

A map of the Saginaw River and Bay area in Michigan. The map shows the Tittabawassee River, Saginaw River, and Saginaw Bay. Major cities like Midland, Bay City, and Saginaw are highlighted in yellow. A red circle on the map indicates a specific location on the Tittabawassee River. The text 'Tittabawassee/Saginaw River and Bay Chemical Contamination & RCRA Corrective Action' is overlaid on the map. The date 'January 31, 2008' is also present.

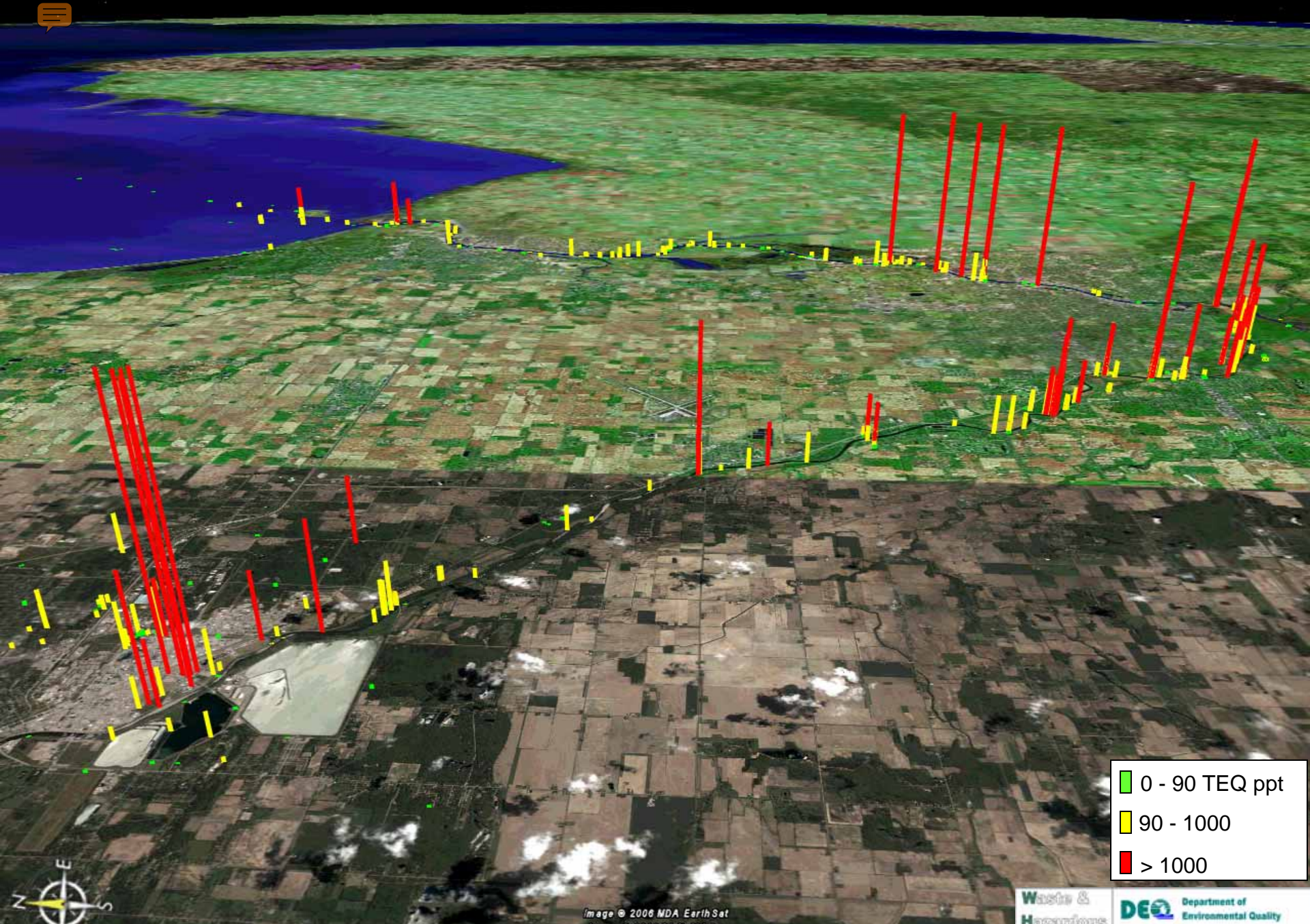
Tittabawassee/Saginaw River and Bay Chemical Contamination & RCRA Corrective Action

January 31, 2008



Source of Dioxin Contamination in Saginaw Bay

- Dioxin moving through the Tittabawassee and Saginaw Rivers into the bay.
- Dioxin levels up to 30,000 ppt TEQ in active transport in bed load of the Saginaw River.
- Tittabawassee and Saginaw Rivers acting as a continuing source of contamination to Saginaw Bay.



