HEALTH CONSULTATION

Imperial Oil Chemical Release to the St. Clair River
Macomb and St. Clair Counties, Michigan

June 30, 2004

Prepared by:
Michigan Department of Community Health
Under Cooperative Agreement with the
Agency for Toxic Substances and Disease Registry

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Summary

Imperial Oil of Sarnia, Ontario, Canada accidentally released 42,000 gallons of methyl ethyl ketone (MEK) and methyl isobutyl ketone (MIBK) to the St. Clair River, which flows between Canada and Michigan. The Canadian and Michigan governments responded quickly to protect public health, issuing advisories and sampling river water, which is used for several public drinking water supplies. Samples taken at water treatment plant (WTP) intakes did not indicate the presence of MEK nor MIBK at these points. On the basis of no evidence of exposure, there was no public health hazard.

Purpose and Health Issues

The purpose of this health consultation is to determine and discuss any public health hazards associated with a chemical release to the St. Clair River, between Ontario and Michigan, on February 1, 2004. The Michigan Emergency Operation Center requested that the Michigan Department of Community Health review the data to determine if a public health hazard existed. The chemicals involved were the volatile organic compounds (VOCs) MEK and MIBK. The main exposure pathway of concern was ingestion of potentially contaminated drinking water. Additional pathways included dermal and inhalational exposures, should the contamination enter household water.

Event and Response

On February 1, 2004, between 3:00 and 4:20 AM, Imperial Oil in Sarnia, Ontario accidentally released approximately 42,000 gallons of a mixture of MEK and MIBK to the St. Clair River. The Canadian plant is located across the St. Clair River from the United States, about halfway between Port Huron and Marysville, Michigan (Figure 1). The release occurred due to the failure of a heat exchanger system. After discovering the spill, Imperial Oil stopped further discharge and notified the Ontario Ministry of the Environment (OME) Spills Action Centre (SAC). The SAC notified officials on both sides of the border at about 5:30 AM. Several hours later the Michigan Governor's office activated the State Emergency Operation Center (EOC).

Initial modeling by Imperial Oil and the OME indicated that significant quantities of MEK and MIBK would migrate across the St. Clair River and impact Michigan drinking water systems. The EOC, coordinating the state's response, conferred with a toxicologist from the Michigan Department of Community Health (MDCH) to determine public health implications and develop appropriate risk communication tools, should any contamination reach the public. The Michigan Department of Environmental Quality (MDEQ) notified the WTPs along the St. Clair River and Lake St. Clair, to which the river empties, of the release. MDEQ advised the WTPs to conserve water, close their intakes if possible, and collect samples for VOC analysis at the MDEQ laboratory. MDCH fully supported these actions. The Michigan State Police, MDEQ, and MDCH

issued a press release advising residents served by water systems in St. Clair, East China Township, Marine City, Algonac, Ira Township (Fair Haven), and New Baltimore (Figure 1) not to drink water or use it for cooking, bathing, or showering until further notice.

As Imperial Oil determined more information about the spill and event-specific river dynamics, the facility revised modeling inputs and provided the results to provincial and state authorities. As they received these results, MDEQ officials relayed this information to the local WTPs so that they could appropriately time shutting down intakes and sampling raw water. When analyses showed that the plume was beyond water intakes and would not affect drinking water supplies, the Michigan State Police lifted the advisory (nearly 24 hours after the spill first occurred).

Discussion

Environmental Contamination

Table 1 shows the estimated river-travel time from the spill to the various intake points. It also shows the dates and times each WTP shut down its intake, sampled raw or pretreated water, and started operations again.

MEK and MIBK were not detected in any of the WTP water samples (detection limit of 5 parts per billion [ppb]).

Human Exposure Pathways

To determine whether persons are, have been, or are likely to be exposed to contaminants, MDCH evaluates the environmental and human components that could lead to human exposure. An exposure pathway contains five elements: (1) a source of contamination, (2) contaminant transport through an environmental medium, (3) a point of exposure, (4) a route of human exposure, and (5) a receptor population. An exposure pathway is considered complete if there is evidence that all five of these elements are, have been, or will be present at the property. It is considered either a potential or an incomplete pathway if there is no evidence that at least one of the elements above are, have been, or will be present at the property, or that there is a lower probability of exposure. The exposure pathway elements for this site are shown in the following table:

Source	Environmental Transport and Media	Chemicals of Interest	Exposure Point	Exposure Route	Exposed Population	Time Frame	Status
Imperial Oil, Sarnia, Ontario	St. Clair River, Lake St. Clair	MEK, MIBK	Public drinking water	Ingestion, dermal contact, inhalation	Persons served by St. Clair River watershed	Past	Incomplete
						Present	Incomplete
						Future	Incomplete

The water sampling results showed that the VOCs were not detected in the raw water at the WTPs. Therefore, there were no drinking water related health risks associated with this event.

