Superfund Records Center
SITE: Centredale
BREAK: 4.1
485660

RE: 2010 Oxbow sampling
Patrick Gwinn to: Anna Krasko 03/29/2011 09:46 AM

Hi Anna,

We are working on the report, but it will not be ready to deliver for another 2 weeks or so. I don't know if that fits your notification time frame or not.

POG

Patrick O. Gwinn | Senior Managing Scientist
Integral Consulting Inc. | www.integral-corp.com
45 Exchange Street, Suite 200 | Portland, ME 04101
Tel: 207.874.9000, ext. 206 | Cell: 207.798.9578| Fax: 207.874.7800

HEALTH ENVIRONMENT TECHNOLOGY SUSTAINABILITY

-----Original Message-----
From: krasko.anna@epamail.epa.gov [mailto:krasko.anna@epamail.epa.gov]
Sent: Thursday, March 24, 2011 2:57 PM
To: Patrick Gwinn
Subject: RE: 2010 Oxbow sampling

No, we were just going to send out an e-mail saying that the Oxbow data was collected and is available, no meeting yet.

From: "Patrick Gwinn" <pgwinn@integral-corp.com>

To: Anna Krasko/R1/USEPA/US@EPA

Date: 03/24/2011 02:32 PM

Subject: RE: 2010 Oxbow sampling

Hi Anna,

We're working on the report and making good progress. When are thinking of having the Dialog Meeting? Are you thinking of sharing with the dialog group just the findings (i.e., the data) or are you going to discuss remedial options as well.

SDMS DocID 485660

Thanks.

POG

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HEALTH ENVIRONMENT TECHNOLOGY SUSTAINABILITY

-----Original Message-----
From: krasko.anna@epamail.epa.gov [mailto:krasko.anna@epamail.epa.gov]
Sent: Thursday, March 24, 2011 11:28 AM
To: Patrick Gwinn
Subject: 2010 Oxbow sampling

Hi Patrick,

Do you know when we can expect to see the report for this sampling? We are thinking of sharing the preliminary dioxin data with the Dialogue group without waiting for the report, unless we should expect the report shortly.

Thanks, Anna

From: "Patrick Gwinn" <pgwinn@integral-corp.com>

To: "Dahlen, Deirdre T" <DahlenD@battelle.org>

Cc: Anna Krasko/R1/USEPA/US@EPA

Date: 03/23/2011 10:07 AM

Subject: November 2010 Oxbow Sediment and supplemental soil validation reports

Deirdre,

Attached are the subject validation reports. Let me know if you need anything further.

POG

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HEALTH ENVIRONMENT TECHNOLOGY SUSTAINABILITY
[attachment "24573_32939.pdf" deleted by Anna Krasko/R1/USEPA/US]
[attachment "24573_32948.pdf" deleted by Anna Krasko/R1/USEPA/US]
[attachment "24593_32947.pdf" deleted by Anna Krasko/R1/USEPA/US]
[attachment "24622_K1013108.pdf" deleted by Anna Krasko/R1/USEPA/US]
[attachment "24622_K1013108-K1013257.pdf" deleted by Anna Krasko/R1/USEPA/US] [attachment "24637_K1013108-K1013257.pdf" deleted by Anna Krasko/R1/USEPA/US] [attachment "24637_K1013108-K1013257_SVOC.pdf" deleted by Anna Krasko/R1/USEPA/US]

RE: EDDs for Centredale Oxbow Area
Patrick Gwinn to: Brennan, Sarah A, Dahlen, Deirdre T 02/08/2011 03:51 PM
Cc: Anna Krasko, "Elizabeth Rand", beverly.e.lawrence

Sarah,

I don't have sample-specific MDLs for those compounds/samples with detectable levels of a compound. The MDLs were provided only for compounds that were non-detected.

I'll have someone double check on you second item and get back with you.

Thanks,

POG

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HEALTH ENVIRONMENT TECHNOLOGY SUSTAINABILITY

From: Brennan, Sarah A [mailto:BRENNANS@battelle.org]
Sent: Tuesday, February 08, 2011 11:16 AM
To: Patrick Gwinn; Dahlen, Deirdre T
Cc: krasko.anna@epamail.epa.gov; Elizabeth Rand; beverly.e.lawrence@usace.army.mil
Subject: RE: EDDs for Centredale Oxbow Area

Patrick,

Thank you for the revised data, but I have a few questions still. Please see below:

1. In the Dioxin data, the MDL field is only populated for the results that are reported as non-detects. Are MDLs available for the rest of the data?
2. The EDDs from CAS lab have duplicates. I have added a worksheet to the attached files called "DUPs" to isolate the records in question. There are multiple results reported for the same parameter for a given sample. Please determine if these should really have the same NSAMPLE ID or if the LAB_QC_CODE (i.e. N vs. DUP) should be changed.
For example, method blanks for the metals report results in UG/L and MG/KG_DRY for the same sample and parameter. Are these really the same NSAMPLE?

Let me know if you need more information. Thanks.