█ 0 - 90 TEQ ppt
█ 90 - 1000
█ > 1000

**Waste &
 Hazardous
 Materials
 Division**

DEQ Department of
 Environmental Quality
**Hazardous Waste Section
 Technical Support Unit**

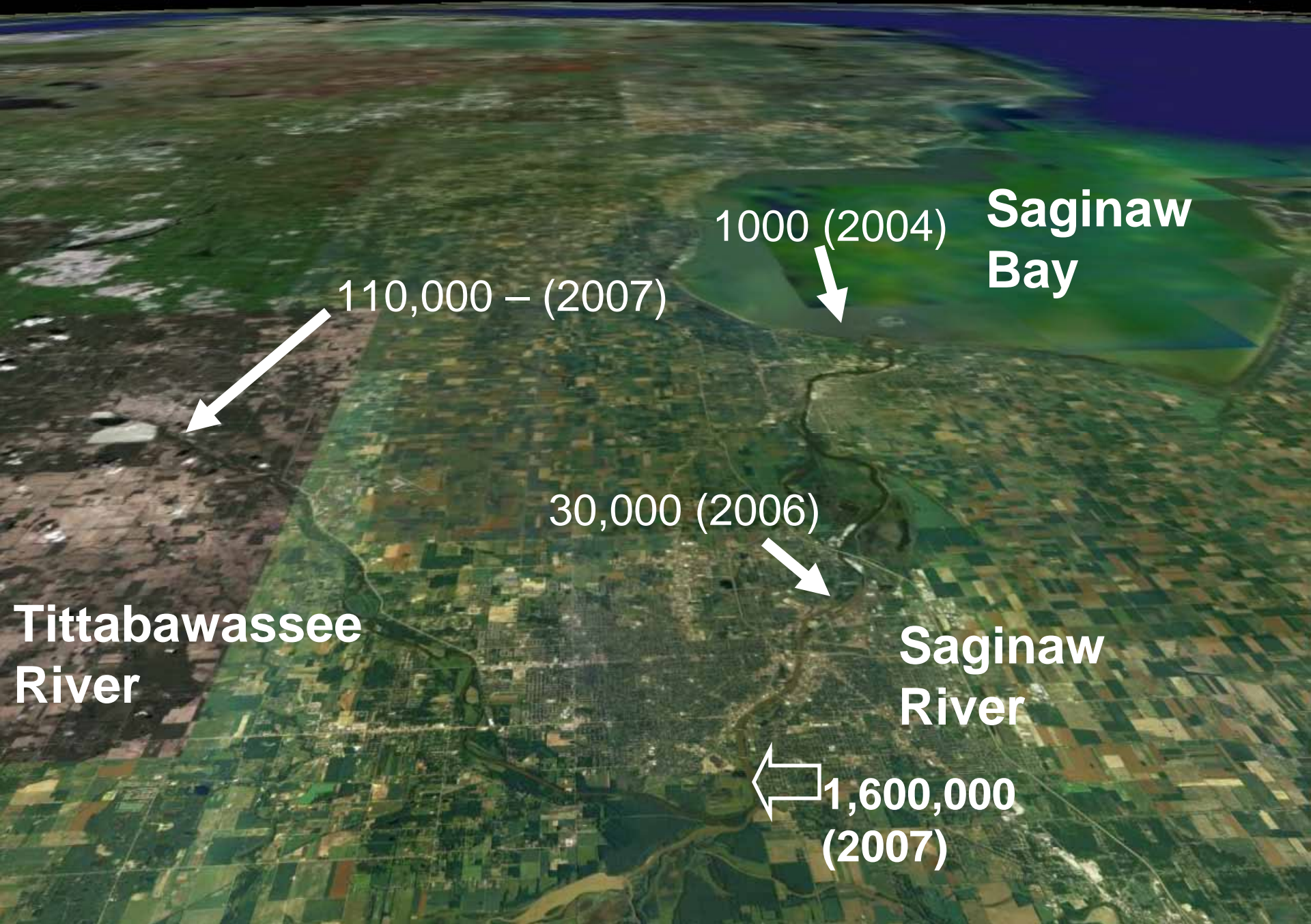
Image © 2006 MDA EarthSat
 Image © 2006 DigitalGlobe

