

Beginning the Treatment Journey

The City of Meridian's Path to Bring Online
Their First Drinking Water Treatment Plant

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"May the Source be with You"



Presentation Overview

Background and History



Pilot Testing



Design and Construction



Startup and Operations



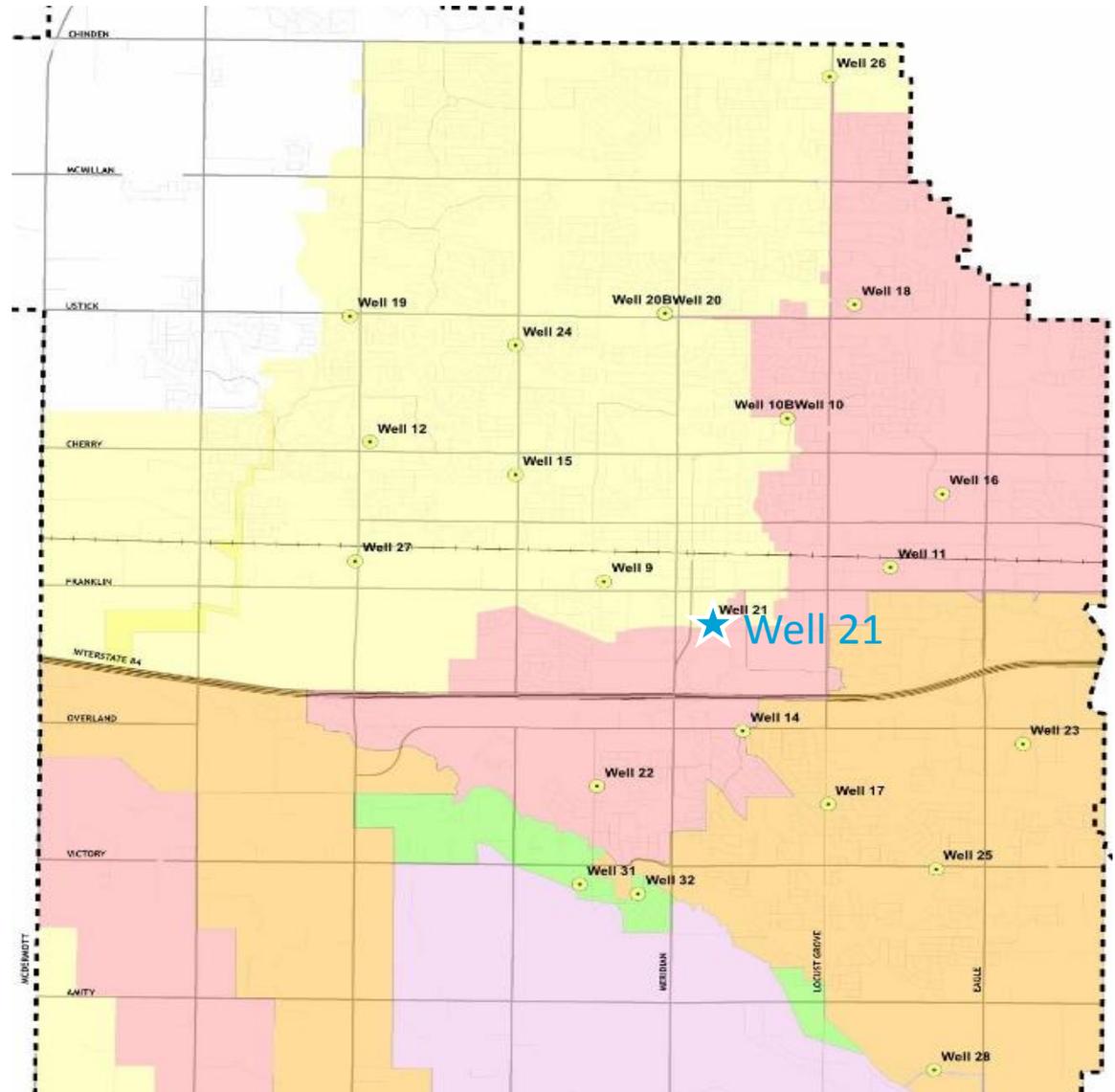
Key Lessons Learned

Background and History

Meridian Water System

Background

- Population 85,000
- 23 Wells
- 47 MGD Supply
- 12 Wells exceed SMCL for Iron/Manganese



Brown Water

Iron and Manganese oxidized and precipitated out by chlorine

- Aesthetic Concerns

- Staining of laundry
- Discoloration of plumbing fixtures
- “Rusty” taste and color to water

- Operational Concerns

- Precipitate in the distribution system
- Promote growth of iron and manganese bacteria
- Reduce pipeline capacities
- Clogging of meters and valves

Brown Water History

- Past

- Slightly lower chlorine residuals in the system
- Customer expectations – not as concerned with brown water
- Ability to utilize wells with better water quality

