INTRODUCTION

OVERVIEW

The Suwannee River Water Management District (District) has included a re-evaluation of the minimum flows and levels (MFLs) for Lower Santa Fe and Ichetucknee Rivers and their associated priority springs in its current priority list and schedule for the establishment of MFLs based on the provisions of Subsection 373.802, Florida Statutes (F.S.). Also, based on the provisions of this subsection, the District has identified these MFLs for independent scientific peer review.

These draft recommended MFLs are described in a document titled ***Minimum Flows and Minimum Levels Re-evaluation for Lower Santa Fe and Ichetucknee Rivers and Priority Springs Draft Report December 2019***, prepared for the District by HSW Engineering, Inc. (HSW 2019).

BACKGROUND

Section 373.042, F.S., provides that MFLs shall be calculated using the best information available, that the Governing Board shall consider and may provide for non-consumptive uses in the establishment of MFLs, and when appropriate, MFLs may be calculated to reflect seasonal variation. The law also requires that when establishing MFLs, changes and structural alterations to watersheds, surface waters, and aquifers shall also be considered (Section 373.0421, F.S.). The State Water Resource Implementation Rule (Chapter 62-40, Florida Administrative Code) includes additional guidance for the establishment of MFLs.

Section 373.042, F.S., also addresses independent scientific peer review of MFLs, specifying the review of all scientific or technical data, methodologies, and models including all scientific and technical assumptions employed in each model, used to establish a minimum flow or minimum water level. In addition, the law requires that the Florida Department of Environmental Protection (FDEP) or the Governing Board shall give significant weight to the final peer review panel report when establishing the minimum flow or minimum water level.

This report is the fourth and final draft of the Chair's consensus report updating the status of the peer review panel's (PRP) ongoing peer review for the LSFR and IR and their associated priority springs. The first draft of this report (Dunn 2020b) was provided to the other two PRP members, Dr. Lou Motz, and Dr. Adam Munson, prior to the first public meeting. That first public meeting occurred on the evening of June 16th, 2020. The public meeting provided an opportunity for the public to make comments. Importantly also, the meeting allowed the PRP member to interact, for the first time in the ongoing peer review process. Until the public meeting the three member PRP had not been able to directly interact due to the constraints of the Florida's Sunshine rules. To that end the PRP did discuss the first draft of the chair's report Dunn 2020a, which included the three individual peer review tabular reports from PRP (Dunn 2020a, Motz 2020, and Munson 2020). The third draft of the chair's consensus report (Dunn 2020e) reflects editing/revision provided by Drs. Motz and Munson.

Next, prior to the June 16th public meeting, Dr. Dunn submitted a technical memorandum (TM) (Dunn 2020c) reviewing and evaluating the public comments on the draft recommended MFLs for the LSFR and IR, and their priority springs. That document was submitted to the District by March 23, 2020. Discussion of the two draft reports, the Chair's second draft (Dunn 2020d) and review of public comments submitted (Dunn 2020c) were the foci of the PRP's discussion

during the second public meeting on July 28th, 2020. The third draft of the Chair's report (Dunn 2020d) was discussed by the PRP during the third public meeting on evening of September 29, 2020. This final draft of the Chair's report reflects the minor edits and corrections approved by the PRP.

SUMMARY OF PEER REVIEW PANEL'S FINDINGS AND RECOMMENDATIONS

This document is the fourth and final draft of the Chair's Consensus Report updating the status of the PRP's ongoing peer review as reported in the third draft (Dunn 2020e). This report section provides a summary of individual and collective findings and recommendations based on the substantive comments made by each reviewer. The individual Peer Review Forms already completed independently by panel members are included as attachments A, B and C.

The three independent technical peer reviews with their respective fields of expertise are:

- Dr. Louis Motz, P.E.—Water resources engineering, groundwater modelling
- Dr. Adam Munson, P.E.—MFLs development, statistical methods, riverine ecology
- Dr. William Dunn—MFLs development, systems ecology, wetland & aquatic ecology, analysis of uncertainty, and adaptive management

At the District's request this peer review was conducted according to the State of Florida's government in the Sunshine rules. The key requirement is that the three peer reviewers cannot interact with each other, or as group except in a publicly noticed, publicly accessible forum.

Importantly, the District's instructions this peer review requests each reviewer identify substantive comments which the District defines as those that have the possibility of causing a change to the report's conclusions including its recommended MFLs. The determination of substantive comments is embedded in a simple Yes or No question in the District's peer review form. The question is asked of each individual comment from each reviewer. The peer review reports already submitted independently are included as attachments:

- Attachment A: Dr. Dunn's report
- Attachment B: Dr. Motz's report
- Attachment C: Dr. Munson's report

SUMMARY OF SUBSTANTIVE AND NON-SUBSTANTIVE REVIEW COMMENTS

For this peer review substantive comments are defined as those that each reviewer flagged as Yes in response to the question—does the comment directly and materially affect the conclusions of the report? Each yes-flagged comment is thus an issue of concern, a problem, a question, a need for additional information, or a recommendation for an alternative. These are the sources of uncertainty in eyes of each reviewer. Individually and collectively they are the active part of the peer review. A statistical summary quickly shows patterns.

Each of the attached Peer Review Reports (Attachments A, B and C) summarize the reviewer's individual general and specific review comments on HSW's MFLs report along with any recommended actions (see the respective Table 1 in each of Attachments A, B, and C).

In these three summary tables each comment is treated as a separate row. Comments are grouped by sections of HSW's MFL document. HSW's MFLs report has seven sections and six appendices in a separate document.

Table 1 provides a statistical summary of panel members comments, broken down by individual sections of HSW's MFLs report, including its six appendices. Summary also includes a yes or no flag as to whether the issue is a substantive one, that is one that can directly and materially affect conclusions of report.

TABLE 1. STATISTICAL SUMMARY OF REVIEW COMMENTS BY INDIVIDUAL REVIEWER, BROKEN OUT BY HSW'S REPORT SECTION. INCLUDES YES/NO ANSWER TO QUESTION: DOES COMMENT DIRECTLY AND MATERIALLY AFFECT CONCLUSIONS OF REPORT?

Section of HSW's MFLs Report	Dunn			Motz			Munson			Panel's Summary		
		Does It Affect Conclusions?			Does It Affect Conclusions?			Does It Affect Conclusions?			Does It Affect Conclusions?	
	#	# Yes	# No	#	# Yes	# No	#	# Yes	# No	#	# Yes	# No
1--Introduction	1	0	1	1	0	1	0	0	0	2	0	2
2--Hydrology	20	0	20	14	9	5	10	6	4	44	15	29
3--Biology	18	3	15	0	0	0	2	0	2	20	3	17
4--Approach to Setting MFLs	16	5	11	3	0	3	1	0	1	20	5	15
5--Evaluation of WRVs	33	31	2	0	0	0	4	2	2	37	33	4
6--River MFLs Development	15	15	0	2	1	1	1	0	1	18	16	2
7--Priority Springs Assessment and MFLs Development	6	4	2	6	3	3	1	0	1	13	7	6
subtotal	109	58	51	26	13	13	19	8	11	154	79	75
Appendix A--Priority Springs	1	0	1	0	0	0	0	0	0	1	0	1
Appendix B--Water Use Hindcasting	2	0	2	9	7	2	0	0	0	11	7	4
Appendix C--Reference Timeframe Flow Methodology	1	0	1	7	7	0	1	0	1	8	6	2
Appendix D--HEC-RAS Model	1	0	1	0	0	0	0	0	0	1	0	1
Appendix E--WRV Duration Curves	1	0	1	0	0	0	0	0	0	1	0	1
Appendix F--SEFA Rating Curves and Area Weighted Suitability Evaluation Results	1	0	1	0	0	0	0	0	0	1	0	1
subtotal	7	0	7	16	14	2	1	0	1	23	13	10
Grand Total	116	58	58	42	27	15	20	8	12	178	93	85

Dr. Dunn provides 116 total comments with 109 and 7 respectively for report and appendices. For the report 58 comments are flagged yes. This sum is 73% of the total yes flags by the panel. These are arrayed across sections 2 through 7 of the MFLs report. His comments account for most yes-flags for report sections 3 through 7. Dr. Dunn provided summary in his initial report (Attachment A). His Attachment A Table 1 lists 18 General Comments that are a distillation of yes flags covering the entire report. His initial report also provided a text summary of the findings and conclusions. Dr. Dunn's substantive comments cover the following issues:

- MFLs Setting Process is Yet Incomplete (See Attachment A, Dr. Dunn's Comments G1, G2),
- Process of parameterizing WRVs should be redone following recommendations (Dunn Comments G4, G6),
- Substantive comments in 2013 peer review of the current MFLs by the University of Florida were not completely addressed, these remain highly relevant today and should be addressed (Dunn Comments G5),
- Seasonality should be addressed comprehensively (Dunn Comments G11),
- Water Quality links to flow and level regimes need to be more deeply explored based on emerging research (Dunn Comments G14),
- Climate Change is not addressed, it needs to be (Dunn Comments G16),
- Update Underlying Science for approach to setting MFLs (Dunn Comments G8),
- Report lacks a comprehensive approach to Managing Uncertainty (Dunn Comments G10),
- Adaptive Management should be considered as the general approach to setting MFLs (Dunn Comments G9, G15).

In his report (Attachment B) Dr. Motz provides 42 comments in total, 26 on the report, and another 16 on Appendices B and C. Of the 26 on the main report, 13 are flagged yes as being substantive.

Dr. Motz's comments on the report focus on the following topics:

- Questions whether there are any additional groundwater data (Motz Comment 5) or any available spring discharges that should have been included in the draft MFL report (Motz Comments 6 and 7),
- Recommends a clarification that the NFSEG model area pumpage was used as the historical pumpage in determining RTF flows and setting MFLs (Motz Comments 10, 11 and 12), and
- Recommends that impacts of historic groundwater pumpage should be investigated by calculating RTF's for UFA wells at Lake City and near Lake Butler and for selected springs with observed discharges (Motz Comments 14 and 15).

Dr. Motz's comments on Appendices B and C focus on the following:

- Recommends a better explanation of how historic groundwater pumpage was determined (Motz Comments 28-32, 34 and 35),
- Recommends a better explanation of the RTF process and how impacts were determined using historical ***transient*** groundwater pumpage and the ***steady-state*** NFSEG groundwater model (Motz Comments 36, 38 and 40),

- Recommends that more details be provided concerning how impacts on surface-water discharges at three gages (Santa Fe River near Ft. White and at US HWY 41 and the Ichetucknee River at HWY 27) were determined using the NFSEG groundwater model (Motz Comments 39, 41 and 42), and
- Questions whether any RTF groundwater heads, or spring flows were determined for the MFL report (Motz Comment 42).

In his report (Attachment C) Dr. Munson provides 20 comments, 19 on the report, and one for Appendix C. Eight of 19 comments on report are flagged yes. Substantive issues identified are:

- Asks questions and requests additional supporting analyses for infilling data in hydro time series using multiple linear regression (MLR) method (Munson 4 and 5),
- A caution not to easily dismiss the presence of an AMO signal. He points to the range of AMO patterns observed by Kelly (2004) for rivers in Florida. Dr. Munson notes that the AMO pattern may be bimodal (Munson Comments 6 and 7),
- Requests additional discussion clarifying: 1) choices made for period of record for annual water use estimates for groundwater use (Munson Comments 9 and 2), question on RTF issues (Munson Comment 10),
- Requests additional discussion of the appropriateness of using reach apportionment methods for setting MFLs (Munson Comments 17 and 18).

Lack of comments on a given section of the MFLs report, and a predominance of No-flags given by panel members in tables are taken as general approval of those report sections. This is the case for report sections 1, and Appendices A, D, E and F.

The report gets good grades on overall water resources engineering and hydrology. Panel generally concurred with the data sources used, statistical and analytical methods applied, and the surface water and groundwater modeling selected, applied and presented. A major goal of this collected effort was to generate time series of daily flow and stage sequences for LSFR and IR with historic groundwater use, and without.

Drs. Motz and Munson by the nature of their respective fields of expertise focus on hydrology and water resource engineering issues in report Section 2, 5, 6 and 7. Dr. Motz makes significant comments to sections 2, 6 and 7, while Dr. Munson confines to 2 also and section 5. Their collective eight topics of substantive comments from the Yes flags. For the most part these cover the development of the RTF flow series. They do not provide much substantive comment on Sections 4, 5, and 6, the process of setting the MFLs. Dr. Dunn, however, makes a significant focus on the MFLs setting process. He makes 55 of his 58 Yes flags on the MFLs setting process from WRV selection, through evaluation of WRVs, to the recommended MFLs.

Reviews by Drs. Motz and Munson focus on the hydrology end of the report, that which yields the time series of flows and levels that are needed to evaluate the potential for harm analysis using the critical WRVs. Section 4 of the report lays out the approach to setting MFLs. It is here where Dr. Dunn finds some problematic decisions on approach and methods. He finds further that the problems cascade forward through evaluation of individual WRVs, the comparative sensitivity analysis of WRVs collectively, and ultimately into the MFLs proposed for both rivers and their priority springs.

There is agreement by all three reviewers that further action is needed to develop individual MFLs for the priority springs.

SUMMARY OF PANELS' FINDINGS AND RECOMMENDATIONS

Overview, as Chair I find that Sections 1, 2, 3, and parts of 4 of HSW's report are on solid basis technically. The resource inventories, data and analytical approaches are scientifically reasonable and appropriate, including data collection, development hydrological data time series, surface water (HEC-RAS) modeling, and the development of the reference flow regime are acceptable. The WRV screening process is well done. The general approach to habitat modeling and assessment using SEFA is also excellent. Problematic decisions, however, begin in Section 4.2 Indicators and Response Functions, on page 58 and continue onward to end of document.

The substantive issues raised collectively by the reviewers are distilled into eighteen sets of recommended actions. Greater detail on the issue and action can be found in the detailed comments from each reviewer (Attachments A, B and C). These are:

1. **Groundwater levels and spring flows—**Reviewer recommends that additional groundwater levels (Motz Comment 5) and spring discharge data (Motz Comments 6 and 7) should be analyzed to determine changes and trends in groundwater levels and spring discharges.
2. **Impacts of historic groundwater use—**Reviewer requests additional explanation concerning estimates of impacts of historic groundwater use (Motz Comments 13, 14 and15),
3. **Generation of RTFs—**Reviewer asks questions and makes suggested text changes in HSW's coverage of the development of the Reference Timeframe Flows at three gages (Motz Comments 12, 13, 14, 15 and 19),
4. **Rating curves for springs—**Reviewer comments on problems encountered with rating curves for springs and questions the conclusion that it is impractical "..to designate spring specific MFLs…at this time."(Motz Comments 22, 24 and 26).
5. **Historical groundwater use and impacts on surface-water discharges at three gages** – Reviewer concludes that better explanations are needed to justify how historical groundwater use (Appendix A) and RTF's were developed for flows at three gages

   (Santa Fe River near Ft. White and at US HWY 41 and the Ichetucknee River at HWY 27) using the NFSEG groundwater model (Appendix B) (Motz Comments 28-32, and 3442).
6. **Infilling Data—**Dr. Munson provided the following revision: *Reviewer asks questions and requests additional supporting analyses for infilling data in hydro time series using multiple linear regression (MLR) method (Munson Comments 4 and 5), After reviewing public comment and seeing the residuals from the MLR provided by the NFUCG (prepared by liquid solutions) the MLR used to hindcast the US441 gage likely does not represent the best possible analysis. The hindcast is not necessarily inadequate, given the Districts charge to use the best available data and that it is responding to an earlier peer review by including its best effort to generate a US441 record. However, better modeling is potentially easily obtainable, and Dr Munson recommends the district*

consider models other than an MLR using an ordinary least square (OLS) fit. The fact is the report does not provide enough information to assess adequately assess the MLR. R^2 above .7 is generally acceptable in such regressions. However, with evidence of OLS assumptions being violation the District could consider weighted least square (WLS), or more specifically Generalized least square (GLS) models to recreate the time series. GLS models have the advantageous of potentially dealing with the heteroskedasticity and the autocorrelation suggested by Liquid Solutions analysis. Dr. Munson points out that in their discussion of time-series recreation on the St. Marks River the NFWMD explored OLS, GLS, non-parametric and non-linear locally weighted regression (LOESS), as well as ARIMA modeling (an auto-regressive generalized model). In that case the LOESS model and the ARIMA model both performed well. The LOESS model was selected because it never predicted negative flow (which had never been observed) and so no further treatment of the results was needed. Their analysis was performed by Janicki Environmental and presented in the St. Marks River Rise and Spring Run MFL document. (Northwest Florida Water Management District, 2018: Recommended Minimum Flows for the St. Marks River Rise and Spring Run Leon County, Florida Appendix B: Development of Baseline Timeseries for the St. Marks River Raise Minimum Flows Evaluation)"

