23 February 2021

Dayton Water System Update

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BUILDING A WORLD OF DIFFERENCE®

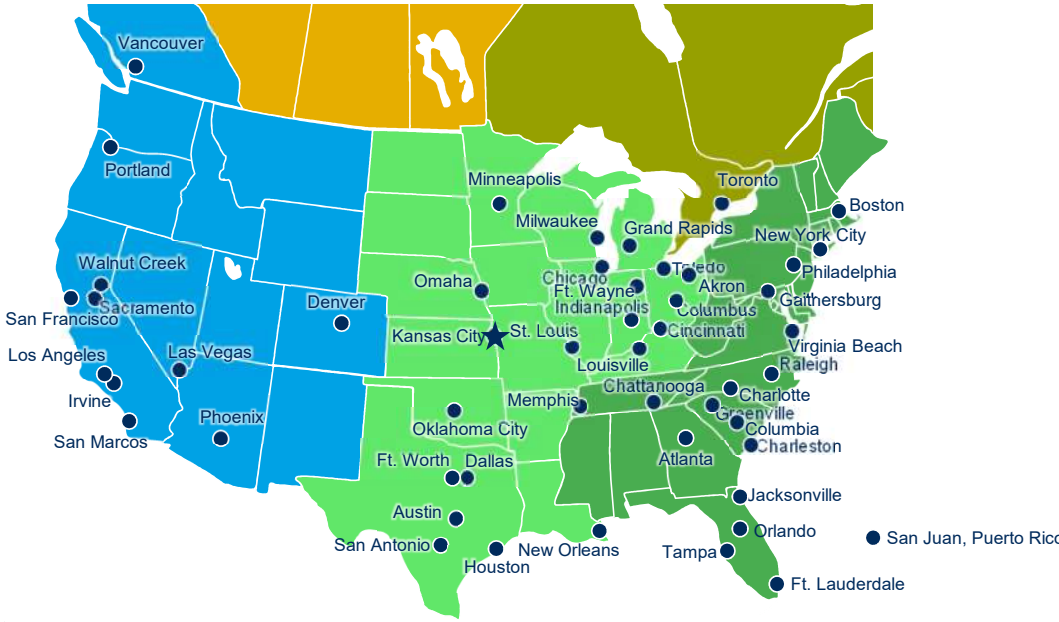
BLACK & VEATCH

Agenda

- Black & Veatch Re-Introduction
- Water Refresher
- Where have we been?
- Where are we going?

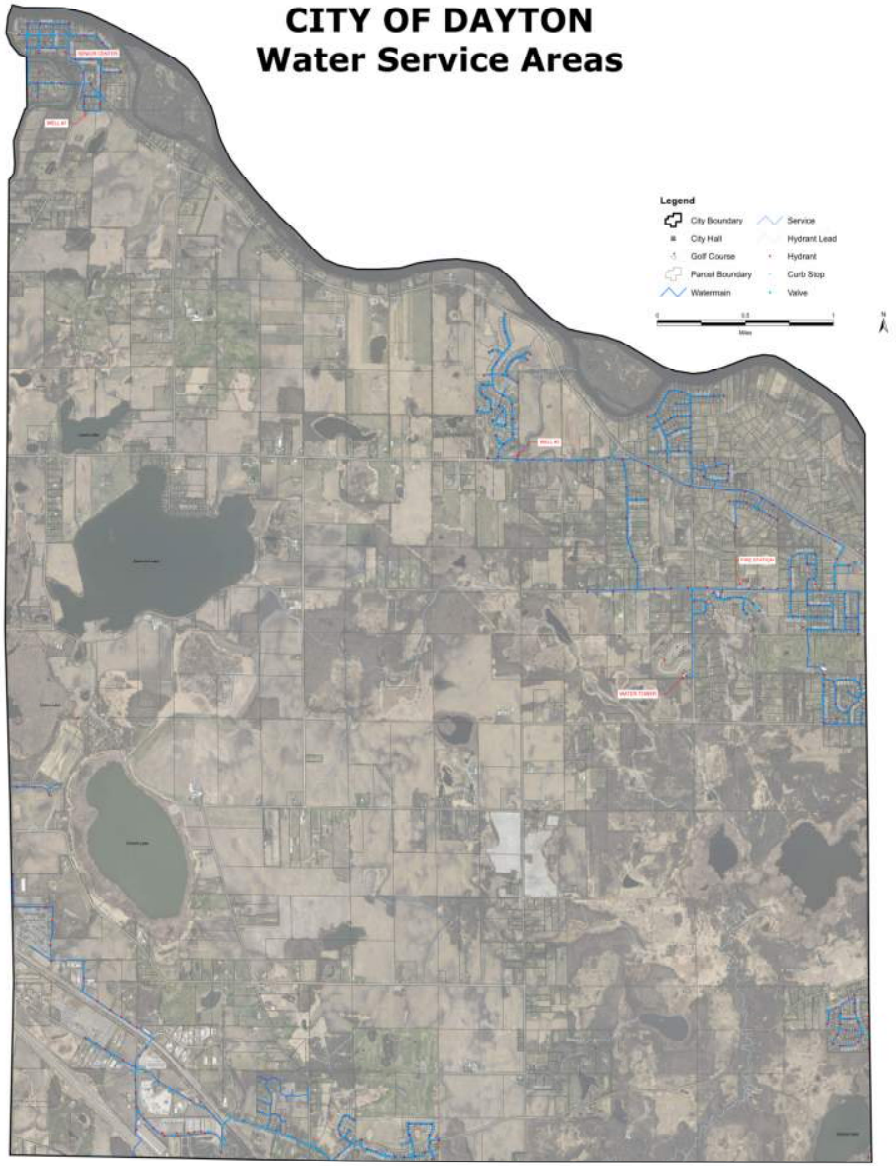
Black & Veatch – Introduction to New Council Members

- Founded in 1915, over 12,000 professionals
- Minneapolis office has 130 professionals working in water, power, and telecom
- B&V is currently providing water consulting for many local communities.



