

RLIA Water Level Operating Order Recommendation:

Due to changing weather patterns, Rock Lake Improvement Association (RLIA) believes that the City needs to be able to capture spring precipitation in order to achieve prescribed summer levels. There are two ecological considerations which need to be further explored to ensure that earlier capture of precipitation does not negatively impact Rock Lake's ecological health. Consequently, RLIA recommends requesting a **one-year temporary waiver** to the existing 1995 Water Level Order (WLO) allowing for capture of spring precipitation while actively investigating whether this concept would be effective in meeting the recreational needs of residents and the ecological needs of Rock Lake's aquatic inhabitants.

This proof of concept would be accepted if:

- Potential walleye spawning areas are not impacted with an earlier rise in water levels
- Marsh Lake's wetlands would not be impacted by an earlier rise in water levels - **OR-** the wetlands are determined to already be compromised or not high quality

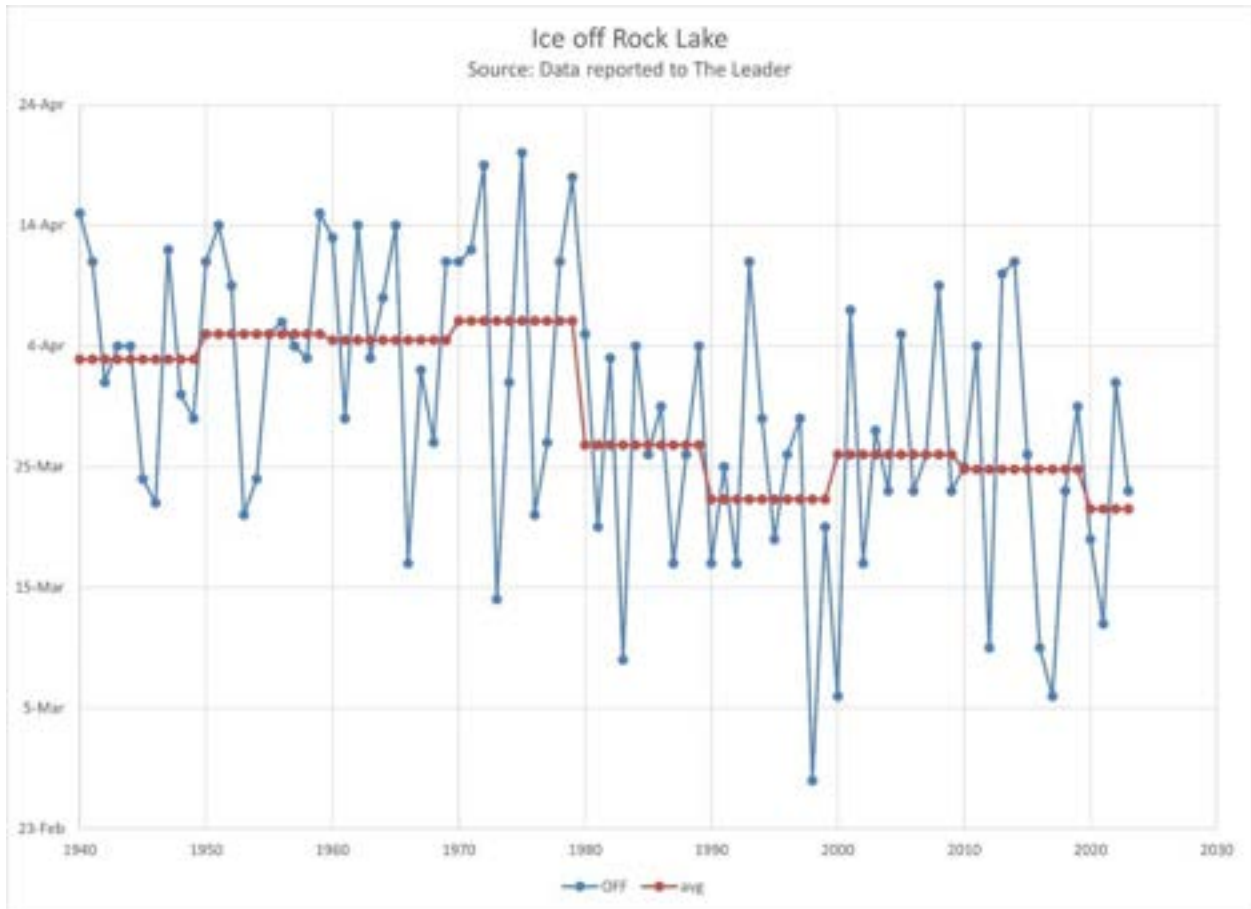
In order for this creative approach to be successful, the City, the WDNR and other lake stakeholders such as RLIA would need to work closely, building an open and collaborative partnership.

