

Tentative Agenda for the WAVERLY CITY COUNCIL SPECIAL MEETING to be held on November 22, 2023 at 6:00 PM. This meeting will be held at the Waverly City Office Building located at 14130 Lancashire Street, Waverly, Nebraska. A current Agenda shall be readily available for public inspection at the office of the City Clerk during normal business hours.

1. **Call to Order**

1.a) Roll Call

1.b) Pledge of Allegiance

1.c) Acknowledgement of the "Open Meetings Act" poster that is posted by the south entrance.

1.d) Adoption of Agenda

2. **Discussion of any present and future changes to municipal ordinance Chapter 51: Water, with intended focus on section 51.37.**

3. **Adjournment**

The Governing Body reserves the right to go into Executive Session at any time for the reasons outlined in State Statute 84-1410.

The following rules are established for audience members and participants at a Council meeting:

- (1) Any person wishing to address the Council shall first state their name and address.
- (2) Public comments are for non-agenda items only.
- (3) Remarks shall be limited to five (5) minutes.

MEMO

- Overnight
- Regular Mail
- Hand Delivery
- Other: _____

To:	Stephanie Fisher; Tracey Whyman City of Waverly
From:	Samantha Corey, EI and Owen Killham, PE Olsson
RE:	Water Restrictions Ordinance Recommendations
Date:	November 22, 2023
Project #:	023-00062

Summary

The City of Waverly Ordinance 51.37 regarding water use restrictions was provided to Olsson to review the triggers for the differing levels of water restriction: Water Watch, Warning, and Emergency. Olsson reviewed the current ordinance and provided recommendations to update the ordinances based on current criteria and demands. However, the ordinances are set up in a way that will be valid over time and not require updating every time the population grows or a new well is added. The following table outlines a summary of the triggers, which are explained in more detail later in this memo.

Trigger A: Pumping Water Level	
Water Watch	When more than 50% of wells (more than 4 of 8) have a pumping water level within 5 feet of the minimum pumping level.
Water Warning	When more than 40% of wells (more than 3 of 8) have a pumping water level within 3 feet of the minimum pumping level.
Water Emergency	When more than 15% of wells (more than 1 of 8) have a pumping water level within 1 foot of the minimum pumping level. Turn off a well when it reaches the minimum pumping level.
Trigger B: Wells Out of Service	
Water Watch	When more than 25% of wells (more than 2 of 8) are taken out of service. OR If one storage tank is taken out of service for 5 or fewer days for a reason other than routine maintenance.
Water Warning	When more than 38% of wells (more than 3 of 8) are taken out of service. OR If the storage tanks are not able to be completely filled within a 24-hour period.

Water Emergency	When more than 50% of wells (more than 4 of 8) are taken out of service. OR If one storage tank is taken out of service for more than 5 days for a reason other than routine maintenance. OR If all storage tanks are simultaneously taken out of service for any amount of time.
Trigger C: Well Run Times	
Water Watch	When all well pumps are running for more than 18 hours per day.
Water Warning	When all well pumps are running for more than 20 hours per day.
Water Emergency	When all well pumps are running for more than 22 hours per day.

Water Restriction Ordinance Recommendations

The existing water restriction ordinance has several different triggers regarding various aspects of the well pumping and water use that result in a Water Watch, Warning, or Emergency. The following sections detail the criteria for each trigger and subsequent recommendations.

A. Pumping Water Level Trigger

CURRENT TRIGGERS:

“Groundwater levels have fallen X feet below the normal seasonal level” where X ranges from 5 to 15, from Water Watch to Emergency.

“Pumping lowers water levels to within five feet of the top of well screens” is only a trigger for a Water Emergency.

Aquifer levels vary between different wells, making it difficult to have an established seasonal level baseline to trigger levels of water restrictions. However, pumping water levels are easier to measure and have consistent criteria once a minimum pumping level has been established for each well. The pumping water level is when the aquifer will be drawn to the potentially most critical level, and it affects if a well needs to be shut off.

Sargent Drilling said that the pumping water level within 5 feet of the top of the well screen should be a warning level. Water should be no lower than 1 or 2 feet above the screen at any time. However, many of Waverly’s wells have a pump bowl higher than the screen, and the shutoff levels are based on the water level with respect to the top of the pump bowls. It is recommended that a well is shut off if the pumping water level reaches the shutoff point, as determined by the top of pump bowls. Manually taking one or more wells out of service to avoid operating below the critical level will potentially trigger another water restriction for wells out of service as described further in the next section.

The shutoff/minimum pumping level for each well was collected and summarized in Table 1. The minimum recommended pump level was provided by Layne Christensen and corresponds to the level needed to keep the pump bowls submerged.

Table 1 includes the pumping water level (PWL) in 2023, which has had with the worst aquifer levels in recent history. 2019 levels were also included, was the last “good” year with around average rainfall and aquifer levels did not decrease.

In 2019, there were three wells with a PWL within 5 feet of the minimum pumping level, and there was a fourth well which was close. It is assumed that this is the normal functional pumping water level for these wells in an average year.

Currently in the baseline average year, three of the City's eight wells (38% of total) regularly operate within five feet of the shutoff level. One other well is close to five feet, and historically it has been common for three or four wells to operate within five feet of the shutoff level without water supply issues. The trigger levels associated with the wells is based upon the pumping water level dropping to a critical level at a fifth well.

In the baseline average year, one well (13%) operated within one foot of the shutoff. If two or more wells fall to this level, that would warrant a Water Emergency. If the pumping water level in a well reaches the minimum pumping level, it shall be shut off and monitored until the water raises to an acceptable level.

Table 1. Minimum Pump Levels and Historical Pumping Water Levels

Well #	Min. Pumping Level (ft)	2019 Average PWL (ft)	Difference: 2019 Avg to Min Pump Level (ft)	Jan-Sept 2023 High PWL (ft)	Difference: 2023 High to Min Pump Level (ft)
4	48	44	4	47.8	0.2
5	47	41	6	46.9	0.1
6	130	127	3	129.6	0.4
8	138	126	12	131.8	6.2
9	150	140	10	148	2
10	142	116	26	122.3	19.7
11	134	133	1	135.9	-1.9

Although there are currently only seven active wells, the City plans to have Well #7 reconstructed within the next year. During construction of Well #7, Olsson intends to review the test hole/well information and potentially modify the design of the well to decrease the screen length. This may lead to a lower capacity at the well, but allow the pump to be placed deeper and allow for more operational flexibility when aquifer levels are low.

Historic water level data from 2019 to 2023 showed that pumping water levels dropped below five feet on several occasions during November through March. This is typically seen as the off-peak season and water use is typically not expected to be near peak uses. These level drops typically occurred in Wells #4, #6, #9, and #11. However, Waverly has more than sufficient well capacity to meet demands, especially the lower demands in the winter. Thus, it is recommended to monitor the pumping water levels in these wells and then slow down with VFD or entirely turn off the wells for some time until the water level can recover. They would not contribute to Trigger B for wells shut off since they could be turned back on at any time. However, it would be more efficient to just turn off the wells rather than go into water restrictions in the winter when there is not much people can do to reduce water use since they are not watering lawns.

PROPOSED TRIGGER LEVELS:

Water Watch: Implement when more than 50% of wells (more than four out of eight) have a pumping water level within 5 feet of the minimum pumping level*.

Water Warning: Implement when more than 38% of wells (more than three out of eight) have a pumping water level within 3 feet of the minimum pumping level*.

Water Emergency: Implement when more than 15% of wells (more than one out of eight) have a pumping water level within 1 foot of the minimum pumping level. A well shall be shut off if pumping water level falls to the minimum pumping level*.

** During the winter, well levels must remain at these trigger points for a duration of at least two weeks prior to entering water restrictions.*

B. Wells Out of Service Trigger

CURRENT TRIGGER:

"The City pumping ability has fallen below X percent capacity" where X ranges from 85 to 50, from Water Watch to Emergency.

The current trigger which relates to pumping ability is difficult to define and to track, so a different baseline is recommended. Alternative criteria considered was:

- The ability to fill the system's storage in 12 hours or less, to limit runtime on well pumps
- Peak day demands
- A percent of wells out of service

After considering these metrics, it was ultimately decided that a trigger based on a percent of wells out of service would be the easiest to keep track of and would also cover other potential issues such as power failure or natural disasters that would take the wells out of service. Assuming that Waverly monitors their water demand and has enough wells and storage to meet regular demands, a degree of redundancy is anticipated to be present in the system where one or two wells could be taken out of service without interrupting the water supply.

There are different demand conditions that the Waverly water system must be able to meet. Ideally, a combination of well pumping and storage will meet these demands. These demands can be used as a baseline to determine how many wells may be out of service while continuing to meet these demands. Current demands and well pumping capacity will be used to determine these percentages which will be easier to compare yearly as Waverly grows. Table 2 below outlines the remaining pump capacities for different percentages of wells out of service, based on an assumption that the average well capacity, determined by calculating the average apparent capacity of all the wells currently in service, is 423 gpm. Well #7, which is anticipated to be replaced in 2024, was included in the total pump capacity at an assumed capacity of 550 gpm.

Table 2. Remaining Well Pump Capacity with Wells Out of Service

Number of Wells Out of Service	Percent of Wells Out (%)	Remaining Pump Capacity (gpm)	Average Day + Fire Flow	Peak Hour Demand	Fill 1 MG Storage in 12 Hours	Peak Day Demand
0	0%	3,382	1,911 gpm	1,538 gpm	1,389 gpm	761 gpm
1	13%	2,959				
2	25%	2,537				
3	38%	2,114				
4	50%	1,691				
5	63%	1,268				
6	75%	846				
7	88%	423				
8	100%	0				

The first level of water restrictions uses the ability to provide an average demand plus residential fire flow, or 1,911 gpm as a basis. The calculations are conservative, as it is unlikely that the wells alone would need to meet this demand due to the one million gallons of storage available, and that a residential fire flow event is assumed to last for 2 hours. However, if well pumping capacity begins to decline below this level, it may be the start of cause for concern.

The next action level evaluated is when the active wells cannot keep up with Waverly's peak hour demand, currently 1,538 gpm. Peak hour demand is associated with short periods of high demand, typically when irrigation coincides with peak residential demands. This peak demand would only occur for a few hours at a time but would indicate that the system is in danger of not being able to provide enough capacity if another well is lost. Also, if the wells were pumping at 1,400 gpm for 12 hours, they could fill up the storage tanks. Thus, if the well pumping capacity falls below this level, then Waverly should enter a Water Warning because the storage tanks should be available to supplement peak demands or fire flows.

The level at which a water emergency is recommended to be implemented is when the well capacity is lower than the peak day demand, or 761 gpm. Waverly's storage is sized to provide a full day at peak demand, but if a significant number of wells are out of service and not able to keep the storage full over time, this suggests that a water shortage is imminent.

For each of these three proposed levels, a corresponding percentage of wells was chosen to indicate when demand may exceed the available well capacity. These restrictions assume that there is water stored to supplement high demands over short periods of time.

