

Perfluorochemicals (PFCs; aka PFAS) in Grey Cloud Island Township

Grey Cloud Island Town Board

March 8, 2017

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Poly- and Perfluoroalkyl Substances (PFASs)

Large class (200+) of surfactants with unique chemical properties - Fluorinated carbon chain with various functional group(s)

Used since 1940s in products that resist heat, stains, water, oil and grease; production increased rapidly in 1970s

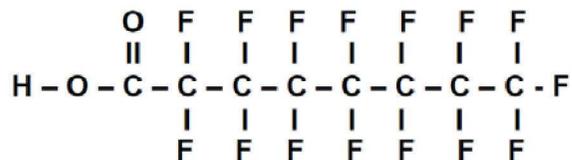
Many other specialized industrial and commercial uses (operative word: non-stick)



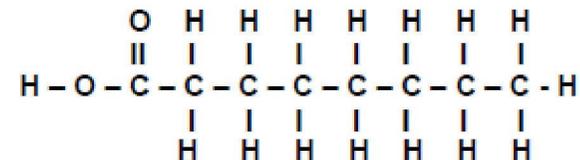


PFCs Behave in Unique Ways

- **Do not break down in the environment**
 - C-F bond is extremely strong
 - No hydrolysis, photolysis, or biodegradation
- **Do not adsorb readily to aquifer materials**
 - Infiltrate rapidly to the groundwater
 - Little or no retardation
 - Rates affected by PFC chain length and functional group
- **Chemical structure similar to fatty acids**
 - Readily adsorbed into blood serum of living organisms



Perfluoro-octanoic Acid (PFOA)



Caprylic Acid

PFASs In The News Again

- **EPA Lifetime Health Advisories (HAs)**
 - PFOS and PFOA – 70 ng/L, individually or combined
 - Based on animal studies and human correlation studies suggesting developmental & immune system effects
 - Short-term exposure concerns for developing fetuses, infants, and children
- **MDH Evaluation**
 - Currently using EPA HAs for PFOS and PFOA
 - Calculate additive effect using PFBA and PFBS HRLs (7 ug/L) and surrogate value for PFHxS (70 ng/L)
 - Hope to establish new HBVs in early 2017
 - Values may be lower than EPA HAs