★ Worldwide Headquarters
● Operation Offices

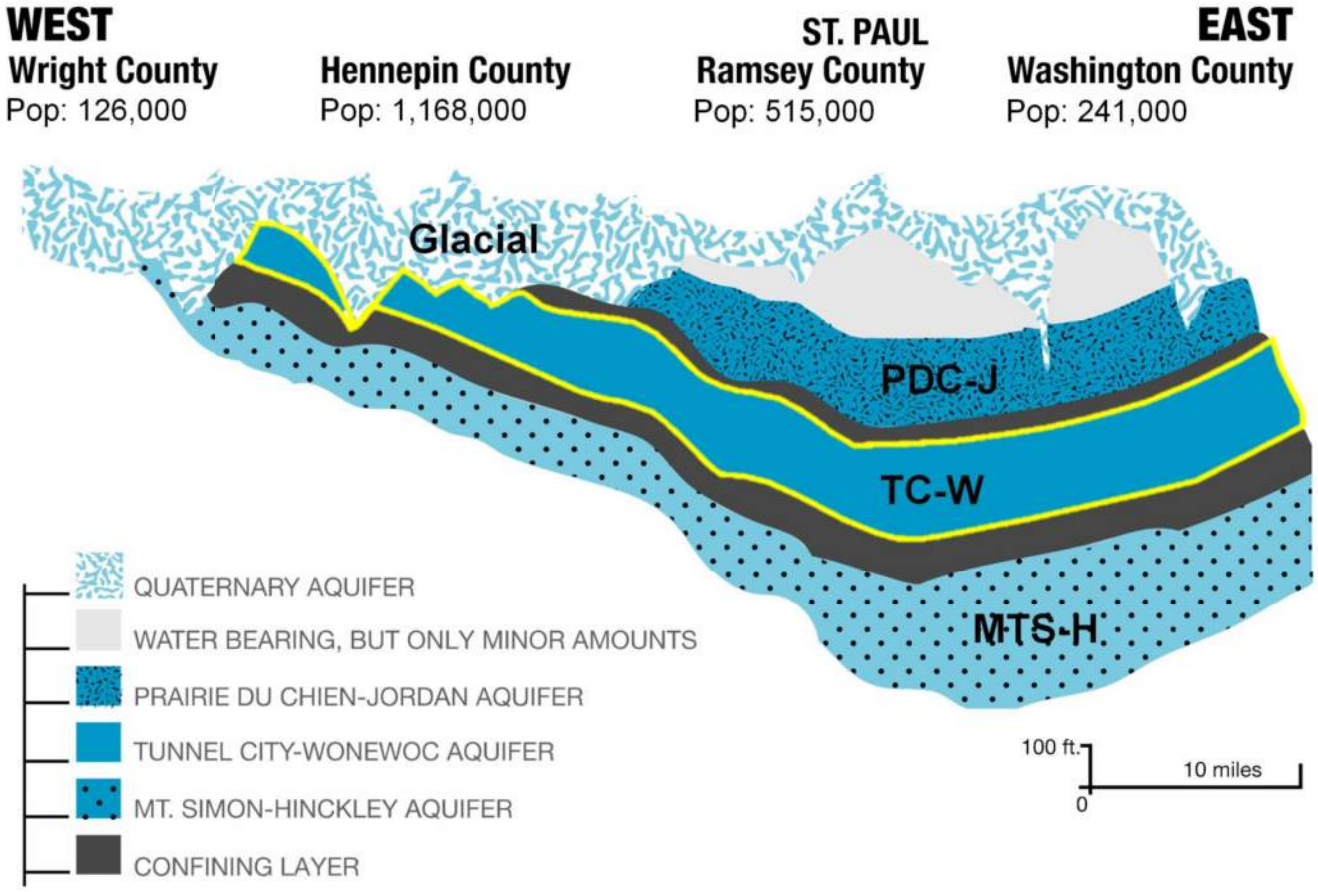
Water Refresher



Dayton's Current Water System

- Water Sources – Well Water + Bulk Purchase
- Well Water
  - Well #1 – Old Village
  - Well #2 – NE Dayton
  - Well #3 – Old Village (Backup)
  - Well #4 – NE Dayton (Under construction)
- Purchase Water from Maple Grove & Champlin

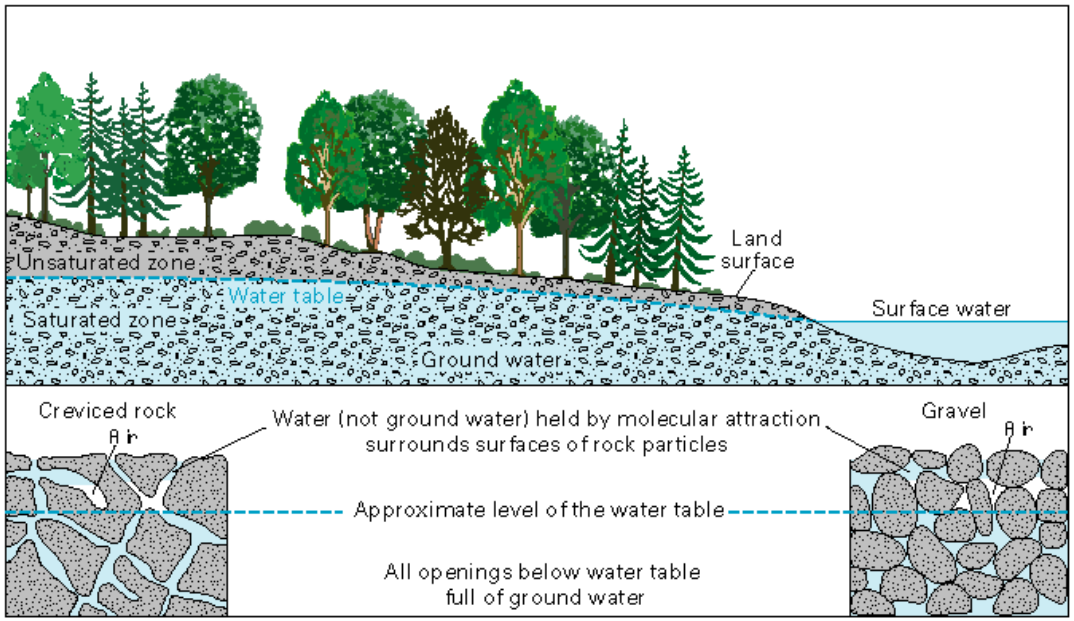
Well Water Basics - Aquifers



- 30 communities rely on TC-W aquifer
- Management Concerns
  - Productivity varies
  - Connected to surface waters
  - Vulnerable to contamination

Aquifers of the Twin Cities Metro Area – Courtesy Met Council

Groundwater Chemistry



- Dissolved Minerals
  - Hardness & Alkalinity
    - Calcium/Magnesium
  - Dissolved Metals
    - Iron/Manganese
  - Other Minerals – Sodium, Sulfate, Chloride, Fluoride, etc.
- Nitrogen Source – Ammonia, Nitrite, Nitrate

Photo Source: USGS "Groundwater General Interest" Publication

Primary Standards vs Secondary Standards

- Primary Standard
  - Inorganic Chemicals – Nitrate, Nitrite, Lead, Copper, etc.
  - Organic Chemicals – Benzene, etc.
  - Microorganisms – Crypto, Giardia, Viruses
  - Radionuclides
  - Disinfectants/Disinfection By Product

