RACER Nodular Industrial Land

Ecological Risk of PCBs in the North Ditch and Wetland Area

September 6, 2019

Preliminary Draft for Discussion

Introduction

Dave Favero, RACER Trust, Michigan Deputy Cleanup Manager

John-Eric Pardys, GHD, Project Manager

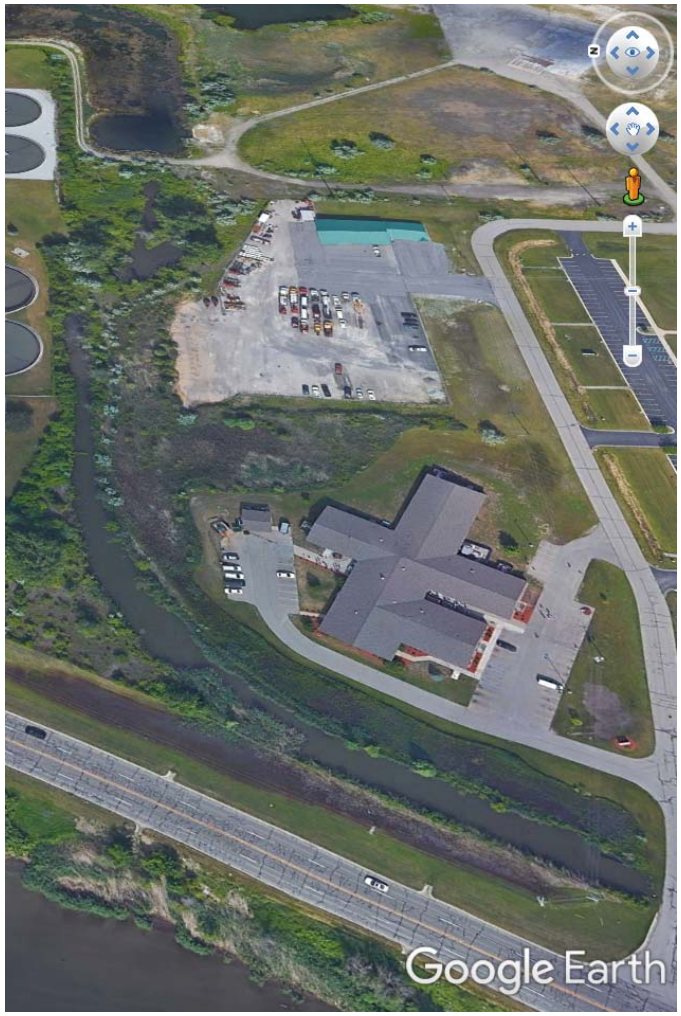
Daniel Smith, GHD, Ecological Risk Assessor

Richard Chatfield, GHD, Environmental Engineer

Ecological Risk of PCBs - North Ditch

BACKGROUND

- North Ditch is a small (<1 acre), L-shaped body of water approximately 1,200 feet long, 20-40 feet wide, and a maximum depth of 6 to 8 feet
  - A man-made feature historically used as an outflow channel from the water treatment system, but was discontinued in mid-80s
  - From the mid-80s until demolition of the Nodular Plant in 1999, received stormwater from Plant
  - Since 1999 inputs to the North Ditch are rain water and surface water from the catchment area (City of Saginaw Waste Water Treatment Plant to the north, Tri-Cap to the south and Fahrner Asphalt Sealers to the south)



