SJRWMD Responses to Stakeholder Comments Regarding the Draft MFLs for Lakes Brooklyn and Geneva, Clay and Bradford Counties, Florida

February 8, 2021

Introduction

The St. Johns River Water Management District (District) completed a reevaluation of minimum levels for Lakes Brooklyn and Geneva in Clay and Bradford counties, Florida. The reevaluated minimum levels recommended for both lakes are based on implementation of updated data, methods and more appropriate environmental criteria. The updated methods include using recently developed North Florida Southeast Georgia (NFSEG) regional steady-state groundwater model and Keystone Heights local-scale transient groundwater model (KHTM) to quantify the effects of local and regional groundwater withdrawals, and the analysis of an additional 20 years of hydrologic data.

Preliminary environmental criteria development resulted in the evaluation of 15 metrics. These preliminary criteria went through independent scientific peer review from Cardno, Brown and Caldwell, and HSW Engineering and were the subject of thorough stakeholder review and collaboration. In addition, the NFSEG and KHTM models used to assess these criteria were peer reviewed by several respected groundwater modeling experts and stakeholders.

Based on substantive comments from peer reviewers and stakeholders, and subsequent data analyses by District staff, some of these preliminary environmental criteria were dropped from further consideration. In addition, several new criteria were developed to address significant concerns raised by peer reviewers and ensure the establishment of protective minimum levels. Further, various sensitivity checks were completed using secondary metrics to ensure that the recommended environmental criteria and minimum levels are protective of relevant ecological and human use benefits.

In addition to independent scientific peer review, comments on the draft Lake Brooklyn and Geneva MFLs Report (draft MFLs Report) and draft environmental criteria were also submitted by stakeholder groups, including the North Florida Utility Coordinating group (NFUCG) and the Save Our Lakes Organization (SOLO). Numerous face-to-face and virtual meetings were conducted over the course of years, with these and other stakeholder groups, in an effort to understand and address significant concerns regarding a variety of relevant subjects including: environmental criteria, model calibration, lake bathymetry, hydrological data analyses, and impact assessment. The District has addressed all salient issues regarding these areas of concern, within the limitations of the best available data and tools. The independent scientific peer review and stakeholder collaboration have resulted in significant improvements to the Lakes Brooklyn and Geneva models, impact assessment, environmental criteria and recommended minimum

levels. This rigorous review process, along with additional data collection and analyses, yielded more appropriate recommended minimum levels.

The following sections of this document provide District responses to remaining questions and comments submitted by the NFUCG and SOLO after the public workshop held on September 24, 2020. Comments 1 through 6 are from the NFUCG, and comments 7 through 19 are from SOLO.

North Florida Utility Coordination Group (NFUCG)

The following comments were submitted to the District by the NFUCG on October 9, 2020, and December 29, 2020.

Comment #1: *"Based on the District's analysis of these draft MFLs, the District did not identify significant harm to the lakes from existing water use based on established and vetted environmental values. The District based the need for recovery solely on new and highly* ***subjective aesthetic, recreational values and metrics*** *that have never been used anywhere in Florida." (emphasis added)*

Response:

As stated in the draft MFLs Report, the open water area metric (the constraint upon which the MFLs for both Lakes Brooklyn and Geneva are based) provides protection for both recreational and ecological functions and values. As the Florida Fish and Wildlife Conservation Commission (FWC) noted in its review of the draft MFLs Report the open water area metric provides critical protections not afforded by nearshore metrics (FWC 2020). FWC supports the open water area metric (and the recommended MFLs), finding that it (in combination with nearshore habitat protection) provides *"a holistic MFLs condition that should be protective of sportfish and nongame fish populations"* (FWC 2020). One of the primary reasons the FWC supports the open water area metric is that it will provide protection for thermal refugia for game fish. Largemouth bass, crappie and other game fish species have lower stress, mortality and access to prey in systems with ample deep open-water habitat (FWC 2020).

As discussed in the draft MFLs report, protection of open water habitats is positively correlated with the diversity of fish and other aquatic species. Fish are known to prefer an intermediate mixture of open water and littoral habitat. A lack of open water can reduce both the abundance and diversity of game fish species (see report for citations). Further, protection of deep-water areas provides water quality benefits. Water quality is positively related to water level (i.e., lake level decline is associated with water quality decline due to increases in nutrient concentration, temperature, light penetration and concomitant algal growth); *see draft MFLs Report for more details*.

Given that the MFLs for both Lakes Brooklyn and Geneva are based on the open water area metric, and that this metric provides protection for important deep water fish and wildlife habitat and water quality, the District does not agree that these MFLs are based on subjective aesthetic and recreational values and metrics.

Comment #2: *"Lakes Brooklyn and Geneva meet the environmental MFL criteria."*

Comment #3: *"Furthermore, the metrics selected for use were deemed to be applicable to Lakes Brooklyn and Geneva and address a number of important lake functions. These metrics which address encroachment of non-wetland upland vegetation, emergent marsh habitat, game fish spawning habitat, large and small wading bird [foraging] habitat, and sandhill crane nesting habitat are all met by many feet…"*

Response:

Pursuant to rule 62-40.473, Florida Administrative Code, environmental criteria that shall be considered when developing MFLs include both ecological and recreational metrics, among others. It is assumed that by "environmental" the NFUCG means "ecological." If this is what is meant, then Comment #1 is not correct. Some ecological metrics are met under the current-pumping condition and some are not; *see draft MFLs Report for details regarding the current-pumping condition*.

The ecological metrics met under the current-pumping condition include the five hydro-period tool (HT) based nearshore fish and wildlife habitats, and the minimum infrequent high (IH). The open water area metric, which protects different ecological functions and values (e.g., deep water habitats), is not met under the current-pumping condition. The District agrees that the HT fish and habitat metrics address "*a number of*" important lake functions. Unfortunately, they do not address *all* important lake functions. As FWC noted in its review of the draft MFLs Report the open water area metric provides critical protections not afforded by nearshore metrics (FWC 2020).

