ATTACHMENT H

MEMORANDUM TO MARK HAMMOND
FROM MARTY KELLY
SUBJECT: FLOWS ON THE LOWER WITHLACOOCHEE RIVER

SUBMITTED BY DAN HILLIARD

November 25, 2008

MEMORANDUM

TO: Mark Hammond, Director Resource Projects

FROM: Marty Kelly, Minimum Flows and Levels Program Director

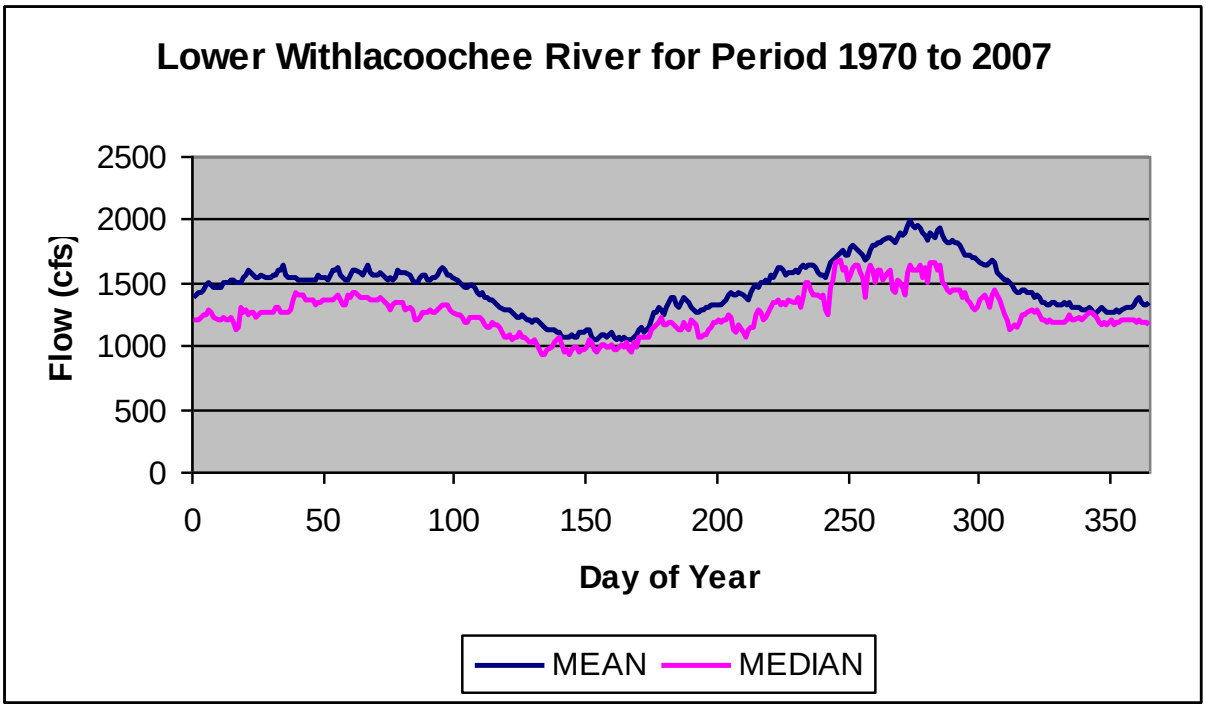
SUBJECT: Flows on the Lower Withlacoochee River