MUST TREAT

- Secondary Standards
  - Color
    - Red (Iron - Fe)
    - Black (Manganese - Mn)
  - Odors – Rotten Egg/Swimming Pool
  - Hardness
  - Taste

SHOULD TREAT

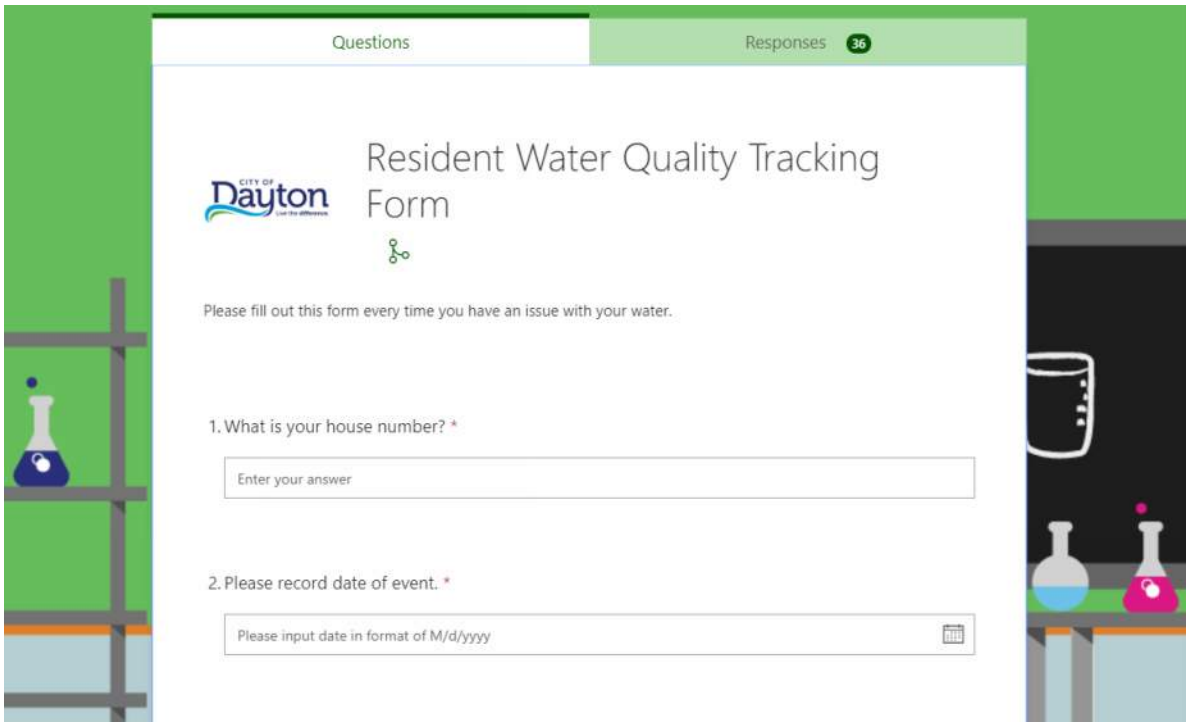
Where have we been?

Issues with Well 2 System

- Black & Veatch contacted in late 2017.
- City Council Updates
  - 5/8/2018
  - 2/27/2019
- Granstrom Resident Update
  - 8/16/2018

Resident Water Quality Tracking

- Introduced at Granstrom Neighborhood Meeting
- Allows residents of neighborhood to log when there are issues with water quality.
- Records:
  - Time
  - Date
  - Location
  - Issue (color, odor, etc.)



Where have we been?

"We should not have to be paying for this water....."

"The smell is super strong and has lasted over a week."

"Water from Champlin has been so much better before we were switched back"

"Horrible water quality"

"Water has been bad all week - seems worse this week than it has been"

"Laundry stinks like sewer"

"Laundry room and master bathroom smell worse like sewer"

"The water smell is getting so bad we can't even mix it with things because the smell is too strong."

"Sulphuric/rotten egg smell is present every day"

"This is the second bath I've tried to run for my wife since our child's birth and while the first one was off color this one was obscene."

"Can we go back to Champlin water supply - the difference is night and day"

Complaints – Color & Odor

Well #2 Water Quality

	pH	Fe	Mn	NH_3	S	Hardness	Alkalinity
Units		µg/L	µg/L	mg/L	mg/L	mg/L	mg/L
Original (2007)	7.7	799	65	ND*	15	265	269
May 2018	7.35	1410	21	0.22	19	300	280
Feb 2019	7.22	1322	72	0	11	-	-
Feb 2021	-	980	93	-	-	-	-
SDWA Secondary Standard	6.5-8.5	300	50	-	250	-	-

