PFAS and Solar Development: Case Studies

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May 22, 2025

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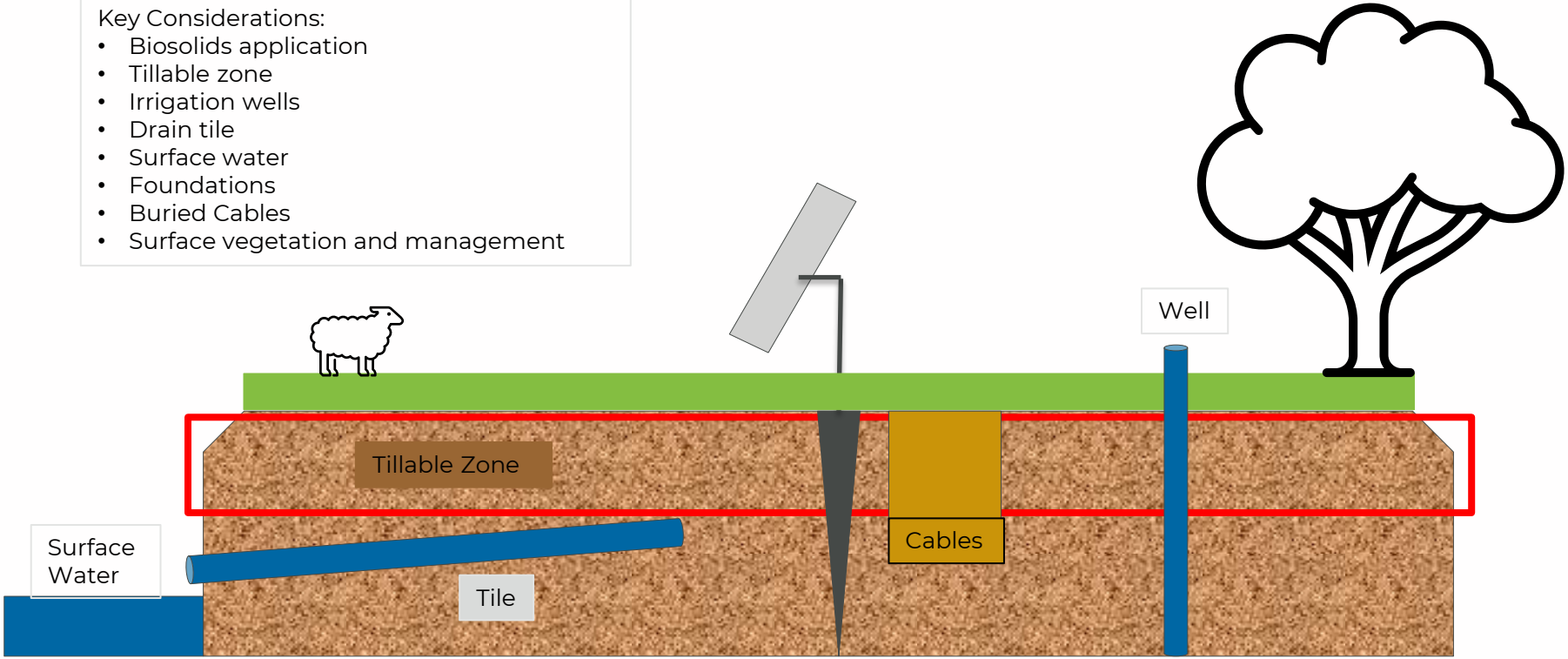
Conceptual Site Model

Key Considerations:
- Biosolids application
- Tillable zone
- Irrigation wells
- Drain tile
- Surface water
- Foundations
- Buried Cables
- Surface vegetation and management



What are biosolids?

Biosolids vs industrial sludges in Michigan

- Biosolids will be sludges from municipal wastewater treatment plants
- Industrial sludges will be sludges from industrial WWTP, industrial processes or residential septic systems

For Michigan: On June 18, 1997 the governor signed 1997, PA 29. Act 29 amended the Natural Resources and Environmental Protection Act, 1994 PA 451 (NREPA) by amending section 3101 (MCL 324.3101) and by adding sections 3131, 3132, and 3133 providing for a fee-based statewide biosolids management program. These changes to part 31 of NREPA provided new ability to better manage the land application of sewage sludge (biosolids) and sewage sludge derivatives.
The Part 24 Biosolids Rules of Part 31, Water Resources Protection, of the NREPA, became effective on November 2, 1999. The rules establish standards consisting of general requirements, pollutant limits, management practices and operational requirements for the beneficial land application of biosolids.
The state statute and Rules are consistent with the federal title 40, Code of Federal Regulations, Part 503 rule.

How do I know if biosolids have been applied?

Main Information Sources:

- Phase I ESA
- State Database
- Local Health Department
- Waste Water Treatment Plant Records
- Historic records are incomplete and vary county by county

