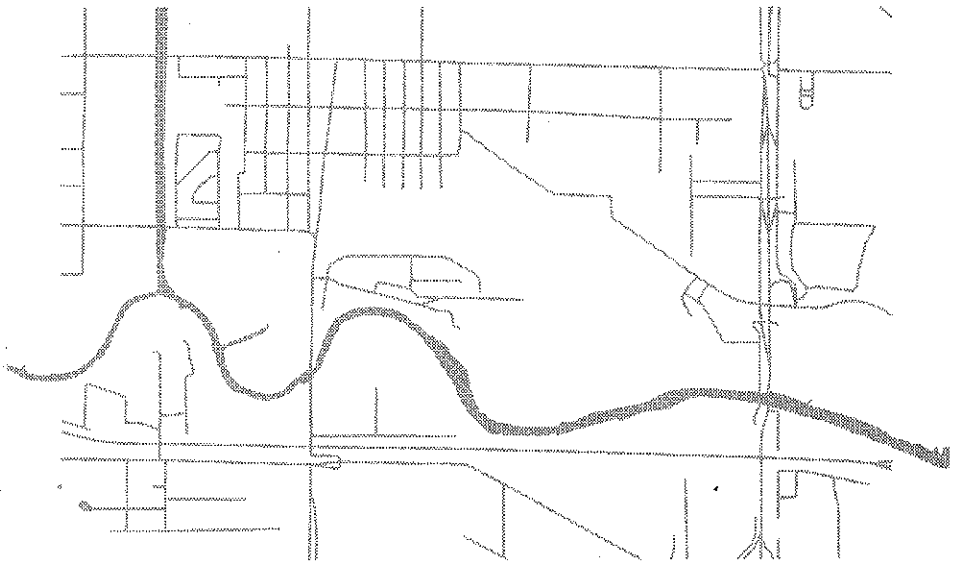
Current Conditions Report for the DuPont East Chicago Facility

Volume 2: Book 2



Prepared for

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Appendixes

Where to Find CCR Items Listed in Attachment II of the Order within this CCR Document

Facility Information

Physical and Environmental Quality Conditions

- Site Topography and Easements
  - Site Topography (Plate 1)
  - Property Maps, Easements, and Rights-of-Way
- Meteorology/Wind Directional Information
- Geologic and Soil Information
  - U.S. Department of Agriculture Soil Survey for Lake County
  - Phase II Soil Boring Logs (MW4 through MW20)
  - Phase III Cone Penetrometer Testing (CPT) Stratigraphic Logs
- Monitoring Network Information
  - Monitoring Sites Installed by U.S.G.S.
  - Summary of DuPont Monitoring Well Construction Information
  - Technical Memorandum No. 1: Phase II Groundwater Assessment Field Work Implementation
  - Phase III Monitoring Wells and Piezometers
  - Re-surveying of Monitoring Well Elevations
- Groundwater/Surface Water Hydraulic Information
  - Pre-1990 Groundwater Level Data
  - Phase II Groundwater/Surface Water Level Data
  - Phase III Groundwater Level Data
  - Phase III Hydraulic Conductivity Information
  - Spring Flow Data
  - U.S.G.S. Water Level Information
- Environmental Quality Information
  - Phase I Groundwater Data
  - Soil Quality Data Collected for IDEM
  - Phase II Quality Assurance Project Plan
  - Phase II Groundwater and Surface Water Quality Data and Associated Data Validation
  - Spring Quality Data

- Sewer Sample Results and Comparision to Nearby Spring and Nearby Groundwater Quality
- Phase III Quality Assurance Project Plan
- Phase III Unsaturated Soil and Groundwater Quality Data
- Phase III Supplemental Groundwater Quality Data (Pumping Test Data)
- U.S.G.S. Groundwater Quality Data
- Property Transfer Study—Conoco Area
- Constituent Distribution Diagrams

Production and Waste Management Information

- Summary of Raw Materials, Products, and Waste Streams by Manufacturing Process
- Relevant Information from the Phase I Groundwater Assessment Report
  - Phase I Waste Management Unit Information
  - Appendix A. Information Sources and Document Reference List
  - Appendix B. Detailed Production History
  - Appendix C. Process Flow Sheets for Chemicals with Productions for Longer Than 25 Years
  - Appendix D. Miscellaneous Process Flow Sheets
  - Appendix E. Waste Management Flow Charts
- Line Shutdown and Facility Dismantlement
  - List of Facilities Dismantled
  - Procedures for Dismantlement
- Identification of Solid Waste Management Units (SWMUs) and Areas of Concern (AOCs)
- Flue Dust Information

Offsite Information

Agency Contacts, Adjacent Property Owners, and Nearby Wells

- Agency Contacts Familiar with Environmental Issues at the Facility
- Adjacent Property Owners
- Wells within One Mile of the DuPont East Chicago Facility

Ecological Information

- Natural Areas Located Nearby
- Ecological Habitats and Species within the Region Identified by Others
  - List of Endangered, Threatened and Rare (ETR) Species
  - List of Native Plants and Exotics
  - Morton Arboretum Information

Neighborhood Information

- Potentially Sensitive Receptors
- Riley Park Area Information
  - Riley Park Water Quality Results
  - Riley Park Sewer Survey
  - Riley Park Well and Basement Sump Survey Results
- East Branch of the Grand Calumet System
  - 100-Year Flood Plain
  - Streamflow

Where to Find CCR Items Listed in Section I of Attachment II of the AOC within this CCR Document
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CCR Items Listed In Section I of Attachment II of the Order	Text Chapter ID	Table (T) or Figure (F) No.	Appendix ID
A. Facility Background			
1. Maps			
General geographic location	1, 2	F1-1, F2-1	--
Property line; adjacent property	2	F2-3	Property Maps, Easements, Rights-of-Way; and Adjacent Property Owners
Topography and surface drainage	2	F2-6, F2-9	Site Topography (Plate 1) and East Branch of the Grand Calumet System for 100-Yr Flood Plain
Tanks, buildings, utilities, paved areas, easements, rights-of-way	2	F2-9	Property Maps, Easements, and Rights-of-Way and Phase I Waste Management Unit Information for Tanks
Solid or hazardous waste treatment, storage, or disposal areas	3	T3-3 F3-6	Identification of SWMUs and AOCs, Phase I Waste Management Unit Information, and Appendix E—Waste Management Flow Charts
Product and waste USTs or piping	--	F3-9	Identification of SWMUs and AOCs
Surrounding land uses	2	F2-4, F2-5	--
Wells at and within 1 mile of the facility	2	F2-17	Monitoring Network Information and Wells within One Mile of the DuPont East Chicago Facility
Wind rose and meteorology	2	--	Meteorology (Wind Directional Information)
2. History of Ownership	3	--	--
3. Spill Information	3	T3-3, T3-4; F3-8, F3-9	Phase I Waste Management Unit Information and Identification of SWMUs and AOCs
4. Permits, Enforcement Actions and Responses, List of Studies	3, 4	Permits: T3-5 Actions: T3-6 Studies: T4-1	--
5. Description of Habitat Types	2, 5	T5-2	Ecological Habitats and Species within the Region
6. Description of Plants and Animals	2, 5	T5-2	Ecological Habitats and Species within the Region

Where to Find CCR Items Listed in Section I of Attachment II of the AOC within this CCR Document
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CCR Items Listed In Section I of Attachment II of the Order	Text Chapter ID	Table (T) or Figure (F) No.	Appendix ID
B. Preliminary Assessment of Nature and Extent			
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Type of hazardous waste or constituents	--	--	Phase I Waste Management Unit Information
Areas where additional information is necessary	4	--	--
Results of RFA and summary of suggested actions	--	--	--
2. Preliminary Assessment of Degree and Extent of Contamination			
Description of extent of contamination for each medium	4	--	Environmental Quality Information
Map of sampling locations/source areas/plumes	4	F4-2 through 4-7b	Constituent Distribution Diagrams
General assessment of data quality	4	T4-2	--
Previous Investigations List and Agency Contacts	4	T4-1	Agency Contacts Familiar with Environmental Issues
3. Preliminary Assessment and Description of Potential Pathways			
Migration pathways	5	F5-4a, F5-4b, F5-5	--
Physical property of contaminants	5	T5-1	--
Assessments of offsite migration of contamination	5	--	Riley Park Area Information
4. Description of Potential Impacts on Human Health and Environment	5	--	Neighborhood Information
C. Interim / Stabilization Measures			
Objectives of ISMs: Mitigation	3	T3-8	Line Shutdown and Facility Dismantlement
Design, construction, operation and maintenance requirements	--	--	--
Schedule for design, construction and monitoring	--	--	--
Schedule for progress reports	--	--	--
Data to support future interim measures	--	--	--

-- = Not applicable or none.

Spring (Seep) Quality Data

(collected by CH2M HILL 1991–92)

Spring (Seep) Quality Data

(collected by CH2M HILL 1991–92)

Groundwater Spring Evaluation

One-time Monitoring Report for the Groundwater Seep (April 1991)

March Monthly Monitoring Report

April Monthly Monitoring Report

May Monthly Monitoring Report

June Monthly Monitoring Report

July Monthly Monitoring Report

August Monthly Monitoring Report

September Monthly Monitoring Report

October Monthly Monitoring Report

November Monthly Monitoring Report

December Monthly Monitoring Report

One-time Monitoring Report for the Groundwater Seeps 2 and 3 (1992)

January Monthly Monitoring Report

February Monthly Monitoring Report

March Monthly Monitoring Report

April Monthly Monitoring Report

May Monthly Monitoring Report

Groundwater Spring Evaluation

Sampling and Analysis

In 1990 and early 1991, three springs were found along the Grand Calumet River (see attached figure). For several months, discharge rates were measured, and the springs (referred to in the attached data sheets as spring) were sampled and analyzed for major ions, selected metals, other inorganics, and selected water quality parameters.

Results

The attached tables summarize the analyses on samples taken from the springs. Tables 1 through 3 list the results of all sampling events for the three springs.

Discussion

Spring to Spring Comparison

Spring 2 generally had the highest concentrations of metals and inorganics, followed by Springs 3 and 1 (see Tables 1 through 3). The only spring with pH less than 6 was Spring 2. The pH at spring 2 ranges from 5 to 6.7, with a mean value of 5.8.

Spring to Groundwater Comparison

The springs were found to contain the same constituents and constituent concentrations as nearby groundwater monitoring wells and groundwater grab samples collected during Phase III. Table 4 compares selected spring and groundwater sampling results. The quality of Spring 1 water was similar to that collected from MW-3 and has the highest spring arsenic concentration at 1.7 μg/L. (Arsenic was not consistently detected in the other springs.) Generally, the constituent concentrations of Spring 2 correlate with those in nearby monitoring well MW-5. In addition, the constituent concentrations of Spring 3 correlate with those of monitoring well MW-4.

This generalization was documented in the One-Time Monitoring Report for Seep 1 (Spring 1) provided to U.S. EPA in April 1991.

Table 1
Groundwater Seep 1 Analytical Data
Du Pont, East Chicago

Lab ID:	128851	129198	129745	130113	130114	130967	131461	131844	132290	132291	132803	137120	141634	141977	142472
Date of Sample:	3/15/91	3/21/91	3/28/91	4/4/91a	4/4/91b	4/11/91	4/18/91	4/25/91	5/2/91a	5/2/91b	5/9/91	5/16/91	5/23/91	5/30/91	6/06/91a
Notes:															
AVERAGE FLOW RATE (gpm)	0.41	0.01	0.10	0.32		0.13	1.57	1.12	0.48		0.97	0.78	0.87	1.2	1.25
WATER QUALITY PARAMETERS (mg/l)															
BOD-Five Day	<1	<1	2 J	4 J	4 J	1	<1	<1	5	<1	2	2	2	3	1
COD	72 J	36 J	7 J	46 J	33 J	<3	13	3	29 J	59 J	13	<3	16	<3	<3
Chloride	40	26	32	28	34	30	32	36	16	32	38	28	42	26	26
Fats, Oils & Grease	<1	<1	1	<1	<1	<1	1 J	1 B	1 J	3 J	1	1 J	2 B	<1	1
Fluoride	1.1	0.9	0.9	1.6 J	1.0 J	0.7	1.0 J	1.0	0.1	1.0	0.9 J	2.8	0.7	0.9	0.8 J
Nitrogen, Ammonia	0.37	0.42	0.42	0.28	0.26	0.26	0.39	0.42	0.41	0.45	0.47	0.61	0.75	0.66	0.56
Nitrogen, Nitrate	NA	0.04	0.07	0.2	0.16	0.25	0.64	0.81	0.16	0.18	1.12	2.31	2.22	0.71	1.43 J
Nitrogen, Nitrite	NA	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Total Dissolved Solids	1020	934	1200	1180 J	1170 J	1260	1240	1370	1370	1380	1420	1420	1400	1420	1360
Total Suspended Solids *	12	2 J	32 J	6	9	4	8	3	4	<1	7	11	8 B	4	11
Sulfate	590	570	733	700	740	740	810	790	1120	930	830	790	770	790	870
pH (lab) *	7.3 J	7.3	7.5	7.2	7.2	7.2	7.2	7.3	7.2	7.2	7.0	7.0	7.2	7.1	7.0
TRACE INORGANIC COMPOUNDS (mg/l)															
Arsenic	0.088	0.097	0.029	0.030	0.028	0.056	0.045 J	0.052 J	0.045	0.046	0.052 J	0.071 J	0.015	0.085	0.073
Copper	<0.01	0.005	<0.050	<0.050	<0.050	<0.02	<0.010	<0.010	<0.010	<0.010	<0.050	<0.050	<0.050	<0.050	<0.050
Zinc	0.956	0.502 J	0.477 J	0.452	0.443	0.388	1.26	1.03	0.452 B	0.465 B	0.676	0.373	0.496	0.717	0.981

Notes:
*Sample fraction not filtered.
NA denotes not analyzed.
No value indicates no sample.
J indicates estimate value.
B indicates blank contaminated
UJ indicates estimated, value probably low.
< indicates less then listed detectiion limit.

Table 1
Groundwater Seep 1 Analytical Data
Du Pont, East Chicago

Lab ID:	142473	143057	143439	143833	144148	144149	144650	145143	145559	146136	146137		146983	147511	147899
Date of Sample:	6/06/91b	6/13/91	6/20/91	6/27/91	7/2/1991a	7/2/91b	7/11/91	7/18/91	7/25/91	8/1/1991a	8/1/1991b	8/8/91	8/15/91	8/22/91	8/29/91
Notes:												covered by GCR			
AVERAGE FLOW RATE (gpm)		1.15	0.88	0.18	0.93		0.72	0.48	0.35	0.28		0	0.37	0.38	0.36
WATER QUALITY PARAMETERS (mg/l)															
BOD-Five Day	<1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA	NA	NA
COD	13	29	26	29	29	29	39	7	<3	33	16		46 J	<3	13
Chloride	26	20	28	24	28	24	20	26	28	26	28		10 B	26	30
Fats, Oils & Grease	1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA	NA	NA
Fluoride	0.8 J	0.6	1.1	1.5	1.3	1.0	0.8 J	0.9 J	1.0 J	0.9 J	0.9 J		0.8 J	1.1	0.6 J
Nitrogen, Ammonia	2.56	0.46	0.60	1.03	0.76 B	0.77 B	<0.01	0.58 B	0.75	0.67	0.86		0.41	0.51	0.43
Nitrogen, Nitrate	3.46 J	0.94	0.31	0.08	0.28	0.13	NA	0.53	0.32	0.10 B	0.08 B		0.07 B	0.07 B	0.09 B
Nitrogen, Nitrite	<0.01	0.04	<0.01	<0.01	<0.01	<0.01	NA	<0.01	<0.01	<0.01	<0.01		<0.01	0.6	<0.01
Total Dissolved Solids	1400	380	1410	1260	1310	1220	1320	1550	1240	1310	1370		1490	1420	1360
Total Suspended Solids *	7	8	19	71	23	38	135	236 J	178	27	18		13	62	13
Sulfate	840	490 J	780 J	850	800	800	900	800	810	800	900		900	800	800
pH (lab) *	7.1	7.0	6.9	7.0	6.8	6.8	7.0	7.0	7.0	6.8	6.8		7.1	7.0	7.0
TRACE INORGANIC COMPOUNDS (mg/l)															
Arsenic	0.071	0.034	0.099	0.065	0.180	0.169	0.132	0.104	<0.005	0.022	0.022		0.024	<0.005	<0.04
Copper	<0.050	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA	NA	NA
Zinc	0.977	0.454 B	0.634 B	0.473 B	1.038	0.932	0.553	0.260 B	0.513 B	0.551	0.606		0.225	0.359	0.349

Notes:
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Table 1
Groundwater Seep 1 Analytical Data
Du Pont, East Chicago

Lab ID:	148385		148709		148710		149109										152268		152811			153959	
Date of Sample:	9/5/91		9/12/91		9/12/91		9/19/91		9/26/91	10/3/91	10/10/91	10/17/91	10/24/91	10/31/91		11/7/91		11/14/91	11/21/91		11/28/91
Notes:									No Data	No Data	No Data	No Data	No Data					No Data			No Data
AVERAGE FLOW RATE (gpm)	0.48		0.56				0.05		0	0	0	0	0	0.78		0.29		0	0.24		0
WATER QUALITY PARAMETERS (mg/l)																					
BOD-Five Day	NA		NA		NA		NA							NA		NA			NA		
COD	3	J	7	J	<3		13	J						33	B	59			49		
Chloride	78		24		24		28							18		20			24		
Fats, Oils & Grease	NA		NA		NA		NA							NA		NA			NA		
Fluoride	0.9	J	0.5	J	0.6	J	1.0							0.9		0.8			0.8		
Nitrogen, Ammonia	1.06		0.79		0.68		0.46							0.4		0.5			0.54		
Nitrogen, Nitrate	0.31	J	0.22		0.19		0.42							0.35		1.35	J		0.28	J	
Nitrogen, Nitrite	<0.01		<0.01		<0.01		<0.01							<0.01		0.01			<0.01		
Total Dissolved Solids	1340		1140		1310		1200							1260		3090			1200		
Total Suspended Solids *	8		3		9		<1							10		475			17		
Sulfate	900		800		900		800							800		800			800		
pH (lab) *	7.0		6.8		6.9		7.5							7.1		7.1			6.8		
TRACE INORGANIC COMPOUNDS (mg/l)																					
Arsenic	0.096		1.69	J	1.39	J	1.32	J						0.100		0.052	J		0.116	J	
Copper	NA		NA		NA		NA							NA		NA			NA		
Zinc	0.565		0.562		0.785		0.060	B						0.977		0.377			0.735		

Notes:
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NA denotes not analyzed.
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Table 1
Groundwater Seep 1 Analytical Data
Du Pont, East Chicago

Lab ID:	154693		155139	155515		12/26/91	1/2/92	1/9/92	1/15/92	1/22/92	1/29/92	2/6/92	2/13/92	2/20/92	2/26/92	3/4/92
Date of Sample:	12/5/91		12/12/91	12/18/91												
Notes:						No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data
AVERAGE FLOW RATE (gpm)	0.24		0.68	0.32		0	0	0	0	0	0	0	0	0	0	0
WATER QUALITY PARAMETERS (mg/l)																
BOD-Five Day	NA		NA	NA												
COD	170		49	14												
Chloride	24		14	18												
Fats, Oils & Grease	NA		NA	NA												
Fluoride	0.8		0.9	1.1												
Nitrogen, Ammonia	0.08		0.46	0.92												
Nitrogen, Nitrate	0.80		0.64	0.20												
Nitrogen, Nitrite	<0.01		<0.01	<0.01												
Total Dissolved Solids	1170		1020	1220												
Total Suspended Solids *	129		9	146	J											
Sulfate	700	J	900	800												
pH (lab) *	6.9		6.8	7.0												
TRACE INORGANIC COMPOUNDS (mg/l)																
Arsenic	0.102		0.060	0.045												
Copper	NA		NA	NA												
Zinc	0.898	J	0.840	0.355												

Notes:
*Sample fraction not filtered.
NA denotes not analyzed.
No value indicates no sample.
J indicates estimate value.
B indicates blank contaminated
UJ indicates estimated, value probably low.
< indicates less then listed detectiion limit.

Table 1
Groundwater Seep 1 Analytical Data
Du Pont, East Chicago

Lab ID:	160376		160875					163139								
Date of Sample:	3/12/92		3/19/92		3/25/92	4/2/92	4/9/92	4/15/92	4/23/92	4/30/92	5/7/92	5/14/92	5/21/92	5/28/92	Max	Average
Notes:					No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data		
AVERAGE FLOW RATE (gpm)	0.15		0.07		0	0	0	0.35	0	0	0	0	0	0	1.57	0.30
WATER QUALITY PARAMETERS (mg/l)																
BOD-Five Day	NA		NA					NA							5	3
COD	57	B	8	B				26	B						170	32
Chloride	14		14	J				10							78	27
Fats, Oils & Grease	NA		NA					NA							3	1
Fluoride	0.98		0.96					0.32							2.8	0.9
Nitrogen, Ammonia	0.87		0.45					0.37							2.56	0.60
Nitrogen, Nitrate	0.32	J	1.03	J				1.47							3.46	0.63
Nitrogen, Nitrite	<0.01		<0.01					0.01							0.6	0.2
Total Dissolved Solids	1100		1130					864							3090	1291
Total Suspended Solids *	3	B	<1					6	B						475	46
Sulfate	779		725					637							1120	795
pH (lab) *	6.9		6.9					6.8							7.5	7.0
TRACE INORGANIC COMPOUNDS (mg/l)																
Arsenic	0.073	J	0.032	J				0.0238							1.69	0.18
Copper	NA		NA					NA							0.005	0.005
Zinc	1.26		0.764					4.66	J						4.66	0.72

Notes:
*Sample fraction not filtered.
NA denotes not analyzed.
No value indicates no sample.
J indicates estimate value.
B indicates blank contaminated
UJ indicates estimated, value probably low.
< indicates less then listed detectiion limit.

Table 2
Groundwater Seep 2 Analytical Data
Du Pont, East Chicago

Lab ID:															
Date of Sample:	7/2/91	7/11/91	7/18/91	7/25/91	8/1/91	8/8/91	8/15/91	8/22/91	8/29/91	9/5/91	9/12/91	9/19/91	9/26/91	10/3/91	10/10/91	10/17/91
Notes:	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data
AVERAGE FLOW RATE (mg/l)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
WATER QUALITY PARAMETERS (mg/l)																
BOD-Five Day																
COD																
Chloride																
Fats, Oils & Grease (FOG) *																
Fluoride																
Nitrogen, Ammonia																
Nitrogen, Nitrate																
Nitrogen, Nitrite																
Total Dissolved Solids																
Total Suspended Solids *																
Sulfate																
pH (lab) *																
TRACE INORGANIC COMPOUNDS (mg/l)																
Arsenic																
Cadmium																
Chromium																
Copper																
Lead																
Mercury																
Zinc																

Notes:
*Sample fraction not filtered.
NA denotes not analyzed.
No value indicates no sample
J indicates estimated value.
B indicates blank contaminated

Table 2
Groundwater Seep 2 Analytical Data
Du Pont, East Chicago

Lab ID:		152265	152812	153437	153960	154410	154694	155140	155516	155756	155913	156346
Date of Sample:	10/24/91	10/31/91	11/7/91	11/14/91	11/21/91	11/28/91	12/5/91	12/12/91	12/18/91	12/26/91	1/2/92	1/9/92
Notes:	No Data											
AVERAGE FLOW RATE (mg/l)	0	8.8	9.5	4.72	17.62	10.22	12.9	16.83	12.0	9.0	6.92	8.24
WATER QUALITY PARAMETERS (mg/l)												
BOD-Five Day		2	<1	NA	1	<1	1	1	<1 J	5 J	5 J	<1
COD		29 B	49	65	36	26	96	39	11	61	10 B	44 B
Chloride		420	520	400	326	360	340	240	250	48	230	254 J
Fats, Oils & Grease (FOG) *		<1 J	2	1	<1	<1	<1	1	<1 J	<1 J	2 B	<1
Fluoride		2.9	3.8	3.6	3.7	4.9	2.2	1.9	1.9	2.5	1.5	1.5
Nitrogen, Ammonia		6.6	10.3	10.6	9.8	9.4	1.49	7.58	5.2	6.2	6.9	7.4
Nitrogen, Nitrate		38.2	37.3 J	38.2 J	28.8 J	20.6	14.7	14.7	11.5	13.3	11.2	10.1
Nitrogen, Nitrite		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Total Dissolved Solids		4040	4460	4450	3980	3580	3050	2720	2840	2760 J	2870 J	3109
Total Suspended Solids *		9	6	5	5	1	3	<1	4 J	4	1 J	4
Sulfate		2800	3200	3200	2900	250	2000 J	1900	1800	1800	1900	1900
pH (lab) *		5.9	5.9	5.7	5.6	5.8	5.6	5.7	5.6	5.9	6.1	5.7
TRACE INORGANIC COMPOUNDS (mg/l)												
Arsenic		<0.0050	<0.0050 J	<0.0050 J	<0.0050 J	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Cadmium												
Chromium												
Copper		<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.050
Lead												
Mercury												
Zinc		26.9	21.0	23.5	16.5	22.6	18.6 J	14.9	13.4	15.8	17.9	17.0

Notes:
*Sample fraction not filtered
NA denotes not analyzed.
No value indicates no sample.
J indicates estimated value.
B indicates blank contaminated

Table 2
Groundwater Seep 2 Analytical Data
Du Pont, East Chicago

Lab ID:	156681	157045	157408	158025	158494	158974	159332	159873	160377	160876	161355	161920
Date of Sample:	1/15/92	1/22/92	1/29/92	2/6/92	2/13/92	2/20/92	2/26/92	3/4/92	3/12/92	3/19/92	3/25/92	4/2/92
Notes:												
AVERAGE FLOW RATE (mg/l)	10.97	3.95	5.37	6.49	4.10	14.65	12.05	10.30	15.08	11.87	11.92	10.08
WATER QUALITY PARAMETERS (mg/l)												
BOD-Five Day	<1	2	1	<1	<1	<1	2	2	<2	<2	<2	1
COD	218	22 B	40 B	37 B	70 B	17 B	<10	17 B	14 B	1 B	49 B	62
Chloride	254	300	299	290	350	370	342	290	290	240 J	216	210
Fats, Oils & Grease (FOG) *	2	1 J	<2	<1	2 J	<1	<1	<1	<1	4 B	14	<1
Fluoride	4.5 J	4.4 J	3.7	3.12 J	3.8	3.9 J	3.2 J	3.7	2.22	2.23	3.25	1.96
Nitrogen, Ammonia	8.60	7.45	9.68	10.9	13.3	10.0	12.2	12.0	8.8	5.8	6.1	11.41
Nitrogen, Nitrate	9.80	9.47	8.37	7.92	9.40 J	7.57 J	7.54 J	8.07 J	7.06 J	6.6 J	8.2	5.44
Nitrogen, Nitrite	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Total Dissolved Solids	3094	3400	3400	3370	3500	3690	3460	3150 J	1290	2730	2683	2997
Total Suspended Solids *	2	13	<1	9	<1	10 B	1	4 J	<1	5	11	11
Sulfate	2100	2900 J	2200 J	2000	2900	2400 J	2100 J	2000	1690	1730	1680	1530
pH (lab) *	5.6	5.9	5.8	5.8	5.8	6.7	5.9	5.9	6.0	5.9	6.0	5.9
TRACE INORGANIC COMPOUNDS (mg/l)												
Arsenic	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0078 J	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Cadmium												
Chromium												
Copper	<0.050	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.050	<0.050	<0.010	<0.010
Lead												
Mercury												
Zinc	18.9	17.3	18.3 J	19.4	21.2	14.6 J	15.5 J	13.8	13.1	12.2	11.8	13.4

Notes:
*Sample fraction not filtered.
NA denotes not analyzed.
No value indicates no sample.
J indicates estimated value.
B indicates blank contaminated

Table 2
Groundwater Seep 2 Analytical Data
Du Pont, East Chicago

Lab ID:	162541	163140	163677	163678	164312	164740	165096	165661		Average
Date of Sample:	4/9/92	4/15/92	4/23/92a	4/23/92b	4/30/92	5/7/92	5/14/92	5/21/92	5/28/92	
Notes:									No Data	
AVERAGE FLOW RATE (mg/l)	7.32	8.22	9.58		5.1	5.65	4.05	1.64		9.17
WATER QUALITY PARAMETERS (mg/l)										
BOD-Five Day	B <1	<1	5 B	7 B	<1	NA	NA	NA		2.69
COD	B 17 B	20 B	18 B	19 B	16 B	NA	NA	NA		40.85
Chloride	210	226	216	230	232	NA	NA	NA		284.04
Fats, Oils & Grease (FOG) *	<2	<5	<5	<5	<5	NA	NA	NA		3.22
Fluoride	0.99	1.02	0.98	0.98	1.01	NA	NA	NA		2.69
Nitrogen, Ammonia	12.5	5.5	17.2	17.8	20.0	NA	NA	NA		9.60
Nitrogen, Nitrate	6.24	7.1	6.37	5.84	1.87	NA	NA	NA		12.91
Nitrogen, Nitrite	<0.01	<0.01	<0.01	<0.01	<0.01	NA	NA	NA		
Total Dissolved Solids	2817	2540	2790	2760	2740 J	NA	NA	NA		3152.50
Total Suspended Solids *	5	11 B	7 J	4 J	<1	NA	NA	NA		5.87
Sulfate	1540	1570	1870	1520	1620	NA	NA	NA		2035.71
pH (lab) *	6.0	6.1	5.9	5.9	5.0	NA	NA	NA		5.84
TRACE INORGANIC COMPOUNDS (mg/l)										
Arsenic	<0.0050	<0.010	<0.0100	<0.0100	<0.0050	<0.0050	<0.0050	<0.0050		
Cadmium						0.048	0.043 J	0.038		0.04
Chromium						<0.040	<0.040	<0.040		
Copper	0.013 B	0.179	0.023 B	0.026 B	<0.010	NA	NA	NA		0.06
Lead						0.083 J	<0.080	<0.080		0.08
Mercury						<0.0002	<0.0002	<0.0002		
Zinc	12.9 J	12.3 J	12.9	13.1	14.7	NA	NA	NA		16.55

Notes:
*Sample fraction not filtered.
NA denotes not analyzed.
No value indicates no sample.
J indicates estimated value.
B indicates blank contaminated

Table 3
Groundwater Seep 3 Analytical Data
Du Pont, East Chicago

Lab ID:					146139		146985		147900	148386							
Date of Sample:	7/2/91	7/11/91	7/18/91	7/25/91	8/1/91	8/8/91	8/15/91	8/22/91	8/29/91	9/5/91	9/12/91	9/19/91	9/26/91	10/3/91	10/10/91	10/17/91	10/24/91
Notes:	No Data	No Data	No Data	No Data		No Data		No Data			No Data	No Data	No Data	No Data	No Data	No Data	No Data
AVERAGE FLOW RATE (gpm)	0	0	0	0	0.10	0	0.61	0	0.47	0.26	0	0	0	0	0	0	0
WATER QUALITY PARAMETERS (mg/l)																	
BOD-Five Day					3		4		6	4							
COD					10		20 J		13	23 J							
Chloride					24		26 B		34	68							
Fats, Oils & Grease					<1		2		<1	2							
Fluoride					1.9 J		1.0 J		0.6 J	1.0 J							
Nitrogen, Ammonia					2.7		4.0		3.61	4.6							
Nitrogen, Nitrate					0.72 B		0.31 B		0.26 B	0.50 J							
Nitrogen, Nitrite					<0.01		<0.01		<0.01	<0.01							
Total Dissolved Solids					2930		3530		2880	2900							
Total Suspended Solids *					63		69		429	46							
Sulfate					2100		2600		900	1770							
pH (lab) *					6.1		6.1		6.2	6.4							
TRACE INORGANIC COMPOUNDS (mg/l)																	
Arsenic					<0.0050		0.0100		<0.004	<0.0050							
Copper					0.124		<0.010		0.037	0.013							
Zinc					2.974		35.8		27.1	28.1							

Notes:
*Sample fraction not filtered.
NA denotes not analyzed.
No value indicates no sample.
J indicates estimated value.
B indicates blank contaminated.

Table 3
Groundwater Seep 3 Analytical Data
Du Pont, East Chicago

Lab ID:	152266	152813						155517									
Date of Sample:	10/31/91	11/7/91	11/14/91	11/21/91	11/28/91	12/5/91	12/12/91	12/18/91	12/26/91	1/2/92	1/9/92	1/15/92	1/22/92	1/29/92	2/6/92	2/13/92	2/20/92
Notes:			No Data	No Data	No Data	No Data	No Data		No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data
AVERAGE FLOW RATE (gpm)	0.53	0.22	0	0	0	0	0	0.33	0	0	0	0	0	0	0	0	0
WATER QUALITY PARAMETERS (mg/l)																	
BOD-Five Day	2	7						6 J									
COD	26 B	65						14									
Chloride	22	32						28									
Fats, Oils & Grease	1 J	7						<1 J									
Fluoride	2.1	3.7						3.1									
Nitrogen, Ammonia	2.0	21.0						17.2									
Nitrogen, Nitrate	0.53	0.60 J						0.20									
Nitrogen, Nitrite	<0.01	0.02						<0.01									
Total Dissolved Solids	2400	1190						2890									
Total Suspended Solids *	49	100						214 J									
Sulfate	800	2300						2100									
pH (lab) *	6.6	6.5						6.2									
TRACE INORGANIC COMPOUNDS (mg/l)																	
Arsenic	<0.0050	0.0055 J						<0.0050									
Copper	<0.010	<0.010						<0.010									
Zinc	21.1	13.4						16.0									

Notes:
*Sample fraction not filtered
NA denotes not analyzed.
No value indicates no sample.
J indicates estimated value.
B indicates blank contaminated.

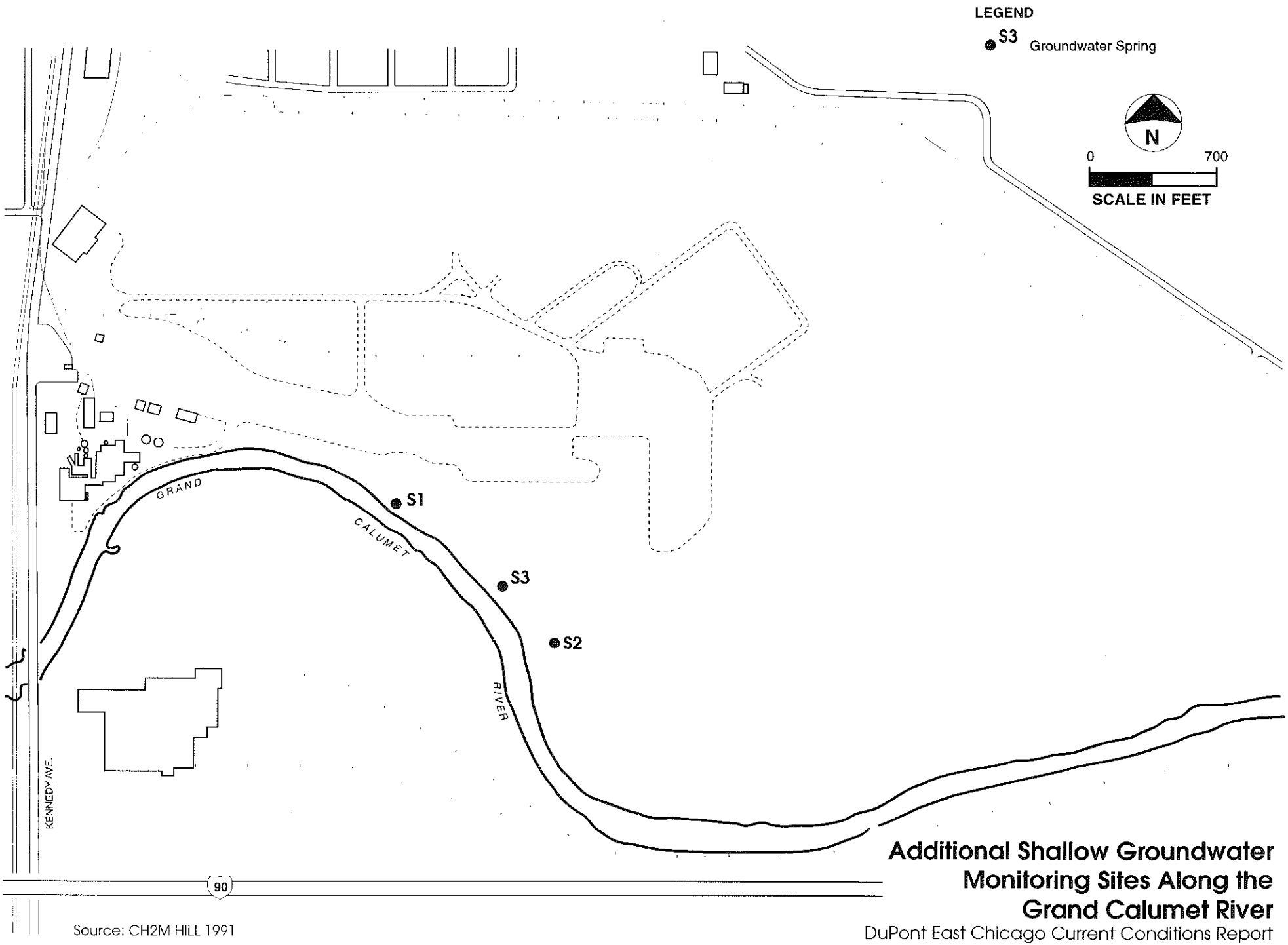
Table 3
Groundwater Seep 3 Analytical Data
Du Pont, East Chicago

Lab ID:															
Date of Sample:	2/26/92	3/4/92	3/12/92	3/19/92	3/25/92	4/2/92	4/9/92	4/15/92	4/23/92	4/30/92	5/7/92	5/14/92	5/21/92	5/28/92	
Notes:	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	Average
AVERAGE FLOW RATE (gpm)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.36
WATER QUALITY PARAMETERS (mg/l)															
BOD-Five Day															4.57
COD															24.4
Chloride															33.4
Fats, Oils & Grease															3.00
Fluoride															1.91
Nitrogen, Ammonia															7.87
Nitrogen, Nitrate															0.45
Nitrogen, Nitrite															0.02
Total Dissolved Solids															2674
Total Suspended Solids *															138.6
Sulfate															1796
pH (lab) *															6.30
TRACE INORGANIC COMPOUNDS (mg/l)															
Arsenic															0.01
Copper															0.06
Zinc															20.6

Notes:
*Sample fraction not filtered.
NA denotes not analyzed.
No value indicates no sample.
J indicates estimated value.
B indicates blank contaminated.

TABLE 4
Comparison of Spring and Groundwater Quality

	Mean Constituent Concentrations (mg/L) by Location					
Constituent	**S1**	**MW-3**	**S2**	**MW-5**	**S3**	**MW-4**
Chloride	27	37.5	267	434	33	48
Fluoride	0.9	1.4	2.6	12	1.7	1.8
Sulfate	795	1030	1,935	5,715	1,773	1,900
Zinc	0.72	0.07	15.4	10.6	18.2	0.72
Arsenic	0.18	1.15	<0.01	0.24	0.01	0.085
pH	7.0	6.8	5.8	6.4	6.3	6.82



Source: CH2M HILL 1991

Additional Shallow Groundwater Monitoring Sites Along the Grand Calumet River

DuPont East Chicago Current Conditions Report

CH2MHILL

E142837.EC.CC Seeps Identified Along Gr Cal 10-16-97mms/tll

One-Time Monitoring Report for the Groundwater Seep at the Du Pont East Chicago Plant East Chicago, Indiana

Prepared by CH2M HILL
on behalf of
E.I. Du Pont de Nemours & Company

April 11, 1991

CH1120/056.51

Missing Information

Note:

The attached One-Time Monitoring Report (April 1991) is lacking the laboratory data sheets for the inorganic analyses. It is believed that they were in the original report and have been misplaced from the file.

INTRODUCTION

In response to U.S. EPA's Section 308 Information Request dated February 13, 1991, Du Pont is submitting this report characterizing the quality of the groundwater seep at Du Pont's East Chicago Plant. This report contains the results of the "one-time monitoring program" specified in U.S. EPA's request.

SAMPLE COLLECTION AND ANALYSIS

As a direct result of actions taken by Du Pont to eliminate the seep, discharge was not occurring in mid- and late February (O.J. Meyer, Du Pont). U.S. EPA's request received on February 15, 1991, requesting Du Pont to implement a "one-time monitoring program" at the seep could not be honored. The seep reappeared on March 4, 1991 (Gene Hartstein, Du Pont). Upon discovery Du Pont asked CH2M HILL to implement the "one-time monitoring program." These sampling activities were performed on March 6, 1991. At the time of sampling, the flow rate of the seep was measured at 0.33 gallons per minute (gpm).

The "one-time monitoring program" consisted of collecting and analyzing two grab samples from the seep "for the Priority Pollutants (40 CFR 423, Appendix A, Numbers 001-013) using U.S. EPA methods 1624 and 1625, and for Priority Pollutants (40 CFR 423, Appendix A, Numbers 114-128) using U.S. EPA method 40 CFR 136,

Appendix C." In addition, an attempt was made "to identify and quantify the ten (10) largest, non-Priority Pollutant peaks on the reconstructed gas chromatogram (ion plots), excluding unsubstituted aliphatic hydrocarbons and any peaks less than 10 times higher than the adjacent background noise."

Because the U.S. EPA's request called for the analysis of total priority pollutant metal concentrations, unfiltered samples were collected and analyzed. To determine how much of the resulting concentrations could be attributed to the resuspension of fines and debris due to mud flat erosion or turbidity induced during sampling, portions of the samples were filtered and analyzed for the same inorganic constituents as the unfiltered samples. The filtered concentrations better represent the quality of seep discharge as it reaches the land surface.

The samples (SP-1 and SP-2) were preserved as necessary and shipped via overnight courier to CH2M HILL's analytical laboratory in Montgomery, Alabama. Selected analyses were subcontracted to Analytical Technologies, Inc. in Fort Collins, Colorado (volatiles and semivolatiles) and Reservoirs Environmental Services, Inc. in Denver, Colorado (asbestos).

To allow data users to compare these results with groundwater quality data generated during the Phase II Groundwater Assessment, an additional sample (SP-3) was collected and sent to National Environmental Testing, Inc. (NET) for analysis. Though not

specifically requested, these data are included for U.S. EPA review. This sample was preserved and shipped in a consistent manner.

ANALYTICAL RESULTS AND INTERPRETATION

Table 1 summarizes the analytical results of the "one-time monitoring program" for the seep. All laboratory data sheets for the field samples collected and analyzed are provided in Attachment 1. Attachment 2 contains a data validation summary of quality assurance/quality control (QA/QC) information associated with the analysis of the samples.

No volatile organics, semivolatile organics, pesticides, PCBs, asbestos, BOD-Five Day, cyanide, antimony, beryllium, mercury, silver, or thallium were detected in the grab samples. Only one peak was observed in the chromatograms when searching for non-priority pollutants at concentrations above background noise. The peak was a semivolatile organic constituent that could not be identified by the library search.

On March 6, 1991, seep water contained low COD and low levels of the nitrogen constituent in ammonia. Low to trace fats, oil and grease were detected. Trace inorganic priority pollutants detected in both of the filtered samples at concentrations above the method detection limits were:

- o Arsenic (at 0.043 to 0.046 mg/l);
- o Total Chromium (at 0.0045 mg/l);
- o Copper (estimated at 0.0115 mg/l); and
- o Zinc (at 1.10 to 1.13 mg/l).

None of the other priority pollutant inorganics (antimony, beryllium, cadmium, lead, mercury, nickel, selenium, silver, or thallium) were detected in the filtered samples.

The total dissolved solids concentrations (1090 and 1100 mg/l) of the samples are not comprised of priority pollutants. The seep sample is collected off the mud flat where sanitary wastes from the combined sewer system outfall are discharged during periods of overflow. Evidence of sanitary wastes and debris can be seen along the bank at the seep site. Given these conditions, this waste may be contributing to the concentrations observed. This contribution cannot be distinguished from that provided by the groundwater.

CONCLUSIONS

Based on the existing data and analytical results of the "one-time monitoring program," many of the constituents analyzed in the grab samples should be eliminated from future monitoring programs. These constituents include the following: volatile organics, semivolatile organics, pesticides, PCBs, asbestos, BOD-Five Day, cyanide, antimony, beryllium, chromium, copper, lead, mercury,

nickel, selenium, silver, and thallium.

Total dissolved solids observed are comprised primarily of cations and anions that are typically present in groundwater. Seep water quality is similar to that detected at monitoring wells installed near the seep (MW-3 and MW-15) as displayed in Figure 1.

TABLE 1

CONSTITUENTS DETECTED IN SEEP WATER
ONE-TIME MONITORING PROGRAM
MARCH 6, 1991

Sample ID:	SP-1	SP-1	SP-2	SP-2
Lab:	CH2M HILL	CH2M HILL	CH2M HILL	CH2M HILL
Lab ID:	17988001/ 17989001	S17989001	17988002/ 17988003/ 17989002	S17989002
Filtered (Yes/No):	No	Yes	No	Yes
WATER QUALITY PARAMETERS (mg/l)				
COD	27	NA	47	NA
Chloride	47.9	NA	46.5	NA
Fats, Oils & Grease (FOG)	4.0	NA	1.0	NA
Fluoride	0.33	NA	0.33	NA
Nitrate/Nitrite		NA		NA
Nitrogen,Ammonia	0.47	NA	0.20	NA
Solids, Dissolved	1100	NA	1090	NA
Solids, Suspended	18	NA	45	NA
Sulfate	584	NA	540	NA
pH (field)	6	NA	6	NA
TRACE INORGANIC COMPOUNDS (ug/l)				
Arsenic	0.0663 J	0.0455	0.137 J	0.0429
Cadmium			0.0072	
Chromium, Total	0.0099 J		0.0296	0.0045 J
Copper	0.0076 J		0.017 J	0.0115 J
Lead	0.0212 J		0.0659 J	
Nickel			0.0105 J	
Selenium	0.00099 J			
Zinc	1.35	1.13	1.94	1.10

Notes:

J qualifier denotes estimated value.
NA denotes not analyzed.
No value denotes not detected.

Comments:

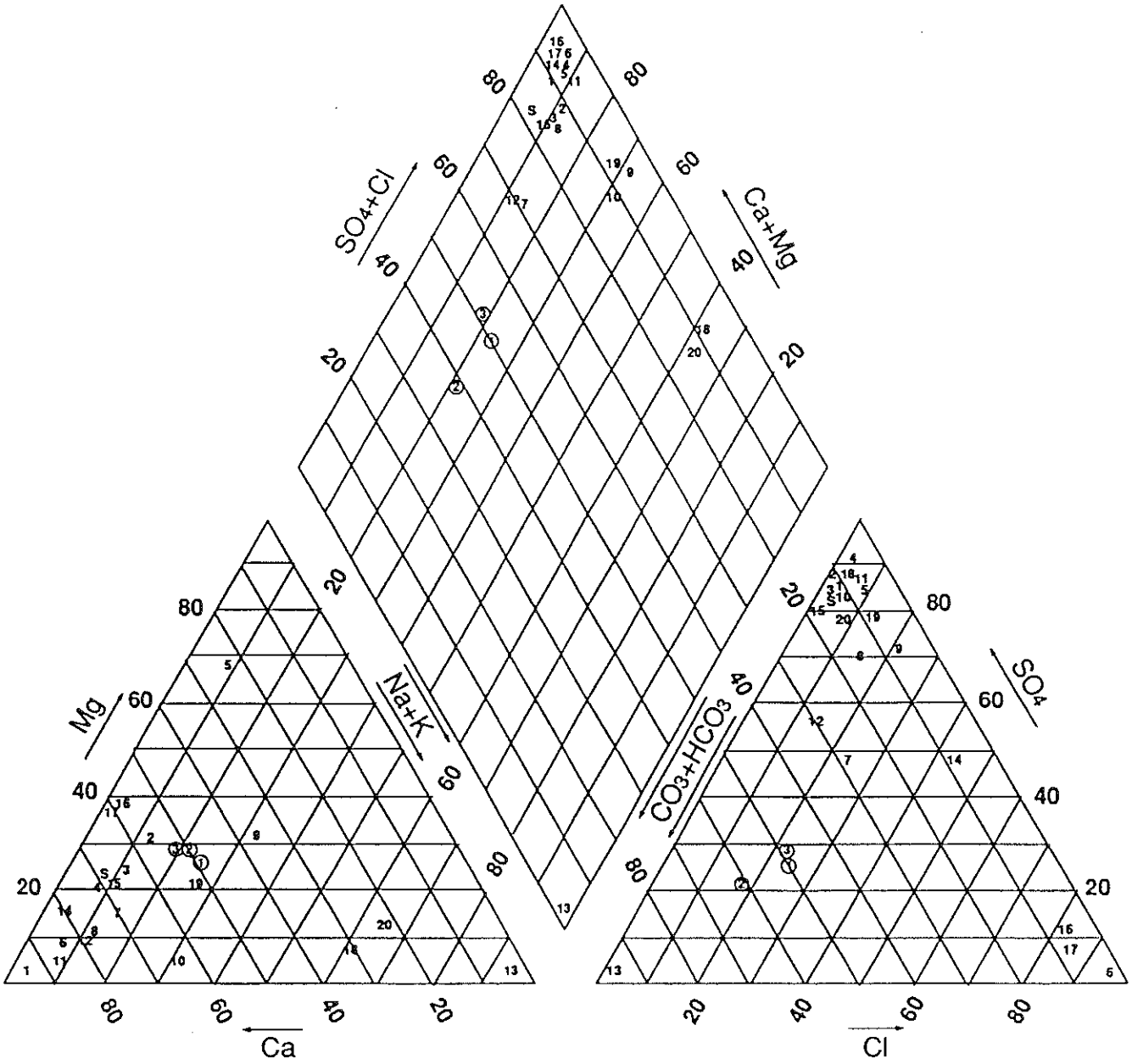
No volatile organic compounds detected.
No semivolatile organic (acid and base/neutral) compounds detected.
No pesticide/PCB compounds detetected.
No asbestos detected.
No BOD-Five Day detected.
No cyanide detected.
No antimony, beryllium, mercury, silver, or thallium detected.
In addition, no lead, nickel, or selenium detected in filtered samples.

LEGEND

MW-5 SAMPLE SEPT.1990

② SW-2 SAMPLE SEPT.1990

S SEEP SAMPLE MAY1990



CATIONS
(meq/l, expressed as %)

ANIONS
(meq/l, expressed as %)

PIPER DIAGRAM

GROUNDWATER, SURFACE WATER, & SEEP ION BALANCE DU PONT EAST CHICAGO PLANT

FIGURE 1

Attachment 1
Laboratory Data Sheets
One-Time Monitoring Program

FORM 1
ANALYSIS DATA SHEET
GENERAL CHEMISTRY LEVEL 2 & 3

Client Sample Number: SP-1

Lab Name: CH2M HILL LABORATORIES

Batch Number(s): 17989

Matrix (soil/water): WATER

Date Collected: 03/06/91

% Solids (if soil): N/A

Date Received: 03/07/91

Lab Sample ID: 17989001

METHOD	ANALYTE	CONCENTRATION	CONC. UNITS	DATE ANALYZED
EPA405.1	BOD 5 DAY	<10	mg/L	03/07/91
EPA325.1	CHLORIDE	47.9	mg/L	03/19/91
EPA410.4	COD	27	mg/L	03/20/91
EPA340.2	FLUORIDE	0.33	mg/L	03/14/91
EPA353.2	NO3/NO2	<0.05	mg/L	03/07/91
EPA350.2	AMMONIA-N	0.47	mg/L	03/12/91
EPA413.1	OIL&GREASE	4.0	mg/L	03/20/91
EPA375.4	SULFATE	~~29.2~~ 584 * SEM 4/11/91	mg/L	03/19/91
EPA160.1	TDS	1100	mg/L	03/11/91
EPA160.2	TSS	18	mg/L	03/08/91

SEM 4/11/91 *Comments: Error in reporting per phone conversation w/ Mary Wisdom of CH2M HILL LABORATORIES on 4/11/91.

FORM 1
ANALYSIS DATA SHEET
GENERAL CHEMISTRY LEVEL 2 & 3

Client Sample Number

SP-2

Lab Name: CH2M HILL LABORATORIES

Batch Number(s): 17989

Matrix (soil/water): WATER

Date Collected: 03/06/91

% Solids (if soil): N/A

Date Received: 03/07/91

Lab Sample ID: 17989002

METHOD	ANALYTE	CONCENTRATION	CONC. UNITS	DATE ANALYZED
EPA405.1	BOD 5 DAY	<10	mg/L	03/07/91
EPA325.1	CHLORIDE	46.5	mg/L	03/19/91
EPA410.4	COD	47	mg/L	03/20/91
EPA340.2	FLUORIDE	0.33	mg/L	03/14/91
EPA353.2	NO3/NO2	<0.05	mg/L	03/07/91
EPA350.2	AMMONIA-N	0.20	mg/L	03/12/91
EPA413.1	OIL&GREASE	1.0	mg/L	03/20/91
EPA375.4	SULFATE	~~27.0~~ 540* SEM 4/11/91	mg/L	03/19/91
EPA160.1	TDS	1090	mg/L	03/11/91
EPA160.2	TSS	45	mg/L	03/08/91

SEM 4/11/91 * Comments: Error in reporting per phone conversation w/ Mary Wisdom of CH2M HILL LABORATORIES on 4/11/91.

Attachment 2
Data Validation Summary
One-Time Monitoring Program

MEMORANDUM CH2M HILL

TO: Pixie Newman/CH2M HILL
John Fleissner/CH2M HILL

FROM: Dan MacGregor/CH2M HILL

DATE: April 10, 1991

SUBJECT: Data validation for Du Pont-East Chicago, Indiana seep samples.

PROJECT: CHI28770.B0.SP

INTRODUCTION

This memorandum presents the data validation discussion for analytical results for the "one-time monitoring program" samples collected on March 6, 1991 at the Du Pont plant in East Chicago, Indiana.

Duplicate seep samples were analyzed for the priority pollutant list compounds by CH2M HILL's Laboratory in Montgomery, Alabama. CH2M HILL subcontracted out the volatile and semivolatile analysis to Reservoirs Analytical Technologies Inc. in Fort Collins, Colorado, and the asbestos analysis to Environmental Services, Inc. in Denver, Colorado. Sampling and transporting of samples was performed under strict chain-of-custody procedures. QA/QC data included: chain of custody forms, holding time data, method blank data and results, sample duplicate results, instrument calibration data, ICP interference check sample data, post digestion spike data, matrix spike and matrix spike duplicate (MS/MSD) results, and laboratory control spike results.

VOLATILE AND SEMIVOLATILE ORGANIC ANALYSIS

The volatile organics (VOA) and semivolatile organics (SVOA) were analyzed by isotopic dilution methods. These methods call for stable isotopically labeled analogs of each compound to be added to the sample, acting as an internal standard and recovery. Due to these methods containing this internal quality control, QA/QC checks, other then holding time and blank data, are not required. No compound detections were found in either of these samples. The library compound search performed with these methods yielded only two detections, both with the SVOA analysis. These detections were not identifiable by the library search.

BLANKS: The laboratory blank and reagent blank quantitation sheets were inspected for possible contaminants. All blanks were free of compound concentrations at levels equal to or greater than their reporting limits.

HOLDING TIMES: These samples met the holding time requirements for organic analyses.

PESTICIDE AND PCB ANALYSIS

No pesticide or PCB detections were found. The data were validated as described below.

BLANKS: The laboratory blank quantitation sheets were inspected for possible contaminants. All blanks were free of compound concentrations at levels equal to or greater than their reporting limits.

QA/QC PARAMETERS: The following QA/QC parameters were validated and no deficiencies were noted: instrument initial and continuing calibration data, holding time data, matrix spike and matrix spike duplicate (MS/MSD) results, surrogate spike results, and DDT/endrin degradation data.

INORGANIC ANALYSIS

BLANKS: The laboratory blank quantitation sheets were inspected for possible contaminants. All blanks were free of compound concentrations at levels equal to or greater than their reporting limits.

QA/QC PARAMETERS: The following QA/QC parameters were validated and no deficiencies were noted: holding time data, instrument initial and continuing calibration, ICP interference check sample data, and laboratory control spike results. Spike sample recoveries were within control limits for all compounds except for arsenic, which had a high recovery, and selenium, which had a low recovery. Results for these compounds are qualified as estimated "J". Post digestion recoveries were within control limits for all compounds except selenium, which had a low recovery. No additional qualifiers were added to the selenium data due to it already being qualified as estimated. Duplicate analysis results were within control limit for all compounds except lead, this result will be qualified as estimated "J".

Inorganic results that are less than the reporting limit but greater than or equal to the instrument detection limit are qualified as estimated "J".

DUPLICATES

As a measure of precision, the duplicate seep sample results were assessed. Results for all analysis compared well.

CHAIN OF CUSTODY

The chain of custody forms were reviewed for accuracy and completeness. The necessary information was provided and was found to be accurate. All requested analyses were performed and the data packages were complete.

RESULTS

In validating the sample data, an error in the sulfate result was noted, this error was confirmed by the laboratory and corrected results were forwarded. With previously noted qualifiers, the results for all analysis were found to be acceptable and valid.

March Monthly Monitoring Report
for the Groundwater Seep at the
Du Pont East Chicago Plant
East Chicago, Indiana

Prepared by CH2M HILL
on behalf of
E.I. Du Pont de Nemours & Company

April 11, 1991

CH1120/056.51

INTRODUCTION

In response to U.S. EPA's Section 308 Information Request, Du Pont is submitting this monthly monitoring report characterizing the quality of the groundwater seep at Du Pont's East Chicago Plant. This report contains the results of the "monthly monitoring program" for March 1991 specified in U.S. EPA's request.

SAMPLE COLLECTION AND ANALYSIS

Samples of the groundwater seep were obtained March 15, 21, and 28, 1991. The flow rate of the seep varied between 0.26 and 0.52 gallons per minute (gpm) on March 15; between no flow and 0.03 gpm on March 21; and between 0.03 and 0.20 gpm on March 28.

The "monthly monitoring program" sampling activities typically consisted of obtaining an 8-hour composite sample of grab samples collected at 0-, 4-, and 8-hour intervals. Based on a conversation with Mr. Novak of U.S. EPA on March 20, 1991, the sampling program was modified to allow for filtering of samples prior to analysis. Filtering was implemented on March 21; however, sample fractions for fats, oil and grease and total suspended solids analyses were duplicated and the duplicates left unfiltered for analysis. On March 28, the sample fractions for fats, oil and grease, total suspended solids, and pH were collected but not filtered. All

other sample fractions were filtered. The March 28 protocol for filtering will be continued for the remainder of the "monthly monitoring program."

Also during that conversation, CH2M HILL and Du Pont came to believe that grab sampling instead of composite sampling was authorized. Clarification (indicating that only composite sampling was authorized) was received too late on March 21 to allow the sampling crew to collect a composite sample. Composite sampling was resumed on March 28.

After sample collection and preservation (as necessary), the sample is shipped via overnight courier to National Environmental Testing, Inc. (NET) analytical laboratory in Bartlett, Illinois. The sample is then analyzed for the following constituents specified in U.S. EPA's request: BOD-Five Day, COD, ammonia-N, nitrate and nitrite, sulfate, chloride, fluoride, oil and grease, total dissolved solids, total suspended solids, arsenic, copper, zinc, and pH. In addition, the seep flow rate is measured and recorded.

ANALYTICAL RESULTS AND INTERPRETATION

Table 1 summarizes the analytical results of the "monthly monitoring program" for the seep during the month of March. Attachment 1 provides laboratory data sheets for the seep samples

collected and analyzed during March for the "monthly monitoring program."

Attachment 2 contains a review of the quality assurance/quality control (QA/QC) associated with the analysis of the March seep samples.

Several of the constituents being monitored have concentrations periodically at or below method detection limits. This is true for BOD-Five Day, fat, oil and grease, and copper. If these conditions persist, these constituents should be dropped from the "monthly monitoring program."

CONCLUSIONS

The flow rate of the seep has varied from a very small rate, 0.52 gpm, to no flow. Although it was possible to collect samples during each of the sampling events, it is conceivable that weekly sampling events may be missed if the seep is not flowing during the scheduled sampling event.

The seep's flow rate varies significantly over time. In some instances, this variability has limited the ability to collect an 8-hour composite sample. Variations in seep flow rate are considerably greater than variations in seep water quality. Given

these conditons, it is recommended that the sampling program be switched from collection of an 8-hour composite to collection of a grab sample.

TABLE 1

CONSTITUENTS DETECTED IN SEEP WATER
MARCH MONTHLY MONITORING PROGRAM
MARCH 1991

Sample ID:	DEC-SP-03-01	DEC-SP-03-02	DEC-SP-03-03
Lab:	NET	NET	NET
Lab ID:	128851	129198/ (129354)	129745
Date:	3/15/91	3/21/91	3/28/91
Filtered (Yes/No):	No	Yes	Yes
AVERAGE FLOW RATE (gpm)	0.41	0.01	0.10
WATER QUALITY PARAMETERS (mg/l)			
BOD-Five Day			2 J
COD	72 J	36 J	7 J
Chloride	40	26	32
Fats, Oils & Grease (FOG)		/(1*)	1*
Fluoride	1.1	0.9	0.9
Nitrogen, Ammonia	0.37	0.42	0.42
Nitrogen, Nitrate	NA	0.04	0.07
Nitrogen, Nitrite	NA		
Nitrogen, Nitrate+Nitrite	1.37	NA	NA
Total Dissolved Solids	1020	934	1200
Total Suspended Solids	12	2 J/(54*)	32* J
Sulfate	590	570	733
pH (lab)	7.3 J	7.3	7.5*
TRACE INORGANIC COMPOUNDS (mg/l)			
Arsenic	0.0880	0.0970	0.0290
Copper			
Zinc	0.956 J	0.502 J	0.477 J

Notes:

*Sample fraction not filtered.
NA denotes not analyzed.
No value denotes not detected.

NATIONAL ENVIRONMENTAL TESTING, INC.

NET Midwest, Inc.
Bartlett Division
850 West Bartlett Road
Bartlett, IL 60103

Tel: (708) 289-3100
Fax: (708) 289-5445

ANALYTICAL REPORT

Ms. Pixie Newman
CH2M HILL
1890 Maple
Suite 200
Evanston, IL 60201

04/11/1991

Sample No.: 129198

Job No.: 91.0085

Sample Description: DEC-SP-2; Grab Liquid
DuPont East Chicago

Date Taken: 03/21/1991
Time Taken: 10:44

Date Received: 03/22/1991
Time Received: 09:55

Zinc	0.502	mg/L

Kelly Jones

Kelly Jones
Project Manager

NATIONAL ENVIRONMENTAL TESTING, INC.

NET Midwest, Inc.
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Bartlett, IL 60103

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ANALYTICAL REPORT

Ms. Pixie Newman
CH2M HILL
1890 Maple
Suite 200
Evanston, IL 60201

04/08/1991

Sample No.: 129198

Sample Description: DEC-SP-2; Grab Liquid
DuPont East Chicago

Date Taken: 03/21/1991
Time Taken: 10:44

Date Received: 03/22/1991
Time Received: 09:55

BOD, Five Day	<1.	mg/L
Chloride	26.	mg/L
COD, Total	36.	mg/L
Fluoride	0.9	mg/L
N-Ammonia	0.42	mg/L
N-Nitrate	0.04	mg/L
N-Nitrite	<0.01	mg/L
Oil & Grease	<1.	mg/L
pH	7.3	units
Solids, Total Dissolved	934.	mg/L
Solids, Total Suspended	2.	mg/L
Sulfate	570.	mg/L
Arsenic GFAA	0.0970	mg/L
Copper	0.005	mg/L

Kelly Jones

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Project Manager

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ANALYTICAL REPORT

Mr. Dan MacGregor
CH2M HILL
310 West Wisconsin Ave
Suite 700 P.O. Box 2090
Milwaukee WI 53201

04-01-91

Sample No.: 128851

Sample Description DEC-SP-01; Composite
Project No. CHI28770.BO.SP; DuPont East Chicago(SEEP)

Date Taken: 03-15-91

Date Received: 03-18-91 0800

*BOD - Five Day	<1.	mg/L
Chloride	40.	mg/L
COD	72.	mg/L
Fluoride	1.1	mg/L
Fats, Oils & Grease (FOG)	<1.	mg/L
Nitrogen, Ammonia	0.37	mg/L
Nitrogen, Nitrate+Nitrite	1.37	mg/L
*pH	7.3	units
*Solids, Dissolved	1020.	mg/L
Solids, Suspended	12.	mg/L
Sulfate	590.	mg/L
Arsenic	0.0880	mg/L
Copper	<0.01	mg/L
Zinc	0.956	mg/L

*Received past holding time.

Kelly Jones

Kelly Jones
Project Manager

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ANALYTICAL REPORT

Ms. Pixie Newman
CH2M HILL
1890 Maple
Suite 200
Evanston, IL 60201

04/11/1991

Sample No.: 129198

Job No.: 91.0085

Sample Description: DEC-SP-2; Grab Liquid
DuPont East Chicago

Date Taken: 03/21/1991
Time Taken: 10:44

Date Received: 03/22/1991
Time Received: 09:55

BOD, Five Day	<1.	mg/L
Chloride	26.	mg/L
COD, Total	36.	mg/L
Fluoride	0.9	mg/L
N-Ammonia	0.42	mg/L
N-Nitrate	0.04	mg/L
N-Nitrite	<0.01	mg/L
Oil & Grease	<1.	mg/L
pH	7.3	units
Solids, Total Dissolved	934.	mg/L
Solids, Total Suspended	2.	mg/L
Sulfate	570.	mg/L
Arsenic	0.0970	mg/L
Copper	0.005	mg/L

Kelly Jones

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ANALYTICAL REPORT

Ms. Pixie Newman
CH2M HILL
1890 Maple
Suite 200
Evanston, IL 60201

04/08/1991

Sample No.: 129198

Sample Description: DEC-SP-2; Grab Liquid
DuPont East Chicago

Date Taken: 03/21/1991
Time Taken: 10:44

Date Received: 03/22/1991
Time Received: 09:55

Zinc	0.502	mg/L

Kelly Jones
Project Manager

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ANALYTICAL REPORT

Ms. Pixie Newman
CH2M HILL
1890 Maple
Suite 200
Evanston, IL 60201

04/03/1991

Sample No.: 129354

Sample Description: DEC-SP-2; Grab Liquid
DuPont East Chicago

Date Taken: 03/21/1991
Time Taken: 10:44

Date Received: 03/22/1991
Time Received: 09:55

Oil & Grease	1.	mg/L
Solids, Total Suspended	54.	mg/L

Kelly Jones

Kelly Jones
Project Manager

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ANALYTICAL REPORT

Ms. Pixie Newman
CH2M HILL
1890 Maple Avenue
Suite 200
Evanston, IL 60201

04/10/1991

Sample No.: 129745

91.0236

Sample Description: DEC-SP-03-03
CHI28770.B0.SP; DuPont

Date Taken: 03/28/1991
Time Taken:

Date Received: ~~04/01/1991~~ 3/29/91 dab
Time Received: 09:18

BOD, Five Day	2.	mg/L
Chloride	32.	mg/L
COD, Total	7.	mg/L
Fluoride	0.9	mg/L
N-Ammonia	0.42	mg/L
N-Nitrate	0.07	mg/L
N-Nitrite	<0.01	mg/L
Oil & Grease	1.	mg/L
pH	7.5	units
Solids, Total Dissolved	1200.	mg/L
Solids, Total Suspended	32.	mg/L
Sulfate	733.	mg/L
Arsenic	0.0290	mg/L
Copper	<0.050	mg/L
Zinc	0.477	mg/L

Kelly Jones

Kelly Jones
Project Manager

MEMORANDUM CH2M HILL

TO: Pixie Newman/CH2M HILL
John Fleissner/CH2M HILL

FROM: Dan MacGregor/CH2M HILL

DATE: April 11, 1991

SUBJECT: Data validation for Du Pont-East Chicago, Indiana seep samples.

PROJECT: CHI28770.B0.SP

INTRODUCTION

This memorandum presents the data validation discussion for the inorganic analytical results for samples collected on March 15, 21, and 28, 1991 at the Du Pont plant in East Chicago, Indiana. This seep sampling was done in compliance with the U.S. EPA requested "monthly monitoring program."

These seep samples were analyzed for major ions and selected metals by NET laboratories in Bartlett, Illinois. Sampling and transporting of these samples were performed under strict chain-of-custody procedures. Requested QA/QC data were limited to holding time data, chain of custody forms, calibration and procedure blank results, continuing calibration recovery results, sample duplicate results, matrix spike and matrix spike duplicate (MS/MSD) results, and laboratory spike results. The QA/QC and sample data were reviewed as described below.

HOLDING TIMES

The holding times for these inorganic analyses were inspected. All holding times were met, except for BOD and pH from the March 15th sampling and BOD from the March 28th sampling. The results for these analyses will be qualified as estimated "J".

CHAIN OF CUSTODY

The chain of custody forms were reviewed for accuracy and completeness. All necessary information was provided and was found to be accurate. All requested analyses were performed and the data packages were complete.

BLANKS

The calibration and procedure blank results were inspected for possible contaminants. The majority of blanks were free of compound concentrations at levels equal to or greater than their reporting limits. The procedure blank for the March 21st and 28th sample data contained low levels of copper. As a result, copper from the March 21st sampling was changed to <0.005 ppm, and the March 28th result did not contain copper, thus no qualifying action was required. Low levels of zinc were found in all procedure blanks, all zinc results were consequently qualified as estimated "J".

CONTINUING CALIBRATION RECOVERIES

Continuing calibration recoveries were within control limits for all compounds except, COD from the March 15th and 21st analyses, and total suspended solids from the March 21st and 28th analyses. The sample results for these parameters for these sampling dates will be qualified as estimated "J".

LABORATORY SPIKES

All laboratory spike recoveries were within control limits.

MATRIX SPIKE/MATRIX SPIKE DUPLICATE FORTIFICATIONS

All matrix spike and matrix spike duplicate results were within control limits.

RESULTS

The results from these sampling events were compared with each other and with previous seep results. The majority of compound concentrations compared well. COD appears to be decreasing with time. With the exception of previously noted qualifiers, the results were found to be complete and accurate.

April Monthly Monitoring Report for the Groundwater Seep at the Du Pont East Chicago Plant East Chicago, Indiana

Prepared by CH2M HILL
on behalf of
E.I. Du Pont de Nemours & Company

May 10, 1991

CHI120/056.51

INTRODUCTION

In response to U.S. EPA's Section 308 Information Request, Du Pont is submitting this monthly monitoring report characterizing the quality of the groundwater seep at Du Pont's East Chicago Plant. This report contains the results of the "monthly monitoring program" for April 1991 specified in U.S. EPA's request.

SAMPLE COLLECTION AND ANALYSIS

Samples of the groundwater seep were obtained April 4, 11, 18, and 25, 1991. The flow rate of the seep averaged 0.32 gallons per minute (gpm) on April 4; 0.013 gpm on April 11; 1.57 gpm on April 18; and 1.12 gpm on April 25.

The "monthly monitoring program" sampling activities consisted of obtaining 8-hour composite samples of seep water collected at 0-, 4-, and 8-hour intervals. Seep flow rates were measured and recorded at each interval. Sample fractions collected for oil and grease, total suspended solids, and pH analyses were not filtered. All other sample fractions were filtered.

After the samples were collected, filtered, and preserved, as appropriate, the samples were shipped via overnight courier to National Environmental Testing, Inc. (NET) analytical laboratory in Bartlett, Illinois. The samples were then analyzed for the following

constituents specified in U.S. EPA's request: BOD-five day, COD, ammonia-N, nitrate and nitrite, sulfate, chloride, fluoride, oil and grease, total dissolved solids, total suspended solids, arsenic, copper, zinc, and pH.

For quality assurance/quality control (QA/QC) purposes, a duplicate sample was collected on April 4.

On April 4, grab samples were collected at each composite sampling interval to compare their anaytical results to the composite sample analytical results.

ANALYTICAL RESULTS AND INTERPRETATION

Tables 1 and 2 summarize the analytical results of the "monthly monitoring program" for the seep during the month of April. The analytical results for the duplicate samples collected on April 4 are shown separated by a slash in the first data column of Table 1. All laboratory data sheets for the seep samples collected and analyzed during April for the "monthly monitoring program" are provided in Attachment 1. Attachment 2 contains a data validation summary of QA/QC information associated with the analysis of the April seep samples.

Four of the constituents being monitored have concentrations consistently at or below method detection limits: BOD-five day, oil and grease, nitrite, and copper. Reported concentrations for COD, ammonia-N, and nitrate were only slightly above their respective method detection

limits in the "one-time monitoring program" sample collected on March 6, 1991, and have remained at these levels throughout the "monthly monitoring program."

The remaining constituents analyzed as part of the "monthly monitoring program" for the seep have remained at relatively consistent levels over this reporting period. The only exception was the zinc concentration which appears to be directly related to seep flow rate.

Table 2 contains the analytical results of the duplicate pair of composite samples and the three grab samples obtained on April 4. Analytical results for each grab sample obtained compare well with those for the composite samples.

Only one constituent in each grab sample was detected at a level greater than 50-percent different than either of the composite samples. In the 0-hour grab sample, total suspended solids was detected at a level greater than 50-percent higher than in either of the composite samples. In both the 4- and 8-hour grab samples, COD was not detected, whereas in the composite samples COD was detected at 46 and 33 mg/l.

CONCLUSIONS

Based on the seep water analytical results obtained during March and April, it is recommended that the following constituents be eliminated from the "monthly monitoring program": BOD-five day, COD, nitrate, nitrite, ammonia-N, oil and grease, and copper.

Comparison of the analytical results for the grab samples and the composite samples obtained from the seep on April 4 supports the recommendation in the "March Monthly Monitoring Report" to switch to the collection of a grab sample instead of the 8-hour composite sample currently being collected.

The switch to grab sampling from composite sampling, and the elimination of laboratory analysis of the seven constituents recommended above, should be implemented as soon as possible.

TABLE 1

CONSTITUENTS DETECTED IN SEEP WATER
APRIL MONTHLY MONITORING PROGRAM
APRIL 1991

Sample ID:	DEC-SP1-4-1T	DEC-SP1-4-2T	DEC-SP1-4-3T	DEC-SP1-4-4T	
Lab:	NET	NET	NET	NET	
Lab ID:	130113/ 130114	130967	131461	131844	
Date:	4/4/91	4/11/91	4/18/91	4/25/91	
Filtered (Yes/No):	Yes	Yes	Yes	Yes	Average
AVERAGE FLOW RATE (gpm)	0.32	0.13	1.57	1.12	0.78
WATER QUALITY PARAMETERS (mg/l)					
BOD-Five Day	4J/4J	1			2
COD	46J/33J		13	3	14
Chloride	28/34	30	32	36	32
Oil and Grease	*/*	*	1*J	1*B	1*
Fluoride	1.6J/1.0J	0.7	1.0J	1.0	1.0
Nitrogen, Ammonia	0.28/0.26	0.26	0.39	0.42	0.34
Nitrogen, Nitrate	0.20/0.16	0.25	0.64	0.81	0.47
Nitrogen, Nitrite	/				
Total Dissolved Solids	1180J/1170J	1260	1240	1370	1260
Total Suspended Solids	6*/9*	4*	8*	3*	6*
Sulfate	700/740	740	810	790	760
pH (lab)	7.2*/7.2*	7.2*	7.2*	7.3*	7.2*
TRACE INORGANIC COMPOUNDS (mg/l)					
Arsenic	0.030/0.028	0.0560	0.045J	0.052J	0.046
Copper	/				
Zinc	0.452/0.443	0.388	1.26	1.03	0.78

Notes:
* Sample fraction not filtered.
No value denotes not detected.
J denotes estimated value.
B denotes blank contamination.
A value of one-half the detection limit used in averaging not detected values.
The average value of the duplicate sample results used in overall averaging.

TABLE 2

COMPARISON OF COMPOSITE SAMPLE ANALYTICAL RESULTS
TO GRAB SAMPLE ANALYTICAL RESULTS

	Composite Sample	0-Hour Sample	4-Hour Sample	8-Hour Sample
Sample ID:	DEC-SP1-4-1T	DEC-SP1-4-1A	DEC-SP1-4-1B	DEC-SP1-4-1C
Lab:	NET	NET	NET	NET
Lab ID:	130113/ 130114	130115	130116	130117
Date:	4/4/91	4/4/91	4/4/91	4/4/91
Filtered (Yes/No):	Yes	Yes	Yes	Yes
FLOW RATE (gpm)	0.32 (avg)	0.20	0.46	0.30
WATER QUALITY PARAMETERS (mg/l)				
BOD-Five Day	4J/4J	5J	5J	3J
COD	46J/33J	42J		
Chloride	28/34	26	28	30
Oils and Grease	*/*	*	*	*
Fluoride	1.6J/1.0J	1.0J	0.9J	0.9J
Nitrogen, Ammonia	0.28/0.26	0.19	0.24	0.31
Nitrogen, Nitrate	0.20/0.16	0.14	0.10	0.10
Nitrogen, Nitrite	/			
Total Dissolved Solids	1180J/1170J	1090J	1100J	1160J
Total Suspended Solids	6*/9*	27*	12*	6*
Sulfate	700/740	740	720	780
pH (lab)	7.2*/7.2*	7.3*	7.0*	7.2*
TRACE INORGANIC COMPOUNDS (mg/l)				
Arsenic	0.030/0.028	0.019	0.027	0.045
Copper	/			
Zinc	0.452/0.443	0.328	0.462	0.460

Notes:
* Sample fraction not filtered.
No value denotes not detected.
J denotes estimated value.

Attachment 1
Laboratory Data Sheets
Monthly Monitoring Program

NATIONAL ENVIRONMENTAL TESTING, INC.