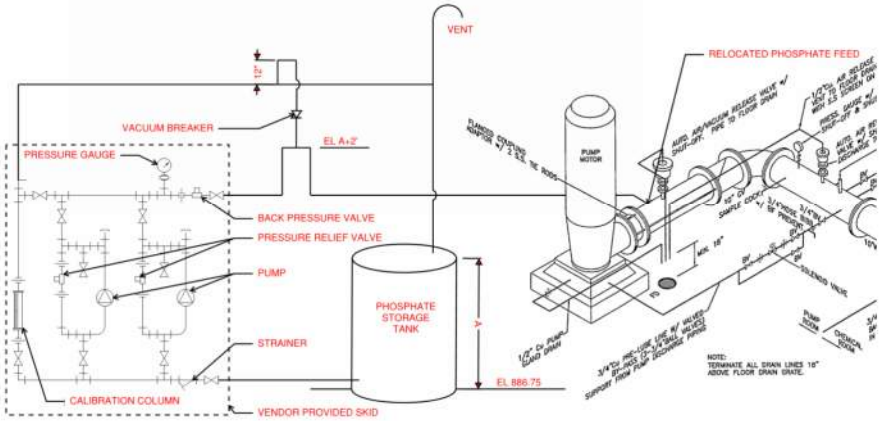
*Non detect limit of 0.5 mg/L

2018 Well 2 Improvements

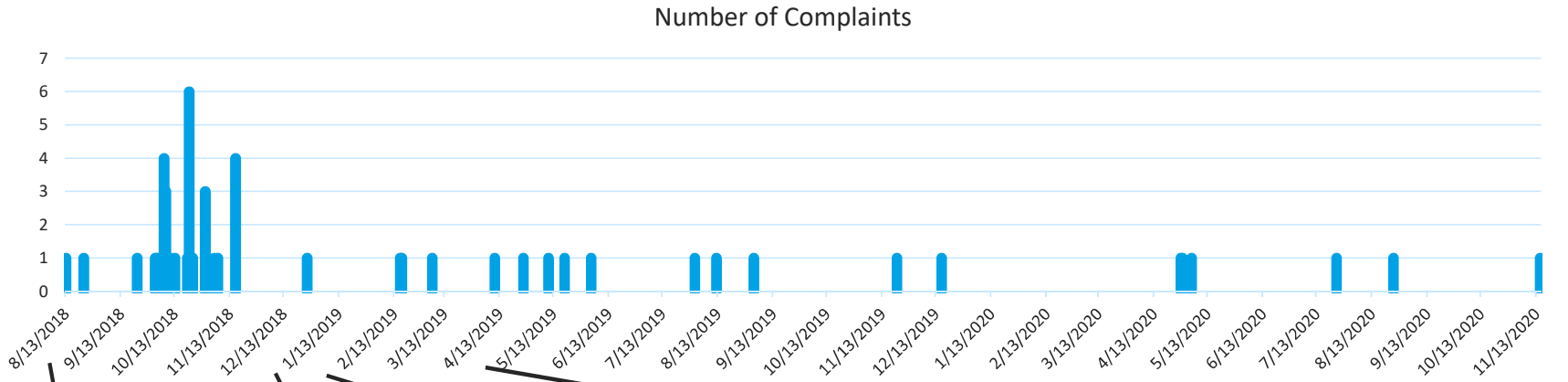
- Increase phosphate and chlorine dosages
  - Optimize phosphate product being fed
- Small improvements to infrastructure
  - Chemical Feed Improvements
    - Mixing
    - Monitoring
  - Additional Chemical Feeds
  - Water Tower Mixing and standpipe

New polyphosphate skid

- Installed in December 2018
- Ability to vary chemical feed with flow rate and water quality
- Provides redundancy
- More accurate metering and tracking of phosphate dosed and used