The reason the five HT fish and wildlife habitat metrics are "met by many feet" is because 1) they protect shallow, nearshore habitats and 2) lake level declines transform Lakes Brooklyn and Geneva into large shallow wetlands (predominantly wet prairie and shallow marsh). The District agrees with NFUCG that lowering Lakes Brooklyn and Geneva creates abundant shallow marsh habitat, and that the functions and values afforded by these nearshore habitats are protected. However, when determining an MFL for a system dewatering a system to the point of expanding one habitat at the detriment of others would not be considered preventing significant harm. Also, these metrics do not provide protection for deep-water areas. Nearshore (shallow) habitats (and associated ecological values) are protected under the current-pumping condition; deep water habitats (and associated ecological values) are not protected. See Figure 1 for a visual approximation of the Lake Brooklyn median lake level

that would result from an MFL based on HT fish and wildlife metrics (photo taken February 11, 2011, when Brooklyn water level was approximately 98 ft NAVD88; this photo shows Lake Brooklyn when much of it is a wet prairie and shallow marsh).

The IH is met under the current-pumping condition because it is extremely insensitive to pumping; this raises the question of its effectiveness as the basis of MFLs for highly

Figure 1. Lake Brooklyn on February 11, 2011. Water level on this date was approximately 98.6 ft. NAVD88, and similar to the minimum median lake level that would result from an MFLs based on HT fish and wildlife metrics.

fluctuating lakes. If the MFLs were based on the IH, this metric would result in a large increase in allowable withdrawal, relative to the current-pumping condition. This would result in large lake level declines that would negatively impact many beneficial uses. Recent modeling, completed for the draft MFLs Report, demonstrates that the IH for Lake Brooklyn would allow a greater than 180% increase in current pumping and result in a greater than 14-foot decline in median lake level relative to the no-pumping (pre-withdrawal) condition; a reduction in P50 from approximately 109 ft to 95 ft; *see draft MFLs Report for details regarding the no-pumping condition*. This large decline in lake level would cause an approximate 55% reduction in lake area (Figure 2). The reduction from the no-pumping P75 is even greater; the IH would result in a 16.5 ft reduction in lake levels at this “dry period” percentile, and a 79% reduction in area (Figure 3). These large changes in lake level would be detrimental to ecological

functions and values dependent on deep-water habitat, and detrimental to recreational uses and the aesthetics of these lakes. The District's standard event-based metric (IH) alone does not provide protection of deep-water fish and wildlife habitats or the human beneficial uses of Lakes Brooklyn or Geneva. Therefore, additional environmental metrics were evaluated.

One of the new metrics evaluated was recommended by a peer reviewer. Cardno suggested an open water area metric that is protective of both recreational and ecological functions and values (see draft MFLs Report for details). The ecological functions and values protected include fish and wildlife habitat that is deeper than what nearshore (i.e., littoral) habitats provide. Some of these habitats are critical for game fish species. The FWC supports the open water area metric, finding that it (in combination with nearshore habitat protection) provides *"a holistic MFLs condition that should be protective of sportfish and nongame fish populations"* (FWC 2020). One of the primary reasons the FWC supports the open water area metric is that it will provide protection for thermal refugia for game fish. Largemouth bass, crappie and other game fish species have lower stress, mortality and access to prey in systems with ample deep open-water habitat (FWC 2020).

Further, protection of deep-water areas provides water quality benefits. Water quality is positively related to water level (i.e., lake level decline is associated with water quality decline due to increases in nutrient concentration, temperature, light penetration and concomitant algal growth); *see draft MFLs Report for more details*.

Since the open water area metric, and the ecological/water quality benefits it provides, are not protected under the current-pumping condition for either Lakes Brooklyn or Geneva, these lakes do not meet all ecological criteria.

