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Memorandum

Date: October 30, 2007
To: Sally Bilodeau/Camarillo
From: Sharon McKechnie/Westford
Subject: Data Review
Routine Monitoring Program
Quarterly Performance Report for Remediation Systems
Tronox LLC Henderson, Nevada

Distribution: Robert Kennedy/Westford

04020-023-110
TH361-383sm

SUMMARY

A limited review was performed on the data for raw groundwater samples, raw surface water samples, one equipment blank, and one field blank analyzed for all or a subset of the following parameters:

- Perchlorate by EPA Method 314
- Hexavalent chromium by SW-846 Method 7196
- Total chromium by SW846 6010B or EPA Method 200.7
- Total dissolved solids by EPA Method 160.1/Standard Methods (SM) 2540C
- Nitrate as nitrogen by EPA Method 300.0
- Chloride by EPA Method 300.0

The samples were collected at the Tronox LLC site in Henderson, Nevada from June 25 through September 24, 2007 and submitted to MWH Laboratories in Monrovia, California for analysis. The MWH project numbers, sample collection dates and analyses included in this review are summarized in Attachment A at the end of this memo. The data reports provided by MWH did not support a validation at the Tier 2 level as requested by NDEP. All provided QC elements submitted by MWH were reviewed and results of that are summarized below.

The sample results were assessed according to the "USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review" (October 2004), the Region 9 Superfund Data Evaluation/Validation Guidance, NDEP guidance (May 2006), and by the laboratory quality control (QC) criteria. The validation guidelines were modified to accommodate the non-CLP methodologies.

The data reviewed required minor qualification for selected samples and appear generally acceptable for decision making. No major problems were identified and no data were rejected.

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REVIEW ELEMENTS

The elements selected for review are based on the documentation provided in the laboratory data reports. Sample data were reviewed for the following elements:

- Agreement of analyses conducted with chain-of-custody (COC) requests
- Holding times and sample preservation
- Method blanks/equipment blanks/field blanks
- Laboratory control sample/laboratory control sample duplicate (LCS/LCSD) results
- Matrix spike/matrix spike duplicate (MS/MSD) results
- Laboratory duplicate results
- Field duplicate results
- Sample results/detection limits

DISCUSSION**Agreement of Analyses Conducted with COC Requests**

Sample reports were checked to verify that the results reported corresponded to analytical requests as detailed on the COC documentation. The following discrepancies were noted:

- **Report number 212022:** Sample H-28A was listed on the COC without a time of collection. The field sampling team was contacted and Brian Ho of ENSR responded via e-mail on October 29, 2007 with a collection time of 1145. No validation action was taken other than this notation.
- **Report number 213675:** Samples MW-K4 and MW-K5 were incorrectly formatted on the laboratory data report form as MWK-4 and MWK-5 respectively. Format corrections were made on the data reports. No validation action was taken other than this notation.
- **Report number 213156:** The total chromium result of 0.3 ppm for sample ART-1 was questioned by Ed Krish of ENSR. Per his request as noted in an e-mail dated October 4, 2007, the sample was re-prepared and re-analyzed to confirm the result. Following the re-analysis, the revised result of 0.2 ppm was recorded. The report was revised and resubmitted with this new result. No validation action was taken other than this notation.
- **Report number 208480:** Sample SF-1 was listed on the COC but a sample at this location was not received at the laboratory and no notation was made on the COC. Roy B. Capati of MWH confirmed that this sample was resubmitted in SDG 208786. No validation action was taken other than this notation.
- **Report number 208786:** Sample SF-1 was listed on the COC with a notation indicating that this sample was being resubmitted. No other explanation was provided. Roy B. Capati of MWH confirmed that this sample was to replace the one missing from SDG 208480. No validation action was taken other than this notation.

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- **Report number 216434:** Samples PC-86, PC-90, PC-91, PC-95, PC-9, ARP-7, and PC-53 were listed on the preprinted COC but samples at these locations were not received at the laboratory and no notation was made on the COC. Roy B. Capati of MWH confirmed that these samples were resubmitted in SDG 216930. No validation action was taken other than this notation.
- **Report number 216930:** Samples PC-86, PC-90, PC-91, PC-95, PC-9, ARP-7, and PC-53 were listed on the COC with a notation indicating that these samples were being resubmitted. No other explanation was provided. Roy B. Capati of MWH confirmed that these samples were to replace those missing from SDG 216434. No validation action was taken other than this notation.
- **Report number 212236:** The matrix and type of sample was not indicated on the COC for sample M-10. No validation action was taken other than this notation.