NET Midwest, Inc.
Bartlett Division
850 West Bartlett Road
Bartlett, IL 60103

Tel: (708) 289-3100
Fax: (708) 289-5445

ANALYTICAL REPORT

Ms. Susan Mulholland
CH2M HILL
1890 Maple Av.
Suite 200
Evanston, IL 60201

04/26/1991

Sample No.: 130113

Job No.: 91.0363

Sample Description: DEC-SP1-4-1T
CHI28770.BO.SP; DuPont

Date Taken: 04/04/1991
Time Taken: 08:00

Date Received: 04/05/1991
Time Received: 09:50

BOD, Five Day	4.	mg/L
Chloride	28.	mg/L
COD, Total	46.	mg/L
Fluoride	1.6	mg/L
N-Ammonia	0.28	mg/L
N-Nitrate	0.20	mg/L
N-Nitrite	<0.01	mg/L
Oil & Grease	<1.	mg/L
pH	7.2	units
Solids, Total Dissolved	1180.	mg/L
Solids, Total Suspended	6.	mg/L
Sulfate	700.	mg/L
Arsenic, AA	0.030	mg/L
Copper, ICP	<0.050	mg/L
Zinc, ICP	0.452	mg/L

Kelly Jones

Kelly Jones
Project Manager

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ANALYTICAL REPORT

Ms. Susan Mulholland
CH2M HILL
1890 Maple Av.
Suite 200
Evanston, IL 60201

04/26/1991

Sample No.: 130114

Job No.: 91.0363

Sample Description: DEC-FRSP1-4-1T
CHI28770.BO.SP; DuPont

Date Taken: 04/04/1991
Time Taken: 08:00

Date Received: 04/05/1991
Time Received: 09:50

BOD, Five Day	4.	mg/L
Chloride	34.	mg/L
COD, Total	33.	mg/L
Fluoride	1.0	mg/L
N-Ammonia	0.26	mg/L
N-Nitrate	0.16	mg/L
N-Nitrite	<0.01	mg/L
Oil & Grease	<1.	mg/L
pH	7.2	units
Solids, Total Dissolved	1170.	mg/L
Solids, Total Suspended	9.	mg/L
Sulfate	740.	mg/L
Arsenic, AA	0.028	mg/L
Copper, ICP	<0.050	mg/L
Zinc, ICP	0.443	mg/L

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ANALYTICAL REPORT

Ms. Susan Mulholland
CH2M HILL
1890 Maple Av.
Suite 200
Evanston, IL 60201

04/26/1991

Sample No.: 130115

Job No.: 91.0363

Sample Description: DEC-SP1-4-1A
CHI28770.BO.SP; DuPont

Date Taken: 04/04/1991
Time Taken: 09:41

Date Received: 04/05/1991
Time Received: 09:50

BOD, Five Day	5.	mg/L
Chloride	26.	mg/L
COD, Total	42.	mg/L
Fluoride	1.0	mg/L
N-Ammonia	0.19	mg/L
N-Nitrate	0.14	mg/L
N-Nitrite	<0.01	mg/L
Oil & Grease	<1.	mg/L
pH	7.3	units
Solids, Total Dissolved	1090.	mg/L
Solids, Total Suspended	27.	mg/L
Sulfate	740.	mg/L
Arsenic, AA	0.019	mg/L
Copper, ICP	<0.050	mg/L
Zinc, ICP	0.328	mg/L

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ANALYTICAL REPORT

Ms. Susan Mulholland
CH2M HILL
1890 Maple Av.
Suite 200
Evanston, IL 60201

04/26/1991

Sample No.: 130116

Job No.: 91.0363

Sample Description: DEC-SP1-4-1B
CHI28770.BO.SP; DuPont

Date Taken: 04/04/1991
Time Taken: 13:17

Date Received: 04/05/1991
Time Received: 09:50

BOD, Five Day	5.	mg/L
Chloride	28.	mg/L
COD, Total	<3.	mg/L
Fluoride	0.9	mg/L
N-Ammonia	0.24	mg/L
N-Nitrate	0.10	mg/L
N-Nitrite	<0.01	mg/L
Oil & Grease	<1.	mg/L
pH	7.0	units
Solids, Total Dissolved	1100.	mg/L
Solids, Total Suspended	12.	mg/L
Sulfate	720.	mg/L
Arsenic, AA	0.027	mg/L
Copper, ICP	<0.050	mg/L
Zinc, ICP	0.462	mg/L

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ANALYTICAL REPORT

Ms. Susan Mulholland
CH2M HILL
1890 Maple Av.
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04/26/1991

Sample No.: 130117

Job No.: 91.0363

Sample Description: DEC-SP1-4-1C
CHI28770.BO.SP; DuPont

Date Taken: 04/04/1991
Time Taken: 17:54

Date Received: 04/05/1991
Time Received: 09:50

BOD, Five Day	3.	mg/L
Chloride	30.	mg/L
COD, Total	<3.	mg/L
Fluoride	0.9	mg/L
N-Ammonia	0.31	mg/L
N-Nitrate	0.10	mg/L
N-Nitrite	<0.01	mg/L
Oil & Grease	<1.	mg/L
pH	7.2	units
Solids, Total Dissolved	1160.	mg/L
Solids, Total Suspended	6.	mg/L
Sulfate	780.	mg/L
Arsenic, AA	0.045	mg/L
Copper, ICP	<0.050	mg/L
Zinc, ICP	0.460	mg/L

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ANALYTICAL REPORT

Ms. Susan Molholland
CH2M HILL
1890 Maple Av.
Suite 200
Evanston, IL 60016

04/26/1991

Sample No.: 130967

Job No.: 91.0526

Sample Description: DEC-SP1-4-2T
CHI28770.B0.SP; DuPont

Date Taken: 04/11/1991
Time Taken: 17:00

Date Received: 04/12/1991
Time Received: 09:45

BOD, Five Day	1.	mg/L
Chloride	30.	mg/L
COD, Total	<3.	mg/L
Fluoride	0.7	mg/L
N-Ammonia	0.26	mg/L
N-Nitrate	0.25	mg/L
N-Nitrite	<0.01	mg/L
Oil & Grease	<1.	mg/L
pH	7.2	units
Solids, Total Dissolved	1260.	mg/L
Solids, Total Suspended	4.	mg/L
Sulfate	740.	mg/L
Arsenic, AA	0.0560	mg/L
Copper, ICP	<0.020	mg/L
Zinc, ICP	0.388	mg/L

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ANALYTICAL REPORT

Ms. Susan Mulholland
CH2M HILL
1890 Maple Avenue
Evanston, IL 60201

05/09/1991

Sample No.: 131461

Job No.: 91.0639

Sample Description: DEC-SP1-04-3T
CH128770.B0.SP; DuPont

Date Taken: 04/18/1991
Time Taken: 00:00

Date Received: 04/19/1991
Time Received: 09:40

BOD, Five Day	<1.	mg/L
Chloride	32.	mg/L
COD, Total	13.	mg/L
Fluoride	1.0	mg/L
N-Ammonia	0.39	mg/L
N-Nitrate	0.64	mg/L
N-Nitrite	<0.01	mg/L
Oil & Grease	1.	mg/L
pH	7.2	units
Solids, Total Dissolved	1240.	mg/L
Solids, Total Suspended	8.	mg/L
Sulfate	810.	mg/L
Arsenic, ICP	0.045	mg/L
Copper, ICP	<0.010	mg/L
Zinc, ICP	1.26	mg/L

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ANALYTICAL REPORT

Ms. Susan Mulholland
CH2M HILL
1890 Maple Avenue
Evanston, IL 60201

05/09/1991

Sample No.: 131844

Job No.: 91.0784

Sample Description: DEC-SP1-4-4T; Comp.
CH28770.B0.SP; DuPont

Date Taken: 04/25/1991
Time Taken: 08:00

Date Received: 04/26/1991
Time Received: 09:30

BOD, Five Day	<1.	mg/L
Chloride	36.	mg/L
COD, Total	3.	mg/L
Fluoride	1.0	mg/L
N-Ammonia	0.42	mg/L
N-Nitrate	0.81	mg/L
N-Nitrite	<0.01	mg/L
Oil & Grease	1.	mg/L
pH	7.3	units
Solids, Total Dissolved	1370.	mg/L
Solids, Total Suspended	3.	mg/L
Sulfate	790.	mg/L
Arsenic, ICP	0.052	mg/L
Copper, ICP	<0.010	mg/L
Zinc, ICP	1.03	mg/L

Kelly Jones

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Project Manager

Attachment 2
Data Validation Summary
Monthly Monitoring Program

MEMORANDUM CH2M HILL

TO: Pixie Newman/CHI
Susan Mulholland/CHI

FROM: Dan MacGregor/GLO

DATE: May 8, 1991

SUBJECT: Data Validation for Seep Samples
Du Pont East Chicago, Indiana

PROJECT: CHI28770.B0.MR

INTRODUCTION

This memorandum presents the data validation discussion for the inorganic analytical results for samples collected on April 4, 11, 18 and 25, 1991, at the Du Pont plant in East Chicago, Indiana. Seep sampling was performed in compliance with the U.S. EPA-requested "monthly monitoring program."

Seep samples were analyzed for major ions and selected metals by NET Laboratories in Bartlett, Illinois. Sample collection and transport were performed under strict chain-of-custody procedures. Requested QA/QC data were limited to holding time data, chain-of-custody forms, calibration and procedure blank results, initial calibration verification and standard recoveries, continuing calibration recovery results, sample duplicate results, matrix spike and matrix spike duplicate results, and laboratory spike results. The QA/QC and sample data were reviewed as described below.

HOLDING TIMES

Inspection of holding times for the inorganic analyses showed that all holding times were met.

CHAIN OF CUSTODY

The chain of custody forms were reviewed for accuracy and completeness. All necessary information was provided and found to be accurate. All requested analyses were performed, and the data packages were complete.

BLANKS

The calibration and procedure blank results were inspected for possible contaminants. Most blanks were free of compound concentrations at levels equal to or greater than their reporting limits. The procedure blank for the April 4 sample data contained 130 ppm of total dissolved solids (TDS). The TDS concentration in the blank is approximately one-tenth the average sample concentration. The blank TDS concentration was determined to be insignificant in comparison to the sample concentrations, and thus the sample TDS results were not qualified. Oil and grease contamination at 2 ppm was found in the April 25 calibration blank, so all oil and grease results from that date were qualified as "B," blank contaminated. The procedure blank for the April 11 sample data contained low levels of copper. The April 11 sampling did not detect copper, so no qualifying action was required.

INITIAL CALIBRATION VERIFICATION AND STANDARD RECOVERIES

The initial calibration verification and standard recoveries were generally within control limits. Fluoride recoveries from the April 4 and 18 sampling were outside control limits. BOD recoveries from the April 4 and 25 samplings were below control limits. The sample results for these parameters for these sampling dates were qualified as "J," estimated.

CONTINUING CALIBRATION RECOVERIES

Continuing calibration recoveries were within control limits for all compounds except, fluoride from the April 18 sampling date. Fluoride recovery from that date was low, and so the fluoride result was qualified as "J."

LABORATORY SPIKES

The laboratory spike recoveries were below control limits for TDS (April 4) and oil and grease (April 18 and 25). The sample results for those parameters will be qualified as "J." All other laboratory spike recoveries were within control limits.

MATRIX SPIKE/MATRIX SPIKE DUPLICATE FORTIFICATIONS

Generally the matrix spike and matrix spike duplicate results were within control limits. BOD and COD from the April 4 sampling were outside the control limits, as was arsenic from the April 18, and 25 sampling. Sample results for these parameters from these dates are qualified as estimated "J."

RESULTS

During the April 4 sampling event, duplicate composite samples (DEC-SP1-4-1T and DEC-FRSP1-4-1T) were taken along with individual grab samples taken at specified times during the day (DEC-SP1-4-1A at 9:41, DEC-SP-1-4-1B at 13:17, and DEC-SP1-4-IC at 17:54). The individual grab samples compared well among themselves for all parameters except COD. The COD level was high in the initial sample, and then was less than the reporting limit in the next two samples. COD concentrations can vary greatly from sampling period to sampling period. The COD values associated with the site are typically very low. At these levels organic matter on glassware or from the atmosphere can cause variability in the results. The duplicate composite sample results compared closely with the grab sample results. Excluding the variability of the COD results, the difference in results from the two sampling plans are analytically insignificant. The results from this month's sampling events were compared with previous seep results, and the sample results compared well. With the exception of previously noted qualifiers, the results were found to be complete and accurate.

May Monthly Monitoring Report
for the Groundwater Seep at the
Du Pont East Chicago Plant
East Chicago, Indiana

Prepared by CH2M HILL
on behalf of
E.I. Du Pont de Nemours & Company

June 12, 1991

CHI120/056.51

INTRODUCTION

In response to U.S. EPA's Section 308 Information Request, Du Pont is submitting this monthly monitoring report characterizing the quality of the groundwater seep at Du Pont's East Chicago Plant. This report contains the results of the "monthly monitoring program" for May 1991 specified in U.S. EPA's request.

SAMPLE COLLECTION AND ANALYSIS

Samples of the groundwater seep were collected on May 2, 9, 16, 23, and 30, 1991. The flow rate of the seep averaged 0.48 gallons per minute (gpm) on May 2; 0.97 gpm on May 9; 0.78 gpm on May 16; 0.87 gpm on May 23; and 1.2 gpm on May 30.

The "monthly monitoring program" sampling activities consisted of obtaining an 8-hour composite sample of seep water collected at 0-, 4-, and 8-hour intervals, once per week. Seep flow rates were measured and recorded at each sampling interval. Sample fractions collected for oil and grease, total suspended solids, and pH analyses were not filtered. All other sample fractions were filtered.

After the samples were collected, filtered, and preserved, as appropriate, the samples were shipped via overnight courier to National Environmental Testing, Inc. (NET) analytical laboratory in Bartlett, Illinois. The samples were then analyzed for the following

constituents specified in U.S. EPA's request: BOD-five day, COD, ammonia-N, nitrate, nitrite, sulfate, chloride, fluoride, oil and grease, total dissolved solids, total suspended solids, arsenic, copper, zinc, and pH.

For quality assurance/quality control (QA/QC) purposes, a duplicate sample and a field blank were collected on May 2.

ANALYTICAL RESULTS AND INTERPRETATION

Table 1 summarizes the analytical results of the "monthly monitoring program" for the seep during the month of May. The analytical results for the duplicate samples collected on May 2 are shown separated by a slash in the first data column of Table 1. All laboratory data sheets for the seep samples collected and analyzed during May for the "monthly monitoring program" are provided in Attachment 1. Attachment 2 contains a data validation summary of QA/QC information associated with the analysis of the May seep samples.

Three of the constituents being monitored have concentrations consistently at or below method detection limits: oil and grease, nitrite, and copper. Reported concentrations for BOD-five day and COD were only slightly above their respective method detection limits in the "one-time monitoring program" sample collected on March 6, 1991, and have remained at these levels throughout the "monthly monitoring program."

The remaining constituents analyzed as part of the "monthly monitoring program" for the seep have remained at relatively consistent levels over the reporting period with the following exceptions: ammonia-N, nitrate, arsenic, and zinc. Ammonia-N levels have ranged from 0.41 to 0.75 mg/l; nitrate levels have ranged from 0.16 to 2.31 mg/l; arsenic levels have ranged from 0.015 to 0.085 mg/l; and zinc levels have ranged from 0.373 to 0.717 mg/l. As was the case in April, zinc concentration appears to increase with increases in seep flow rate.

Although minor variations have been observed from week to week, average parameter values for the two sets of complete monthly monitoring data (April and May) are very similar (Table 2).

TABLE 1

CONSTITUENTS DETECTED IN SEEP WATER
MAY MONTHLY MONITORING PROGRAM
MAY 1991

Sample ID:	DEC-SP1-5-1T	DEC-SP1-5-2T	DEC-SP1-5-3T	DEC-SP1-5-4T	DEC-SP1-5-5T	
Lab:	NET	NET	NET	NET	NET	
Lab ID:	132290/ 132291	132803	137120	141634	141977	
Date:	5/2/91	5/9/91	5/16/91	5/23/91	5/30/91	
Filtered (Yes/No):	Yes	Yes	Yes	Yes	Yes	Average
AVERAGE FLOW RATE (gpm)	0.48	0.97	0.78	0.87	1.2	0.86
WATER QUALITY PARAMETERS (mg/l)						
BOD-Five Day	5/	2	2	2	2	2
COD	29J/59J	13		16		15
Chloride	16/32	38	28	42	26	32
Oil and Grease	1*J/3*J	1*	1*J	2*B		1*
Fluoride	0.1/1.0	0.9J	2.8	0.7	0.9	1.2
Nitrogen, Ammonia	0.41/0.45	0.47	0.61	0.75	0.66	0.58
Nitrogen, Nitrate	0.16/0.18	1.12	2.31	2.22	0.71	1.3
Nitrogen, Nitrite	/					
Total Dissolved Solids	1370/1380	1420	1420	1400	1420	1400
Total Suspended Solids	4*/*	7*	11*	8*J	4*	6*
Sulfate	1120/930	830	790	770	790	840
pH (lab)	7.2*/7.2*	7.0*	7.0*	7.2*	7.1*	7.1*
TRACE INORGANIC COMPOUNDS (mg/l)						
Arsenic	0.0450/0.0460	0.052J	0.0710J	0.015	0.0850	0.054
Copper	/					
Zinc	0.452B/0.465B	0.676	0.373	0.496	0.717	0.544

Notes:
* Sample fraction not filtered.
No value denotes not detected.
J denotes estimated value.
B denotes blank contamination.
A value of one-half the detection limit used in averaging not detected values.
The average value of the duplicate sample results used in overall averaging.

TABLE 2

AVERAGE CONCENTRATIONS IN SEEP WATER
MONTHLY MONITORING PROGRAM

	April	May
AVERAGE FLOW RATE (gpm)	0.78	0.86
WATER QUALITY PARAMETERS (mg/l)		
BOD-Five Day	2	2
COD	14	15
Chloride	32	32
Oil and Grease	1*	1*
Fluoride	1.0	1.2
Nitrogen, Ammonia	0.34	0.58
Nitrogen, Nitrate	0.47	1.3
Nitrogen, Nitrite		
Total Dissolved Solids	1260	1400
Total Suspended Solids	6*	6*
Sulfate	760	840
pH (lab)	7.2*	7.1*
TRACE INORGANIC COMPOUNDS (mg/l)		
Arsenic	0.046	0.054
Copper		
Zinc	0.78	0.544

Notes:
* Sample fraction not filtered.
No value denotes not detected.
A value of one-half the detection limit used in averaging not detected value
The average value of the duplicate sample results used in overall averaging.

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ANALYTICAL REPORT

Ms. Susan Mulholland
CH2M HILL
1890 Maple Ave.
Suite 200
Evanston, IL 60201

05/16/1991

Sample No.: 132290

Job No.: 91.0939

Sample Description: DEC-SP1-5-1T
CH128770.B0.MS; DuPont

Date Taken: 05/02/1991
Time Taken: 08:00

Date Received: 05/03/1991
Time Received: 09:45

BOD, Five Day	5.	mg/L
Chloride	16.	mg/L
COD, Total	29.	mg/L
Fluoride	0.1	mg/L
N-Ammonia	0.41	mg/L
N-Nitrate	0.16	mg/L
N-Nitrite	<0.01	mg/L
Oil & Grease	1.	mg/L
pH	7.2	units
Solids, Total Dissolved	1370.	mg/L
Solids, Total Suspended	4.	mg/L
Sulfate	1120.	mg/L
Arsenic, AA	0.0450	mg/L
Copper, ICP	<0.010	mg/L
Zinc, ICP	0.452	mg/L

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1890 Maple Ave.
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05/16/1991

Sample No.: 132291

Job No.: 91.0939

Sample Description: DEC-FRSP1-5-1T
CH128770.B0.MS; DuPont

Date Taken: 05/02/1991
Time Taken: 08:00

Date Received: 05/03/1991
Time Received: 09:45

BOD, Five Day	<1.	mg/L
Chloride	32.	mg/L
COD, Total	59.	mg/L
Fluoride	1.0	mg/L
N-Ammonia	0.45	mg/L
N-Nitrate	0.18	mg/L
N-Nitrite	<0.01	mg/L
Oil & Grease	3.	mg/L
pH	7.2	units
Solids, Total Dissolved	1380.	mg/L
Solids, Total Suspended	<1.	mg/L
Sulfate	930.	mg/L
Arsenic, AA	0.0460	mg/L
Copper, ICP	<0.010	mg/L
Zinc, ICP	0.465	mg/L

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05/16/1991

Sample No.: 132292

Job No.: 91.0939

Sample Description: DEC-FBSP1-5-1T
CH128770.B0.MS; DuPont

Date Taken: 05/02/1991
Time Taken: 08:00

Date Received: 05/03/1991
Time Received: 09:45

BOD, Five Day	1.	mg/L
Chloride	2.	mg/L
COD, Total	20.	mg/L
Fluoride	<0.1	mg/L
N-Ammonia	0.05	mg/L
N-Nitrate	0.59	mg/L
N-Nitrite	<0.01	mg/L
Oil & Grease	3.	mg/L
pH	5.5	units
Solids, Total Dissolved	7.	mg/L
Solids, Total Suspended	4.	mg/L
Sulfate	<4.	mg/L
Arsenic, AA	<0.0050	mg/L
Copper, ICP	<0.010	mg/L
Zinc, ICP	0.048	mg/L

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ANALYTICAL REPORT

Ms. Susan Mulholland
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Evanston, IL ~~60016~~

05/23/1991

Sample No.: 132803

Job No.: 91.1095

Sample Description: DEC-SP1-5-2T
CH28770.B0.MS; DuPont

Date Taken: 05/09/1991
Time Taken: 16:00

Date Received: 05/10/1991
Time Received: 10:00

BOD, Five Day	2.	mg/L
Chloride	38.	mg/L
COD, Total	13.	mg/L
Fluoride	0.9	mg/L
N-Ammonia	0.47	mg/L
N-Nitrate	1.12	mg/L
N-Nitrite	<0.01	mg/L
Oil & Grease	1.	mg/L
pH	7.0	units
Solids, Total Dissolved	1420.	mg/L
Solids, Total Suspended	7.	mg/L
Sulfate	830.	mg/L
Arsenic, AA	0.052	mg/L
Copper, AA	<0.050	mg/L
Zinc, AA	0.676	mg/L

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ANALYTICAL REPORT

Ms. Susan Mulholland
CH2M HILL
1890 Maple Avenue
Evanston, IL 60201

05/31/1991

Sample No.: 137120

Job No.: 91.1220

Sample Description: DEC-SP1-5-3T; Composite
CH128770.30.MS; DuPont

Date Taken: 05/16/1991
Time Taken:

Date Received: 05/17/1991
Time Received: 10:00

BOD, Five Day	2.	mg/L
Chloride	28.	mg/L
COD, Total	<3.	mg/L
Fluoride	2.8	mg/L
N-Ammonia	0.61	mg/L
N-Nitrate	2.31	mg/L
N-Nitrite	<0.01	mg/L
Oil & Grease	1.	mg/L
pH	7.0	units
Solids, Total Dissolved	1420.	mg/L
Solids, Total Suspended	11.	mg/L
Sulfate	790.	mg/L
Arsenic, AA	0.0710	mg/L
Copper, AA	<0.050	mg/L
Zinc, AA	0.373	mg/L

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ANALYTICAL REPORT

Ms. Susan Mulholland
CH2M HILL
1890 Maple Avenue
Suite 200
Evanston, IL 60201

06/11/1991

Sample No.: 141634

Job No.: 91.1396

Sample Description: DEC-SP1-5-4T
CH128770.B0.3S; DuPont

Date Taken: 05/23/1991
Time Taken: 08:00

Date Received: 05/24/1991
Time Received: 09:45

BOD, Five Day	2.	mg/L
Chloride	42.	mg/L
COD, Total	16.	mg/L
Fluoride	0.7	mg/L
N-Ammonia	0.75	mg/L
N-Nitrate	2.22	mg/L
N-Nitrite	<0.01	mg/L
Oil & Grease	2.	mg/L
pH	7.2	units
Solids, Total Dissolved	1400.	mg/L
Solids, Total Suspended	8.	mg/L
Sulfate	770.	mg/L
Arsenic, AA	0.015	mg/L
Copper, AA	<0.050	mg/L
Zinc, AA	0.496	mg/L

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1890 Maple Avenue
Suite 200
Evanston, IL 60201

06/11/1991

Sample No.: 141977

Job No.: 91.1492

Sample Description: DEC-SP1-5-5T; Comp
CH128770.BO.MS; DuPont

Date Taken: 05/30/1991
Time Taken: 10:00

Date Received: 05/31/1991
Time Received: 10:00

BOD, Five Day	3.	mg/L
Chloride	26.	mg/L
COD, Total	<3.	mg/L
Fluoride	0.9	mg/L
N-Ammonia	0.66	mg/L
N-Nitrate	0.71	mg/L
N-Nitrite	<0.01	mg/L
Oil & Grease	<1.	mg/L
pH	7.1	units
Solids, Total Dissolved	1420.	mg/L
Solids, Total Suspended	4.	mg/L
Sulfate	790.	mg/L
Arsenic, AA	0.0850	mg/L
Copper, AA	<0.050	mg/L
Zinc, AA	0.717	mg/L

Kelly Jones

Kelly Jones
Project Manager

MEMORANDUM CH2M HILL

TO: Pixie Newman

FROM: Dan MacGregor/GLO

DATE: June 12, 1991

SUBJECT: Data Validation for Seep Samples
Du Pont East Chicago, Indiana

PROJECT: CHI28770.B0.MR

INTRODUCTION

This memorandum presents the data validation discussion for the inorganic analytical results for samples collected on May 2, 9, 16, 23, and 30, 1991, at the Du Pont plant in East Chicago, Indiana. Seep sampling was performed in compliance with the U.S. EPA-requested "monthly monitoring program."

Seep samples were analyzed for major ions and selected metals by NET Laboratories in Bartlett, Illinois. Sample collection and transport were performed under strict chain-of-custody procedures. Requested QA/QC data were limited to holding time data, chain-of-custody forms, calibration and procedure blank results, initial calibration verification and standard recoveries, continuing calibration recovery results, sample duplicate results, matrix spike and matrix spike duplicate results, and laboratory spike results. The QA/QC and sample data were reviewed as described below.

HOLDING TIMES

Inspection of holding times for the inorganic analyses showed that all holding times, with the exception of total suspended solids (TSS) from the May 23 sampling, were met. The TSS result from that date was qualified as estimated "J."

CHAIN OF CUSTODY

The chain of custody forms were reviewed for accuracy and completeness. All necessary information was provided and found to be accurate. All requested analyses were performed, and the data packages were complete.

BLANKS

A field blank was collected and analyzed as part of the May 2nd sampling event. The field blank contained low levels of BOD, chloride, COD, ammonia, nitrate, oil and grease, and total suspended and dissolved solids. The field blank water was a commercially available brand of distilled water. The quality of this water is unknown, thus making it inappropriate to qualify any data results based on this information. The field blank results demonstrate that any contamination that was occurring was of analytically insignificant proportion.

The calibration and procedure blank results were inspected for possible contaminants. All but two blanks were free of compound concentrations at levels equal to or greater than their reporting limits. Oil and grease contamination, at 2 ppm, was found in the May 23 procedure blank, and zinc at 0.037 ppm was found in the May 2 procedure blank. The oil and grease and zinc results from these dates were qualified as blank contaminated "B."

INITIAL CALIBRATION VERIFICATION STANDARD RECOVERIES

The initial calibration verification standard recoveries were generally within control limits. The fluoride recovery from the May 9 sampling was above control limits, and the arsenic recovery from the May 16 sampling was below control limits. The sample results for these parameters for these sampling dates were qualified as "J," estimated.

CONTINUING CALIBRATION RECOVERIES

Continuing calibration recoveries were within control limits for all compounds except arsenic from the May 16 sampling and total COD from the May 2 sampling. Due to the arsenic result from this date being previously qualified as estimated, no further qualifying action was required for arsenic. The COD results from the May 2 sampling were qualified as estimated "J."

LABORATORY CONTROL SPIKES

The oil and grease laboratory control spike recoveries were below control limits for the May 2, 16, and 23, sampling dates. The sample result for oil and grease from the May 23 sampling date had been previously qualified as blank contaminated, so this result required no further

qualifying action. The May 2 and 16 results were qualified as estimated "J." All other laboratory spike recoveries were within control limits.

MATRIX SPIKE/MATRIX SPIKE DUPLICATE FORTIFICATIONS

Generally the matrix spike and matrix spike duplicate results were within control limits. Oil and grease from the May 16 sampling, arsenic from the May 9 sampling, and zinc from the May 2 sampling were outside control limits. Sample results for oil and grease and arsenic from their respective dates were qualified as estimated "J." The May 2 zinc results were previously qualified as blank contaminated, so no additional qualifiers for this compound were required.

RESULTS

During the May 2 sampling event, duplicate composite samples (DEC-SP1-5-1T and DEC-FRSP1-5-1T) were taken. These sample results did not compare well. The duplicate sample results varied by as much as a factor of ten. The sample results associated with the site are typically very low. At these levels some variance should be expected. To further check sample precision, results from this month's sampling events were compared with previous seep results. In reviewing these results it was noted that the results from this round of sampling fell into the range of previous sample results, so no qualifying action due to poor sample precision was taken.

With the exception of previously noted qualifiers, all results were found to be complete and accurate.

NATIONAL ENVIRONMENTAL TESTING, INC.

NET Midwest, Inc.
Bartlett Division
850 West Bartlett Road
Bartlett, IL 60103

Tel: (708) 289-3100
Fax: (708) 289-5445

ANALYTICAL REPORT

Ms. Susan Mulholland
CH2M HILL
1890 Maple Av.
Suite 200
Evanston, IL 60201

07/09/1991

Sample No.: 143833

Job No.: 91.2024

Sample Description: DEC-SP1-6-3
CHI28770.B0.MS; DuPont

Date Taken: 06/27/1991
Time Taken: 13:22

Date Received: 06/28/1991
Time Received: 10:00

Chloride	24.	mg/L
COD, Total	29.	mg/L
Fluoride	1.5	mg/L
N-Ammonia	1.03	mg/L
N-Nitrate	0.08	mg/L
N-Nitrite	<0.01	mg/L
pH	7.0	units
Solids, Total Dissolved	1260.	mg/L
Solids, Total Suspended	71.	mg/L
Sulfate	850.	mg/L
Arsenic, AA	0.0650	mg/L
Zinc,ICP	0.473	mg/L

Kelly Jones

Kelly Jones
Project Manager

June Monthly Monitoring Report
for the Groundwater Seep at the
Du Pont East Chicago Plant
East Chicago, Indiana

Prepared by CH2M HILL
on behalf of
E.I. Du Pont de Nemours & Company

July 10, 1991

CH1120/056.51

INTRODUCTION

In response to U.S. EPA's Section 308 Information Request dated February 13, 1991, Du Pont is submitting this monthly monitoring report characterizing the quality of the groundwater seep referenced in that request at Du Pont's East Chicago Plant. This report contains the results of the "monthly monitoring program" for June 1991.

SAMPLE COLLECTION AND ANALYSIS

Samples of the groundwater seep were collected on June 6, 13, 20, and 27, 1991. The flow rate of the seep averaged 1.25 gallons per minute (gpm) on June 6; 1.15 gpm on June 13; 0.88 gpm on June 20; and 0.18 gpm on June 27.

The June "monthly monitoring program" sampling activities consisted of obtaining a grab sample of seep water once per week. Seep flow rates were measured and recorded at each sampling interval. Sample fractions collected for oil and grease, total suspended solids, and pH analyses were not filtered. All other sample fractions were filtered.

After the samples were collected, filtered, and preserved, as appropriate, the samples were shipped via overnight courier to National Environmental Testing, Inc. (NET) analytical laboratory in Bartlett, Illinois. The samples collected on June 6 were analyzed for the following constituents specified in U.S. EPA's request: BOD-five day, COD, ammonia-N,

nitrate, nitrite, sulfate, chloride, fluoride, oil and grease, total dissolved solids, total suspended solids, arsenic, copper, zinc, and pH. The samples collected later in the month were analyzed for all of the constituents listed above, except BOD-five day, oil and grease, and copper. Du Pont received verbal approval from U.S. EPA to eliminate these three constituents from the monthly monitoring program prior to the collection of the seep sample during the second week of June.

For quality assurance/quality control (QA/QC) purposes, a duplicate sample was collected on June 6.

ANALYTICAL RESULTS AND INTERPRETATION

Table 1 summarizes the analytical results of the "monthly monitoring program" for the seep during the month of June. The analytical results for the duplicate samples collected on June 6 are shown separated by a slash in the first data column of Table 1. All laboratory data sheets for the seep samples collected and analyzed during June for the "monthly monitoring program" are provided in Attachment 1. Attachment 2 contains a data validation summary of QA/QC information associated with the analysis of the June seep samples.

Seep constituents remained at relatively consistent levels during June with the following exceptions: ammonia-N, nitrate, and total suspended solids. Ammonia-N levels ranged from 0.46 to 2.56 mg/l; nitrate levels ranged from 0.08 to 3.46 mg/l; and total suspended solids

levels ranged from 7 to 71 mg/l.

Average parameter values for the three sets of complete monthly monitoring data (April, May, and June) are shown in Table 2.

TABLE 1

CONSTITUENTS DETECTED IN SEEP WATER
JUNE MONTHLY MONITORING PROGRAM
JUNE 1991

Sample ID:	DEC-SP1-G-1	DEC-SP1-6-2T	DEC-SP1-6-3	DEC-SP1-6-3	
Lab:	NET	NET	NET	NET	
Lab ID:	142472/ 142473	143057	143439	143833	
Date:	6/6/91	6/13/91	6/20/91	6/27/91	
Filtered (Yes/No):	Yes	Yes	Yes	Yes	Average
AVERAGE FLOW RATE (gpm)	1.25	1.15	0.88	0.18	0.87
WATER QUALITY PARAMETERS (mg/l)					
BOD-Five Day	1/	NA	NA	NA	NC
COD	/13	29	26	29	23
Chloride	26/26	20	28	24	25
Oil and Grease	1*/1*	NA	NA	NA	NC
Fluoride	0.8J/0.8J	0.6	1.1	1.5	1.0
Nitrogen, Ammonia	0.56/2.56	0.46	0.60	1.03	0.91
Nitrogen, Nitrate	1.43J/3.46J	0.94	0.31	0.08	0.94
Nitrogen, Nitrite	/	0.04			0.01
Total Dissolved Solids	1360/1400	380	1410	1260	1110
Total Suspended Solids	11*/7*	8*	19*	71*	27*
Sulfate	870/840	490J	780J	850	740
pH (lab)	7.0*/7.1*	7.0*	6.9*	7.0*	7.0*
TRACE INORGANIC COMPOUNDS (mg/l)					
Arsenic	0.073/0.071	0.0340	0.0990	0.0650	0.068
Copper	/	NA	NA	NA	NC
Zinc	0.981/0.977	0.454B	0.634B	0.473B	0.635

Notes:
* Sample fraction not filtered.
No value denotes not detected.
NA denotes not analyzed.
NC denotes not calculated (constituent eliminated from monthly monitoring program).
J denotes estimated value.
B denotes blank contamination.
A value of one-half the detection limit used in averaging not detected values.
The average value of the duplicate sample results used in overall averaging.

TABLE 2

AVERAGE CONCENTRATIONS IN SEEP WATER
MONTHLY MONITORING PROGRAM

	April	May	June
AVERAGE FLOW RATE (gpm)	0.78	0.86	0.87
WATER QUALITY PARAMETERS (mg/l)			
BOD-Five Day	2	2	NC
COD	14	15	23
Chloride	32	32	25
Oil and Grease	1*	1*	NC
Fluoride	1.0	1.2	1.0
Nitrogen, Ammonia	0.34	0.58	0.91
Nitrogen, Nitrate	0.47	1.3	0.94
Nitrogen, Nitrite			0.01
Total Dissolved Solids	1260	1400	1110
Total Suspended Solids	6*	6*	27*
Sulfate	760	840	740
pH (lab)	7.2*	7.1*	7.0*
TRACE INORGANIC COMPOUNDS (mg/l)			
Arsenic	0.046	0.054	0.068
Copper			NC
Zinc	0.78	0.544	0.635

Notes:
* Sample fraction not filtered.
No value denotes not detected.
NC denotes not calculated (constituent eliminated from monthly monitoring program).
A value of one-half the detection limit used in averaging not detected values.
The average value of the duplicate sample results used in overall averaging.

Attachment 1
Laboratory Data Sheets
Monthly Monitoring Program

NATIONAL ENVIRONMENTAL TESTING, INC.

NET Midwest, Inc.
Bartlett Division
850 West Bartlett Road
Bartlett, IL 60103

Tel: (708) 289-3100
Fax: (708) 289-5445

ANALYTICAL REPORT

JUN 28 1991

Ms. Susan Mulholland
CH2M HILL
1890 Maple Ave
Suite 200
Evanston, IL 60201

06/25/1991

Sample No.: 142472

Job No.: 91.1642

Sample Description: DEC-SP1-G-1
CH128770.B0.SP; DuPont

Date Taken: 06/06/1991
Time Taken: 09:00

Date Received: 06/07/1991
Time Received: 09:30

BOD, Five Day	1.	mg/L
Chloride	26.	mg/L
COD, Total	<3.	mg/L
Fluoride	0.8	mg/L
N-Ammonia	0.56	mg/L
N-Nitrate	1.43	mg/L
N-Nitrite	<0.01	mg/L
Oil & Grease	1.	mg/L
pH	7.0	units
Solids, Total Dissolved	1360.	mg/L
Solids, Total Suspended	11.	mg/L
Sulfate	870.	mg/L
Arsenic, AA	0.073	mg/L
Copper, ICP	<0.050	mg/L

Kelly Jones

Kelly Jones
Project Manager

NATIONAL ENVIRONMENTAL TESTING, INC.

NET Midwest, Inc.
Bartlett Division
850 West Bartlett Road
Bartlett, IL 60103

Tel: (708) 289-3100
Fax: (708) 289-5445

ANALYTICAL REPORT

Ms. Susan Mulholland
CH2M HILL
1890 Maple Ave
Suite 200
Evanston, IL 60201

06/25/1991

Sample No.: 142472

Job No.: 91.1642

Sample Description: DEC-SP1-G-1
CH128770.B0.SP; DuPont

Date Taken: 06/06/1991
Time Taken: 09:00

Date Received: 06/07/1991
Time Received: 09:30

Zinc, ICP	0.981	mg/L

Kelly Jones

Kelly Jones
Project Manager

NATIONAL ENVIRONMENTAL TESTING, INC.

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Bartlett, IL 60103

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ANALYTICAL REPORT

Ms. Susan Mulholland
CH2M HILL
1890 Maple Ave
Suite 200
Evanston, IL 60201

06/25/1991

Sample No.: 142473

Job No.: 91.1642

Sample Description: DEC-FRSP1-G-1
CH128770.E0.SP; DuPont

Date Taken: 06/06/1991
Time Taken: 09:00

Date Received: 06/07/1991
Time Received: 09:30

BOD, Five Day	<1.	mg/L
Chloride	26.	mg/L
COD, Total	13.	mg/L
Fluoride	0.8	mg/L
N-Ammonia	2.56	mg/L
N-Nitrate	3.46	mg/L
N-Nitrite	<0.01	mg/L
Oil & Grease	1.	mg/L
pH	7.1	units
Solids, Total Dissolved	1400.	mg/L
Solids, Total Suspended	7.	mg/L
Sulfate	840.	mg/L
Arsenic, AA	0.071	mg/L
Copper, ICP	<0.050	mg/L

Kelly Jones

Kelly Jones
Project Manager

NATIONAL ENVIRONMENTAL TESTING, INC.

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ANALYTICAL REPORT

Ms. Susan Mulholland
CH2M HILL
1890 Maple Ave
Suite 200
Evanston, IL 60201

06/25/1991

Sample No.: 142473

Job No.: 91.1642

Sample Description: DEC-FRSP1-G-1
CH128770.B0.SP; DuPont

Date Taken: 06/06/1991
Time Taken: 09:00

Date Received: 06/07/1991
Time Received: 09:30

Zinc, ICP	0.977	mg/L

Kelly Jones
Project Manager

NATIONAL ENVIRONMENTAL TESTING, INC.

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ANALYTICAL REPORT

Ms. Susan Mulholland
CH2M HILL
1890 Maple Ave
Suite 200
Evanston, IL 60201

07/01/1991

Sample No.: 143057

Job No.: 91.1772

Sample Description: DEC-SP1-6-2T
CHI28770.B0.MS DuPont

Date Taken: 06/13/1991
Time Taken: 12:00

Date Received: 06/14/1991
Time Received: 10:45

Chloride	20.	mg/L
COD, Total	29.	mg/L
Fluoride	0.6	mg/L
N-Ammonia	0.46	mg/L
N-Nitrate	0.94	mg/L
N-Nitrite	0.04	mg/L
pH	7.0	units
Solids, Total Dissolved	380.	mg/L
Solids, Total Suspended	8.	mg/L
Sulfate	490.	mg/L
Arsenic, AA	0.0340	mg/L
Zinc, ICP	0.454	mg/L

Kelly Jones

Kelly Jones
Project Manager

NATIONAL ENVIRONMENTAL TESTING, INC.

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ANALYTICAL REPORT

Ms. Susan Mulholland
CH2M HILL
1890 Maple Ave
Suite 200
Evanston, IL 60201

07/03/1991

Sample No.: 143439

Job No.: 91.1913

Sample Description: DEC-SP1-6-3
CH128770.B0.MS; DuPont

Date Taken: 06/20/1991
Time Taken: 08:25

Date Received: 06/21/1991
Time Received: 09:00

Chloride	28.	mg/L
COD, Total	26.	mg/L
Fluoride	1.1	mg/L
N-Ammonia	0.60	mg/L
N-Nitrate	0.31	mg/L
N-Nitrite	<0.01	mg/L
pH	6.9	units
Solids, Total Dissolved	1410.	mg/L
Solids, Total Suspended	19.	mg/L
Sulfate	780.	mg/L
Arsenic, AA	0.0990	mg/L
Zinc, ICP	0.634	mg/L

Kelly Jones

Kelly Jones
Project Manager

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Tel: (708) 289-3100
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ANALYTICAL REPORT

Ms. Susan Mulholland
CH2M HILL
1890 Maple Av.
Suite 200
Evanston, IL 60201

07/09/1991

Sample No.: 143833

Job No.: 91.2024

Sample Description: DEC-SP1-6-3
CHI28770.B0.MS; DuPont

Date Taken: 06/27/1991
Time Taken: 13:22

Date Received: 06/28/1991
Time Received: 10:00

Chloride	24.	mg/L
COD, Total	29.	mg/L
Fluoride	1.5	mg/L
N-Ammonia	1.03	mg/L
N-Nitrate	0.08	mg/L
N-Nitrite	<0.01	mg/L
pH	7.0	units
Solids, Total Dissolved	1260.	mg/L
Solids, Total Suspended	71.	mg/L
Sulfate	850.	mg/L
Arsenic, AA	0.0650	mg/L
Zinc,ICP	0.473	mg/L

Kelly Jones

Kelly Jones
Project Manager

NATIONAL ENVIRONMENTAL TESTING, INC.

NET Midwest, Inc.
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Bartlett, IL 60103

Tel: (708) 289-3100
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ANALYTICAL REPORT

Ms. Susan Mulholland
CH2M HILL
1890 Maple Av.
Suite 200
Evanston, IL 60201

07/09/1991

Sample No.: 143833

Job No.: 91.2024

Sample Description: DEC-SP1-6-3
CHI28770.B0.MS; DuPont

Date Taken: 06/27/1991
Time Taken: 13:22

Date Received: 06/28/1991
Time Received: 10:00

Chloride	24.	mg/L
COD, Total	29.	mg/L
Fluoride	1.5	mg/L
N-Ammonia	1.03	mg/L
N-Nitrate	0.08	mg/L
N-Nitrite	<0.01	mg/L
pH	7.0	units
Solids, Total Dissolved	1260.	mg/L
Solids, Total Suspended	71.	mg/L
Sulfate	850.	mg/L
Arsenic, AA	0.0650	mg/L
Zinc,ICP	0.473	mg/L

Kelly Jones

Kelly Jones
Project Manager

Attachment 2
Data Validation Summary
Monthly Monitoring Program

MEMORANDUM CH2M HILL

TO: Pixie Newman/CHI
Susan Mulholland/CHI

FROM: Dan MacGregor/GLO

DATE: July 8, 1991

SUBJECT: Data Validation for Seep Samples
Du Pont East Chicago, Indiana

PROJECT: CHI28770.B0.MR

INTRODUCTION

This memorandum presents the data validation discussion for the inorganic analytical results for samples collected on June 6, 13, 20, and 27, 1991, at the Du Pont plant in East Chicago, Indiana. Seep sampling was performed in compliance with the U.S. EPA-requested "monthly monitoring program."

Seep samples were analyzed for major ions and selected metals by NET Laboratories in Bartlett, Illinois. Sample collection and transport were performed under strict chain-of-custody procedures. Requested QA/QC data were limited to holding time data, chain-of-custody forms, calibration and procedure blank results, initial calibration verification and standard recoveries, continuing calibration recovery results, sample duplicate results, matrix spike and matrix spike duplicate results, and laboratory spike results. The QA/QC and sample data were reviewed as described below.

HOLDING TIMES

Inspection of holding times for the inorganic analyses showed that all holding times were met.

CHAIN OF CUSTODY

The chain of custody forms were reviewed for accuracy and completeness. All necessary information was provided and found to be accurate. All requested analyses were performed, and the data packages were complete.

BLANKS

The calibration and procedure blank results were inspected for possible contaminants. Zinc was found in the June 13, 20, and 27 procedure blanks. Zinc results from these dates were qualified as blank contaminated "B." All other blanks were free of compound concentrations at levels equal to or greater than their reporting limits.

INITIAL CALIBRATION VERIFICATION STANDARD RECOVERIES

The initial calibration verification standard recoveries were generally within control limits. Fluoride and nitrate recoveries from the June 6 sampling were above control limits, as was the zinc standard recovery from the June 13 sampling. The June 6 fluoride and nitrate sample results were qualified as "J," estimated. Due to the zinc result from the June 13 sampling date being previously qualified as blank contaminated, no further qualifying action was taken.

CONTINUING CALIBRATION RECOVERIES

Continuing calibration recoveries were found to be within control limits for all compounds.

LABORATORY CONTROL SPIKES

All laboratory spike recoveries were within control limits. No qualifying action was required.

MATRIX SPIKE/MATRIX SPIKE DUPLICATE FORTIFICATIONS

Generally the matrix spike and matrix spike duplicate results were within control limits. Nitrite from the June 6 sampling, and sulfate from the June 13 and 20 samplings were found to have high relative percent differences. The June 6 sampling contained no nitrite so no qualifying action for this compound was required. The sulfate results for the two above mentioned dates were qualified as estimated "J."

RESULTS

Duplicate samples (DEC-SP1-G-1 and DEC-FRSP1-G-1) were taken during the June 6th sampling event, these sample results compared well. The results from this round of sampling were compared, and found to be consistent, with data from previous sample events.

With the exception of previously noted qualifiers, all results were found to be complete and accurate.

July Monthly Monitoring Report
for the Groundwater Seeps at the
DuPont East Chicago Plant
East Chicago, Indiana

Prepared by CH2M HILL
on behalf of
E.I. du Pont de Nemours & Company

August 23, 1991

INTRODUCTION

In response to U.S. EPA's Section 308 Information Request dated February 13, 1991 and U.S. EPA's amended Information Request dated June 27, 1991, Du Pont is submitting this monthly monitoring report characterizing the quality of the groundwater seep (Groundwater Seep 1) referenced in the original request and the other two groundwater seeps (Groundwater Seeps 2 and 3) referenced in the amended request at Du Pont's East Chicago Plant. This report contains the results of the "monthly monitoring program" for July 1991.

SAMPLE COLLECTION AND ANALYSIS

The July "monthly monitoring program" sampling activities consisted of monitoring groundwater seep conditions and obtaining a grab sample from each seep, if possible, once per week. Monitoring was performed on July 2, 11, 18, and 25, 1991. Seep flow rates were measured and recorded during each sampling event (Table 1). Samples were collected from Groundwater Seep 1 on July 2, 11, 18, and 25. Samples from Groundwater Seeps 2 and 3 were not collected because the seeps were either dry or submerged* at the time. Sample fractions collected for total suspended solids and pH analyses were not filtered. All other sample fractions were filtered.

*Note:
When a groundwater seep becomes submerged beneath the surface of a water body, it (by definition) is no longer a seep and technically is no different than the rest of the groundwater discharge to that surface water body. There is no simple way to measure and distinguish this discharge from the rest of the groundwater discharge to the Grand Calumet River.

After the samples were collected, filtered, and preserved, as appropriate, the samples were shipped via overnight courier to National Environmental Testing, Inc. (NET) analytical laboratory in Bartlett, Illinois. The samples collected from Groundwater Seep 1 were analyzed for the following constituents: COD, ammonia-N, nitrate, nitrite, sulfate, chloride, fluoride, total dissolved solids, total suspended solids, arsenic, zinc, and pH. The samples collected from Groundwater Seeps 2 and 3 were to be analyzed for all of the constituents listed above, plus BOD-five day, oil and grease, and copper, as originally requested. In the amended request, BOD-five day, oil and grease, and copper were dropped from the Groundwater Seep 1 monitoring.

For quality assurance/quality control (QA/QC) purposes, a duplicate sample was collected from Groundwater Seep 1 on July 2.

ANALYTICAL RESULTS AND INTERPRETATION

Table 2 summarizes the analytical results of the "monthly monitoring program" for the month of July. The analytical results for the duplicate samples collected on July 2 are shown separated by a slash in the first data column of Table 2. All laboratory data sheets for samples collected and analyzed during July for the "monthly monitoring program" are provided in Attachment 1. Attachment 2 contains a data validation summary of QA/QC information associated with the analysis of the July seep samples.

Groundwater Seep 1 constituents remained at relatively consistent levels during July with the following exceptions: COD and total suspended solids. COD levels ranged from less than 3 to 39 mg/l and total suspended solids levels ranged from 23 to 236 mg/l.

Comparing the July data to that collected in preceding months, several observations were made. The average COD level for July was consistent with the range of COD level averages during April, May, and June (Table 3). The July average for total suspended solids was higher than the averages for the preceding months. Arsenic levels appear to be higher in July than in the preceding months.

TABLE 1

GROUNDWATER SEEP FLOW RATES (GPM)

Date	Groundwater Seep 1	Groundwater Seep 2	Groundwater Seep 3
July 2	0.93	NP**	NP**
July 11	0.72	NP*	NP**
July 18	0.48	NP*	NP**
July 25	0.35	NP*	NP**

Notes:

NP* denotes not present. No flow. Groundwater seep location dry.

NP** denotes not present. Groundwater seep location submerged below river surface. When a groundwater seep becomes submerged beneath the surface of a water body, it (by definition) is no longer a seep and technically is no different than the rest of the groundwater discharge to that surface water body. There is no simple way to measure and distinguish this discharge from the rest of the groundwater discharge to the Grand Calumet River.

TABLE 2

CONSTITUENTS DETECTED IN GROUNDWATER SEEP 1
JULY MONTHLY MONITORING PROGRAM
JULY 1991

Sample ID:	DEC-SP1-7-1	DEC-SP1-7-2	DEC-SP1-7-3	DEC-SP1-7-4	
Lab:	NET	NET	NET	NET	
Lab ID:	144148/ 144149	144650	145143	145559	
Date:	7/2/91	7/11/91	7/18/91	7/25/91	
Filtered (Yes/No):	Yes	Yes	Yes	Yes	Average
AVERAGE FLOW RATE (gpm)	0.93	0.72	0.48	0.35	0.62
WATER QUALITY PARAMETERS (mg/l)					
COD	29/29	39	7		19
Chloride	28/24	20	26	28	25
Fluoride	1.3/1.0	0.8J	0.9J	1.5J	1.1
Nitrogen, Ammonia	0.76B/0.77B		0.58B	0.75	0.53
Nitrogen, Nitrate	0.28/0.13	**	0.53	0.32	0.35
Nitrogen, Nitrite	/	**			
Total Dissolved Solids	1310/1220	1320	1550	1240	1340
Total Suspended Solids	23*/38*	135*	236*J	178*	145*
Sulfate	800/800	900	800	810	830
pH (lab)	6.8*/6.8*	7.0*	7.0*	7.0*	7.0*
TRACE INORGANIC COMPOUNDS (mg/l)					
Arsenic	0.1800/0.1690	0.1320	0.104	UJ	0.103
Zinc	1.038/0.932	0.553	0.260B	0.513B	0.578

Notes:
* Sample fraction not filtered.
**Sample analyzed, in error, for Nitrate + Nitrite (0.11 mg/l) instead of Nitrate and Nitrite.
No value denotes not detected.
NA denotes not analyzed.
J denotes estimated value.
B denotes blank contamination.
UJ denotes not detected and possibly biased low.
A value of one-half the detection limit used in averaging not detected values.
The average value of the duplicate sample results used in overall averaging.

TABLE 3

AVERAGE CONCENTRATIONS
GROUNDWATER SEEP 1
MONTHLY MONITORING PROGRAM

	April	May	June	July
AVERAGE FLOW RATE (gpm)	0.78	0.86	0.87	0.62
WATER QUALITY PARAMETERS (mg/l)				
COD	14	15	23	19
Chloride	32	32	25	25
Fluoride	1.0	1.2	1.0	1.1
Nitrogen, Ammonia	0.34	0.58	0.91	0.53
Nitrogen, Nitrate	0.47	1.3	0.94	0.35
Nitrogen, Nitrite			0.01	
Total Dissolved Solids	1260	1400	1110	1340
Total Suspended Solids	6*	6*	27*	145*
Sulfate	760	840	740	830
pH (lab)	7.2*	7.1*	7.0*	7.0*
TRACE INORGANIC COMPOUNDS (mg/l)				
Arsenic	0.046	0.054	0.068	0.103
Zinc	0.78	0.544	0.635	0.578

Notes:
* Sample fraction not filtered.
No value denotes not detected.
A value of one-half the detection limit used in averaging not detected values.
The average value of the duplicate sample results used in overall averaging.

Attachment 1
Laboratory Data Sheets
Monthly Monitoring Program

NATIONAL ENVIRONMENTAL TESTING, INC.

NET Midwest, Inc.
Bartlett Division
850 West Bartlett Road
Bartlett, IL 60103

Tel: (708) 289-3100
Fax: (708) 289-5445

ANALYTICAL REPORT

Ms. Susan Mulholland
CH2M HILL
1890 Maple Ave.
Suite 200
Evanston, IL 60201

07/22/1991

Sample No.: 144148

Job No.: 91.2119

Sample Description: DEC-SP1-7-1
CH128770.B0.MS; DuPont

Date Taken: 07/02/1991
Time Taken: 08:08

Date Received: 07/03/1991
Time Received: 09:45

Chloride	28.	mg/L
COD, Total	29.	mg/L
Fluoride	1.3	mg/L
N-Ammonia	0.76	mg/L
N-Nitrate	0.28	mg/L
N-Nitrite	<0.01	mg/L
pH	6.8	units
Solids, Total Dissolved	1310.	mg/L
Solids, Total Suspended	23.	mg/L
Sulfate	800.	mg/L
Arsenic, AA	0.1800	mg/L
Zinc, ICP	1.038	mg/L

Kelly Jones
Project Manager

NATIONAL ENVIRONMENTAL TESTING, INC.

NET Midwest, Inc.
Bartlett Division
850 West Bartlett Road
Bartlett, IL 60103

Tel: (708) 289-3100
Fax: (708) 289-5445

ANALYTICAL REPORT

Ms. Susan Mulholland
CH2M HILL
1890 Maple Ave.
Suite 200
Evanston, IL 60201

07/22/1991

Sample No.: 144149

Job No.: 91.2119

Sample Description: DEC-FRSP1-7-1
CH128770.B0.MS; DuPont

Date Taken: 07/02/1991
Time Taken: 08:08

Date Received: 07/03/1991
Time Received: 09:45

Chloride	24.	mg/L
COD, Total	29.	mg/L
Fluoride	1.0	mg/L
N-Ammonia	0.77	mg/L
N-Nitrate	0.13	mg/L
N-Nitrite	<0.01	mg/L
pH	6.8	units
Solids, Total Dissolved	1220.	mg/L
Solids, Total Suspended	38.	mg/L
Sulfate	800.	mg/L
Arsenic, AA	0.1690	mg/L
Zinc, ICP	0.932	mg/L

Kelly Jones
Project Manager

NATIONAL ENVIRONMENTAL TESTING, INC.

NET Midwest, Inc.
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ANALYTICAL REPORT

Ms. Sue Mulholland
CH2M HILL
1890 Maple Avenue
Suite 200
Evanston, IL 60201

07/25/1991

Sample No.: 144650

Job No.: 91.2279

Sample Description: DEC-SP1-7-2
CHI28770.B0.MS;Dupont-East

Date Taken: 07/11/1991
Time Taken: 12:28

Date Received: 07/12/1991
Time Received: 10:00

Chloride	20.	mg/L
COD, Total	39.	mg/L
Fluoride	0.8	mg/L
N-Ammonia	<0.01	mg/L
Nitrate + Nitrite	0.11	mg/L
pH	7.0	units
Solids, Total Dissolved	1320.	mg/L
Solids, Total Suspended	135.	mg/L
Sulfate	900.	mg/L
Arsenic, AA	0.1320	mg/L
Zinc, ICP	0.553	mg/L

Kelly Jones
Project Manager

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NET Midwest, Inc.
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ANALYTICAL REPORT

Ms. Susan Mulholland
CH2M HILL
1890 Maple Avenue
Suite 200
Evanston, IL 60201

08/07/1991

Sample No.: 145143

Job No.: 91.2424

Sample Description: DEC-SP1-7-3
CHI 28770.B0.MS; DuPont

Date Taken: 07/18/1991
Time Taken: 12:02

Date Received: 07/19/1991
Time Received: 09:00

Chloride	26.	mg/L
COD, Total	7.	mg/L
Fluoride	0.9	mg/L
N-Ammonia	0.58	mg/L
N-Nitrate	0.53	mg/L
N-Nitrite	<0.01	mg/L
pH	7.0	units
Solids, Total Dissolved	1550.	mg/L
Solids, Total Suspended	236.	mg/L
Sulfate	800.	mg/L
Arsenic, AA	0.104	mg/L
Zinc, ICP	0.260	mg/L

Kelly Jones

Kelly Jones
Project Manager

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ANALYTICAL REPORT

Ms. Susan Mulholland
CH2M HILL
1890 Maple Avenue
Suite 200
Evanston, IL 60201

08/09/1991

Sample No.: 145559

Job No.: 91.2565

Sample Description: DEC-SP1-7-4
CHI28770.B0.MS; DuPont

Date Taken: 07/25/1991
Time Taken: 09:30

Date Received: 07/26/1991
Time Received: 10:30

Chloride	28.	mg/L
COD, Total	<3.	mg/L
Fluoride	1.0	mg/L
N-Ammonia	0.75	mg/L
N-Nitrate	0.32	mg/L
N-Nitrite	<0.01	mg/L
pH	7.0	units
Solids, Total Dissolved	1240.	mg/L
Solids, Total Suspended	178.	mg/L
Sulfate	810.	mg/L
Arsenic, AA	<0.005	mg/L
Zinc, ICP	0.513	mg/L

for Paula Kalicki
Kelly Jones
Project Manager

Attachment 2
Data Validation Summary
Monthly Monitoring Program

MEMORANDUM CH2M HILL

TO: Pixie Newman/CHI
Susan Mulholland/CHI

FROM: Dan MacGregor/GLO

DATE: August 26, 1991

SUBJECT: Data Validation for Groundwater Seep Samples
Du Pont East Chicago, Indiana

PROJECT: CHI28770.B0.MR

INTRODUCTION

This memorandum presents the data validation discussion for the inorganic analytical results for groundwater seep samples collected on July 2, 11, 18, and 25, 1991, at the Du Pont Plant in East Chicago, Indiana. Sampling was performed in compliance with the U.S. EPA-requested "monthly monitoring program."

Samples were analyzed for major ions and selected metals by NET Laboratories in Barlett, Illinois. Sample collection and transport were performed under strict chain-of-custody procedures. Requested QA/QC data were limited to holding time data, chain-of-custody forms, calibration and procedure blank results, initial calibration verification and standard recoveries, continuing calibration recovery results, sample duplicate results, matrix spike and matrix spike duplicate results, and laboratory spike results. The QA/QC and sample data were reviewed as described below.

HOLDING TIMES

Inspection of holding times for the inorganic analyses showed that all holding times were met.

CHAIN OF CUSTODY

The chain of custody forms were reviewed for accuracy and completeness. All necessary information was provided and found to be accurate. All requested analyses were performed, and the data packages were complete.

BLANKS

The calibration and procedure blank results were inspected for possible contaminants. Zinc was found in the July 18 and 25 procedure blanks. Zinc results from these dates were qualified as possibly blank contaminated "B." Ammonia was found in the July 2, 11, and 18 procedure blanks. Ammonia results from the July 2 and 18 sampling dates were qualified as possibly blank contaminated. No ammonia was detected in the July 11 seep sample, thus no qualifying action was required with this sample. Any other compounds that may have been present were at concentrations equal to or less than their reporting limits.

INITIAL CALIBRATION VERIFICATION STANDARD RECOVERIES

The initial calibration verification standard recoveries were all within control limits. Initial calibration results for total suspended solids (TSS) were not provided for the July 11 sample results. No qualifying action was taken.

CONTINUING CALIBRATION RECOVERIES

Continuing calibration recoveries were found to be within control limits for all compounds, except fluoride. Fluoride results from the July 11, 18 and 25 samplings dates were outside control limits. The fluoride results from these dates were qualified as estimated "J."

LABORATORY CONTROL SPIKES

All laboratory spike recoveries were within control limits. No qualifying action was required.

MATRIX SPIKE/MATRIX SPIKE DUPLICATE FORTIFICATIONS

Generally the matrix spike and matrix spike duplicate results were within control limits. The relative percent difference (RPD) for fluoride and TSS were outside control limits for the July 18 sampling date, and the zinc and arsenic recoveries from the July 25 sampling date were below control limits. Due to the zinc and fluoride results for these dates being previously qualified no further qualifying action was taken. Arsenic was not detected in the July 25 sampling and as a result the less than value was qualified as not detected and possibly biased low "UJ." The TSS result from the July 18 sampling was qualified as estimated "J."

RESULTS

Duplicate samples (DEC-SP1-7-1 and DEC-FRSP1-7-1) were collected during the July 2 sampling event. These sample results compared well. The results from July's sampling were compared, and found to be generally consistent, with data from previous sampling events. One exception is the arsenic results from the July 2 and 11 sampling events. Arsenic has been routinely found in Seep 1 samples, but the values associated with these sampling dates are two to three times the average of the previously analyzed samples. After reviewing the data and discussions with NET laboratory personnel, the values appear to be valid.

The lab performance for this month of sampling was poor, 30% of all results from the July 18 and 25 sampling dates required qualification.

With the exception of previously noted qualifiers, all results were found to be complete and accurate.

August Monthly Monitoring Report for the Groundwater Seeps at the Du Pont East Chicago Plant East Chicago, Indiana

Prepared by CH2M HILL
on behalf of
E.I. du Pont de Nemours & Company

September 24, 1991

CHI185/035.51

Introduction

In response to U.S. EPA's Section 308 Information Request dated February 13, 1991, and U.S. EPA's amended Information Request dated June 27, 1991, Du Pont is submitting this monthly monitoring report characterizing the quality of the groundwater seep referenced in the original request (Groundwater Seep 1) and two other groundwater seeps referenced in the amended request (Groundwater Seeps 2 and 3) at Du Pont's East Chicago Plant. This report contains the results of the "monthly monitoring program" for August 1991.

Sample Collection and Analysis

The August "monthly monitoring program" sampling activities consisted of monitoring groundwater seep conditions and obtaining a grab sample from each seep, if possible, once per week. Monitoring was performed on August 1, 8, 15, 22, and 29, 1991. Seep flow rates were measured and recorded during each sampling event (Table 1). Samples were collected from Groundwater Seep 1 on August 1, 15, 22, and 29. Samples from Groundwater Seep 2 were not collected because the seep was not present (it was either dry or submerged*) at monitoring times. Samples from Groundwater Seep 3 were collected on

*Note:
When a groundwater seep becomes submerged beneath the surface of a water body, it (by definition) is no longer a seep and technically is no different than the rest of the groundwater discharge to that surface water body. There is no simple way to measure and distinguish this discharge from the rest of the groundwater discharge to the Grand Calumet River.

August 1, 15, and 29. Groundwater Seep 3 was not present on August 22. On August 8, all three groundwater seeps were submerged beneath the Grand Calumet River surface.

Sample fractions collected for oil and grease, total suspended solids, and pH analyses were not filtered. All other sample fractions were filtered.

After the samples were collected, filtered, and preserved, as appropriate, the samples were shipped via overnight courier to National Environmental Testing, Inc. (NET) analytical laboratory in Bartlett, Illinois. The samples collected from Groundwater Seep 1 were analyzed for the following constituents: chemical oxygen demand (COD), ammonia-N, nitrate, nitrite, sulfate, chloride, fluoride, total dissolved solids, total suspended solids, arsenic, zinc, and pH. The samples collected from Groundwater Seep 3 were analyzed for all of the constituents listed above, plus biological oxygen demand (BOD-five day), oil and grease, and copper, as originally requested. In the amended request, BOD-five day, oil and grease, and copper were dropped from the Groundwater Seep 1 monitoring requirements.

For quality assurance/quality control (QA/QC) purposes, a field blank and duplicate samples from Groundwater Seep 1 were collected on August 1.

Analytical Results and Interpretation

Tables 2 (Groundwater Seep 1) and 3 (Groundwater Seep 3) summarize the analytical results of the "monthly monitoring program" for the month of August. The analytical results for the duplicate samples collected on August 1 are shown separated by a slash in the first data column of Table 2. All laboratory data sheets for samples collected and analyzed during August for the "monthly monitoring program" are provided in Attachment 1. Attachment 2 contains a data validation summary of QA/QC information associated with the analysis of the August groundwater seep samples.

Except for COD, Groundwater Seep 1 constituents remained at relatively consistent levels during August. COD levels ranged from less than 3 to 46 mg/l. Groundwater Seep 3 constituent levels were relatively consistent for at least two of the three August Groundwater Seep 3 data sets. Generalizations regarding trends in water quality can be formulated when more data are available for this groundwater seep.

Comparing the August Groundwater Seep 1 data to that collected in preceding months for Groundwater Seep 1, several observations were made. The average COD level for August was consistent with the range of COD level averages during April, May, June, and July (Table 4). Nitrate, arsenic, and zinc levels appear to be lower in August than in the preceding months.

TABLE 1

GROUNDWATER SEEP FLOW RATES (GPM)
AUGUST MONTHLY MONITORING PROGRAM
AUGUST 1991

Date	Groundwater Seep 1	Groundwater Seep 2	Groundwater Seep 3
August 1	0.28	NP*	0.10
August 8	NP**	NP**	NP**
August 15	0.37	NP*	0.61
August 22	0.38	NP*	NP**
August 29	0.36	NP*	0.47

Notes:
NP* denotes not present. No flow. Groundwater seep location dry.
NP** denotes not present. Groundwater seep location submerged below river surface. When a groundwater seep becomes submerged beneath the surface of a water body, it (by definition) is no longer a seep and technically is no different than the rest of the groundwater discharge to that surface water body. There is no simple way to measure and distinguish this discharge from the rest of the groundwater discharge to the Grand Calumet River.

TABLE 2

CONSTITUENTS DETECTED IN GROUNDWATER SEEP 1
AUGUST MONTHLY MONITORING PROGRAM
AUGUST 1991

Sample ID:	DEC-SP1-8-1	DEC-SP1-8-3	DEC-SP1-8-4	DEC-SP1-8-5	
Lab:	NET	NET	NET	NET	
Lab ID:	146136/ 146137	146983	147511	147899	
Date:	8/1/91	8/15/91	8/22/91	8/29/91	
Filtered (Yes/No):	Yes	Yes	Yes	Yes	Average
AVERAGE FLOW RATE (gpm)	0.28	0.37	0.38	0.36	0.35
WATER QUALITY PARAMETERS (mg/l)					
COD	33/16	46J		13	21
Chloride	26/28	10B	26	30	23
Fluoride	0.9J/0.9J	0.8J	1.1	0.6J	0.9
Nitrogen, Ammonia	0.67/0.86	0.41	0.51	0.43	0.53
Nitrogen, Nitrate	0.10B/0.08B	0.07B	0.07B	0.09B	0.08
Nitrogen, Nitrite	/		0.6		0.15
Total Dissolved Solids	1310/1370	1490	1420	1360	1400
Total Suspended Solids	27*/18*	13*	62*	13*	28*
Sulfate	800/900	900	800	800	840
pH (lab)	6.8*/6.8*	7.1*	7.0*	7.0*	7.0*
TRACE INORGANIC COMPOUNDS (mg/l)					
Arsenic	0.022/0.022	0.0240			0.017
Zinc	0.551/0.606	0.225	0.359	0.349	0.378

Notes:
* Sample fraction not filtered.
No value denotes not detected.
J denotes estimated value.
B denotes blank contamination.
A value of one-half the detection limit used in averaging not detected values.
The average value of the duplicate sample results used in overall averaging.

TABLE 3

CONSTITUENTS DETECTED IN GROUNDWATER SEEP 3
AUGUST MONTHLY MONITORING PROGRAM
AUGUST 1991

Sample ID:	DEC-SP3-8-1	DEC-SP3-8-3	DEC-SP3-8-5	
Lab:	NET	NET	NET	
Lab ID:	146139	146985	147900	
Date:	8/1/91	8/15/91	8/29/91	
Filtered (Yes/No):	Yes	Yes	Yes	Average
AVERAGE FLOW RATE (gpm)	0.10	0.61	0.47	0.39
WATER QUALITY PARAMETERS (mg/l)				
BOD-Five Day	3	4	6	4
COD	10	20J	13	14
Chloride	24	26B	34	28
Fluoride	1.9J	1.0J	0.6J	1.2
Nitrogen, Ammonia	2.7	4.0	3.61	3.4
Nitrogen, Nitrate	0.72B	0.31B	0.26B	0.43
Nitrogen, Nitrite				
Oil and Grease	*	2*	*	1*
Total Dissolved Solids	2930	3530	2880	3110
Total Suspended Solids	63*	69*	429*	190*
Sulfate	2100	2600	900	1900
pH (lab)	6.1*	6.1*	6.2*	6.1*
TRACE INORGANIC COMPOUNDS (mg/l)				
Arsenic		0.0100		0.005
Copper	0.124		0.037	0.055
Zinc	2.974	35.8	27.1	22.0

Notes:
* Sample fraction not filtered.
No value denotes not detected.
J denotes estimated value.
B denotes blank contamination.
A value of one-half the detection limit used in averaging not detected values.
The average value of the duplicate sample results used in overall averaging.

TABLE 4

AVERAGE CONCENTRATIONS IN GROUNDWATER SEEP 1
MONTHLY MONITORING PROGRAM
1991

	April	May	June	July	August
AVERAGE FLOW RATE (gpm)	0.78	0.86	0.87	0.62	0.35
WATER QUALITY PARAMETERS (mg/l)					
COD	14	15	23	19	21
Chloride	32	32	25	25	23
Fluoride	1.0	1.2	1.0	1.1	0.9
Nitrogen, Ammonia	0.34	0.58	0.91	0.53	0.53
Nitrogen, Nitrate	0.47	1.3	0.94	0.35	0.08
Nitrogen, Nitrite			0.01		0.15
Total Dissolved Solids	1260	1400	1110	1340	1400
Total Suspended Solids	6*	6*	27*	145*	28*
Sulfate	760	840	740	830	840
pH (lab)	7.2*	7.1*	7.0*	7.0*	7.0*
TRACE INORGANIC COMPOUNDS (mg/l)					
Arsenic	0.046	0.054	0.068	0.103	0.017
Zinc	0.78	0.544	0.635	0.578	0.378

Notes:
* Sample fraction not filtered.
No value denotes not detected.
A value of one-half the detection limit used in averaging not detected values.
The average value of the duplicate sample results used in overall averaging.

Attachment 1
Laboratory Data Sheets
Monthly Monitoring Program

NATIONAL ENVIRONMENTAL TESTING, INC.

NET Midwest, Inc.
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ANALYTICAL REPORT

Ms. Susan Mulholland
CH2M HILL
1890 Maple Ave
Suite 200
Evanston, IL 60201

08/20/1991

Sample No.: 146136

Job No.: 91.2711

Sample Description: DEC-SP1-8-1
CH128770.B0.MS; DuPont

Date Taken: 08/01/1991
Time Taken: 08:46
IEPA Cert. No. 100221

Date Received: 08/02/1991
Time Received: 10:30
WDNR Cert. No. 999447130

Chloride	26.	mg/L
COD, Total	33.	mg/L
Fluoride	0.9	mg/L
N-Ammonia	0.67	mg/L
N-Nitrate	0.10	mg/L
N-Nitrite	<0.01	mg/L
pH	6.8	units
Solids, Total Dissolved	1310.	mg/L
Solids, Total Suspended	27.	mg/L
Sulfate	800.	mg/L
Arsenic, AA	0.022	mg/L
Zinc, ICP	0.551	mg/L

Neal E. Cleghorn
Project Manager

NATIONAL ENVIRONMENTAL TESTING, INC.

NET Midwest, Inc.
Bartlett Division
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Bartlett, IL 60103

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ANALYTICAL REPORT

Ms. Susan Mulholland
CH2M HILL
1890 Maple Ave
Suite 200
Evanston, IL 60201

08/20/1991

Sample No.: 146137

Job No.: 91.2711

Sample Description: DEC-FRSP1-8-1
CH128770.B0.MS; DuPont

Date Taken: 08/01/1991
Time Taken: 08:46
IEPA Cert. No. 100221

Date Received: 08/02/1991
Time Received: 10:30
WDNR Cert. No. 999447130

Chloride	28.	mg/L
COD, Total	16.	mg/L
Fluoride	0.9	mg/L
N-Ammonia	0.86	mg/L
N-Nitrate	0.08	mg/L
N-Nitrite	<0.01	mg/L
pH	6.8	units
Solids, Total Dissolved	1370.	mg/L
Solids, Total Suspended	18.	mg/L
Sulfate	900.	mg/L
Arsenic, AA	0.022	mg/L
Zinc, ICP	0.606	mg/L

Neal E. Cleghorn
Project Manager

NATIONAL ENVIRONMENTAL TESTING, INC.

NET Midwest, Inc.
Bartlett Division
850 West Bartlett Road
Bartlett, IL 60103

Tel: (708) 289-3100
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ANALYTICAL REPORT

Ms. Susan Mulholland
CH2M HILL
1890 Maple Av.
Suite 200
Evanston, IL 60201

09/05/1991

Sample No.: 146983

Job No.: 91.2953

Sample Description: DEC-SP1-8-3
CHI28770.B0.MS; DuPont

Date Taken: 08/15/1991
Time Taken: 13:14
IEPA Cert. No.: 100221

Date Received: 08/16/1991
Time Received: 10:00
WDNR Cert. No.: 999447130

Chloride	10.	mg/L
COD, Total	46.	mg/L
Fluoride	0.8	mg/L
N-Ammonia	0.41	mg/L
N-Nitrate	0.07	mg/L
N-Nitrite	<0.01	mg/L
pH	7.1	units
Solids, Total Dissolved	1490.	mg/L
Solids, Total Suspended	13.	mg/L
Sulfate	900.	mg/L
Arsenic, AA	0.0240	mg/L
Zinc, ICP	0.225	mg/L

Kelly Jones

Kelly Jones
Project Manager

NATIONAL ENVIRONMENTAL TESTING, INC.

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ANALYTICAL REPORT

Ms. Susan Mulholland
CH2M HILL
1890 Maple Avenue
Suite 200
Evanston, IL 60201

09/09/1991

Sample No.: 147511

Job No.: 91.3099

Sample Description: DEC-SP1-8-4
CHI28770.B0.MS; DuPont

Date Taken: 08/22/1991
Time Taken: 11:30
IEPA Cert. No.: 100221

Date Received: 08/23/1991
Time Received: 10:00
WDNR Cert. No.: 999447130

Chloride	26.	mg/L
COD, Total	<3.	mg/L
Fluoride	1.1	mg/L
N-Ammonia	0.51	mg/L
N-Nitrate	0.07	mg/L
N-Nitrite	0.6	mg/L
pH	7.0	units
Solids, Total Dissolved	1420.	mg/L
Solids, Total Suspended	62.	mg/L
Sulfate	800.	mg/L
Arsenic, AA	<0.005	mg/L
Zinc, AA	0.359	mg/L

Kelly Jones
Project Manager

NATIONAL ENVIRONMENTAL TESTING, INC.

NET Midwest, Inc.
Bartlett Division
850 West Bartlett Road
Bartlett, IL 60103

Tel: (708) 289-3100
Fax: (708) 289-5445

ANALYTICAL REPORT

Ms. Susan Mulholland
CH2M HILL
1033 University Place
Suite 300
Evanston, IL 60201-3137

09/09/1991

Sample No.: 147899

Job No.: 91.3229

Sample Description: Seep 1;DEC-SPI-8-5
DuPont East Chicago Seep 1

Date Taken: 08/29/1991
Time Taken: 08:15
IEPA Cert. No. 100221

Date Received: 08/30/1991
Time Received: 10:00
WDNR Cert. No. 999447130

Chloride	30.	mg/L
COD, Total	13.	mg/L
Fluoride	0.6	mg/L
N-Ammonia	0.43	mg/L
N-Nitrate	0.09	mg/L
N-Nitrite	<0.01	mg/L
pH	7.0	units
Solids, Total Dissolved	1360.	mg/L
Solids, Total Suspended	13.	mg/L
Sulfate	800.	mg/L
Arsenic, AA	<0.04	mg/L
Zinc, ICP	0.349	mg/L

Kelly Jones

Kelly Jones
Project Manager

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ANALYTICAL REPORT

Ms. Susan Mulholland
CH2M HILL
1890 Maple Ave
Suite 200
Evanston, IL 60201

08/20/1991

Sample No.: 146139

Job No.: 91.2712

Sample Description: DEC-SP3-8-1
CH128770.B0.3S; DuPont

Date Taken: 08/01/1991
Time Taken: 10:24
IEPA Cert. No. 100221

Date Received: 08/02/1991
Time Received: 10:30
WDNR Cert. No. 999447130

BOD, Five Day	3.	mg/L
Chloride	24.	mg/L
COD, Total	10.	mg/L
Fluoride	1.9	mg/L
N-Ammonia	2.7	mg/L
N-Nitrate	0.72	mg/L
N-Nitrite	<0.01	mg/L
Oil & Grease	<1.	mg/L
pH	6.1	units
Solids, Total Dissolved	2930.	mg/L
Solids, Total Suspended	63.	mg/L
Sulfate	2100.	mg/L
Arsenic, AA	<0.005	mg/L
Copper, ICP	0.124	mg/L
Zinc, ICP	2.974	mg/L

Neal E. Cleghorn
Project Manager

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ANALYTICAL REPORT

Ms. Susan Mulholland
CH2M HILL
1890 Maple Av.
Suite 200
Evanston, IL 60201

09/04/1991

Sample No.: 146985

Job No.: 91.2954

Sample Description: DEC-SP3-8-3
CHI28770.B0.3R

Date Taken: 08/15/1991
Time Taken: 15:25
IEPA Cert. No.: 100221

Date Received: 08/16/1991
Time Received: 10:00
WDNR Cert. No.: 999447130

BOD, Five Day	4.	mg/L
Chloride	26.	mg/L
COD, Total	20.	mg/L
Fluoride	1.0	mg/L
N-Ammonia	4.0	mg/L
N-Nitrate	0.31	mg/L
N-Nitrite	<0.01	mg/L
Oil & Grease	2.	mg/L
pH	6.1	units
Solids, Total Dissolved	3530.	mg/L
Solids, Total Suspended	69.	mg/L
Sulfate	2600.	mg/L
Arsenic, AA	0.0100	mg/L
Copper, ICP	<0.010	mg/L

Kelly Jones
Kelly Jones
Project Manager

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ANALYTICAL REPORT

Ms. Susan Mulholland
CH2M HILL
1890 Maple Av.
Suite 200
Evanston, IL 60201

09/04/1991

Sample No.: 146985

Job No.: 91.2954

Sample Description: DEC-SP3-8-3
CHI28770.B0.3R

Date Taken: 08/15/1991
Time Taken: 15:25
IEPA Cert. No.: 100221

Date Received: 08/16/1991
Time Received: 10:00
WDNR Cert. No.: 999447130

Zinc, ICP	35.8	mg/L

Kelly Jones

Kelly Jones
Project Manager

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ANALYTICAL REPORT

Ms. Susan Mulholland
CH2M HILL
1033 University Place
Evanston, IL 60201

09/09/1991

Sample No.: 147900

Job No.: 91.3230

Sample Description: Seep 3; DEC-SP3-8-5
DuPont East Chicago Seep 1

Date Taken: 08/29/1991
Time Taken: 09:16
IEPA Cert. No. 100221

Date Received: 08/30/1991
Time Received: 10:00
WDNR Cert. No. 999447130

BOD, Five Day	6.	mg/L
Chloride	34.	mg/L
COD, Total	13.	mg/L
Fluoride	0.6	mg/L
N-Ammonia	3.61	mg/L
N-Nitrate	0.26	mg/L
N-Nitrite	<0.01	mg/L
Oil & Grease	<1.	mg/L
pH	6.2	units
Solids, Total Dissolved	2880.	mg/L
Solids, Total Suspended	429.	mg/L
Sulfate	900.	mg/L
Arsenic, AA	<0.004	mg/L
Copper, ICP	0.037	mg/L
Zinc, ICP	27.1	mg/L

Kelly Jones

Kelly Jones
Project Manager

Attachment 2
Data Validation Summary
Monthly Monitoring Program

MEMORANDUM CH2M HILL

TO: Pixie Newman/CHI
Susan Mulholland/CHI

FROM: Dan MacGregor/GLO

DATE: September 16, 1991

SUBJECT: Data Validation for Groundwater Seep Samples
Du Pont East Chicago, Indiana

PROJECT: CHI28770.B0.MR

Introduction

This memorandum presents the data validation discussion for the inorganic analytical results for groundwater seep samples collected on August 1, 15, 22, and 29, 1991, at the Du Pont Plant in East Chicago, Indiana. Sampling was performed in compliance with the U.S. EPA-requested "monthly monitoring program."

Samples were analyzed for major ions and selected metals by NET Laboratories in Bartlett, Illinois. Sample collection and transport were performed under strict chain-of-custody procedures. Requested QA/QC data included holding time data, chain-of-custody forms, calibration and method blank results, initial calibration verification and standard recoveries, continuing calibration recovery results, sample duplicate results, matrix spike and matrix spike duplicate results, and laboratory spike results. The QA/QC and sample data were reviewed as described below.

Holding Times

Inspection of holding times showed that the holding time requirements as specified by the EPA *Methods for Chemical Analysis of Water and Wastes* were met.

Chain of Custody

The chain-of-custody forms were reviewed for accuracy and completeness. All necessary information was provided and found to be accurate. All requested analyses were performed, and the data packages were complete.

Blanks

The field blank sampled and analyzed with the August 1 samples contained concentrations of chloride (4 mg/L), ammonia (0.05 mg/L), and nitrate (0.04 mg/L). As a result, the following results were qualified as possibly blank contaminated and flagged with a "B":

- The nitrate results from August 1
- The chloride and nitrate results from August 15
- The nitrate result from August 22
- The nitrate results from August 29

The calibration and procedure blank results were inspected for possible contaminants. The calibration blanks were free of compound concentrations equal to or greater than compound reporting limits. Zinc was found in the August 1 method blank, and ammonia was found in the August 15 method blank. The concentrations of these method blank contaminants were at least a factor of five lower than their corresponding sample concentrations. Subsequently, data qualification was not necessary.

Initial Calibration Verification Standard Recoveries

With one exception, the initial calibration verification standard recoveries were all within control limits, ±10 percent of true value. The fluoride recovery associated with the August 29 data was outside control limits. As a result, the fluoride results from that date were qualified as estimated and flagged with a "J."

Continuing Calibration Recoveries

Continuing calibration recoveries were found to be within control limits for all compounds except fluoride and COD. Fluoride results from the August 1 and 15 samplings and COD from the August 15 sampling were outside the ±10 percent control limit. The fluoride and COD results for their respective dates were qualified as estimated "J."

Laboratory Control Spikes

The laboratory spike recoveries were within the control limit of ±20 percent of true value. No qualifying action was required.

Matrix Spike / Matrix Spike Duplicate Fortifications

The matrix spike and matrix spike duplicate results, with one exception, were within control limits. The relative percent difference for oil and grease was outside control limits for the August 29 sample. Oil and grease were not detected in the sample, and thus data qualification was not required.

Duplicates

Duplicate samples (DEC-SP1-8-1 and DEC-FRSP1-8-1) were taken during the August 1 sampling event. Three compounds had relative percent differences greater than the 25 percent control limit. Upon reviewing previous months' results with results from this round of sampling, it was determined that this round of analytical results were consistent with previous results and thus no qualifiers were added.

Results

Generally sample results were found to be complete and accurate. With the exception of the qualified samples, the Groundwater Seep 3 results appear to be valid and usable. The Groundwater Seep 1 arsenic result from August 29 had a detection limit of 0.04 mg/L. This detection limit is a factor of 10 greater than the expected detection limit. This increase in the detection limit resulted from NET being required to subcontract out its arsenic analyses, in this instance to a laboratory with a higher arsenic detection limit. Unfortunately, when arsenic appears it is at a concentration between 0.004 mg/L and 0.04 mg/L, rendering the arsenic data unusable. With the exception of qualified data and the aforementioned arsenic result, the data results from Groundwater Seep 1 appear to be valid and usable.

September Monthly Monitoring Report for the Groundwater Seeps at the Du Pont East Chicago Plant East Chicago, Indiana

Prepared by CH2M HILL
on behalf of
E.I. du Pont de Nemours & Company

October 23, 1991

CHI185/035.51

Introduction

In response to U.S. EPA's Section 308 Information Request dated February 13, 1991, and U.S. EPA's amended Information Request dated June 27, 1991, Du Pont is submitting this monthly monitoring report characterizing the quality of the groundwater seep referenced in the original request (Groundwater Seep 1) and two other groundwater seeps referenced in the amended request (Groundwater Seeps 2 and 3) at Du Pont's East Chicago Plant. This report contains the results of the "monthly monitoring program" for September 1991.