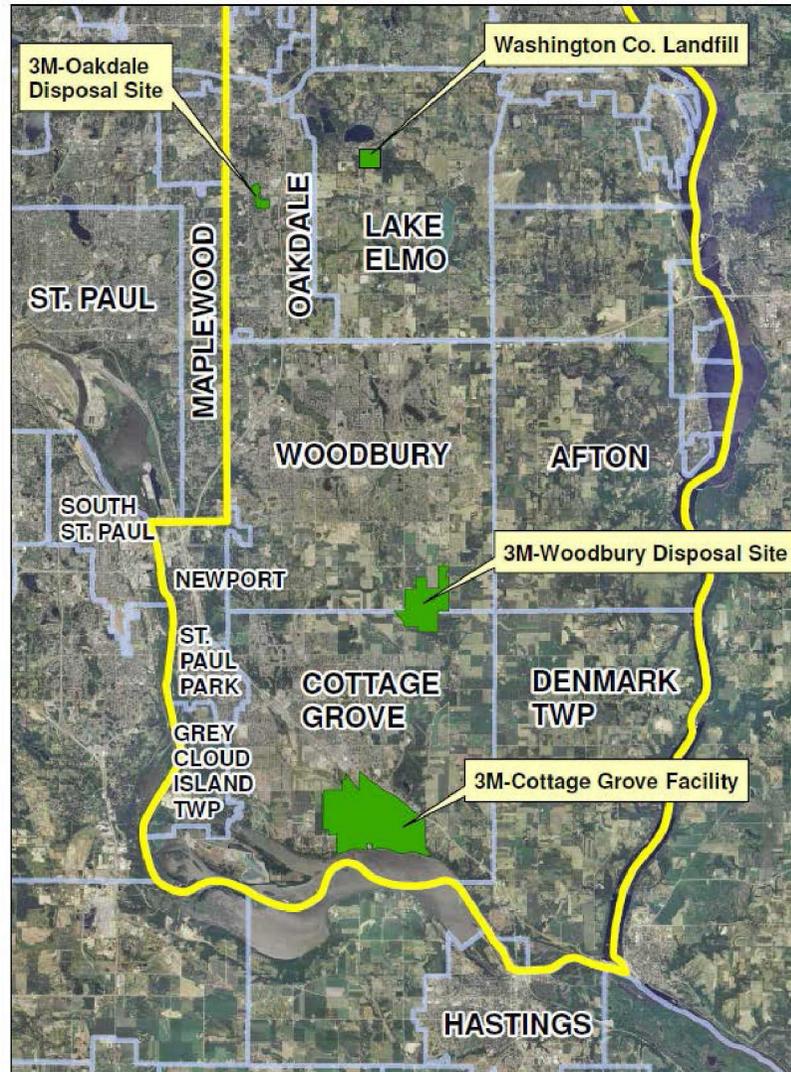
PFASs in the East Metro

Manufactured in Cottage Grove, MN since the 1940s

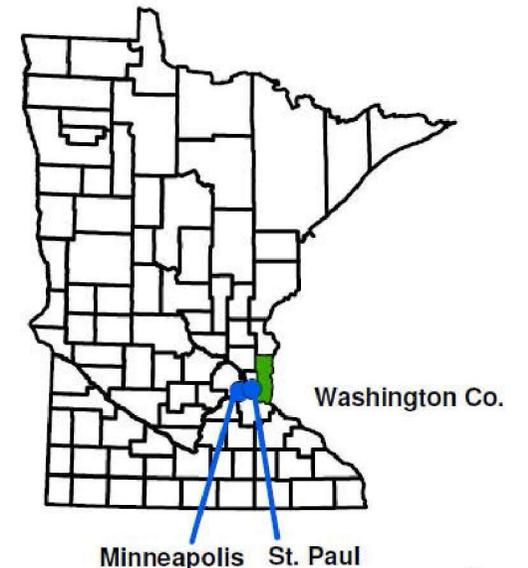
Wastes disposed of at plant and 3 major off-site disposal areas

Investigated since 2003

New EPA Health Advisories for PFOS & PFOA: more sampling & well advisories



Location of 3M PFC Sites in Washington Co., Minnesota



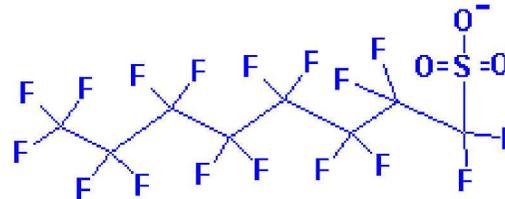
00.51 2 3 4 5 Miles



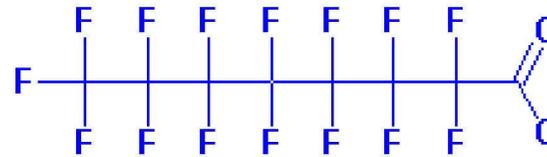
PFCs of Concern in Washington Co.