7. **AMO signal—**Reviewer cautions that report should not so easily dismiss the presence of an AMO signal. He points to the range of AMO patterns observed by Kelly 2004 for rivers in Florida. Dr. Munson specifically notes that the AMO pattern may be bimodal (Munson Comments 6 and 7),
8. **Development of RTFs—**Reviewer requests additional discussion clarifying: 1) choices made for period of record for annual water use estimates for groundwater use (Munson Comment 9), and issues concerning estimates of RTFs (Munson Comment 10),
9. **Use of the reach apportionment method—**Reviewer requests additional discussion of the appropriateness of using reach apportionment methods for setting MFLs (Munson Comments 17 and 18),
10. **The MFLs Setting Process is Incomplete—**Reviewer finds that the MFLs setting process for the Lower Santa Fe and Ichetucknee Rivers and their priority springs is incomplete. Overall, Dr. Dunn finds that the proposed re-evaluated MFLs are yet incomplete, since the latter parts of the process are problematic. He recommends that that problem areas be reevaluated and redone. Specific problems are identified in the definition and setting of indicators and metrics for WRVs, specifically the parameterization of the WRVs as they are used as the defining protective criteria for setting minimum flows and levels. Protective thresholds are set to prevent significant harm. Beyond identifying problems specific recommendations are given to address each problem. These remedial actions if implemented can significantly improve the scientific rigor of this MFLs setting effort. Dr. Dunn's specific comments on this topic are: G2, G3, 6.1, 6.2, 6.4. 6.5, 6.7, 6.8, 6.9, 6.10, 6.11, 6.15, 7.5, and 7.6.
11. **Parameterizing WRVs—**Reviewer finds that HSW's MFLs report has a major shortcoming in setting the proper indicators and metrics for several of the fourteen key WRVs elements. From this he concludes that reasonable assurance is not provided that the sensitive water resources of the LSFR & IR and their associated springs will be protected by the proposed MFLs. Dr. Dunn recommends that the WRV parameterization

process be redone following specific recommendations. This recommendation thus calls for the MFLs development process be rolled back to this point, the WRV parameterization step. Dr. Dunn's specific comments on this topic are: G4, G6, G14, 4.1, 4.5, 4.16, 5.1, 5.2, 5.3, 5.4, 5.5, 5.6, 5.8, 5.9, 5.10, 5.11, 5.12, 5.13, 5.14, 5.15, 5.16, 5.17, 5.18, 5.19, 5.20, 5.21, 5.22, 5.23, 5.25, 5.26, 5.27, 5.28, 5.29, 5.30, 5.31, 5.32, 5.33, 6.1, 6.4, 6.5, 6.7, 6.8, and 6.9.

- On the question of setting proper metrics for WRV of interest Dr. Dunn strongly recommend that whenever relevant and possible protective metrics for the MFLs be based on statistically defined protective hydrological events composed of 1) a magnitude (flow and/or level), 2) continuous duration for the specific inundation or drying period, and 3) with a return interval.
- The report's authors selected and applied only a single approach to setting metrics for WRVs, the 15% allowable change developed by SWFWMD. This is identified as key shortcoming.
- He advocates that a toolbox of methods be used to screen and select the best approach to setting WRV metrics. The toolbox should include a full array of options available and used by practitioners. Abundant examples exist from numerous from other MFL WRV metrics developed by the SRWMD and other sister districts. In addition, recent technical reviews of the field can help define the contents of the toolbox.
- Analysis by Graham et al. (2013) clearly show that sensitivity of flow and levels reductions can be quite different for WRV threshold metrics set using 15% change versus event metrics that include components of magnitude, duration and return interval (MDR). This strongly advocates for the reevaluated all the relevant WRV for both rivers, and their associated springs.

12. **UF Peer Review Panel—**Reviewer finds that major recommendations from 2013 peer review for MFLs that are now being re-evaluated (Graham et al. 2013) have not been fully followed. Key recommendations from the previous peer review (Graham et al. 2013) were not fully addressed in the previous peer review for the initial MFLs adopted in 2015. Furthermore, all of these remain problematic in this re-evaluation. Dr. Dunn's specific comment on this topic is G5. Graham et al. (2013) as yet not fully addressed significant concerns were:
    - To prevent significant harm MFLs threshold metrics should include consideration of duration and return interval of both low flow and high flow events in addition to cumulative frequency. They state concerns with the use of flow duration curves

      (FDCs) alone to characterize the flow regime as they may not adequately relate important biological, or ecological responses to variations in the flow regime. Five critical components of flow regime are frequently recognized in the it when assessing environmental flows: 1) magnitude, 2) return interval 3), duration 4), timing, and 5) rate of change
    - The Panel recommended that the 15% threshold of change be more fully justified as it applies specifically to the LSF and Ichetucknee Rivers. They found that justification for the proposed threshold of a 15% habitat loss in the establishment of MFLs is based on precedent and cannot be justified based on the data presented in

the report. So, while there is a precedent for the adoption of the 15% threshold, its general applicability is unproven. While the panel[2] encourages the District to make a practical attempt to report on the uncertainty and subjectivity of the 15% threshold, the 15% criteria provides consistency with MFL's developed throughout the state.

- Panel found that quite different outcomes result from applying the % change method versus events with return intervals. Their Table 1 table is comparison of 15% allowable flow reductions by WRV for LSFR range from 5-8 percent but change in return interval for WRV events range from 14 to 29 percent, for the IR the numbers are 3-12%, versus 27-45%.
- In the face of uncertainties caused by absence of key supporting data, the panel urged the District to adopt an adaptive management (AM) approach allowing decisions based on limited data to be reinforced or modified as new research and monitoring information become available

13. **Seasonality—**Reviewer finds that report needs to address seasonality issues when they are relevant to defining WRVs and setting their metrics. How seasonality is handled should be stated in the approach for defining WRVs. Seasonality typically adds components of seasonal occurrence and duration of that seasonal window. So, using an event-based metric seems both prudent, and a scientifically defensible choice. Also, if this were being done by the SJRWMD, then the event would be defined. I am sure that SJR District has many examples from established MFLs. Dr. Dunn's specific comments on this topic are: G11, 3.18, 5.9, and 5.10.
14. **Water Quality Nexus to Flow Regime –**Reviewer notes that there are clearly identified water quality impairments of concerns in these rivers and springs. These key water quality issues remain largely divorced from consideration in this MFL. Several recent research findings indicate however, that some water quality problems do have link with flow regimes. As WRV metrics will now be assessed anew we may have the opportunity to incorporate meaningful water quality thresholds in one or more WRV metrics. Dr. Dunn's specific comments on this topic are: G14, 5.30, and 7.6.
15. **Climate Change is Upon Us—**Reviewer asks about impact of climate change. Climate change is not addressed in the document. MFLs are by their nature our estimates of sustainable resource management. If we are indeed in a time of climate change, then the assumptions upon which we base MFL type sustainability may not hold in the future. In statistical hydrology this is a question of stationarity of the statistical populations comprising our climate driven time series data for temperature, rainfall, runoff, aquifer recharge, etc. The consensus of climate experts is that key time series are in flux, that is they are statistically non-stationary. Climate change is another element of uncertainty, it needs to be discussed, and likely impacts identified and planned for. Dr. Dunn's specific comment on this topic is G16. In addition, Dr. Motz notes that the draft MFL report (HSW Engineering 2019) does not address the impacts that climate change will have on stream flows and groundwater and surface-water levels in the Lower Santa Fe River and Ichetucknee River Basins. Also, impacts of climate change on the Priority Springs

[2] The term "Panel" in this sentence is intended to have the same meaning as the term "PRP" as otherwise used herein. (Chair's footnote, not approved by entire panel)

ATTACHMENT A - PEER REVIEW FORMS: REPORT FROM WILLIAM DUNN, PH.D.

PEER REVIEW FORM

SUWANNEE RIVERE WATER MANAGEMENT DISTRICT

Project or Report Name: Technical Report-Minimum Flows and Minimum Levels Re-Evaluation for the Lower Santa Fe and Ichetucknee Rivers and Priority Springs

Name and Affiliation of Reviewer: William J. Dunn, Ph.D., Senior Scientist, Barnes Ferland and Associates

Discipline specialty/specialties covered by this review: Development of protective metrics for MFLs

This document is for the use of project Peer Review Chair retained by the Suwannee River Water Management District (District) for the purpose of providing a technical peer review of a District report, including manuscripts prepared by District staff and consultants.

REVIEW REQUIRED BY THE DISTRICT:

1. **Determine whether the methods used for establishing the minimum flows are scientifically reasonable.**

A. Supporting Data and Information: Review the data and information that supports the method and the proposed minimum flows, as appropriate. The reviewer shall assume the following:
   1. The data and information used were properly collected;
   2. Reasonable quality assurance assessments were performed on the data and information;

   Note: The reviewers are not expected to provide independent review of standard procedures used as part of institutional programs that have been established for the purpose of collecting data, such as the USGS and SRWMD hydrologic monitoring networks.

B. Technical Assumptions: Review the technical assumptions inherent in the methodology and determine:
   1. If the assumptions are clearly stated, reasonable and consistent with the best information available; and
   2. Assumptions were eliminated to the extent possible, based on available information.

C. Procedures and Analyses: Review the procedures and analyses used in developing quantitative measures and determine qualitatively whether:

1. The procedures and analyses were appropriate and reasonable, based on the best available;
2. The procedures and analyses incorporate appropriate factors;
3. The procedures and analyses were correctly applied;
4. Limitations and imprecision in the information were reasonably handled;
5. The procedures and analyses are repeatable;
6. Conclusions based on the procedures and analyses are supported by the data.

***2.* If a proposed method used in the MFL report is not scientifically reasonable, the CONTRACTOR shall:**

A. Deficiencies: List and describe scientific deficiencies;
B. Remedies: Determine if the identified deficiencies can be remedied and provide suggested remedies;
C. If the identified deficiencies can be remedied, then describe the necessary corrections and, if possible provide an estimate of time and effort required to develop and implement; and
D. If the identified deficiencies cannot be remedied, then, if possible, identify one or more alternative methods that are scientifically reasonable, based on published literature to the extent feasible.

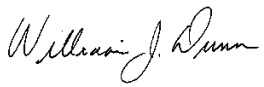
REVIEW CONSTRAINTS

CONTRACTOR and Peer Review Chair shall acknowledge the statutory constraints and conditions (Sections 373.042 and 373.0421, Florida Statutes) affecting the DISTRICT's development of MFLs. CONTRACTOR and Peer Review Chair shall also acknowledge that review of certain assumptions, conditions, and established legal and policy interpretations of the Governing Board (hereinafter referred to as "givens") is not included in the scope of work. These givens include:

1. The selection of waterbodies or aquifers for which minimum flow and/or levels have initially been set;
2. The consideration given to changes and structural alterations to watersheds, surface waters, and aquifers, and the effects and constrains that such changes or alterations have had or placed on the hydrology of a given watershed, surface water, or aquifer;
3. The method(s) used for establishing MFLs for other waterbodies and aquifers; and
4. Standard procedures used as part of institutional programs that have been established for the purpose of collecting data, such as the USGS and SRWMD hydrologic monitoring networks.

Instructions:

1. The results of this review are for the use of the District and they are not to be revealed to others without the express permission of the District.
2. By signing this form, the reviewer certifies that the peer review was conducted according to the guidelines listed above and that the opinions and recommendations included in the review constitute an independent review per Chapter 373.042(5), in the discipline noted above.
3. The reviewer also certifies that the review was conducted according to the Scope and Conditions specified above.

Signature of Reviewer	**Date of Peer Review: February 21, 2020**
	

Responders Certification: The comments and criticisms provided by the Peer Review Chair have been addressed as noted in column C in a separate response document, which is attached, and in the report.

Name and Affiliation of Responder to Peer Review Comments:
Signature of Responder: **Date of Response:**

TABLE 1. SUMMARY REVIEW COMMENTS ON MFL DOCUMENTS

Comment No.	Figure, Table, or Page and Paragraph Number	Does Comment Directly and Materially Affect Conclusions of Report? (Yes/No)	To be completed by Reviewer(s)		To be completed by Report Author(s)
			A. Reviewer's Specific Comments	B. Reviewer's Specific Recommended Corrective Action	C. Action to be Taken in Response to Comment
G1	General comment	Yes	Overall the proposed re-evaluated MFLs are yet incomplete based on this technical peer review. Very specific recommendations are given to address problems. These actions if implemented can significantly improve the scientific rigor of this MFLs setting proves. Until the issues identified are resolved, I conclude that this re-evaluation is incomplete, and I cannot support the recommended MFLs.	Follow recommendations provided in this peer review.	
G2	General comment	Yes	Shortcomings lead me to conclude that reasonable assurance is not provided that the sensitive water resources of the LSFR & IR and their associated springs will be protected.	Follow recommendations provided in this peer review.	
G3	General comment	Yes	Sections 1, 2, 3, and parts of 4 are on solid basis technically. The resource inventories, data and analytical approaches are scientifically reasonable and appropriate, including data collection, development hydrological data	Follow recommendations provided in this peer review.	

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			time series, surface water (HEC-RAS) modeling, and the development of the reference flow regime are acceptable. The WRV screening process is well done. The general approach to habitat modeling and assessment using SEFA is also excellent. Problematic decisions begin in Section 4.2 Indicators and Response Functions, on page 58 and continue onward to end of document.		
G4	General comment	Yes	I very strongly recommend that whenever possible protective metrics for the MFLs be based on statistically defined protective hydrological events composed of 1) a magnitude (flow and/or level), 2) continuous duration for the specific inundation or drying period, and 3) with a return interval.	Follow recommendations provided in this peer review.	
G5	General comment	Yes	1. Major recommendations from 2013 peer review (Graham et al. 2013) have not been followed. Key recommendations from the previous peer review (Graham et al. 2013) were not addressed in peer review process for the initial MFLs adopted	Peer panel provided specific recommendations for hydrology and for setting metrics for WRV elements.	

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			in 2015. Furthermore, these remain problematic in this re-evaluation. 2. To prevent significant harm MFLs threshold metrics should include consideration of duration and return interval of both low flow and high flow events in addition to cumulative frequency. They state concerns with the use of flow duration curves (FDCs) alone to characterize the flow regime as they may not adequately relate important biological, or ecological responses to variations in the flow regime. Five critical components of flow regime are frequently recognized in the it when assessing environmental flows: 1) magnitude, 2) return interval 3), duration 4), timing, and 5) rate of change 3. The Panel recommends that the 15% threshold of change be more fully justified as it applies specifically to the LSF and Ichetucknee Rivers. They find that justification for the proposed threshold of a 15% habitat loss in the establishment of MFLs is based on precedent and cannot be		

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			justified based on the data presented in the report. So, while there is a precedent for the adoption of the 15% threshold, its general applicability is unproven 4. Comparison of allowable flow reductions based on a 15% decrease in number of days a critical flow is exceeded and the percent change in return interval of a critical event duration that would occur when applying the proposed allowable flow reductions… their Table 1 table is comparison of allowable flow reductions by WRV for LSFR range from 5-8 percent, but change in return interval for WRV events range from 14 to 29 percent, for the IR the numbers are 3-12%, versus 27-45%. 5. In absence of key supporting data, the panel urges the District to adopt an adaptive management approach allowing decisions based on limited data to be reinforced or modified as new research and monitoring information become available		

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G6	General comment	Yes	The report's authors considered only a single approach to setting metrics for WRVs. Rather as a general approach, a toolbox of methods should be screened for the best available method/approach. Examples are numerous from other MFL WRV metrics developed by the SRWMD and other sister districts.	Follow recommendations provided in this peer review. Toolbox actual ant thought process needs to be developed and used.	
G8	General comment	Yes	Update the science for methods used to set minimum flows and levels, specifically the WRV metrics.	Water for the Environment: From Policy and Science to Implementation and Management, Edited by Avril C. Horne, J. Angus Webb, Michael J. Stewardson, Brian Richter and Mike Acreman. Academic Press, 2017, 720 pages. Chapter 11—Evolution of Environmental Flows Assessment Science, Principles and Methodologies by Poff, N.F., and R.E. Tharme, and A.H. Arthington. 13—Physical Habitat Modeling and Ecohydrological Tools by Lamoureux, N., C.H. Hauer, M.J. Stewardson, and N.L. Poff. 14—Models of Ecological Responses to Flow Regime	

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				Change to Inform Environmental Flows Assessments by Webb, J.A., A.H. Arthington, and J.D. Olden. 15—Uncertainty and Environmental Water by Lowe, L., J. Szemis, and J.A. Webb 16 Water Budgets to Inform Sustainable Water Management by Richter, B. and S. Orr 25--Principles of Monitoring, Evaluation, and Adaptive Management of Environmental Water Regimes by Webb, J.A., R.J. Watts, C. Allan, and A.T. Warner. 27--Moving Forward: The Implementation Challenge for Environmental Water Management by Horne, A.C., E.L. O'Donnell, M. Acreman, M.E. McClain, N.L. Poff, A.J. Webb, M.J. Stewardson, N.R. Bond, B. Richter, A.H. Arthington, R,E. Tharme, D.E. Garrick, K.A. Danielli, K.C..Conallin, G.A. Thomas, and B.T. Hart.	