Assessing the Risk

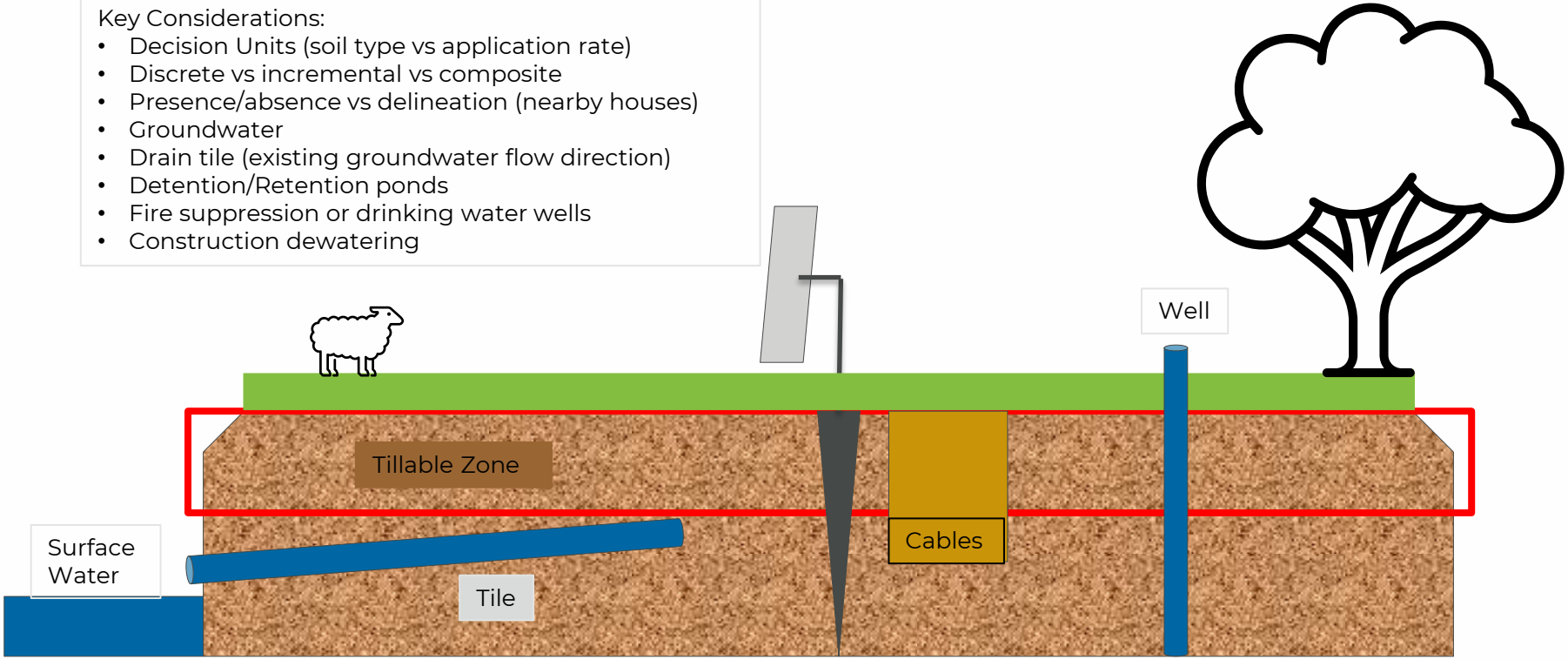
Case Studies

The sources for Figures shown in the case studies are listed on the Resource Slide

Sampling Approach

Key Considerations:

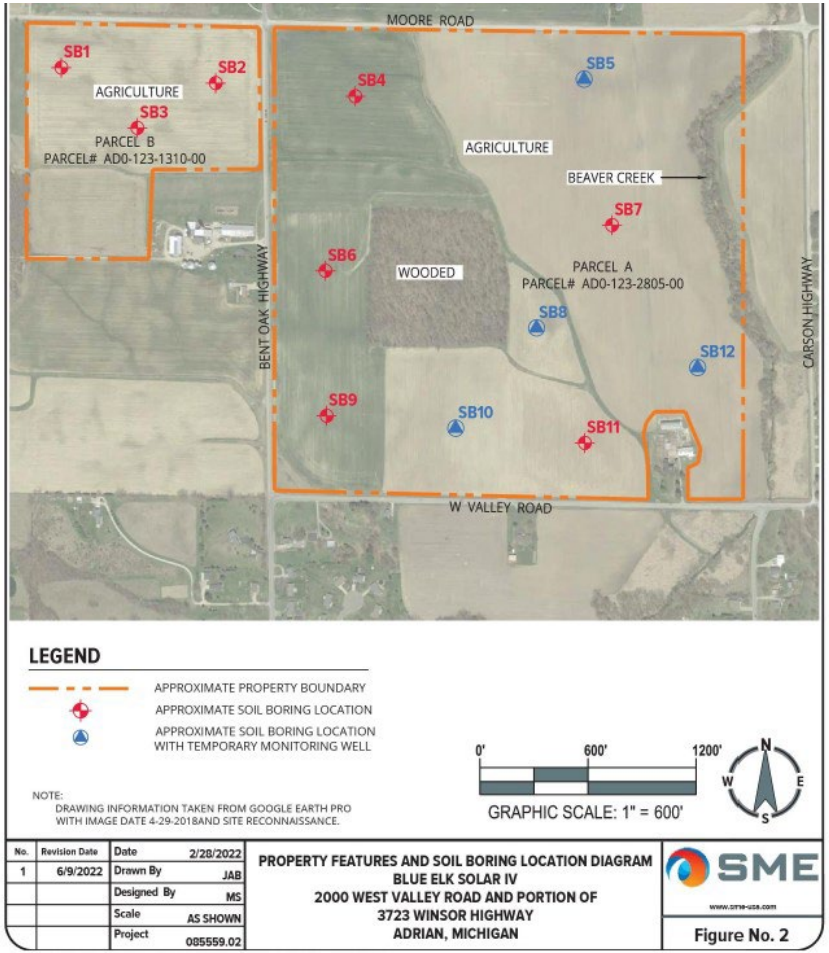
- Decision Units (soil type vs application rate)
- Discrete vs incremental vs composite
- Presence/absence vs delineation (nearby houses)
- Groundwater
- Drain tile (existing groundwater flow direction)
- Detention/Retention ponds
- Fire suppression or drinking water wells
- Construction dewatering