Recommended Rock Lake Operating Orders for Temporary Waiver:

Our recommendation gives the City the flexibility to capture spring precipitation by setting multiple water level targets from spring breakup/ice-off to early May. Rock Lake data indicates that ice-off has been trending 11-12 days earlier. (See Figure 1) In the 1995 WLO, May precipitation fuels attainment of summer prescribed water levels. However, May precipitation is declining. When May precipitation was high, Rock Lake reached summer minimum levels in early May (2018, 2019). When May precipitation began to slump, it took until Memorial Day weekend to reach minimum summer levels (2020). In the drought years of 2021 and 2023, we never reached summer levels. Interestingly, we reached summer levels by the end of March in 2022 because the dam never released water. (See Figure 2)

In our recommendation, the target for early spring is the 1995 WLO recommendation for spring maximum levels. This gives the City some leeway within the existing order. On April 16, we propose a spring rise to May 1. April 16 reflects the two week window shift seen in Lake Mills weather patterns. (See Figure 3) Summer water levels, starting on May 2, remain unchanged. Since issuing the 1995 WLO, DNR research shows that protecting turtle and amphibians' ability to overwinter requires substantially stable water levels by 10/1. Interestingly, the City will be able to honor that research and meet residents' desire for a longer recreation season with RLIA's fall drawn recommendation. Currently, the City actively drops to fall levels starting on 9/15. For example, on 9/14/2020, the City dropped water levels 3.4" in a single day. That year, they completed a 7.2" drop within 5 days. (See Figure 4) We are confident that the City can meet drawdown requirements within a week. Accordingly, we recommend a September 25 fall drawdown, giving residents another 10 days of fall recreation or additional time to get their docks/lifts and boats off the water while still protecting Rock Lake's aquatic inhabitants. (See Figure 5)