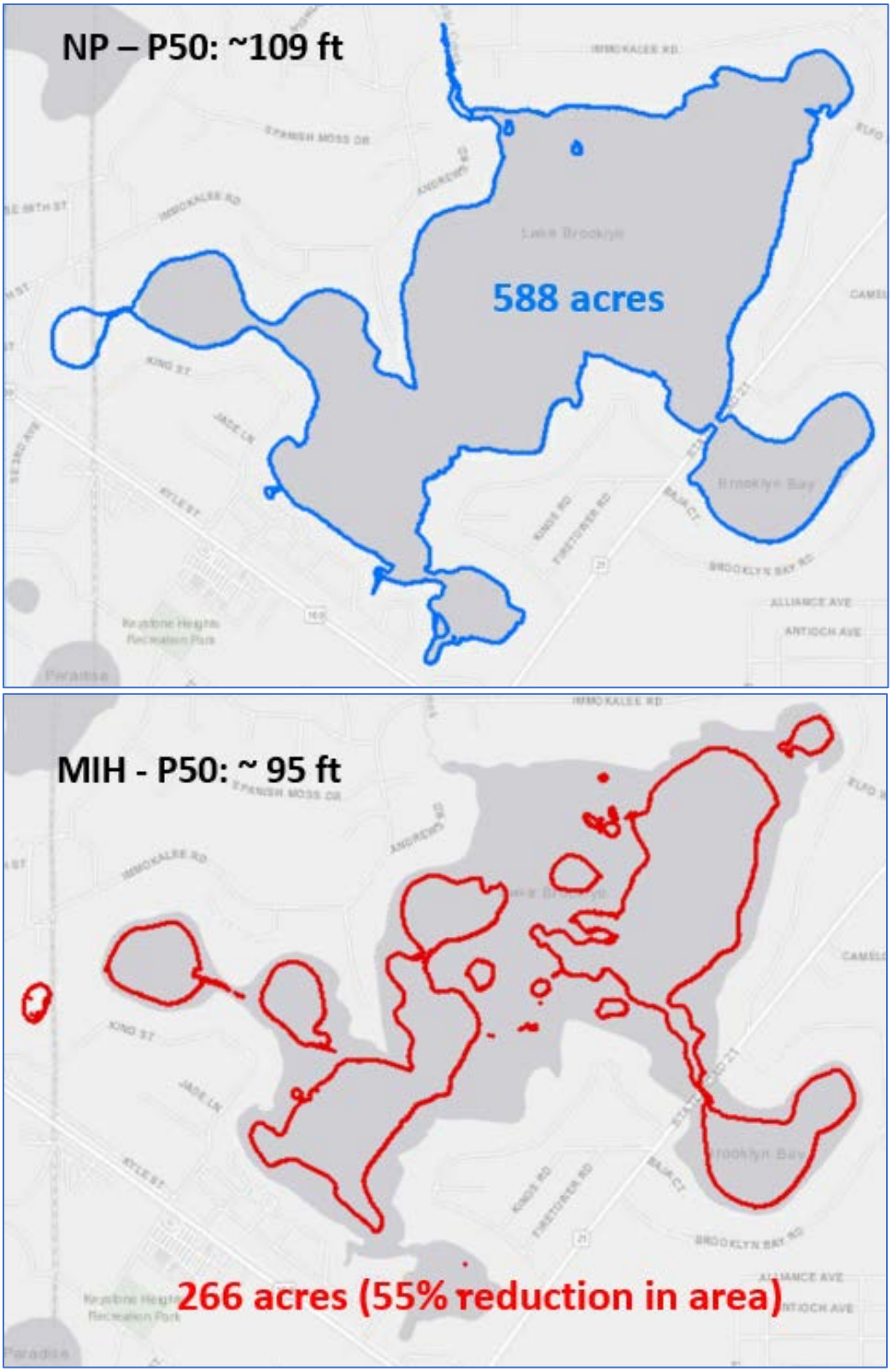

Figure 2: Hydroperiod tool output data showing difference in Lake Brooklyn area (acres) for P50 under no-pumping condition versus P50 under MFLs condition using the IH.

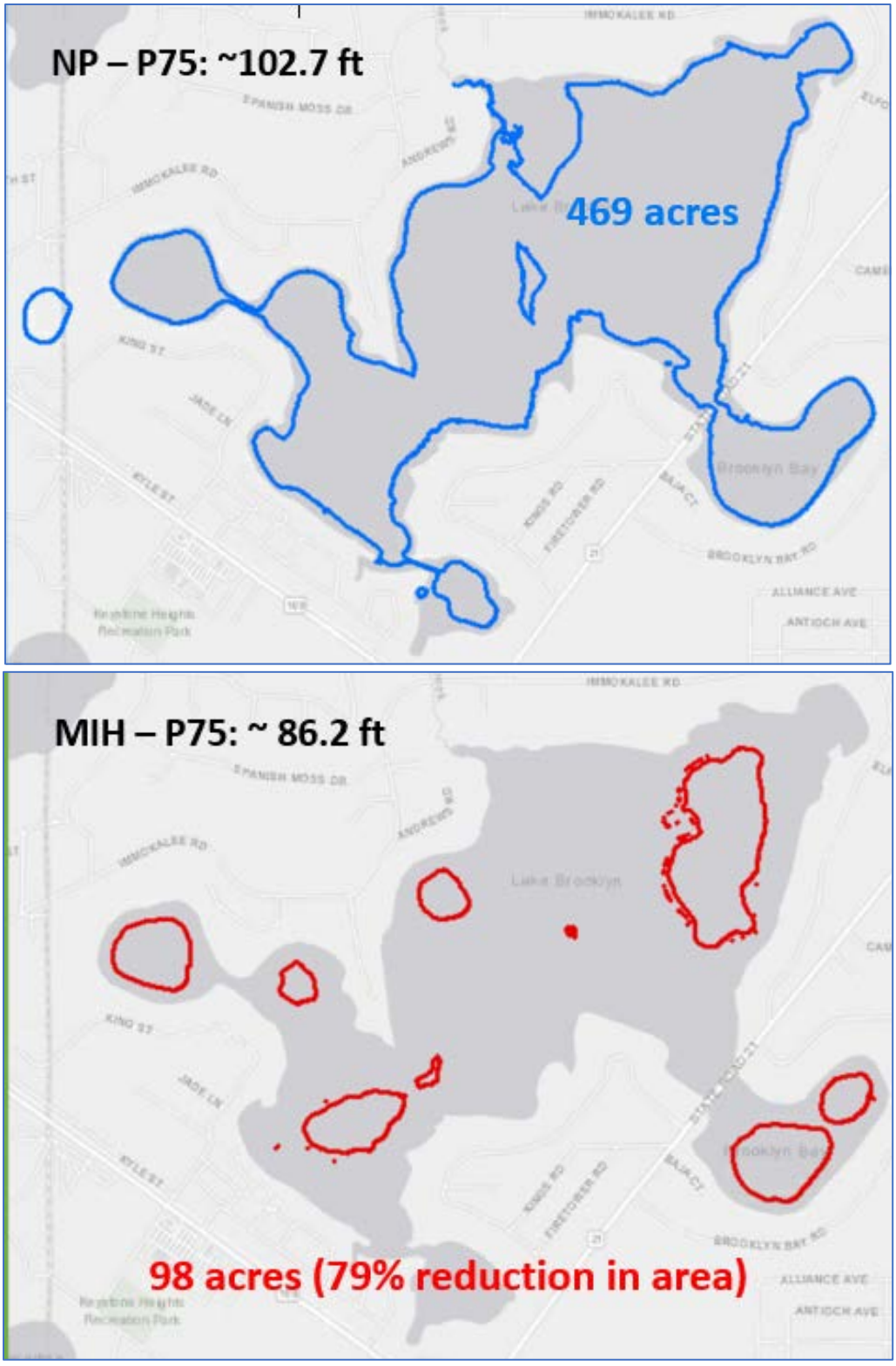

Figure 3: Hydroperiod tool output data showing difference in Lake Brooklyn area (acres) for P75 under no-pumping condition versus P75 under MFLs condition using the IH.