Ecological Risk of PCBs - North Ditch

SAMPLING EVENTS

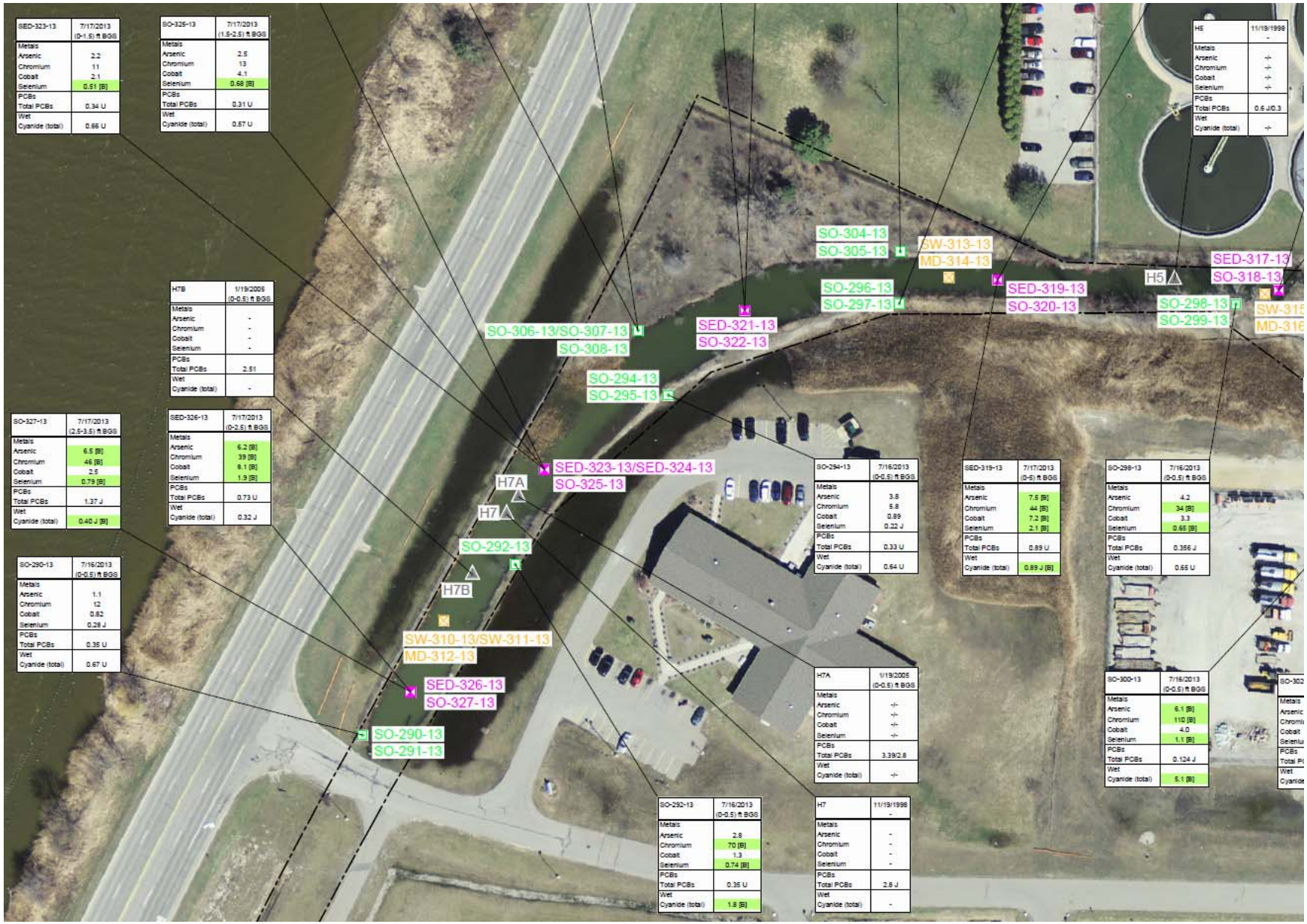
- In 1998 as part of the Phase 1A RFI, three sediment samples (one duplicate) were collected from two locations and analyzed for metals, SVOCs, PCBs, and general chemistry
- In 2005 as part of the Phase 1C RFI, three sediment samples (one duplicate) were collected from two locations and analyzed for PCBs
- In 2013 to support RCRA corrective action, seven sediment samples (one duplicate) were collected from six locations and analyzed for metals, PCBs, general chemistry, and AVS/SEM and seven water samples were collected and analyzed for metals, PCBs, and general chemistry