Streaming 100%

Post 2004 Dioxin / Furan TEQ Distribution

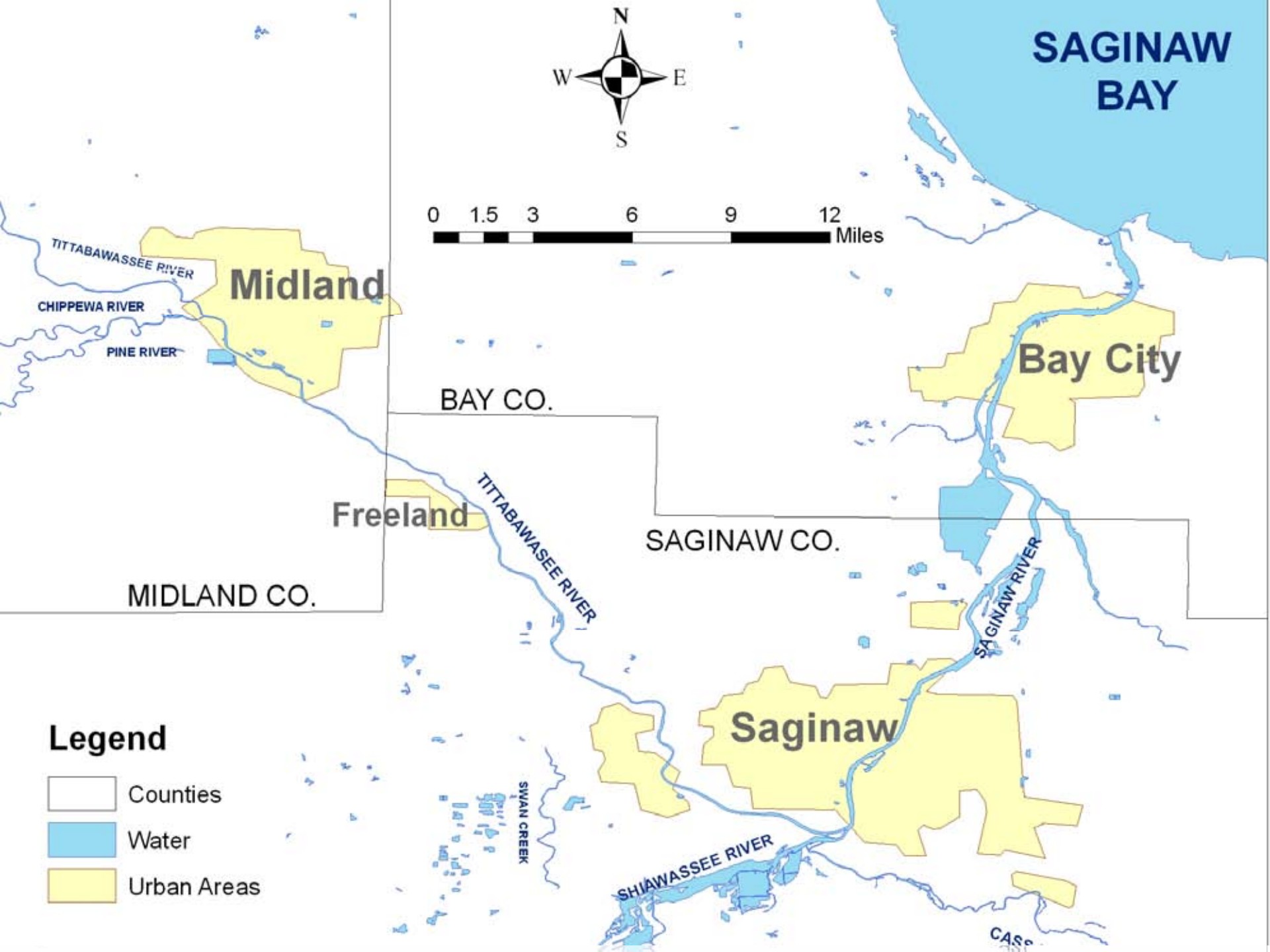


Where the highest concentrations have been found to date (ppt TEQ 2007)



Background

- **Contamination:** Pervasive throughout lower 24 miles of Tittabawassee River and floodplain, the Saginaw River (25 miles) and portions of Saginaw Bay.
- **Primary contaminant:** Dioxins and furans.
- **Primary Source:** Dow Chemical, Midland, Michigan.
- **Target population:** People living along the rivers, and recreational users of the rivers and bay (especially fish and game consumers).