Case Study: Blue Elk

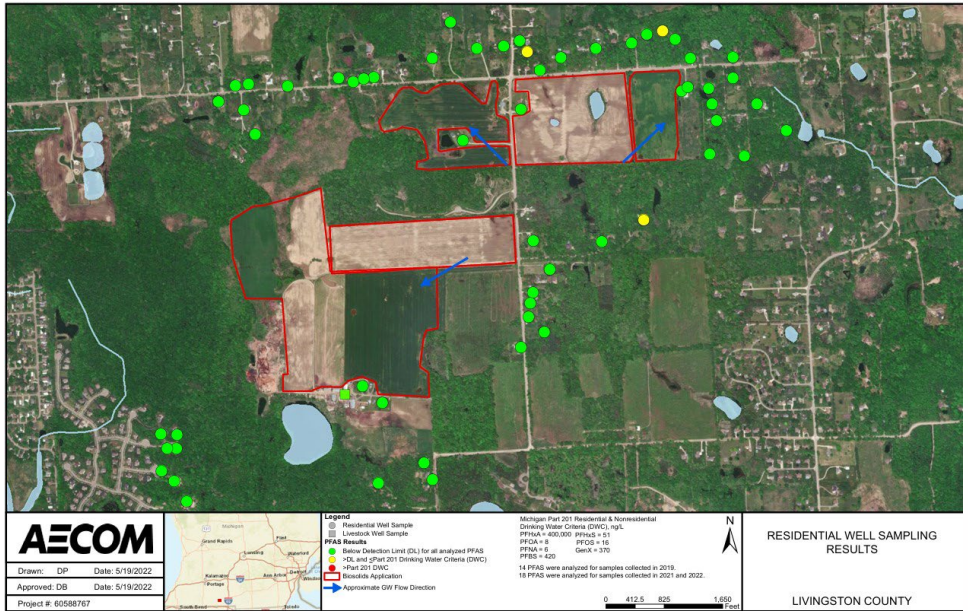
- LPH record of biosolids in 1980's and 1990's
- Soil – Discrete sampling
- Soil: 8.220 / 2.0 / 3.6
- Groundwater: 176.08 / 8 / 2.1
- Listed as MPART Site with Immediate Risk to adjacent residential wells