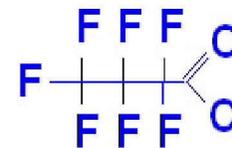
Perfluorooctane sulfonate



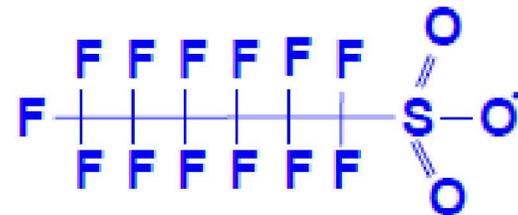
Perfluorooctanoic acid



Perfluorobutanoic acid



Perfluorohexane sulfonate



Other PFCs detected: PFPeA, PFHxA, PFBS



Bedrock Structures & Groundwater

Faults

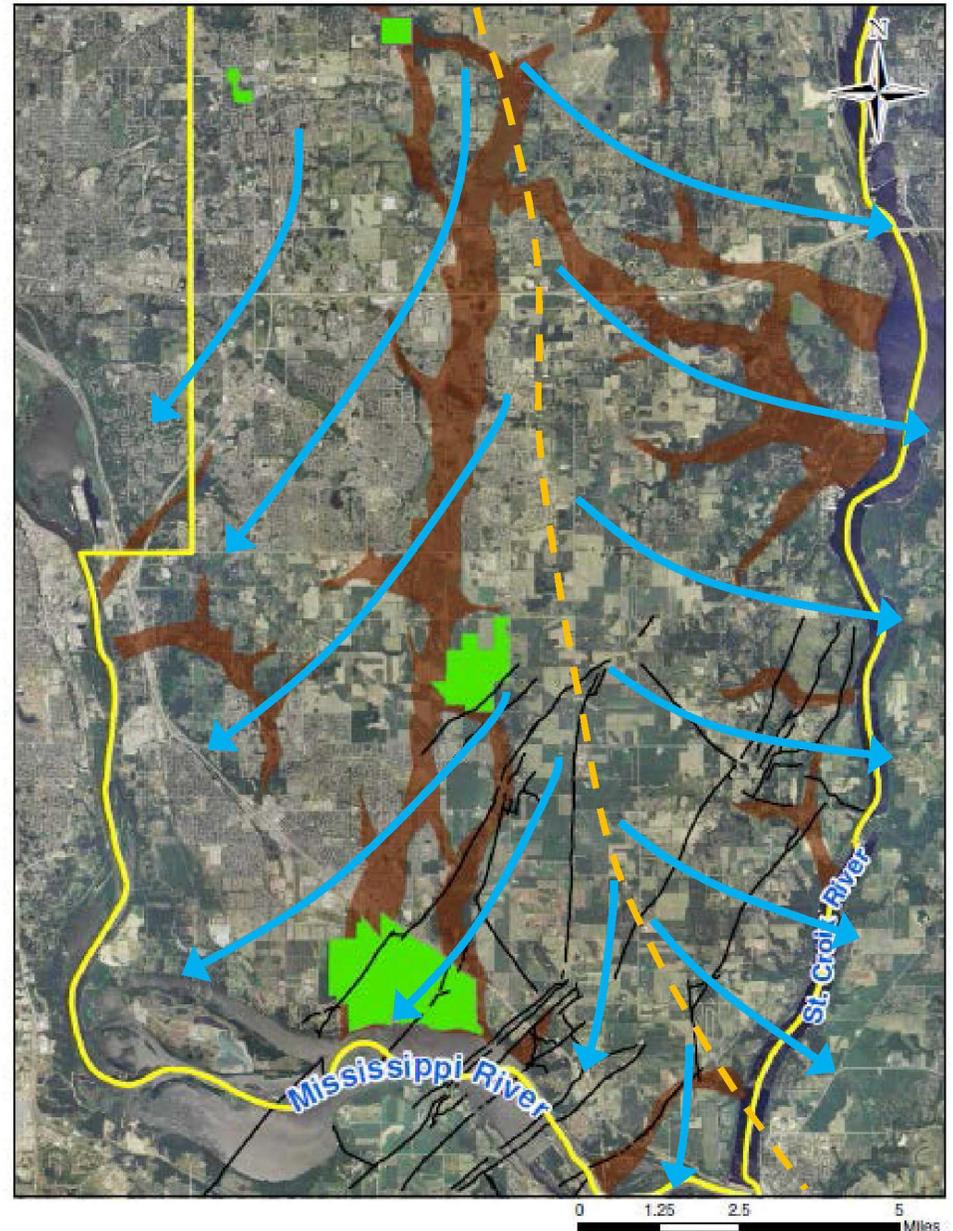
Fractures

- Parallel and at an angle to faults
- Vertical and horizontal

Buried Bedrock Valleys

Groundwater Divide

- Bisection south Washington Co.