Comment #4: *"The open water depth criterion, which is based on maintenance of lake area with adequate depth for water skiing (as defined by the US Coast Guard), is the most constraining on both Lakes Brooklyn and Geneva. The District asserts that the application of the open water metric is protective of environmental standards including fish refugia and water quality. To this end, the District provides a qualitative linkage between the open water metric and these standards. However, the District does not provide any quantifiable relationship between the open water metric and the prevention of significant harm to any environmental variable. If there is a concern about these environmental standards, then we would recommend that the District use a proven, quantifiable metric."*

Response:

As stated in the draft MFLs Report, the open water area metric provides protection for both recreational and ecological functions and values. Although the six HT metrics (five original fish and wildlife metrics and open water area metric) have different purposes (i.e., they protect different habitats, which are defined by different depth ranges) they are conceptually identical. The six HT metrics are based on the following:

1) Depth ranges that protect specific ecological functions and values; and in the case of the open water area metric this depth range also protects recreational values;
2) Habitat areas estimated using the hydroperiod tool assessed over the entire POR; and
3) a 15% impact threshold.

Comment #5: *"As a result of the iterative process to develop these recreational and aesthetic metrics, numerous subjective assumptions have been layered onto each other in the final calculations. By changing a few of these assumptions, significantly different levels of impact result from the calculations. So, while the District's assessments of these MFLs metrics may represent possible results, other parties could reach very different conclusions. We think that this degree of subjectivity in the MFL process is not adequate and have always supported the use of sound science which minimizes uncertainty."*

Response:

The iterative process is the result of the comprehensive collaboration with peer reviewers and stakeholders. Feedback from stakeholders, peer reviewers and the FWC has driven the revisions to and conclusions of the draft MFLs Report. The District worked diligently with peer reviewers and stakeholders to ensure their concerns were addressed within the limitation of best available data and tools. The District continues to revise and refine environmental criteria and models as new data and tools become available. The comprehensive collaboration with peer reviewers and stakeholders has led to more appropriate MFLs supported by scientific literature and the FWC.

Comment #6: *"So, based on the information we have been provided, the Black Creek project appears to be a good project to address the MFLs issues identified by the District. If other projects are required to address these MFLs issues, then they must be achievable, cost-effective and equitable."*

Response: Details regarding potential projects and measures to meet the Lakes Brooklyn and Geneva MFLs are provided in the draft Recovery Strategy.

Save Our Lakes Organization (SOLO)

The following comments were submitted to the District by members of SOLO on September 21, 2020, September 23, 2020, October 12, 2020, and January 4, 2021.

Comment #7: *"… the MFLs condition seemed low considering only a 15% reduction in lake surface (recreation metric). After going through the steps made in calculating the MFLs condition, I realized that a 15% reduction in area does not at all equate to a 15% reduction of the resource EV. Attached are graphs for Brooklyn and Geneva that show the P50 reduction of 15% surface area of the lakes, that actually reduces the exceedance by over 40%. This exceedance reduction is the actual (real) degradation of the levels from natural. This should be corrected as shown to limit the reduction of the resource value to 15% of exceedance. The MFLs condition curve will be higher as indicated. Direct surface area reductions have been used for wildlife metrics, where habitat can actually be created by low water as you have stated, but this approach is inapplicable for recreation where a loss is a loss. This is particularly true when an actual reduction is created at over 40%."*

PARAPHRASED FROM ATTACHED GRAPH FOR BROOKLYN (SIMILAR FOR GENEVA): P50 15% area reduction not applicable for recreational environmental values. Results in an estimated 41% reduction in exceedance. Water area reduction can provide additional/alternate habitat for wildlife, but not at all the case for recreational environmental values.; P50 15% exceedance reduction results in estimated 1.7 ft deficit when subtracted from 110.3 ft, indicates a P50 of 108.6 ft. (Note: the 110.3 ft figure arrived at, according to the graph, by adding 4.1 ft to the MFLs P50; the 4.1 ft figure was chosen from page 44 of draft MFLs report).Direct surface area reductions have been used for wildlife metrics, where habitat can actually be created by low water as you have stated, but this approach is inapplicable for recreation where a loss is a loss. This is particularly true when an actual reduction is created at over 40%.

Response:

The MFLs condition curve cited in Comment #7 represents the most constraining metric (open-water area). The 4.1 ft of change mentioned in this comment is the allowable change in average lake depth (not average lake elevation) and is less constraining than the MFLs

condition based on the open water area metric. A metric based on open water area (the area of the lake ≥ 5 ft deep) is meant to protect area for boating, swimming, fishing. During dry periods, this area is also important refugia for game fish and other organisms. Protection of sufficient lake area is important for protection of both types of environmental values (recreation and fish/wildlife habitat).

The District has not identified an ecological or recreational metric associated with a reduction in exceedance of the median lake level, for Lakes Brooklyn and Geneva. The open water area metric is based on a change in area (not elevation), which is appropriate for recreation and fish/wildlife values. The District agrees with the FWC and the peer reviewers of the draft MFLs Report (i.e., Cardno and Brown & Caldwell) all of whom support this area-based metric, and the 15% impact threshold used for this metric.

The District considers the MFLs condition for Lake Brooklyn, based on the open water area metric, to be protective of the most critical ecological and human beneficial uses identified in the MFLs determination. The MFLs condition only allows for the following changes, relative to the no-pumping (pre-withdrawal) condition:

- 15 % change in lake area greater than or equal to 5 ft deep;
- Less than 15 % change in nearshore (fish and wildlife) habitat depths;
- 9 % change in median surface area;
- 12.9 % change in average lake depth;
- 9.2 % change in shoreline exposure relative to no-pumping condition range of exposure (0 to 430 ft);
- 3.1 ft change in median elevation; and
- 2.3 ft change in P25 elevation.

