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MEMORANDUM

TO: Jim Kay
REF. NO.: 005513

FROM: Susan Scrocchi/bjw/5 SCS
DATE: July 15, 2011

E-Mail and Hard Copy If Requested

RE: **Analytical Results and QA/QC Review**
Annual Groundwater Monitoring Program
UCAR Carbon Company, Inc.
Niagara Falls, New York
May 2011

INTRODUCTION

Eight groundwater samples, including one field duplicate sample were collected during May 2011 in support of the annual monitoring program at the UCAR Carbon Site in Niagara Falls, New York (Site). The samples were submitted to Columbia Analytical Services (CAS), located in Rochester, New York, and analyzed for the following:

Parameter	*Methodology*
Volatile Organic Compounds (VOCs)	SW-846 8260B[1]
Total & Dissolved Iron, Potassium, and Zinc	SW-846 6010B[1]
Ammonia	USEPA 350.1[2]
Nitrite	USEPA 353.2[2]
Total Kjeldahl Nitrogen (TKN)	USEPA 351.2[2]

A sampling and analysis summary is presented in Table 1. The analytical results are summarized in Table 2. The quality assurance/quality control (QA/QC) criteria by which the data have been assessed are outlined in the respective methods and the following documents:

i) "USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review", October 1999, United States Environmental Protection Agency (USEPA) 540/R-99/008
ii) "USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review", February 1994, USEPA 540/R-94/013

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[1] "Test Methods for Solid Waste Physical/Chemical Methods", SW-846, 3rd Edition, September 1986 (with all subsequent revisions).

[2] "Methods for Chemical Analysis of Water and Wastes", United States Environmental Protection Agency (USEPA) 600/4-79-220, March 1983 (with all subsequent revisions).

Full Contract Laboratory Program (CLP) equivalent raw data deliverables were provided by the laboratory. The data quality assessment and validation presented in the following subsections were performed based on the sample results, supporting QA/QC and raw data provided.

HOLDING TIME PERIOD AND SAMPLE ANALYSIS

The holding time periods are presented in the analytical methods. All samples were properly preserved and cooled to 4°C (±2°C) after collection. All samples were prepared and analyzed within the method-required holding times.

GAS CHROMATOGRAPHY/MASS SPECTROMETER (GC/MS) MASS CALIBRATION

Prior to analysis, GC/MS instrumentation is tuned to ensure optimization over the mass range of interest. To evaluate instrument tuning, the volatile organic compound (VOC) method requires the analysis of the specific tuning compound bromofluorobenzene (BFB). The resulting spectra must meet the criteria cited in the method before analysis is initiated. Analysis of the tuning compound must then be repeated every 12 hours throughout sample analysis to ensure the continued optimization of the instrument.

Instrument tuning data were reviewed. The tuning compound was analyzed at the required frequency throughout the VOC analysis periods. All tuning criteria were met for the analyses, indicating proper optimization of the instrumentation.

INITIAL CALIBRATION – GC/MS ANALYSES

To quantify compounds of interest in samples, calibration of the GC/MS over a specific concentration range must be performed. Initially, a minimum of a five-point calibration curve containing all compounds of interest is analyzed to characterize instrument response for each analyte over a specific concentration range.

Calibration data were reviewed for all samples. Linearity of the calibration curve and instrument sensitivity were evaluated against the following criteria:

i) All relative response factors (RRFs) for the GC/MS must be greater than or equal to 0.05.

ii) Percent relative standard deviation (%RSD) values for the GC/MS must not exceed 30 percent, or if linear regression is used, the correlation coefficient (R^2) value must be at least 0.990.

Initial calibration standards were analyzed as required and the data showed acceptable sensitivity and linearity.

INITIAL CALIBRATION – METALS ANALYSES

To calibrate the inductively coupled plasma (ICP), a calibration blank and at least one standard must be analyzed at each wavelength to establish the analytical curve. After calibration, an initial calibration verification (ICV) standard must be analyzed to verify the analytical accuracy of the calibration curves within a method-specific percent recovery of the accepted or true value. A Contract Required Detection Limit (CRDL) standard is analyzed before and after sample analyses to verify instrument sensitivity.

A review of the data showed that all metals calibration curves, ICVs and CRDL were analyzed at the proper frequencies and were within the acceptance criteria.