Result: A PFAS Megaplume

Over 100 mi² contaminated

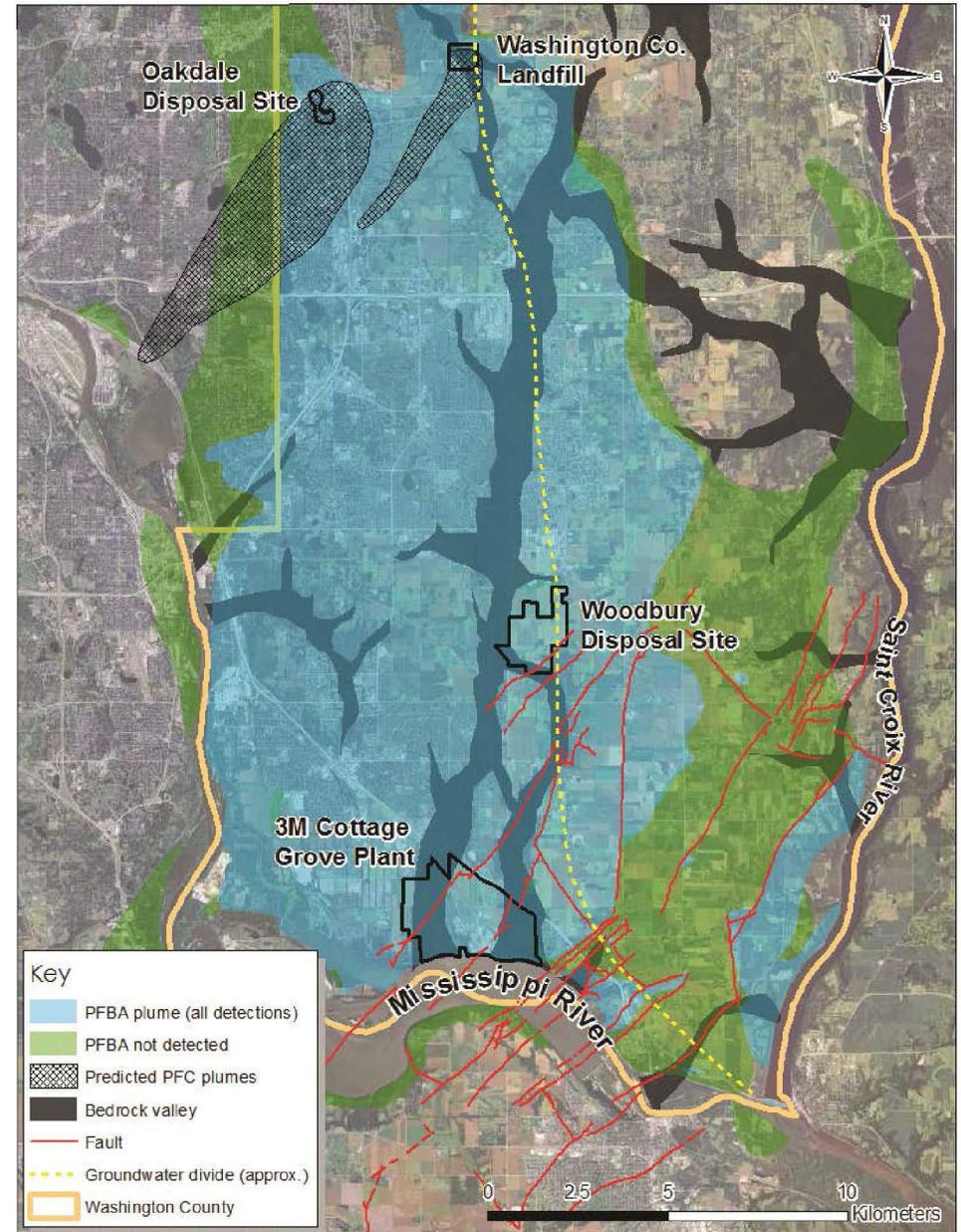
- 4 major aquifers
- 8 municipal systems
- >1,500 private wells
- Much larger plume than models predicted