- Present

- Slightly higher chlorine residuals
- Build-up in pipes over time
- Customer expectation increase

Decision to Treat

- Customer service expectations /City's elevated focus on customer service
- Drilling out of it gets us into other contaminates
- Better understanding of treatment technology and its cost
- Coupling treatment with unidirectional flushing to clean pipes in the distribution system
- Pilot Testing

Why Well 21

- Located in the largest pressure zone
- Higher levels of iron/manganese
- Larger producer in the pressure zone



Well 21 History

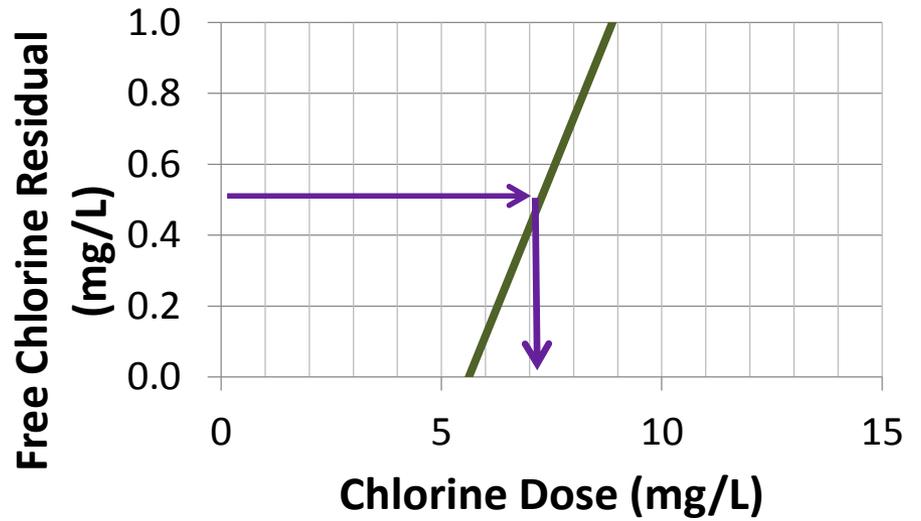
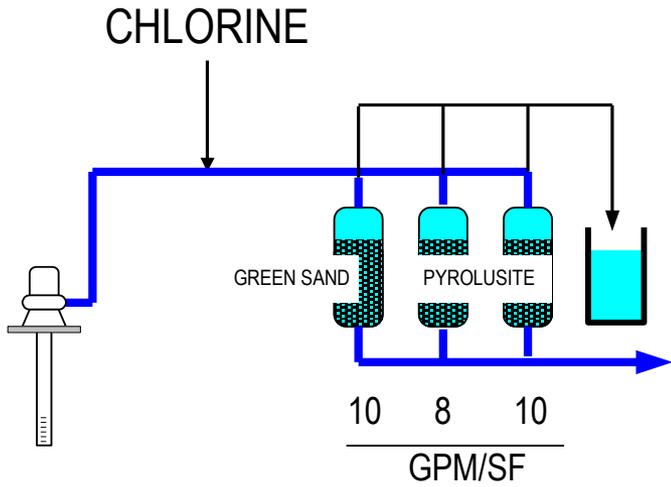
- Constructed in 2000
- Water rights for 2,020 gpm
- “Deep” well consisting of:
 - 18-inch diameter steel from surface to 590 feet below ground surface (bgs)
 - 10-inch diameter alternating steel and screen from 557 feet bgs to 806 feet bgs
- Pump drawdown test at 1,760 gpm and total drawdown of 42 feet to a resulting water surface elevation of ~62 feet bgs
- Primary production well until water quality concerns emerged and then moved to a backup well

Well 21 Water Quality Issues

Constituent	Historical Level	SMCL
Ammonia as N, mg/L	0.41	-
Iron, mg/L	0.33	0.3
Manganese, mg/L	0.15	0.05
Hydrogen Sulfide/Sulfate	Enough to Smell/Taste	