Holding Times and Sample Preservation

Method-specified holding times were met for all samples analyzed except for the following:

- **Report number 211929R2:** The hexavalent chromium analyses for samples M-94, M-44, MD-1, and FB-1 were performed six hours outside of the method specified 24-hour holding time criterion. Detected and nondetect results for these samples were qualified as estimated (J and UJ, respectively). The total dissolved solids analysis for sample PC-126 was performed fifteen days beyond the method specified 7-day holding time criterion. The positive result for this sample was qualified as estimated, biased low (J-).
- **Report number 211999:** The hexavalent chromium analyses for samples M-37 and EB-1 were performed one hour outside of the method specified 24-hour holding time criterion. The nondetect results for these samples were qualified as estimated (UJ). The total dissolved solids analysis for sample M-37 was performed two days beyond the method specified 7-day holding time criterion. The positive result for this sample was qualified as estimated, biased low (J-).
- **Report number 212281:** The total dissolved solids analysis for samples M-89 and M-17A were performed four days beyond the method specified 7-day holding time criterion. The positive results for these samples were qualified as estimated, biased low (J-).
- **Report number 208480:** The total dissolved solids analysis for sample PC-99R2/R3 was performed four days beyond the method specified 7-day holding time criterion. The initial analysis was performed within the method specified holding time; however, the sample was reanalyzed due to not matching historical data. The positive result for this sample was qualified as estimated, biased low (J-).

The cooler temperatures upon receipt at the laboratory met the acceptable range of $4 \pm 2^{\circ}\text{C}$.

Documentation regarding sample pH verification upon receipt at the laboratory for total chromium and hexavalent chromium was not included in the data package. No action was taken except for this notation.

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Method Blanks/Equipment Blanks/Field Blanks

Field blank FB-1 (collected July 30, 2007) and equipment blank EB-1 (collected July 31, 2007), were reviewed in association with the samples in this data set.

In instances where laboratory method blanks and field blanks are associated with a given sample, laboratory method blanks and field blanks were evaluated in the following order:

- Laboratory method blank actions were applied to equipment blank and field blank samples as well as associated field samples.
- Field blank actions were applied to the associated equipment blanks.
- Actions for contamination remaining in the equipment blanks were applied to the associated field samples.

Target analytes were not detected in the method blanks associated with the samples in this data set. Therefore, no data validation actions were required on this basis.

No target analytes were detected in the field blanks associated with the equipment blanks in this data set. Therefore, no data validation actions were required on this basis.

The following analytes were detected in the equipment blank samples. The following table summarizes the concentration detected and the associated samples.

Equipment Blank	Analyte	Conc. Detected
EB-1	Perchlorate	1720 ug/L
Associated samples: M-64, M-65, M-66, M-57A, M-79, M-69, M-99, M-98, M-25, M-37, MD-4		

Sample results were qualified as follows:

For blank results > the method reporting limit (MRL):

- Positive sample results > method detection limit (MDL) but < MRL were qualified as nondetect (U) at the MRL.
- Positive sample results > MRL but < 10x the blank result were qualified as estimated high (J+).
- Positive sample results that were > 10x the blank result were accepted unqualified.
-

For blank results \geq MDL but \leq MRL:

- Nondetects were accepted unqualified.
- Positive sample results > MDL but < MRL were qualified as nondetect (U) at the MRL.
- Positive sample results > MRL and < the Action Level (AL) (determined by professional judgment) of 5x the blank contamination level were qualified as undetected (U) at the reported concentration.

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No samples were qualified for EB contamination.

LCS/LCSD Results

The percent recoveries (%Rs) and relative percent differences (RPDs) of the LCS/LCSD analyses for chloride, perchlorate, total dissolved solids, nitrate, total chromium, and hexavalent chromium met the laboratory acceptance criteria.

MS/MSD Results

The %Rs and RPDs of the MS/MSDs performed on client specific samples met the laboratory acceptance criteria the following exception:

MS/MSD analysis for total chromium was performed on sample M-71 in SDG 212281. The MS/MSD results were not useable for determination of accuracy since the spiked amount was lower than the original sample concentration. Associated samples were: M-85, M-83, M-70, M-71, M-72, M-22A, M-38, M-89, M-17A, M-115, and M-14A. No action was taken except for this notation.