Figure 1



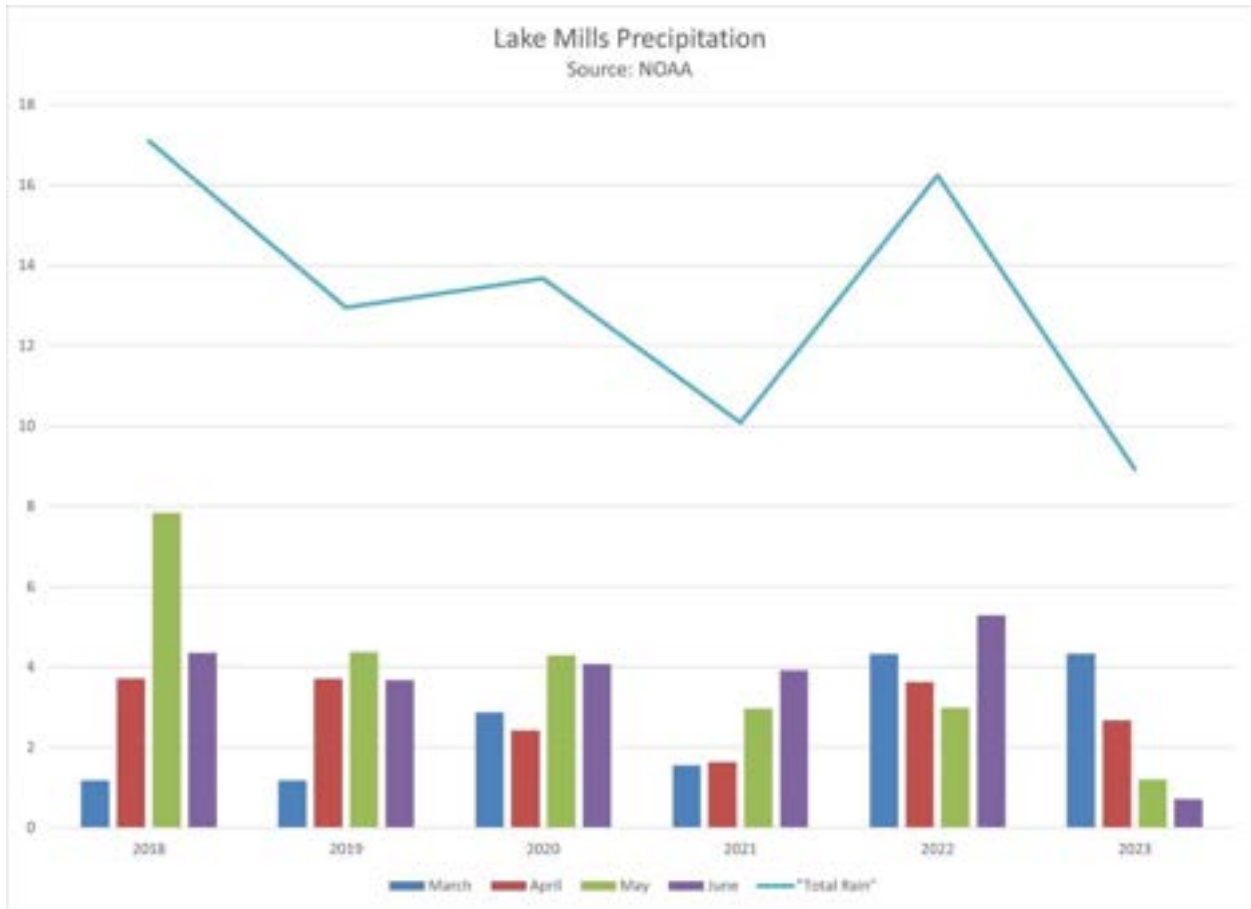
Ice-off data is showing a trend of earlier ice-off dates. The above data is from the Lake Mills Leader. The red lines show a decade average for ice-off. This information was what the DNR would have used to set the Water Level Order in 1959-1995.

The DNR began capturing ice off data in 2014. The two reporting methods substantially agree:

Year	Lake Mills Leader	DNR
2014	4/11	4/12
2015	3/26	3/28
2016	3/10	3/12
2017	3/6	3/6
2018	3/23	3/27
2019	3/30	3/30
2020	3/19	3/19
2021	3/12	3/22
2022	4/1	4/3

Consequently, ice off is averaging 11-12 days earlier.

Figure 2



Precipitation is also changing. According to the current Water Level Operating order, May precipitation is critical to attaining prescribed summer levels. Rock Lake has been experiencing declining May precipitation.