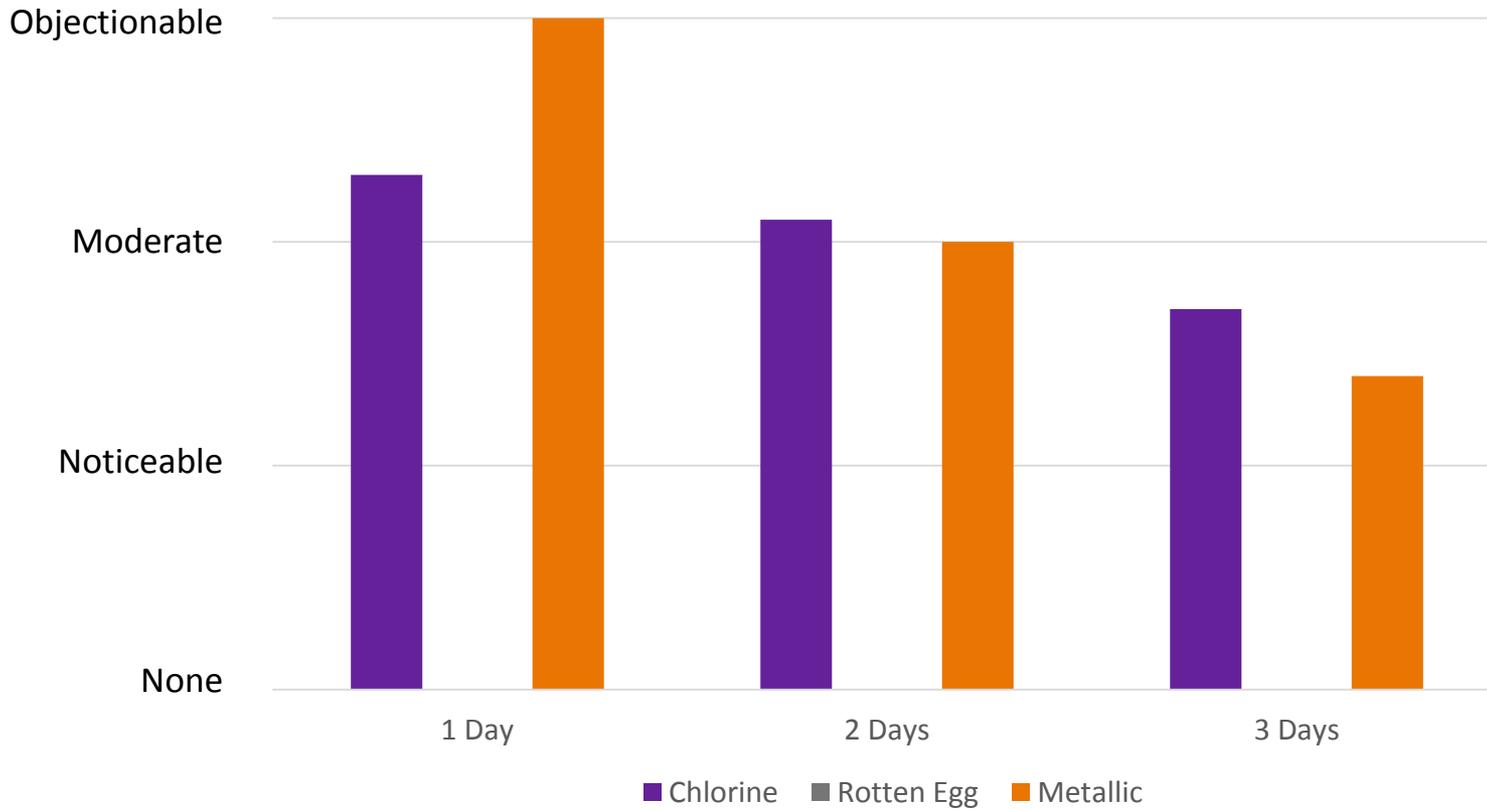
Pilot Testing

Pilot Testing – Round 1



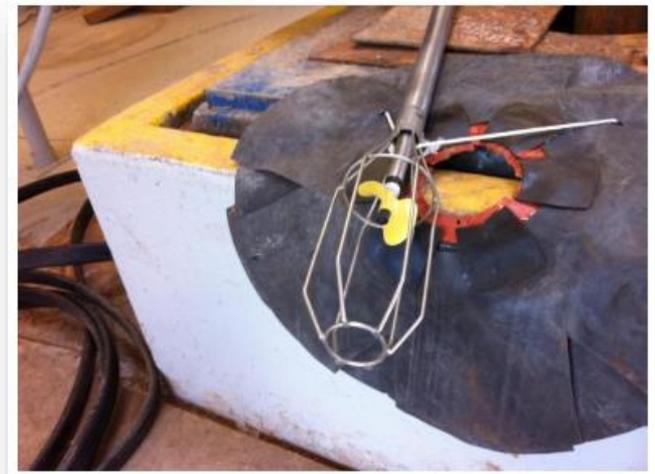
Pilot Testing – Round 1

Well 21 Pilot Testing Taste and Odor Panel Results

