










Date	Ohio River near Cairo (365939089084601)				
					
	Measured Main Channel	Measured Overflow	Questionable Measured Overflow	Measured Total	Questionable Total
4/28/2011					
4/29/2011	800,000		104,000		904,000
4/30/2011	778,000		111,000		889,000
5/1/2011	854,000		92,600		946,600
5/2/2011	873,000		105,000		978,000
5/3/2011	999,000		339,000		1,338,000
5/4/2011	997,000	293,000		1,290,000	
5/5/2011	1,020,000				
5/6/2011	1,060,000				
5/7/2011					
5/8/2011	1,070,000				
5/9/2011	1,000,000				
5/10/2011		254,000			
5/11/2011	997,000				
5/11/2011	1,020,000				
5/12/2011	966,000	251,000		1,220,000	
5/13/2011					
5/14/2011	964,000				
5/15/2011	900,000	181,000		1,080,000	
5/16/2011	886,000	155,000		1,040,000	
5/17/2011	807,000				
5/18/2011	763,000	101,000		864,000	
5/19/2011					
5/20/2011	671,000	86,800		758,000	
5/21/2011	642,000	60,800		703,000	
5/22/2011	592,000	46,100		638,000	
5/23/2011	585,000	36,000		621,000	
5/24/2011	561,000	29,500		591,000	
5/25/2011					

Ohio R @ Metropolis	
	
Daily Mean at Metropolis	Field Measure- ments at Metropolis
974,000	
964,000	
986,000	
1,050,000	
1,140,000	
1,220,000	1,300,000
1,250,000	
1,260,000	
1,260,000	
1,260,000	
1,250,000	
1,230,000	
1,200,000	
1,180,000	
1,180,000	
1,140,000	
1,090,000	
1,050,000	
998,000	
945,000	
893,000	931,000
843,000	
791,000	
717,000	
660,000	
624,000	
597,000	
584,000	
559,000	585,000

Ohio R @ Cairo Estimates		
		
Estimated Overflow	Estimated Total	(rounded)
172,000	972,000	972,000
181,000	959,000	959,000
205,000	1,059,000	1,060,000
239,000	1,112,000	1,110,000
270,000	1,269,000	1,270,000
285,000	1,305,000	1,310,000
285,000	1,345,000	1,350,000
281,000	1,351,000	1,350,000
274,000	1,274,000	1,270,000
255,000	1,252,000	1,250,000
255,000	1,275,000	1,280,000
205,000	1,169,000	1,170,000
145,000	952,000	952,000

