Bedrock Layers in South Washington Co.

Sedimentary Deposits: 0-100 ft. thick, sand and gravel with clay layers Decorah Shale: 0-15 ft. thick

Platteville & Glenwood Formations: 0-30 ft. thick, thinly bedded limestone, dolomite, and shale

St. Peter Sandstone: 0-150 ft. thick; private well aquifer

Prairie du Chien Group: 130-200 ft. thick, heavily karsted dolomite with sandy and shaley layers – high transmissivity zone near Shakopee -Oneota contact; private well aquifer

Jordan Sandstone: 65-95 ft. thick; main aquifer used by city wells, also used by private wells

St. Lawrence Formation: 35-60 ft. thick, dolomitic sandy shale and siltstone can help slow or stop downward movement of PFAS

Tunnel City Group (formerly Franconia): 165 ft. thick, green glauconitic sandstone, private well aquifer near Mississippi and St. Croix Rivers

Wonewoc Sandstone (formerly Ironton-Galesville): 45-75 ft. thick, light grey sandstone, private well aquifer near St. Croix R.

Eau Claire Formation: 80-100 ft. thick, sandstone/siltstone/shale - can help slow or stop downward movement of PFAS

Mt. Simon Sandstone: 280 ft. thick, pinkish - light grey sandstone, Lakeland city wells and some older private wells aquifer near St. Croix R.

Bedrock Geology of South Washington Co.



Groundwater Flow in South Washington County

- A groundwater divide extends from north to south beneath the county
 - West of the divide flows to Mississippi River
 - East of the divide flows to St. Croix River
 - Flow "fans out" near confluence of rivers
- Buried bedrock valleys exert significant control over local flow directions



PFAS in groundwater – Washington County, MN

- **PFAAs highly soluble, mobile, persistent = very large plumes**
 - Much larger than predicted by models XXX
 - Co-mingled plumes
- PFBA most widespread
 - Extremely soluble and mobile = groundwater tracer
 - Distal plume difficult to distinguish from "ambient" levels
- Distribution controlled by:
 - Bedrock features (buried valleys and faults)
 - Groundwater divide (Mississippi R. and St. Croix R. –)
 - Groundwater surface water interactions
 - PFAS chemical properties (partitioning)
 - Source area PFAS "signature"
 - Groundwater pumping



NOTES: Map combines data from all aquifers, actual concentrations in any area may vary; blank spaces indicate no sample data; PFBA HRL = 7 ppb 3/26/2018

PFOS & PFOA are the PFAS of Main Concern

- Bioaccumulate
- Very low Health Based Values
 - PFOS: 0.027 ppb
 - PFOA: 0.035 ppb
 - PFHxS: 0.027 ppb (surrogate), but not widespread
- Driving most of the current investigations and well advisories
- Relative amounts vary by disposal site
 - High PFOS levels in 3M-Oakdale
 - Modest PFOS levels in 3M-Woodbury
 - Low PFOS levels in Wash. Co. landfill



Aquifer use varies across the county

- Groundwater PFAS data is primarily from private wells
 - Large areas with no private wells (city water)
 - Large areas where most wells access the same aquifer (limiting our ability to map vertical distribution of PFAS)
- Older wells tend to be in shallower aquifers (St. Peter and Prairie du Chien); well code requirements mean most newer wells are in the Jordan or deeper aquifers.
- Most private wells are completed in the Prairie du Chien (OPDC) or Jordan (CJDN), which are hydrologically connected
 - Where wells in both aquifers are present, it appears the extent of the PFAS plumes are similar in both, but
 - In some areas OPDC has slightly higher concentrations



PFOS by "Aquifer"



PFOA by "Aquifer"



No. AND

Location of wells sampled for PFAS and private well advisories

