










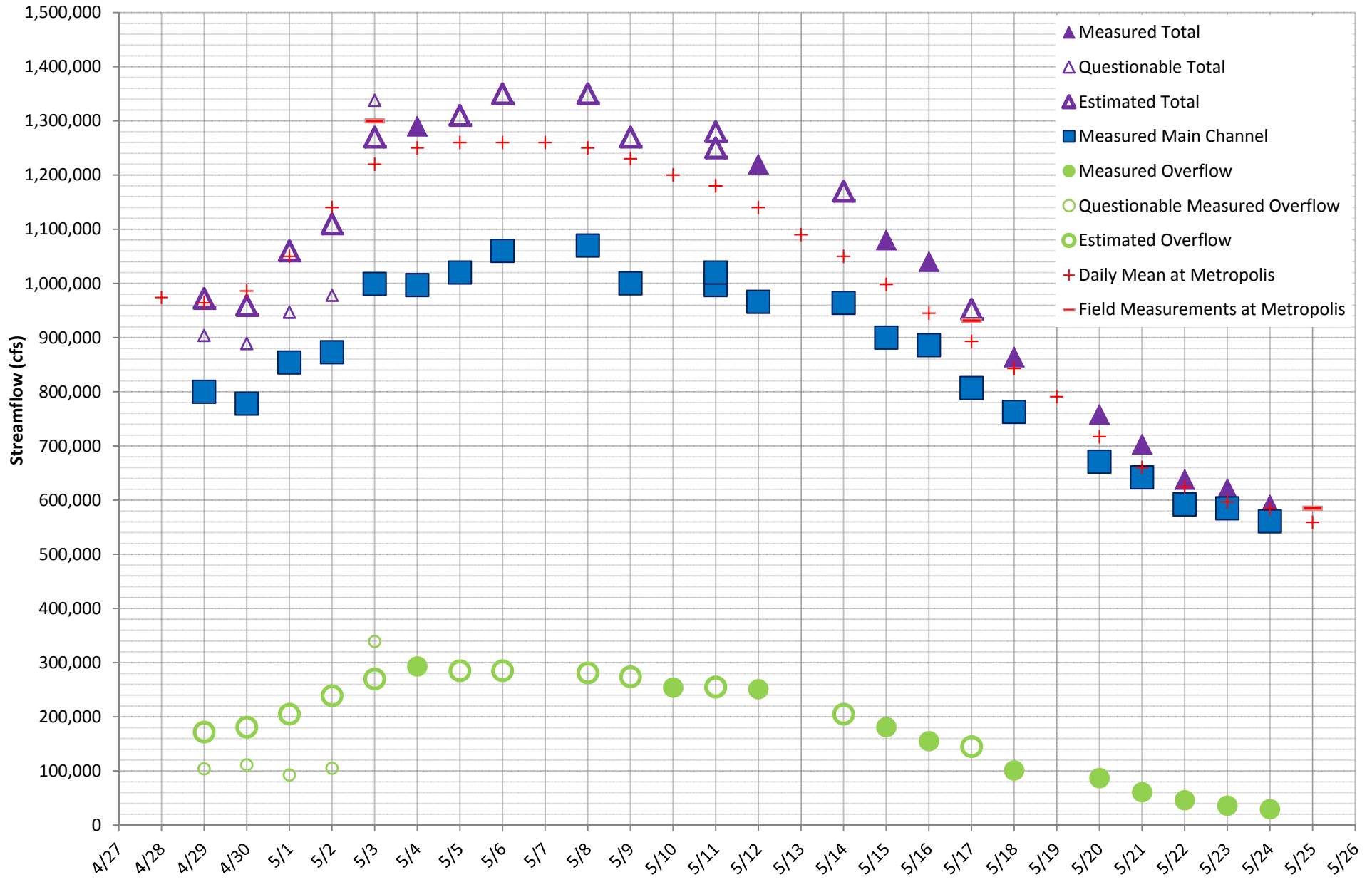
Date	Ohio River near Cairo (365939089084601)					Ohio R @ Metropolis		Ohio R @ Cairo Estimates			Ohio R Qm's reported in NWIS		
													
