 4-Dioxane is a clear liquid that dissolves in water. It is used primarily as a solvent in the manufacture of chemicals and as a laboratory reagent. Trace amounts are used in cosmetics, detergents, and shampoos (7). Specific information on the exposure of children to 1,4-dioxane does not exist. As for adults in the general population, small exposures occur from the normal ingestion of food and drinking water, inhaling air, and dermal contact with consumer products (e.g., baby shampoo, household detergents) containing 1,4-dioxane. The extent of this possible exposure route in the general population is unknown (8).

## Non Cancer Health Effects

Limited information exists regarding the health effects of 1,4-dioxane in humans. Yet, the available data is sufficient to clearly identify the liver and kidneys as the target organs for 1,4-dioxane toxicity following short-term exposure to relatively high amounts of 1,4-dioxane, regardless of the route of exposure. This has been corroborated in animal studies (8).

When 1,4-dioxane is found in tap water, ingestion is the primary exposure route of concern. In this scenario, exposures can also occur through inhalation, and dermal contact during activities such as showering, bathing, and laundering.

It should be noted that exposure to 1, 4-dioxane by breathing in evaporated contaminated water during showering or other indoor activities can result in exposures that equal or exceed exposures from ingestion.

The ATSDR comparison value (CV) in drinking water for 1, 4-dioxane is 1,000 ppb for children and 4,000 ppb for adults. A comparison value is a calculated concentration of a substance in air, water, food, or soil that is unlikely to cause harmful (adverse) health effects in exposed people. CVs are used as a screening levels to determine contaminants needing in depth review.

ATSDR has established a minimal risk level (MRL) for 1, 4-dioxane. A MRL a level of exposure below which adverse effects are not expected. The MRL is not intended to define clean-up or action levels for ATSDR or other Agencies. The ATSDR oral MRL for acute exposure is 4 milligrams per kilo gram per day (mg/kg/day); the oral intermediate (15-364 days) exposure for 1, 4-dioxane is 0.6 mg/kg/day; and the oral chronic exposure is 0.1 mg/kg/day. A chronic exposure dose calculation for the 1, 4-dioxane maximum concentration in private well RW-2 (34 ppb) shows that the results for an adult and a child are unlikely to cause any adverse health effects from ingestion. See Appendix A for a dose calculation of 1, 4-dioxane (8). Similarly, adverse effects from inhalation and dermal exposure are not likely.

## Carcinogenic Effects

On the basis of inadequate evidence in humans and sufficient evidence in experimental animals, the International Agency for Research on Cancer (IARC) has determined that 1, 4-dioxane is possibly carcinogenic to humans. The U.S. Department of Health and Human Services (DHHS) considers 1,4-dioxane as reasonably anticipated to be a human carcinogen on the basis sufficient evidence of carcinogenicity in experimental animals. EPA has established that 1,4-dioxane is a probable human carcinogen on the basis of inadequate evidence in people and sufficient evidence in animals.

EPA has developed cancer risk values for 1, 4-dioxane based on the increased incidence of tumors of the nasal cavity in male Osborne-Mendel rats in a 2-year drinking –water bioassay. The relevance of these tumors to human has been questioned. It was suggested that the tumors resulted from inspiration of water containing 1,4-dioxane into the nasal cavity. Preliminary studies with a dye in the drinking water have demonstrated that large amounts of inhaled water may be deposited directly into the nose. The lack of nasal tumors in mice in chronic oral studies could be due to different tissue sensitivity and/or repair mechanism, or to a difference in anatomical features. Also, the lack of nasal cytotoxicity and nasal tumors in Wistar rats exposed intermittently to 111 parts per million (ppm) 1,4-dioxane in the air for 2 years suggests that the minimal effective dose may not have been reached (7,8).

That highest concentrations of 1,4-dioxane found in the private wells near the CAM-OR site are many times lower than the levels cited in available studies where the target organs (liver and kidneys) are affected by exposure to 1, 4-dioxane is much higher than the maximum concentration detected. Based on the limited sampling data available, past exposures through well water use are not likely to have resulted in an increase risk of cancer.