Comment #8: *"Dock Use Standard's SWFWMD formula led to really bizarre results (124.4 ft NAVD88 and 111.6 ft NAVD88 for Brooklyn and Geneva respectively). Unfortunately, that result is used to disregard what might be a useful Environmental value. The originally proposed minimum of the bottom of the lakeward piling + 2 ft yields logical values."*

Response:

One of the peer reviewers (Cardno) raised the following concerns regarding the dock access criterion developed by the District:

"A large proportion of the permanent docks in the Property Appraiser's database appear to have been built during or shortly after the end of the period of high rainfall that characterized the 1960s and early 1970s with a few additional docks built during and after more recent brief high-water events. As a result, we have concerns with the use of a mean end-of-dock elevation in the methodology used to develop the criterion. Assuming that most docks, especially the

ones with permanent pilings, were constructed primarily under "wet conditions" such as occurred from the late 1950s to the early 1970s, the waterward dock piling elevation would be located relatively high in the landscape compared to what might have occurred under "dry conditions." If this hypothetical were true, the standard could be viewed as protecting an artificially high condition."

In addition to these concerns, the District was concerned that a mean dock elevation could be sensitive to small changes in elevation, yielding very different assessment results if it increased or decreased slightly (based on the climatic conditions under which docks were built…i.e., increasing subjectivity of the metric). To address this concern, the District evaluated whether the assessment of the dock access metric would yield significantly different results (i.e., allowable lake level reduction) for docks built at different times (i.e., under wetter, drier or average conditions). A sensitivity analysis was conducted to determine if the allowable shift (15% reduction in exceedance) varies significantly from the mean dock elevation to +/- 1 standard deviation (SD) above/below mean elevation. The standard deviation for dock elevations (waterward dock piling elevations) at Lake Brooklyn and Lake Geneva is 1.7 ft and 3.7 ft, respectively (i.e., a range of 5.4 feet). The sensitivity analysis, based on draft hydrological data, showed that the freeboard/deficit calculation varied significantly from the mean elevation minus 1 SD to the mean elevation plus 1 SD; there was an approximate doubling of freeboard/deficit, based on draft hydrological data.

Therefore, the District agrees with the concerns raised by Cardno about using the mean dock elevation for such a highly fluctuating system, where freeboard/deficit calculations are very sensitive to small changes in elevation. The District also agrees that the critical elevation for this metric (i.e., dock elevation) is subject to when the homeowners happened to build their dock, and the resulting allowable water level reduction varies significantly based on whether docks were built during wet or dry periods. For these reasons, the dock access metric was removed from consideration.

Comment #9: *"With regards to Fig. 11 and subsequent Figures and calculations of the impact of pumping on the lake levels of Lake Geneva (in particular) and also Lake Brooklyn, the impact of rainfall amounts is considered for its cumulative effect, why is the impact of the withdrawals from the aquifer not to be considered as a cumulative effect?"*

Response:

The cumulative impacts of both rainfall and withdrawals have been taken into account in the local-scale Keystone Heights transient groundwater model. The model simulated the cumulative impact of pumping from 1957 through 2018.

Comment #10: *"It is difficult to understand much less explain to anyone familiar with Lake Geneva over the "period of record" that the deficit for Lake Geneva is only 0.3 ft. and that the Minimum Infrequent High which hasn't been met in over 45 years is exceeded by 3 ft. Some exposition of the math mechations involved might be of help."*

Response:

The deficit for Lake Geneva is based on the assessment of the most constraining metric (open water area metric) using the current-pumping condition lake level timeseries; *see draft MFLs Report for details.* This assessment is not based on past conditions or past impacts (i.e., the historical record), but rather is based on a timeseries that reflects Lake Geneva water levels if current-pumping conditions persist into the future. It is worth noting that part of the decline in the current-pumping condition timeseries is due to current levels of withdrawal, and part of the decline is due to drought. See Appendix B and Appendix D for details regarding these calculations.

Comment #11: *"Cardno states: "Reiterating Shaw et al (2005), (a report on a section of the Peace River for thew SWFWMD) 'in the absence of any clear statutory guidance' the extension of the 15% is reasonable and consistent with previous MFL efforts." However, its application in a way that negates the protection of an accepted environmental value is inappropriate. There is an accepted environmental value for the connection of the main body of Lake Geneva to the western lobes. The elevation of the bottom at this connection is at 96.5 ft. NAVD. The NP P50 elevation is 98.3 ft. NAVD. The minimum level (not the minimum safe level) for the passage of watercraft is +2 ft or 98.5ft NAVD. The 15% reduction takes away 2 ft of water and takes away all access to and from the main body of the lake. The application of criteria for rivers and stable lakes to these highly variable lakes is fraught with difficulty."*

Response:

The open water area metric and the lake lobe connectivity metric are separate and distinct metrics. They were evaluated separately, and the former was more constraining (i.e., the open water area metric has a higher deficit than the lake lobe connectivity metric). The open water metric does not "negate the protection" afforded by the lake lobe connectivity metric. In fact, the open water area metric is more constraining and thus allows less impact from water withdrawals than the lake lobe connectivity metric.

Comment #12: *"Some mention needs to be included of the changes that will soon take place in these lakes due the impending input of large amounts of water from the Black Creek Water Resource Project."*

Response:

Details regarding projects and measures required to meet the Lakes Brooklyn and Geneva MFLs are provided in the draft Recovery Strategy.

Comment #13: *"A mechanism needs to be in place so that the lakes' MFLs will be reviewed and revised as conditions change."*

Response:

As part of ongoing adaptive management, MFLs within the District are reviewed periodically to determine if level (or flow) declines are due to water withdrawal (as opposed to drought).

Comment #14: *"IMPACT THRESHOLD pg. 39 "Because of the large range of water level fluctuations of Lakes Brooklyn and Geneva, criteria meant to protect recreational uses must be based on an acceptable change from the pre-withdrawal (no-pumping) condition, not based on absolute levels below which each lake cannot decline." If you have an elevation that is described a "critical" it is an elevation that must be met. If it is not met then the value that it was meant to protect is either lost or compromised. That would not be an acceptable change. The studies used to determine the appropriateness of the proposed 15% reduction from a prescribed level were described as being from river and spring reports and managed reservoirs. With the reservoirs, the allowable 15% reduction was from a "full pool" elevation in the reservoir. It seems inappropriate to apply this to Brooklyn & Geneva. Studies based on managed reservoirs (often dam controlled), rivers and springs should not be the justification for com-promising "Critical Elevations" which may require absolute levels to be met. For equivalent values for Lakes Brooklyn and Geneva consider that the "full pool" for Brooklyn is 116.4 ft. Geneva is 106.4 ft. Start there, not at P-50. Using Figures 14 & 15, equivalent values would be between 115 and 112.6 ft for Lake Brooklyn and 104 and 104.5 ft for Lake Geneva."*

Response:

Studies based on managed reservoirs, rivers and springs were not the basis for any metrics used for Lakes Brooklyn and Geneva. The only critical elevations used are for the lake lobe connection metric, and elevations for this metric are based on lake bathymetry (updated using high resolution acoustic doppler data), not studies based on managed reservoirs, rivers or springs.