Sarah

Sarah A. Brennan
Research Scientist, Environmental Assessment and Monitoring Section
Environmental Solutions Product Line(ENVS)

Office 781.952.5354 Fax 614.458.6871
brennans@battelle.org

Battelle 397 Washington St. Duxbury, MA 02332

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From: Patrick Gwinn [mailto:pgwinn@integral-corp.com]
Sent: Friday, February 04, 2011 4:57 PM
To: Dahlen, Deirdre T; Brennan, Sarah A
Cc: krasko.anna@epamail.epa.gov; Elizabeth Rand; beverly.e.lawrence@usace.army.mil
Subject: RE: EDDs for Centredale Oxbow Area

Here are the EDD's updated to reflect either Level 3 or 4 data validation effort.

Have a pleasant weekend.

POG

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HEALTH ENVIRONMENT TECHNOLOGY SUSTAINABILITY

From: Dahlen, Deirdre T [mailto:DahlenD@battelle.org]
Sent: Friday, February 04, 2011 4:22 PM
To: Patrick Gwinn; Brennan, Sarah A
Cc: krasko.anna@epamail.epa.gov; Elizabeth Rand; beverly.e.lawrence@usace.army.mil
Subject: RE: EDDs for Centredale Oxbow Area

Ok. We'll stop loading the data. Please send revised EDDs to Sarah Brennan. Please also remember that the DVTier field is a numeric field (3, not III).

Thanks,
Deirdre

From: Patrick Gwinn [mailto:pgwinn@integral-corp.com]
Sent: Friday, February 04, 2011 4:19 PM
To: Dahlen, Deirdre T
Cc: krasko.anna@epamail.epa.gov; Elizabeth Rand; beverly.e.lawrence@usace.army.mil; Brennan, Sarah A
Subject: RE: EDDs for Centredale Oxbow Area

Deirdre,

It turns out that it's a nomenclature difference and not substantive. Most of the samples were validated with Level III and the rest with Level IV. I am having those columns edited to conform with the Level III or IV nomenclature and will pass that along to you when edited (likely after COB today as they are being modified on the west coast).

POG

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HEALTH ENVIRONMENT TECHNOLOGY SUSTAINABILITY

From: Dahlen, Deirdre T [mailto:DahlenD@battelle.org]
Sent: Friday, February 04, 2011 3:48 PM
To: Patrick Gwinn
Cc: krasko.anna@epamail.epa.gov; Elizabeth Rand; beverly.e.lawrence@usace.army.mil; Brennan, Sarah A
Subject: RE: EDDs for Centredale Oxbow Area

Patrick – some of the dioxin EDDs (e.g., 32939, 32947) identify the DVTier as 2B. Dioxin data normally receive level 3 third party validation. Is 2B correct?

Thanks,
Deirdre

From: Patrick Gwinn [mailto:pgwinn@integral-corp.com]
Sent: Wednesday, February 02, 2011 9:37 PM
To: Dahlen, Deirdre T
Cc: krasko.anna@epamail.epa.gov; Elizabeth Rand
Subject: EDDs for Centredale Oxbow Area

Deirdre,

Attached are revised EDDs for all of the data. Please don't hesitate to call or email with any questions.

POG

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HEALTH ENVIRONMENT TECHNOLOGY SUSTAINABILITY

RE: EDDs for Centredale Oxbow Area
Patrick Gwinn to: Patrick Gwinn, Dahlen, Deirdre T 02/02/2011 09:42 PM
Cc: Anna Krasko, "Elizabeth Rand"

History: This message has been replied to.

Deirdre,

I should have noted that the files with the "EDD" prefix are the dioxin/furan data and those with the "K" prefix contain all other chemical and physical data.

I will follow up with photos and sample descriptions tomorrow.

POG

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HEALTH ENVIRONMENT TECHNOLOGY SUSTAINABILITY

From: Patrick Gwinn
Sent: Wednesday, February 02, 2011 9:37 PM
To: 'Dahlen, Deirdre T'
Cc: krasko.anna@epamail.epa.gov; Elizabeth Rand
Subject: EDDs for Centredale Oxbow Area

Deirdre,

Attached are revised EDDs for all of the data. Please don't hesitate to call or email with any questions.

POG

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HEALTH ENVIRONMENT TECHNOLOGY SUSTAINABILITY

EDDs
Patrick Gwinn to: Anna Krasko, Dahlen, Deirdre T 02/01/2011 05:39 PM

Anna,

I completed my review of the EDDs, and I believe we've addressed all of Battelle's comments. However, we have a handful of questions on some MDLs to the lab, which should be answered tomorrow. Rather than send the EDDs without that data , I've decide to wait until we get the answer from the lab to send these off. I'll have the final EDDs to you tomorrow, which, if you are like me, you can view nicely from you home office.

In addition, I will forward to you photographs and sample logs as well.

Regards,

POG

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HEALTH ENVIRONMENT TECHNOLOGY SUSTAINABILITY

Transmittal of Draft, Non-Validated dioxin/furan data from the September 2001 Lyman Mill Reach and Flood Plain Soil Vadose Zone Soil Sampling Effort

Patrick Gwinn to: Anna Krasko 11/10/2010 12:10 PM

Cc: Eve Vaudo, "Louis Maccarone", "Dahlen, Deirdre T", "David Scotti", "Karp, Jeffrey M.", "Brust, Laura Ford", "Muys, Jr., Jerome C.", "Russ Keenan", "Jeff Loureiro"

History: This message has been replied to and forwarded.