The water storage tanks are sized to meet a full day of peak demands. If the storage tanks are not able to be filled within 24 hours, then the system is at risk of peak demands or a fire flow situation exceeding the current well capacity with no storage as backup. For this reason, this trigger will include criteria to also enter water restrictions if the storage tanks are not able to be filled up on a daily basis, most likely to happen overnight when the demands are lower.

Routine maintenance, inspection, cleaning, and repainting of the tank is one unavoidable task. However, this should ideally be planned in the off-peak season when water use is lower. If sufficient wells are in service, then the system should be able to meet demands with just one tank and the pump capacity. For this reason, a caveat is included in the triggers that one tank out of service for routine maintenance tasks does not trigger water restrictions. However, if

unplanned emergency maintenance was needed, then a restriction would still be triggered, especially if it happens in the peak summer months.

Additionally, if water storage tanks are taken out of service, this will also contribute to water restrictions being triggered because they can help supplement peak water demands over short periods of time.

PROPOSED TRIGGER LEVELS:

Water Watch: Implement when more than 25% of the wells (more than two out of eight) are taken out of service, which coincides with the inability of the wells to accommodate an average day of demand plus a residential fire flow event.

OR

Implement if one water storage tank is taken out of service for 5 or fewer days for any reason other than routine maintenance or inspection.

Water Warning: Implement when more than 38% of the wells (more than three out of eight) are taken out of service, which coincides with an inability to accommodate a peak hour demand.

OR

Implement if the storage tanks are not able to be completely filled within a 24-hour period.

Water Emergency: Implement when more than 50% of the wells (more than four out of eight) are taken out of service, which coincides with an inability to meet peak day demands.

OR

Implement if one water storage tank is taken out of service for more than 5 days for any reason other than routine maintenance or inspection.

OR

Implement if all storage tanks are simultaneously taken out of service for any amount of time.

C. Well Run Times Trigger

CURRENT TRIGGER:

“Daily demand is in excess of X gallons per day based on a three-day average” where X ranges from 800,000 to 1,000,000 gallons, from Water Watch to Emergency.

Previously, the third trigger related to the daily demand exceeding set numbers. However, since demand would increase as Waverly’s population continues to grow, and it is hard to set an objective demand limit.

It is important to ensure that the total daily demand does not exceed the available daily well capacity. The overall maximum amount of water that the system could provide is if all wells are running for 24 hours per day. Ideally, Waverly would never get to this point because if all wells were running for 24 hours and then one of them went out of service, then the remaining wells would not be able to meet the current system demands. For this reason, it is recommended that a Water Emergency go into effect if all wells are pumping for more than 22 hours per day. This allows for a little redundancy rather than maximizing the full 24 hours of all wells pumping.

Generally, it is best practice to not regularly run wells more than 12-15 hours per day in order to give the aquifer time to recharge and so that the motor and pump don’t overheat. It is typically recommended that a community construct a new well if the current wells are continuously pumping for more than 18 hours per day. Thus, it is recommended to enter a Water Watch

when all wells are running for 18 hours per day. The next level, Water Warning, is recommended to be in the middle at 20 hours.

PROPOSED TRIGGER LEVELS:

Water Watch: Implement when all well pumps are running for more than 18 hours per day.

Water Warning: Implement when all well pumps are running for more than 20 hours per day.

Water Emergency: Implement when all well pumps are running for more than 22 hours per day..

Ending Water Restrictions

Another important aspect to consider when setting the water restrictions is clearly identifying when they will end. It is important that the water restrictions do not keep being added and removed, which will likely have a negative impact on water conservation and desensitize water users to the greater goal of conserving water use. Restrictions should be in place long enough to lessen risk to the water system, supply, and aquifer levels and allow the facilities to recover when the restriction ends.

It is recommended to include a clause in the ordinance stating when a level of water restrictions will end. A level (i.e., Water Watch, Warning, or Emergency) should end after two weeks of the trigger expiring. After the two-week period where the pumping ability, water level, or water use has lowered, the water restriction level may fall down one level.

Water Restriction Levels

Currently each trigger level of water restrictions has different levels of water reductions. The ordinance outlines possible conservation measures such as limiting car washes and watering lawns on certain days only based on even or odd addresses.

- Water Watch: Voluntary reductions in use
- Water Warning: Recommended restrictions on nonessential uses
- Water Emergency: Mandatory restrictions on water use

It is recommended to update these guidelines, because the voluntary and recommended reductions in use have not had the desired effects of curbing use and preventing a Water Emergency. The City could put out some educational material in the spring and let residents know how voluntary reductions could help throughout the summer. Then, water restrictions could be phrased as a combination of recommended and mandatory cutbacks.

Proposed levels of reduction are as follows:

- Water Watch
 - Recommended restrictions on nonessential uses
 - Recommended reduction in lawn irrigation (maximum 3 days per week as determined by address)
- Water Warning:
 - Recommended restrictions on nonessential uses
 - Mandatory reduction in lawn irrigation (maximum 3 days per week as determined by address)
- Water Emergency:

- Mandatory conservation measures (as outlined in current ordinance)
- Mandatory reduction in lawn irrigation (Saturday or Sunday as determined by house number)

Additional Recommendations

In addition to the recommended modifications to the water restriction ordinance, as noted above, there are several other recommendations that could positively incentivize residents to conserve water and avoid restrictions. Suggesting voluntary water restrictions in the spring or educating the public about ensuring their sprinklers are set to appropriate levels could help get ahead of the peak summer water use.

Incentives could be provided for water customers who are below a certain level of water use during the peak season. This could include forgiving or providing a discount on a water bill or potentially asking businesses to offer gift cards as rewards. This could go even further by providing larger rewards for those who conserve water usage for multiple months. This would work towards positive reinforcement rather than punishment for excessive water use.

It is also possible to implement permanent lawn watering restrictions to three days a week. Many communities divide this based on even or odd street addresses, and it can help manage water demands during the peak summer months. If water restrictions are implemented, then the allowable days for watering can be further cut back to fewer days a week.

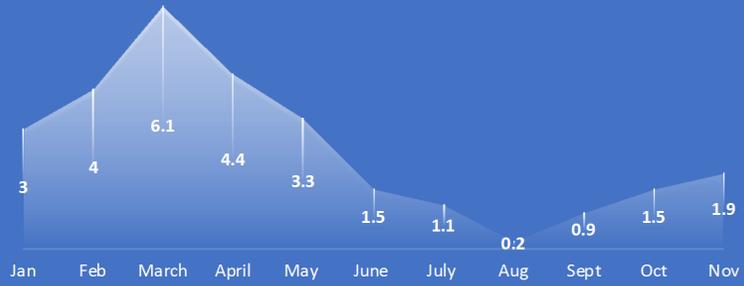
Olsson water restrictions as proposed

Drought Restriction Levels	Well out of Service Restrictions	Water Demand Restrictions
Trigger A Pumping Water Levels	Trigger B	Trigger C Well Run Times
Water Watch 50% of wells/ 5 of 8 wells within 5 feet of shutoff, or	25% of wells/ 3 of 8 out of service, or	All wells runtime exceeds 18 hours per day= 3.65 MGD
Water Warning 40% of wells/ 4 of 8 wells within 3 feet of shutoff or	38% of wells/ 4 of 8 out of service, or	All wells runtime exceeds 20 hours per day= 4.05 MDG
Water Emergency 15% of wells/ 2 of 8 wells within 1 foot of shutoff, or	50% of wells/ 5 of 8 out of service, or	All wells runtime exceeds 22 hours per day= 4.46 MGD

Waverly current water restrictions

Drought Restriction Levels	Well out of Service Restrictions	Water Demand Restrictions
Water Watch 5 feet below normal season levels	2 wells out of service	3 day average over 800,000 gallons
Water Warning 10 feet below normal seasonal levels	3 wells out of service	3 day average over 900,000 gallons
Water Emergency 15 feet below NSL, pumping 5 feet from top of screen	4 wells out of service	3 day average over 1,000,000 gallons

WELL # 4 PUMPING LEVEL TO STUTOFF



WELL # 5 PUMPING LEVEL TO SHUTOFF



WELL # 6 PUMPING LEVEL TO SHUTOFF



WELL # 8 PUMPING LEVEL TO SHUTOFF



WELL # 9 PUMPING LEVEL TO SHUTOFF



WELL #10 PUMPING LEVEL TO SHUTOFF



WELL # 11 PUMPING LEVEL TO SHUTOFF



WELL #4 STATIC LEVELS 2023



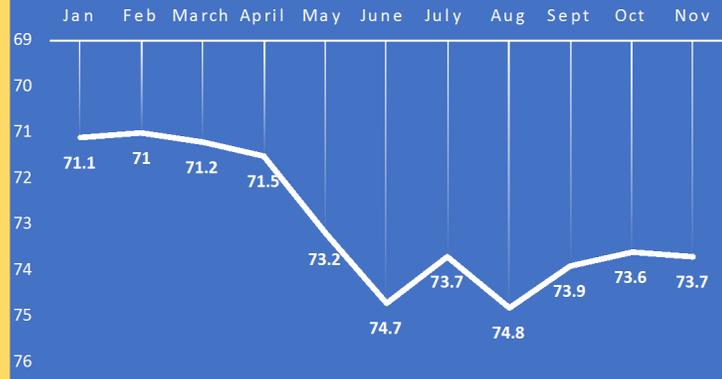
WELL #5 STATIC LEVELS 2023



WELL #6 STATIC LEVELS 2023



WELL #8 STATIC LEVELS 2023



WELL #9 STATIC LEVELS 2023



WELL #10 STATIC LEVELS 2023



WELL #11 STATIC LEVELS 2023



Precipitation 2023



How things would have looked with the current proposed Olsson restrictions based on well levels

2019

Pumping Levels distance from shutoff points

Well	Water watch												Total Precip.
	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec	
4	4.9	4.5	3.7	3.7	3.7	3.7	3.7	3.1	3	2	1.7	3	
5	8.4	7.7	7.7	8	9.5	6	4.4	7.9	5.9	4.6	4.6	5	
6	3.8	4.8	4.2	4.2	4.2	4.4	4.9	5.2	4.2	2.3	2.3	2.3	
8	12.1	12.1	12.1	12	11.8	8	5	3.7	10.8	13.2	13.4	13.3	
9	10	10.9	10.3	10.3	10.3	9	8.9	8.9	2.6	2.6	2.6	2.6	
10	28.3	28.1	28.4	28.4	27.2	27.6	25.9	25.9	24.8	27.2	22.9	22.9	
11	5.5	5.4	5.4	5.4	5.1	6	4.3	4.3	5.4	4	4	4	
Precip. Inches	0.75	1.59	2.65	1.13	7.29	4.38	4.08	2.79	3.4	4.69	0.79	2.57	36.11

