APPENDIX G-2

Initial peer review report.

Scientific Peer Review Panel Review of "Proposed Minimum Flows for the Lower Peace River and Lower Shell Creek" – Final Initial Report

Prepared for:

Southwest Florida Water Management District

Prepared by:

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Draft April 2020

Introduction

The Southwest Florida Water Management District (District) has contracted with a Peer Review Panel (Panel) comprised of Laura Bedinger, Ph.D., Peter Sheng, Ph.D. and David Tomasko, Ph.D. to provide an independent, scientific peer review of its proposed minimum flows and levels for the Lower Peace River (LPR) and Lower Shell Creek (LSC), as outlined in the report "Proposed Minimum Flows for the Lower Peace River and Lower Shell Creek – Draft Report" dated March 20, 2020 along with six appendices.

The draft MFLs report summarizes prior efforts to establish MFLs guidance for the Lower Peace River and Lower Shell Creek. For the purposes of the draft MFL report, the LPR is defined as the river segment from the USGS gage location at Arcadia down to Charlotte Harbor, while the LSC is defined as the segment of the creek that extends from the Hendrickson Dam at Shell Creek Reservoir to the confluence of Shell Creek with the Lower Peace River.

The District's prior MFL guidance for the previously developed minimum flows for the LPR and guidance proposed for LSC were summarized in a 2010 District report. This information supported adoption of minimum flows for the Lower Peace River into District Rules as Rule 40D-8.041(8), Florida Administrative Code (FAC) that became effective in August 2010, as shown below:

Period	Effective Dates	Where Flow on Previous Day Equals:	Minimum Flow Is
Annually	January 1 through December 31	≤ 130 cfs*	Actual flow (no surface water withdrawals permitted)
		> 130 cfs	Seasonally dependent – see Blocks below In addition, the total permitted maximum withdrawals on any day shall not exceed 400 cfs
Block 1	April 20 through June 25	≤ 130 cfs	Actual flow (no surface water withdrawals permitted)
		> 130 cfs	Previous day's flow minus 16% but not less than 130 cfs
Block 2	October 28 through April 19	≤ 130 cfs	Actual flow (no surface water withdrawals permitted)
		> 130 cfs and < 625 cfs	Previous day's flow minus 16% but not less than 130 cfs
		≥ 625 cfs	Previous day's flow minus 29%
Block 3	June 26 through October 27	≤ 130 cfs	Actual flow (no surface water withdrawals permitted)
		> 130 cfs and < 625 cfs	Previous day's flow minus 16% but not less than 130 cfs
		≥625 cfs	Previous day's flow minus 38%

*cfs = cubic feet per second

In 2010, the District developed draft minimum flows guidance for the LSC, and determined that a recovery strategy was needed for the LSC, as existing (at the time) flow rates in the LSC were below the draft MFL guidance developed for the LSC. Based on this finding, and the need to develop a recovery strategy for the LSC, draft MFL guidance for the LSC was not adopted into District rules.

The revised MFL guidance for the LPR, from the draft 2020 MFLs report, is listed below:

Block	If Combined Flow on Previous Day is	Allowable Flow Reduction
All	<130 cfs	0%
Block 1	>130 cfs - 149 cfs >149 cfs - 297 cfs	Flow - 130 cfs 13% of flow
Block 2	>297 cfs - 386 cfs >386 cfs - 622 cfs	23% of (flow - 297 cfs) plus 13% of remaining flow 23% of flow
Block 3	>622 cfs - 1037 cfs >1,037 cfs	40% of (flow - 622 cfs) plus 23% of remaining flow 40% of flow
The total permitted maximum withdrawals on any day shall not exceed 400 cfs		

The MFLs guidance for the LSC from the draft 2020 MFLs report is listed below:

Block	If Inflow to Reservoir on Previous Day is	Allowable Flow Release
Block 1	<56 cfs	87% of inflow
Block 2	56 cfs - 137 cfs	77% of inflow
Block 3	>137 cfs	60% of inflow

The most apparent difference between the initial (2010) and draft revised MFL guidance for the LPR (and that proposed for LSC) is the move from a calendar-based regulatory approach to guidance that is based on defined threshold flow levels – which vary over the course of a year.

Peer Review Panel Responsibilities

To begin, the District's charge to the Peer Review Panel (Panel) was for the members to become familiar with the relevant regulatory background.

Section 373.042 of the Florida Statutes, states that for waterbodies such as the LPR and the LSC, established minimum flows represent the limit at which further withdrawals would be significantly harmful to the water resources or ecology of the area. The legislative guidance further states 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.

Additional and more detailed guidance on the development of MFLs is provided in Rule 62-40, FAC, which states that MFLs should consider the following concerns: 1) recreation, 2) fish and wildlife habitats, 3) estuarine resources, 4) transfer of detrital material, 5) maintenance of freshwater storage and supply, 6) aesthetics, 7) filtration and absorption of pollutants and/or nutrients, 8) sediment loads, 9) water quality, and 10) navigation.

As such, MFLs are to cover not only the protection of natural resources, but also navigation, recreation, and – for r the LSC in particular – the maintenance of freshwater storage and supply.

In its broadest sense, the Panel is charged with the following six tasks, as related to their review of the 2020 Draft MFL for the LPR and the LSC:

1) Determine whether District conclusions are supported by analyses/results presented
2) Determine whether data/information were properly collected and used, any data exclusions were justified, and the data were the best available information
3) Determine whether technical assumptions are clearly stated, reasonable and consistent with the best available information, and if better analyses could be used
4) Determine whether procedures and analyses were appropriate and reasonable, based on the best available data, correctly applied, limitations were handled appropriately, and conclusions are supported by the data
5) For methods judged to be not scientifically reasonable, describe scientific deficiencies, identify remedies, if any, or alternative methods

6) As appropriate, identify and characterize effort involved for preferred alternative methods that could be used in lieu of scientifically reasonable methods that were used

Summary of Review Panel Comments

After discussion in publicly-accessible teleconferences, the Panel decided to produce a draft MFLs review report using the following format: 1) Panel comments by all panelists would be compiled, based on the sequencing of the Draft MFL, 2) Panel comments would first be summarized in tabular form, by report section, in terms of the concern – briefly described – and the relevant Panel charge for which the concern was raised, and 3) additional text would follow to provide any needed back-up for the concern.

The tabular presentation of comments and concerns is tied to the 6 main charges of the Panel in a manner that likely over-simplifies the Panel process. Nonetheless, the Panel felt that this was an appropriate method to show the links between Panel comments and the specific contractual obligations of each Panel member.

The Panel report format appears to differ from most other Peer Review reports, which tend to separately list concerns by individual reviewers. Using the report format we selected, we believe that the District review process will be more efficient, as shared concerns can be characterized once, rather than perhaps being listed two or three times in different sections of the Peer Review report. This report makes no effort to attribute individual comments to individual reviewers. However, a separate column on the summary table for each section notes whether or not a comment or concern was raised by more than one reviewer. This should not be construed such that comments raised by more than one reviewer are more “important” than others, as it could be that an algorithm or conclusion raised as an issue by one reviewer was not known to be potentially problematic by others.

If the same comment or concern was raised in more than one location, due that topic arising in more than one part of the draft MFLs report, it would be listed in tabular form each time it was encountered, but supplementary text would not necessarily be included in latter portions of the report, to minimize repetition.

In addition, initial comments from the Panel are included for each member, as Appendices.