SAGINAW BAY



0 1.5 3 6 9 12 Miles

Midland

Bay City

BAY CO.

Freeland

SAGINAW CO.

MIDLAND CO.

TITTABAWASSEE RIVER
CHIPPEWA RIVER
PINE RIVER

TITTABAWASSEE RIVER

SAGINAW RIVER

Saginaw

SHIAWASSEE RIVER

SWAN CREEK

CASS

Legend

- Counties
- Water
- Urban Areas

Tittabawassee/Saginaw Dioxin Contamination

(Michigan Residential Cleanup Criteria is 90 ppt TEQ)

- Tittabawassee floodplain soils range up to 100,000 ppt TEQ.
 - High concentrations generally found in levees and to a lesser extent terraces.
- Tittabawassee sediments range up to 140,000 ppt TEQ.
- Saginaw sediments range up to 1,600,000 ppt TEQ.
 - Dioxin levels in active transport in bed load up to 30,000 ppt TEQ.

Why is this of concern?

- MDEQ Fish Sampling.
 - Cancer risks may be as high as 1 in 1,000 excess cancers (10^{-3}).
 - Non-Cancer Risks (e.g., effects on brain and reproductive system with early life exposure).
 - May be as high as 40 times acceptable exposure values.
 - Fish advisories: Tittabawassee/Saginaw Rivers and Saginaw Bay.
- Dow Wild Game Study.
 - Consumption risk.
 - Wild game consumption advisories issued by MDCH, MDNR and MDEQ.





RCRA/Part 111 Regulatory Requirements

- Hazardous waste operating license issued to Dow by State in 2003.
- License corrective action requirements include:
 - Tittabawassee River and floodplain.
 - Saginaw River and floodplain.
 - Saginaw Bay.
- Primary vehicle for addressing releases of contaminants.
- Work has been progressing since 2003 under the Part 111 Operating License.