Figure 3

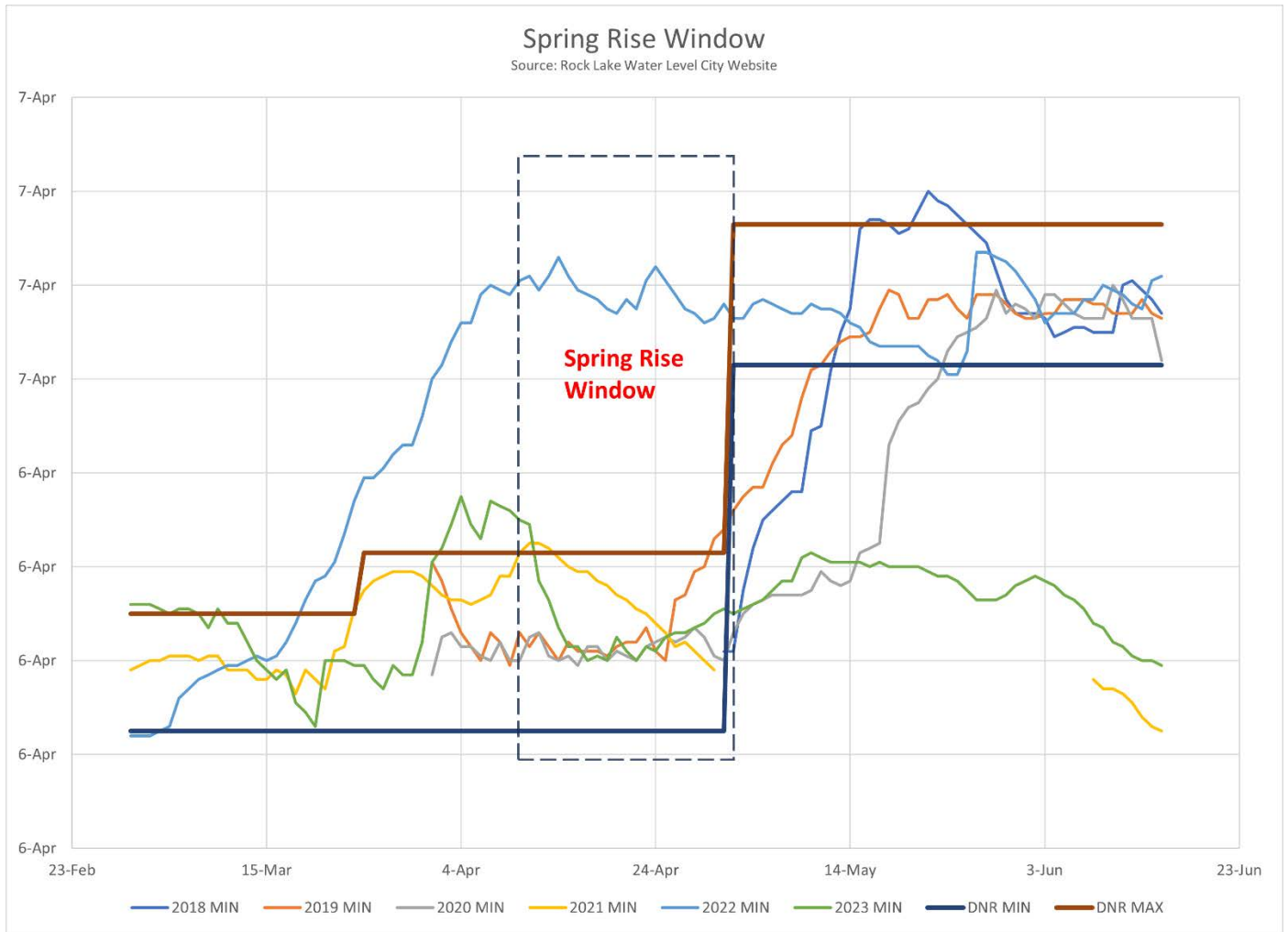


Figure 4