Sample Collection and Analysis

The September "monthly monitoring program" sampling activities consisted of monitoring groundwater seep conditions and obtaining a grab sample from each seep, if possible, once per week. Monitoring was performed on September 5, 12, 19, and 26, 1991. Seep flow rates were measured and recorded during each sampling event (Table 1). Samples were collected from Groundwater Seep 1 on September 5, 12, and 19. Samples from Groundwater Seep 2 were not collected because the seep was not present at the monitoring times. A sample was collected from Groundwater Seep 3 on September 5. Groundwater Seep 3 was not present on September 12 and 19. None of the three groundwater seeps were present on September 26.

Sample fractions collected for oil and grease, total suspended solids, and pH analyses were

not filtered. All other sample fractions were filtered.

After the samples were collected, filtered, and preserved, as appropriate, the samples were shipped via overnight courier to National Environmental Testing, Inc. (NET) analytical laboratory in Bartlett, Illinois. The samples collected from Groundwater Seep 1 were analyzed for the following constituents: chemical oxygen demand (COD), ammonia-N, nitrate, nitrite, sulfate, chloride, fluoride, total dissolved solids, total suspended solids, arsenic, zinc, and pH. The sample collected from Groundwater Seep 3 was analyzed for all of the constituents listed above, plus biological oxygen demand (BOD-five day), oil and grease, and copper, as originally requested. In the amended request, BOD-five day, oil and grease, and copper were dropped from the Groundwater Seep 1 monitoring requirements.

For quality assurance/quality control (QA/QC) purposes, duplicate samples from Groundwater Seep 1 were collected on September 12.

Analytical Results and Interpretation

Tables 2 and 3 summarize the analytical results of the "monthly monitoring program" for the month of September for Groundwater Seeps 1 and 3, respectively. The analytical results for the duplicate samples collected on September 12 are shown separated by a slash in the second data column of Table 2. All laboratory data sheets for samples collected and analyzed during September for the "monthly monitoring program" are provided in Attachment 1.

Attachment 2 contains a data validation summary of QA/QC information associated with the analysis of the September groundwater seep samples.

With few exceptions, Groundwater Seep 1 constituents remained at relatively consistent levels during September. Comparing the September Groundwater Seep 1 data to that collected in preceding months for Groundwater Seep 1 (Table 4), the following observations were made:

- The average COD, fluoride, and total suspended solids concentrations for September were lower than all previous months in the "monthly monitoring program."

- The average chloride, sulfate, and arsenic concentrations for September were higher than all previous months in the "monthly monitoring program."

Generalizations regarding trends in Groundwater Seep 3 water quality can be formulated when more data are available for this groundwater seep.

TABLE 1

GROUNDWATER SEEP FLOW RATES (GPM)
SEPTEMBER MONTHLY MONITORING PROGRAM
SEPTEMBER 1991

Date	Groundwater Seep 1	Groundwater Seep 2	Groundwater Seep 3
September 5	0.48	NP*	0.26
September 12	0.56	NP*	NP***
September 19	0.05	NP*	NP*
September 26	NP*	NP*	NP*

Notes:
NP* denotes not present. No flow. Groundwater seep location dry.
NP** denotes not present. Groundwater seep location submerged below river surface. When a groundwater seep becomes submerged beneath the surface of a water body, it (by definition) is no longer a seep and technically is no different than the rest of the groundwater discharge to that surface water body. There is no simple way to measure and distinguish this discharge from the rest of the groundwater discharge to the Grand Calumet River.
NP*** denotes not present. No flow. Groundwater seep location wet, but no flow to river.

TABLE 2

CONSTITUENTS DETECTED IN GROUNDWATER SEEP 1
SEPTEMBER MONTHLY MONITORING PROGRAM
SEPTEMBER 1991

Sample ID:	DEC-SP1-9-1	DEC-SP1-9-2	DEC-SP1-9-3	
Lab:	NET	NET	NET	
Lab ID:	148385	148709/ 148710	149109	
Date:	9/5/91	9/12/91	9/19/91	
Filtered (Yes/No):	Yes	Yes	Yes	Average**
AVERAGE FLOW RATE (gpm)	0.48	0.56	0.05	0.36
WATER QUALITY PARAMETERS (mg/l)				
COD	3J	7J/	13J	7
Chloride	78	24/24	28	43
Fluoride	0.9J	0.5J/0.6J	1.0	0.8
Nitrogen, Ammonia	1.06	0.79/0.68	0.46	0.75
Nitrogen, Nitrate	0.31J	0.22/0.19	0.42	0.31
Nitrogen, Nitrite		/		
Total Dissolved Solids	1340	1140/1310	1200	1260
Total Suspended Solids	8*	3*/9*	*	5*
Sulfate	900	800/900	800	850
pH (lab)	7.0*	6.8*/6.9*	7.5*	7.1*
TRACE INORGANIC COMPOUNDS (mg/l)				
Arsenic	0.096	1.69J/1.39J	1.32J	0.99
Zinc	0.565	0.562/0.785	0.060B	0.433

Notes:
* Sample fraction not filtered.
**Average based on three sampling events.
No value denotes not detected.
J denotes estimated value.
B denotes blank contamination.
A value of one-half the detection limit used in averaging not detected values.
The average value of the duplicate sample results used in overall averaging.

TABLE 3

CONSTITUENTS DETECTED IN GROUNDWATER SEEP 3
SEPTEMBER MONTHLY MONITORING PROGRAM
SEPTEMBER 1991

Sample ID:	DEC-SP3-9-1
Lab:	NET
Lab ID:	148386
Date:	9/5/91
Filtered (Yes/No):	Yes
AVERAGE FLOW RATE (gpm)	0.26
WATER QUALITY PARAMETERS (mg/l)	
BOD-Five Day	4
COD	23J
Chloride	68
Fluoride	1.0J
Nitrogen, Ammonia	4.6
Nitrogen, Nitrate	0.50J
Nitrogen, Nitrite	
Oil and Grease	2*
Total Dissolved Solids	2900
Total Suspended Solids	46*
Sulfate	1770
pH (lab)	6.4*
TRACE INORGANIC COMPOUNDS (mg/l)	
Arsenic	
Copper	0.013
Zinc	28.1

Notes:
* Sample fraction not filtered.
No value denotes not detected.
J denotes estimated value.
B denotes blank contamination.

TABLE 4

AVERAGE CONCENTRATIONS IN GROUNDWATER SEEP 1
MONTHLY MONITORING PROGRAM
1991

	April	May	June	July	August	September
AVERAGE FLOW RATE (gpm)	0.78	0.86	0.87	0.62	0.35	0.36
WATER QUALITY PARAMETERS (mg/l)						
COD	14	15	23	19	21	7
Chloride	32	32	25	25	23	43
Fluoride	1.0	1.2	1.0	1.1	0.9	0.8
Nitrogen, Ammonia	0.34	0.58	0.91	0.53	0.53	0.75
Nitrogen, Nitrate	0.47	1.3	0.94	0.35	0.08	0.31
Nitrogen, Nitrite			0.01		0.15	
Total Dissolved Solids	1260	1400	1110	1340	1400	1260
Total Suspended Solids	6*	6*	27*	145*	28*	5*
Sulfate	760	840	740	830	840	850
pH (lab)	7.2*	7.1*	7.0*	7.0*	7.0*	7.1*
TRACE INORGANIC COMPOUNDS (mg/l)						
Arsenic	0.046	0.054	0.068	0.103	0.017	0.99
Zinc	0.78	0.544	0.635	0.578	0.378	0.433

Notes:
* Sample fraction not filtered.
No value denotes not detected.
A value of one-half the detection limit used in averaging not detected values.
The average value of the duplicate sample results used in overall averaging.

Attachment 1
Laboratory Data Sheets
Monthly Monitoring Program

NATIONAL ENVIRONMENTAL TESTING, INC.

NET Midwest, Inc.
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850 West Bartlett Road
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Tel: (708) 289-3100
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ANALYTICAL REPORT

Ms. Susan Mulholland
CH2M HILL
1033 University Place
Suite 300
Evanston, IL 60201-3137

09/23/1991

Sample No.: 148385

Job No.: 91.3349

Sample Description: DEC-SP1-9-1
CHI28770B0.MS; DuPont

Date Taken: 09/05/1991
Time Taken: 08:51
IEPA Cert. No.: 100221

Date Received: 09/06/1991
Time Received: 10:00
WDNR Cert. No.: 999447130

Chloride	78.	mg/L
COD, Total	3.	mg/L
Fluoride	0.9	mg/L
N-Ammonia	1.06	mg/L
N-Nitrate	0.31	mg/L
N-Nitrite	<0.01	mg/L
pH	7.0	units
Solids, Total Dissolved	1340.	mg/L
Solids, Total Suspended	8.	mg/L
Sulfate	900.	mg/L
Arsenic, AA	0.096	mg/L
Zinc, ICP	0.565	mg/L

Kelly Jones
Project Manager

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ANALYTICAL REPORT

Ms. Susan Mulholland
CH2M HILL
1033 University Place
Suite 300
Evanston, IL 53201

09/27/1991

Sample No.: 148709

Job No.: 91.3457

Sample Description: DEC-SP1-9-2
CH128770.B0.MS; DuPont

Date Taken: 09/12/1991
Time Taken: 09:33
IEPA Cert. No.: 100221

Date Received: 09/13/1991
Time Received: 10:00
WDNR Cert. No.: 999447130

Chloride	24.	mg/L
COD, Total	7.	mg/L
Fluoride	0.5	mg/L
N-Ammonia	0.79	mg/L
N-Nitrate	0.22	mg/L
N-Nitrite	<0.01	mg/L
pH	6.8	units
Solids, Total Dissolved	1140.	mg/L
Solids, Total Suspended	3.	mg/L
Sulfate	800.	mg/L
Arsenic, AA	1.69	mg/L
Zinc, ICP	0.562	mg/L

Kelly Jones
Project Manager

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ANALYTICAL REPORT

Ms. Susan Mulholland
CH2M HILL
1033 University Place
Suite 300
Evanston, IL 53201

09/27/1991

Sample No.: 148710

Job No.: 91.3457

Sample Description: DEC-FRSP1-9-2
CH128770.B0.MS; DuPont

Date Taken: 09/12/1991
Time Taken: 09:37
IEPA Cert. No.: 100221

Date Received: 09/13/1991
Time Received: 10:00
WDNR Cert. No.: 999447130

Chloride	24.	mg/L
COD, Total	<3.	mg/L
Fluoride	0.6	mg/L
N-Ammonia	0.68	mg/L
N-Nitrate	0.19	mg/L
N-Nitrite	<0.01	mg/L
pH	6.9	units
Solids, Total Dissolved	1310.	mg/L
Solids, Total Suspended	9.	mg/L
Sulfate	900.	mg/L
Arsenic, AA	1.39	mg/L
Zinc, ICP	0.785	mg/L

Kelly Jones
Project Manager

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ANALYTICAL REPORT

Ms. Susan Mulholland
CH2M HILL
1033 University Place
Suite 300
Evanston, IL 60201-3137

10/04/1991

Sample No.: 149109

Job No.: 91.3557

Sample Description: DEC-SP1-9-3
CHI28770.B0.MS; DuPont

Date Taken: 09/19/1991
Time Taken: 11:00
IEPA Cert. No.: 100221

Date Received: 09/20/1991
Time Received: 10:00
WDNR Cert. No.: 999447130

Chloride	28.	mg/L
COD, Total	13.	mg/L
Fluoride	1.0	mg/L
N-Ammonia	0.46	mg/L
N-Nitrate	0.42	mg/L
N-Nitrite	<0.01	mg/L
pH	7.5	units
Solids, Total Dissolved	1200.	mg/L
Solids, Total Suspended	<1.	mg/L
Sulfate	800.	mg/L
Arsenic, AA	1.32	mg/L
Zinc, ICP	0.060	mg/L

Kelly Jones
Project Manager

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ANALYTICAL REPORT

Ms. Susan Mulholland
CH2M HILL
1033 University Place
Suite 300
Evanston, IL 60201-3137

09/23/1991

Sample No.: 148386

Job No.: 91.3350

Sample Description: DEC-SP3-9-1
CHI28770.B0.3R; DuPont

Date Taken: 09/05/1991
Time Taken: 11:00
IEPA Cert. No.: 100221

Date Received: 09/06/1991
Time Received: 10:00
WDNR Cert. No.: 999447130

BOD, Five Day	4.	mg/L
Chloride	68.	mg/L
COD, Total	23.	mg/L
Fluoride	1.0	mg/L
N-Ammonia	4.6	mg/L
N-Nitrate	0.50	mg/L
N-Nitrite	<0.01	mg/L
Oil & Grease	2.	mg/L
pH	6.4	units
Solids, Total Dissolved	2900.	mg/L
Solids, Total Suspended	46.	mg/L
Sulfate	1770.	mg/L
Arsenic, AA	<0.0050	mg/L
Copper, ICP	0.013	mg/L

Kelly Jones
Project Manager

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ANALYTICAL REPORT

Ms. Susan Mulholland
CH2M HILL
1033 University Place
Suite 300
Evanston, IL 60201-3137

09/23/1991

Sample No.: 148386

Job No.: 91.3350

Sample Description: DEC-SP3-9-1
CHI28770.B0.3R; DuPont

Date Taken: 09/05/1991
Time Taken: 11:00
IEPA Cert. No.: 100221

Date Received: 09/06/1991
Time Received: 10:00
WDNR Cert. No.: 999447130

Zinc, ICP	28.1	mg/L

Kelly Jones

Kelly Jones
Project Manager

Attachment 2
Data Validation Summary
Monthly Monitoring Program

MEMORANDUM CH2M HILL

TO: Pixie Newman/CHI
Susan Mulholland/CHI

FROM: Dan MacGregor/GLO

DATE: October 9, 1991

SUBJECT: Data Validation for Groundwater Seep Samples
Du Pont East Chicago, Indiana

PROJECT: CHI28770.B0.MR

Introduction

This memorandum presents the data validation discussion for the inorganic analytical results for Groundwater Seep 1 samples collected on September 5, 12, and 19, 1991, and a Groundwater Seep 3 sample collected on September 5 at the Du Pont Plant in East Chicago, Indiana. Sampling was performed in compliance with the U.S. EPA-requested "monthly monitoring program."

Samples were analyzed for major ions and selected metals by NET Laboratories in Bartlett, Illinois. Sample collection and transportation were performed under strict chain-of-custody procedures. Requested QA/QC data included holding time data, chain-of-custody forms, calibration and procedure blank results, initial calibration verification standard recoveries, continuing calibration recovery results, sample duplicate results, matrix spike and matrix spike duplicate results, and laboratory spike results. The QA/QC and sample data were reviewed as described below.

Holding Times

Inspection of holding times showed that the holding time requirements, as specified by the U.S. EPA *Methods for Chemical Analysis of Water and Wastes*, were met.

Chain of Custody

The chain-of-custody forms were reviewed for accuracy and completeness. All necessary information was provided and found to be accurate. All requested analyses were performed, and the data packages were complete.

Blanks

The calibration and procedure blank results were inspected for possible contaminants. The calibration blanks were free of compound concentrations equal to or greater than compound reporting limits. Zinc was found in the September 5 and 19 procedure blanks. The zinc concentration in the September 5 procedure blank was at least a factor of five smaller than the corresponding Groundwater Seeps 1 and 3 zinc concentrations, making data qualification unnecessary. The zinc result for the September 19 Groundwater Seep 1 sample was qualified as possibly blank contaminated and flagged with a "B."

Initial Calibration Verification Standard Recoveries

The initial calibration verification standard recoveries were generally within control limits, ±10 percent of true value. Fluoride recoveries associated with the September 5 and 12 results were outside the control limit. As a result, sample results associated with these recoveries were qualified as estimated and flagged with a "J."

Continuing Calibration Recoveries

Continuing calibration recoveries were found to be within control limits for all compounds except COD and arsenic. COD results from the September 5, 12, and 19 samplings and arsenic from the September 12 and 19 samplings were outside the ±10 percent control limit. The COD results for those dates and arsenic from the September 12 and 19 sampling dates were qualified as estimated and flagged with a "J."

Laboratory Control Spikes

Except for the September 12 COD recovery, the laboratory spike recoveries were within the control limit of ±20 percent of true value. The September 12 COD result had been qualified previously, so no additional qualifying action was required.

Matrix Spike/Matrix Spike Duplicate Fortifications

The matrix spike and matrix spike duplicate results were generally within control limits. Nitrate recoveries were high for the September 5 sampling data, and the nitrite recoveries associated with the September 12 and 19 sampling data were also high. September 5 nitrate results for Groundwater Seeps 1 and 3 were qualified as estimated and flagged with a "J." Nitrite was not detected in the September 12 and 19 samplings and thus no data qualification was required.

Duplicates

Duplicate samples DEC-SP1-9-2 and DEC-FRSP1-9-2 were taken during the September 12 sampling. The precision associated with the samples was good, and the percent difference between compounds was generally less than the 25 percent control limit. The Groundwater Seep 1 analytical results were consistent with previous results, and no qualifiers were added as a result of imprecision.

Results

Groundwater Seep 1 results from this round of sampling were found to be generally consistent when compared with data from previous sample events. The one set of Groundwater Seep 3 results were compared with August results for Groundwater Seep 3. The results were generally consistent, but the Groundwater Seep 3 data are still too limited to make data observations.

With the exception of the qualified results, the results for Groundwater Seeps 1 and 3 appear to be valid and usable.

CHI185/036.51

October Monthly Monitoring Report
for the Groundwater Seeps at the
Du Pont East Chicago Plant
East Chicago, Indiana

Prepared by CH2M HILL
on behalf of
E.I. du Pont de Nemours & Company

November 22, 1991

CHI185/035.51

Introduction

In response to U.S. EPA's Section 308 Information Request dated February 13, 1991, and U.S. EPA's amended Information Request dated June 27, 1991, Du Pont is submitting this monthly monitoring report characterizing the quality of the groundwater seep referenced in the original request (Groundwater Seep 1) and two other groundwater seeps referenced in the amended request (Groundwater Seeps 2 and 3) at Du Pont's East Chicago Plant. This report contains the results of the "monthly monitoring program" for October 1991.

Sample Collection and Analysis

The October "monthly monitoring program" sampling activities consisted of monitoring groundwater seep conditions and obtaining a grab sample from each seep, if possible, once per week. Monitoring was performed on October 3, 10, 17, 23 and 31, 1991. Seep flow rates were measured and recorded during each sampling event (Table 1). Samples were collected from Groundwater Seeps 1, 2, and 3 on October 31. Groundwater seep samples were not collected at any other time in October because none of the three groundwater seeps were present at the monitoring times.

Sample fractions collected for oil and grease, total suspended solids, and pH analyses were not filtered. All other sample fractions were filtered.

After the samples were collected, filtered, and preserved, as appropriate, the samples were shipped via overnight courier to National Environmental Testing, Inc. (NET) analytical laboratory in Bartlett, Illinois. The sample collected from Groundwater Seep 1 was analyzed for the following constituents: chemical oxygen demand (COD), ammonia-N, nitrate, nitrite, sulfate, chloride, fluoride, total dissolved solids, total suspended solids, arsenic, zinc, and pH. The samples collected from Groundwater Seeps 2 and 3 were analyzed for all of the constituents listed above, plus biological oxygen demand (BOD-five day), oil and grease, and copper, as originally requested. In the amended request, BOD-five day, oil and grease, and copper were dropped from the Groundwater Seep 1 monitoring requirements.

For quality assurance/quality control (QA/QC) purposes, a field blank was collected on October 31.

Analytical Results and Interpretation

Tables 2, 3, and 4 summarize the analytical results of the "monthly monitoring program" for the month of October for Groundwater Seeps 1, 2, and 3, respectively. All laboratory data sheets for samples collected and analyzed during October for the "monthly monitoring program" are provided in Attachment 1.

Attachment 2 contains a data validation summary of QA/QC information associated with

the analysis of the October groundwater seep samples.

Comparing the October 31 Groundwater Seep 1 data to that collected in preceding months for Groundwater Seep 1 (Table 5), the following observations were made:

- The chloride concentration on October 31 was lower than all previous months in the "monthly monitoring program."

- The COD and zinc concentrations on October 31 were higher than all previous months in the "monthly monitoring program."

- All October 31 data were similar to data obtained in previous months.

Generalizations regarding trends in water quality for Groundwater Seeps 2 and 3 can be formulated when more data are available for these groundwater seeps.

TABLE 1

GROUNDWATER SEEP FLOW RATES (GPM)
OCTOBER MONTHLY MONITORING PROGRAM
OCTOBER 1991

Date	Groundwater Seep 1	Groundwater Seep 2	Groundwater Seep 3
October 3	NP***	NP*	NP***
October 10	NP*	NP*	NP***
October 17	NP*	NP*	NP***
October 23	NP***	NP***	NP***
October 31	0.78	8.1	0.54

Notes:
NP* denotes not present. No flow. Groundwater seep location dry.
NP** denotes not present. Groundwater seep location submerged below river surface. When a groundwater seep becomes submerged beneath the surface of a water body, it (by definition) is no longer a seep and technically is no different than the rest of the groundwater discharge to that surface water body. There is no simple way to measure and distinguish this discharge from the rest of the groundwater discharge to the Grand Calumet River.
NP*** denotes not present. No flow. Groundwater seep location wet, but no flow to river.

TABLE 2

CONSTITUENTS DETECTED IN GROUNDWATER SEEP 1
OCTOBER MONTHLY MONITORING PROGRAM
OCTOBER 1991

Sample ID:	DEC-SP1-10-5
Lab:	NET
Lab ID:	152268
Date:	10/31/91
Filtered (Yes/No):	Yes
AVERAGE FLOW RATE (gpm)	0.78
WATER QUALITY PARAMETERS (mg/l)	
COD	33B
Chloride	18
Fluoride	0.9
Nitrogen, Ammonia	0.4
Nitrogen, Nitrate	0.35
Nitrogen, Nitrite	
Total Dissolved Solids	1260
Total Suspended Solids	10*
Sulfate	800
pH (lab)	7.1*
TRACE INORGANIC COMPOUNDS (mg/l)	
Arsenic	0.100
Zinc	0.977

Notes:
* Sample fraction not filtered.
No value denotes not detected.
B denotes blank contamination.

TABLE 3

CONSTITUENTS DETECTED IN GROUNDWATER SEEP 2
OCTOBER MONTHLY MONITORING PROGRAM
OCTOBER 1991

Sample ID:	DEC-SP2-10-5
Lab:	NET
Lab ID:	152265
Date:	10/31/91
Filtered (Yes/No):	Yes
AVERAGE FLOW RATE (gpm)	8.1
WATER QUALITY PARAMETERS (mg/l)	
BOD-Five Day	2
COD	298
Chloride	420
Fluoride	2.9
Nitrogen, Ammonia	6.6
Nitrogen, Nitrate	38.2
Nitrogen, Nitrite	
Oil and Grease	J*
Total Dissolved Solids	4040
Total Suspended Solids	9*
Sulfate	2800
pH (lab)	5.9*
TRACE INORGANIC COMPOUNDS (mg/l)	
Arsenic	
Copper	
Zinc	26.9

Notes:
* Sample fraction not filtered.
No value denotes not detected.
B denotes blank contamination.
J denotes estimated value.

TABLE 4

CONSTITUENTS DETECTED IN GROUNDWATER SEEP 3
OCTOBER MONTHLY MONITORING PROGRAM
OCTOBER 1991

Sample ID:	DEC-SP3-10-5
Lab:	NET
Lab ID:	152266
Date:	10/31/91
Filtered (Yes/No):	Yes
AVERAGE FLOW RATE (gpm)	0.54
WATER QUALITY PARAMETERS (mg/l)	
BOD-Five Day	2
COD	26B
Chloride	22
Fluoride	2.1
Nitrogen, Ammonia	2.0
Nitrogen, Nitrate	0.53
Nitrogen, Nitrite	
Oil and Grease	1J*
Total Dissolved Solids	2400
Total Suspended Solids	49*
Sulfate	800
pH (lab)	6.6*
TRACE INORGANIC COMPOUNDS (mg/l)	
Arsenic	
Copper	
Zinc	21.1

Notes:
* Sample fraction not filtered.
No value denotes not detected.
B denotes blank contamination.
J denotes estimated value.

TABLE 5

AVERAGE CONCENTRATIONS IN GROUNDWATER SEEP 1
MONTHLY MONITORING PROGRAM
1991

	April	May	June	July	August	September	October**
AVERAGE FLOW RATE (gpm)	0.78	0.86	0.87	0.62	0.35	0.36	0.78
WATER QUALITY PARAMETERS (mg/l)							
COD	14	15	23	19	21	7	33
Chloride	32	32	25	25	23	43	18
Fluoride	1.0	1.2	1.0	1.1	0.9	0.8	0.9
Nitrogen, Ammonia	0.34	0.58	0.91	0.53	0.53	0.75	0.4
Nitrogen, Nitrate	0.47	1.3	0.94	0.35	0.08	0.31	0.35
Nitrogen, Nitrite			0.01		0.15		
Total Dissolved Solids	1260	1400	1110	1340	1400	1260	1260
Total Suspended Solids	6*	6*	27*	145*	28*	5*	10*
Sulfate	760	840	740	830	840	850	800
pH (lab)	7.2*	7.1*	7.0*	7.0*	7.0*	7.1*	7.1*
TRACE INORGANIC COMPOUNDS (mg/l)							
Arsenic	0.046	0.054	0.068	0.103	0.017	0.99	0.100
Zinc	0.78	0.544	0.635	0.578	0.378	0.433	0.977

Notes:
* Sample fraction not filtered.
**October values derived from one sampling event. Values are not averages.
No value denotes not detected.
A value of one-half the detection limit used in averaging not detected values.
The average value of the duplicate sample results used in overall averaging.

Attachment 1
Laboratory Data Sheets
Monthly Monitoring Program

NATIONAL ENVIRONMENTAL TESTING, INC.

NET Midwest, Inc.
Bartlett Division
850 West Bartlett Road
Bartlett, IL 60103

Tel: (708) 289-3100
Fax: (708) 289-5445

ANALYTICAL REPORT

Ms. Susan Mulholland
CH2M HILL
1033 University Place
Suite 300
Evanston, IL 60201-3137

11/18/1991

Sample No.: 152268

Job No.: 91.4348

Sample Description: DEC-SP1-10-5
CH128770.B0.MS;DuPont East

Date Taken: 10/31/1991
Time Taken:
IEPA Cert. No. 100221

Date Received: 11/01/1991
Time Received: 09:45
WDNR Cert. No. 999447130

Chloride	18.	mg/L
COD, Total	33.	mg/L
Fluoride	0.9	mg/L
N-Ammonia	0.4	mg/L
N-Nitrate	0.35	mg/L
N-Nitrite	<0.01	mg/L
pH	7.1	units
Solids, Total Dissolved	1260.	mg/L
Solids, Total Suspended	10.	mg/L
Sulfate	800.	mg/L
Arsenic, AA	0.100	mg/L
Zinc, ICP	0.977	mg/L

Kelly Jones

Kelly Jones
Project Manager

NATIONAL ENVIRONMENTAL TESTING, INC.

NET Midwest, Inc.
Bartlett Division
850 West Bartlett Road
Bartlett, IL 60103

Tel: (708) 289-3100
Fax: (708) 289-5445

ANALYTICAL REPORT

Ms. Susan Mulholland
CH2M HILL
1033 University Place
Suite 300
Evanston, IL 60201-3137

11/18/1991

Sample No.: 152265

Job No.: 91.4348

Sample Description: DEC-SP2-10-5
CH128770.B0.MS;DuPont East

Date Taken: 10/31/1991
Time Taken: 13:30
IEPA Cert. No. 100221

Date Received: 11/01/1991
Time Received: 09:45
WDNR Cert. No. 999447130

BOD, Five Day	2.	mg/L
Chloride	420.	mg/L
COD, Total	29.	mg/L
Fluoride	2.9	mg/L
N-Ammonia	6.6	mg/L
N-Nitrate	38.2	mg/L
N-Nitrite	<0.01	mg/L
Oil & Grease	<1.	mg/L
pH	5.9	units
Solids, Total Dissolved	4040.	mg/L
Solids, Total Suspended	9.	mg/L
Sulfate	2800.	mg/L
Arsenic, AA	<0.0050	mg/L
Copper, ICP	<0.010	mg/L
Zinc, ICP	26.9	mg/L

Kelly Jones

Kelly Jones
Project Manager

NATIONAL ENVIRONMENTAL TESTING, INC.

NET Midwest, Inc.
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850 West Bartlett Road
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ANALYTICAL REPORT

Ms. Susan Mulholland
CH2M HILL
1033 University Place
Suite 300
Evanston, IL 60201-3137

11/18/1991

Sample No.: 152266

Job No.: 91.4348

Sample Description: DEC-SP3-10-5
CH128770.B0.MS;DuPont East

Date Taken: 10/31/1991
Time Taken: 11:35
IEPA Cert. No. 100221

Date Received: 11/01/1991
Time Received: 09:45
WDNR Cert. No. 999447130

BOD, Five Day	2.	mg/L
Chloride	22.	mg/L
COD, Total	26.	mg/L
Fluoride	2.1	mg/L
N-Ammonia	2.0	mg/L
N-Nitrate	0.53	mg/L
N-Nitrite	<0.01	mg/L
Oil & Grease	1.	mg/L
pH	6.6	units
Solids, Total Dissolved	2400.	mg/L
Solids, Total Suspended	49.	mg/L
Sulfate	800.	mg/L
Arsenic, AA	<0.0050	mg/L
Copper, ICP	<0.010	mg/L
Zinc, ICP	21.1	mg/L

Kelly Jones

Kelly Jones
Project Manager

NATIONAL ENVIRONMENTAL TESTING, INC.

NET Midwest, Inc.
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850 West Bartlett Road
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Tel: (708) 289-3100
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ANALYTICAL REPORT

Ms. Susan Mulholland
CH2M HILL
1033 University Place
Suite 300
Evanston, IL 60201-3137

11/18/1991

Sample No.: 152267

Job No.: 91.4348

Sample Description: DEC-FP-10-5
CH128770.B0.MS;DuPont East

Date Taken: 10/31/1991
Time Taken: 14:50
IEPA Cert. No. 100221

Date Received: 11/01/1991
Time Received: 09:45
WDNR Cert. No. 999447130

BOD, Five Day	<1.	mg/L
Chloride	2.	mg/L
COD, Total	33.	mg/L
Fluoride	0.2	mg/L
N-Ammonia	<0.1	mg/L
N-Nitrate	0.03	mg/L
N-Nitrite	<0.01	mg/L
Oil & Grease	<1.	mg/L
pH	5.6	units
Solids, Total Dissolved	2.	mg/L
Solids, Total Suspended	1.	mg/L
Sulfate	<4.	mg/L
Arsenic, AA	<0.0050	mg/L
Copper, ICP	<0.010	mg/L
Zinc, ICP	0.035	mg/L

Kelly Jones

Kelly Jones
Project Manager

Attachment 2
Data Validation Summary
Monthly Monitoring Program

MEMORANDUM CH2M HILL

TO: Pixie Newman/CHI
Susan Mulholland/CHI

FROM: Dan MacGregor/GLO

DATE: November 19, 1991

SUBJECT: Data Validation for Groundwater Seep Samples
Du Pont East Chicago, Indiana

PROJECT: CHI28770.B0.MR

Introduction

This memorandum presents the data validation discussion for the inorganic analytical results for Groundwater Seeps 1, 2, 3, and a field blank, collected on October 31, 1991, at the Du Pont Plant in East Chicago, Indiana. Sampling was performed in compliance with the U.S. EPA-requested "monthly monitoring program."

Samples were analyzed for major ions and selected metals by NET Laboratories in Bartlett, Illinois. Sample collection and transport were performed under strict chain-of-custody procedures. Requested QA/QC data included holding time data, chain-of-custody forms, calibration and procedure blank results, initial calibration verification standard recoveries, continuing calibration recovery results, field blank results, matrix spike and matrix spike duplicate results, and laboratory spike results. The QA/QC and sample data were reviewed as described below.

Holding Times

Inspection of holding times showed that the holding time requirements, as specified by the EPA **Methods for Chemical Analysis of Water and Wastes**, were met.

Chain of Custody

The chain-of-custody forms were reviewed for accuracy and completeness. All necessary information was provided and found to be accurate. All requested analyses were performed, and the data packages were complete.

Blanks

The calibration and procedure blank results were inspected for possible contaminants. These blanks were free of compound concentrations equal to or greater than compound reporting limits.

The field blank contained low levels of chloride, COD, fluoride, nitrate, TDS, TSS, and zinc. These compound concentrations, With the exception of COD, were a factor of ten or less than their correlating sample concentrations. The field blank COD result, 33 mg/L, is probably a result of sample bottle contamination. The groundwater seep sample COD values were qualified as blank contaminated, and flagged with a "B." The other compounds detected in the field blank were at low enough concentrations that data qualification was not required.

Calibration Recovery Results

The initial calibration verification (ICV) standard recoveries were within the EPA established control limits of ± 10% of true value. Continuing calibration recoveries were also found to be within these control limits. No qualifying action was required as a result of initial or continuing calibration recoveries.

Laboratory Control Spikes

Except for an oil & grease recovery, the laboratory spike recoveries were within the control limit of ± 20% of true value. As a result of the low oil & grease laboratory control recovery, Seeps 2 and 3 oil & grease results were qualified as estimated and flagged with a "J."

Matrix Spike/Matrix Spike Duplicate Fortifications

The matrix spike and matrix spike duplicate results were within EPA and methodology control limits. No data qualifying action was required.

Sample Results and Conclusions

Future COD groundwater seep sample results in the range of 0 mg/L to 150 mg/L should be considered possibly blank contaminated and reviewed closely.

The Groundwater Seeps 1 and 3 results from this round of sampling were compared, and found to be generally consistent with data from previous sample events. The amount of Groundwater Seep 2 data is too limited to make data observations.

With the exception of the qualified results, this round of sample results are valid and useable.

November Monthly Monitoring Report for the Groundwater Seeps at the Du Pont East Chicago Plant East Chicago, Indiana

Prepared by CH2M HILL
on behalf of
E.I. du Pont de Nemours & Company

December 27, 1991

CHI185/035.51

Introduction

In response to U.S. EPA's Section 308 Information Request dated February 13, 1991, and U.S. EPA's amended Information Request dated June 27, 1991, Du Pont is submitting this monthly monitoring report characterizing the quality of the groundwater seep referenced in the original request (Groundwater Seep 1) and two other groundwater seeps referenced in the amended request (Groundwater Seeps 2 and 3) at Du Pont's East Chicago Plant. This report contains the results of the "monthly monitoring program" for November 1991.

Sample Collection and Analysis

The November "monthly monitoring program" sampling activities consisted of monitoring groundwater seep conditions and obtaining a grab sample from each seep, if possible, once per week. Monitoring was performed on November 7, 14, 21, and 26, 1991. Groundwater seep flow rates were measured and recorded during each sampling event (Table 1). Samples were collected from Groundwater Seeps 1, 2, and 3 on November 7. On November 14 and 26, Groundwater Seeps 1 and 3 were not present. Consequently, samples were collected from Groundwater Seep 2 only. Groundwater Seeps 1 and 2 were present and sampled on November 21. Groundwater Seep 3 was not present.

Sample fractions collected for oil and grease, total suspended solids, and pH analyses

were not filtered. All other sample fractions were filtered.

After the samples were collected, filtered, and preserved, as appropriate, the samples were shipped via overnight courier to National Environmental Testing, Inc. (NET) analytical laboratory in Bartlett, Illinois. The samples collected from Groundwater Seep 1 were analyzed for the following constituents: chemical oxygen demand (COD), ammonia-N, nitrate, nitrite, sulfate, chloride, fluoride, total dissolved solids, total suspended solids, arsenic, zinc, and pH. The samples collected from Groundwater Seeps 2 and 3 were analyzed for all of the constituents listed above, plus biological oxygen demand (BOD-five day), oil and grease, and copper, as originally requested. In the amended request, BOD-five day, oil and grease, and copper were dropped from the Groundwater Seep 1 monitoring requirements.

Analytical Results and Interpretation

Tables 2, 3, and 4 summarize the analytical results of the "monthly monitoring program" for the month of November for Groundwater Seeps 1, 2, and 3, respectively. All laboratory data sheets for samples collected and analyzed during November for the "monthly monitoring program" are provided in Attachment 1.

Attachment 2 contains a data validation summary of QA/QC information associated with the analysis of the November groundwater seep samples.

Comparing the November Groundwater Seep 1 data to that collected in preceding months for Groundwater Seep 1 (Table 5), the following observations were made:

- The average COD, total dissolved solids, and total suspended solids concentrations for November were higher than all previous months in the "monthly monitoring program."

- Except those previously noted, all November data were similar to data obtained in previous months.

Generalizations regarding trends in water quality for Groundwater Seeps 2 and 3 can be formulated when more data are available for these groundwater seeps.

TABLE 1

GROUNDWATER SEEP FLOW RATES (GPM)
NOVEMBER MONTHLY MONITORING PROGRAM
NOVEMBER 1991

Date	Groundwater Seep 1	Groundwater Seep 2	Groundwater Seep 3
November 7	0.29	9.5	0.22
November 14	NP***	4.7	NP*
November 21	0.24	17.6	NP***
November 26	NP****	10.2	NP****

Notes:
NP* denotes not present. No flow. Groundwater seep location dry.
NP** denotes not present. Groundwater seep location submerged below river surface. When a groundwater seep becomes submerged beneath the surface of a water body, it (by definition) is no longer a seep and technically is no different than the rest of the groundwater discharge to that surface water body. There is no simple way to measure and distinguish this discharge from the rest of the groundwater discharge to the Grand Calumet River.
NP*** denotes not present. No flow. Groundwater seep location wet, but no flow to river.
NP**** denotes not present. Groundwater seep location frozen.

TABLE 2

CONSTITUENTS DETECTED IN GROUNDWATER SEEP 1
NOVEMBER MONTHLY MONITORING PROGRAM
NOVEMBER 1991

Sample ID:	DEC-SP1-11-1	DEC-SP1-11-3	
Lab:	NET	NET	
Lab ID:	152811	153959	
Date:	11/7/91	11/21/91	
Filtered (Yes/No):	Yes	Yes	Average
AVERAGE FLOW RATE (gpm)	0.78	0.24	0.51
WATER QUALITY PARAMETERS (mg/l)			
COD	59	49	54
Chloride	20	24	22
Fluoride	0.8	0.8	0.8
Nitrogen, Ammonia	0.5	0.54	0.5
Nitrogen, Nitrate	1.35J	0.28J	0.82
Nitrogen, Nitrite	0.01		0.01
Total Dissolved Solids	3090	1200	2100
Total Suspended Solids	475*	17*	250*
Sulfate	800	800	800
pH (lab)	7.1*	6.8*	7.0*
TRACE INORGANIC COMPOUNDS (mg/l)			
Arsenic	0.052J	0.116J	0.084
Zinc	0.377	0.735	0.556

Notes:
* Sample fraction not filtered.
No value denotes not detected.
J denotes estimated value.
A value of one-half the detection limit used in averaging not detected values.

TABLE 3

CONSTITUENTS DETECTED IN GROUNDWATER SEEP 2
NOVEMBER MONTHLY MONITORING PROGRAM
NOVEMBER 1991

Sample ID:	DEC-SP2-11-1	DEC-SP2-11-2	DEC-SP2-11-3	DEC-SP2-11-4	
Lab:	NET	NET	NET	NET	
Lab ID:	152812	153437	153960	154410	
Date:	11/7/91	11/14/91	11/21/91	11/26/91	
Filtered (Yes/No):	Yes	Yes	Yes	Yes	Average
AVERAGE FLOW RATE (gpm)	9.5	4.7	17.6	10.2	10.5
WATER QUALITY PARAMETERS (mg/l)					
BOD-Five Day		NA	1		0.7
COD	49	65	36	26	44
Chloride	520	400	326	360	400
Fluoride	3.8	3.6	3.7	4.9	4.0
Nitrogen, Ammonia	10.3	10.6	9.8	9.4	10.0
Nitrogen, Nitrate	37.3J	38.2J	28.8J	20.6	31.2
Nitrogen, Nitrite					
Oil and Grease	2*	1*	*	*	1*
Total Dissolved Solids	4460	4450	3980	3580	4120
Total Suspended Solids	6*	5*	5*	1*	4*
Sulfate	3200	3200	2900	250	2400
pH (lab)	5.9*	5.7*	5.6*	5.8*	5.8*
TRACE INORGANIC COMPOUNDS (mg/l)					
Arsenic	J	J	J		
Copper					
Zinc	21.0	23.5	16.5	22.6	20.9

Notes:
* Sample fraction not filtered.
No value denotes not detected.
NA denotes not analyzed.
J denotes estimated value.
A value of one-half the detection limit used in averaging not detected values.

TABLE 4

CONSTITUENTS DETECTED IN GROUNDWATER SEEP 3
NOVEMBER MONTHLY MONITORING PROGRAM
NOVEMBER 1991

Sample ID:	DEC-SP3-11-1
Lab:	NET
Lab ID:	152813
Date:	11/7/91
Filtered (Yes/No):	Yes
AVERAGE FLOW RATE (gpm)	0.22
WATER QUALITY PARAMETERS (mg/l)	
BOD-Five Day	7
COD	65
Chloride	32
Fluoride	3.7
Nitrogen, Ammonia	21.0
Nitrogen, Nitrate	0.60J
Nitrogen, Nitrite	0.02
Oil and Grease	7*
Total Dissolved Solids	1190
Total Suspended Solids	100*
Sulfate	2300
pH (lab)	6.5*
TRACE INORGANIC COMPOUNDS (mg/l)	
Arsenic	0.0055J
Copper	
Zinc	13.4

Notes:
* Sample fraction not filtered.
No value denotes not detected.
J denotes estimated value.

TABLE 5

AVERAGE CONCENTRATIONS IN GROUNDWATER SEEP 1
MONTHLY MONITORING PROGRAM
1991

	April	May	June	July	August	September	October**	November
AVERAGE FLOW RATE (gpm)	0.78	0.86	0.87	0.62	0.35	0.36	0.78	0.51
WATER QUALITY PARAMETERS (mg/l)								
COD	14	15	23	19	21	7	33	54
Chloride	32	32	25	25	23	43	18	22
Fluoride	1.0	1.2	1.0	1.1	0.9	0.8	0.9	0.8
Nitrogen, Ammonia	0.34	0.58	0.91	0.53	0.53	0.75	0.4	0.5
Nitrogen, Nitrate	0.47	1.3	0.94	0.35	0.08	0.31	0.35	0.82
Nitrogen, Nitrite			0.01		0.15			0.01
Total Dissolved Solids	1260	1400	1110	1340	1400	1260	1260	2100
Total Suspended Solids	6*	6*	27*	145*	28*	5*	10*	250*
Sulfate	760	840	740	830	840	850	800	800
pH (lab)	7.2*	7.1*	7.0*	7.0*	7.0*	7.1*	7.1*	7.0*
TRACE INORGANIC COMPOUNDS (mg/l)								
Arsenic	0.046	0.054	0.068	0.103	0.017	0.99	0.100	0.084
Zinc	0.78	0.544	0.635	0.578	0.378	0.433	0.977	0.556

Notes:
* Sample fraction not filtered.
**October values derived from one sampling event. Values are not averages.
No value denotes not detected.
A value of one-half the detection limit used in averaging not detected values.
The average value of the duplicate sample results used in overall averaging.

Attachment 1
Laboratory Data Sheets
Monthly Monitoring Program

NATIONAL ENVIRONMENTAL TESTING, INC.

NET Midwest, Inc.
Bartlett Division
850 West Bartlett Road
Bartlett, IL 60103

Tel: (708) 289-3100
Fax: (708) 289-5445

ANALYTICAL REPORT

Ms. Susan Mulholland
CH2M HILL
1033 University Place
Suite 300
Evanston, IL 60201

12/18/1991

Sample No.: 152811

Job No.: 91.4479

Sample Description: DEC-SP1-11-1
CHI28770.BO.MS; Du Pont

Date Taken: 11/07/1991
Time Taken: 12:35
IEPA Cert. No.: 100221

Date Received: 11/08/1991
Time Received: 10:00
WDNR Cert. No.: 999447130

Chloride	20.	mg/L
COD, Total	59.	mg/L
Fluoride	0.8	mg/L
N-Ammonia	0.5	mg/L
N-Nitrate	1.35	mg/L
N-Nitrite	0.01	mg/L
pH	7.1	units
Solids, Total Dissolved	3090.	mg/L
Solids, Total Suspended	475.	mg/L
Sulfate	800.	mg/L
Arsenic, AA	0.052	mg/L
Zinc, ICP	0.377	mg/L

Kelly Jones

Kelly Jones
Project Manager

NATIONAL ENVIRONMENTAL TESTING, INC.

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ANALYTICAL REPORT

Ms. Susan Mulholland
CH2M HILL
1033 University Place
Suite 300
Evanston, IL 60201

12/18/1991

Sample No.: 152812

Job No.: 91.4479

Sample Description: DEC-SP2-11-1
CHI28770.BO.MS; Du Pont

Date Taken: 11/07/1991
Time Taken: 13:25
IEPA Cert. No.: 100221

Date Received: 11/08/1991
Time Received: 10:00
WDNR Cert. No.: 999447130

BOD, Five Day	<1.	mg/L
Chloride	520.	mg/L
COD, Total	49.	mg/L
Fluoride	3.8	mg/L
N-Ammonia	10.3	mg/L
N-Nitrate	37.3	mg/L
N-Nitrite	<0.01	mg/L
Oil & Grease	2.	mg/L
pH	5.9	units
Solids, Total Dissolved	4460.	mg/L
Solids, Total Suspended	6.	mg/L
Sulfate	3200.	mg/L
Arsenic, AA	<0.0050	mg/L
Copper, ICP	<0.010	mg/L

Kelly Jones

Kelly Jones
Project Manager

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ANALYTICAL REPORT

Ms. Susan Mulholland
CH2M HILL
1033 University Place
Suite 300
Evanston, IL 60201

12/18/1991

Sample No.: 152812

Job No.: 91.4479

Sample Description: DEC-SP2-11-1
CHI28770.BO.MS; Du Pont

Date Taken: 11/07/1991
Time Taken: 13:25
IEPA Cert. No.: 100221

Date Received: 11/08/1991
Time Received: 10:00
WDNR Cert. No.: 999447130

Zinc, ICP	21.0	mg/L

Kelly Jones

Kelly Jones
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ANALYTICAL REPORT

Ms. Susan Mulholland
CH2M HILL
1033 University Place
Suite 300
Evanston, IL 60201

12/18/1991

Sample No.: 152813

Job No.: 91.4479

Sample Description: DEC-SP3-11-1
CHI28770.BO.MS; Du Pont

Date Taken: 11/07/1991
Time Taken: 13:05
IEPA Cert. No.: 100221

Date Received: 11/08/1991
Time Received: 10:00
WDNR Cert. No.: 999447130

BOD, Five Day	7.	mg/L
Chloride	32.	mg/L
COD, Total	65.	mg/L
Fluoride	3.7	mg/L
N-Ammonia	21.0	mg/L
N-Nitrate	0.60	mg/L
N-Nitrite	0.02	mg/L
Oil & Grease	7.	mg/L
pH	6.5	units
Solids, Total Dissolved	1190.	mg/L
Solids, Total Suspended	100.	mg/L
Sulfate	2300.	mg/L
Arsenic, AA	0.0055	mg/L
Copper, ICP	<0.010	mg/L

Kelly Jones

Kelly Jones
Project Manager

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ANALYTICAL REPORT

Ms. Susan Mulholland
CH2M HILL
1033 University Place
Suite 300
Evanston, IL 60201

12/18/1991

Sample No.: 152813

Job No.: 91.4479

Sample Description: DEC-SP3-11-1
CHI28770.BO.MS; Du Pont

Date Taken: 11/07/1991
Time Taken: 13:05
IEPA Cert. No.: 100221

Date Received: 11/08/1991
Time Received: 10:00
WDNR Cert. No.: 999447130

Zinc, ICP	13.4	mg/L

Kelly Jones
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ANALYTICAL REPORT

Ms. Susan Mulholland
CH2M HILL
1033 University Place
Suite 300
Evanston, IL 60201

12/18/1991

Sample No.: 153437

Job No.: 91.4614

Sample Description: DEC-SP2-11-2
CH128770.BO.MS; Du Pont

Date Taken: 11/14/1991
Time Taken: 07:55
IEPA Cert. No.: 100221

Date Received: 11/15/1991
Time Received: 10:30
WDNR Cert. No.: 999447130

Chloride	400.	mg/L
COD, Total	65.	mg/L
Fluoride	3.6	mg/L
N-Ammonia	10.6	mg/L
N-Nitrate	38.2	mg/L
N-Nitrite	<0.01	mg/L
Oil & Grease	1.	mg/L
pH	5.7	units
Solids, Total Dissolved	4450.	mg/L
Solids, Total Suspended	5.	mg/L
Sulfate	3200.	mg/L
Arsenic, AA	<0.0050	mg/L
Copper, ICP	<0.010	mg/L
Zinc, ICP	23.5	mg/L

Kelly Jones

Kelly Jones
Project Manager

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ANALYTICAL REPORT

Ms. Susan Mulholland
CH2M HILL
1033 University Place
Suite 300
Evanston, IL 60201

12/13/1991

Sample No.: 153959

Job No.: 91.4767

Sample Description: DEC-SP1-11-3
CH128770.B0.MS;DuPont East

Date Taken: 11/21/1991
Time Taken: 08:10
IEPA Cert. No.: 100221

Date Received: 11/22/1991
Time Received: 10:00
WDNR Cert. No.: 999447130

Chloride	24.	mg/L
COD, Total	49.	mg/L
Fluoride	0.8	mg/L
N-Ammonia	0.54	mg/L
N-Nitrate	0.28	mg/L
N-Nitrite	<0.01	mg/L
pH	6.8	units
Solids, Total Dissolved	1200.	mg/L
Solids, Total Suspended	17.	mg/L
Sulfate	800.	mg/L
Arsenic, AA	0.116	mg/L
Zinc, ICP	0.735	mg/L

(Ray Kalick)

for Kelly Jones
Project Manager

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NET Midwest, Inc.
Bartlett Division
850 West Bartlett Road
Bartlett, IL 60103

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Fax: (708) 289-5445

ANALYTICAL REPORT

Ms. Susan Mulholland
CH2M HILL
1033 University Place
Suite 300
Evanston, IL 60201

12/13/1991

Sample No.: 153960

Job No.: 91.4767

Sample Description: DEC-SP2-11-3
CH128770.B0.MS;DuPont East

Date Taken: 11/21/1991
Time Taken: 09:00
IEPA Cert. No.: 100221

Date Received: 11/22/1991
Time Received: 10:00
WDNR Cert. No.: 999447130

BOD, Five Day	1.	mg/L
Chloride	326.	mg/L
COD, Total	36.	mg/L
Fluoride	3.7	mg/L
N-Ammonia	9.8	mg/L
N-Nitrate	28.8	mg/L
N-Nitrite	<0.01	mg/L
Oil & Grease	<1.	mg/L
pH	5.6	units
Solids, Total Dissolved	3980.	mg/L
Solids, Total Suspended	5.	mg/L
Sulfate	2900.	mg/L
Arsenic, AA	<0.0050	mg/L
Copper, ICP	<0.010	mg/L

for Kelly Jones
Project Manager

NATIONAL ENVIRONMENTAL TESTING, INC.

NET Midwest, Inc.
Bartlett Division
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ANALYTICAL REPORT

Ms. Susan Mulholland
CH2M HILL
1033 University Place
Suite 300
Evanston, IL 60201

12/13/1991

Sample No.: 153960

Job No.: 91.4767

Sample Description: DEC-SP2-11-3
CH128770.B0.MS;DuPont East

Date Taken: 11/21/1991
Time Taken: 09:00
IEPA Cert. No.: 100221

Date Received: 11/22/1991
Time Received: 10:00
WDNR Cert. No.: 999447130

Zinc, ICP	16.5	mg/L

(Ray Kalick)
for Kelly Jones
Project Manager

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ANALYTICAL REPORT

Ms. Susan Mulholland
CH2M HILL
1033 University Place
Suite 300
Evanston, IL 60201

12/18/1991

Sample No.: 154410

Job No.: 91.4865

Sample Description: DEL-SP2-11-4
CH128770.B0.MS; DuPont

Date Taken: 11/26/1991
Time Taken: 08:15
IEPA Cert. No.: 100221

Date Received: 11/27/1991
Time Received: 10:00
WDNR Cert. No.: 999447130

BOD, Five Day	<1.	mg/L
Chloride	360.	mg/L
COD, Total	26.	mg/L
Fluoride	4.9	mg/L
N-Ammonia	9.4	mg/L
N-Nitrate	20.6	mg/L
N-Nitrite	<0.01	mg/L
Oil & Grease	<1.	mg/L
pH	5.8	units
Solids, Total Dissolved	3580.	mg/L
Solids, Total Suspended	1.	mg/L
Sulfate	250.	mg/L
Arsenic, AA	<0.0050	mg/L
Copper, ICP	<0.010	mg/L

Kelly Jones
Kelly Jones
Project Manager

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ANALYTICAL REPORT

Ms. Susan Mulholland
CH2M HILL
1033 University Place
Suite 300
Evanston, IL 60201

12/18/1991

Sample No.: 154410

Job No.: 91.4865

Sample Description: DEL-SP2-11-4
CH128770.B0.MS; DuPont

Date Taken: 11/26/1991
Time Taken: 08:15
IEPA Cert. No.: 100221

Date Received: 11/27/1991
Time Received: 10:00
WDNR Cert. No.: 999447130

Zinc, ICP	22.6	mg/L

Kelly Jones

Kelly Jones
Project Manager

Attachment 2
Data Validation Summary
Monthly Monitoring Program

MEMORANDUM CH2M HILL

TO: Pixie Newman/CHI
Susan Mulholland/CHI

FROM: Lori J. Bootz/GLO

DATE: December 20, 1991

SUBJECT: Data Validation for Groundwater Seep Samples
Du Pont East Chicago, Indiana

PROJECT: CHI28770.B0.MR

Introduction

This memorandum presents the data validation discussion for the inorganic analytical results for Groundwater Seep 1 samples collected on November 7, and 21, 1991, and Groundwater Seep 2 samples collected on November 7, 14, 21, and 26, 1991, and a Groundwater sample collected from Seep 3 on November 7, 1991, at the Du Pont Plant in East Chicago, Indiana. Sampling was performed in compliance with the U.S. EPA-requested "monthly monitoring program."

Samples were analyzed for major ions and selected metals by NET Laboratories in Bartlett, Illinois. Sample collection and transport were performed under strict chain-of-custody procedures. Requested QA/QC data included holding time data, chain-of-custody forms, calibration and procedure blank results, initial calibration verification standard recoveries, continuing calibration recovery results, field blank results, matrix spike and matrix spike duplicate results, and laboratory spike results. The QA/QC and sample data were reviewed as described below.

Holding Times

Inspection of holding times showed that the holding time requirements, as specified by the EPA **Methods for Chemical Analysis of Water and Wastes**, were met with the exception of the following instances: one total suspended solids (TSS) sample and three total dissolved solid (TDS) samples exceeded their 7-day holding time by one day. In this reviewers opinion, the qualification of TSS and TDS results is inappropriate for missing a holding time by one day.

Chain of Custody

The chain-of-custody forms were reviewed for accuracy and completeness. All necessary information was provided and found to be accurate. All requested analyses were performed, and the data packages were complete.

Blanks

The calibration and procedure blank results were inspected for possible contaminants. These blanks were free of compound concentrations equal to or greater than compound reporting limits.

Calibration Recovery Results

Except for arsenic recoveries, the initial calibration verification (ICV) and continuing calibration verification (CCV) standard recoveries were within the EPA established control limits of $\pm$ 10% of true value.

Arsenic ICV and CCV standard recoveries were below the 10% control limit. The arsenic results for groundwater seep samples collected November 7, 14, and 21, 1991 were qualified as estimated and flagged with a "J."

Laboratory Control Spikes

The laboratory spike recoveries were within the EPA control limit of $\pm$ 20% of true value. No qualifying action was required as a result of laboratory control spikes.

Matrix Spike/Matrix Spike Duplicate Fortifications

Except for nitrate, the matrix spike and matrix spike duplicate results were within EPA and methodology control limits for all parameters. Nitrate recoveries were low for all samples except for the Seep 2 sample collected on November 26, 1991. Nitrate results associated with these low recoveries were qualified as estimated and flagged with a "J".

Sample Results and Conclusions

The Groundwater Seeps 1 and 3 results from this round of sampling were compared, and found to be generally consistent with data from previous sample events. The amount of Groundwater Seep 2 data is too limited to make data observations.

In this round of data validation, eleven typographical errors were encountered in the data tables. These errors required clarification from the lab, via phone, and subsequent reissuing of the corrected tables. Future data reviews will have to pay attention to this issue to ensure that this problem has been resolved.

With the exception of the qualified results, this round of sample results are valid and useable.

December Monthly Monitoring Report for the Groundwater Seeps at the Du Pont East Chicago Plant East Chicago, Indiana

Prepared by CH2M HILL
on behalf of
E.I. du Pont de Nemours & Company

January 23, 1992

CHI185/035.51

Introduction

In response to U.S. EPA's Section 308 Information Request dated February 13, 1991, and U.S. EPA's amended Information Request dated June 27, 1991, Du Pont is submitting this monthly monitoring report characterizing the quality of the groundwater seep referenced in the original request (Groundwater Seep 1) and two other groundwater seeps referenced in the amended request (Groundwater Seeps 2 and 3) at Du Pont's East Chicago Plant. This report contains the results of the "monthly monitoring program" for December 1991.

Sample Collection and Analysis

The December "monthly monitoring program" sampling activities consisted of monitoring groundwater seep conditions and obtaining a grab sample from each seep, if possible, once per week. Monitoring was performed on December 5, 12, 18, and 26, 1991. Groundwater seep flow rates were measured and recorded during each sampling event (Table 1). Samples were collected from Groundwater Seeps 1, 2, and 3 on December 18. On December 5 and 12, Groundwater Seep 3 was not present. Consequently, samples were collected from Groundwater Seeps 1 and 2 only. Groundwater Seep 2 was present and sampled on December 26. Groundwater Seeps 1 and 3 were not present.

Sample fractions collected for oil and grease, total suspended solids, and pH analyses

were not filtered. All other sample fractions were filtered.

After the samples were collected, filtered, and preserved, as appropriate, the samples were shipped via overnight courier to National Environmental Testing, Inc. (NET) analytical laboratory in Bartlett, Illinois. The samples collected from Groundwater Seep 1 were analyzed for the following constituents: chemical oxygen demand (COD), ammonia-N, nitrate, nitrite, sulfate, chloride, fluoride, total dissolved solids, total suspended solids, arsenic, zinc, and pH. The samples collected from Groundwater Seeps 2 and 3 were analyzed for all of the constituents listed above, plus biological oxygen demand (BOD-five day), oil and grease, and copper, as originally requested. In the amended request, BOD-five day, oil and grease, and copper were dropped from the Groundwater Seep 1 monitoring requirements.

Analytical Results and Interpretation

Tables 2, 3, and 4 summarize the analytical results of the "monthly monitoring program" for the month of December for Groundwater Seeps 1, 2, and 3, respectively. All laboratory data sheets for samples collected and analyzed during December for the "monthly monitoring program" are provided in Attachment 1.

Attachment 2 contains a data validation summary of QA/QC information associated with the analysis of the December groundwater seep samples.

Comparing the December Groundwater Seep 1 data to that collected in preceding months for Groundwater Seep 1 (Table 5), the following observations were made:

- The average COD concentration for December was higher than all previous months in the "monthly monitoring program."

- The average pH for December was slightly lower than all previous months in the "monthly monitoring program."

- Except those previously noted, all December data were similar to data obtained in previous months.

Tables 6 and 7 present average concentrations of constituents analyzed in Groundwater Seep 2 and 3 samples, respectively, for each month that these seeps have been included in the "monthly monitoring program." Generalizations regarding trends in water quality for Groundwater Seeps 2 and 3 can be formulated when more data are available for these groundwater seeps.

TABLE 1

GROUNDWATER SEEP FLOW RATES (GPM)
DECEMBER MONTHLY MONITORING PROGRAM
DECEMBER 1991

Date	Groundwater Seep 1	Groundwater Seep 2	Groundwater Seep 3
December 5	0.24	12.9	NP****
December 12	0.68	16.8	NP***
December 18	0.32	12	0.33
December 26	NP*	9.0	NP*

Notes:
NP* denotes not present. No flow. Groundwater seep location dry.
NP** denotes not present. Groundwater seep location submerged below river surface. When a groundwater seep becomes submerged beneath the surface of a water body, it (by definition) is no longer a seep and technically is no different than the rest of the groundwater discharge to that surface water body. There is no simple way to measure and distinguish this discharge from the rest of the groundwater discharge to the Grand Calumet River.
NP*** denotes not present. No flow. Groundwater seep location wet, but no flow to river.
NP**** denotes not present. No flow. Groundwater seep location frozen.

TABLE 2

CONSTITUENTS DETECTED IN GROUNDWATER SEEP 1
DECEMBER MONTHLY MONITORING PROGRAM
DECEMBER 1991

Sample ID:	DEC-SP1-12-1	DEC-SP1-12-2	DEC-SP1-12-3	
Lab:	NET	NET	NET	
Lab ID:	154693	155139	155515	
Date:	12/5/91	12/12/91	12/18/91	
Filtered (Yes/No):	Yes	Yes	Yes	Average
AVERAGE FLOW RATE (gpm)	0.24	0.68	0.32	0.41
WATER QUALITY PARAMETERS (mg/l)				
COD	170	49	14	78
Chloride	24	14	18	19
Fluoride	0.8	0.9	1.1	0.9
Nitrogen, Ammonia	0.08	0.46	0.92	0.49
Nitrogen, Nitrate	0.80	0.64	0.20	0.55
Nitrogen, Nitrite				
Total Dissolved Solids	1170	1020	1220	1140
Total Suspended Solids	129*	9*	146J*	90*
Sulfate	700J	900	800	800
pH (lab)	6.9*	6.8*	7.0*	6.9*
TRACE INORGANIC COMPOUNDS (mg/l)				
Arsenic	0.102	0.060	0.045	0.069
Zinc	0.898J	0.840	0.355	0.700

Notes:
* Sample fraction not filtered.
No value denotes not detected.
J denotes estimated value.
A value of one-half the detection limit used in averaging not detected values.

TABLE 3

CONSTITUENTS DETECTED IN GROUNDWATER SEEP 2
DECEMBER MONTHLY MONITORING PROGRAM
DECEMBER 1991

Sample ID:	DEC-SP2-12-1	DEC-SP2-12-2	DEC-SP2-12-3	DEC-SP2-12-4	
Lab:	NET	NET	NET	NET	
Lab ID:	154694	155140	155516	155756	
Date:	12/5/91	12/12/91	12/18/91	12/26/91	
Filtered (Yes/No):	Yes	Yes	Yes	Yes	Average
AVERAGE FLOW RATE (gpm)	12.9	16.8	12	9.0	13
WATER QUALITY PARAMETERS (mg/l)					
BOD-Five Day	1	1	J	5J	2
COD	96	39	11	61	52
Chloride	340	240	250	48	220
Fluoride	2.2	1.9	1.9	2.5	2.1
Nitrogen, Ammonia	1.49	7.58	5.2	6.2	5.1
Nitrogen, Nitrate	14.7	14.7	11.5	13.3	13.6
Nitrogen, Nitrite					
Oil and Grease	*	1*	J*	J*	1*
Total Dissolved Solids	3050	2720	2840	2760J	2840
Total Suspended Solids	3*	*	4J*	4*	3*
Sulfate	2000J	1900	1800	1800	1900
pH (lab)	5.6*	5.7*	5.6*	5.9*	5.7*
TRACE INORGANIC COMPOUNDS (mg/l)					
Arsenic					
Copper					
Zinc	18.6J	14.9	13.4	15.8	15.7

Notes:
* Sample fraction not filtered.
No value denotes not detected.
NA denotes not analyzed.
J denotes estimated value.
A value of one-half the detection limit used in averaging not detected values.

TABLE 4

CONSTITUENTS DETECTED IN GROUNDWATER SEEP 3
DECEMBER MONTHLY MONITORING PROGRAM
DECEMBER 1991

Sample ID:	DEC-SP3-12-3
Lab:	NET
Lab ID:	155517
Date:	12/18/91
Filtered (Yes/No):	Yes
AVERAGE FLOW RATE (gpm)	0.33
WATER QUALITY PARAMETERS (mg/l)	
BOD-Five Day	6J
COD	14
Chloride	28
Fluoride	3.1
Nitrogen, Ammonia	17.2
Nitrogen, Nitrate	0.20
Nitrogen, Nitrite	
Oil and Grease	J*
Total Dissolved Solids	2890
Total Suspended Solids	214J*
Sulfate	2100
pH (lab)	6.2*
TRACE INORGANIC COMPOUNDS (mg/l)	
Arsenic	
Copper	
Zinc	16.0

Notes:
* Sample fraction not filtered.
No value denotes not detected.
J denotes estimated value.

TABLE 5

AVERAGE CONCENTRATIONS IN GROUNDWATER SEEP 1
MONTHLY MONITORING PROGRAM
1991

	April	May	June	July	August	September	October**	November	December
AVERAGE FLOW RATE (gpm)	0.78	0.86	0.87	0.62	0.35	0.36	0.78	0.51	0.41
WATER QUALITY PARAMETERS (mg/l)									
COD	14	15	23	19	21	7	33	54	78
Chloride	32	32	25	25	23	43	18	22	19
Fluoride	1.0	1.2	1.0	1.1	0.9	0.8	0.9	0.8	0.9
Nitrogen, Ammonia	0.34	0.58	0.91	0.53	0.53	0.75	0.4	0.5	0.49
Nitrogen, Nitrate	0.47	1.3	0.94	0.35	0.08	0.31	0.35	0.82	0.55
Nitrogen, Nitrite			0.01		0.15			0.01	
Total Dissolved Solids	1260	1400	1110	1340	1400	1260	1260	2100	1140
Total Suspended Solids	6*	6*	27*	145*	28*	5*	10*	250*	90*
Sulfate	760	840	740	830	840	850	800	800	800
pH (lab)	7.2*	7.1*	7.0*	7.0*	7.0*	7.1*	7.1*	7.0*	6.9*
TRACE INORGANIC COMPOUNDS (mg/l)									
Arsenic	0.046	0.054	0.068	0.103	0.017	0.99	0.100	0.084	0.069
Zinc	0.78	0.544	0.635	0.578	0.378	0.433	0.977	0.556	0.700

Notes:
* Sample fraction not filtered.
**October values derived from one sampling event. Values are not averages.
No value denotes not detected.
A value of one-half the detection limit used in averaging not detected values.
The average value of the duplicate sample results used in overall averaging.

TABLE 6

AVERAGE CONCENTRATIONS IN GROUNDWATER SEEP 2
MONTHLY MONITORING PROGRAM
1991

	July	August	September	October**	November	December
AVERAGE FLOW RATE (gpm)	NP	NP	NP	8.1	10.5	13
WATER QUALITY PARAMETERS (mg/l)						
BOD-Five Day				2	0.7	2
COD				29	44	52
Chloride				420	400	220
Fluoride				2.9	4.0	2.1
Nitrogen, Ammonia				6.6	10.0	5.1
Nitrogen, Nitrate				38.2	31.2	13.6
Nitrogen, Nitrite						
Oil and Grease				*	1*	1*
Total Dissolved Solids				4040	4120	2840
Total Suspended Solids				9*	4*	3*
Sulfate				2800	2400	1900
pH (lab)				5.9*	5.8*	5.7*
TRACE INORGANIC COMPOUNDS (mg/l)						
Arsenic						
Copper						
Zinc				26.9	20.9	15.7

Notes:
* Sample fraction not filtered.
**Values derived from one sampling event. Values are not averages.
NP denotes not present.
No value denotes not detected.
A value of one-half the detection limit used in averaging not detected values.
The average value of the duplicate sample results used in overall averaging.

TABLE 7

AVERAGE CONCENTRATIONS IN GROUNDWATER SEEP 3
MONTHLY MONITORING PROGRAM
1991

	July	August	September**	October**	November**	December**
AVERAGE FLOW RATE (gpm)	NP	0.39	0.26	0.54	0.22	0.33
WATER QUALITY PARAMETERS (mg/l)						
BOD-Five Day		4	4	2	7	6
COD		14	23	26	65	14
Chloride		28	68	22	32	28
Fluoride		1.2	1.0	2.1	3.7	3.1
Nitrogen, Ammonia		3.4	4.6	2.0	21.0	17.2
Nitrogen, Nitrate		0.43	0.50	0.53	0.60	0.20
Nitrogen, Nitrite					0.02	
Oil and Grease		1*	2*	1*	7*	*
Total Dissolved Solids		3110	2900	2400	1190	2890
Total Suspended Solids		190*	46*	49*	100*	214*
Sulfate		1900	1770	800	2300	2100
pH (lab)		6.1*	6.4*	6.6*	6.5*	6.2*
TRACE INORGANIC COMPOUNDS (mg/l)						
Arsenic		0.005			0.0055	
Copper		0.055	0.013			
Zinc		22.0	28.1	21.1	13.4	16.0

Notes:
* Sample fraction not filtered.
**Values derived from one sampling event. Values are not averages.
NP denotes not present.
No value denotes not detected.
A value of one-half the detection limit used in averaging not detected values.
The average value of the duplicate sample results used in overall averaging.

Attachment 1
Laboratory Data Sheets
Monthly Monitoring Program

NET NATIONAL ENVIRONMENTAL TESTING, INC.

NET Midwest, Inc.
Bartlett Division
850 West Bartlett Road
Bartlett, IL 60103

Tel: (708) 289-3100
Fax: (708) 289-5445

ANALYTICAL REPORT

Ms. Susan Mulholland
CH2M HILL
1033 University Place
Suite 300
Evanston, IL 60201

12/23/1991

Sample No.: 154693

Job No.: 91.4947

Sample Description: DEC-SP1-12-1
CHI28770.B0.MS; DuPont

Date Taken: 12/05/1991
Time Taken: 10:20
IEPA Cert. No. 100221

Date Received: 12/06/1991
Time Received: 10:00
WDNR Cert. No. 999447130

Chloride	24.	mg/L
COD, Total	170.	mg/L
Fluoride	0.8	mg/L
N-Ammonia	0.08	mg/L
N-Nitrate	0.80	mg/L
N-Nitrite	<0.01	mg/L
pH	6.9	units
Solids, Total Dissolved	1170.	mg/L
Solids, Total Suspended	129.	mg/L
Sulfate	700.	mg/L
Arsenic, AA	0.102	mg/L
Zinc, ICP	0.898	mg/L

Neal E. Cleghorn
Project Manager

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ANALYTICAL REPORT

Ms. Susan Mulholland
CH2M HILL
1033 University Place
Suite 300
Evanston, IL 60201

01/02/1992

Sample No.: 155139

Job No.: 91.5088

Sample Description: DEC-SP1-12-2
CH128770.B0.MS; DuPont

Date Taken: 12/12/1991
Time Taken: 09:31
IEPA Cert. No.: 100221

Date Received: 12/13/1991
Time Received: 10:00
WDNR Cert. No.: 999447130

Chloride	14.	mg/L
COD, Total	49.	mg/L
Fluoride	0.9	mg/L
N-Ammonia	0.46	mg/L
N-Nitrate	0.64	mg/L
N-Nitrite	<0.01	mg/L
pH	6.8	units
Solids, Total Dissolved	1020.	mg/L
Solids, Total Suspended	9.	mg/L
Sulfate	900.	mg/L
Arsenic, AA	0.060	mg/L
Zinc, ICP	0.840	mg/L

Kelly Jones

Kelly Jones
Project Manager

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ANALYTICAL REPORT

Ms. Susan Mulholland
CH2M HILL
1033 University Place
Suite 300
Evanston, IL 53201

01/10/1992

Sample No.: 155515

Job No.: 91.5202

Sample Description: DEC-SP1-12-3
CHI28770.B0.MS; DuPont

Date Taken: 12/18/1991
Time Taken: 10:45
IEPA Cert. No.: 100221

Date Received: 12/19/1991
Time Received: 10:00
WDNR Cert. No.: 999447130

Chloride	18.	mg/L
COD, Total	14.	mg/L
Fluoride	1.1	mg/L
N-Ammonia	0.92	mg/L
N-Nitrate	0.20	mg/L
N-Nitrite	<0.01	mg/L
pH	7.0	units
Solids, Total Dissolved	1220.	mg/L
Solids, Total Suspended	146.	mg/L
Sulfate	800.	mg/L
Arsenic, AA	0.045	mg/L
Zinc, ICP	0.355	mg/L

Kelly Jones

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ANALYTICAL REPORT

Ms. Susan Mulholland
CH2M HILL
1033 University Place
Suite 300
Evanston, IL 60201

12/23/1991

Sample No.: 154694

Job No.: 91.4947

Sample Description: DEC-SP2-12-1
CHI28770.B0.MS; DuPont

Date Taken: 12/05/1991
Time Taken: 10:40
IEPA Cert. No. 100221

Date Received: 12/06/1991
Time Received: 10:00
WDNR Cert. No. 999447130

BOD, Five Day	1.	mg/L
Chloride	340.	mg/L
COD, Total	96.	mg/L
Fluoride	2.2	mg/L
N-Ammonia	1.49	mg/L
N-Nitrate	14.7	mg/L
N-Nitrite	<0.01	mg/L
Oil & Grease	<1.	mg/L
pH	5.6	units
Solids, Total Dissolved	3050.	mg/L
Solids, Total Suspended	3.	mg/L
Sulfate	2000.	mg/L
Arsenic, AA	<0.0050	mg/L
Copper, ICP	<0.010	mg/L
Zinc, ICP	18.6	mg/L

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ANALYTICAL REPORT

Ms. Susan Mulholland
CH2M HILL
1033 University Place
Suite 300
Evanston, IL 60201

01/02/1992

Sample No.: 155140

Job No.: 91.5088

Sample Description: DEC-SP2-12-2
CH128770.B0.MS; DuPont

Date Taken: 12/12/1991
Time Taken: 10:15
IEPA Cert. No.: 100221

Date Received: 12/13/1991
Time Received: 10:00
WDNR Cert. No.: 999447130

BOD, Five Day	1.	mg/L
Chloride	240.	mg/L
COD, Total	39.	mg/L
Fluoride	1.9	mg/L
N-Ammonia	7.58	mg/L
N-Nitrate	14.7	mg/L
N-Nitrite	<0.01	mg/L
Oil & Grease	1.	mg/L
pH	5.7	units
Solids, Total Dissolved	2720.	mg/L
Solids, Total Suspended	<1.	mg/L
Sulfate	1900.	mg/L
Arsenic, AA	<0.0050	mg/L
Copper, ICP	<0.010	mg/L

Kelly Jones

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ANALYTICAL REPORT

Ms. Susan Mulholland
CH2M HILL
1033 University Place
Suite 300
Evanston, IL 60201

01/02/1992

Sample No.: 155140

Job No.: 91.5088

Sample Description: DEC-SP2-12-2
CH128770.B0.MS; DuPont

Date Taken: 12/12/1991
Time Taken: 10:15
IEPA Cert. No.: 100221

Date Received: 12/13/1991
Time Received: 10:00
WDNR Cert. No.: 999447130

Zinc, ICP	14.9	mg/L

Kelly Jones

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ANALYTICAL REPORT

Ms. Susan Mulholland
CH2M HILL
1033 University Place
Suite 300
Evanston, IL 53201

01/10/1992

Sample No.: 155516

Job No.: 91.5202

Sample Description: DEC-SP2-12-3
CHI28770.B0.MS; DuPont

Date Taken: 12/18/1991
Time Taken: 11:50
IEPA Cert. No.: 100221

Date Received: 12/19/1991
Time Received: 10:00
WDNR Cert. No.: 999447130

BOD, Five Day	<1.	mg/L
Chloride	250.	mg/L
COD, Total	11.	mg/L
Fluoride	1.9	mg/L
N-Ammonia	5.2	mg/L
N-Nitrate	11.5	mg/L
N-Nitrite	<0.01	mg/L
Oil & Grease	<1.	mg/L
pH	5.6	units
Solids, Total Dissolved	2840.	mg/L
Solids, Total Suspended	4.	mg/L
Sulfate	1800.	mg/L
Arsenic, AA	<0.0050	mg/L
Copper, ICP	<0.010	mg/L

Kelly Jones

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ANALYTICAL REPORT

Ms. Susan Mulholland
CH2M HILL
1033 University Place
Suite 300
Evanston, IL 53201

01/10/1992

Sample No.: 155516

Job No.: 91.5202

Sample Description: DEC-SP2-12-3
CHI28770.B0.MS; DuPont

Date Taken: 12/18/1991
Time Taken: 11:50
IEPA Cert. No.: 100221

Date Received: 12/19/1991
Time Received: 10:00
WDNR Cert. No.: 999447130

Zinc, ICP	13.4	mg/L

Kelly Jones

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ANALYTICAL REPORT

Ms. Susan Mulholland
CH2M HILL
1033 University Place
Suite 300
Evanston, IL 60201

01/14/1992

Sample No.: 155756

Job No.: 91.5279

Sample Description: DEC - SP2-12-4
CHI28770.B0.MS; Dupont

Date Taken: 12/26/1991
Time Taken: 10:15
IEPA Cert. No.: 100221

Date Received: 12/27/1991
Time Received: 10:00
WDNR Cert. No.: 999447130

BOD, Five Day	5.	mg/L
Chloride	48.	mg/L
COD, Total	61.	mg/L
Fluoride	2.5	mg/L
N-Ammonia	6.2	mg/L
N-Nitrate	13.3	mg/L
N-Nitrite	<0.01	mg/L
Oil & Grease	<1.	mg/L
pH	5.9	units
Solids, Total Dissolved	2760.	mg/L
Solids, Total Suspended	4.	mg/L
Sulfate	1800.	mg/L
Arsenic, AA	<0.0050	mg/L
Copper, ICP	<0.010	mg/L

Kelly Jones

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ANALYTICAL REPORT

Ms. Susan Mulholland
CH2M HILL
1033 University Place
Suite 300
Evanston, IL 60201

01/14/1992

Sample No.: 155756

Job No.: 91.5279

Sample Description: DEC - SP2-12-4
CHI28770.B0.MS; Dupont

Date Taken: 12/26/1991
Time Taken: 10:15
IEPA Cert. No.: 100221

Date Received: 12/27/1991
Time Received: 10:00
WDNR Cert. No.: 999447130

Zinc, ICP	15.8	mg/L

Kelly Jones

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ANALYTICAL REPORT

Ms. Susan Mulholland
CH2M HILL
1033 University Place
Suite 300
Evanston, IL 53201

01/10/1992

Sample No.: 155517

Job No.: 91.5202

Sample Description: DEC-SP3-12-3
CHI28770.B0.MS; DuPont

Date Taken: 12/18/1991
Time Taken: 11:15
IEPA Cert. No.: 100221

Date Received: 12/19/1991
Time Received: 10:00
WDNR Cert. No.: 999447130

BOD, Five Day	6.	mg/L
Chloride	28.	mg/L
COD, Total	14.	mg/L
Fluoride	3.1	mg/L
N-Ammonia	17.2	mg/L
N-Nitrate	0.20	mg/L
N-Nitrite	<0.01	mg/L
Oil & Grease	<1.	mg/L
pH	6.2	units
Solids, Total Dissolved	2890.	mg/L
Solids, Total Suspended	214.	mg/L
Sulfate	2100.	mg/L
Arsenic, AA	<0.0050	mg/L
Copper, ICP	<0.010	mg/L

Kelly Jones
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ANALYTICAL REPORT

Ms. Susan Mulholland
CH2M HILL
1033 University Place
Suite 300
Evanston, IL 53201

01/10/1992

Sample No.: 155517

Job No.: 91.5202

Sample Description: DEC-SP3-12-3
CHI28770.B0.MS; DuPont

Date Taken: 12/18/1991
Time Taken: 11:15
IEPA Cert. No.: 100221

Date Received: 12/19/1991
Time Received: 10:00
WDNR Cert. No.: 999447130

Zinc, ICP	16.0	mg/L

Kelly Jones

Kelly Jones
Project Manager

Attachment 2
Data Validation Summary
Monthly Monitoring Program

MEMORANDUM CH2M HILL

TO: Pixie Newman/CHI
Susan Mulholland/CHI

FROM: Lori J. Bootz/GLO

DATE: January 16, 1992

SUBJECT: Data Validation for Groundwater Seep Samples
Du Pont, East Chicago, Indiana

PROJECT: CHI28770.B0.MR

Introduction

This memorandum presents the data validation discussion for the inorganic analytical results for Groundwater Seep 1 samples collected on December 5, 12, and 18, 1991; Groundwater Seep 2 samples collected on December 5, 12, 18, and 26, 1991; and Groundwater Seep 3 samples collected on December 18, 1991, at the Du Pont Plant in East Chicago, Indiana. Sampling was performed in compliance with the U.S. EPA-requested "monthly monitoring program."

Samples were analyzed for major ions and selected metals by NET Laboratories in Bartlett, Illinois. Sample collection and transport were performed under strict chain-of-custody procedures. Requested QA/QC data included holding time data, chain-of-custody forms, calibration and procedure blank results, initial calibration verification standard recoveries, continuing calibration recovery results, field blank results, matrix spike and matrix spike duplicate results, and laboratory spike results. The QA/QC and sample data were reviewed as described below.

Holding Times

Inspection of holding times showed that the holding time requirements, as specified by the U.S. EPA's **Methods for Chemical Analysis of Water and Wastes**, were met with the exception of the following instances. BOD-five day samples collected on December 18, 1991, exceeded the 48-hour holding time by one day. Results for Groundwater Seeps 2 and 3 associated with this analysis were qualified as estimated and flagged with "UJ" and "J" respectively. Total suspended solids collected on December 18, 1991, exceeded the 7-day holding time by two days. Results for Groundwater Seeps 1, 2 and 3 associated with this analysis were qualified as estimated and flagged with a "J". BOD-five day samples collected on December 26, 1991, exceeded holding times by six days. The Groundwater Seep 2 result associated with the analysis was qualified as estimated and flagged with a "J". Total

dissolved solids collected on December 26, 1991, exceeded the 7-day holding time by four days. The Groundwater Seep 2 result was qualified as estimated and flagged with a "J".