The Panel's comments are captured for this Draft Report, starting below:

Overall Comments and/or Concerns

Summary of concern/comment	Relevant Panel charge	Raised by more than Panel member?
MFL report was comprehensive, well-written and thorough	1 to 5	Yes
Basing MFL on specific flows, vs. calendar dates, a good idea	2, 3, 4	Yes
15% threshold value for "significant harm" needs further support, rather than reference that others have found it reasonable	1, 3, 5	Yes
Hydrodynamic modeling represents a substantial improvement from prior efforts	4, 5	Yes
Helpful for the MFL report to tie into other relevant regulatory guidance (i.e., FDEP water quality guidance, SWIM Plans, etc.)	2, 3, 4	Yes
Uncertainty and accuracy of hydrologic model should be discussed in more detail	1, 3, 4	Yes
In a changing climate, long-term (50-100 year) averaged flow are not necessarily more indicative of the hydrologic conditions in the next 15-20 years. Should more recent data in the past two decades be given more weight in the development of the baseline flow which was based on the average in 1950-2014?	2, 4, 6	Yes
Would be helpful to quantify actual or potential benefits associated with changes to existing MFL guidance	4, 5	Yes
Early in the report, give a holistic overview of how hydrodynamics could influence other in-Harbor phenomena. For example, describe the importance of high flows on bottom water hypoxia and other phenomena	2, 3	Yes
Consider development of a "dynamic" MFL with real-time now-cast/forecast capabilities	5	No
Discuss potential influence of inflows to the Harbor from other far-field sources, e.g., Caloosahatchee	2, 4, 5	Yes
Analyze the potential impact of sea level rise on the MFL, using best available SLR data for 2020-2050	2. 4. 5	Yes

The Panel felt that the draft MFL report was obviously the result of an impressive effort by the District and its consultants. The variety, quantity and quality of data that was

compiled, collected, analyzed and interpreted, as well as the hydrodynamic model, was universally viewed as impressive, and obviously indicative of the MFL process being approached in a thorough and professional manner by District staff.

The conversion of the MFL guidance from a calendar-based system to a flow-based guidance was considered to be a valuable improvement over the earlier guidance.

The District's use of a 15% threshold for "significant harm" will be considered elsewhere in the report, but the primary concern raised by the Panel was not that there was anything inherently "wrong" with the threshold, but the District's MFL report contains language that suggests that threshold values for withdrawal limits should first focus on a search to develop locally-relevant threshold values, such as the 0.6' fish passage criteria used in the Upper Peace River MFL, or perhaps water quality "triggers" or inflection points for wetland inundation frequencies. A thorough and detailed review of the MFL does show that such locally-derived triggers were examined, and that no link could be made for water quality, and that wetland inundation triggers were less protective than the 15% salinity-habitat metric. However, the MFL report would be more useful for future reviewers (and future District staff, perhaps) if the process that led to the adoption of the 15% threshold value for the salinity-habitat metric was more thoroughly, yet succinctly, discussed in the Executive Summary and elsewhere in the repot.

Panel members felt that while the expanded and more detailed hydrodynamic model used in the MFL was a substantial improvement over prior efforts, the issue of baseline conditions and the overall hydrologic output for non-gaged portions of the watershed continued to have limitations.

The Panel also sought to have the MFL report include reference to other regulatory guidance documents. For example, while the draft MFL report included reference to the lack of compliance of the LPR with various water quality criteria developed by FDEP, it did not include reference to the Pollutant Load Reduction Goal (PLRG) developed for Charlotte Harbor. While this is not a specific charge of the enabling legislation for setting MFLs, the Panel felt that public agencies should seek to develop regulatory guidance that is as complementary – or at least consistent with – guidance from other local, regional and/or state agencies.

Issues associated with the potential influence of the Caloosahatchee River and/or inflows from the south were of concern to the Panel, especially in light of recent adverse impacts to seagrass resources along the eastern wall – impacts that could be attributed to the Peace River, given its much closer proximity.

In view of rapidly accelerating sea level rise (SLR), the Panel felt it would be prudent to consider the potential impact of SLR on the MFL by using the NOAA (2017) projection of SLR for Fort Myers in 2020-2050. For example, as a first step the impact of SLR on the volume of 2-psu water in 2020-2050 could be investigated using the low, medium, and high SLR values corresponding to the 50 percentile SLR projection for 2100 (3.3 ft

global mean sea level rise of 3.3 ft) from NOAA (2017). The NOAA projection for Fort Myers in 2035 is 0.47, 0.80, 1.22 ft for the low, medium, high scenarios, respectively. The USACE SLR values used by the District are 0.2, 0.35, 0.76 ft, based on their 2013 report. Due to the increasing SLR and Florida Governor's effort in building coastal resiliency against the rising sea level, the Panel felt it is prudent for the District to use the best available information on SLR in its consideration of the potential impact of SLR on the MFL.

In consideration of the rapidly changing climate, the Panel recommends that, during its five-year evaluation with the regional water supply planning, the District evaluates the current and future climate conditions to determine if the MFL needs to be updated sooner than its regular schedule.

Comments on Executive Summary

Summary of concern/comment	Relevant Panel charge	Raised by more than one Panel member?
Definition of “significant harm”	1, 4	Yes
Definition of “best available information”	2, 3	No
Could MFL be set for more than 3 flow blocks?	3, 4	Yes
Concern over LSC low flow conditions	1, 2	Yes
Helpful for the MFL report to tie into other relevant regulatory guidance (i.e., FDEP water quality guidance, SWIM Plans, etc.)	2, 3, 4	No
Water quality data analyzed in the report are inconsistent with water quality criteria included in FDEP’s Numeric Nutrient Concentration (NNC) criteria	2, 4, 5, 6	Yes
Explain the need for MFL to be protective of high inflow requirements needed for Charlotte Harbor	1, 4	Yes
15% threshold value for “significant harm” needs further support, rather than reference that others have found it reasonable	1, 3, 5	Yes
Lack of maximum flow diversion quantity for LSC, while the LPR has a 400 cfs maximum diversion criterion to protect downstream ecological health	2, 4, 5	Yes
Say something about potential impact of SLR on the MFL	2, 4, 5	No

The Panel found that it would be helpful for the draft MFL to attempt to define the terms “significant harm” and “best available information” in the Executive Summary. While not all terms will be clearly defined, their use in the Executive Summary suggests that they are standard phrases recognizable to the reader, which they are not.

Concerns were raised by the Panel related to the absence of a maximum flow value for the LSC, compared to a proposed value of 400 cfs for the Lower Peace River. This seems to be a function of the District determining that the area of interest for MFL development for the LSC ends at its downstream boundary with the LPR, even though the area of concern for the LPR extends out into Charlotte Harbor. Since flows from the LSC average (on an annual time step) perhaps 20 to 30% of the annual average flows of the LPR, if flows from the LPR are important to the Harbor such that a maximum withdrawal value of 400 cfs is included in the draft MFL, it would appear that a similar maximum diversion criterion could also be derived for the LSC.

The report recognized that climate change has significantly affected the sea level and precipitation in the region. In a changing climate, as the sea level rise continues to accelerate in the world and specifically in southwest Florida, the impact of SLR on MFL will need to be fully addressed at some time in the near future. Baseline flow will need to incorporate future SLR and flow conditions, instead of completely relying on averaged long-term historical flows.

Comments on Chapter 1 – Introduction

Summary of concern/comment	Relevant Panel charge	Raised by more than one Panel member?
Formatting of Table 1-1 Improve within cell formatting so text in final column matches up with that in preceding columns	5	No
1.2.1 Remove ‘s from Florida in title	5	No

The Panel felt that the draft MFL report’s Introduction was well developed, and gave the Panel a thorough introduction to the LPR and LSC, as well as the District’s responsibilities. As is noted in other parts of this report, the Panel concluded that the definition of significant harm requires a careful discussion, not just of literature that supports proposed guidance criteria, but the diversity of opinions about the topic.