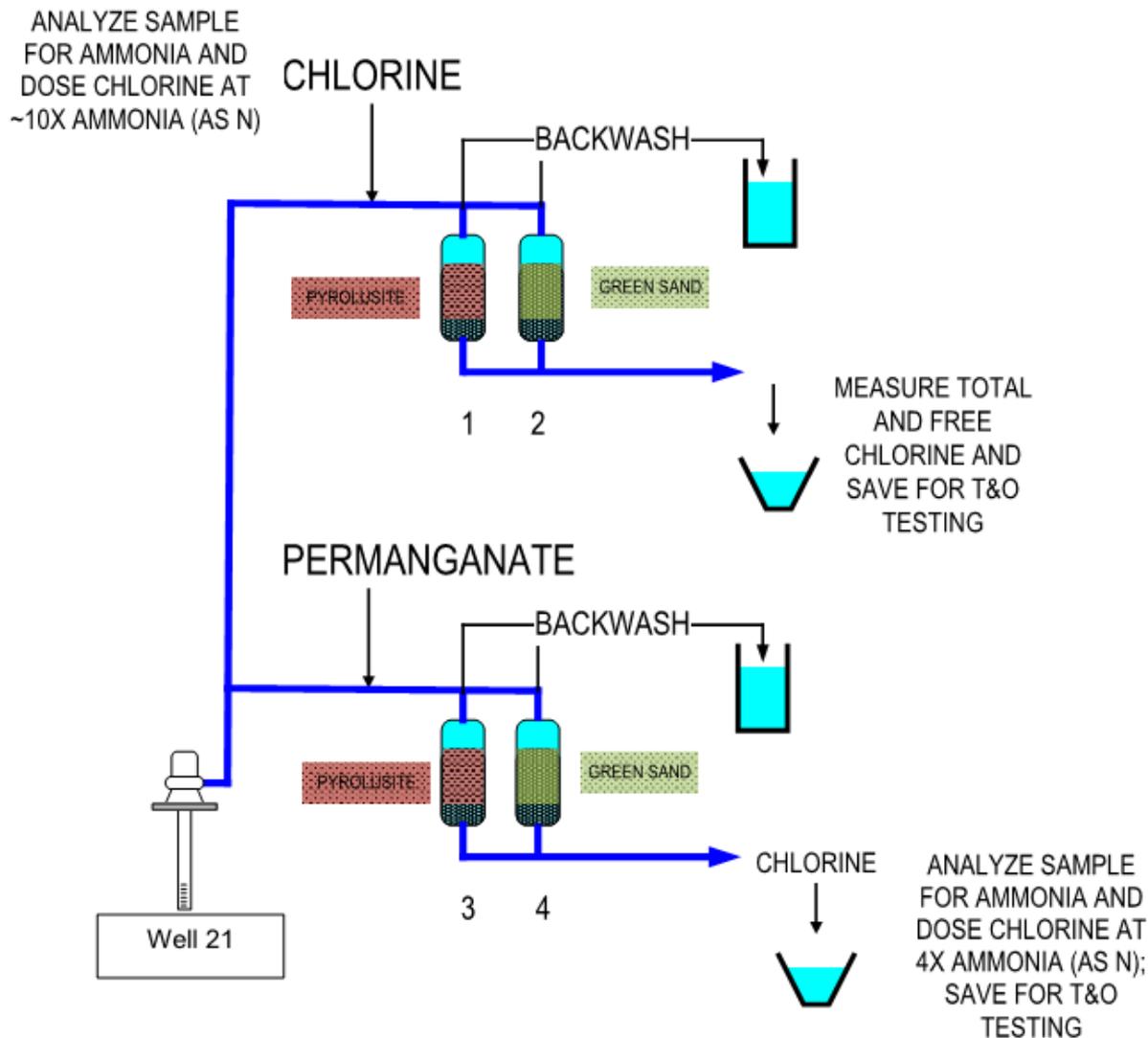


Well Zone Water Chemistry Determination

- Cleaning and redevelopment of the well
- Spinner logging performed
- Depth-specific sampling performed