Chain of Custody

The chain-of-custody forms were reviewed for accuracy and completeness. All necessary information was provided and found to be accurate. All requested analyses were performed, and the data packages were complete.

Blanks

The calibration and procedure blank results were inspected for possible contaminants. With the exception of copper and zinc, these blanks were free of compound concentrations equal to or greater than compound reporting limits.

Copper and zinc were found in the January 9 procedure blanks. The zinc concentration was at least a factor of three hundred smaller than the corresponding Groundwater Seep 2 zinc concentration, making data qualification unnecessary. The corresponding copper result of Groundwater Seep 2 was below the detection limit, indicating that qualifying action is unnecessary.

Calibration Recovery Results

The initial calibration verification (ICV) standard recoveries were within the EPA established control limits of $\pm$ 10% of true value. With the exception of zinc recoveries, the continuing calibration verification (CCV) recoveries were within the EPA established control limits of $\pm$ 10% of true value.

A CCV zinc standard yielded recovery above the 10% control limit for the groundwater seep samples collected on December 5, 1991. The associated samples were qualified as estimated and flagged with a "J".

Laboratory Control Spikes

The laboratory spike recoveries were within the EPA control limit of $\pm$ 20% of true value with the exception of oil and grease. Groundwater seep samples collected December 18 and 26, 1991, were qualified as estimated and flagged with a "UJ" due to low recoveries of oil and grease.

Matrix Spike/Matrix Spike Duplicate Fortifications

Except for sulfate, the matrix spike and matrix spike duplicate results were within EPA and methodology control limits. Groundwater seep samples collected December 5, 1991 did not

meet the EPA ±25% spike recovery value for sulfate. The groundwater seep sample sulfate values associated with these high recoveries were qualified as estimated and flagged with a "J".

Sample Results and Conclusions

The Groundwater Seeps 1, 2 and 3 results from this round of sampling were compared, and found to be generally consistent with data from previous sample events.

With the exception of the qualified results, this round of sample results are valid and useable.

One-Time Monthly Monitoring Report for the Groundwater Seeps 2 and 3 at the DuPont East Chicago Plant East Chicago, Indiana

Prepared by CH2M HILL
on behalf of
E.I. du Pont de Nemours & Company

January 27, 1992

MEMORANDUM

CH2M HILL

TO: Gene Hartstein/Du Pont
O.J. Meyer/Du Pont
Norman Griffiths/Du Pont
David Epps/DERS

FROM: Susan Mulholland/CH2M HILL
Erik Spande/CH2M HILL
Pixie Newman/CH2M HILL

DATE: January 27, 1992

SUBJECT: Report of One-Time Monitoring at Groundwater Seeps 2 and 3
Du Pont East Chicago Plant

In response to U.S. EPA's amended Section 308 Information Request dated June 27, 1991, Du Pont is submitting this "one-time monitoring program" report characterizing the quality of Groundwater Seeps 2 and 3 at Du Pont's East Chicago Plant. The groundwater seeps are located along the Grand Calumet River (see enclosed figure).

As specified in U.S. EPA's original Section 308 Information Request dated February 13, 1991, two grab samples were collected from Groundwater Seeps 2 and 3. These samples were analyzed for priority pollutants using U.S. EPA Methods 1624 and 1625 and priority pollutants using the U.S. EPA methods described in 40 CFR 136, Appendix C. In addition, the water quality parameters specified for the "monthly monitoring program" were analyzed. The fraction of each sample for inorganics analysis was split for analysis of total and dissolved inorganics. Although the U.S. EPA's Request specified total concentrations, dissolved concentrations were analyzed because these are more representative of the quality of the groundwater discharge than total concentrations including suspended solids.

A duplicate sample from each groundwater seep was also sent to a second laboratory for analysis. The results of these analyses are for quality assurance purposes, as well as, consistency with the "monthly monitoring program," the samples for which are being analyzed by this laboratory.

Groundwater Seep 2 was sampled April 4, 1991, and Groundwater Seep 3 was sampled April 25, 1991. Laboratory analyses for organics, pesticides/PCBs, and inorganics of Groundwater Seep 2 and 3 samples were validated (Attachments 1 and 2), resulting in the qualification of specified constituents (Tables 1 and 2).

TABLE 1

CONSTITUENTS DETECTED IN GROUNDWATER SEEP 2

Sample ID:	DEC-SP2-4-1	DEC-SP2-4-1	DEC-FRSP2-4-1	DEC-FRSP2-4-1	DEC-SSP2-4-1
Lab:	CH2M HILL	CH2M HILL	CH2M HILL	CH2M HILL	NET
Lab ID:	18272001/ 18276001/ 18426001	S18272001	18272002/ 18276002/ 18426002	S18272002	130118/ 132608
Filtered (Yes/No):	No	Yes	No	Yes	No*
WATER QUALITY PARAMETERS (mg/l)					
Alkalinity, (CaCO3) Bicarb.	NA	NA	NA	NA	66
Alkalinity, (CaCO3) Carb.	NA	NA	NA	NA	
BOD-Five Day		NA		NA	3
COD		NA		NA	20
Chloride	121	NA	124	NA	126
Fluoride	0.60	NA	0.60	NA	1.5
Nitrate + Nitrite	4.55	NA	4.42	NA	3.11**
Nitrogen,Ammonia	14.8	NA	15.0	NA	1.18
Solids, Dissolved	1,720	NA	1,740	NA	1,580
Solids, Suspended	8	NA	8	NA	1
Sulfate	984	NA	977	NA	1,040
pH (field)	5.0	NA	5.0	NA	5.0
Oil and Grease	1.7	NA	1.8	NA	
TRACE INORGANIC COMPOUNDS (mg/l)					
Aluminum	NA	NA	NA	NA	0.28
Beryllium		0.0014 B	0.00081 B		
Cadmium	0.0203	0.0184	0.0212	0.0204	
Calcium	NA	NA	NA	NA	220
Chromium, Total	0.0029 J		0.0049 J		
Copper	0.0089 B		0.0144 B	0.0085 B	
Iron	NA	NA	NA	NA	0.275
Lead	0.0055 J	0.0024 J	0.0043 J	0.0028 J	
Magnesium	NA	NA	NA	NA	110
Manganese	NA	NA	NA	NA	0.863
Mercury	0.00018 B	0.00018 B	0.00018 B	0.00018 B	
Nickel	0.0135 J	0.0161 J	0.0181 J	0.0150 J	
Potassium	NA	NA	NA	NA	7.61
Selenium	0.0013 B				
Silver	0.0068 B		0.0081 B		
Sodium	NA	NA	NA	NA	29.3
Zinc	5.05 J	4.87 J	4.94 J	4.89 J	4.69

Notes:
* Inorganic compounds sample fraction filtered.
**Value represents nitrate detected. No nitrite detected.
No value denotes not detected.
NA denotes not analyzed.
B qualifier denotes blank contamination.
J qualifier denotes estimated value.

Comments regarding constituents not detected:
No pesticides/PCBs detected in Groundwater Seep 2.
No known volatile or semivolatile organic (acid and base/neutral) compounds detected in Groundwater Seep 2.
No antimony, arsenic, barium, cobalt, cyanide, thallium, or vanadium detected in Groundwater Seep 2.
No asbestos fibers greater than 10 um in length detected in Groundwater Seep 2.

TABLE 2

CONSTITUENTS DETECTED IN GROUNDWATER SEEP 3

Sample ID:	DEC-SP3-4-4A	DEC-SP3-4-4A	DEC-SP3-4-4B	DEC-SP3-4-4B	DEC-SSP3-4-4B
Lab:	CH2M HILL	CH2M HILL	CH2M HILL	CH2M HILL	NET
Lab ID:	18424001/ 18425001	S18424001	18424002/ 18425002	S18424002	131855
Filtered (Yes/No):	No	Yes	No	Yes	No*
WATER QUALITY PARAMETERS (mg/l)					
Alkalinity, (CaCO3) Bicarb.	NA	NA	NA	NA	188
Alkalinity, (CaCO3) Carb.	NA	NA	NA	NA	
BOD-Five Day		NA		NA	1
COD		NA		NA	7
Chloride	27.8	NA	25.6	NA	26
Fluoride	0.94	NA	0.96	NA	1.1
Nitrate + Nitrite		NA	0.23	NA	1.72**
Nitrogen, Ammonia	1.5	NA	0.9	NA	0.68
Solids, Dissolved	2830	NA	2860	NA	2600
Solids, Suspended	83	NA	57	NA	52
Sulfate	1690	NA	1650	NA	1700
pH (field)	6.51	NA	6.65	NA	6.65
Oil and Grease	1.4	NA	1.5	NA	1
TRACE INORGANIC COMPOUNDS (mg/l)					
Aluminum	NA	NA	NA	NA	0.08
Arsenic	0.0038 B	0.00095 B	0.0054 B	0.0032 B	0.004
Cadmium	0.0069	0.0064	0.0081	0.0066	
Calcium	NA	NA	NA	NA	460
Iron	NA	NA	NA	NA	20.4
Lead	0.0056 B		0.0042 B		
Magnesium	NA	NA	NA	NA	90
Manganese	NA	NA	NA	NA	0.611
Nickel	0.0582	0.0626	0.0682	0.0717	
Potassium	NA	NA	NA	NA	1
Selenium	0.0138 J	0.0094 J	0.0051 J		0.004
Silver			0.0044 B	0.0057 B	
Sodium	NA	NA	NA	NA	82
Zinc	10.6	9.95	11.6	11.1	9.17
VOLATILE ORGANIC COMPOUNDS (ug/l)					
Methylene chloride	12 B	NA	15 B	NA	
Trichlorofluoromethane	9 J	NA	23 J	NA	NA

Notes:
* Inorganic compounds sample fraction filtered.
** Value represents 1.71 mg/l nitrate and 0.01 mg/l nitrite.
No value denotes not detected.
NA denotes not analyzed.
B qualifier denotes blank contamination.
J qualifier denotes estimated value.

Comments regarding constituents not detected:
No pesticides/PCBs detected in Groundwater Seep 3.
No known semivolatile organic (acid and base/neutral) compounds detected in Groundwater Seep 3.
No antimony, barium, beryllium, chromium, cobalt, copper, cyanide, iron, mercury, thallium, or vanadium detected in Groundwate
No asbestos fibers greater than 10 um in length detected in Groundwater Seep 3.

ATTACHMENT 1

GROUNDWATER SEEP 2 DATA VALIDATION

DU PONT, EAST CHICAGO, INDIANA

CH2M HILL

MEMORANDUM

TO: Pixie Newman/CHI
Susan Mulholland/CHI

FROM: Dan MacGregor/GLO

DATE: May 8, 1991

SUBJECT: Groundwater Seep 2 Data Validation
Du Pont, East Chicago, Indiana

PROJECT: CHI28770.B0.2R

INTRODUCTION

This memorandum presents the data validation discussion for analytical results for samples collected on April 4, 1991 at the Du Pont Plant in East Chicago, Indiana. The sampling was performed in accordance with the requirements of the one-time monitoring program for Groundwater Seep 2.

Duplicate seep samples were analyzed for the priority pollutant list compounds by CH2M HILL's laboratory in Montgomery, Alabama. CH2M HILL subcontracted the volatile and semivolatile chemical analyses to Reservoirs Analytical Technologies, Inc., in Fort Collins, Colorado. Sample collection and transport were performed under strict chain-of-custody procedures. The data were validated by procedures analogous to the U.S. EPA's Laboratory Data Validation Functional Guidelines. QA/QC data included: chain-of-custody forms, holding time data, method blank data and results, sample duplicate results, instrument calibration data, ICP interference check sample data, post-digestion spike data, matrix spike and matrix spike duplicate (MS/MSD) results, and laboratory control spike results.

VOLATILE AND SEMIVOLATILE ORGANIC ANALYSIS

The volatile organic analysis (VOA) and semivolatile organic analysis (SVOA) were performed using U.S. EPA isotopic dilution methods 1624 and 1625, respectively. These methods call for stable, isotopically labeled analogs of each compound to be added to the sample, acting as an internal standard and recovery. Because both methods exercise this internal quality control, QA/QC checks other then holding time and blank data are not required. No compounds were detected in either sample. The library compound search

performed with these methods yielded one detection in each SVOA sample. The detections were not identifiable by the library search.

BLANKS: The laboratory blank and reagent blank quantitation sheets were inspected for possible contaminants. All blanks were free of compound concentrations at levels equal to or greater than their reporting limits.

HOLDING TIMES: The samples met the holding time requirements for organic analyses.

PESTICIDE AND PCB ANALYSIS

No pesticides or PCBs were detected.

QA/QC PARAMETERS: The following QA/QC parameters were reviewed, and no deficiencies were noted: holding time data, instrument initial and continuing calibration results, process blank results, DDT/endrin degradation results, surrogate spike results, and MS/MSD results. Because there were no detections, validation of duplicate results was not possible.

INORGANIC ANALYSIS

Zinc, cadmium, and lead were the only metals detected above the reporting limit.

BLANKS: Initial and continuing calibration and preparation blank data were inspected for possible contaminants. Beryllium, mercury, silver, zinc, selenium, and copper were found to be low level contaminants. Zinc is the only one of these metals that was detected in the samples at an appreciable level. Because the zinc concentrations in the samples were significantly (i.e., 50 times) greater than the zinc concentration in the blanks, the blank concentration was deemed insignificant and no qualifiers were added to the sample zinc results. All other detections of these chemicals were qualified as "B," blank contaminated.

QA/QC PARAMETERS: The following QA/QC parameters were validated, and no deficiencies were noted: holding time data, instrument initial and continuing calibration, ICP interference check sample data, and duplicate results. Laboratory control spikes for antimony, silver, zinc, and lead had low recoveries. Due to silver being previously qualified as blank contaminated, the additional "J," estimated qualifier was not added. All other

detections of these compounds are qualified as "J," estimated. Post-digestion recoveries were within control limits for all chemicals except antimony and selenium, whose recoveries were low. Because the one detection of selenium was previously qualified as blank contaminated, no additional qualifiers were added.

Inorganic results that are less than the reporting limit but greater than or equal to the instrument detection limit are qualified as "J."

CHAIN OF CUSTODY

The chain-of-custody forms were reviewed for accuracy and completeness. The necessary information was provided and was found to be accurate.

RESULTS

The samples were analyzed for the priority pollutant list compounds. The semivolatile compound phenanthrene was not reported on the results page. After discussions with the laboratory performing this analysis it was determined that phenanthrene was analyzed and should have been reported at $< 10\ \mu g/L$. Except for phenanthrene, the organics data was found to be complete and acceptable.

The inorganic analytical performance was poor. Many elements were found to be either blank contaminants or found to have poor analytical recovery. Cadmium is the only inorganic element remaining unqualified.

With the previously noted qualifiers, the results for all analyses were found to be acceptable and valid.

ATTACHMENT 2

GROUNDWATER SEEP 3 DATA VALIDATION

DU PONT, EAST CHICAGO, INDIANA

CH2M HILL

MEMORANDUM

TO: Pixie Newman/CHI
Susan Mulholland/CHI

FROM: Lori J. Bootz/GLO

DATE: January 8, 1992

SUBJECT: Groundwater Seep 3 Data Validation
Du Pont, East Chicago, Indiana

PROJECT: CHI28770.B0.3R

INTRODUCTION

This memorandum presents the data validation discussion for analytical results for samples collected on April 25, 1991 at the Du Pont Plant in East Chicago, Indiana. The sampling was performed in accordance with the requirements of the one-time monitoring program for Groundwater Seep 3.

Duplicate seep samples were analyzed for the priority pollutant list volatile, semivolatile and inorganic compounds, with select conventional parameters. The analyses were primarily performed by CH2M HILL's laboratory in Montgomery, Alabama. CH2M HILL subcontracted the volatile, semivolatile and asbestos chemical analyses to Reservoirs Analytical Technologies, Inc., in Fort Collins, Colorado. Sample collection and transport were performed under strict chain-of-custody procedures. The data were validated by procedures analogous with the U.S. EPA's Laboratory Data Validation Functional Guidelines. QA/QC data included: chain-of-custody forms, holding time data, method blank data and results, sample duplicate results, instrument calibration data, ICP interference check sample data, post-digestion spike data, matrix spike and matrix spike duplicate (MS/MSD) results, and laboratory control spike results.

VOLATILE AND SEMIVOLATILE ORGANIC ANALYSIS

The volatile organic analysis (VOA) and semivolatile organic analysis (SVOA) were performed using U.S. EPA isotopic dilution methods 1624 and 1625, respectively. These methods call for stable, isotopically labeled analogs of each compound to be added to the sample, acting as an internal standard and recovery. Because both methods exercise this

internal quality control, QA/QC checks other then holding time and blank data are not required.

Methylene chloride was detected in the VOA samples. This detection was found to be due to laboratory contamination, therefore, the methylene chloride results were qualified as probably blank contaminated, flagged with a "B", and are not to be used in making project decisions.

The library compound search revealed that trichlorofluoromethane was detected in each VOA sample. The average trichlorofluoromethane concentration was 16 μg/L. This concentration is an estimate only. Other tentatively identified compound detections were not identifiable.

The EPA method 1625 SVOA sample analysis resulted in no compound detections being made, with the exception of one tentatively identified compound found in sample SP3-4-4A, which was unidentifiable.

BLANKS: The laboratory blank and reagent blank quantification sheets were inspected for possible contaminants. The VOA laboratory blank contained methylene chloride, and as previously discussed all corresponding results were qualified as probably blank contaminated. All SVOA blanks were free of compound concentrations at levels equal to or greater than their reporting limits.

HOLDING TIMES: The samples met the holding time requirements for organic analyses.

PESTICIDE AND PCB ANALYSIS

No pesticides or PCBs were detected.

QA/QC PARAMETERS: The following QA/QC parameters were reviewed, and no deficiencies were noted: holding time data, instrument initial and continuing calibration results, process blank results, DDT/endrin degradation results, MS/MSD results and surrogate spike results. As a result of no compound detections being made, the accuracy of duplicate results could not be determined.

INORGANIC ANALYSIS

Zinc, cadmium, nickel and lead were the only metals detected above the reporting limit.

BLANKS: Initial and continuing calibration and preparation blank data were inspected for possible contaminants. Lead was found to be a low level contaminant. The detections of lead were qualified as probably blank contaminated and flagged with a "B."

QA/QC PARAMETERS: The following QA/QC parameters were validated, and no deficiencies were noted: holding time data, instrument initial and continuing calibration, ICP interference check sample data, and duplicate results.

Selenium was detected in the samples at concentrations less than the method detection limit but greater than the instrument detection limit, therefore these results were considered as estimated and flagged with a "J".

Post-digestion recoveries were within control limits for all elements except selenium, whose recovery was below acceptable QC limits. As previously stated, selenium results were qualified as estimated due to low concentrations, and subsequently, no additional qualifiers were added.

CHAIN OF CUSTODY

The chain-of-custody forms were reviewed for accuracy and completeness. The necessary information was provided and was found to be accurate.

ASBESTOS ANALYSIS

The asbestos analysis was performed using method EPA 600/M4/82-020. Asbestos was detected in one of the two samples. One asbestos matrice was detected in the duplicate sample at a concentration equal to the method detection limit. Due to only one matrice being found, the sample result was qualified as estimated and flagged with a "J."

QA/QC PARAMETERS: The following QA/QC parameters were validated, and no deficiencies were noted: holding time data, method blank data and sample preparation data.

RESULTS

The samples were analyzed for the priority pollutant list compounds. There were no true organic detections. Trichlorofluoromethane was detected as a tentatively identified compound. The organics data was found to be complete and acceptable.

The inorganic analytical performance was complete and acceptable. Selenium was detected at concentrations less than or equal to the method detection limit and lead was found to be a low level laboratory contaminant. All lead results were qualified as blank contaminated and flagged with a "B." All selenium results were qualified as estimated and flagged with a "J."

With the exception of previously noted qualified results, the sample results for all analyses were found to be acceptable and valid.

INORGANIC DATA PACKAGE

WET CHEMISTRY DATA

Engineers
Planners
CH2M HILL
Economists
Scientists

CASE NARRATIVE
General Chemistry

Batch Number: 18272

Client/Project: DUPONT - EAST CHICAGO

I. Holding Time: All criteria met.

II. Analysis:

A.	Calibration:	Acceptance criteria met.
B.	Blanks:	Acceptance criteria met.
C.	Matrix Spike:	Acceptance criteria met.
D.	Duplicate Analysis:	Acceptance criteria met.
E.	Lab Control Sample:	Acceptance criteria met.
F.	Other:	The matrix spike and duplicate results associated with 18272 are in-house batch specific results.

III. I certify that this data package is in compliance with the terms and conditions agreed to by the client and CH2M HILL, both technically and for completeness, for other than the conditions detailed above.

SIGNED: _____ DATE: _____
Kevin A. Sanders
Inorganic Division Manager

CH2M HILL
Quality Analytical Laboratories
2567 Fairlane Drive, P.O. Box 230548, Montgomery, Alabama 36116
205.271.1444

COVER PAGE
GENERAL CHEMISTRY ANALYSES DATA PACKAGE
Level 2 and 3

Lab Name: CH2M HILL LABORATORIES Batch Number(s): 18272

Client/Project: DUPONT - EAST CHICAGO Project No: CHI28770.B0.SP

Client Sample ID	CH2M HILL/LMG Lab Sample ID	(lab name) Lab Sample ID	(lab name) Lab Sample ID
DEC-SP2-4-1	18272001		
DEC-FRSP2-4-1	18272002		

Comments:

I certify that this data package is in compliance with the terms and conditions of the contract, both technically and for completeness, for other than the conditions detailed above. Release of the data contained in this hardcopy data package has been authorized by the Laboratory Manager or the Manager's designee, as verified by the following signature.

Signature: Name: Kevin A. Sanders

Date: Title: Inorganic Division Manager

FORM 1
ANALYSIS DATA SHEET
GENERAL CHEMISTRY LEVEL 2 & 3

Client Sample Number

DEC-SP2-4-1

Lab Name: CH2M HILL LABORATORIES

Batch Number(s): 18272

Matrix (soil/water): WATER

Date Collected: 04/04/91

% Solids (if soil): N/A

Date Received: 04/06/91

Lab Sample ID: 18272001

METHOD	ANALYTE	CONCENTRATION	CONC. UNITS	DATE ANALYZED
EPA405.1	BOD, 5-DAY	<10	mg/L	04/06/91
EPA325.1	CHLORIDE	121	mg/L	04/19/91
EPA410.4	COD	<20	mg/L	04/18/91
EPA340.2	FLUORIDE	0.60	mg/L	04/17/91
EPA353.2	NITRATE/NITRITE	4.55	mg/L	04/11/91
EPA350.2	AMMONIA	14.8	mg/L	04/16/91
EPA375.4	SULFATE	984	mg/L	04/17/91
EPA160.1	TDS	1720	mg/L	04/11/91
EPA160.2	TSS	8	mg/L	04/11/91

Comments:

FORM 1
ANALYSIS DATA SHEET
GENERAL CHEMISTRY LEVEL 2 & 3

Client Sample Number

DEC-FRSP2-4-1

Lab Name: CH2M HILL LABORATORIES

Batch Number(s): 18272

Matrix (soil/water): WATER

Date Collected: 04/04/91

% Solids (if soil): N/A

Date Received: 04/06/91

Lab Sample ID: 18272002

METHOD	ANALYTE	CONCENTRATION	CONC. UNITS	DATE ANALYZED
EPA405.1	BOD, 5-DAY	<10	mg/L	04/06/91
EPA325.1	CHLORIDE	124	mg/L	04/19/91
EPA410.4	COD	<20	mg/L	04/18/91
EPA340.2	FLUORIDE	0.60	mg/L	04/17/91
EPA353.2	NITRATE/NITRITE	4.42	mg/L	04/11/91
EPA350.2	AMMONIA	15.0	mg/L	04/16/91
EPA375.4	SULFATE	977	mg/L	04/17/91
EPA160.1	TDS	1740	mg/L	04/11/91
EPA160.2	TSS	8	mg/L	04/11/91

Comments:

FORM 2
INITIAL AND CONTINUING CALIBRATION VERIFICATION
GENERAL CHEMISTRY LEVEL 2 & 3

Lab Name: CH2M HILL LABORATORIES Batch Number(s): 18272

ANALYTE	Conc. Units	INITIAL CALIBRATION			CONTINUING CALIBRATION					
		True	Found	% Rec.	True	Found	% Rec.	True	Found	% Rec.
CHLORIDE*	mg/L	51.60	54.35	105.3	51.60	49.94	96.8			
CHLORIDE**	mg/L	51.60	50.26	97.4	51.60	48.66	94.3			
NO3/NO2	mg/L	2.20	2.16	98.1	2.20	2.18	99.1	2.20	2.13	96.8
NO3/NO2	mg/L				2.20	2.20	100.0			
SULFATE	mg/L	25.00	26.57	106.3						

Control Limits: 90.0-110.0 (except as noted)
* DATA FOR SAMPLES ANALYZED WITH A DILUTION FACTOR OF 10.
** DATA FOR SAMPLES ANALYZED WITH A DILUTION FACTOR OF 5.

FORM 3
BLANKS
GENERAL CHEMISTRY LEVELS 2 & 3

Lab Name: CH2M HILL LABORATORIES Batch Number(s): 18272

Preparation Blank Matrix (soil/water): WATER

ANALYTE	Initial Calib. Blank	Continuing Calibration Blank 1	Continuing Calibration Blank 2	Method Blank	Conc. Units
BOD, 5-DAY	N/A	N/A	N/A	<2	mg/L
CHLORIDE	<1.0	<1.0	<1.0	<1.0	mg/L
COD	N/A	N/A	N/A	<20	mg/L
FLUORIDE	N/A	N/A	N/A	<0.10	mg/L
NITRATE/NITRITE	<0.05	<0.05	<0.05	<0.05	mg/L
AMMONIA	N/A	N/A	N/A	<0.1	mg/L
SULFATE	<1.0	<1.0	<1.0	<1.0	mg/L
TDS	N/A	N/A	N/A	<10	mg/L
TSS	N/A	N/A	N/A	<4	mg/L

COMMENTS:

FORM 5
MATRIX SPIKE SAMPLE RECOVERY
GENERAL CHEMISTRY LEVEL 2 & 3

Client Sample Number

MATRIX SPIKE

Lab Name: CH2M HILL LABORATORIES

Matrix (soil/water): WATER

Batch Number(s): 18272

% Solids (if soil): N/A

Lab Sample ID:

Analyte	Control Limit %R	Spiked Sample Result (SSR)	Sample Result (SR)	Spike Added (SA)	%R	Conc. Units
CHLORIDE	85-115	35.63	12.20	25.0	93.7	mg/L
COD	85-115	508.92	<20	500.0	101.8	mg/L
NO3/NO2	85-115	2.42	1.37	1.00	105.0	mg/L
AMMONIA	85-115	20.17	1.13	21.20	95.1	mg/L
SULFATE	85-115	36.10	9.0	25.0	108.4	mg/L

Comments: THESE MATRIX SPIKE RESULTS ARE IN-HOUSE BATCH SPECIFIC SPIKE RESULTS.

FORM 5A
MS/MSD SAMPLE RECOVERY
GENERAL CHEMISTRY LEVEL 2 & 3

Client Sample Number: MS/MSD

Lab Name: CH2M HILL LABORATORIES

Matrix (soil/water): WATER

Batch Number(s): 18272

% Solids (if soil): N/A

Lab Sample ID:

MATRIX SPIKE

ANALYTE	Spike Control Limit % Rec	Sample Result (SR)	Spike Added (SA)	MS Spiked Result (SSR)	MS % R	Conc. Units
FLUORIDE	85-115	1.13	1.00	2.16	103.0	mg/L

MATRIX SPIKE DUPLICATE

ANALYTE	Spike Control Limit % Rec	MSD Spiked Result (SSR)	MSD % R	RPD	Duplicate Control Limit RPD	Conc. Units
FLUORIDE	85-115	2.22	109.0	2.7	20	mg/L

Comments: THE MS/MSD RESULTS ARE IN-HOUSE BATCH SPECIFIC RESULTS.

FORM 6
DUPLICATES
GENERAL CHEMISTRY LEVEL 2 & 3

Client Sample Number

DUPLICATE

Lab Name: CH2M HILL LABORATORIES

Matrix (soil/water): WATER

Batch Number(s): 18273

% Solids (if soil): N/A

Lab Sample ID:

% Solids for Duplicate: N/A

Analyte	Control Limit	Sample (S)	Duplicate (D)	Conc. Units	RPD
CHLORIDE	20	12.2	11.1	mg/L	9.4
COD	20	<20	<20	mg/L	ND
NO3/NO2	20	1.37	1.35	mg/L	1.5
AMMONIA	20	<0.1	<0.1	mg/L	ND
SULFATE	20	9.0	8.7	mg/L	3.4

Comments: THESE DUPLICATE RESULTS ARE IN-HOUSE BATCH SPECIFIC RESULTS. ND = THE RPD COULD NOT BE DETERMINED AS THE SAMPLE AND DUPLICATE RESULTS WERE LESS THAN THE DETECTION LIMIT.

FORM 7
LABORATORY CONTROL SAMPLE
GENERAL CHEMISTRY LEVEL 2 & 3

Lab Name: CH2M HILL LABORATORIES Batch Number(s): 18272

ANALYTE	Conc. Units	AQUEOUS True	AQUEOUS Found	AQUEOUS % Rec	SOLID True	SOLID Found	SOLID % Rec	Limits
BOD, 5-DAY	mg/L	200.0	196.7	98.3				80-120
CHLORIDE	mg/L	51.6	51.0	98.8				88-109
COD	mg/L	162.30	174.55	107.5				90-108
FLUORIDE	mg/L	2.75	2.77	100.7				80-120
NO3/NO2	mg/L	2.20	2.08	94.5				91-104
AMMONIA	mg/L	5.50	5.25	95.4				87-105
SULFATE	mg/L	25.00	26.70	106.8				86-115
TDS	mg/L	408	431	105.6				80-120
TSS	mg/L	31.5	35.0	111.1				80-120

Comments:

FORM 10
DETECTION LIMITS
GENERAL CHEMISTRY LEVEL 2 & 3

b Name: CH2M HILL LABORATORIES Batch Number(s): 18272

ANALYTE	Method	Method Detection Limit	Reporting Limit	Conc. Units
BOD, 5-DAY	EPA405.1	2	2	mg/L
CHLORIDE	EPA325.1	0.28	1.0	mg/L
COD	EPA410.4	20	20	mg/L
FLUORIDE	EPA340.2	0.10	0.10	mg/L
NITRATE/NITRITE	EPA353.2	0.05	0.05	mg/L
AMMONIA	EPA350.2	0.1	0.1	mg/L
SULFATE	EPA375.4	0.9	1.0	mg/L
TDS	EPA160.1	10	10	mg/L
TSS	EPA160.2	4	4	mg/L

Comments:

CHAIN-OF-CUSTODY

FOR LAB USE ONLY

LAB # 18272
PROJ # CHI 28770.B0.SP
VERIFIED 4/9/91
HAZ/RAP/NEESA Y
QC LEVEL 1 2 3
COC yes | ICE yes
ANA REQ yes | TEMP 12°C
CUST SEAL yes | PH
SAMPLE COND

C.O.C from Cooler #1

NET NATIONAL ENVIRONMENTAL TESTING, INC.

NET Midwest, Inc.
Bartlett Division
850 West Bartlett Road
Bartlett, IL 60103

Tel: (708) 289-3100
Fax: (708) 289-5445

(ONLY FORM AVAILABLE - MADE ERROR ON PROVIDED CH2M FORM - EPS)

CHAIN OF CUSTODY

Client CH2M HILL/CHI	Project Name DU PONT - EAST CHICAGO
Send Report to: SUSAN MULHOLLAND/CHI DAVID MacGREGOR/GCO	
Address 1890 MAPLE AVE EVANSTON, IL 60016	Collected by: ERIK SPANDE
Telephone # (708) 866-9490	

Collection Information								Parameters														
Sample ID	Sampling Location	Date	Time	GRAB	COMP	Sample Type LAB#	No. of Container	Oil & Grease	PEST/PCB 608	Ammon-N, COD, NO3, NO2, Cl	Total Fluoride, SO4, BOD, TSS, TDS	Metals	Cyanide									
DEC-SP2-4-1		4/4/91	14:57	X		001	2	1	1													
							2	rec'd Broken 5/4/91		1	1											
							2					2										
							2						2									
DEC-FRSP2-4-1		4/4/91	14:57	X		002	2	1	1													
							2			1	1											
							2					2										
							2						2									
	METHOD BLANK					ZW1																

1-l amber, 2-l amber
1-l poly/H_2SO_4, 1-l poly
1-l poly/HNO_3, 1-l poly
2 1/2 gal poly w/NaOH
as above

Remarks: Contact Susan Mulholland with any questions or comments

Relinquished by:	Date	Time	Received by:	Date	Time
ERIK SPANDE	4/4/91	14:57			

Shipping Notes/Lab Comments
Fed Ex ~~0439478~~ 0439472482

Received for ~~NET Midwest~~ CH2M HILL by: Penelope E. Pietrowski 4-6-91 0915

Samples Field Filtered: X Yes ___ No
Seals Intact Upon Receipt: X Yes ___ No ___ N/A

000058 5/4/91 4/8

Engineers
Planners
CH2M HILL Economists
Scientists

April 26, 1991

CHI28770.B0.SP

Ms. Susan Mulholland
CH2M HILL/CHI
1890 Maple Avenue
Suite 200
Evanston, Illinois 60201

RE: Analytical Data for DuPont-East Chicago, LMG Laboratory No. 18272

Dear Ms. Mulholland:

On April 6, 1991, the CH2M HILL Montgomery Laboratory received two samples with a request for analysis of selected inorganic parameters.

The analytical results and associated quality control data are enclosed. Any unusual difficulties encountered during the analysis of these samples are discussed in the case narratives.

If you should have any questions concerning the data, please inquire.

The CH2M HILL policy is to store samples for up to 30 days after reporting. If you desire, our laboratory will maintain your samples for a longer period at a cost of $5.00 per sample per month. Samples determined to be hazardous can either be returned to you or disposed of at a cost of $25.00 per sample.

Sincerely,

Wanda L. Hall

Wanda L. Hall
Data Package Supervisor

Enclosures

cc: Mr. Dan MacGreggor/GLO

Engineers
Planners
CH2M HILL
Economists
Scientists

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EPA QUALIFIERS

INORGANIC ANALYSES

- C (Concentration) Qualifier -- Enter "B" if the reported value obtained was less than the CRDL but greater than or equal to the IDL. Enter "U" if the value was less than the IDL or was not detected.

- Q Qualifier -- Entries and their meanings are:

  E - The reported value is estimated because of interference. An explanatory comment must be included under "Comments" on the Cover Page if the problem applies to all samples in this data package or on the individual FORM I if it is an isolated problem.

  M - Duplicate injection precision was not met (two analyses of the same sample did not agree).

  N - Spiked sample recovery not within control limits.

  S - The reported value was determined by the Method of Standard Additions (MSA).

  W - Post-digestion spike for Furnace AA analysis is out of control limits (85-115%), while sample absorbance is less than 50 % of spike absorbance.

  * - Duplicate analysis not within control limits.

  + - Correlation coefficient for the MSA is less than 0.995.

  Entering "S", "W", or "+" is mutually exclusive. No combination of these qualifiers can appear in the same field.

- M (Method) Qualifier -- Enter one of the following:

  P - ICP
  A - Flame AA
  F - Furnace AA
  CV - Manual Cold Vapor AA
  AV - Automated Cold Vapor AA
  AS - Semi-Automated Spectrophotometric
  C - Manual Spectrophotometric
  T - Titrimetric
  NR - Analyte was not required by your lab

CH2M HILL Quality Analytical Laboratories 2567 Fairlane Drive, P.O. Box 230548, Montgomery, Alabama 36116 205.271.1444

TABLE 1

SAMPLE CROSS-REFERENCE SUMMARY

CH2M HILL Laboratory No. 18272

CH2M HILL Sample No.	Sample Description			
18272001	SAMPLE DEC-SP2-4-1	04/04/91	1457	GRAB
18272002	SAMPLE DEC-FRSP2-4-1	04/04/91	1457	GRAB

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CATIONS DATA PACKAGE

Engineers
Planners
CH2M HILL Economists
Scientists

CASE NARRATIVE
Cations

Batch Number: 18272

Client/Project: DUPONT - EAST CHICAGO

I. Holding Time:
All holding times were met.

II. Analysis:

A. Blanks:
All acceptance criteria were met.

B. Calibration:
All acceptance criteria were met.

C. ICP Interference Check Sample:
All acceptance criteria were met.

D. Spike Sample Analysis:
Prespike and postspike recoveries outside criteria are flagged accordingly.

E. Duplicate Sample Analysis:
All acceptance criteria were met.

F. Laboratory Control Sample Analysis:
All acceptance criteria were met.

G. ICP Serial Dilution:
Not required for this level QC.

H. Other:
Batch specific QC samples for cyanide are also contained within this data package.

III. I certify that this data package is in compliance with the terms and conditions agreed to by the client and CH2M HILL, both technically and for completeness, for other than the conditions detailed above.

SIGNED: _____ DATE: 26APR91
Kevin A. Sanders
Inorganic Division Manager

CH2M HILL
Quality Analytical Laboratories
2567 Fairlane Drive, P.O. Box 230548, Montgomery, Alabama 36116
205.271.1444

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COVER PAGE - INORGANIC ANALYSES DATA PACKAGE

Lab Name: CH2M_HILL_MGM_____ Contract: 18272_____

Lab Code: NA____ Case No.: 18272 SAS No.: 18272_ SDG No.:18272_

SOW No.: 7/88_

EPA Sample No.	Lab Sample ID
_RSP2-41_____	__18272002_ ___
_RSP241D_____	__S18272002D__
_RSP241S_____	__S18272002___
_RSP241S_____	__S18272002S__
_SP2-4-1_____	__18272001____
_P2-4-1D_____	__18272001D___
_P2-4-1D_____	__S18272001D__
_P2-4-1S_____	__S18272001___
_P2-4-1S_____	__18272001S___
_P2-4-1S_____	__S18272001S__
_XXXX_____	__XXXXXXXX____
_____D_____	__XXXXXXXXD___
_____S_____	__XXXXXXXXS___

Were ICP interelement corrections applied ? Yes/No NO_

Were ICP background corrections applied ? Yes/No YES
If yes - were raw data generated before application of background corrections ? Yes/No NO_

Comments: BATCH_SPECIFIC_QC_SAMPLES_FOR_CYANIDE_ARE_ALSO_CONTAINED_WITHIN_THIS__ _____DATA_PACKAGE._____

I certify that this data package is in compliance with the terms and conditions of the contract, both technically and for completeness, for other than the conditions detailed above. Release of the data contained in this hardcopy data package and in the computer-readable data submitted on floppy diskette has been authorized by the Laboratory Manager or the Manager's designee, as verified by the following signature.

Signature: _____ Name: Kevin A. Sanders_____

Date: 25APR91 Title: Inorganic Division Mgr._

COVER PAGE - IN

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1

INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

DEC-SP2-4-1

Lab Name: CH2M_HILL_MGM_____ Contract: 18272_____

Lab Code: NA____ Case No.: 18272 SAS No.: 18272_ SDG No.: 18272_

Matrix (soil/water): WATER Lab Sample ID: 18272001__

Level (low/med): LOW__ Date Received: 04/06/91

% Solids: __0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L_

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum_		-		NR
7440-36-0	Antimony_	53.3	U	N	P_
7440-38-2	Arsenic__	0.60	U		F_
7440-39-3	Barium___				NR
7440-41-7	Beryllium	0.13	U		P_
7440-43-9	Cadmium__	20.3			P_
7440-70-2	Calcium__				NR
7440-47-3	Chromium_	2.9	B		P_
7440-48-4	Cobalt___				NR
7440-50-8	Copper___	8.9	B		P_
7439-89-6	Iron_____				NR
7439-92-1	Lead_____	5.5			F_
7439-95-4	Magnesium				NR
7439-96-5	Manganese				NR
7439-97-6	Mercury__	0.18	B		CV
7440-02-0	Nickel___	13.5	B		P_
7440-09-7	Potassium				NR
7782-49-2	Selenium_	1.3	B	W	F_
7440-22-4	Silver___	6.8	B	N	P_
7440-23-5	Sodium___				NR
7440-28-0	Thallium_	1.5	U		F_
7440-62-2	Vanadium_				NR
7440-66-6	Zinc_____	5050			P_
_____	Cyanide__	3.6	U		CN

Color Before: CLEAR____ Clarity Before: CLEAR_ Texture: N/A___

Color After: CLEAR____ Clarity After: CLEAR_ Artifacts: _____

Comments:

THE_"N"_QUALIFIER_REFLECTS_POOR_PRESPIKE_RECOVERY._THE_"W"_REFLECTS___
POOR_RECOVERY_OF_THE_ANALYTICAL_POSTSPIKE._____

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1
INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

DEC-SP2-4-1S

Lab Name: CH2M_HILL_MGM Contract: 18272

Lab Code: NA Case No.: 18272 SAS No.: 18272 SDG No.: 18272

Matrix (soil/water): WATER Lab Sample ID: S18272001

Level (low/med): LOW Date Received: 04/06/91

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum				NR
7440-36-0	Antimony	53.3	U	N	P
7440-38-2	Arsenic	0.60	U		F
7440-39-3	Barium				NR
7440-41-7	Beryllium	1.4	B		P
7440-43-9	Cadmium	18.4			P
7440-70-2	Calcium				NR
7440-47-3	Chromium	2.6	U		P
7440-48-4	Cobalt				NR
7440-50-8	Copper	2.2	U		P
7439-89-6	Iron				NR
7439-92-1	Lead	2.4	B		F
7439-95-4	Magnesium				NR
7439-96-5	Manganese				NR
7439-97-6	Mercury	0.18	B		CV
7440-02-0	Nickel	16.1	B		P
7440-09-7	Potassium				NR
7782-49-2	Selenium	0.90	U		F
7440-22-4	Silver	4.0	U		P
7440-23-5	Sodium				NR
7440-28-0	Thallium	1.5	U		F
7440-62-2	Vanadium				NR
7440-66-6	Zinc	4870			P
	Cyanide				NR

Color Before: CLEAR Clarity Before: CLEAR Texture: N/A

Color After: CLEAR Clarity After: CLEAR Artifacts:

Comments:
THESE_DATA_ARE_FOR_SOLUBLE_ANALYTES.

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1
INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

DEC-FRSP2-41

Lab Name: CH2M_HILL_MGM Contract: 18272

Lab Code: NA Case No.: 18272 SAS No.: 18272 SDG No.: 18272

Matrix (soil/water): WATER Lab Sample ID: 18272002

Level (low/med): LOW Date Received: 04/06/91

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum				NR
7440-36-0	Antimony	53.3	U	N	P
7440-38-2	Arsenic	0.60	U		F
7440-39-3	Barium				NR
7440-41-7	Beryllium	0.81	B		P
7440-43-9	Cadmium	21.2			P
7440-70-2	Calcium				NR
7440-47-3	Chromium	4.9	B		P
7440-48-4	Cobalt				NR
7440-50-8	Copper	14.4	B		P
7439-89-6	Iron				NR
7439-92-1	Lead	4.3			F
7439-95-4	Magnesium				NR
7439-96-5	Manganese				NR
7439-97-6	Mercury	0.18	B		CV
7440-02-0	Nickel	18.1	B		P
7440-09-7	Potassium				NR
7782-49-2	Selenium	0.90	U		F
7440-22-4	Silver	8.1	B	N	P
7440-23-5	Sodium				NR
7440-28-0	Thallium	1.5	U		F
7440-62-2	Vanadium				NR
7440-66-6	Zinc	4940			P
	Cyanide	3.6	U		CN

Color Before: CLEAR Clarity Before: CLEAR Texture: N/A

Color After: CLEAR Clarity After: CLEAR Artifacts:

Comments:
EPA_SAMPLE_NAME_WAS_MODIFIED_FROM_DEC-FRSP2-4-1_TO_DEC-FRSP2-41,DUE_TO SOFTWARE_LIMITATIONS.

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1

INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

DEC-FRSP241S

Lab Name: CH2M_HILL_MGM Contract: 18272

Lab Code: NA Case No.: 18272 SAS No.: 18272 SDG No.: 18272

Matrix (soil/water): WATER Lab Sample ID: S18272002

Level (low/med): LOW Date Received: 04/06/91

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum				NR
7440-36-0	Antimony	53.3	U	N	P
7440-38-2	Arsenic	0.60	U		F
7440-39-3	Barium				NR
7440-41-7	Beryllium	0.13	U		P
7440-43-9	Cadmium	20.4			P
7440-70-2	Calcium				NR
7440-47-3	Chromium	2.6	U		P
7440-48-4	Cobalt				NR
7440-50-8	Copper	8.5	B		P
7439-89-6	Iron				NR
7439-92-1	Lead	2.8	B		F
7439-95-4	Magnesium				NR
7439-96-5	Manganese				NR
7439-97-6	Mercury	0.18	B		CV
7440-02-0	Nickel	15.0	B		P
7440-09-7	Potassium				NR
7782-49-2	Selenium	0.90	U		F
7440-22-4	Silver	4.0	U		P
7440-23-5	Sodium				NR
7440-28-0	Thallium	1.5	U		F
7440-62-2	Vanadium				NR
7440-66-6	Zinc	4890			P
	Cyanide				NR

Color Before: CLEAR Clarity Before: CLEAR Texture: N/A

Color After: CLEAR Clarity After: CLEAR Artifacts:

Comments:
THESE_DATA_ARE_FOR_SOLUBLE_ANALYTES.
EPA_SAMPLE_NAME_WAS_MODIFIED_FROM_DEC-FRSP2-4-1_TO_DEC-FRSP241,_DUE
TO_SOFTWARE_LIMITATIONS.

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1
INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

XXXX

Lab Name: CH2M_HILL_MGM_____ Contract: 18272_____

Lab Code: NA____ Case No.: 18272 SAS No.: 18272_ SDG No.: 18272_

Matrix (soil/water): WATER Lab Sample ID: XXXXXXXX__

Level (low/med): LOW__ Date Received: 06/28/89

% Solids: __0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L_

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum_				NR
7440-36-0	Antimony_				NR
7440-38-2	Arsenic__				NR
7440-39-3	Barium___				NR
7440-41-7	Beryllium				NR
7440-43-9	Cadmium__				NR
7440-70-2	Calcium__				NR
7440-47-3	Chromium_				NR
7440-48-4	Cobalt___				NR
7440-50-8	Copper___				NR
7439-89-6	Iron_____				NR
7439-92-1	Lead_____				NR
7439-95-4	Magnesium				NR
7439-96-5	Manganese				NR
7439-97-6	Mercury__				NR
7440-02-0	Nickel___				NR
7440-09-7	Potassium				NR
7782-49-2	Selenium_				NR
7440-22-4	Silver___				NR
7440-23-5	Sodium___				NR
7440-28-0	Thallium_				NR
7440-62-2	Vanadium_				NR
7440-66-6	Zinc_____				NR
	Cyanide__	3.6	U		CN

Color Before: CLEAR____ Clarity Before: CLEAR_ Texture: N/A___

Color After: CLEAR____ Clarity After: CLEAR_ Artifacts: _____

Comments:
THIS_IS_THE_NATIVE_SAMPLE_ASSOCIATED_WITH_THE_BATCH_SPECIFIC_QC_FOR___
CYANIDE.

U.S. EPA - CLP

2A
INITIAL AND CONTINUING CALIBRATION VERIFICATION

Lab Name: CH2M_HILL_MGM_____ Contract: 18272_____

Lab Code: NA____ Case No.: 18272 SAS No.: 18272_ SDG No.: 18272_

Initial Calibration Source: (EPA 0690)__

Continuing Calibration Source: (EPA 0690)__

Concentration Units: ug/L

Analyte	Initial Calibration True	Initial Calibration Found	Initial Calibration %R(1)	Continuing Calibration True	Continuing Calibration Found	Continuing Calibration %R(1)	Continuing Calibration Found	Continuing Calibration %R(1)	M
Aluminum									NR
Antimony	1956.0	1919.52	98.1	1956.0	1931.67	98.8	1902.51	97.3	P
Arsenic	37.9	38.66	102.0	37.9	37.27	98.3	36.01	95.0	F
Barium									NR
Beryllium	510.0	494.82	97.0	510.0	497.14	97.5	499.90	98.0	P
Cadmium	498.0	484.24	97.2	498.0	487.34	97.9	488.52	98.1	P
Calcium									NR
Chromium	510.0	501.54	98.3	510.0	509.72	99.9	509.19	99.8	P
Cobalt									NR
Copper	519.0	486.23	93.7	519.0	488.09	94.0	487.83	94.0	P
Iron									NR
Lead	39.0	41.46	106.3	39.0	38.45	98.6	40.94	105.0	F
Magnesium									NR
Manganese									NR
Mercury	4.9	4.55	92.9	4.9	4.99	101.8	4.77	97.3	CV
Nickel	497.0	493.93	99.4	497.0	496.68	99.9	493.99	99.4	P
Potassium									NR
Selenium	41.6	42.40	101.9	41.6	40.14	96.5	38.02	91.4	F
Silver	498.0	490.28	98.4	498.0	494.20	99.2	494.64	99.3	P
Sodium									NR
Thallium	38.9	37.43	96.2	38.9	41.35	106.3	41.96	107.9	F
Vanadium									NR
Zinc	3316.0	3230.80	97.4	3316.0	3253.01	98.1	3249.34	98.0	P
Cyanide	37.6	37.30	99.2	37.6	37.26	99.1	40.19	106.9	CN

(1) Control Limits: Mercury 80-120; Other Metals 90-110; Cyanide 85-115

U.S. EPA - CLP

2A
INITIAL AND CONTINUING CALIBRATION VERIFICATION

Lab Name: CH2M_HILL_MGM_____ Contract: 18272_____

Lab Code: NA____ Case No.: 18272 SAS No.: 18272_ SDG No.: 18272_

Initial Calibration Source: (EPA 0690)__

Continuing Calibration Source: (EPA 0690)__

Concentration Units: ug/L

Analyte	Initial Calibration True	Initial Calibration Found	Initial Calibration %R(1)	Continuing Calibration True	Continuing Calibration Found	Continuing Calibration %R(1)	Continuing Calibration Found	Continuing Calibration %R(1)	M
Aluminum									NR
Antimony				1956.0	1901.02	97.2	1942.53	99.3	P
Arsenic									NR
Barium									NR
Beryllium									NR
Cadmium									NR
Calcium									NR
Chromium									NR
Cobalt									NR
Copper									NR
Iron									NR
Lead									NR
Magnesium									NR
Manganese									NR
Mercury				4.9	4.55	92.9			CV
Nickel									NR
Potassium									NR
Selenium									NR
Silver									NR
Sodium									NR
Thallium									NR
Vanadium									NR
Zinc									NR
Cyanide				37.6	40.17	106.8	38.71	103.0	CN

(1) Control Limits: Mercury 80-120; Other Metals 90-110; Cyanide 85-115

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2A
INITIAL AND CONTINUING CALIBRATION VERIFICATION

Lab Name: CH2M_HILL_MGM_____ Contract: 18272_____

Lab Code: NA____ Case No.: 18272 SAS No.: 18272_ SDG No.: 18272_

Initial Calibration Source: (EPA 0690)__

Continuing Calibration Source: (EPA 0690)__

Concentration Units: ug/L

Analyte	Initial Calibration True	Initial Calibration Found	Initial Calibration %R(1)	Continuing Calibration True	Continuing Calibration Found	Continuing Calibration %R(1)	Continuing Calibration Found	Continuing Calibration %R(1)	M
Aluminum_									NR
Antimony_									NR
Arsenic__									NR
Barium___									NR
Beryllium									NR
Cadmium__									NR
Calcium__									NR
Chromium_									NR
Cobalt___									NR
Copper___									NR
Iron____									NR
Lead____									NR
Magnesium									NR
Manganese									NR
Mercury__									NR
Nickel___									NR
Potassium									NR
Selenium_									NR
Silver___									NR
Sodium___									NR
Thallium_									NR
Vanadium_									NR
Zinc____									NR
Cyanide__				37.6	38.75	103.1	35.18	93.6	CN

(1) Control Limits: Mercury 80-120; Other Metals 90-110; Cyanide 85-115

U.S. EPA - CLP

2A
INITIAL AND CONTINUING CALIBRATION VERIFICATION

Lab Name: CH2M_HILL_MGM_____ Contract: 18272_____

Lab Code: NA____ Case No.: 18272 SAS No.: 18272_ SDG No.: 18272_

Initial Calibration Source: (EPA 0690)__

Continuing Calibration Source: (EPA 0690)__

Concentration Units: ug/L

Analyte	Initial Calibration True	Initial Calibration Found	Initial Calibration %R(1)	Continuing Calibration True	Continuing Calibration Found	Continuing Calibration %R(1)	Continuing Calibration Found	Continuing Calibration %R(1)	M
Aluminum_									NR
Antimony_									NR
Arsenic__									NR
Barium___									NR
Beryllium									NR
Ca[illegible]ium__									NR
Ca[illegible]ium__									NR
Chromium_									NR
Cobalt___									NR
Copper___									NR
Iron____									NR
Lead____									NR
Magnesium									NR
Manganese									NR
Mercury__									NR
Nickel___									NR
Potassium									NR
Selenium_									NR
Silver___									NR
Sodium___									NR
Thallium_									NR
Vanadium_									NR
Zinc____									NR
Cyanide__				37.6	35.34	94.0			CN

(1) Control Limits: Mercury 80-120; Other Metals 90-110; Cyanide 85-115

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3
BLANKS

Lab Name: CH2M_HILL_MGM_____ Contract: 18272_____

Lab Code: NA____ Case No.: 18272 SAS No.: 18272_ SDG No.: 18272_

Preparation Blank Matrix (soil/water): WATER

Preparation Blank Concentration Units (ug/L or mg/kg): UG/L_

Analyte	Initial Calib. Blank (ug/L)	C	Continuing Calibration Blank (ug/L) 1	C	2	C	3	C	Prepa-ration Blank	C	M
Aluminum											NR
Antimony	53.3	U	53.3	U	53.3	U	53.3	U	53.3	U	P
Arsenic	0.6	U	0.6	U	0.6	U			0.6	U	F
Barium											NR
Beryllium	0.1	U	0.1	U	0.7	B			1.4	B	P
Cadmium	3.7	U	3.7	U	3.7	U			3.7	U	P
Calcium											NR
Chromium	2.6	U	2.6	U	-3.5	B			2.6	U	P
Cobalt											NR
Copper	2.2	U	2.2	U	-2.5	B			2.2	U	P
Iron											NR
Lead	1.3	U	1.3	U	1.3	U			1.3	U	F
Magnesium											NR
Manganese											NR
Mercury	0.2	B	0.2	B	0.2	B	0.2	B	0.2	B	CV
Nickel	8.6	U	8.6	U	8.6	U			8.6	U	P
Potassium											NR
Selenium	0.9	U	0.9	U	0.9	U			0.9	U	F
Silver	4.9	B	4.0	U	4.1	B			9.6	B	P
Sodium											NR
Thallium	1.5	U	1.5	U	1.5	U			1.5	U	F
Vanadium											NR
Zinc	3.9	U	3.9	U	3.9	U			3.9	U	P
Cyanide	3.6	U	3.6	U	3.6	U	3.6	U	3.6	U	CN

U.S. EPA - CLP

3
BLANKS

Lab Name: CH2M_HILL_MGM_____ Contract: 18272_____

Lab Code: NA____ Case No.: 18272 SAS No.: 18272_ SDG No.: 18272_

Preparation Blank Matrix (soil/water): WATER

Preparation Blank Concentration Units (ug/L or mg/kg): UG/L_

Analyte	Initial Calib. Blank (ug/L)	C	Continuing Calibration Blank (ug/L) 1	C	2	C	3	C	Prepa-ration Blank	C	M
Aluminum											NR
Antimony			53.3	U					53.3	U	P
Arsenic									0.6	U	F
Barium											NR
Beryllium									1.4	B	P
Cadmium									3.7	U	P
Calcium											NR
Chromium									2.6	U	P
Cobalt											NR
Copper									-4.2	B	P
Iron											NR
Lead									1.3	U	F
Magnesium											NR
Manganese											NR
Mercury									0.2	B	CV
Nickel									8.6	U	P
Potassium											NR
Selenium									-1.3	B	F
Silver									4.0	U	P
Sodium											NR
Thallium									1.5	U	F
Vanadium											NR
Zinc									9.8	B	P
Cyanide			3.6	U	3.6	U	3.6	U			CN

U.S. EPA - CLP

3
BLANKS

Lab Name: CH2M_HILL_MGM_____ Contract: 18272_____

Lab Code: NA____ Case No.: 18272 SAS No.: 18272_ SDG No.: 18272_

Preparation Blank Matrix (soil/water): _____

Preparation Blank Concentration Units (ug/L or mg/kg): _____

Analyte	Initial Calib. Blank (ug/L)	C	Continuing Calibration Blank (ug/L) 1	C	2	C	3	C	Prepa-ration Blank	C	M
Aluminum											NR
Antimony											NR
Arsenic											NR
Barium											NR
Beryllium											NR
Cadmium											NR
Calcium											NR
Chromium											NR
Cobalt											NR
Copper											NR
Iron											NR
Lead											NR
Magnesium											NR
Manganese											NR
Mercury											NR
Nickel											NR
Potassium											NR
Selenium											NR
Silver											NR
Sodium											NR
Thallium											NR
Vanadium											NR
Zinc											NR
Cyanide			3.6	U							CN

U.S. EPA - CLP

4

ICP INTERFERENCE CHECK SAMPLE

Lab Name: CH2M_HILL_MGM_____ Contract: 18272_____

Lab Code: NA____ Case No.: 18272 SAS No: 18272_ SDG No.: 18272_

ICP ID Number: PE-PLASMA 2_ ICS Source: EPA (1287)__

Concentration Units: ug/L

Analyte	True Sol. A	True Sol. AB	Initial Found Sol. A	Initial Found Sol. AB	%R	Final Found Sol. A	Final Found Sol. AB	%R
Aluminum_								
Antimony_								
Arsenic__								
Barium___								
Beryllium		472		487.4	103.3		492.9	104.4
Cadmium__		958		851.3	88.9		863.9	90.2
Calcium__								
Chromium_	25	525	22	529.8	100.9	20	542.6	103.4
Cobalt___								
Copper___		523		508.8	97.3		514.3	98.3
Iron_____								
Lead_____								
Magnesium								
Manganese								
Mercury__								
Nickel___		940		900.6	95.8		899.1	95.6
Potassium								
Selenium_								
Silver___		990		968.9	97.9		965.5	97.5
Sodium___								
Thallium_								
Vanadium_								
Zinc_____		1026		1032.2	100.6		1039.9	101.4

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Bartlett Division
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Fax: (708) 289-5445

ANALYTICAL REPORT

Ms. Susan Mulholland
CH2M HILL
1890 Maple Av.
Suite 200
Chicago, IL 60201

05/03/1991

Sample No.: 130118

Job No.: 91.0364

Sample Description: DEC-SSP2-4-1
CH128770.B0.SP; Du Pont

Date Taken: 04/04/1991
Time Taken: 14:58

Date Received: 04/05/1991
Time Received: 09:50

Alkalinity, bicarb (CaCO3)	66.	mg/L
Alkalinity, carbonate (CaCO3)	<1.	mg/L
BOD, Five Day	3.	mg/L
Chloride	126.	mg/L
COD, Total	20.	mg/L
Cyanide, total	<0.001	mg/L
Fluoride	1.5	mg/L
N-Ammonia	1.18	mg/L
N-Nitrate	3.11	mg/L
N-Nitrite	<0.01	mg/L
Oil & Grease	<1.	mg/L
Solids, Total Dissolved	1580.	mg/L
Solids, Total Suspended	1.	mg/L
Sulfate	1040.	mg/L
Aluminum, ICP	0.37	mg/L
Antimony, ICP	<0.50	mg/L
Arsenic, AA	<0.005	mg/L
Barium, ICP	<0.020	mg/L
Beryllium, ICP	<0.0050	mg/L
Cadmium, ICP	<0.040	mg/L
Chromium, ICP	<0.040	mg/L
Cobalt, ICP	<0.10	mg/L
Copper, ICP	<0.050	mg/L
Iron, ICP	0.275	mg/L
Lead, ICP	<0.080	mg/L
Magnesium, AA	110.	mg/L
Manganese, ICP	0.018	mg/L
Mercury, CVAA	<0.0002	mg/L
Nickel, ICP	<0.050	mg/L
Potassium, AA	7.61	mg/L

Neal E. Clapham
Project Manager

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05/03/1991

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CH128770.B0.SP; Du Pont

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Selenium, AA	<0.1	mg/L
Silver, ICP	<0.050	mg/L
Sodium, AA	29.3	mg/L
Thallium, ICP	<0.20	mg/L
Vanadium, ICP	<0.050	mg/L
Zinc, ICP	4.69	mg/L

Neal E. Cleghorn
Project Manager

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05/03/1991

Sample No.: 130118

Job No.: 91.0364

Sample Description: DEC-SSP2-4-1
CH128770.B0.SP; Du Pont

Date Taken: 04/04/1991
Time Taken: 14:58

Date Received: 04/05/1991
Time Received: 09:50

PESTICIDES/PCB - 8080 AQUEOUS

Aldrin	<0.05	ug/L
alpha-BHC	<0.05	ug/L
beta-BHC	<0.05	ug/L
delta-BHC	<0.05	ug/L
gamma-BHC (Lindane)	<0.05	ug/L
Chlordane	<0.5	ug/L
4,4'-DDD	<0.1	ug/L
4,4'-DDE	<0.1	ug/L
4,4'-DDT	<0.1	ug/L
Dieldrin	<0.1	ug/L
Endosulfan I	<0.05	ug/L
Endosulfan II	<0.1	ug/L
Endosulfan sulfate	<0.1	ug/L
Endrin	<0.1	ug/L
Endrin aldehyde	<0.1	ug/L
Heptachlor	<0.05	ug/L
Heptachlor epoxide	<0.05	ug/L
Methoxychlor	<0.5	ug/L
Toxaphene	<0.5	ug/L
PCB-1016	<1.0	ug/L
PCB-1221	<1.0	ug/L
PCB-1232	<1.0	ug/L
PCB-1242	<1.0	ug/L
PCB-1248	<1.0	ug/L
PCB-1254	<1.0	ug/L
PCB-1260	<1.0	ug/L

Neal E. Cleghorn
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05/03/1991

Sample No.: 130118

Job No.: 91.0364

Sample Description: DEC-SSP2-4-1
CH128770.B0.SP; Du Pont

Date Taken: 04/04/1991
Time Taken: 14:58

Date Received: 04/05/1991
Time Received: 09:50

ACID CMPDS - 8270 AQUEOUS

2-Chlorophenol	<10.0	ug/L
2,4-Dichlorophenol	<10.0	ug/L
2,4-Dimethylphenol	<10.0	ug/L
2,4-Dinitrophenol	<50.0	ug/L
2-Methyl-4,6-dinitrophenol	<50.0	ug/L
2-Methylphenol (o-Cresol)	<10.0	ug/L
4-Methylphenol (p-Cresol)	<10.0	ug/L
Cresols, Total	<10.0	ug/L
4-Nitrophenol	<50.0	ug/L
Pentachlorophenol	<50.0	ug/L
Phenol	<10.0	ug/L
2,4,5-Trichlorophenol	<10.0	ug/L
2,4,6-Trichlorophenol	<10.0	ug/L

Neal E. Cleghorn
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Date Taken: 04/04/1991
Time Taken: 14:58

Date Received: 04/05/1991
Time Received: 09:50

BASE/NEUTRALS - 8270 AQUEOUS

Acenaphthene	<10.0	ug/L
Acenaphthylene	<10.0	ug/L
Aniline	<10.0	ug/L
Anthracene	<10.0	ug/L
Benzidine	<50.0	ug/L
Benzo(a)anthracene	<10.0	ug/L
Benzo(b)fluoranthene	<10.0	ug/L
Benzo(k)fluoranthene	<10.0	ug/L
Benzo(g,h,i)perylene	<10.0	ug/L
Benzo(a)pyrene	<10.0	ug/L
Benzyl butyl phthalate	<10.0	ug/L
Bis(2-chloroethoxy)methane	<10.0	ug/L
Bis(2-chloroethyl)ether	<10.0	ug/L
Bis(2-chloroisopropyl)ether	<10.0	ug/L
Bis(2-ethylhexyl)phthalate	<10.0	ug/L
4-Bromophenyl phenyl ether	<10.0	ug/L
4-Chloroaniline	<20.0	ug/L
2-Chloronaphthalene	<10.0	ug/L
4-Chlorophenyl phenyl ether	<10.0	ug/L
Chrysene	<10.0	ug/L
Dibenzo(a,h)anthracene	<10.0	ug/L
Dibenzofuran	<10.0	ug/L
Di-n-butyl phthalate	<10.0	ug/L
1,2-Dichlorobenzene	<10.0	ug/L
1,3-Dichlorobenzene	<10.0	ug/L
1,4-Dichlorobenzene	<10.0	ug/L
3,3'-Dichlorobenzidine	<20.0	ug/L
Diethyl phthalate	<10.0	ug/L
Dimethyl phthalate	<10.0	ug/L
2,4-Dinitrotoluene	<10.0	ug/L

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CH128770.B0.SP; Du Pont

Date Taken: 04/04/1991
Time Taken: 14:58

Date Received: 04/05/1991
Time Received: 09:50

BASE/NEUTRALS - 8270 AQUEOUS

2,6-Dinitrotoluene	<10.0	ug/L
Di-n-octyl phthalate	<10.0	ug/L
Fluoranthene	<10.0	ug/L
Fluorene	<10.0	ug/L
Hexachlorobenzene	<10.0	ug/L
Hexachlorobutadiene	<10.0	ug/L
Hexachlorocyclopentadiene	<10.0	ug/L
Hexachloroethane	<10.0	ug/L
Indeno(1,2,3-cd)pyrene	<10.0	ug/L
Isophorone	<10.0	ug/L
2-Methylnaphthalene	<10.0	ug/L
Naphthalene	<10.0	ug/L
2-Nitroaniline	<50.0	ug/L
3-Nitroaniline	<50.0	ug/L
4-Nitroaniline	<50.0	ug/L
Nitrobenzene	<10.0	ug/L
N-Nitrosodimethylamine	<10.0	ug/L
N-Nitrosodi-n-propylamine	<10.0	ug/L
N-Nitrosodiphenylamine	<10.0	ug/L
Phenanthrene	<10.0	ug/L
Pyrene	<10.0	ug/L
1,2,4-Trichlorobenzene	<10.0	ug/L

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05/03/1991

Sample No.: 130118

Job No.: 91.0364

Sample Description: DEC-SSP2-4-1
CH128770.B0.SP; Du Pont

Date Taken: 04/04/1991
Time Taken: 14:58

Date Received: 04/05/1991
Time Received: 09:50

VOLATILES - 8240 AQUEOUS

Acetone	<10.0	ug/L
Benzene	<1.0	ug/L
Bromodichloromethane	<1.0	ug/L
Bromoform	<1.0	ug/L
Bromomethane	<10.0	ug/L
2-Butanone (MEK)	<10.0	ug/L
Carbon disulfide	<5.0	ug/L
Carbon tetrachloride	<1.0	ug/L
Chlorobenzene	<1.0	ug/L
Chloroethane	<10.0	ug/L
2-Chloroethylvinyl ether	<5.0	ug/L
Chloroform	<1.0	ug/L
Chloromethane	<10.0	ug/L
Dibromochloromethane	<1.0	ug/L
1,2-Dichlorobenzene	<1.0	ug/L
1,3-Dichlorobenzene	<1.0	ug/L
1,4-Dichlorobenzene	<1.0	ug/L
1,1-Dichloroethane	<1.0	ug/L
1,2-Dichloroethane	<1.0	ug/L
1,1-Dichloroethene	<1.0	ug/L
cis-1,2-Dichloroethene	<1.0	ug/L
trans-1,2-Dichloroethene	<1.0	ug/L
1,2-Dichloropropane	<1.0	ug/L
cis-1,3-Dichloropropene	<1.0	ug/L
trans-1,3-Dichloropropene	<1.0	ug/L
1,3-Dichloropropylene	ND	ug/L
Ethylene dibromide	ND	ug/L
Ethyl benzene	<1.0	ug/L
2-Hexanone	<10.0	ug/L
Methylene chloride	<5.0	ug/L

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ANALYTICAL REPORT

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05/03/1991

Sample No.: 130118

Job No.: 91.0364

Sample Description: DEC-SSP2-4-1
CH128770.B0.SP; Du Pont

Date Taken: 04/04/1991
Time Taken: 14:58

Date Received: 04/05/1991
Time Received: 09:50

VOLATILES - 8240 AQUEOUS

4-Methyl-2-pentanone (MIBK)	<10.0	ug/L
Styrene	<5.0	ug/L
1,1,2,2-Tetrachloroethane	<1.0	ug/L
Tetrachloroethene	<1.0	ug/L
Toluene	<1.0	ug/L
1,1,1-Trichloroethane	<1.0	ug/L
1,1,2-Trichloroethane	<1.0	ug/L
Trichloroethene	<1.0	ug/L
Vinyl acetate	<10.0	ug/L
Vinyl chloride	<10.0	ug/L
o-Xylene	<5.0	ug/L
m,p-Xylenes	<5.0	ug/L

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ANALYTICAL REPORT

Ms. Susan Mulholland
CH2M HILL
1890 Maple Av.
Suite 200
Chicago, IL 60201

05/03/1991

Sample No.: 130123

Job No.: 91.0364

Sample Description: Trip Blank
CH128770.B0.SP; Du Pont

Date Taken:
Time Taken:

Date Received: 04/05/1991
Time Received: 09:50

VOLATILES - 8240 AQUEOUS

Acetone	<10.0	ug/L
Benzene	<1.0	ug/L
Bromodichloromethane	<1.0	ug/L
Bromoform	<1.0	ug/L
Bromomethane	<10.0	ug/L
2-Butanone (MEK)	<10.0	ug/L
Carbon disulfide	<5.0	ug/L
Carbon tetrachloride	<1.0	ug/L
Chlorobenzene	<1.0	ug/L
Chloroethane	<10.0	ug/L
2-Chloroethylvinyl ether	<5.0	ug/L
Chloroform	<1.0	ug/L
Chloromethane	<10.0	ug/L
Dibromochloromethane	<1.0	ug/L
1,2-Dichlorobenzene	<1.0	ug/L
1,3-Dichlorobenzene	<1.0	ug/L
1,4-Dichlorobenzene	<1.0	ug/L
1,1-Dichloroethane	<1.0	ug/L
1,2-Dichloroethane	<1.0	ug/L
1,1-Dichloroethene	<1.0	ug/L
cis-1,2-Dichloroethene	<1.0	ug/L
trans-1,2-Dichloroethene	<1.0	ug/L
1,2-Dichloropropane	<1.0	ug/L
cis-1,3-Dichloropropene	<1.0	ug/L
trans-1,3-Dichloropropene	<1.0	ug/L
1,3-Dichloropropylene	ND	ug/L
Ethylene dibromide	ND	ug/L
Ethyl benzene	<1.0	ug/L
2-Hexanone	<10.0	ug/L
Methylene chloride	<5.0	ug/L

Neal E. Cleghorn
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Suite 200
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05/03/1991

Sample No.: 130123

Job No.: 91.0364

Sample Description: Trip Blank
CH128770.B0.SP; Du Pont

Date Taken:
Time Taken:

Date Received: 04/05/1991
Time Received: 09:50

VOLATILES - 8240 AQUEOUS

4-Methyl-2-pentanone (MIBK)	<10.0	ug/L
Styrene	<5.0	ug/L
1,1,2,2-Tetrachloroethane	<1.0	ug/L
Tetrachloroethene	<1.0	ug/L
Toluene	<1.0	ug/L
1,1,1-Trichloroethane	<1.0	ug/L
1,1,2-Trichloroethane	<1.0	ug/L
Trichloroethene	<1.0	ug/L
Vinyl acetate	<10.0	ug/L
Vinyl chloride	<10.0	ug/L
o-Xylene	<1.0	ug/L
m,p-Xylenes	<1.0	ug/L

Neal E. Cleghorn
Project Manager

CH2M HILL QUALITY ANALYTICS

CHAIN OF CUSTODY RECORD

PROJECT NUMBER	PROJECT NAME
CA1287704.B7.SP	DU PONT - EAST CHICAGO

CLIENT NAME: CH2M HILL / CNI

PROJECT MANAGER: SUSAN MULHOLLAND/CNI

COPY TO: DAN McGREGOR/GIO

REQUESTED COMP. DATE: 2-wk TAT

SAMPLING REQUIREMENTS: SDWA ☐ NPDES ☐ RCRA ☐ OTHER ____

CLIENT ADDRESS AND PHONE NUMBER: 1840 MAPLE AVE, EVANSTON, IL 60016 (708)866-9490

ANALYSES REQUESTED

STA NO.	DATE	TIME	COMP	GRAB	SOIL	SAMPLE DESCRIPTIONS (12 CHARACTERS)	# OF CONTAINERS	VOA-624	SVOA-625	PESTICIDES, PCB-608	METALS, CYANIDE *	TOTAL CHLORIDE, FLUORIDE, SULFATE	AMMONIA-N, COD, NITRATE+NITRITE	OIL + GREASE	TSS, TDS	BOD5	CARBONATE + BICARBONATE	LAB ID
	4/4/91	14:58		X		DEC-SSP2-4-1	~~18~~ 12	X	X	X	X	X	X	X	X	X	X	
							2	X										

FOR LAB USE ONLY		
LAB		
LAB #		
PROJECT NO.		
ACK	VERIFIED	
QUOTE#	BS	
NO. OF SAMP	PG	OF

REMARKS

*1 500ml poly w/HNO3 field filtered for metals analysis

SAMPLED BY AND TITLE	DATE/TIME	RELINQUISHED BY	DATE/TIME
ERIK SPANDE/HYDROGEO	4/4/91 14:58	ERIK SPANDE	4/4/91 19:00
RECEIVED BY:	DATE/TIME	RELINQUISHED BY:	DATE/TIME
RECEIVED BY:	DATE/TIME	RELINQUISHED BY:	DATE/TIME
RECEIVED BY LAB: N Billings	DATE/TIME 4/5/91 0950	SAMPLE SHIPPED VIA UPS BUS ~~FED-EX~~ HAND OTHER ____	AIR BILL# 043947293

HAZWRAP/NEESA Y N

QC LEVEL 1 2 3

COC | ICE

ANA REQ | TEMP

CUST SEAL | Ph

SAMPLE COND.

REMARKS: Please call Susan Mulholland w/ questions or comments

ENTERED INTO LIMS ____ COC REVIEWED ____

Engineers
Planners
Economists
Scientists

REPORT OF ANALYTICAL RESULTS

Date: 05/10/91

Client: CH2M HILL/CHI
1890 MAPLE AVENUE SUITE 200
EVANSTON, IL 60201

Atten: MS. SUSAN MULHOLLAND

Project Number: CHI28770.B0.SP
DUPONT EAST CHICAGO SEEP
Laboratory Number: 18424
Date Received: 04/26/91

Sample Description: DEC-SP3-4-4A GRAB
Laboratory Sample Number: 18424001 Date Collected: 04/25/91 Matrix: WATER

Analytical Parameter	Method	Rep Limit	Result	Units	Ana Date
Silver	EPA200.7/SW6010	10	<10	ug/L	05/10/91
Soluble Silver	EPA200.7/SW6010	10	<10	ug/L	05/10/91
Arsenic	EPA206.2/SW7060	10	<10	ug/L	05/01/91
Soluble Arsenic	EPA206.2/SW7060	10	<10	ug/L	05/01/91
Beryllium	EPA200.7/SW6010	5	<5	ug/L	05/10/91
Soluble Beryllium	EPA200.7/SW6010	5	<5	ug/L	05/10/91
BOD, 5 Day	EPA405.1	10	<10	mg/L	04/26/91
BOD 5, Date In	EPA405.1	----	04/26/91	----	----
BOD 5, Date Out	EPA405.1	----	05/01/91	----	----
Cadmium	EPA200.7/SW6010	5	6.9	ug/L	05/10/91
Soluble Cadmium	EPA200.7/SW6010	5	6.4	ug/L	05/10/91
Chloride	EPA325.1	5.0	27.8	mg/L	04/29/91
Cyanide, Distilled	EPA335.2	5.0	<5.0	ug/L	04/29/91
Chemical Oxygen Demand	EPA410.4	20	<20	mg/L	05/02/91
Chromium	EPA200.7/SW6010	10	<10	ug/L	05/10/91
Soluble Chromium	EPA200.7/SW6010	10	<10	ug/L	05/10/91
Copper	EPA200.7/SW6010	25	<25	ug/L	05/10/91
Soluble Copper	EPA200.7/SW6010	25	<25	ug/L	05/10/91
Fluoride	EPA340.2	0.10	0.94	mg/L	05/09/91
Mercury	EPA245.1/SW7470	0.2	<0.2	ug/L	05/02/91
Soluble Mercury	EPA245.1/SW7470	0.2	<0.2	ug/L	05/02/91
Ammonia-N	EPA350.2	0.1	1.5	mg/L	05/08/91
Nickel	EPA200.7/SW6010	40	58	ug/L	05/10/91
Soluble Nickel	EPA200.7/SW6010	40	63	ug/L	05/10/91
Nitrate/Nitrite-N	EPA353.3/354.1	0.05	<0.05	mg/L	05/01/91
Oil and Grease	EPA413.1	0.1	1.4	mg/L	05/01/91
Lead	EPA239.2/SW7421	3	6	ug/L	05/01/91
Soluble Lead	EPA239.2/SW7421	3	<3	ug/L	05/01/91
Antimony	EPA200.7/SW6010	60	<60	ug/L	05/10/91
Soluble Antimony	EPA200.7/SW6010	60	<60	ug/L	05/10/91
Selenium	EPA270.2/SW7740	25	<25	ug/L	05/02/91
Soluble Selenium	EPA270.2/SW7740	25	<25	ug/L	05/02/91
Sulfate	EPA375.4	50.0	1690	mg/L	05/07/91
Total Dissolved Solids	EPA160.1	10	2830	mg/L	04/30/91

Results for non-aqueous matrices are based on dry sample weight unless noted otherwise.

Reviewed by: _____

INRPRPT(v910124)

Engineers
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CH2M HILL Economists
Scientists

REPORT OF ANALYTICAL RESULTS

Date: 05/10/91

Client: CH2M HILL/CHI
1890 MAPLE AVENUE SUITE 200
EVANSTON, IL 60201

Atten: MS. SUSAN MULHOLLAND

Project Number: CHI28770.B0.SP
DUPONT EAST CHICAGO SEEP
Laboratory Number: 18424
Date Received: 04/26/91

Sample Description: DEC-SP3-4-4A GRAB
Laboratory Sample Number: 18424001 Date Collected: 04/25/91 Matrix: WATER

Analytical Parameter	Method	Rep Limit	Result	Units	Ana Date
Thallium	EPA279.2/SW7841	10	<10	ug/L	05/02/91
Soluble Thallium	EPA279.2/SW7841	10	<10	ug/L	05/02/91
Total Suspended Solids	EPA160.2	4	83	mg/L	05/01/91
Zinc	EPA200.7/SW6010	0.02	10.6	mg/L	05/10/91
Soluble Zinc	EPA200.7/SW6010	0.02	10.0	mg/L	05/10/91

Results for non-aqueous matrices are based on dry sample weight unless noted otherwise.

Reviewed by: _____

INRPRPT(v910124)

Engineers
Planners
CH2M HILL Economists
Scientists

REPORT OF ANALYTICAL RESULTS

Date: 05/10/91

Client: CH2M HILL/CHI
1890 MAPLE AVENUE SUITE 200
EVANSTON, IL 60201

Atten: MS. SUSAN MULHOLLAND

Project Number: CHI28770.B0.SP
DUPONT EAST CHICAGO SEEP
Laboratory Number: 18424
Date Received: 04/26/91

Sample Description: DEC-SP3-4-4B GRAB
Laboratory Sample Number: 18424002 Date Collected: 04/25/91 Matrix: WATER

Analytical Parameter	Method	Rep Limit	Result	Units	Ana Date
Silver	EPA200.7/SW6010	10	<10	ug/L	05/10/91
Soluble Silver	EPA200.7/SW6010	10	<10	ug/L	05/10/91
Arsenic	EPA206.2/SW7060	10	<10	ug/L	05/01/91
Soluble Arsenic	EPA206.2/SW7060	10	<10	ug/L	05/01/91
Beryllium	EPA200.7/SW6010	5	<5	ug/L	05/10/91
Soluble Beryllium	EPA200.7/SW6010	5	<5	ug/L	05/10/91
BOD, 5 Day	EPA405.1	10	<10	mg/L	04/26/91
BOD 5, Date In	EPA405.1	----	04/26/91	----	----
BOD 5, Date Out	EPA405.1	----	05/01/91	----	----
Cadmium	EPA200.7/SW6010	5	8.1	ug/L	05/10/91
Soluble Cadmium	EPA200.7/SW6010	5	6.6	ug/L	05/10/91
Chloride	EPA325.1	5.0	25.6	mg/L	04/29/91
Cyanide, Distilled	EPA335.2	5.0	<5.0	ug/L	04/29/91
Chemical Oxygen Demand	EPA410.4	20	<20	mg/L	05/02/91
Chromium	EPA200.7/SW6010	10	<10	ug/L	05/10/91
Soluble Chromium	EPA200.7/SW6010	10	<10	ug/L	05/10/91
Copper	EPA200.7/SW6010	25	<25	ug/L	05/10/91
Soluble Copper	EPA200.7/SW6010	25	<25	ug/L	05/10/91
Fluoride	EPA340.2	0.10	0.96	mg/L	05/09/91
Mercury	EPA245.1/SW7470	0.2	<0.2	ug/L	05/02/91
Soluble Mercury	EPA245.1/SW7470	0.2	<0.2	ug/L	05/02/91
Ammonia-N	EPA350.2	0.1	0.9	mg/L	05/08/91
Nickel	EPA200.7/SW6010	40	68	ug/L	05/10/91
Soluble Nickel	EPA200.7/SW6010	40	72	ug/L	05/10/91
Nitrate/Nitrite-N	EPA353.3/354.1	0.05	0.23	mg/L	05/01/91
Oil and Grease	EPA413.1	0.1	1.5	mg/L	05/01/91
Lead	EPA239.2/SW7421	3	4	ug/L	05/01/91
Soluble Lead	EPA239.2/SW7421	3	<3	ug/L	05/01/91
Antimony	EPA200.7/SW6010	60	<60	ug/L	05/10/91
Soluble Antimony	EPA200.7/SW6010	60	<60	ug/L	05/10/91
Selenium	EPA270.2/SW7740	25	<25	ug/L	05/02/91
Soluble Selenium	EPA270.2/SW7740	25	<25	ug/L	05/02/91
Sulfate	EPA375.4	50.0	1650	mg/L	05/07/91
Total Dissolved Solids	EPA160.1	10	2860	mg/L	04/30/91

Results for non-aqueous matrices are based on dry sample weight unless noted otherwise.