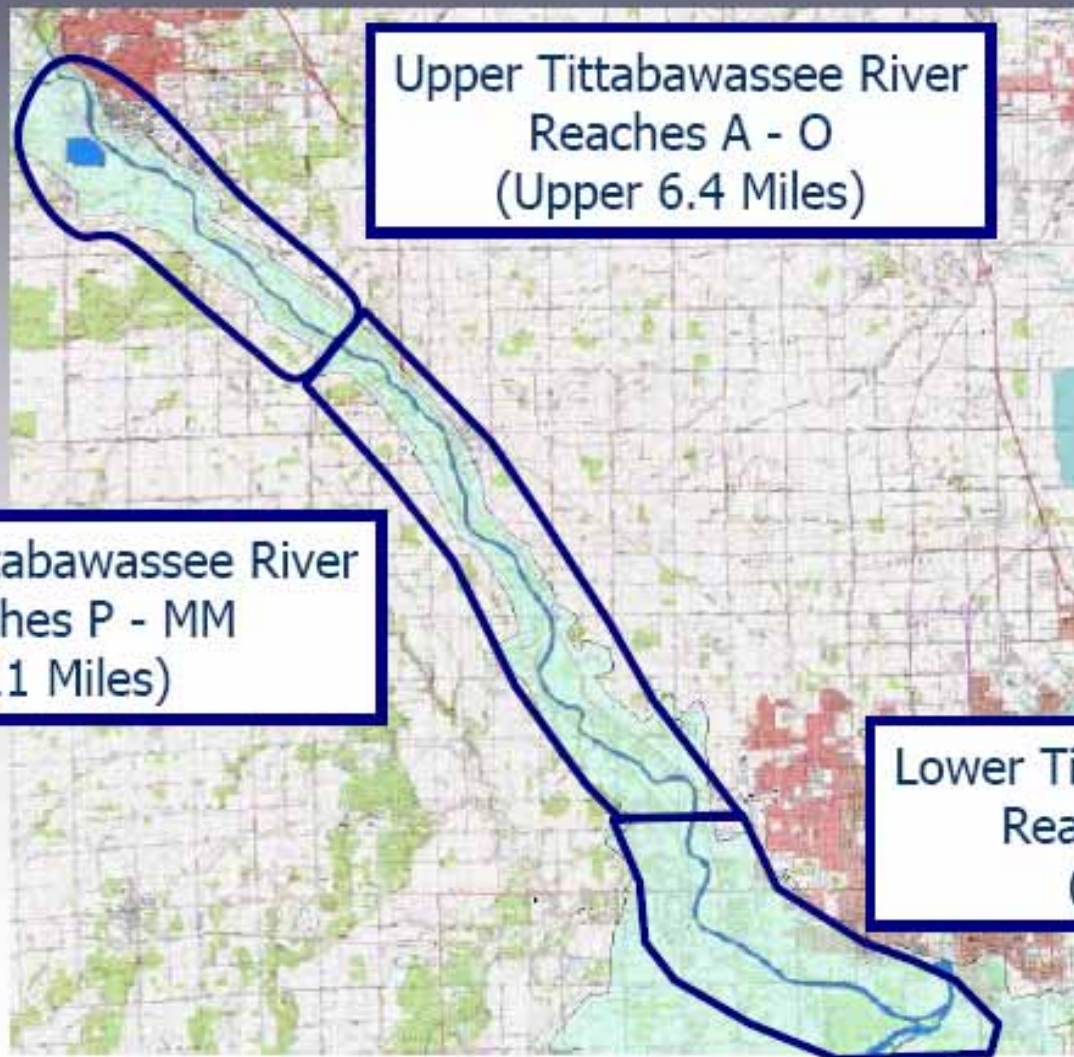


Current Part 111/RCRA Activity

- Tittabawassee River Sampling Programs.
 - Upper 18 miles investigated in 2006 & 2007.
 - Lower 5 miles to be investigated in 2008.
 - Approximately 8100 samples from 1500 locations.
 - Identified Reach D, J/K, and O hot spots in 2006.
 - Removals completed in 2007 under Superfund.
 - Additional hot spots identified in 2007.
- Tittabawassee River Remedial Investigation Work Plan.
- Saginaw River and Bay Scope of Work.
 - Will lead to investigation of river and bay.



