

Health Consultation

WISCONSIN FUEL AND LIGHT
FORMER MANUFACTURED GAS PLANT

CITY OF MANITOWOC, MANITOWOC COUNTY, WISCONSIN

EPA FACILITY ID: WID007946510

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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

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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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HEALTH CONSULTATION

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Prepared by:

Wisconsin Department of Health and Family Services
Under Cooperative Agreement with the
U.S. Department of Health and Human Services
Agency for Toxic Substances and Disease Registry

Summary

The Wisconsin Department of Health and Family Services (DHFS), at the request of the Wisconsin Department of Natural Resources (WDNR), reviewed environmental assessment data collected from the site of a former manufactured gas plant (MGP) in Manitowoc Wisconsin in order to evaluate possible health hazards associated with contamination in sediment. Elevated concentrations of polycyclic aromatic hydrocarbons (PAHs) are present in sediment and are visibly and continuously released to surface waters of the Manitowoc River in the form of an oily sheen. The sheen on the Manitowoc River near the former MGP is a health hazard for anyone who comes in contact with the coal tars. The health hazard will likely continue for as long as the coal tar-contaminated sediment mass remains. DHFS recommends the placement of signs advising the public of the problem and the development of both short-term and permanent remedies for the coal tar release from contaminated sediment.

Background and Statement of Issues

A manufactured gas plant (MGP) was formerly located on the Manitowoc River at 402 North Tenth Street, Manitowoc. Upland portions of the site underwent remediation in the early 1990s (Earth Tech 1995). MGP wastes, primarily coal tars, remain in Manitowoc River sediments adjoining the site. These sediments are currently being evaluated by environmental consultants (NRT 2003) for Wisconsin Public Service Corporation (WPSC), under the oversight of the WDNR.

Oily sheens have been reported in areas of the Manitowoc River near the site of the former MGP. Current environmental assessments indicate that the oil sheens are related to contaminated sediments remaining from the former MGP. The river bank in this area sees some recreational use, primarily fishing. This report addresses the question of health risk from exposure to these oil sheens and coal tar-contaminated sediments.

Discussion

Site visit. DHFS visited the site on September 15, 2004. The riverbank of the former MGP property consists of sheet piling capped by a concrete walkway and steel handrail (Figure 1: A,B). The river adjacent to the sheet piling and walkway is obviously affected by surface sheens (Figure 1: C,D). During the site visit, oily globs frequently rose to the surface, without any obvious source of disturbance to sediments, where they immediately spread into the sheen layer. The adjacent river is a deep turning basin serving barge traffic. The riverbank in this area is neither safe nor attractive for swimming or wading. The property along this part of the river is privately owned but has no obvious restrictions to access, fencing, or placards that would indicate a hazard. Local reports indicate the walkway is used for fishing. The riverbank here does not appear to be used for mooring or anchoring of recreational boats. There are no mooring facilities here, and there are many preferable mooring and anchoring locations in the city.

Exposure evaluation. A coal tar-associated hydrocarbon sheen on surface waters always presents a risk of skin contact exposure to polycyclic aromatic hydrocarbons (PAHs) typically found in coal tars (ATSDR 1995; 2000; 2002). Exposure to those hydrocarbons could occur through skin contact with the sheens or through hand contact and secondary ingestion of the oils. There is no exposure pathway through affected groundwater. Due to metabolism of PAHs in fish, there is no significant accumulation PAHs in fish muscle (Nakata et al. 2003, Hellou et al. 1999). In the area near the former MGP, most exposure would be related to fishing, and exposure comes directly from the scales of fish being handled. Most of the exposure is to the hands, with a lesser probability from splashes to limbs or face. Some of the hydrocarbons could also be ingested after being transferred by hand contact to food or cigarettes. In addition to exposure related to fishing, there is a potential for skin contact via wading. Immediately upstream from the wall is a steep wooded stream bank that has signs of frequent use by children and others, evidenced by foot traffic erosion, child construction projects, and empty beer cans. The river in this area is shallow enough to wade, and it is likely that the sheens could wind-drift into this wading area. Here, significant exposure is possible, but with unknown frequency.

Predicting risk from the concentration of contaminants in sediment. People who contact water along the riverbank of the former MGP unknowingly come in contact with coal tars released from sediments. At this time, enough information exists to make general conclusions and recommendations about avoiding acute effects from exposure to surface sheens observed in the Manitowoc River, but insufficient information exists to make formal predictions of risk from chronic exposure. The uppermost layer of sediments sampled in the phase I environmental assessment (NRT 2003) contains contaminants consistent with weathered coal tar (summarized in Table 1), and the oily sheen observed rising to surface waters above these sediments is similar to creosote oil (WDNR 2003). The current environmental assessments of the coal tar mass in sediment indicate that the contaminants are sufficiently extensive and immobile to allow their release to surface waters for many years. Some risk assessments have attempted to predict the partitioning of contaminants from sediment into the water column and the subsequent risk of exposure from contact with either water or sediment. There are no widely accepted human health standards or guidelines for contaminants in sediment. Wisconsin's Consensus-Based Sediment Quality Guidelines (CBSQG: WDNR 2003) were developed primarily for ecological risk assessment, based on direct effects to benthic organisms. For the purpose of predicting risk to humans, the CBSQGs (Table 1) are generally stringent.