Reviewed by: _____

INRPRPT(v910124)

Engineers
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Scientists

REPORT OF ANALYTICAL RESULTS

Date: 05/10/91

Client: CH2M HILL/CHI
1890 MAPLE AVENUE SUITE 200
EVANSTON, IL 60201

Atten: MS. SUSAN MULHOLLAND

Project Number: CHI28770.B0.SP
DUPONT EAST CHICAGO SEEP
Laboratory Number: 18424
Date Received: 04/26/91

Sample Description: DEC-SP3-4-4B GRAB
Laboratory Sample Number: 18424002 Date Collected: 04/25/91 Matrix: WATER

Analytical Parameter	Method	Rep Limit	Result	Units	Ana Date
Thallium	EPA279.2/SW7841	10	<10	ug/L	05/02/91
Soluble Thallium	EPA279.2/SW7841	10	<10	ug/L	05/02/91
Total Suspended Solids	EPA160.2	4	57	mg/L	05/01/91
Zinc	EPA200.7/SW6010	0.02	11.6	mg/L	05/10/91
Soluble Zinc	EPA200.7/SW6010	0.02	11.1	mg/L	05/10/91

Results for non-aqueous matrices are based on dry sample weight unless noted otherwise.

Reviewed by: _____

INRPRPT(v910124)

Engineers
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CH2M HILL Economists
Scientists

May 28, 1991

CHI28770.B0.SP

Ms. Susan Mulholland
CH2M HILL/CHI
1890 Maple Avenue
Suite 200
Evanston, Illinois 60016

RE: Analytical Data for DuPont-East Chicago SEEP, LMG Laboratory No. 18425

Dear Ms. Mulholland:

On April 26, 1991, the CH2M HILL Montgomery Laboratory received two samples with a request for analysis of selected organic parameters.

The analytical results and associated quality control data are enclosed. The volatile and semivolatile analyses were performed at Analytical Technologies, Inc. Their report is enclosed.

If you should have any questions concerning the data, please inquire.

The CH2M HILL policy is to store samples for up to 30 days after reporting. If you desire, our laboratory will maintain your samples for a longer period at a cost of $5.00 per sample per month. Samples determined to be hazardous can either be returned to you or disposed of at a cost of $25.00 per sample.

Sincerely,

Wanda L. Hall

Wanda L. Hall
Data Package Supervisor

Enclosures

cc: Mr. Dan MacGreggor/GLO

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Economists
Scientists

TABLE 1

SAMPLE CROSS-REFERENCE SUMMARY

CH2M HILL Laboratory No. 18425

CH2M HILL Sample No.	Sample Description		
18425001	SAMPLE DEC-SP3-4-4A	04/25/91	GRAB
18425002	SAMPLE DEC-SP3-4-4B	04/25/91	GRAB

CH2M HILL
Quality Analytical Laboratories
2567 Fairlane Drive, P.O. Box 230548, Montgomery, Alabama 36116
205.271.1444

AnalyticalTechnologies,Inc.

QUALITY ASSURANCE
DATA REVIEW

The data contained in the following report has been reviewed and approved by the appropriate supervisory personnel listed below:

Steve Workman

Steve Workman, GC/HPLC/Inorganics Supervisor

Alex Blanche, GC/GCMS Supervisor

CERTIFICATION

Analytical Technologies Inc. certifies that the analyses reported herein are true, complete and correct within the limits of the method employed.

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET
Method 1625

Client Name: CH2M Hill

Client Project ID: Batch 18425

Matrix (soil/water): Water

Client Sample ID: 18425001

Sample wt/vol: 1000 mL

Lab Sample ID: 91-04-153-01

Level (low/med): 2 Low

Date Received: 04/27/91

Column: (pack/cap) Cap

Date Analyzed: 05/13/91

Fraction: Acid/Base

Dilution Factor: 1

CONCENTRATION UNITS (ug/L or ug/kg): ug/L

CAS NO.	COMPOUND		
62-75-9	N-Nitrosodimethylamine	< 50	
109-06-8	alpha-Picoline	< 50	
100-42-5	Styrene	< 10	
111-44-4	bis(2-Chloroethyl)ether	< 10	
108-95-2	Phenol	< 10	
95-57-8	2-Chlorophenol	< 10	
124-18-5	n-C10 Decane	< 10	
541-73-1	1,3-Dichlorobenzene	< 10	
106-46-7	1,4-Dichlorobenzene	< 10	
99-87-6	p-Cymene	< 10	
95-50-1	1,2-Dichlorobenzene	< 10	
108-60-1	bis(2-Chloroisopropyl)ether	< 10	
621-64-7	N-Nitrosodi-n-propylamine	< 20	
67-72-1	Hexachloroethane	< 10	
98-95-3	Nitrobenzene	< 10	
78-59-1	Isophorone	< 10	
88-75-5	2-Nitrophenol	< 20	
105-67-9	2,4-Dimethylphenol	< 10	
111-91-1	bis(2-Chloroethoxy)methane	< 10	
120-83-2	2,4-Dichlorophenol	< 10	
120-82-1	1,2,4-Trichlorobenzene	< 10	
91-20-3	Naphthalene	< 10	

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET
Method 1625

CONCENTRATION UNITS (ug/L or ug/kg): ug/L

CAS NO.	COMPOUND		
98-55-5	alpha-Terpineol	< 10	
112-40-3	n-C12 Dodecane	< 10	
87-61-6	1,2,3-Trichlorobenzene	< 10	
87-68-3	Hexachlorobutadiene	< 10	
59-50-7	4-Chloro-3-methylphenol	< 10	
77-47-4	Hexachlorocyclopentadiene	< 10	
88-06-2	2,4,6-Trichlorophenol	< 10	
95-95-4	2,4,5-Trichlorophenol	< 10	
91-58-7	2-Chloronaphthalene	< 10	
92-52-4	Biphenyl	< 10	
933-75-5	2,3,6-Trichlorophenol	< 10	
629-59-4	n-C14 Tetradecane	< 10	
101-84-8	Diphenyl ether	< 10	
131-11-3	Dimethyl phthalate	< 10	
208-96-8	Acenaphthylene	< 10	
606-20-2	2,6-Dinitrotoluene	< 10	
83-32-9	Acenaphthene	< 10	
51-28-5	2,4-Dinitrophenol	< 50	
132-64-9	Dibenzofuran	< 10	
100-02-7	4-Nitrophenol	< 50	
121-14-2	2,4-Dinitrotoluene	< 10	
91-59-8	beta-Naphthylamine	< 50	
86-73-7	Fluorene	< 10	
544-76-3	n-C16 Hexadecane	< 10	
84-66-2	Diethyl phthalate	< 10	
7005-72-3	4-Chlorophenyl phenyl ether	< 10	
534-52-1	2-Methyl-4,6-dinitrophenol	< 20	
122-39-4	Diphenylamine	< 20	
86-30-6	N-Nitrosodiphenylamine	< 20	
122-66-7	1,2-Diphenylhydrazine	< 20	
101-55-3	4-Bromophenylphenyl ether	< 20	
118-74-1	Hexachlorobenzene	< 10	

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET
Method 1625

CAS NO.	COMPOUND	CONCENTRATION UNITS (ug/L or ug/kg) ug/L	
87-86-5	Pentachlorophenol	< 10	
132-65-0	Dibenzothiophene	< 10	
593-45-3	n-C18 Octadecane	< 10	
85-01-8	Phenanthrene	< 10	
120-12-7	Anthracene	< 20	
86-74-8	Carbazole	< 10	
84-74-2	Di-n-butyl phthalate	< 10	
112-95-8	n-C20 Eicosane	< 10	
206-44-0	Fluoranthene	< 10	
92-87-5	Benzidine	< 50	
129-00-0	Pyrene	< 10	
629-97-0	n-C22 Docosane	< 10	
85-68-7	Butylbenzyl phthalate	< 10	
646-31-1	n-C24 Tetracosane	< 10	
56-55-3	Benzo(a)anthracene	< 10	
91-94-1	3,3-Dichlorobenzidine	< 50	
218-01-9	Chrysene	< 10	
117-81-7	bis(2-Ethylhexyl)phthalate	< 10	
630-01-3	n-C26 Hexacosane	< 10	
117-84-0	Di-n-octyl phthalate	< 10	
630-02-4	n-C28 Octacosane	< 10	
205-99-2	Benzo(b)fluoranthene	< 10	
207-08-9	Benzo(k)fluoranthene	< 10	
50-32-8	Benzo(a)pyrene	< 10	
638-68-6	n-C30 Triacontane	< 10	
193-39-5	Indeno(1,2,3-cd)pyrene	< 20	
53-70-3	Dibenzo(a,h)anthracene	< 20	
191-24-2	Benzo(g,h,i)perylene	< 20	

1F
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET CLIENT SAMPLE NO.
TENTATIVELY IDENTIFIED COMPOUNDS

18425001

Lab Name: ATI Client Name: CH2M Hill

Lab Code: N/A Case No.: N/A SAS No.: N/A SDG No.: N/A

Matrix: (soil/water) Water
Sample wt/vol: 1000 (g/mL) mL
Level: (low/med) LOW
% Moisture: not dec. N/A dec. N/A
Extraction: (SepF/Cont/Sonc) CONT
GPC Cleanup: (Y/N) N pH: N/A

Lab Sample ID: 91-04-153-01
Date Received: 04/27/91
Date Analyzed: 05/13/91
Dilution Factor: 1
Acid/Base: Acid

Number TICs found: 1

CONCENTRATION UNITS:
(ug/L or ug/Kg) ug/L

COMPOUND NAME	RT	EST. CONC.	Q
UNKNOWN COMPOUND	27:48	13	J

J - Estimated Concentration

FORM 1 SV-TIC 1/87 Rev.

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET
Method 1625

Client Name: CH2M Hill

Client Project ID: Batch 18425

Matrix (soil/water): Water

Client Sample ID: 18425002

Sample wt/vol: 1000 mL

Lab Sample ID: 91-04-153-02

Level (low/med): 2 Low

Date Received: 04/27/91

Column: (pack/cap) Cap

Date Analyzed: 05/13/91

Fraction: Acid/Base

Dilution Factor: 1

CONCENTRATION UNITS (ug/L or ug/kg): ug/L

CAS NO.	COMPOUND		
62-75-9	N-Nitrosodimethylamine	< 50	
109-06-8	alpha-Picoline	< 50	
100-42-5	Styrene	< 10	
111-44-4	bis(2-Chloroethyl)ether	< 10	
108-95-2	Phenol	< 10	
95-57-8	2-Chlorophenol	< 10	
124-18-5	n-C10 Decane	< 10	
541-73-1	1,3-Dichlorobenzene	< 10	
106-46-7	1,4-Dichlorobenzene	< 10	
99-87-6	p-Cymene	< 10	
95-50-1	1,2-Dichlorobenzene	< 10	
108-60-1	bis(2-Chloroisopropyl)ether	< 10	
621-64-7	N-Nitrosodi-n-propylamine	< 20	
67-72-1	Hexachloroethane	< 10	
98-95-3	Nitrobenzene	< 10	
78-59-1	Isophorone	< 10	
88-75-5	2-Nitrophenol	< 20	
105-67-9	2,4-Dimethylphenol	< 10	
111-91-1	bis(2-Chloroethoxy)methane	< 10	
120-83-2	2,4-Dichlorophenol	< 10	
120-82-1	1,2,4-Trichlorobenzene	< 10	
91-20-3	Naphthalene	< 10	

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET
Method 1625

CONCENTRATION UNITS (ug/L or ug/kg): ug/L

CAS NO.	COMPOUND		
98-55-5	alpha-Terpineol	< 10	
112-40-3	n-C12 Dodecane	< 10	
87-61-6	1,2,3-Trichlorobenzene	< 10	
87-68-3	Hexachlorobutadiene	< 10	
59-50-7	4-Chloro-3-methylphenol	< 10	
77-47-4	Hexachlorocyclopentadiene	< 10	
88-06-2	2,4,6-Trichlorophenol	< 10	
95-95-4	2,4,5-Trichlorophenol	< 10	
91-58-7	2-Chloronaphthalene	< 10	
92-52-4	Biphenyl	< 10	
933-75-5	2,3,6-Trichlorophenol	< 10	
629-59-4	n-C14 Tetradecane	< 10	
101-84-8	Diphenyl ether	< 10	
131-11-3	Dimethyl phthalate	< 10	
208-96-8	Acenaphthylene	< 10	
606-20-2	2,6-Dinitrotoluene	< 10	
83-32-9	Acenaphthene	< 10	
51-28-5	2,4-Dinitrophenol	< 50	
132-64-9	Dibenzofuran	< 10	
100-02-7	4-Nitrophenol	< 50	
121-14-2	2,4-Dinitrotoluene	< 10	
91-59-8	beta-Naphthylamine	< 50	
86-73-7	Fluorene	< 10	
544-76-3	n-C16 Hexadecane	< 10	
84-66-2	Diethyl phthalate	< 10	
7005-72-3	4-Chlorophenyl phenyl ether	< 10	
534-52-1	2-Methyl-4,6-dinitrophenol	< 20	
122-39-4	Diphenylamine	< 20	
86-30-6	N-Nitrosodiphenylamine	< 20	
122-66-7	1,2-Diphenylhydrazine	< 20	
101-55-3	4-Bromophenylphenyl ether	< 20	
118-74-1	Hexachlorobenzene	< 10	

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET
Method 1625

CAS NO.	COMPOUND	CONCENTRATION UNITS (ug/L or ug/kg) ug/L	
87-86-5	Pentachlorophenol	< 10	
132-65-0	Dibenzothiophene	< 10	
593-45-3	n-C18 Octadecane	< 10	
85-01-8	Phenanthrene	< 10	
120-12-7	Anthracene	< 20	
86-74-8	Carbazole	< 10	
84-74-2	Di-n-butyl phthalate	< 10	
112-95-8	n-C20 Eicosane	< 10	
206-44-0	Fluoranthene	< 10	
92-87-5	Benzidine	< 50	
129-00-0	Pyrene	< 10	
629-97-0	n-C22 Docosane	< 10	
85-68-7	Butylbenzyl phthalate	< 10	
646-31-1	n-C24 Tetracosane	< 10	
56-55-3	Benzo(a)anthracene	< 10	
91-94-1	3,3-Dichlorobenzidine	< 50	
218-01-9	Chrysene	< 10	
117-81-7	bis(2-Ethylhexyl)phthalate	< 10	
630-01-3	n-C26 Hexacosane	< 10	
117-84-0	Di-n-octyl phthalate	< 10	
630-02-4	n-C28 Octacosane	< 10	
205-99-2	Benzo(b)fluoranthene	< 10	
207-08-9	Benzo(k)fluoranthene	< 10	
50-32-8	Benzo(a)pyrene	< 10	
638-68-6	n-C30 Triacontane	< 10	
193-39-5	Indeno(1,2,3-cd)pyrene	< 20	
53-70-3	Dibenzo(a,h)anthracene	< 20	
191-24-2	Benzo(g,h,i)perylene	< 20	

No TICs found

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET
Method 1625

Client Name: CH2M Hill

Client Project ID: Batch 18425

Matrix (soil/water): Water

Client Sample ID: 18425003

Sample wt/vol: 1000 mL

Lab Sample ID: 91-04-153-00

Level (low/med):2 Low

Date Received: 04/27/91

Column: (pack/cap) Cap

Date Analyzed: 05/13/91

Fraction: Acid/Base

Dilution Factor: 1

CONCENTRATION UNITS (ug/L or ug/kg): ug/L

CAS NO.	COMPOUND		
62-75-9	N-Nitrosodimethylamine	< 50	
109-06-8	alpha-Picoline	< 50	
100-42-5	Styrene	< 10	
111-44-4	bis(2-Chloroethyl)ether	< 10	
108-95-2	Phenol	< 10	
95-57-8	2-Chlorophenol	< 10	
124-18-5	n-C10 Decane	< 10	
541-73-1	1,3-Dichlorobenzene	< 10	
106-46-7	1,4-Dichlorobenzene	< 10	
99-87-6	p-Cymene	< 10	
95-50-1	1,2-Dichlorobenzene	< 10	
108-60-1	bis(2-Chloroisopropyl)ether	< 10	
621-64-7	N-Nitrosodi-n-propylamine	< 20	
67-72-1	Hexachloroethane	< 10	
98-95-3	Nitrobenzene	< 10	
78-59-1	Isophorone	< 10	
88-75-5	2-Nitrophenol	< 20	
105-67-9	2,4-Dimethylphenol	< 10	
111-91-1	bis(2-Chloroethoxy)methane	< 10	
120-83-2	2,4-Dichlorophenol	< 10	
120-82-1	1,2,4-Trichlorobenzene	< 10	
91-20-3	Naphthalene	< 10	

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET
Method 1625

CONCENTRATION UNITS (ug/L or ug/kg): ug/L

CAS NO.	COMPOUND		
98-55-5	alpha-Terpineol	< 10	
112-40-3	n-C12 Dodecane	< 10	
87-61-6	1,2,3-Trichlorobenzene	< 10	
87-68-3	Hexachlorobutadiene	< 10	
59-50-7	4-Chloro-3-methylphenol	< 10	
77-47-4	Hexachlorocyclopentadiene	< 10	
88-06-2	2,4,6-Trichlorophenol	< 10	
95-95-4	2,4,5-Trichlorophenol	< 10	
91-58-7	2-Chloronaphthalene	< 10	
92-52-4	Biphenyl	< 10	
933-75-5	2,3,6-Trichlorophenol	< 10	
629-59-4	n-C14 Tetradecane	< 10	
101-84-8	Diphenyl ether	< 10	
131-11-3	Dimethyl phthalate	< 10	
208-96-8	Acenaphthylene	< 10	
606-20-2	2,6-Dinitrotoluene	< 10	
83-32-9	Acenaphthene	< 10	
51-28-5	2,4-Dinitrophenol	< 50	
132-64-9	Dibenzofuran	< 10	
100-02-7	4-Nitrophenol	< 50	
121-14-2	2,4-Dinitrotoluene	< 10	
91-59-8	beta-Naphthylamine	< 50	
86-73-7	Fluorene	< 10	
544-76-3	n-C16 Hexadecane	< 10	
84-66-2	Diethyl phthalate	< 10	
7005-72-3	4-Chlorophenyl phenyl ether	< 10	
534-52-1	2-Methyl-4,6-dinitrophenol	< 20	
122-39-4	Diphenylamine	< 20	
86-30-6	N-Nitrosodiphenylamine	< 20	
122-66-7	1,2-Diphenylhydrazine	< 20	
101-55-3	4-Bromophenylphenyl ether	< 20	
118-74-1	Hexachlorobenzene	< 10	

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET
Method 1625

CAS NO.	COMPOUND	CONCENTRATION UNITS (ug/L or ug/kg) ug/L	
87-86-5	Pentachlorophenol	< 10	
132-65-0	Dibenzothiophene	< 10	
593-45-3	n-C18 Octadecane	< 10	
85-01-8	Phenanthrene	< 10	
120-12-7	Anthracene	< 20	
86-74-8	Carbazole	< 10	
84-74-2	Di-n-butyl phthalate	< 10	
112-95-8	n-C20 Eicosane	< 10	
206-44-0	Fluoranthene	< 10	
92-87-5	Benzidine	< 50	
129-00-0	Pyrene	< 10	
629-97-0	n-C22 Docosane	< 10	
85-68-7	Butylbenzyl phthalate	< 10	
646-31-1	n-C24 Tetracosane	< 10	
56-55-3	Benzo(a)anthracene	< 10	
91-94-1	3,3-Dichlorobenzidine	< 50	
218-01-9	Chrysene	< 10	
117-81-7	bis(2-Ethylhexyl)phthalate	< 10	
630-01-3	n-C26 Hexacosane	< 10	
117-84-0	Di-n-octyl phthalate	< 10	
630-02-4	n-C28 Octacosane	< 10	
205-99-2	Benzo(b)fluoranthene	< 10	
207-08-9	Benzo(k)fluoranthene	< 10	
50-32-8	Benzo(a)pyrene	< 10	
638-68-6	n-C30 Triacontane	< 10	
193-39-5	Indeno(1,2,3-cd)pyrene	< 20	
53-70-3	Dibenzo(a,h)anthracene	< 20	
191-24-2	Benzo(g,h,i)perylene	< 20	

VOLATILE ORGANICS DATA SHEET
Method 1624

Client Sample ID:
18425001

Lab Name: Analytical Technologies

Client Name: CH2M Hill

Client Project ID: Batch 18425

Matrix (soil/water): Water

Dilution Factor: 1

Column (pack/cap): Pack

Lab Sample ID: 91-04-153-01

Sample wt/vol: 5 mL

Level (low/med): Low

Date Received: 04/29/91

Date Analyzed: 05/06/91

% Moisture: N/A

Concentration (ug/L or ug/kg): ug/L

COMPOUND NAME	Concentration		Q
Chloromethane	<	50	
Bromomethane	<	50	
Vinyl chloride	<	10	
Chloroethane	<	50	
Methylene chloride		12	B
Acetone	<	50	
Acrolein	<	50	
Acrylonitrile	<	50	
1,1-Dichloroethene	<	10	
1,1-Dichloroethane	<	10	
trans-1,2-Dichloroethene	<	10	
Diethyl ether	<	50	
Chloroform	<	10	
2-Butanone	<	50	
1,2-Dichloroethane	<	10	
1,1,1-Trichloroethane	<	10	
Carbon tetrachloride	<	10	
Bromodichloromethane	<	10	
1,2-Dichloropropane	<	10	
trans-1,3-Dichloropropene	<	10	
Trichloroethene	<	10	
Benzene	<	10	
Dibromochloromethane	<	10	
1,1,2-Trichloroethane	<	10	
2-Chloroethyl vinyl ether	<	10	
Bromoform	<	10	
p-Dioxane	<	100	
1,1,2,2-Tetrachloroethane	<	10	
Tetrachloroethene	<	10	
Toluene	<	10	
Chlorobenzene	<	10	
Ethylbenzene	<	10	

B - Found in reagent blank.

VOLATILE ORGANICS DATA SHEET
Tentatively Identified Compounds

Client Sample ID:
18425001

Lab Name: Analytical Technologies

Client Name: CH2M Hill

Client Project ID: Batch 18425

Matrix (soil/water): Water

Dilution Factor: 1

Column (pack/cap): Pack

Lab Sample ID: 91-04-153-01

Sample wt/vol: 5 mL

Level (low/med): Low

Date Received: 04/29/91

Date Analyzed: 05/06/91

% Moisture: N/A

Concentration (ug/L or ug/kg): ug/L

COMPOUND NAME	RT	Concentration	Q
Trichlorofluoromethane	9:27	9	J

J - Estimated Concentration

VOLATILE ORGANICS DATA SHEET
Method 1624

Client Sample ID:
18425002

Lab Name: Analytical Technologies

Client Name: CH2M Hill

Client Project ID: Batch 18425

Matrix (soil/water): Water

Dilution Factor: 1

Column (pack/cap): Pack

Lab Sample ID: 91-04-153-02

Sample wt/vol: 5 mL

Level (low/med): Low

Date Received: 04/29/91

Date Analyzed: 05/06/91

% Moisture: N/A

Concentration (ug/L or ug/kg): ug/L

COMPOUND NAME	Concentration		Q
Chloromethane	<	50	
Bromomethane	<	50	
Vinyl chloride	<	10	
Chloroethane	<	50	
Methylene chloride		15	B
Acetone	<	50	
Acrolein	<	50	
Acrylonitrile	<	50	
1,1-Dichloroethene	<	10	
1,1-Dichloroethane	<	10	
trans-1,2-Dichloroethene	<	10	
Diethyl ether	<	50	
Chloroform	<	10	
2-Butanone	<	50	
1,2-Dichloroethane	<	10	
1,1,1-Trichloroethane	<	10	
Carbon tetrachloride	<	10	
Bromodichloromethane	<	10	
1,2-Dichloropropane	<	10	
trans-1,3-Dichloropropene	<	10	
Trichloroethene	<	10	
Benzene	<	10	
Dibromochloromethane	<	10	
1,1,2-Trichloroethane	<	10	
2-Chloroethyl vinyl ether	<	10	
Bromoform	<	10	
p-Dioxane	<	100	
1,1,2,2-Tetrachloroethane	<	10	
Tetrachloroethene	<	10	
Toluene	<	10	
Chlorobenzene	<	10	
Ethylbenzene	<	10	

B - Found in reagent blank.

VOLATILE ORGANICS DATA SHEET
Tentatively Identified Compounds

Client Sample ID:
18425002

Lab Name: Analytical Technologies

Client Name: CH2M Hill

Client Project ID: Batch 18425

Matrix (soil/water): Water

Dilution Factor: 1

Column (pack/cap): Pack

Lab Sample ID: 91-04-153-02

Sample wt/vol: 5 mL

Level (low/med): Low

Date Received: 04/29/91

Date Analyzed: 05/06/91

% Moisture: N/A

Concentration (ug/L or ug/kg): ug/L

COMPOUND NAME	RT	Concentration	Q
Trichlorofluoromethane	9:27	23	J

J - Estimated Concentration

VOLATILE ORGANICS DATA SHEET
Method 1624

Client Sample ID:
Reagent Blank

Lab Name: Analytical Technologies

Client Name: CH2M Hill

Client Project ID: Batch 18425

Matrix (soil/water): Water

Dilution Factor: 1

Column (pack/cap): Pack

Lab Sample ID: Reagent Blank

Sample wt/vol: 5 mL

Level (low/med): Low

Date Received: N/A

Date Analyzed: 05/06/91

% Moisture: N/A

Concentration (ug/L or ug/kg): ug/L

COMPOUND NAME	Concentration	Q
Chloromethane	< 50	
Bromomethane	< 50	
Vinyl chloride	< 10	
Chloroethane	< 50	
Methylene chloride	29	
Acetone	< 50	
Acrolein	< 50	
Acrylonitrile	< 50	
1,1-Dichloroethene	< 10	
1,1-Dichloroethane	< 10	
trans-1,2-Dichloroethene	< 10	
Diethyl ether	< 50	
Chloroform	< 10	
2-Butanone	< 50	
1,2-Dichloroethane	< 10	
1,1,1-Trichloroethane	< 10	
Carbon tetrachloride	< 10	
Bromodichloromethane	< 10	
1,2-Dichloropropane	< 10	
trans-1,3-Dichloropropene	< 10	
Trichloroethene	< 10	
Benzene	< 10	
Dibromochloromethane	< 10	
1,1,2-Trichloroethane	< 10	
2-Chloroethyl vinyl ether	< 10	
Bromoform	< 10	
p-Dioxane	< 100	
1,1,2,2-Tetrachloroethane	< 10	
Tetrachloroethene	< 10	
Toluene	< 10	
Chlorobenzene	< 10	
Ethylbenzene	< 10	

No TIC's found.

CH2M HILL UALITY ANALYTICS

CHAIN OF CUSTODY RECORD

MISMS MISMV ASB

PROJECT NUMBER	CHI28770.B0.SP
PROJECT NAME	DUPONT EAST CHICAGO SEEP
CLIENT NAME	CH2M HILL /CHI
PROJECT MANAGER	SUSAN MULHOLLAND/CHI
COPY TO:	DAN MACGREGOR/GLO
REQUESTED COMP. DATE	2 WK TAT
SAMPLING REQUIREMENTS	SDWA ☐ NPDES ☐ RCRA ☐ OTHER ___
CLIENT ADDRESS AND PHONE NUMBER	1890 MAPLE AVENUE SUITE 200 EVANSTON, IL ~~60016~~ 60201 (708) 866-9490

ANALYSES REQUESTED

STA NO.	DATE	TIME	COMP	GRAB	SOIL	SAMPLE DESCRIPTIONS (12 CHARACTERS)	# OF CONTAINERS	VOA-1624	SVOA-1625	ASBESTOS	LAB ID	REMARKS
000018	4/25			X		DEC-SP3-4-4A	2	2			001	40-ml w/HCl, 40-ml "NO TREAT"
	↓			↓		↓	1		1			2.5-l AMBER GLASS
							~~1~~ 2			2		2-l AMBER GLASS
	4/25			X		DEC-SP3-4-4B ~~DEC-SP1~~	2	2			002	40-ml w/HCl, 40-ml "NO TREAT"
	↓			↓		↓	1		1			2.5-l AMBER GLASS
							~~1~~ 2			2		2-l AMBER GLASS
	~~4/25~~	~~1624~~		~~X~~		~~DEC-SP3-4-4TB~~	~~2~~	~~2~~		CANCEL TRAVEL BLANK	~~003~~	40-ml w/HCl, 40-ml "NO TREAT"
		1625				ASBESTOS				4/26/91		
											ZW1	

ANALYSIS 1624 1625 — QC LEVEL 2 DATE DUE 5/7 — REPORT TO E. RAMUCHAK/LMG — SHIP # FedX LAB ATF INIT SK 5037970490

ANALYSIS ASBESTOS — QC LEVEL 2 DATE DUE 5/7 — REPORT TO E. RAMUCHAK/LMG — SHIP # FedX Reservoir Environmental LAB INIT SK 5037970501

Level 2 Provide In House QC
1.5X FORM I's Due 5/10
Final Report Due 5/27

NOTE - NO SAMPLES ARE FIELD FILTERED

TO CH2M HILL

FOR LAB USE ONLY

LAB#	18425
LAB#	
PROJECT NO.	CHI 28770.B0.SP
ACK	CS 4-30
VERIFIED	4/29/91 OHS
QUOTE#	
BS	4/29
NO. OF SAMP	
PG	1 OF 1

SAMPLED BY AND TITLE	ERIK SPANDE/HYDROGEO	DATE/TIME	4/25/91 ~~16:00~~
RELINQUISHED BY	Erik P. Spande	DATE/TIME	4/25/91 19:00
RECEIVED BY:		DATE/TIME	
RELINQUISHED BY:		DATE/TIME	
RECEIVED BY:		DATE/TIME	
RELINQUISHED BY:		DATE/TIME	
RECEIVED BY LAB:	[signature]	DATE/TIME	4/26/91 0900
SAMPLE SHIPPED VIA	UPS BUS FED-EX HAND OTHER ___	AIR BILL#	0439472261

HAZWRAP/NEESA Y (N)
QC LEVEL 1 (2) 3 IN HOUSE QC
COC yes — ICE yes
ANA REQ yes — TEMP 5°C
CUST SEAL yes — Ph ~6
SAMPLE COND. water

REMARKS: PLEASE CALL SUSAN MULHOLLAND W/QUESTIONS AND COMMENTS

ENTERED INTO LIMS 4/26 — COC REVIEWED 4/26

REV 6/89 FORM 340

NATIONAL ENVIRONMENTAL TESTING, INC.

NET Midwest, Inc.
Bartlett Division
850 West Bartlett Road
Bartlett, IL 60103

Tel: (708) 289-3100
Fax: (708) 289-5445

ANALYTICAL REPORT

Ms. Susan Mulholland
CH2M HILL
1890 Maple Ave.
Evanston, IL 60201

05/21/1991

Sample No.: 131855

Job No.: 91.0789

Sample Description: DEC-SSP3-4-4B
CH128770.B0.SP; DuPont

Date Taken: 04/25/1991
Time Taken: 00:00

Date Received: 04/26/1991
Time Received: 09:30

Alkalinity, bicarb (CaCO3)	188.	mg/L
Alkalinity, carbonate (CaCO3)	<2.	mg/L
BOD, Five Day	1.	mg/L
Chloride	26.	mg/L
COD, Total	7.	mg/L
Cyanide, total	<0.002	mg/L
Fluoride	1.1	mg/L
N-Ammonia	0.68	mg/L
N-Nitrate	1.71	mg/L
N-Nitrite	0.01	mg/L
Oil & Grease	1.	mg/L
Solids, Total Dissolved	2600.	mg/L
Solids, Total Suspended	52.	mg/L
Sulfate	1700.	mg/L
Aluminum, ICP	0.08	mg/L
Antimony, ICP	<0.50	mg/L
Arsenic, ICP	0.004	mg/L
Barium, ICP	<0.50	mg/L
Beryllium, ICP	<0.050	mg/L
Cadmium, ICP	<0.010	mg/L
Calcium, ICP	460.	mg/L
Chromium, ICP	<0.040	mg/L
Cobalt, ICP	<0.10	mg/L
Copper, ICP	<0.010	mg/L
Iron, ICP	20.4	mg/L
Lead, ICP	<0.080	mg/L
Magnesium, ICP	90.	mg/L
Manganese, ICP	0.611	mg/L
Mercury, CVAA	<0.0002	mg/L
Nickel, ICP	<0.050	mg/L

Neal E. Cleghorn
Project Manager

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ANALYTICAL REPORT

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CH2M HILL
1890 Maple Ave.
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05/21/1991

Sample No.: 131855

Job No.: 91.0789

Sample Description: DEC-SSP3-4-4B
CH128770.B0.SP; DuPont

Date Taken: 04/25/1991
Time Taken: 00:00

Date Received: 04/26/1991
Time Received: 09:30

Potassium, ICP	1.	mg/L
Selenium, ICP	0.004	mg/L
Silver, ICP	<0.050	mg/L
Sodium, ICP	82.	mg/L
Thallium, ICP	<0.20	mg/L
Vanadium, ICP	<0.50	mg/L
Zinc, ICP	9.17	mg/L

Neal E. Cleghorn

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1890 Maple Ave.
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05/21/1991

Sample No.: 131855

Job No.: 91.0789

Sample Description: DEC-SSP3-4-4B
CH128770.B0.SP; DuPont

Date Taken: 04/25/1991
Time Taken: 00:00

Date Received: 04/26/1991
Time Received: 09:30

VOLATILE TARGET COMPOUNDS

Chloromethane	<10.	ug/L
Vinyl chloride	<10.	ug/L
Bromomethane	<10.	ug/L
Chloroethane	<10.	ug/L
1,1-Dichloroethene	<1.0	ug/L
Carbon disulfide	<1.0	ug/L
Acetone	<10.	ug/L
Methylene chloride	<5.0	ug/L
trans-1,2-Dichloroethene	<1.0	ug/L
1,1-Dichloroethane	<1.0	ug/L
Vinyl acetate	<10.	ug/L
2-Butanone	<10.	ug/L
cis-1,2-Dichloroethene	<1.0	ug/L
Chloroform	<1.0	ug/L
1,1,1-Trichloroethane	<1.0	ug/L
1,2-Dichloroethane	<1.0	ug/L
Benzene	<1.0	ug/L
Carbon tetrachloride	<1.0	ug/L
1,2-Dichloropropane	<1.0	ug/L
Trichloroethene	<1.0	ug/L
Bromodichloromethane	<1.0	ug/L
2-Chloroethylvinyl ether	<1.0	ug/L
trans-1,3-Dichloropropene	<1.0	ug/L
4-Methyl-2-pentanone	<10.	ug/L
Toluene	<1.0	ug/L
cis-1,3-Dichloropropene	<1.0	ug/L
1,1,2-Trichloroethane	<1.0	ug/L
Dibromochloromethane	<1.0	ug/L
2-Hexanone	<10.	ug/L
Tetrachloroethene	<1.0	ug/L

Neal E. Cleghorn
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ANALYTICAL REPORT

Ms. Susan Mulholland
CH2M HILL
1890 Maple Ave.
Evanston, IL 60201

05/21/1991

Sample No.: 131855

Job No.: 91.0789

Sample Description: DEC-SSP3-4-4B
CH128770.B0.SP; DuPont

Date Taken: 04/25/1991
Time Taken: 00:00

Date Received: 04/26/1991
Time Received: 09:30

VOLATILE TARGET COMPOUNDS

Chlorobenzene	<1.0	ug/L
Ethylbenzene	<1.0	ug/L
meta & para-Xylene	<1.0	ug/L
Bromoform	<1.0	ug/L
Styrene	<1.0	ug/L
ortho-Xylene	<1.0	ug/L
1,1,2,2-Tetrachloroethane	<1.0	ug/L
1,3-Dichlorobenzene	<1.0	ug/L
1,4-Dichlorobenzene	<1.0	ug/L
1,2-Dichlorobenzene	<1.0	ug/L

Neal E. Cleghorn
Project Manager

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1890 Maple Ave.
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05/21/1991

Sample No.: 131855

Job No.: 91.0789

Sample Description: DEC-SSP3-4-4B
CH128770.B0.SP; DuPont

Date Taken: 04/25/1991
Time Taken: 00:00

Date Received: 04/26/1991
Time Received: 09:30

PESTICIDE/PCB TARGET COMPOUNDS

Aldrin	<0.05	ug/L
alpha-BHC	<0.05	ug/L
beta-BHC	<0.05	ug/L
delta-BHC	<0.05	ug/L
gamma-BHC (Lindane)	<0.05	ug/L
Chlordane	<0.5	ug/L
4,4'-DDD	<0.1	ug/L
4,4'-DDE	<0.1	ug/L
4,4'-DDT	<0.1	ug/L
Dieldrin	<0.1	ug/L
Endosulfan I	<0.05	ug/L
Endosulfan II	<0.1	ug/L
Endosulfan sulfate	<0.1	ug/L
Endrin	<0.1	ug/L
Endrin aldehyde	<0.1	ug/L
Heptachlor	<0.05	ug/L
Heptachlor epoxide	<0.05	ug/L
Methoxychlor	<0.5	ug/L
Toxaphene	<0.5	ug/L
PCB-1016	<1.0	ug/L
PCB-1221	<1.0	ug/L
PCB-1232	<1.0	ug/L
PCB-1242	<1.0	ug/L
PCB-1248	<1.0	ug/L
PCB-1254	<1.0	ug/L
PCB-1260	<1.0	ug/L

Neal E. Cleghorn

Neal E. Cleghorn
Project Manager

January Monthly Monitoring Report for the Groundwater Seeps at the Du Pont East Chicago Plant East Chicago, Indiana

Prepared by CH2M HILL
on behalf of
E.I. du Pont de Nemours & Company

February 24, 1992

CHI185/035.51

Introduction

In response to U.S. EPA's Section 308 Information Request dated February 13, 1991, and U.S. EPA's amended Information Request dated June 27, 1991, Du Pont is submitting this monthly monitoring report characterizing the quality of the groundwater seep referenced in the original request (Groundwater Seep 1) and two other groundwater seeps referenced in the amended request (Groundwater Seeps 2 and 3) at Du Pont's East Chicago Plant. This report contains the results of the "monthly monitoring program" for January 1992.

Sample Collection and Analysis

The January "monthly monitoring program" sampling activities consisted of monitoring groundwater seep conditions and obtaining a grab sample from each groundwater seep, if possible, once per week. Monitoring was performed on January 2, 9, 15, 22, and 29, 1992. Groundwater seep flow rates were measured and recorded during each sampling event (Table 1). Samples were collected from Groundwater Seep 2 on each monitoring date. Groundwater Seeps 1 and 3 were not present during any of the monitoring events. Consequently, no samples were collected from Groundwater Seeps 1 or 3 in January.

Sample fractions collected for oil and grease, total suspended solids, and pH analyses were not filtered. All other sample fractions were filtered.

After the samples were collected, filtered, and preserved, as appropriate, the samples were shipped via overnight courier to National Environmental Testing, Inc. (NET) analytical laboratory in Bartlett, Illinois. When collected, the samples from Groundwater Seep 1 are analyzed for the following constituents: chemical oxygen demand (COD), ammonia-N, nitrate, nitrite, sulfate, chloride, fluoride, total dissolved solids, total suspended solids, arsenic, zinc, and pH. The samples collected from Groundwater Seeps 2 and 3 are analyzed for all of the constituents listed above, plus biological oxygen demand (BOD-five day), oil and grease, and copper, as originally requested. In the amended request, BOD-five day, oil and grease, and copper were dropped from the Groundwater Seep 1 monitoring requirements.

Analytical Results and Interpretation

Table 2 summarizes the analytical results of the "monthly monitoring program" for the month of January for Groundwater Seep 2. All laboratory data sheets for samples collected and analyzed during January for the "monthly monitoring program" are provided in Attachment 1.

Attachment 2 contains a data validation summary of QA/QC information associated with the analysis of the January groundwater seep samples.

Comparing the January Groundwater Seep 2 data to that collected in previous months for Groundwater Seep 2 (Table 3), the following observations were made:

- The average flow rate in January was lower than all previous months in which Groundwater Seep 2 was flowing.

- The average COD concentration for January was higher than all previous months in the "monthly monitoring program."

- The average nitrate concentration for January was lower than all previous months in the "monthly monitoring program."

- Except those previously noted, all January data were similar to data obtained in previous months.

TABLE 1

GROUNDWATER SEEP FLOW RATES (GPM)
JANUARY MONTHLY MONITORING PROGRAM
JANUARY 1992

Date	Groundwater Seep 1	Groundwater Seep 2	Groundwater Seep 3
January 2	NP*	6.9	NP*
January 9	NP*	8.2	NP*
January 15	NP*	6.8	NP*
January 22	NP*	4.0	NP*
January 29	NP*	5.4	NP*

Notes:
NP* denotes not present. No flow. Groundwater seep location dry.

TABLE 2

CONSTITUENTS DETECTED IN GROUNDWATER SEEP 2
JANUARY MONTHLY MONITORING PROGRAM
JANUARY 1992

Sample ID:	DEC-SP2-1-1	DEC-SP2-1-2	DEC-SP2-3-1	DEC-SP2-1-3	DEC-SP2-1-1	
Lab:	NET	NET	NET	NET	NET	
Lab ID:	155913	156346	156681	157045	157408	
Date:	1/2/92	1/9/92	1/15/92	1/22/92	1/29/92	
Filtered (Yes/No):	Yes	Yes	Yes	Yes	Yes	Average
AVERAGE FLOW RATE (gpm)	6.9	8.2	6.8	4.0	5.4	6.3
WATER QUALITY PARAMETERS (mg/l)						
BOD-Five Day	5J			2	1	2
COD	10B	44B	218	22B	40B	70
Chloride	230	254J	254	300	299	270
Fluoride	1.5	1.5	4.5J	4.4J	3.7	3.1
Nitrogen, Ammonia	6.9	7.4	8.60	7.45	9.68	8.0
Nitrogen, Nitrate	11.2	10.1	9.80	9.47	8.37	9.79
Nitrogen, Nitrite						
Oil and Grease	2*B	*	2*	1*J	*	1*
Total Dissolved Solids	2870J	3109	3094	3400	3400	3200
Total Suspended Solids	1*J	4*	2*	13*	*	4*
Sulfate	1900	1900	2100	2900J	2200J	2200
pH (lab)	6.1*	5.7*	5.6*	5.9*	5.8*	5.8*
TRACE INORGANIC COMPOUNDS (mg/l)						
Arsenic						
Copper						
Zinc	17.9	17.0	18.9	17.3	18.3J	17.9

Notes:
* Sample fraction not filtered.
No value denotes not detected.
B denotes blank contaminated.
J denotes estimated value.
A value of one-half the detection limit used in averaging not detected values.

TABLE 3

AVERAGE CONCENTRATIONS IN GROUNDWATER SEEP 2
MONTHLY MONITORING PROGRAM
1991/1992

	July	August	September	October**	November	December	January
AVERAGE FLOW RATE (gpm)	NP	NP	NP	8.1	10.5	13	6.3
WATER QUALITY PARAMETERS (mg/l)							
BOD-Five Day				2	0.7	2	2
COD				29	44	52	70
Chloride				420	400	220	270
Fluoride				2.9	4.0	2.1	3.1
Nitrogen, Ammonia				6.6	10.0	5.1	8.0
Nitrogen, Nitrate				38.2	31.2	13.6	9.79
Nitrogen, Nitrite							
Oil and Grease				*	1*	1*	1*
Total Dissolved Solids				4040	4120	2840	3200
Total Suspended Solids				9*	4*	3*	4*
Sulfate				2800	2400	1900	2200
pH (lab)				5.9*	5.8*	5.7*	5.8*
TRACE INORGANIC COMPOUNDS (mg/l)							
Arsenic							
Copper							
Zinc				26.9	20.9	15.7	17.9

Notes:
* Sample fraction not filtered.
**Values derived from one sampling event. Values are not averages.
NP denotes not present.
No value denotes not detected.
A value of one-half the detection limit used in averaging not detected values.
The average value of duplicate sample results used in overall averaging.

Attachment 1
Laboratory Data Sheets
Monthly Monitoring Program

NATIONAL ENVIRONMENTAL TESTING, INC.

NET Midwest, Inc.
Bartlett Division
850 West Bartlett Road
Bartlett, IL 60103

Tel: (708) 289-3100
Fax: (708) 289-5445

ANALYTICAL REPORT

Ms. Susan Mulholland
CH2M HILL
1033 University Place
Suite 300
Evanston, IL 60201-3137

01/13/1992

Sample No.: 155913

Job No.: 92.0013

Sample Description: DEC-SP2-1-1
CHI28770.B0.MS; DuPont

Date Taken: 01/02/1992
Time Taken: 12:00
IEPA Cert. No.: 100221

Date Received: 01/03/1992
Time Received: 10:00
WDNR Cert. No.: 999447130

BOD, Five Day	5.	mg/L
Chloride	230.	mg/L
COD, Total	10.	mg/L
Fluoride	1.5	mg/L
N-Ammonia	6.9	mg/L
N-Nitrate	11.2	mg/L
N-Nitrite	<0.01	mg/L
Oil & Grease	2.	mg/L
pH	6.1	units
Solids, Total Dissolved	2870.	mg/L
Solids, Total Suspended	1.	mg/L
Sulfate	1900.	mg/L
Arsenic, AA	<0.0050	mg/L
Copper, ICP	<0.010	mg/L

Kelly Jones

Kelly Jones
Project Manager

NATIONAL ENVIRONMENTAL TESTING, INC.

NET Midwest, Inc.
Bartlett Division
850 West Bartlett Road
Bartlett, IL 60103

Tel: (708) 289-3100
Fax: (708) 289-5445

ANALYTICAL REPORT

Ms. Susan Mulholland
CH2M HILL
1033 University Place
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01/13/1992

Sample No.: 155913

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Sample Description: DEC-SP2-1-1
CHI28770.B0.MS; DuPont

Date Taken: 01/02/1992
Time Taken: 12:00
IEPA Cert. No.: 100221

Date Received: 01/03/1992
Time Received: 10:00
WDNR Cert. No.: 999447130

Zinc, ICP	17.9	mg/L

Kelly Jones
Project Manager

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Bartlett Division
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Tel: (708) 289-3100
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ANALYTICAL REPORT

Ms. Susan Mulholland
CH2M HILL
1033 University Place
Suite 300
Evanston, IL 60201

01/31/1992

Sample No.: 156346

Job No.: 92.0129

Sample Description: DEC-SP2-1-2
CH128770.B0.MS; DuPont

Date Taken: 01/09/1992
Time Taken: 10:01
IEPA Cert. No. 100221

Date Received: 01/10/1992
Time Received: 10:00
WDNR Cert. No. 999447130

BOD, Five Day	<1.	mg/L
Chloride	254.	mg/L
COD, Total	44.	mg/L
Fluoride	1.5	mg/L
N-Ammonia	7.4	mg/L
N-Nitrate	10.1	mg/L
N-Nitrite	<0.01	mg/L
Oil & Grease	<1.	mg/L
pH	5.7	units
Solids, Total Dissolved	3109.	mg/L
Solids, Total Suspended	4.	mg/L
Sulfate	1900.	mg/L
Arsenic, AA	<0.0050	mg/L
Copper, AA	<0.050	mg/L
Zinc, AA	17.0	mg/L

Paula Kalicki
for Kelly Jones
Project Manager

NATIONAL ENVIRONMENTAL TESTING, INC.

NET Midwest, Inc.
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850 West Bartlett Road
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ANALYTICAL REPORT

Ms. Susan Mulholland
CH2M HILL
1033 University Place
Suite 300
Evanston, IL 60201

01/31/1992

Sample No.: 156681

Job No.: 92.0215

Sample Description: DEC-SP2-3-1
CH128770.B0.MS; DuPont

Date Taken: 01/15/1992
Time Taken: 10:30
IEPA Cert. No. 100221

Date Received: 01/16/1992
Time Received: 10:00
WDNR Cert. No. 999447130

BOD, Five Day	<1.	mg/L
Chloride	254.	mg/L
COD, Total	218.	mg/L
Fluoride	4.5	mg/L
N-Ammonia	8.60	mg/L
N-Nitrate	9.80	mg/L
N-Nitrite	<0.01	mg/L
Oil & Grease	2.	mg/L
pH	5.6	units
Solids, Total Dissolved	3094.	mg/L
Solids, Total Suspended	2.	mg/L
Sulfate	2100.	mg/L
Arsenic, AA	<0.0050	mg/L
Copper, AA	<0.050	mg/L
Zinc, AA	18.9	mg/L

Darla Kalicki
for Kelly Jones
Project Manager

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Bartlett Division
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ANALYTICAL REPORT

Ms. Susan Mulholland
CH2M HILL
1033 University Place
Suite 300
Evanston, IL 60201

02/10/1992

Sample No.: 157045

Job No.: 92.0316

Sample Description: DEC-SP2-1-3
CH128770.B0.MS;DuPont East

Date Taken: 01/22/1992
Time Taken: 12:50
IEPA Cert. No.: 100221

Date Received: 01/23/1992
Time Received: 10:00
WDNR Cert. No.: 999447130

BOD, Five Day	2.	mg/L
Chloride	300.	mg/L
COD, Total	22.	mg/L
Fluoride	4.4	mg/L
N-Ammonia	7.45	mg/L
N-Nitrate	9.47	mg/L
N-Nitrite	<0.01	mg/L
Oil & Grease	1.	mg/L
pH	5.9	units
Solids, Total Dissolved	3400.	mg/L
Solids, Total Suspended	13.	mg/L
Sulfate	2900.	mg/L
Arsenic, AA	<0.0050	mg/L
Copper, ICP	<0.010	mg/L

Kelly Jones
Project Manager

NATIONAL ENVIRONMENTAL TESTING, INC.

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ANALYTICAL REPORT

Ms. Susan Mulholland
CH2M HILL
1033 University Place
Suite 300
Evanston, IL 60201

02/10/1992

Sample No.: 157045

Job No.: 92.0316

Sample Description: DEC-SP2-1-3
CH128770.B0.MS;DuPont East

Date Taken: 01/22/1992
Time Taken: 12:50
IEPA Cert. No.: 100221

Date Received: 01/23/1992
Time Received: 10:00
WDNR Cert. No.: 999447130

Zinc, ICP	17.3	mg/L

Kelly Jones

Kelly Jones
Project Manager

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ANALYTICAL REPORT

Ms. Susan Mulholland
CH2M HILL
1033 University Place
Suite 300
Evanston, IL 60201

02/12/1992

Sample No.: 157408

Job No.: 92.0429

Sample Description: DEC-SP2-1-1
CHI28770.B0.MS;DuPont East

Date Taken: 01/29/1992
Time Taken: 10:30
IEPA Cert. No.: 100221

Date Received: 01/30/1992
Time Received: 10:00
WDNR Cert. No.: 999447130

BOD, Five Day	1.	mg/L
Chloride	299.	mg/L
COD, Total	40.	mg/L
Fluoride	3.7	mg/L
N-Ammonia	9.68	mg/L
N-Nitrate	8.37	mg/L
N-Nitrite	<0.01	mg/L
Oil & Grease	<2.	mg/L
pH	5.8	units
Solids, Total Dissolved	3400.	mg/L
Solids, Total Suspended	<1.	mg/L
Sulfate	2200.	mg/L
Arsenic, AA	<0.0050	mg/L
Copper, ICP	<0.010	mg/L

Darla Kalicki
for Kelly Jones
Project Manager

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ANALYTICAL REPORT

Ms. Susan Mulholland
CH2M HILL
1033 University Place
Suite 300
Evanston, IL 60201

02/12/1992

Sample No.: 157408

Job No.: 92.0429

Sample Description: DEC-SP2-1-1
CHI28770.B0.MS;DuPont East

Date Taken: 01/29/1992
Time Taken: 10:30
IEPA Cert. No.: 100221

Date Received: 01/30/1992
Time Received: 10:00
WDNR Cert. No.: 999447130

Zinc, ICP	18.3	mg/L

Darla Kalicki
for Kelly Jones
Project Manager

Attachment 2
Data Validation Summary
Monthly Monitoring Program

MEMORANDUM CH2M HILL

TO: Pixie Newman/CHI
Susan Mulholland/CHI

FROM: Dan MacGregor/GLO

DATE: February 24, 1992

SUBJECT: Data Validation for Grounwater Seep Samples
Du Pont, East Chicago, Indiana

PROJECT: CHI28770.B0.MR

Introduction

This memorandum presents the data validation discussion for the inorganic analytical results for Grounwater Seep 2 samples collected on January 2, 9, 15, 22, and 29, 1992, at the Du Pont Plant in East Chicago, Indiana. Grounwater Seeps 1 and 3 were not flowing during any of the sampling events. Sampling was performed in compliance with the U.S. EPA-requested "monthly monitoring program."

Samples were analyzed for major ions and selected metals by NET Laboratories in Bartlett, Illinois. Sample collection and transport were performed under strict chain-of-custody procedures. Requested QA/QC data included holding time data, chain-of-custody forms, calibration and procedure blank results, initial calibration verification standard recoveries, continuing calibration verification recovery results, matrix spike and matrix spike duplicate results, and laboratory spike results. The QA/QC and sample data were reviewed as described below.

Holding Times

Inspection of holding times showed that the holding time requirements, as specified by the U.S. EPA's *Methods for Chemical Analysis of Water and Wastes,* were met except for the January 2 sample's total dissolved solids analysis. The holding time for that analysis was exceeded by one day. The sample result is qualified as estimated and flagged with a "J."

Chain of Custody

The chain-of-custody forms were reviewed for accuracy and completeness. All necessary information was provided and found to be accurate. All requested analyses were performed, and the data packages were complete.

Blanks

The calibration and procedure blank results were inspected for possible contaminants.

The calibration blank and procedure blank associated with the January 2 sample each contained oil and grease at a concentration of 1 mg/l. The data are qualified as estimated and flagged with a "B."

The procedure blanks associated with the samples collected on January 2, 22, and 29 contained low-level concentrations of copper and zinc. Copper was not detected in the groundwater seep samples. The concentrations of zinc in the groundwater seep samples were significantly greater than the blank concentrations, and so no data qualifying action was taken.

COD values less than 150 mg/l are qualified as blank contaminated and flagged with a "B." This qualification is a consequence of the latest field blank (November 1991) containing significant concentrations of COD.

Calibration Recovery Results

Initial calibration verification (ICV) standard recoveries were within the EPA's established control limits of ± 10 percent of true value, with the exception of the January 9 chloride ICV recovery which was greater than the 110 percent control limit.

The continuing calibration verification (CCV) recoveries were also, generally, within the calibration control limits. The CCV recoveries for fluoride (January 15) and zinc (January 29) were outside the ± 10 percent control limit.

Sample results associated with the poor calibration recoveries were qualified as estimated and flagged with a "J."

Laboratory Control Spikes

Except for the oil and grease recoveries associated with the January 2, 9, 22, and 29 sampling dates and the January 2 BOD recovery, the laboratory spike recoveries were within the control limit of ± 20 percent of true value. The January 22 oil and grease result and the January 2 BOD result were qualified as estimated and flagged with a "J." The oil and grease results for the other samples were either previously qualified or were nondetects.

Matrix Spike/Matrix Spike Duplicate Fortifications

The matrix spike and matrix spike duplicate results associated with the following samples and sample parameters were outside EPA or method control limits:

- January 2—oil and grease and total suspended solids
- January 15—fluoride
- January 22—fluoride and sulfate
- January 29—sulfate

Associated sample results were qualified as estimated and flagged with a "J."

Sample Results and Conclusions

The sample results associated with Groundwater Seep 2 from this round of sampling were compared and found generally to be consistent with data from previous sampling rounds. The only noted anomaly is the COD value from the January 15 sample, which appears several orders of magnitude greater than previous average results.

The unqualified results are valid and usable and should be used as reported. The results qualified as estimated are true detections, but because the magnitude of the detection is an estimate, the results can be used qualitatively but not quantitatively. The results qualified as probably being blank contaminated should not be used to make project decisions.

February Monthly Monitoring Report for the Groundwater Seeps at the Du Pont East Chicago Plant East Chicago, Indiana

Prepared by CH2M HILL
on behalf of
E.I. du Pont de Nemours & Company

March 24, 1992

CHI185/035.51

Introduction

In response to U.S. EPA's Section 308 Information Request dated February 13, 1991, and U.S. EPA's amended Information Request dated June 27, 1991, Du Pont is submitting this monthly monitoring report characterizing the quality of the groundwater seep referenced in the original request (Groundwater Seep 1) and two other groundwater seeps referenced in the amended request (Groundwater Seeps 2 and 3) at Du Pont's East Chicago Plant. This report contains the results of the "monthly monitoring program" for February 1992.

Sample Collection and Analysis

The February "monthly monitoring program" sampling activities consisted of monitoring groundwater seep conditions and obtaining a grab sample from each groundwater seep, if possible, once per week. Monitoring was performed on February 6, 13, 20, and 26, 1992. Groundwater seep flow rates were measured and recorded during each sampling event (Table 1). Samples were collected from Groundwater Seep 2 on each monitoring date. Groundwater Seeps 1 and 3 were not present during any of the monitoring events. Consequently, no samples were collected from Groundwater Seeps 1 or 3 in February.

Sample fractions collected for oil and grease, total suspended solids, and pH analyses were not filtered. All other sample fractions were filtered.

After the samples were collected, filtered, and preserved, as appropriate, the samples were shipped via overnight courier to National Environmental Testing, Inc. (NET) analytical laboratory in Bartlett, Illinois. When collected, the samples from Groundwater Seep 1 are analyzed for the following constituents: chemical oxygen demand (COD), ammonia-N, nitrate, nitrite, sulfate, chloride, fluoride, total dissolved solids, total suspended solids, arsenic, zinc, and pH. The samples collected from Groundwater Seeps 2 and 3 are analyzed for all of the constituents listed above, plus biological oxygen demand (BOD-five day), oil and grease, and copper, as originally requested. In the amended request, BOD-five day, oil and grease, and copper were dropped from the Groundwater Seep 1 monitoring requirements.

Analytical Results and Interpretation

Table 2 summarizes the analytical results of the "monthly monitoring program" for the month of February for Groundwater Seep 2. All laboratory data sheets for samples collected and analyzed during February for the "monthly monitoring program" are provided in Attachment 1.

Attachment 2 contains a data validation summary of QA/QC information associated with the analysis of the February groundwater seep samples.

Comparing the February Groundwater Seep 2 data to that collected in previous months for Groundwater Seep 2 (Table 3), the following observations were made:

- The average ammonia-N concentration and pH for February were higher than all previous months in the "monthly monitoring program."

- The average nitrate concentration for February was lower than all previous months in the "monthly monitoring program."

- Except those previously noted, all February data were similar to data obtained in previous months.

TABLE 1

GROUNDWATER SEEP FLOW RATES (GPM)
FEBRUARY MONTHLY MONITORING PROGRAM
FEBRUARY 1992

Date	Groundwater Seep 1	Groundwater Seep 2	Groundwater Seep 3
February 6	NP*	6.5	NP*
February 13	NP*	4.1	NP*
February 20	NP*	14.6	NP*
February 26	NP*	12.0	NP*

Notes:
NP* denotes not present. No flow. Groundwater seep location dry.

TABLE 2

CONSTITUENTS DETECTED IN GROUNDWATER SEEP 2
FEBRUARY MONTHLY MONITORING PROGRAM
FEBRUARY 1992

Sample ID:	DEC-SP2-2-1	DEC-SP2-2-2	DEC-SP2-2-3	DEC-SP2-2-4	
Lab:	NET	NET	NET	NET	
Lab ID:	158025	158494	158974	159332	
Date:	2/6/92	2/13/92	2/20/92	2/26/92	
Filtered (Yes/No):	Yes	Yes	Yes	Yes	Average
AVERAGE FLOW RATE (gpm)	6.5	4.1	14.6	12.0	9.3
WATER QUALITY PARAMETERS (mg/l)					
BOD-Five Day				2	
COD	37B	70B	17B		30
Chloride	290	350	370	342	340
Fluoride	3.12J	3.8	3.9J	3.2J	3.5
Nitrogen, Ammonia	10.9	13.3	10.0	12.2	11.6
Nitrogen, Nitrate	7.92	9.40J	7.57J	7.54J	8.11
Nitrogen, Nitrite					
Oil and Grease	*	2*J	*	*	*
Total Dissolved Solids	3370	3500	3690	3460	3510
Total Suspended Solids	9*	*	10*B	1*	5*
Sulfate	2000	2900	2400J	2100J	2400
pH (lab)	5.8*	5.8*	6.7*	5.9*	6.1*
TRACE INORGANIC COMPOUNDS (mg/l)					
Arsenic			0.0078J		
Copper					
Zinc	19.4	21.2	14.6J	15.5J	17.7

Notes:
* Sample fraction not filtered.
No value denotes not detected.
B denotes blank contaminated.
J denotes estimated value.
A value of one-half the detection limit used in averaging not detected values.
Average values below the detection limit shown as not detected values.

TABLE 3

AVERAGE CONCENTRATIONS IN GROUNDWATER SEEP 2
MONTHLY MONITORING PROGRAM
1991/1992

	July	August	September	October**	November	December	January	February
AVERAGE FLOW RATE (gpm)	NP	NP	NP	8.1	10.5	13	6.3	9.3
WATER QUALITY PARAMETERS (mg/l)								
BOD-Five Day				2		2	2	
COD				29	44	52	70	30
Chloride				420	400	220	270	340
Fluoride				2.9	4.0	2.1	3.1	3.5
Nitrogen, Ammonia				6.6	10.0	5.1	8.0	11.6
Nitrogen, Nitrate				38.2	31.2	13.6	9.79	8.11
Nitrogen, Nitrite								
Oil and Grease				*	1*	1*	1*	*
Total Dissolved Solids				4040	4120	2840	3200	3510
Total Suspended Solids				9*	4*	3*	4*	5*
Sulfate				2800	2400	1900	2200	2400
pH (lab)				5.9*	5.8*	5.7*	5.8*	6.1*
TRACE INORGANIC COMPOUNDS (mg/l)								
Arsenic								
Copper								
Zinc				26.9	20.9	15.7	17.9	17.7

Notes:
* Sample fraction not filtered.
**Values derived from one sampling event. Values are not averages.
NP denotes not present.
No value denotes not detected.
A value of one-half the detection limit used in averaging not detected values.
Average values below the detection limit shown as not detected values.
The average value of duplicate sample results used in overall averaging.

Attachment 1
Laboratory Data Sheets
Monthly Monitoring Program

NATIONAL ENVIRONMENTAL TESTING, INC.

NET Midwest, Inc.
Bartlett Division
850 West Bartlett Road
Bartlett, IL 60103

Tel: (708) 289-3100
Fax: (708) 289-5445

ANALYTICAL REPORT

Ms. Susan Mulholland
CH2M HILL
1033 University Place
Suite 300
Evanston, IL 60201

02/25/1992

Sample No.: 158025

Job No.: 92.0600

Sample Description: DEC-SP2-2-1
CH128770.BC.MS; DuPont

Date Taken: 02/06/1992
Time Taken: 10:40
IEPA Cert. No.: 100221

Date Received: 02/07/1992
Time Received: 10:00
WDNR Cert. No.: 999447130

BOD, Five Day	<1.	mg/L
Chloride	290.	mg/L
COD, Total	37.	mg/L
Fluoride	3.12	mg/L
N-Ammonia	10.9	mg/L
N-Nitrate	7.92	mg/L
N-Nitrite	<0.01	mg/L
Oil & Grease	<1.	mg/L
pH	5.8	units
Solids, Total Dissolved	3370.	mg/L
Solids, Total Suspended	9.	mg/L
Sulfate	2000.	mg/L
Arsenic, AA	<0.0050	mg/L
Copper, ICP	<0.010	mg/L

Kelly Jones
Project Manager

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ANALYTICAL REPORT

Ms. Susan Mulholland
CH2M HILL
1033 University Place
Suite 300
Evanston, IL 60201

02/25/1992

Sample No.: 158025

Job No.: 92.0600

Sample Description: DEC-SP2-2-1
CH128770.B0.MS; DuPont

Date Taken: 02/06/1992
Time Taken: 10:40
IEPA Cert. No.: 100221

Date Received: 02/07/1992
Time Received: 10:00
WDNR Cert. No.: 999447130

Zinc, ICP	19.4	mg/L

Kelly Jones
Project Manager

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ANALYTICAL REPORT

Ms. Susan Mulholland
CH2M HILL
1033 University Place
Suite 300
Evanston, IL 60201-3137

03/02/1992

Sample No.: 158494

Job No.: 92.0693

Sample Description: DEC-SP2-2-2
CH128770.B0.MS; DuPont

Date Taken: 02/13/1992
Time Taken: 11:00
IEPA Cert. No.: 100221

Date Received: 02/14/1992
Time Received: 10:00
WDNR Cert. No.: 999447130

BOD, Five Day	<1.	mg/L
Chloride	350.	mg/L
COD, Total	70.	mg/L
Fluoride	3.8	mg/L
N-Ammonia	13.3	mg/L
N-Nitrate	9.40	mg/L
N-Nitrite	<0.01	mg/L
Oil & Grease	2.	mg/L
* pH	5.8	units
Solids, Total Dissolved	3500.	mg/L
Solids, Total Suspended	<1.	mg/L
Sulfate	2900.	mg/L
Arsenic, AA	<0.0050	mg/L
Copper, ICP	<0.010	

*Received past holding time

Kelly Jones
Project Manager

Kelly Jones

NATIONAL ENVIRONMENTAL TESTING, INC.

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Bartlett, IL 60103

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ANALYTICAL REPORT

Ms. Susan Mulholland
CH2M HILL
1033 University Place
Suite 300
Evanston, IL 60201-3137

03/02/1992

Sample No.: 158494

Job No.: 92.0693

Sample Description: DEC-SP2-2-2
CH128770.B0.MS; DuPont

Date Taken: 02/13/1992
Time Taken: 11:00
IEPA Cert. No.: 100221

Date Received: 02/14/1992
Time Received: 10:00
WDNR Cert. No.: 999447130

Zinc, ICP	21.2

Kelly Jones
Project Manager

NATIONAL ENVIRONMENTAL TESTING, INC.

NET Midwest, Inc.
Bartlett Division
850 West Bartlett Road
Bartlett, IL 60103

Tel: (708) 289-3100
Fax: (708) 289-5445

ANALYTICAL REPORT

Mr. Dan McGregor
CH2M HILL
1033 University Place
Suite 300
Evanston, IL 60201

03/11/1992

Sample No.: 158974

Job No.: 92.0825

Sample Description: DEC-SP2-2-3
CH123770.B0.MS; Dupont

Date Taken: 02/20/1992
Time Taken: 11:40
IEPA Cert. No. 100221

Date Received: 02/21/1992
Time Received: 10:00
WDNR Cert. No. 999447130

BOD, Five Day	<1.	mg/L
Chloride	370.	mg/L
COD, Total	17.	mg/L
Fluoride	3.9	mg/L
N-Ammonia	10.0	mg/L
N-Nitrate	7.57	mg/L
N-Nitrite	<0.01	mg/L
Oil & Grease	<1.	mg/L
pH	6.7	units
Solids, Total Dissolved	3690.	mg/L
Solids, Total Suspended	10.	mg/L
Sulfate	2400.	mg/L
Arsenic, AA	0.0078	mg/L
Copper, ICP	<0.010	mg/L
Zinc, ICP	14.6	mg/L

Kelly Jones
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ANALYTICAL REPORT

Ms. Susan Mulholland
CH2M HILL
1033 University Place
Suite 300
Evanston, IL 60201

03/10/1992

Sample No.: 159332

Job No.: 92.0909

Sample Description: DEC-SP2-2-4
CHI28770.B0.MS; Chcg. Seep

Date Taken: 02/26/1992
Time Taken:
IEPA Cert. No. 100221

Date Received: 02/27/1992
Time Received: 10:00
WDNR Cert. No. 999447130

BOD, Five Day	2.	mg/L
Chloride	342.	mg/L
COD, Total	<10.	mg/L
Fluoride	3.2	mg/L
N-Ammonia	12.2	mg/L
N-Nitrate	7.54	mg/L
N-Nitrite	<0.01	mg/L
Oil & Grease	<1.	mg/L
*pH	5.9	units
Solids, Total Dissolved	3460.	mg/L
Solids, Total Suspended	1.	mg/L
Sulfate	2100.	mg/L
Arsenic, AA	<0.0050	mg/L
Copper, ICP	<0.010	mg/L
Zinc, ICP	15.5	mg/L

*Received past holding time.

Kelly Jones

Kelly Jones
Project Manager

Attachment 2
Data Validation Summary
Monthly Monitoring Program

MEMORANDUM CH2M HILL

TO: Pixie Newman/CHI
Susan Mulholland/CHI

FROM: Dan MacGregor/GLO

DATE: March 18, 1992

SUBJECT: Data Validation for Groundwater Seep Samples
Du Pont, East Chicago, Indiana

PROJECT: CHI28770.B0.MR

Introduction

This memorandum presents the data validation discussion for the inorganic analytical results for Groundwater Seep 2 samples collected on february 6, 13, 20, and 26, 1992, at the Du Pont Plant in East Chicago, Indiana. Groundwater Seeps 1 and 3 were not flowing during any of the sampling events. Sampling was performed in compliance with the U.S. EPA-requested "monthly monitoring program."

Samples were analyzed for major ions and selected metals by NET Laboratories in Bartlett, Illinois. Sample collection and transport were performed under strict chain-of-custody procedures. Requested QA/QC data included holding time data, chain-of-custody forms, calibration and procedure blank results, initial calibration verification standard recoveries, continuing calibration verification recovery results, matrix spike and matrix spike duplicate results, and laboratory spike results. The QA/QC and sample data were reviewed as described below.

Holding Times

Inspection of holding times showed that the holding time requirements, as specified by the U.S. EPA's *Methods for Chemical Analysis of Water and Wastes,* were met.

Chain of Custody

The chain-of-custody forms were reviewed for accuracy and completeness. All necessary information was provided and found to be accurate. All requested analyses were performed, and the data packages were complete.

Blanks

The calibration and procedure blank results were inspected for possible contaminants.

The calibration blank associated with the February 20 sample contained total suspended solids (TSS) at a concentration of 4 mg/l. The February 20 TSS result is qualified as blank contaminated and flagged with a "B."

Low-level concentrations of copper and zinc were found in the procedure blanks. Copper was not detected in the groundwater seep samples. The concentrations of zinc in the groundwater seep samples were significantly greater than the blank concentrations, thus no data qualifying action was taken.

COD values less than 150 mg/l are qualified as blank contaminated and flagged with a "B." This qualification is a consequence of the latest field blank (November 1991) containing significant concentrations of COD.

Calibration Recovery Results

Initial calibration verification (ICV) standard recoveries were within the EPA's established control limits of ± 10 percent of true value, with the exception of the February 20 and 26 zinc ICV recoveries which were greater than the 110 percent control limit.

The continuing calibration verification (CCV) recoveries were also, generally, within the calibration control limits. The CCV recoveries for fluoride (February 6) and arsenic (February 20) were outside the ± 10 percent control limit.

Sample results associated with the poor calibration recoveries were qualified as estimated and flagged with a "J."

Laboratory Control Spikes

The laboratory spike recoveries were within the control limit of ± 20 percent of true value.

Matrix Spike/Matrix Spike Duplicate Fortifications

The matrix spike and matrix spike duplicate results associated with the following samples and sample parameters were outside EPA or method control limits:

- February 13—oil and grease, and nitrate
- February 20—fluoride, nitrate, and sulfate
- February 26—fluoride, nitrate, and sulfate

Associated sample results were qualified as estimated and flagged with a "J."

Sample Results and Conclusions

The sample results associated with Groundwater Seep 2 from this round of sampling were compared and found generally to be consistent with data from previous sampling rounds.
The unqualified results are valid and usable and should be used as reported. The results qualified as estimated are true detections, but because the magnitude of the detection is an estimate, the results can be used qualitatively but not quantitatively. The results qualified as probably being blank contaminated should not be used to make project decisions.

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Street Address: 5339 ALPHA RD SUITE 300

City: DALLAS State: TX ZIP Required: 75240

2 To (Recipient's Name) Please Print: GENE HARTSTEIN

Recipient's Phone Number (Very Important): (219) 391-4601

Company: E.I. DuPONT DE NEMOURS

Department/Floor No.: CHEMICALS & PIGMENTS

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March Monthly Monitoring Report for the Groundwater Seeps at the Du Pont East Chicago Plant East Chicago, Indiana

Prepared by CH2M HILL
on behalf of
E.I. du Pont de Nemours & Company

April 22, 1992

CHI185/035.51

Introduction

In response to U.S. EPA's Section 308 Information Request dated February 13, 1991, and U.S. EPA's amended Information Request dated June 27, 1991, Du Pont is submitting this monthly monitoring report characterizing the quality of the groundwater seep referenced in the original request (Groundwater Seep 1) and two other groundwater seeps referenced in the amended request (Groundwater Seeps 2 and 3) at Du Pont's East Chicago Plant. This report contains the results of the "monthly monitoring program" for March 1992.

Sample Collection and Analysis

The March "monthly monitoring program" sampling activities consisted of monitoring groundwater seep conditions and obtaining a grab sample from each groundwater seep, if possible, once per week. Monitoring was performed on March 4, 12, 19, and 25, 1992. Groundwater seep flow rates were measured and recorded during each sampling event (Table 1). Samples were collected from Groundwater Seep 2 on each monitoring date. Groundwater Seep 1 was not present on March 4 and March 25, therefore, samples were collected from Groundwater Seep 1 on March 12 and March 19 only. Groundwater Seep 3 was not present during any of the monitoring events. Consequently, no samples were collected from Groundwater Seep 3 in March.

Sample fractions collected for oil and grease, total suspended solids, and pH analyses were not filtered. All other sample fractions were filtered.

After the samples were collected, filtered, and preserved, as appropriate, the samples were shipped via overnight courier to National Environmental Testing, Inc. (NET) analytical laboratory in Bartlett, Illinois. The samples from Groundwater Seep 1 are analyzed for the following constituents: chemical oxygen demand (COD), ammonia-N, nitrate, nitrite, sulfate, chloride, fluoride, total dissolved solids, total suspended solids, arsenic, zinc, and pH. The samples collected from Groundwater Seeps 2 and 3 are analyzed for all of the constituents listed above, plus biological oxygen demand (BOD-five day), oil and grease, and copper, as originally requested. In the amended request, BOD-five day, oil and grease, and copper were dropped from the Groundwater Seep 1 monitoring requirements.

Analytical Results and Interpretation

Tables 2 and 3 summarize the analytical results of the "monthly monitoring program" for the month of March for Groundwater Seeps 1 and 2, respectively. All laboratory data sheets for samples collected and analyzed during March for the "monthly monitoring program" are provided in Attachment 1.

Attachment 2 contains a data validation summary of QA/QC information associated with the analysis of the March groundwater seep samples.

Comparing the March Groundwater Seep 1 data to that collected in previous months for Groundwater Seep 1 (Table 4), the following observations are made:

- The average flow rate for March was lower than all previous months in the "monthly monitoring program" in which Groundwater Seep 1 was flowing. However, in January and February, Groundwater Seep 1 was not flowing during monitoring events.

- The average zinc concentration for March was higher than all previous months in the "monthly monitoring program."

- The average chloride, total dissolved solids, and total suspended solids concentrations for March were lower than all previous months in the "monthly monitoring program."

- Except those previously noted, all March data were similar to data obtained in previous months.

Comparing the March Groundwater Seep 2 data to that collected in previous months for

Groundwater Seep 2 (Table 5), the following observations are made:

- The average flow rate for March was higher than all previous months in the "monthly monitoring program" in which Groundwater Seep 2 was flowing.

- The average oil and grease concentration for March was higher than all previous months in the "monthly monitoring program."

- The average chloride, nitrate, total dissolved solids, and zinc concentrations for March were lower than all previous months in the "monthly monitoring program."

- Except those previously noted, all March data were similar to data obtained in previous months.

TABLE 1

GROUNDWATER SEEP FLOW RATES (GPM)
MARCH MONTHLY MONITORING PROGRAM
MARCH 1992

Date	Groundwater Seep 1	Groundwater Seep 2	Groundwater Seep 3
March 4	NP*	10.3	NP*
March 12	0.15	15.1	NP*
March 19	0.07	11.9	NP***
March 25	NP*	11.9	NP*

Notes:
NP* denotes not present. No flow. Groundwater seep location dry.
NP** denotes not present. Groundwater seep location submerged below river surface. When a groundwater seep becomes submerged beneath the surface of a water body, it (by definition) is no longer a seep and technically is no different than the rest of the groundwater discharge to that surface water body. There is no simple way to measure and distinguish this discharge from the rest of the groundwater discharge to the Grand Calumet River.
NP*** denotes not present. No flow. Groundwater seep location wet, but no flow to river.

TABLE 2

CONSTITUENTS DETECTED IN GROUNDWATER SEEP 1
MARCH MONTHLY MONITORING PROGRAM
MARCH 1992

Sample ID:	DEC-SP1-3-2	DEC-SP1-3-3	
Lab:	NET	NET	
Lab ID:	160376	160875	
Date:	3/12/92	3/19/92	
Filtered (Yes/No):	Yes	Yes	Average
AVERAGE FLOW RATE (gpm)	0.15	0.07	0.11
WATER QUALITY PARAMETERS (mg/l)			
COD	57B	8B	30
Chloride	14	14J	14
Fluoride	0.98	0.96	0.97
Nitrogen, Ammonia	0.87	0.45	0.66
Nitrogen, Nitrate	0.32J	1.03J	0.68
Nitrogen, Nitrite			
Total Dissolved Solids	1100	1130	1100
Total Suspended Solids	3*B	*	2*
Sulfate	779	725	752
pH (lab)	6.9*	6.9*	6.9*
TRACE INORGANIC COMPOUNDS (mg/l)			
Arsenic	0.073J	0.032J	0.052
Zinc	1.26	0.764	1.01

Notes:
* Sample fraction not filtered.
No value denotes not detected.
B denotes blank contaminated.
J denotes estimated value.
A value of one-half the detection limit used in averaging not detected values.

TABLE 3

CONSTITUENTS DETECTED IN GROUNDWATER SEEP 2
MARCH MONTHLY MONITORING PROGRAM
MARCH 1992

Sample ID:	DEC-SP2-3-1	DEC-SP2-3-2	DEC-SP2-3-3	DEC-SP2-3-4	
Lab:	NET	NET	NET	NET	
Lab ID:	159873	160377	160876	161355	
Date:	3/4/92	3/12/92	3/19/92	3/25/92	
Filtered (Yes/No):	Yes	Yes	Yes	Yes	Average
AVERAGE FLOW RATE (gpm)	10.3	15.1	11.9	11.9	12.3
WATER QUALITY PARAMETERS (mg/l)					
BOD-Five Day	2				
COD	17B	14B	1B	49B	20
Chloride	290	290	240J	216	260
Fluoride	3.7	2.22	2.23	3.25	2.8
Nitrogen, Ammonia	12.0	8.8	5.8	6.1	8.2
Nitrogen, Nitrate	8.07J	7.06J	6.6J	8.2	7.5
Nitrogen, Nitrite					
Oil and Grease	*	*	4*B	14*	5*
Total Dissolved Solids	3150J	1290	2730	2683	2460
Total Suspended Solids	4*J	*	5*	11*	5*
Sulfate	2000	1690	1730	1680	2000
pH (lab)	5.9*	6.0*	5.9*	6.0*	6.0*
TRACE INORGANIC COMPOUNDS (mg/l)					
Arsenic					
Copper					
Zinc	13.8	13.1	12.2	11.8	12.7

Notes:
* Sample fraction not filtered.
No value denotes not detected.
B denotes blank contaminated.
J denotes estimated value.
A value of one-half the detection limit used in averaging not detected values.
Average values below the detection limit shown as not detected values.

TABLE 4

AVERAGE CONCENTRATIONS IN GROUNDWATER SEEP 1
MONTHLY MONITORING PROGRAM
1991/1992

	April	May	June	July	August	September	October**	November	December	January/ February	March
AVERAGE FLOW RATE (gpm)	0.78	0.86	0.87	0.62	0.35	0.36	0.78	0.51	0.41	NP	0.11
WATER QUALITY PARAMETERS (mg/l)											
COD	14	15	23	19	21	7	33	54	78		30
Chloride	32	32	25	25	23	43	18	22	19		14
Fluoride	1.0	1.2	1.0	1.1	0.9	0.8	0.9	0.8	0.9		0.97
Nitrogen, Ammonia	0.34	0.58	0.91	0.53	0.53	0.75	0.4	0.5	0.49		0.66
Nitrogen, Nitrate	0.47	1.3	0.94	0.35	0.08	0.31	0.35	0.82	0.55		0.68
Nitrogen, Nitrite			0.01		0.15			0.01			
Total Dissolved Solids	1260	1400	1110	1340	1400	1260	1260	2100	1140		1100
Total Suspended Solids	6*	6*	27*	145*	28*	5*	10*	250*	90*		2*
Sulfate	760	840	740	830	840	850	800	800	800		752
pH (lab)	7.2*	7.1*	7.0*	7.0*	7.0*	7.1*	7.1*	7.0*	6.9*		6.9*
TRACE INORGANIC COMPOUNDS (mg/l)											
Arsenic	0.046	0.054	0.068	0.103	0.017	0.99	0.100	0.084	0.069		0.052
Zinc	0.78	0.544	0.635	0.578	0.378	0.433	0.977	0.556	0.700		1.01

Notes:
* Sample fraction not filtered.
**October values derived from one sampling event. Values are not averages.
NP denotes not present.
No value denotes not detected.
A value of one-half the detection limit used in averaging not detected values.
The average value of the duplicate sample results used in overall averaging.