Toxicological Evaluation

MEK and MIBK are solvents that have a relatively low oral toxicity, as depicted by the MDEQ Drinking Water Criterion (DWC) for each: 13,000 ppb and 1,800 ppb, respectively (MDEQ 2001). The MDEQ DWC identifies a drinking water concentration that is safe for long-term, daily residential consumption. As already mentioned, the VOCs were not detected at the WTPs. Since there was likely no significant exposure (if any), no toxic effects would be expected.

VOCs in household water can volatilize and enter indoor air during washing, bathing, and showering. Again, as mentioned previously, the VOCs were not detected at the WTPs and little, if any, exposure occurred.

ATSDR Child Health Considerations

Children may be at greater risk than adults from exposure to hazardous substances at sites of environmental contamination. A child's lower body weight and higher intake rate, as compared to an adult's, results in a greater dose of hazardous substance per unit of body weight. The developing body systems of children can sustain permanent damage if toxic exposures are high enough during critical growth stages. Exposure of a pregnant mother could lead to exposure of the fetus, via the placenta, or affect the fetus because of injury or illness sustained by the mother (ATSDR 1998). The obvious implication for environmental health is that children can experience substantially greater exposures than adults to toxicants that are present in soil, water, or air.

However, MEK and MIBK released into the St. Clair River did not enter the public water supplies along the St. Clair River or Lake St. Clair, at least not to a significant extent. Therefore, children were not exposed to these chemicals in their drinking water.

Community Health Concerns

Neither MDEQ nor MDCH received any health complaints pertaining to this incident from the release date onward.

Conclusions

The release of MEK and MIBK to the St. Clair River from Imperial Oil on February 1, 2004 ultimately posed no public health hazard. Analytical results of raw water samples

from treatment plants indicated that the chemicals were not present. Closing the intakes as a precautionary measure further ensured that exposure did not occur.

Recommendations

MDCH makes no further recommendations at this time.

Public Health Action Plan

MDCH will remain available as a public health information resource in the event future spills should occur from Imperial Oil or other chemical plants. (On May 23, 2004, following heavy rains, containment basins at Imperial Oil and nearby Sunoco Oil in Sarnia overflowed and spilled into the St. Clair River. Responders notified MDCH but did not request guidance.)

If any citizen has additional information or health concerns regarding this health consultation, please contact the Michigan Department of Community Health, Environmental and Occupational Epidemiology Division, at 1-800-648-6942.

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References

Agency for Toxic Substances and Disease Registry (ATSDR). 1998. ATSDR, Division of Health Assessment and Consultation. Guidance on Including Child Health Issues in Division of Health Assessment and Consultation Documents. July 2, 1998.

Michigan Department of Environmental Quality (MDEQ). 2001. Drinking Water Criteria.

Michigan Department of Environmental Quality (MDEQ). 2004. A Report on the Michigan Community Water Supplies Served by the St. Clair River Watershed During and Subsequent to the February 1, 2004 MEK and MIBK Release from Imperial Oil, Sarnia, Ontario. MDEQ Water Division. Prepared by B. Feighner.

Table 1. Shutdown, sampling, and startup times for the Water Treatment Plants along the St. Clair River and Lake St. Clair downstream of the Imperial Oil chemical spill.

WTP Intake Point	Travel Time from 3AM Spill (hrs)	Shutdown Time (Date)	Sampling Time (Date)	Startup Time (Date)
Marysville	2	9:30 PM (1/31/04)	(not sampled before initial startup)	11:00 AM (2/1/04)
		11:45 AM (2/1/04)	11:45 AM (2/1/04)	remained shut down
		---	midnight (2/1/04)	12:15AM (2/2/04)
St. Clair	6.5	11:00 PM (1/31/04)	(not sampled before initial startup)	9:00 AM (2/1/04)
		(not shut down before sampling)	between 9:30 and 10:30 AM (2/1/04)	continued operating
		---	between 11:30 AM and 12:30 PM (2/1/04)	continued operating
		12:10 PM (2/1/04)	6:30 PM (2/1/04)	11:30 PM (2/1/04)
		(not shut down before sampling)	between 1:30 and 2:30 AM (2/2/04)	continued operating
East China	8.5	data not available (sometime before 4:30 AM)	(not sampled before initial startup)	4:30 AM (2/1/04)
		(not shut down before sampling)	10:00 AM (2/1/04)	12 noon (2/1/04)
		data not available	6:15 PM (2/1/04)	7:00 AM (2/2/04)
		(not shut down before sampling)	between 5:30 and 6:30 AM (2/2/04)	continued operating
		(not shut down before sampling)	between 8:30 and 9:30 AM (2/2/04)	continued operating
Marine City	11.5	1:15 PM (2/1/04)	1:15 PM (2/1/04)	remained shut down
		---	6:30 PM (2/1/04)	12:01 AM (2/2/04)
Algonac	16		5:00 PM (2/1/04)	8:30 PM (2/1/04)
		9:37 PM (2/1/04) - briefly	9:37 PM (2/1/04)	1:05 AM (2/2/04)
Ira Township	*	11:00 PM (2/1/04)		8:00 AM (2/2/04)
New Baltimore	*	8:00 PM (2/1/04)		8:00 AM (2/2/04)
Mt. Clemens	*	6:30 PM (2/1/04)		8:30 AM (2/2/04)
Grosse Pointe Farms	*	9:00 PM (2/1/04)		5:00 AM (2/2/04)