Total PFAS / PFOA / PFOS
Soil ug/kg
Water ng/L



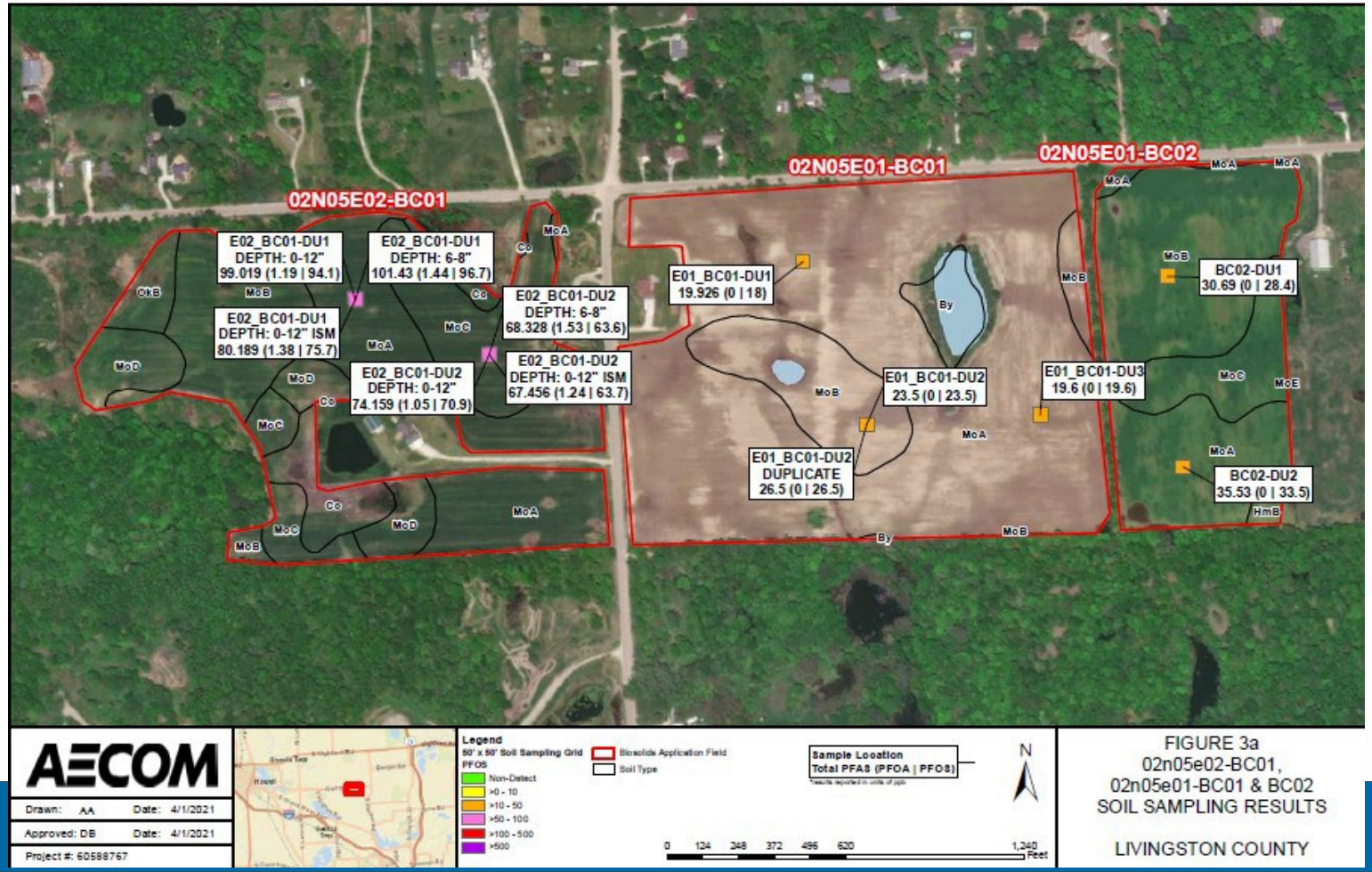
Case Study Wixom Biosolids

- Biosolids applied 2010-2015
- Soil: 50’x50’ composite 9 aliquots three approaches
  - Depth applied 6-8” 101 / 1.44 / 96.7
  - Tile depth 0-12” 99 / 1.19 / 94.1
  - Lab ISM 0-12”ISM 80 / 1.38 / 75.7
- Groundwater: 356 / 2.5 / 16.4
- Surface Water: 386 / 11.7 / 49.7
- Perched Water: 968 / 37.7 / 533
- Drain tiles: 50 / 5.96 / 17.6
- State Health Department Beef Advisory