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G9	General comment	Yes	An explicit adaptive management (AM) framework is missing, it should be added and used as a guiding principle. This is a repeat of a major recommendation by UF's peer review panel's finding and recommendations from five years ago (Graham et al. 2013).	Follow recommendations provided in this peer review.	
G10	General comment	Yes	Report lacks an integrated treatment of the sources of uncertainty. Uncertainty issues are discussed throughout the report, and are key to many of key decisions made for choosing methods of analysis, time series data, etc. Management if uncertainty moving forward is not highlighted, and it should be.	Add a discussion on the major sources of uncertainty, and their respective and collective uncertainty effect on the development of the recommended minimum levels.	
G11	General comment	Yes	Report needs to address seasonality issues when defining WRV and setting their metrics. How seasonality is handled should be stated in the approach for defining WRVs. Seasonality typically adds components of seasonal occurrence and duration. So, using an event-based metric seems both prudent, and a scientifically defensible choice. Also, if this were being done by the SJRWMD, then the event would be	Revise report to include more comprehensive treatment of seasonality. Seasonality as a component of WRV metrics should be expected, or likely based on experience with the applying the WRVs to riverine and spring run systems.	

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			defined. I am sure that SJR District has many examples from established MFLs.		
G12	General comment	Yes	Analysis by others clearly show that sensitivity of flow and levels reductions can be quite different for WRV metrics set using 15% change versus event metrics that include components of magnitude, duration and return interval (MDR).	Follow recommendations provided in this peer review. The District has used event based criteria for setting WRV metrics for MFLs for lakes (Lakes Brooker, Hampton, Santa Fe, and Alto.	
G13	General comment	Yes	Significant revisions to the MFLs setting process for the LSFR, IR and their associated priority springs is needed. The WRV response functions, indicators and metrics used in this report must be re-evaluated, and then revised if warranted. At a minimum this should include significant revision to Sections 4, 5, 6 and 7 of HSW's report. The sequence of steps necessary to do this is covered in Recommendations section of this report.	Detailed recommendations on how the this do are provided. The District has used event based criteria for setting WRV metrics for MFLs for lakes (Lakes Brooker, Hampton, Santa Fe, and Alto.	
G14	General comment	Yes	Key water quality issues reflecting the health of these two rivers and their associated springs remain largely divorced from consideration in this MFL. Several recent research findings indicate	Follow recommendations provided in this peer review.	

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			however, that some water quality problems do have link with flow regimes. As WRV metrics will now be assessed anew we may have the opportunity to incorporate meaningful water quality thresholds in one or more WRV metrics.		
G15	General comment	Yes	An explicit AM framework for the process is recommended as the tool for addressing and managing uncertainty. Sources of uncertainty in this MFL setting process include: • Groundwater modeling • Surface water modeling • Water budget develop • Reference flow developed for assess impacts of historic consumptive use • Selection of relevant WRVs • Water quality • Effects of climate change	Follow recommendations provided in this peer review.	

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G16	General comment	Yes	What about impact of climate change? Climate change is not addressed. MFLs are by their nature our estimates of resource sustainability. If we are in time of change, then the assumptions upon which we base MFL type sustainability may not hold. In statistical hydrology this is a question of stationarity of the statistical populations comprising our climate driven time series data for temperature, rainfall, runoff, aquifer recharge, etc. The consensus of climate experts is that key time series are in flux, that is they are statistically non-stationary. This is another element of uncertainty, it needs to be discussed, and likely impacts identified and planned for.	Follow recommendations provided in this peer review.	
G17	General comment	Yes	Setting individual MFLs for priority springs is problematic due to uncertainty	Follow recommendations provided in this peer review.	
G18	General comment	Yes	The overall science behind this process of setting environmental flows for the rivers and springs in north Florida needs to be updated. The state of the science is	Follow recommendations provided in this peer review.	

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			evolving. The field has moved considerably beyond change threshold metrics based solely on a percent allowable change. A good start might be with a recent book Water for The Environment (Horne et al. editors, 2017) provides in depth reviews of current status of theory practice, research and application.		
	1.0 Introduction: pages1-3 with Figure 1.				
1.1		No	I accept the content of this section. It covers: the rule-based peer review process, the list water resource values the ten WRVs identified in the Water Resource Implementation Rule (62-40.473, FAC), and an overview of the watershed and study area.	No further action required.	
	2.0 Hydrology: pages 4-28.				
2.1	Page 4	No	First paragraph—I agree starting assumption about approach.	No further action required.	

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2.2	Pages 4-8	No	I accept the content of these report sections. Including supporting Figures 2, 3 and 4.	No further action required.	
2.3	Page 8	No	I accept the focus on the Ft. White and US441 on the LSFR, and HWY 27 gage on IR.	No further action required.	
2.4	Page 9, Table 1	No	Most recent gage data I cited as 2015. Is there more recent data that can added? Will extending the respective time series help?	If the most current available data is not being used, then please provide reason why.	
2.5	Page 11	No	Bottom paragraph—states an assumption about LOESS procedure. I agree with the choice of a smoothing parameter of 0.33.	No further action required.	
2.6	Page 12	No	Section covers the need for infilling data series using multiple linear regression (MLR) I concur that need exists, and I concur with the method selected.	No further action required.	
2.7	Page 12, 2.3.3 Watershed Yield	No	I agree that watershed yield is a useful parameter to characterize flow changes in the watershed.	No further action required.	
2.8	Page 13	No	Figures 6 and 7. Figure 6 flow exceedance for Ft White, US441, and Hwy 27 gages. Figure 7 annual average flows at Ft White and Hwy 27 gages. It	Please complete the labeling.	

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			appears that LOESS is included for Ft White, but this is not labeled, or otherwise indicated.		
2.9	Pages 14-15, discussion of AMO	No	2.3.4 Atlantic Multidecadal Oscillation—authors conclude that AMO is not observed in time series. Do I agree? Maybe, I am not certain. Page 15—Figures 8 and 9. Fig. 8 is AMO surface temperature sequence. Figure 9 is flow exceedances for AMO warm vs cool periods for SFR at Ft White and Worthington Springs. Appears to be no apparent AMO effect.	Please confirm that District staff agree with authors conclusion that the AMO cycle is not a strong signal in the data. Beyond the AMO issues the authors do need to also address the potential effect of climate change on the health of the LSFR and IR, and their associated artesian springs. This is covered in comment G16.	
2.10	Page 14, Section 2.3.5 Rainfall and Air Temperature	No	2.3.5 Rainfall and Air Temperature—first paragraph—agree with use of PRISM? Yes	No further action required.	
2.12	Page 18	No	2.3.6 Groundwater Level—do I agree with choices for GW monitor wells? Yes, I do, but I am interested response by Dr. Motz my fellow panel member and a groundwater modeling expert.	No further action required.	

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2.13	Pages 22, Section 2.5 Surface Water Quality	No	Surface water quality: Page 22—Figure 16 in part. Fig. 16 Nitrate levels in LSFR, cited source as Florida Springs Institute (2012). Question—any data more recent than what appears to be 2010? Next, two locations plotted High Springs and Ft White-both trend lines appear to be declining over period 1987 to 2010. Also, concentrations at FW look to be twice that at High Springs. Please discuss. 2.5—Surface Water Quality—text covers nitrate issues and	Please provide answers to questions.	
2.14	Page 23	No	TMDLs, and the FDEP threshold of 0.35 mg/L. Figure 17. Nitrate levels in LSFR springs, source cited as Florida Springs Institute (2012). Question—any data more recent than what appears to be 2010? Data from Seven springs: some trendlines declining others rising. trend lines appear to be declining over period 1990 to 2010. Agree? Also, concentrations at Blue and Ginnie look to be 2-4X that at the remaining	Please provide answers to questions.	

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			5…agree? So, looks like Blue and Ginnie are not in compliance with the 0.35 mg/L standard. Agree?		
2.15	Page 23, Section 2.6 Groundwater Use	No	Content of this section is very important feed into this exercise. For this review however none of it can be verified from what is in the report. That includes the single paragraph of text and supporting Figures 19 and 20. Secondly, it seems that this section should be referencing Appendix B: Water Use Hindcasting.	Add text to reference Appendix B	
2.16	Pages 24-28, Section 2.7 Reference Timeframe Flow	No	Content of this section is very important feed into this exercise. For this review however none of it can be verified from what is in the report. That includes the single paragraph of text and supporting Figure 21.	No further action required	
2.17	Pages 24 and 26, Section 2.7 Reference Timeframe flow	No	Text for intro to 2.7 Reference Timeframe Flow (RTF). I concur with approach to generate the RTF. It appears to be reasonable approach. See the remaining pages in this section and supporting material in Appendix B and C.	No further action required	

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2.18	Page 25, Section 2.7.1 Flow Characteristics	No	Figures 19 and 20. Breakout of water use in planning area. Both figures look reasonable.	No further action required	
2.19	Page 27, Figures 22 and 23	No	Figures 22 and 23. Fig 22—flow exceedances for Ft. White and US441. Fig 23 flow exceedances for IR at HWY 27. Plots show that the RTF vs measured flows differ very little. Can hardly see differences.	No further action required	
2.20	Page 28, Figure 24	No	Figure 24--Temporal change in relative difference between RTF and measured flow at FW, US441, and Hwy27. Plots by gage have data overlying each other, so this is difficult figure to interpret. May help to drill down on residuals.	Can clarity of figure be improved?	
	3.0 Biology: pages 29-55				
3.1	Page 29	Yes	3.1 intro to the Conceptual Ecological model. This CES is a simple linear flow diagram of cascading influences. It is an effective visual for this introduction Text for introductory paragraph list of six effects of flow alteration on ecosystems.	Introduction covering the conceptual ecological model in text on pages 29 and 30 and including Figure 25 are acceptable. Consider updating this conceptual overview following	

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			Text in section 3.1 references Poff et al. 1997, this reference is foundational to the field, but it is a bit old. Suggest that the science update can carry over to the conceptual framing of the biological communities.	the update the science. A more detailed recommendation on how to move this forward is included as comment G8.	
3.2	Page 31	No	Page 31—Figure 26 in part, Conceptual trophic model. This a another very simple trophic pyramid but highlights the major taxonomic groups of aquatic insects the Ephemeroptera, Plecoptera, and Trichoptera (EPS). Arrows in the figure are not labeled, so it not clear what the transfers represent.	Please annotate the figure or legend to make it clear what the arrow flows represent.	
3.3	Pages 37-38	Yes	Table 4, Effects of hydrologic factors on floodplain vegetation. Neither table nor text cover the dewatering and stays-dry end of the full hydrologic regime. This is an oversight that needs to be corrected.	Please revise Table 25 and supporting text to cover the critical need for dewatering events. There are very good review articles covering this topic in detail.	
3.4	Page 39	No	Text 3.4.1 SAV—details of SAV coverage are given, but these are not directly verified. Historic SAV survey covered in reports by FDEP and others.	Can summary acreage value be added to figure?	

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			Figure 33, two maps showing extent of LSFR floodplain wetlands, and 10-year flood zone. Legend shows emergent wetlands, but I do not see that in either of the two figures It would help to know the acreage area values for the different vegetation types displayed.		
3.5	Page 40	No	Figure 34. Extent of IR floodplain wetlands, and Flood Zone A It would help to know the acreage area values for the different vegetation types displayed.	Can summary acreage value be added to figure?	
3.6	Page 41	No	Table 5 in part. List of SAV species identified during a 2017 survey of LSFR (Morris et al 2017). Text following highlights SAV. Notes effect of recreational use on SAV, by the tubers. Table 4--Check scientific name for Chara. The name scientific name provided appears to be an error. Species lists on page 41lists look good and as complete as needed. Lists are acceptable but cannot be independently	Please check the Latin name for species, the specific epithet, of Chara. Please an answer the question about long-term drought and potential effects of climate change.	

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			verified. Lists comport with my knowledge of these habitats, the rivers and springs of the SR district, and observation from the two field trips in May 2019 covering the IR and LSFR respectively. Final para comments on impacts of recreational use, especially during long-term drought conditions. This begs the question…do the MFLs address this? Do they protect from impact during long-term drought? What about climate change?		
3.7	Page 42	No	Figure 35, Location of SAV transects on IR. Visited a couple of these transects. Number and spatial distribution appear to be a good plan to characterize the habitats in the IR. I visited a number of these transects during field inspection. This page is fine as is.	No further action required.	
3.8	Page 43	No	Figure 36 in part, Upper IR SAV transect summary, from FSI 2016. Figure is a good visual time series summary of SAV dynamics. Shows that species change occurs through time. Note the demise of Chara from 1998 to 2004. Is this	Please provide answers to questions.	

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			significant? Are SAV species interchangeable? Is some better habitat? Several paragraphs of new text covering factors that affect SAV. Last paragraph of page mentions research by Hensley and Cohen 2017 on effect of flow reversals, that is there may be negative effects on algal consumers. This argument may need to be carried forward as explanatory, or exploratory. Authors certainly suggest causal relationship that should be explored further.		
3.9	Page 44	No	Table 6 starts at bottom of page. List of species of fish found in the SFR 1972-2018. There are 50+ species. Table is fine as is.	No further action required.	
3.10	Page 44	No	Begins text on Aquatic Macroinvertebrates 3.4.2. First sentence states these populations in the LSFR are healthy based on water quality and community sampling, the work done by others. Cannot verify by what is in report, I assume that these studies are interpreted correctly for the LSFR and IR	No further action required.	

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3.11	Pages 45-46	No	Begin text, 3.4.3 Fish. Basic descriptions of fish sampling on SFR and IR. Table 6 continued listing fish species found in the SFR. Also, Table 7 in part, Fish species in IR. Some text, 3.4.4 intro to T&E Species. Table 7 is fine as is.	No further action required.	
3.12	Page 47	No	Section3.4.4 Threatened and Endangered Species. The content of this is fine Table 8. Species deemed likely to be at risk from LSJR/IR flow and water level reductions. Also, paragraph on T&E species. Both Table 8 and text coverage are fine as is, and therefore acceptable.	No further action required.	
3.13	Pages 48-49	No	Lower page begin text on manatee, 3.4.5. Frames manatee habitat as for thermal refuge. Question--should thermal refuge be an event-based criterion, such as SJRWMD does for Volusia Blue Springs? Figure 37 mostly, Comparison of water temps in 2017 and 2018 at Blue Hole, The IR, and LSFR. What should we	Pleas provide responses to questions.	

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			conclude from these data time series summaries? Both figures in Figure 37 look to be fine/acceptable. Cannot independently validate.		
3.14	Pages 50-51	No	Tables 9 and 10. Table 9 manatee counts in LSFR (2005-2018). Table 10 Counts in IR (1992-2018). Cannot independently verify manatee sighting records. Tables are thus acceptable. Table 8 continued in part. Text 3.4.6 on silt snail. Text covers protective criteria for thermal refuge. I agree.	No further action is required.	
3.15	Page 52	No	Text begins, 2.4.6 Ichetucknee silt snail. Biology of species and habitat preference are covered. Cannot independently verify silt snail information. Text is therefore presumed to be accurate, and thus acceptable. Based on observations of Coffee Spring, concur that habitat is quite small. Species designated as species of greatest conservation need by FF&WCC.	No further action is required.	

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			It is not clear that the species is at risk, but since it is included in this report, then yes, the concern is stated. And I concur		
3.16	Page 53	No	Text on Oval pigtoe mussel, Gulf sturgeon, Suwannee bass continues. Text covers the basic threat to these species. I concur with these threat assessments. For Suwannee bass, the basic research cited is 35 years old. Is that OK? Content of page is fine as is.	Please answer question about Suwannee bass.	
3.17	Page 54	No	Figure 40 Extent of gulf sturgeon critical habitat. Figure 40 is a bit confusing as it is reproduced from and references other reports.	Is there a better figure to use in place of this one?	
3.18	Page 55	Yes	Table 11. Seasonality of fish spawning for select species. Brief text on seasonality in section 3.4.10. Figure shows spawning seasons for six major fish species. Should all this seasonal info be captured in the protective events? I say yes.	Please respond to question.	

