Proposed Minimum and Guidance Levels for Lake Starr in Polk County, Florida

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DRAFT, July 2015

Executive Summary

This report describes the development of proposed Minimum and Guidance levels for Lake Starr in Polk County, Florida based on reevaluation of levels in Southwest Florida Water Management District rules that became effective August 2000. Minimum levels are the levels at which further water withdrawals would be significantly harmful to the water resources of the are (Section 373.042(1)(b), F.S.). Adopted minimum levels are used to support water resource planning and permitting activities. Adopted guidance levels are used as advisory guidelines for construction of lake shore development, water dependent structures, and operation of water management structures.

Section 373.0421(3), F.S., requires the periodic reevaluation and, as needed, the revision of established minimum flows and levels. Lake Starr was selected for reevaluation based on development of modeling tools for simulating lake level fluctuation that are not available when levels currently adopted for the lake were developed. The adopted lake levels were also reevaluated so support ongoing assessments of minimum flows and levels in the northern Tampa Bay Water Use Caution Area, a region of the District where recovery strategies are being implemented to support recovery to minimum flow and level thresholds. $latexalpha

ft^3 ft_3

bquote('Assimilation ('*mu~ 'mol'* $_{CO[2]}$ $m^{-2~s}$*-1*')')

The Lake Starr water budget was built over the period 1988-2012. Lake elevation data was available over this period at a daily continuous increment.

Figure 1: Lake Starr Water Balance Model results

Table 1: Summary table of water balance variables for calibration

	Mean	SD	Median	Min	Max	N
levelLakeStarrOrig	102.5	3.156	102.4	96.23	109.8	6048
levelLakeStarrFilled	101.8	2.784	101.6	96.23	109.8	9862
levelUFAHart	94.83	2.967	94.78	88.21	102.1	155
levelUFAHartFilled	93.27	2.781	93.08	85.54	102.1	9862
levelUFAHartFilled4Feet	97.27	2.781	97.08	89.54	106.1	9862
levelUFAHartECFT	103.7	2.549	103.7	95.19	110.8	9862
levelSASWTS1Orig	106.1	3.132	105.7	101.8	113.1	101
levelSASWTS1Filled	105	2.663	104.8	99.72	113.1	9862
levelSASSTUSEOrig	103.2	2.921	102.1	99.35	109.1	68
levelSASSTUSEFilled	100.6	2.829	100.3	94.88	109.1	9862
rainFinal_inday	0.1362	0.3969	0	0	6	9862
rainMtnLk_inday	0.1388	0.4124	0	0	6.96	9862
rainFinal_ftday	0.01135	0.03308	0	0	0.5	9862
evapStarrUSGS_ftday	0.01326	0.004249	0.01399	0.004969	0.0204	5478

	Mean	SD	Median	Min	Max	N
evapETG_ftday	0.013	0.00424	0.01434	0.006322	0.01855	9862
lakeArea_acres	129.9	10.38	129.7	111.2	149.6	9862
lakeArea_ft2	5658191	452291	5650603	4843872	6518318	9862
watershedArea_ft2	14179033	452291	14186621	13318906	14993352	9862
rain_ft3day	64146	188069	0	0	3247398	9861
evap_ft3day	73446	24493	78177	30624	119420	9861
inflowSASWTS1_ft3day	7424	12084	7146	-20998	56195	9861
inflowSASSTUSE_ft3day	-816.6	236.8	-797.1	-1382	-120.4	9861
headDif_ft	0.7591	1.333	0.7747	-2.783	6.378	9861
leakage_ft3day	7774	13566	7528	-25984	58140	9861
runoffSCS_ft3day	5818	84507	0	0	4465268	9861
DCIA_ft3day	6753	19685	0	0	297558	9861
date.1	37074	2847	37074	32143	42004	9862
levelLakeStarrPred_ft	104.4	2.478	104.1	100.4	110.5	9862
levelLakeStarrResid_ft	2.582	0.973	2.618	-0.0247	5.306	9862

The Upper Floridan aquifer well near Lake Starr was filled using Romp 57 to present a more complete dataset for the water budget model.