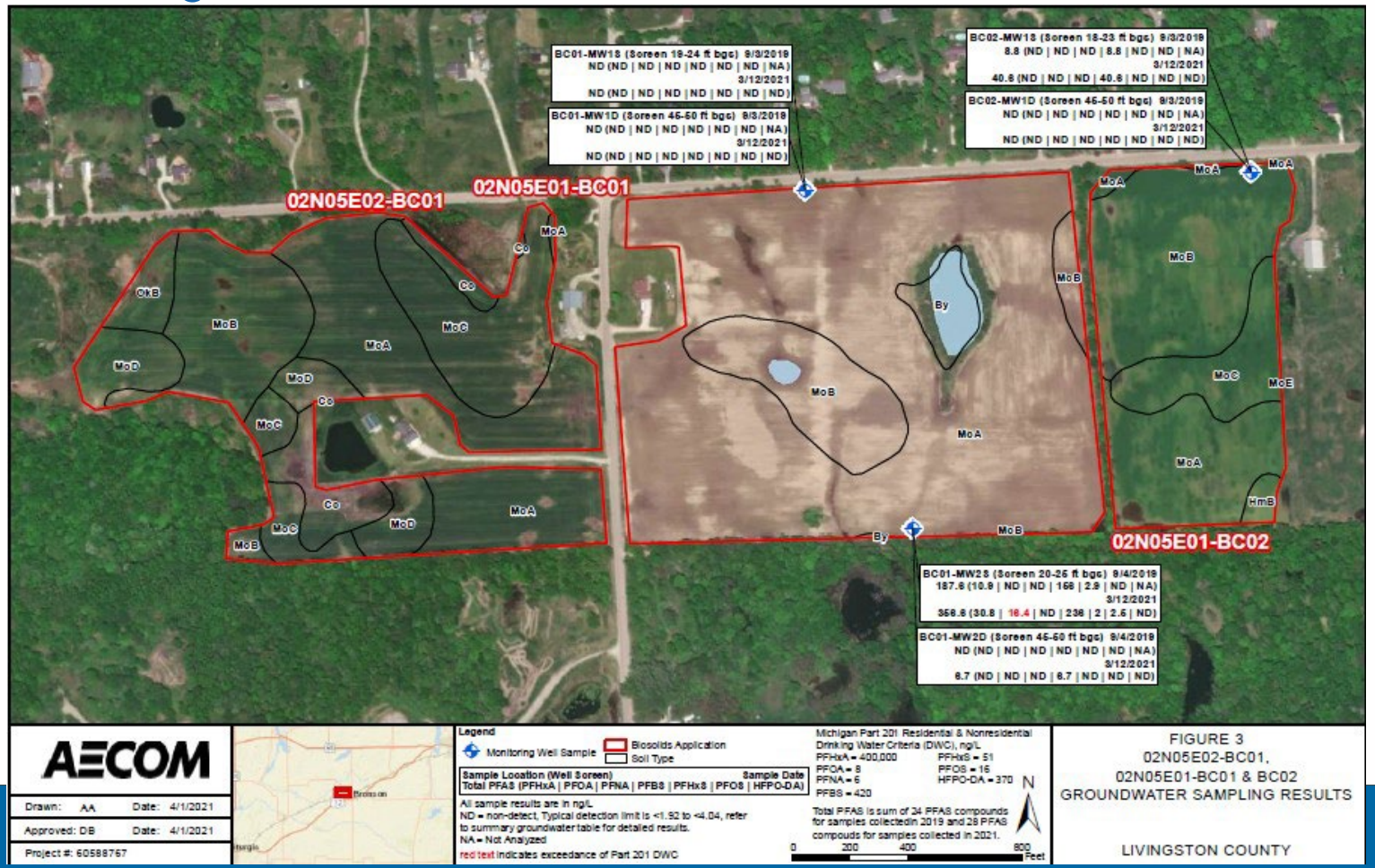


Total PFAS / PFOA / PFOS
Soil ug/kg
Water ng/L

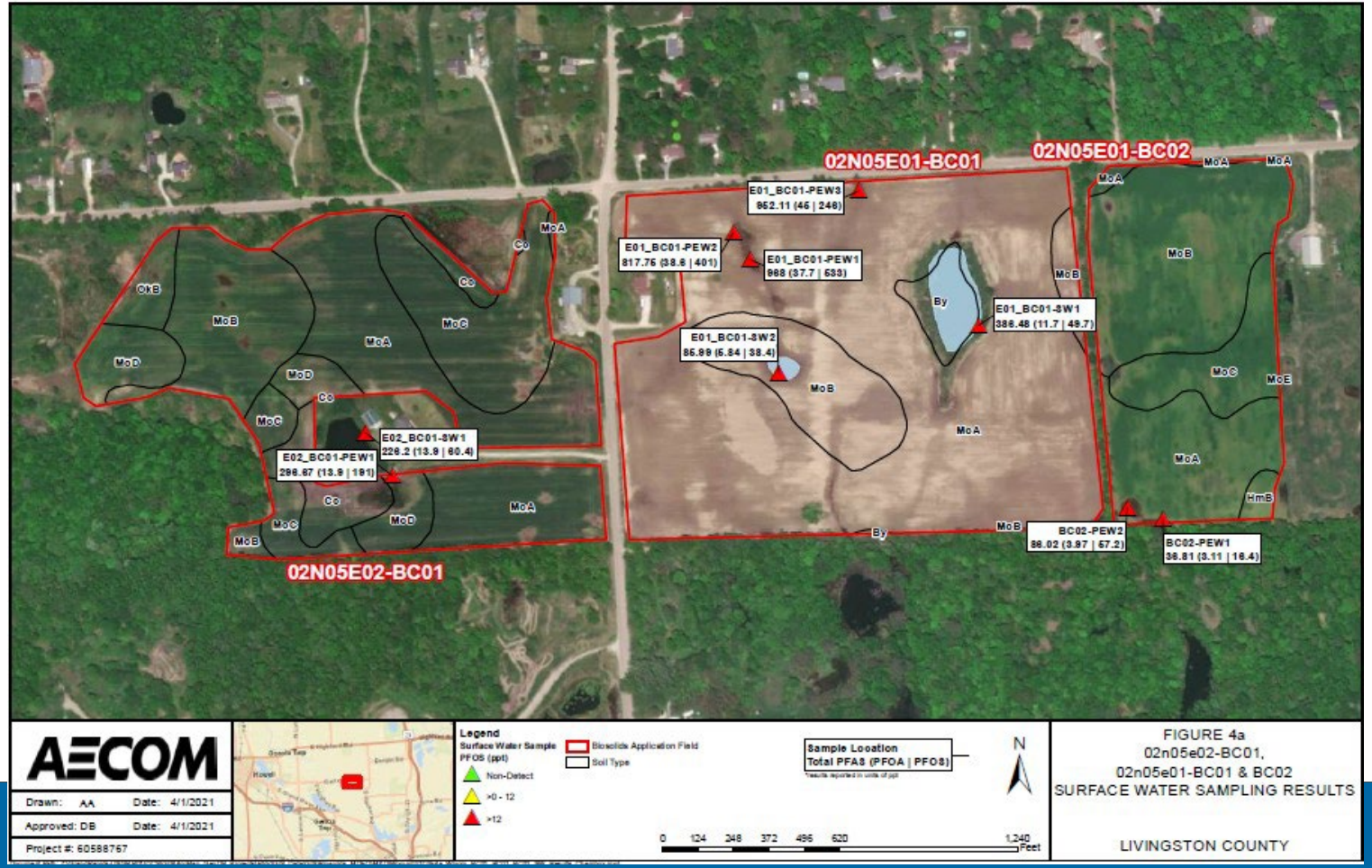
Case Study Wixom Biosolids – Soil



Case Study Wixom Biosolids – Groundwater

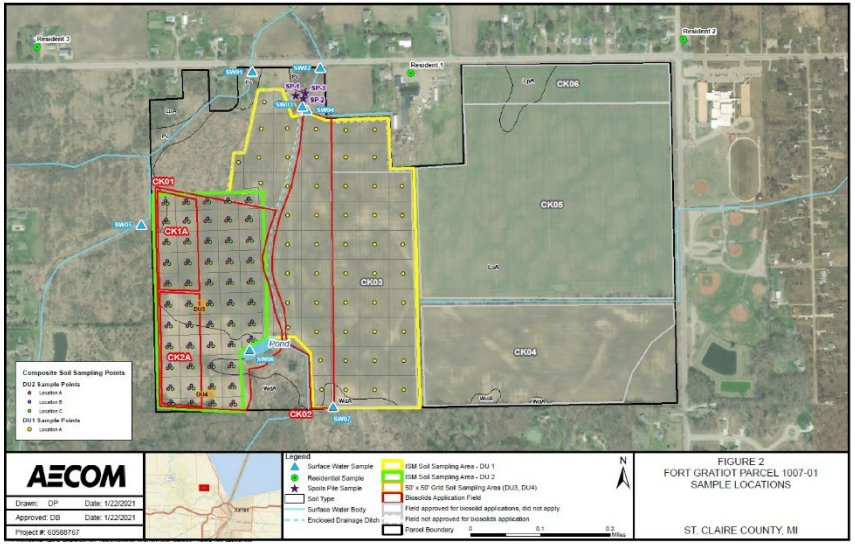


Case Study Wixom Biosolids – Surface Water