TABLE 5

AVERAGE CONCENTRATIONS IN GROUNDWATER SEEP 2
MONTHLY MONITORING PROGRAM
1991/1992

	July/August/September	October**	November	December	January	February	March
AVERAGE FLOW RATE (gpm)	NP	8.1	10.5	13	6.3	9.3	12.3
WATER QUALITY PARAMETERS (mg/l)							
BOD-Five Day		2		2	2		
COD		29	44	52	70	30	20
Chloride		420	400	220	270	340	260
Fluoride		2.9	4.0	2.1	3.1	3.5	2.8
Nitrogen, Ammonia		6.6	10.0	5.1	8.0	11.6	8.2
Nitrogen, Nitrate		38.2	31.2	13.6	9.79	8.11	7.5
Nitrogen, Nitrite							
Oil and Grease		*	1*	1*	1*	*	5*
Total Dissolved Solids		4040	4120	2840	3200	3510	2460
Total Suspended Solids		9*	4*	3*	4*	5*	5*
Sulfate		2800	2400	1900	2200	2400	2000
pH (lab)		5.9*	5.8*	5.7*	5.8*	6.1*	6.0*
TRACE INORGANIC COMPOUNDS (mg/l)							
Arsenic							
Copper							
Zinc		26.9	20.9	15.7	17.9	17.7	12.7

Notes:
* Sample fraction not filtered.
**Values derived from one sampling event. Values are not averages.
NP denotes not present.
No value denotes not detected.
A value of one-half the detection limit used in averaging not detected values.
Average values below the detection limit shown as not detected values.
The average value of duplicate sample results used in overall averaging.

Attachment 1
Laboratory Data Sheets
Monthly Monitoring Program

NATIONAL ENVIRONMENTAL TESTING, INC.

NET Midwest, Inc.
Bartlett Division
850 West Bartlett Road
Bartlett, IL 60103

Tel: (708) 289-3100
Fax: (708) 289-5445

ANALYTICAL REPORT

Ms. Susan Mulholland
CH2M HILL
1033 University Place
Suite 300
Evanston, IL 60201

03/31/1992

Sample No.: 160376

Job No.: 92.1187

Sample Description: DEC-SP1-3-2
CH128770.B0.MS;DuPont East

Date Taken: 03/12/1992
Time Taken: 09:40
IEPA Cert. No. 100221

Date Received: 03/13/1992
Time Received: 10:00
WDNR Cert. No. 999447130

Chloride	14.	mg/L
COD, Total	57.	mg/L
Fluoride	0.98	mg/L
N-Ammonia	0.87	mg/L
N-Nitrate	0.32	mg/L
N-Nitrite	<0.01	mg/L
pH	6.9	units
Solids, Total Dissolved	1100.	mg/L
Solids, Total Suspended	3.	mg/L
Sulfate	779.	mg/L
Arsenic, AA	0.073	mg/L
Zinc, AA	1.26	mg/L

Kelly Jones

Kelly Jones
Project Manager

NATIONAL ENVIRONMENTAL TESTING, INC.

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ANALYTICAL REPORT

Ms. Susan Mulholland
CH2M HILL
1033 University Place
Suite 300
Evanston, IL 60201

04/03/1992

Sample No.: 160875

Job No.: 92.1302

Sample Description: DEC-SP1-3-3
CH128770.B0.MS;DuPont-East

Date Taken: 03/19/1992
Time Taken: 10:20
IEPA Cert. No. 100221

Date Received: 03/20/1992
Time Received: 10:00
WDNR Cert. No. 999447130

Chloride	14.	mg/L
COD, Total	8.	mg/L
Fluoride	0.96	mg/L
N-Ammonia	0.45	mg/L
N-Nitrate	1.03	mg/L
N-Nitrite	<0.01	mg/L
pH	6.9	units
Solids, Total Dissolved	1130.	mg/L
Solids, Total Suspended	<1.	mg/L
Sulfate	725.	mg/L
Arsenic, AA	0.032	mg/L
Zinc, ICP	0.764	mg/L

*pH received past Holding Time.

Kelly Jones

Kelly Jones
Project Manager

NATIONAL ENVIRONMENTAL TESTING, INC.

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ANALYTICAL REPORT

Ms. Susan Mulholland
CH2M HILL
1033 University Place
Suite 300
Evanston, IL 60201

03/24/1992

Sample No.: 159873

Job No.: 92.1045

Sample Description: DEC-SP2-3-1
CHI28770.B0.MS;DuPont-East

Date Taken: 03/04/1992
Time Taken: 12:00
IEPA Cert. No. 100221

Date Received: 03/05/1992
Time Received: 10:00
WDNR Cert. No. 999447130

Parameter	Result	Units	Date Analyzed
BOD, Five Day	2.	mg/L	03/06/1992
Chloride	290.	mg/L	03/20/1992
COD, Total	17.	mg/L	03/16/1992
Fluoride	3.7	mg/L	03/18/1992
N-Ammonia	12.0	mg/L	03/12/1992
N-Nitrate	8.07	mg/L	03/20/1992
N-Nitrite	<0.01	mg/L	03/10/1992
Oil & Grease	<1.	mg/L	03/20/1992
pH	5.9	units	03/05/1992
Solids, Total Dissolved	3150.	mg/L	03/13/1992
Solids, Total Suspended	4.	mg/L	03/14/1992
Sulfate	2000.	mg/L	03/18/1992
Arsenic, AA	<0.0050	mg/L	03/11/1992
Copper, ICP	<0.010	mg/L	03/17/1992
Zinc, ICP	13.8	mg/L	03/17/1992

Kelly Jones

Kelly N. Jones
Project Manager

NATIONAL ENVIRONMENTAL TESTING, INC.

NET Midwest, Inc.
Bartlett Division
850 West Bartlett Road
Bartlett, IL 60103

Tel: (708) 289-3100
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ANALYTICAL REPORT

Ms. Susan Mulholland
CH2M HILL
1033 University Place
Suite 300
Evanston, IL 60201

03/31/1992

Sample No.: 160377

Job No.: 92.1187

Sample Description: DEC-SP2-3-2
CH128770.B0.MS;DuPont East

Date Taken: 03/12/1992
Time Taken: 10:20
IEPA Cert. No. 100221

Date Received: 03/13/1992
Time Received: 10:00
WDNR Cert. No. 999447130

BOD, Five Day	<2.	mg/L
Chloride	290.	mg/L
COD, Total	14.	mg/L
Fluoride	2.22	mg/L
N-Ammonia	8.8	mg/L
N-Nitrate	7.06	mg/L
N-Nitrite	<0.01	mg/L
Oil & Grease	<1.	mg/L
pH	6.0	units
Solids, Total Dissolved	1290.	mg/L
Solids, Total Suspended	<1.	mg/L
Sulfate	1,690.	mg/L
Arsenic, AA	<0.0050	mg/L
Copper, AA	<0.050	mg/L
Zinc, AA	13.1	mg/L

Kelly Jones

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ANALYTICAL REPORT

Ms. Susan Mulholland
CH2M HILL
1033 University Place
Suite 300
Evanston, IL 60201

04/03/1992

Sample No.: 160876

Job No.: 92.1302

Sample Description: DEC-SP2-3-3
CH128770.B0.MS;DuPont-East

Date Taken: 03/19/1992
Time Taken: 11:25
IEPA Cert. No. 100221

Date Received: 03/20/1992
Time Received: 10:00
WDNR Cert. No. 999447130

BOD, Five Day	<2.	mg/L
Chloride	240.	mg/L
COD, Total	1.	mg/L
Fluoride	2.23	mg/L
N-Ammonia	5.8	mg/L
N-Nitrate	6.6	mg/L
N-Nitrite	<0.01	mg/L
Oil & Grease	4.	mg/L
pH	5.9	units
Solids, Total Dissolved	2730.	mg/L
Solids, Total Suspended	5.	mg/L
Sulfate	1,730.	mg/L
Arsenic, AA	<0.0050	mg/L
Copper, ICP	<0.050	mg/L
Zinc, ICP	12.2	mg/L

*pH received past Holding Time.

Kelly Jones

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ANALYTICAL REPORT

Ms. Susan Mulholland
CH2M HILL
1033 University Place
Suite 300
Evanston, IL 60201

04/08/1992

Sample No.: 161355

Job No.: 92.1413

Sample Description: DEC-SP2-3-4
CH128770.B0.MS;DuPont-East

Date Taken: 03/25/1992
Time Taken: 09:55
IEPA Cert. No.: 100221

Date Received: 03/26/1992
Time Received: 10:42
WDNR Cert. No.: 999447130

BOD, Five Day	<2.	mg/L
Chloride	216.	mg/L
COD, Total	49.	mg/L
Fluoride	3.25	mg/L
N-Ammonia	6.1	mg/L
N-Nitrate	8.2	mg/L
N-Nitrite	<0.01	mg/L
Oil & Grease	14.	mg/L
pH	6.0	units
Solids, Total Dissolved	2683	mg/L
Solids, Total Suspended	11.	mg/L
Sulfate	1680.	mg/L
Arsenic, AA	<0.0050	mg/L
Copper, ICP	<0.010	mg/L

Kelly Jones
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ANALYTICAL REPORT

Ms. Susan Mulholland
CH2M HILL
1033 University Place
Suite 300
Evanston, IL 60201

04/08/1992

Sample No.: 161355

Job No.: 92.1413

Sample Description: DEC-SP2-3-4
CH128770.B0.MS;DuPont-East

Date Taken: 03/25/1992
Time Taken: 09:55
IEPA Cert. No.: 100221

Date Received: 03/26/1992
Time Received: 10:42
WDNR Cert. No.: 999447130

Zinc, ICP	11.8	mg/L

Kelly Jones
Project Manager

Attachment 2
Data Validation Summary
Monthly Monitoring Program

MEMORANDUM CH2M HILL

TO: Pixie Newman/CHI
Susan Mulholland/CHI

FROM: Dan MacGregor/GLO

DATE: April 16, 1992

SUBJECT: Data Validation for Groundwater Seep Samples
Du Pont, East Chicago, Indiana

PROJECT: CHI28770.B0.MR

Introduction

This memorandum presents the data validation discussion for the inorganic analytical results for Groundwater Seep 2 samples collected on March 4, 12, 19 and 25, 1992, and Seep 1 samples collected on March 12 and 19, 1992 at the Du Pont Plant in East Chicago, Indiana. Groundwater Seep 3 was not flowing during any of the sampling events, and Seep 1 was not flowing during the March 4 and 25, 1992 sampling events. Sampling was performed in compliance with the U.S. EPA-requested "monthly monitoring program."

Samples were analyzed for major ions and selected metals by NET Laboratories in Bartlett, Illinois. Sample collection and transport were performed under strict chain-of-custody procedures. Requested QA/QC data included holding time data, chain-of-custody forms, calibration and procedure blank results, initial calibration verification standard recoveries, continuing calibration verification recovery results, matrix spike and matrix spike duplicate results, and laboratory spike results. The QA/QC and sample data were reviewed as described below.

Holding Times

Inspection of holding times showed that the holding time requirements, as specified by the U.S. EPA's *Methods for Chemical Analysis of Water and Wastes,* were met with the exception of total dissolved solids (TDS) and total suspended solids (TSS) from the March 4 sampling. The TDS and TSS results from the March 4 sampling are qualified as estimated and flagged with a "J."

Chain of Custody

The chain-of-custody forms were reviewed for accuracy and completeness. All necessary information was provided and found to be accurate. All requested analyses were performed, and the data packages were complete.

Blanks

The calibration and procedure blank results were inspected for possible contaminants.

The calibration blank associated with the March 12 sample contained TSS at a concentration of 2 mg/l. The March 12 TSS result is qualified as blank contaminated and flagged with a "B."

Low-level concentrations of TDS (March 12 and 19) and oil & grease (March 19) were found in the procedure blanks. The concentrations of TDS in the groundwater seep samples were significantly greater than the blank concentrations, thus no data qualifying action was taken. The oil & grease result from the March 19 sampling is qualified as blank contaminated and flagged with a "B."

COD values less than 150 mg/l are qualified as blank contaminated and flagged with a "B." This qualification is a consequence of the latest field blank (November 1991) containing significant concentrations of COD.

Calibration Recovery Results

The following initial calibration verification (ICV) standard recoveries were not within the EPA's established control limits of ± 10 percent of true value.

- March 4–oil & grease, and arsenic
- March 12–COD, arsenic, and oil & grease
- March 19–arsenic, and oil & grease
- March 25–BOD, and arsenic

The continuing calibration verification (CCV) recoveries were, with one exception, within the calibration control limits. The CCV recovery for chloride (March 19) was below the ± 10 percent control limit.

Sample results that are greater than their associated reporting limits and associated with poor calibration recoveries were qualified as estimated and flagged with a "J."

Laboratory Control Spikes

A TDS (March 4) and three oil & grease (March 4, 12, and 19) laboratory spike recoveries were outside the control limit of ± 20 percent of true value. The March 4 TDS result was previously qualified as estimated, and no true detections of oil & grease were found, so no qualifying action was taken as a result of these poor recoveries.

Matrix Spike/Matrix Spike Duplicate Fortifications

The matrix spike and matrix spike duplicate results were generally within EPA or method control limits. Nitrate from the March 4, 12, and 19 sampling events was outside control limits. The nitrate results from these sampling dates were qualified as estimated and flagged with a "J."

Sample Results and Conclusions

The sample results associated with Groundwater Seeps Nos. 1 and 2 from this round of sampling were compared and found generally to be consistent with data from previous sampling rounds.

The unqualified results are valid and usable and should be used as reported. The results qualified as estimated are true detections, but because the magnitude of the detection is an estimate, the results can be used qualitatively but not quantitatively. The results qualified as probably being blank contaminated should not be used to make project decisions.

April Monthly Monitoring Report for the Groundwater Seeps at the Du Pont East Chicago Plant East Chicago, Indiana

Prepared by CH2M HILL
on behalf of
E.I. du Pont de Nemours & Company

May 26, 1992

CHI185/035.51

Introduction

In response to U.S. EPA's Section 308 Information Request dated February 13, 1991, and U.S. EPA's amended Information Request dated June 27, 1991, Du Pont is submitting this monthly monitoring report characterizing the quality of the groundwater seep referenced in the original request (Groundwater Seep 1) and two other groundwater seeps referenced in the amended request (Groundwater Seeps 2 and 3) at Du Pont's East Chicago Plant. This report contains the results of the "monthly monitoring program" for April 1992.

Sample Collection and Analysis

The April "monthly monitoring program" sampling activities consisted of monitoring groundwater seep conditions and obtaining a grab sample from each groundwater seep, if possible, once per week. Monitoring was performed on April 2, 9, 15, 23, and 30, 1992. Groundwater seep flow rates were measured and recorded during each sampling event (Table 1). Samples were collected from Groundwater Seep 2 on each monitoring date. Groundwater Seep 1 was not present on April 2, 9, 23, and 30, therefore, samples were collected from Groundwater Seep 1 on April 15 only. Groundwater Seep 3 was not present during any of the monitoring events. Consequently, no samples were collected from Groundwater Seep 3 in April.

Sample fractions collected for oil and grease, total suspended solids, and pH analyses were not filtered. All other sample fractions were filtered.

After the samples were collected, filtered, and preserved, as appropriate, the samples were shipped via overnight courier to National Environmental Testing, Inc. (NET) analytical laboratory in Bartlett, Illinois. The samples from Groundwater Seep 1 are analyzed for the following constituents: chemical oxygen demand (COD), ammonia-N, nitrate, nitrite, sulfate, chloride, fluoride, total dissolved solids, total suspended solids, arsenic, zinc, and pH. The samples collected from Groundwater Seeps 2 and 3 are analyzed for all of the constituents listed above, plus biological oxygen demand (BOD-five day), oil and grease, and copper, as originally requested. In the amended request, BOD-five day, oil and grease, and copper were dropped from the Groundwater Seep 1 monitoring requirements.

In an April 21, 1992, letter to Du Pont, U.S. EPA confirmed that for the months of April and May 1992, Groundwater Seeps 1, 2, and 3, need only be analyzed for five parameters: arsenic, cadmium, chromium, lead, and mercury. Unfortunately, the written correspondence was received after the April monthly monitoring was completed and the April samples were already analyzed or in the process of being analyzed for the constituents specified in the original Information Request and the amendment to it. The May monitoring will include only the analysis of the five parameters listed in U.S. EPA's April 21, 1992, letter. Du Pont understands that no additional information will be

required under this Information Request after submitting the May Monthly Monitoring Report, due to U.S. EPA on July 1, 1992.

Analytical Results and Interpretation

Tables 2 and 3 summarize the analytical results of the "monthly monitoring program" for the month of April for Groundwater Seeps 1 and 2, respectively. All laboratory data sheets for samples collected and analyzed during April for the "monthly monitoring program" are provided in Attachment 1.

Attachment 2 contains a data validation summary of QA/QC information associated with the analysis of the April groundwater seep samples.

Comparing the April Groundwater Seep 1 data to that collected in previous months for Groundwater Seep 1 (Table 4), the following observations are made:

- The nitrate and zinc concentrations corresponding to the one sampling event in April were higher than all of the previous months' averages in the "monthly monitoring program."

- The chloride, fluoride, total dissolved solids, and sulfate concentrations, as

well as, the pH, corresponding to the one sampling event in April were lower than all of the previous months' averages in the "monthly monitoring program."

- Except those previously noted, all April data were similar to data obtained in previous months.

Comparing the April Groundwater Seep 2 data to that collected in previous months for Groundwater Seep 2 (Table 5), the following observations are made:

- The average fluoride, nitrate, and sulfate concentrations for April were lower than all previous months in the "monthly monitoring program."

- The average ammonia and copper concentrations for April were higher than all previous months in the "monthly monitoring program."

- Except those previously noted, all April data were similar to data obtained in previous months.

TABLE 1

GROUNDWATER SEEP FLOW RATES (GPM)
APRIL MONTHLY MONITORING PROGRAM
APRIL 1992

Date	Groundwater Seep 1	Groundwater Seep 2	Groundwater Seep 3
April 2	NP*	10.1	NP*
April 9	NP*	7.3	NP*
April 15	0.34	8.2	NP***
April 23	NP*	9.6	NP*
April 30	NP*	5.1	NP*

Notes:
NP* denotes not present. No flow. Groundwater seep location dry.
NP** denotes not present. Groundwater seep location submerged below river surface. When a groundwater seep becomes submerged beneath the surface of a water body, it (by definition) is no longer a seep and technically is no different than the rest of the groundwater discharge to that surface water body. There is no simple way to measure and distinguish this discharge from the rest of the groundwater discharge to the Grand Calumet River.
NP*** denotes not present. No flow. Groundwater seep location wet, but no flow to river.

TABLE 2

CONSTITUENTS DETECTED IN GROUNDWATER SEEP 1
APRIL MONTHLY MONITORING PROGRAM
APRIL 1992

Sample ID:	DEC-SP1-4-3
Lab:	NET
Lab ID:	163139
Date:	4/15/92
Filtered (Yes/No):	Yes
AVERAGE FLOW RATE (gpm)	0.34
WATER QUALITY PARAMETERS (mg/l)	
COD	26B
Chloride	10
Fluoride	0.32
Nitrogen, Ammonia	0.37
Nitrogen, Nitrate	1.47
Nitrogen, Nitrite	0.01
Total Dissolved Solids	864
Total Suspended Solids	6*B
Sulfate	637
pH (lab)	6.8*
TRACE INORGANIC COMPOUNDS (mg/l)	
Arsenic	0.0238
Zinc	4.66J

Notes:
* Sample fraction not filtered.
No value denotes not detected.
B denotes blank contaminated.
J denotes estimated value.

TABLE 3

CONSTITUENTS DETECTED IN GROUNDWATER SEEP 2
APRIL MONTHLY MONITORING PROGRAM
APRIL 1992

Sample ID:	DEC-SP2-4-1	DEC-SP2-4-2	DEC-SP2-4-3	DEC-SP2-4-4	DEC-SP2-4-5	
Lab:	NET	NET	NET	NET	NET	
Lab ID:	161920	162541	163140	163677/ 163678	164312	
Date:	4/2/92	4/9/92	4/15/92	4/23/92	4/30/92	
Filtered (Yes/No):	Yes	Yes	Yes	Yes	Yes	Average
AVERAGE FLOW RATE (gpm)	10.1	7.3	8.2	9.6	5.1	8.1
WATER QUALITY PARAMETERS (mg/l)						
BOD-Five Day	1B			5B/7B		2
COD	62B	17B	20B	18B/19B	16B	27
Chloride	210	210	226	216/230	232	220
Fluoride	1.96	0.99	1.02	0.98/0.98	1.01	1.19
Nitrogen, Ammonia	11.41	12.5	5.5	17.2/17.8	20	13
Nitrogen, Nitrate	5.44	6.24	7.1	6.37/5.84	1.87	5.4
Nitrogen, Nitrite				/		
Oil and Grease	*	*	*	*/*	*	*
Total Dissolved Solids	2997	2817	2540	2790/2760	2740J	2770
Total Suspended Solids	11*	5*	11*B	7*J/4*J	*	7*
Sulfate	1530	1540	1570	1870/1520	1620	1590
pH (lab)	5.9*	6.0*	6.1*	5.9*/5.9*	5.0*	5.8*
TRACE INORGANIC COMPOUNDS (mg/l)						
Arsenic				/		
Copper		0.013B	0.179	0.023B/0.026B		0.045
Zinc	13.4	12.9J	12.3J	12.9/13.1	14.7	13.3

Notes:
* Sample fraction not filtered.
No value denotes not detected.
B denotes blank contaminated.
J denotes estimated value.
A value of one-half the detection limit used in averaging not detected values.
Average values below the detection limit shown as not detected values.
The average value of the duplicate sample results used in overall averaging.

TABLE 4

AVERAGE CONCENTRATIONS IN GROUNDWATER SEEP 1
MONTHLY MONITORING PROGRAM
1991/1992

	April	May	June	July	August	September	October**	November	December	January/ February	March	April**
AVERAGE FLOW RATE (gpm)	0.78	0.86	0.87	0.62	0.35	0.36	0.78	0.51	0.41	NP	0.11	0.34
WATER QUALITY PARAMETERS (mg/l)												
COD	14	15	23	19	21	7	33	54	78		30	26
Chloride	32	32	25	25	23	43	18	22	19		14	10
Fluoride	1.0	1.2	1.0	1.1	0.9	0.8	0.9	0.8	0.9		0.97	0.32
Nitrogen, Ammonia	0.34	0.58	0.91	0.53	0.53	0.75	0.4	0.5	0.49		0.66	0.37
Nitrogen, Nitrate	0.47	1.3	0.94	0.35	0.08	0.31	0.35	0.82	0.55		0.68	1.47
Nitrogen, Nitrite			0.01		0.15			0.01				0.01
Total Dissolved Solids	1260	1400	1110	1340	1400	1260	1260	2100	1140		1100	864
Total Suspended Solids	6*	6*	27*	145*	28*	5*	10*	250*	90*		2*	6*
Sulfate	760	840	740	830	840	850	800	800	800		752	637
pH (lab)	7.2*	7.1*	7.0*	7.0*	7.0*	7.1*	7.1*	7.0*	6.9*		6.9*	6.8*
TRACE INORGANIC COMPOUNDS (mg/l)												
Arsenic	0.046	0.054	0.068	0.103	0.017	0.99	0.100	0.084	0.069		0.052	0.0238
Zinc	0.78	0.544	0.635	0.578	0.378	0.433	0.977	0.556	0.700		1.01	4.66

Notes:
* Sample fraction not filtered.
**October 1991 and April 1992 values derived from one sampling event. Values are not averages.
NP denotes not present.
No value denotes not detected.
A value of one-half the detection limit used in averaging not detected values.
The average value of the duplicate sample results used in overall averaging.

TABLE 5

AVERAGE CONCENTRATIONS IN GROUNDWATER SEEP 2
MONTHLY MONITORING PROGRAM
1991/1992

	July/August/September	October**	November	December	January	February	March	April
AVERAGE FLOW RATE (gpm)	NP	8.1	10.5	13	6.3	9.3	12.3	8.1
WATER QUALITY PARAMETERS (mg/l)								
BOD-Five Day		2		2	2			2
COD		29	44	52	70	30	20	27
Chloride		420	400	220	270	340	260	220
Fluoride		2.9	4.0	2.1	3.1	3.5	2.8	1.19
Nitrogen, Ammonia		6.6	10.0	5.1	8.0	11.6	8.2	13
Nitrogen, Nitrate		38.2	31.2	13.6	9.79	8.11	7.5	5.4
Nitrogen, Nitrite								
Oil and Grease		*	1*	1*	1*	*	5*	*
Total Dissolved Solids		4040	4120	2840	3200	3510	2460	2770
Total Suspended Solids		9*	4*	3*	4*	5*	5*	7*
Sulfate		2800	2400	1900	2200	2400	2000	1590
pH (lab)		5.9*	5.8*	5.7*	5.8*	6.1*	6.0*	5.8*
TRACE INORGANIC COMPOUNDS (mg/l)								
Arsenic								
Copper								0.045
Zinc		26.9	20.9	15.7	17.9	17.7	12.7	13.3

Notes:
* Sample fraction not filtered.
**October 1991 values derived from one sampling event. Values are not averages.
NP denotes not present.
No value denotes not detected.
A value of one-half the detection limit used in averaging not detected values.
Average values below the detection limit shown as not detected values.
The average value of duplicate sample results used in overall averaging.

Attachment 1
Laboratory Data Sheets
Monthly Monitoring Program

NATIONAL ENVIRONMENTAL TESTING, INC.

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ANALYTICAL REPORT

Ms. Susan Mulholland
CH2M HILL
1033 University Place
Suite 300
Evanston, IL 60201

04/23/1992

Sample No.: 161920

Job No.: 92.1554

Sample Description: DEC-SP2-4-1
CH128770.B0.MS;DuPont-East

Date Taken: 04/02/1992
Time Taken: 10:25
IEPA Cert. No.: 100221

Date Received: 04/03/1992
Time Received: 09:40
WDNR Cert. No.: 999447130

BOD, Five Day	1.	mg/L
Chloride	210.	mg/L
COD, Total	62.	mg/L
Fluoride	1.96	mg/L
N-Ammonia	11.41	mg/L
N-Nitrate	5.44	mg/L
N-Nitrite	<0.01	mg/L
Oil & Grease	<1.	mg/L
pH	5.9	units
Solids, Total Dissolved	2997.	mg/L
Solids, Total Suspended	11.	mg/L
Sulfate	1530.	mg/L
Arsenic, AA	<0.0050	mg/L
Copper, ICP	<0.010	mg/L

Kelly Jones
Project Manager

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ANALYTICAL REPORT

Ms. Susan Mulholland
CH2M HILL
1033 University Place
Suite 300
Evanston, IL 60201

04/23/1992

Sample No.: 161920

Job No.: 92.1554

Sample Description: DEC-SP2-4-1
CH128770.B0.MS;DuPont-East

Date Taken: 04/02/1992
Time Taken: 10:25
IEPA Cert. No.: 100221

Date Received: 04/03/1992
Time Received: 09:40
WDNR Cert. No.: 999447130

Zinc, ICP	13.4	mg/L

Kelly Jones

Kelly Jones
Project Manager

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ANALYTICAL REPORT

Ms. Susan Mulholland
CH2M HILL
1033 University Place
Suite 300
Evanston, IL 60201

04/30/1992

Sample No.: 162541

Job No.: 92.1698

Sample Description: DEC-SP2-4-2
CH128770.B0.MS;DuPont-East

Date Taken: 04/09/1992
Time Taken: 09:40
IEPA Cert. No.: 100221

Date Received: 04/10/1992
Time Received: 10:25
WDNR Cert. No.: 999447130

BOD, Five Day	<1.	mg/L
Chloride	210.	mg/L
COD, Total	17.	mg/L
Fluoride	0.99	mg/L
N-Ammonia	12.5	mg/L
N-Nitrate	6.24	mg/L
N-Nitrite	<0.01	mg/L
Oil & Grease	<2.	mg/L
pH	6.0	units
Solids, Total Dissolved	2817.	mg/L
Solids, Total Suspended	5.	mg/L
Sulfate	1540.	mg/L
Arsenic, AA	<0.0050	mg/L
Copper, ICP	0.013	mg/L

Kelly Jones
Project Manager

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ANALYTICAL REPORT

Ms. Susan Mulholland
CH2M HILL
1033 University Place
Suite 300
Evanston, IL 60201

04/30/1992

Sample No.: 162541

Job No.: 92.1698

Sample Description: DEC-SP2-4-2
CH128770.B0.MS;DuPont-East

Date Taken: 04/09/1992
Time Taken: 09:40
IEPA Cert. No.: 100221

Date Received: 04/10/1992
Time Received: 10:25
WDNR Cert. No.: 999447130

Zinc, ICP	12.9	mg/L

Kelly Jones

Kelly Jones
Project Manager

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ANALYTICAL REPORT

Ms. Susan Mulholland
CH2M HILL
1033 University Place
Suite 300
Evanston, IL 60201

05/12/1992

Sample No.: 163139

Job No.: 92.1816

Sample Description: DEC-SP1-4-3
CH128770.B0.MS;DuPont-East

Date Taken: 04/15/1992
Time Taken: 10:30
IEPA Cert. No.: 100221

Date Received: 04/16/1992
Time Received: 10:30
WDNR Cert. No.: 999447130

Chloride	10.	mg/L
COD, Total	26.	mg/L
Fluoride	0.32	mg/L
N-Ammonia	0.37	mg/L
N-Nitrate	1.47	mg/L
N-Nitrite	0.01	mg/L
pH	6.8	units
Solids, Total Dissolved	864.	mg/L
Solids, Total Suspended	6.	mg/L
Sulfate	637.	mg/L
Arsenic, AA	0.0238	mg/L
Zinc, ICP	4.66	mg/L

Kelly Jones
Project Manager

NATIONAL ENVIRONMENTAL TESTING, INC.

NET Midwest, Inc.
Bartlett Division
850 West Bartlett Road
Bartlett, IL 60103

Tel: (708) 289-3100
Fax: (708) 289-5445

ANALYTICAL REPORT

Ms. Susan Mulholland
CH2M HILL
1033 University Place
Suite 300
Evanston, IL 60201

05/12/1992

Sample No.: 163140

Job No.: 92.1816

Sample Description: DEC-SP2-4-3
CH128770.B0.MS;DuPont-East

Date Taken: 04/15/1992
Time Taken: 11:10
IEPA Cert. No.: 100221

Date Received: 04/16/1992
Time Received: 10:30
WDNR Cert. No.: 999447130

BOD, Five Day	<1.	mg/L
Chloride	226.	mg/L
COD, Total	20.	mg/L
Fluoride	1.02	mg/L
N-Ammonia	5.5	mg/L
N-Nitrate	7.1	mg/L
N-Nitrite	<0.01	mg/L
Oil & Grease	<5.	mg/L
pH	6.1	units
Solids, Total Dissolved	2540.	mg/L
Solids, Total Suspended	11.	mg/L
Sulfate	1570.	mg/L
Arsenic, AA	<0.010	mg/L
Copper, ICP	0.179	mg/L

K Jones

Kelly Jones
Project Manager

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ANALYTICAL REPORT

Ms. Susan Mulholland
CH2M HILL
1033 University Place
Suite 300
Evanston, IL 60201

05/12/1992

Sample No.: 163140

Job No.: 92.1816

Sample Description: DEC-SP2-4-3
CH128770.B0.MS;DuPont-East

Date Taken: 04/15/1992
Time Taken: 11:10
IEPA Cert. No.: 100221

Date Received: 04/16/1992
Time Received: 10:30
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Zinc, ICP	12.3	mg/L

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ANALYTICAL REPORT

Ms. Susan Mulholland
CH2M HILL
1033 University Place
Suite 300
Evanston, IL 60201

05/14/1992

Sample No.: 163677

Job No.: 92.1968

Sample Description: DEC-SP2-4-4
CH128770.B0.MS;DuPont-East

Date Taken: 04/23/1992
Time Taken: 10:10
IEPA Cert. No. 100221

Date Received: 04/24/1992
Time Received: 12:00
WDNR Cert. No. 999447130

Parameter	Result	Units	Date Analyzed
BOD, Five Day	5.	mg/L	04/24/1992
Chloride	216.	mg/L	04/29/1992
COD, Total	18.	mg/L	05/11/1992
Fluoride	0.98	mg/L	04/30/1992
N-Ammonia	17.2	mg/L	05/07/1992
N-Nitrate	6.37	mg/L	05/04/1992
N-Nitrite	<0.01	mg/L	04/28/1992
Oil & Grease	<5.	mg/L	05/07/1992
pH	5.9	units	04/24/1992
Solids, Total Dissolved	2790.	mg/L	04/29/1992
Solids, Total Suspended	7.	mg/L	05/02/1992
Sulfate	1870.	mg/L	04/29/1992
Arsenic, AA	<0.0100	mg/L	05/13/1992
Copper, ICP	0.023	mg/L	04/29/1992
Zinc, ICP	12.9	mg/L	04/29/1992

Toni Gartner
Division Manager

NATIONAL ENVIRONMENTAL TESTING, INC.

NET Midwest, Inc.
Bartlett Division
850 West Bartlett Road
Bartlett, IL 60103

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ANALYTICAL REPORT

Ms. Susan Mulholland
CH2M HILL
1033 University Place
Suite 300
Evanston, IL 60201

05/14/1992

Sample No.: 163678

Job No.: 92.1968

Sample Description: DEC-FRSP2-4-4
CH128770.B0.MS;DuPont-East

Date Taken: 04/23/1992
Time Taken: 10:10
IEPA Cert. No. 100221

Date Received: 04/24/1992
Time Received: 12:00
WDNR Cert. No. 999447130

Parameter	Result	Units	Date Analyzed
BOD, Five Day	7.	mg/L	04/24/1992
Chloride	230.	mg/L	04/29/1992
COD, Total	19.	mg/L	05/11/1992
Fluoride	0.98	mg/L	04/30/1992
N-Ammonia	17.8	mg/L	05/07/1992
N-Nitrate	5.84	mg/L	05/04/1992
N-Nitrite	<0.01	mg/L	04/28/1992
Oil & Grease	<5.	mg/L	05/07/1992
pH	5.9	units	04/24/1992
Solids, Total Dissolved	2760.	mg/L	04/29/1992
Solids, Total Suspended	4.	mg/L	05/02/1992
Sulfate	1520.	mg/L	04/29/1992
Arsenic, AA	<0.0100	mg/L	05/13/1992
Copper, ICP	0.026	mg/L	04/29/1992
Zinc, ICP	13.1	mg/L	04/29/1992

Toni Gartner
Division Manager

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ANALYTICAL REPORT

Ms. Susan Mulholland
CH2M HILL
1033 University Place
Suite 300
Evanston, IL 60201

05/18/1992

Sample No.: 164312

Job No.: 92.2099

Sample Description: DES-SP2-4-5
CHI28770.B0.MS;DuPont-East

Date Taken: 04/30/1992
Time Taken: 12:05
IEPA Cert. No. 100221

Date Received: 05/01/1992
Time Received: 10:50
WDNR Cert. No. 999447130

Parameter	Result	Units	Date Analyzed
BOD, Five Day	<1.	mg/L	05/01/1992
Chloride	232.	mg/L	05/14/1992
COD, Total	16.	mg/L	05/18/1992
Fluoride	1.01	mg/L	05/06/1992
N-Ammonia	20.	mg/L	05/07/1992
N-Nitrate	1.87	mg/L	05/08/1992
N-Nitrite	<0.01	mg/L	05/02/1992
Oil & Grease	<5.	mg/L	05/13/1992
*pH	5.0	units	05/01/1992
Solids, Total Dissolved	2740.	mg/L	05/14/1992
Solids, Total Suspended	<1.	mg/L	05/06/1992
Sulfate	1620.	mg/L	05/14/1992
Arsenic, AA	<0.0050	mg/L	05/06/1992
Copper, ICP	<0.010	mg/L	05/11/1992
Zinc, ICP	14.7	mg/L	05/12/1992

*Sample received past holding time.

Kelly N. Jones
Project Manager

Attachment 2
Data Validation Summary
Monthly Monitoring Program

MEMORANDUM CH2M HILL

TO: Pixie Newman/CHI
Susan Mulholland/CHI

FROM: Lori Bootz/GLO

DATE: May 21, 1992

SUBJECT: Data Validation for Groundwater Seep Samples
Du Pont, East Chicago, Indiana

PROJECT: CHI28770.B0.MR

Introduction

This memorandum presents the data validation discussion for the inorganic analytical results for Groundwater Seep 2 samples collected on April 2, 9, 15, 23 and 30, 1992, and Seep 1 samples collected on April 15, 1992 at the Du Pont Plant in East Chicago, Indiana. Groundwater Seep 3 was not flowing during any of the sampling events, and Seep 1 was not flowing during the April 2, 9, 23 and 30, 1992 sampling events. Sampling was performed in compliance with the U.S. EPA-requested "monthly monitoring program."

Samples were analyzed for major ions and selected metals by NET Laboratories in Bartlett, Illinois. Sample collection and transport were performed under strict chain-of-custody procedures. Requested QA/QC data included holding time data, chain-of-custody forms, calibration and procedure blank results, initial calibration verification standard recoveries, continuing calibration verification recovery results, matrix spike and matrix spike duplicate results, and laboratory spike results. The QA/QC and sample data were reviewed as described below.

Holding Times

Inspection of holding times showed that the holding time requirements, as specified by the U.S. EPA's *Methods for Chemical Analysis of Water and Wastes,* were met with the exception of total dissolved solids (TDS) from the April 30 sampling and total suspended solids (TSS) from the April 23 sampling. The Seep 2 TDS result from the April 30 sampling and the Seep 2 TSS results from the April 23 sampling are qualified as estimated and flagged with a "J."

Chain of Custody

The chain-of-custody forms were reviewed for accuracy and completeness. All necessary information was provided and found to be accurate. All requested analyses were performed, and the data packages were complete.

Blanks

The calibration and procedure blank results were inspected for possible contaminants.

The calibration and procedure blanks associated with the April 15 sample contained TSS at a concentration of 6 mg/l. The April 15 TSS results are qualified as blank contaminated and flagged with a "B."

Low-level concentrations of TDS (April 23) and nitrate (April 2 and 9) were found in the calibration blanks. The concentrations of TDS and nitrate in the groundwater seep samples were significantly greater than the blank concentrations, thus no data qualifying action was taken.

A field blank was collected during the April 23 sampling. COD, BOD, and copper concentrations were found at concentrations greater than the method reporting limits. As a result, COD values less than 85 mg/l, BOD values less than 40 mg/l, and copper values less than 0.130 mg/L are qualified as possibly blank contaminated and flagged with a "B."

Calibration Recovery Results

The following initial calibration verification (ICV) standard recoveries were not within the EPA's established control limits of ± 10 percent of true value.

- April 2–BOD, arsenic and COD
- April 9–BOD and arsenic
- April 15–COD and zinc
- April 23–COD
- April 30-COD and oil & grease

The continuing calibration verification (CCV) recoveries were, with two exceptions, within the calibration control limits. The CCV recoveries for arsenic and zinc (April 9) were below the ± 10 percent control limit.

Sample results that are greater than their associated reporting limits and associated with poor calibration recoveries were qualified as estimated and flagged with a "J."

Laboratory Control Spikes

The laboratory control spike (LCS) recoveries were within the ± 20% percent control limit. The laboratory did not analyze a LCS for oil & grease with the April 2 and 9 sampling.

Matrix Spike/Matrix Spike Duplicate Fortifications

The matrix spike (MS) and matrix spike duplicate (MSD) results were generally within EPA or method control limits. Copper from the April 23 sampling event was outside control limits for the MSD. As a result of the Seep 2 copper results being previously qualified for field blank contamination, no additional data qualification was taken.

Sample Results and Conclusions

The sample results associated with Groundwater Seeps Nos. 1 and 2 from this round of sampling were compared and found generally to be consistent with data from previous sampling rounds.

The unqualified results are valid and usable as reported. The results qualified as estimated are true detections, but because the magnitude of the detection is an estimate, the results can be used qualitatively but not quantitatively. The results qualified as probably being blank contaminated should not be used to make project decisions.

May Monthly Monitoring Report for the Groundwater Seeps at the Du Pont East Chicago Plant East Chicago, Indiana

Prepared by CH2M HILL
on behalf of
E.I. du Pont de Nemours & Company

June 29, 1992

CHI185/035.51

Introduction

In response to U.S. EPA's Section 308 Information Request dated February 13, 1991, and U.S. EPA's amended Information Request dated June 27, 1991, Du Pont is submitting this monthly monitoring report characterizing the quality of the groundwater seep referenced in the original request (Groundwater Seep 1) and two other groundwater seeps referenced in the amended request (Groundwater Seeps 2 and 3) at Du Pont's East Chicago Plant. This report contains the results of the "monthly monitoring program" for May 1992.

Sample Collection and Analysis

The May "monthly monitoring program" sampling activities consisted of monitoring groundwater seep conditions and obtaining a grab sample from each groundwater seep, if possible, once per week. Monitoring was performed on May 7, 14, 21, and 28, 1992. Groundwater seep flow rates were measured and recorded during each sampling event (Table 1). Samples were collected from Groundwater Seep 2 on May 7, 14, and 21. Groundwater Seeps 1 and 3 were not present during any of the monitoring events. Consequently, no samples were collected from Groundwater Seeps 1 and 3 in May.

After the samples were collected, filtered, and preserved, as appropriate, the samples were shipped via overnight courier to National Environmental Testing, Inc. (NET) analytical laboratory in Bartlett, Illinois. The samples were analyzed for the following constituents: arsenic, cadmium, chromium, lead, and mercury. In an April 21, 1992, letter to Du Pont, U.S. EPA confirmed that for the months of April and May 1992, Groundwater Seeps 1, 2, and 3, need only be analyzed for these five constituents. Du Pont understands that no additional information will be required under this Information Request after submitting this May Monthly Monitoring Report.

Analytical Results and Interpretation

Table 2 summarizes the analytical results of the "monthly monitoring program" for the month of May for Groundwater Seep 2. All laboratory data sheets for samples collected and analyzed during May for the "monthly monitoring program" are provided in Attachment 1.

Attachment 2 contains a data validation summary of QA/QC information associated with the analysis of the May groundwater seep samples.

Comparing the May Groundwater Seep 2 data to that collected in previous months for Groundwater Seep 2 (Table 3), the following observations are made:

- The average flow rate of Groundwater Seep 2 in May was lower than in all previous months in the "monthly monitoring program."

- The average arsenic concentration was below the detection limit in May as in all previous months in the "monthly monitoring program."

- Other constituents analyzed in May were not analyzed in any other month in the "monthly monitoring program" per the original and amended requests.

TABLE 1

GROUNDWATER SEEP FLOW RATES (GPM)
MAY MONTHLY MONITORING PROGRAM
MAY 1992

Date	Groundwater Seep 1	Groundwater Seep 2	Groundwater Seep 3
May 7	NP*	5.7	NP*
May 14	NP*	4.1	NP*
May 21	NP*	1.6	NP*
May 28	NP*	NP*	NP*

Notes:
NP* denotes not present. No flow. Groundwater seep location dry.

TABLE 2

CONSTITUENTS DETECTED IN GROUNDWATER SEEP 2
MAY MONTHLY MONITORING PROGRAM
MAY 1992

Sample ID:	DEC-SP2-5-1	DEC-SP2-5-2	DEC-SP2-5-3	
Lab:	NET	NET	NET	
Lab ID:	164740	165096	165661	
Date:	5/7/92	5/14/92	5/21/92	
Filtered (Yes/No):	Yes	Yes	Yes	Average
AVERAGE FLOW RATE (gpm)	5.7	4.1	1.6	3.8
TRACE INORGANIC COMPOUNDS (mg/l)				
Arsenic				
Cadmium	0.048	0.043J	0.038	0.043
Chromium				
Lead	0.083J			
Mercury				

Notes:
No value denotes not detected.
B denotes blank contaminated.
J denotes estimated value.
A value of one-half the detection limit used in averaging not detected values.
Average values below the detection limit shown as not detected values.

TABLE 3

AVERAGE CONCENTRATIONS IN GROUNDWATER SEEP 2
MONTHLY MONITORING PROGRAM
1991/1992

	July/August/September	October**	November	December	January	February	March	April	May
AVERAGE FLOW RATE (gpm)	NP	8.1	10.5	13	6.3	9.3	12.3	8.1	3.8
WATER QUALITY PARAMETERS (mg/l)									
BOD-Five Day		2		2	2			2	NA
COD		29	44	52	70	30	20	27	NA
Chloride		420	400	220	270	340	260	220	NA
Fluoride		2.9	4.0	2.1	3.1	3.5	2.8	1.19	NA
Nitrogen, Ammonia		6.6	10.0	5.1	8.0	11.6	8.2	13	NA
Nitrogen, Nitrate		38.2	31.2	13.6	9.79	8.11	7.5	5.4	NA
Nitrogen, Nitrite									NA
Oil and Grease		*	1*	1*	1*	*	5*	*	NA
Total Dissolved Solids		4040	4120	2840	3200	3510	2460	2770	NA
Total Suspended Solids		9*	4*	3*	4*	5*	5*	7*	NA
Sulfate		2800	2400	1900	2200	2400	2000	1590	NA
pH (lab)		5.9*	5.8*	5.7*	5.8*	6.1*	6.0*	5.8*	NA
TRACE INORGANIC COMPOUNDS (mg/l)									
Arsenic									
Copper								0.045	NA
Zinc		26.9	20.9	15.7	17.9	17.7	12.7	13.3	NA

Notes:
* Sample fraction not filtered.
**October 1991 values derived from one sampling event. Values are not averages.
NA denotes not analyzed. Constituent dropped from monthly monitoring program.
NP denotes not present.
No value denotes not detected.
A value of one-half the detection limit used in averaging not detected values.
Average values below the detection limit shown as not detected values.
The average value of duplicate sample results used in overall averaging.

Attachment 1
Laboratory Data Sheets
Monthly Monitoring Program

NATIONAL ENVIRONMENTAL TESTING, INC.

NET Midwest, Inc.
Bartlett Division
850 West Bartlett Road
Bartlett, IL 60103

Tel: (708) 289-3100
Fax: (708) 289-5445

ANALYTICAL REPORT

Ms. Susan Mulholland
CH2M HILL
1033 University Place
Suite 300
Evanston, IL 60201

05/18/1992

Sample No.: 164740

Job No.: 92.2213

Sample Description: DEC-SP2-5-1
CH128770.B0.MS;DuPont-East

Date Taken: 05/07/1992
Time Taken: 10:10
IEPA Cert. No.: 100221

Date Received: 05/08/1992
Time Received: 10:20
WDNR Cert. No.: 999447130

Arsenic, AA	<0.0050	mg/L
Cadmium, ICP	0.048	mg/L
Chromium, ICP	<0.040	mg/L
Lead, ICP	0.083	mg/L
Mercury, CVAA	<0.0002	mg/L

Kelly Jones
Project Manager

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ANALYTICAL REPORT

Ms. Susan Mulholland
CH2M HILL
1033 University Place
Suite 300
Evanston, IL 60201

05/26/1992

Sample No.: 165096

Job No.: 92.2301

Sample Description: DEC-Sp2-5-2
CH128770.B0.MS;Dupont-East

Date Taken: 05/14/1992
Time Taken: 10:15
IEPA Cert. No.: 100221

Date Received: 05/15/1992
Time Received: 10:35
WDNR Cert. No.: 999447130

Arsenic, AA	<0.0050	mg/L
Cadmium, ICP	0.043	mg/L
Chromium, ICP	<0.040	mg/L
Lead, ICP	<0.080	mg/L
Mercury, CVAA	<0.0002	mg/L

Kelly Jones

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ANALYTICAL REPORT

Ms. Susan Mulholland
CH2M HILL
1033 University Place
Suite 300
Evanston, IL 60201

06/02/1992

Sample No.: 165661

Job No.: 92.2433

Sample Description: DEC-SP2-5-3
CH128770.B0.MS;DuPont-East

Date Taken: 05/21/1992
Time Taken: 10:50
IEPA Cert. No.: 100221

Date Received: 05/22/1992
Time Received: 11:20
WDNR Cert. No.: 999447130

Arsenic, AA	<0.0050	mg/L
Cadmium, ICP	0.038	mg/L
Chromium, ICP	<0.040	mg/L
Lead, ICP	<0.080	mg/L
Mercury, CVAA	<0.0002	mg/L

Kelly Jones

Kelly Jones
Project Manager

Attachment 2
Data Validation Summary
Monthly Monitoring Program

MEMORANDUM CH2M HILL

TO: Pixie Newman/CHI
Susan Mulholland/CHI

FROM: Lori Bootz/GLO

DATE: June 12, 1992

SUBJECT: Data Validation for Groundwater Seep Samples
Du Pont, East Chicago, Indiana

PROJECT: CHI28770.B0.MR

Introduction

This memorandum presents the data validation discussion for the inorganic analytical results for Groundwater Seep 2 samples collected on May 7, 14 and 21, 1992 at the Du Pont Plant in East Chicago, Indiana. Groundwater Seeps 1 and 3 were not flowing during any of the sampling events. Due to a sampling program change approved by Region 5 EPA, the May seep samples were analyzed for five parameters: arsenic, cadmium, chromium, lead and mercury. Sampling was performed in compliance with the updated U.S. EPA-requested "monthly monitoring program."

Samples were analyzed for selected metals by NET Laboratories in Bartlett, Illinois. Sample collection and transport were performed under strict chain-of-custody procedures. Requested QA/QC data included holding time data, chain-of-custody forms, calibration and procedure blank results, initial calibration verification standard recoveries, continuing calibration verification recovery results, matrix spike and matrix spike duplicate results, and laboratory spike results. The QA/QC and sample data were reviewed as described below.

Holding Times

Inspection of holding times showed that the holding time requirements, as specified by the U.S. EPA's *Methods for Chemical Analysis of Water and Wastes,* were met.

Chain of Custody

The chain-of-custody forms were reviewed for accuracy and completeness. All necessary information was provided and found to be accurate. All requested analyses were performed, and the data packages were complete.

Blanks

The calibration and procedure blank results were inspected for possible contaminants.

The procedure blank associated with the May 21 sample contained lead at a concentration of 0.171 mg/l. The May 21 lead result was reported as less than the method detection limit, thus no data qualifying action was taken.

Calibration Recovery Results

The following initial calibration verification (ICV) standard recoveries were not within the EPA's established control limits of ± 10 percent of true value.

- May 7—Arsenic and lead
- May 14—Arsenic, cadmium and chromium
- May 21—Arsenic and lead

The continuing calibration verification (CCV) recoveries were, with two exceptions, within the calibration control limits. The CCV recoveries for arsenic associated with the May 7 and May 21 samples were below the ± 10 percent control limit.

Sample results that are greater than their associated reporting limits and associated with poor calibration recoveries were qualified as estimated and flagged with a "J."

Laboratory Control Spikes

The laboratory control spike (LCS) recoveries were within the ± 20% percent control limit.

Matrix Spike/Matrix Spike Duplicate Fortifications

The matrix spike (MS) and matrix spike duplicate (MSD) results were within EPA or method control limits.

Sample Results and Conclusions

The unqualified sample results associated with Groundwater Seep No. 2 from this round of sampling are valid and usable and should be used as reported. The results qualified as estimated are true detections, but because the magnitude of the detection is an estimate, the results can be used qualitatively but not quantitatively.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 5
77 WEST JACKSON BOULEVARD
CHICAGO, IL 60604-3590

REPLY TO THE ATTENTION OF:

WCC-15J

APR 21 1992

CERTIFIED MAIL P 679 172 265
RETURN RECEIPT REQUESTED

Mr. E. F. Hartstein
Plant Manager
E.I. DuPont
5215 Kennedy Avenue
East Chicago, Indiana 46312

Re: Section 308 (Clean Water Act)
Information Request
E.I. DuPont de Nemours & Co., Inc.
NPDES Permit No. IN0000329
Docket No. V-W-91-308-11

Dear Mr. Hartstein:

This letter confirms the April 3, 1992, telephone conversation between Mr. James Novak of my staff and Mr. O. J. Meyer regarding the above referenced information request. They agreed that for the months of April and May 1992, seeps numbered 1, 2 and 3 need only be analyzed for five parameters: arsenic, cadmium, chromium, lead, and mercury.

Upon receipt of the above requested data for the months of April and May, no additional information will be required under this action. If you have any questions, please call Mr. Novak at (312) 886-0177.

Sincerely yours,

for Dale S. Bryson
Director, Water Division

cc: Joe Thomas, IDEM
Lee Bridges, IDEM

Printed on Recycled Paper

Sewer Sample Results and Comparison to Nearby Spring (Seep) and Nearby Groundwater Quality

Sewer Water and Sediment Sampling

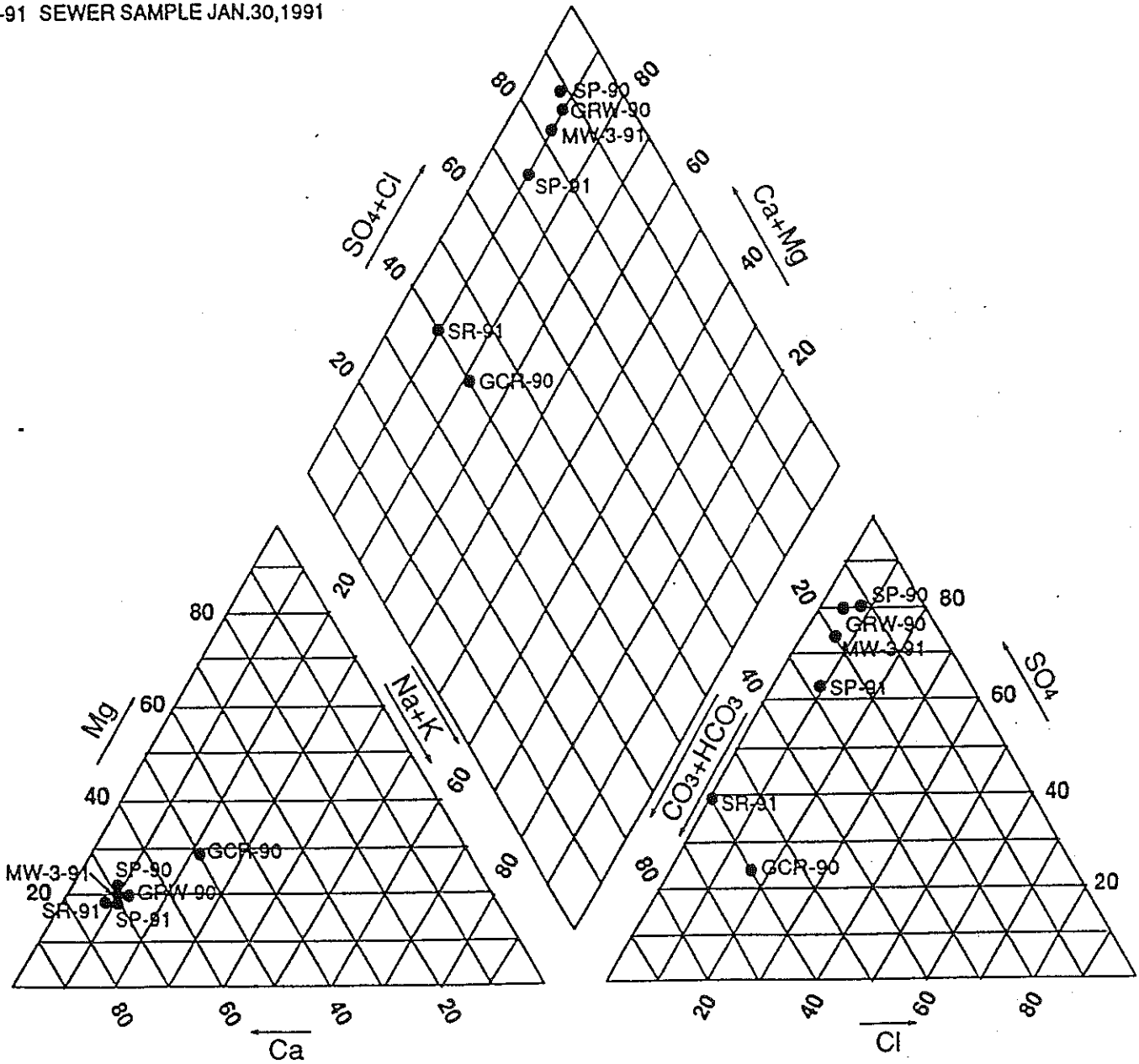
In January 1991, a single water sample and a single sediment sample were collected from the abandoned process sewer near the AgChem building (E-04 in Figure 3-5). In addition, samples were collected from monitoring well MW3, near the terminus of the sewer and Spring 1, at the waterway bank near the terminus of the sewer. The samples were DE-CON-A (for the sewer water sample), DE-CON-B (for the sewer sediment sample), DE-SP-A and DE-SP-B (for the spring samples), and DE-MW3-A (for monitoring well MW-3). The water samples were analyzed for a variety of analytes (see attached data sheets).

Using the attached Piper diagram, water quality data from the sewer sample were compared to the MW-3 data, Spring 1 data, and the 1990 East Branch water quality data. Water chemistry for the sewer water sample was found to fall between groundwater/spring data and the East Branch water quality data on the Piper diagram but is closer to the waterway data. This suggests that water in the sewer is neither groundwater nor surface water but liquid left within the abandoned sewer.

The sewer water, sewer sediment, MW-3, and spring samples were analyzed for diuron, fenuron, hexazinone, linuron, and siduron. Siduron (750 μg/L) and hexazinone (1,590 μg/L) were detected in the water sample from the sewer. Both pesticides were manufactured at the AgChem building. Hexazinone was observed in the regular and duplicate samples from Spring 1 (near the sewer terminus) at levels just above the method detection limit. Pesticides were not detected in the MW-3 sample or the sewer sediment sample. Because these analyses were only performed once for a limited number of samples, the representativeness of these results has not been established.

LEGEND

SP-90 SEEP SAMPLE MAY 22-23,1990
SP-91 SEEP SAMPLE JAN.23,1991
MW-3-91 MONITORING WELL 3 SAMPLE JAN.23,1991
GRW-90 AVERAGE GROUNWATER QUALITY AT MW-3 AND MW-15 IN JUNE + SEPT.1990
GCR-90 GEOMETRIC MEAN, SURFACE WATER QUALITY IN GRAND CALUMET RIVER JUNE + SEPT.1990
SR-91 SEWER SAMPLE JAN.30,1991



CATIONS
(meq/l, expressed as %)

ANIONS
(meq/l, expressed as %)

PIPER DIAGRAM

FIGURE 1

COMPARISON OF SEEP ION BALANCE TO ION BALANCE FOR OTHER WATER AT OR NEAR DU PONT EAST CHICAGO PLANT

Attachment

Sewer Water Sample Analysis

(DE-CON-A)

Engineers
Planners
Economists
Scientists

February 21, 1991

CHI28770.BO.SP

Ms. Pixie Newman
CH2M HILL/CHI
1890 Maple Avenue
Suite 200
Evanston, Illinois 60201

RE: Analytical Data for DuPont-East Chicago, LMG Laboratory No. 17706

Dear Ms. Newman:

On January 31, 1991, the CH2M HILL Montgomery Laboratory received one sample with a request for analysis of selected inorganic parameters.

The analytical results and associated quality control data are enclosed. The Boron analysis was performed at our Redding, California laboratory. A copy of their report is enclosed.

If you should have any questions concerning the data, please inquire.

The CH2M HILL policy is to store samples for up to 30 days after reporting. If you desire, our laboratory will maintain your samples for a longer period at a cost of $5.00 per sample per month. Samples determined to be hazardous can either be returned to you or disposed of at a cost of $25.00 per sample.

Sincerely,

Wanda L. Hall

Wanda L. Hall
Data Package Supervisor

Enclosures

cc: Mr. John Flessner/GLO

Engineers
Planners
Economists
Scientists

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Scientists

TABLE 1

SAMPLE CROSS-REFERENCE SUMMARY

CH2M HILL Laboratory No. 17706

CH2M HILL Sample No.	Sample Description			
17706001	SAMPLE DE-CON-A	01/30/91	1400	GRAB

CH2M HILL Quality Analytical Laboratories 2567 Fairlane Drive, P.O. Box 230548, Montgomery, Alabama 36116 205.271.1444

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CASE NARRATIVE
Cations

Batch Number: 17706

Client/Project: DUPONT EAST CHICAGO

I. Holding Time:
All holding times were met.

II. Analysis:

A. Blanks:
All acceptance criteria were met.

B. Calibration:
All acceptance criteria were met.

C. ICP Interference Check Sample:
All acceptance criteria were met.

D. Spike Sample Analysis:
All acceptance criteria were met.

E. Duplicate Sample Analysis:
All acceptance criteria were met.

F. Laboratory Control Sample Analysis:
All acceptance criteria were met.

G. ICP Serial Dilution:
Not required for this level QC.

H. Other:
The Boron analysis was performed at our Redding, California laboratory. A copy of their report is enclosed.

III. I certify that this data package is in compliance with the terms and conditions agreed to by the client and CH2M HILL, both technically and for completeness, for other than the conditions detailed above.

SIGNED: _____ DATE: 21FEB91

Kevin A. Sanders
Inorganic Division Manager

CH2M HILL
Quality
Analytical Laboratories
2567 Fairlane Drive, P.O. Box 230548,
Montgomery, Alabama 36116
205.271 1444

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CASE NARRATIVE
General Chemistry

Batch Number: 17706

Client/Project: DUPONT EAST CHICAGO

I. Holding Time: All criteria met.

II. Analysis:

A.	Calibration:	Acceptance criteria met.
B.	Blanks:	Acceptance criteria met.
C.	Matrix Spike:	Acceptance criteria met.
D.	Duplicate Analysis:	Acceptance criteria met.
E.	Lab Control Sample:	Acceptance criteria met.
F.	Other:	None.

III. I certify that this data package is in compliance with the terms and conditions agreed to by the client and CH2M HILL, both technically and for completeness, for other than the conditions detailed above.

SIGNED: _____ DATE: 21 FEB 91
Kevin A. Sanders
Inorganic Division Manager

CH2M HILL
Quality Analytical Laboratories
2567 Fairlane Drive, P.O. Box 230548, Montgomery, Alabama 36116
205.271.1444

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REPORT OF ANALYTICAL RESULTS

Date: 02/21/91

Client: CH2M HILL/CHI
1890 MAPLE AVENUE SUITE 200
EVANSTON, IL 60201

Atten: MS. PIXIE NEWMAN

Project Number: CHI28770.B0.SP
DUPONT EAST CHICAGO
Laboratory Number: 17706
Date Received: 01/31/91

Sample Description: DE-CON-A 1400 GRAB
Laboratory Sample Number: 17706001 Date Collected: 01/30/91 Matrix: WATER

Analytical Parameter	Method	Det Limit	Result	Units	Ana Date
Soluble Aluminum	EPA200.7/SW6010	200	<200	ug/L	02/11/91
Alkalinity as CaCO3	EPA310.1	1	545	mg/L	02/14/91
Soluble Arsenic	EPA206.2/SW7060	10	13	ug/L	02/12/91
Boron	EPA200.7/SW6010	20	251	ug/L	02/06/91
Soluble Barium	EPA200.7/SW6010	200	<200	ug/L	02/09/91
Soluble Calcium	EPA200.7/SW6010	50	160	mg/L	02/11/91
Soluble Cadmium	EPA200.7/SW6010	5	<5	ug/L	02/11/91
Chloride	EPA325.1	1.0	7.9	mg/L	02/14/91
Cyanide, Distilled	EPA335.2	5.0	93.2	ug/L	02/14/91
Chemical Oxygen Demand	EPA410.4	60	1610	mg/L	02/07/91
Soluble Chromium	EPA200.7/SW6010	10	<10	ug/L	02/09/91
Soluble Copper	EPA200.7/SW6010	25	<25	ug/L	02/09/91
Fluoride	EPA340.2	0.10	0.38	mg/L	02/05/91
Soluble Iron	EPA200.7/SW6010	100	<100	ug/L	02/10/91
Soluble Mercury	EPA245.1/SW7470	0.2	<0.2	ug/L	02/08/91
Soluble Potassium	EPA200.7/SW6010	5	<5	mg/L	02/09/91
Soluble Magnesium	EPA200.7/SW6010	5	23.2	mg/L	02/10/91
Soluble Manganese	EPA200.7/SW6010	15	250	ug/L	02/09/91
Soluble Sodium	EPA200.7/SW6010	5	16.2	mg/L	02/09/91
Ammonia-N	EPA350.2	0.1	<0.1	mg/L	02/12/91
Soluble Nickel	EPA200.7/SW6010	40	<40	ug/L	02/09/91
Soluble Lead	EPA239.2/SW7421	3	4	ug/L	02/12/91
Soluble Antimony	EPA200.7/SW6010	60	<60	ug/L	02/18/91
Sulfate	EPA375.4	10.0	348	mg/L	02/08/91
Total Kjeldahl Nitrogen	EPA351.3	0.1	17.6	mg/L	02/11/91
Soluble Zinc	EPA200.7/SW6010	20	1000	ug/L	02/09/91

Results for non-aqueous matrices are based on dry sample weight unless noted otherwise.

COMMENT: NA = NOT APPLICABLE.

Reviewed by: _____

INRPRPT(v910124)

CH2M HILL Quality Analytical Laboratories 2567 Fairlane Drive, P.O. Box 230548, Montgomery, Alabama 36116 205.271.1444

Engineers
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REPORT OF ANALYTICAL RESULTS

Date: 02/21/91

Client: CH2M HILL/CHI
1890 MAPLE AVENUE SUITE 200
EVANSTON, IL 60201

Atten: MS. PIXIE NEWMAN

Project Number: CHI28770.B0.SP
DUPONT EAST CHICAGO
Laboratory Number: 17706
Date Received: 01/31/91

Sample Description: METHOD BLANK
Laboratory Sample Number: 17706ZW1 Date Collected: 01/31/91 Matrix: WATER BLANK

Analytical Parameter	Method	Det Limit	Result	Units	Ana Date
Soluble Aluminum	EPA200.7/SW6010	200	<200	ug/L	02/11/91
Alkalinity as CaCO3	EPA310.1	1	NA	mg/L	02/14/91
Soluble Arsenic	EPA206.2/SW7060	10	<10	ug/L	02/12/91
Boron	EPA200.7/SW6010	20	<20	ug/L	02/06/91
Soluble Barium	EPA200.7/SW6010	200	<200	ug/L	02/09/91
Soluble Calcium	EPA200.7/SW6010	5.0	<5.0	mg/L	02/11/91
Soluble Cadmium	EPA200.7/SW6010	5	<5	ug/L	02/11/91
Chloride	EPA325.1	1.0	<1.0	mg/L	02/14/91
Cyanide, Distilled	EPA335.2	5.0	<5.0	ug/L	02/14/91
Chemical Oxygen Demand	EPA410.4	20	<20	mg/L	02/07/91
Soluble Chromium	EPA200.7/SW6010	10	<10	ug/L	02/09/91
Soluble Copper	EPA200.7/SW6010	25	<25	ug/L	02/09/91
Fluoride	EPA340.2	0.10	<0.10	mg/L	02/05/91
Soluble Iron	EPA200.7/SW6010	100	<100	ug/L	02/10/91
Soluble Mercury	EPA245.1/SW7470	0.2	<0.2	ug/L	02/08/9
Soluble Potassium	EPA200.7/SW6010	5	<5	mg/L	02/09/91
Soluble Magnesium	EPA200.7/SW6010	5.0	<5.0	mg/L	02/10/91
Soluble Manganese	EPA200.7/SW6010	15	<15	ug/L	02/09/91
Soluble Sodium	EPA200.7/SW6010	5	<5	mg/L	02/09/91
Ammonia-N	EPA350.2	0.1	<0.1	mg/L	02/12/91
Soluble Nickel	EPA200.7/SW6010	40	<40	ug/L	02/09/91
Soluble Lead	EPA239.2/SW7421	3	<3	ug/L	02/12/91
Soluble Antimony	EPA200.7/SW6010	60	<60	ug/L	02/09/91
Sulfate	EPA375.4	1.	<1.0	mg/L	02/08/91
Total Kjeldahl Nitrogen	EPA351.3	0.1	<0.1	mg/L	02/11/91
Soluble Zinc	EPA200.7/SW6010	20	<20	ug/L	02/09/91

Results for non-aqueous matrices are based on dry sample weight unless noted otherwise.

COMMENT: NA = NOT APPLICABLE.

Reviewed by: _____

INRPRPT(v910124)

CH2M HILL Quality Analytical Laboratories 2567 Fairlane Drive, P.O. Box 230548, Montgomery, Alabama 36116 205.271.1444

CASE NARRATIVE
Metals

28679

I. Holding Time:
All holding times were met.

II. Analysis:

A. Blanks:
All acceptance criteria were met.

B. Calibration:
All acceptance criteria were met.

C. ICP Interference Check Sample:
All acceptance criteria were met.

D. Spike Sample Analysis:
All acceptance criteria were met.

E. Duplicate Sample Analysis:
All acceptance criteria were met.

F. Laboratory Control Sample Analysis:
All acceptance criteria were met.

G. ICP Serial Dilution:
Not required for this level QC.

H. Other:
None.

III. I certify that this data package is in compliance with the terms and conditions agreed to by the client and CH2M HILL, both technically and for completeness, for other than the conditions detailed above.

Signed: Fred Bickell Date: 2/12/91
Fred Bickell
Cations Supervisor

CH2M HILL Redding Quality Analytical Laboratories 5090 Caterpillar Road, Redding, California 96003

Engineers
Planners
Economists
Scientists

REPORT OF ANALYTICAL RESULTS

Date: 02/12/91

Client: CH2M HILL/LMG
2567 FAIRLANE DR.
P.O. BOX 230548
MONTGOMERY, AL 36123-0548
Atten: MS. EMILY RAMUCHAK

Project Number: CHI28770.B0.SP
DUPONT EAST CHICAGO/SEEP CHAR.
Laboratory Number: 28679
Date Received: 02/01/91

Sample Description: DE-CON-A LM17706001
Laboratory Sample Number: 28679001 Date Collected: 01/30/91 Matrix: WATER

Analytical Parameter	Method	Det Limit	Result	Units	Ana Date
Soluble Boron	EPA200.7	20	251	ug/L	02/06/91

Results for non-aqueous matrices are based on dry sample weight unless noted otherwise.

Reviewed by: J. Hawley

INRPRPT(v910124)

000006

Engineers
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REPORT OF ANALYTICAL RESULTS

Date: 02/12/91

Client: CH2M HILL/LMG
2567 FAIRLANE DR.
P.O. BOX 230548
MONTGOMERY, AL 36123-0548
Atten: MS. EMILY RAMUCHAK

Project Number: CHI28770.B0.SP
DUPONT EAST CHICAGO/SEEP CHAR.
Laboratory Number: 28679
Date Received: 02/01/91

Sample Description: METHOD BLANK
Laboratory Sample Number: 28679ZW1 Date Collected: 02/01/91 Matrix: WATER BLANK

Analytical Parameter	Method	Det Limit	Result	Units	Ana Date
Soluble Boron	EPA200.7	20	<20	ug/L	02/06/91

Results for non-aqueous matrices are based on dry sample weight unless noted otherwise.

Reviewed by: J. Hawley

INRPRPT(v910124)

CH2M HILL QUALITY ANALYTICS

CHAIN OF CUSTODY RECORD

PROJECT NUMBER	PROJECT NAME
CH128770.B0.SP	SEEP CHARACTERIZATION

CLIENT NAME: DU PONT EAST CHICAGO

PROJECT MANAGER: PIXIE NEWMAN/CDI

COPY TO: JOHN FLESSNER/GLO

REQUESTED COMP. DATE:

SAMPLING REQUIREMENTS: SDWA ☐ NPDES ☐ RCRA ☐ OTHER ____

CLIENT ADDRESS AND PHONE NUMBER: CH2M HILL, 1890 MAPLE AVE, SUITE 200, EVANSTON, IL 60016

FOR LAB USE ONLY: LAB# 17706; LAB#; PROJECT NO. CH128770.B0.SP; ACK ER 2/4/91; VERIFIED 2/4/91 JHS; QUOTE#; BS 2/4/91 AHS; NO. OF SAMP; PG 1 OF 1

ANALYSES REQUESTED

STA NO.	DATE	TIME	COMP	GRAB	SOIL	SAMPLE DESCRIPTIONS (12 CHARACTERS)	# OF CONTAINERS	METALS (NOT FILTERED)	CHLORIDE (LAB FILTERED PER GEO. 1/31/91)	FLUORIDE	SULFATE	NH_3	TKN	ALKALINITY	COD	CNDT		LAB ID	REMARKS
	1/30/91	2:00		X		DE-CON-A	5	X	X	X	X	X	X	X	X	X		001	METALS SAMPLE NEEDS TO BE FILTERED. HAVE INCLUDED AN ACIDIFIED AND UNACIDIFIED WATER SAMPLE. USE WHICH EPA IS APPROPRIATE.
																		FZW1	

ANALYSIS Boron LRD — must be filtered at prior to analysis — not preserved yet. (AHS)

QC LEVEL 1 DATE DUE 2/19/91

REPORT TO E. RAMUCHAK/LMG

SHIP# FedX LAB LRD INIT AHS 504 387 9212

METALS: As, Al, Sb, Ba, B, Cd, Ca, Cr, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Na, Zn

FILTR, DGW, DGG, 7, 9

SAMPLED BY AND TITLE	DATE/TIME	RELINQUISHED BY	DATE/TIME
Eric D. Spande	1/30/91 2:50	Eric D. Spande	1/30/91 2:50
RECEIVED BY:	DATE/TIME	RELINQUISHED BY:	DATE/TIME
RECEIVED BY:	DATE/TIME	RELINQUISHED BY:	DATE/TIME
RECEIVED BY LAB:	DATE/TIME 1/31/91 1000	SAMPLE SHIPPED VIA UPS BUS FED-EX HAND OTHER ____	AIR BILL# 6352 149241

HAZWRAP/NEESA Y (N)

QC LEVEL (1) 2 3

COC yes; ICE yes; ANA REQ yes; TEMP 4°C; CUST SEAL yes; Ph <2/>12 (w); SAMPLE COND. Intact

lab: B2155692

REMARKS: METALS SAMPLE(S) NEED TO BE FILTERED.

ENTERED INTO LIMS 2/1/91; COC REVIEWED 2/1/91

B1155906 1/31/91 Sent Chlorides

CH2M HILL FORM 340 7/89

Attachment
Seep and MW3 Sample Analyses
(DE-SP-A and B and DE-MW-3-A

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Scientists

March 19, 1991

CHI28770.BO.SP

Ms. Pixie Newman
CH2M HILL/CHI
1890 Maple Avenue
Suite 200
Evanston, IL 60201

RE: Analytical Data for DuPont-East Chicago, LMG Laboratory No. 17643

Dear Ms. Newman:

On January 24, 1991, the CH2M HILL Montgomery Laboratory received three samples with a request for analysis of selected inorganic parameters.

The analytical results and associated quality control data are enclosed. This is a corrected report reflecting the changes we discussed during late February 1991.

If you should have any questions concerning the data, please inquire.

The CH2M HILL policy is to store samples for up to 30 days after reporting. If you desire, our laboratory will maintain your samples for a longer period at a cost of $5.00 per sample per month. Samples determined to be hazardous can either be returned to you or disposed of at a cost of $25.00 per sample.

Sincerely,

Angie Smith

for Wanda L. Hall
Data Package Supervisor

Enclosures

cc: Mr. Dan McGregor/GLO
Mr. John Flessner/GLO

Engineers
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Economists
Scientists

REPORT OF ANALYTICAL RESULTS

Date: 02/15/91

Client: CH2M HILL/CHI
1890 MAPLE AVENUE SUITE 200
EVANSTON, IL 60201

Atten: MS. PIXIE NEWMAN

Project Number: CHI28770.B0.SP
SEEP CHARACTERIZATION
Laboratory Number: 17643
Date Received: 01/24/91

Sample Description: DE-SP-A 0915 GRAB
Laboratory Sample Number: 17643001 Date Collected: 01/23/91 Matrix: WATER

Analytical Parameter	Method	Det Limit	Result	Units	Ana Date
Soluble Aluminum	EPA200.7/SW6010	200	<200	ug/L	02/02/91
Alkalinity as CaCO3	EPA310.1	1	155	mg/L	01/31/91
Soluble Arsenic	EPA206.2/SW7060	10	53	ug/L	02/02/91
Soluble Boron	EPA200.7	20	253	ug/L	01/30/91
Soluble Barium	EPA200.7/SW6010	200	<200	ug/L	02/02/91
Soluble Calcium	EPA200.7/SW6010	50	160	mg/L	02/05/91
Soluble Cadmium	EPA200.7/SW6010	5	<5	ug/L	02/02/91
Chloride	EPA325.1	1.0	26.1	mg/L	02/14/91
Cyanide, Distilled	EPA335.2	0.005	0.008	mg/L	02/04/91
Chemical Oxygen Demand	EPA410.4	20	222	mg/L	02/07/91
Soluble Chromium	EPA200.7/SW6010	10	<10	ug/L	02/02/91
Soluble Copper	EPA200.7/SW6010	25	<25	ug/L	02/02/91
Fluoride	EPA340.2	0.10	0.34	mg/L	02/05/91
Soluble Iron	EPA200.7/SW6010	100	1800	ug/L	02/02/91
Soluble Mercury	EPA245.1/SW7470	0.2	<0.2	ug/L	01/29/91
Soluble Potassium	EPA200.7/SW6010	5.0	<5.0	mg/L	02/02/91
Soluble Magnesium	EPA200.7/SW6010	5.0	23.7	mg/L	02/02/91
Soluble Manganese	EPA200.7/SW6010	15	510	ug/L	02/02/91
Soluble Sodium	EPA200.7/SW6010	5.0	29	mg/L	02/02/91
Ammonia-N	EPA350.2	0.1	<0.1	mg/L	02/11/91
Soluble Nickel	EPA200.7/SW6010	40	<40	ug/L	02/02/91
Soluble Lead	EPA239.2/SW7421	3	<3	ug/L	01/31/91
Soluble Antimony	EPA200.7/SW6010	60	<60	ug/L	02/04/91
Sulfate	EPA375.4	10.0	346	mg/L	01/29/91
Total Kjeldahl Nitrogen	EPA351.3	0.1	2.7	mg/L	02/13/91
Soluble Zinc	EPA200.7/SW6010	20	83	ug/L	02/02/91

Results for non-aqueous matrices are based on dry sample weight unless noted otherwise.

COMMENT: NA = Not applicable.

Reviewed by: _____

INRPRPT(v910124)

Engineers
Planners
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Scientists

REPORT OF ANALYTICAL RESULTS

Date: 02/15/91

Client: CH2M HILL/CHI
1890 MAPLE AVENUE SUITE 200
EVANSTON, IL 60201

Atten: MS. PIXIE NEWMAN

Project Number: CHI28770.B0.SP
SEEP CHARACTERIZATION
Laboratory Number: 17643
Date Received: 01/24/91

Sample Description: DE-SP-B 0940 GRAB
Laboratory Sample Number: 17643002 Date Collected: 01/23/91 Matrix: WATER

Analytical Parameter	Method	Det Limit	Result	Units	Ana Date
Soluble Aluminum	EPA200.7/SW6010	200	<200	ug/L	02/02/91
Alkalinity as CaCO3	EPA310.1	1	151	mg/L	01/31/91
Soluble Arsenic	EPA206.2/SW7060	10	55	ug/L	02/02/91
Soluble Boron	EPA200.7	20	238	ug/L	01/30/91
Soluble Barium	EPA200.7/SW6010	200	<200	ug/L	02/02/91
Soluble Calcium	EPA200.7/SW6010	50	160	mg/L	02/05/91
Soluble Cadmium	EPA200.7/SW6010	5	<5	ug/L	02/02/91
Chloride	EPA325.1	10.0	29.1	mg/L	02/14/91
Cyanide, Distilled	EPA335.2	0.005	0.011	mg/L	02/04/91
Chemical Oxygen Demand	EPA410.4	20	296	mg/L	02/07/91
Soluble Chromium	EPA200.7/SW6010	10	<10	ug/L	02/02/91
Soluble Copper	EPA200.7/SW6010	25	<25	ug/L	02/02/91
Fluoride	EPA340.2	0.10	0.30	mg/L	02/05/91
Soluble Iron	EPA200.7/SW6010	100	1900	ug/L	02/02/91
Soluble Mercury	EPA245.1/SW7470	0.2	<0.2	ug/L	01/29/91
Soluble Potassium	EPA200.7/SW6010	5.0	<5.0	mg/L	02/02/91
Soluble Magnesium	EPA200.7/SW6010	5.0	24.3	mg/L	02/02/91
Soluble Manganese	EPA200.7/SW6010	15	530	ug/L	02/02/91
Soluble Sodium	EPA200.7/SW6010	5.0	29.2	mg/L	02/02/91
Ammonia-N	EPA350.2	0.1	<0.1	mg/L	02/11/91
Soluble Nickel	EPA200.7/SW6010	40	<40	ug/L	02/02/91
Soluble Lead	EPA239.2/SW7421	3	<3	ug/L	01/31/91
Soluble Antimony	EPA200.7/SW6010	60	<60	ug/L	02/04/91
Sulfate	EPA375.4	10.0	383	mg/L	01/29/91
Total Kjeldahl Nitrogen	EPA351.3	0.1	6.6	mg/L	02/13/91
Soluble Zinc	EPA200.7/SW6010	20	89	ug/L	02/02/91

Results for non-aqueous matrices are based on dry sample weight unless noted otherwise.

COMMENT: NA = Not applicable.