## Child Health Considerations

It appears that children are exposed to 1, 4-dioxane in the same manner as adults. Very few studies have looked at the effects of 1, 4-dioxane on children. It is not known whether children are different in their weight-adjusted intake of 1, 4-dioxane. Additional studies would help to determine if children are more or less exposed to 1, 4-dioxane as compared to adults. Just as adults, children can be exposed to 1,4-dioxane from drinking contaminated well or tap water, from showering or bathing with contaminated water and from using consumer products that contain small amounts of 1,4-dioxane. Based on available data, these risks are very low.

EPA recommends that the level of 1, 4-dioxane in drinking water that children drink for 1 day not exceed 400 ppb if they drink the water for 10 days. The EPA has not yet

established a Federal drinking water standard or maximum contaminant level (MCL) for 1, 4-dioxane (10).

The dose calculated for children being exposed to 1, 4-dioxane from the maximum concentration detected in the private wells tested is unlikely to have any health impact. Studies indicate that 1,4-dioxane levels causing adverse health effects are much higher than those calculated. See Appendix A for the estimated child dose calculation.

**Conclusions**

It is unknown whether people who drank 1, 4-dioxane in their water in the past were exposed to levels that are a public health threat. If the limited data available are reflective of levels present historically, health effects from past exposures would not be expected.

The extension of the municipal water supply system to the area of the affected private wells RW-2, RW-3, and RW-6 has removed the exposure pathway. Private wells RW-2 and RW-3 have been abandoned. Private well RW-6 is connected to municipal water. ISDH concludes the private wells near the 1, 4 dioxane contamination plume currently poses no apparent public health hazard.

According to EPA, the 1, 4- dioxane detected in private well RW-2 appears to be impacted from another source. It could impact additional water supplies if the contamination migrates and the source is not controlled.

**Recommendations**

- Identify the source of the 1,4-dioxane groundwater contamination.

- Monitor/sample private wells in the area of the 1, 4-dioxane groundwater contamination plume that may still be affected by 1, 4-dioxane contamination.

**Public Health Action Plan**

- The CAM-OR PRP Site Extended Group, through the oversight of EPA, will identify the 1, 4- dioxane source during the RI/FS investigation. The RI/FS was begun during the summer of 2003. EPA expects the RI/FS to become final in 2006. Currently, no more private well sampling is planned during the remainder of the RI/FS investigation. There are monitoring wells between some of the private wells that will be sampled to assist in determining the 1, 4-dioxane source.

- In 1999, the CAM-OR PRP Site Extended Group installed a municipal water line to the Coulter Road Loop area where affected private well users have the opportunity to connect to municipal water.

## References


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4. Arcadis Geraghty & Miller, Inc., abandonment of private water supply wells, cam-or site, westville, indiana, December 2000.

5. U.S. Census Bureau, Profile of general demographic characteristics: 2000, summary file sf-2, westville, Indiana, www.census.gov/main2000.html.

