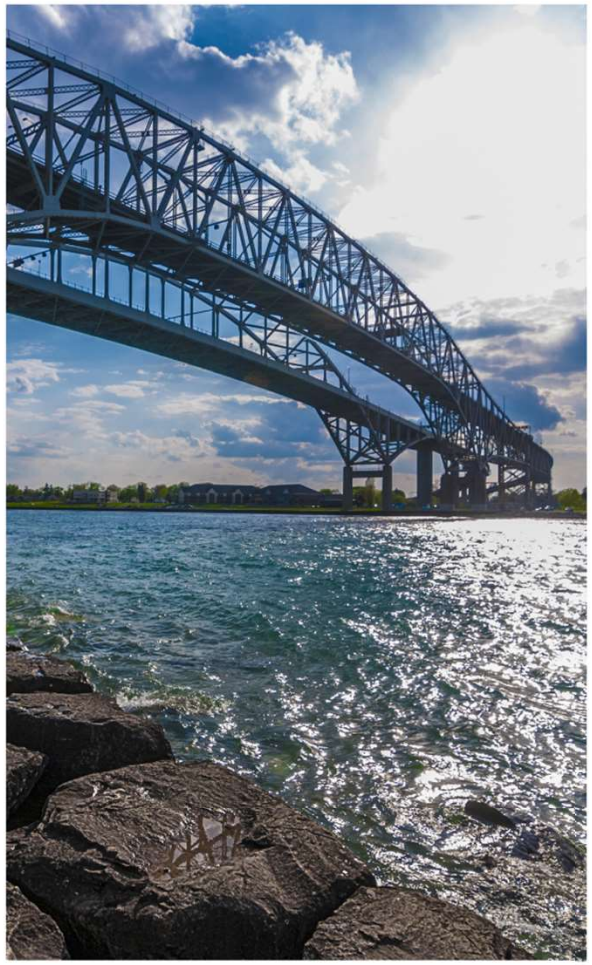


MI-ACE 2023

85th Annual Conference & Exhibits

Lansing BWL Wellfield CA Program

Data Wrangling and Tool Development

Presented By: Matt Coulthard – Black & Veatch

BLACK & VEATCH

LANSING BWL

A889

Agenda

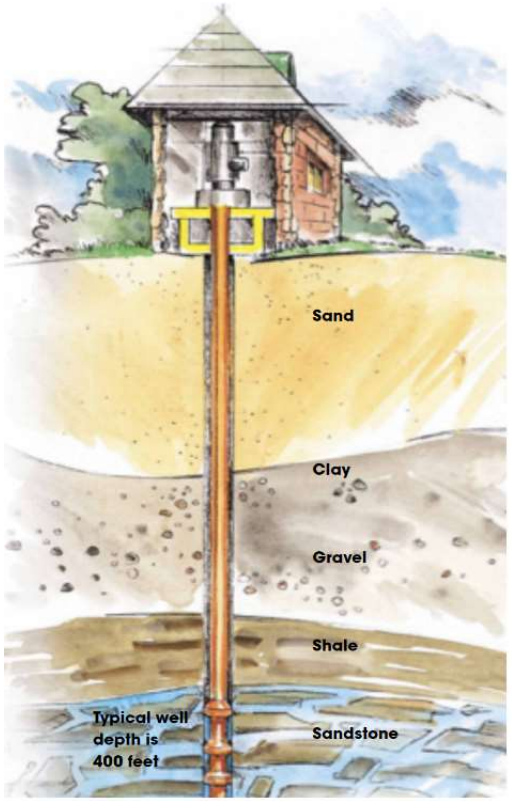
- BWL's water supply system
- Project overview
- Site condition assessment
- Data review
- Matrix tool development
- 5-Year Maintenance Plan
- Questions

A889

BWL's Water Supply System

BWL's Water Supply System

- Raw water from wells is pumped to John F Dye and Wise Rd WCP's
- BWL has ~ 124 groundwater wells
- BWL operates ~ 89 water supply wells that produce an average of 20 MGD
- 60 + wells currently not operational
- 86% of wells are 50 years old
- 95% of wells are 40 years old
- Wells are approx. 400 ft deep and completed within the Saginaw Formation.



Project Overview

Project Drivers

- Aging infrastructure
- Time and expense required to maintain existing facilities
- Data and analysis needed to make informed decisions to plan ahead

WISE ROAD WCP

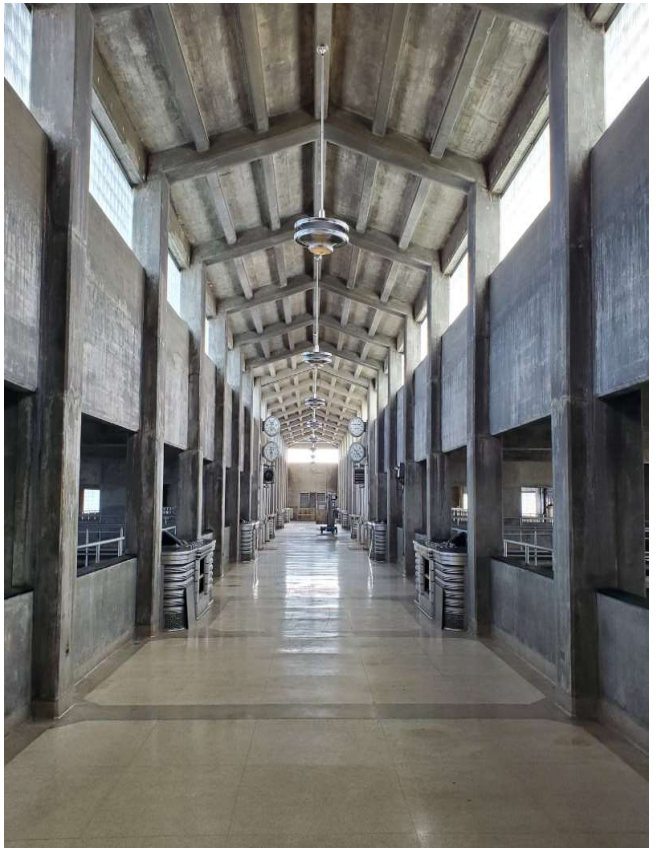
- Constructed in 1966
- 10 MGD

DYE WCP

- Constructed in 1938
- 40 MGD
- Primary plant

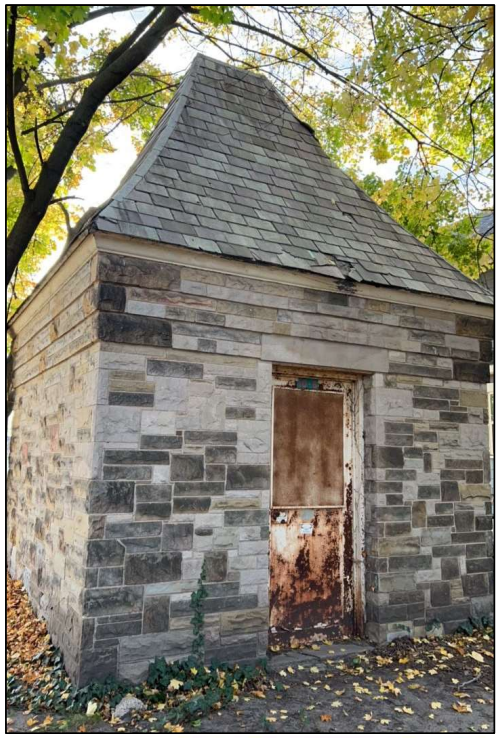
Project components

- Phase 1 – WCP Condition Assessment
- Phase 2 – Gap Analysis
- Phase 3 – Cost of Continued Operation
- Phase 4 – Risk Register Development
- Phase 5 – Alternatives Development and Analysis
- Phase 5 Amend 1 – Wellfield CA Program