Reviewed by: _____

INRPRPT(v910124)

Engineers
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REPORT OF ANALYTICAL RESULTS

Date: 02/15/91

Client: CH2M HILL/CHI
1890 MAPLE AVENUE SUITE 200
EVANSTON, IL 60201

Atten: MS. PIXIE NEWMAN

Project Number: CHI28770.B0.SP
SEEP CHARACTERIZATION
Laboratory Number: 17643
Date Received: 01/24/91

Sample Description: DE-MW3-A 0828 GRAB
Laboratory Sample Number: 17643003 Date Collected: 01/23/91 Matrix: WATER

Analytical Parameter	Method	Det Limit	Result	Units	Ana Date
Soluble Aluminum	EPA200.7/SW6010	200	<200	ug/L	02/05/91
Alkalinity as CaCO3	EPA310.1	1	216	mg/L	01/31/91
Soluble Arsenic	EPA206.2/SW7060	1000	3552	ug/L	02/02/91
Soluble Boron	EPA200.7	20	323	ug/L	01/30/91
Soluble Barium	EPA200.7/SW6010	200	<200	ug/L	02/05/91
Soluble Calcium	EPA200.7/SW6010	50	300	mg/L	02/05/91
Soluble Cadmium	EPA200.7/SW6010	5	<5	ug/L	02/05/91
Chloride	EPA325.1	10.0	30.8	mg/L	02/14/91
Cyanide, Distilled	EPA335.2	0.005	<0.005	mg/L	02/04/91
Chemical Oxygen Demand	EPA410.4	20	24	mg/L	02/07/91
Soluble Chromium	EPA200.7/SW6010	10	<10	ug/L	02/05/91
Soluble Copper	EPA200.7/SW6010	25	<25	ug/L	02/05/91
Fluoride	EPA340.2	0.10	0.12	mg/L	02/05/91
Soluble Iron	EPA200.7/SW6010	0.1	12.1	mg/L	02/05/91
Soluble Mercury	EPA245.1/SW7470	0.2	<0.2	ug/L	01/29/91
Soluble Potassium	EPA200.7/SW6010	5.0	5.5	mg/L	02/05/91
Soluble Magnesium	EPA200.7/SW6010	5.0	57	mg/L	02/05/91
Soluble Manganese	EPA200.7/SW6010	15	1300	ug/L	02/05/91
Soluble Sodium	EPA200.7/SW6010	5.0	42.6	mg/L	02/05/91
Ammonia-N	EPA350.2	0.1	1.5	mg/L	02/11/91
Soluble Nickel	EPA200.7/SW6010	40	<40	ug/L	02/05/91
Soluble Lead	EPA239.2/SW7421	3	<3	ug/L	01/31/91
Soluble Antimony	EPA200.7/SW6010	60	<60	ug/L	02/04/91
Sulfate	EPA375.4	50.0	744	mg/L	01/29/91
Total Kjeldahl Nitrogen	EPA351.3	0.2	3.0	mg/L	02/13/91
Soluble Zinc	EPA200.7/SW6010	20	49	ug/L	02/05/91

Results for non-aqueous matrices are based on dry sample weight unless noted otherwise.

COMMENT: NA = Not applicable.

Reviewed by: _____

INRPRPT(v910124)

Engineers
Planners
CH2M HILL Economists
Scientists

REPORT OF ANALYTICAL RESULTS

Date: 02/15/91

Client: CH2M HILL/CHI
1890 MAPLE AVENUE SUITE 200
EVANSTON, IL 60201

Atten: MS. PIXIE NEWMAN

Project Number: CHI28770.B0.SP
SEEP CHARACTERIZATION
Laboratory Number: 17643
Date Received: 01/24/91

Sample Description: METHOD BLANK
Laboratory Sample Number: 17643ZW1 Date Collected: 01/25/91 Matrix: WATER BLANK

Analytical Parameter	Method	Det Limit	Result	Units	Ana Date
Soluble Aluminum	EPA200.7/SW6010	200	<200	ug/L	02/02/91
Alkalinity as CaCO3	EPA310.1	1	NA	mg/L	01/31/91
Soluble Arsenic	EPA206.2/SW7060	10	<10	ug/L	02/02/91
Soluble Boron	EPA200.7	20	<20	ug/L	01/30/91
Soluble Barium	EPA200.7/SW6010	200	<200	ug/L	02/02/91
Soluble Calcium	EPA200.7/SW6010	5.0	<5.0	mg/L	02/02/91
Soluble Cadmium	EPA200.7/SW6010	5	<5	ug/L	02/02/91
Chloride	EPA325.1	1.0	<1.0	mg/L	02/14/91
Cyanide, Distilled	EPA335.2	0.005	<0.005	mg/L	02/04/91
Chemical Oxygen Demand	EPA410.4	20	<20	mg/L	02/07/91
Soluble Chromium	EPA200.7/SW6010	10	<10	ug/L	02/02/91
Soluble Copper	EPA200.7/SW6010	25	<25	ug/L	02/02/91
Fluoride	EPA340.2	0.10	<0.10	mg/L	02/05/91
Soluble Iron	EPA200.7/SW6010	100	<100	ug/L	02/02/91
Soluble Mercury	EPA245.1/SW7470	0.2	<0.2	ug/L	01/29/91
Soluble Potassium	EPA200.7/SW6010	5.0	<5.0	mg/L	02/02/91
Soluble Magnesium	EPA200.7/SW6010	5.0	<5.0	mg/L	02/02/91
Soluble Manganese	EPA200.7/SW6010	15	<15	ug/L	02/02/91
Soluble Sodium	EPA200.7/SW6010	5.0	<5.0	mg/L	02/02/91
Ammonia-N	EPA350.2	0.1	<0.1	mg/L	02/11/91
Soluble Nickel	EPA200.7/SW6010	40	<40	ug/L	02/02/91
Soluble Lead	EPA239.2/SW7421	3	<3	ug/L	01/31/91
Soluble Antimony	EPA200.7/SW6010	60	<60	ug/L	02/04/91
Sulfate	EPA375.4	1.0	<1.0	mg/L	01/29/91
Total Kjeldahl Nitrogen	EPA351.3	0.1	<0.1	mg/L	02/13/91
Soluble Zinc	EPA200.7/SW6010	20	<20	ug/L	02/02/91

Results for non-aqueous matrices are based on dry sample weight unless noted otherwise.

COMMENT: NA = Not applicable.

Reviewed by: _____

INRPRPT(v910124)

Attachment
Sewer Water, Sewer Sediment, Seep and Monitoring Well MW-3 Pesticide Analyses

SOUTHWEST RESEARCH INSTITUTE

6220 CULEBRA ROAD • POST OFFICE DRAWER 28510 • SAN ANTONIO, TEXAS, USA 78228-0510 • (512) 684-5111 • TELEX 244846

Chemistry and Chemical Engineering Division
Department of Environmental Sciences

March 18, 1991

CH_2 M Hill
310 W. Wisconsin Avenue, Suite 700
Post Office Box 2090
Milwaukee, Wisconsin 53201

Attn: Mr. Dan McGregor

Subject: Sample Result Forms
SwRI Project 01-3784-032

Dear Dan:

Enclosed please find the result forms you requested.

If you have any questions please call me at (512) 522-3051 or fax inquiries to (512) 522-3649.

Very truly yours,

Herbert J. Schattenberg, III
Senior Research Scientist

HJS:tg

PESTICIDE ORGANICS ANALYSIS DATA SHEET

SAMPLE NO.

WQCBLANK

Lab Name: S w R I

Client: CH2M HILL

MATRIX: (soil/water) WATER

Sample wt/vol: 500 (g/ml) ML

Level: (low/med) LOW

% Dry weight: NA

Extraction: (SepF/Cont/Sonc) SEPF

GPC Cleanup: (Y/N) N pH: 6.0

Lab Sample ID: WQCBLANK

Lab File ID: A01FE6

Date Received: 00-00-00

Date Extracted: 01-28-91

Date Analyzed: 02-01-91

Dilution Factor: 1.00

COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) ug/L	Q
-------Fenuron	100	U
-------Linuron	100	U
-------Siduron	100	U
-------Hexazinone	100	U
-------Diuron	100	U

FORM I PEST

PESTICIDE ORGANICS ANALYSIS DATA SHEET

SAMPLE NO.

WQCBLANK

ab Name: S w R I

lient: CH2M HILL

ATRIX: (soil/water) WATER

Lab Sample ID:WQCBLANK

ample wt/vol: 5ØØ (g/ml) ML

Lab File ID: AØ1FE13

evel: (low/med) LOW

Date Received: ØØ-ØØ-ØØ

Dry weight: NA

Date Extracted: Ø2-Ø1-91

xtraction: (SepF/Cont/Sonc) SEPF

Date Analyzed: Ø2-Ø2-91

PC Cleanup: (Y/N) N pH: 6.Ø

Dilution Factor: 1.ØØ

COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) ug/L	Q
-------Fenuron	1ØØ	U
-------Linuron	1ØØ	U
-------Siduron	1ØØ	U
-------Hexazinone	1ØØ	U
-------Diuron	1ØØ	U

FORM I PEST

PESTICIDE ORGANICS ANALYSIS DATA SHEET

SAMPLE NO.

SOIL BLK

Lab Name: S w R I

Client: CH2M HILL

MATRIX: (soil/water) SOIL

Sample wt/vol: 30 (g/ml) G

Level: (low/med) LOW

% Dry weight: 100

Extraction: (SepF/Cont/Sonc) SONC

GPC Cleanup: (Y/N) N

Lab Sample ID: SOIL BLK

Lab File ID: A05FE6

Date Received: 00-00-00

Date Extracted: 02-05-91

Date Analyzed: 02-05-91

Dilution Factor: 1.00

CONCENTRATION UNITS:
(ug/L or ug/Kg) ug/Kg

COMPOUND		Q
Fenuron	100	U
Linuron	100	U
Siduron	100	U
Hexazinone	100	U
Diuron	100	U

FORM I PEST

PESTICIDE ORGANICS ANALYSIS DATA SHEET

SAMPLE NO.

DE-SP-A

ab Name: S w R I

lient: CH2M HILL

ATRIX: (soil/water) WATER

ample wt/vol: 5ØØ (g/ml) ML

evel: (low/med) LOW

Dry weight: NA

xtraction: (SepF/Cont/Sonc) SEPF

PC Cleanup: (Y/N) N pH: 6.6

Lab Sample ID: DE-SP-A

Lab File ID: AØ1FE7

Date Received: Ø1-24-91

Date Extracted: Ø1-28-91

Date Analyzed: Ø2-Ø1-91

Dilution Factor: 1.ØØ

COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) ug/L	Q
Fenuron	1ØØ	U
Linuron	1ØØ	U
Siduron	1ØØ	U
Hexazinone	2ØØ	
Diuron	1ØØ	U

FORM I PEST

PESTICIDE ORGANICS ANALYSIS DATA SHEET

SAMPLE NO.

DE-SP-B

Lab Name: S w R I

Client: CH2M HILL

MATRIX: (soil/water) WATER

Lab Sample ID: DE-SP-B

Sample wt/vol: 500 (g/ml) ML

Lab File ID: A01FE8

Level: (low/med) LOW

Date Received: 01-24-91

% Dry weight: NA

Date Extracted: 01-28-91

Extraction: (SepF/Cont/Sonc) SEPF

Date Analyzed: 02-01-91

GPC Cleanup: (Y/N) N pH: 7.2

Dilution Factor: 1.00

COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) ug/L	Q
Fenuron	100	U
Linuron	100	U
Siduron	100	U
Hexazinone	200	
Diuron	100	U

FORM I PEST

PESTICIDE ORGANICS ANALYSIS DATA SHEET

SAMPLE NO.

DE-MW3-A

ab Name: S w R I

lient: CH2M HILL

ATRIX: (soil/water) WATER

ample wt/vol: 5ØØ (g/ml) ML

evel: (low/med) LOW

Dry weight: NA

xtraction: (SepF/Cont/Sonc) SEPF

PC Cleanup: (Y/N) N pH: 7.2

Lab Sample ID: DE-MW3-A

Lab File ID: AØ1FE9

Date Received: Ø1-24-91

Date Extracted: Ø1-28-91

Date Analyzed: Ø2-Ø1-91

Dilution Factor: 1.ØØ

COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) ug/L	Q
Fenuron	1ØØ	U
Linuron	1ØØ	U
Siduron	1ØØ	U
Hexazinone	1ØØ	U
Diuron	1ØØ	U

FORM I PEST

PESTICIDE ORGANICS ANALYSIS DATA SHEET

SAMPLE NO.

WQC-MS

Lab Name: S w R I

Client: CH2M HILL

MATRIX: (soil/water) WATER

Lab Sample ID: WQC-MS

Sample wt/vol: 500 (g/ml) ML

Lab File ID: A01FE10

Level: (low/med) LOW

Date Received: 01-24-91

% Dry weight: NA

Date Extracted: 01-28-91

Extraction: (SepF/Cont/Sonc) SEPF

Date Analyzed: 02-01-91

GPC Cleanup: (Y/N) N pH: 6.0

Dilution Factor: 1.00

COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) ug/L	Q
Fenuron	100	U
Linuron		S
Siduron		S
Hexazinone		S
Diuron		S

FORM I PEST

PESTICIDE ORGANICS ANALYSIS DATA SHEET

SAMPLE NO.

DE-CON-A

Lab Name: S w R I

Client: CH2M HILL

MATRIX: (soil/water) WATER

Sample wt/vol: 500 (g/ml) ML

Level: (low/med) LOW

% Dry weight: NA

Extraction: (SepF/Cont/Sonc) SEPF

GPC Cleanup: (Y/N) N pH: 6.4

Lab Sample ID: DE-CON-A

Lab File ID: A01FE14

Date Received: 01-31-91

Date Extracted: 02-01-91

Date Analyzed: 02-02-91

Dilution Factor: 1.00

COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) ug/L	Q
-------Fenuron	100	U
-------Linuron	100	U
-------Siduron	750	
-------Hexazinone	1590	
-------Diuron	100	U

FORM I PEST

PESTICIDE ORGANICS ANALYSIS DATA SHEET

SAMPLE NO.

DE-CON-B

Lab Name: S w R I

Client: CH2M HILL

MATRIX: (soil/water) SOIL

Sample wt/vol: 30 (g/ml) G

Level: (low/med) LOW

% Dry weight: 70.6

Extraction: (SepF/Cont/Sonc) SONC

GPC Cleanup: (Y/N) N

Lab Sample ID: DE-CON-B

Lab File ID: A05FE7

Date Received: 01-31-91

Date Extracted: 02-05-91

Date Analyzed: 02-05-91

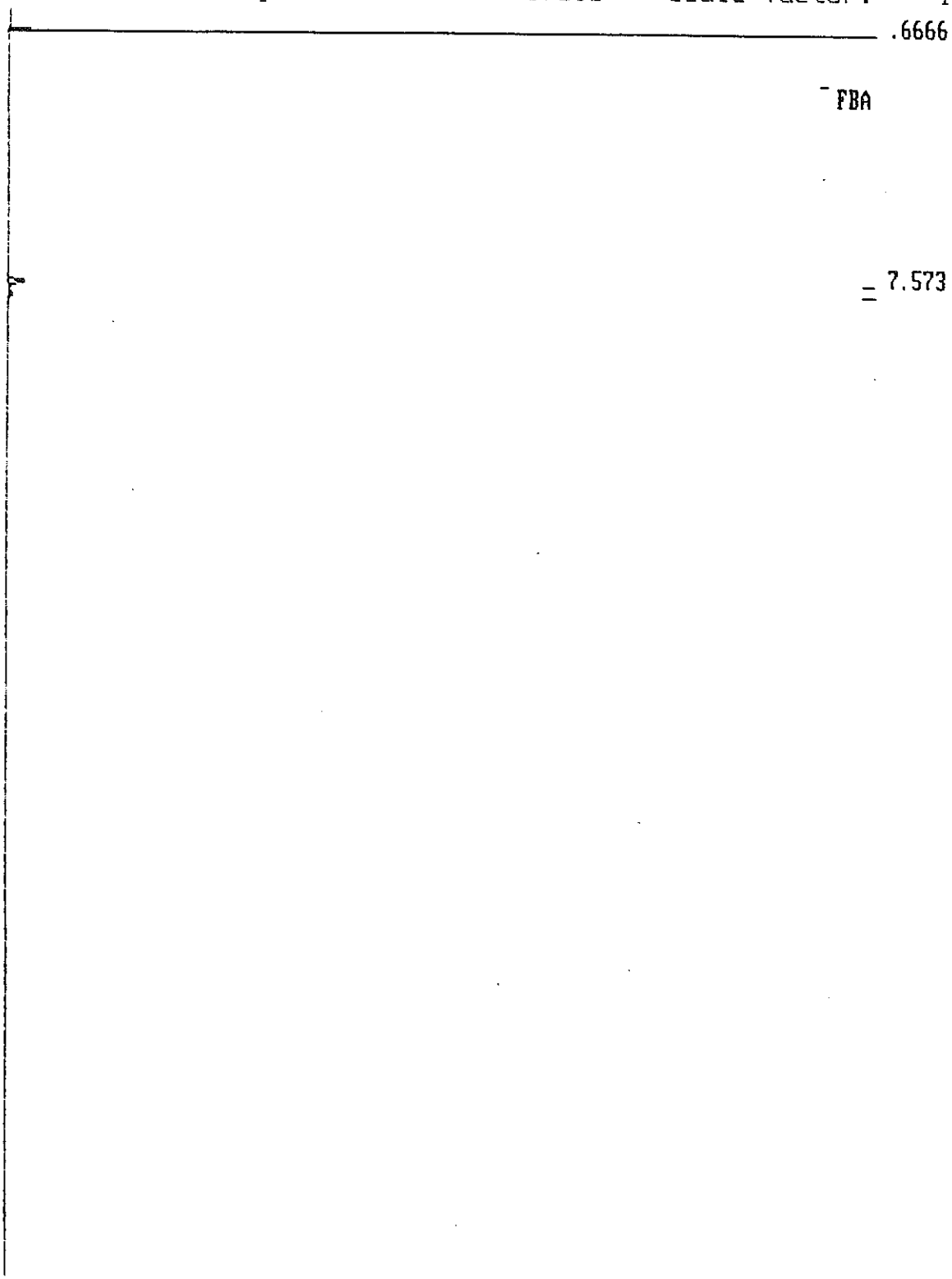
Dilution Factor: 1.00

COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) ug/Kg	Q
Fenuron	142	U
Linuron	142	U
Siduron	142	U
Hexazinone	142	U
Diuron	142	U

FORM I PEST

SAMPLE RAW DATA

DE-SP-A D Processed: 02-01-1991 19:58:21, segment 7, cycle 7
R' DATA SAVED IN FILE E:A01FE7.PTS
sion 4.0, Nelson Analytical Chromatography Software, 02-01-1991 19:58:25
Areas, times, and heights stored in: E:A01FE7.ATB
Start time: 0.00 Stop time: 35.00 Offset: 0
Low Value: 5353 High Value: 937616 Scale factor: 1



Sample: DE-SP-A DUPONT

Filename: E:A01FE7.

TIME OF ANALYSIS (data upload): 02-01-1991 19:58:23

****
Sample Name: DE-SP-A DUPONT
Amount injected: 1.5 uL
Filename:E:A01FE7 Date & Time of data upload: 02-01-1991 19:58:23 Acquisition Method: M:SASPEST
Interface#: 0 Cycle#: 7
****
Instrument: HP5890 Column Type: CAPILLARY-DB5
Detector: 0 This analysis was performed on Column #1

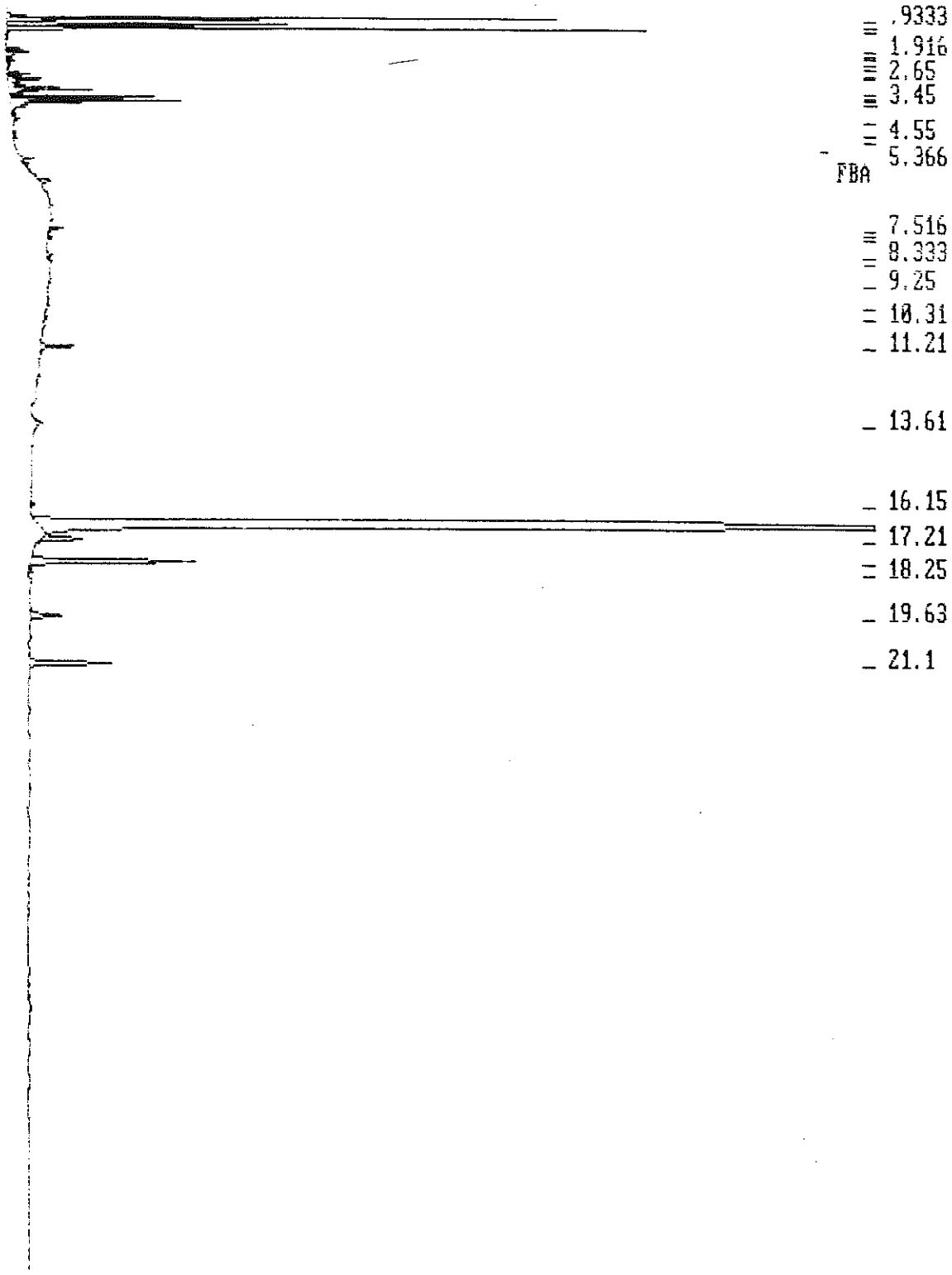
Mobile phase: Helium
Operating conditions: 60-0.5MIN-30DEG/MIN-270DEG-2.5DEG/MIN-270DEG-10MIN
****
Peaks with area less than 10000 are not listed below.

Peak#	Ret. Time	Area	Height
1	0.67	698,692	931,669
2	7.57 FAMFUR	131,490	17,457
3	7.92	23,034	3,391

Fora-VIII information saved to disk as INTF-13A.LOG in the NELSON subdirectory. E:A01FE7.PTS

Hexazinone = 196 ppb

DE-SP-A D Processed: 02-05-1991 21:20:04, segment 7, cycle 7
RAW DATA SAVED IN FILE J:A05FE7.PTS
Version 4.0, Nelson Analytical Chromatography Software, 02-05-1991 21:20:12
Peaks, times, and heights stored in: J:A05FE7.ATB
Start time: 0.00 Stop time: 40.00 Offset: 0
Low Value: 16748 High Value: 976594 Scale factor: 1



Sample: DE-SP-A DUPONT

Filename: J:A05FE7.PTS

TIME OF ANALYSIS (data upload): 02-05-1991 21:20:10

****
Sample Name: DE-SP-A DUPONT
Amount injected: 1.5 uL
Filename:J:A05FE7 Date & Time of data upload: 02-05-1991 21:20:10 Acqu.
sition Method: M:DTMPLOT
Interface#: 2 Cycle#: 7
****
Instrument: HP5890 Column Type: CAPILLARY
Detector: ECD This analysis was performed on Column #2
COL1:DB608 COL2:DB5
Mobile phase: HELIUM
Operating conditions: 60deg-1min-25deg/min-200deg-4deg/min-275deg-15min
****
Peaks with area less than 1500 are not listed below.

Peak#	Ret. Time	Area	Height
1	0.93	1,720,683	604,838
2	1.13	1,279,769	308,363
3	1.27	2,024,262	703,665
4	1.92	40,419	13,572
5	2.00	58,604	24,817
6	2.12	51,097	9,461
7	2.32	22,256	8,706
8	2.45	11,402	3,121
9	2.65	28,306	12,567
10	2.73	69,204	25,228
11	3.18	583,371	90,745
12	3.37	55,092	13,851
13	3.45	418,719	157,618
14	3.57	637,071	186,578
15	4.10	26,159	7,011
16	4.55	8,827	2,786
17	4.75	12,023	4,345
18	5.37	35,060	13,886
19	5.52	16,698	4,494
20	5.70	4,777	2,039
21	5.83	8,637	3,323
22	6.07	68,510	13,432
23	7.52	43,683	15,048
24	7.67	10,309	3,993
25	7.80	29,337	8,976
26	8.33	34,119	6,837
27	8.55	5,651	2,079
28	9.25	11,527	3,574
29	9.93	15,806	3,684
30	10.32	11,789	3,194
31	11.22	167,419	36,4[illegible]
32	13.62	51,687	7,47[illegible]
33	16.15	27,014	4,6[illegible]
34	16.83	14,351,985	92[illegible]
35	17.22	293,025	42,[illegible]
36	17.93 DBC	1,204,040	181,[illegible]
37	18.25	27,392	4,[illegible]

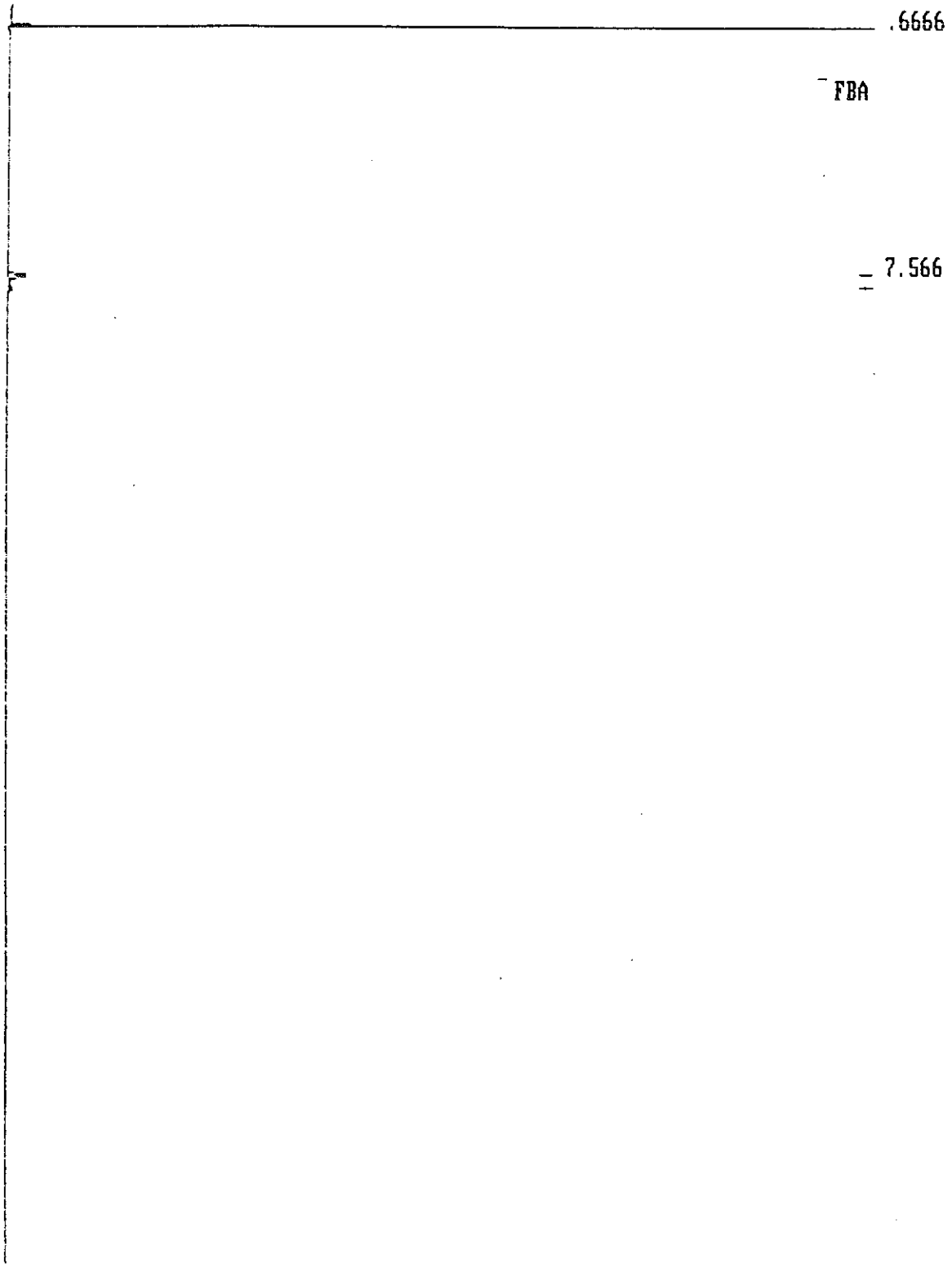
Continued...

****
Sample Name: DE-SP-A DUPONT
Amount injected: 1.5 uL
Filename: J:A05FE7 Date & Time of data upload: 02-05-1991 21:20:10 Acquisition Method: M:DTMPLOT
Interface#: 2 Cycle#: 7
****

Peak#	Ret. Time	Area	Height
36	19.63	220,343	33,708
37	21.10	536,662	89,552

Form-VIII information saved to disk as INTF-13A.LOG in the NELSON subdirectory. J:A05FE7.PTS

DE-SP-B D Processed: 02-01-1991 20:50:03, segment 8, cycle 8
RAW DATA SAVED IN FILE E:A01FE8.PTS
Version 4.0, Nelson Analytical Chromatography Software, 02-01-1991 20:50:06
Areas, times, and heights stored in: E:A01FE8.ATB
Start time: 0.00 Stop time: 35.00 Offset: 0
Low Value: 5337 High Value: 933316 Scale factor: 1



Sample: DE-SP-B DUPONT

Filename: E:A01FE8.P

TIME OF ANALYSIS (data upload): 02-01-1991 20:50:05

****
Sample Name: DE-SP-B DUPONT
Amount injected: 1.5 uL
Filename:E:A01FE8 Date & Time of data upload: 02-01-1991 20:50:05 Acquisition Method: M:SASPEST

Interface#: 0 Cycle#: 8
****
Instrument: HP5890 Column Type: CAPILLARY-DB5
Detector: 0 This analysis was performed on Column #1

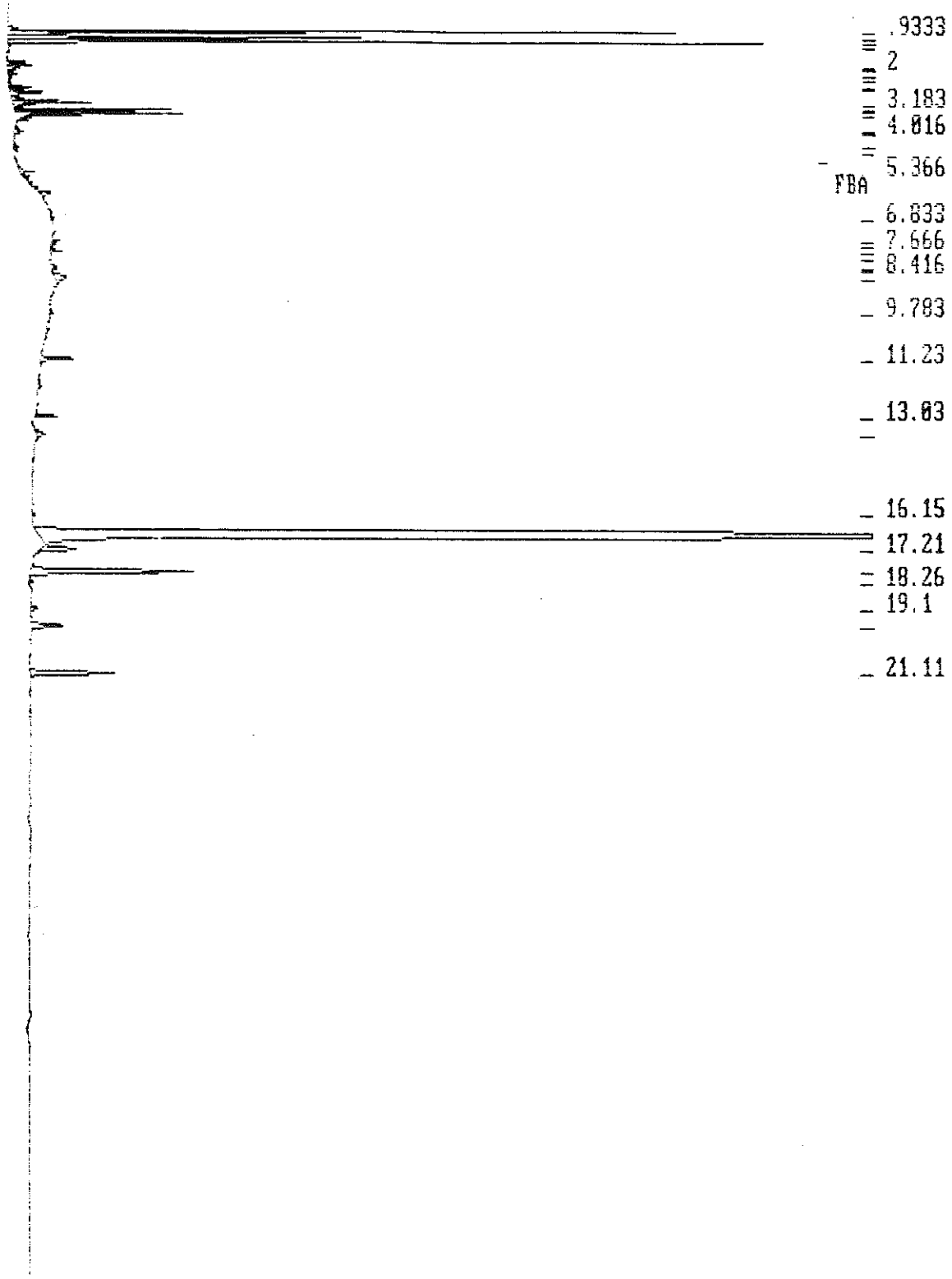
Mobile phase: Helium
Operating conditions: 60-0.5MIN-30DEG/MIN-270DEG-2.5DEG/MIN-270DEG-10MIN
****
Peaks with area less than 10000 are not listed below.

Peak#	Ret. Time	Area	Height
1	0.67	697,411	927,328
2	7.57 FAMPUR	134,991	17,919
3	7.92	23,528	3,484

Form-VIII information saved to disk as INTF-13A.LOG in the NELSON subdirectory. E:A01FE8.PTS

Hexazinone
200 ppb

DE-SP-B D Processed: 02-05-1991 22:11:48, segment 3, cycle 8
RAW DATA SAVED IN FILE J:A05FEB.PTS
Version 4.0, Nelson Analytical Chromatography Software, 02-05-1991 22:11:57
Areas, times, and heights stored in: J:A05FEB.ATB
Start time: 0.00 Stop time: 40.00 Offset: 0
Low Value: 16920 High Value: 776716 Scale factor: 1



Sample: DE-SP-B DUPONT

Filename: J:A05FEB.P

TIME OF ANALYSIS (data upload): 02-05-1991 22:11:55

****
Sample Name: DE-SP-B DUPONT
Amount injected: 1.5 uL
Filename:J:A05FE8 Date & Time of data upload: 02-05-1991 22:11:55 Acquisition Method: M:DTMPLOT

Interface#: 2 Cycle#: 3
****
Instrument: HP5890 Column Type: CAPILLARY
Detector: ECD This analysis was performed on Column #1
COL1:25608 COL2:DB5
Mobile phase: HELIUM
Operating conditions: 60deg-1min-25deg/min-200deg-4deg/min-275deg-15min
****
Peaks with area less than 1500 are not listed below.

Peak#	Ret. Time	Area	Height
1	0.93	2,029,561	740,073
2	1.13	1,613,938	388,637
3	1.27	2,421,254	834,272
4	1.43	9,793	3,457
5	2.00	117,359	27,187
6	2.12	61,160	12,554
7	2.32	25,417	10,221
8	2.45	10,646	3,030
9	2.65	33,037	15,205
10	2.77	68,209	24,961
11	3.18	529,782	86,877
12	3.37	38,748	10,611
13	3.45	433,333	171,447
14	3.57	574,710	183,837
15	4.02	20,096	4,506
16	4.10	41,791	9,857
17	4.55	10,716	3,230
18	4.75	14,681	3,988
19	5.37	54,794	15,577
20	5.52	30,807	6,269
21	5.70	7,879	3,067
22	5.83	9,975	2,836
23	6.07	62,553	12,422
24	6.83	13,913	3,[illegible]
25	7.53	28,718	5,721
26	7.67	12,383	5,041
27	7.85	49,469	13,164
28	8.05	6,556	1,495
29	8.33	18,477	3,707
30	8.42	10,321	4,33[illegible]
31	8.67	139,771	13,05[illegible]
32	9.78	19,393	3,8[illegible]
33	11.23	157,753	34,[illegible]
34	13.03	98,856	23,[illegible]
35	13.62	70,532	[illegible]
36	16.15	18,928	[illegible]
37	16.83	14,308,941	912,[illegible]

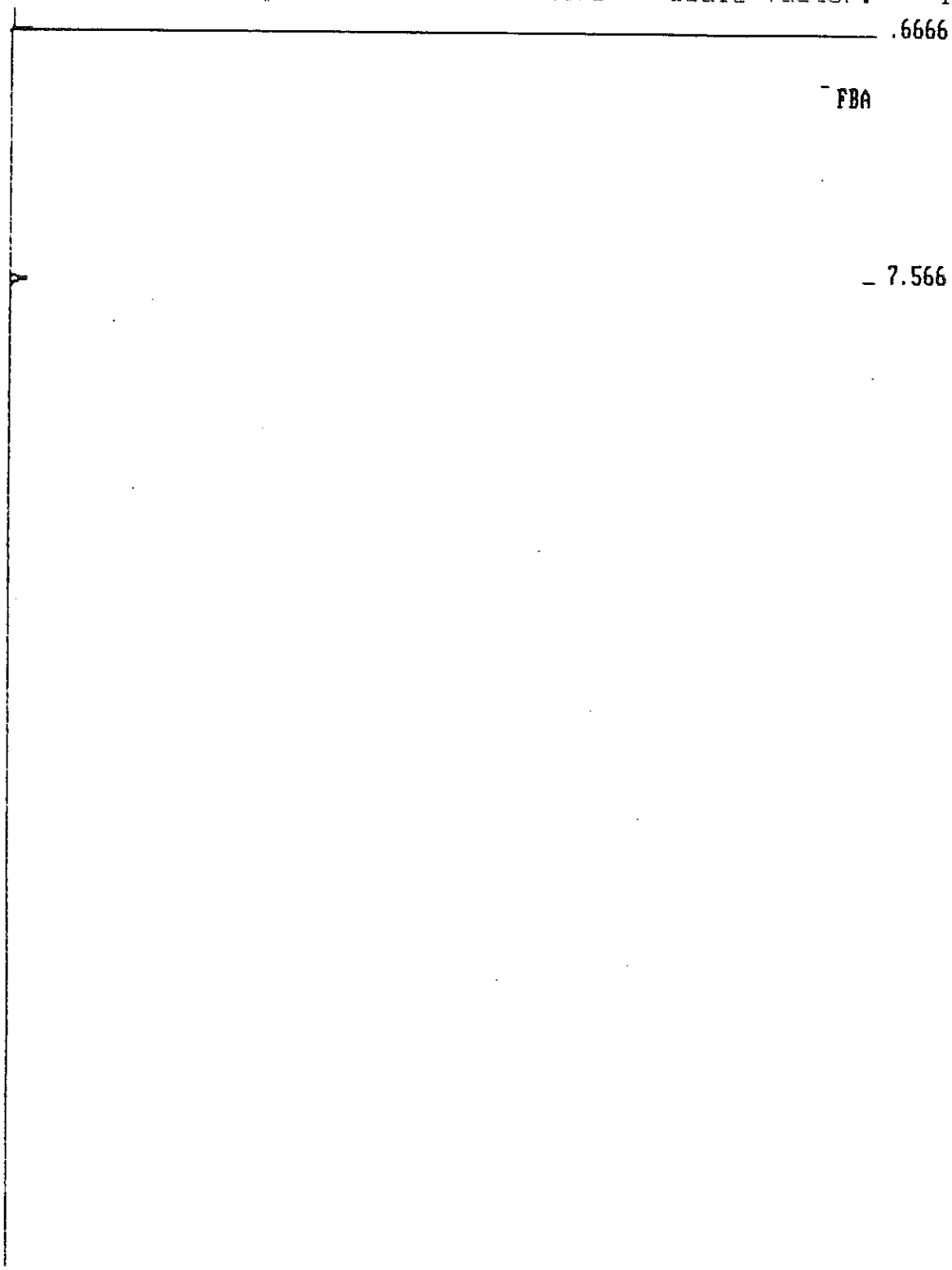
 Continued...

****
Sample Name: DE-SP-B DUPONT
Amount injected: 1.5 uL
Filename:J:A05FE8 Date & Time of data upload: 02-05-1991 22:11:55 Acq...
sition Method: M:DTMPLOT
Interface#: 2 Cycle#: 3
****

Peak#	Ret. Time	Area	Height
38	17.22	264,136	38,707
39	17.93 DBC	1,185,392	177,977
40	18.27	24,696	4,547
41	19.10	42,723	7,532
42	19.63	219,719	34,179
43	21.12	547,982	95,116

Form-VIII information saved to disk as INTF-13A.LOG in the NELSON subdirectory. J:A05FE8.PTS

DE-MW3-A D Processed: 02-01-1991 21:41:41, segment 9, cycle 0
RAW DATA SAVED IN FILE E:A01FE9.PTS
ersion 4.0, Nelson Analytical Chromatography Software, 02-01-1991 21:41:44
Areas, times, and heights stored in: E:A01FE9.ATB
Start time: 0.00 Stop time: 35.00 Offset: 0
Low Value: 5363 High Value: 942876 Scale factor: 1



Sample: DE-MW3-A DUPONT

Filename: E:A01FE9.F

TIME OF ANALYSIS (data upload): 02-01-1991 21:41:42

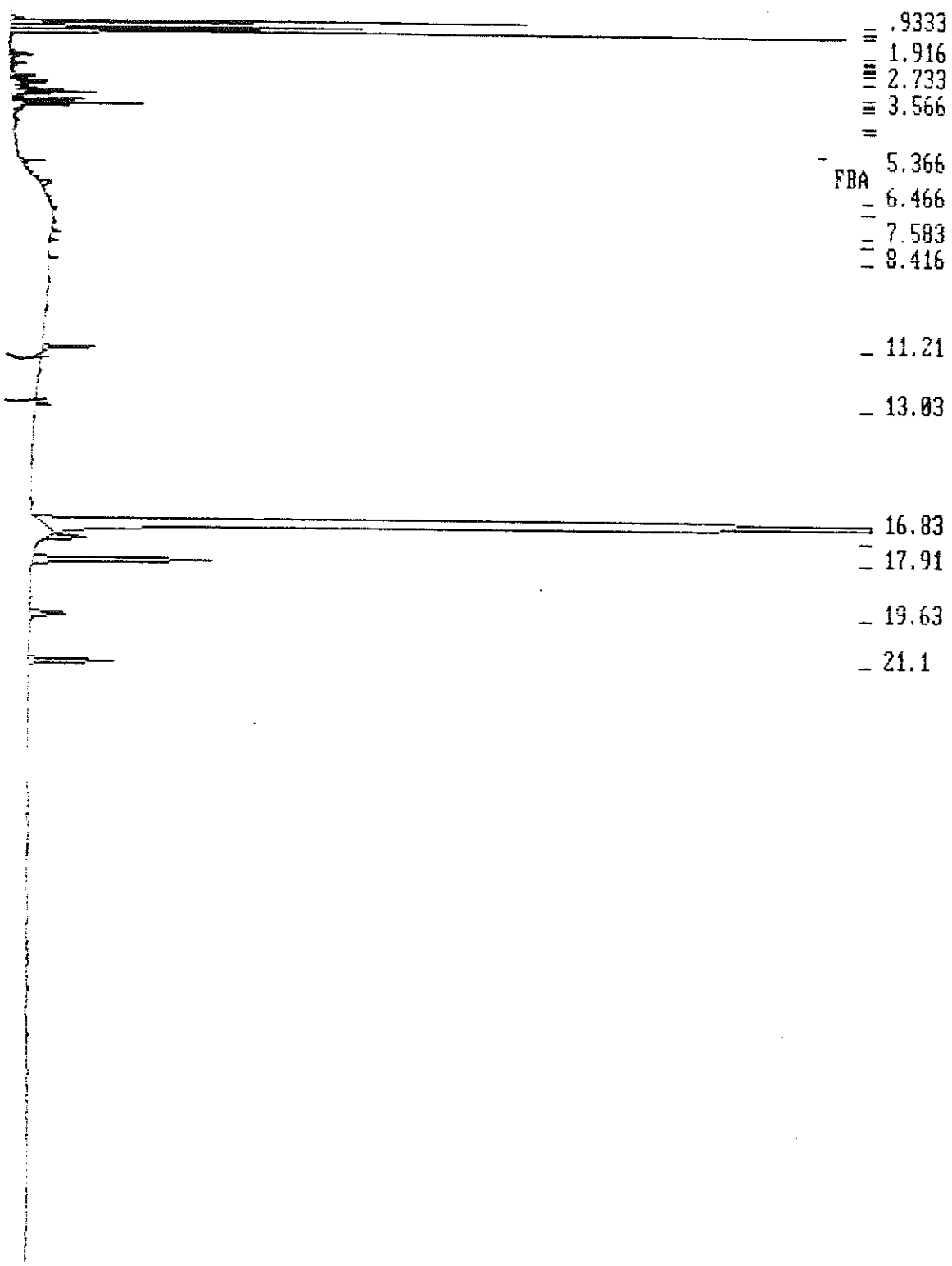
****
Sample Name: DE-MW3-A DUPONT
Amount injected: 1.5 uL
Filename:E:A01FE9 Date & Time of data upload: 02-01-1991 21:41:42 Acqu
sition Method: M:SASPEST
Interface#: 0 Cycle#: 9
****
Instrument: HP5890 Column Type: CAPILLARY-DB5
Detector: 0 This analysis was performed on Column #1

Mobile phase: Helium
Operating conditions: 60-0.5MIN-30DEG/MIN-270DEG-2.5DEG/MIN-270DEG-10MIN
****
Peaks with area less than 10000 are not listed below.

Peak#	Ret. Time	Area	Height
1	0.67	705,403	936,869
2	7.57 FAMFUR	129,300	17,219

Form-VIII information saved to disk as INTF-13A.LOG in the NELSON subdirectory. E:A01FE9.PTS

DE-MW3-A Processed: 02-05-1991 23:03:29, segment 9, cycle 9
RAW DATA SAVED IN FILE J:A05FE9.PT9
Version 4.0, Nelson Analytical Chromatography Software, 02-05-1991 23:03:27
Peak, times, and heights stored in: J:A05FE9.ATB
Start time: 0.00 Stop time: 40.00 Offset: 0
Low Value: 16960 High Value: 776898 Scale factor: 1



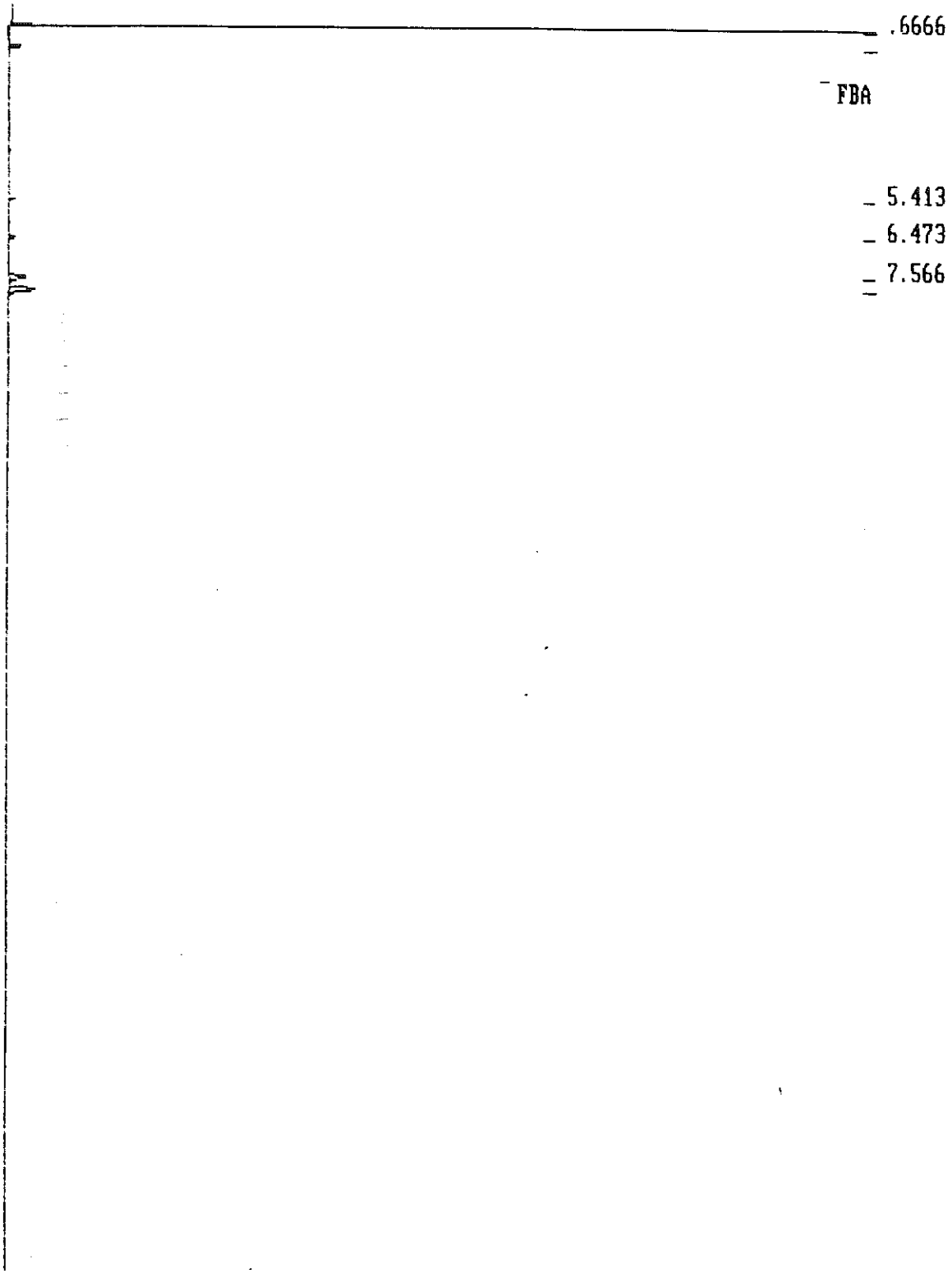
Sample: DE-MW3-A DUPONT
Filename: J:A05FE9
TIME OF ANALYSIS (data upload): 02-05-91 23:03:35

****
Sample Name: DE-MW3-A DUPONT
Amount Injected: 1.5 uL
Filename:J:A05FE9 Date & Time of data upload: 02-05-1991 23:03:3[illegible]
[illegible]ition Method: M:DTMPLOT
Interface#: 2 Cycle#: [illegible]
****
Instrument: HP5890 Column Type: CAPILLARY
Detector: ECD This analysis was performed on Column #2
COL1:DB608 COL2:DB5
Mobile phase: HELIUM
Operating conditions: 60deg-1min-25deg/min-200deg-4deg/min-275deg-15m[illegible]
****
Peaks with area less than 1500 are not listed below.

Peak#	Ret. Time	Area	Height
1	0.93	1,603,755	571,513
2	1.13	1,628,249	388,789
3	1.27	2,741,358	925,469
4	1.92	14,359	5,128
5	2.00	80,777	25,770
6	2.08	39,779	9,559
7	2.22	16,428	3,506
8	2.32	40,513	16,604
9	2.45	11,672	3,328
10	2.73	136,301	26,648
11	3.18	682,654	94,120
12	3.37	40,870	12,150
13	3.45	230,362	75,386
14	3.57	458,770	144,147
15	4.08	26,699	7,074
16	4.27	6,938	2,604
17	5.37	64,514	26,980
18	5.60	5,260	2,749
19	5.70	9,858	4,397
20	5.83	19,878	6,199
21	6.07	70,313	12,554
22	6.47	13,473	4,011
23	6.83	18,928	4,380
24	7.58	44,286	10,391
25	7.85	21,462	9,957
26	8.42	25,182	9,334
27	11.22	251,663	58,977
28	13.03	61,638	15,533
29	16.83	14,500,633	916,727
30	17.22	251,502	39,874
31	17.92 DBC	1,326,036	199,007
32	19.63	251,233	37,727
33	21.10	555,121	93,355

Form-VIII information saved to disk as INTF-13A.LOG in the NELSON subdirectory. J:A05FE9.PTS

DE-CON-A Processed: 02-02-1991 02:00:03, segment 1, cycle 14
RAW DATA SAVED IN FILE E:A01FE14.PTS
ersion 4.0, Nelson Analytical Chromatography Software, 02-02-1991 02:00:07
Areas, times, and heights stored in: E:A01FE14.ATB
Start time: 0.00 Stop time: 35.00 Offset: 0
Low Value: 5359 High Value: 916076 Scale factor: 1



Sample: DE-CON-A DUPONT

Filename: E:A01FE14.PT

TIME OF ANALYSIS (data upload): 02-02-1991 02:00:05

****
Sample Name: DE-CON-A DUPONT
Amount injected: 1.5 uL
Filename:E:A01FE14 Date & Time of data upload: 02-02-1991 02:00:05 Acqu
sition Method: M:SASPEST
Interface#: 0 Cycle#: 14
****
Instrument: HP5890 Column Type: CAPILLARY-DB5
Detector: 0 This analysis was performed on Column #1

Mobile phase: Helium
Operating conditions: 60-0.5MIN-30DEG/MIN-270DEG-2.5DEG/MIN-270DEG-10MIN
****
Peaks with area less than 10000 are not listed below.

Peak#	Ret. Time	Area	Height
1	0.67	705,371	910,029
2	0.75	12,624	1,796
3	1.25	21,492	12,557
4	5.41	17,332	6,841
5	Sidrow ← 6.47	32,942	6,867
6	7.57 Famfur	135,306	18,377
7	Hex ← 7.91	186,815	27,046

Form-VIII information saved to disk as INTF-13A.LOG in the NELSON subdirectory. E:A01FE14.PTS

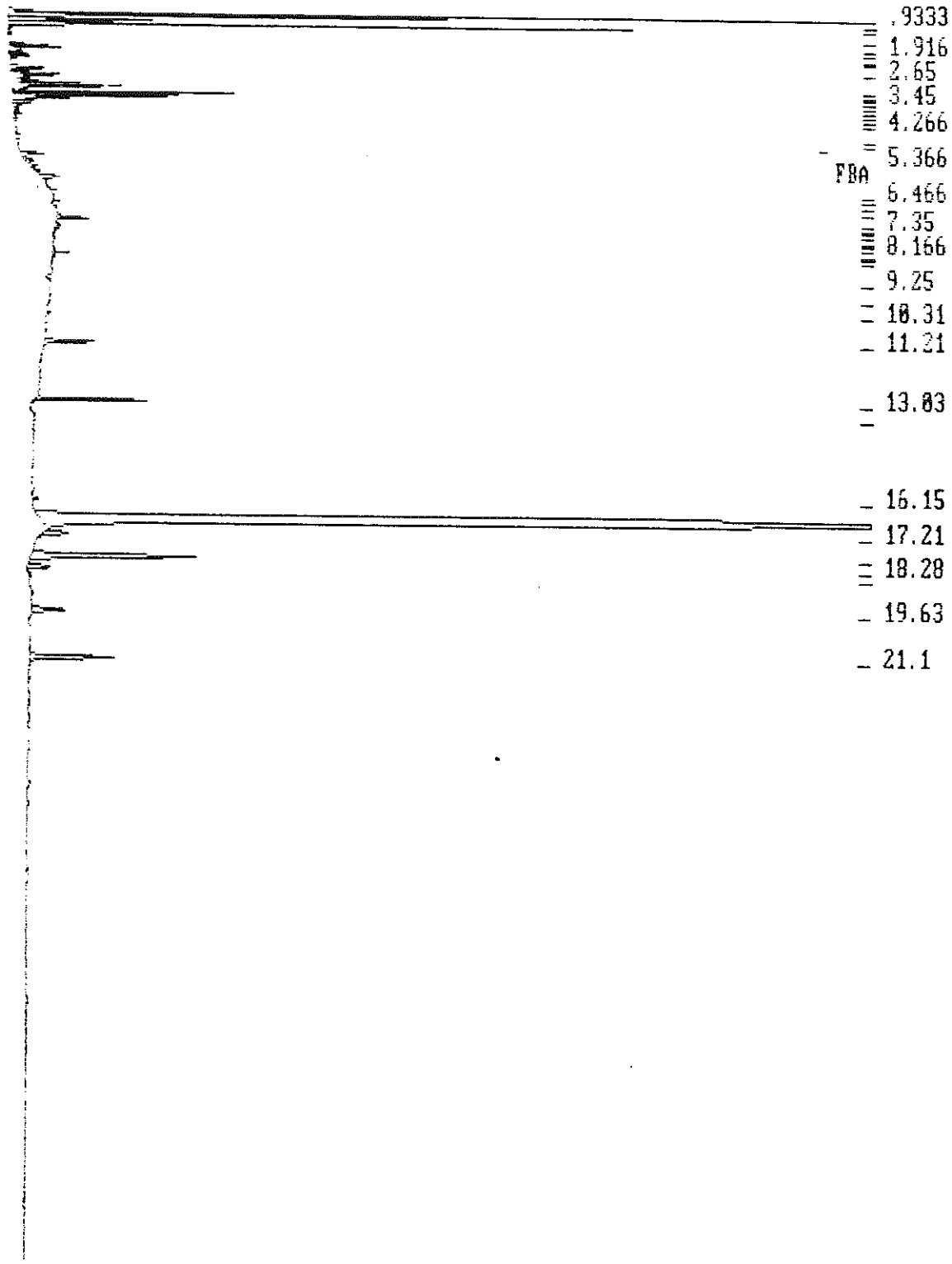
Sid
748 ppb

Hex
1587 ppb

186815
12355
79.327 x10 - 500 x1000 = 1586.5

NO Linuron
5.63 - 5.66

DE-CON-A Processed: 02-06-1991 04:13:45, segment 15, cycle 15
RAW DATA SAVED IN FILE J:A05FE15.[illegible]
Version 4.0, Nelson Analytical Chromacography Software, 02-06-1991 04:13:54
Areas, times, and heights stored : J:A05FE15.ATB
Start time: 0.00 Stop time: [illegible] Offset: 0
Low Value: 16764 High Value: 976983 Scale factor: [illegible]



Sample: DE-CON-A DUPONT

Filename: J:A05FE15.[illegible]

TIME OF ANALYSIS (data upload) 02-06-1991 04:13:52

****
Sample Name: DE-CON-A DUPONT
Amount injected: 1.5 uL
Filename:J:A05FE15 Date & Time of data upload: 02-06-1991 04:13:32 Acqu
sition Metho M:DTMPLOT

Interface#: 2 Cycle#: 15
********** ********** ********** **********
Instrument: HP5890 Column Type: CAPILLARY
Detector: FID This analysis was performed on Column #2
COL1:DB608 COL2:DB5
Mobile phase: HELIUM
Operating conditions: 60deg-1min-25deg/min-200deg-4deg/min-275deg-15min
********** ********** ********** **********
Peaks with area less than 1500 are not listed below.

Peak#	Ret. Time	Area	Height
1	0.93	2,854,009	952,937
2	1.13	679,777	156,694
3	1.27	1,939,088	689,391
4	1.58	15,097	4,041
5	1.92	47,484	16,630
6	2.00	194,216	56,929
7	2.22	51,323	20,103
8	2.32	50,882	21,591
9	2.65	172,644	35,954
10	3.18	962,156	121,5[illegible]
11	3.37	63,584	17,095
12	3.45	624,847	243,578
13	3.57	546,155	170,140
14	3.72	89,008	23,562
15	3.85	52,364	10,083
16	4.00	22,870	6,027
17	4.08	31,354	8,136
18	4.27	10,6[illegible]4	3,020
19	4.75	12,880	4,462
20	4.87	9,0[illegible]0	3,604
21	5.37	99,962	24,227
22	5.60	46,472	7,338
23	5.70	23,125	8,44[illegible]
24	5.83	23,4[illegible]4	6,67[illegible]
25	6.07	132,358	21,[illegible]
26	6.47	24,413	[illegible]
27	6.62	12,043	3,[illegible]
28	6.82	19,[illegible]3	7,35[illegible]
29	7.00	9,932	2,[illegible]
30	7.20	2,324	1,[illegible]
31	7.35	93,275	34,[illegible]
32	7.53	10,871	4,6[illegible]
33	7.62	17,886	6,5[illegible]
34	7.73	19,301	4,[illegible]
35	7.90	6,581	[illegible]
36	8.00	9,406	[illegible]
37	8.17	3,969	[illegible]
38	8.32	3,649	[illegible]

Continued...

**********:**********:**********:**********

Sample Name: DE-CON-A DUPONT

Amount injected: 1.5 uL

Filename: J:A05FE15 Date & Time of data upload: 02-06-1991 04:15:[illegible] Acquisition Method: M:DTMPLDT

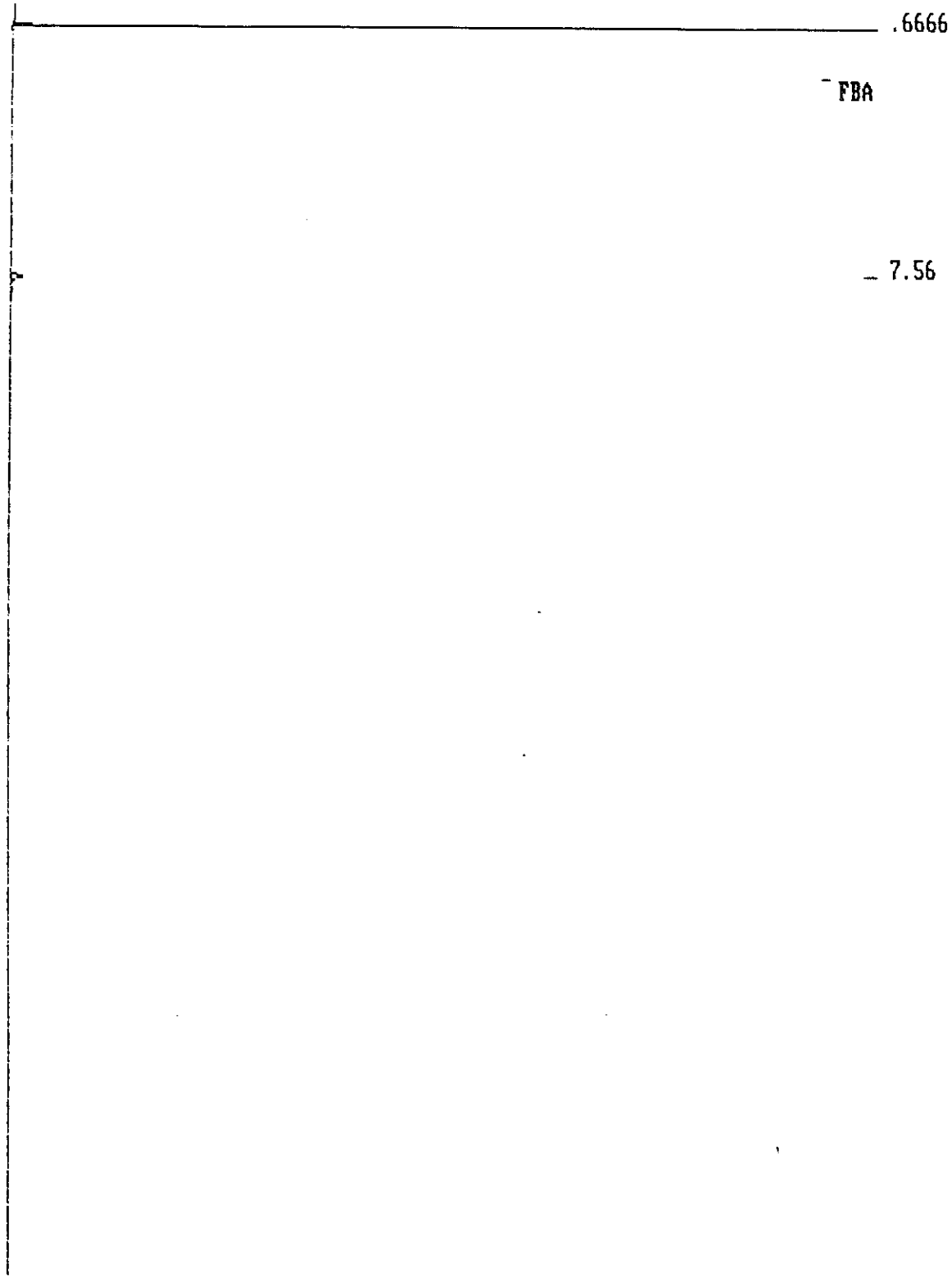
Interface#: 2 Cycle#: 15

**********:**********:**********:**********

Peak#	Ret. Time	Area	Height
39	8.42	5[illegible],1[illegible]3	18,[illegible]
40	8.55	10,346	3,[illegible]
41	9.25	17,278	3,[illegible]
42	9.75	9,290	2,[illegible]
43	10.32	18,003	4,[illegible]
44	11.22	240,954	35,553
45	15.02	482,[illegible]79	124,[illegible]
46	15.53	11,900	2,156
47	16.15	40,5[illegible]2	6,817
48	16.83	14,402,107	919,256
49	17.22	192,[illegible]70	28,441
50	17.93 DBC	1,237,554	181,303
51	18.28	156,4[illegible]6	24,683
52	19.32	12,731	2,499
53	19.63	235,7[illegible]2	36,8[illegible]9
54	21.10	557,691	94,387

Form-VIII information saved to disk as INTF-13A.L36 in the NELSON subdirectory. J:A05FE15.PTS

DE-CON-B Processed: 02-05-1991 22:06:25. segment 7, cycle 7
RAW DATA SAVED IN FILE E:A05FE7.PTS
Version 4.0, Nelson Analytical Chromatography Software, 02-05-1991 22:06:28
Areas, times, and heights stored in: E:A05FE7.ATB
Start time: 0.00 Stop time: 35.00 Offset: 0
Low Value: 5336 High Value: 944692 Scale factor: 1



Sample: DE-CON-B DUPONT LLS
Filename: E:A05FE7.PTS
TIME OF ANALYSIS (data upload): 02-05-1991 22:06:27

****
Sample Name: DE-CON-B DUPONT LLS
Amount injected: 1.5 uL
Filename:E:A05FE7 Date & Time of data upload: 02-05-1991 22:06:27 Acqu
sition Method: M:SASPEST

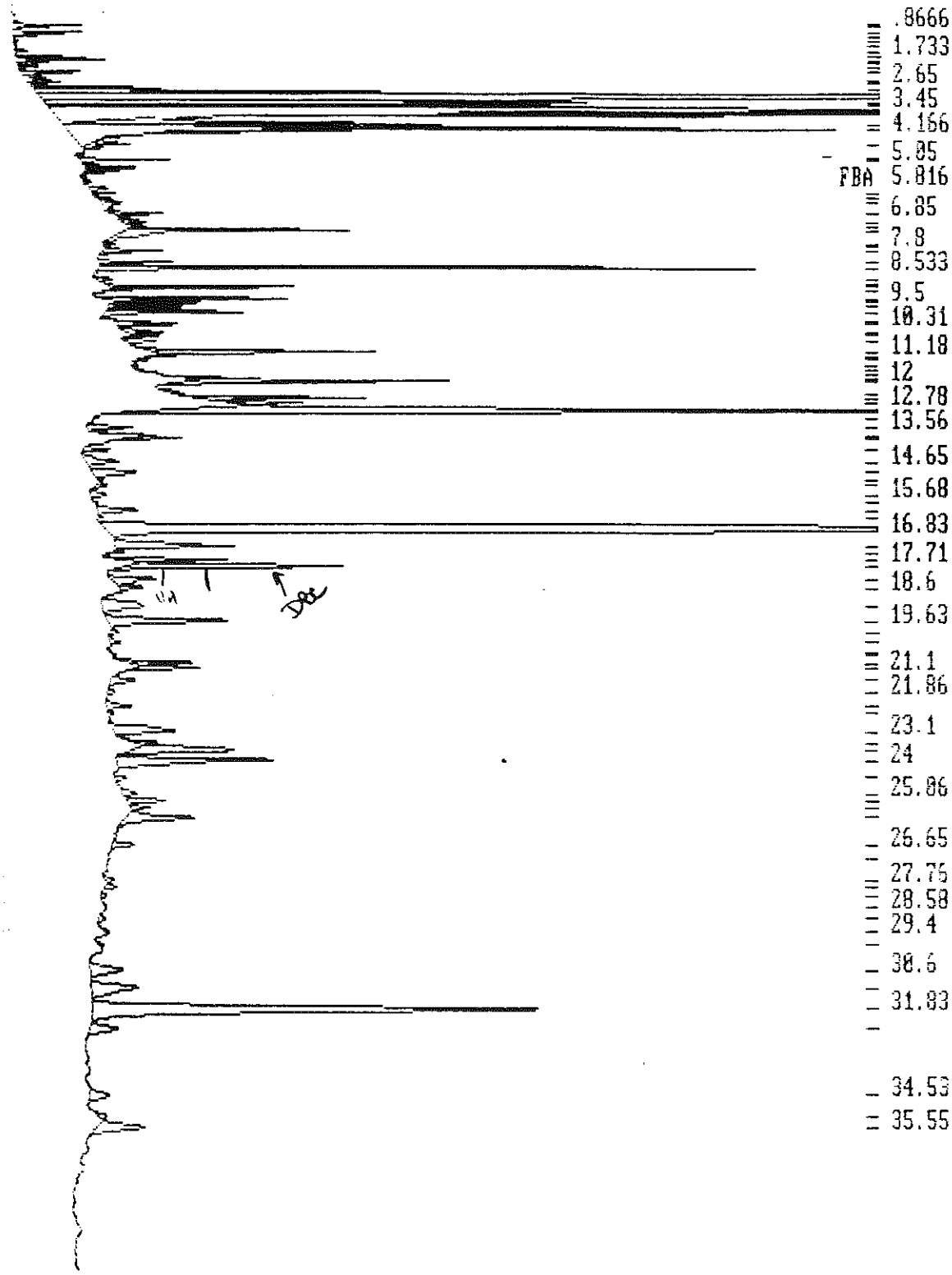
Interface#: 0 Cycle#: 7
****
Instrument: HP5890 Column Type: CAPILLARY-DB5
Detector: 0 This analysis was performed on Column #1

Mobile phase: Helium
Operating conditions: 60-0.5MIN-30DEG/MIN-270DEG-2.5DEG/MIN-270DEG-10MIN
****
Peaks with area less than 10000 are not listed below.

Peak#	Ret. Time	Area	Height
1	0.67	677,508	938,725
2	7.56 Fampur	90,090	11,850

Form-VIII information saved to disk as INTF-13A.LOG in the NELSON subdirectory. E:A05FE7.PTS

DE-CON-B L Processed: 02-06-1991 06:48:56, segment 16, cycle 15
RAW DATA SAVED IN FILE J:A05FE16.PTS
Version 4.0, Nelson Analytical Chromatography Software, 02-06-1991 06:49:03
Areas, times, and heights stored in: J:A05FE16.ATB
Start time: 0.00 Stop time: 40.00 Offset: 0
Low Value: 17450 High Value: 777289 Scale Factor:



Sample: DE-CON-B LLS DUPONT
Filename: J:A05FE16
TIME OF ANALYSIS (data upload): 02-06-1991 06:49:03

****
Sample Name: DE-CON-B LLS DUPONT
Amount injected: 1.5 uL
Filename:J:A05FE18 Date & Time of data upload: 02-06-1991 06:49:03 Acqu
[illegible] Method: M:DTMPLOT

Interface#: 2 Cycle#: 18
****
[illegible] Column Type: CAPILLARY
Detector: [illegible] This analysis was performed on Column #2
COL1:DB6[illegible] COL2:DB5
Mobile phase: HELIUM
Operating conditions: 60deg-1min-25deg/min-200deg-4deg/min-275deg-15min
****
Peaks with area less than 1500 are not listed below.

Peak#	Ret. Time	Area	Height
1	0.87	51,394	10,386
2	0.93	260,383	76,495
3	1.13	367,402	76,524
4	1.27	54,337	22,352
5	1.43	14,494	5,493
6	1.55	10,071	2,646
7	1.73	42,383	13,683
8	1.92	145,998	50,830
9	2.00	272,234	98,115
10	2.12	115,015	33,303
11	2.22	79,315	21,399
12	2.40	269,853	65,233
13	2.65	175,299	26,388
14	2.73	94,166	35,577
15	2.92	836,688	141,402
16	3.05	1,575,466	448,254
17	3.35	3,371,689	600,410
18	3.45	2,896,319	555,860
19	3.60	13,621,091	915,616
20	4.02	1,723,303	410,587
21	4.17	6,381,261	849,621
22	4.65	289,405	47,812
23	5.05	35,123	14,796
24	5.15	448,285	100,157
25	5.52	141,280	40,759
26	5.82	28,368	9,12[illegible]
27	6.07	96,164	20,343
28	6.20	72,859	27,19[illegible]
29	6.33	35,122	16,94[illegible]
30	6.48	236,535	24,0[illegible]
31	6.85	215,729	56,9[illegible]
32	7.10	94,649	24,95[illegible]
33	7.22	69,037	20,8[illegible]
34	7.35	1,081,630	249,2[illegible]
35	7.80	33,111	13,[illegible]
36	7.88	14,862	6,[illegible]
37	8.00	312,055	[illegible]

Continued...

****

Sample Name: DE-CON-R LLS DUPONT

Amount injected: 1.5 uL

Filename:J:A05FE18 Date & Time of data upload: 02-06-1991 06:49:07

Integration Method: M:DTMPLOT

Interface#: 2 Cycle#: 12

****

Peak #	Ret. Time	Area	Height
38	6.35	280,461	52,054
39	6.53	2,220,295	725,287
40	6.90	90,505	17,913
41	7.03	9,018	2,583
42	7.13	647,179	202,722
43	7.35	94,275	29,237
44	7.50	659,362	198,480
45	7.62	312,443	94,124
46	7.77	336,096	82,297
47	7.92	661,083	153,491
48	10.27	59,484	19,982
49	10.32	146,564	46,464
50	10.55	229,172	38,996
51	10.67	143,740	34,515
52	10.83	142,005	32,042
53	11.13	1,102,729	244,445
54	11.22	91,978	23,172
55	11.43	44,445	14,[illegible]
56	11.58	20,676	6,02[illegible]
57	11.72	13,345	2,692
58	11.90	29,429	4,630
59	12.00	107,505	35,655
60	12.10	1,253,966	281,771
61	12.52	70,834	6,65[illegible]
62	12.63	757,683	163,097
63	12.78	289,876	33,764
64	13.08	7,426,627	811,467
65	13.27	21,241	6,415
66	13.57	274,607	50,304
67	13.82	81,450	15,872
68	13.90	200,238	47,985
69	14.27	154,611	22,877
70	14.65	341,325	37,333
71	14.95	504,549	30,162
72	15.25	33,618	7,403
73	15.38	81,445	12,407
74	15.68	150,245	16,992
75	15.93	18,957	4,157
76	16.17	344,520	43,[illegible]
77	16.38	29,073	6,[illegible]
78	16.83	13,415,818	850,[illegible]
79	17.30	1,097,225	171,[illegible]
80	17.48	77,097	15,[illegible]
81	17.72	614,554	113,[illegible]

Continued...

****

Sample Name: DE-CON-B LLS DUPONT

Amount Injected: 1.5 uL

Filename: J:A05FE18 Date & Time of Data Upload: 02-06-1991 06:49:07

Set of Method: M:DTMPLOT

Interface#: 2 Cycle#: 13

****

Peak #	Ret. Time	Area	Height
82	17.93 DBC	1,451,559	[illegible]
83	18.32	391,454	48,[illegible]
84	18.60	135,264	24,[illegible]
85	19.18	661,963	45,[illegible]
86	19.63	1,171,236	132,[illegible]
87	19.98	46,471	8,170
88	20.30	82,938	11,415
89	20.60	4,845	1,130
90	20.73	21,638	4,451
91	20.95	344,095	65,483
92	21.10	380,760	71,899
93	21.50	231,208	26,429
94	21.87	54,161	8,369
95	22.32	213,159	27,670
96	22.53	37,850	6,796
97	23.10	810,360	67,7[illegible]
98	23.45	125,932	22,0[illegible]
99	23.68	1,182,672	113,673
100	24.00	1,522,973	171,899
101	24.55	88,686	13,431
102	25.07	174,174	16,[illegible]
103	25.27	278,274	41,477
104	25.48	114,902	20,869
105	25.80	767,625	73,865
106	26.65	208,119	23,972
107	27.08	16,172	2,74[illegible]
108	27.77	73,847	9,717
109	27.97	101,547	13,51[illegible]
110	28.25	47,387	6,38[illegible]
111	28.58	26,445	3,0[illegible]
112	28.96	60,614	7,[illegible]
113	29.40	37,943	4,4[illegible]
114	29.82	42,608	5,[illegible]
115	30.60	544,844	35,[illegible]
116	31.17	852,306	52,[illegible]
117	31.83	6,592,772	49[illegible]
118	32.47	384,488	31[illegible]
119	34.53	318,333	2[illegible]
120	35.22	85,913	7[illegible]
121	35.55	739,743	5[illegible]

[illegible]-VIII information saved to disk as INTF-13A.LOG in the NELSON subdirectory. J:A05FE18.PTS

EXTRACTION SHEETS

TITLE Dupont PEST. WATERS

PROJECT NO. 01-3184-032 27

BOOK NO. I-91

Work continued from Page

SAMPLE ID	pH	vol.	CLP PEST. SURR. 1-23-BI-P46 12-19-90	F.C. O.P. SURR. 03-43-08 1-15-91	Dupont MS Soln. 07-02-0191 01-28-91	F.V. Ext.
WQC BLK.	6.0	500mL	1.0mL	2.0mL	—	10mL
DE-SP-A	6.6	↓	↓	↓	—	↓
DE-SP-B	7.2	↓	↓	↓	—	↓
DE-MW3-A	7.2	↓	↓	↓	—	↓
WQC MS	6.0	↓	↓	↓	1.0mL	↓

EXTRACT LOCATION: Freezer #24, Rack I; B-5.

$$\frac{10000\,\mu L}{500\,mL}$$

$$MS: \frac{1000\,\mu L \times 250\,ng/\mu L}{500\,mL} = 500\,\frac{ng}{mL}$$

1 mL x 250 ng/mL / 500 mL = 500 ng/mL

1-28-91 KV

Work continued

SIGNATURE (SW) (SPJ) 1-28-91

DISCLOSED TO AND UNDERSTOOD BY DATE WITNESS

(JB-CS), HS, MK, MF, LS, RB

Work continued from Page

SAMPLE ID	PH	VOL	CLA PEST SURR L23-8I-P46 12-19-90	F.C.O.P. SURR 03-43-02 1-15-91	FV HEX
W QC BLK	6.0	500mL	1.0 mL	200 µL	10mL
DE-CON-A	6.4	500 mL	↓	↓	10mL

→ 1ml of Extracts transfer to Auto-Sampler vials and placed at QC I.E. and the rest of Extracts Log in in freezer #24 Rack XIII, C-4

2-4-91 KY

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Work continued to Page

SIGNATURE Kevin Villalobos / Jose A. Bustamante / [illegible] DATE 2-1-91

DISCLOSED TO AND UNDERSTOOD BY (JB-CS) RB, MF, MK, LS, HS DATE WITNESS DATE

TITLE DUPONT LLS

PEST - SOIL RE-RUN

PROJECT NO. 01-3784-032

BOOK NO. I-91

Work continued from Page

SAMPLE ID.	SAMPLE WT.	CLP SOIL PEST SURR. PIV-25-1 1-11-91	FC OP SURR 03-43-02 1-15-91	F.V. (HEX)
SMB	3160g VS	100 µL	200 µL	10 mL
DE-CON-B (COMPOSITE)	30g	↓	↓	↓
REC. STD.	–	–	200 µL	

NOTE: REFER TO PAGE 34 OF THIS BOOK FOR % DRY WTS.

EXTRACTS LOCATION: FREEZER 24, RACK XI, B1. 2-5-91 VS.