Anna,

Attached is a letter presenting and discussing the draft, non-validated dioxin/furan data from the September 2010 surface soil sampling effort of the Lyman Mill reach sediments and flood plain soils (including the Oxbow Area). We have also attached a sampling location map, which will aid in your interpretation of the data. Please call me with any questions you may have.

Regards,

POG

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HEALTH ENVIRONMENT TECHNOLOGY SUSTAINABILITY

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November 10, 2010 Project No. C656-003

Via Electronic and Regular Mail

Ms. Anna Krasko
Project Manager
United States Environmental Protection Agency
5 Post Office Square, Suite 100
Mail Code OSRR07-1
Boston, MA 02109-3912

Subject: **Preliminary Non-Validated Dioxin Results - Centredale Manor Restoration Project Superfund Site: Administrative Settlement Agreement and Order on Consent, CERCLA Docket No. 01-2010-0045, Effective June 30, 2010.**

Dear Ms. Krasko:

As you know, in September 2010, Integral Consulting Inc. (Integral) and Loureiro Engineering Associates, Inc. (LEA), on behalf of Emhart Industries, Inc. (Emhart), collected soil samples in the Lyman Mill Reach Sediments and Flood Plain Soils (Oxbow Area) pursuant to the subject Administrative Settlement Agreement and Order on Consent (Order). We have received non-validated dioxin/furan results of the soil samples from Vista Analytical, which are undergoing validation as per the Sampling and Analysis Plan (SAP). The purpose of this letter is to transmit a summary of the non-validated results and provide a discussion on the implications of these results as they relate to the potential human and ecological health risks computed by EPA for the Oxbow Area. Additionally, since these results have direct bearing on the Feasibility Study (FS) and the Proposed Remedial Action Plan (PRAP), we also provide an analysis of how these results might modify the existing remedial alternatives presented in the FS.

Emhart has filed extensive comments regarding EPA's human health and ecological risk assessments prepared by Battelle (Battelle 2006) for the Oxbow Area (AMEC 2006

& 2007). Though the comments detail many facets of the risk assessments, there are several significant issues that we will briefly reiterate here. First, the data upon which the Battelle risk assessments were based are discrete samples (primarily sediment), focused on those areas with the highest potential for flooding and sedimentation. Therefore, although important from a fate and transport perspective, the Battelle samples are not indicative of the areas that would be most frequented by plausible human receptors. Moreover, because the primary focus of the Battelle samples was identifying high concentration areas rather than adequately characterizing the Oxbow Area as a whole, the risk estimates computed for both human and ecological receptors are overstated. Moreover, Battelle used overly conservative and unrealistic human health exposure parameters in deriving the risk estimates.

As discussed below, a more complete characterization of the forested wetland and upland portions of the Oxbow Area is possible with the September 2010 analytical data. Estimates of human health risk using this improved characterization data are several orders of magnitude lower than those computed in the Addendum to the Interim-Final Baseline Human Health Risk Assessment: Oxbow Area (Oxbow BHHRA) (Battelle 2006). As we understand it, EPA intends to incorporate the analytical results of the September 2010 field sampling effort into a revised human health and ecological risk assessment and to use exposure factors that are more realistic and less conservative than those employed in Battelle (2006). The following discussion takes into consideration the new data only, and does not make any adjustments for changes to exposure parameters, which would further reduce the estimated risks.

Implications of Data on Potential Human Health and Ecological Risks

Table 1 summarizes the non-validated dioxin/furan data for the eleven human health surface soil samples collected in September 2010. The locations of the sampling stations are shown on the attached Figure 1. The human health samples were collected from areas that have a higher potential of human exposure when compared to other areas of the Oxbow forested wetland.

The minimum, maximum, and average concentration dioxin TEQ in the human health samples is 1.47 pg/g, 8.66 pg/g, and 4.066 pg/g. The 95% upper confidence limit (UCL) for these data is 5.21 pg/g. The exposure point concentration (EPC) used in the Oxbow BHHRA (4,291 pg/g) is over 800 times greater than the 95% UCL

computed with September 2010 data (5.21 pg/g). Furthermore, the EPC used in the Oxbow BHHRA was the maximum detected concentration from a single sampling location, whereas the September 2010 data are reflective of the entire Oxbow higher-use exposure area. Consequently, the potential human health risks presented in Battelle (2006) are nearly three orders of magnitude greater than what would be computed with the September 2010 human health surface soil sampling data. Substituting the 95% UCL of the September 2010 data into the health risk calculations in Battelle (2006) results in a potential human health cancer risk of approximately 4E-07, which is significantly lower than the cancer risk of 3E-04 computed in Battelle (2006).[1] Again, this reduction does not take into consideration any downward modifications to the exposure parameters.

Table 2 summarizes the dioxin/furan results for soil samples collected in areas identified as general use areas. The sampling locations for these samples are shown on Figure 1.

The minimum, maximum, and average concentration dioxin TEQ in the general area use surface soil samples is 8.28 pg/g, 11,500 pg/g, and 1,641 pg/g. It should be noted that the maximum detected concentration (11,500 pg/g) was from lab sample SO-001, which was collected at location SS_G-01. A replicate sample from this same location (lab sample SO-002) contained 2,080 pg/g. Because of this large relative percent difference, Integral instructed Vista Analytical to re-extract and re-analyze lab samples SO-001 and SO-002. Though preliminary and not reported on the attached table, the re-extracted/analyzed results are 2,470 pg/g for lab sample SO-001 and 2,600 pg/g for SO-002, indicating that the higher result for this location (11,500 pg/g) may be an anomaly.