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	4.0 Approach to Setting MFLs: pages 56-74				
4.1	Page 56	Yes	Text 4.0 Approach to setting MFLs, two paragraphs. Last sentence in second paragraph mentions flow duration curves as the organizing idea for assessing hydrologic change. I disagree, as already noted this is too simplistic to protect the flow regime in these rivers and springs, and I know where this leads in the rest of the document. So, this is an opportunity emphasize the hydrologic regime. I do however concur with this basic coverage of the ten WRVs and the breakout to the 14 WRV elements in Table 12.		
4.2	Page 56	No	Text: 4.0 Intro, two short paragraphs that describe approach. First is mention of the RTFs, and key assumptions: RTFs are protective of the systems and WRVs, and that some amount of water is available within the RTF regime. Do I agree? Mostly yes. This is the basis of most MFLs for rivers, springs, lakes and wetlands.	This MFL setting process must be re-evaluated and updated. At a minimum this should include significant revision to Sections 4, 5, 6 and 7 of HSW's report. The sequence of steps necessary to do this is covered in Recommendations section of this report.	

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			Second paragraph has a few more key assumptions in how to identify the most relevant WVs. I concur with the approach. Final sentence mentions flow duration curve, which may be a subtle warning		
4.3	Page 57	Yes	Section 4.1.8, WRV 8 sediment loads—report notes that there is lack of data regarding sediment loads for these rivers. This is uncertainty issue. Do they eventually make recommendations for reducing uncertainty? Does the uncertainty make this WRV less valuable? Less Reliable?	Please provide answers to questions.	
4.4	Page 58	No	Section 4.2, Indicators and response functions. I generally agree with the examples they have listed. And these carry over to the details in Table 12.	No further action required.	
4.5	Pages 60-61	Yes	Table 12 Selected indicators, response functions, and MFLs assessment metrics for WRVs Table 12 Table is the creation of each indicator for each WRV selected. I concur with the content of the first two columns, the indicators, and their	This MFL setting process must be re-evaluated and updated. At a minimum this should include significant revision to Sections 4, 5, 6 and 7 of HSW's report. The sequence of steps necessary to do this is covered in	

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			relevance. The next two columns become more problematic: the WRV's response function, and its metric. Authors choose an across the board percent change approach to response functions and metric for all 14 proposed protective metrics. I strongly disagree with the % change approach.	Recommendations section of this report.	
4.6	Pages 62-63	No	Section 4.3 HEC-RAS Modeling: I agree with choice of HEC_RAS model. I have no sound technical reason to reject the choice. Text, 4.3.1 HEC-RAS Modeling. See also Appendix D Text, 4.3.1.1 Model development—I accept the choices and assumptions made for selection of HEC-RAS model, model development, and model revisions from the version used for the previous MFL.	No further action required.	
4.7	Page 64	No	Text, coverage of calculating values of model fit, based on Nash & Sutcliff 1970). I agree with the method.	No further action required.	

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4.8	Page 65	No	HEC-RAS model Second paragraph, I do agree with premise laid out on ranking and acceptance of efficiency coefficient values. I find that Section 4.3 for the report is general summary of the more extensive coverage of the HEC_RAS model in Appendix D. I do not identify any inconsistencies between this text and Appendices D and D1.	No further action required.	
4.9	Page 65	No	It appears that the HEC-RAS used for the initial MFLs is revised here. If so, then does the update address the issues raised by Graham et al. (2013)? Is uncertainty being addressed in the model revision process?	Please answer the questions.	
4.10	Page 66	No	I find that text in report agrees with information that is presented in more detail in Appendix D. Table 13 presents the Final Transient Model Results. I have no reason to doubt the veracity of results presented	No further action required.	

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4.11	Page 67	No	Table 14: Nash Sutcliff coefficient of model fit efficiency for streamflow gages on LSFR and IR. Table 15 Proportion of all simulated value daily water depths values within 10, 15 and 20% of the measured values of Nash-Sutcliff coefficients. Content of both tables is acceptable as is. For Table 15 what problems and/or uncertainties arise from the two gages rated as unsatisfactory?	Please answer the question.	
4.12	Page 68	No	Section 4.3.1.3 HEC-RAS Steady State Model Development and predictive simulations: I agree with use of the steady state model to generate the flow profiles that follow in Figure 43.	No further action required.	
4.13	Page 69	No	Figure 43, two-part plot of flow profiles for select non-exceedance frequencies for LSFR and IR, respectively. Cannot independently verify, so I accept as	No further action required.	
4.14	Page 70	No	Figures 44 and 45. Figure 44, steady state water profiles for select flow non-exceedance for LSFR. Figure 45, steady	No further action required.	

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			state water profiles for select flow non-exceedance for IR. Cannot independently verify, so I accept as valid representations.		
4.15	Page 71-73	Yes	As a general comment on SEFA I support the use of this habitat analysis method. SEFA is a good choice. SEFA is much highlighted in the Horne et al. 2017 review volume. Next, I found that the SFA analyses presented are scientifically reasonable, and reproducible, for: 1) taxa-species-life stage used 2) transect locations, and 3) data inputs from the HEC_RAS model	In general, the use and application of SEFA is acceptable. If habitat relevant WRVs must be reevaluated, then SEFA analyses will likely have to be re-done too. Findings, outcomes and recommendations may change as result.	
4.16	Pages 73-74	Yes	Text, 4.4 MFLs Assessment Methods. I have significant disagreement on methods used. Beginning in third paragraph, the adoption of the % change method is invoked. The final sentence in the paragraph claims that this is an event-based approach, citing Neubauer et al. 2008. I find this misleading. The two methods are quite different. I explain this in detail elsewhere.	This MFL setting process must be re-evaluated and updated. At a minimum this should include significant revision to Sections 4, 5, 6 and 7 of HSW's report. The sequence of steps necessary to do this is covered in both the Recommendations section of this report, and in General comments 1 through 18 above.	

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			Text continues MFLs Assessment Method. I have significant disagreement on methods used. Significant disagreement in choice made to use only frequency change criteria for WRV indictors. And adoption of SWFWMD's 15% allowable change. Authors make no mention of other approaches, such as event based. In fact, text on the event-based method that was included in the April draft document has been deleted. In addition, Graham et al. 2013 included a major recommendation for change to approach for setting metrics for a group of the WRVs. Their recommendation was not acted on then, and so remains relevant still. Finally, in Poff et al. 2017 review of the state of science in setting environmental flows shows that frequency change measures are much earlier generation of hydrologic change method. The simple frequency change method has shortcomings that are better addressed by event-based methods that can address more detailed aspects of the hydrologic regime.		

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	5.0 Evaluation of WRVs, Section 5, pages 75-98				
5.1	Page 75	Yes	Figure 47 Threshold flow translation between Ft White and US441 (percent of time that flow is exceeded). It is helpful to see all the threshold flows for both rivers arrayed on FDCs from their respective RTFs. So, the figure itself is an illustrative visual. But where did the threshold values come from? The threshold values were not directly presented in Table 12. I agree with assumption regarding level of protection WRVs provide to the river and spring systems state in the first paragraph. Second paragraph: I accept the method used for the translation of threshold flows from US441 to Ft. White gage. Text indicates the emphasis of the percent change approach using flow duration curves (FDCs). I do not agree with the reliance upon this approach for	This MFL setting process must be re-evaluated and updated. At a minimum this should include significant revision to Sections 4, 5, 6 and 7 of HSW's report. The sequence of steps necessary to do this is covered in both the Recommendations section of this report, and in General comments 1 through 18 above.	

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			all WRVs. This is a major problem with this how the WRV indicators and measurement metrics are developed for this set of MFLs.		
5.2	Page 76	Yes	Text for Section 5.1 Recreation In and On the Water. This is where HSW's approach becomes problematic. Authors assume that the % change approach is best method, and that the threshold for significant harm can be defined using the SWFWMD's 15% allowable change. This is the first WRV covered, but the same format is carried through the other WRVs/indicators selected in Section 4 and detailed in Table 12.	This MFL setting process must be re-evaluated and updated. The sequence of steps necessary to do this is covered in both the Recommendations section of this report, and General comments G1 though 18, above.	
5.3	Page 76	Yes	Text on page includes 5 paragraphs on WRV1 for the LSFR. Several assumptions are given with which I agree: • Paragraph 1—general guidance available from paddlers guides • Paragraph 2—allowable change defined by change in time, that is amount of time the activity is precluded. As an application of the	This MFL setting process must be re-evaluated and updated. The sequence of steps necessary to do this is covered in Recommendations section of this report, and General comments G1 though 18, above.	

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			%change method, then this sounds like a standard application. • Paragraph 3—define passage for paddling, boating and tubing.		
5.4	Page 77	Yes	Report section addressing the IR: Text on IR notes that impacts to SAV beds are most worrisome and have been since early work by Charlie Dutoit in 1979. Tubing season is Memorial Day to Labor Day. Paragraph 2 notes critical concern over extreme low water conditions—does this warrant an extreme low water protective regime?	Please answer the question.	
5.5	Page 78	Yes	Table 17. Flow reductions associated with 15% decrease in exceedance for paddling/boating/tubing. Key assumptions in this analysis is problematic. And it does not seem that the Threshold for tubing on the IR covers the seasonality of use. Shouldn't it? Should it be an MDR event? Text, top one third of page. Second paragraph covers the threshold estimates under RTF conditions. Do I agree? Yes.	Please answer the questions. This MFL setting process must be re-evaluated and updated. The sequence of steps necessary to do this is covered in Recommendations section of this report, and General comments G1 though 18, above.	

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5.6	Sequence of Ten Tables on various pages	Yes	Ten tables covering the WRVs are or may be problematic. Included are: Table 17, page 78 Table 19, page 80 Table 20, page 81 Table 23, page 86 Table 24, page 87 Table 25, page 88 Table 26, page 90 Table 27, page 91 Table 28, page 92 Table 29, page 94	This MFL setting process must be re-evaluated and updated. The sequence of steps necessary to do this is covered in Recommendations section of this report, and General comments G1 though 18, above.	
5.7	Page 79	Yes	Figure 49, RTF flow duration curve depicting threshold flows protective of paddling on the LSFR at FW. Content of this figure is acceptable if the % change method is appropriate metric here for flows protective of paddling.	This MFL setting process must be re-evaluated and updated. The sequence of steps necessary to do this is covered in Recommendations section of this report, and General comments G1 though 18, above.	
5.8	Page 80	Yes	Text, 5.2 Fish passage, 5.2.1 Fish Passage. Paragraph 2 defines fish passage conditions. I concur with depth and width recommendation. Table 19—Flow reductions associated with 15% decrease in time that threshold	This MFL setting process must be re-evaluated and updated. The sequence of steps necessary to do this is covered in Recommendations section of this report, and General comments G1 though 18, above.	

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			stages for fish passage on LSFR and IR were exceeded. If %change metric is valid, then this presentation is acceptable. I cannot verify that values in table were entered properly, but values look correct based on the array of threshold plotted for LSFR and IR in Figure 47, page 75.		
5.9	Pages 80-81	Yes	Text, 5.2.2 Gulf Sturgeon Passage covers two paragraphs. First paragraph covers recommended channel depth and width for sturgeon passage. I concur with these habitat values. Question—what do sturgeon do between the two spawning periods? Does the downriver movement of juveniles require protection? Other life stages? Spawning habitat?	Please answer the questions regarding spawning. This MFL setting process must be re-evaluated and updated. The sequence of steps necessary to do this is covered in Recommendations section of this report, and General comments G1 though 18, above.	
5.10	Pages 80-81	Yes	Question—in general how should seasonality issue be handled? Seasonality adds another component of seasonal occurrence and duration. So, using an MDR event makes a lot of sense. Also, if this were being done by the SJRWMD, then the event would be	Please answer the questions.	

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			defined. I am sure that SJR District has many examples from established MFLs.		
5.11	Pages 80- 81	Yes	Last para estimates the critical flow threshold associated with criterion for LSJR at FW and US441 gages. I accept these values as estimated. Table 20 Flow reductions associated with 15% decrease in time that threshold stages for Gulf sturgeon passage on LSFR and IR were exceeded. Since an MDR event may be useful here, I note that the %change approach collapses a lot of detail that may be important. Spawning season is two part and must be captured. Also begs the question as to need for protection of other life stages of the Gulf sturgeon, and quantity and quality of spawning habitat. When do young move down to estuary or coast?	Please answer the questions. This MFL setting process must be re-evaluated and updated. The sequence of steps necessary to do this is covered in Recommendations section of this report, and General comments G1 though 18, above.	
5.12	Page 81	No	Text bottom of page, 5.2.3 Instream Habitat, this is the SEFA habitat modeling and assessment step. I agree with choice of SEFA as the habitat analysis tool. SEFA is also a broadly supported habitat analysis tool by series of authors in Horne et al. 2017. The	No further action required.	

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			multiple authors in this volume are enthusiastic supporters and users of SEFA and its historical evolution from PHABSIM. Six sites selected SEFA modeling, four on LSFR and two on IR. Site selection is acceptable		
5.13	Pages 83	Yes	Table 21 General characteristics of LSFR SEFA Sites. Table is acceptable as is. SEFA Site Characteristics—basic descriptions of LSFR SEFA sites. Text acceptable, no problems. Two paragraphs on SEFA sites are acceptable Text, Flow Reduction Assessment, one paragraph. Assessment method explained. I question the %change approach on this. Need to drill down on this some more, Big point is that an MDR, or other approach was not considered. So, is the %change method appropriate for this use?	Please answer the questions. This MFL setting process must be re-evaluated and updated. The sequence of steps necessary to do this is covered in Recommendations section of this report, and General comments G1 though 18, above.	

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5.14	Page 84	Yes	Text covers six paragraphs on SEFA. SEFA analysis gets boiled down to allowable 15% reduction average weighted score (AWS) for each species and life stage at each SEFA site. I find this approach to be problematic. Beyond the problematic application of the % change method, the remaining summary on how the mechanics of the SEFA modeling and analysis was performed is acceptable.	This MFL setting process must be re-evaluated and updated. The sequence of steps necessary to do this is covered in Recommendations section of this report, and General comments G1 though 18, above.	
5.15	Page 84	Yes	Section 5.2.4 Woody Habitat begins at bottom of page. First paragraph provides summary of the importance of woody habitats in these flowing water systems. I concur with this summary. Question—can this be developed as an event-based MDR metric?	Please answer the question. This MFL setting process must be re-evaluated and updated. The sequence of steps necessary to do this is covered in Recommendations section of this report, and General comments G1 though 18, above.	
5.16	Page 85	Yes	Table 22, Basis for SEFA based hydrologic shifts for LSFR at FW and US441 gages. Table has a seasonal window of April to July in reference to SEFA analyses, why is that? Also, table has five footnotes detailing how values were estimated. All five are individually	Please answer the question. This MFL setting process must be re-evaluated and updated. The sequence of steps necessary to do this is covered in	

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			and collectively logical in this use. If any step is called into question, then the value of these estimates must be reviewed.	Recommendations section of this report, and General comments G1 though 18, above.	
5.17	Page 85	Yes	Text has three paragraphs on woody habitat quality evaluation. Paragraph 1—this paragraph lays out why this WRV should be an assessed using an MDR metric I agree with arguments for importance of magnitude of inundation + duration + seasonality issues. All these critical components however are not addressed by the % change method. By contrast MDR metrics will capture these components of the hydrologic regime. Paragraph 2—more detail on the ecological functions provided by woody habitats, such as submergent and emergent woody habitats. Again, this difference can be accomplished with an MDR metric. Paragraph 3—agree that data for three locations were reviewed. The 15% change is problematic. So, I do not agree that the threshold values applied are the	Please comment on the recommended action. This MFL setting process must be re-evaluated and updated. The sequence of steps necessary to do this is covered in Recommendations section of this report, and General comments G1 though 18, above.	

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			best available for the protection of woody habitat. The choice of method and metric may be problematic. This choice should be re-evaluated. Specifically, the authors should use a metric that addresses magnitude, duration, seasonality and return interval.		
5.18	Page 86	Yes	Table 23 Flow reductions associated with 15% decrease in time that threshold stages for woody habitat sustainability on LSFR and IR were exceeded. The 15% presumption method is problematic. Thresholds are problematic.	This MFL setting process must be re-evaluated and updated. The sequence of steps necessary to do this is covered in Recommendations section of this report, and General comments G1 though 18, above.	
5.19	Pages 86	Yes	Text, 5.2.5 Manatee Thermal Refuge, text covers two short paragraphs: Paragraph 1—temperature data used. But again, it seems that this manatee protection metric needs to be an MDR metric that addresses seasonality and return. The return interval is likely annual, but that can be verified by manatee experts. See also the SJRWMD work on manatee protection for Volusia Blue Springs, that will be event based.	Please comment on the recommended action. This MFL setting process must be re-evaluated and updated. The sequence of steps necessary to do this is covered in Recommendations section of this report, and General comments G1 though 18, above.	