In most cases the batch MS/MSD analyses were performed on samples from other clients, and although this practice is acceptable, the results could not be directly applied to the samples reviewed in these data packages due to possible differences in the sample matrix and type. No validation action was taken on this basis.

Laboratory Duplicate Results

The RPDs of the laboratory duplicates for the total dissolved solids analyses performed on client specific samples met the laboratory acceptance criteria with the following exception:

- **Report number 213675:** The RPD for total dissolved solids in the laboratory duplicate analysis performed on sample PC-18 did not meet QC acceptance criteria for laboratory duplicate precision. The positive results for total dissolved solids in samples MW-K4, ARP-1, ARP-2, ARP-3, and PC-18 were qualified as estimated (J).

In most cases batch laboratory duplicate analyses were performed on samples from other clients, and although this practice is acceptable, the results could not be directly applied to the samples reviewed in these data packages due to possible differences in the sample matrix and type. No validation action was taken on this basis.

No laboratory duplicates were analyzed for perchlorate, total chromium, and hexavalent chromium. Precision in the laboratory was demonstrated by the MS/MSD and/or the LCS/LCSD analyses (see discussions above).

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Field Duplicate Results

The following field duplicates pairs were submitted with the samples in this data set. The following table summarizes the sample IDs, the detected results and the associated RPDs.

Analyte	Sample IDs/Collection Date	Sample	Duplicate	RPD
Perchlorate (ug/L)	M-94/MD-1 (7/30/2007)	625000	687000	9.5
Total Dissolved Solids (mg/L)		8280	8120	2
Hexavalent Chromium (mg/L)		0.74	0.76	2.7
Perchlorate (ug/L)	PC-73/MD-3 (7/30/2007)	398000	416000	4.4
Total Chromium (mg/L)		0.40	0.41	2.5
Total Dissolved Solids (mg/L)		7500	7680	2.4
Perchlorate (ug/L)	M-69/MD-4 (7/31/2007)	464000	423000	9.2
Total Chromium (mg/L)		0.071	0.073	2.8
Total Dissolved Solids (mg/L)		4050	4490	10.3

The RPDs met the QC acceptance criteria of 30% maximum RPD for an aqueous matrix.

Sample Results/Detection Limits

Analytical dilutions were necessary for most samples due to matrix interferences or to bring the perchlorate and total chromium concentrations within the instrument calibration range.

Attachment A

MWH Report #	Sample Collection Date	Analyses
208480	6/25/07	Perchlorate, Total Dissolved Solids
208786	6/27/07	Perchlorate, Total Dissolved Solids
209108	7/2/07	Perchlorate, Total Dissolved Solids
209827	7/10/07	Perchlorate, Total Dissolved Solids
210342	7/11/07 - 7/13/07	Perchlorate, Total Dissolved Solids
210606	7/16/07	Perchlorate, Total Dissolved Solids
211354	7/23/07	Perchlorate, Total Dissolved Solids
211878	7/30/07	Perchlorate, Total Dissolved Solids
211999	7/31/07	Perchlorate, Total Chromium, Total Dissolved Solids
212022	7/31/07	Perchlorate, Total Chromium, Total Dissolved Solids

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Attachment A

MWH Report #	Sample Collection Date	Analyses
212236	8/2/07	Total Chromium, Total Dissolved Solids, Chloride, Nitrate as Nitrogen
212281	8/3/07	Perchlorate, Total Chromium, Total Dissolved Solids
213156	8/13/07	Perchlorate, Total Chromium, Total Dissolved Solids
213675	8/13/07 - 8/17/07	Perchlorate, Total Chromium, Total Dissolved Solids
213892	8/20/07	Perchlorate, Total Dissolved Solids
214530	8/27/07	Perchlorate, Total Dissolved Solids
215287	9/4/07	Perchlorate, Total Dissolved Solids
215827	9/10/07	Perchlorate, Total Dissolved Solids
216434	9/10/07-9/12/07 and 9/14/07	Perchlorate, Total Dissolved Solids
216598	9/17/07	Perchlorate, Total Dissolved Solids
216930	9/19/07	Perchlorate, Total Dissolved Solids
217344	9/24/07	Perchlorate, Total Dissolved Solids
211929R2	7/30/07	Perchlorate, Total Chromium, Total Dissolved Solids, Hexavalent Chromium
212133R	7/31/07	Perchlorate, Total Chromium Total Dissolved Solids