Comments on Chapter 2 – Physical and Hydrologic Description

Summary of concern/comment	Relevant Panel charge	Raised by more than one Panel member?
Issues related to clarity of maps and figures, for example, enhancing Figure 2-2 so it is better related/connected to a Google street map for the same area. In addition, river scales are discussed or displayed in both miles and km. Perhaps use both metrics each time.	2, 3	Yes
Question related to LiDAR sources, for example, is 2017 LiDAR data for the region available from the state?	2, 4	No
Use of NGVD29 vs. NAVD88 for elevation and bathymetry data	2, 4, 6	No
Question about the order of MFL development vs. water supply planning efforts	4	No
Definition of flow lag	2, 4	No
Consider adding a most recent 10 or 20 year average bar to Figures 2-12 to 2-16 in addition to the one that is the long-term average for POR	5	No
Discuss the importance of hydrodynamics and hydrodynamic modeling	4, 5	No
Additional and more detailed description of hydrodynamic model elements needed	4, 5	Yes

Figures 2-2 and 2-3 could be made clearer and easier to read. And the use of "%" should be used rather than "percent' to shorten the report. More substantively, the elevation and bathymetry data appear to be compromised to some extent by the use of both NGVD29 and NAVD88 as datums for elevation, as tied to LiDAR and the development of the hydrologic model.

The Panel felt that the draft MFL should more clearly describe the timeline of development of MFL guidance, as it relates to water supply. As MFLs must take into consideration existing water supply needs, the timing of the development of water supply plans and MFLs could be addressed earlier and more succinctly in the draft MFL report.

As important as the hydrologic and hydrodynamic models are, the Panel felt that they could have been described in greater detail earlier in the draft report. While the hydrodynamic model is viewed as a substantial improvement from the work included in

the 2010 MFL report, the hydrologic model has limitations related to those portions of the watershed located downstream of gages. Also, and touched on later, the factors that account for the conclusion that a result of groundwater withdrawals is a reduction in baseflow in parts of the Peace River watershed, but an increase in baseflow in locations such as Joshua Creek – those factors should be discussed in greater detail. The assumptions and data limitations associated with quantifying the water budget from both ungauged and gauged sources should be more clearly discussed.

Comments on Chapter 3 – Water Quality

Summary of concern/comment	Relevant Panel charge	Raised by more than one Panel member?
Salinity data presented in Figure 3-3 not that helpful	1, 4	No
Influences of factors other than flow on concentrations of chlorophyll *a*	1, 4, 6	Yes
Values of phosphorus only shown for orthophosphorus	2, 4, 5, 6	Yes
Values of nitrogen only shown for Total Kjeldahl Nitrogen (TKN) and nitrate plus nitrite	2, 4, 5, 6	Yes
Definition needed for "flow-lag"	2, 3	No
Various figures have legends that appear to be mislabeled	1, 4	Yes
Figure 3-22 caption says it is dissolved oxygen, but y-axis says chl *a*	3, 4, 5, 6	No
Mislabeling of y-axis on Figure 3.23	3, 4, 5, 6	Yes
Importance of hydrodynamic model description	4, 5	No
Additional and more detailed description of hydrodynamic model elements needed	4, 5	Yes
More refined explanation needed for isohaline location trend analyses	1, 4	Yes
Better description of results shown Figures 3-12 to 3-16	1, 4	Yes
Value of developing dynamic water quality model, vs. empirical approaches	4, 5	No
Flow-salinity relationships in Figure 3-11 include stations at or below the confluence of the LSC, but flows from the LSC are not included	1, 4, 5, 6	No
Table 3-1 – improve explanation of location of isohaline location trends	1, 3, 5	Yes
Table 3-2 ,3, 4 to 3-7 and 3-12 tp 3-16 – improve explanation of summertime hypoxia development and other data presentations	1, 3, 5	Yes

The Panel felt that some of the figures in the draft MFL were not overly useful, or could benefit from restructuring. For example, Figure 3-3 shows the variability in levels of salinity at various locations in the LPR. However, the analyses were conducted on 40 years of data, and variability could be due to seasonal variability, inter-annual variability,

or some combination of both. Figure 3-3 is not entirely clear, as to what it is meant to convey to the reader. Suggestions were raised as to how the data could be displayed to address these concerns. For example, additional box and whisker plots could be displayed for pre and post MFL salinity data would be informative for the reader. Similar modifications could be make for DO (Figure 3-4) and chlorophyll-*a* (Figure 3-5), nitrogen (Figure 3-7) and phosphorus (Figure 3-8)

Related to this issue, Figures 3-12 to 3-16 are confusing, as the label on the y-axis does not match what the draft MFL report suggests is displayed. This likely is a result of a "short cut" in terms of description of what the graphics are intended to display. A more detailed description of the intent of the figures (what they are meant to convey) would be useful, as they currently are confusing to the reader.

The draft MFL report seems to focus on flows and residence time, as an influence on concentrations of chlorophyll *a*. While this is a worthwhile issue to investigate, several decades of work on the LPR and upper Charlotte Harbor have indicated that the amount of colored dissolved organic matter (CDOM) in the system is likely a key consideration. As well, the role – if any – of zooplankton grazing should be at least mentioned as an additional moderating influence on chlorophyll-a concentrations.

This section includes analyses on water quality variables that need additional attention. For example, Section 3.3.1.3 on "chlorophyll" does not specify that the analyses refer to chlorophyll-a that is corrected for the presence of phaeophytin. The state of Florida's regulatory programs for water quality no longer accept un-corrected chlorophyll-*a* for analysis. If the water quality data sets used for analysis were not corrected for phaeophytin, they are of limited value for comparison with other systems and with relevant regulatory criteria. The reader should not have to search in the appendices to determine what the word "chlorophyll" refers to.

The draft MFL reports on "Ortho-phosphorus" which likely refers to concentrations of orthophosphate, not Total Phosphorus. Orthophosphorus appears to be a bit of technical jargon short cut for orthophosphate, which is the dissolved inorganic form of phosphorus. While this could represent 90% of the total pool of phosphorus, it could also represent a substantially smaller percentage. The suggestion made by the Panel is to conduct analyses on those stations and data sets that have total phosphorus, as that is the most complete form of nutrient content, and is also the nutrient form for which FDEP's NNC criteria have been developed.

The draft MFL report discuses status and trends in both TKN and nitrate plus nitrite, but does not add the two together to calculate the abundance of Total Nitrogen. Since Total Nitrogen is the form of nutrient that is most complete, and is the form of nitrogen in FDEP's NNC criteria, and the form that is involved in the PLRG for Charlotte Harbor, these analyses should be redone using Total Nitrogen, not TKN and nitrate plus nitrite.

When exploring empirical relationships between LPR flows and salinity in the LPR, it should be noted that two of the stations involved in those assessments are located

below the confluence of the LSC. On an annual basis, LSC flows average about 20 to 30% of the flow of the LPR. Therefore, not including LSC flows in the flow vs. salinity empirical relationships could limit the explanatory power of the derived relationships.

The Panel also suggested the District consider the value of a mechanistic water quality model for the LSC, LPR and Upper Charlotte Harbor. Such a mechanistic model, although my not be necessary for the MFL for LPR and LSC, should benefit a variety of water management decisions on the Charlotte Harbor estuarine-riverine system by the District. The Panel, however, recognizes that developing such a model would require addressing the influences of factors and parameters that may or may not have been adequately understood/quantified and more data may be needed.