Ecological Risk of PCBs - North Ditch

SEDIMENT SAMPLING RESULTS - PCBs

- 1998 results for PCBs: H5 (0.6J/0.3 mg/kg) and H7 (2.8 mg/kg)
- 2005 results for PCBs: H7A (3.39/2.8 mg/kg) and H7B (2.51 mg/kg)
- 2013 results for PCBs: non-detect to 0.11 mg/kg in 7 samples
- PCBs in sediments had a maximum concentration of 3.39 mg/kg (2005 H7A sample; duplicate result of 2.8 mg/kg) and a mean sediment sample concentration of 0.96 mg/kg.
  - These were ameliorated by very high organic carbon (OC) concentrations of about 6% and small area of North Ditch
- Uncertainty about PCB concentrations and bioavailability
  - PCBs were only detected at one location at a concentration of 0.11 mg/kg in all the 2013 samples but these were sometimes quite deep (i.e., top 2 to top 5 feet). See following figure.
  - Also potential for black carbon to further reduce PCB bioavailability
  - Verification/delineation sampling would provide critical supplemental information before any remedial activities (if necessary).

Ecological Risk of PCBs - North Ditch



Ecological Risk of PCBs - North Ditch

ECOLOGICAL RISK ASSESSMENT (Exponent, 2007)

- Evaluated data collected from the 1998 and 2005
- Then, North Ditch was not habitat, as it was considered part of the Nodular Plant stormwater treatment system
  - Thus, only considered risk to piscivorous wildlife, not aquatic biota
  - Exponent's ERA found no risk to fish-eating wildlife
- EPA reviewed and provided minimal comments
  - However, ERA was not formally accepted by EPA for the entire Site, before bankruptcy
  - Portions of the ERA relevant to the GM LLC property were accepted by EPA in August 2015

Ecological Risk of PCBs - North Ditch

ECOLOGICAL SCREENING ASSESSMENT (GHD, 2019)

- North Ditch no longer part of storm water system, naturalizing as small pond
- A screening ecological assessment was done, using same streamlined methods as ERA for Secondary Pond (GHD, 2017)
- The assessment screened all available data in the North Ditch and considered risks to aquatic life and, again, predators of aquatic life
  - Water, sediment, and soil data were screened vs. Ecological Screening Values (ESVs) to assess potential risk from all chemicals
    - Water and soil were screened against typical conservative ESVs
    - But sediment screening started with re-screening values (Probable Effect Concentrations [PEC])

Ecological Risk of PCBs - North Ditch

ECOLOGICAL SCREENING ASSESSMENT (GHD, 2019)

Risks of PCBs to Invertebrates

- Although PCBs are not toxic to invertebrates, PCB concentrations were compared to the PEC value (0.67 mg/kg) as per EPA procedures
  - 31% of the samples (all associated with the 1998 and 2005 samples), reported Total PCBs above the PEC
  - 0% of the samples had reported Total PCBs above the PEC when normalized to 1% OC

Ecological Risk of PCBs - North Ditch

ECOLOGICAL SCREENING ASSESSMENT (GHD, 2019)

Risks of PCBs to Vertebrates

- As indicator of risks to fish-eating, risk assessment addressed PCB risks to mink (most sensitive and most exposed receptor)
  - PCB concentrations in fish estimated to be only 2X the No Observable Effect Concentration (NOEC) (0.5 mg/kg), due to the 1998 and 2005 data
    - Mink usually eat terrestrial prey as well as fish
    - Mink foraging range is 10 to 100 times larger than the North Ditch
    - PCB conc. is based on benthivorous fish (other feeding guilds may have lower PCBs)
    - There may be high concentrations of black carbon, which make PCBs unavailable, as occurred with the Secondary Pond
- Given these multiple safety factors, risks to mink were, again, considered unlikely

Ecological Risk of PCBs - North Ditch

ECOLOGICAL SCREENING ASSESSMENT (GHD, 2019)