2020

Pumping Levels distance from shutoff points

Well	Jan	Feb	March	April	May	June	July	Water	Water	Water	Nov	Dec	
								Emergency	Warning	Watch			
4	4.9	4.1	3.7	3.7	3.6	3.6	3.6	0.5	1.5	1.5	1.4	1.4	
5	6.4	6.4	4.4	4.4	7	6.9	11	7.4	6.3	5.1	4.9	4.9	
6	2.8	2	1.4	2	2	2	0.9	0.9	0.9	0.9	0.9	0.9	
8	13.2	13.2	13.3	13.4	14	15.2	15.7	15.7	15	15.5	15.7	15.7	
9	7.8	8	9.6	9.6	2.5	4	9.2	7.9	7.1	2.4	9.3	2.4	
10	26.6	26.6	25.8	25.8	27.1	27.4	26.9	23.4	23.4	23.4	25.8	24.9	
11	5	5	5	5	5.7	5.8	5.1	3.5	2.9	2.9	2.9	4.2	Total Precip.
Precip. Inches	1.29	0.13	1.67	0.88	5.09	3.15	5.73	1.27	1.62	0.4	1.2	1.2	23.63

2021

Pumping Levels distance from shutoff points

Well	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec	
4	1.4	1.4	7.5	8.1	6.7	4.9	5.6	5.7	2.2	3.8	5.2	3	
5	6	8	10.2	10.8	9.5	8.5	8.5	8.3	6.2	6.4	7.7	6	
6	1.2	3	5.2	5	5.4	4.1	4.5	3.5	4.2	4	3.7	3.8	
8	9.5	10	11.2	10.8	14.9	12.9	12.6	3.4	11	12.4	11.9	12	
9	2.4	4	8.6	9	7.7	10	6.2	7.6	5.1	5.5	7.4	7	
10	24.4	24.9	24.9	27	25.8	24	24	24	23.9	23.9	24.7	24.9	
11	4.2	5	6.6	5.4	7.7	7.3	5	5.4	4.5	4.1	5.4	5	Total Precip.
Precip. Inches	1.53	0.79	5.23	1.74	2.55	4.46	1.73	3.41	0.64	4.04	0.49	0.25	26.86

2022

Pumping Levels distance from shutoff points

Well	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec	Water	Water	Water warning
													Watch	Water Watch	Watch
4	2.9	2.4	3.6	3	3.8	6.6	4	2.5	1.7	2.3	1.3	2.5			
5	5.7	5.2	6.8	6.1	7.5	10.1	7.5	6.9	4.8	4.1	3.1	0.1			
6	3.9	4	4	3.7	4.1	3.4	4	4.2	3.9	4	4	1.2			
8	12	12	12.6	12.9	12.6	12.3	11	9.7	9.8	12.2	9.9	10.1			
9	6.9	6.9	9.7	9.1	8.8	8.3	3.4	2.4	2.4	3.7	4.2	3.6			
10	24.9	25.1	26	25	24.6	23.4	21.1	19.6	20.7	21.5	22	22.6			
11	5	5	6.4	5.6	6.2	6	2.4	3.7	4.2	2.9	2.3	4			
Precip. Inches	0.28	0.03	1.96	3.05	5.27	3.73	2.57	0.55	0.97	0.61	0.26	0.64	Total Precip.	19.92	

2023

Water Watch →

Pumping Levels distance from shutoff points

Water Watch

Water Emergency →

Water Watch

Water Emergency →

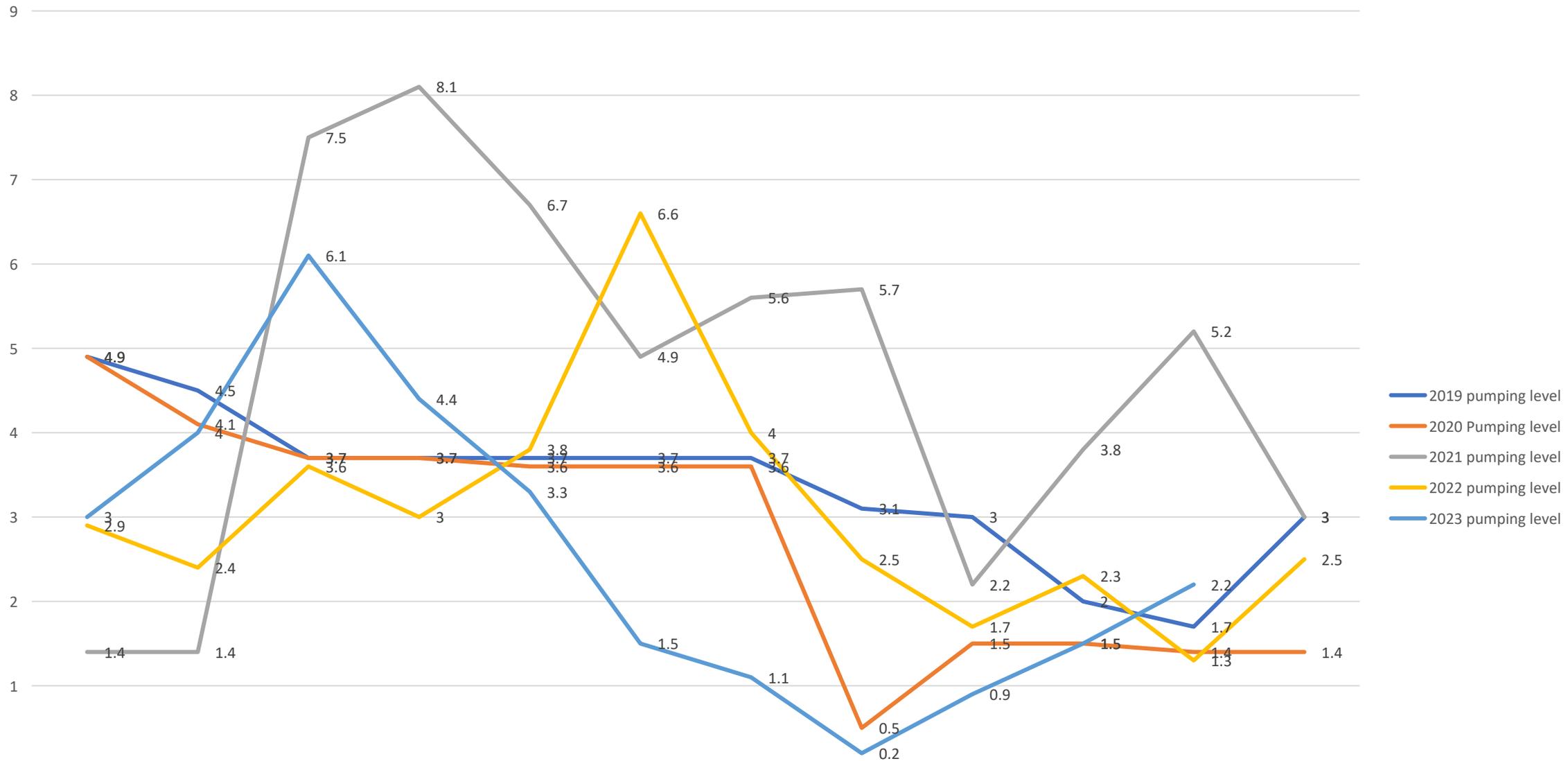
Water Watch →

Nov 20, 2023

Well	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov
4	3	4	6.1	4.4	3.3	1.5	1.1	0.2	0.9	1.5	1.9
5	4.5	4	3	2.6	0.3	0.1	1.5	1.1	0.7	1.3	0.9
6	4	3	2	1.3	0.6	0.5	0.4	0.5	0.6	1.3	1.3
8	11	11	11	10.4	8.8	6	7.3	6.3	7	7.3	7.2
9	4.8	5	5	4.8	2	2.2	3.2	2.7	3	3.8	4.2
10	23.2	23	23.6	24.1	21.3	19.7	20.3	20.1	20.4	21.4	22
11	4.9	4.5	4.2	4.2	4.1	4.1	4.1	4.1	4.1	4.2	4.1
Precip. Inches	1.32	1.29	0.63	0.59	0.51	4.53	5.61	3.76	0.6	1.42	.5