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			Paragraph 2—15% change is problematic. So, I do not agree with the thresholds developed. Strongly recommend that authors consider using the manatee thermal refuge event developed by SJRWMD for the Blue Spring in Volusia County.		
5.20	Page 87	Yes	Table 24 Flow reductions associated with 15% decrease in exceedance corresponding to manatee thermal threshold flow on IR. 15% change is problematic. So, I do not agree with the thresholds developed. Strongly recommend that authors consider using the manatee thermal refuge event developed by SJRWMD for the Blue Spring in Volusia County.	This MFL setting process must be re-evaluated and updated. The sequence of steps necessary to do this is covered in Recommendations section of this report, and General comments G1 though 18, above.	
5.21	Page 88	Yes	Section 5.2.6 Floodplain Habitat—Based on my own experience strongly recommend that the two critical structural features of floodplain habitat, the vegetative communities and hydric soils should be protected by MDR metrics.	This MFL setting process must be re-evaluated and updated. The sequence of steps necessary to do this is covered in Recommendations section of this report, and General comments G1 though 18, above.	

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5.22	Page 88	Yes	Table 25, Threshold flows for four predominant vegetative types in LSFR floodplain. The %change method used is particularly problematic for the floodplain system. The MDR criteria from SJRWMD should be applied for each relevant community type, and cover the typically relevant MFLs for infrequent high (IH), frequent high (FH), minimum average (MA, and frequent low (FL), etc.	This MFL setting process must be re-evaluated and updated. The sequence of steps necessary to do this is covered in Recommendations section of this report, and General comments G1 though 18, above.	
5.23	Page 88	Yes	Text, floodplain, two paragraphs—I strongly disagree with 15%change method. Bottom of page, text on 5.2.7 Hydric soils. Absolutely disagree with method used and request MDR following SJRWMD methods. Many examples exist covering application to floodplain hydric soils on rivers and springs throughout north and central Florida.	This MFL setting process must be re-evaluated and updated. The sequence of steps necessary to do this is covered in Recommendations section of this report, and General comments G1 though 18, above.	
5.24	Page 89	No	Figures 52 and 53. Figures are explanatory and are fine as is.	No further action required.	
5.25	Pages 90	Yes	Table 26, Flow reductions associated with 15% reduction in time of threshold flows for the four predominant vegetation	This MFL setting process must be re-evaluated and updated. The sequence of steps	

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			types in the LSFR floodplain at FT. White and US441. I strongly disagree with this analysis. Do the MDR following SJRWMD methods, then compare.	necessary to do this is covered in Recommendations section of this report, and General comments G1 though 18, above.	
5.26	Page 91	Yes	Table 27 in part, Flow reductions associated…threshold flows for hydric soils in LSFR and IR floodplains I strongly disagree with this analysis. Do the MDR following SJRWMD methods, then compare.	This MFL setting process must be re-evaluated and updated. The sequence of steps necessary to do this is covered in Recommendations section of this report, and General comments G1 though 18, above.	
5.27	Page 91	Yes	Text for Section 5.2.8 SAV. Three paragraphs on SAV communities in IR. I strongly disagree with this analysis.	This MFL setting process must be re-evaluated and updated. The sequence of steps necessary to do this is covered in Recommendations section of this report, and General comments G1 though 18, above.	
5.28	Page 92	Yes	Table 28, I strongly disagree with this SAV analysis. Please apply the MDR events following SJRWMD methods, then compare.	This MFL setting process must be re-evaluated and updated. The sequence of steps necessary to do this is covered in Recommendations section of this	

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				report, and General comments G1 though 18, above.	
5.29	Pages 93	Yes	Sediment and load classification categories (FISRWG 1998). Figure is acceptable, looks to be from a standard reference, cited as FISRWG 1998. Text includes two paragraphs on sediment loads. Para 2—describes the 15% change threshold applied to bankfull discharges. I am not sure that I agree with this choice. And so, I ask if an MDR event-based approach is better? I recall the SJRWMD using a mass sediment balance method on the Silver River. To that end I ask Is a mass balance approach needed for long term sustainability? What other approaches have been used by the district's for sediment dynamics?	Please answer the questions. This MFL setting process must be re-evaluated and updated. The sequence of steps necessary to do this is covered in Recommendations section of this report, and General comments G1 though 18, above.	
5.30	Page 93	Yes	Text, 5.4 Water Quality. Water quality is addressed in two short intro paragraphs. Water quality remains a significant issue of concern in both rivers and all artesian springs. Document side steps this issue for the most part. The relegation of water	Please consider addressing water quality impairments and their known relation to the flow regime of these rivers and spring runs. Impairments and flow reductions are both threats to the	

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			quality issues to the realm of TMDLs and BMAPs does not benefit the LSFR and IR, and their associated springs.	sustainability of these spring and river systems. There is then an opportunity to do this comprehensive assessment of relationship between flow regime and water quality.	
5.31	Page 94	Yes	Figure 55 and Table 29. Figure 59, Lane's diagram of balance of dynamic river forces effects on sediment load. Figure acceptable, it is illustrative one from Rosgen 1996 Table 29 Flow reductions associated with 15% decrease in time that viable bankfull flows in LSFR and IR are exceeded. As with similar comments on several previous WRV metrics, these thresholds were developed using the 15%change metric. If that is valid, then all of this is OK. But I ask if the sediment issues are best handled with an MDR metric, or something else? It seems that the sediment load issue is addressed on many flowing water MFLs (SR, SWF, and SJR WMDs) so it would be helpful to check/survey those.	Please answer the questions. This MFL setting process must be re-evaluated and updated. The sequence of steps necessary to do this is covered in Recommendations section of this report, and General comments G1 though 18, above.	

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5.32	Page 95	Yes	Text page, 5.5 Resources Upstream from US441. First of two full pages of text covering the topic. Four paragraphs on this page. I agree with rational and detail provided in support of protection of resources upstream from US441.	This MFL setting process must be re-evaluated and updated. The sequence of steps necessary to do this is covered in Recommendations section of this report, and General comments G1 though 18, above.	
5.33	Page 97	Yes	Text page includes five paragraphs on resources upstream of US441.Method described for proportioning flows seems reasonable and logical.	Recommend that WRV metrics selected to protect the upstream resources be appropriately chosen. This MFL setting process must be re-evaluated and updated. The sequence of steps necessary to do this is covered in Recommendations section of this report, and General comments G1 though 18, above.	
	6.0 River MFLs Development, Section 6, pages 99-107				
6.1	General comment	Yes	For the numerous reasons already enumerated in comments on sections 4 and 5 of the report I cannot approve of	This MFL setting process must be re-evaluated and updated. At a minimum this should include	

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			A. Reviewer's Specific Comments	B. Reviewer's Specific Recommended Corrective Action	C. Action to be Taken in Response to Comment
			the approach chosen to define most of WRV metrics used in the critical sensitivity analysis. Because of this, then I cannot approve of the respective MFLs developed. If my recommendations are followed then many key WRV metrics for both rivers will be redefined as MDR events, following the SJRWMD method, and possibly some other forms too. District has applied these event metrics to floodplain communities and hydric soils on lake MFLs. Analysis by Graham et al. 2013 clearly show that we get strikingly different results for floodplain wetland communities and their associated hydric soils using proposed 15% change versus MDR metrics. They point out that in their test case, the MDR metrics were much more sensitive to flow reductions compared to the proposed 15% change metric So, at this stage of the peer review process I find that I cannot support the proposed MFLs as being protective of	significant revision to Sections 4, 5, 6 and 7 of HSW's report. The sequence of steps necessary to do this is covered in Recommendations section of this report, and General comments G1 though 18, above.	

Comment No.	Figure, Table, or Page and Paragraph Number	Does Comment Directly and Materially Affect Conclusions of Report? (Yes/No)	To be completed by Reviewer(s)		To be completed by Report Author(s)
			A. Reviewer's Specific Comments	B. Reviewer's Specific Recommended Corrective Action	C. Action to be Taken in Response to Comment
			the LSFR and IR and their associated springs and providing strong assurance that the thresholds for significant harm for al WRVs will be scientifically sound. I am very confident however that a re-evaluation of this re-evaluation can address the shortcomings found. My full list of recommendations is given elsewhere. My remaining comments on Section 6 follow below, all with the caveat that if WRV analysis is redone as recommended then results are likely to be different.		
6.2	Page 99	Yes	Section 6.0 River MFLs Development, 6.1 Introduction: Four paragraphs provide summary of the sensitivity of MFL metrics, and the most limiting one. This is distillation of results from Section 5. Text cites Tables 30, 31, and 32, and Figures 57, 58, 59. I don't concur with this since I do not approve of the approach chosen to define most of WRV metrics used in the sensitivity analysis.	This MFL setting process must be re-evaluated and updated. The sequence of steps necessary to do this is covered in Recommendations section of this report, and General comments G1 though 18, above.	

Comment No.	Figure, Table, or Page and Paragraph Number	Does Comment Directly and Materially Affect Conclusions of Report? (Yes/No)	To be completed by Reviewer(s)		To be completed by Report Author(s)
			A. Reviewer's Specific Comments	B. Reviewer's Specific Recommended Corrective Action	C. Action to be Taken in Response to Comment
			I am confident however that a re-evaluation of this re-evaluation can address the shortcomings found.		
6.4	Page 99	Yes	***Note: It is my expectation that once the WRV analyses are redone, then the revised MFLs for the LSFR and IR will be quite different. As part of this next level review I include the following evaluation of this section of the report***: Document states that woody habitat and hydric soils are the most conservative WRVs with hydrologic shifts of 10cfs at the Hwy 27 gage. I don't concur with this since I do not approve of the approach chosen to define most of WRV metrics used in the sensitivity analysis. As noted, if my recommendations are followed then many key WRV metrics for both rivers will be redefined as MDR events, and maybe some other forms too.	This MFL setting process must be re-evaluated and updated. At a minimum this should include significant revision to Sections 4, 5, 6 and 7 of HSW's report. The sequence of steps necessary to do this is covered in Recommendations section of this report, and General comments G1 though 18, above.	

Comment No.	Figure, Table, or Page and Paragraph Number	Does Comment Directly and Materially Affect Conclusions of Report? (Yes/No)	To be completed by Reviewer(s)		To be completed by Report Author(s)
			A. Reviewer's Specific Comments	**B. Reviewer's Specific Recommended Corrective Action**	**C. Action to be Taken in Response to Comment**
			So, at this stage of the peer review process I find that I cannot support the proposed MFLs as being protective of the LSFR and IR and their associated springs and providing strong assurance that the thresholds for significant harm for al WRVs will be scientifically sound. I am confident however that a re-evaluation of this re-evaluation can address the shortcomings found.		
6.5	Page 100	Yes	***Note: It is my expectation that once the WRV analyses are redone, then the revised MFLs for the LSFR and IR will be quite different. As part of this next level review I include the following evaluation of this section of the report:*** Page 100—Table 30 in part, Summary of WRV metrics and hydrological shifts for the LSFR at Ft. White gage. Table 30 is a good summary for 15% change metric, but I strongly disagree with HSW's choice to apply across the board for All WRV metrics. There are 13 WRV metrics listed in Table 30: 1) paddling, 2) boating,	This MFL setting process must be re-evaluated and updated. At a minimum this should include significant revision to Sections 4, 5, 6 and 7 of HSW's report. The sequence of steps necessary to do this is covered in Recommendations section of this report, and General comments G1 though 18, above.	

Comment No.	Figure, Table, or Page and Paragraph Number	Does Comment Directly and Materially Affect Conclusions of Report? (Yes/No)	To be completed by Reviewer(s)		To be completed by Report Author(s)
			A. Reviewer's Specific Comments	B. Reviewer's Specific Recommended Corrective Action	C. Action to be Taken in Response to Comment
			3) sturgeon spring and fall spawns, 4) general fish passage and general instream habitat, % time, and 5) SEFA, 6) woody habitat, 7) woody habitat snags, 8) hardwood swamp, 9) cypress swamp, 10) hardwood cypress, 11) hydric hammock, 12) hydric soils, and 13) sediment loads. All thirteen can be and have been developed and applied as MDR metrics. All should be evaluated as candidates for an MDR metric. I feel very strongly that the five floodplain habitat elements/components, covering the four dominant vegetative communities and hydric soils, should be MDR metrics. Previous comments have noted that SJRWMD has applied MDR metrics to all 13. This re-evaluation is critically needed. For Table 30 the smallest, therefore most conservative hydrologic shifts are for general fish passage at 103-115 cfs, but cypress swamp is not far off at 110 cfs. See hydrologic shifts plotted by WRVs in Figure 60. This indicates that recasting WRV criteria as MDR may have an impact.		

Comment No.	Figure, Table, or Page and Paragraph Number	Does Comment Directly and Materially Affect Conclusions of Report? (Yes/No)	To be completed by Reviewer(s)		To be completed by Report Author(s)
			A. Reviewer's Specific Comments	B. Reviewer's Specific Recommended Corrective Action	C. Action to be Taken in Response to Comment
6.7	Page 101	Yes	***Note: It is my expectation that once the WRV analyses are redone, then the recommended MFLs for the LSFR and IR will be quite different. As part of this next level review I include the following evaluation of this section of the report:*** Table 31, Summary of WRV metrics and hydrologic shifts for the LSFR at US441 gage. This table, like the previous one Table 30, is deeply problematic for the same reasons as noted above in comments for page 100, above. For Table 31 the smallest, therefore most conservative hydrologic shifts are for general fish passage at 53 cfs, but cypress swamp is not far off at 110 cfs. See WRVs plotted with hydrologic shift on Figure 61. This may indicate that recasting WRV criteria as MDR may have an impact.	This MFL setting process must be re-evaluated and updated. The sequence of steps necessary to do this is covered in Recommendations section of this report, and General comments G1 though 18, above.	
6.8	Page 102	Yes	***Note: It is my expectation that once the WRV analyses are redone, then the recommended MFLs for the LSFR and IR will be quite different. As part of this next level review I include the***	Please answer question regarding omission of wetland plant communities.	

Comment No.	Figure, Table, or Page and Paragraph Number	Does Comment Directly and Materially Affect Conclusions of Report? (Yes/No)	To be completed by Reviewer(s)		To be completed by Report Author(s)
			A. Reviewer's Specific Comments	B. Reviewer's Specific Recommended Corrective Action	C. Action to be Taken in Response to Comment
			following evaluation of this section of the report: Table 32 and Figure 57. Table 32, Summary of WRV metrics….IR at Hwy 27 gage. For Table 32 there are four WRV metrics with low hydrologic shifts in range of 10-15 cfs, these are woody habitat, hydric soils sediment loads and SAV. See hydrologic shifts plotted by WRVs in Figure 62. This indicates that recasting WRV criteria as MDR may have an impact. Table 32 does not include WRV metrics for floodplain vegetation. And subsequently these are not included in plot on Figure 62. The IR flood plain does indeed support these wetland plant communities. Why are the wetland community types not included? Figure 57, Flow duration curves and WRV metrics determined for LSFR at Ft. White gage. For reasons enumerated already above, I do not concur with the all the content of either table or figure. The placement of the WRV metrics on the FDC is helpful. It	This MFL setting process must be re-evaluated and updated. The sequence of steps necessary to do this is covered in Recommendations section of this report, and General comments G1 though 18, above.	

Comment No.	Figure, Table, or Page and Paragraph Number	Does Comment Directly and Materially Affect Conclusions of Report? (Yes/No)	To be completed by Reviewer(s)		To be completed by Report Author(s)
			A. Reviewer's Specific Comments	**B. Reviewer's Specific Recommended Corrective Action**	**C. Action to be Taken in Response to Comment**
			provides a means of comparison with other river and springs in the Florida, across the SR, SWF and SJR districts.		
6.9	Page 103	Yes	***Note: It is my expectation that once the WRV analyses are redone, then the recommended MFLs for the LSFR and IR will be quite different. As part of this next level review I include the following evaluation of this section of the report:*** Page 103—Figures 58 and 59. Flow duration curves and WRV metrics for LSFR at US441, and IR at Hwy 27 gages, respectively For reasons enumerated already above, I do not concur with the all the content of either figure.	This MFL setting process must be re-evaluated and updated. The sequence of steps necessary to do this is covered in Recommendations section of this report, and General comments G1 though 18, above.	
6.10	Page 104	Yes	***Note: It is my expectation that once the WRV analyses are redone, then the recommended MFLs for the LSFR and IR will be quite different. As part of this next level review I include the following evaluation of this section of the report:***	This MFL setting process must be re-evaluated and updated. The sequence of steps necessary to do this is covered in Recommendations section of this report, and General comments G1 though 18, above.	