Pilot Testing – Round 2



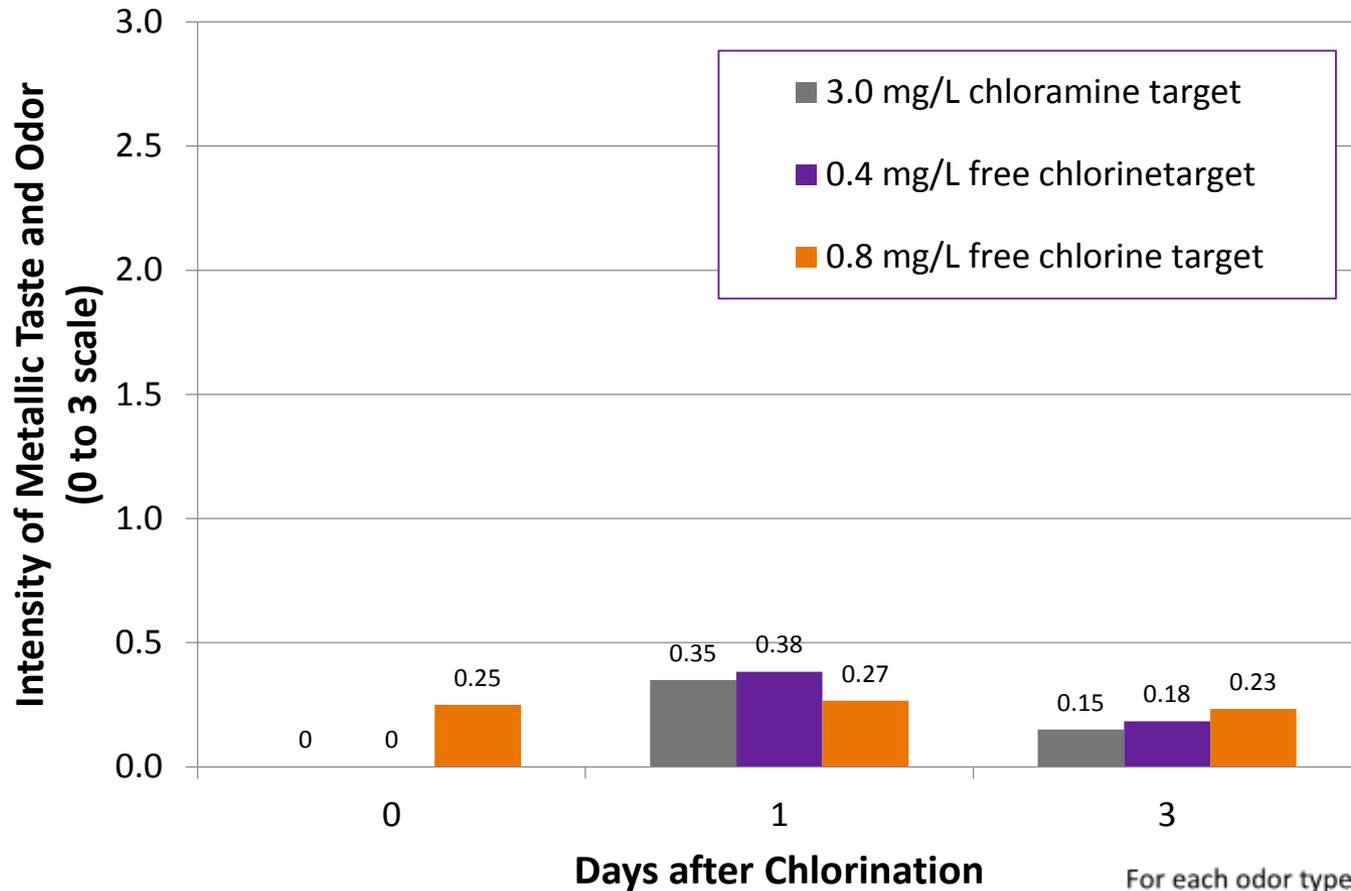
Pilot Testing – Round 2

Average Filtered Water Quality

Filter Media and Oxidant	Iron (mg/L)	Manganese (mg/L)	pH	Free Chlorine (mg/L)	Ammonia (mg/L)	Silica (mg/L)
Greensand Media with Chlorine	0	0.05	7.3	0.9	0.09	37
Pyrolusite Media with Chlorine	0	0.05	7.4	0.8	0.05	38
Greensand Media with Permanganate	0	0.05	7.3	0.08	0.71	38
Pyrolusite Media with Permanganate	0	0.02	7.5	0	0.73	38