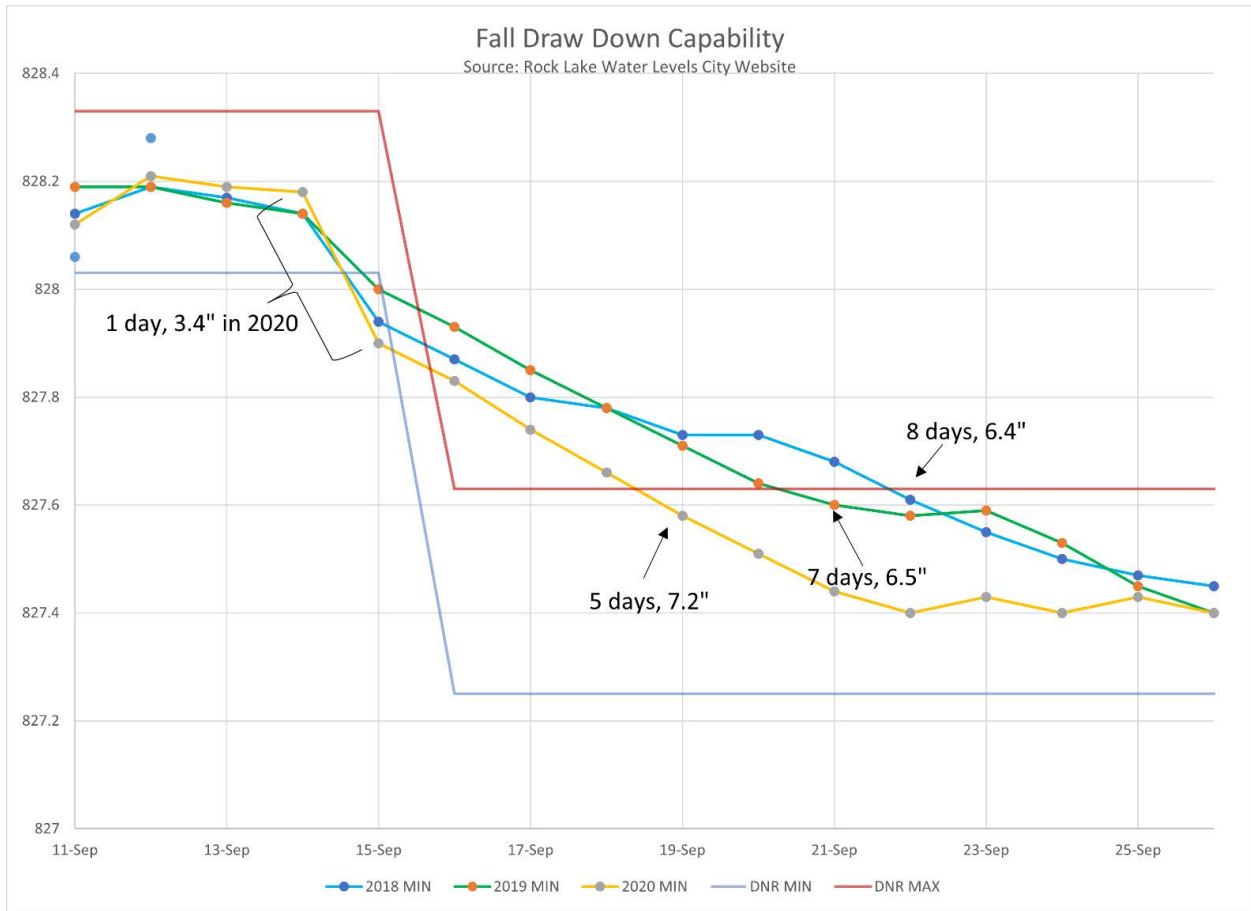
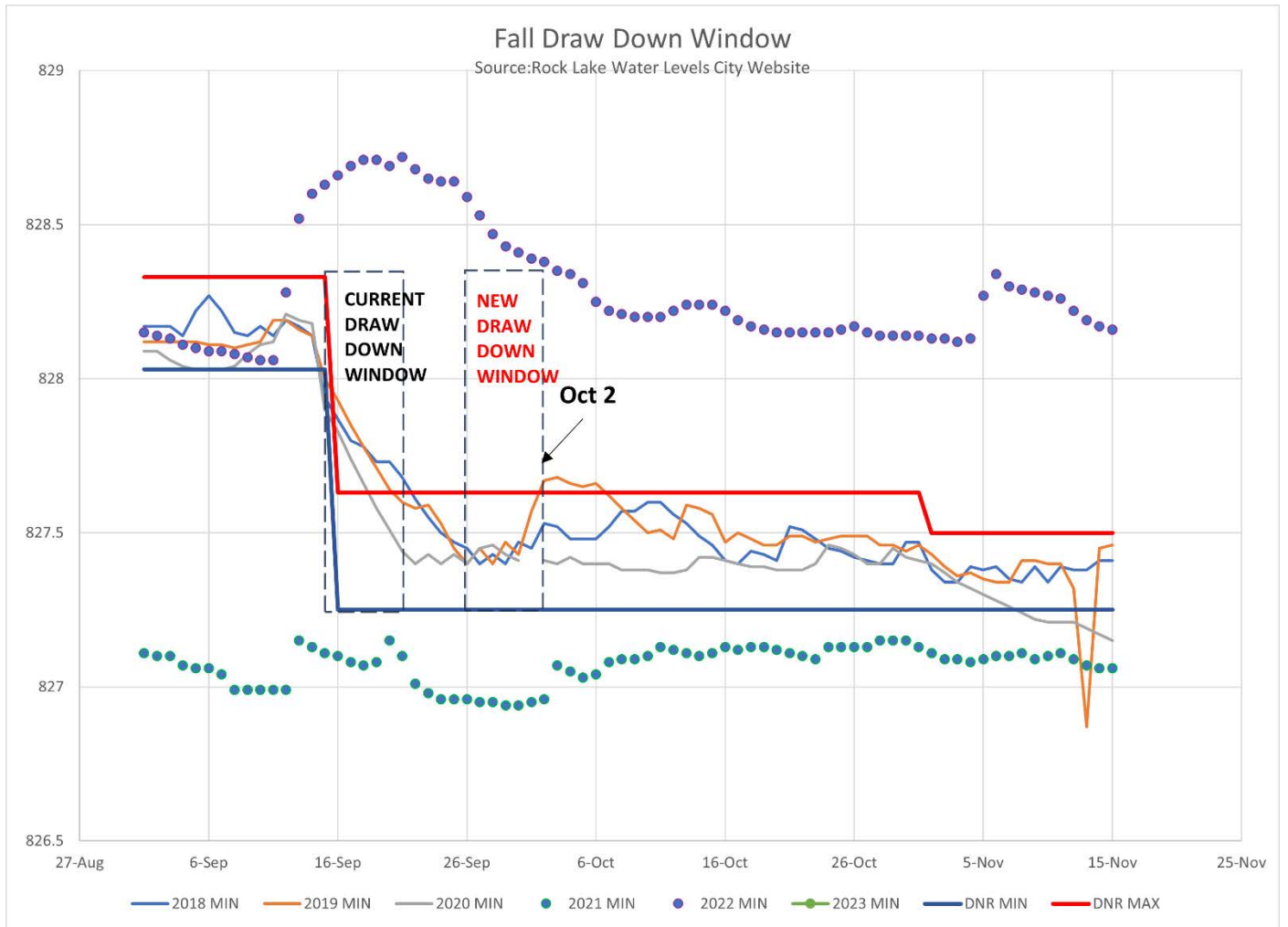


