



COMMONWEALTH of VIRGINIA

DEPARTMENT OF ENVIRONMENTAL QUALITY

Street address: 629 East Main Street, Richmond, Virginia 23219

Mailing address: P.O. Box 1105, Richmond, Virginia 23218

www.deq.virginia.gov

Molly Joseph Ward
Secretary of Natural Resources

David K. Paylor
Director

(804) 698-4000
1-800-592-5482

September 18, 2015

Mr. Michael Liberati
DuPont Corporate Remediation Group
Chestnut Run Plaza 715-236
Wilmington, DE 19805
VIA ELECTRONIC MAIL

**Re: AOC#4 - Proposed Revision of LTM Plan
Former DuPont Waynesboro Plant, Waynesboro, Virginia
EPA ID# VAD003114832**

Dear Mr. Liberati:

The Department of Environmental Quality, Office of Remediation Programs (DEQ) received the proposed revision to the AOC#4 Long Term Monitoring (LTM) Plan dated September 3, 2015. The proposal is considered part of RCRA Site-Wide Correction Action associated with the Former DuPont Waynesboro Plant (Facility) located in Waynesboro, Virginia, and the Corrective Action requirements of the Hazardous Waste Management Permit for the Facility.

DEQ has reviewed this proposal and conditionally approves the transition from the current lethal fish tissue sampling techniques to a non-lethal tissue plug sampling and the request that fish tissue plug samples are analyzed for total mercury (THg) only. The Department's statistician is currently in the process of reviewing the statistical package submitted to support this request. This approval will become final once the statistics have been reviewed and confirmed. The facility may proceed with implementation of this proposal immediately.

Please note that DEQ has not formally approved the LTM plan to date. It is anticipated that this plan will be incorporated in to the Corrective Measures Study and/or Corrective Action Implementation phases of the project. A comprehensive regulatory review will be conducted at that time.

EPA ID# VAD003114832, DuPont Waynesboro
AOC#4 Proposed Revision of LTM Plan
September 17, 2015

If you have any questions, you may contact me at 804-698-4064 or by email at Vincent.Maiden@deq.virginia.gov.

Sincerely,

A handwritten signature in blue ink that reads "Vincent Maiden".

Vincent A. Maiden
Office of Remediation Programs

cc: Brett Fisher, File – DEQ CO
Andrea Barbieri, EPA Region III (3LC50)
Graham Simmerman, Don Kain – DEQ VRO
Ralph Stahl, DuPont
Josh Collins, AECOM
Paul Bugas, DGIF



OFFICE OF PERMITTING AND COMPLIANCE

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TO: Vince Maiden

FROM: Hasan Keceli *H.K.*

DATE: October 6, 2015

SUBJECT: Statistical Review of Fish Tissue Sampling
And Analyses for DuPont

Per your request, I have reviewed the fish tissue sampling and analyses report dated September 3, 2015 for the Dupont Former Waynesboro Site.

Based on the information provided in the report, the Department agrees with the facility that mercury concentrations in plug vs fillet are strongly correlated. Since the data provided in the report shows that the mean of mercury concentrations in plugs is statistically different than the mean of mercury concentrations in fillets, then mercury concentration in plugs may not to be used as an estimate for mercury concentrations in fillets. If the facility has any questions regarding for this memorandum, I can be reached at (804) 968-4246.



AECOM
625 West Ridge Pike, Suite E-100
Conshohocken, PA 19428
Telephone: (610)-832-2500
Facsimile: (610) 832-3501

MEMORANDUM

TO: Michael Liberati, DuPont
Ralph Stahl, DuPont

DATE: September 3, 2015

CC: Cecilia Mancini, AECOM

FROM: Joshua Collins, AECOM

SUBJECT: PROPOSED REVISION TO LONG-TERM MONITORING PLAN –
FISH TISSUE SAMPLING AND ANALYSES
DUPONT FORMER WAYNESBORO SITE, AREA OF CONCERN 4, VIRGINIA

This memorandum provides the basis for revision to two components of the Long-term Monitoring (LTM) Program for the Former DuPont Waynesboro Site, Area of Concern 4 (AOC 4) (URS, 2015). Based on fish tissue data collected to date, it is proposed that:

- Current lethal fish tissue sampling techniques be replaced with non-lethal tissue plug sampling to collect fish tissue mercury data; and
- Fish tissue plug samples are analyzed for total mercury (THg) only.