The allowable 15% reduction from a no-pumping condition was used for average lake area and depth across the entire period of record (not the P50 as stated in the comment). A 15% reduction of habitat availability has been used by other water management districts as a significant harm threshold for MFLs (Munson and Delfino 2007). This threshold has been peer

reviewed and has been the basis for numerous adopted MFLs (see SWFWMD MFLs for Crystal River, Gum Slough, Chassahowitzka River, and Homosassa River, among others). While many MFLs using this threshold are for flowing systems, a 15% reduction in habitat has also been used as a critical threshold for lakes, and is based on bird species richness studies (Hoyer and Canfield 1994, Leeper et al., 2001, Emery et al., 2009). This threshold is also within the range (10 to 33%) of percent allowable change documented in other studies (Munson and Delfino 2007). As noted by the peer reviewer of this MFL, this threshold has been supported by others, including Shaw et al. (2005) who states that *"… changes in available habitat due…occur along a continuum with few inflections or breakpoints where the response dramatically shifts.", and therefore "…loss or reduction in a given metric occurs incrementally …and in the absence of any clear statutory guidance [they] believe that the use of a 15 percent for loss of habitat is reasonable and prudent."*

Comment #15: *"The minimum depth for safe boating should be required between the lobes as identified in the report as well as between the public boat ramps and what is identified as lake lobe #1 in each lake. The water bottoms of these passages will likely be littered with obstacles in the form of dead tree stumps and logs for many years to come unless a concerted effort is made to clear at least enough of them to make safe corridors. A "safe" water level for boating is imperative."*

Response:

The standard boat draft for channels and lake lobe connections, used for District MFLs is 2 ft. This assumes that boaters won't be moving at high speeds when navigating these connections, and this depth provides a *minimum* boat draft, which is in line with setting a *minimum* water level.

Regarding assessing any metric relative to the elevation of man-made structures (i.e., public boat ramps, docks, etc.), the MFLs peer reviewers considered it inappropriate to assess criteria based on man-made structures that were located based on the climatic conditions occurring at time of construction. The District agrees with this peer reviewer concern. The elevations of boat ramps, docks and other man-made structures are largely a function of the climatic conditions under which they were built. Also, sensitivity analyses of dock elevations at Lake Brooklyn demonstrated that small differences in elevation result in meaningful differences in freeboard/deficit. Therefore, criteria based on dock or boat ramp elevations were determined to be inappropriate for such highly fluctuating lakes. This conclusion would apply to any metrics with elevations that are subject to change based on climate. This conclusion was also part of the rationale for evaluating criteria that assess the effects of water withdrawal on the average condition (i.e., high, medium and low elevations experienced over the period of record).

Comment #16: *"According to Tables 9,10 & 11 : For Lake Brooklyn, the "allowable shift" at the Median (P50) lake level of 4.3 ft appears to put the lake at (106.2ft — 4.3ft) or 101.9ft. This would be a depth of 2.3 ft. This just above the minimum for any kind of boating connection and well below the 5ft+ "safe boating" requirement. For Lake Geneva, the "allowable shift" at the Median (P50) lake level of 2.1 ft appears to put the lake at (98.3 ft—2.1 ft) or 96.2 ft. As this would be .3ft below the elevation of the connection, there would be no connection between the lobes much less a "safe boating" connection."*

Response:

The allowable shift in the P50 is 3.1 feet (difference between no-pumping P50 of 109.3 ft and MFL P50 of 106.2 ft). The MFLs condition is based on a 15% reduction from the no-pumping condition on the lake area that is greater than or equal to 5 feet deep. It is not clear what the basis is for the statement "*This would be a depth of 2.3 ft.*".

Regarding Lake Geneva, the open water metric is more constraining than the lake lobe connectivity metric. If the latter allows a 15% reduction in exceedance (from the no-pumping condition) of the critical lake lobe connection elevation, then the former would allow less than a 15% change from no-pumping (i.e., it is more constraining). Based on our current understanding of the systems (i.e., based on our current modeling and hydrological data analyses), there would have been times under a no-pumping (i.e., the pre-withdrawal) condition when the lake lobes would have been disconnected. The MFLs condition increases that amount of time by less than 15% (it is less than 15% because the MFLs is based on a metric that is more constraining than the lake lobe connectivity metric).

Comment #17: "*Table 15 pg. 48 & Appendix D pg. 4: The Water Resource Values for MIH call for the lake to be at 105.2 ft NAVD88 for 30 Days with a return rate of 25 years. Lake Geneva has been below the prescribed level for the last 47 years and, until the last 8 years, by ever increasing amounts. While mathematically possible, intuitively it seems unlikely that the lake will, on its own, ever reach this elevation without intervention much less spot the utilities another 3 ft loss to pumping as "freeboard"."*

Response:

Additional environmental criteria were evaluated because of the insensitivity of the IH to withdrawal. The freeboard for this metric is not the basis of the MFLs; it is not being used because there are more constraining metrics.