Conclusions

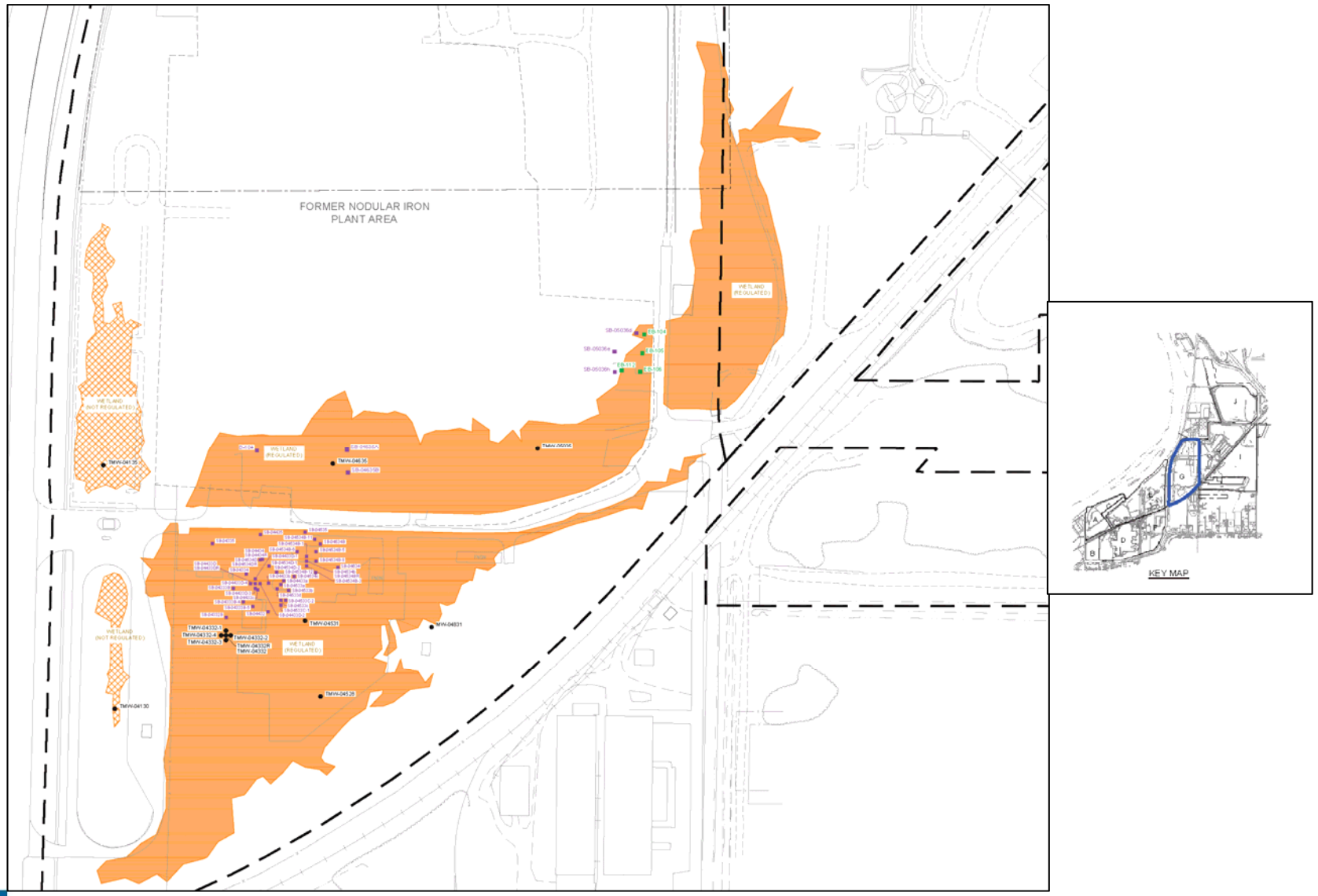
- Highest PCB concentration in sediment was 3.39/2.8 mg/kg, which was collected in 2005, and a mean concentration in sediment slightly less than 1 mg/kg (a typical cleanup level)
  - PCB concentrations offset by very high OC concentrations
  - No PCB concentration at 1% OC exceeded PEC
- PCBs are not toxic to benthic invertebrates
- Risks of PCB toxicity to mink (most sensitive semi-aquatic predator) are considered unlikely, again, largely based on the Ditch's very small size and, consequently, very low exposure potential to mink.