Reference: MDEQ 2004

St. Clair River

from Port Huron to Mt. Clemens

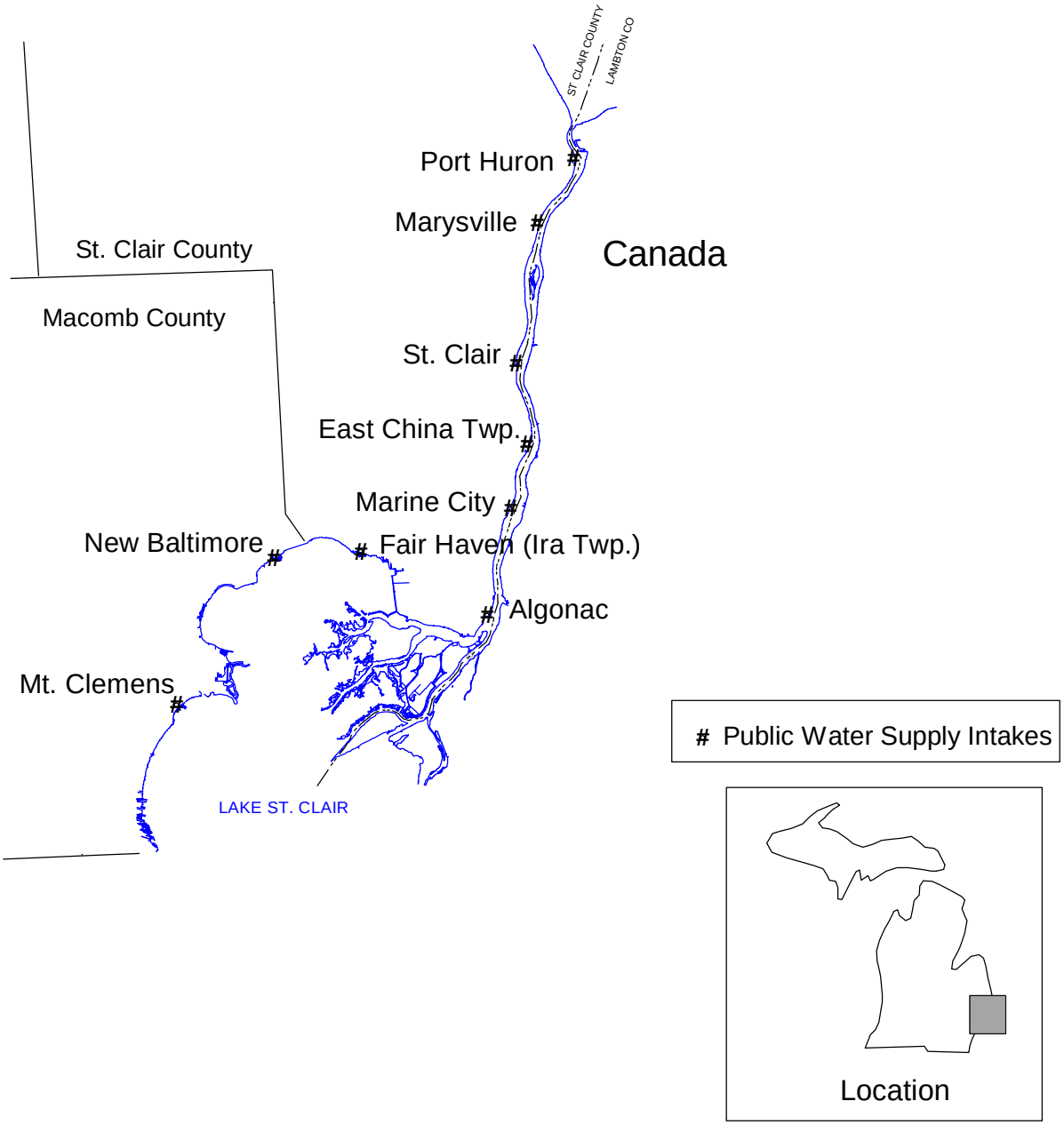

Figure 1

Certification

This "Imperial Oil Chemical Release to the St. Clair River" Health Consultation was prepared by the Michigan Department of Community 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 consultation was begun.

Technical Project Officer, Cooperative Agreement Team, SSAB, DHAC, ATSDR

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

Team Leader, Cooperative Agreement Team, SSAB, DHAC, ATSDR