Comment #18: *"Re: Rainfall and Lake Levels. It is unfortunate that usable data from the decades prior to 1957 are not available for the data set. There is ample evidence that before, during and after the founding of Keystone Heights beginning in the early 1920's (a "dry period") the chief selling point for getting people to move from the "Keystone State" to Keystone Heights was the quality of its lakes and water. Even in this climatologically dry cycle, in both aerial photographs and scenic shots, the lakes appear to be at "full pool." It seems likely that the pattern of the lakes in those years was much like the years 1957 to 1978."*

Response:

Unfortunately, there is not enough reliable water level data available before 1957 which can be incorporated into the MFLs process. Please note that MFLs cannot be set based on anecdotal information. More importantly, a robust semi-integrated transient groundwater model was developed to simulate lake levels and the impacts of withdrawals from 1957 through 2018. As a result, no-pumping lake levels (representing a lake condition in the absence of pumping) were developed and used in the MFLs determination.

Comment #19: *Simply put, the MFLs and deficits for Brooklyn and Geneva can be derived using the SJRWMD "No Pumping" exceedance curves, "Current Pumping" exceedance curves, and "Impact Threshold" of significant harm (15%):*

BROOKLYN: 1) 109.3 Ft (NP P50) minus 1.7 Ft (15% exceedance reduction) equals 107.6 Ft (MFLs Condition) 2) 107.6 Ft (MFLs Condition) minus 104.6 Ft (Current Pumping) equal 3.0 Ft Deficits

GENEVA: 1) 99.8 Ft (NP P50) minus 0.9 Ft (15% exceedance reduction) equals 98.9 Ft (MFLs Condition) 2) 98.9 Ft (MFLs Condition) minus 98.0 Ft (Current Pumping) equal 0.9 Ft Deficits

Consider: The basis of the 15% impact threshold from Munson/Delfino 2007, and Shaw/Golladay 2005, appears to be focused on impacts to wildlife habitat rather than to aesthetic and recreational uses. It has been stated that wildlife habitat impacts can be self-mitigating, while impacts to aesthetics and recreational environmental values clearly are not. It is reasonable to consider a 10% impact threshold for non-mitigating aesthetic and recreational environmental values.

Response:

MFLs are determined based on identifying values, criteria and thresholds. All exceedance-based criteria are based on critical elevations identified (e.g., lake lobe connection elevation for boat passage, or river bottom elevation for fish passage or paddling). It would not be defensible to base the MFLs simply on the exceedance of a percentile, without first identifying a defendable criterion tied to that given elevation.

The District has not identified an ecological or recreational metric associated with a reduction in exceedance of the median lake level, for Lakes Brooklyn and Geneva. The constraint (i.e., the open water area metric) is based on a change in area (not elevation), which is appropriate for recreation and fish/wildlife values. The District agrees with the FWC (see attached FWC letter) and the peer reviewers of the draft MFLs Report (i.e., Cardno and Brown & Caldwell) who support this area-based metric, and the 15% impact threshold used for this metric.

The District considers the MFLs condition for Lake Brooklyn, based on the open water area metric, to be protective of the most critical ecological and human beneficial uses identified in the MFLs determination. The MFLs condition only allows for the following changes, relative to the no-pumping (pre-withdrawal) condition:

- 15 % change in lake area greater than or equal to 5 ft deep;
- Less than 15 % change in nearshore (fish and wildlife) habitat depths;
- 9 % change in median surface area;
- 12.9 % change in average lake depth;
- 9.2 % change in shoreline exposure relative to no-pumping condition range of exposure (0 to 430 ft);
- 3.1 ft change in median elevation; and
- 2.3 ft change in P25 elevation.

All of the criteria listed above will positively influence both fish and wildlife functions and values and aesthetics/recreational values. Regarding thresholds for ecological versus aesthetics/recreational values, there is some precedent for using a limit of 15% reduction from no-pumping for both (Munson and Delfino 2007). This threshold has been peer reviewed and has been the basis for numerous adopted MFLs (see SWFWMD MFLs for Crystal River, Gum Slough, Chassahowitzka River, and Homosassa River, among others). While many MFLs using this threshold are for flowing systems, a 15% reduction in habitat has also been used as a critical threshold for lakes (Hoyer and Canfield 1994, Leeper et al., 2001, Emery et al., 2009). Districts have also used a 15% threshold for recreational values, but typically when there is a critical exceedance elevation identified (e.g., river bottom exceedance for canoeing or tubing). There is not such precedent or support from literature for a 10% reduction for aesthetics/recreational values.

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November 16, 2020

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RE: Minimum Levels Reevaluation for Lakes Brooklyn and Geneva, St. Johns River Water Management District, Clay and Bradford Counties

Dear Mr. Sutherland:

Florida Fish and Wildlife Conservation Commission (FWC) staff have reviewed the above-referenced minimum flows and levels (MFL) draft report and appendices for Lakes Brooklyn and Geneva. The following comments and recommendations are provided as technical assistance during your review of the draft MFL under Chapter 373, Florida Statutes, and in accordance with FWC's authorities under Chapter 379, Florida Statutes.

Executive Summary

The St. Johns River Water Management District (SJRWMD) has completed a reevaluation of minimum levels for Lakes Brooklyn and Geneva in Clay and Bradford counties. Lakes Brooklyn and Geneva are sandhill lakes adjacent to the city of Keystone Heights and are part of a chain of lakes and wet prairies in the Upper Etonia Creek Basin.

Minimum levels for both lakes were originally adopted in January 1996. The reevaluated minimum levels recommended for Lakes Brooklyn and Geneva are based on implementation of updated methods and more appropriate environmental criteria. The updated methods include results from a new, regional, steady-state groundwater model, and a local scale, transient groundwater model used to quantify the effects of local and regional groundwater withdrawals, and the analysis of an additional 20 years of hydrologic data. The proposed minimum levels for Lakes Brooklyn and Geneva are based on the most up-to-date methods, criteria, and data. Numerous criteria were investigated during the development of the proposed minimum levels that will protect relevant environmental values and beneficial uses at Lakes Brooklyn and Geneva. After peer review and staff evaluation of the criteria, 10 environmental metrics were chosen for evaluation and assessment at Lakes Brooklyn and Geneva.