Recommendations

- Additional sampling for black carbon, OC, and PCBs to address uncertainty about current PCB concentrations and PCB bioavailability.

Ecological Risk of PCBs – IU G Wetland

Ecological Risk of PCBs – IU G Wetland



Ecological Risk of PCBs – IU G Wetland

BACKGROUND

- Former Nodular Plant (IUG) was demolished (including stopping dewatering sumps), covered with clean fill (Exponent 2007), and revegetated in 1999
  - Exponent's 2007 ERA did not consider IU G, which includes the PCB-impacted area, because the area was poor, highly disturbed upland habitat
- In 2012 sumps that drained the haul road area and discharged to the Secondary Pond, were shut off which caused ponding in the area
- In 2015, a wetland survey of the area was completed to support redevelopment and identified five small isolated wetlands (total area of ~11 acres)
  - Wetlands are low quality habitat: artificial, small, isolated, dominated by invasive species, and in an area slated for redevelopment

Ecological Risk of PCBs – IU G Wetland

SAMPLING EVENTS

- In 1998, Phase 1A of the RFI was conducted. Seven samples were collected in this area of IU G and analyzed for a broad range of parameters including: metals, VOCs, SVOCs, and PCBs
- Between 2001 and 2003, multiple sampling events were conducted as part of Phase 1B of the RFI to further delineate impacts identified in the Phase 1A. Seventy-two samples were collected in the wetland area and analyzed for PCBs. Note some of the 2003 samples were also analyzed for metals.
- In 2015, additional sampling was completed with the objective of confirming historical PCB sampling results and delineate PCB impacts to 1 mg/kg.
  - Thus, thirty-four samples were concentrated near previous lukewarm spots and analyzed for PCBs.
- Samples described above include many in soil horizons deeper than 2 feet.

Ecological Risk of PCBs – IU G Wetland

SURFACE SOIL SAMPLING RESULTS

- The following is a summary of the surficial soil sample results:
  - PCBs in surficial soils had a maximum concentration of 8.8/7.3 mg/kg (SB-04433D – sample collected in 2001)
  - Despite high bias in sampling locations, PCBs had a mean concentration of 0.56 mg/kg (which is below 1 mg/kg, a typical cleanup level).
    - In 2001 SB-04433D had total PCBs in the surficial soil sample at 8.8/7.3 mg/kg. The location was re-sampled and samples were also collected from four 10-ft stepout locations in 2015. The 2001 results were not confirmed: results ranged from non-detect to 0.355J mg/kg.
    - In 2001 SB-04534b had total PCBs in the surficial soil sample at 1.1 mg/kg. The location was resampled and samples were also collected from four 10-ft stepout locations in 2015. Stepouts to the west could not be completed due to deep water (>5-ft deep). Seven additional stepouts were completed to the south, east, and north. The total PCB results ranged from non-detect to 0.428 mg/kg.
    - Therefore, previous PCB detections could not be confirmed, and the highest remaining shallow soil sample result for PCBs is 4.4 mg/kg in SB-04433b, which was sampled in 2001. No attempt was made to confirm this result.

Ecological Risk of PCBs – IU G Wetland

SURFACE SOIL SAMPLING RESULTS

- 1998 results for PCBs in surface soil: MW-04831 (non-detect) and SB-04434 (0.2 mg/kg)
- 2001 to 2003 results for PCBs in surface soil: non-detect to 8.8/7.3 mg/kg in 30 samples. Only five surface soil samples had detections above 1 mg/kg
- 2015 results for PCBs in surface soil: non-detect to 0.84 mg/kg in 26 samples. No surface soil samples had detections above 1 mg/kg.
- The additional sampling completed in 2015 was unable to confirm previous results

Ecological Risk of PCBs – IU G Wetland

ECOLOGICAL SCREENING ASSESSMENT (GHD, 2019)

- Given the emergence of wetlands in IU G, an ecological screening assessment was completed
  - The goal of the streamlined ERA is not a return to a natural state but prevention of significant toxic effects.
- Streamlined ERA methods used again
  - Soil/sediment data were screened against Ecological Screening Values (ESVs) to more fully assess potential risk from all chemicals
  - The screening assessment looked at all available data in wetland area and considered risks to wetland plants, aquatic invertebrates, and vertebrate predators that consume these invertebrate fauna.
- To evaluate ecological risk only the surficial soil samples (0 to 2 feet) were included in the evaluation and treated as sediments.