Phase 5 Amend 1: Wellfield CA Program

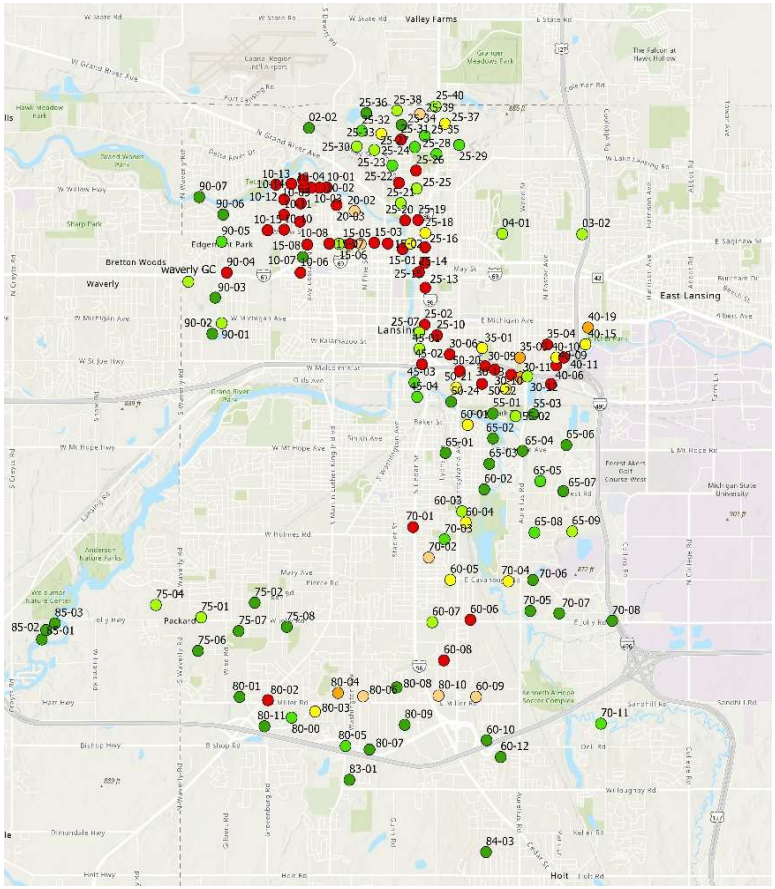
- Site Condition Assessment
  - Visually inspect each well
  - Work with BWL staff to capture O&M information from each well
- Assimilate Existing Information
  - Review local area hydrogeological information, reports, and historical data
  - Review historical water quality data in wells
  - Environmental database searches
- Develop Scoring Matrix Tool
- Develop a 5-Year plan to help increase the capacity of well system



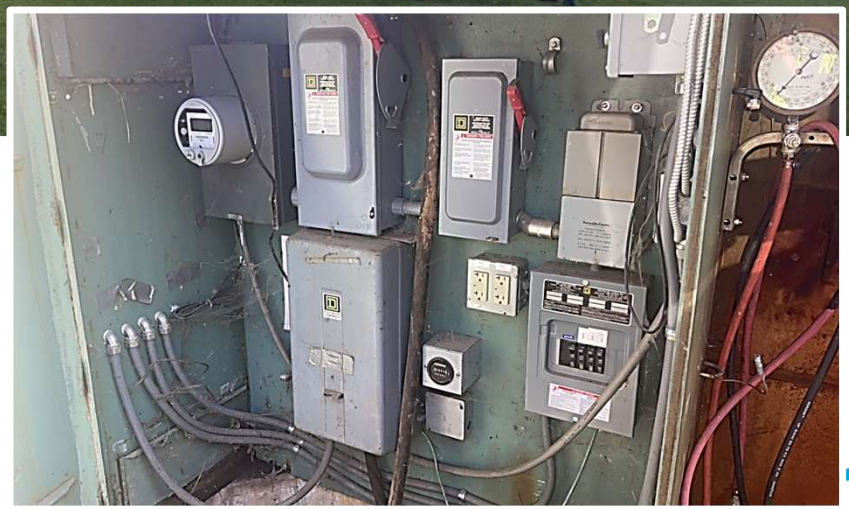
Site Condition Assessment

Site condition assessment

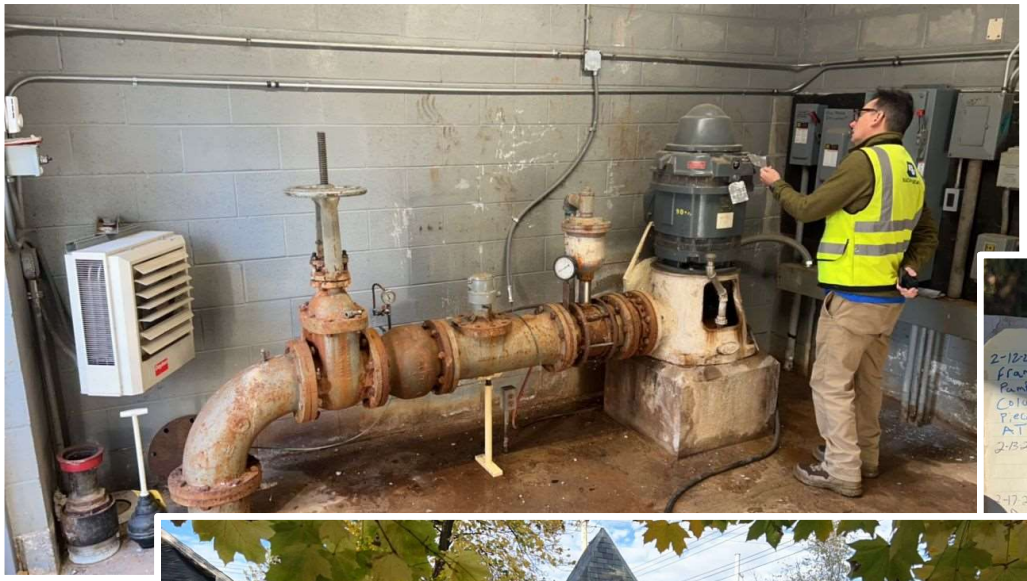
- Visited 112 wells in 8 business days
- Gathered O&M information from BWL staff
- Looked at electrical components, logbooks, repair history, casing condition, etc.
- Observed site accessibility and parcel information
- Looked at areas for possible offsetting and redrilling