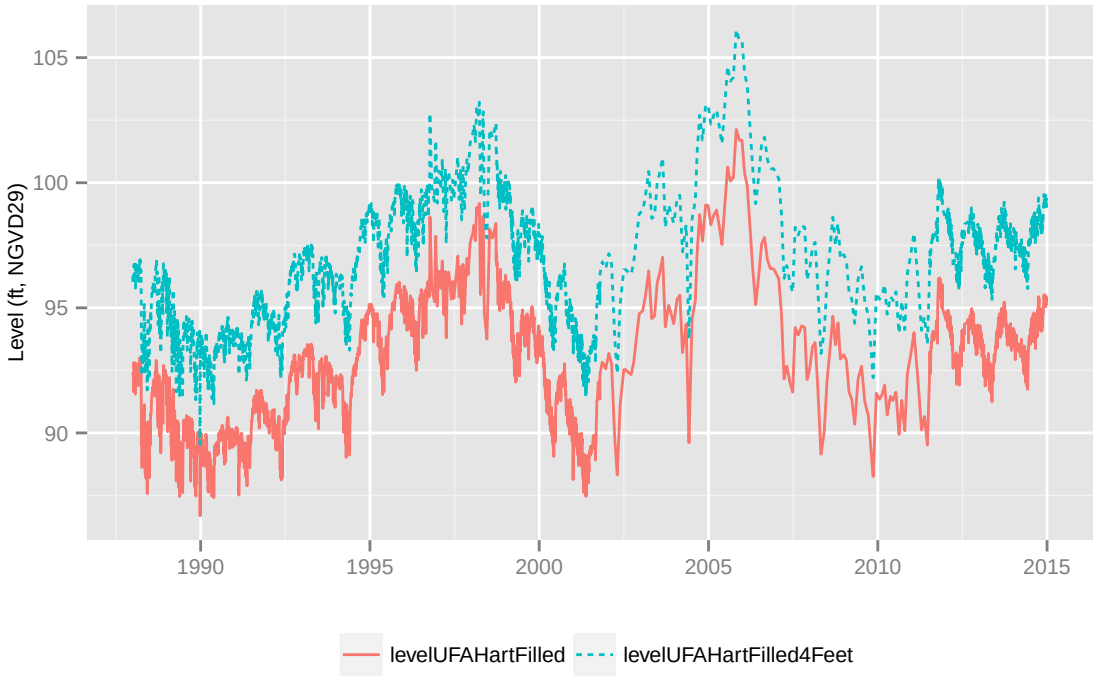

Figure 2: Hart UFA well near Lake Starr

Composite rainfall was coverted from in/day into ft3/day for the water budget model.

Figure 3: Rainfall ft^3/day

Evaporation data was collected at Lake Starr over the period 1998-2012. The GOES ET data was used in

the water budget model since it was very comprable to the USGS data as well as was consistent over the period of record used by the water budget model.