Attachments to this memorandum include:

- Attachment A - Spreadsheet of Plug & Fillet Analytical Data

FISH TISSUE SAMPLING

A summary of the approach and results of statistical analysis are provided to demonstrate that dermal biopsy plugs are reliable predictors of total mercury (THg) and methylmercury (MeHg) concentrations in bass tissue, while minimizing lethal impacts to local fish populations.

Approach

Paired biopsy plug and fillet samples ($n=548$) were collected from smallmouth bass (*Micropterus dolomieu*) and largemouth bass (*Micropterus salmoides*) to develop correlations among concentrations of THg and MeHg and tissue types in biopsy plugs and fillets (URS, 2015). Fish tissue samples were collected according to the procedures in the LTM Plan and submitted to CEBAM Analytical; the samples were frozen and packed on dry ice for shipping. The tissues were analyzed for THg and MeHg by EPA Methods 1631 and 1630, respectively. Summary statistics were calculated and the correlations were evaluated individually for each species/sex combination, as well as for all bass combined.

Results

Mean THg and MeHg concentrations (wet weight basis) were comparable between biopsy plug and fillet samples for all groups; however, mercury concentrations were consistently and slightly higher in biopsy plug than fillet samples in paired comparisons (Table 1, Figure 1). This difference may be attributable to lower moisture content in smaller sample volume biopsy plugs (75.3% moisture) compared to fillets (78.8% moisture); it results in tissue plug concentrations being a more conservative estimate relative to fillet data.

Strong correlations were observed between mercury concentrations measured in biopsy plug vs. fillet samples. Linear regression performed for each data grouping resulted in correlation coefficient (R^2) values ranging from 0.89 to 0.93 indicating that 89 to 93% of the variability in the

datasets were explained by the correlations (Table 1, Figure 2). A Spearman Rank Order test was also performed for each grouping as confirmation of the linear regression results due to the non-normal data distribution. Spearman's correlation coefficient (ρ) values ranged from 0.94 to 0.97, which confirms a strong correlation between biopsy plug and fillet data (Table 1).

FISH TISSUE ANALYSES

Almost all mercury (> 95%) in fish tissues was comprised of MeHg, consistent with the well-established bio-magnification of MeHg by piscivorous fish like smallmouth and largemouth bass (Bloom, 1992). A Spearman Rank Order test for THg vs. MeHg in biopsy plugs and fillets also resulted in Spearman's correlation coefficient values of 0.99 indicating a very strong correlation between THg and MeHg.

SUMMARY OF FINDINGS AND RECOMMENDATIONS

These results demonstrate that:

- 1) Mercury concentrations in plug vs. fillet are strongly correlated
- 2) Mercury concentration in plugs is likely to be a conservative estimate for mercury concentrations in fillets; and
- 3) Almost all mercury bioaccumulated in fish tissues is MeHg.

Based on these findings, it is recommended that lethal sampling techniques be replaced by non-lethal plug sampling in the AOC 4 LTM tissue monitoring program for adult smallmouth and largemouth bass. It is also recommended that tissue samples be analyzed for THg only. This analytical approach is consistent with the Virginia Department of Environmental Quality (VDEQ) 100-year Monitoring Program for the South River and South Fork Shenandoah River.

Upon VDEQ's approval, the above monitoring modifications will be initiated beginning with the fall 2015 monitoring event. Paired biopsy plug and fillet samples will be collected in years when VDEQ conducts sampling as part of the 100-year Monitoring Program to monitor for potential changes to the correlations established in the current evaluation.

REFERENCES

- Bloom, N.S. 1992. On the chemical form of mercury in edible fish and marine invertebrate tissue. *Can. J. Fish Aquat. Sci.* 55: 453-457.
- URS Corporation. 2015. AOC 4 Long Term Monitoring Plan; South River and a Segment of the South Fork of the Shenandoah River, Virginia. Final Document February, 2015.