Resident Water Quality Tracking – Results



Increase level range in water tower

Increase chlorine feed

Water quality feedback form

Decrease well pump speed

Phosphate Skid Install

Phosphate Scale

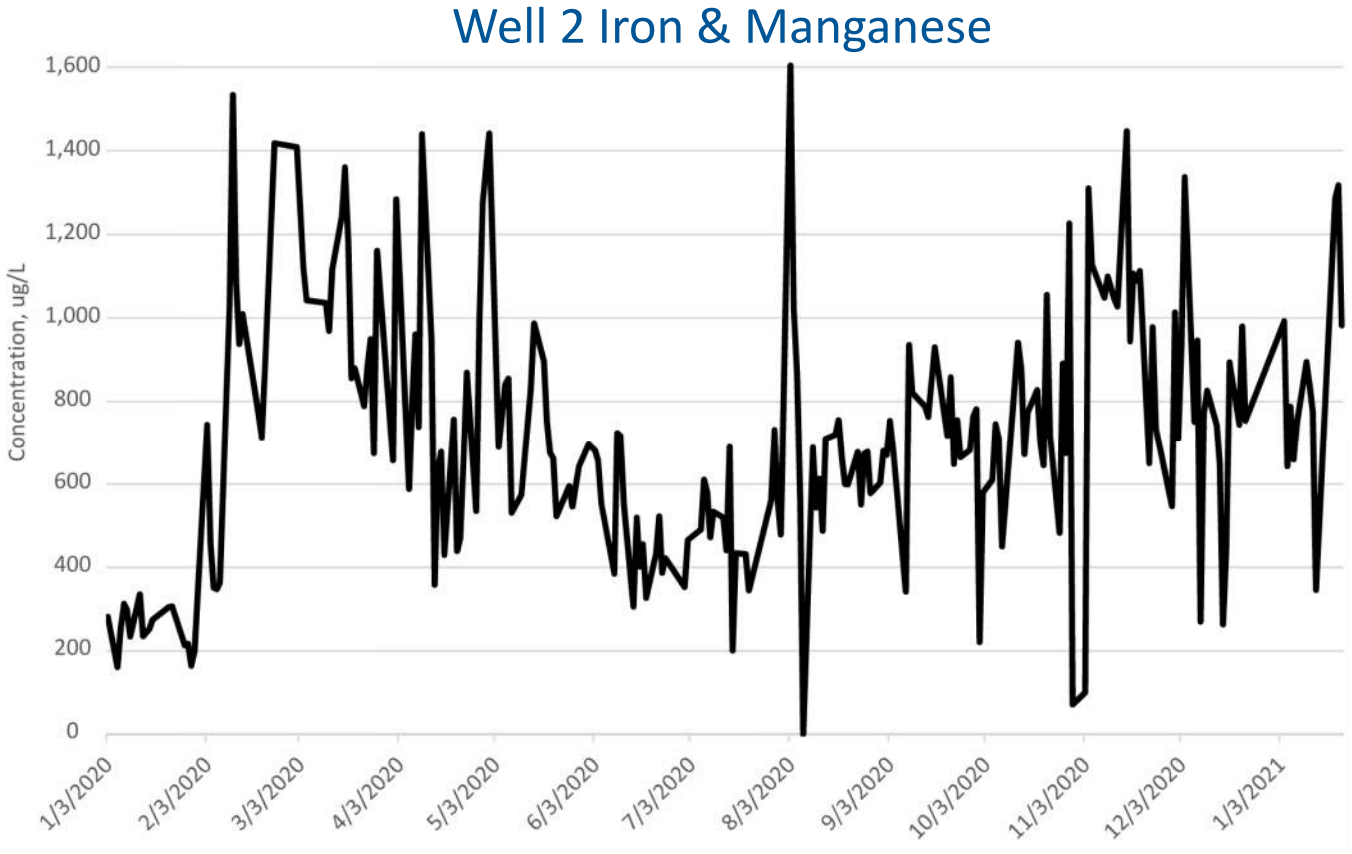
Dosing Spreadsheet

Water Tower Improvements

Phosphate feed relocation

Implemented Regular Water Quality Testing Program

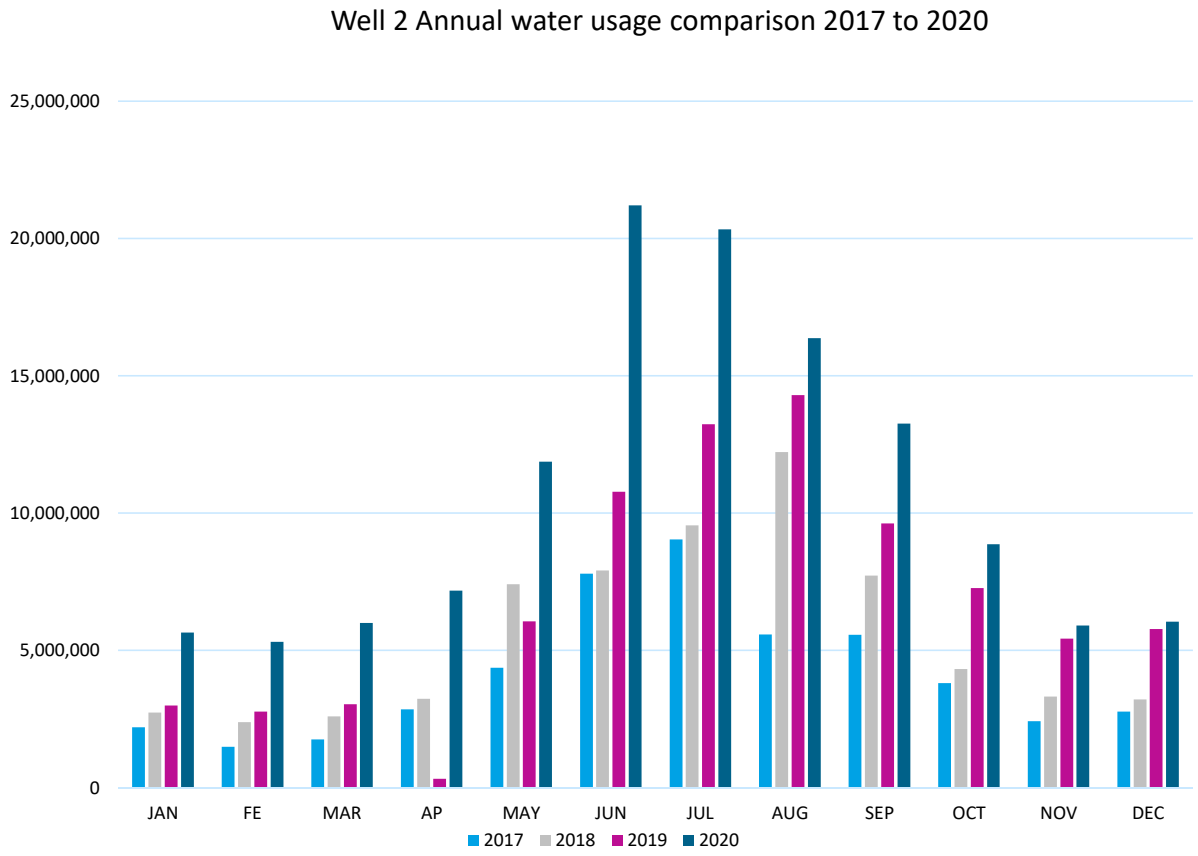
- **Testing for iron, manganese, chlorine, sulfate, and ammonia.**
- **Historical trends**



Where are we going?

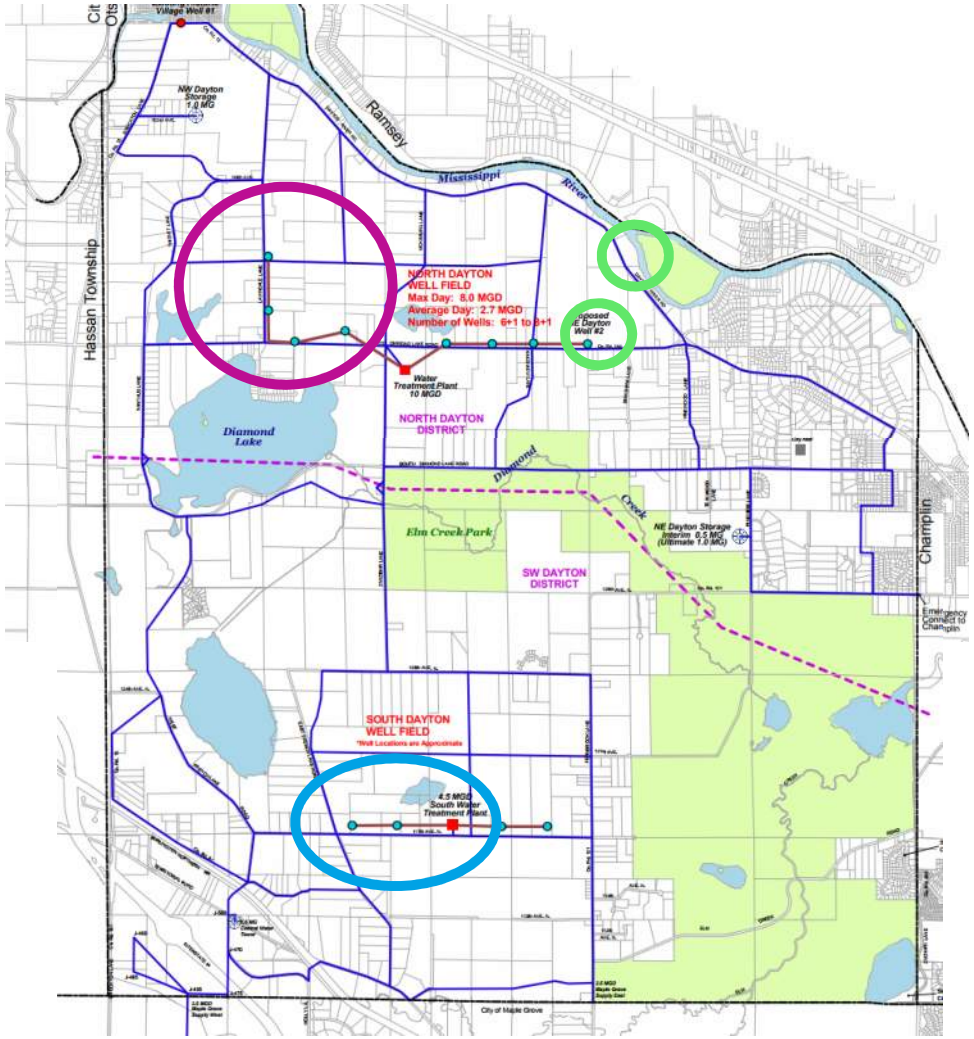
Where are we going?

- Population Growth is out pacing water system production
- Aquifer Water Quality is Poor
  - High Iron, High Mn = Colored Water & Complaints
- Water purchased from Maple Grove & Champlin = loss of revenue for Dayton



Find New Water Source

- 2018 Recommendation
- Bring another well online
  - Required for future capacity
  - Potentially could find better water quality
- Wenck Conducting Now
  - 2021 Testing – Well 4
  - 2021 Testing – SW Area
  - 2021-2022 Testing – NW Area?