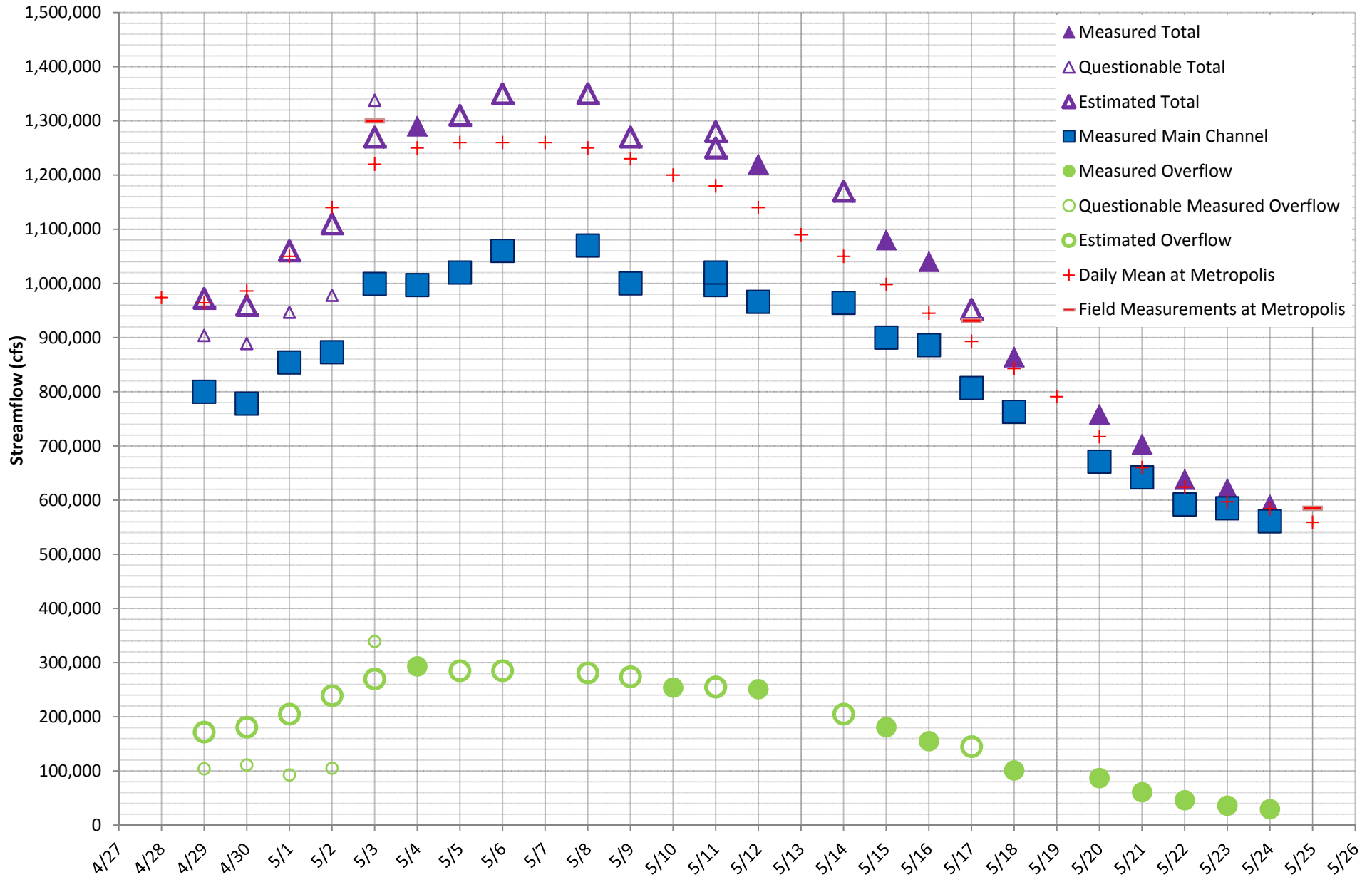
Ohio R Qm's reported in NWIS		
Main Flow	Overflow	Total Flow
800,000	172,000	972,000
778,000	181,000	959,000
854,000	205,000	1,060,000
873,000	239,000	1,110,000
999,000	270,000	1,270,000
997,000	293,000	1,290,000
1,020,000	285,000	1,310,000
1,060,000	285,000	1,350,000
1,070,000	281,000	1,350,000
1,000,000	274,000	1,270,000
997,000	255,000	1,250,000
1,020,000	255,000	1,280,000
966,000	251,000	1,220,000
964,000	205,000	1,170,000
900,000	181,000	1,080,000
886,000	155,000	1,040,000
807,000	145,000	952,000
763,000	101,000	864,000
671,000	86,800	758,000
642,000	60,800	703,000
592,000	46,100	638,000
585,000	36,000	621,000
561,000	29,500	591,000

notes:

Questionable overflow values were measured during long transects (2+ hrs) with frequent direction changes through trees which greatly reduced the accuracy of the measurement

Estimated Overflow is calculated as $[0.381 * Q_{\text{Metropolis}} - 195,000]$, which is the equation of the Overflow_vs_Metropolis trendline.

Ohio River near Cairo (365939089084601)



Problem:**TAK: 2/7/2012**

26 measurement days were assigned for the Ohio River at Cairo between 4/29 and 5/24 of 2011.

Of those 26, only 10 had valid, verifiable measurements for both the main channel and the overflow channel.

There were 13 valid, verifiable main-channel measurements with no corresponding overflow measurement.

Due to the difficulty of making overflow Qm's, the field crews intended to make overflow measurements every other day and interpolate between them.

However, the first five days of measuring produced unreliable results, and valid results were found only on 5/4, 5/10, and then more consistently after that.

A method was needed to estimate the overflows that were missing, despite the lack of measurements at the beginning.

Solution:

- 1 . I plotted the existing 11 verifiable overflow Qm's against Metropolis mean daily Q and found a strong correlation (Regr chart).
- 2 . I used this relationship to estimate 13 new overflow Q values for the missing days (green values on Data sheet).
- 3 . I added the estimated overflow values to their respective measured main Q values to get 13 new total Q values (purple values on Data sheet).
- 4 . I plotted the estimated total Q values and the measured total Q values together on the EstStreamflow chart.
Also included are the questionable measurements that were originally thrown out and the Metropolis mean daily streamflow graph.
- 5 . As a check, I plotted the total measured streamflow at Cairo against the Metropolis gage ($R^2=0.991$) as shown on QA chart.
- 6 . I then plotted the estimated total flows at Cairo on this same chart to see how the estimated flows fit. They were within 10% of the expected values.
- 7 . As a final check, on the Data sheet, I computed the standard error of prediction for my known overflows to test the method used to estimate overflow.

