# APPENDIX D — MFLS STATUS ASSESSMENT

# CURRENT STATUS ASSESSMENT AND LAKE FREEBOARD/DEFICIT CALCULATIONS

## Current Status Assessment

Current MFLs status for Lakes Brooklyn and Geneva was based on the 2014-2018 current-pumping condition (not current CUP allocations) and was assessed for each of the final environmental criteria (*see MFLs Determination in main report*). The MFLs condition and current-pumping condition were compared, resulting in a lake freeboard or deficit for each environmental criterion (*see Appendix B for description of current-pumping condition timeseries development*).

Lake freeboard or deficit was determined at the median (P50) for environmental criteria, to facilitate comparison among metrics. If a metric was met under current-pumping condition, freeboard at the P50 was calculated, and if a metric was not met under current-condition pumping, deficit at the P50 was calculated for that metric. The monthly multiple linear regressions (MLRs) (*described in Appendix B*) were used to calculate freeboard/deficit for each metric. The calculation process involved the following steps:

1. A new lake level dataset was generated by adjusting the current pumping rate in the MLR equations. The current pumping rate was reduced (if deficit was calculated) or increased (if freeboard was calculated) by a certain amount to generate a new lake level dataset;
2. Each MFL metric was assessed with the new lake level dataset;
3. The above steps were repeated until each metric was met; and
4. The freeboard/deficit was the difference between the median level of the current pumping condition lake levels and the median level of the final lake level dataset generated from Step 3.

Freeboards and deficits were compared to determine the most constraining environmental criterion, which is the basis for the adopted minimum levels for each lake. The following briefly summarizes the comparison of MFLs and current-pumping conditions and lake freeboard or deficit calculations for each environmental criterion.

## SJRWMD Minimum Infrequent High (IH)

Frequency analysis was used to compare the recommended IH (i.e., recommended frequency of this event) to the frequency of this event under the current-pumping condition. Annual series data generated from the current-pumping condition lake level time series, were ranked using the Weibull plotting position formula:

$$P(S \geq \hat{S}_m) = \frac{m}{n+1}$$

Ranked current-pumping data were graphed on a frequency plot and compared graphically to the recommended level for the IH, for each lake (Figures 1 and 2). The difference between