Sampling location SS_G-01 is co-located with EPA sample LPX-SD-4405. Sample LPX-SD-4405 was collected in 2005 along with the other LPX-SD-44XX samples shown on Figure 1. Sample LPX-SD-4405 contained the highest concentration of dioxin TEQ detected in the LPX-SD-44XX samples, 4,291 pg/g – the data from this location is used in the Oxbow BHHRA.

In the FS, EPA proposes excavating soil in the immediate vicinity of SS_G-01. Assuming that the surface soil in this area is removed, the average and 95% UCL

[1] Potential cancer risks expressed are Reasonable Maximum Exposure (RME) estimates. Central Tendency Exposure (CTE) risk estimates would be lower.

dioxin TEQ of the remaining eleven SS_G-XX samples is 705 pg/g and 1,710 pg/g, respectively.

If the 95% UCL of the SS_G-XX samples (1,710 pg/g) were substituted for the EPC used in the Oxbow BHHRA, then the RME human health risks would drop from 3E-04 to 1E-04, without including the necessary modifications to the exposure parameters for the general use area. With the downward modifications to the EPCs, the computed RME risks would drop below 1E-04.

In the Addendum to the Interim-Final Baseline Ecological Risk Assessment: Oxbow Area (Oxbow BERA), Battelle (2006) relied on the average concentrations of chemicals in soil to compute potential ecological risks. Combining the September 2010 human health and the general area use samples, the average TEQ concentration is 326 pg/g, not including data from SS_G-01, which is proposed for excavation in the FS. Substituting this average concentration into the risk models used in the Oxbow BERA, the NOAEL-based hazard index (HI) for TEQ/TCDD for the shrew would drop from 187 to approximately 33.[2] Assuming risks from other chemicals (PCBs and metals) remain the same, the total NOAEL-based HI for the short-tailed shrew in the Oxbow Area would be 146, which is approximately equivalent to the background NOAEL-based HI derived for the shrew in Greystone Mill (130). A similar calculation for the LOAEL-based HI shows that the potential risk to shrews in the Oxbow Area is lower than that computed for Greystone Mill (11.6 for the Oxbow versus 16 for Greystone Mill).

Using the average TEQ computed above (326 pg/g) as the exposure point soil concentration for the American woodcock results in similar findings – the total NOAEL-based HI in the Oxbow Area is 30.7 versus 41 for Greystone Mill, and the total LOAEL-based HI in the Oxbow is 2.44 versus 6.7 for Greystone Mill.

Implications of Data on the Selection of Remedial Alternatives

As discussed above, the supplemental soil data collected in September 2010 have significant ramifications on the human health and ecological risks in the forested wetland portion of the Oxbow Area. Though the preliminary data suggest that a targeted removal in the immediate vicinity of SS_G-01 and LPX-SD-4405 may be warranted, levels of dioxin detected throughout the remainder of the forested

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[2] Revised TEQ BERA risks are computed as Revised Risk = BERA TEQ HI/BERA TEQ EPC pg/g x 326 pg/g. The BERA TEQ EPC for soil is 1,800 (Battelle 2006; Table D.1-2).

wetland do not pose an unacceptable risk to human health or a risk to terrestrial ecological receptors above the risks computed for upstream environs (Greystone Mill). Consequently, excavation and/or thin layer capping in the remaining terrestrial portions of the Oxbow is not warranted.

Surface soil sampling data from the forested and emergent wetlands located at the confluence of Assapumpsett Brook and the Woonasquatucket River in Lyman Mill Pond (SS_G-31 and SS_G-32) also suggest that this area requires no remediation. The sample collected from the forested wetland (SS_G-31) contained 48.7 pg/g dioxin TEQ, but only 2.44 pg/g was from 2,3,7,8-TCDD. The emergent wetland sample (SS_G-32) contained 140 pg/g dioxin TEQ. The average TEQ concentration for these samples is 94.35 pg/g, which if applied to the risk assessment paradigm used by Battelle in the Oxbow BERA, would result in risk to terrestrial ecological receptors that is lower than that posed upstream at Greystone Mill to the same receptors. Furthermore, these reported dioxin TEQ concentrations would not pose a significant human health risk to potential receptors accessing this land. Based on this information, EPA should reconsider the excavation and/or thin layer capping remedial alternatives for this area.

Surface soil samples collected from flood plain soils located in the southeastern portion of Lyman Mill pond adjacent to Earl and Jefferson Streets (SS_G-30 and SS_G-33) had dioxin TEQ concentrations of 14.7 and 0.864 pg/g, respectively. Based on these data, it appears that this area is not being impacted by contaminated flood waters. In the FS, EPA is considering thin layer capping and excavation of these flood plain soils. However, the September 2010 data suggest that remediation is not warranted at this location.