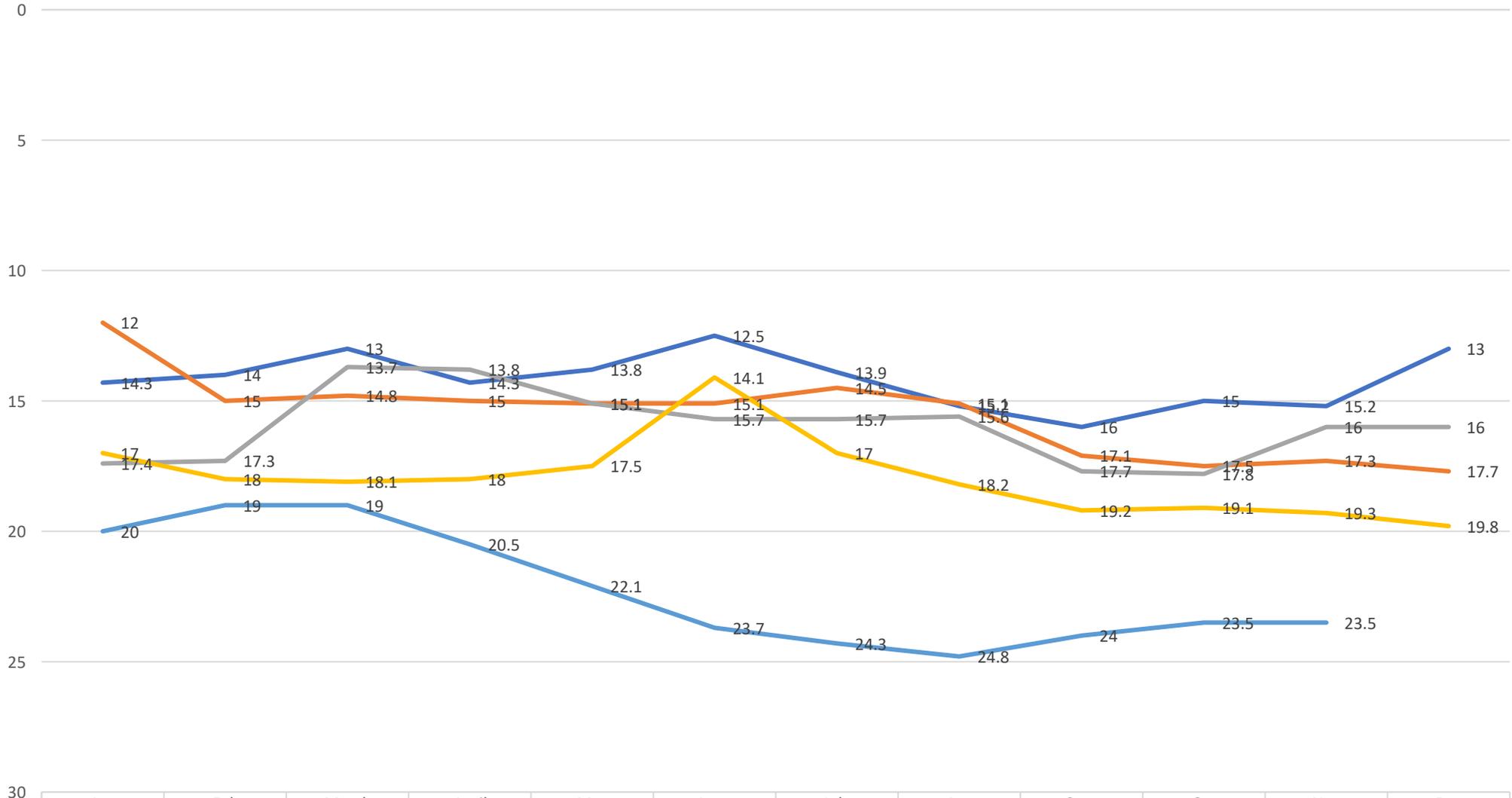
20.76 total

Well 4 pumping level distance to shutoff last 5 years



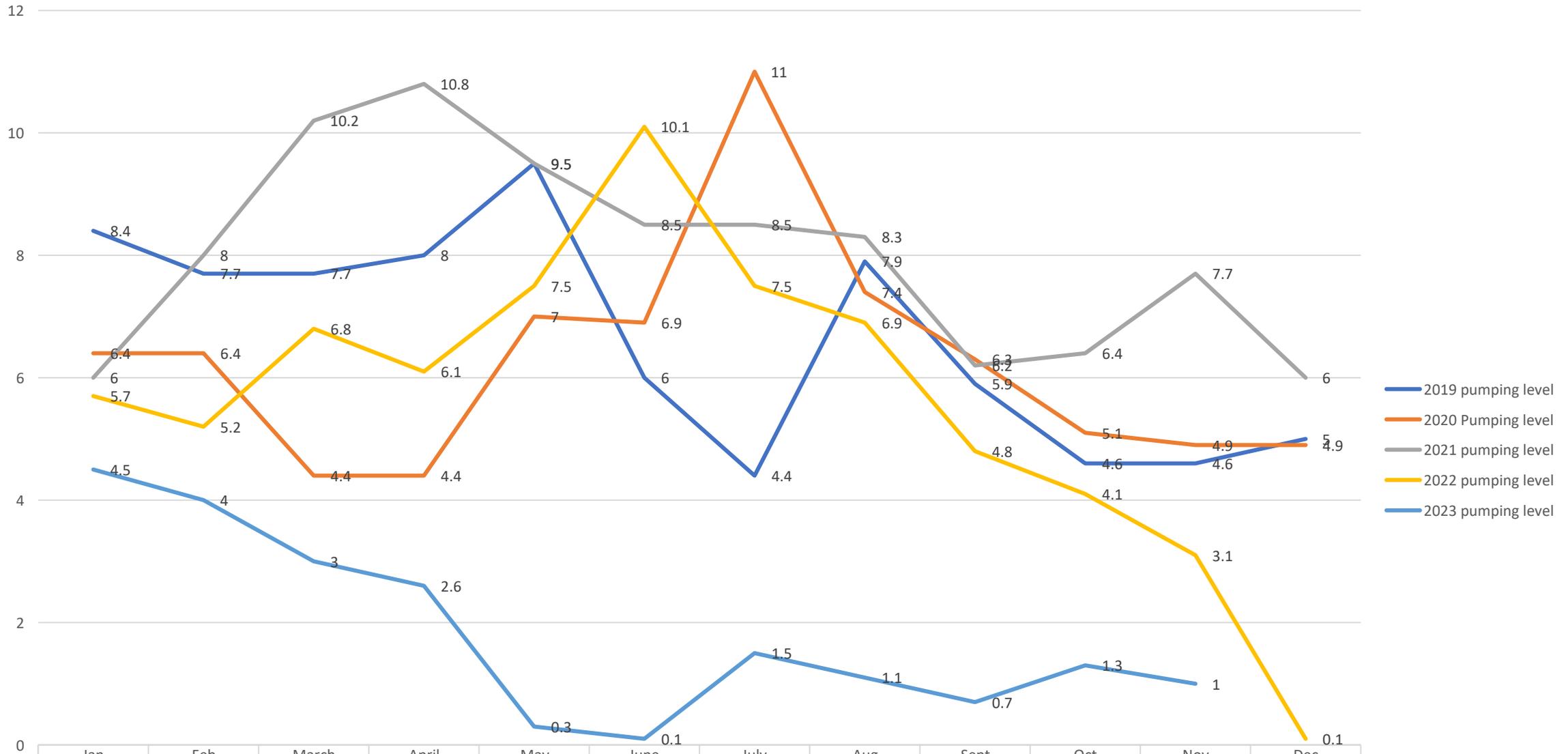
	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
2019 pumping level	4.9	4.5	3.7	3.7	3.7	3.7	3.7	3.1	3	2	1.7	3
2020 Pumping level	4.9	4.1	3.7	3.7	3.6	3.6	3.6	0.5	1.5	1.5	1.4	1.4
2021 pumping level	1.4	1.4	7.5	8.1	6.7	4.9	5.6	5.7	2.2	3.8	5.2	3
2022 pumping level	2.9	2.4	3.6	3	3.8	6.6	4	2.5	1.7	2.3	1.3	2.5
2023 pumping level	3	4	6.1	4.4	3.3	1.5	1.1	0.2	0.9	1.5	2.2	2.2

Well 4 static level last 5 years



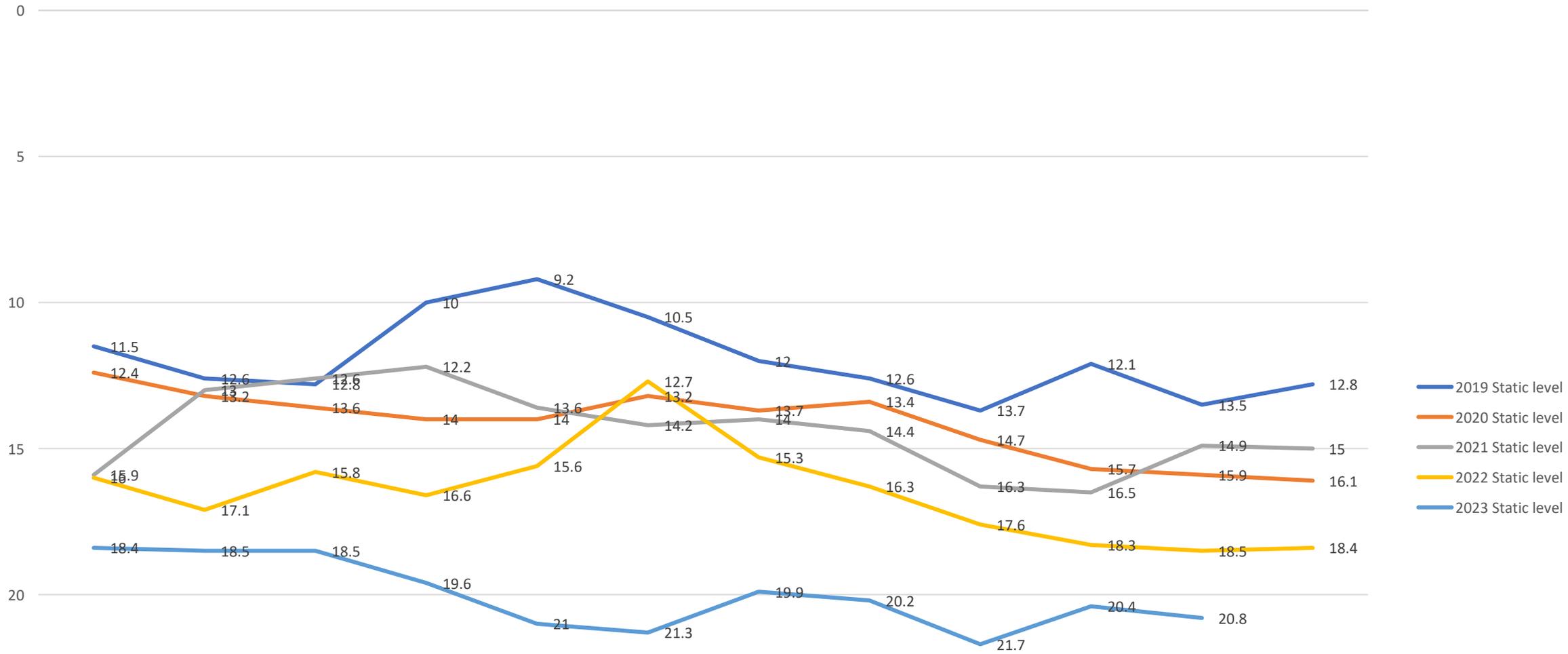
	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
2019 static level	14.3	14	13	14.3	13.8	12.5	13.9	15.2	16	15	15.2	13
2020 Static level	12	15	14.8	15	15.1	15.1	14.5	15.1	17.1	17.5	17.3	17.7
2021 static level	17.4	17.3	13.7	13.8	15.1	15.7	15.7	15.6	17.7	17.8	16	16
2022 static level	17	18	18.1	18	17.5	14.1	17	18.2	19.2	19.1	19.3	19.8
2023 static level	20	19	19	20.5	22.1	23.7	24.3	24.8	24	24	23.5	23.5