PFBA most widespread

- Short-chain carboxylate

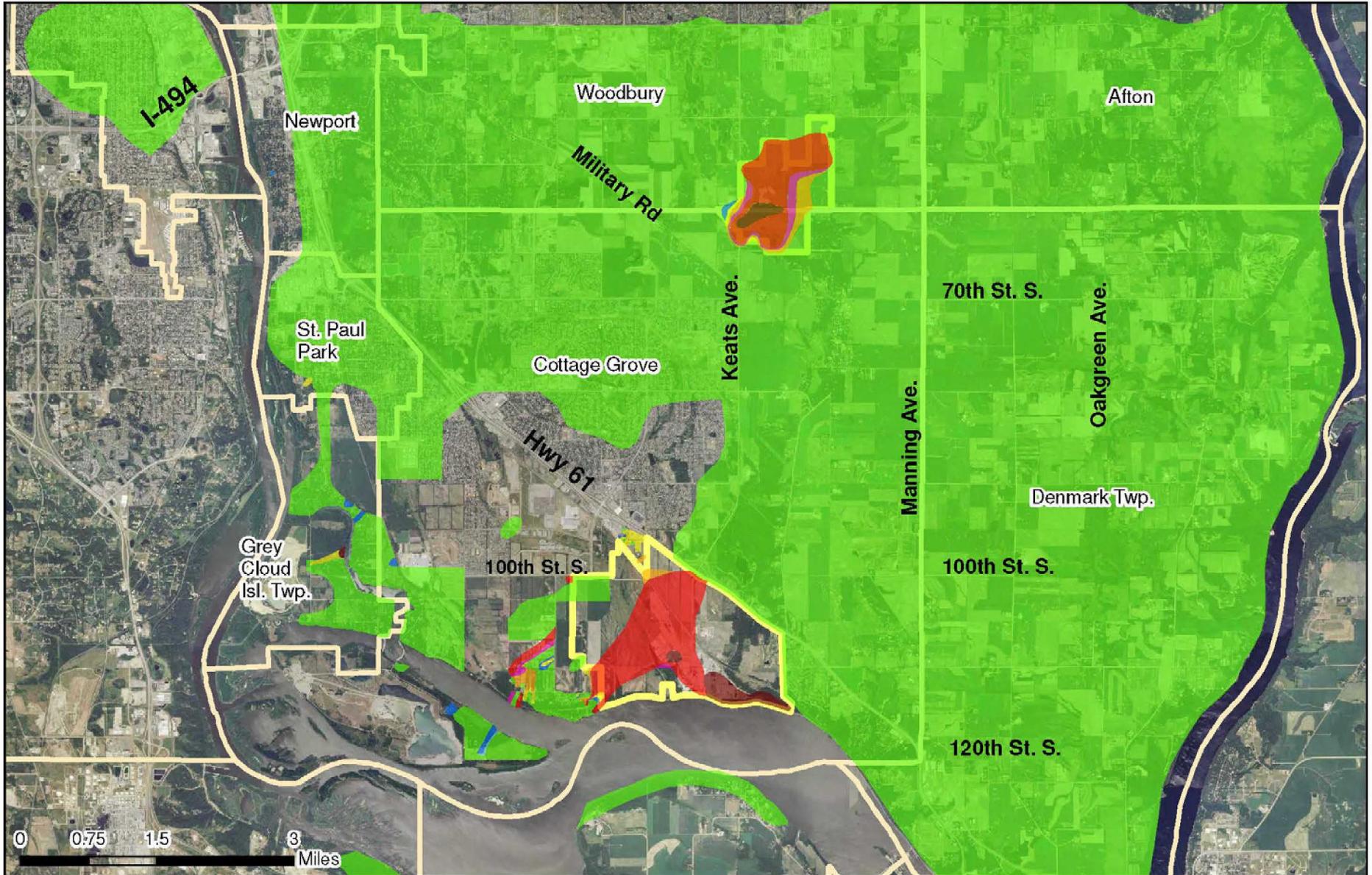
Distribution controlled by:

- Bedrock features
- GW-SW interactions
- Human interventions
- PFC partitioning



MPCA & MDH Response to EPA HAs

- **Expanded investigations in East Metro**
 - **West Lakeland Twp. & Afton now within affected area**
 - **Sampling 500+ wells this fall/winter**
 - **Surface water transport again a major pathway**
- **185+ new well advisories issued (so far)**
- **Bottled water → GAC or city water**
- **Working w/ affected public water systems (Oakdale and Cottage Grove)**
- **MN Public Health Laboratory lowered PFC reporting limits**