Tittabawassee River Study Areas

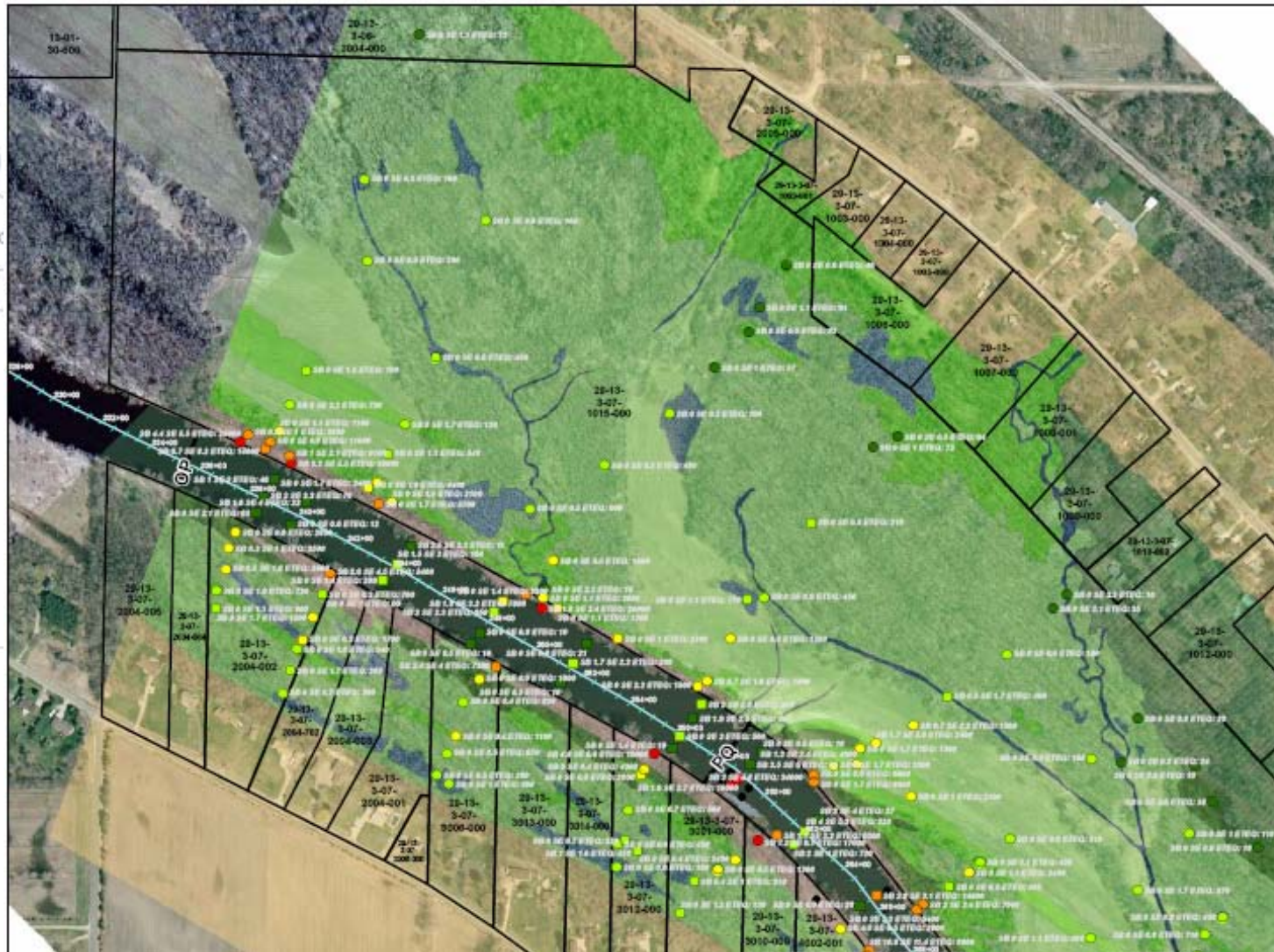


Upper Tittabawassee River
Reaches A - O
(Upper 6.4 Miles)

Middle Tittabawassee River
Reaches P - MM
(11 Miles)

Lower Tittabawassee River
Reaches NN - YY
(4.6 Miles)

Sample Results and GeoMorph Surfaces " Middle Tittabawassee River"



Soil TEQ Concentration

- > 15,001
- 5,001 - 15,000
- 1,001 - 5,000
- 101 - 1,000
- < 100

Proposed Samples

Reach Break

Geomorph Surfaces

- Geomorphic Wetland
- High
- Historic Natural Level (Pre-Industrial Level)
- Intermediate
- Low
- Natural Level (Post-Industrial Level)
- Shoreline
- Tributary
- Upland
- Upper High

0 350 700 Feet

W N E S



Drawn By: JAT Date: Jan. 7, 2008
 Checked By: PO Edited By: JAT

**Overbank Maximum ETEQ
 By Location
 GeoMorph® Site Characterization
 Working Draft:
 Middle Tittabawassee River
 Reach P and Upper Q
 01/07/2008**

ET Project Number: 91503
 ET Map File Location:
 MTR Sample Results MAX TEQ with depth interval.mxd

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What is the Relationship of Part 111/RCRA to CERCLA?

- CERCLA (Superfund) can be used to supplement the Corrective Action Program under Part 111/RCRA.
- 3 Removal Actions undertaken in 2007 based on data from the Part 111/RCRA investigation.
 - Reaches D, J/K, and O.
- Removal Action/IRA also conducted on Saginaw River adjacent to Wickes Park.
- Where possible, it is important to integrate IRAs/Removal Actions into overall remediation process.