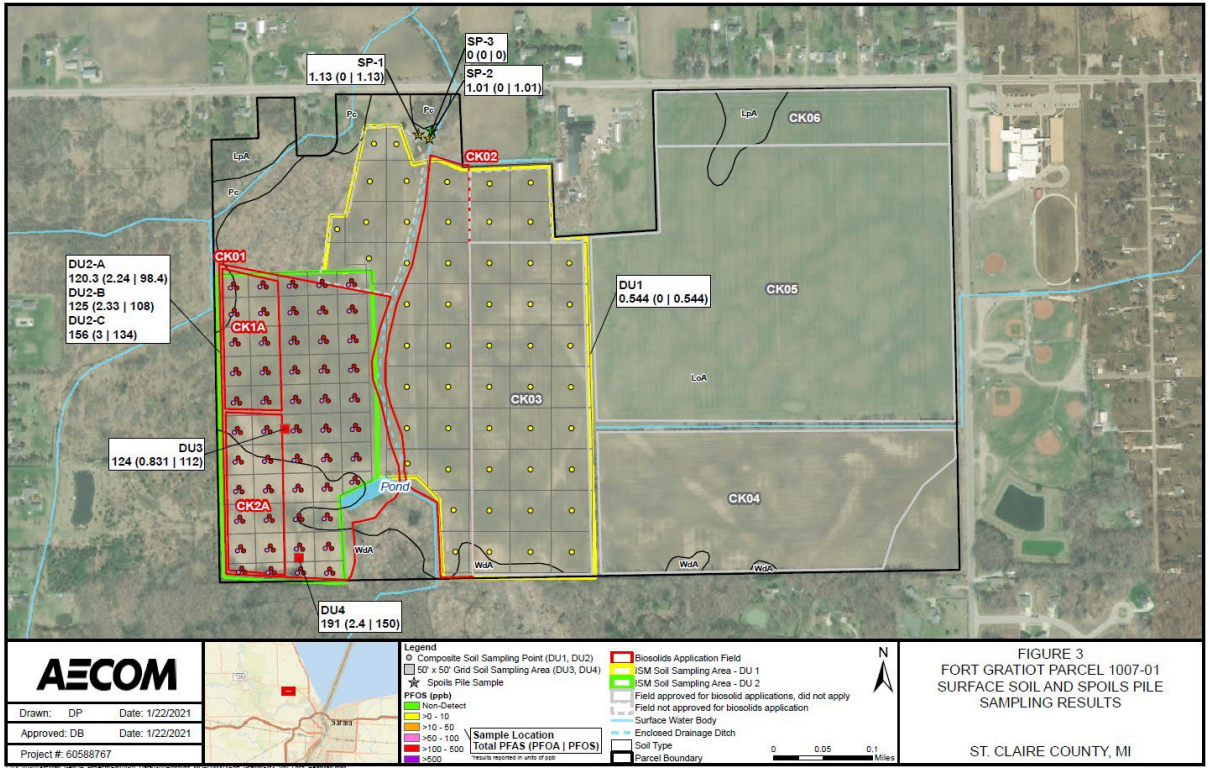
Case Study Fort Gratiot Biosolids

- Biosolids applied in 1982 to 1983
- Soil
  - Incremental Sampling Methodology
    3.00 / 134/ 156
  - Composite 2.40 / 150 / 191
- Surface Water
  - Pond 27.9 / 120 / 168
  - Enclosed drainage channel 164 / 813 / 1012