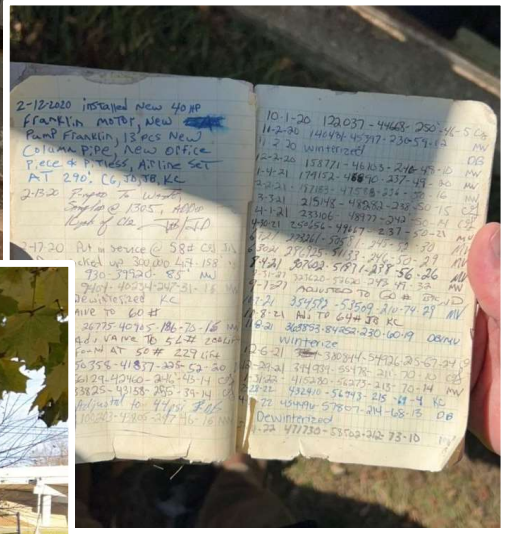


Field Surveys

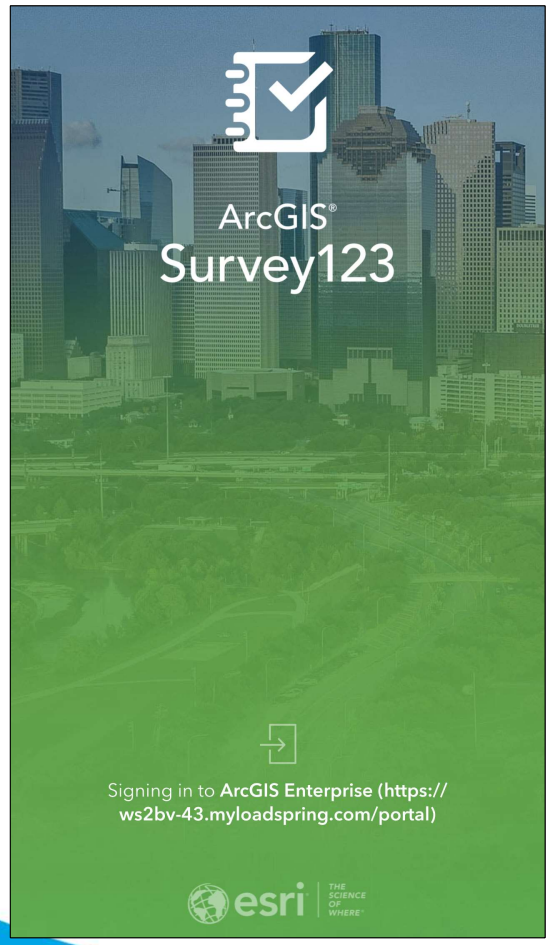


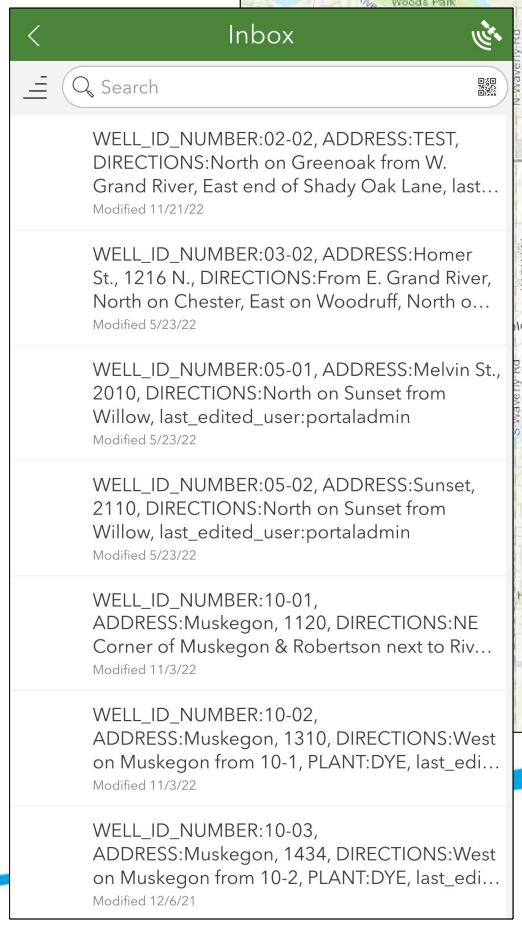
Field Surveys





Survey 123


ArcGIS®
Survey123
Signing in to ArcGIS Enterprise (https://ws2bv-43.myloadspring.com/portal)
esri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Search
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Modified 11/21/22
WELL_ID_NUMBER:03-02, ADDRESS:Homer St., 1216 N., DIRECTIONS:From E. Grand River, North on Chester, East on Woodruff, North o…
Modified 5/23/22
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Modified 5/23/22
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Modified 5/23/22
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Modified 11/3/22
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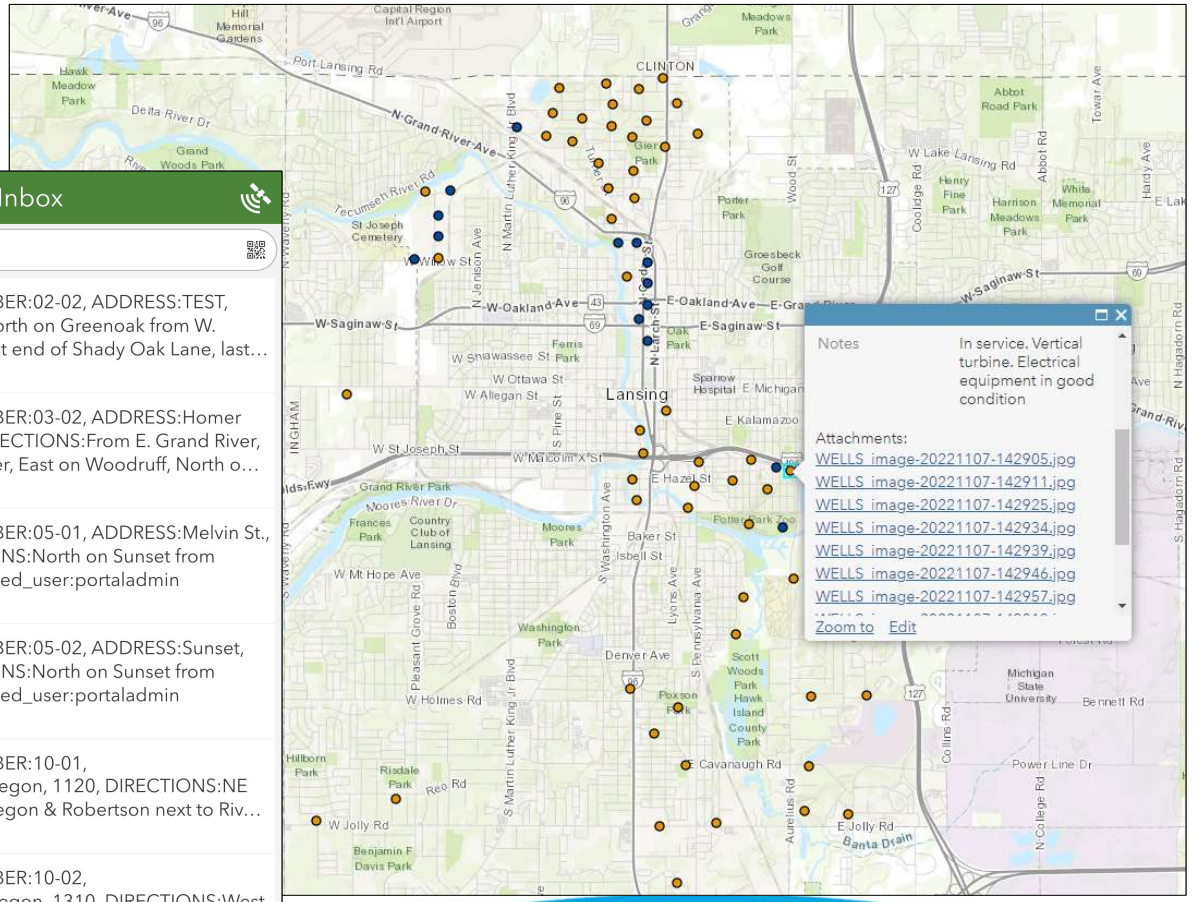
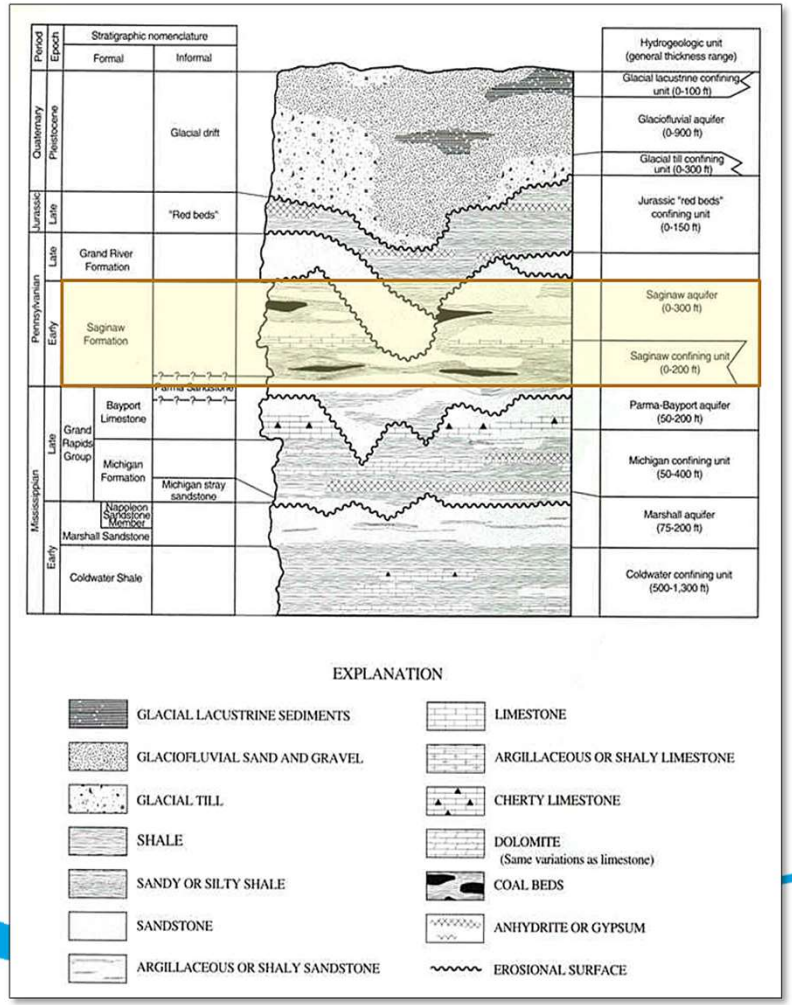
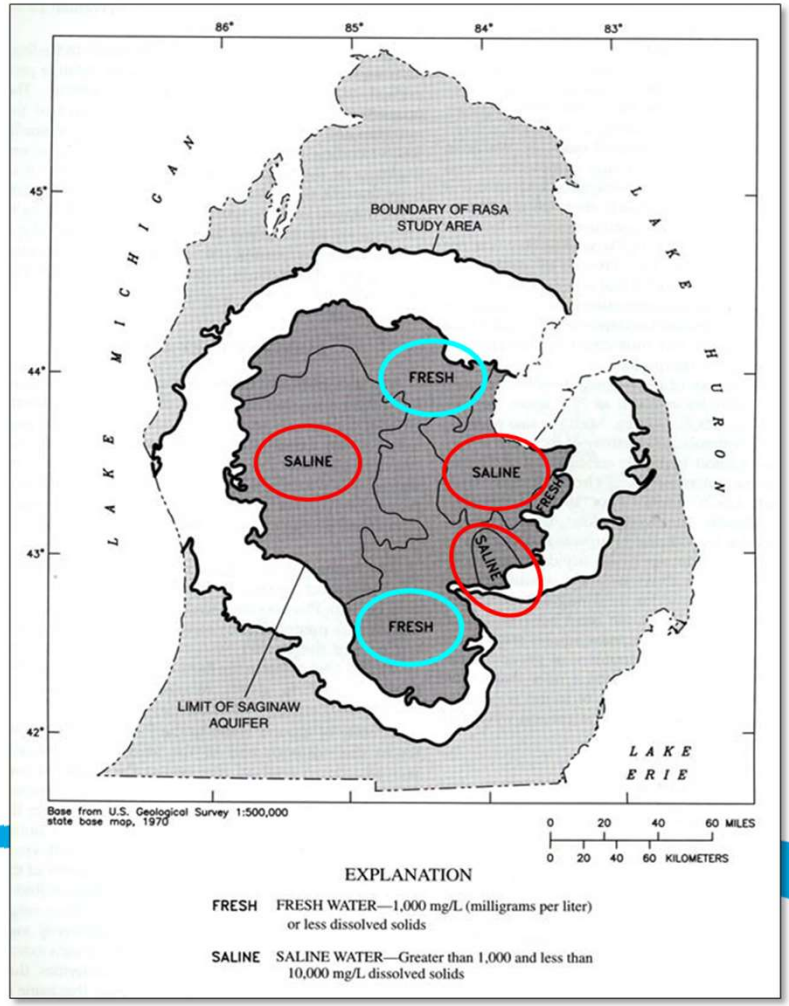
Modified 11/3/22
WELL_ID_NUMBER:10-03, ADDRESS:Muskegon, 1434, DIRECTIONS:West on Muskegon from 10-2, PLANT:DYE, last_edi…
Modified 12/6/21