	Measured Main Channel	Measured Overflow	Questionable Measured Overflow	Measured Total	Questionable Total	Daily Mean at Metropolis	Field Measure- ments at Metropolis	Estimated Overflow	Estimated Total	(rounded)	Main Flow	Overflow	Total Flow
4/28/2011						974,000							
4/29/2011	800,000		104,000		904,000	964,000		172,000	972,000	972,000	800,000	172,000	972,000
4/30/2011	778,000		111,000		889,000	986,000		181,000	959,000	959,000	778,000	181,000	959,000
5/1/2011	854,000		92,600		946,600	1,050,000		205,000	1,059,000	1,060,000	854,000	205,000	1,060,000
5/2/2011	873,000		105,000		978,000	1,140,000		239,000	1,112,000	1,110,000	873,000	239,000	1,110,000
5/3/2011	999,000		339,000		1,338,000	1,220,000	1,300,000	270,000	1,269,000	1,270,000	999,000	270,000	1,270,000
5/4/2011	997,000	293,000		1,290,000		1,250,000					997,000	293,000	1,290,000
5/5/2011	1,020,000					1,260,000		285,000	1,305,000	1,310,000	1,020,000	285,000	1,310,000
5/6/2011	1,060,000					1,260,000		285,000	1,345,000	1,350,000	1,060,000	285,000	1,350,000
5/7/2011						1,260,000							
5/8/2011	1,070,000					1,250,000		281,000	1,351,000	1,350,000	1,070,000	281,000	1,350,000
5/9/2011	1,000,000					1,230,000		274,000	1,274,000	1,270,000	1,000,000	274,000	1,270,000
5/10/2011		254,000				1,200,000							
5/11/2011	997,000					1,180,000		255,000	1,252,000	1,250,000	997,000	255,000	1,250,000
5/11/2011	1,020,000					1,180,000		255,000	1,275,000	1,280,000	1,020,000	255,000	1,280,000
5/12/2011	966,000	251,000		1,220,000		1,140,000					966,000	251,000	1,220,000
5/13/2011						1,090,000							
5/14/2011	964,000					1,050,000		205,000	1,169,000	1,170,000	964,000	205,000	1,170,000
5/15/2011	900,000	181,000		1,080,000		998,000					900,000	181,000	1,080,000
5/16/2011	886,000	155,000		1,040,000		945,000					886,000	155,000	1,040,000
5/17/2011	807,000					893,000	931,000	145,000	952,000	952,000	807,000	145,000	952,000
5/18/2011	763,000	101,000		864,000		843,000					763,000	101,000	864,000
5/19/2011						791,000							
5/20/2011	671,000	86,800		758,000		717,000					671,000	86,800	758,000
5/21/2011	642,000	60,800		703,000		660,000					642,000	60,800	703,000
5/22/2011	592,000	46,100		638,000		624,000					592,000	46,100	638,000
5/23/2011	585,000	36,000		621,000		597,000					585,000	36,000	621,000
5/24/2011	561,000	29,500		591,000		584,000					561,000	29,500	591,000
5/25/2011						559,000	585,000						

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.

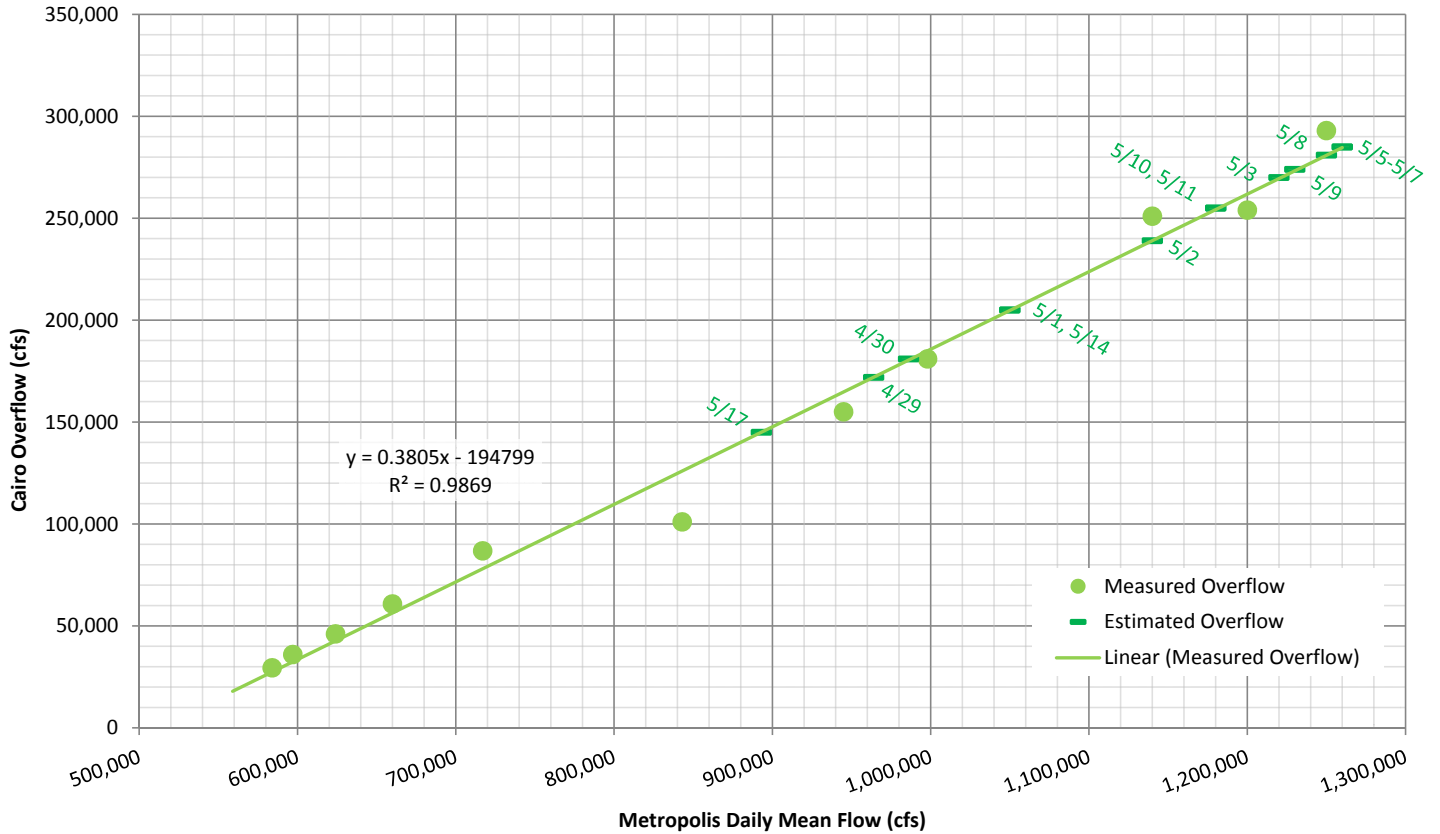
**Comments:**

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