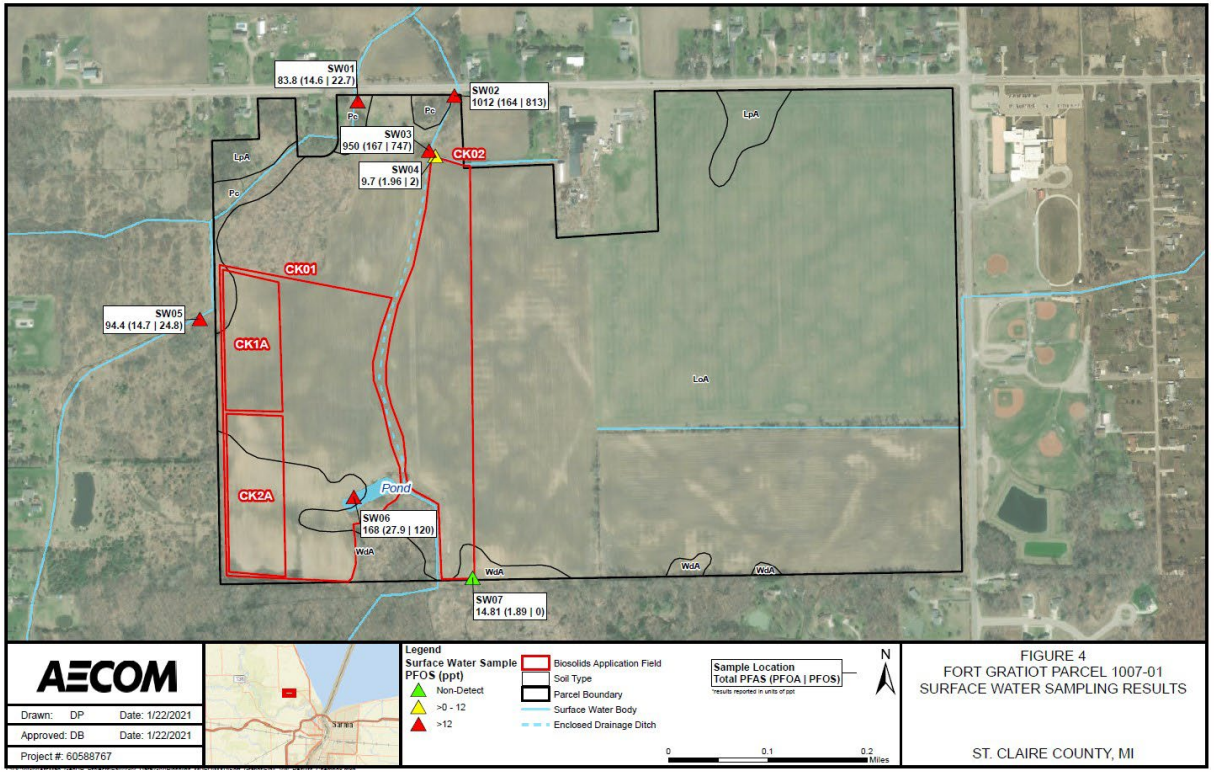


PFOA / PFOS / Total PFAs
Soil ug/kg
Water ng/L

Case Study Fort Gratiot Biosolids - Soil

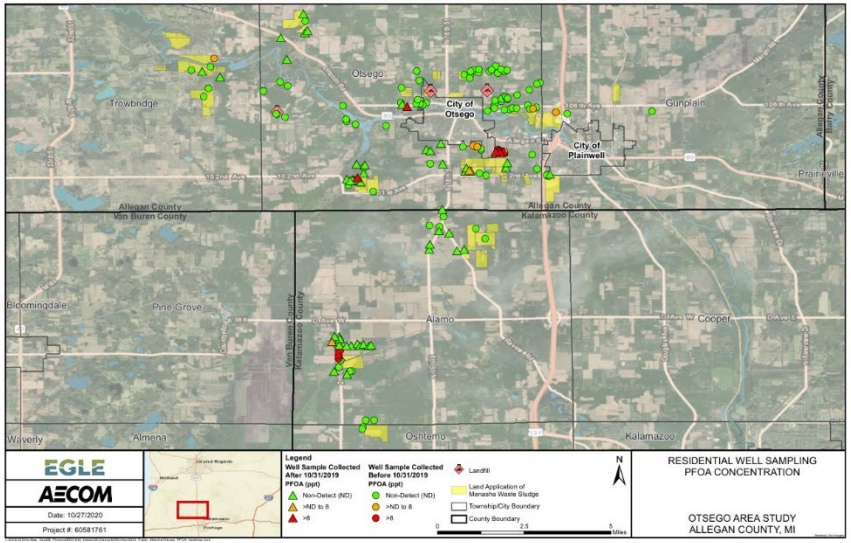


Case Study Fort Gratiot Biosolids - Water



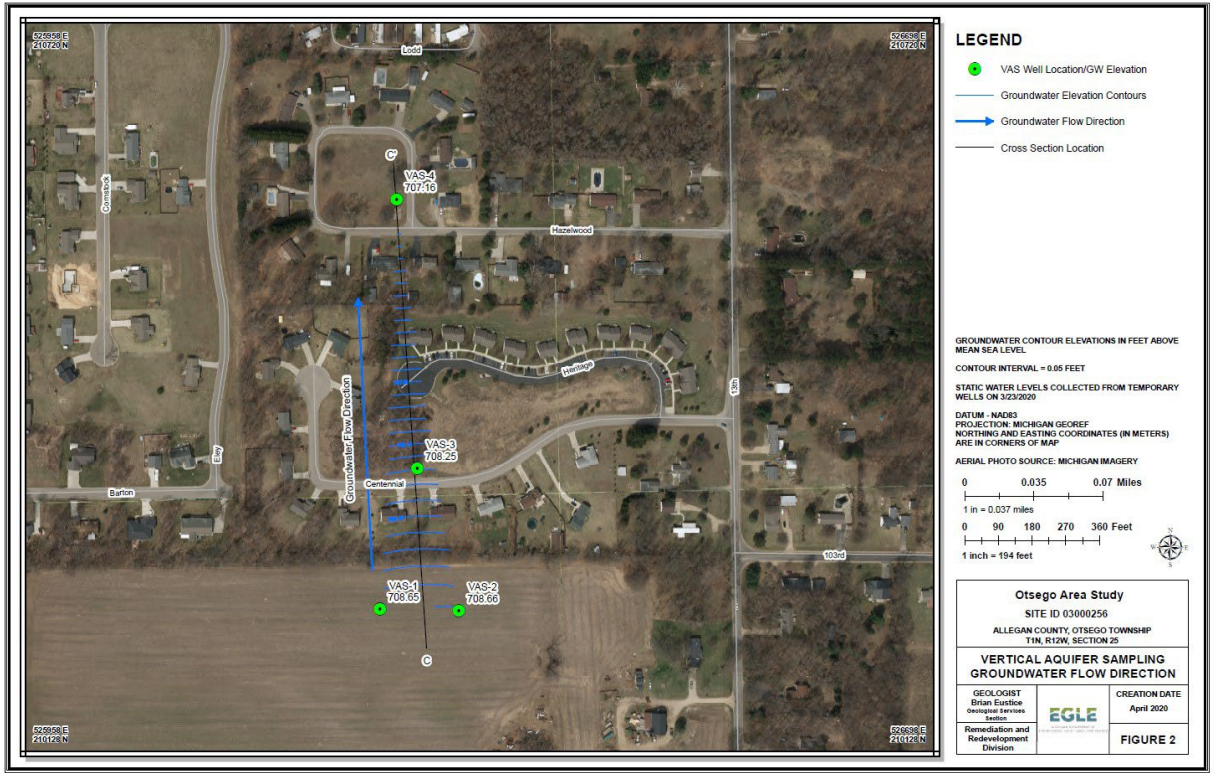
Case Study Otsego Industrial Sludge

- Paper mill sludge 1980-90s?
- Soil ND / 15.8 / NA
- Groundwater 312 / 86.7 / NA
- Res Wells 12 of 16 wells tested with ¼ exceed MI MCL