Notes
In service. Vertical turbine. Electrical equipment in good condition
Attachments:
WELLS_image-20221107-142905.jpg
WELLS_image-20221107-142911.jpg
WELLS_image-20221107-142925.jpg
WELLS_image-20221107-142934.jpg
WELLS_image-20221107-142939.jpg
WELLS_image-20221107-142946.jpg
WELLS_image-20221107-142957.jpg
Zoom to
Edit
Lansing
CLINTON
N Grand River Ave
W Saginaw St
E Saginaw St
W Oakland Ave
E Oakland Ave
W Lake Lansing Rd
Port Lansing Rd
Delta River Dr
Tecumseh River Rd
W Willow St
W Shiawassee St
W Ottawa St
W Allegan St
W St Joseph St
W Mt Hope Ave
W Holmes Rd
E Hazel St
E Kalamazoo
Denver Ave
E Cavanaugh Rd
E Jolly Rd
W Jolly Rd
Reo Rd
Bennett Rd
Power Line Dr
Michigan State University
Hill Memorial Gardens
Capital Region Int'l Airport
Hawk Meadow Park
Grand Woods Park
Meadows Park
Abbot Road Park
Groesbeck Golf Course
Oak Park
Ferris Park
Potter Park
Moores Park
Washington Park
Scott Woods Park
Hawk Island County Park
Foxson Park
Risdale Park
Hillborn Park
Benjamin F Davis Park
Frances Park
Country Club of Lansing
Grand River Park
Moores River Dr
Baker St
Isbell St
Lyons Ave
Boston Blvd
S Pleasant Grove Rd
S Martin Luther King Jr Blvd
N Martin Luther King Jr Blvd
N Jenison Ave
N Larch St
S Fine St
S Washington Ave
S Pennsylvania Ave
Aurelius Rd
Collins Rd
N College Rd
Coolidge Rd
Abbot Rd
Towar Ave
Handy Ave
N Hagadorn Rd
S Hagadorn Rd
Henry Fine Park
Harrison Meadows Park
White Memorial Park
Sparrow Hospital
St Joseph Cemetery
Banta Drain
INGHAM

Data Review

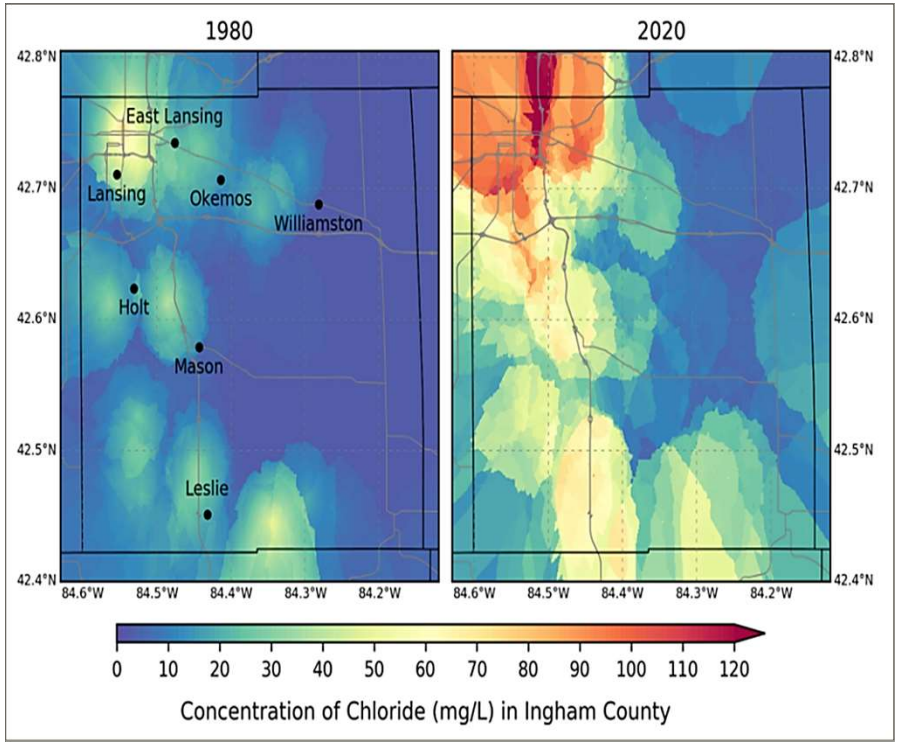
Hydrogeology of the Project Area



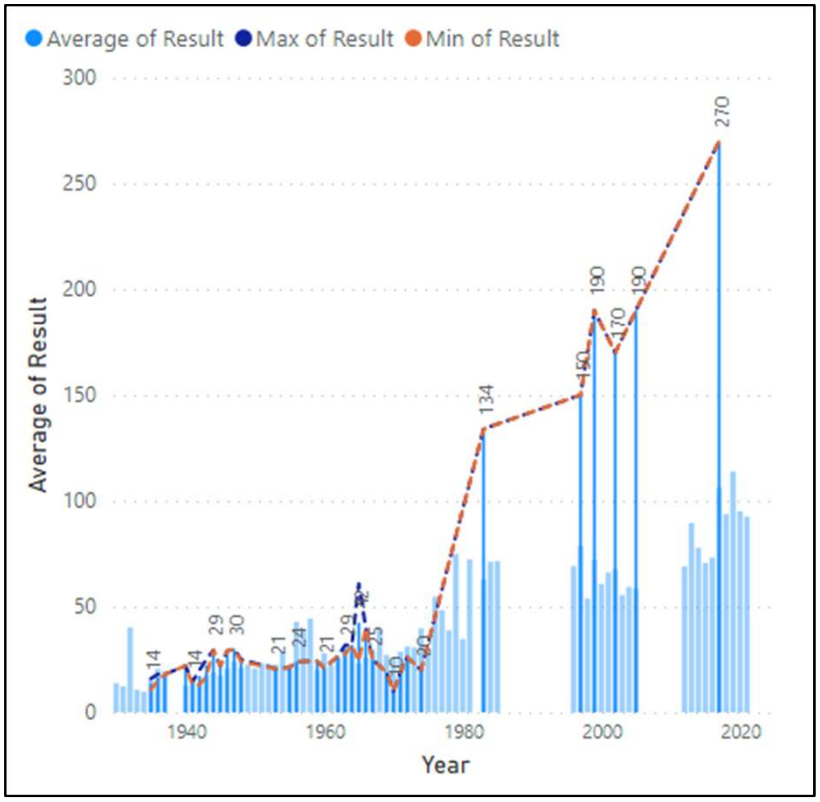


Groundwater Quality

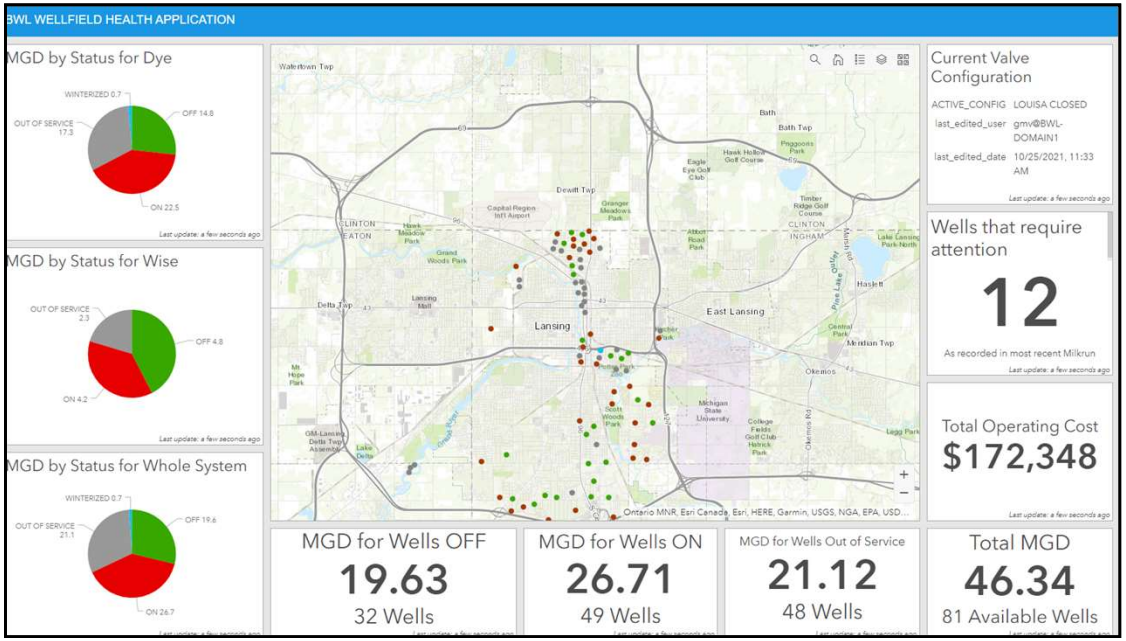
	1986/87 Survey	2015/20 Survey
pH	7.15	7.40
Alkalinity	288	325
Hardness	304	329
Calcium	81.6	85.6
Magnesium	23.7	26.2
Iron	1.12	1.11
Conductivity	654	798
Sodium	27.4	42.2
Chloride	10.2 →	33.3
Boron	0.51	0.63
Sulfate	49.0	51.1
Arsenic	0.005	0.003
Nitrate	0.12	0.12
Fluoride	0.46	0.44
Potassium	3.78	2.95
Silica	8.50	12.44
Temperature	11.7°C	11.9°C