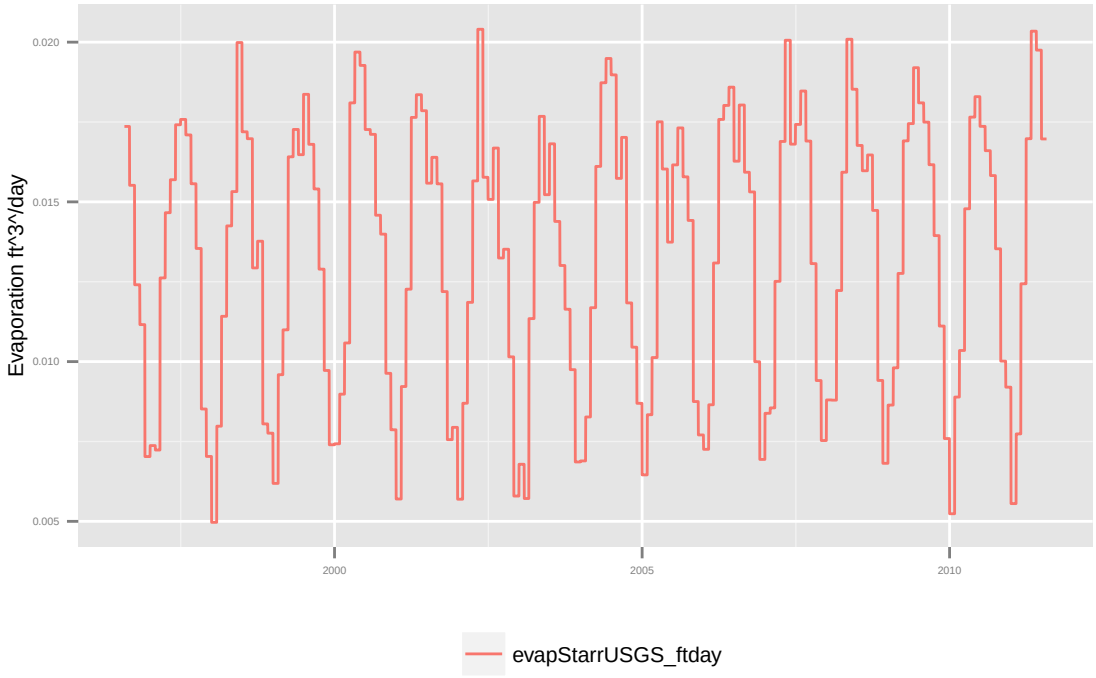

Figure 4: Evaporation ft^3/day

Leakage from the lake was captured by a coefficient to determine the interaction between the underlying aquifer and the lake.