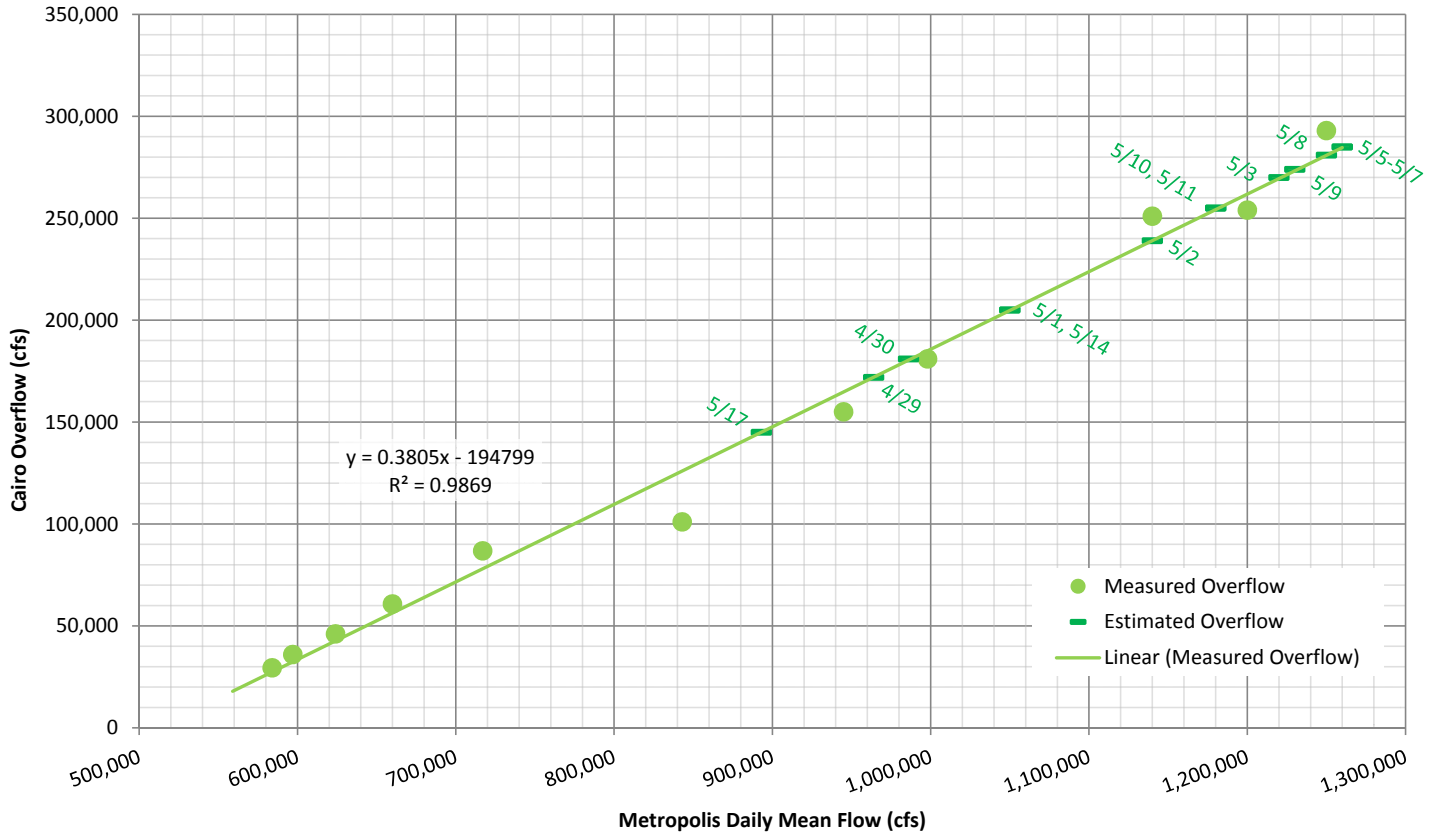
Comments:

The graphs show that the variability in the estimated total flows are due almost exclusively to the variability in the main flow measurements.

I was comfortable estimating the overflow measurements in this manner, especially given that the overflow typically represented less than 20% of the total.

I was not comfortable making similar estimates of the main channel flow and saw no need to do so. Thus, four days of 26 remain unmeasured and unestimated.

Cairo Overflow vs Metropolis Daily Mean Flow



Cairo Total Flow vs Metropolis Daily Mean Flow