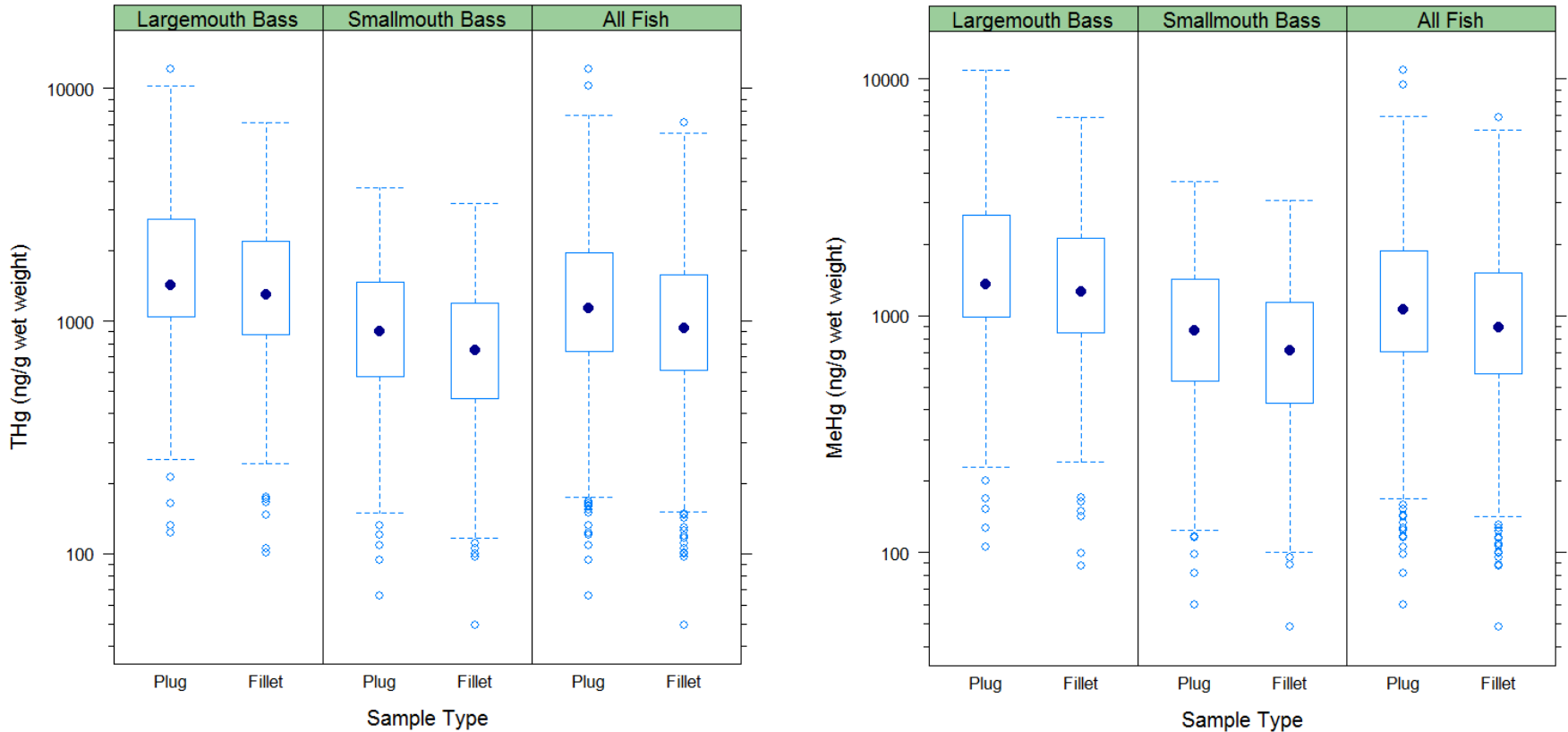
Table 1
Summary of Linear Regression and Spearman Rank Order for
Paired Biopsy Plugs and Fillets
AOC 4 Long-Term Monitoring Program
South River and a Segment of the Shenandoah River

Species	Sex	Analyte	N	Linear Regression			Spearman Coefficient
				Slope	Intercept	R ²	ρ
Largemouth Bass	M	THg	104	0.64	370.1	0.89	0.95
		MeHg	104	0.67	305.8	0.90	0.96
	F	THg	125	0.84	56.1	0.91	0.97
		MeHg	125	0.86	52.1	0.91	0.97
	All	THg	229	0.75	210.9	0.88	0.96
		MeHg	229	0.78	172.5	0.89	0.96
Smallmouth Bass	M	THg	160	0.75	64.5	0.92	0.94
		MeHg	160	0.77	44.8	0.92	0.94
	F	THg	153	0.74	62.5	0.92	0.97
		MeHg	153	0.75	56.6	0.93	0.97
	All	THg	313	0.75	64.3	0.92	0.96
		MeHg	313	0.76	51.4	0.93	0.96
All Bass	All	THg	548	0.77	95.6	0.90	0.97
		MeHg	548	0.79	68.7	0.91	0.97