SAGINAW BAY





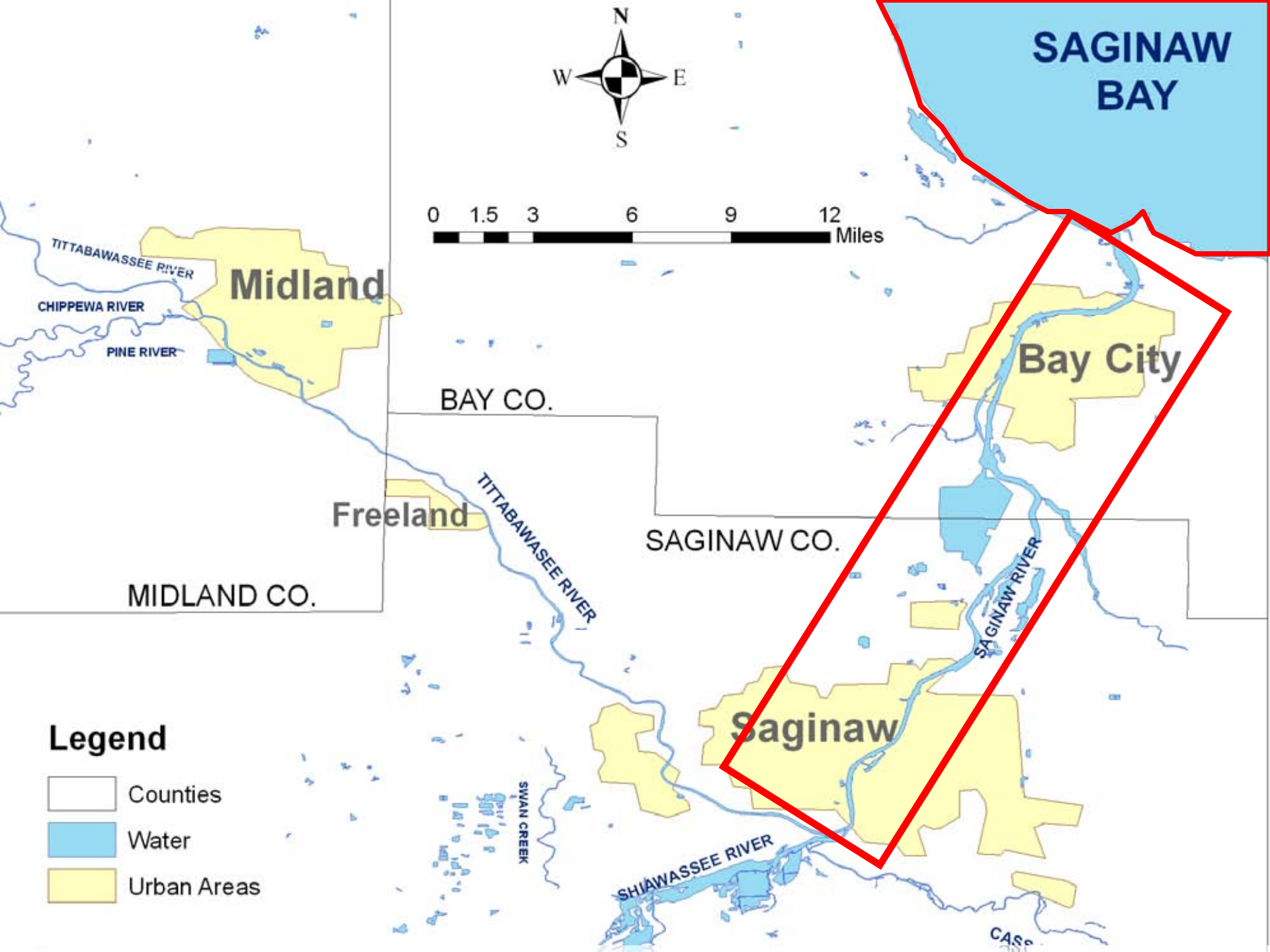


Tittabawassee River Remedial Investigation

Work Plan (RIWP)

- Investigation to date has proceeded in Phases (Upper and Middle Tittabawassee River). Moving ahead with components of the RIWP that MDEQ has approved.
- MDEQ and EPA currently completing review of the revised RIWP for the Tittabawassee River (revised 9/17/07). Problem areas include Human Health and Ecological Risk Assessments.
- MDEQ preparing Notice of Deficiency (NOD) for Tittabawassee River RIWP. To be completed in February 2008.
- Dow will have 60 days from the date of the NOD to submit revised RIWP to MDEQ.
- Lower Tittabawassee River Characterization Work Plan to be submitted in May 2008.