6. Engineering Management, Inc., Cam-Or superfund site private well abandonment, December 2000.

7. ATSDR, Public health statement for 1, 4-dioxane, September 2004.

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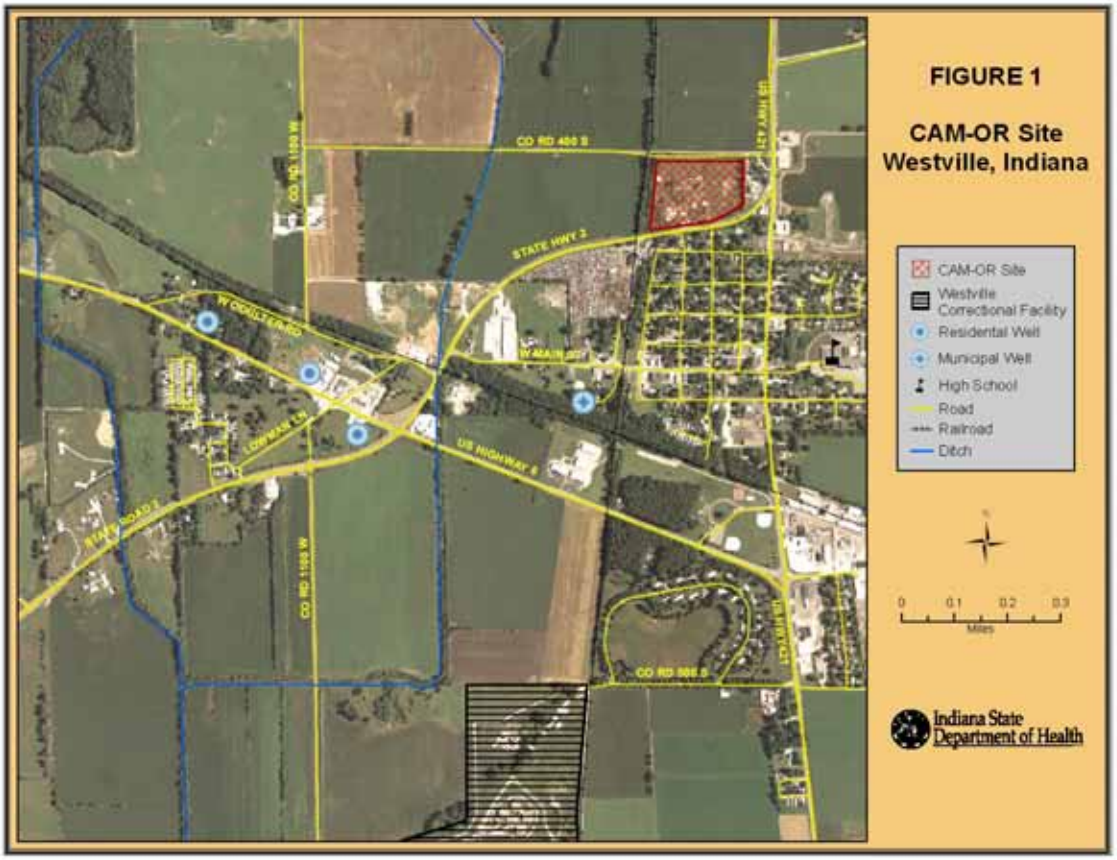
## Authors


Garry L. Mills
Environmental Manager
Environmental Epidemiology Section

LaNetta Alexander
Director
Environmental Epidemiology Section

**CAM-OR Site Map**

**Figure 1.**
**CAM-OR Site Map**



# Appendix A
# Private Well Estimated Dose Calculation

## Estimated Dose Calculation

IDw = ingestion exposure dose, milligrams per kilo grams per day (mg/kg/day)
C = contaminant concentration, milligrams per Liter (mg/L)
IR = ingestion rate, Liter per day (L/day)
EF = exposure factor (unitless)
BW = body weight, kilograms (kg)
Adult- 70 kg =154 pounds
Child - 10 kg = 22 pounds

**Adult**

$$IDw = \frac{0.034 \text{ mg/L} \times 2 \text{ L/day} \times 1}{70 \text{ kg}} = 0.0001 \text{ mg/kg/day}$$

**Child**

$$IDw = \frac{0.034 \text{ mg/L} \times 1 \text{ L/day} \times 1}{10 \text{ kg}} = 0.0034 \text{ mg/kg/day}$$

**Certification**

This Cam-or Incorporated, Westville, Indiana Public Health Consultation was prepared by the Indiana State Department of Health 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 that the health consultation was initiated. Editorial review was completed by the Cooperative Agreement partner.

Technical Project Officer, CAT, SPAB, DHAC

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

Team Lead, CAT, SPAB, DHAC, ATSDR