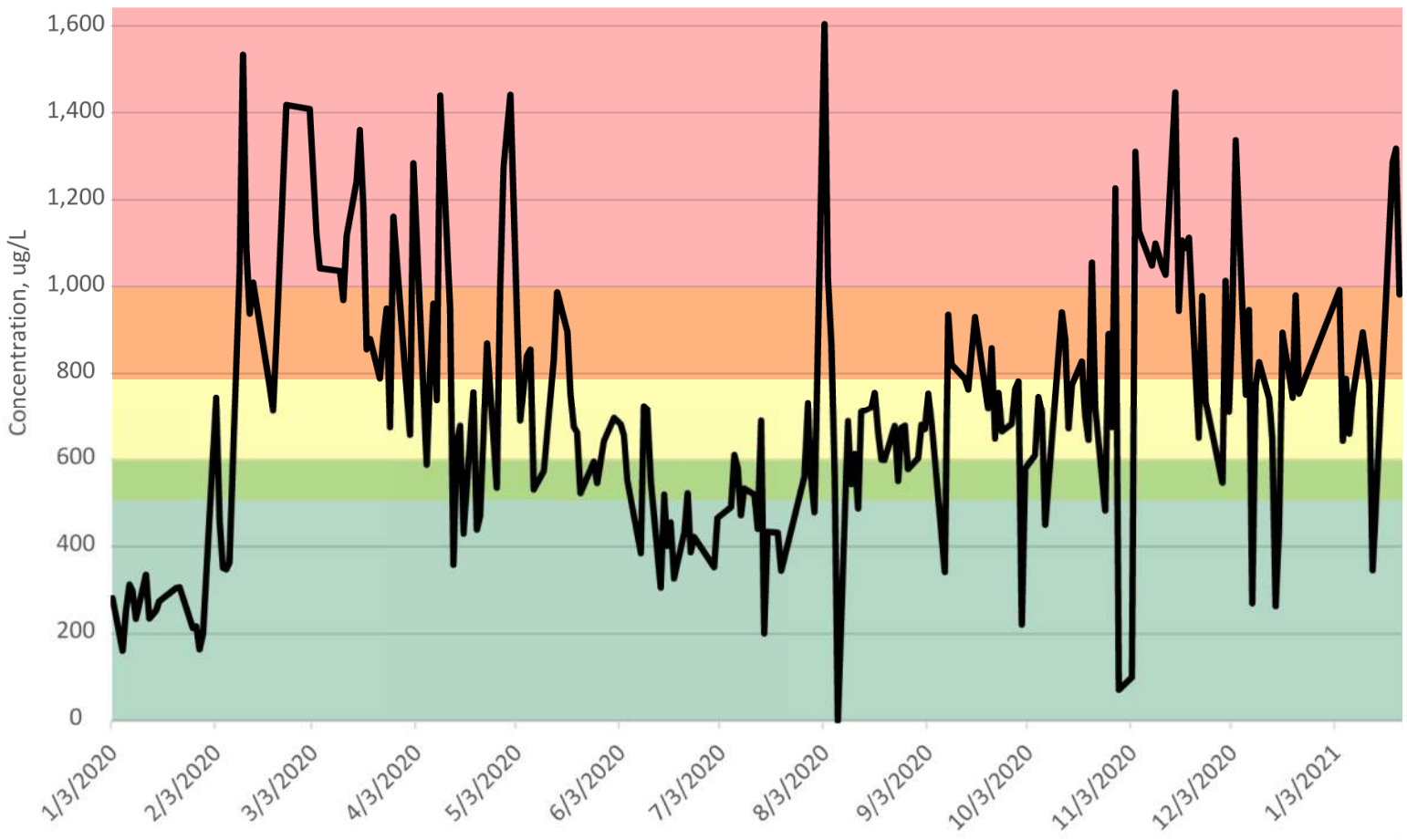


Dissolved Iron & Manganese (µg/L) – An Example

	Target (Secondary Standard)	Well #1	Well #2	Well #3	Well #4 (Test Well)
Iron	300	1020	980	1010	1020
Manganese	50	328	93	195	60

- **Future Testing**
  - **SW Area (Currently being tested)**

Iron & Manganese – The Larger Issue

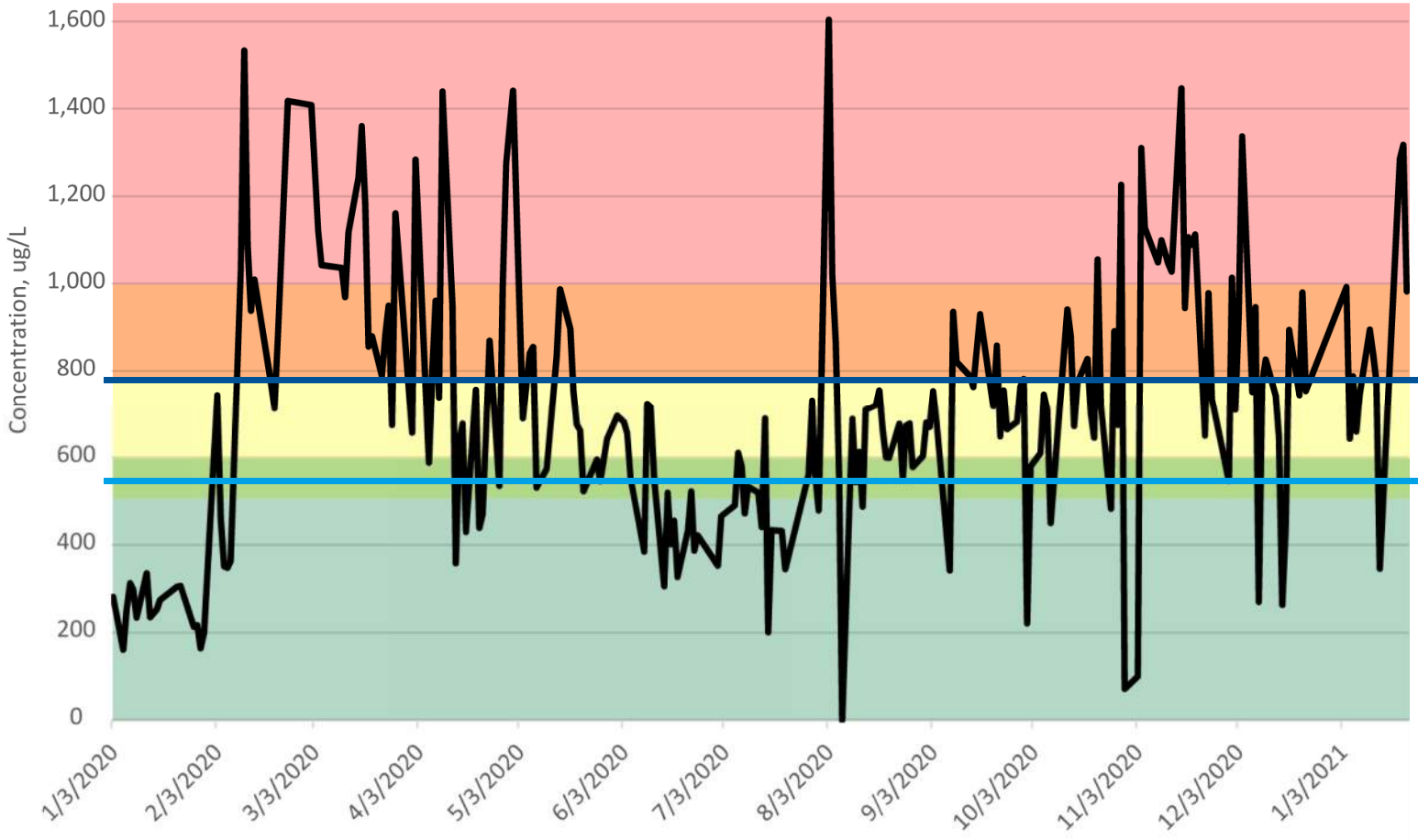


Oxidize & Filter Zone (>800-1000)