Hypoxia was mentioned numerous times in the report and during our discussions. It would be good to have a more comprehensive discussion in the report on the naturally-occurring as well as non-naturally-occurring hypoxia, how they impact the Charlotte Harbor system, how they are influenced by the high flow from Peace River (e.g., what rate of flow triggers hypoxia? 20000 cfs? 1000 cfs?), and how will they be affected by the MFL.

Comments on Chapter 4 – Ecological Resources

Summary of concern/comment	Relevant Panel charge	Raised by more than one Panel member?
Plant community data set from 1998 is problematic	2, 3, 4	Yes
Status and trends in seagrass coverage in the LPR over time	2, 4	No
Concern over shift in HBMP focus to physical factors, rather than fish communities, macroinvertebrates, and/or macroalgae	2, 3, 4	Yes
Fisheries Independent Monitoring newest data from 2016 not included in the modeling approach (Appendix E) or compared to data collected through 2013	2, 3, 4	No
Should endangered species, such as sawfish and manatees, be included in MFL assessments?	2, 3, 4	No
In Appendix E it is stated that “predicted CPUE grids” were derived from catch data and these predictions were used to generate the population estimates which were used to model the effect of water withdrawals	1, 2, 4	No
Figure 4-2 difficult to review due color choices	1, 3	Yes
Explain “decreased flow may also contribute to increases in dissolved oxygen concentrations”. Add your response to p.76 of the report.	1, 3	No

The Panel was concerned about the reasonableness of analyses related to plant communities that were last quantified in 1998. It is not known to the Panel if the physical locations of various plant communities have changed over time since 1988, although 22 years of sea level rise could result in migration of some communities upstream, in response to increased marine influence.

Members of the Panel would like the draft MFL report to more thoroughly discuss the reason(s) why biotic variables such as fish abundance, macroinvertebrates, and/or macroalgae are not currently monitored to the same extent as they were in past years. A more detailed description of the relationship between the Hydro-biological Monitoring Program (HBMP), guidance from the HBMP review committee, and the data set used to develop the draft MFL would be helpful.

The Panel observed the levels of extrapolation involved in using HSM (habitat suitability modeling) to determine the effects of minimum flow conditions on the seven fish and one commercially important invertebrate. Populations were estimated and then effects on these estimated populations via changes in environmental conditions (temperature and salinity only) were modeled.

Questions related to the relative use (if any) by listed species should be considered, especially as how they were included (sawfish) in the proposed MFL for the Caloosahatchee River. The report could be a little more detailed/specific about the relationship of sawfish lifestages to salinity/freshwater flows. It might be helpful to NOT include rarely occurring species in the development of MFL guidance, but the draft MFL should at least include language that suggests why the decision to not include them is an appropriate decision.

Comments on Chapter 5 – Resources of Concern and Modeling Tools

Summary of concern/comment	Relevant Panel charge	Raised by more than one Panel member?
Figure 5-1 could be more clearly identified as to what the graphics are meant to represent, in terms of “exceedance”	3, 4	No
Timeframe and data sources used to develop the hydrodynamic model	1, 3, 4	No
Need to understand basis for variation in baseflow differences over different time periods	1, 3, 4, 6	Yes
Further clarify the meaning of “transitional flow triggers”, using simple terminology such as “safety valves” to explain concept.	3, 4, 5	No
Helpful to include a graphical display of residence time/flushing rates	4, 5	Yes
Language related to impacts of hurricanes based on model runs	1, 2, 4, 5	Yes
Request for more information related to the hydrodynamic model, including consider the possibility of adding a short chapter which gives a holistic overview on the role of hydrodynamics (flow and water level, salinity, temperature, flushing) on water quality, ecology and fishery.	4, 5	No
Limitations of hydrologic model in ungaged portions of the watershed should be discussed in more detail	1, 3, 4	No
Suggested development of a dynamic water quality model, vs. empirical approaches	4, 5	No
Justification for the use of Charlie Creek watershed yields from 1950 to 1969 is needed	1, 3, 4, 6	No
Explanation needed for why PRIM model expects flow reductions with groundwater withdrawals in some locations, but increases in other locations	1, 3, 4	No
Relevant literature or basis for model algorithms for irrigation efficiencies differing between row crops and citrus are needed	1, 3, 4, 6	Yes
Logic for not including a maximum diversion quantity for LSC is not clear	1, 3, 4, 5	Yes
Basis for 15% as threshold for “significant harm” needs more detail	1, 3, 5	Yes

Members of the Panel felt that data limitations associated with various aspects and algorithms of the hydrologic model should be better addressed. Differences in baseflow during different time periods, for different sub-basins, require more detailed discussion. These issues are particularly important for those portions of the LPR and LSC watershed that are downstream of USGS gage sites. Even for locations that are in gaged portions of the LPR and LSC watersheds, the following issues should be discussed in greater detail:

- Why is it expected that some parts of the LPR watershed would have reduced baseflow with increased groundwater withdrawals, while other areas would have increased baseflow?
- If Charlie Creek's hydrologic yield (cfs/square mile) during 1950 to 1969 is a good reference condition, why is that? Is this due to the characteristics of the watershed being more "natural" than other locations at other times?
- As the algorithms in the PRIM modeling effort are important for the hydrologic model development, it should be more clearly stated where relevant algorithms came from, lest a reader conclude that the algorithms were developed after the model runs, as opposed to the algorithms perhaps being modified from default values during the calibration phase of model development

The Panel noted that in the last MFL report (2010) the hydrologic model greatly over-estimated the ungaged flow from the watershed into the LPR and Charlotte Harbor, which seems to have been acknowledged by the District.

Portions of this chapter appear to be internally inconsistent. For example, Table 5-1 displays result of a Seasonal Kendall Tau test that found no monotonic trends over time for flows in Joshua Creek, and yet figures and text in the same section refer to the observed increases in dry season flows during the period of April to May as being evidence of an anthropogenic influence on dry season flows. The District should consider that the use of a Seasonal Kendall Tau test can give results at odds with an examination of flow data on a monthly time step, and consider a flow analysis on the monthly time step most useful for their discussion and later model development.

As was noted in earlier sections, the basis for there not being a maximum flow diversion threshold for the LSC, while such a value (400 cfs) exists for the LPR should be better explained. While the Panel realizes that the District is currently working to develop a recovery strategy for low flow conditions for the LSC, this issue relates to high flows, and the Panel does not yet understand why a similar maximum flow diversion threshold could not be developed for the LSC, particularly for times when inflows to the reservoir are matched (or nearly so) by outflows into the LSC from the reservoir.

As was noted elsewhere, the draft MFL report should further develop the reason(s) why a 15% reduction in the salinity-habitat metric is considered to not be problematic, vs. other thresholds.

Comments on Chapter 6 – Recommended Minimum Flow Values

Summary of concern/comment	Relevant Panel charge	Raised by more than one Panel member?
Would a 400 cfs value for the LPR apply during all conditions, including tropical storms and/or hurricanes?	2	No
Estimates of expected rates of sea level rise are lower than more recent studies by NOAA suggest are likely over the next few decades	1, 2, 3, 4	Yes
Logic for not including a maximum diversion quantity for LSC is not clear	1, 3, 4, 5	Yes
15% threshold value for "significant harm" needs further support, rather than reference that others have found it reasonable	1, 3, 5	Yes

Many of the Panel's comments related to Chapter 6 and the proposed MFL values had been made in earlier portions of this Panel draft report. These include the following main features:

- The shift from calendar-based to flow-based thresholds is to be commended
- Issues with the various algorithms and model components for the hydrologic model should be discussed in greater detail
- The District's logic for relying on a 15% change in habitat as being protective of "significant harm" should be elaborated on, and concerns related to why other techniques did not give rise to locally-relevant threshold guidance should be made more clearly
- The lack of a maximum flow diversion threshold for the LSC seems to be a function of a somewhat arbitrary truncation of the area of concern to that portion of the LSC upstream from its confluence with the LPR. No such restriction is placed on the LPR, which has a 400 cfs maximum diversion threshold which appears to be protective of portions of Charlotte Harbor beyond the downstream boundary of the LPR alone

In addition to previously raised concerns, the Panel felt that incorporating sea level rise scenarios was very useful, but that the more recent values derived by NOAA would be the most appropriate values to use.