Finally, data collected from flood plain soils east of the main stem of the Woonasquatucket River, behind the former Boys and Girls Club, suggests that remedial measures may be warranted for this area. Samples collected from this area, SS_G-23, SS_G-26, and SS_G-29, contained dioxin TEQ concentrations of 1,010 pg/g, 594 pg/g, and 5,150 pg/g, respectively. Although the concentration at SS_G-29 is elevated, the contamination is restricted, at most, to the top foot of soil. The 1-2 foot sample from SS_G-26 contained only 14.9 pg/g dioxin TEQ, which demonstrates that dioxin is primarily limited to the upper strata. These data suggest that EPA's attention to the floodplain soils in this area in the FS is appropriate.

Conclusion

The September 2010 dioxin sampling data, though draft and non-validated, raises questions regarding the prior risk assessment results and the remedy selection process for the Oxbow Area forested wetland and other Lyman Mill flood plain soils currently targeted by EPA for remediation. Though we understand that EPA intends to conduct additional risk assessments when the final validated data are available, the foregoing discussion illustrates the potentially significant impact of these new data on the process of assessing remedial alternatives for these areas.

Moreover, Emhart is preparing to conduct Oxbow sediment sampling, which will provide data on areas that have not yet been characterized. The data collected in the proposed sediment sampling field effort may provide further bases to re-evaluate the remedial alternatives for the Oxbow Area. Given that the vast majority of the stakeholders who submitted letters to the National Remedy Review Board commented on the community importance of the Oxbow Area, it is essential that EPA ensure that the Oxbow Area flood plain soils and sediments are adequately characterized and the potential risks refined, before selecting any proposed remedies for this area.

Should you have any questions on the draft data or our assessment of the data, please call me at (207) 874-9000 ext. 206.

Sincerely,

Patrick O. Gwinn
Senior Managing Scientist's

Enclosures

cc: Eve Vaudo, Esq., USEPA
Lou Maccarone, RIDEM
Deirdre Dahlen, Battelle
Jerome C. Muys, Jr., Esq.

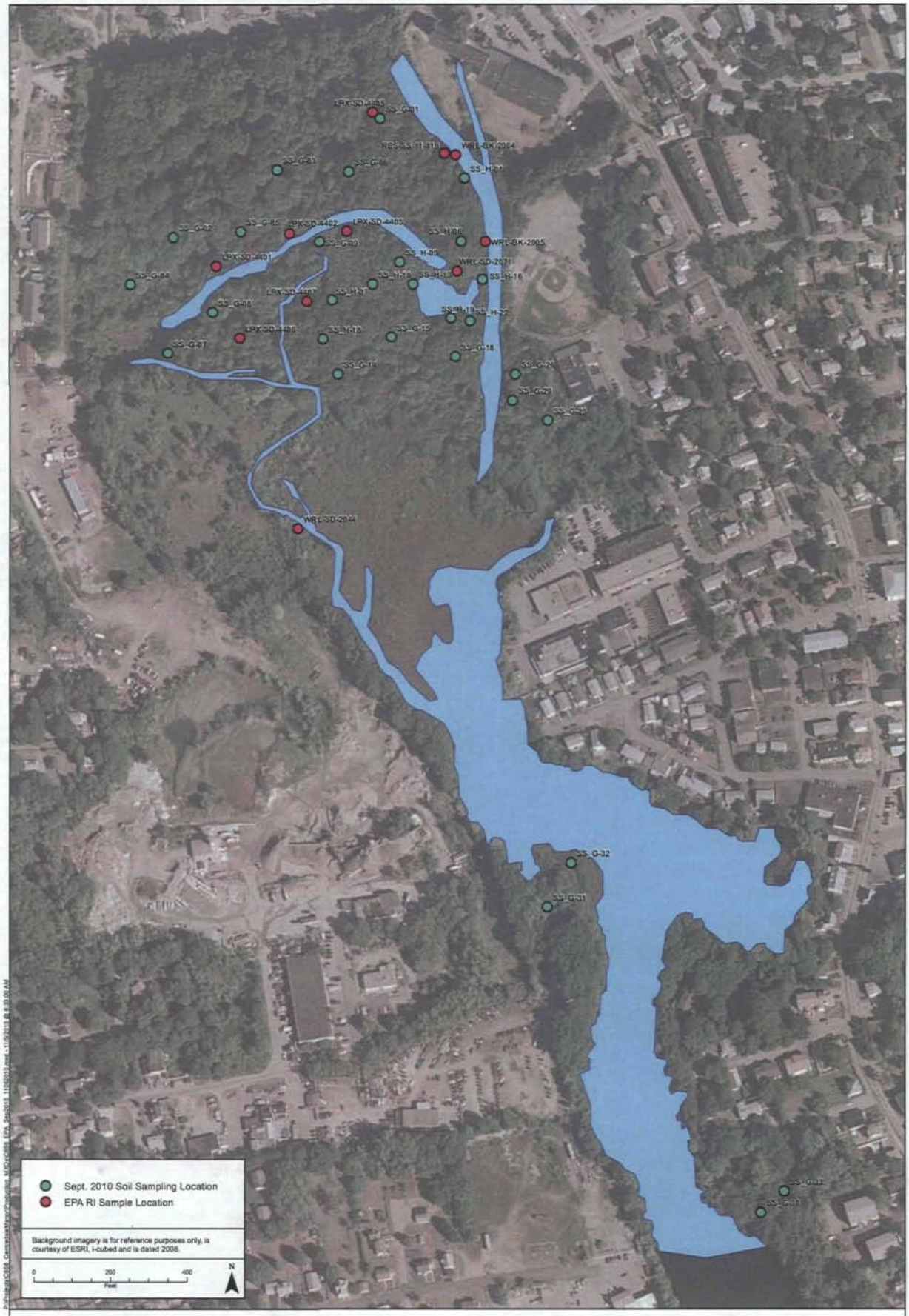
David N. Scotti, LEA
Jeffrey M. Karp, Esq.
Laura Ford Brust, Esq.
Russell E. Keenan, Integral Consulting, Inc.
Jeffrey J. Loureiro, LEA