Notes:

THg = Total mercury, MeHg = Methylmercury, ρ = Spearman correlation coefficient, M = Male, F = Female

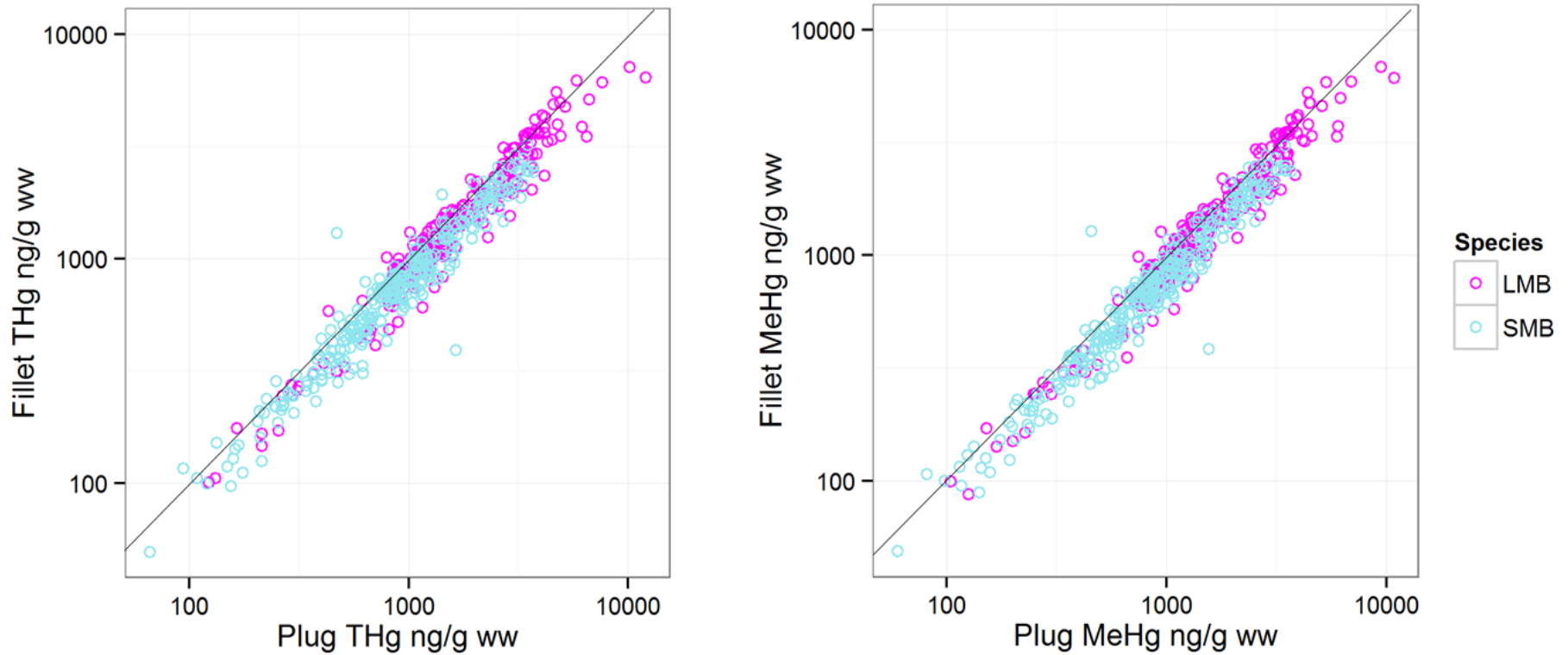
Figure 1
Summary of Mean Mercury Concentrations
In Biopsy Plugs and Fillets
AOC 4 Long-Term Monitoring Program
South River and a Segment of the Shenandoah River



Notes:

THg = Total mercury, MeHg = Methylmercury. The filled circle is the median value, and the box surrounding the filled circle depicts the 25th and 75th quartiles. The range of values is given by the dotted lines outside of each box, and possible outliers are given by the open circles outside the dotted line.

Figure 2
Summary of Mercury Concentrations
In Paired Biopsy Plugs and Fillets
AOC 4 Long-Term Monitoring Program
South River and a Segment of the Shenandoah River



Notes:

THg = Total mercury, MeHg = Methylmercury, ww = wet weight, SMB = Smallmouth bass, LMB = Largemouth Bass. Diagonal black line represents a 1:1 slope.