Pilot Testing – Round 2

Metallic Taste and Odor

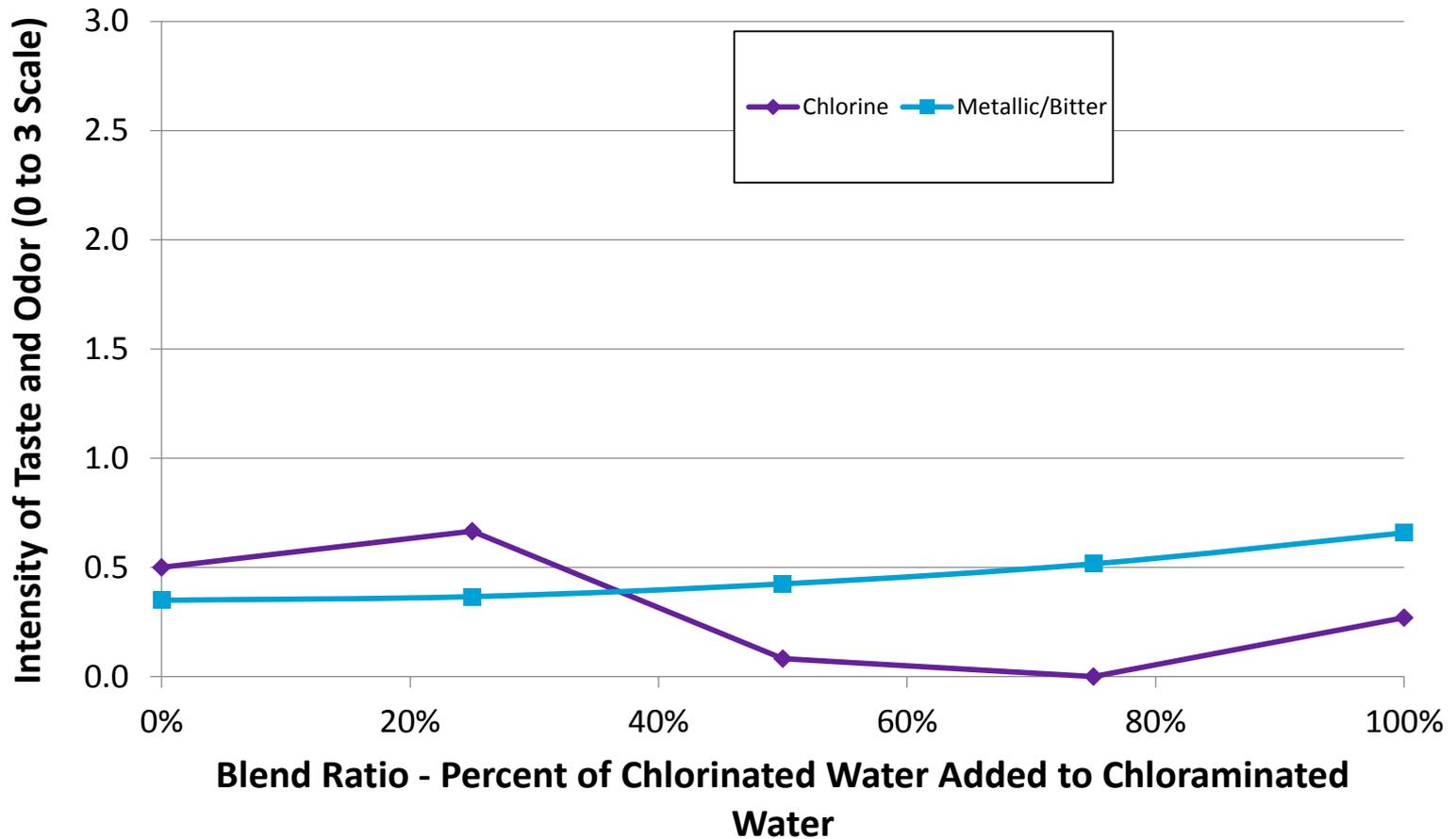


For each odor type, a common scale was used:

- 0 = nothing (no odor)
- 1 = noticeable
- 2 = moderately strong
- 3 = objectionable