Well 5 pumping level distance to shutoff last 5 years



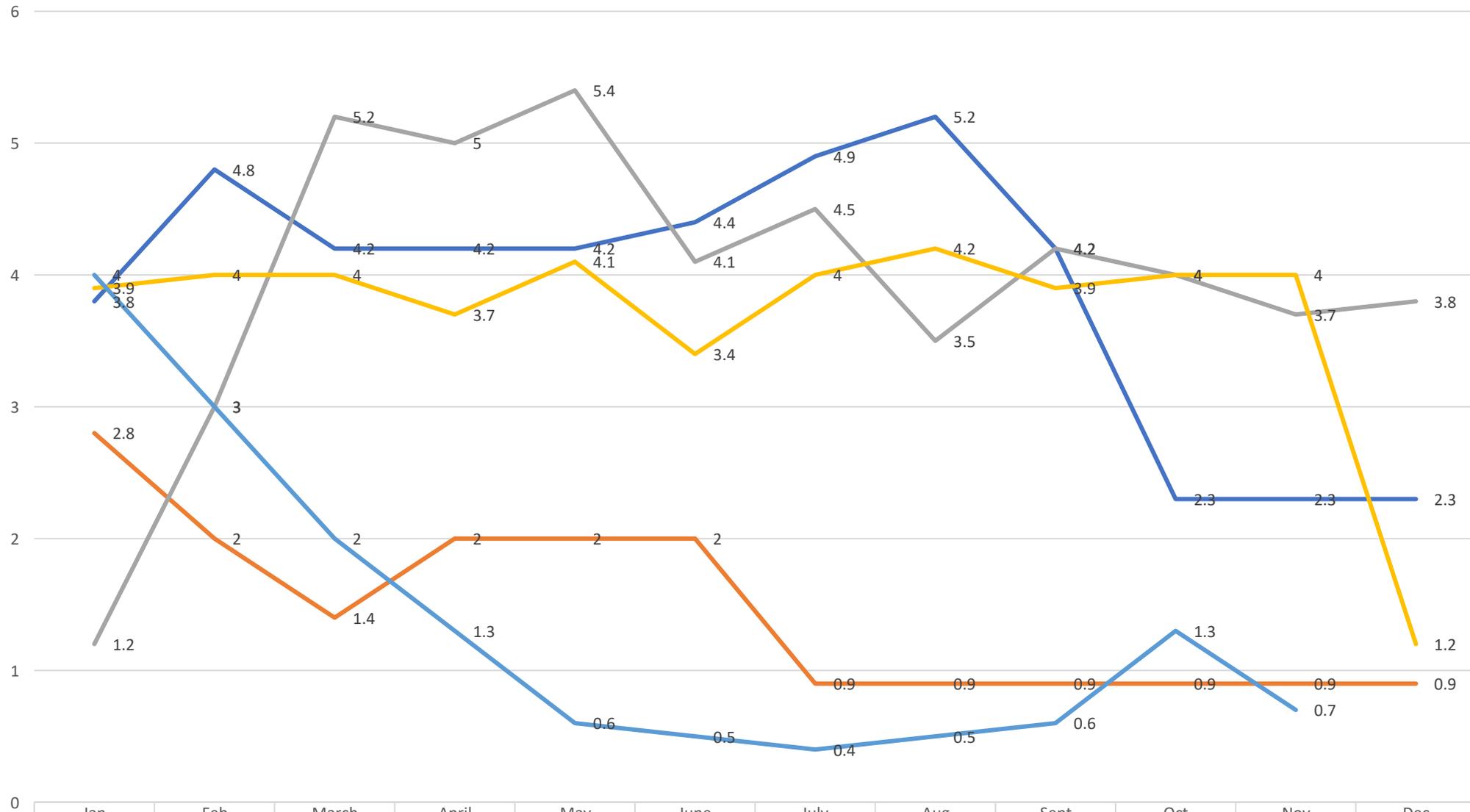
2019 pumping level	8.4	7.7	7.7	8	9.5	6	4.4	7.9	5.9	4.6	4.6	5
2020 Pumping level	6.4	6.4	4.4	4.4	7	6.9	11	7.4	6.3	5.1	4.9	4.9
2021 pumping level	6	8	10.2	10.8	9.5	8.5	8.5	8.3	6.2	6.4	7.7	6
2022 pumping level	5.7	5.2	6.8	6.1	7.5	10.1	7.5	6.9	4.8	4.1	3.1	0.1
2023 pumping level	4.5	4	3	2.6	0.3	0.1	1.5	1.1	0.7	1.3	1	1

Well 5 static level last 5 years



	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
2019 Static level	11.5	12.6	12.8	10	9.2	10.5	12	12.6	13.7	12.1	13.5	12.8
2020 Static level	12.4	13.2	13.6	14	14	13.2	13.7	13.4	14.7	15.7	15.9	16.1
2021 Static level	15.9	13	12.6	12.2	13.6	14.2	14	14.4	16.3	16.5	14.9	15
2022 Static level	16	17.1	15.8	16.6	15.6	12.7	15.3	16.3	17.6	18.3	18.5	18.4
2023 Static level	18.4	18.5	18.5	19.6	21	21.3	19.9	20.2	21.7	20.4	20.4	20.8

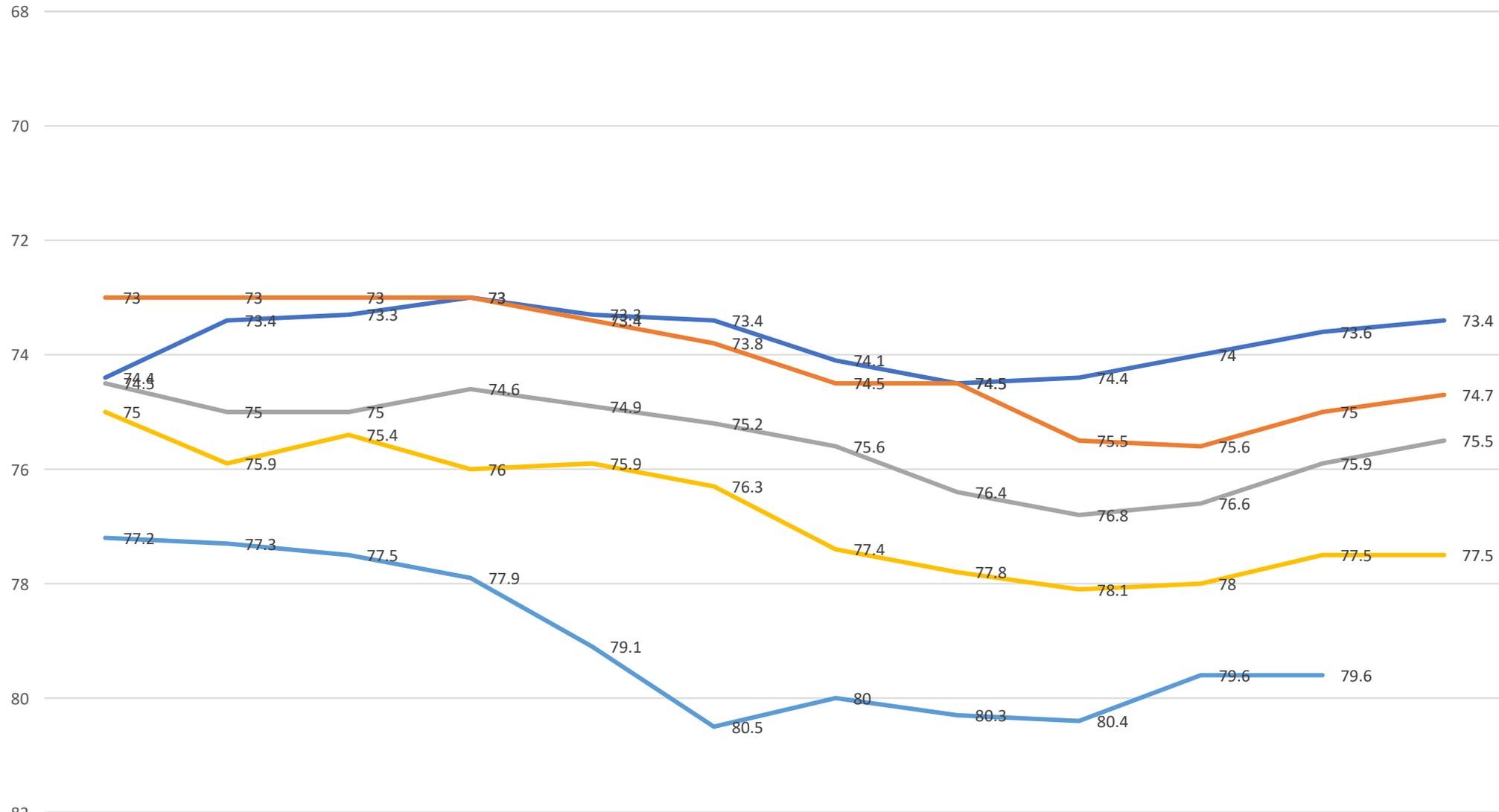
Well 6 pumping level distance to shutoff last 5 years



- 2019 pumping level
- 2020 Pumping level
- 2021 pumping level
- 2022 pumping level
- 2023 pumping level

	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
2019 pumping level	3.8	4.8	4.2	4.2	4.2	4.4	4.9	5.2	4.2	2.3	2.3	2.3
2020 Pumping level	2.8	2	1.4	2	2	2	0.9	0.9	0.9	0.9	0.9	0.9
2021 pumping level	1.2	3	5.2	5	5.4	4.1	4.5	3.5	4.2	4	3.7	3.8
2022 pumping level	3.9	4	4	3.7	4.1	3.4	4	4.2	3.9	4	4	1.2
2023 pumping level	4	3	2	1.3	0.6	0.5	0.4	0.5	0.6	1.3	0.7	0.7

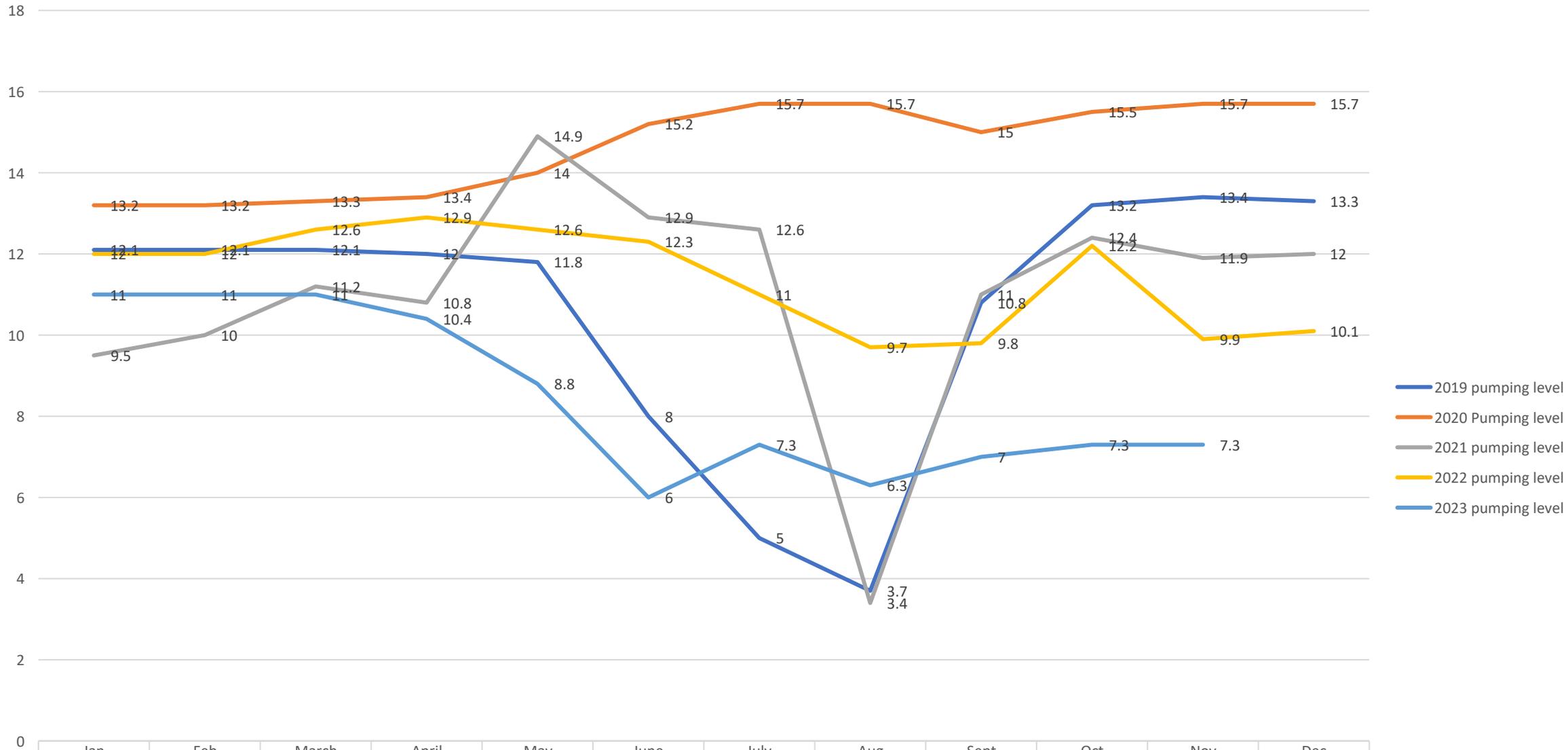
Well 6 static level last 5 years



- 2019 Static level
- 2020 Static level
- 2021 Static level
- 2022 Static level
- 2023 Static level