Comment No.	Figure, Table, or Page and Paragraph Number	Does Comment Directly and Materially Affect Conclusions of Report? (Yes/No)	To be completed by Reviewer(s)		To be completed by Report Author(s)
			A. Reviewer's Specific Comments	**B. Reviewer's Specific Recommended Corrective Action**	**C. Action to be Taken in Response to Comment**
			Page 104—Figures 60 and 61. WRV hydrologic shifts at the Ft. White and US441 gages, respectively. These figures plot hydrologic shifts provided in Tables 30 and 31, respectively. Visual picture given is useful, but I don't agree with much of the basis. Again, for reasons enumerated already above, I do not concur with the all the content of either figure.		
6.11	Page 105	Yes	***Note: It is my expectation that once the WRV analyses are redone, then the recommended MFLs for the LSFR and IR will be quite different. As part of this next level review I include the following evaluation of this section of the report:*** Page 105—Figure 62 and Table 33. Figure 62, WRV hydrologic shifts at the Hwy 27 gage. Table 33, RTF and MFL flow values at the medians for the LSFR and IR. Based on the % change metric which I do not support. Also, there is no discussion on the relevance/significance of the 10 cfs limit for IR. Within the range of error, this	This MFL setting process must be re-evaluated and updated. The sequence of steps necessary to do this is covered in Recommendations section of this report, and General comments G1 though 18, above.	

Comment No.	Figure, Table, or Page and Paragraph Number	Does Comment Directly and Materially Affect Conclusions of Report? (Yes/No)	To be completed by Reviewer(s)		To be completed by Report Author(s)
			A. Reviewer's Specific Comments	B. Reviewer's Specific Recommended Corrective Action	C. Action to be Taken in Response to Comment
			may mean that the MFL is at its threshold. MFLs for IR are problematic for a number of concerns: 1) wrong assessment metric applied to some WRVs, 2) floodplain vegetative communities left out of list of relevant WRVs, but they are included for both LSFR MFL sites, Ft White and US441, and 3) no discussion the significance of the 10 cfs estimate of available water. If the estimate is this close to limit, what is the uncertainty? Does this imply that the UFA is at its limit? What if WRV metrics that are recast as MDR are found to be exceeded? That could trigger a recovery plan. Text begin 6.2.1 Summary. Highlights the 15% change metric, which I do not support.		
6.13		Yes	***Note: It is my expectation that once the WRV analyses are redone, then the recommended MFLs for the LSFR and IR will be quite different. As part of this next level review I include the following evaluation of this section of the report:***	Expand future considerations into part of a more comprehensive analysis of uncertainty with recommendations for reducing effects in future.	

Comment No.	Figure, Table, or Page and Paragraph Number	Does Comment Directly and Materially Affect Conclusions of Report? (Yes/No)	To be completed by Reviewer(s)		To be completed by Report Author(s)
			A. Reviewer's Specific Comments	B. Reviewer's Specific Recommended Corrective Action	C. Action to be Taken in Response to Comment
			Section 6.2.3 Future Considerations. Provide four bulleted examples of ongoing work. This is a big opportunity to give the AM uncertainty reduction efforts. But that is not what this is. I would expand this considerably.	This MFL setting process must be re-evaluated and updated. The sequence of steps necessary to do this is covered in Recommendations section of this report, and General comments G1 though 18, above.	
6.15		Yes	***Note: It is my expectation that once the WRV analyses are redone, then the recommended MFLs for the LSFR and IR will be quite different. As part of this next level review I include the following evaluation of this section of the report:*** Section 6:3 Future Considerations Overall, I conclude that MFLs development for the LSFR and IR watersheds, including the priority springs, is incomplete. Specific recommendations are made to address the concerns raised. Many comments made throughout the document, but very strong recommendations for further work on the WRV metrics. Until this re-evaluation is completed, I cannot endorse the MFLs as proposed. I expect that this will result in some changes to the metrics, and therefore with an array of other	This MFL setting process must be re-evaluated and updated. The sequence of steps necessary to do this is covered in Recommendations section of this report, and General comments G1 though 18, above.	

Comment No.	Figure, Table, or Page and Paragraph Number	Does Comment Directly and Materially Affect Conclusions of Report? (Yes/No)	To be completed by Reviewer(s)		To be completed by Report Author(s)
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			dependent factors, like the amount of water potentially available without violating MFLs.		
	7.0 Priority Springs Assessment and MFLs Development, Section 7, pages 108-114				
7.1	Page 108	No	Text, 7.1 Priority Springs Description. Three short paragraphs. Content of all three paragraphs and Table 34 is acceptable, no changes required	Content is acceptable as is, no corrective is action required.	
7.2	Page 109	No	Figure 63 is a conceptual model of hydraulic spring-flow regimes. This is a very helpful conceptual summary of interactions possible between surface and groundwater.	Content is acceptable as is, no corrective is action required.	
7.4	Page 111	Yes	Table 35, Number of zero and negative spring flow measurements. This appears to be a new parameter to use to assess	As part of the re-evaluation recommended these low and no flow issues at the priority springs should be explored more	

Comment No.	Figure, Table, or Page and Paragraph Number	Does Comment Directly and Materially Affect Conclusions of Report? (Yes/No)	To be completed by Reviewer(s)		To be completed by Report Author(s)
			A. Reviewer's Specific Comments	B. Reviewer's Specific Recommended Corrective Action	C. Action to be Taken in Response to Comment
			conditions at springs based on some new research.	thoroughly. This a new element of uncertainty.	
7.5	Page 114	Yes	Page 114—text page, 2.3.1 Proposed MFL Rule Language. HSW takes a big punt on setting MFLs for the 11 individual springs, due to uncertainties, best way to afford protection is to group the priority springs together collectively for a defined river reach such that river hydrology at a reference gage is maintained. So, they mimic the river MFLs for LSFR at Ft. White, and IR at Hwy 27. Each set as median flow with some estimated percent reduction for the respective RTFs. The estimated headroom of available water these medians are 103 cfs (8.1%) for LSFR, and 10 cfs (2.8%) for IR. WOW, the values for the IR at the limit. Does this mean that the system is at the limit of potential for harm? Also need to consider that the headroom estimates may look different if some key WRV metrics, such as for the floodplain vegetative communities and hydric soils, are changed to MDR metrics.	Please answer the questions regarding potential exceedance of WRV metrics. This MFL setting process must be re-evaluated and updated. The sequence of steps necessary to do this is covered in Recommendations section of this report.	

Comment No.	Figure, Table, or Page and Paragraph Number	Does Comment Directly and Materially Affect Conclusions of Report? (Yes/No)	To be completed by Reviewer(s)		To be completed by Report Author(s)
			A. Reviewer's Specific Comments	B. Reviewer's Specific Recommended Corrective Action	C. Action to be Taken in Response to Comment
7.6	Page 114	Yes	Section7.3.2 Future Consideration to Support Spring-Specific MFLs: Six bulleted examples are given. I agree with the six recommendations. I note that water quality, however, is not addressed. Setting MFL setting in this impaired watershed should address the link between system health and water quality, especially in a system with such intimate linkage between the surface water and the UFA. And this future consideration section ought to be expanded into a full AM uncertainty management exercise. And as I have advocated time and time again, an explicit AM umbrella should be applied by the District in each setting each MFL, and for re-evaluations. A first step is simply bringing a full discussion of sources of uncertainty in every stage of the process, and identifying specific actions that can be undertaken or implemented to reduce the negative effects of uncertainty on our ability to protect and manage the water resources and the WRVs of the LSFR and IR watersheds.	Consider adding water quality as issue of ongoing concern for the priority springs. This MFL setting process must be re-evaluated and updated. The sequence of steps necessary to do this is covered in Recommendations section of this report.	

Comment No.	Figure, Table, or Page and Paragraph Number	Does Comment Directly and Materially Affect Conclusions of Report? (Yes/No)	To be completed by Reviewer(s)		To be completed by Report Author(s)
			A. Reviewer's Specific Comments	B. Reviewer's Specific Recommended Corrective Action	C. Action to be Taken in Response to Comment
			My key concern was also raised by the UF team in their peer review of the initial set of MFLs back in 2013. Those comments were not acted upon by the District then in establishing the initial MFLs for the LSFR and IR in 2013, and it appears that this specific and very pointed peer review recommendation to evaluate event based WRV metrics was rejected outright. I consider this an error. It was an error in 2013, it was an error ignored in 2013, and it is an error that persists in 2020. The same issues are before us again. I note that any real comment on this matter were deleted from the earlier April 2019 draft of this MFL documents. So, there is a concerted effort now over 7 years to discount any method other than the %change. Further, as the field of E flows develops (see document) it is important to keep abreast of the state of the science. It is my opinion that a reliance on %change metrics, and specifically the 15% change method is not the best available approach.		

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	Appendix A				
	Appendix A	No	Appendix A Priority Springs Description Document is very well written summary of the priority springs in the LSFR and IR watersheds. Table 1 provides summary characteristics for all 17 springs, 11 in the LSFR and six in the IR. Includes list of references. Includes a very nicely composed and formatted 1-page description for each spring with photo, and text covering: location, physical description of spring system, and utilization. Overall, this is a well written, easy to read document. It that serves its purpose admirably. I do not recommend changes`	No further action required.	
	Appendix B				
	Appendix B	No	Appendix B1 Water Use Hindcasting (Author: SRWMD, 2019) Fourteen pages. Into, Overview of Process, Timeseries of groundwater use data, sources, break out of use types, summary of state by state tailored approach (FL, GA, SC). List of references.	No further action required.	

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			A. Reviewer's Specific Comments	**B. Reviewer's Specific Recommended Corrective Action**	**C. Action to be Taken in Response to Comment**
			Since this GW use assessment was done in support of the NFSEG model, which was also peer reviewed, then I assume this work has already been deemed acceptable for use in the NFSEG model.		
			Appendix B2 Injection Well Hindcasting (Author: SRWMD, 2019) It appears that this is the same activity that District did in support of NFSEG model. There is a lot of hindcasting done here, and the text reads like it is part of a larger document. So, I expect that it is part of what was done for development and validation-calibration of NFSEG. Apparent error—page 3 first paragraph—ratio is off by order of magnitude. It should be 0.0795	Please answer questions and make correction noted.	
	Appendix C				
	Appendix C	No	Appendix C Reference Timeframe Flow Methodology Four pages of text. This is a very concise description of RT flows/heads.	No further action required.	

Comment No.	Figure, Table, or Page and Paragraph Number	Does Comment Directly and Materially Affect Conclusions of Report? (Yes/No)	To be completed by Reviewer(s)		To be completed by Report Author(s)
			A. Reviewer's Specific Comments	B. Reviewer's Specific Recommended Corrective Action	C. Action to be Taken in Response to Comment
			Generating the time series is largely done using NFSEG. It all sounds like a reasonable approach to get to the RT flows and heads.		
	Appendix D				
	Appendix D	No	Appendix D-Attachment 1 Transient Model Calibration Results Graphics Fifty-one+ pages. Fifty-one graph figures see the content list on pages 2 and 3. Figures are grouped by river/spring gage/logger location. Twenty-one different sites in the LSFR 7IR watersheds are covered. Fourteen locations on the LSFR from Worthington Springs down to Hildreth. Seven locations on the IR, five of these at priority springs. Most figures address stage, but seven figures cover flows: on the five on the LSFR: Worthington Springs, O'leno SP, US441, Ft. White, Hildreth, and two on the IR: Blue Hole Spring, Dampier's Landing, and Hwy 27. The sets by location have 2-3 supporting figures., One is a scatter plot and the second a time series of daily simulated and observed flows at the given location. Makes for set of three plots the scatter	No further action required	

Comment No.	Figure, Table, or Page and Paragraph Number	Does Comment Directly and Materially Affect Conclusions of Report? (Yes/No)	To be completed by Reviewer(s)		To be completed by Report Author(s)
			A. Reviewer's Specific Comments	B. Reviewer's Specific Recommended Corrective Action	C. Action to be Taken in Response to Comment
			plot of simulated versus observed stage, time series of simulated and observed stages at that gage, and residuals plot for stage difference at that site location. The sequence of three figures do given a good visual picture of the transient model calibration results. Each set tells us quickly how well the simulated match the observed. Moving beyond this section/document, this information forms the basis for doing the species and habitat analysis for SEFA. So, a basic question is, did HSW do the job robustly enough so that we are confident in the using this modeling as the basis for SEFA?		
	Appendix E				
	Appendix E	No	Appendix E WRV Duration Curves Seventeen pages of plots, Figures 1 through 33. Each is flow duration curve with threshold flows for a particular WRV metric.	No further action required.	
	Appendix F				

Comment No.	Figure, Table, or Page and Paragraph Number	Does Comment Directly and Materially Affect Conclusions of Report? (Yes/No)	To be completed by Reviewer(s)		To be completed by Report Author(s)
			A. Reviewer's Specific Comments	**B. Reviewer's Specific Recommended Corrective Action**	**C. Action to be Taken in Response to Comment**
	Appendix F	No	Appendix F SEFA Rating Curves and Area Weighted Suitability Evaluation Results Twenty-five pages of plots and tables. Overall this section is simple presentation of results with no supporting text. Tables and figures are straight forward, but I cannot independently verify that results are correct. So, I accept them with that caveat.	No further action required.	

ATTACHMENT B - PEER REVIEW FORMS: REPORT FROM LOUIS MOTZ, PH.D., P.E., D.WRE

PEER REVIEW FORM

SUWANNEE RIVERE WATER MANAGEMENT DISTRICT

Project or Report Name: Technical Report-Minimum Flows and Minimum Levels Re-Evaluation for the Lower Santa Fe and Ichetucknee Rivers and Priority Springs

Name and Affiliation of Reviewer: Louis H. Motz, Ph.D., P.E., D.WRE

Discipline specialty covered by this review: Water Resources Engineering

This document is for the use of project Peer Review Chair retained by the Suwannee River Water Management District (District) for the purpose of providing a technical peer review of a District report, including manuscripts prepared by District staff and consultants.

REVIEW REQUIRED BY THE DISTRICT:

1. **Determine whether the methods used for establishing the minimum flows are scientifically reasonable.**

A. Supporting Data and Information: Review the data and information that supports the method and the proposed minimum flows, as appropriate. The reviewer shall assume the following:
   1. The data and information used were properly collected;
   2. Reasonable quality assurance assessments were performed on the data and information;

   Note: The reviewers are not expected to provide independent review of standard procedures used as part of institutional programs that have been established for the purpose of collecting data, such as the USGS and SRWMD hydrologic monitoring networks.

B. Technical Assumptions: Review the technical assumptions inherent in the methodology and determine:
   1. If the assumptions are clearly stated, reasonable and consistent with the best information available; and
   2. Assumptions were eliminated to the extent possible, based on available information.

C. Procedures and Analyses: Review the procedures and analyses used in developing quantitative measures and determine qualitatively whether:

1. The procedures and analyses were appropriate and reasonable, based on the best available;
2. The procedures and analyses incorporate appropriate factors;
3. The procedures and analyses were correctly applied;
4. Limitations and imprecision in the information were reasonably handled;
5. The procedures and analyses are repeatable;
6. Conclusions based on the procedures and analyses are supported by the data.

2. **If a proposed method used in the MFL report is not scientifically reasonable, the CONTRACTOR shall:**

A. Deficiencies: List and describe scientific deficiencies;
B. Remedies: Determine if the identified deficiencies can be remedied and provide suggested remedies;
C. If the identified deficiencies can be remedied, then describe the necessary corrections and, if possible provide an estimate of time and effort required to develop and implement; and
D. If the identified deficiencies cannot be remedied, then, if possible, identify one or more alternative methods that are scientifically reasonable, based on published literature to the extent feasible.

REVIEW CONSTRAINTS

CONTRACTOR and Peer Review Chair shall acknowledge the statutory constraints and conditions (Sections 373.042 and 373.0421, Florida Statutes) affecting the DISTRICT's development of MFLs. CONTRACTOR and Peer Review Chair shall also acknowledge that review of certain assumptions, conditions, and established legal and policy interpretations of the Governing Board (hereinafter referred to as "givens") is not included in the scope of work. These givens include:

1. The selection of waterbodies or aquifers for which minimum flow and/or levels have initially been set;
2. The consideration given to changes and structural alterations to watersheds, surface waters, and aquifers, and the effects and constrains that such changes or alterations have had or placed on the hydrology of a given watershed, surface water, or aquifer;
3. The method(s) used for establishing MFLs for other waterbodies and aquifers; and
4. Standard procedures used as part of institutional programs that have been established for the purpose of collecting data, such as the USGS and SRWMD hydrologic monitoring networks.