Pilot Testing – Round 2

Chlorine/Chloramine Taste and Odor



Pilot Testing – Round 2

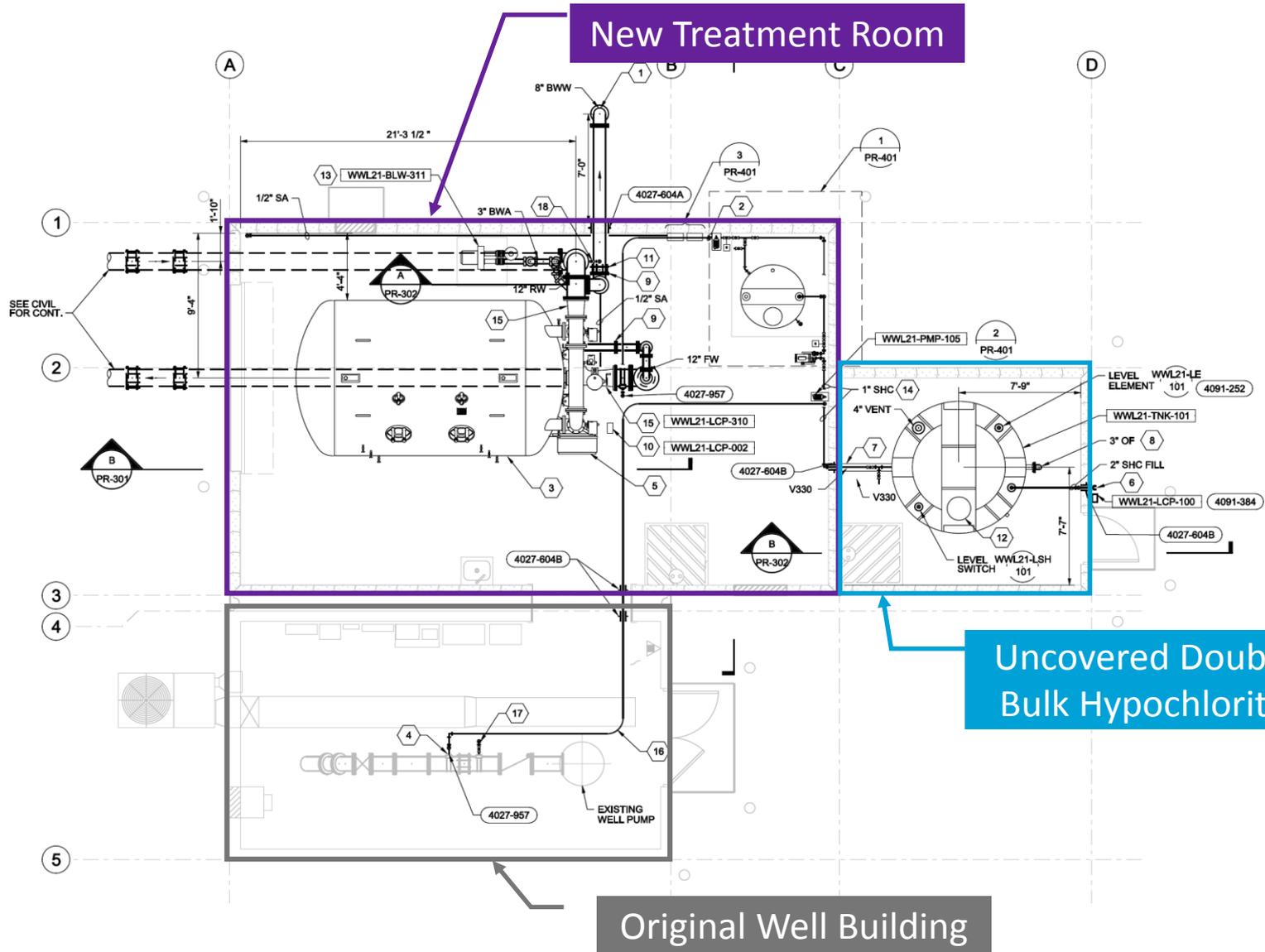
Outcomes and Path Forward

- Periodic well redevelopment is beneficial
 - More consistent water quality, especially ammonia
 - Lower occurrence of reduced sulfur
- Both chlorine and permanganate were good oxidants
- Both treatment regimes produced good tasting water and confirmed loading rate of 10 gpm/sf
- Recommended using free chlorine for both oxidation and for residual maintenance targeting free chlorine residual of 0.8 mg/L
- Provide space in facility for potential future permanganate feed system

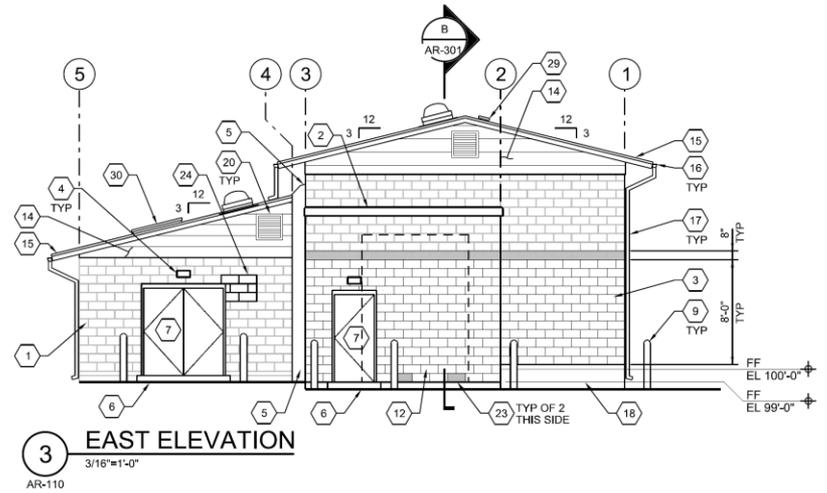
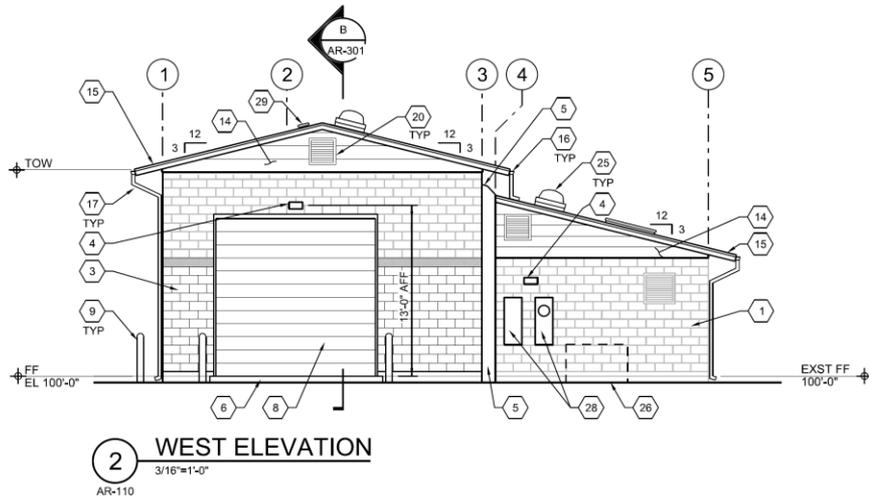
Treatment Equipment Preselection



Facility Design



Integration with Existing Structure



Contractor Experience



Startup and Operations

Coordination During Startup

Orchestrated

Collaboration

was

Key

Operational Requirements During Testing



Operator Training



Operational Data – Iron and Manganese

	Total Chlorine	Free Chlorine		Iron		Manganese	
	Finished Water mg/L	Treated Water mg/L	Finished Water	Raw Water mg/L	Treated Water	Raw Water mg/L	Treated Water
Minimum	0.54	0.46	0.30	0.01	0.00	0.03	0.01
Maximum	1.91	7.20	1.39	0.32	0.09	0.28	0.21
Average	1.26	3.90	0.64	0.14	0.02	0.23	0.02