	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
2019 Static level	74.4	73.4	73.3	73	73.3	73.4	74.1	74.5	74.4	74	73.6	73.4
2020 Static level	73	73	73	73	73.4	73.8	74.5	74.5	75.5	75.6	75	74.7
2021 Static level	74.5	75	75	74.6	74.9	75.2	75.6	76.4	76.8	76.6	75.9	75.5
2022 Static level	75	75.9	75.4	76	75.9	76.3	77.4	77.8	78.1	78	77.5	77.5
2023 Static level	77.2	77.3	77.5	77.9	79.1	80.5	80	80.3	80.4	79.6	79.6	79.6

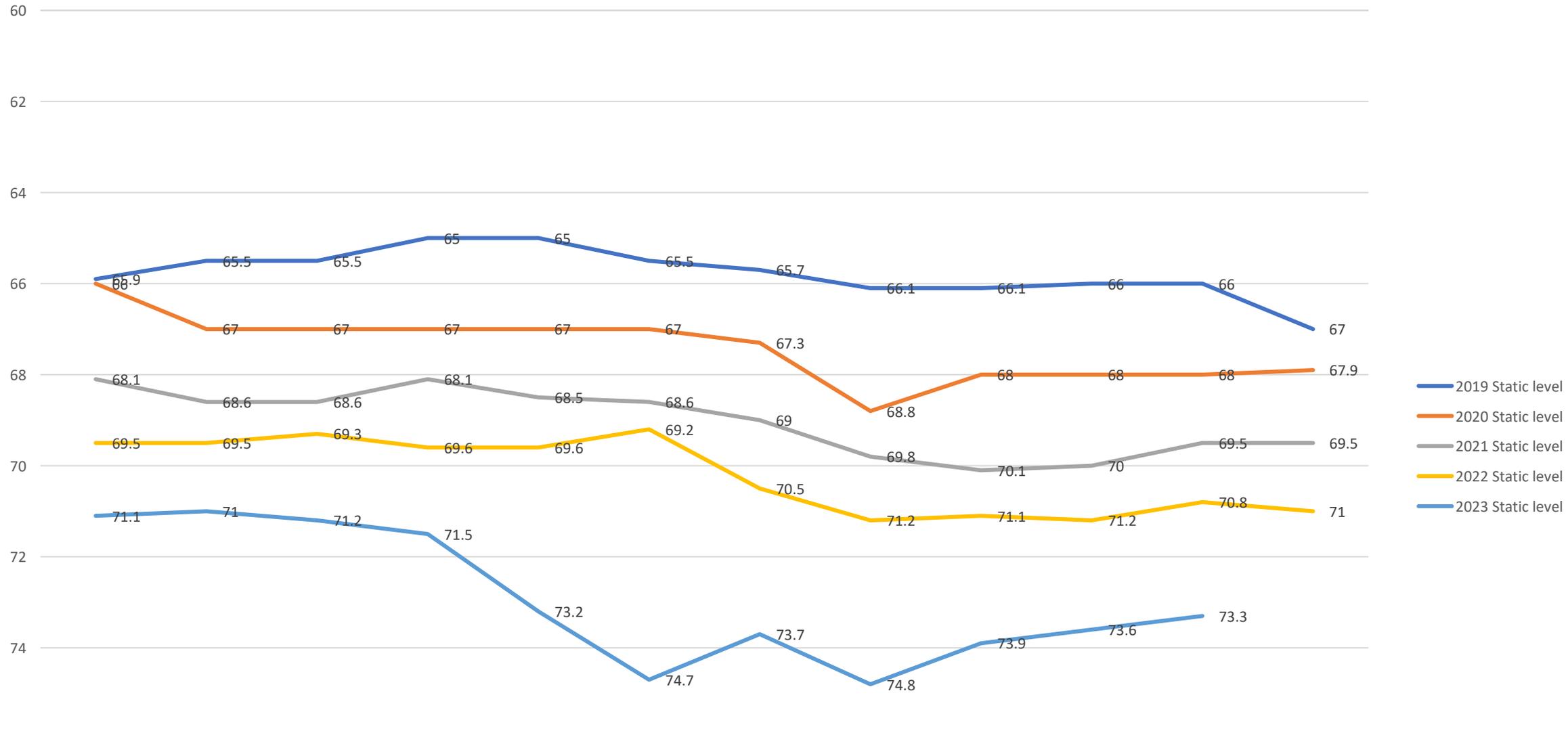
Well 8 pumping level distance to shutoff last 5 years



- 2019 pumping level
- 2020 Pumping level
- 2021 pumping level
- 2022 pumping level
- 2023 pumping level

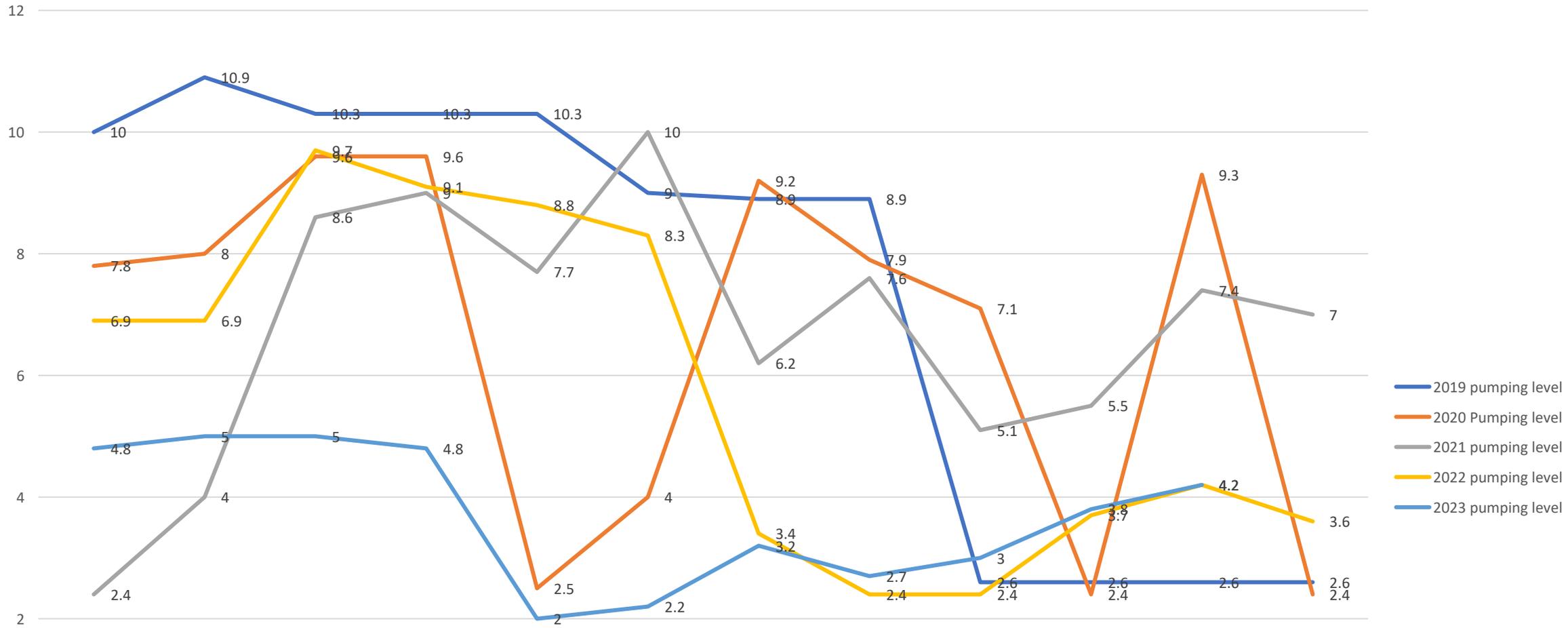
	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
2019 pumping level	12.1	12.1	12.1	12	11.8	8	5	3.7	10.8	13.2	13.4	13.3
2020 Pumping level	13.2	13.2	13.3	13.4	14	15.2	15.7	15.7	15	15.5	15.7	15.7
2021 pumping level	9.5	10	11.2	10.8	14.9	12.9	12.6	3.4	11	12.4	11.9	12
2022 pumping level	12	12	12.6	12.9	12.6	12.3	11	9.7	9.8	12.2	9.9	10.1
2023 pumping level	11	11	11	10.4	8.8	6	7.3	6.3	7	7.3	7.3	7.3

Well 8 static level last 5 years



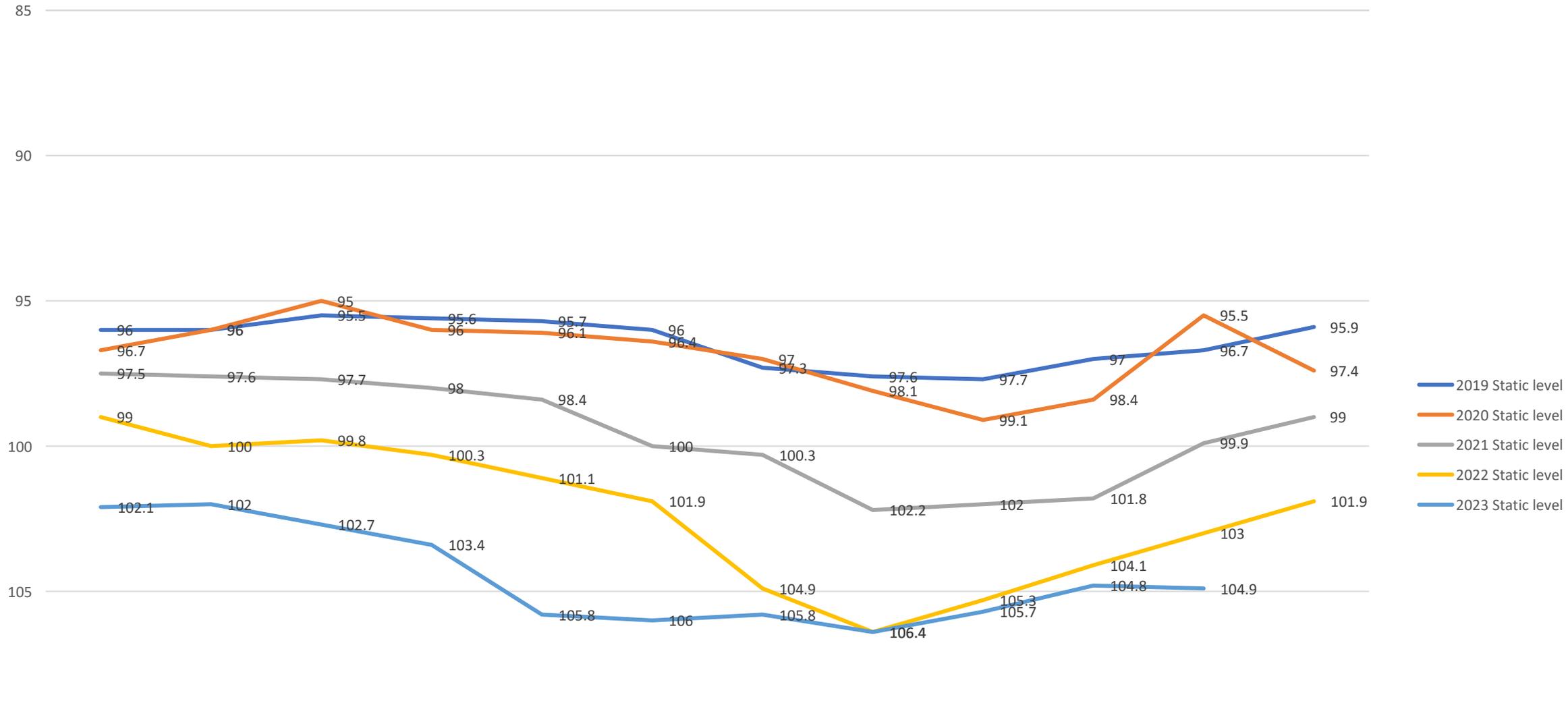
	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
2019 Static level	65.9	65.5	65.5	65	65	65.5	65.7	66.1	66.1	66	66	67
2020 Static level	66	67	67	67	67	67	67.3	68.8	68	68	68	67.9
2021 Static level	68.1	68.6	68.6	68.1	68.5	68.6	69	69.8	70.1	70	69.5	69.5
2022 Static level	69.5	69.5	69.3	69.6	69.6	69.2	70.5	71.2	71.1	71.2	70.8	71
2023 Static level	71.1	71	71.2	71.5	73.2	74.7	73.7	74.8	73.9	73.6	73.6	73.3