The presence of a hydrocarbon slick or sheen creates a special case of the sediment-to-water skin exposure model. Hydrocarbons floating on the water surface can be regarded as a thin concentrated layer of free-phase hydrocarbon. This layer is hydrophobic and adheres readily to hydrophobic surfaces such as human skin. In this way, the sheen mass is transferred directly to the skin, where it may remain and exert toxic effects until removed with detergent. The actual toxic effects experienced depend on the frequency and duration of exposure, the secondary effect of photoactivation in sunlight, and the actual composition of the floating hydrocarbons. It is difficult to predict harm from the infrequent exposure expected at this river location, but acute effects have been observed in similar situations both in experimental animals and in exposed humans. The ATSDR (2000) Toxicological Profile for Creosote addresses aromatic mixtures that

include coal tars. The Toxicological Profile summarizes that coal tar product “exerts its acute toxic effects in humans primarily via dermal contact, causing irritation or structural damage to the tissues that it contacts, such as skin and eyes,” and that “animal studies corroborate these observations. Longer periods of dermal exposure to coal tar products seem to be associated with dermal irritation and noncancerous lesions, and skin cancer in both humans and animals” (ATSDR 2000). The presence of coal tars in sediments that are released into water poses a public health hazard to anyone who has direct contact with the coal tar. Chronic skin contact with PAHs typically present in coal tars increases the lifetime risk for certain skin cancers. A single instance of direct contact with coal tars can cause dermal inflammation and heighten a person’s sensitivity to sunburn. Based on this information, DHFS advises against unnecessary exposure to waters containing floating coal tars.

Toxicological effects of chronic exposure to coal tar. Coal tar, produced by the pyrolytic heating of coal in retort ovens, is a complex mixture of polycyclic hydrocarbons, aromatic hydrocarbons, phenols, and paraffin oils. The precise mixture varies with the source coal used and the temperature and duration of the retort process (L’Epee *et al.* 1983). Humans are able to metabolize PAHs, although some PAH structures are carcinogenic with chronic exposure. Under occupational conditions, chronic exposure to coal tars, by dermal contact or inhalation, produces lesions to skin and mucous membranes that begins with burning and itching and progresses to open sores and benign growths such as hardened skin patches and “tar warts.” □ Several PAHs structures may become carcinogenic after their structures are transformed to reactive epoxides. This oxidative transformation occurs following exposure to ultraviolet light (this can occur on the skin) or is catalyzed by oxidizing enzymes within living cells. The PAHs with the greatest potential to be activated to reactive structures are dibenz[a,h]anthracene, benzo[a]pyrene, benz[a]anthracene, benzo[b]fluoranthene, and benzo[k]fluoranthene (ATSDR 1995). Each of these materials was detected in sediments near the Wisconsin Fuel and Light former Manufactured Gas Plant.

Child Health Considerations

Children may fish the river at this location, and, based upon their use of the streambank, are perhaps the group most likely to wade in the river near the former MGP. This places children at risk of exposure to coal tar contaminants, and the recommendation to avoid unnecessary exposure to by minimizing contact with hydrocarbon sheens and contaminated sediment applies especially to this group.

Conclusions

- The heavy oily film and continuous surfacing of hydrocarbons on the Manitowoc River near the former MGP indicate an ongoing release and dispersal of coal tar-related PAHs from contaminated sediments to surface water.
- The hydrocarbon film on the Manitowoc River near the former MGP, combined with complete exposure pathways, is a health hazard.
- The release of coal tar to the surface of the Manitowoc River will continue as long the contaminated sediment mass remains.

Recommendations

- DHFS recommends posting signs advising against contact with the oily sheens and sediment near the former MGP site.
- DHFS recommends interim action to mitigate the release of coal tar at this location. Pending a permanent solution, this might entail an adsorbent blotter, containment boom, or similar technique to remove surface hydrocarbons.
- WDNR should take action towards remediating sediments contaminated with hydrocarbons from the former Wisconsin Fuel and Light MGP as a permanent solution to the ongoing release of coal tar at this location.

Public Health Action Plan

- Advisory signs will be placed around the concrete walkway. DHFS, the Manitowoc County Health Department, and WDNR are discussing wording for the signs and plans to place the signs with WPSC.
- WDNR has begun to discuss temporary and permanent remedies to the coal tar release with WPSC.

References

ATSDR. 1995. *Toxicological Profile for Polycyclic Aromatic Hydrocarbons*. Atlanta, GA: US Department of Health and Human Services, Public Health Service, Agency for Toxic Substances and Disease Registry.

ATSDR. 2000. *Toxicological Profile for Wood Creosote, Coal Tar Creosote, Coal Tar, Coal Tar Pitch, and Coal Tar Pitch Volatiles*. Update - Public Comment Draft. Atlanta, GA: US Department of Health and Human Services, Public Health Service, Agency for Toxic Substances and Disease Registry.