Typos and Comments on Various Appendices

Summary of concern/comment	Relevant Panel charge	Raised by more than one Panel member?
Appendix E – page 7 – typo	5	No
Section 5.1 – typo	5	No
Page 88 – typo – add “on data from a 13-year period”	5	No
Page 96 – typo, first sentence “result in”	5	No
Page 98 – clarification needed	5	No
Page 113 – “psu” missing from first sentence of second paragraph, also change spacing	5	No
Appendix C should be a separate chapter	5	No
Page 16 – typo in title	5	No
Page 47 replace “is” with “in” first sentence of 3.3.1.2.	5	No
Figure 3-11, page 57 – model failed to predict several observed salinity peaks	1, 2, 3, 5	No
Caption of Figure 3-27 typo	5	No
Use of wind data from nearby airports might be helpful	1, 2, 3, 5	No
Appendix C – typo on page 42	5	No
Appendix C – typo on page 44	5	No
Appendix C – definition of shoreline length needed	2, 4	No
Appendix C – need justify not including influences of Caloosahatchee River and other significant sources of freshwater inflow on Charlotte Harbor	1, 2, 3, 5	Yes
Caption for Figure 2-13 needs a space	5	Yes
Consider adding conversion table	5	Yes

Appendices – Initial Written Comments from Drs. Laura Bedinger, Y. Peter Sheng and David Tomasko

First Comments on Proposed Minimum Flows for Lower Peace River and Lower Shell Creek

L. Bedinger

Overall

- The report was well written and thorough.
- I also thought the new blocking system seems to be an improvement on the old calendar-based one for guaranteeing flows. This seems to be a point of strong agreement.
- When using/looking at the flow record from the entire period (1950 for LPR and 1966 for LSC), might it make sense to examine that data in decadal blocks or the like to look for changes over time? This also applies to the water quality appendix where means of the entire POR are presented. Would like to see 5 or 10 year means in addition.
- Would like to further discuss the 15% reduction (vs 10% or 20% for example) in the most sensitive habitats (oligohaline) as significant harm. Is this mainly just because this number has been previously used by other MFLs? Could the report more fully explain and support use of this as the standard for "significant harm" in this system? Section 1.3.5 could have more information specific to this system (if possible). However, it does seem like a logical choice considering the need for surface water withdrawal for water supply.

Water Quality Section and Data: Chapter 3 and Appendix F

- Positive there is increased monitoring of salinity in recent years. The isohaline-based stations seem like a good idea when coupled with fixed location stations.
- Figure 3-3. Might it be better not to lump all the data from 1976 through 2016 exclusively, but show box and whiskers for smaller time periods (by decade?) as well, so the reader can look for trends? DO data (3.3.1.2) also lumped from 1976 to 2016 when shown.
- As Dave stated, specify chlorophyll *a* in section heading and first paragraph of 3.3.1.3. Again, I would like to see box and whisker of smaller time periods for this variable. There is not mention of day length being a factor driving seasonal phytoplankton biomass changes. Would it be important and separate from river flow?
- With regard to phosphorus, Appendix F (p. 5) states that since 2003 the HBMP program is "reporting phosphorus concentrations as orthophosphate (which is usually more than ninety percent total phosphorus)". A couple of comments and questions: first I think there is a typo that it should say that orthophosphate usually makes up 90% of the total phosphorous. Is orthophosphate being monitored instead of total phosphorus as it is a cheaper or simpler lab test? Is the percentage of the total phosphorus made up by orthophosphate constant in the Peace River? Maybe provide a reference or data.
- With regard to nitrogen, it appears the HBMP program is collecting samples that are analyzed for total nitrogen (1983 to 2018 in table 2.2 of Appendix F). In the main report NOx and TKN are shown rather than TN. Why? Or am I missing something? Again I would also like to see the data graphed with some visual of changes over time (decade blocks for box and whisker?).
- In dissolved oxygen and chlorophyll section/methods, there is no breakdown of readings into day or night values. Would day length/sunlight intensity that vary with seasons be worth mentioning in addition to water color and nutrients. Assuming surface DO decreases overnight and during darker periods in response to less photosynthesis by phytoplankton and benthic algae. Is the extent of hypoxia an issues, not just that is less than a threshold value, but by how

much? When water flow increases, how much is river depth affected? Is increased depth a driver of lower DO on the bottom?

Ecological Resources Section and Data: Chapter 4 and Appendix E

- I agree with Peter, the examination of plant communities from 1998 seems outdated. Maybe these plant communities should be assessed/mapped every 10 years to look for shifts?
- Was there historically more seagrass in the lower Peace River than there is now? Is this known?
- HBMP data collection has shifted away from monitoring populations of fish and macroinvertebrates in recent years to focus on physical factors, water quality, and phytoplankton (biomass via chlorophyll *a*). It is assumed that these are the drivers and that direct monitoring of biotic communities is not needed or not informative? Would data on these communities and benthic algae also be important for assessing the MFL?
- It looks like FIM collected fish data during 2016 but the modeling in Appendix E only includes data collected from 1996 to 2013. The report does not address changes from 2013 to 2016. Since the MFL was implemented in 2010, it seems like recent changes would be most informative and helpful for assessing the MFL.
- How reliable are the designations of euryhaline etc. when applied to the animals? Are they being found where they are supposed to be? (I mean in LPR and LSC are animals showing any flexibility in habitat/distribution when compared with predicted distribution with regard to average salinity.)
- Should sawfish (*Pristis pectinata*) and manatee habitat in LPR be given special attention due to their special statuses with regard to protection? Maybe the species chosen for the HSM model adequately represent the needs of sawfish? Could the main report text be more specific about the salinity requirements of sawfish at different life stages?
- With regard to the methods of the HSM modeling and data collection: it appears there are a couple of layers of extrapolation. CPUE is predicted based on biotic variables, then the predicted CPUE information was used to extrapolate population abundance, then the effect of water withdrawals on each species-life stage was modeled. Just want to make sure I understand and point out the layering of extrapolation. The model uses data collected through 2013. Will more recent data be input soon? Are the factors used to estimate populations enough? Are things like fishing and disturbance (dredging? Bottom types/structure) not also important?
- It looks like no benthic invertebrate sampling has been conducted since the implementation of the MFL. Maybe this should be implemented at least every 10 years (if not every five). These organisms role in food webs and for water filtration and grazing of benthic algae should be mentioned. More on the recent status of oyster populations could also be included.

Questions

- Is the lack of a rule for maximum withdrawal from Shell Creek a jurisdiction issue?
- What are the future plans for monitoring the fish, invertebrate, and other biotic communities going forward to continue to assess how the minimum flow implementation is affecting them?