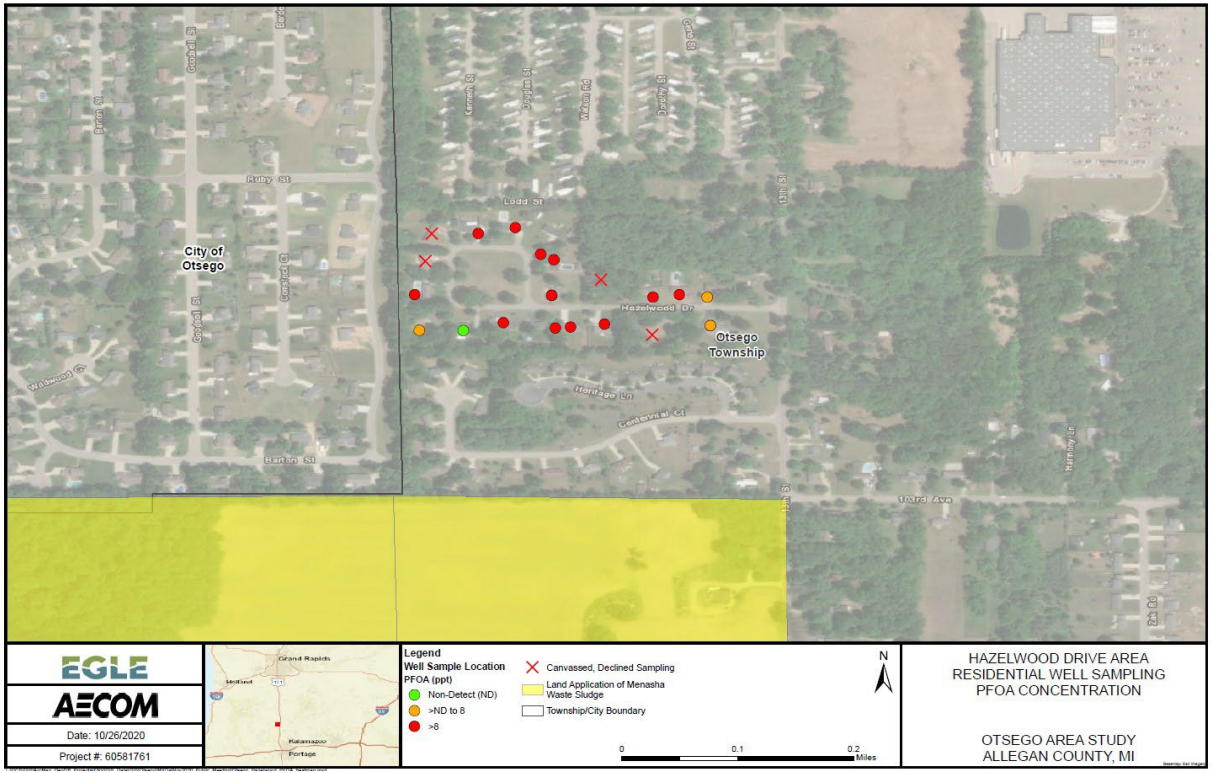
Total PFAS / PFOA / PFOS
Soil ug/kg
Water ng/L

Case Study Otsego Industrial Sludge



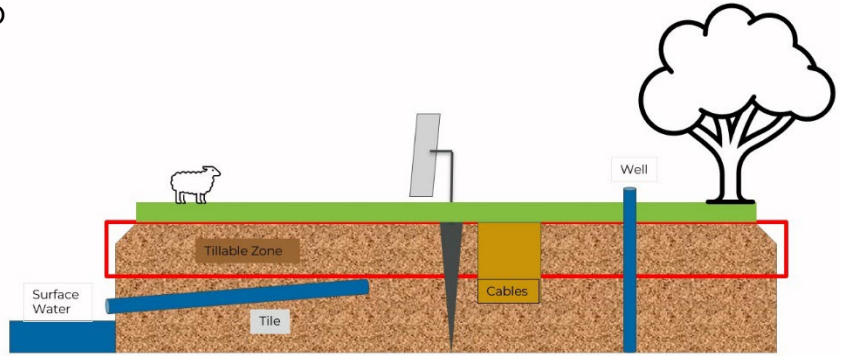
VAS-1		VAS-2		VAS-3		VAS-4	
Farm Field		Farm Field		Cul-de-sac 1		Cul-de-sac 2	
267	69	311	72	246	56	214	21
265	54	303	70	223	45	227	11
83	11	312	33	186	23	188	ND
57	8	181	13	172	ND	139	ND
12	2	163	11	229	ND	125	ND
78	9	95	2	216	ND	149	ND
35	7	124	3	192	ND	142	ND
68	6	100	7	194	ND	129	ND
55	8	59	11	196	ND	120	ND
49	8	37	64	203	ND	40	ND
39	7	61	13	178	ND		
53	9	121	101				
41	6	145	52				
188	52	186	87				
23	5						

Case Study Otsego Industrial Sludge Res Wells



Due Care Considerations for PFAS Solar Site

- Soil: Limit long-term stockpiles to mitigate exacerbating leaching
- Groundwater: prohibit potable wells, locate fire suppression wells on non-biosolids parcels
- Groundwater: Dewatering systems may need to be tested before discharge
- Drain tile: maintain tile and flow direction to mitigate exacerbation
- Surface water: Locate detention / retention ponds on non-biosolids parcels; if possible, limit use of pond hydrants for dust and fire suppression
- Limit crops beneath the panels to non-consumption crops
- Limit grazing animals to non-consumption livestock
- Tree trimming / removal limit wood / wood chips to onsite use



Resources

Blue Elk Solar Remediation Information and Data Exchange Facility ID 46000319

Wixom Biosolids Evaluation of Wixom Wastewater Treatment Plant (WWTP) Biosolids Land Application Sites Sites 02N05E01-BC01 & BC02, 02N05E02-BC01 & AG01 03N06E04-JW01 & JW05 (Full Report)

Fort Gratiot Biosolids Evaluation of Port Huron Wastewater Treatment Plant (WWTP) Biosolids Land Application Fort Gratiot Agricultural Field Parcel ID 74-20-019-1007-01 (Full Report)

Otsego Otsego Area Study/Fields Area of Interest (Otsego, Allegan County)

General

MPART Sampling Guidance PFAS Sampling Guidance

ITRC PFAS Page PFAS — Per- and Polyfluoroalkyl Substances

Questions

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