

# SAGINAW BAY AREA OF CONCERN (AOC) SUMMARY

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## **PHYSICAL CHARACTERISTICS**

- AOC extends from the confluence of the Shiawassee and Tittabawassee rivers, to the mouth of the Saginaw River (22 miles), and all of Saginaw Bay (1,143 square miles) out to its interface with Lake Huron at an imaginary line drawn between Au Sable Point and Point Aux Barques (see map).
- Areas outside the above boundaries, but within the Saginaw Bay drainage basin, are included in the Remedial Action Plan if they are known or suspected sources of contaminants to the Saginaw River and/or Saginaw Bay.
- Michigan's largest watershed (8,709 square miles).
- Over half of the land use is agricultural.
- Primary urban and industrial centers are Flint, Saginaw, Bay City and Midland.
- America's largest contiguous freshwater coastal wetland system and was once one of the world's largest fresh water fisheries.
- Drains approximately 15% of Michigan's land area.
- Contaminated sediments, fish consumption advisories, degraded fisheries and loss of significant recreational values are the major reasons for the AOC designation.
- Problems are mainly caused by high amounts of tributary soil erosion, excessive nutrients (e.g., phosphorus and nitrogen) entering the water and current loadings of contaminated sediments.

**SAGINAW RIVER & BAY AOC (orange shading)**



## **BENEFICIAL USES IMPAIRED FOR SAGINAW RIVER AND BAY (underlined may be attributed to the Dow Chemical Co.):**

- Restrictions on fish and wildlife consumption
- Eutrophication or undesirable algae
- Tainting of fish and wildlife flavor
- Restrictions on drinking water consumption or taste/odor
- Degradation of fish and wildlife populations/reproduction
- Beach closings
- Degradation of aesthetics
- Bird or animal deformities or reproduction problems
- Degradation of benthos
- Degradation of phytoplankton & zooplankton populations
- Restriction on dredging activities
- Loss of fish and wildlife habitat

## **FLOOD EVENTS**

- The Tittabawassee River has a long history of significant flood events (flood events recorded dating back to the late 1800s).
- During the early years of the Dow facility, flood control in the River was especially troublesome, many times resulting in inundation of the plant site and waste treatment facilities.
- Particularly severe storm events have caused flooding of the entire Midland region, including the Dow facility.
- These heavy floods usually occurred during the spring and resulted in discharges to the Tittabawassee River of stored brines and untreated or partially treated process wastewaters.
- Releases to the River, as a result of flooding, included overflows from the brine storage and tertiary treatment ponds

## **September 1986 Flood Impacts at Dow Midland Facility**

- ~100 million gallons of untreated wastewaters were discharged to the Tittabawassee River.
- Three open influent sewers that transport manufacturing waste to Dow's wastewater treatment plant filled with rainwater and overflowed into the surrounding area. The rainwater and untreated wastewater accumulated and eventually overflowed the dikes separating the plant and the river.
- Stormwater flowed into the brine pond and resulted in erosion of the dike between the pond and the river.
- During September 12 and 13, discharges from Dow contained phenol, pentachlorophenol, and 2,4,6-trichlorophenol that exceeded daily maximum loads by up to 210, 69 and 199 percent, respectively, at some time during the 2-day period.
- Discharge of 2,3,7,8-TCDD was diluted by the floodwaters resulting in an instream concentration of one-third of normal.