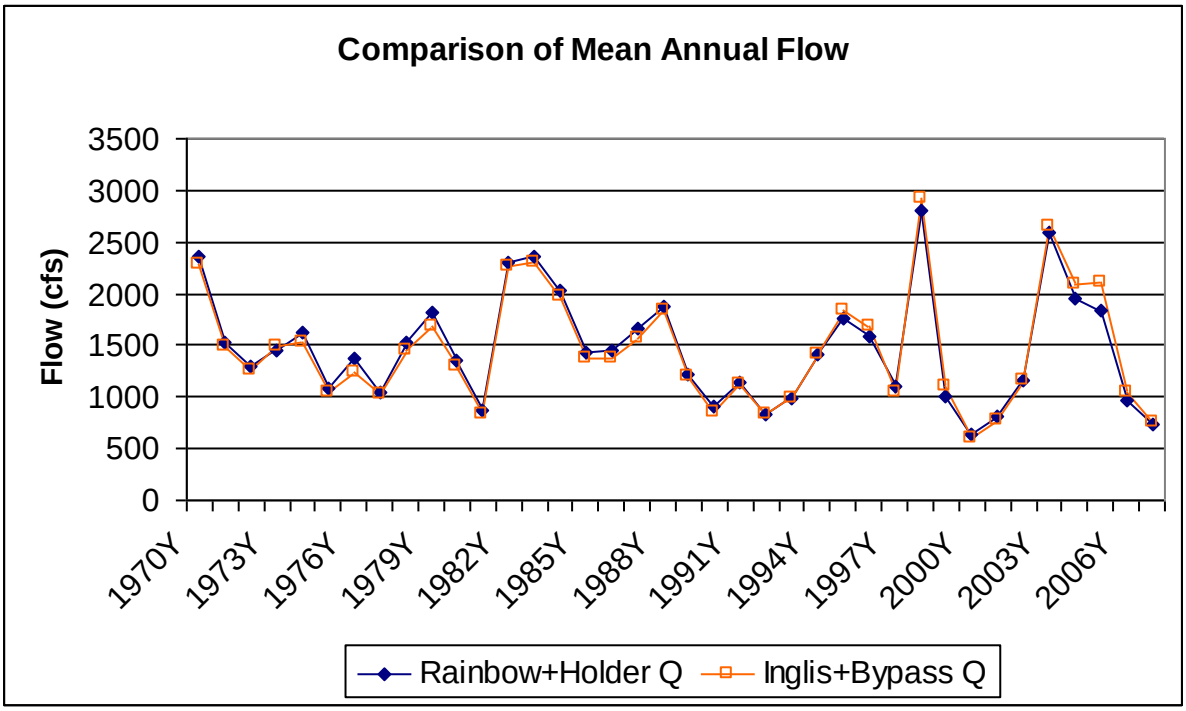
I've looked at the flow data and comments in Mr. Hillard's email and have the following observations/comments.

I made a comparison of the data summarized in his email and checked them versus a retrieval of my own. In general we agree on the monthly mean values for December for most of the stations, and we are close on the monthly period of record averages presented for the Inglis Dam. Differences are probably attributable to slightly different periods of record used. I used data all the way to end of 2007. I'm not sure what a Yearly Maximum Avg. Daily is, but I assume that it is similar to the maximum daily value reported for a particular year. We did not agree on a number of these.

I'm not sure why Mr. Hillard would choose the December mean values to examine. I would concentrate on monthly mean values for May or June, since this is seasonally when flows are typically at their lowest (around Julian day 150 plus or minus). Please see the attached graphic where I summed the daily flows for the Inglis Dam and the Bypass to get a total daily flow for the lower Withlacoochee for each day in the period 1970 to 2007. For this time period, I then took the daily mean and median for all the January 1's, January 2's, etc. . . . all the way to December 31, and plotted these as shown to get a general impression of what the average or median flow were on any particular day of the year. The lowest flows typically occur in May-Jun, and average less 1,100 cfs. In fact, the plot indicates that the median flow (i.e., half the days were below) is at or below 1,000 cfs for the period of record. Flows typically peak between calendar day (Julian date) 250 to 300 (sometime in October). Although, flow rates can vary considerably from year to year, I do agree with Mr. Hillard that there does not appear to be a declining trend in flow (see attached figure of mean annual flows). The average flow rate in the lower river for the period 1970 to 2007 is approximately 1,460 cfs; however, annual mean flow has ranged from a low of 599 cfs in 2000 to a maximum of 2,923 in 1998 (only two years between these data points; see figure for comparison of these two years). And as noted above, it can be expected that seasonally the flow will typically reach a minimum of around 1,000 cfs in the May to June timeframe, but as the 1998 and 2000 comparison indicates, the variability in volume of flow occurring in any one year can be considerable.