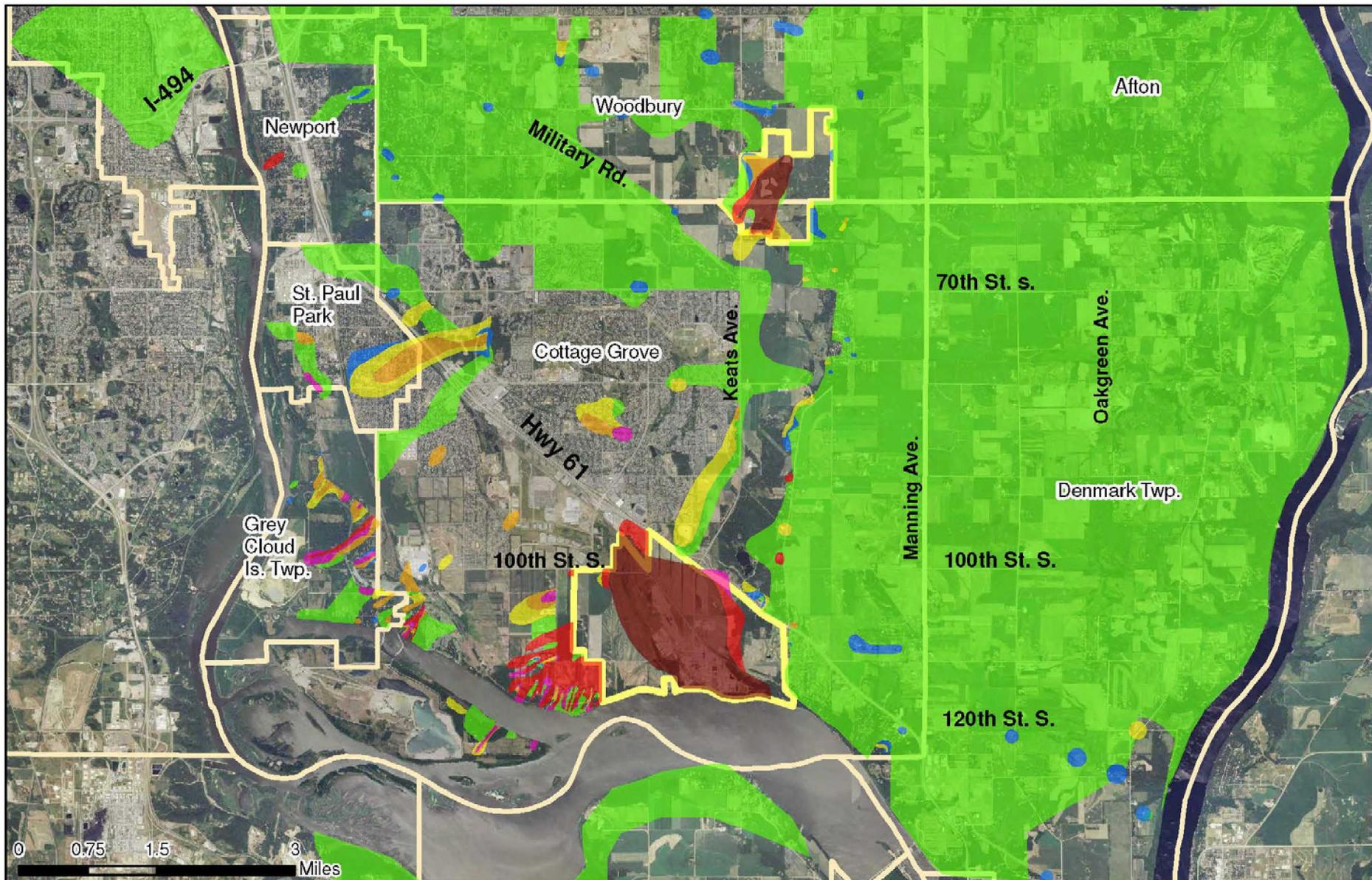


PFOS in Cottage Grove/Grey Cloud Island Twp. Area - All Aquifers



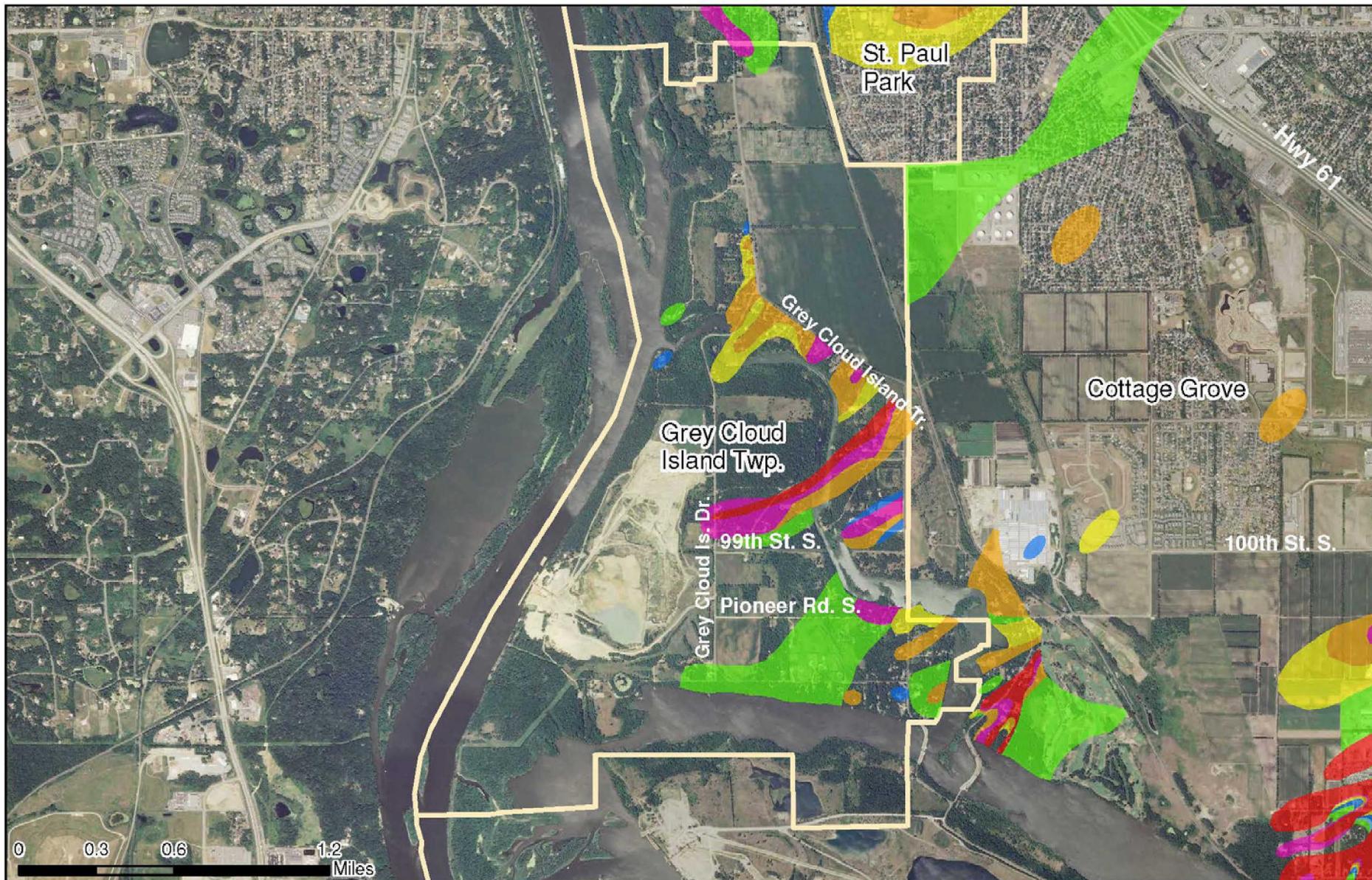
MDH - 2/22/2017

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PFOA in Cottage Grove/Grey Cloud Island Twp. Area - All Aquifers





PFOA in Grey Cloud Island Twp. - All Aquifers

- | | | |
|--|--|---|
|  PFOA > 10x EPA HA |  PFOA 50-75% EPA HA |  PFOA < 10% EPA HA |
|  PFOA > EPA HA and < 10x EPA HA |  PFOA 25-50% EPA HA |  PFOA not detected |
|  PFOA 75-100% EPA HA |  PFOA 10-25% EPA HA | |