Proposed MFLs and current-pumping conditions were compared to determine lake freeboards and deficits for the final suite of environmental criteria. The most constraining of these were used to develop a minimum hydrologic regime (MFLs condition) for each lake. The local scale Keystone Heights Transient Model (KHTM) and the regional scale North Florida Southeast Georgia (NFSEG) groundwater models were used for both MFLs criteria determination and assessment. The status assessment for Lakes Brooklyn and Geneva indicate that they are currently not meeting their proposed MFLs. A comparison of the MFLs and current-pumping conditions for lakes Brooklyn and Geneva yields a P50 lake deficit of 1.6 feet and 0.3 feet, respectively. Therefore, Lakes Brooklyn and Geneva are in recovery, and a recovery strategy must be adopted concurrently with the MFLs. Consistent with the provisions for establishing and implementing MFLs provided for in section 373.0421, Florida Statutes, the recovery strategy for Lakes Brooklyn and Geneva MFLs identifies a suite of projects and measures that, when implemented,

will recover these lakes from impacts due to withdrawals. In addition, the recovery strategy will also provide sufficient water supply options to meet all existing and projected reasonable beneficial uses.

Three minimum levels, a minimum P25, P50, and P75, are recommended for both Lake Brooklyn and Lake Geneva. These three percentiles were calculated from the MFLs condition exceedance curve for each lake. Adopting these three minimum levels will ensure the protection of the minimum hydrologic regime at low, average, and high levels for Lakes Brooklyn and Geneva. The SJRWMD concludes that the recommended minimum levels for Lakes Brooklyn and Geneva will protect relevant environmental values (found in Rule 62-40.473, *Florida Administrative Code*) from significant harm due to water withdrawals. The recommended MFLs presented in this report are preliminary and will not become effective until adopted by the SJRWMD Governing Board, as directed in Rule 40C-8.031, *Florida Administrative Code.*

Comments and Recommendations

Overall, FWC staff find that the SJRWMD has done a commendable job of considering fish and wildlife water resource values in developing minimum lake level standards for Lakes Brooklyn and Geneva. The available data were well examined, and additional hydrological tools were utilized to support the SJRWMD's objective of protecting environmental values from significant harm due to water withdrawals. FWC Staff supports the SJRWMD's approach of evaluating relevant environmental criteria, including a novel open water criterion, and relying on the most constraining of these to develop the recommended minimum hydrologic regime. In addition, FWC staff agree with the SJRWMD's assertion that a 15% habitat reduction threshold from a no-pumping condition as a benchmark of significant harm to fish and wildlife habitats is prudent and reasonable, though it is recognized that this threshold is largely arbitrary and lacks a firm scientific foundation. This aside, the rationale and analysis for the water resource values evaluated are scientifically sound and should therefore be protective of fish and wildlife and their habitats. Specific comments pertaining to fish and wildlife habitats are provided below for your consideration.

Game Fish Spawning – The entire no-pumping condition lake level timeseries was used to evaluate the change to game fish spawning area and determine the recommended MFL condition. Game fish (i.e., *Micropterus*, *Pomoxis*, and *Lepomis* sp.) spawning occurs from February to August, and FWC staff suggest constraining the analysis to these months as opposed to an overall average across the timeseries. This metric understandably provides year-round benefits to small forage fish and other wildlife as noted, but the purpose was presented as a metric to prevent significant harm to game fish spawning.

Large/Small Wading Bird Habitat – The criteria used for large and small wading bird foraging habitat are appropriate. Given that neither lake supports nesting colonies, no further consideration needs to be made for these species.

Florida Sandhill Crane Nesting Habitat – The analysis estimates that there is a relatively small amount of suitable nesting habitat for the Florida sandhill crane (*Antigone canadensis pratensis*, State Threatened) at either lake under the no-pumping condition, and not a substantial loss under the proposed MFLs condition (i.e., an estimated 1-acre loss at Lake Brooklyn and 3 acres at Lake Geneva). The 0.5-1.0 foot water depth may be too restrictive to what cranes will use on lakes. Very shallow wetlands are used for nesting, foraging, and roosting; however, an FWC Florida sandhill crane nesting study during 2010-2012 found the average water depth around 39 crane nests to be 27 inches. This average is greater because about a third of the nests were located on floating mats of vegetation near pond/lake edges. Thus, the MFLs condition may not greatly affect the existing crane population. Both lakes have good upland areas with low vegetation adjacent to the lake shore, Lake Geneva with improved pasture and Lake Brooklyn with

residential areas. The uplands and relatively open ecotone between the lake and uplands, would be a factor in cranes continuing to maintain territories and nest in the lake, even with 15% reduction.

Regarding the scientific name of sandhill cranes on page 30, the American Ornithological Union (AOU) reclassified sandhill cranes from the *Grus* genus to the *Antigone* genus in 2016. Some organizations accept it, and others do not; however, FWC has implemented the change to be consistent with the AOU.

Open-Water Area Metric – This is a novel and sensible metric that provides profound protections to fish populations during periods of low water while also maintaining thermal refugia opportunity. Unpublished FWC studies have documented that largemouth bass populations with access to deep water habitat have lower natural mortality and are composed by older fish that can attain larger sizes relative to largemouth bass populations in shallow water systems that lack deep water habitat. This is largely due to largemouth bass selecting cooler water during the summer months, which minimizes their metabolic stress. Largemouth bass on average grow one pound per year, and maintenance of summer stratification is likely partially responsible for the number of approved TrophyCatch submissions from Lakes Brooklyn and Geneva. Maintenance of open water is also highly valuable to black crappie populations and their prey species, such as threadfin shad, which primarily reside in open water habitats. Use of this metric in combination with nearshore habitat metrics provides a holistic MFLs condition that should be protective of sportfish and nongame fish populations.

In closing, FWC staff appreciate the opportunity to review the proposed MFL documents and look forward to working with the SJRWMD throughout the final approval process. If you have specific technical questions regarding the content of this letter, please contact Eric Nagid at (352) 273-3651 or by email at eric.nagid@MyFWC.com. All other inquires may be directed to ConservationPlanningServices@MyFWC.com.

Sincerely,

Stasey Whichel

Stasey Whichel, Director
Division of Freshwater Fisheries Management

Lakes Brooklyn and Geneva MFL 2020_42491_11162020