Sequestration Zone (<500 ug/L)

Well #2 Data

Iron & Manganese – The Larger Issue



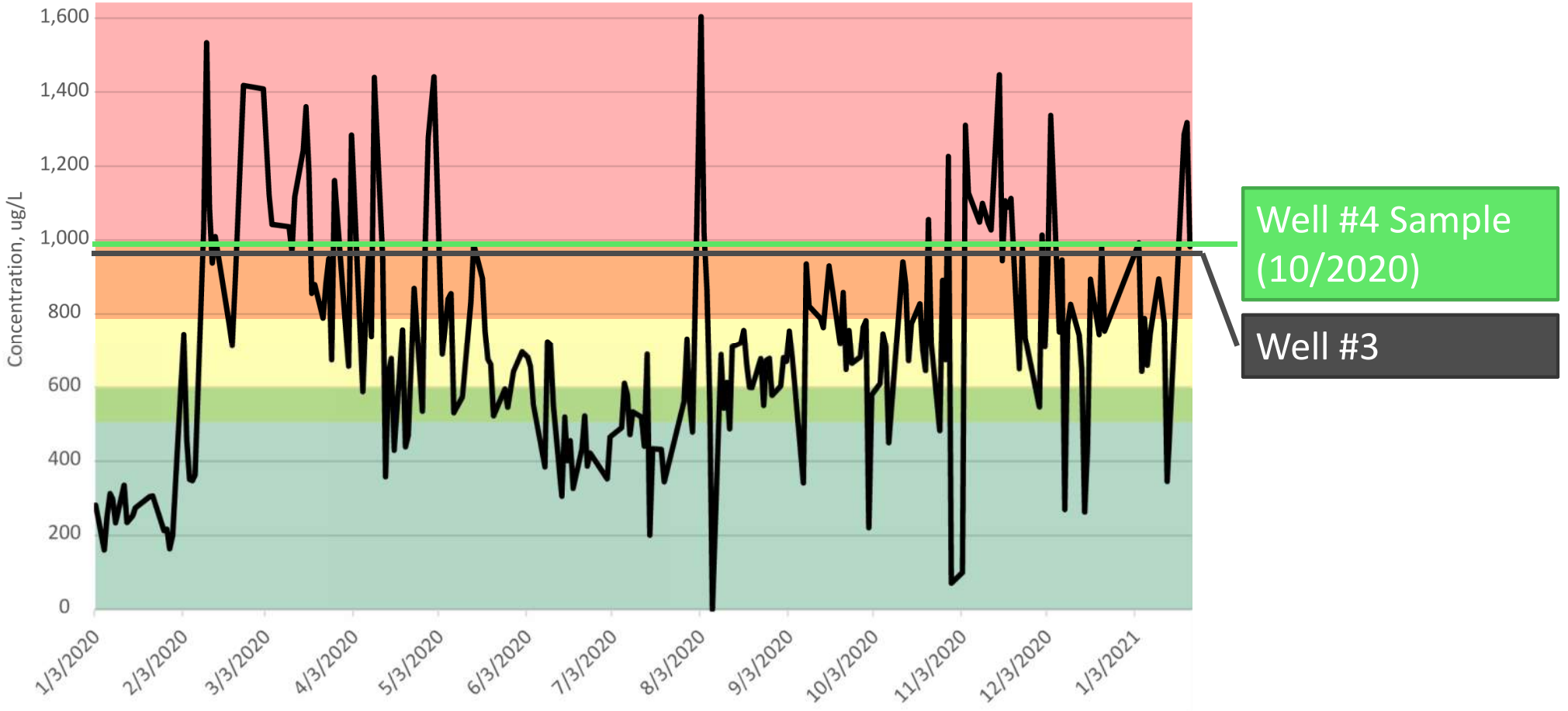
Well #2 Average
700
Range (70-1600)

Original Well #2

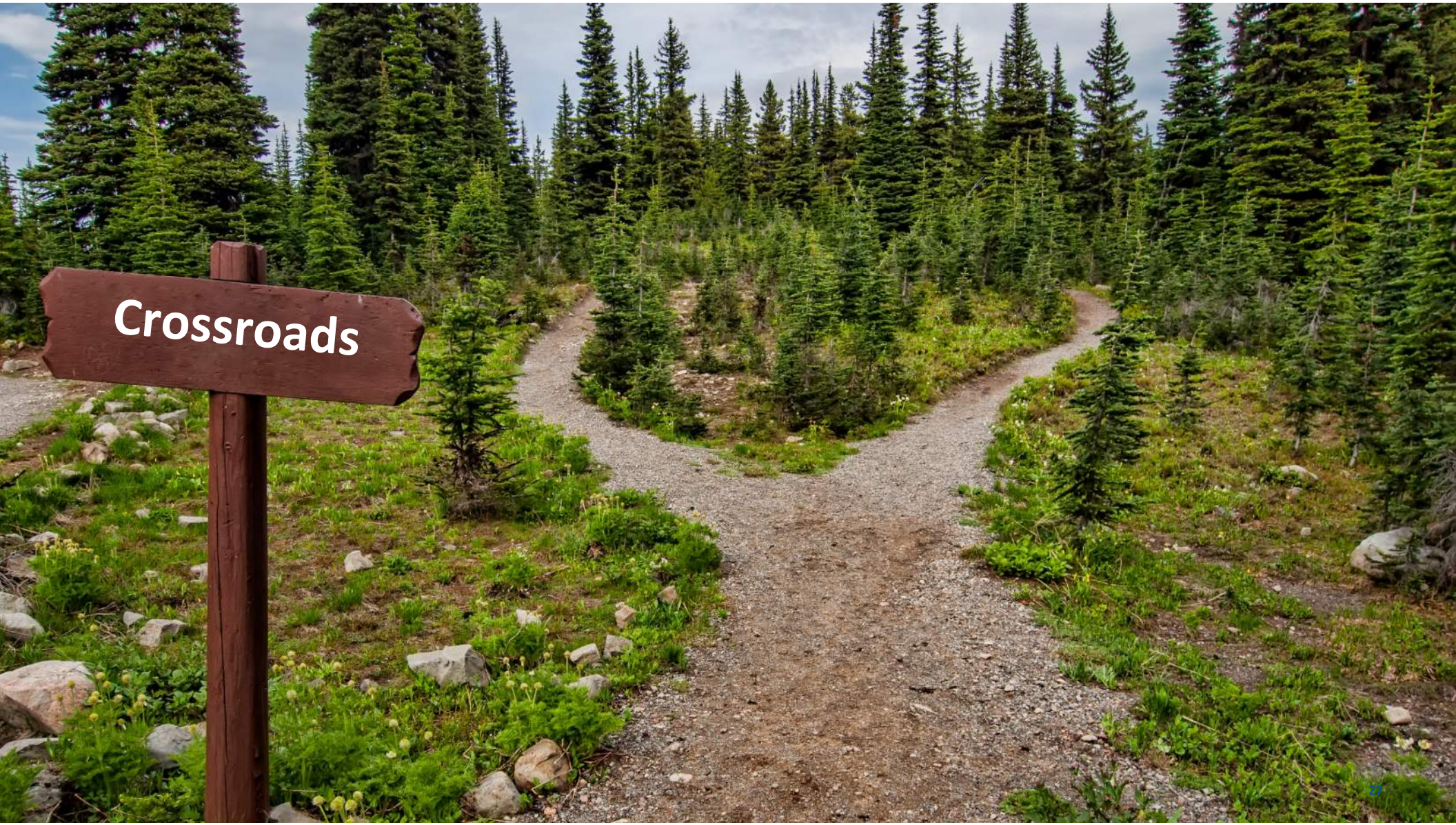
Original Well #1
(2007 Data)