Small Edits

- Use lowercase for common names, example: “blue crab”.
- Table 1-1 could have within cell formatting improved to match text in final column to the column that precedes it (the lines are not spaced out in the final column).
- Consider using ISO date format in tables (example Table 2-3).
- Page 47. “higher **in** surface water”
- Page 49. “food” repeats in first sentence of first paragraph
- Use spaces on either side of an equals sign.
- Appendix E page 7 “BF” appears, but should be “BL” in Creation of HSM maps?
- Wording of the first sentence of 5.1 needs to be improved “resources of concern”.
- Page 88 “The PRIM was run on data from a 13 year period” – second paragraph
- Wording in bottom paragraph on page 98 “freshwater plants tolerant of low salinity”
- Page 113 < 2 **psu** in second paragraph

Comments on MFL for Lower Peace River and Shell Creek - Peter Sheng

General Comments:

1. Overall effort is very comprehensive, covering all relevant aspects and issues. Reports are well written.
2. Changing from the old calendar-based blocking regime to the new flow-based blocking regime is a major improvement.
3. Hydrodynamic modeling is a big step forward from the previous effort, due to the use of 3D model and extension of model domain into the Gulf of Mexico. The 3D model is peer-reviewed and robust. Verification of the model is rigorous.
4. Uncertainty and inaccuracy of the hydrologic model remains a concern.
5. The base flow is constructed from the average flow during 1950-2014 for LPR and 1966-2014 for LSC. To account for climate change effect, however, is it more appropriate to place more weight on flow conditions in the past 20 years?
6. Considering sea level rise effect on MFL is commendable. The sea level rise values, which are based on the USACE study in 2013, appear to be at least 50% lower than those recommended by NOAA (2017) which is the leading U.S. climate agency. Are future predictions on precipitation, wind, atmospheric temperature, land use, and storms all incorporated into the new MFL?
7. Explanation on how and why the new MFL flow reduction strategy is better than the old MFL flow reduction strategy could be improved. For example, would it be useful to demonstrate that, under the new proposed MFL, the impact of flow reduction for any given year in the past 5-10 years would be much better than the old strategy?
8. Instead of measuring the impact of flow reduction in terms of 15% reduction of various habitats, is it possible to quantify the impact in terms of economic damage?
9. Southwest Florida is prone to hurricanes and hurricane-induced flooding. For example, Hurricane Elena (1985), Charley (2004), Wilma (2006), and Irma (2017) all impacted the lower Peace River area with storm surge, high flow, salinity stratification, and sometimes hypoxia. After Hurricane Charley, it was reported that flow in the Peace River peaked and water smelled like septic tank because of hypoxia. Predictions by most climate scientists suggest hurricanes will become more intense in the future. How will the proposed MFL guide the flow reduction during hurricane events?
10. Shouldn't the MFL be updated every five years, instead of every 10-15 years, in a changing climate?
11. How about creating a dynamic MFL with a realtime nowcast/forecast system for the Peace River, Shell Creek, and Charlotte Harbor region? The system can nowcast the current flow/salinity and forecast the future flow/salinity during the next 48-72 hours. Allowable flow reduction can be determined based on the nowcast/forecast flow/salinity conditions in the system.
12. SWFWMD has jurisdiction over the northern Charlotte Harbor system while SFWMD has jurisdiction over the southern part of the system, including Caloosahatchee River which sends a large amount of water into the estuarine system. Given sufficiently long time, water from Caloosahatchee could impact the flow in the northern part of Charlotte Harbor. Does the hydrodynamic model include Caloosahatchee flow as the boundary condition?

Executive Summary

1. Can someone define “significantly harmful”? Is it to be determined by the District or State Legislature?
2. What is “best information available”? Please define.
3. Second to the last line on page vii: “hydrodynamic” should be “hydrodynamic model”.
4. Base flow was divided into three flow blocks. Is it the best possible way? Can it be broken into 4 or 5 blocks? How does the MFL outcome vary with the number of blocks?
5. Any impact on the wetlands by flow reduction?
6. Should Table for LPR on page ix be numbered?
7. How do you prove the proposed MFL summarized in the table is the BEST possible?
8. Should Table for LSC be numbered?
9. It is concerning that minimum flow for SC is and will not be met for the next 20 years. Does it mean City of Punta Gorda will have water shortage for the next 20 years?
10. District is committed to “periodic” reevaluation and revision of minimum flow for LPR and LSC. Please define “periodic”.

Chapter 1 Introduction

1. Page 3 - “The proposed minimum flows, which are described in this report…..” should provide a reference to a Chapter number or Table number somewhere in the report.
2. Page 4 - Can “best information available” be defined? What is its legal definition? Scientific definition?
3. Page 6 - What are “Alternative hydrologic regimes”?
4. Can the definition of “impacted flows” be improved. It is unclear.
5. Page 11- “a loss of more than 15 percent habitat” is over how long a time period and with what time lag?
6. Does the “15% harm” guideline apply to all the habitats?
7. Is it more appropriate to consider 15% reduction in economic value?
8. To prove the success of the proposed new MFL, did the District confirm that there will not be significant harm to resources and habitats if it were applied to any year in the last five years?
9. Would the new MFL significantly reduce the harm to habitats and resources than the old MFL?
10. Page 14 – Why not use the 3D model in the rivers as well as the Charlotte Harbor?
11. Page 15 - I assume the 3D model has moving boundary feature?

Chapter 2 Physical and Hydrolgic Description

1. Figure 2-2 on Page 18: This lower left corner of this map does not look similar to a Google map for the region. Perhaps it is good to show a Google map for the region?
2. Figure 2-3 – Please explain the dark map which corresponds to the white region in the larger map shown in the inset.
3. Table 2-1. No need to show % again after the numbers.
4. What is the LiDAR data for the land area used in this MFL study? Is it 2017 data? I understand Florida took LiDAR data over Southwest Florida after Irma in 2017.

5. Page 30 – Line #2 “can all affected” should be “can all be affected”.
6. Are all elevation and bathymetry data converted to NAVD88?
7. What is the vertical datum for the water level at the open boundary condition of the 3D model?
8. On Page 37, it was said that many executive orders were issued in 2009. How were these orders determined? With modeling? What were the impact on the ecosystem and resources?
9. Do you set a goal for total water supply first, then determine the flow reduction strategy? Or is it the other way around?
10. The sentence on the bottom of page 37 “However,…..” is unclear. Please clarify.

Chapter 3 Water Quality

1. Please define “flow lags”. Is it “flow at previous x days”?
2. Figure 3-23 – label “salinity” should be “chlorophyll”.
3. Given the importance of flow and salinity in affecting the water quality and ecosystem, hydrodynamics and hydrodynamic modeling is the cornerstone of the MFL study. However, “hydrodynamic modeling” does not appear in the report until page 57 in a very short paragraph: “Given the strong interaction between freshwater flows and salt transport processes, a coupled 3D and 2D hydrodynamic model (Chen 2020) was developed to estimate responses of salinity to reductions in freshwater inflows and support development of proposed minimum flows for the Lower Peace River and Shell Creek. The hydrodynamic model is discussed briefly in Chapter 5 and in greater detail in the Appendix C.”
4. It would be appropriate for a chapter on flow, water level, and salinity with some more details on the hydrodynamic modeling effort as well as a good summary of flow and salinity in the system and how they might influence the other elements of the study. Describe the model assumptions, input and output, and setup for the various scenarios it simulated.
5. Table 3-1 tries to explain the isohaline location trend. Please explain the meaning of it more clearly with simple layman language without statistical jargons.
6. Same for Table 3-2. What is Table 3-2 trying to say? No hypoxia during summer months due to flow reduction?
7. Same for Table 3-4, 3-5, 3-6, 3-7.
8. Figure 3-12, 3-13, 3-14, 3-15, 3-16 are highly technical figures with lots of statistical terminologies. Please explain in simple language the meanings of these plots.
9. Stoker et al. (1998, USGS Report) measured the flow and salinity along the Peace River during 1982 – 1985. They found that significant salinity stratification (10 psu between bottom and surface salinity) occurred along the lower reaches of the river when Peace River flow at Arcadia was between 487 and 1420 cfs, or when 5-day sum of discharge was over 20,000 cfs. Kim et al. (2010, ECSS) found that, during 2000, bottom-water hypoxic conditions occur during periods with relatively steady moderate to high (5-40m3/s or 180-1440 cfs freshwater inflows and sediment oxygen demand (SOD). Spring-neap tide also has significant impact on the formation of hypoxia. High flow condition is found almost throughout the B3 block period during June-October in the Base Flow. So how often is hypoxia expected to occur during the summer month with and without flow reduction? During these high flow events, can more flow be withdrawn to reduce the likelihood of salinity stratification and hypoxia?