INITIAL CALIBRATION – GENERAL CHEMISTRY ANALYSES

The general chemistry analyses of ammonia, nitrite, and TKN were calibrated in accordance with the methods and all calibration criteria were met.

CONTINUING CALIBRATION – GC/MS

To ensure that instrument calibration is acceptable throughout the sample analysis period, continuing calibration standards must be analyzed and compared to the initial calibration curve every 12 hours.

The following criteria were employed to evaluate continuing calibration data:

i) All RRF values for the GC/MS must be greater than or equal to 0.05.
ii) Percent difference (%D) values must not exceed 25 percent.

Continuing calibration standards were analyzed at the required frequency and the results met the above criteria for instrument sensitivity and linearity of response.

CONTINUING CALIBRATION – INORGANICS

Continuing calibration criteria for inorganic analyses were the same criteria as used for assessing the initial calibration data. All continuing calibration verification data were within the acceptance criteria.

SURROGATE COMPOUND RECOVERIES

Surrogates were added to all samples, blanks, and QC samples prior to analysis of VOCs. All recoveries met the method criteria.

METHOD BLANK SAMPLES

Method blanks were analyzed for all parameters. All results were non-detect, indicating that contamination during analysis was not a concern.

LABORATORY CONTROL SAMPLE (LCS) ANALYSIS

The LCS serves as a measure of overall analytical performance. LCSs are prepared with all analytes of interest and analyzed with each sample batch.

LCSs were prepared and analyzed for all parameters at the proper frequency. The LCS recoveries were within the control limits for all analytes of interest, indicating acceptable analytical accuracy.

MATRIX SPIKE/MATRIX SPIKE DUPLICATE (MS/MSD) ANALYSES

The recoveries of MS analyses are used to assess the analytical accuracy achieved on individual sample matrices. MS/MSD analyses were performed on the sample submitted for metals and VOC analysis. All MS/MSD recoveries and relative percent differences (RPDs) were within laboratory control limits for all analytes of interest, indicating good analytical accuracy and precision with the exception of a low ammonia recovery. All associated ammonia results were qualified as estimated (see Table 3).

LABORATORY DUPLICATE ANALYSES

Laboratory duplicates were performed for inorganic analyses. All results were within laboratory control limits showing acceptable analytical precision.

INDUCTIVELY COUPLED PLASMA (ICP) INTERFERENCE CHECK SAMPLE (ICS) ANALYSIS

To verify that proper inter-element and background correction factors have been established by the laboratory, ICSs are analyzed. These samples contain high concentrations of aluminum, calcium, magnesium, and iron and are analyzed at the beginning and end of each sample analysis period.

ICS analysis results were evaluated for all samples. All ICS recoveries were within the established control limits of 80 to 120 percent.

SERIAL DILUTION – METALS ANALYSES

The serial dilution determines whether significant physical or chemical interferences exist due to sample matrix. A minimum of one per 20 investigative samples is analyzed at a five-fold dilution. For samples with sufficient analyte concentrations, the serial dilution results must agree within 10 percent of the original results.

Serial dilution analyses were performed and all results were within the method criteria.

INTERNAL STANDARD (IS) SUMMARIES

To correct for changes in GC/MS response and sensitivity, IS compounds are added to investigative samples and QC samples prior to VOC analyses. All results are calculated as a ratio of the IS response. The criteria by which the IS results are assessed are as follows:

i) IS area counts must not vary by more than a factor of two (-50 percent to +100 percent) from the associated calibration standard.

ii) The retention time of the IS must not vary more than ±30 seconds from the associated calibration standard.

All sample IS results met the above criteria and were correctly used to calculate sample results.

TRIP BLANKS – VOCS

Trip blanks are transported, stored, and analyzed with the investigative samples to identify potential cross-contamination of VOCs. A trip blank was collected as shown on Table 1. All results were non-detect for the analytes of interest, indicating that contamination during transport and storage was not an issue.

FIELD DUPLICATES

Samples were collected in duplicate as summarized in Table 1 and submitted "blind" to the laboratory for analysis. All sample results outside of estimated ranges of detection showed acceptable sampling and analytical precision.

CONCLUSION

Based on the preceding assessment, the data were acceptable for use with the qualifications noted.