Well #2 Data with Well #1 Original Data

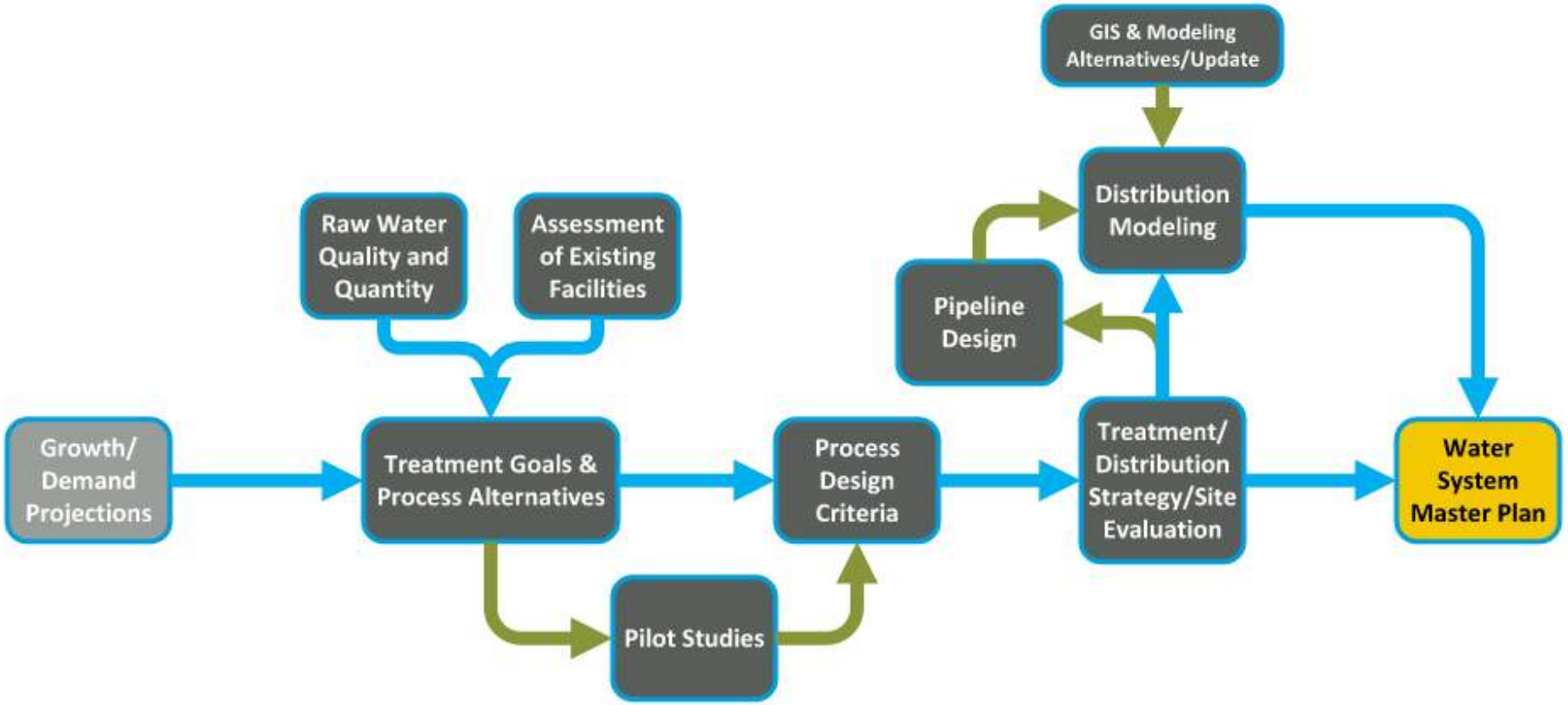
Iron & Manganese – The Larger Issue



Well #2 Data


Crossroads

Water System Master Plan – Typical Flow Chart



What to do about Well #4?

- Bid & Awarded 2021 - Being brought online as backup water source (need to keep up with demand)
- Water Quality Concerns
  - High Iron –1000 ug/L Fe (Sample October 2020)
  - Limited effectiveness of Phosphate (Iron Sequestration)
- Develop Interim Water Options
- Screen Acceptable Technologies
  - Adaptable for both in short term wellhead treatment and moving to larger treatment concepts
  - Developing Preliminary Sizing & Full Scale Cost Estimate for Council Consideration

Oxidation & Filtration

- Oxidize Iron with Chlorine
  - Wellhouse will have Chlorine technology for disinfection.
- Fast Iron Reaction – Dissolved -> Solid State
- Filter out with media filter
  - Potentially use Greensand for Manganese removal
- Significant Questions
  - What to do with the Backwash? Location of Sewer? Backwash disposal versus sludge disposal?
  - Size of Filters? Diameter ~8-12 feet

Where do we go from here?

- Continue to explore water sources.
  - The cheapest water to treat is one with best water quality.
  - Needed for future expansion discussions
- Evaluate Treatment for Well #4
  - Costs to City for consideration.
  - Focus on technologies that can be reused in future.
- Continue down path towards Water Master Plan tasks.
  - Gives City better understanding of roadmap for >20 years out

Questions & Discussion