10. Empirical, regression, and statistical models are used for the water quality analysis. In the long run, is it more appropriate to develop a dynamic water quality model for the estuarine and riverine system?

Chapter 4 Ecological Resources

1. Vegetation map shown in Figure 4-1 is from 1998. Seems outdated.
2. Figure 4-2 is difficult to see. Please use different color tones for the seagrass.
3. Page 76 – "decreased flows may also contribute to increases in dissolved oxygen concentrations." Is it so? Flow reduction will lead to increased DO?

Chapter 5 Flow Blocks, Baseline Flows, resources of concern and modeling tools relevant to minimum flows development

1. Should indicate the meaning of curves with green and blue colors. What if 1994-2014 model results are used? Climate in the past two decades is likely more different from the previous years so flow data during 1994-2014 maybe more meaningful to consider here.
2. Did the hydrodynamic simulation for the 1950-2014 and 2007-2014 periods use the appropriate atmospheric forcing including air temperature, cloud cover, wind, and ocean forcing over the region? For example, my understanding is that wind data from only one local wind station was used in the model simulation. Perhaps it would be worthwhile to use predictions by regional wind model, e.g., the NOAA NAM (North Atlantic Mesoscale) model to more accurately capture the wind influence?
3. Perhaps it would be useful to understand how and why the base flows vary with different time periods 2007-2014, 1950-2014, and 1994-2014 before determining which the best base flows are?
4. Please explain "With this new approach, the determination of transitional flow trigger (e.g. 625 cfs in the existing Lower Peace River minimum flows, Table 1-1) is not required when high flows remained depressed due to climatological conditions."
5. It might be useful to produce a "flushing map" (50% renewal time map) for the various sections of the flow system. The map can be used to aid the discussion of flow effect on DO, water quality, fishery, etc.
6. Page 77 mentions the following: "Hurricanes can cause high river-inflows events, which reduce the salinity in the area and reduce dissolved oxygen." Were these events simulated by the models used for this study?
7. Figure 5-8 shows the domain of the 3D model used for the MFL study. This should have been shown in a new chapter on hydrodynamics (flow, water level, and salinity), preceding the water quality chapter.
8. Hydrologic model prediction of the watershed flow remains to eb a weak link in the new MFL study as the previous one. Improvement is needed.
9. Figure 5-11. There is a typo in the figure caption: "independent" is mis-spelled.
10. Water quality "models" are relatively simplistic and empirical compared to the hydrodynamic model. Consider the use of a dynamic water quality model?

Chapter 6

1. During hurricanes and king tide events, is 400 cfs still the maximum flow withdrawal?
2. Should “minimum flows scenario” be replaced by “minimum flow scenarios”?
3. The stated sea level changes at Ft. Myers station for the period from 2010 to 2035 are 0.20, 0.33, and 0.76 feet, respectively. These values are lower than the latest NOAA predictions.

Appendix C Hydrodynamic Modeling

1. This Appendix deserves to be a separate Chapter.
2. The 3D hydrodynamic model is very robust and efficient. Most results generally agree well with observations.
3. Page 16, Line#5. “friction” should be “fraction”.
4. Figure 3-11 on page 57 - Model simulated salinity missed several observed salinity peaks. Observed salinity range is between 10-25 psu but simulated salinity is between 20-26 psu. These occurred mostly during the hurricane season.
5. Perhaps it is useful to try to use more wind data from nearby airports, instead of only one station. Can also try to find NOAA NAM wind fields or Navy wind fields (from Naval Research Lab) for the region.
6. During the last MFL study, watershed model greatly over-estimated the flow from the watershed into Peace River and Charlotte Harbor. There is no improvement in the watershed modeling in this MFL study.
7. Good choice of skill index.
8. On page 42 – “January 2017” should be “January 2007”.
9. On page 44 – “exited” should be “existed”.
10. Figure 37 simulated “shoreline length”. Please define. Is flooding-and-during a part of the 3D and 2D model?
11. Has alternative model domain been considered for the southern part? The alternative would move the southern boundary to the south of San Carlos Bay and use the water level and salinity provided by the USF model as boundary condition there, but use flow conditions in Caloosahatchee measured by SFWMD as boundary condition. I am assuming that the current 3D model uses the water level and salinity inside Caloosatchee provided by the USF model. If this is true, my concern is the Caloosahatchee flow is not correctly represented in the 3D simulation. Our simulations found that, given sufficient time (~ 1 month), high flow in Caloosahatchee could reach the northern Charlotte Harbor.
12. Sea level rise values for 2020, 2030, 2040, 2050 are based on USACE’s estimate. On the website provided in Appendix C, it states that the sea level values are based on a 2012 study by the National Academies and a USACE report in 2013. Since 2013, there has been rapid development of new and more robust predictions on future sea level values. NOAA, the leading U.S. climate agency, published a comprehensive report on the future sea level rise values throughout the U.S., including southwest Florida. The NOAA sea level rise values for Ft. Myers area are typically twice of the USACE values. It would be prudent to use the NOAA values and recalculate the impact of Sea Level Rise on MFL in the LPR and LSC. M<ore information can be supplied if requested by the SWFMWD.

DRAFT OUTLINE OF COMMENTS – D. Tomasko

Comments and/or requests for clarification

1. The MFL does not incorporate some of the other regulatory programs that overlap with MFL topics:
    a. SWIM Plan not referenced (which included documentation of impacts of hydrologic alterations on health of Charlotte Harbor)
    b. No reference to Pollutant Load Reduction Goal, as laid out in SWIM Plan (see comment 3). Even though reference is made to FDEP's Numeric Nutrient Concentration (NNC) criteria.
    c. NNC criteria set by FDEP mentioned, however, nutrient forms included are not the same as the nutrient forms included in NNC criteria (see comment 5).
    d. Adoption and subsequent implementation of the proposed MFL would not complicate the TMDL, as shown in the text. But mention should be made of the PLRG, and its links to high flow requirements as necessary for the "reset button" of bottom water hypoxia in Charlotte Harbor.
    e. The MFL statute does not state that MFLs are to address every management issue, but the MFL should include language that addresses whether or not non-attainment of the MFL would make it less likely that other regulatory programs would meet their goals?
2. Related to very high flows and the "reset button" for Charlotte Harbor due to salinity stratification and bottom water hypoxia…
    a. It appears improbable that even maximum water withdrawals would reduce flows sufficient to prevent bottom water hypoxia, which requires an average flow of 10,000 CFS at Arcadia (Stoker et al 1989) – roughly equivalent to total gaged PR flow of about 20,000 cfs
    b. Proposed max withdrawal of 400 cfs represents ca. 2% of the minimum flow from PR watershed required to initiate stratification of 10 ppt in Harbor. Consequently, maximum withdrawal appears to be protective of the "reset button" of bottom water hypoxia.
    c. However, would be helpful to see the District-developed MFL reference the District-developed and NEP-approved PLRG, which is based on protecting natural phenomena of bottom water hypoxia from becoming increased ***or reduced*** by human activities
3. The MFL seems to be based upon the "significant harm threshold" of 15% for salinity-based habitats
    a. Text implies that this is to be a default approach for MFLs, to be used only if other approaches to develop thresholds were not found (e.g., fish passage of 0.6-foot depth {for UPR}, wetland inundation elevations, etc.)
    b. The wetland inundation approach and water quality approaches are modeled and results discussed, but text is not very robust that 15% threshold for salinity-habitat metric was needed as a fallback guidance for "significant harm"
    c. While used in many MFLs, a potential 14% loss of habitat being considered to be "not significant" is not universally applied, including District regulatory programs
        i. Development permits are not allowed to arbitrarily eliminate 14% of wetlands without repercussions

ii. Coastal construction is not allowed to arbitrarily cause the loss of 14% of the seagrass habitat in, for example, Lemon Bay
iii. Enhanced text justifying the need to defer to 15% threshold would be helpful. Is this the best approach, based on inability to identify other thresholds, or does it represent a repeated use of what has become the default metric of acceptable impacts?