TABLE 1

SAMPLE COLLECTION AND ANALYSIS SUMMARY
ANNUAL GROUNDWATER MONITORING
UCAR CARBON COMPANY, INC.
NIAGARA FALLS, NEW YORK
MAY 2011

				Analysis/Parameters					
Sample I.D.	*Location I.D.*	*Collection Date (mm/dd/yy)*	*Collection Time (hr:min)*	*VOCs*	*Selected Metals-total and dissolved*	*TKN*	*Nitrate*	*Ammonia*	*Comments*
WG-5513050511-001	GW-9B	05/05/11	10:35	X	X	X	X	X	
WG-5513050511-002	BW-2	05/05/11	12:15	X	X	X	X	X	
WG-5513050511-003	BW-3	05/05/11	13:25	X	X	X	X	X	
WG-5513050511-004	BW-4	05/05/11	14:15	X	X	X	X	X	
WG-5513050511-005	BW-1	05/05/11	15:15	X	X	X	X	X	
WG-5513050511-006	GW-8B	05/05/11	15:40	X	X	X	X	X	
WG-5513050511-007	GW-8B	05/05/11	*16:45*	X	X	X	X	X	Field Duplicate of WG-5513050511-006
WG-5513050511-008	MW-3	05/05/11	16:20	X	X	X	X	X	
TB-5513-050511	TRIP BLANK	05/05/11	-	X					Trip blank

Notes:

- = Not applicable.
TKN - Total Kjeldahl Nitrogen.
VOCs - Volatile Organic Compounds.

TABLE 2

ANALYTICAL RESULTS SUMMARY
ANNUAL GROUNDWATER MONITORING
UCAR CARBON COMPANY, INC.
NIAGARA FALLS, NEW YORK
MAY 2011

	Sample Location:	*BW-1*	*BW-2*	*BW-3*	*BW-4*	*GW-8B*
	Sample ID:	*WG-5513-050511-005*	*WG-5513-050511-002*	*WG-5513-050511-003*	*WG-5513-050511-004*	*WG-5513-050511-006*
	Sample Date:	*05/05/2011*	*05/05/2011*	*05/05/2011*	*05/05/2011*	*05/05/2011*
Parameters	*Units*					
Volatile Organic Compounds						
1,1,1-TRICHLOROETHANE	µg/L	0.3 U	0.3 U	0.98 J	0.3 U	0.3 U
1,1,2,2-TETRACHLOROETHANE	µg/L	0.3 U	0.3 U	0.3 U	4.1 J	0.3 U
1,1,2-TRICHLOROETHANE	µg/L	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U
1,1-DICHLOROETHANE	µg/L	0.3 U	0.3 U	0.88 J	0.3 U	0.3 U
1,1-DICHLOROETHENE	µg/L	0.37 U	0.37 U	0.37 U	4.2 J	0.37 U
1,2-DICHLOROETHANE	µg/L	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U
1,2-DICHLOROPROPANE	µg/L	0.66 U	0.66 U	0.66 U	0.66 U	0.66 U
2-HEXANONE	µg/L	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U
ACETONE	µg/L	1.8 J	2.4 J	1.6 U	1.6 U	1.9 J
BENZENE	µg/L	0.31 U	0.31 U	0.31 U	0.52 J	0.31 U
BROMODICHLOROMETHANE	µg/L	0.41 U	0.41 U	0.41 U	0.41 U	0.41 U
BROMOFORM	µg/L	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U
BROMOMETHANE	µg/L	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U
CARBON DISULFIDE	µg/L	0.42 J	0.66 J	0.35 U	0.35 U	0.35 U
CARBON TETRACHLORIDE	µg/L	0.36 U	0.36 U	0.36 U	0.36 U	0.36 U
CHLOROBENZENE	µg/L	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U
CHLOROETHANE	µg/L	10	0.94 J	0.3 U	0.3 U	0.3 U
CHLOROFORM	µg/L	0.3 U	0.3 U	0.3 U	5.6	0.3 U
CHLOROMETHANE	µg/L	0.46 U	0.46 U	0.46 U	0.46 U	0.46 U
CIS-1,3-DICHLOROPROPENE	µg/L	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U
DIBROMOCHLOROMETHANE	µg/L	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U
DICHLOROETHYLENES	µg/L	0.79 J	0.6 U	0.95 J	1000 D	19
DIMETHYL BENZENE	µg/L	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U
ETHYLBENZENE	µg/L	0.42 U	0.42 U	0.42 U	0.42 U	0.42 U
METHYL ETHYL KETONE (2-BUTANONE)	µg/L	1 U	1 U	1 U	1 U	1 U
METHYL ISOBUTYL KETONE (4-METHYL-2-PENTANONE)	µg/L	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U
METHYLENE CHLORIDE	µg/L	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U
STYRENE	µg/L	0.35 U	0.35 U	0.35 U	0.35 U	0.35 U
TETRACHLOROETHYLENE (PCE)	µg/L	0.42 U	0.42 U	0.42 U	92	0.42 U