Instructions:

1. The results of this review are for the use of the District and they are not to be revealed to others without the express permission of the District.
2. By signing this form, the reviewer certifies that the peer review was conducted according to the guidelines listed above and that the opinions and recommendations included in the review constitute an independent review per Chapter 373.042(5), in the discipline noted above.
3. The reviewer also certifies that the review was conducted according to the Scope and Conditions specified above.

Signature of Reviewer:	**Date of Peer Review: February 18, 2020**
	

Responders Certification: The comments and criticisms provided by the Peer Reviewer have been addressed as noted in column C in a separate response document, which is attached, and in the report.

Name and Affiliation of Responder to Peer Review Comments:
Signature of Responder: **Date of Response:**

TABLE 1. SUMMARY REVIEW COMMENTS ON MFL DOCUMENTS

Comment No.	Figure, Table, or Page and Paragraph Number	Does Comment Directly and Materially Affect Conclusions of Report? (Yes/No)	To be completed by Reviewer(s)		To be completed by report author(s)
			A. Reviewer's Specific Comments	B. Reviewer's Specific Recommended Corrective Action	C. Action to be Taken in Response to Comment
1	p. 1, Section 1	No	"Because these water bodies have the potential to be affected by withdrawals in *an adjacent water management district*…."	Identify the adjacent water management district(s).	
2	p. 9, Heading for Table 1	No	"listed by decreasing river mile, per river"	The river miles should be included in Table 1.	
3	p. 11, line 3	No	"A non-parametric regression model, LOESS (LOcal RegrESSion), is fitted…."	Please provide a reference for this model.	
4	p. 12, 2.3.2 Infilling of Ichetucknee River Data at HWY 27 Near Hildreth Gage, last sentence	No	Is "local monitoring well (FDOTS041705001)" on p. 12 the same well as the "…Florida DOT monitoring well in Lake City…" on p. 18?	If so, use the same name for this well on pp. 12 and 18 and elsewhere in the report and appendices.	
5	p. 18, Section 2.3.6, Figure 13	Yes	"Figure 13 …groundwater levels in the UFA at Lake City and near Lake Butler, Florida." Are there any other UFA wells in or adjacent to the Ft. White combined surface and groundwater basins (Figure 10) that could be included in this report?	If data are available, add addition UFA wells to illustrate historical changes in groundwater levels in or adjacent to the Ft. White basin similar to what is shown in Figure 13.	
6	p. 19, Section 2.4, Figure 14	Yes	The timeline of flow measurements at Poe Spring (137 manual measurements)	Plot the flow measurements at Poe Spring and discuss whether	

Comment No.	Figure, Table, or Page and Paragraph Number	Does Comment Directly and Materially Affect Conclusions of Report? (Yes/No)	To be completed by Reviewer(s)		To be completed by report author(s)
			A. Reviewer's Specific Comments	B. Reviewer's Specific Recommended Corrective Action	C. Action to be Taken in Response to Comment
			indicates measurements that date back nearly to 1915.	there are any long-term trends in the discharge record.	
7	p. 19, Section 2.4, Figure 14	Yes	The timelines of flow measurements for many of the other springs in Figure 14 indicate that spring flow data from the mid-1990's to 2015 may be available.	Evaluate whether there are sufficient data for any of the other springs in Figure 14 to plot and indicate whether there are any trends in the (short-term) discharge records.	
8	p. 22, Section 2.5 Surface Water Quality, second paragraph	No	These two sentences require editing for clarity: "…nitrate concentrations in the Santa Fe River at US 47 near Ft. White averaged about 0.70 mg/L in 2011 (Figure 16). The average nitrate levels…have not increased significantly at several LSFR USGS stations (High Springs, Ft. White) during the 1990-2011 period (Figure 16)."	Suggested re-write: "Based on recent data, nitrate concentrations averaged about 0.70 mg/L during 1990-2011 in the Santa Fe River near Ft. White and decreased slightly from about 0.3 mg/L in 1990 to slightly less than 0.2 mg/L in 2011 in the Santa Fe River near High Springs (see Figure 5 for locations of gages)."	
9	p. 22, Section 2.5 Surface Water Quality, last sentence	No	This sentence needs editing for clarity: "Nitrate concentrations are on the rise in two downstream springs including Gilchrist Blue but are declining in the springs that are farther east (upstream) (Figure 17)."	The names of the downstream and upstream springs that are listed in Figure 17 should be specifically identified in this sentence, along with reference to their locations that are shown in Figure 15.	

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10	p. 23-25, Section 2.6 Ground-water Use	Yes	Groundwater use in the NFSEG model area also may have "…potentially influence[d] flows along the LSFR and IR." [p. 23].	In place of the pumping illustrated for the North Florida Regional Water Supply Planning Area, consider illustrating historical groundwater use in the NFSEG model area in Figures 19 and 20. This would be more consistent with the development of groundwater use for the NFSEG model area described in Appendix B and the use of the NFSEG pumpage used in the development of the reference timeframe (RTF) flow and groundwater head time-series at groundwater monitoring locations, springs, and/or stream gage locations described in Appendix C. Also, discuss the historical trend of pumpage, particularly recent trends, in the NFSEG model area.	
11	p. 23, Section 2.6 Ground-water Use	Yes	The first part of this section on p. 23 describes groundwater use in the North Florida Regional Water Supply Planning area, in which groundwater use "has stabilized…at about 500 million gallons per day (mgd)", and the last sentence in this section indicates that "Long-term historical	Similar to comment 10 above, the pumping illustrated for the North Florida Regional Water Supply Planning Area should be replaced by pumpage in the NFSEG model area in Figures 19 and 20, which would be more	

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			water demands are summarized in Appendix B." Long-term historical water demands in Appendix B are described for the entire NFSEG model area in which net groundwater withdrawals were approximately 1,150 mgd in 2010 (Durden et al., 2019, p. 5-12). It is confusing to the reader for both North Florida Regional Water Supply Planning area pumpage and NFSEG pumpage to be included in the same paragraph, particularly since the last sentence does not indicate which "long-term historical water demands" are summarized in Appendix B.	consistent with the NFSEG model area pumpage described in Appendices B and C.	
12	pp. 24 and 26, Section 2.7 Reference Time-frame Flow	Yes	The RTF's for the rivers were developed using the pumpage for the NFSEG model, not the pumpage for the North Florida Regional Supply Planning area.	This is another reason to consider replacing the North Florida Regional Water Supply Planning Area pumpage in Figures 19 and 29 with the NFSEG pumpage. Also, it should be indicated that the determination of groundwater use in the NFSEG model area is described in Appendix B.	
13	p. 26, Figure 21. Estimated Impacts at Fort White, US441,	Yes	Figure 21 indicates the impacts of groundwater pumping in terms of combined ($Q_{RTF} - Q_{measured}$) flows for each of the three gages. It would be helpful to	Consider adding a figure (or figures) in which the Q_{RTF} flows and $Q_{measured\ flows}$ are plotted	

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	and HWY 27 gages		be able to see plots that show the Q_{RTF} flows and $Q_{measured\ flows}$ separately for each of the three gages.	separately for each of the three gages.	
14	pp. 24-26, Section 2.7 Reference Time-frame Flow	Yes	Figure 21 illustrates the estimated impacts of historical groundwater pumping on discharge measured at the Fort White, US441, and Hwy 27 stream gages, but there are no corresponding results shown for the impacts of pumping on groundwater levels in the Fort White surface-water and groundwater basin (Figure 10).	Consider illustrating the impacts of groundwater pumping on groundwater levels by calculating RTF's for UFA wells at Lake City and near Lake Butler (Figure 13) and (if data are available) for other UFA wells in the Fort White surface-water and groundwater basin.	
15	pp. 24-26, Section 2.7 Reference Time-frame Flow	Yes	Are there any long-term impacts due to groundwater pumping in the historical discharge measurements for any of the springs listed in Figure 14?	If sufficient data are available for any of the springs listed in Figure 14, consider illustrating the impacts of groundwater pumping on spring discharge by calculating RTF's for a selected spring (or springs).	
16	p. 56, Section 4. Approach to Setting MFLS, first paragraph	No	"The technical approach makes use of the RTF flows presented in Section 2."	Consider adding reference to Appendix C in this sentence: "The technical approach makes use of the RTF flows presented in Section 2 ***and described in detail in appendix C."***	

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17	p. 63, 4.3.1 HEC-RAS Modeling, Second Paragraph	No	"The SFR portion of the model is composed of ten model reaches (Figure 42) …." Is the Ichetucknee River divided into reaches or treated as one reach?	Indicate whether or not the Ichetucknee River is divided into reaches and, if so, list the names of the reaches.	
18	4.3.1.3, HEC-RAS Steady State Model Development and Predictive Simulations, p. 68, fourth paragraph	No	"Predictive steady-state simulations were made for the ***49*** RTF flow scenarios…."	Please explain how "49" was obtained, i.e., what does it represent?	
19	p. 99, Section 6. River MFLs Development, Second paragraph	Yes	"A[n] RFT time series of daily flows was developed for…the Ft. White and US441 gages on the LSR and for the Hwy 27 gage on the IR…."	Indicate on p. 96 that these flows are plotted in Figures 22 and 23 in Section 2.7.1.	
20	p. 106, Third paragraph	No	Typo: "Richter, et al.	Replace with: "Richter et al. (2011)."	
21	p. 108, last line in text and Table 34	No	The average measured flow of the Santa Fe River Rise is "about 553 cfs" in the text and its "mean flow" is "552 cfs" in Table 34.	There should be only one value for these flows.	

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22	pp. 108-113, Section 7. Priority Springs Assessment and MFLS Development	Yes	Equations of rating curves developed for 11 of the 17 priority springs are in Table 36, but the plots of the rating curves are not included.	The plots of the rating curves developed for 11 of the 17 priority springs should be included in the text or in an appendix.	
23	p. 108, Table 34	No	"Ten of the 17 Priority Springs on the LSFR and IR are classified as historical first-magnitude springs…." First-, second-, and third magnitude springs are not identified in Table 34.	Add a column to Table 34 identifying first, second, and third magnitude springs.	
24	p. 111, Section 7.3 Springs MFLs Development, two paragraphs	Yes	"While it is desirable to designate spring-specific MFLs, it is Impractical to do so at this time." and "These relative uncertainties are substantially greater than the corresponding flow reductions associated with the proposed LSFR and IR MFLs…." These conclusions are not supported by any results.	One or more examples of the results of calculating spring-specific MFL's should be included in the text or an appendix to illustrate and substantiate this conclusion.	
25	p. 113. Table 37, heading for third column	No	Typo: "Flow Rating…from **Table 37** (cfs)" should be **Table 36**.	Make correction.	
26	p. 113, Section 7.3.2 Future Considerations	Yes	"…an appropriate way to afford protection from significant harm at this time	See comment 24 above. One or more examples of the results	

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	to Support Spring-Specific MFLs, last paragraph.		is to treat the Priority Springs collectively for a defined river reach…." This conclusion is not supported by any results.	of calculating spring specific MFL's should be included in the text to illustrate and substantiate this conclusion, i.e., that it is necessary to treat the priority springs collectively for a defined river reach.	
27	Appendix B – Water Use Hindcasting and Injection Well Hindcasting	No	Pages in Appendix B – Water Use Hindcasting and Injection Well Hindcasting are not numbered.	Number the pages in Appendix B – Water Use hindcasting and Injection Well Hindcasting.	
28	Appendix B – Water Use Hindcasting, p. 1	Yes	Groundwater in Appendix B is developed for the NFSEG model area, but groundwater use in the report is illustrated for the North Florida Regional Water Supply Planning Area.	Consider replacing the pumpage for the North Florida Regional Water Supply Planning Area shown in the text in Figures 19 and 20 with the pumpage for the NFSEG model area described in Appendix B. For consistency, the NFSEG pumpage should be described in the report and in Appendix B (and also in Appendix C).	
29	Appendix B – Water Use Hindcasting, p. 11 Moving	Yes	"Results…were then merged into one dataset." Where are these results?	The dataset for the 5-year moving average pumpage "for each state, county, and use-type combination in the model	

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	Average Calculation			domain" should be made available, perhaps on a web site.	
30	Appendix B – Water Use Hindcasting, p. 11 Moving Average Calculation	Yes	Where are the quantitative results for pumpage?	The groundwater withdrawals through time and ground-water use by category for a current year such as 2015 should be represented in the report in figures similar to the bar graph and pie chart shown in Figures 19 and 20 or preferably in a line graph illustrating the pumpage versus time for the various water-use categories and total pumpage. It would be more consistent with appendices B and C if the pumpage for the NFSEG model area were represented in Figures 19 and 20 instead of the pumpage for the planning area (see comment 28 above).	
31	Appendix B – Water Use Hindcasting, p. 11 Moving Average Calculation	Yes	Are the pumpage results in the dataset in agreement with the pumpage in the NFSEG model (Durden et al., 2019, Table 5-1)?	Compare pumpage results in the dataset to pumpage in NFSEG model (Durden et al., 2019, Table 5-1).	

Comment No.	Figure, Table, or Page and Paragraph Number	Does Comment Directly and Materially Affect Conclusions of Report? (Yes/No)	To be completed by Reviewer(s)		To be completed by report author(s)
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32	Appendix B – Water Use Hindcasting	Yes	How were well locations determined in previous years when no detailed water use records and well locations were kept?	Explain how individual well locations were determined in previous years.	
33	Appendix B – Water Use Hindcasting, pp. 12-13 References	No	Is each reference listed in this section also indicated in the text where it is used?	Make sure that each reference listed in this section is also indicated in the text where it is used.	
34	Appendix B – Injection Well Hindcasting	Yes	Where are the quantitative results for the injection rates?	The 5-year moving average injection rates for the NFSEG model area versus time should be plotted and discussed.	
35	Appendix B – Injection Well Hindcasting	Yes	Are the injection rates in the dataset in agreement with the injection rates in the NFSEG model (Durden et al., 2019, Table 5-1)?	Compare injection rates in the dataset to pumpage in NFSEG model (Durden et al., 2019, Table 5-1).	
36	Appendix C	Yes	Is "reference timeframe" a concept developed for this project or has it been used before?	Discuss the origin of the reference timeframe process, including references in published reports and peer-reviewed papers and previous water resource investigations that involve setting minimum flows and levels (MFL's).	

Comment No.	Figure, Table, or Page and Paragraph Number	Does Comment Directly and Materially Affect Conclusions of Report? (Yes/No)	To be completed by Reviewer(s)		To be completed by report author(s)
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37	Appendix C, p.1, 1.Introduction, first two paragraphs.	Yes	"This reference time series process incorporated data from two versions of the North Florida Southeast Groundwater Model…." i.e., NFSEGv1.1 (007h) and NFSEGv1.1 (007h1) (first paragraph), and "The response of the groundwater system…was evaluated through application of the NFSEG v1.1 groundwater model…." (second paragraph). Why were two different versions of the NFSEG model used? This suggests that there may be two different results based on whichever version of the NFSEG model is used to develop reference timeframe flows and groundwater heads.	The text in Section 1. Introduction should more clearly explain how two versions of the NFSEG model were used to produce the results described in this appendix.	
38	Appendix C, p.1, 1.Introduction, second paragraph.	Yes	"The response of the groundwater system to changes in groundwater use was evaluated through application of the NFSEG v1.1 groundwater model in a manner that did not require development of a transient version of the model."	This is a major assumption that requires further explanation. See comment 40 below.	
39	Appendix C, p.1, 2. General Approach, first paragraph.	Yes	"Changes in …flows at an MFL site of interest in response to changes in groundwater withdrawals were estimated on a yearly basis from 1933 through	Provide more explanation concerning how changes in river flows were determined using results from the NFSEG model.	

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			2015." How were changes in surface-water flows calculated using the NFSEG model, which is a groundwater model?		
40	Appendix C, p. 4, 2.4 Development of Reference Time-frame Flow or Head Time-Series	Yes	"Thus, the historical groundwater withdrawals time-series used to develop the reference timeframe time-series was smoothed using a five-year moving average." This is a major assumption that does appear to be reasonable. However, the validity of this assumption needs to be demonstrated.	Provide the graphical results of an analysis that demonstrates whether using a five-year moving average is sufficient to smooth variations in pumpage from 1933 through 2015.	
41	Appendix C	Yes	Appendix C describes a very detailed, somewhat confusing process that includes "…estimating historical impacts from groundwater withdrawals…" (p. 1), determining "…flow and head sensitivities…" (p. 2), and developing "…sensitivity maps for each model layer and waterbody of interest." (p. 2). The process by which impacts on river flows are determined using the NFSEG groundwater model needs further explanation as well as the purpose and use of the sensitivity maps.	This process should be more clearly explained in Appendix C, particularly illustrating how impacts on river flows at the three river gages (Santa Fe River near Ft. White and at US HWY 41 and the Ichetucknee River at HWY 27 in Figures 22 and 23, pp. 26-27 were determined from changes in heads and flows in the NFSEG groundwater model. The purpose and use of the sensitivity maps also requires further explanation.	