Ecological Risk of PCBs – IU G Wetland

ECOLOGICAL SCREENING ASSESSMENT (GHD, 2019)

- Exposure media are chemicals in surficial soil/sediment (top 2 feet) and those estimated in the aquatic biological tissue for bioaccumulating substances.

Risks of PCBs to Invertebrates

- Although PCBs are not toxic to invertebrates, PCB concentrations were compared to the PEC value (0.67 mg/kg) as per EPA procedures
  - Only 16% of the surface samples reported Total PCBs above the PEC (without OC adjustment)
  - No OC data was available to normalize the data, however, any OC would further reduce bioavailability of PCBs.

Ecological Risk of PCBs – IU G Wetland

ECOLOGICAL SCREENING ASSESSMENT (GHD, 2019)

Risks of PCBs to Vertebrates (Predators of Aquatic Biota)

- The risks assessed to vertebrates (bats/swallows) were limited to bioaccumulation of PCBs in aquatic insects.
- There was no risk to swallows identified.
- Under more conservative exposure assumptions and exposure based on simple mean, PCB exposure to bats only 130% of No Observed Adverse Effect Level (NOAEL).

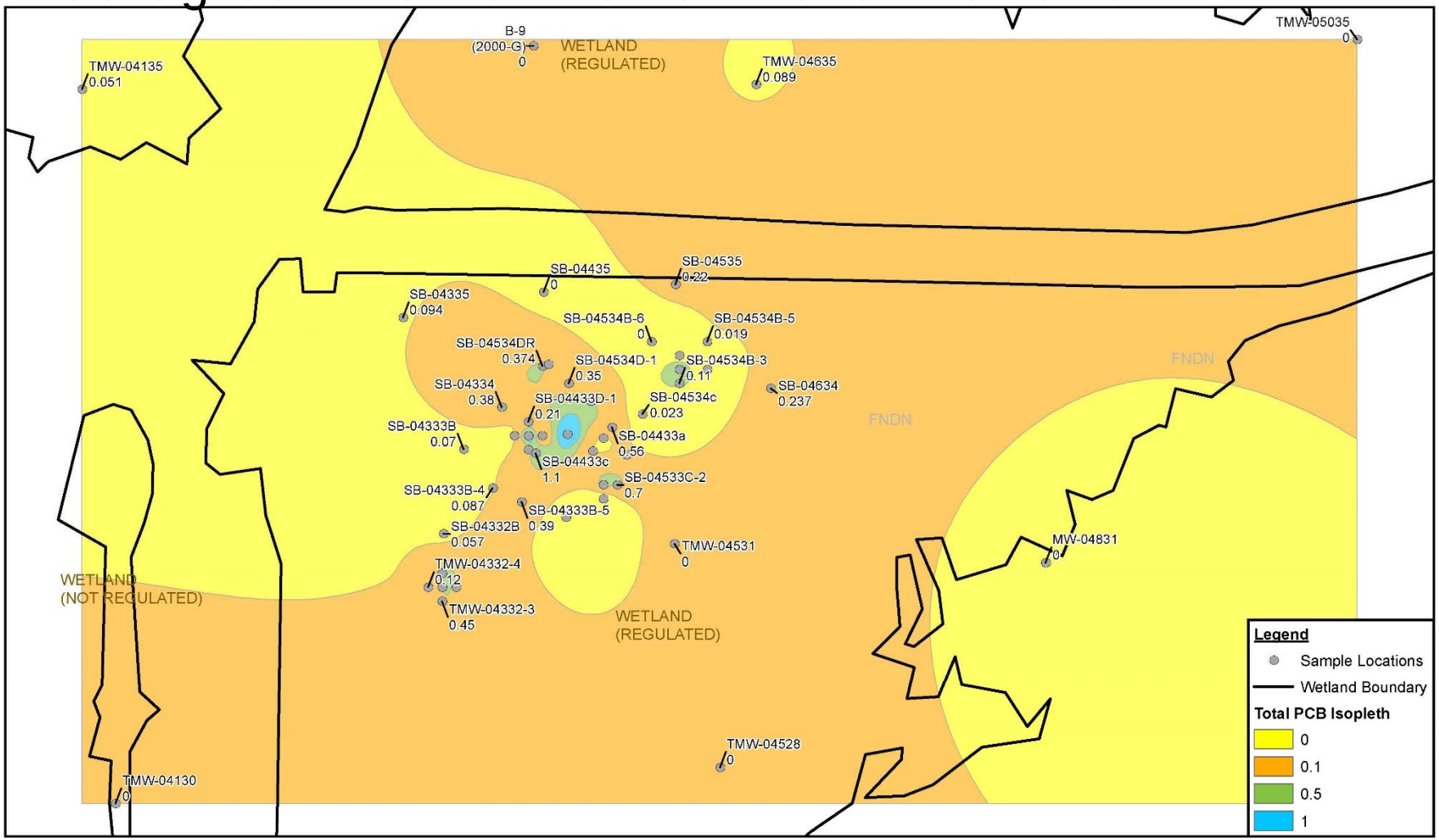
Ecological Risk of PCBs – IU G Wetland

ECOLOGICAL SCREENING ASSESSMENT (GHD, 2019)

Risk of PCBs to Vertebrates (Predators of Aquatic Biota)

- But risks to bats are unlikely under realistic exposure scenarios:
  - Bats will eat terrestrial and aquatic insects
  - Bats foraging range is about 7 times larger than the wetland
  - PCB estimate is based on infaunal benthic insects (other aquatic insects likely have lower PCBs)
  - PCB concentrations are based on top two feet, not top 2 or 3 inches
- In addition, highest PCB concentrations were not reproducible in the subsequent sampling event (2015), are limited to very small area, and samples biased to elevated locations