Table 1. DRAFT, Non-Validated Dioxin/Furan Results - Human Health Samples Collected From the Lyman Mill Reach Sediment and Floodplain Soil

Field Sample ID	SS_H-01-SS1	SS_H-03-SS1	SS_H-06-SS1	SS_H-07-SS1	SS_H-10-SS1	SS_H-13-SS1	SS_H-16-SS1	SS_H-18-SS1	SS_H-18-SS1	SS_H-19-SS1	SS_H-22-SS1
Lab Sample ID	SO-053	SO-054	SO-058	SO-059	SO-060	SO-061	SO-063	SO-064	SO-067	SO-065	SO-066
Sample Type	Surface Soil	Surface Soil	Surface Soil	Surface Soil	Surface Soil	Surface Soil	Surface Soil	Surface Soil	QA-Field Split	Surface Soil	Surface Soil
Sample Depth	0-1'	0-1'	0-1'	0-1'	0-1'	0-1'	0-1'	0-1'	0-1'	0-1'	0-1'
Matrix	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil
Units	pg/g	pg/g	pg/g	pg/g	pg/g	pg/g	pg/g	pg/g	pg/g	pg/g	pg/g
2,3,7,8-TCDD	3.69	0.717	1.96	1.92	1.25	7.9	1.89	3.62	5.39	2.2	1.67
1,2,3,7,8-PeCDD	0.355 J	0.151 J	0.216 J	0.164 EMPC	0.227 J	0.173 EMPC	0.179 J	0.189 J	0.154 J	0.349 J	0.365 J
1,2,3,4,7,8-HxCDD	0.278 J	0.185 J	0.225 J	0.242 J	0.309 J	0.193 J	0.194 J	0.281 J	0.195 J	0.314 EMPC	0.209
1,2,3,6,7,8-HxCDD	0.657 J	0.322 J	0.393 J	0.404 J	0.483 J	0.421 J	0.37 J	0.427 J	0.379 J	0.717 J	0.838 J
1,2,3,7,8,9-HxCDD	0.437 J	0.24	0.431 J	0.367 J	0.347 J	0.31 EMPC	0.286 J	0.36 J	0.309 J	0.683 J	0.265
1,2,3,4,6,7,8-HpCDD	6.15	3.24	6.04	5.04	5.73	5.2	4.92	5.01	5.12	10	3.51
OCDD	35.9 B	20.1 B	40.5 B	31.2 B	33.9 B	35.2 B	34.9 B	32.5 B	32.5 B	64.7	21 B
2,3,7,8-TCDF	2.08	0.973	1.46	1.15	1.53	1.46	0.836	0.405 J	0.388 J	1.5	0.755
1,2,3,7,8-PeCDF	0.943 J	0.472 EMPC	0.597 J	0.494 J	0.667 J	0.58 J	0.476 J	0.422 J	0.396 J	0.964 J	0.387 J
2,3,4,7,8-PeCDF	1.85 J	0.75 J	0.906 J	0.738 J	1.1 J	0.816 J	0.727 J	0.734 J	0.602 J	1.85 J	0.549 J
1,2,3,4,7,8-HxCDF	4.59	0.613 J	0.825 J	0.666 J	1.02 J	0.777 J	0.743 J	0.671 J	0.602 J	1.8 J	0.626 J
1,2,3,6,7,8-HxCDF	1.23 J	0.432 J	0.627 J	0.476 J	0.748 J	0.505 J	0.611 J	0.501 J	0.413 J	1.24 J	0.445 J
1,2,3,7,8,9-HxCDF	0.118 J	0.173	0.0389 EMPC	0.13	0.0535 EMPC	0.124	0.0653 J	0.156	0.121	0.111 EMPC	0.207
2,3,4,6,7,8-HxCDF	1.21 J	0.573 J	0.754 J	0.58 J	0.975 J	0.644 J	0.792 J	0.632 J	0.568 J	2.04 J	0.636 J
1,2,3,4,6,7,8-HpCDF	12.9	2.49	3.63	2.85	3.76	3.14	5.53	2.7	2.51	8.9	43.1
1,2,3,4,7,8,9-HpCDF	0.545 J	0.127 EMPC	0.222 J	0.159 EMPC	0.321 J	0.152 EMPC	0.249 J	0.229 J	0.148 J	0.395 EMPC	0.291 J
OCDF	15.5	2.54 J	3.97 J	3.1 J	4.07 J	3.39 J	5.05	2.99 J	2.63 J	7.63	24.9
Total TCDD	11.9	3.92	6.55	5.52	6.32	11.7	3.31	7.48	9.34	5.76	3.1
Total PeCDD	8.99	3.58	4.74	3.52	5.82	4.22	2.05	4.35	4.08	4.9	4.9
Total HxCDD	9.4	3.99	6.36	5.21	6.85	5.07	4.58	4.71	4.63	9.75	25
Total HpCDD	14.1 B	7.47 B	14.1 B	10.8 B	12.4 B	10.9 B	11.7 B	9.08 B	9.46 B	22.6 B	7.62 B
Total TCDF	25.9	10.9	15.5	13.3	18.7	14.3	11.6	12.3	11.9	18.2	8
Total PeCDF	24.9	10.5	14.4	10.3	16.3	13.5	13.2	11.7	10.9	29	8.99
Total HxCDF	17.8	5.74	8.56	5.98	9.76	7.48	8.55	6.02	5.66	20.6	15
Total HpCDF	15.9	3.34	5.55	4.12	5.66	4.71	8.3	3.8	2.65	13.1	71.8
Total TEQ	5.9	1.47	3.05	2.63	2.48	8.66	2.81	4.46	6.11	4.14	3.02