Constituent	Iron, mg/L	Manganese, mg/L
Historical Level	0.33	0.15
SMCL	0.3	0.05

Operational Data – Backwash Frequency

- Dependent upon flow rates through the filter based on system demands
- At full flow of 1,600 gpm, backwash cycles once every 24 hours
- Lower flows result in longer duration between backwash cycles- up to 3 days

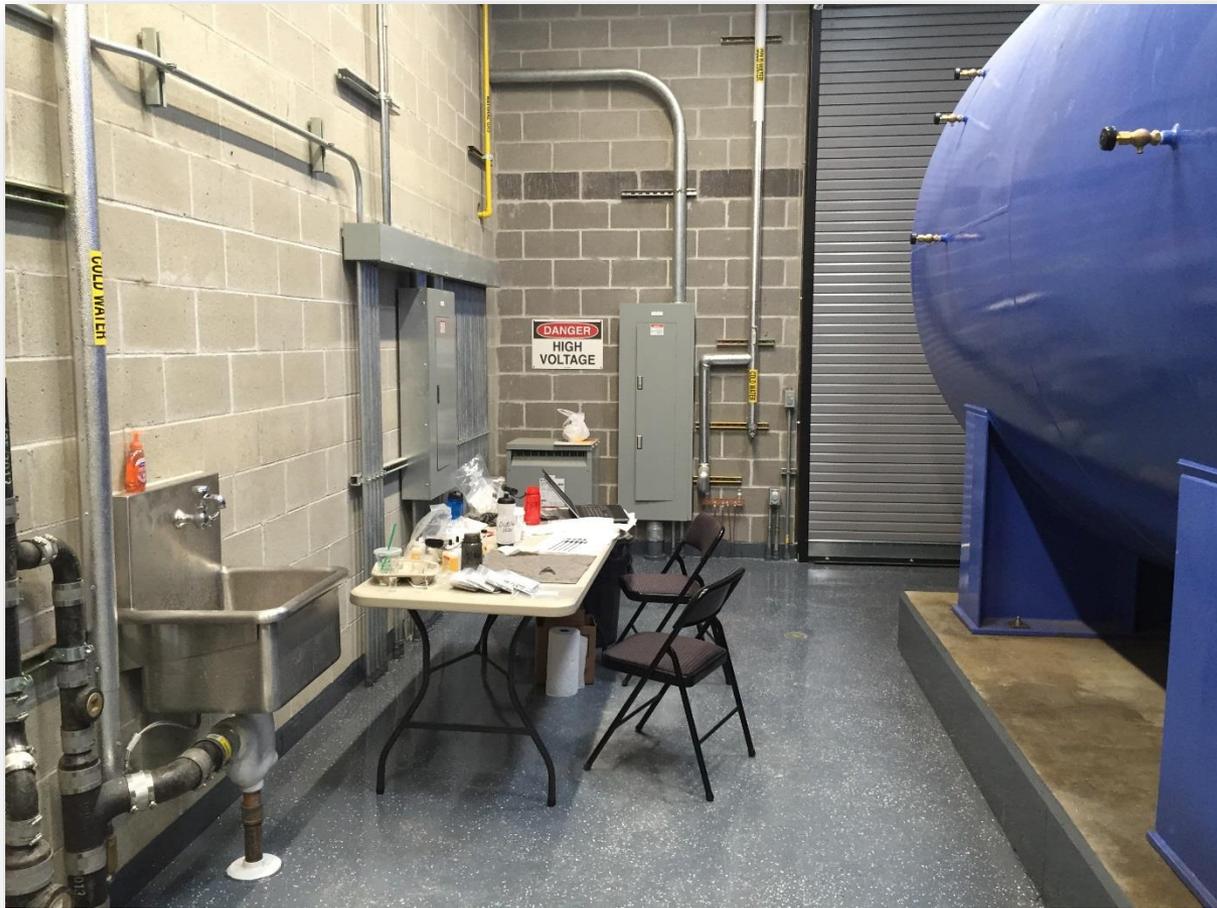


Benefits

- Reduction in customer complaints
- Less water required to administer City's distribution system flushing program – flushed 200 more hydrants with the same quantity of water
- Overall: Clearer, higher quality water

Key Lessons Learned

#1 – “Nice to have’s” are sometimes worth it



#2 – Bubbles, Bubbles, Bubbles



#3 – Loading Filter Media into the Vessel is No Simple Matter

- Confined space entry – rigged a temporary hoist system from the ceiling
- Manufacturer recommended lifted media bag-by-bag – How?
- Small diameter access hatches
- Conveyor was the trick

#4 – Collaboration is Essential



#5 – Flexibility is a Necessity



Thank You

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