Comment 42 for Appendices B and C

A major part of the MFL report (Section 6 River MFLS Development) describes using Reference Timeframe (RTF) flows at three river gages (Santa Fe River near Ft. White and at US HWY 41 and the Ichetucknee River at HWY 27 in Figures 22 and 23, pp. 26-27) to determine recommended minimum flows at these gages (p. 106, Section 6.2.2 Proposed MFL Language). The RTF flows are estimates of historical flows from which the impacts of historical groundwater withdrawals have been removed. The historical influence of groundwater withdrawals over time was evaluated using estimates of groundwater usage in the North Florida Southeast Georgia (NFSEG) groundwater model area (Section 2.7 Reference Timeframe Flow, p. 24). Appendix B documents the data and methods used to establish the historical groundwater use throughout the NFSEG groundwater model area by hindcasting groundwater pumpage and injection rates from as far back as 1900 to 2015. Appendix C outlines the process used to develop an RTF flow and/or groundwater-head time-series at groundwater monitoring locations, springs, and/or steam gage locations (Appendix C, p. 1, first paragraph) using modeled data and the estimated time series of historical groundwater withdrawals that are described in Appendix B. In the process to determine RTF flows, increases in river flows in response to decreases in groundwater withdrawals were estimated on a yearly basis from 1933 through 2015, and the resulting estimates were added to observed hydrographs of river flows to obtain hypothetical hydrographs representing the variation in river flows in the absence of groundwater withdrawals during the period from 1933 to 2015 (from Appendix C, p. 1, third paragraph). As discussed below, the historical groundwater withdrawals in the NFSEG model area need to be quantified and plotted in Appendix B and in Figures 19 and 20 (2.7 Reference Timeframe Flow, p. 25). Also, the description of the process used to determine the RTF flows in Appendix C needs to be more focused on describing the development of the RTF flows at the three river gages.

Appendix B

A detailed procedure for determining historical groundwater use in the NFSEG model area based on data sources, water-use types, counties, states (Florida, Georgia, and South Carolina), and injection sites is described in Appendix B along with the use of a five-year moving average to smooth variations in year-to-year pumping rates from 1930 to 2015. The results of this determination of historical groundwater use in the NFSEG model area should be described quantitatively in Appendix B with numerical values for pumping rates over time and by plotting pumpage versus time for the various groundwater uses and total pumpage in a bar graph or (preferably) in a line graph and in a pie chart illustrating groundwater use for a selected year such as 2015. The historical groundwater use in the NFSEG model area also should be plotted in Figures 19 and 20 (2.6 Groundwater Use, p. 25) instead of the pumpage illustrated for the North Florida Regional Water Supply Planning Area, because the NFSEG pumpage is used in the development of the RTF flows described in Section 2.7 Reference Timeframe Flow. Also, any historical trends in groundwater pumpage, particularly recent trends, in the NFSEG model area should be noted and discussed in Appendix B and in Section 2.6 Groundwater Use.

Appendix C

The description in Appendix C of the process used to determine the RTF flows should be more focused on describing and illustrating the development of the RTF flows at the Santa Fe River gages near Ft. White and at US HWY 41 and the Ichetucknee River gage at HWY 27, including details of the calculations used to determine the RTF flows. Determining how "Changes in …flows at an MFL site of interest in response to changes in groundwater withdrawals were estimated on a yearly basis from 1933 through 2015..." (Appendix C, p. 1, 2. General Approach, first paragraph) involves a major, but unstated, relation between groundwater heads and flows and river flows, i.e., that the increased river flows resulting from decreased groundwater withdrawals represent increases in *base flows* into the rivers. This relation should be explicitly and clearly stated. Also, additional explanation is needed to describe how increases in flows at individual cells in the NFSEG groundwater model in response to decreases in groundwater withdrawals were summed to estimate increased base flows at the three river gages. For each of the three river gages, the locations of the cells in the NFSEG model that represent the reach of the part of the river into which increased base flow occurs should be identified. The cells (i.e., river and drain cells and any other cells) in the NFSEG groundwater model used to calculate the increased base flows should be identified. An additional figure (in plan view) that overlays the locations of the model cells used to represent the river reaches above each river gage onto a map of the Santa Fe and Ichetucknee rivers that supports this additional explanation should be added to Appendix C. The details of the process, including numerical results that illustrate how the Reference Timeframe (RTF) flows (Figures 22 and 23, pp. 26-27) were determined at each of the three river gages, should be included in Appendix C. Figures 22 and 23, pp. 26-27, should be included in Appendix C as well as in Section 2.7.1.

The determination of "flow or head sensitivities" and the use of the "sensitivity maps" described in Appendix C (Section 2.1, p. 2) also needs further explanation. Were the RTF flows for the Santa Fe and Ichetucknee River gages determined using this method? If so, a detailed explanation illustrating how this method was used should be added to Appendix C. Also, were any RTF groundwater heads or spring flows determined for this MFL report? If so, detailed explanations of these determinations should be added to Appendix C as well.

ATTACHMENT C - PEER REVIEW FORMS: REPORT FROM ADAM MUNSON, PH.D., P.E.

PEER REVIEW FORM

SUWANNEE RIVERE WATER MANAGEMENT DISTRICT

Project or Report Name: Technical Report-Minimum Flows and Minimum Levels Re-Evaluation for the Lower Santa Fe and Ichetucknee Rivers and Priority Springs

Name and Affiliation of Reviewer: Adam Munson, PhD PE University of Florida

Discipline specialty/specialties covered by this review: MFL Development, Statistical Methods, Use of Hydrologic/Biologic Models for MFL Development. Riverine Ecology.

This document is for the use of project Peer Review Chair retained by the Suwannee River Water Management District (District) for the purpose of providing a technical peer review of a District report, including manuscripts prepared by District staff and consultants.

REVIEW REQUIRED BY THE DISTRICT:

1. **Determine whether the methods used for establishing the minimum flows are scientifically reasonable.**

A. Supporting Data and Information: Review the data and information that supports the method and the proposed minimum flows, as appropriate. The reviewer shall assume the following:
   1. The data and information used were properly collected;
   2. Reasonable quality assurance assessments were performed on the data and information;

   Note: The reviewers are not expected to provide independent review of standard procedures used as part of institutional programs that have been established for the purpose of collecting data, such as the USGS and SRWMD hydrologic monitoring networks.

B. Technical Assumptions: Review the technical assumptions inherent in the methodology and determine:
   1. If the assumptions are clearly stated, reasonable and consistent with the best information available; and
   2. Assumptions were eliminated to the extent possible, based on available information.

Instructions:

1. The results of this review are for the use of the District and they are not to be revealed to others without the express permission of the District.
2. By signing this form, the reviewer certifies that the peer review was conducted according to the guidelines listed above and that the opinions and recommendations included in the review constitute an independent review per Chapter 373.042(5), in the discipline noted above.
3. The reviewer also certifies that the review was conducted according to the Scope and Conditions specified above.

Signature of Reviewer:	Date of Peer Review: Commenced January 2020

Responders Certification: The comments and criticisms provided by the Peer Review Chair have been addressed as noted in column C in a separate response document, which is attached, and in the report.

Name and Affiliation of Responder to Peer Review Comments:
Signature of Responder: **Date of Response:**

TABLE 1. SUMMARY REVIEW COMMENTS ON MFL DOCUMENTS

Comment No.	Figure, Table, or Page and Paragraph Number	Does Comment Directly and Materially Affect Conclusions of Report? (Yes/No)	To be completed by Reviewer(s)		To be completed by report author(s)
			A. Reviewer's Specific Comments	B. Reviewer's Specific Recommended Corrective Action	C. Action to be Taken in Response to Comment
1	P5, P8 Figure 4	No	Page 5 refers to the use of the "best available elevation data" and the cited table refers to the "surveyed cross sections" for the creation of the thalweg. This is a re-eval and there is interest in what information has changed between the 2013 and 2019 reports.	It would be useful to define the origins cross-sections either directly or through reference, so the reader knows if any new data is included in this graphic. It looks like the same graph as the 2013 report, so I assume no underlying changes to the data? But the HC cross sections did undergo some changes?	
2	P9	Not Likely	WY 1933-2015 was selected as the POR "based on the flow data available". Table 1 suggest that the Ft. White Gage data goes back to 1927 while the US441 and HWY27 gage go back only 1992 and 2002, respectively. The longest concurrent data (Worthington Springs and Ft. White) data date back to WY 1932. The report does not specify why WY 1932 was omitted.	The report might benefit from discussion on the omission of WY1932 from the POR which is defined in the second paragraph of page 8 as WY 1933-2015.	
3	P 11	No	The report states that "for all LOESS curves presented in this report, a	The authors should consider how many points (years) should	

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			smoothing value of 0.33 was used". The smoothing value represents the proportion of the data that is used. Essentially controlling the number of points used. Because .33 is a proportion of the size of the data set when the POR changes the span in time that influences local smoothing changes and in fact the number of points considered changes. The net effect is that longer PORs are smoothed to a greater extent than shorter PORs which will be more heavily influenced by a small number of points temporally closer to the smoothed point. This effect is visible in Figure 13 where the two smoothed curves show different levels of response to near term changes in water level.	be considered when smoothing PORs rather than applying a constant proportion to records of varying length.	
4	P 12	Yes	A MLR was used to infill a few months of missing data from 2000 and 2001 in the flow record of the US441 gage. It was also used to extend the 441 back to WY 33 (the POR). This seems a critical step in the formation of the RFT and it is treated fairly casually in the report. It would be useful to present information beyond the R-squared.	This seems like an important component of the MFL and would benefit from greater discussion and documentation.	

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			t-stats and p-values for the two coefficients as well as a scatter plots to establish the appropriateness of the linear relationships. Residual plots might also be insightful. This data is important since it is an MFL. The infilling of the Hildreth gage has been reviewed prior to this re-evaluation.		
5	Page 12, 1st Paragraph	Yes	"A truncated dataset" was used to omit flows at or below zero and above 3500 cfs from the regression. I assume this is due to non-linearity observed above the flow or at least excessive heteroskedasticity of the residuals but no reason is given in the text.	Please explain the rational for the truncated dataset and weather the resulting equation is ever used to predict values outside of the regression bounds. The nature of multiple WRVs rely on high or low flow conditions so extremes can be important in MFL development (especially low flows)	
6	P14 section 2.3.4	Yes	The reports sites Kelly 2004 noting that the AMO patterns are not displayed at the Ft White or Worthington Springs Gage. But Kelly's works noted that rivers between the northern flow pattern and southern flow patter might exhibit a bi-modal pattern with	Look at intra-annual flows between the two periods to assess if the timing of flow events has changed. It is likely that through discussions with Kelly you have already	

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			influences from both the norther and southern rain flow patterns. In the initial 2013 document Figure 2-31 clearly shows the bi-model pattern Kelly identified. By using annual flow duration curves this nuance is obfuscated. It is possible that while the annual flows are unchanged between the two AMO cycles the timing of flows has changed between early and late year peaks. This may have meaningful effect on seasonal evaluations such as for specific life stage analysis in the SEFA methods.	considered this, but the document would be improved with a discussion of any rational involved in dismissing the AMO as relevant to the development of the historic record.	
7	P14 Section 2.3.5	Yes	The last sentence on the page note that the annual rainfall averaged the same in the "wet" and "dry" periods identified by Kelly. My comment is the same as above. On the boundary you might expect a shift in timing as you move from a northern to a southern dominated pattern resulting in a long term bi-model hydrograph which will show alternating dominate peaks when examined over the two periods.		

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8	P 24, P=Last Paragraph	No	Published data was used "where available" and by estimating water use based on population where not available. What % of the land area "counties" were from data and what percent was estimated based on population and what per capita use rate was used. I think this is meant to be details in Appendix B. If so please cite appendix B here.	I think this is somewhat detailed in Appendix B. If so please cite appendix B here. Given the importance of the RTF this section might benefit from some expansion in the body of the report.	
9	Page 25 Figure 19	Yes	The table estimates water use through time but only goes back to 1965. Figure 2 in appendix B suggest a longer estimate (hindcast) was developed back to 1900 and the water use estimates were used to recreate the RTF back to WY 1933 so why does the graph not show the estimated back to at least WY 1933?	Extend graph to show estimates back to WY 1933 (or 1930 if 5-year blocks are used or even 1900 if that is the entire period estimated) or explain why the graph only goes back to 1965.	
10	Page 25 and Appendix C	Unknown	The RTF development is referenced here in the second paragraph and the reader is directed to Appendix C. Appendix C does a reasonable job of outlining the logic of the RTF creation but is devoid of number or graphs or examples. I will defer to the	No action requested other than consideration of additional information/examples.	

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			opinion of the groundwater experts on the Panel but I at least feel some sample values or summary values would be beneficial to the discussion in Appendix C given the importance of the RTF in measuring compliance with the MFL.		
11	P 106 Section 6.6.2	No	Recalling Figure 21 – It might be nice section 6.6.2 to add a graph similar to Figure 21 and impose the suggested MFLs. It would show clearly and quickly the relationship of the proposed MFLs with the estimated impacts over time.	Add a graphic	
12	P 48	No	The report cites the Warm Water Task Force 2004. This citation is a draft report. Presumably, since the draft was 2004, there is a final report available in which the FFWCC would have confirmed their draft assessment?	If a final report is available, please cite the final version of the report in support of the 68 degree threshold. If the report was never finalized perhaps cite (Laist and Reynolds, Coastal Management 33:279-295, 2005; Irving, Biological Conservation 25:314-334 1983; or Bossart, Handbook of Marine Medicine, 2001)	

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13	P 48	No	It is commendable that the District continues to improve modeling as new data is available. The HEC-RAS model has evolved allot since 2002.	No Action	
14	P 76, Second paragraph	No	32 NGVD is cited as being recommended for paddling. The last sentence states "if river levels are below 31.5" at US 441 paddlers may encounter some shallow spots. This seems like a random statement that play no other roll in the discussion. Why is 31.5 ft of interest? It seems only the 32 ft NGVD guidance is used so the mention of the 31.5 ft clutters the discussion.	Suggest either removing the sentence with 31.5 ft or explaining why it is mentioned.	
15	P 72 Table 16	No	It would be helpful to have easily available the periods of time for which each of the 42 habit curves were evaluate. I have found in the text where it states that fry were evaluated for April through July. It would be helpful if in Table 16 you could list the period of the year for which each curve was evacuated in SEFA	Append table 16	

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16	P 83	No	It is reported that flows above 3,200 cfs were not used in the SEFA evaluations. Traditionally in stream habitat modeling has been used for low flows and only evaluated seasonally so a cutoff probably makes sense.	A discussion of why flow was limited to 3,200 cfs and not some other flow might benefit the reader. Also, the text might benefit from a discussion of which months were evaluated for which life stages or were all but the spawning evaluated annually?	
17	P 84 Third Paragraph	Yes	For apportionment, the "reach methodology" was used. This is stated to be because the SEFA sites are all downstream of the US441 gage. Therefore the "sensitivity to the flow reductions of instream habitat upstream from US441 gage was evaluated implicitly." This seems more a policy assumption than an assessment of instream habitat sensitivity. Especially when the report notes that 75% of the downstream (of US441) weight is based on cross sections dissimilar to the one at and the next closest to the 441 gage.	Consider the wording to not overstate the representative nature of the assumption.	

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18	Page 84	Yes	Apportionment 1) Both times Jacobs and Romesser (2006) is cite there is a hedge saying this application is "similar" and that it is "largely consistent". Please explain differences. 2) At seems Good and Mattson (2004) proposed, and Jacobs and Romesser (2006) tested the reach methodology for apportioning withdrawals within a stream based on ecologically derived limitations at a downstream gage to guarantee greater restriction at an upstream gage to assure compliance above the reach (Nash 2007). 3) However, we have POFR and CFR standards developed at US441 (figure 61.) They include a SEFA site which is basically at the US441 gage. The downstream river is quite different than the upstream.	Additional discussion of the appropriateness of apportionment for setting an MFL in this case.	

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19	Appendix C		Seems data and graphs might be useful.		
20	Section 7	No	The conclusion that "an appropriate way to afford protection from significant harm at this time is to treat the Priority Springs collectively for a defined reach" is reasonable and consistent with other adopted MFLs. The districts on ongoing efforts listed in section 7.3.2 are commendable and reflective of their commitment to improving spring protection.		