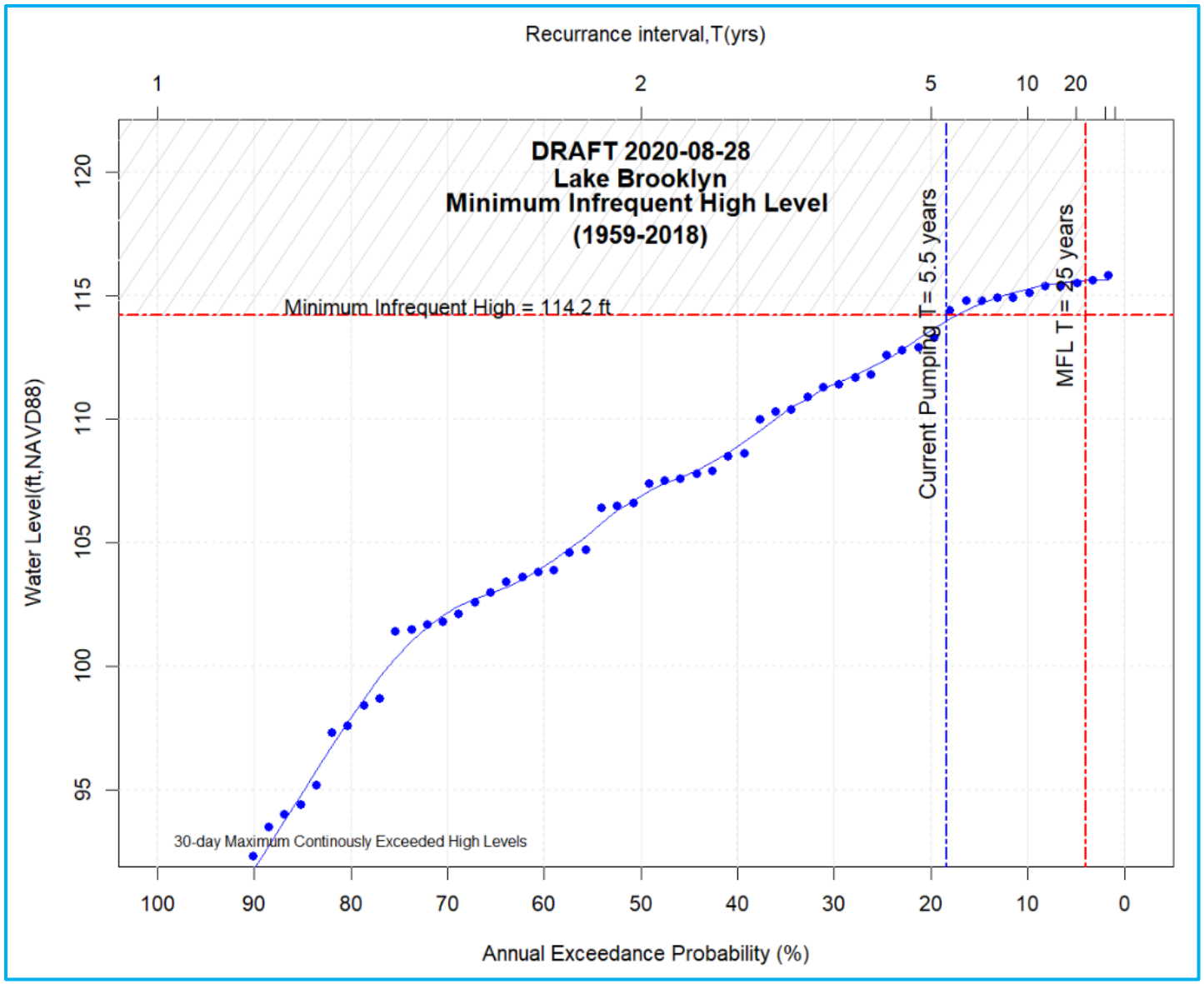


*Figure 1. Frequency analysis plot of Minimum Infrequent High (IH), for Lake Brooklyn, Clay County, Florida*

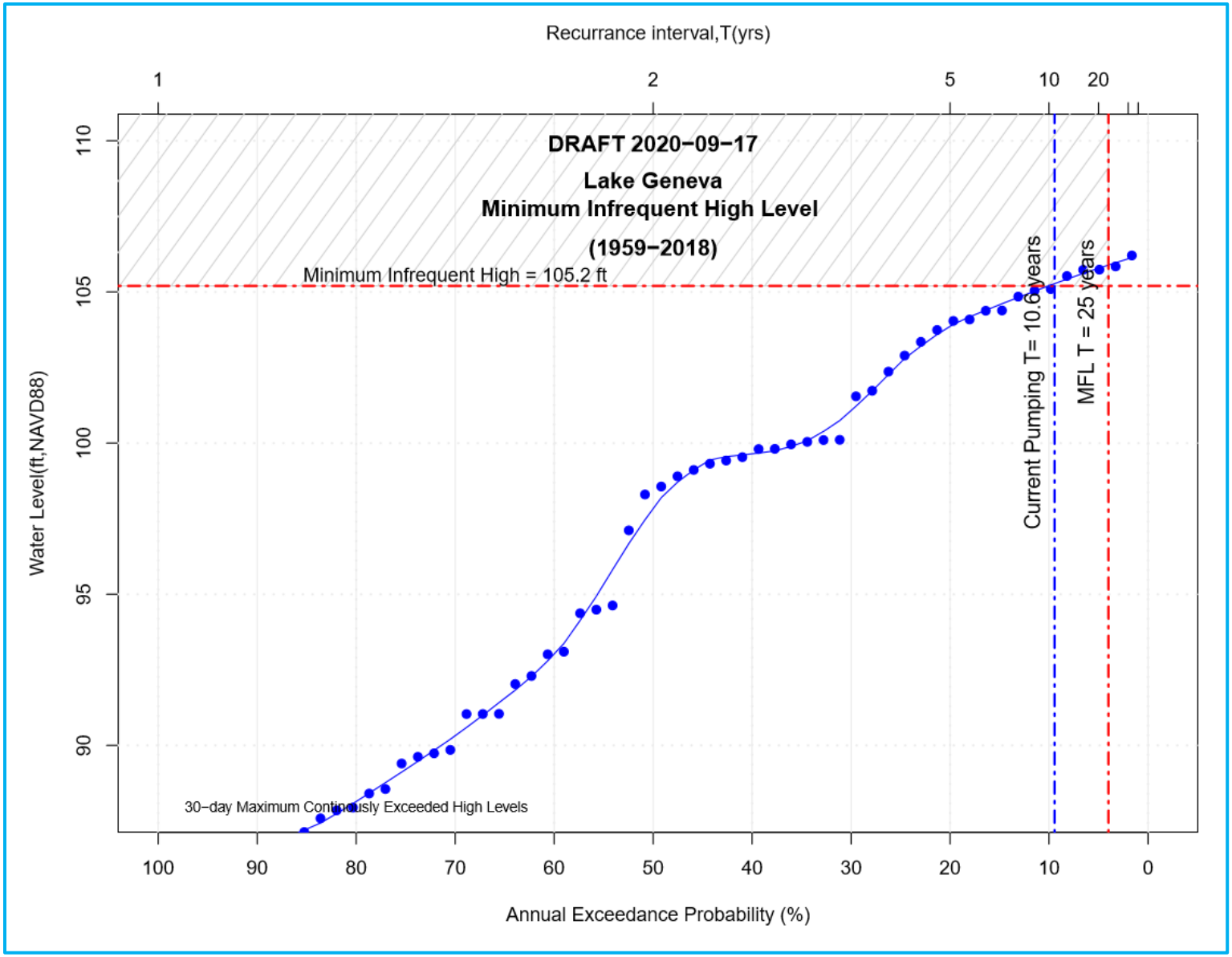


*Figure 2. Frequency analysis plot of Minimum Infrequent High (IH), for Lake Geneva, Clay and Bradford Counties, Florida*

current-pumping condition water level and MFLs condition water level (at the recommended duration and frequency) constitutes the freeboard or deficit before the MFLs is achieved.