BWL's Water Quality Data



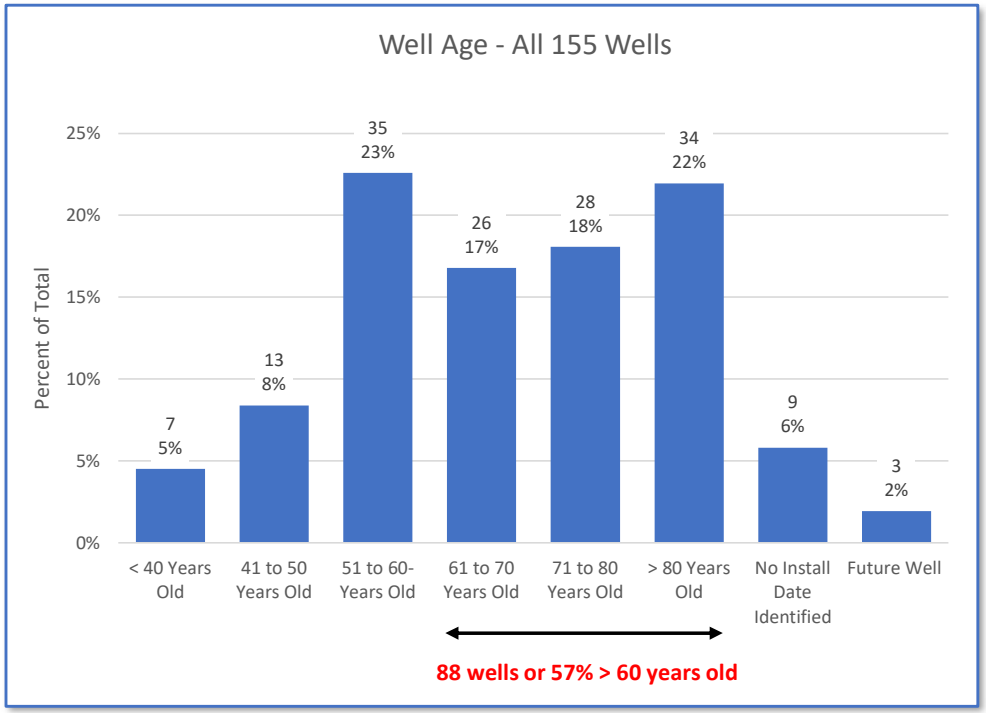
Hardness levels from 1939 -2022 provided by BWL



BWL's Power BI Platform for data collection

Well Age

- Approx. 86% of wells are greater than 50 yrs old
- Approx. 95% of wells are greater than 40 yrs old
- Factors that contribute to the service life of a well include:
  - Prolonged intervals between well rehabilitations.
  - Elevated chloride levels in the groundwater.
  - The presence of iron bacteria.
  - Cumulative effects of well cleaning agents on well casings.
  - Possible mineralization and clogging
  - Decline in specific capacity that can no longer be corrected through well rehabilitation.
  - Age of well seals.
- BWL wells could be estimated at 50-60 yrs life cycle



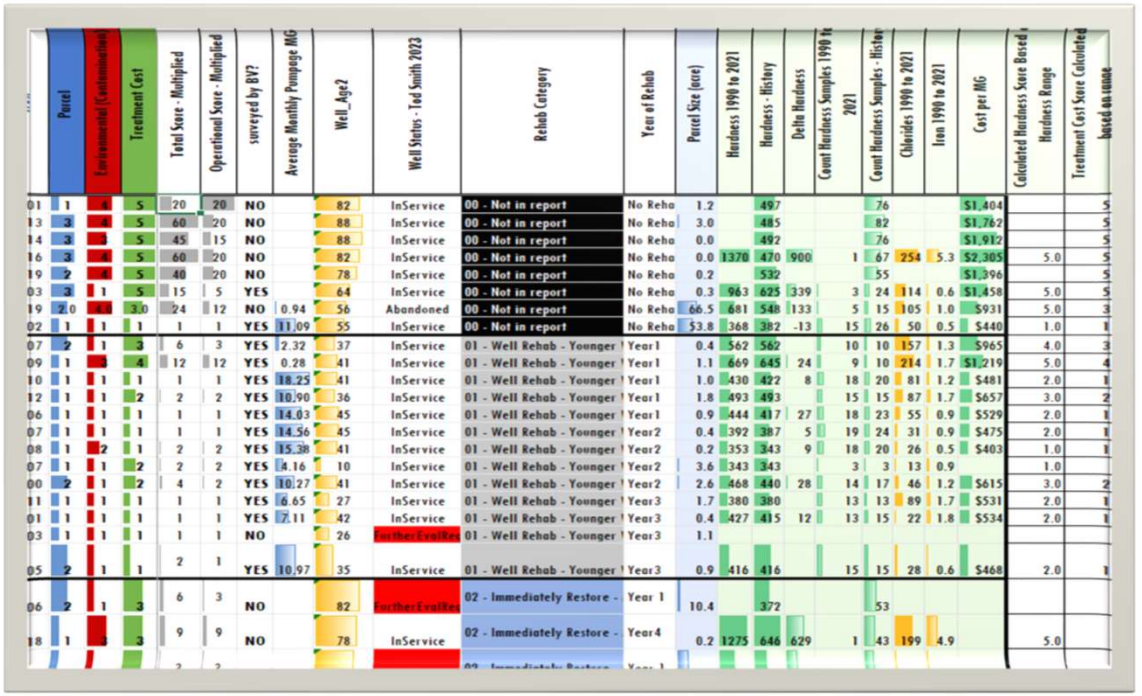
Additional Data Review

- Current, original and rated capacities of each well
- Pumpage over time
- Water treatment costs
- Risk attributed to nearby contamination sources
- Institutional issues/problems, floodplain concern
- Routing of well discharge transmission mains
- Real estate limits (i.e., is the site conducive to an offset well if needed)
- BWL's WellStat Field Collection Data

Matrix Tool Development

Scoring Matrix

- 3 primary categories for each well that were scored
  - Parcel Availability
  - Environmental Risk
  - Water Treatment Costs