ATSDR. 2002. *Public Health Consultation, Former Merrill Gas Company, Merrill, Lincoln County, Wisconsin*. US Department of Health and Human Services, Public Health Service, Agency for Toxic Substances and Disease Registry.

Earth Tech. 1995. *Interim environmental site closure for former coal gas manufacturing plant, Manitowoc, Wisconsin*. Prepared for Wisconsin Fuel & Light by Earth Tech, Grand Rapids, MI. File 22574.

Hellou J, Mackay D, Banoub J. 1999. Levels, persistence and bioavailability of organic contaminants present in marine harbor sediments impacted by raw sewage. *Chemosphere*. 38: 457-73.

L'Epee P, Lazarini, HJ, Doignon J. 1983. Tar and Pitch. Pp2471-9 in Parmeggiani L, ed *Encyclopedia of Occupational Health and Safety 3rd ed*. Intl. Labour Office, Geneva.

Nakata H, Sakai Y, Miyawaki T, Takemura A. 2003. Bioaccumulation and toxic potencies of polychlorinated biphenyls and polycyclic aromatic hydrocarbons in tidal flat and coastal ecosystems of the Ariake Sea, Japan. *Environ. Sci. Technol.* 15;37: 3513-21.

NRT. 2003. Phase I sediment sampling results for the former Wisconsin Fuel & Light manufactured gas plant, Manitowoc, Wisconsin. Natural Resource Technology Inc. October 14, 2003.

WDNR. 2003. Consensus-Based Sediment Quality Guidelines: Recommendations for Use & Application. Wisconsin Department of Natural Resources. Document WT-732 2003. Available: http://dnr.wi.gov/org/aw/rr/technical/cbsqg_interim_final.pdf

WDNR. 2003b. Wisconsin Department of Natural Resources Laboratory Report. DNR ID 113133790.

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Table 1. Concentration of hydrocarbons in Manitowoc River sediments near former manufactured gas plant, Manitowoc, Wisconsin¹.

	EPA cancer class	Mean mg/kg ± standard error n=11	Maximum reported, mg/kg (sample site)	DNR CBSQG ² Prob. Effect Conc. mg/kg
Anthracene	D	12.9±6.3	60 (T2-2)	0.85
Benzo(a)anthracene	B2	13.8±7.2	67 (T8-1)	1.1
Benzo(b)fluoranthene	B2	9.6±3.1	47 (T8-1)	13.4
Benzo(k)fluoranthene	B2	10.4±5.3	52 (T8-1)	13.4
Benzo(a)pyrene	B2	14.2±7.3	70 (T8-1)	1.5
Benzo(g,h,i)perylene	D	5.1±2.4	22 (T8-1)	3.2
Chrysene	B2	10.5±5.3	47 (T8-1)	1.3
Dibenz(a,h)anthracene	B2	1.4±0.71	6.1 (T8-1)	0.14
Fluoranthene	D	35.3±18.35	170 (T8-1)	2.23
Fluorene	D	8.7±4.5	41 (T2-2)	0.54
Indeno(1,2,3cd)pyrene	B2	5.2±2.5	23 (T8-1)	3.2
Naphthalene	C	23.9±11.5	120 (T2-2)	0.56
Phenanthrene	D	38.2±19.4	160 (T2-2, T8-1)	1.17
Pyrene	D	27.7±14.8	140 (T8-1)	1.52
Benzene	A	0.13±0.09	0.9 (T3-1)	0.11
Ethylbenzene	D	0.38±0.25	2.7 (T3-1)	--
Toluene	D	0.33±0.21	2.1 (T6-1)	1.8
Xylenes	na	0.71±0.48	5.4 (T3-1)	0.05

¹Reference: Natural Resource Technology Inc. Phase I sediment sampling results for the former Wisconsin Fuel & Light manufactured gas plant, Manitowoc, Wisconsin. October 14, 2003.

²Consensus-based sediment quality guidelines. See WDNR 2003.

na: not applicable

mg/kg: milligram per kilogram

Figure 1. Site of former Wisconsin Fuel and Light Manufactured Gas Plant, Manitowoc, Wisconsin. Images from September 15, 2004.



A: View from concrete walkway, site of former MGP; B: Manitowoc River stream bank with former MGP site in background. C, D: Hydrocarbon sheen in river, viewed from walkway in (A).

Certification

This Health Consultation for the former Wisconsin Fuel and Light Manufactured Gas Plant was prepared by the Wisconsin Department of Health and Family Services under a cooperative agreement with the Agency for Toxic Substances and Disease Registry (ATSDR). It is in accordance with the approved methodology and procedure existing at the time the Health Consultation was begun.

Technical Project Officer, CAT, SPAB, DHAC

The Division of Health Assessment and Consultation, ATSDR, has reviewed this Health Consultation and concurs with the findings.

Team Lead, CAT, SPAB, DHAC, ATSDR