Well 9 pumping level distance to shutoff last 5 years



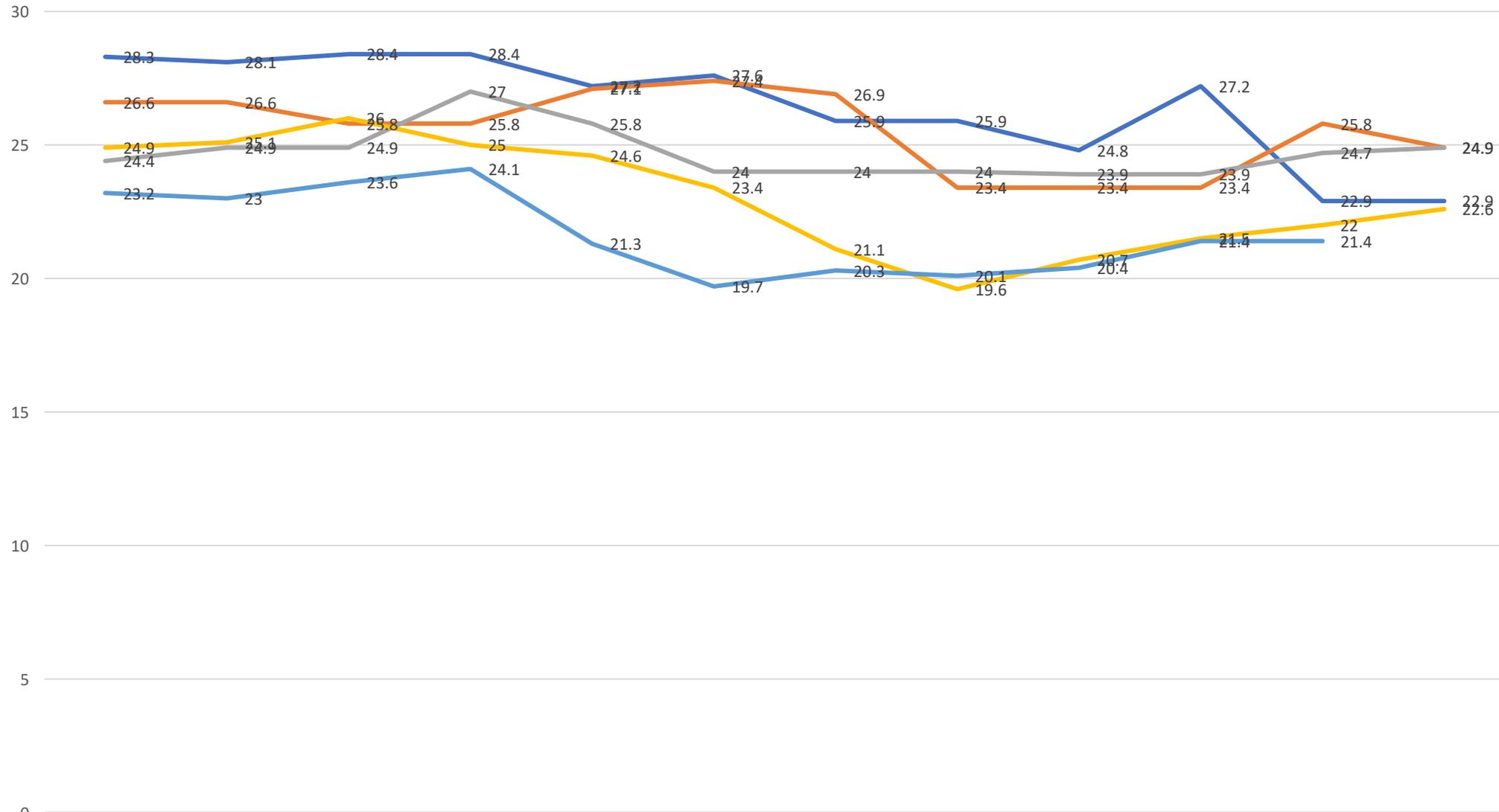
	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
2019 pumping level	10	10.9	10.3	10.3	10.3	9	8.9	8.9	2.6	2.6	2.6	2.6
2020 Pumping level	7.8	8	9.6	9.6	2.5	4	9.2	7.9	7.1	2.4	9.3	2.4
2021 pumping level	2.4	4	8.6	9	7.7	10	6.2	7.6	5.1	5.5	7.4	7
2022 pumping level	6.9	6.9	9.7	9.1	8.8	8.3	3.4	2.4	2.4	3.7	4.2	3.6
2023 pumping level	4.8	5	5	4.8	2	2.2	3.2	2.7	2.7	3	3.8	4.2

Well 9 static level last 5 years



	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
2019 Static level	96	96	95.5	95.6	95.7	96	97.3	97.6	97.7	97	96.7	95.9
2020 Static level	96.7	96	95	96	96.1	96.4	97	98.1	99.1	98.4	95.5	97.4
2021 Static level	97.5	97.6	97.7	98	98.4	100	100.3	102.2	102	101.8	99.9	99
2022 Static level	99	100	99.8	100.3	101.1	101.9	104.9	106.4	105.3	104.1	103	101.9
2023 Static level	102.1	102	102.7	103.4	105.8	106	105.8	106.4	105.7	104.8	104.8	104.9

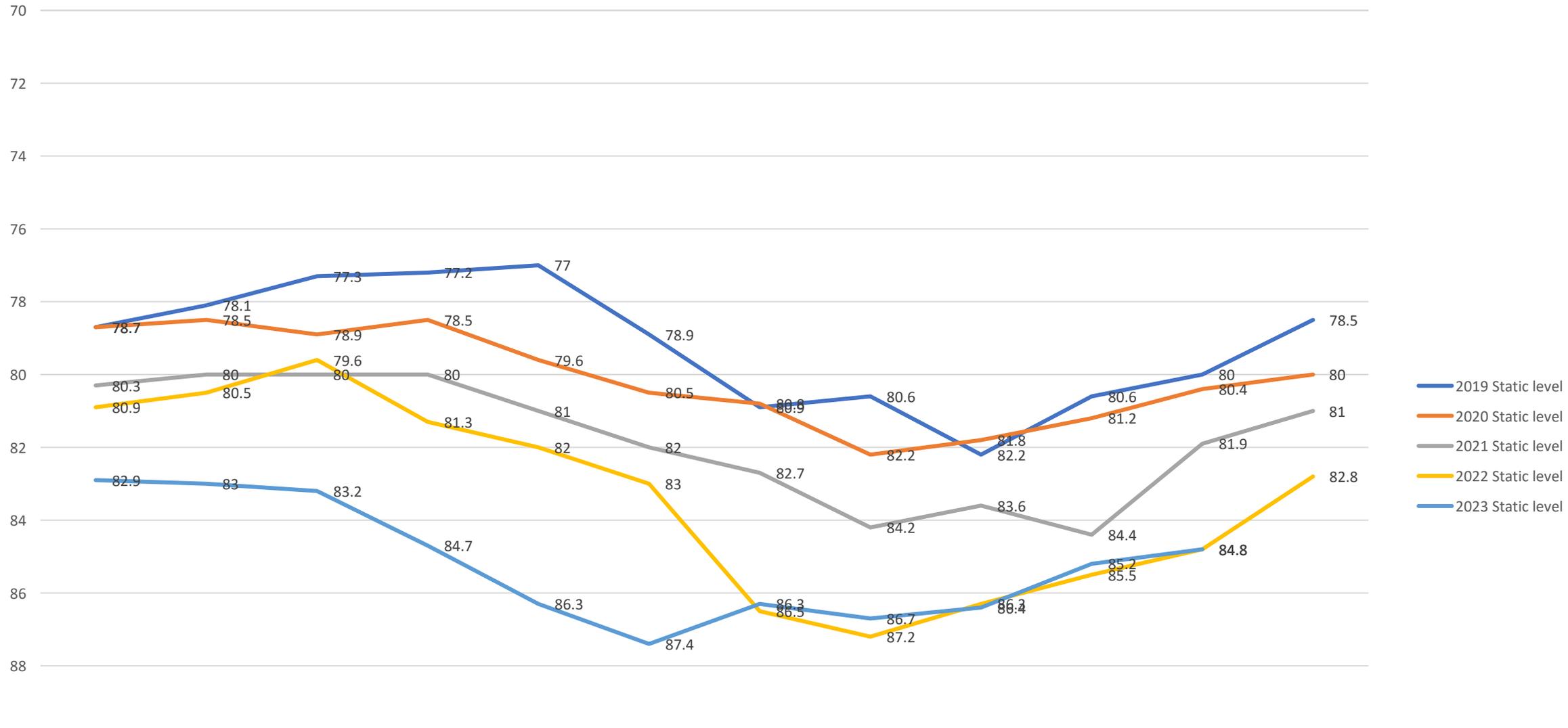
Well 10 pumping level distance to shutoff last 5 years



- 2019 pumping level
- 2020 Pumping level
- 2021 pumping level
- 2022 pumping level
- 2023 pumping level