	Parcel	Environmental (Contamination)	Treatment Cost	Total Score - Multiplied	Operational Score - Multiplied	surveyed by BV?	Average Monthly Pumpage MG	Well_Age2	Well Status - Ted Smith 2023	Rehab Category	Year of Rehab	Parcel Size (acre)	Hardness 1990 to 2021	Hardness - History	Delta Hardness	Count Hardness Samples 1990 to 2021	Count Hardness Samples - History	Chlorides 1990 to 2021	Iron 1990 to 2021	Cost per MG	Calculated Hardness Score Based on Hardness Range	Treatment Cost Score Calculated based on range
01	1	4	5	20	20	NO		82	InService	00 - Not in report	No Reha	1.2		497			76			$1,404		5
13	3	4	5	60	20	NO		88	InService	00 - Not in report	No Reha	3.0		485			82			$1,762		5
14	3	3	5	45	15	NO		88	InService	00 - Not in report	No Reha	0.0		492			76			$1,912		5
16	3	4	5	60	20	NO		82	InService	00 - Not in report	No Reha	0.0	1370	470	900	1	67	254	5.3	$2,305	5.0	5
19	2	4	5	40	20	NO		78	InService	00 - Not in report	No Reha	0.2		532			55			$1,396		5
03	3	1	5	15	5	YES		64	InService	00 - Not in report	No Reha	0.3	963	625	339	3	24	114	0.6	$1,458	5.0	5
19	2.0	4.0	3.0	24	12	NO	0.94	56	Abandoned	00 - Not in report	No Reha	66.5	681	548	133	5	15	105	1.0	$931	5.0	3
02	1	1	1	1	1	YES	11.09	55	InService	00 - Not in report	No Reha	53.8	368	382	-13	15	26	50	0.5	$440	1.0	1
07	2	1	3	6	3	YES	2.32	37	InService	01 - Well Rehab - Younger	Year1	0.4	562	562		10	10	157	1.3	$965	4.0	3
09	1	3	4	12	12	YES	0.28	41	InService	01 - Well Rehab - Younger	Year1	1.1	669	645	24	9	10	214	1.7	$1,219	5.0	4
10	1	1	1	1	1	YES	18.25	41	InService	01 - Well Rehab - Younger	Year1	1.0	430	422	8	18	20	81	1.2	$481	2.0	1
12	1	1	2	2	2	YES	10.90	36	InService	01 - Well Rehab - Younger	Year1	1.8	493	493		15	15	87	1.7	$657	3.0	2
06	1	1	1	1	1	YES	14.03	45	InService	01 - Well Rehab - Younger	Year1	0.9	444	417	27	18	23	55	0.9	$529	2.0	1
07	1	1	1	1	1	YES	14.56	45	InService	01 - Well Rehab - Younger	Year2	0.4	392	387	5	19	24	31	0.9	$475	2.0	1
08	1	2	1	2	2	YES	15.38	41	InService	01 - Well Rehab - Younger	Year2	0.2	353	343	9	18	20	26	0.5	$403	1.0	1
07	1	1	2	2	2	YES	4.16	10	InService	01 - Well Rehab - Younger	Year2	3.6	343	343		3	3	13	0.9		1.0	
00	2	1	2	4	2	YES	10.27	41	InService	01 - Well Rehab - Younger	Year2	2.6	468	440	28	14	17	46	1.2	$615	3.0	2
11	1	1	1	1	1	YES	6.65	27	InService	01 - Well Rehab - Younger	Year3	1.7	380	380		13	13	89	1.7	$531	2.0	1
01	1	1	1	1	1	YES	7.11	42	InService	01 - Well Rehab - Younger	Year3	0.4	427	415	12	13	15	22	1.8	$534	2.0	1
03	1	1	1	1	1	NO		26	FurtherEvalRea	01 - Well Rehab - Younger	Year3	1.1										
05	2	1	1	2	1	YES	10.97	35	InService	01 - Well Rehab - Younger	Year3	0.9	416	416		15	15	28	0.6	$468	2.0	1
06	2	1	3	6	3	NO		82	FurtherEvalRea	02 - Immediately Restore -	Year 1	10.4		372			53					
18	1	3	3	9	9	NO		78	InService	02 - Immediately Restore -	Year4	0.2	1275	646	629	1	43	199	4.9		5.0	

Parcel Availability

Parcel Availability			
No Offset ←			→ Offset
4	3	2	1
Parcel Availability Scoring Factors			
Parcel			**Score**
Room to offset and redrill within parcel. Minimum of 200 feet to offset			1
Variance required. 100-200 feet available to offset within parcel			2
No room to offset and redrill within parcel, but adjacent property available to acquire			3
No room to offset and no nearby parcel available			4

Note – a score of 4 resulted in a "fatal flaw" to offset and redrill.

Environmental Risk/Contamination

Environmental Risk				
Higher ←				→ Lower
5	4	3	2	1
1	No sources of contamination noted.			
2	A contamination source is in the area but is unlikely to impact water quality. A file review is needed to confirm the nature of the contamination.			
3	A contamination source is in the area could possibly impact water quality. A detailed file review is needed to confirm the nature of the contamination.			
4	A contamination source is in the area and is likely to impact water quality. A detailed file review is needed to rule out contamination risks.			
5	A known contamination source is situated in the vicinity of the well and is very likely to impact groundwater quality.			

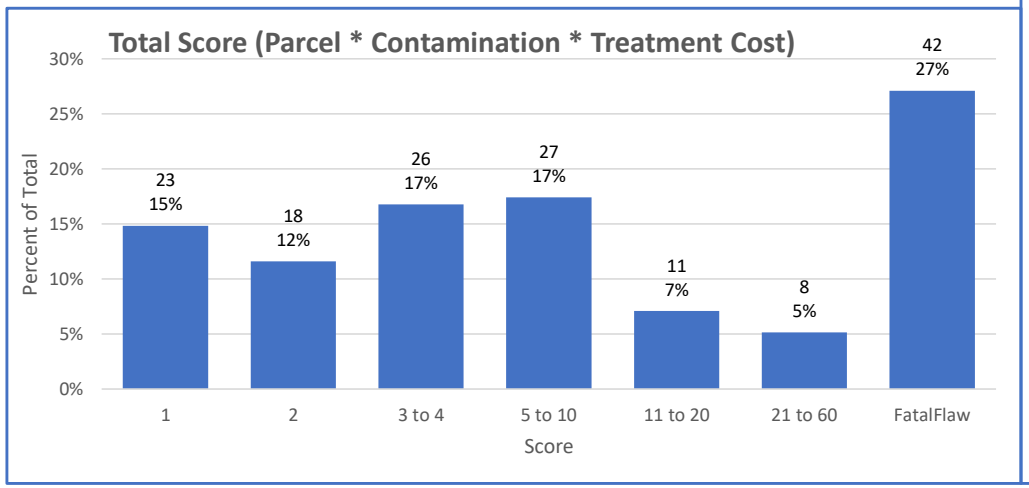
Note – a score of a 5 resulted in a "fatal flaw" to offset and redrill.

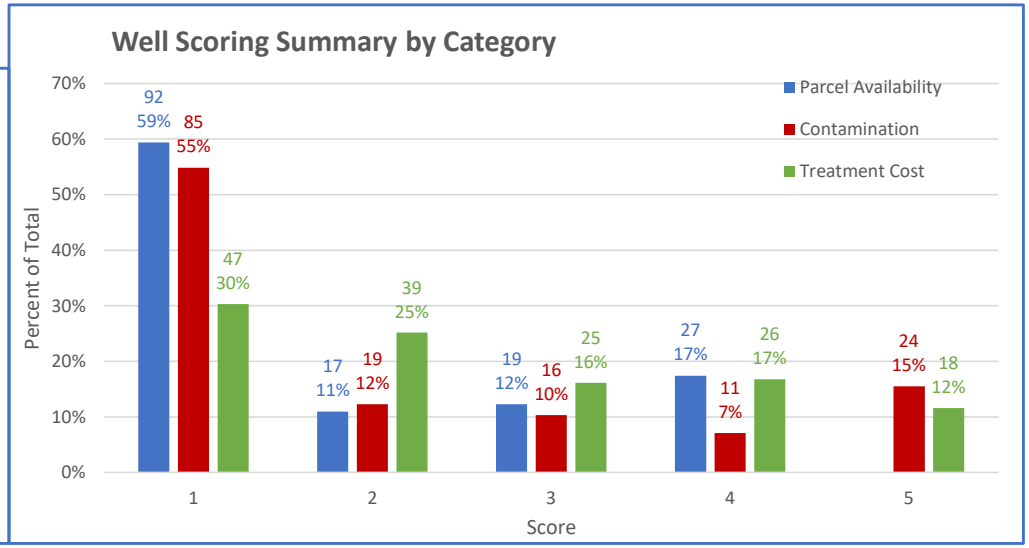
Water Treatment Costs

Water Treatment Cost				
5	4	3	2	1
>$1,300	$1,000 to $1,300	$800 to $1,000	$600 to $800	$300 to $600