Table 2. DRAFT, Non-Validated Dioxin/Furan Results - General Area Samples Collected From the Lyman Mill Reach Sediment and Floodplain Soil

Field Sample ID	SS_G-01-SS1	SS_G-01-SS1	SS_G-02-SS1	SS_G-03-SS1	SS_G-04-SS1	SS_G-05-SS1	SS_G-05-CR1A	SS_G-06-SS1	SS_G-07-SS1	SS_G-08-SS1	SS_G-09-SS1	SS_G-14-SS1	SS_G-15-SS1	SS_G-18-SS1	SS_G-23-SS1	SS_G-26-SS1	SS_G-26-CR1A	SS_G-29-SS1	SS_G-30-SS1	SS_G-31-SS1	SS_G-32-SS1	SS_G-33-SS1
Lab Sample ID	SO-001	SO-002	SO-003	SO-004	SO-005	SO-006	SO-007	SO-010	SO-014	SO-015	SO-016	SO-023	SO-024	SO-031	SO-039	SO-042	SO-043	SO-048	SO-049	SO-050	SO-051	SO-052
Sample Type	Surface Soil	QA-Field Split	Surface Soil	Surface Soil	Surface Soil	Surface Soil	Core	Surface Soil	Surface Soil	Surface Soil	Surface Soil	Surface Soil	Surface Soil	Surface Soil	Surface Soil	Surface Soil	Core	Surface Soil	Surface Soil	Surface Soil	Surface Soil	Surface Soil
Sample Depth	0-1'	0-1'	0-1'	0-1'	0-1'	0-1'	1-2'	0-1'	0-1'	0-1'	0-1'	0-1'	0-1'	0-1'	0-1'	0-1'	1-2'	0-1'	0-1'	0-1'	0-1'	0-1'
Matrix	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil
Units	pg/g	pg/g	pg/g	pg/g	pg/g	pg/g	pg/g	pg/g	pg/g	pg/g	pg/g	pg/g	pg/g	pg/g	pg/g	pg/g	pg/g	pg/g	pg/g	pg/g	pg/g	pg/g
2,3,7,8-TCDD	11500 E	2080	8.12	233	491	44.6	16.3	7.95	2880	585 E	2270	390	392	1190	1000	590 E	14.9	5130	1.21	2.44	192	0.292 EMPC
1,2,3,7,8-PeCDD	3.66 J	1.47 EMPC	1.07 J	0.641 J	6.07 J	0.195 EMPC	0.101 EMPC	0.322 J	3.35 J	1.35 J	3.95 J	1.15 J	1.13 J	2.34 EMPC	4.55 J	0.928 J	0.134	5.77 J	2 J	8.3	3.71	0.166 EMPC
1,2,3,4,7,8-HxCDD	3.88	5.85	2.03 J	0.477 J	11.1 J	0.265	0.238	0.381 J	4.04	1.7 J	5.05	1.69 J	1.58 J	5.5	4.18 EMPC	1.4 J	0.178	5.48 EMPC	1.87 EMPC	8.83	3.93	0.375 J
1,2,3,6,7,8-HxCDD	3.96	5.93	4.57	0.948 J	23.8 J	0.542 J	0.24	0.97 J	4.2	4.52	8.75 J	2.84	3.3	9.14 J	9.89 EMPC	3.34	0.169	15.1 J	4.92	28.7	7.5 J	0.899 J
1,2,3,7,8,9-HxCDD	4.79	7.27	4.13	0.82 EMPC	18.2 J	0.417 J	0.288	1.13 J	5.13	3.31	6.4	2.52	2.35 J	7.19	5.99 J	2.26 J	0.232	6.97	3.77	17.2	5.78 J	0.621 J
1,2,3,4,6,7,8-HpCDD	104	74.8	113	15.9	555	8.34	3.39	8.36	118	91.2	223	58	77.2	183	276	82.6	2.33 J	371	66.7	592	142	19.6
OCDD	750	543	739	107 B	3700	59.1	23.1	48.9 B	933	733 B	1730	401	559	1310	2250	644 B	18.5	2770	441	4230 E	1050	138
2,3,7,8-TCDF	3.12 J	2.59	1.96	2.41	5.7 J	0.922	0.426 J	1.15	12.5	4.7	14.1	2.92	2.98	10 J	3.91 EMPC	1.52	0.0913	8.52 J	5.88	12.7	3.51 J	0.284 EMPC
1,2,3,7,8-PeCDF	1.5 EMPC	2.29	1.05 J	1.05 J	4.14 J	0.413 J	0.151 EMPC	0.605 J	4.98 J	2.44 J	6.36 J	2.82	1.88 J	4.36 EMPC	3.35 J	0.809 J	0.079 J	4.04 J	5.85	17.3	3.74 J	0.285 J