Figure 5



RLIA Specific Water Level Order Recommendation:

Season	Minimum/Maximum	Target
Winter November 1 to Spring Breakup*	Minimum = 827.25 ft Maximum = 827.50 ft	827.38 ft
Winter to Early Spring = 3" Rise (winter target to early spring target)		
Early Spring Spring Breakup to April 15		827.63 ft
Early Spring to Spring Rise = 4.8" Rise (early spring target to early spring rise target)		
Spring Rise April 16 – May 1st		828.03 ft
Spring Rise to Summer = 1.8" Rise (spring rise target to summer target)		
Summer May 2 – September 24	Minimum = 828.03 ft Maximum = 828.33 ft	828.18 ft
Summer to Fall Drop = 8.9" Drop (summer target to fall drop target)		
Fall Drop September 25 – October 1	Minimum = 827.25 ft Maximum = 827.63 ft	827.44 ft
Fall Drop to Late Fall = No Change		
Late Fall October 2 – October 31	Minimum = 827.25 ft Maximum = 827.63 ft	827.44 ft
Late Fall to Winter = 0.72" Drop (late fall target to winter target)		
Winter November 1 to Spring Breakup*	Minimum = 827.25 ft Maximum = 827.50 ft	827.38 ft

*Spring Breakup needs to be defined by the City for dam automation. One suggestion is to use the average ice-off date of 3/24.

Timing:

The temporary waiver should be in place for the Spring Rise window in 2024. The reason for the rapid granting of this waiver include:

- The upcoming season will likely result in less precipitation during the winter and early spring. According to the World Meteorological Organization (WMO), the likelihood of El Niño developing later this year is increasing. According to WKOW.com, as we head into winter, temperatures should rise, and precipitation will likely be below average. In five of the last seven El Niño seasons, southern Wisconsin has followed this trend.