TABLE 2

ANALYTICAL RESULTS SUMMARY
ANNUAL GROUNDWATER MONITORING
UCAR CARBON COMPANY, INC.
NIAGARA FALLS, NEW YORK
MAY 2011

	Sample Location:	***BW-1***	***BW-2***	***BW-3***	***BW-4***	***GW-8B***
	Sample ID:	***WG-5513-050511-005***	***WG-5513-050511-002***	***WG-5513-050511-003***	***WG-5513-050511-004***	***WG-5513-050511-006***
	Sample Date:	***05/05/2011***	***05/05/2011***	***05/05/2011***	***05/05/2011***	***05/05/2011***
Parameters	***Units***					
Volatile Organic Compounds (Cont'd.)						
TOLUENE	µg/L	0.3 U	0.3 U	0.3 U	0.51 J	0.3 U
TRANS-1,3-DICHLOROPROPENE	µg/L	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U
TRICHLOROETHYLENE (TCE)	µg/L	0.3 U	0.3 U	0.3 U	390 D	8.2
VINYL CHLORIDE	µg/L	0.81 J	0.3 U	0.3 U	190	2.9 J
Metals						
IRON	µg/L	1910	7790	350	10100	470
IRON (dissolved)	µg/L	1130	1720	179	4590	180
POTASSIUM	µg/L	6460	5980	1180 J	16800	5680
POTASSIUM (dissolved)	µg/L	6100	6220	1170 J	16600	5300
ZINC	µg/L	9230	1320	648	1250	1780
ZINC (dissolved)	µg/L	59.5	132	509	203	454
Wet Chemistry						
NITROGEN, AMMONIA (AS N)	mg/L	0.786 J	0.383 J	0.004 UJ	2.87 J	0.004 UJ
NITROGEN, KJELDAHL, TOTAL	mg/L	1.21	1.02	0.09 U	3.49	0.09 U
NITROGEN, NITRITE	mg/L	0.003 U	0.003 U	0.003 U	0.003 U	0.003 U

TABLE 2

ANALYTICAL RESULTS SUMMARY
ANNUAL GROUNDWATER MONITORING
UCAR CARBON COMPANY, INC.
NIAGARA FALLS, NEW YORK
MAY 2011

	Sample Location:	*GW-8B*	*GW-9B*	*MW-3*
	Sample ID:	*WG-5513-050511-007*	*WG-5513-050511-001*	*WG-5513-050511-008*
	Sample Date:	*05/05/2011*	*05/05/2011*	*05/05/2011*
		Duplicate		
Parameters	*Units*			
Volatile Organic Compounds				
1,1,1-TRICHLOROETHANE	µg/L	0.3 U	0.3 U	0.3 U
1,1,2,2-TETRACHLOROETHANE	µg/L	0.3 U	0.3 U	0.3 U
1,1,2-TRICHLOROETHANE	µg/L	0.3 U	0.3 U	0.3 U
1,1-DICHLOROETHANE	µg/L	0.3 U	0.3 U	0.3 U
1,1-DICHLOROETHENE	µg/L	0.37 U	0.37 U	0.37 U
1,2-DICHLOROETHANE	µg/L	0.3 U	0.3 U	0.3 U
1,2-DICHLOROPROPANE	µg/L	0.66 U	0.66 U	0.66 U
2-HEXANONE	µg/L	0.4 U	0.4 U	0.4 U
ACETONE	µg/L	1.8 J	1.9 J	1.6 U
BENZENE	µg/L	0.31 U	0.31 U	0.31 U
BROMODICHLOROMETHANE	µg/L	0.41 U	0.41 U	0.41 U
BROMOFORM	µg/L	0.3 U	0.3 U	0.3 U
BROMOMETHANE	µg/L	0.4 U	0.4 U	0.4 U
CARBON DISULFIDE	µg/L	0.35 U	0.35 U	0.35 U
CARBON TETRACHLORIDE	µg/L	0.36 U	0.36 U	0.36 U
CHLOROBENZENE	µg/L	0.3 U	0.3 U	0.3 U
CHLOROETHANE	µg/L	0.3 U	0.3 U	0.3 U
CHLOROFORM	µg/L	0.3 U	0.3 U	0.3 U
CHLOROMETHANE	µg/L	0.46 U	0.46 U	0.46 U
CIS-1,3-DICHLOROPROPENE	µg/L	0.3 U	0.3 U	0.3 U
DIBROMOCHLOROMETHANE	µg/L	0.3 U	0.3 U	0.3 U
DICHLOROETHYLENES	µg/L	20	0.6 U	0.6 U
DIMETHYL BENZENE	µg/L	1.2 U	1.2 U	1.2 U
ETHYLBENZENE	µg/L	0.42 U	0.42 U	0.42 U
METHYL ETHYL KETONE (2-BUTANONE)	µg/L	1 U	1 U	1 U
METHYL ISOBUTYL KETONE (4-METHYL-2-PENTANONE)	µg/L	0.34 U	0.34 U	0.34 U
METHYLENE CHLORIDE	µg/L	0.3 U	0.3 U	0.3 U
STYRENE	µg/L	0.35 U	0.35 U	0.35 U
TETRACHLOROETHYLENE (PCE)	µg/L	0.42 U	0.42 U	0.42 U