  - Surface weighted average << than simple mean of samples

Ecological Risk of PCBs – IU G Wetland



0 30 60 90
Feet

Coordinate System:
NAD 1983 StatePlane Michigan
South FIPS 2113 Feet Intl

REVITALIZING AUTO COMMUNITIES ENVIRONMENTAL REPSONSE (RACER)
SAGINAW NODULAR INDUSTRIAL LAND
SAGINAW, MICHIGAN

058502-A09
Aug 14, 2019

TOTAL PCB ISOPLETH

FIGURE 1

Ecological Risk of PCBs – IU G Wetland

ECOLOGICAL SCREENING ASSESSMENT (GHD, 2019)

Conclusions

- PCBs in sediments had a maximum concentration of 8.8/7.3 mg/kg (2001) and a simple mean concentration of 0.56 mg/kg, however;
  - Simple mean includes elevated 2001 PCB concentrations that could not be reproduced in additional sampling
  - Simple mean includes high bias of sampling focused on lukewarm spots
  - Still, simple mean is less than typical cleanup level
  - If we did not use the unconfirmed concentrations of 8.8/7.3 mg/kg the simple mean concentration is reduced to 0.47 mg/kg
- PCBs are not toxic to benthic invertebrates/wetland plants

Ecological Risk of PCBs – IU G Wetland

ECOLOGICAL SCREENING ASSESSMENT (GHD, 2019)

Conclusions (continued)

- Risks of toxicity to aerial insectivores (bats and swallows) were considered unlikely under less unrealistic exposure scenarios and simple PCB mean, which is quite biased high even if unreproducible results are included
- GHD concluded that significant ecological risks are unlikely to occur in the newly formed wetlands
- In addition, the wetlands are unnatural, small, isolated, dominated by invasive species, and slated for redevelopment

Recommendations

- No further evaluation of ecological risk or remedial activities beyond establishing institutional controls is warranted.

www.ghd.com