

APPENDIX B
UPDATE OF THE CORRELATION
BETWEEN TRI+ PCB AND AROCLOR PCB
MEASUREMENTS

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B.1 BACKGROUND

The Residual Standard metrics are expressed as Tri+ PCBs. An Aroclor method is used to measure polychlorinated biphenyls (PCBs) and the reported Aroclor concentrations are used to estimate Tri+ PCBs. This approach was developed to convert pre-dredging sediment Aroclor measurements to Tri+ PCBs for purposes of dredge delineation (QEA 2005). The equation used has the following form:

$$PCB_{3+} = a[A1221] + b[A1242 + A1254]$$

where:

a and b are regression coefficients

PCB₃₊ = Tri+ PCB concentration (mg/kg)

[Aroclor1221] = the reported Aroclor 1221 PCB concentration (mg/kg)

[Aroclor1242 + Aroclor1254] = the sum of the reported Aroclor 1242 and Aroclor 1254 PCB concentrations (mg/kg)

The pre-dredging data set for determining regression coefficients includes 278 paired PCB₃₊ concentrations measured using the modified Green Bay method (mGBM) and Aroclor concentrations measured using GEHR8082 from the Sediment Sampling and Analysis Program samples collected in 2004 and 2005. As specified in the Remedial Action Monitoring program Quality Assurance Project Plan (RAM QAPP) (Anchor QEA 2009), the initial values of the coefficients “a” and “b” were 0.14 and 0.91, respectively. As additional sediment samples were collected and analyzed for PCBs during the Phase 1 dredging program in 2009, the regression equation was recalculated each time the overall data set increased by five percent; updated regression coefficients were used in subsequent evaluations of dredge certification units (CU) per the Phase 1 QAPP (Anchor QEA 2009; Appendix 51). This appendix describes the updating of the regression equation.

B.2 REGRESSION EQUATION UPDATES

Over the course of the Phase 1 dredging program, the regression equation was updated four times, with the PCB analysis being “front loaded” (i.e., more frequent at the beginning of the program) to the extent that laboratory capacity was available. During each update, the new paired congener and Aroclor data were added to the pool of existing paired data and the regression analysis was redone using the statistical software package R (<http://www.R-project.org>). As with the original regression, the basic regression methodology consisted of applying a weighted least squares (i.e., “damped-leveraged”) algorithm to calculate the coefficients, summary statistics, and goodness of fit measures. The new coefficients derived from each round of updates are provided in Table B-1.

Table B-1
Regression Coefficient Updates

Round	Regression Date	Number of Samples		PCB ₃₊ = X [A1221] + Y [A1242 + A1254]	
		Additional	Total in Regression	X	Y
---	In QAPP 2009	---	278	0.14	0.91
1	8/14/09	21	299	0.14	0.91
2	9/3/09	63	362	0.13	0.89
3	9/17/09	21	383	0.13	0.90
4	10/26/09	20	403	0.13	0.89

The performances of the regressions including the new data are similar to that with the original data only. The coefficients derived from each round are comparable to those developed from the original set of samples. The additional data result in tighter bounds on the coefficients (i.e., lower standard errors) and approximately the same goodness of fit statistics (Table B-2). Figure B-1 presents comparisons of predicted and measured Tri+ PCBs concentrations for the entire data set for each round of updates; Figure B-2 presents comparisons for measured concentrations in the range of 0-5 mg/kg, 5-80 mg/kg, and greater than 80 mg/kg. Like with the original dataset, the model shows little decay in predictive ability at low concentrations and no significant bias for each round of updates. Residuals and relative residuals for the three concentration ranges are shown in Figure B-3. The relative

residuals are largely between $\pm 50\%$ of the measured Tri+ PCBs concentration. Even at concentrations less than 0.5 mg/kg, the relative residuals remain below $\pm 100\%$.

Table B-2
Statistics of the Regression Models

Statistic	Original	Round 1	Round 2	Round 3	Round 4
A1221 Coefficient	0.140	0.140	0.134	0.128	0.127
Std. Error of A1221 Coefficient	0.0105	0.0099	0.0083	0.0079	0.0076
A1242+A1254 Coefficient	0.913	0.911	0.893	0.895	0.892
Std. Error of A1242+A1254 Coefficient	0.0253	0.0235	0.0209	0.0203	0.0195
Multiple R ²	0.961	0.962	0.959	0.959	0.959

B.3 REFERENCES

- Anchor QEA, LLC, 2009. *Phase 1 Remedial Action Monitoring Program – Quality Assurance Project Plan*. Prepared for the General Electric Company, May 2009.
- Quantitative Environmental Analysis, LLC (QEA), 2005. *Hudson River PCBs Site. Phase 1 Dredge Area Delineation Report*. Prepared for the General Electric Company, February 28, 2009.