Well	Parcel	Environmental (Contamination)	Treatment Cost	Total Score - Multiplied	Operational Score - Multiplied	surveyed by BV?	Average Monthly Pumpage MG	Well_Age2	Well Status - Tod Smith 2023	Rehab Category	Year of Rehab	Parcel Size (acre)	Hardness 1990 to 2021	Hardness - History	Delta Hardness	Count Hardness Samples 1990 to 2021	Count Hardness Samples - History	Chlorides 1990 to 2021	Iron 1990 to 2021	Cost per MG	Calculated Hardness Score Based on Hardness Range	Treatment Cost Score Calculated based on range	B&V Notes
15-01	1	4	5	20	20	NO		82	InService	00 - Not in report	No Reha	1.2		497			76			$1,404		5.3	USTs nearby
25-13	3	4	5	60	20	NO		88	InService	00 - Not in report	No Reha	3.0		485			82			$1,762		5.8	Poor water quality.
25-14	3	3	5	45	15	NO		88	InService	00 - Not in report	No Reha	0.0		492			76			$1,912		5.8	Poor water quality. Nearby parcels a potential, but water quality needs investigating.
25-16	3	4	5	60	20	NO		82	InService	00 - Not in report	No Reha	0.0	1370	470	900	1	67	254	5.3	$2,305	5.0	5.8	Poor water quality. Nearby metals recycling facility.
25-19	2	4	5	40	20	NO		78	InService	00 - Not in report	No Reha	0.2		532			55			$1,396		5.0	Nearby metals recycling facility.
35-03	3	1	5	15	5	YES		64	InService	00 - Not in report	No Reha	0.3	963	625	339	3	24	114	0.6	$1,458	5.0	5.3	Poor water quality.
40-19	2.0	4.0	3.0	24	12	NO	0.94	56	Abandoned	00 - Not in report	No Reha	66.5	681	548	133	5	15	105	1.0	$931	5.0	3.5	Likely abandoned due to new housing development. Confirm with BWL.
60-02	1	1	1	1	1	YES	11.09	55	InService	00 - Not in report	No Reha	53.8	368	382	-13	15	26	50	0.5	$440	1.0	1.3	Room to offset and redrill.
60-07	2	1	3	6	3	YES	2.32	37	InService	01 - Well Rehab - Younger W	Year1	0.4	562	562		10	10	157	1.3	$965	4.0	3.5	Relatively poor water quality. Possibly room to offset and redrill.
60-09	1	3	4	12	12	YES	0.28	41	InService	01 - Well Rehab - Younger W	Year1	1.1	669	645	24	9	10	214	1.7	$1,219	5.0	4.7	Poor water quality
60-10	1	1	1	1	1	YES	18.25	41	InService	01 - Well Rehab - Younger W	Year1	1.0	430	422	8	18	20	81	1.2	$481	2.0	1.3	Room to offset and redrill.
60-12	1	1	2	2	2	YES	10.90	36	InService	01 - Well Rehab - Younger W	Year1	1.8	493	493		15	15	87	1.7	$657	3.0	2.0	Room to offset and redrill.
70-06	1	1	1	1	1	YES	14.03	45	InService	01 - Well Rehab - Younger W	Year1	0.9	444	417	27	18	23	55	0.9	$529	2.0	1.7	Room to offset and redrill.
70-07	1	1	1	1	1	YES	14.56	45	InService	01 - Well Rehab - Younger W	Year2	0.4	392	387	5	19	24	31	0.9	$475	2.0	1.3	Room to offset and redrill.
70-08	1	2	1	2	2	YES	15.38	41	InService	01 - Well Rehab - Younger W	Year2	0.2	353	343	9	18	20	26	0.5	$403	1.0	1.3	Room to offset and redrill.
75-07	1	1	2	2	2	YES	4.16	10	InService	01 - Well Rehab - Younger W	Year2	3.6	343	343		3	3	13	0.9		1.0		Several test borings have been drilled at this site. Well 75-07 was drilled in 2013.
80-00	2	1	2	4	2	YES	10.27	41	InService	01 - Well Rehab - Younger W	Year2	2.6	468	440	28	14	17	46	1.2	$615	3.0	2.0	Potential for offset and redrill.
80-11	1	1	1	1	1	YES	6.65	27	InService	01 - Well Rehab - Younger W	Year3	1.7	380	380		13	13	89	1.7	$531	2.0	1.7	Good candidate for offset and redrill.
83-01	1	1	1	1	1	YES	7.11	42	InService	01 - Well Rehab - Younger W	Year3	0.4	427	415	12	13	15	22	1.8	$534	2.0	1.7	Enough room to offset and redrill.
84-03	1	1	1	1	1	NO		26	FurtherEvalReq	01 - Well Rehab - Younger W	Year3	1.1											No treatement cost data.
90-05	2	1	1	2	1	YES	10.97	35	InService	01 - Well Rehab - Younger W	Year3	0.9	416	416		15	15	28	0.6	$468	2.0	1.3	Not running. Pump pulled for maintenante. Good water quality and runs all the time, per BWL.
15-06	2	1	3	6	3	NO		82	FurtherEvalReq	02 - Immediately Restore -	Year 1	10.4		372			53						No treatment cost data, cost assumed based on nearby WQ. Possible good candidate for offset and redrill. Per BWL it has been out of service for a long time, unsure why.

Well Scoring Summary



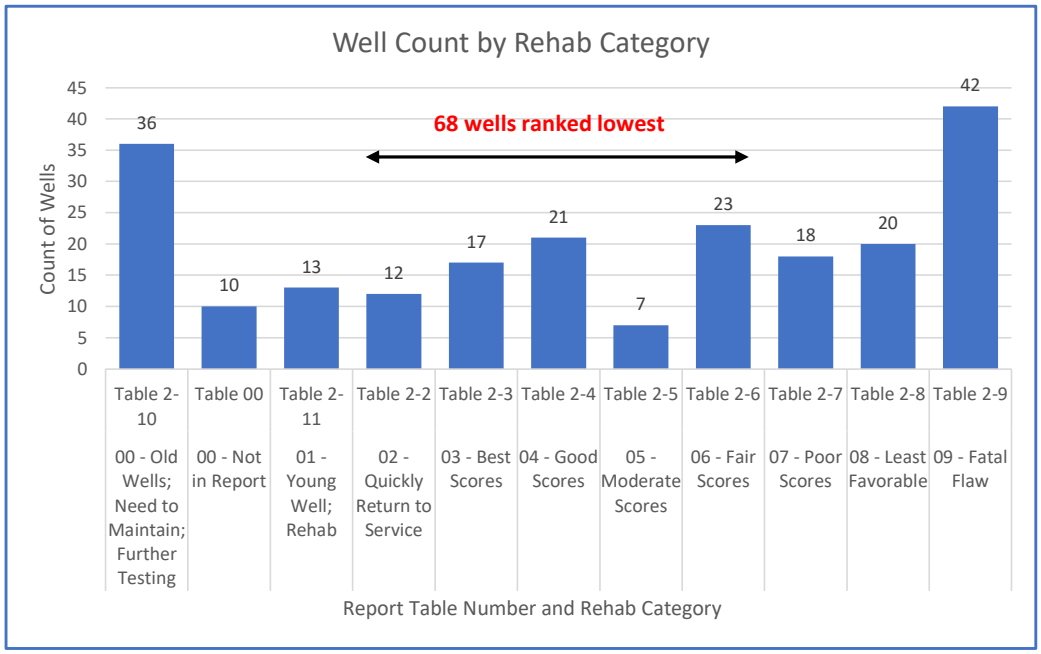


- Approximately 60% of the wells are located on properties large enough to offset and redrill
- Approximately 60% of the wells were scored such that there are no known sources of contamination noted.
- Approximately 61% of the wells within the matrix had a total multiplied score less than 10.
- Approximately 27% of the wells within the matrix had a fatal flaw to offset/redrill.

5-Year Maintenance Plan

Rehabilitation Categories

1. Old Wells; Need to Maintain; Further Testing
2. Young Well; Rehab
3. Quickly Return to Service
4. Best Scores
5. Good Scores
6. Moderate Scores
7. Fair Scores
8. Poor Scores
9. Least Favorable
10. Fatal Flaw