### **Effects on Saginaw River and Bay from 1986 Flood**

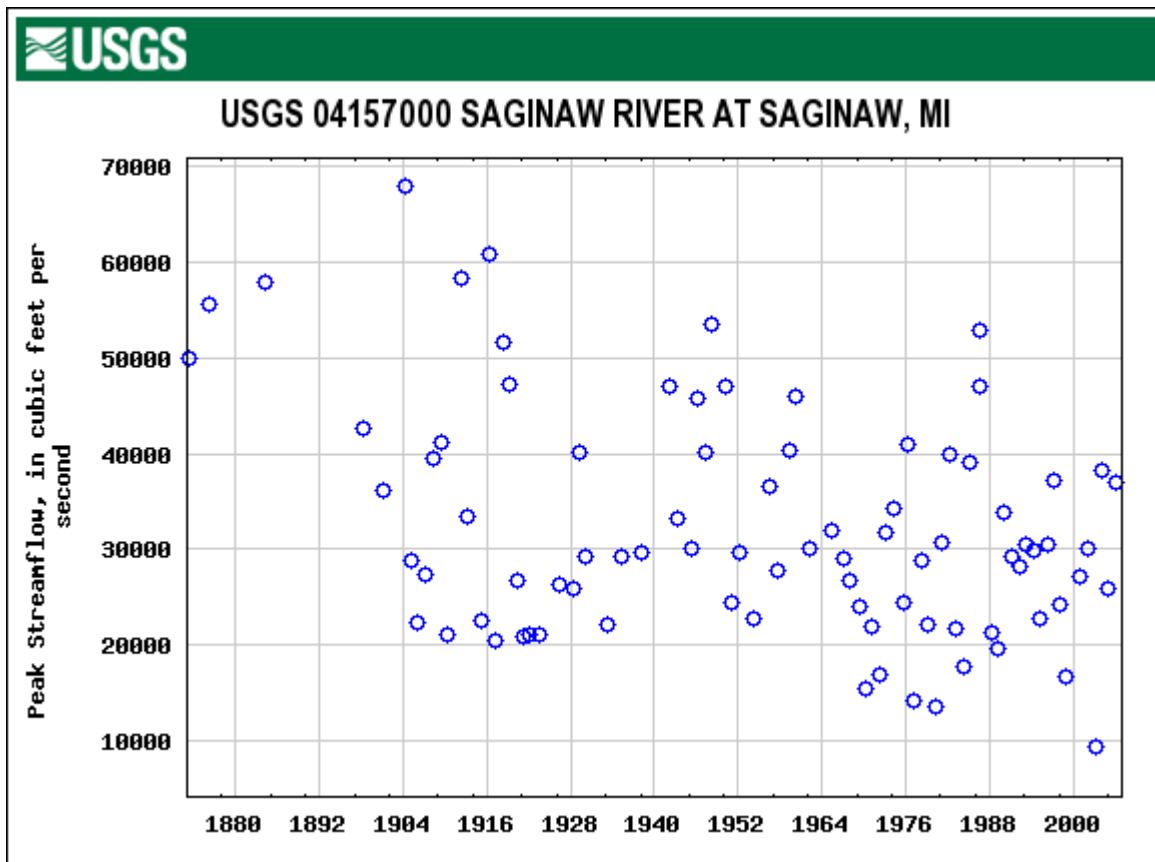
Available data indicates that the 1986 flood removed large quantities of sediment from the river and transported them to the bay; however, the possibility of contaminated sediment burial during 1986 is not beyond the realm of possibility (*Trace Elements in 1988 Saginaw Bay and River Sediments: Comparison to Historical Data*, August, 1989).

### **DIOXIN/FURAN CONTAMINATION IN THE SAGINAW RIVER AND BAY**

- Dioxin/furan levels have been found in Saginaw River sediment as high as 1,600,000 ppt TEQ.
- Dioxin/furan levels have been found in Saginaw Bay sediment as high as 690 ppt TEQ
- Floodplain contamination is not as prevalent as on the Tittabawassee River
- Dioxin in active transport has been found at levels as high as 30,000 ppt TEQ.
- Contamination extends at least 10 miles out into the bay.
- Only preliminary characterization sampling has been completed for the Saginaw River and Bay.
- Large freighters have been observed suspending large amounts of sediments due to prop wash as they travel through the Saginaw River. This process is likely to play a significant role in accelerating the downstream migration of dioxin/furan contaminated sediments into Saginaw Bay.
- Higher levels of dioxin/furan have been found within sediments of the navigation channels in Saginaw Bay than in sediments under open waters.

### **IMPLICATIONS OF DOW DIOXIN/FURAN CONTAMINATION IN THE TITTABAWASSEE AND SAGINAW RIVERS**

- The Saginaw River and Bay has been, and continues to be, impacted by the downstream migration of high levels of dioxins/furans, and likely other hazardous constituents, from the Dow Midland facility.
- Flood events have likely transported, and continue to transport, large amounts of contaminated sediments downstream from the Dow Midland facility; down the Tittabawassee and Saginaw Rivers; and into Saginaw Bay.
- The streamflow chart below shows that flood events comparable to the 1986 flood have occurred 7 times since the late 1800s.
- At least 3 flood events of greater magnitude than the 1986 flood have occurred in the last 100 years.
- There is a continuing risk of relatively large amounts dioxin/furan contaminated sediments being transported during flood events into Saginaw Bay.
- Prop wash from freighters continues to suspend dioxin/furan contaminated sediments and accelerate their downstream transport into Saginaw Bay.
- There are fish consumption advisories for the Saginaw River and Bay due to dioxin contamination.



**Historic Streamflow for Saginaw River**