2,3,4,7,8-PeCDF	2.18 EMPC	1.47 EMPC	1.54 J	1.63 J	5.03 J	0.557 J	0.185 EMPC	0.757 J	6.41 J	4	8.83 J	4.11	2.73	11.3 J	5.01 J	1.52 J	0.0646 EMPC	6.92 J	12.4	38.6	4.72 J	0.478 J
1,2,3,4,7,8-HxCDF	3.9 J	3.17 J	2.11 J	1.51 J	9.7 J,B	0.662 J	0.272 J	0.971 J	6.92 EMPC	3.95	11.5 J	4.35	3.56	9.53 J,B	6.32 EMPC	2.14 J	0.132 J	10.8 J,B	13.3	41.3	8.8 J,B	0.546 J
1,2,3,6,7,8-HxCDF	3.65 J	2.63 J	1.87 J	1.15 J	11 J	0.514 J	0.182 J	0.751 J	5.69 J	3.72	7.82 J	3.28	3.03	8.64 J	6.57 EMPC	2.17 J	0.107 J	9.08 J	11.7	30.4	7.44 J	0.516 J
1,2,3,7,8,9-HxCDF	3.38	3.23	0.139 J	0.131 J	4.49	0.248	0.148	0.113 J	3.07	0.38 J	3.88	0.179 EMPC	0.107 J	5.52	5.02	0.172 EMPC	0.129	3.71	3.53	8.6	4.23	0.0642 J
2,3,4,6,7,8-HxCDF	4.57 J	3.06 J	2.43 J	1.34 J	12.4 J	0.608 J	0.202 EMPC	0.689 J	6.4 J	3.92	10.3 J	3.87	3.26	9.47 J	9.32 J	2.57	0.13 EMPC	13 J	16.8	31.4	8.84 J	0.774 J
1,2,3,4,6,7,8-HpCDF	30.7 J	26.6 J	29.1	7.59	150	4.05	1.54 J	3.76	43.5 J	37.8	66.5	22.8	25.1	78.2	89.7	25.7	0.914 J	105	74.3	241	60.1	8.73
1,2,3,4,7,8,9-HpCDF	3.2	3.26	1.6 J	0.405 J	8.74 J	0.244 J	0.158	0.251 J	3.8	1.74 J	4.05 J	1.11 J	1.23 J	4.68	5.42 J	1.5 J	0.128	7.52 J	4.31	17.3	4.32 J	0.358 J
OCDF	43.2 J	30.9 J	48.3	8.92	274	4.34 J	1.72 J	4.13 J	60.5 J	54.9 B	91.2 J	27.1	37.7	112 J	152	43.5 B	1.51 J	172	38.5	576	98.3 J	14.6
Total TCDD	11600	2140	8.34	249	512	47.9	11.7	10	2130	621	2370	422	421	1240	1030	608	15.3	5260	17.3	76.9	145	0.76
Total PeCDD	18.5	5.12	12.1	12.4	26.8	2.34	0.932	5.65	30.7	23.5	56.7	29.8	21.1	20.2	17.8	11.4	0.4397 EMPC	60.4	27.5	139	21.6	1.26
Total HxCDD	50.3	35.5	40.9	18.2	170	5.43	2.18	10.8	49.8	41.9	79.1	40.6	34.9	77.4	67.5	28.7	0.815	161	51.3	282	59.9	7.13
Total HpCDD	201	146	201 B	30.4 B	979	16.3 B	6.64 B	16.8 B	232	207 B	430	112 B	148 B	370	579	209 B	6.09 B	705	139 B	1070 B	272	40.5 B
Total TCDF	79.1	51.4	19.6	38.6	68.4	12.6	4.31	11.2	136	72.7	197	65.3	47	104	50.3	28.9	0.13	142	135	262	60.9	6
Total PeCDF	120	86.2	29.5	29	100	10.3	3.35	13.4	150	87.6	235	81.6	59.2	147	140	51.7	1.47	250	201	443	96.1	11.8
Total HxCDF	124	88.6	39.7	19.6	194 B	7.66	2.66	9.5	109	71.7	173	53.5	54.9	146 B	152 B	52.9	1.54	248 B	163	438	107 B	11.3
Total HpCDF	59.5	51.7	60	12.1	315	6.59	2.4	5.97	77.6	78	124	38.2	47.9	145	192	58.8	1.61	228	115	614	121	17.5
Total TEQ	11500	2080	8.28	235	516	45.3	10.4	9.29	2070	592	2290	396	397	1200	1010	594	15	5150	14.7	48.7	140	0.864



integral consulting inc.

Figure 1.
September 2010 Soil Sampling Locations