Well ID	Rehab Year	5-Year Rehab Recommendation	Report Rehab Category	Tod Smith Status	Other Status	Well Age	Original Capacity	Current Capacity	Delta Capacity	Total Score Nutt	Parcel Score	Comm Score	Treat Score	Hardness 1990 to 2021	# Samples (30-yr)	Hardness - History	Avg Monthly Pumpage	Cost	Cost by Year
15-06	Year1	Return to Service	02 - Quickly Return to Service	FurtherEvalRe	out of service	82	0.07	0.00	0.1	6	2	1	3			372	0.0	$ 50k - $ 100k	
25-18	Year1	Return to Service	02 - Quickly Return to Service	InService	out of service	78	0.72	0.84	-0.1	9	1	3	3	1,275	1	646	0.0	$ 50k - $ 100k	
25-27	Year1	Return to Service	05 - Moderate Scores	FurtherEvalRe	out of service	73	0.58	0.52	0.1	3	1	1	3	689	1	320	0.0	$ 50k - $ 100k	
25-32	Year1	Return to Service	02 - Quickly Return to Service	InService	Pump off	63	0.43	0.40	0.0	2	2	1	1	347	10	298	4.6	$ 50k - $ 100k	
50-21	Year1	Return to Service	02 - Quickly Return to Service	InService	out of service	88	1.44	1.29	0.1	9	1	3	3			468	0.0	$ 50k - $ 100k	
55-02	Year1	Return to Service	02 - Quickly Return to Service	InService	out of service	57	0.50	0.43	0.1	4	1	1	4	770	1	459	0.0	$ 50k - $ 100k	
55-03	Year1	Return to Service	02 - Quickly Return to Service	InService	out of service	96	0.50	0.40	0.1	2	1	1	2	534	1	399	0.0	$ 50k - $ 100k	
65-07	Year1	Return to Service	02 - Quickly Return to Service	InService	Pump off	54	0.50	0.50	0.0	2	1	1	2	452	16	419	10.0	$ 50k - $ 100k	
83-01	Year1	Return to Service	01 - Young Well; Rehab	InService	Pump off	42	0.50	0.40	0.1	1	1	1	1	427	13	415	7.1	$ 50k - $ 100k	
85-01	Year1	Return to Service	02 - Quickly Return to Service	InService	out of service	58	1.01	0.40	0.6	1	1	1	1	309	8	308	0.0	$ 50k - $ 100k	
85-02	Year1	Return to Service	02 - Quickly Return to Service	InService	out of service	58	2.30	0.60	1.7	1	1	1	1	333	6	336	0.0	$ 50k - $ 100k	$ 1.6 M - $ 3.1 M
85-03	Year1	Return to Service	02 - Quickly Return to Service	InService	out of service	58	1.73	0.62	1.1	1	1	1	1	321	6	324	0.0	$ 50k - $ 100k	
60-07	Year1	Rehab	01 - Young Well; Rehab	InService	Pump off	37	0.60	0.60	0.0	6	2	1	3	562	10	562	2.3	$ 50k - $ 100k	
60-09	Year1	Rehab	01 - Young Well; Rehab	InService	Pump off	41	0.50	0.60	-0.1	12	1	4	4	669	9	645	0.3	$ 50k - $ 100k	
60-10	Year1	Rehab	01 - Young Well; Rehab	InService	Pump on	41	0.50	0.80	-0.3	1	1	1	1	430	18	422	18.3	$ 50k - $ 100k	
60-12	Year1	Rehab	01 - Young Well; Rehab	InService	Pump on	36	0.65	0.55	0.1	2	1	1	2	493	15	493	10.9	$ 50k - $ 100k	
70-06	Year1	Rehab	01 - Young Well; Rehab	InService	Pump on	45	0.50	0.60	-0.1	1	1	1	1	444	18	417	14.0	$ 50k - $ 100k	
70-07	Year1	Rehab	01 - Young Well; Rehab	InService	Pump on	45	0.50	0.50	0.0	1	1	1	1	392	19	387	14.6	$ 50k - $ 100k	
70-08	Year1	Rehab	01 - Young Well; Rehab	InService	Pump on	41	0.50	0.60	-0.1	2	1	1	1	353	18	343	15.4	$ 50k - $ 100k	
10-07	Year1	Offset and Redrill	03 - Best Scores	InService	pump on	78	0.29	0.50	-0.2	1	1	1	1	399	16	374	11.3	$ 200k - $ 400k	
90-02	Year1	Offset and Redrill	03 - Best Scores	InService	Pump on	78	0.00	0.40	-0.4	1	1	1	1	395	13	395	8.4	$ 200k - $ 400k	
90-03	Year1	Offset and Redrill	03 - Best Scores	InService	Pump on	78	0.00	0.30	-0.3	1	1	1	1	421	14	421	8.2	$ 200k - $ 400k	
75-04	Year2	Rehab	06 - Fair Scores	Test Well	Test hole	36	0.00	0.00	0.0	6	3	1	2				0.0	$ 100k - $ 185k	
75-07	Year2	Rehab	01 - Young Well; Rehab	InService	Pump on	10	0.00	0.00	0.0	2	1	1	2	343	3	343	4.2	$ 50k - $ 100k	
80-00	Year2	Rehab	01 - Young Well; Rehab	InService	Pump off	41	0.50	0.60	-0.1	4	2	1	2	468	14	440	10.3	$ 50k - $ 100k	
80-11	Year2	Rehab	01 - Young Well; Rehab	InService	Pump off	27	0.86	0.50	0.4	1	1	1	1	380	13	380	6.7	$ 50k - $ 100k	
83-01	Year2	Rehab	01 - Young Well; Rehab	InService	Pump off	42	0.50	0.40	0.1	1	1	1	1	427	13	415	7.1	$ 50k - $ 100k	$ 1.0k - $ 2.0 M
84-03	Year2	Rehab	01 - Young Well; Rehab	FurtherEvalRe	No data	26	0.00	0.00	0.0	1	1	1	1				0.0	$ 50k - $ 100k	
90-05	Year2	Rehab	01 - Young Well; Rehab	InService	Out of Service	35	0.00	0.40	-0.4	2	2	1	1	416	15	416	11.0	$ 50k - $ 100k	
02-02	Year2	Offset and Redrill	03 - Best Scores	InService	Pump on	66	0.50	0.30	0.2	1	1	1	1	316	15	307	5.4	$ 200k - $ 400k	
25-36	Year2	Offset and Redrill	03 - Best Scores	InService	Pump on	63	0.58	0.40	0.2	1	1	1	1	364	16	321	10.1	$ 200k - $ 400k	
90-06	Year2	Offset and Redrill	03 - Best Scores	InService	Pump on	57	0.00	0.50	-0.5	1	1	1	1	401	14	401	11.5	$ 200k - $ 400k	
80-01	Year3	Rehab	04 - Good Scores	InService	Pump off	46	0.50	0.40	0.1	2	1	1	1	386	15	382	7.8	$ 100k - $ 185k	
65-01	Year3	Rehab	04 - Good Scores	InService	Pump off	49	0.50	0.50	0.0	2	1	1	2	532	15	491	8.6	$ 100k - $ 185k	
65-08	Year3	Rehab	04 - Good Scores	InService	Pump on	50	0.50	0.65	-0.1	4	1	1	2	588	17	546	15.1	$ 100k - $ 185k	
80-05	Year3	Rehab	04 - Good Scores	InService	Pump off	51	0.50	0.60	-0.1	4	1	1	2	521	14	463	10.3	$ 100k - $ 185k	
65-09	Year3	Rehab	06 - Fair Scores	InService	Pump off	51	0.50	0.50	0.0	6	2	1	3	607	12	517	5.1	$ 100k - $ 185k	$ 1.4M - $ 2.7 M
80-09	Year3	Rehab	04 - Good Scores	InService	Pump off	52	0.50	0.60	-0.1	2	1	1	2	455	13	413	7.6	$ 100k - $ 185k	
80-08	Year3	Offset and Redrill	04 - Good Scores	InService	Pump on	53	0.50	0.70	-0.2	2	1	1	2	557	15	468	8.6	$ 200k - $ 400k	
85-02	Year3	Offset and Redrill	02 - Quickly Return to Service	InService	out of service	58	2.30	0.60	1.7	1	1	1	1	333	6	336	0.0	$ 200k - $ 400k	
85-03	Year3	Offset and Redrill	02 - Quickly Return to Service	InService	out of service	58	1.73	0.62	1.1	1	1	1	1	321	6	324	0.0	$ 200k - $ 400k	
85-01	Year3	Offset and Redrill	02 - Quickly Return to Service	InService	out of service	58	1.01	0.40	0.6	1	1	1	1	309	8	308	0.0	$ 200k - $ 400k	
70-03	Year4	Rehab	05 - Moderate Scores	InService	Pump off	53	0.50	0.80	-0.3	3	1	1	3	688	14	624	3.8	$ 100k - $ 185k	
65-04	Year4	Rehab	04 - Good Scores	InService	Pump off	54	0.50	0.60	-0.1	2	1	1	2	542	14	469	9.4	$ 100k - $ 185k	
65-05	Year4	Rehab	05 - Moderate Scores	InService	Pump off	54	0.50	0.60	-0.1	3	1	1	3	676	8	549	1.2	$ 100k - $ 185k	
60-02	Year4	Rehab	00 - Not in Report	InService	Pump on	55	0.50	0.50	0.0	1	1	1	1	368	15	382	11.1	$ 100k - $ 185k	
50-24	Year4	Rehab	04 - Good Scores	InService	Pump on	56	0.58	0.60	-0.0	2	1	1	1	505	15	488	13.1	$ 100k - $ 185k	$ 1.3M - $ 2.5M
65-03	Year4	Rehab	04 - Good Scores	InService	Pump off	56	0.50	0.65	-0.1	2	1	1	2	505	17	445	11.8	$ 100k - $ 185k	
75-02	Year4	Rehab	04 - Good Scores	InService	Pump off	56	0.43	0.50	-0.1	2	1	1	2	406	15	379	12.0	$ 100k - $ 185k	
65-02	Year4	Offset and Redrill	03 - Best Scores	InService	Pump on	56	0.50	0.55	-0.0	1	1	1	1	532	13	462	8.7	$ 200k - $ 400k	
90-07	Year4	Offset and Redrill	03 - Best Scores	InService	Pump on	56	0.00	1.00	-1.0	1	1	1	1	348	17	348	19.2	$ 200k - $ 400k	
84-01	Year4	Offset and Redrill	03 - Best Scores	Monitoring	Test hole	55	0.00	0.00	0.0	1	1	1	1			424	0.0	$ 200k - $ 400k	
55-01	Year5	Rehab	04 - Good Scores	InService	Pump off	57	0.50	0.60	-0.1	2	1	1	2	606	1	517	0.0	$ 100k - $ 185k	
65-06	Year5	Offset and Redrill	03 - Best Scores	InService	Pump off	54	0.50	0.40	0.1	1	1	1	1	394	18	373	9.5	$ 200k - $ 400k	$ 700k - $ 1.4 M
80-07	Year5	Offset and Redrill	03 - Best Scores	InService	Pump on	51	0.50	0.70	-0.2	1	1	1	1	410	16	387	12.2	$ 200k - $ 400k	
70-05	Year5	Offset and Redrill	03 - Best Scores	InService	Pump on	49	0.50	0.50	0.0	1	1	1	1	391	14	379	12.2	$ 200k - $ 400k	

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