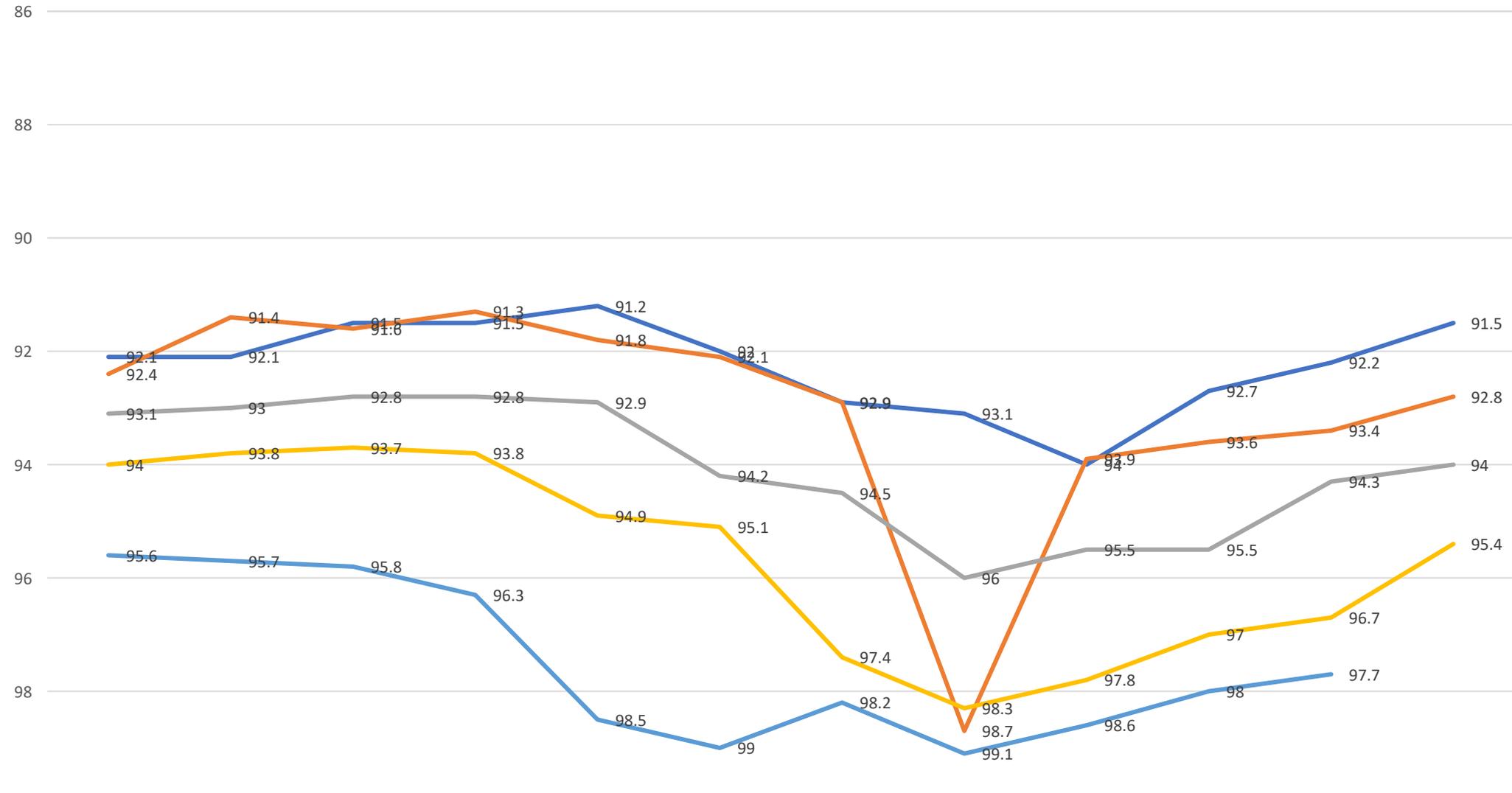
	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
2019 pumping level	28.3	28.1	28.4	28.4	27.2	27.6	25.9	25.9	24.8	27.2	22.9	22.9
2020 Pumping level	26.6	26.6	25.8	25.8	27.1	27.4	26.9	23.4	23.4	23.4	25.8	24.9
2021 pumping level	24.4	24.9	24.9	27	25.8	24	24	24	23.9	23.9	24.7	24.9
2022 pumping level	24.9	25.1	26	25	24.6	23.4	21.1	19.6	20.7	21.5	22	22.6
2023 pumping level	23.2	23	23.6	24.1	21.3	19.7	20.3	20.1	20.4	21.4	21.4	21.4

Well 10 static level last 5 years



	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
2019 Static level	78.7	78.1	77.3	77.2	77	78.9	80.9	80.6	82.2	80.6	80	78.5
2020 Static level	78.7	78.5	78.9	78.5	79.6	80.5	80.8	82.2	81.8	81.2	80.4	80
2021 Static level	80.3	80	80	80	81	82	82.7	84.2	83.6	84.4	81.9	81
2022 Static level	80.9	80.5	79.6	81.3	82	83	86.5	87.2	86.3	85.5	84.8	82.8
2023 Static level	82.9	83	83.2	84.7	86.3	87.4	86.3	86.7	86.7	86.4	85.2	84.8

Well 11 static level last 5 years



	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
2019 Static level	92.1	92.1	91.5	91.5	91.2	92	92.9	93.1	94	92.7	92.2	91.5
2020 Static level	92.4	91.4	91.6	91.3	91.8	92.1	92.9	98.7	93.9	93.6	93.4	92.8
2021 Static level	93.1	93	92.8	92.8	92.9	94.2	94.5	96	95.5	95.5	94.3	94
2022 Static level	94	93.8	93.7	93.8	94.9	95.1	97.4	98.3	97.8	97	96.7	95.4
2023 Static level	95.6	95.7	95.8	96.3	98.5	99	98.2	99.1	98.6	98	98	97.7

MUD Metropolitan Utilities District in Omaha, supplies most of the Omaha area's water.

The triggers they have are-

Level 1: Voluntary Alternate Day Watering

Trigger:

Water consumption reaches 95 percent (about 300 million gallons per day) of available supply or system capacity, or any of the water storage reservoirs cannot be refilled from day to day, or low pressure jeopardizes fire fighting or causes numerous customer complaints.

Enforcement:

None

Level 2: Voluntary No Watering Days

Purpose:

Specified no-watering days will allow M.U.D. to fill water system reservoirs. Trigger: Water consumption reaches 95 percent of available supply or system capacity, or any of the water storage reservoirs cannot be refilled from day to day, or low pressure jeopardizes fire fighting or causes numerous customer complaints.

Enforcement:

None

Level 3: Water Alert

Trigger:

Water consumption meets or exceeds available supply or system capacity, or useable water storage has been reduced 50 percent, or there are widespread pressure problems.

Enforcement:

Customers who do not comply with the watering restrictions will be subject to having their water shut off until mandatory restrictions are lifted. The current turn-on fee will be charged to restore service.

Level 4: Water Emergency

Trigger:

Water use exceeds production or distribution capacity due to emergency situations.

Enforcement:

Customers who do not comply with the watering restrictions will be subject to having their water shut off until the water emergency is lifted. The current turn-on fee will be charged to restore service.

Circumstances sometimes dictate that customers must have water on designated non-watering days. Exceptions may be made for new sod less than three weeks old and other circumstances deemed appropriate by M.U.D.

Lincoln Water system

III. Drought Water Restriction Phases

PHASE 1: MODERATE SHORTAGE: VOLUNTARY DESIGNATED DAY

Signals: 3,000-1,500 cfs river flow; greater than 65 MGD water use

Possible Action: Voluntary three (3) designated days

PHASE 2: SEVERE SHORTAGE: MANDATORY DESIGNATED DAY

Signals: 1,500-200 cfs river flow; greater than 75 MGD water use

Possible Action: Mandatory three (3) designated days

PHASE 3: CRITICAL SHORTAGE: LIMITED OUTDOOR WATER USE

Signals: less than 200 cfs river flow; greater than 85 MGD water use

Possible Action: Limited outdoor water use; may result in either mandatory two (2) or one (1) designated day or no outside water use

IV. Catastrophic Water Shortage Levels

Level 1 - Water Use Restriction Alert

A. Signal(s) for Implementation

Level 1 may be implemented when system usage exceeds the ability to supply or reservoirs do not refill above 25 percent (25%) reservoir operational storage level overnight; or a major transmission/distribution link is disrupted; or a system failure occurs which causes a loss of capability to provide adequate services. This Level shall be implemented in emergency situations to sustain life and maintain the health of the community.

B. Restrictions for Reduction in Use

The use of water shall be limited to indoor usage only unless otherwise prescribed.

Request a voluntary 25 percent (25%) curtailment of residential/industrial/ commercial/institutional usage.

A mandatory shutdown of all commercial car washes shall be implemented.

Washing of vehicles such as garbage trucks, vehicles transporting food and perishables, emergency, and sludge vehicles shall be permitted only between the hours of midnight and 6 a.m.

Eating and drinking establishments shall serve water to customers upon request only.

Retailers, suppliers, and manufacturers on the “Emergency Water Resources List” will be contacted to provide increased supplies of bottled water, non-alcoholic beverages, and shall use disposable place settings for supply through normal market outlets.

Level 2 - Water Use Restriction Emergency

A. Signal(s) for Implementation

Level 2 shall be implemented when circumstances exist that cause the system supply to fall below the average winter day usage (i.e., approximately thirty million gallons per day (30 MGD)). All actions will focus on preserving “lifeline” indoor water use and fire reserves in the reservoirs.

B. Restrictions for Reduction in Use

All measures implemented in previous Levels shall continue with the following additions:

A mandatory 25 percent (25%) curtailment of all industrial/commercial/ institutional usage shall be implemented.

A mandatory 50 percent (50%) curtailment of all residential indoor usage shall be implemented. City Communications, working with Lincoln/Lancaster County Health Department, shall provide citizens with specific information via local and area media for meeting mandatory water curtailment actions.

Golf course watering which utilizes Lincoln Water System sources may be prohibited.

All air-conditioning utilizing Lincoln Water System sources are prohibited.

All restaurants and institutional users shall begin using non-washable disposable table settings. All bars and liquor serving establishments shall use single service glasses to reduce water usage.

If water used for drinking purposes is disrupted, the Director of Lincoln Transportation and Utilities may arrange for the trucking of drinking water from surrounding areas using sources on the “Emergency Water Resource List.” This emergency drinking water may be distributed to the public from City park locations to be determined as appropriate to the situation.

Nebraska National Guard will be contacted and assistance sought to provide support should either of the above actions prove inadequate or the situation continues to deteriorate.

Level 3 - Water Use Restriction Crisis

A. Signal(s) for Implementation

Level 3 shall be implemented when system usage has depleted lifeline indoor water use and fire reserves in the reservoirs, and/or water quality in the distribution system poses a threat to the health and safety of users.

B. Restrictions for Reduction in Use

All measures implemented in previous Levels shall continue, with the following additions:

A mandatory 50 percent (50%) curtailment in all industrial/commercial/ institutional usage shall be implemented.

The Mayor, utilizing emergency powers, shall implement specific mandatory industrial/commercial/institutional/residential shutdowns if necessary based on recommendations from Lincoln Water System.

Nebraska National Guard will be requested to provide support to the community in the area of water purification, storage and transport, based on exhaustion of local/regional resources and the continued threat to human life and health.