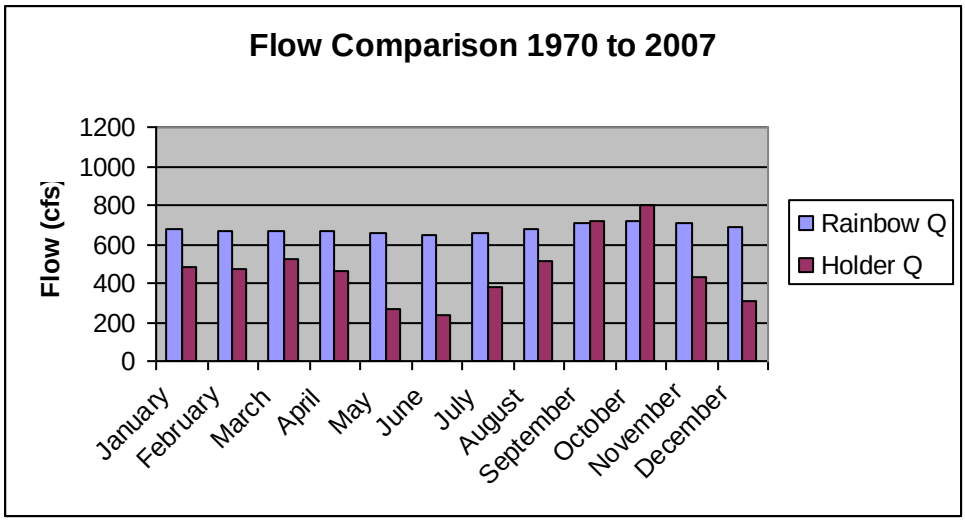
The data can be examined any number of ways, and I would be happy to make any comparisons you or Mr. Hillard would like. In summary, I would observe that the amount of water entering the system upstream (as the sum of Rainbow and Holder flows) is about the same as the volume leaving the system (Inglis + Bypass). There is no readily apparent trend in mean annual flow. Lowest flows typically occur in May-June timeframe, and average around 1,000 cfs. Annual variation can be extreme as evidenced by the El Nino year of 1998 and the drought year of 2000.

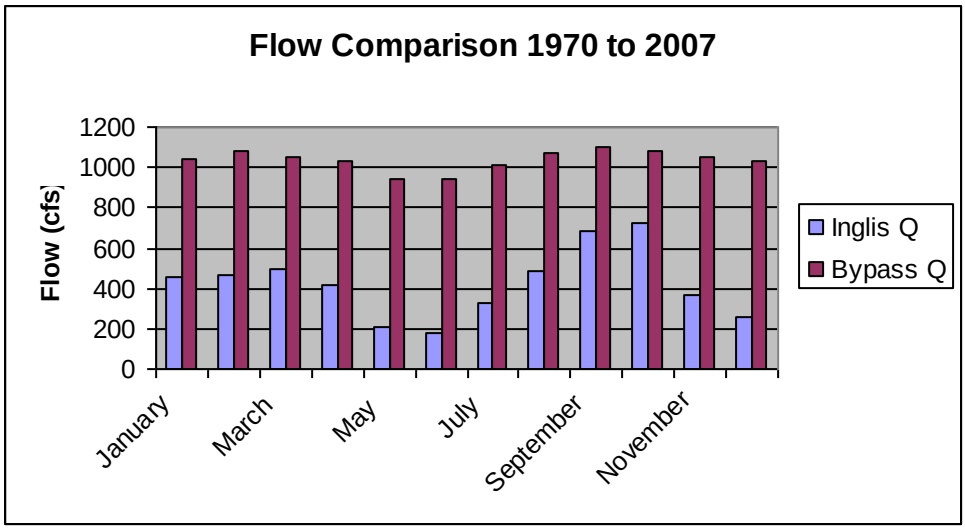

Lower Withlacoochee River for Period 1970 to 2007
Flow (cfs)
2500
2000
1500
1000
500
0
0
50
100
150
200
250
300
350
Day of Year
MEAN
MEDIAN