As described above, new lake level datasets were generated by adjusting the current pumping rate in the MLR equations. Frequency analysis was conducted on the new datasets to determine lake freeboard/deficit at the median. For Lake Brooklyn, this process was conducted until the P50 freeboard reached 10 feet. The IH frequency was not reached at this point, and so the freeboard for this metric is recorded as greater than 10 feet at the P50. This process was repeated for Lake Geneva, and the resulting median freeboard is approximately 3.2 feet (Table 1).

**Hydroperiod Tool Metrics**

The SJRWMD GIS-based hydroperiod tool was used to evaluate the effect of water level decline on the following criteria:

- Emergent marsh habitat area;
- Game fish spawning habitat area;
- Large wading bird habitat area;
- Small wading bird habitat area;
- Sandhill crane nesting habitat area;
- Open-water area;
- Average lake surface area; and
- Average lake depth.

For the 5 habitat metrics, open-water area metric and lake surface area metric, the long-term average area was calculated at 0.1 ft intervals for the no-pumping lake level timeseries, using stage/ area output from the hydroperiod tool. Current status was assessed by comparing the percent reduction of average area (i.e., averaged across the entire POR) under the current-pumping condition, relative to the no-pumping condition. Metrics that exhibited less than or equal to a 15% reduction in average habitat area, relative to the no-pumping condition, are deemed to be meeting their MFLs condition. The average lake depth metric was evaluated in the same way, except comparing long-term average lake depth between the no-pumping condition and current-pumping condition.

For Lake Brooklyn, all 5 fish and wildlife habitat metrics were met under the current-pumping condition. The open-water area metric, average lake depth metric and average lake surface area metric all exhibited a greater than 15% change in their long-term average under the current-pumping condition, relative to the no-pumping condition. Therefore, these three metrics are deemed in recovery.

For Lake Geneva, all 5 fish and wildlife habitat metrics were met under the current-pumping condition, as were the average lake depth metric and average lake surface area metric. The open-water area metric exhibited a greater than 15% change under current-pumping conditions, relative to the no-pumping condition. Therefore, this one metric is deemed in recovery.

As described above, new lake level datasets were generated by adjusting the current pumping rate in the MLR equations. The average areas, or average depth based on these new lake level timeseries were compared to the no-pumping condition to determine the amount of freeboard (for metrics meeting their MFLs condition) or deficit (for metrics in recovery) at the P50 for individual metrics. Table 1 provides a summary of P50 freeboard/deficit results of all hydroperiod tool metrics.

Table 1. P50 freeboard or deficits for Lakes Brooklyn and Geneva environmental criteria

| Environmental Criterion | Environmental Value(s) Protected | Lake Freeboard or Deficit at the P50 (ft, NAVD88) | |
|---|---|---|---|
| | | Lake Brooklyn | Lake Geneva |
| Minimum Infrequent High | Upland / wetland boundary | > 10.0 | > 3.0 |
| Emergent marsh habitat | Fish and wildlife habitat | > 5.0 | > 5.0 |
| Gamefish spawning habitat | Fish and wildlife habitat | > 5.0 | > 5.0 |
| Large wading bird foraging habitat | Fish and wildlife habitat | > 5.0 | > 5.0 |
| Small wading bird foraging habitat | Fish and wildlife habitat | > 5.0 | > 5.0 |
| Sandhill crane nesting habitat | Fish and wildlife habitat | > 5.0 | > 5.0 |
| Open water area | Recreation / aesthetics/ water quality / fish habitat | - 1.6 | - 0.3 |
| Lake lobe connection exceedance | Boating / fishing / fish passage | -1.3 | 0.2 |
| Average lake surface area | Aesthetics | - 0.5 | 1.0 |
| Average lake depth | Water quality / fish habitat | - 0.6 | 0.0 |

## Lake Lobe Connection Metric

Current status of the lake lobe connectivity metrics was assessed by comparing the percent exceedance at critical lobe connection elevation under the current-pumping condition and the MFLs condition. The MFLs condition for this metric is defined as a 15% reduction of exceedance at a critical elevation relative to no-pumping condition (see MFLs determination for description of elevations).

If the percent exceedance at critical lake lobe elevations is greater under current pumping than the MFL conditions, then the current hydrologic condition is considered to be met for this metric. The comparison results indicate that for Lake Brooklyn this metric is not met under the

current-pumping condition. For Lake Geneva, this metric is met under the current pumping condition.

To determine the deficit for Lake Brooklyn and the freeboard for Lake Geneva, new lake level timeseries were generated by adjusting the current pumping rate in the MLR equations, using the process described above. When a 15% in exceedance, relative to the no-pumping condition, was achieved, the freeboard or deficit equaled the resulting decrease or increase in P50 lake level. For Lake Brooklyn the P50 deficit equals 1.3 ft, and for Lake Geneva the P50 freeboard equals 0.2 ft.