4. Lack of maximum flow diversion quantity of Shell Creek is problematic
    a. Is this based on assumption that Shell Creek flows are only of concern in Lower Shell Creek?
    b. Mean annual flows for LPR (PR @ Arcadia, HC and JC) of 1,302 cfs. Mean annual flow of SC 363 cfs, so mean flow of SC ca. 28% of mean LPR flows
        i. If high flows for the LPR are important to protect the health and functioning of Charlotte Harbor (400 cfs maximum diversion) why wouldn't SC high flows be similarly considered in terms of health of the Harbor?
        ii. Not likely that max withdrawals (if set) for LSC would affect threshold values for stratification, but should be mentioned/acknowledged
5. Water quality review (Section 3.3)
    a. Make sure that analyses used "Chlorophyll-a (corrected for phaeophytin)" rather than "Chlorophyll" – too vague as to what the units were.
        i. Revise text as appropriate, or revise analyses, if needed
    b. Section 3.3.1.4 – why aren't nitrate plus nitrite and Total Kjeldahl Nitrogen (TKN) combined into Total Nitrogen (TN) for analysis?
        i. Helpful to have it broken down to this level, but NNC criteria and PLRG "hold the line" goal are both based on TN concentrations or loads, respectively
    c. Section 3.3.1.5 – why is "Orthophosphorus" examined, and not Total Phosphorus (TP)?
        i. Does this mean only dissolved inorganic phosphate (i.e., soluble reactive phosphate; SRP) examined?
        ii. If so, then SRP is potentially not conservative
        iii. If section refers to TP, then revise text to say TP
    d. Figure 3-11 – flows vs. salinity
        i. Data from stations 6 and 15.5 are located at or below the point of confluence of flows from SC into the LPR
        ii. Without accounting for SC flows, this might underestimate total flows by ca. 25 to 30%
        iii. Add in LSC flows for these relations, or explain why not relevant
    e. Figures 3-12 through 3-16
        i. Values on y-axis appear to be for Coefficient of Correlation (CC) for Spearman's Rank Correlation
            1. Spearman's used to test for monotonic but non-linear (potentially exponential) correlations of ranked data
            2. Were data not tested for parametric analyses? (even if non-linear)
        ii. Label on y-axis is of water quality parameters, not values of CC for tested relationships. Confusing.

iii. Does the appearance of a bar imply that relationship is statistically significant? CC values alone do not by themselves imply statistical significance
iv. Are lack of bars equal to CC value of zero, or not significant?

f. Section 3.3.3.4 – see comments above…why reference to TKN and OP?
   i. Are nitrate and nitrite not available? Why reference to TKN, not TN?
   ii. Are data truly orthophosphorus, or Total Phosphorus?

g. Section 3.3.4 – reference made to role of "tide, residence time, nutrients) as likely affecting chlorophyll concentrations
   i. Figure 3-26 shows summer time color values in LSC of > 200 PCU
   ii. Equal consideration should be given to potential role of color as reason for observation (Figure 3-22) of lower chlorophyll-a(?) values in summer
   iii. Is there a potential that a maximum or minimum withdrawal limit might be important for keeping color levels high enough to keep chlorophyll-a below threshold values to limit nutrient sensitivity?

6. Section 5.2 – Identification of need to change the 3-block system with set dates to a 3-block system based on flows is well developed, and that modification appears to be appropriate and logical
7. Section 5.3.1 – interpretation of results shown in Figure 5-3 seem to suggest that if flow yields match the pattern seen in Charlie Creek in 1950 to 1969, then results are "…indicating that there has not been a significant anthropogenic impact over time…"
   a. However, Kissingen Spring stopped flowing in 1950, and the MFL should discuss why Charlie Creek had more natural flow pattern than UPR in 1950 to 1969. Not saying Charlie Creek isn't a good reference, but citation of lack of agricultural or mining land uses upstream of the gage would support its use as a reference condition.
   b. How does PR @ Arcadia higher yield in 1950-1969 match up with loss of Kissingen Spring? Seems counter to the idea that flows in the Upper Peace River were <u>already</u> reduced by anthropogenic impacts by 1950
   c. Text for figure 5-3 explicitly states that Joshua Creek displays increased hydrologic yield (cfs/mi2) during April to May – more flow than in 1950 to 1969 period
      i. Yet Table 5-1 has no trend over time (Seasonal Kendall Tau) for Joshua Creek
      ii. Is it possible that Seasonal Kendall Tau finds no significant trend, because the deviation in flows is only occurring in 2 to 3 months per year?
      iii. Keep in mind that a Seasonal Kendall Tau value is calculated from 12 individual (in the case of monthly) estimates of trend. If 10 are non-trending, and 2 are strongly trending, then "overall" could be no trend.
      iv. Test for flows on a monthly time step, to ensure consistency between Table 5-1 and the interpretation or results in Figure 5-3.
   d. PRIM model results (Table 5-2) suggest reducing groundwater withdrawals will increase flow in the UPR, but decrease flows in Joshua and Charlie
      i. This differential response appears logical if the destination of groundwater withdrawals differs between the UPR and Joshua and Charlie Creeks, but it should be discussed in greater detail - why the difference in direction of response?

8. Section 5.3.3 – the PRIM model includes the assumption that irrigation efficiencies are 60 and 85% for row crops and citrus, respectively – very important to the algorithm. But where is reference for this assumption?
    a. For mechanistic models, assumptions are supposed to be generated by literature or data, then incorporated into models, and then models "calibrated" by comparing output to predictions
    b. Is this a model assumption that was based on literature, of was observed vs. modeled flows from these systems used to develop the assumed irrigation efficiencies?
9. Section 5.4 – potential techniques for developing thresholds for MFLS are briefly discussed, but then 15% threshold for "significant harm" is then relied upon for salinity-habitat metric
    a. See comments listed above.
10. Section 5.4.1 – Was not 130 cfs initially established as a breakpoint/threshold value for the upstream movement of the 2 psu isohaline?
11. Section 6.2 – The logic for a maximum withdrawal threshold not being included for Lower Shell Creek is not clear. Suggestive of a disconnect of some sort between withdrawing from Shell Creek Reservoir is not impactful to flows and ecology of Lower Shell Creek?
12. Section 6.3 – appears that flow reductions of 0, 10, 20, 40% etc. are applied and CDF plots to see what level of flow reduction creates a more than 15% decrease in salinity-habitat and floodplain inundation.
    a. While not in and of itself problematic, this should be the default approach, if other thresholds did not arise
    b. Floodplain inundation less sensitive than salinity-habitat metrics – good that not used
    c. Salinity-habitat metrics are related to essential fish habitat (EFH)? Is this implied, or actually tested? Was not sure why EFH not tied to salinity-habitat metric as much as I was expecting.