MDH - 2/21/2017

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Well Sampling & Advisories

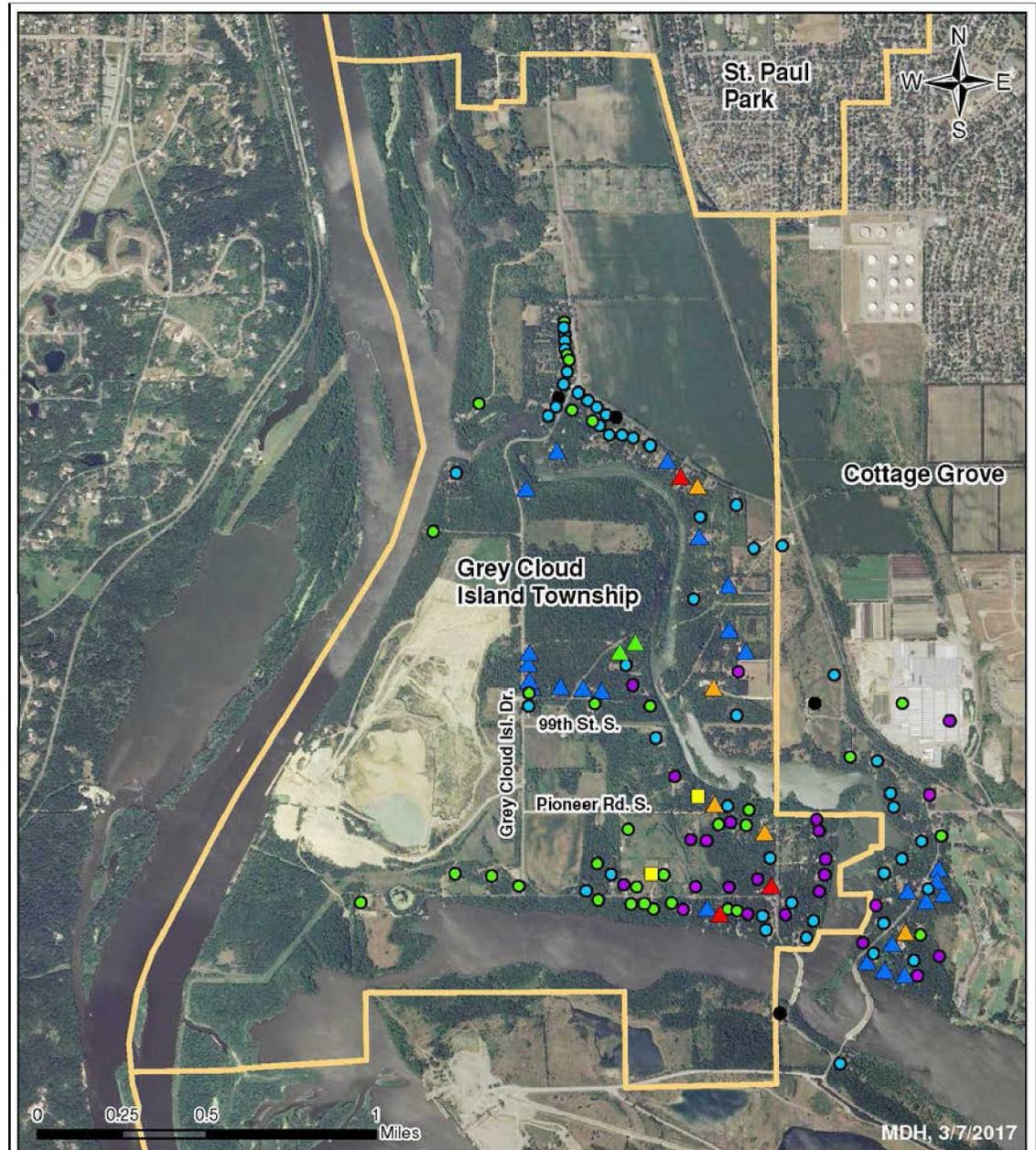
Prior to Aug. 2016:

- 2 well advisories in the township

Since Aug. 2016:

- 14 advisories based on pre-existing data (2014-2016)
- 7 advisories based on new samples
- 60 wells sampled
- 28 to be sampled
- 2 refusals

MDH



Private Well Sampling and Advisories - Grey Cloud Isl. Twp.

- | | |
|--------------------------------------|---|
| ▲ New well adv (Dec 2016 - Feb 2017) | ● Well on "to be sampled" list |
| ▲ New well adv (Oct-Nov 2016) | ● PFOS/PFOA, below current HAs |
| ▲ New well adv (Aug-Sept 2016) | ● Below levels of health concern, no PFOS/PFOA |
| ▲ Pre-existing well advisory | ■ Well w/ recent (2014-15) data, not on sampling list |

2737.0013

Drinking Water Treatment

Private Wells

- 2,000+ sampled to date
- Approximately 500 sampled annually
- 350+ well advisories have been issued since 2005
- Residents provided bottled water, then GAC
- 220 homes in Lake Elmo connected to city water (2007)



Biomonitoring

Three rounds: 2008, 2010, 2014

196 initial participants (164 returned)

PFCs decreased in blood of people drinking treated water
(but average concentrations > national average)