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0 1.5 3 6 9 12 Miles

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Freeland

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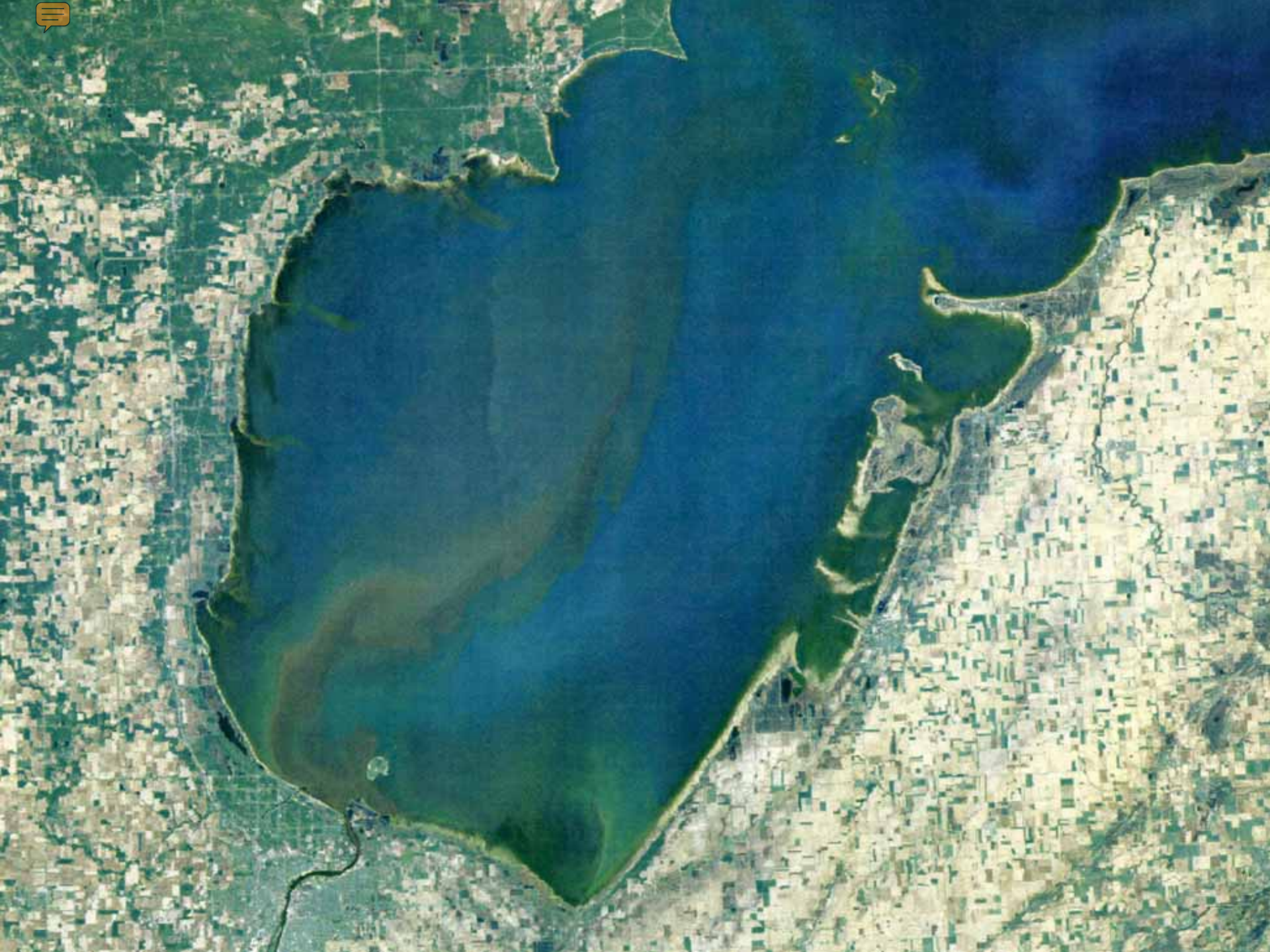
CASS

Legend

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Saginaw River and Bay Scope of Work (SOW)

- Dow submitted a revised SOW to MDEQ on 10/15/07 in response to MDEQ NOD.
- MDEQ approval of SOW with modifications shortly (2/1/08).
- Starts clock for development of RIWP (60 days).
- Goal is to have Dow investigating river and bay under an approved RIWP this summer.
- Dow conducted some preliminary investigation activities “at risk” in Fall 2007.



TRI-CITIES DIOXIN COMMUNITY MEETING

February 7, 2008

6:30 - 9:00 p.m.

Horizons Center, 6200 State Street, Saginaw

- Tittabawassee/Saginaw River and Bay corrective action will be discussed in more detail.



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