TABLE 2

ANALYTICAL RESULTS SUMMARY
ANNUAL GROUNDWATER MONITORING
UCAR CARBON COMPANY, INC.
NIAGARA FALLS, NEW YORK
MAY 2011

	Sample Location:	*GW-8B*	*GW-9B*	*MW-3*
	Sample ID:	*WG-5513-050511-007*	*WG-5513-050511-001*	*WG-5513-050511-008*
	Sample Date:	*05/05/2011*	*05/05/2011*	*05/05/2011*
		Duplicate		
Parameters	*Units*			
Volatile Organic Compounds (Cont'd.)				
TOLUENE	µg/L	0.3 U	0.3 U	0.3 U
TRANS-1,3-DICHLOROPROPENE	µg/L	0.3 U	0.3 U	0.3 U
TRICHLOROETHYLENE (TCE)	µg/L	8.7	0.3 U	0.3 U
VINYL CHLORIDE	µg/L	3.5 J	0.3 U	0.3 U
Metals				
IRON	µg/L	414	205	6580
IRON (dissolved)	µg/L	177	173	230
POTASSIUM	µg/L	5230	4260	2680
POTASSIUM (dissolved)	µg/L	5600	4480	1970 J
ZINC	µg/L	1830	4.6 J	43.1
ZINC (dissolved)	µg/L	453	12.3 J	3.6 U
Wet Chemistry				
NITROGEN, AMMONIA (AS N)	mg/L	0.004 UJ	0.4 J	0.004 UJ
NITROGEN, KJELDAHL, TOTAL	mg/L	0.09 U	0.59	0.37
NITROGEN, NITRITE	mg/L	0.003 U	0.003 U	0.003 U

Notes:

J - Estimated.
U - Not detected.
UJ - Not detected, estimated reporting limit.

TABLE 3

QUALIFIED SAMPLE RESULTS DUE TO OUTLYING MATRIX SPIKE RECOVERIES
ANNUAL GROUNDWATER MONITORING
UCAR CARBON COMPANY, INC.
NIAGARA FALLS, NEW YORK
MAY 2011

Analyte	*Spike ID*	*MS Recovery (percent)*	*Control Limits (percent)*	*Associated Samples*	*Qualified Sample Results*	*Units*
Ammonia, as N	WG-5513-050511-001	66	90 - 110	WG-5513-050511-001	0.4 J	mg/L
				WG-5513-050511-002	0.383 J	mg/L
				WG-5513-050511-003	0.004 UJ	mg/L
				WG-5513-050511-004	2.87 J	mg/L
				WG-5513-050511-005	0.786 J	mg/L
				WG-5513-050511-006	0.004 UJ	mg/L
				WG-5513-050511-007	0.004 UJ	mg/L
				WG-5513-050511-008	0.004 UJ	mg/L

Notes:

J	Estimated.
MS	Matrix Spike.
UJ	Not detected, estimated reporting limit.