- The DNR acknowledged to the City in 1982 that “the capacity of the Rock Lake watershed to recharge the system is extremely limited.” At this point in time, Rock Lake’s water levels are below winter minimums.
- Riparian owners’ access to the water in 2023 was greatly reduced and subsequent expenses and frustration are high. Implementing this plan will help re-gain riparian trust and confidence that the City and DNR are working pro-actively together to resolve the residents’ concerns.
- According to the DNR’s Drinking & Ground Water Use Information System, the DNR Lake Mills Fish Hatchery has reported withdrawing surface water from Rock Lake at the below rates. Given how low Rock Lake is, similar water withdrawals would add additional hurdles in meeting 2024 summer levels.

	2018	2019	2020	2021	2022
Oct-Apr (gal)	112,313,400	145,179,526	125,092,800	142,572,800	143,147,520
Inches Reduction in Lake Surface (*)	3.05”	3.95”	3.4”	3.85”	3.9”

(*) 36.93 million gallons = 1” of lake height

(water acreage calculations include Rock Lake, Millpond, Marsh Lake)

Note: 2021 was a drought year

Ecological Considerations:

Impact to Walleye Spawning:

Walleye spawning begins soon after ice goes out at 38-44° F water temperatures. Peak spawning is at 42-50° F which is typically mid-April to early May, however, it may extend from the beginning of April to mid-May. Walleye prefer rock, rubble, and gravel substrates in shallower spawning areas with moderate wave action to keep the substrate clean of algae and provide adequate water circulation to cleanse and aerate incubating eggs. This habitat is typically found along shore edges. For Rock Lake, the DNR believes the best walleye spawning habitat is along the east side of the lake. Higher lake levels may expand this habitat by submerging shoreline that is exposed by extremely low water levels.

According to the Rock Lake Management Plan 2018-2027, natural walleye reproduction in Rock Lake ended in the 1980s. By 2008, the Schumacher-Eschmeyer formula estimated a population size of .06 per acre. In 2015, Rock Lake became a “Walleye Initiative Lake”. In this program, the DNR seeks to increase walleyes and their natural reproduction. In Rock Lake’s case, walleyes are stocked as large fingerlings (about 6-7”) during the fall at about 15 per acre, during odd number years. This translates to about 20,000 which will be stocked again in Fall 2023. In 2022, the DNR estimated an increase in walleye per acre up from .2 in 2014 to 1 per acre in 2022. The big question is whether walleye is reproducing in the lake or if the population is strictly from stocking efforts.

Proof of Concept Action:

Task	Who	When
Electrofishing to look for young walleye to do DNA testing to try to determine if there's natural reproduction	WDNR / Fish Biologists	Fall 2023 Already planned
Identify key walleye spawning locations that they would like to be monitored	WDNR / Fish Biologists	Fall 2023
Measure water depth and temperature at the identified locations	RLIA	2024 Early Spring (Spring breakup-4/15) Spring Rise (4/16-5/1) Spring Rise thru Summer (5/2-5/15)
Walleye Survey	WDNR / Fish Biologists	Fall 2024

Impact to Marsh Lake Wetlands:

According to the Rock Lake Management Plan 2018-2027, there are approximately 1,836 acres of wetlands representing 23% of the land cover in the Rock Lake watershed. Much of this acreage is owned by the DNR and surrounds Marsh Lake.

Task	Who	When
Community Mapping	WDNR / Wetland LWCD	2024
Vegetation Survey	WDNR / Wetland	2024

Suggestions for Dam Operations:

Since we are requesting a temporary waiver with a proof of concept, any changes to the operational logic of the dam should be minimized. To minimize re-programming costs, we would recommend setting the dam on manual with the top gate set 2" above the maximum level for that period. The bottom gate should be adjusted to allow for the minimum discharge and then changed to accommodate maintaining appropriate levels or doing maintenance. Minimizing water flow over the top gate helps reassure residents that the dam is retaining the maximum amount of water for the season. The City should decide, however, what is the easiest, most cost effective way to manage the dam during this transition.

Date	Maximum Water Level
Winter: November 1 – Spring Breakup	827.5
Early Spring: Spring Breakup - April 15	827.63
Spring Rise: April 16 – May 1	828.03
Summer: May 2 – September 25	828.33
Fall Drop: September 26 – October 1	827.63
Late Fall: October 2 – October 31	827.63