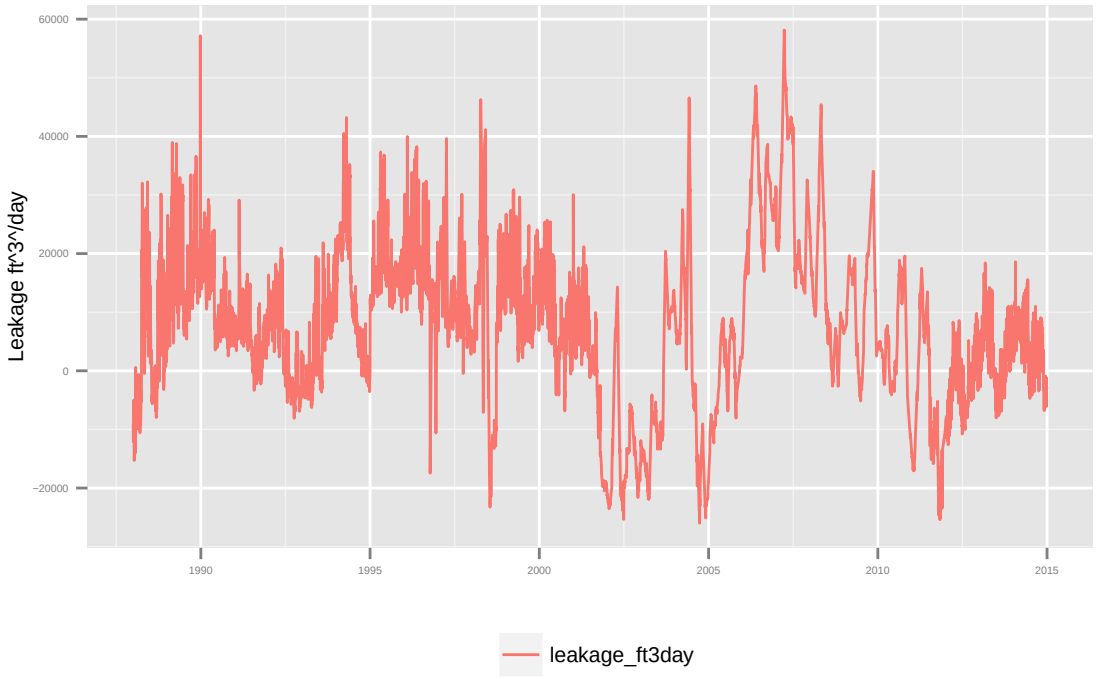

Figure 5: Leakage ft3/day

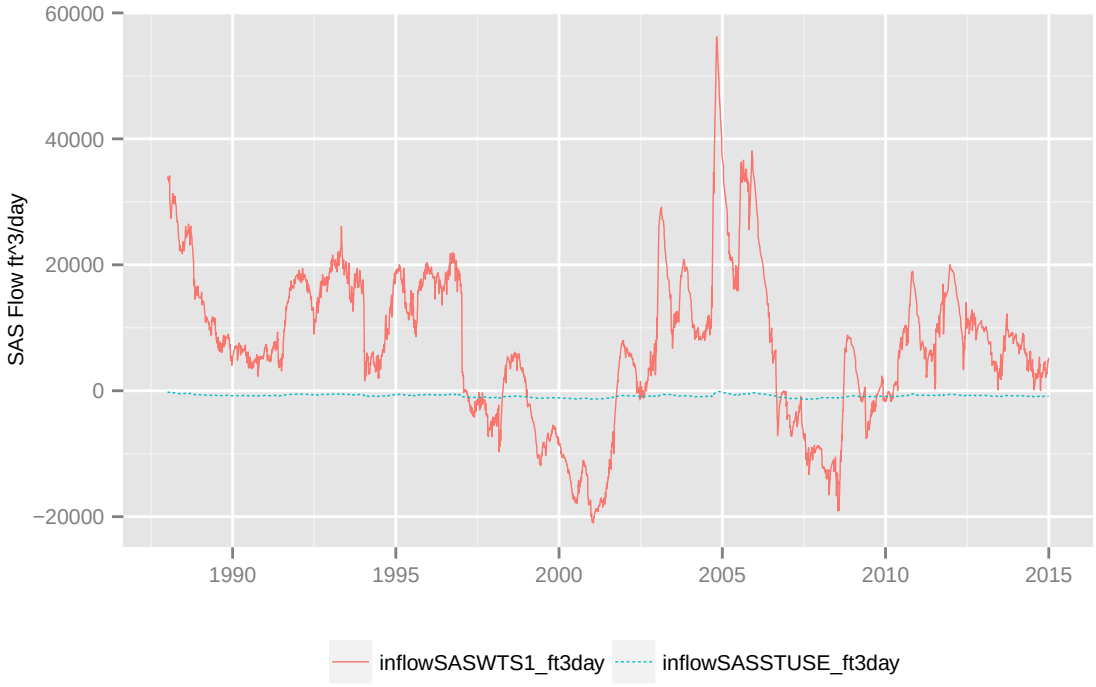

Figure 6: SAS flow ft3/day

Groundwater flow from the surface was provided by the effective

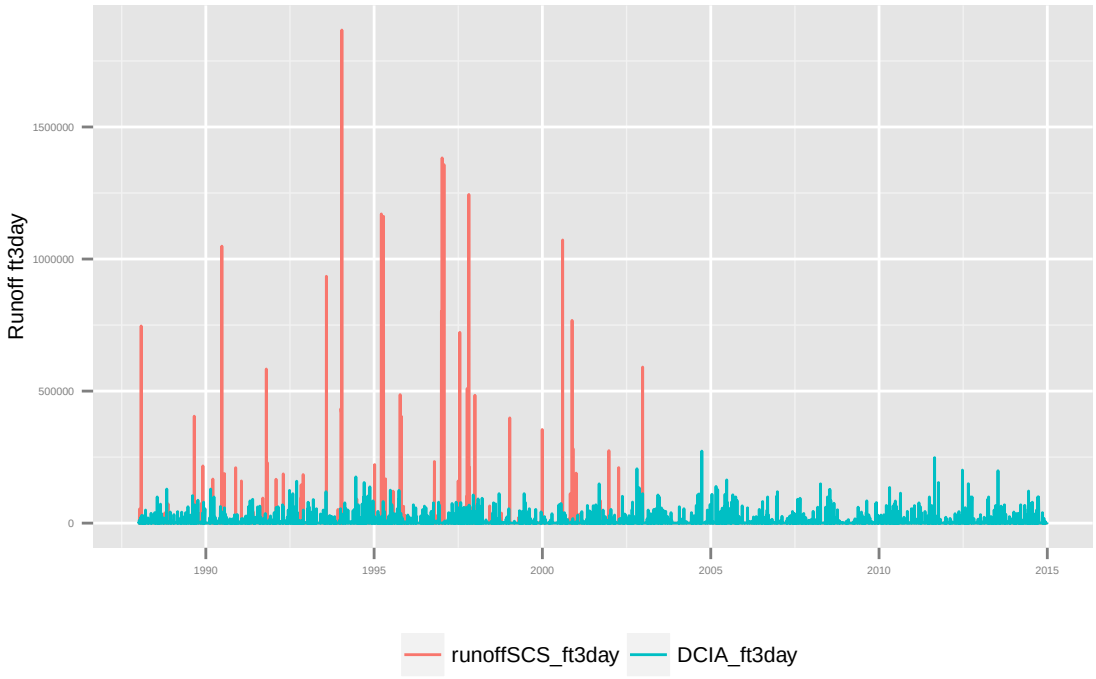

Figure 7: SCS and DCIA runoff ft3day