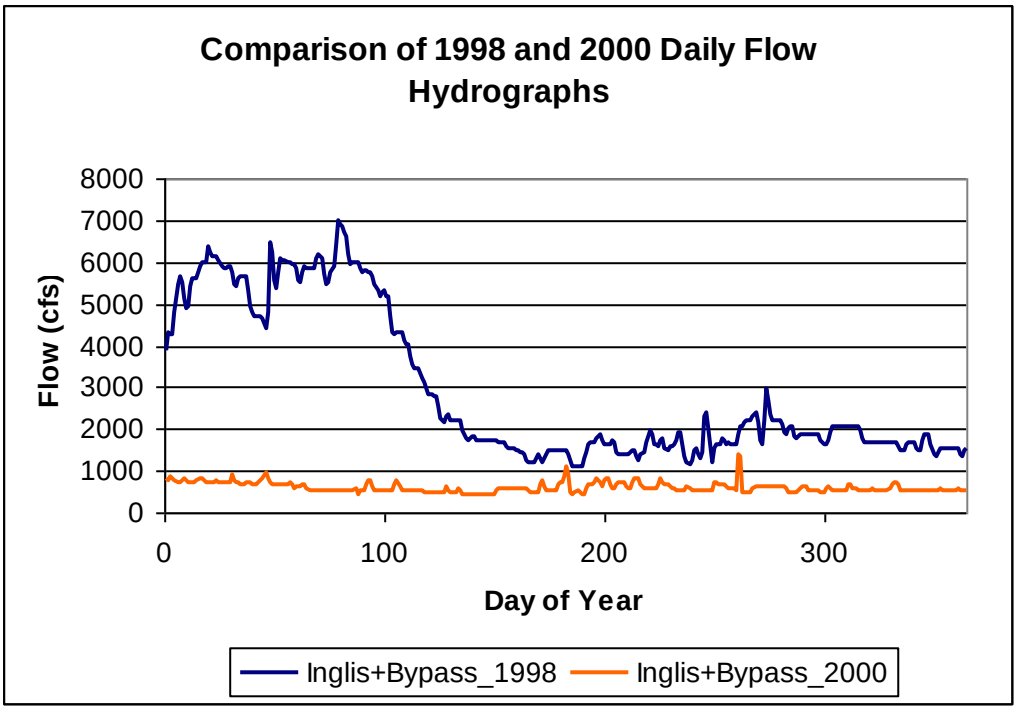

Comparison of Mean Annual Flow
Flow (cfs)
3500
3000
2500
2000
1500
1000
500
0
1970Y
1973Y
1976Y
1979Y
1982Y
1985Y
1988Y
1991Y
1994Y
1997Y
2000Y
2003Y
2006Y
Rainbow+Holder Q
Inglis+Bypass Q

Period 1970 thru 2007

Month	Inglis Q	Bypass Q	SumQs
January	455	1044	1499
February	463	1083	1547
March	495	1056	1551
April	420	1034	1454
May	210	940	1150
June	182	938	1120
July	324	1014	1338
August	490	1071	1561
September	688	1098	1786
October	726	1078	1804
November	371	1051	1422
December	256	1033	1289
	423	1037	1460






Comparison of 1998 and 2000 Daily Flow Hydrographs
Flow (cfs)
8000
7000
6000
5000
4000
3000
2000
1000
0
0
100
200
300
Day of Year
Inglis+Bypass_1998
Inglis+Bypass_2000