2-5-91 [illegible]

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Work continued to Page

SIGNATURE (SP) [signature] / (SW) [signature]

DATE 2-5-91

DISCLOSED TO AND UNDERSTOOD BY (SB-CS) HS, MK

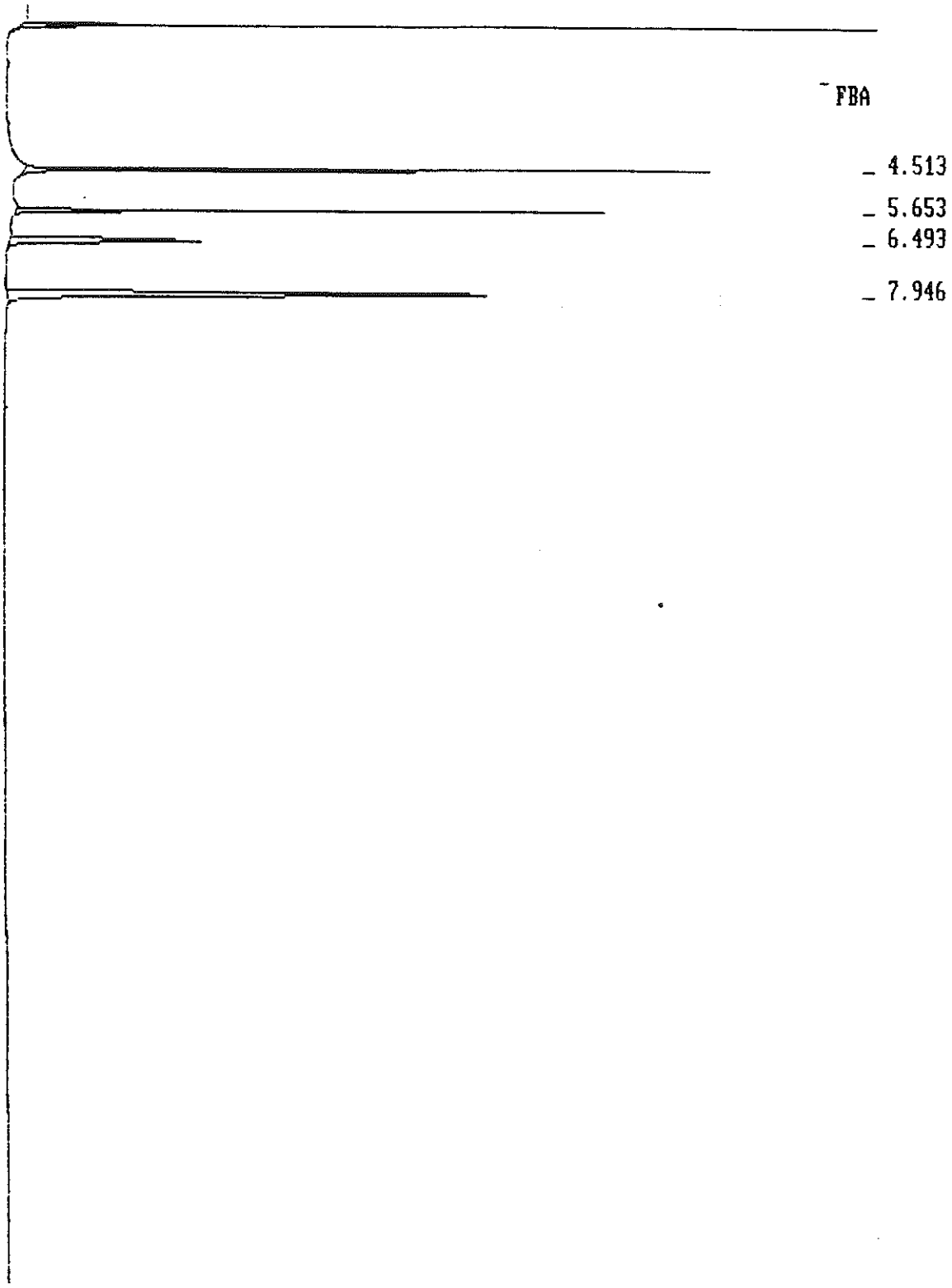
DATE

WITNESS

DATE

STANDARDS RAW DATA

STD MIX 10 Processed: 02-01-1991 15:39:59, segment 2, cycle 2
RAW DATA SAVED IN FILE E:A01FE2.PTS
Version 4.0, Nelson Analytical Chromatography Software, 02-01-1991 15:40:02
Areas, times, and heights stored in: E:A01FE2.ATB
Start time: 0.00 Stop time: 35.00 Offset: 0
Low Value: 6108 High Value: 71974 Scale factor: 1



Sample: STD MIX 100 NG/UL

Filename: E:A01FE2.PTS

TIME OF ANALYSIS (data upload): 02-01-1991 15:40:01

****
Sample Name: STD MIX 100 NG/UL
Amount injected: 1.5 uL
Filename:E:A01FE2 Date & Time of data upload: 02-01-1991 15:40:01 Acqu
sition Method: M:SASPEST

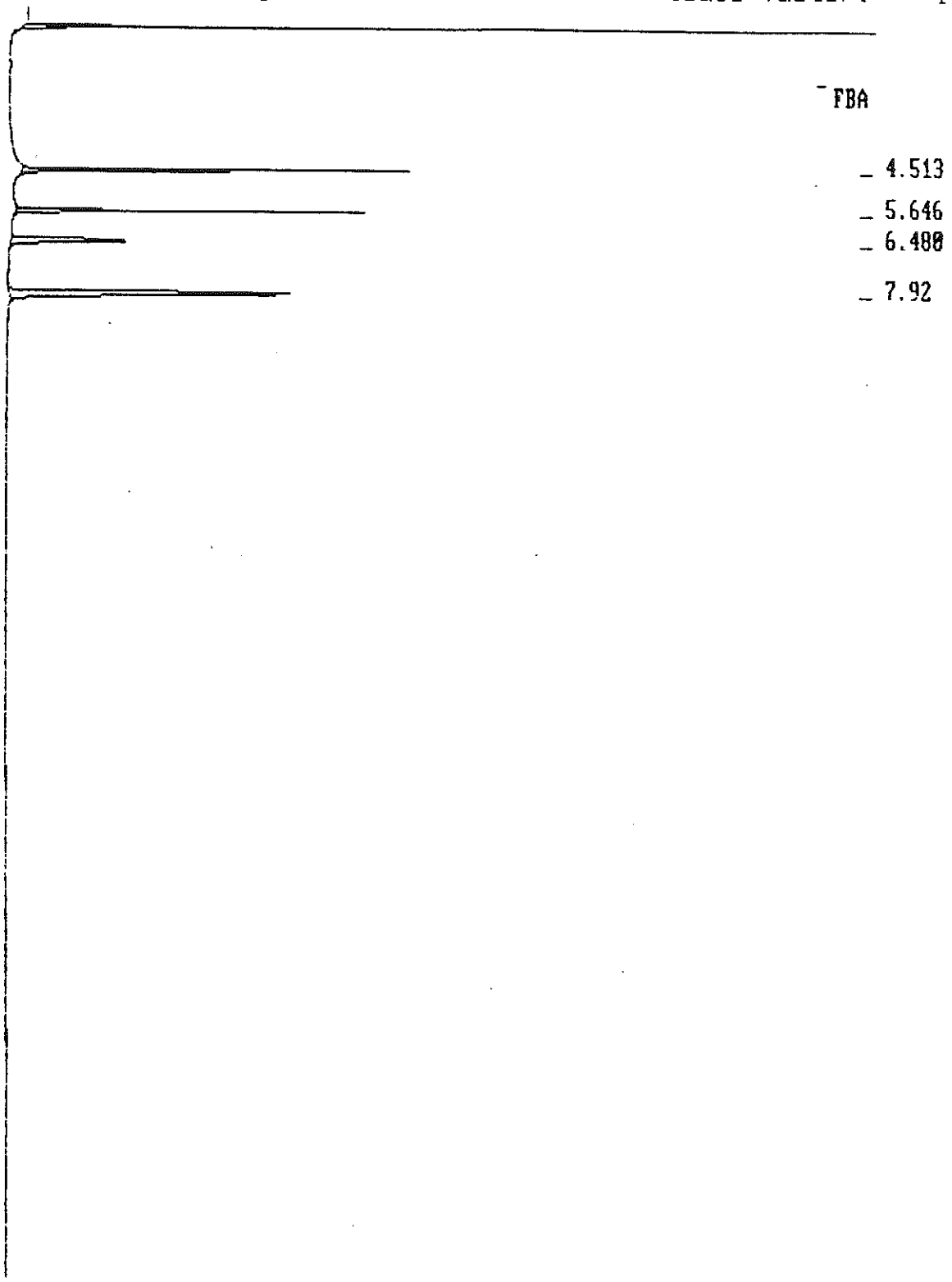
Interface#: 0 Cycle#: 2
****
Instrument: HP5890 Column Type: CAPILLARY-DB5
Detector: 0 This analysis was performed on Column #1

Mobile phase: Helium
Operating conditions: 60-0.5MIN-30DEG/MIN-270DEG-2.5DEG/MIN-270DEG-10MIN
****
Peaks with area less than 10000 are not listed below.

Peak#		Ret. Time	Area	Height
1		0.62	68,044	64,662
2	Fenuron	4.51	113,702	51,836
3	Linuron	5.65	114,760	44,316
4	Siduron	6.49	95,728	14,438
5	Velpar	7.95	252,595	36,279

Form-VIII information saved to disk as INTF-13A.LOG in the NELSON subdirectory. E:A01FE2.PTS

STD MIX 75 Processed: 02-01-1991 16:31:37, segment 3, cycle 3
RAW DATA SAVED IN FILE E:A01FE3.PTS
ersion 4.0, Nelson Analytical Chromatography Software, 02-01-1991 16:31:40
areas, times, and heights stored in: E:A01FE3.ATB
Start time: 0.00 Stop time: 35.00 Offset: 0
Low Value: 6116 High Value: 83431 Scale factor: 1



Sample: STD MIX 75NG/UL

Filename: E:A01FE3.F

TIME OF ANALYSIS (data upload): 02-01-1991 16:31:38

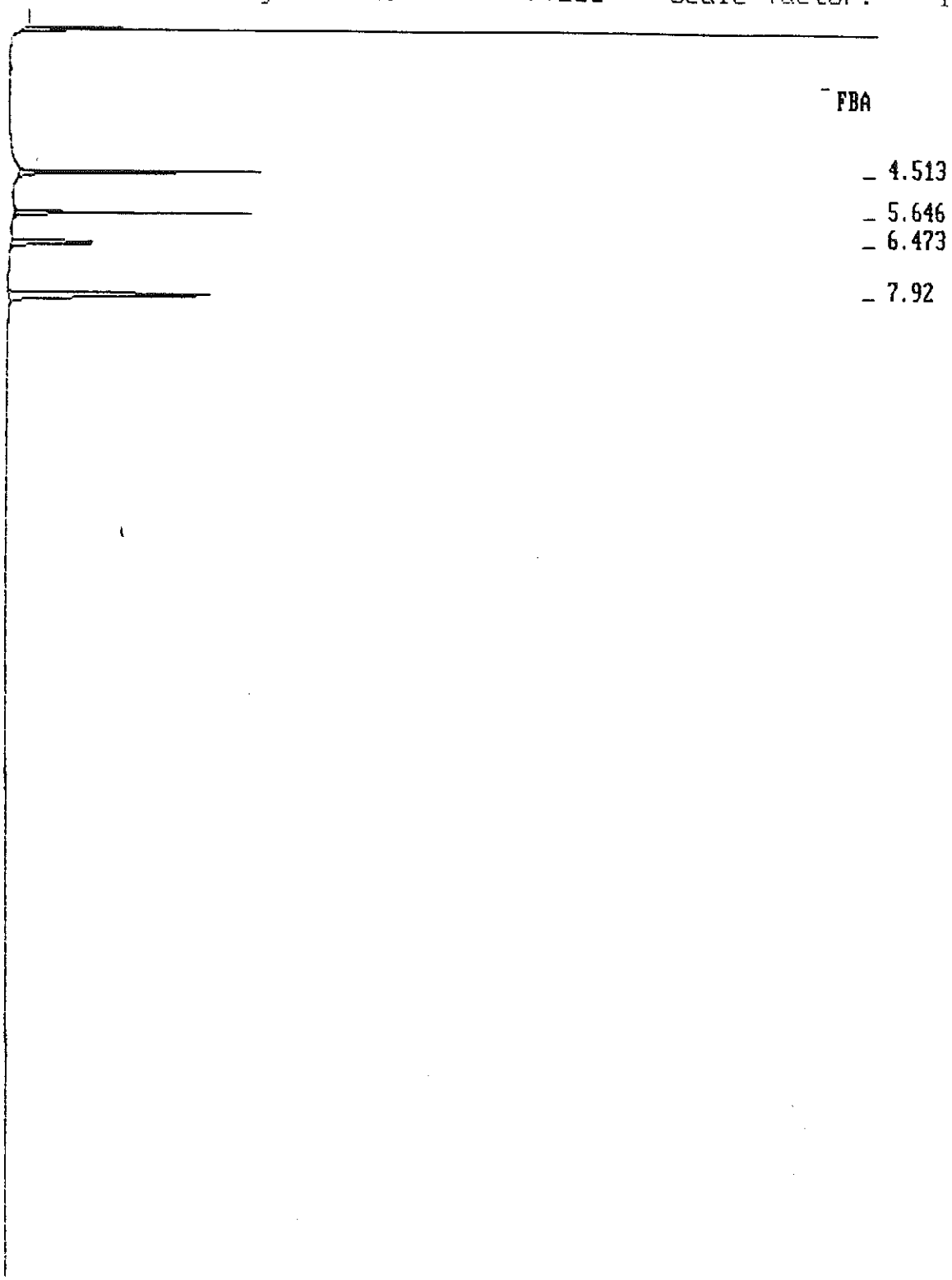
****
Sample Name: STD MIX 75NG/UL
Amount injected: 1.5 uL
Filename:E:A01FE3 Date & Time of data upload: 02-01-1991 16:31:38 Acqu
sition Method: M:SASPEST
Interface#: 0 Cycle#: 3
****
Instrument: HP5890 Column Type: CAPILLARY-DB5
Detector: 0 This analysis was performed on Column #1

Mobile phase: Helium
Operating conditions: 60-0.5MIN-30DEG/MIN-270DEG-2.5DEG/MIN-270DEG-10MIN
****
Peaks with area less than 10000 are not listed below.

Peak#		Ret. Time	Area	Height
1		0.62	71,844	76,098
2	Fenuron	4.51	76,979	34,467
3	Linuron	5.65	79,607	31,109
4	Siduron	6.48	66,734	10,131
5	Velpar	7.92	176,390	25,022

Form-VIII information saved to disk as INTF-13A.LOG in the NELSON subdirectory. E:A01FE3.PTS

STD MIX 50 Processed: 02-01-1991 17:23:19, segment 4, cycle 4
RAW DATA SAVED IN FILE E:A01FE4.PTS
ersion 4.0, Nelson Analytical Chromatography Software, 02-01-1991 17:23:23
Areas, times, and heights stored in: E:A01FE4.ATB
Start time: 0.00 Stop time: 35.00 Offset: 0
Low Value: 6120 High Value: 79256 Scale factor: 1



Sample: STD MIX 50 NG/UL

Filename: E:A01FE4.PTS

TIME OF ANALYSIS (data upload): 02-01-1991 17:23:21

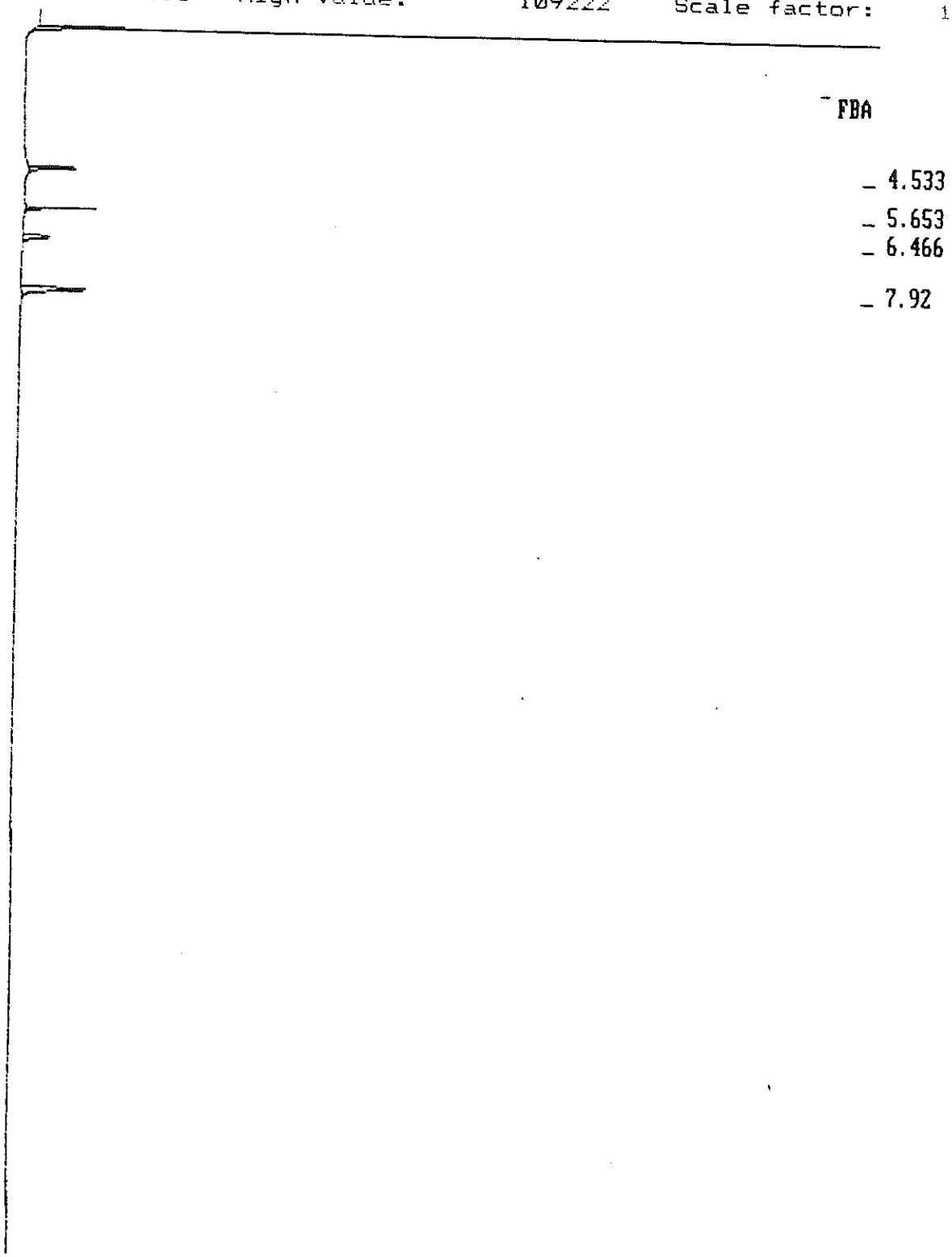
****
Sample Name: STD MIX 50 NG/UL
Amount injected: 1.5 uL
Filename:E:A01FE4 Date & Time of data upload: 02-01-1991 17:23:21 Acq
sition Method: M:SASPEST
Interface#: 0 Cycle#: 4
****
Instrument: HP5890 Column Type: CAPILLARY-DB5
Detector: 0 This analysis was performed on Column #1

Mobile phase: Helium
Operating conditions: 60-0.5MIN-30DEG/MIN-270DEG-2.5DEG/MIN-270DEG-10MIN
****
Peaks with area less than 10000 are not listed below.

Peak#		Ret. Time	Area	Height
1		0.62	72,482	71,946
2	Fenuron	4.51	46,857	20,140
3	Linuron	5.65	51,063	19,849
4	Siduron	6.47	43,750	6,737
5	Velpar	7.92	117,326	16,754

Form-VIII information saved to disk as INTF-13A.LOG in the NELSON subdirectory. E:A01FE4.PTS

STD MIX 25 Processed: 02-01-1991 18:14:59, segment 5, cycle 5
RAW DATA SAVED IN FILE E:A01FE5.PTS
'ersion 4.0, Nelson Analytical Chromatography Software, 02-01-1991 18:15:02
.reas, times, and heights stored in: E:A01FE5.ATB
Start time: 0.00 Stop time: 35.00 Offset: 0
Low Value: 6110 High Value: 109222 Scale factor: 1



Sample: STD MIX 25 NG/UL

Filename: E:A01FE5.P

TIME OF ANALYSIS (data upload): 02-01-1991 18:15:00

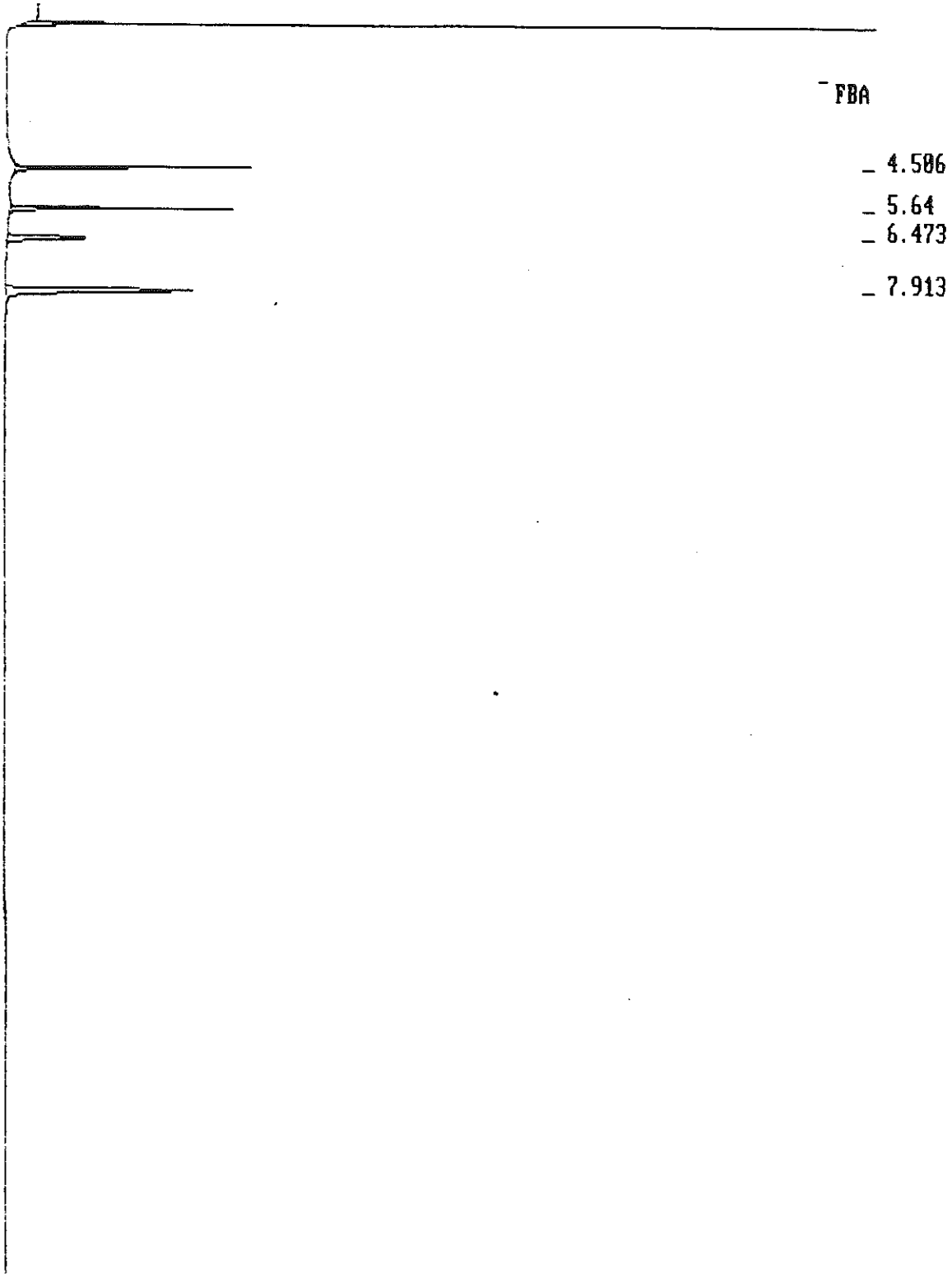
****
Sample Name: STD MIX 25 NG/UL
Amount injected: 1.5 uL
Filename:E:A01FE5 Date & Time of data upload: 02-01-1991 18:15:00 Acqu
sition Method: M:SASPEST
Interface#: 0 Cycle#: 5
****
Instrument: HP5890 Column Type: CAPILLARY-DB5
Detector: 0 This analysis was performed on Column #1

Mobile phase: Helium
Operating conditions: 60-0.5MIN-30DEG/MIN-270DEG-2.5DEG/MIN-270DEG-10MIN
****
Peaks with area less than 10000 are not listed below.

Peak#		Ret. Time	Area	Height
1		0.62	86,421	101,927
2	Fenuron	4.53	16,845	5,685
3	Linuron	5.65	22,671	8,549
4	Siduron	6.47	20,010	3,061
5	relpar	7.92	54,847	7,780

Fora-VIII information saved to disk as INTF-13A.LOG in the NELSON subdirectory. E:A01FE5.PTS

STD MIX 75 Processed: 02-02-1991 02:51:41, segment 2, cycle 15
End of sequence file reached at cycle 15
W DATA SAVED IN FILE E:A01FE15.PTS
Version 4.0, Nelson Analytical Chromatography Software, 02-02-1991 02:51:45
Areas, times, and heights stored in: E:A01FE15.ATB
Start time: 0.00 Stop time: 35.00 Offset: 0
Low Value: 6115 High Value: 109973 Scale factor: 1



Sample: STD MIX 75 NG/UL

Filename: E:A01FE15.PTS

TIME OF ANALYSIS (data upload): 02-02-1991 02:51:43

****
Sample Name: STD MIX 75 NG/UL
Amount injected: 1.5 uL
Filename:E:A01FE15 Date & Time of data upload: 02-02-1991 02:51:43 Acquisition Method: M:SASPEST

Interface#: 0 Cycle#: 15
****
Instrument: HP5890 Column Type: CAPILLARY-DB5
Detector: 0 This analysis was performed on Column #1

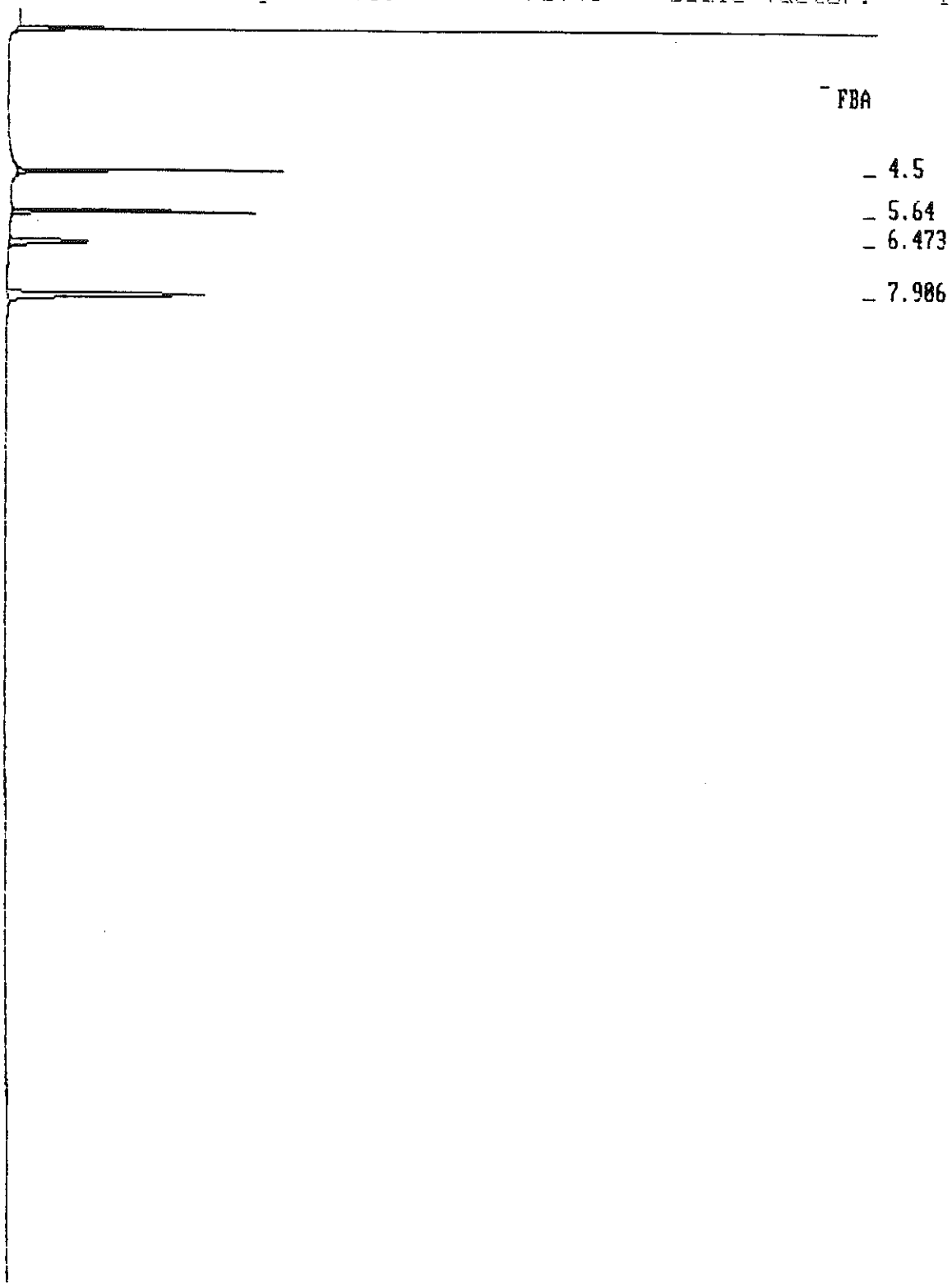
Mobile phase: Helium
Operating conditions: 60-0.5MIN-30DEG/MIN-270DEG-2.5DEG/MIN-270DEG-10MIN
****
Peaks with area less than 10000 are not listed below.

Peak#		Ret. Time	Area	Height
1		0.62	86,715	101,743
2	Fenuron	4.51	65,582	28,111
3	Linuron	5.64	69,867	26,515
4	Siduron	6.47	59,817	9,152
5	Velpar	7.91	157,903	22,343

Form-VIII information saved to disk as INTF-13A.LOG in the NELSON subdirectory. E:A01FE15.PTS

STD MIX 75 Processed: 02-05-1991 17:48:03, segment 2, cycle 2
RAW DATA SAVED IN FILE E:A05FE2.PTS
Version 4.0, Nelson Analytical Chromatography Software, 02-05-1991 17:48:06
Areas, times, and heights stored in: E:A05FE2.ATB

'art time:	0.00	Stop time:	35.00	Offset:	0
,w Value:	6111	High Value:	75941	Scale factor:	1



Sample: STD MIX 75NG/UL

Filename: E:A05FE2.PTS

TIME OF ANALYSIS (data upload): 02-05-1991 17:48:05

****
Sample Name: STD MIX 75NG/UL
Amount injected: 1.5 uL
Filename:E:A05FE2 Date & Time of data upload: 02-05-1991 17:48:05 Acqu
sition Method: M:SASPEST

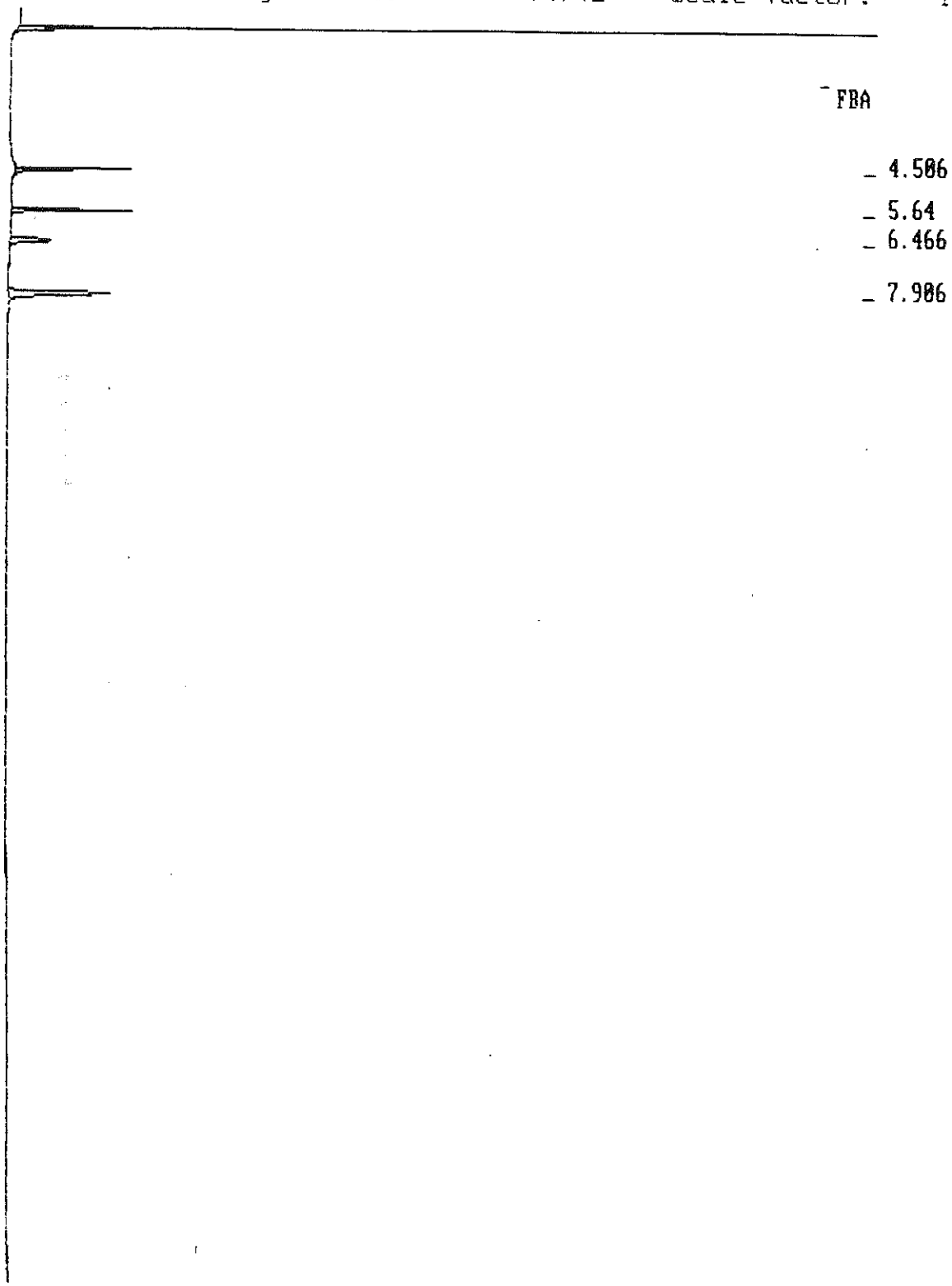
Interface#: 0 Cycle#: 2
****
Instrument: HP5890 Column Type: CAPILLARY-DB5
Detector: 0 This analysis was performed on Column #1

Mobile phase: Helium
Operating conditions: 60-0.5MIN-30DEG/MIN-270DEG-2.5DEG/MIN-270DEG-10MIN
****
Peaks with area less than 10000 are not listed below.

Peak#	Ret. Time		Area	Height
1	0.62		70,169	69,152
2	4.50	Fenuron	47,189	21,256
3	5.64	Linuron	50,327	19,440
4	6.47	Siduron	42,067	6,263
5	7.91	Velpar	111,051	15,741

Form-VIII information saved to disk as INTF-13A.LOG in the NELSON subdirectory. E:A05FE2.PTS

STD MIX 50 Processed: 02-05-1991 18:39:40, segment 3, cycle 3
RAW DATA SAVED IN FILE E:A05FE3.PTS
Version 4.0, Nelson Analytical Chromatography Software, 02-05-1991 18:39:44
Areas, times, and heights stored in: E:A05FE3.ATB
Start time: 0.00 Stop time: 35.00 Offset: 0
Low Value: 6148 High Value: 94742 Scale factor: 1



Sample: STD MIX 50 NG/UL

Filename: E:A05FE3.P

TIME OF ANALYSIS (data upload): 02-05-1991 18:39:42

****
Sample Name: STD MIX 50 NG/UL
Amount injected: 1.5 uL
Filename:E:A05FE3 Date & Time of data upload: 02-05-1991 18:39:42 Acqu
sition Method: M:SASPEST

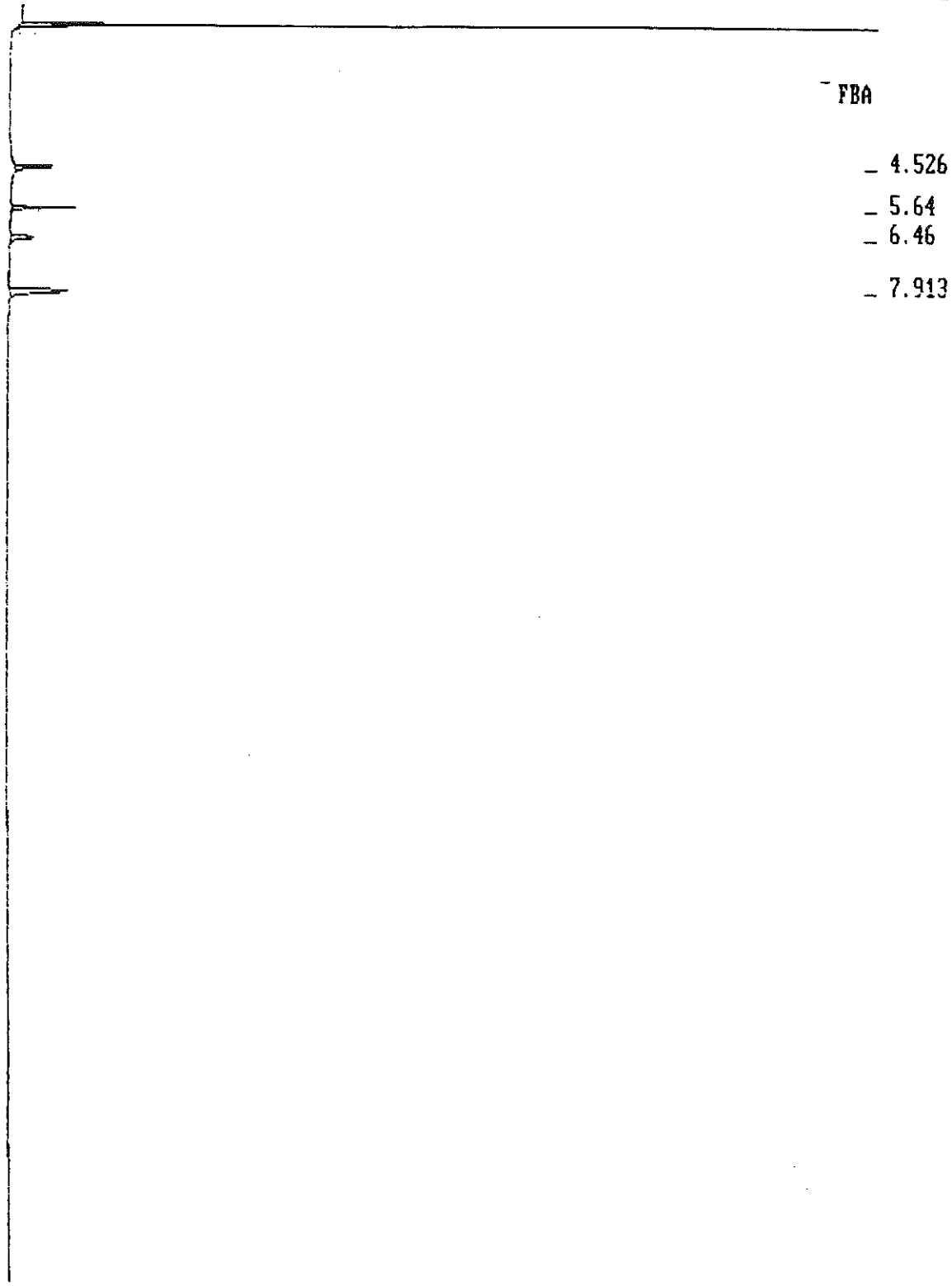
Interface#: 0 Cycle#: 3
****
Instrument: HP5890 Column Type: CAPILLARY-DB5
Detector: 0 This analysis was performed on Column #1

Mobile phase: Helium
Operating conditions: 60-0.5MIN-30DEG/MIN-270DEG-2.5DEG/MIN-270DEG-10MIN
****
Peaks with area less than 10000 are not listed below.

Peak#	Ret. Time		Area	Height
1	0.62		77,277	87,834
2	4.51	Fenuron	27,943	11,674
3	5.64	Linuron	31,364	12,118
4	6.47	Siduron	27,133	4,097
5	7.91	Velpar	72,126	10,218

Form-VIII information saved to disk as INTF-13A.LOG in the NELSON subdirectory. E:A05FE3.PTS

STD MIX 25 Processed: 02-05-1991 19:31:23, segment 4, cycle 4
RAW DATA SAVED IN FILE E:A05FE4.PTS
Version 4.0, Nelson Analytical Chromatography Software, 02-05-1991 19:31:26
Areas, times, and heights stored in: E:A05FE4.ATB
Start time: 0.00 Stop time: 35.00 Offset: 0
Low Value: 6142 High Value: 76761 Scale factor: 1



Sample: STD MIX 25 NG/UL

Filename: E:A05FE4.PTS

TIME OF ANALYSIS (data upload): 02-05-1991 19:31:25

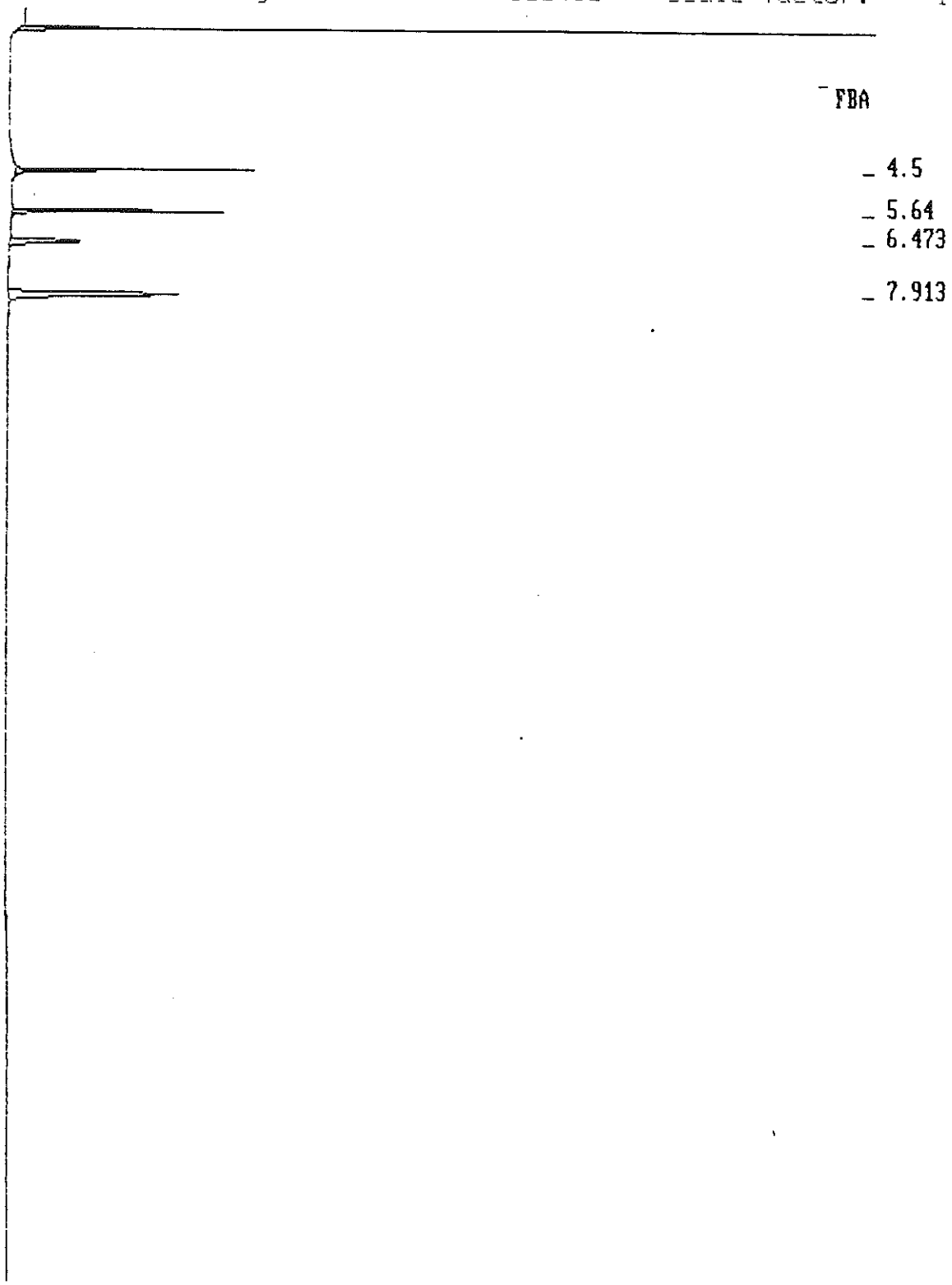
****
Sample Name: STD MIX 25 NG/UL
Amount injected: 1.5 uL
Filename:E:A05FE4 Date & Time of data upload: 02-05-1991 19:31:25 Acq
sition Method: M:SASPEST
Interface#: 0 Cycle#: 4
****
Instrument: HP5890 Column Type: CAPILLARY-DB5
Detector: 0 This analysis was performed on Column #1

Mobile phase: Helium
Operating conditions: 60-0.5MIN-30DEG/MIN-270DEG-2.5DEG/MIN-270DEG-10MIN
****
Peaks with area less than 5000 are not listed below.

Peak#	Ret. Time		Area	Height
1	0.62		72,239	69,767
2	4.53	Fenuron	8,833	3,017
3	5.64	Linuron	13,815	5,188
4	6.46	Siduron	12,291	1,866
5	7.91	Velpar	33,287	4,695

Form-VIII information saved to disk as INTF-13A.LOG in the NELSON subdirectory. E:A05FE4.PTS

STD MIX 75 Processed: 02-06-1991 00:41:27, segment 10, cycle 10
End of sequence file reached at cycle 10
RAW DATA SAVED IN FILE E:A05FE10.PTS
Version 4.0, Nelson Analytical Chromatography Software, 02-06-1991 00:41:31
Meas, times, and heights stored in: E:A05FE10.ATB
Start time: 0.00 Stop time: 35.00 Offset: 0
Low Value: 6151 High Value: 105435 Scale factor: 1



Sample: STD MIX 75 NG/UL
Filename: E:A05FE10.
TIME OF ANALYSIS (data upload): 02-06-1991 00:41:29

****
Sample Name: STD MIX 75 NG/UL
Amount injected: 1.5 uL
Filename:E:A05FE10 Date & Time of data upload: 02-06-1991 00:41:29 Acq
sition Method: M:SASPEST

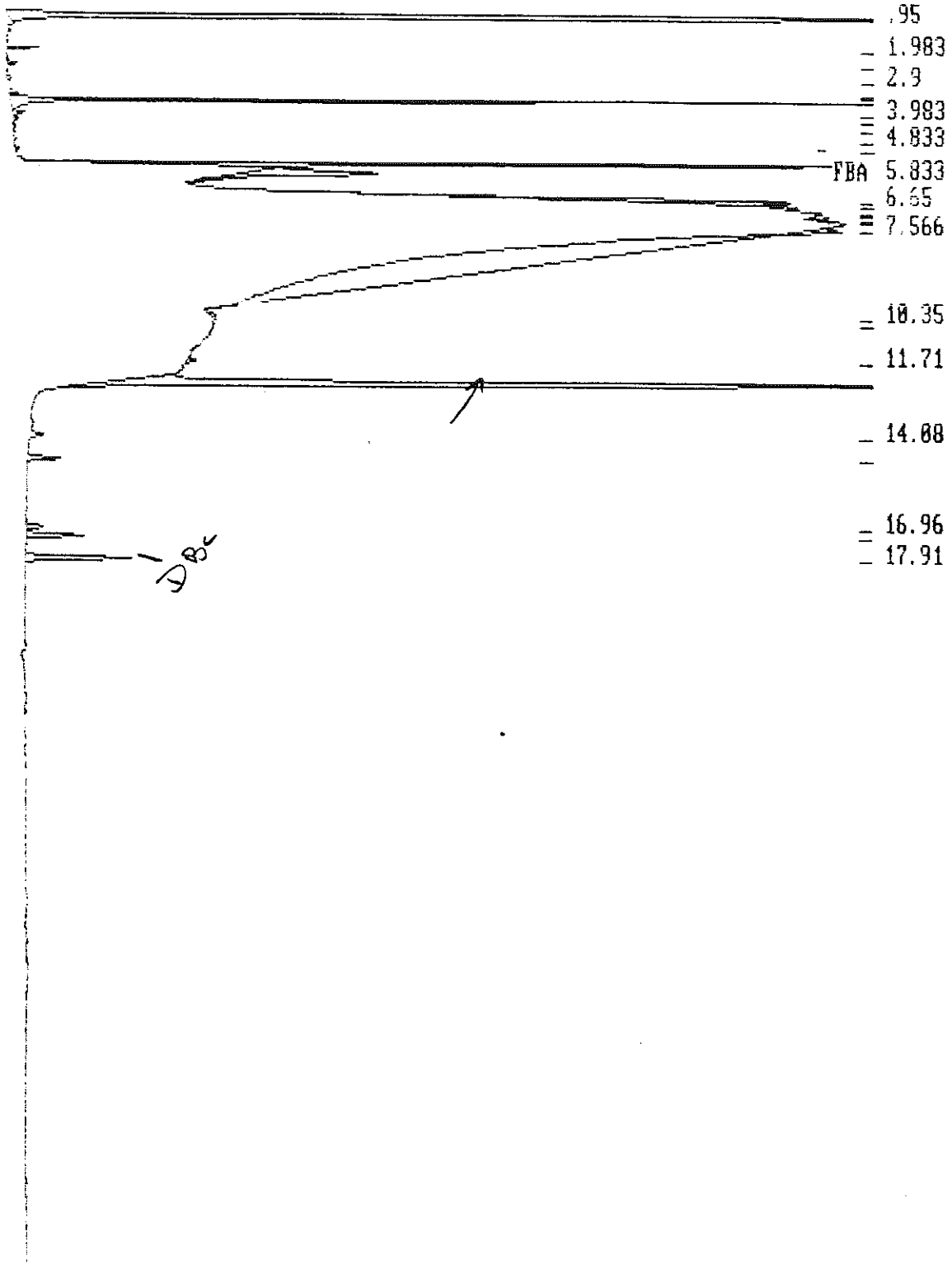
Interface#: 0 Cycle#: 10
****
Instrument: HP5890 Column Type: CAPILLARY-DB5
Detector: 0 This analysis was performed on Column #1

Mobile phase: Helium
Operating conditions: 60-0.5MIN-30DEG/MIN-270DEG-2.5DEG/MIN-270DEG-10MIN
****
Peaks with area less than 10000 are not listed below.

Peak#	Ret. Time		Area	Height
1	0.62		80,351	98,091
2	4.50	Fenuron	60,617	27,208
3	5.64	Linuron	62,513	24,178
4	6.47	Siduron	53,055	7,847
5	7.91	Velpar	138,470	19,424

Form-VIII information saved to disk as INTF-13A.LOG in the NELSON subdirectory. E:A05FE10.PTS

DIURON 100 Processed: 02-05-1991 17:01:25, segment 1, cycle 1
~~Error, duplicate file name = J:A05FE2.PTS~~
RAW DATA SAVED IN FILE J:A15FE2.PTS
Version 4.0, Nelson Analytical Chromatography Software, 02-05-1991 17:01:2
gas, times, and heights stored in: J:A15FE2.ATS
Start time: 0.00 Stop time: 40.00 Offset: 0
Low value: 18214 High Value: 977030 Scale factor: 1



Sample: DIURON 100 NG/UL

Filename: J:A15FE2.PT

TIME OF ANALYSIS (data upload): 02-05-1991 17:01:32

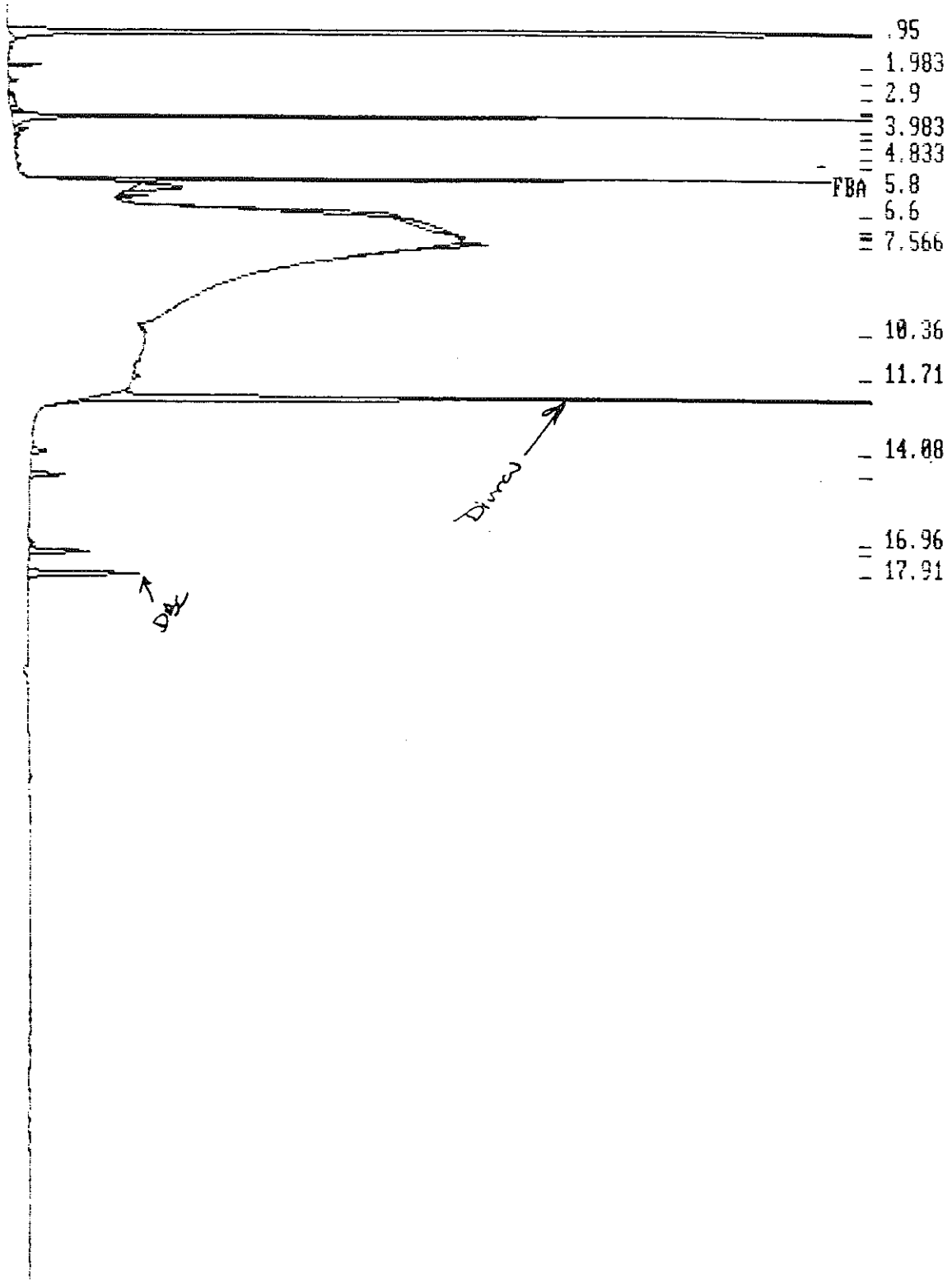
****
Sample Name: DIURON 100 NG/UL
Amount injected: 1.5 uL
Filename:J:A15FE2 Date & Time of data upload: 02-05-1991 17:01:32 Acq. edition Method: M:DTMPLOT

Interface#: 2 Cycle#: 2
****
Instrument: HP5890 Column Type: CAPILLARY
Detector: ECD This analysis was performed on Column #2
COL1:DB608 COL2:DB5
Mobile phase: HELIUM
Operating conditions: 60deg-1min-25deg/min-200deg-4deg/min-275deg-15min
****
Peaks with area less than 1500 are not listed below.

Peak#		Ret. Time		Area	Height
1		0.95		7,555,861	954,284
2		1.98		89,829	36,888
3		2.45		51,603	11,019
4		2.90		26,040	4,463
5		3.33		47,824	7,906
6		3.43		34,938	9,415
7		3.57		3,365,486	951,948
8		3.98		78,766	14,184
9		4.20		28,205	5,082
10		4.43		7,188	1,879
11		4.83		18,954	4,400
12		5.12		12,470	4,030
13		5.40		10,624	4,929
14		5.53		4,448,264	840,941
15		5.83		1,497,362	145,269
16		6.65		1,418,281	142,353
17		6.83		114,115	18,147
18		7.00		55,648	10,187
19		7.12		82,564	20,307
20		7.23		33,069	8,426
21		7.30		132,053	18,957
22		7.57		16,218,905	46,3[illegible]
23		10.35		48,963	[illegible]
24		10.57		9,104	2,4[illegible]
25		11.72		50,226	9,8[illegible]
26	Diuron	12.45	100 ng/uL	7,426,575	854,9[illegible]
27		14.08		109,860	14,758
28		14.82		207,064	36,718
29		16.97		119,262	17,[illegible]
30		17.22		398,571	61,8[illegible]
31		17.92 DBC	0.1 ng/uL	766,791	117,19[illegible]

Form-VIII information saved to disk as INTF-12A.LOG in the NELSON subdirectory. J:A15FE2.PTS

DIURON 50 Processed: 02-05-1991 17:53:06, segment 3, cycle 3
~~Error, duplicate file name = J:A05FE3.FTB~~ NK
RAW DATA SAVED IN FILE J:A15FE3.FTB
Version 4.0, Nelson Analytical Chromatography Software, 02-05-1991 17:5[illegible]
Areas, times, and heights stored in: J:A15FE3.ATB
Start time: 0.00 Stop time: 40.00 Offset: 0
Low Value: 17968 High value: 777043 Scale factor:



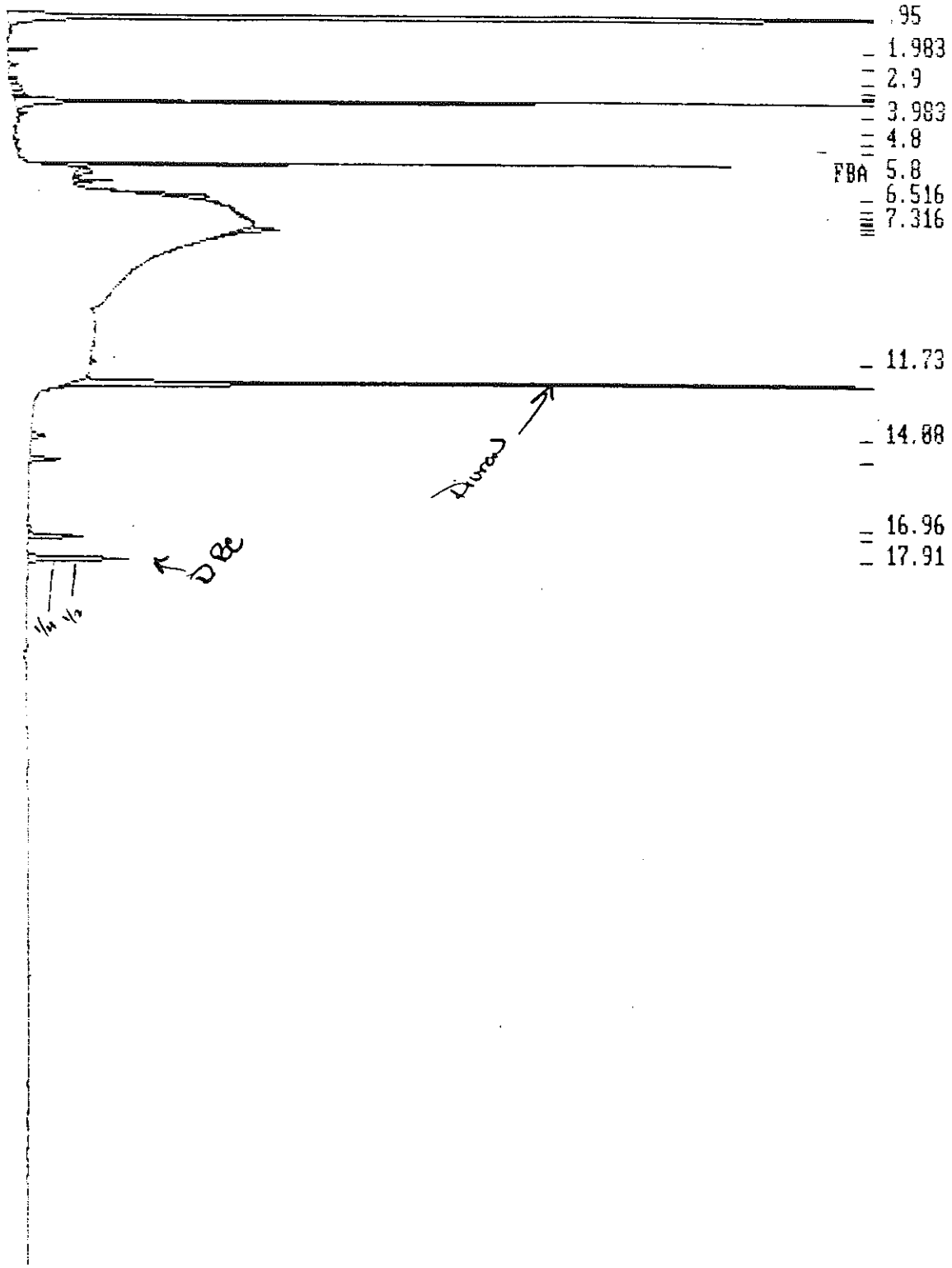
Sample: DIURON 50 NG/LU
Filename: J:A15FE3.F[illegible]
TIME OF ANALYSIS (data upload): 02-05 [illegible] 17:53:13

****
Sample Name: DIURON 50 NG/UL
Amount injected: 1.5 uL
Filename:J:A15FE3 Date & Time of data upload: 02-05-1991 17:53:13 Acquisition Method: M:DTMPLOT
Interface#: 2 Cycle#: 3
****
Instrument: [illegible] Column Type: CAPILLARY
Detector: FID This analysis was performed on Column #2
COL1:DB608 COL2:DB5
Mobile phase: HELIUM
Operating conditions: 60deg-1min-25deg/min-200deg-4deg/min-275deg-15min
****
Peaks with area less than 1500 are not listed below.

Peak#		Ret. Time		Area	Height
1		0.95		7,583,827	953,882
2		1.98		87,216	36,209
3		2.45		46,108	10,528
4		2.90		33,796	6,329
5		3.33		68,775	10,038
6		3.43		51,506	11,702
7		3.57		3,451,414	952,068
8		3.98		83,993	14,673
9		4.20		28,186	4,990
10		4.43		6,986	1,884
11		4.83		16,900	4,201
12		5.12		11,843	3,913
13		5.40		9,024	4,271
14		5.52		3,374,491	900,201
15		5.80		560,019	53,327
16		6.60		728,594	52,441
17		7.10		446,390	19,250
18		7.23		21,457	5,956
19		7.33		49,048	8,317
20		7.57		421,782	53,610
21		10.37		41,019	2,493
22		11.72		45,952	7,2[illegible]
23	Diuron	12.43	50 ns/uc	6,243,121	876,[illegible]
24		14.08		111,520	15,[illegible]
25		14.82		218,076	37,[illegible]
26		16.97		26,589	4,[illegible]
27		17.22		417,321	64,[illegible]
28	DBC	17.92	0.1 ns/uc	789,960	121,[illegible]

Form-VIII information saved to disk as INTF-13A.LOG in the NELSON subdirectory. J:A15FE3.PTS

DIURON 25 Processed: 02-05-1991 18:44:52, segment 4, cycle 4
RAW DATA SAVED IN FILE J:A05FE4.PTS
Version 4.0, Nelson Analytical Chromatography Software, 02-05-1991 18:44:01
Peas, times, and heights stored in: J:A05FE4.ATR
Start time: 0.00 Stop time: 40.00 Offset: 0
Low Value: 17767 High Value: 976375 Scale Factor: 1



Sample: DIURON 25 NG/UL

Filename: J:A05FE4.

TIME OF ANALYSIS (data upload): 02-05-1991 18:44:59

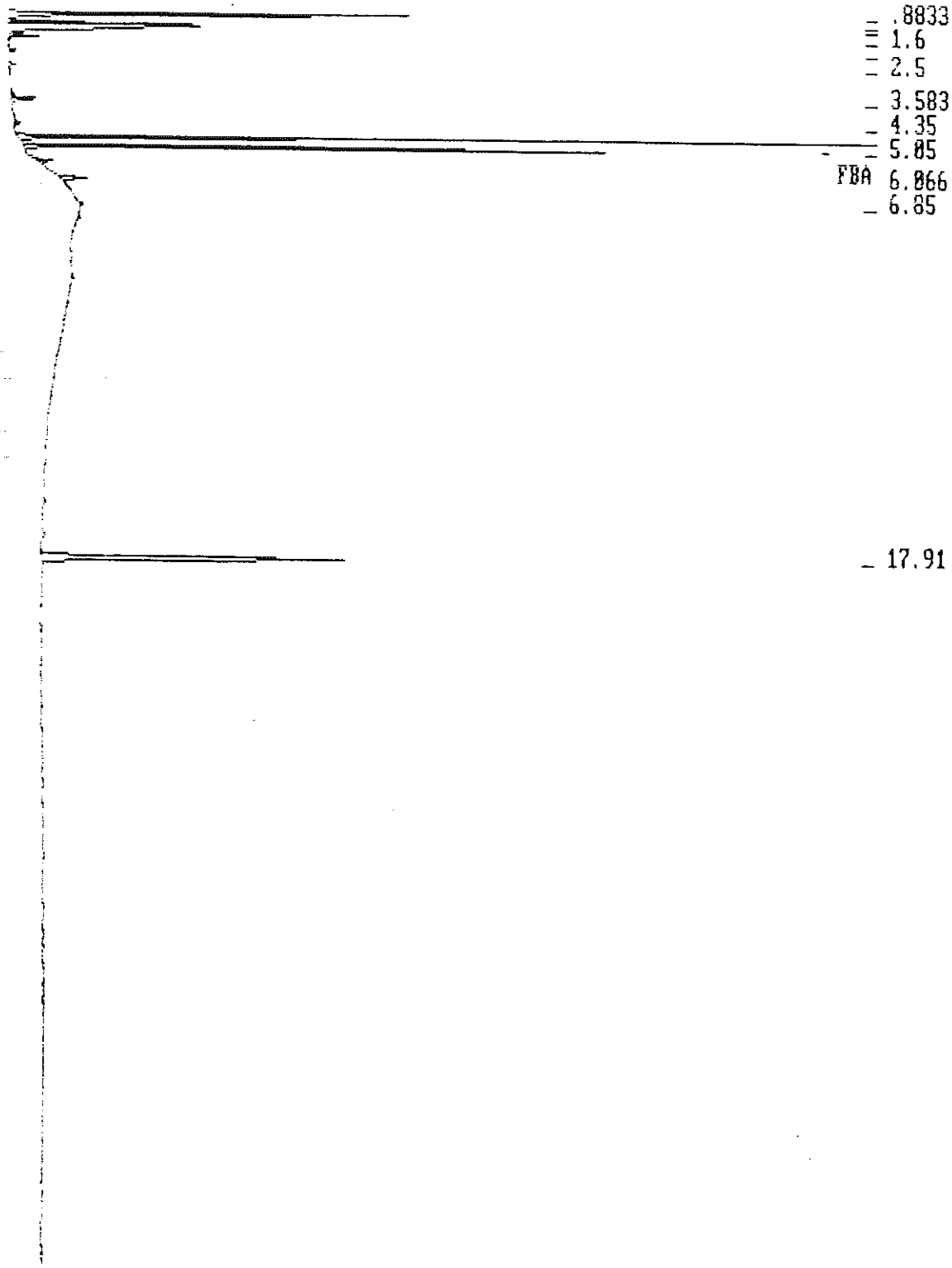
****
Sample Name: DIURON 25 NG/UL
Amount injected: 1.5 uL
Filename: J:A05FE4 Date & Time of date upload: 02-05-1991 18:44:59 Acquisition Method: M:DTMPLOT

Interface#: 2 Cycle#: 4
****
Instrument: HP5890 Column Type: CAPILLARY
Detector: ECD This analysis was performed on Column #2
COL1:DB608 COL2:DB5
Mobile phase: HELIUM
Operating conditions: 60deg-1min-25deg/min-200deg-4deg/min-275deg-15min
****
Peaks with area less than 1500 are not listed below.

Peak#		Ret. Time	ng/uL	Area	Height
1		2.25		7,728,738	957,140
2		1.95		80,067	31,168
3		2.48		48,548	10,254
4		2.90		40,168	9,056
5		3.18		135,808	11,270
6		3.35		98,153	13,644
7		3.43		62,670	14,417
8		3.57		3,548,231	948,832
9		3.98		37,933	10,021
10		4.43		7,616	2,075
11		4.80		21,608	4,825
12		5.12		10,963	3,607
13		5.40		8,904	4,260
14		5.52		2,199,396	741,192
15		5.80		159,821	17,327
16		6.07		124,548	44,158
17		6.52		417,919	49,500
18		6.88		82,936	3,815
19		7.10		46,174	6,717
20		7.23		13,463	3,261
21		7.32		14,384	3,658
22		7.43		4,014	1,199
23		7.57		308,487	41,589
24		11.73		32,682	2,412
25	Diuron	12.42	25	4,561,824	888,075
26		14.08		105,343	14,316
27		14.82		199,542	34,367
28		16.97		25,462	4,070
29		17.22		388,231	60,211
30	DBC	17.92	0.1	726,416	1[illegible],875

Form-VIII information saved to disk as INTF-13A.L06 in the NELSON subdirectory. J:A05FE4.PTS

DBC SURROG Processed: 02-05-1991 19:36:35, segment 5, cycle 5
RAW DATA SAVED IN FILE J:A05FE5.PTS
Version 4.0, Nelson Analytical Chromatography Software, 02-05-1991 19:36:43
Areas, times, and heights stored in: J:A05FE5.ATS
Start time: 0.00 Stop time: 60.00 Offset: 0
Low Value: 17252 High Value: 285739 Scale Factor: 1



Sample: DBC SURROGATE STD DUPONT
Filename: J:A05FE5.P
TIME OF ANALYSIS (data upload): 02-05-1991 19:36:41

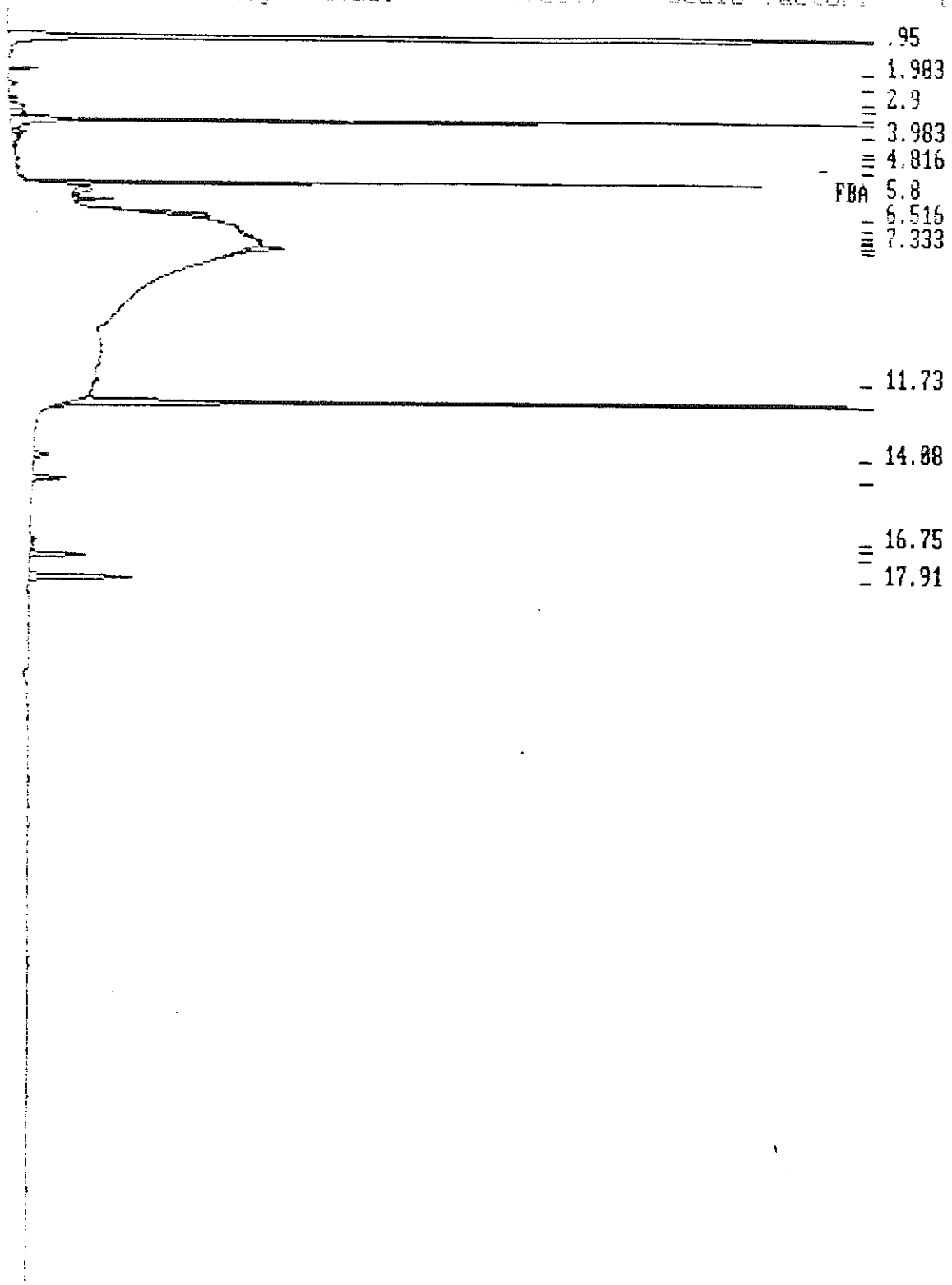
****
Sample Name: DBC SURROGATE STD DUPONT
Amount injected: 1.5 uL
Filename:J:A05FE5 Date & Time of data upload: 02-05-1991 19:36:41 Acquisition Method. M:DTMPLOT

Interface#: 2 Cycle#: 5
********** ********** ********** **********
Instrument: HP5890 Column Type: CAPILLARY
Detector: ECD This analysis was performed on Column #2
COL1:DB608 COL2:DB5
Mobile phase: HELIUM
Operating conditions: 60deg-1min-25deg/min-200deg-4deg/min-275deg-15min
********** ********** ********** **********
Peaks with area less than 1500 are not listed below.

Peak#	Ret. Time	Area	Height
1	0.88	828,247	260,541
2	1.15	151,[illegible]	48,688
3	1.23	1,265,612	124,469
4	1.60	53,[illegible]	19,307
5	2.05	12,066	4,318
6	2.50	14,[illegible]	3,418
7	3.58	57,492	15,116
8	4.35	11,[illegible]	3,675
9	4.75	1,321,589	562,[illegible]
10	5.05	886,513	379,935
11	5.50	50,325	10,351
12	6.07	73,7[illegible]	16,960
13	6.85	9,620	2,[illegible]
14 DBC	0.1 ng/uL 17.92	1,295,7[illegible]	196,[illegible]

Form-VIII information [illegible]d to disk as INTF-13A.LOG in the NELSON subdirectory. J:A05FE5.PTS

DIURON 25 Pr ssed: 02-06-1991 05:05:32, segment 16, cycle 16
RAW DATA SAVED IN FILE J:A05FE16.PTS
Version 4.0, Nelson Analytical C matography Software, 02-06-1991 05:05:
Areas, times, and heights stored in: J:A05FE16.ATB
art time: 0.00 Stop t : 40.00 Offset: 0
w Value: 17672 High Value: 976397 Scale factor:



Sample: DIURON 25 NG/UL

Filename: J:A05FE16

TIME OF ANALYSIS (data upload): 02-06- 1 05:05:39

****

Sample Name: **DIURON 25 NG/UL**

Amount injected: 1.5 uL

Filename:J:A05FE16 Date & Time of data upload: 02-06-1991 05:05:39 [illegible]

[illegible]ition Method: M:DTMPLOT

Interface#: 2 Cycle#: 1[illegible]

****

Instrument: HP5890 Column Type: CAPILLARY

Detector: ECD This analysis was performed on Column #2

COL1:DB608 COL2:DB5

Mobile phase: HELIUM

Operating conditions: 60deg-1min-25deg/min-200deg-4deg/min-275deg-15min

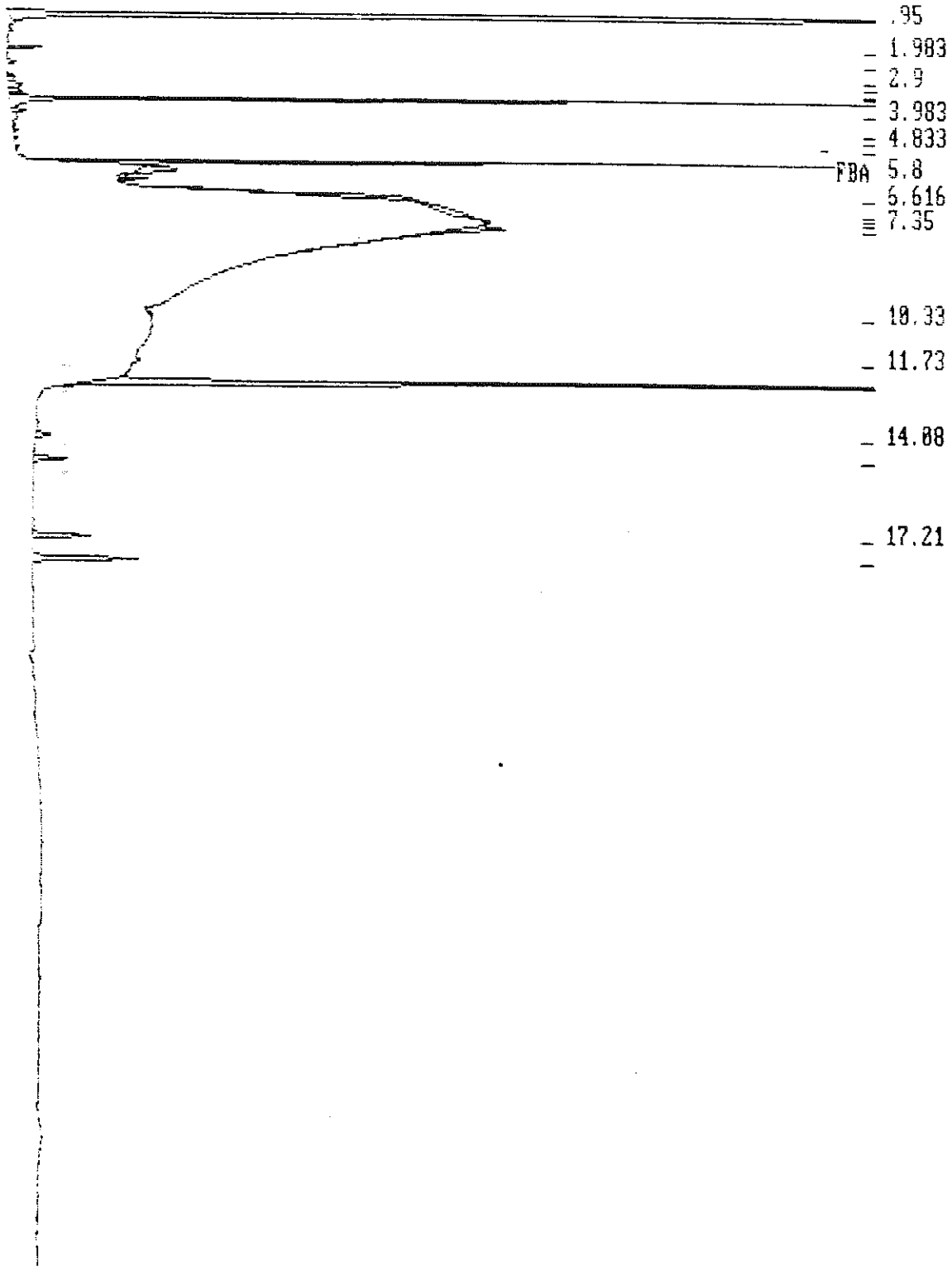
****

Peaks with area less than 1500 are not listed below.

Peak#		Ret. Time	ns/uL	Area	Height
1		0.95		7,662,967	957,518
2		1.98		80,394	31,923
3		2.45		40,779	9,047
4		2.90		48,001	9,008
5		3.15		180,393	17,936
6		3.43		202,816	17,709
7		3.57		3,594,605	953,720
8		3.98		95,017	15,962
9		4.13		13,963	3,[illegible]
10		4.58		8,593	[illegible]
11		4.82		21,560	[illegible]
12		5.12		11,642	[illegible]
13		5.40		13,073	[illegible]
14		5.52		2,325,181	[illegible]
15		5.80		137,944	[illegible]
16		6.07		126,154	[illegible]
17		6.52		357,646	[illegible]
18		6.88		62,073	[illegible]
19		7.12		47,617	[illegible]
20		7.22		16,294	[illegible]
21		7.33		24,952	[illegible]
22		7.43		6,367	[illegible]
23		7.57		358,940	[illegible]
24		11.73		23,743	[illegible]
25	Diuron	12.42	25	4,411,979	[illegible]
26		14.08		107,488	[illegible]
27		14.82		204,240	[illegible]
28		16.75		28,564	[illegible]
29		16.97		22,255	[illegible]
30		17.22		391,194	[illegible]
31	DBC	17.92	0.1	735,581	[illegible]

Form-VIII information saved to disk as INTF-13A.LOG in the NELSON subdirectory. J:A05FE16.PTS

DIURON 50 Processed: 02-06-1991 08:32:20, segment 20, cycle 10
RAW DATA SAVED IN FILE J:A05FE20.PTS
Version 4.0, Nelson Analytical Chromatography Software, 02-06-1991 08:32:3
Areas, times, and heights stored in: J:A05FE20.ATS
Start time: 0.00 Stop time: 40.00 Offset: 0
Low Value: 17794 High Value: 277164 Scale Factor:



Sample: DIURON 50 NG/UL

Filename: J:A05FE20.PT

TIME OF ANALYSIS (data upload): 02-06-1991 08:32:27

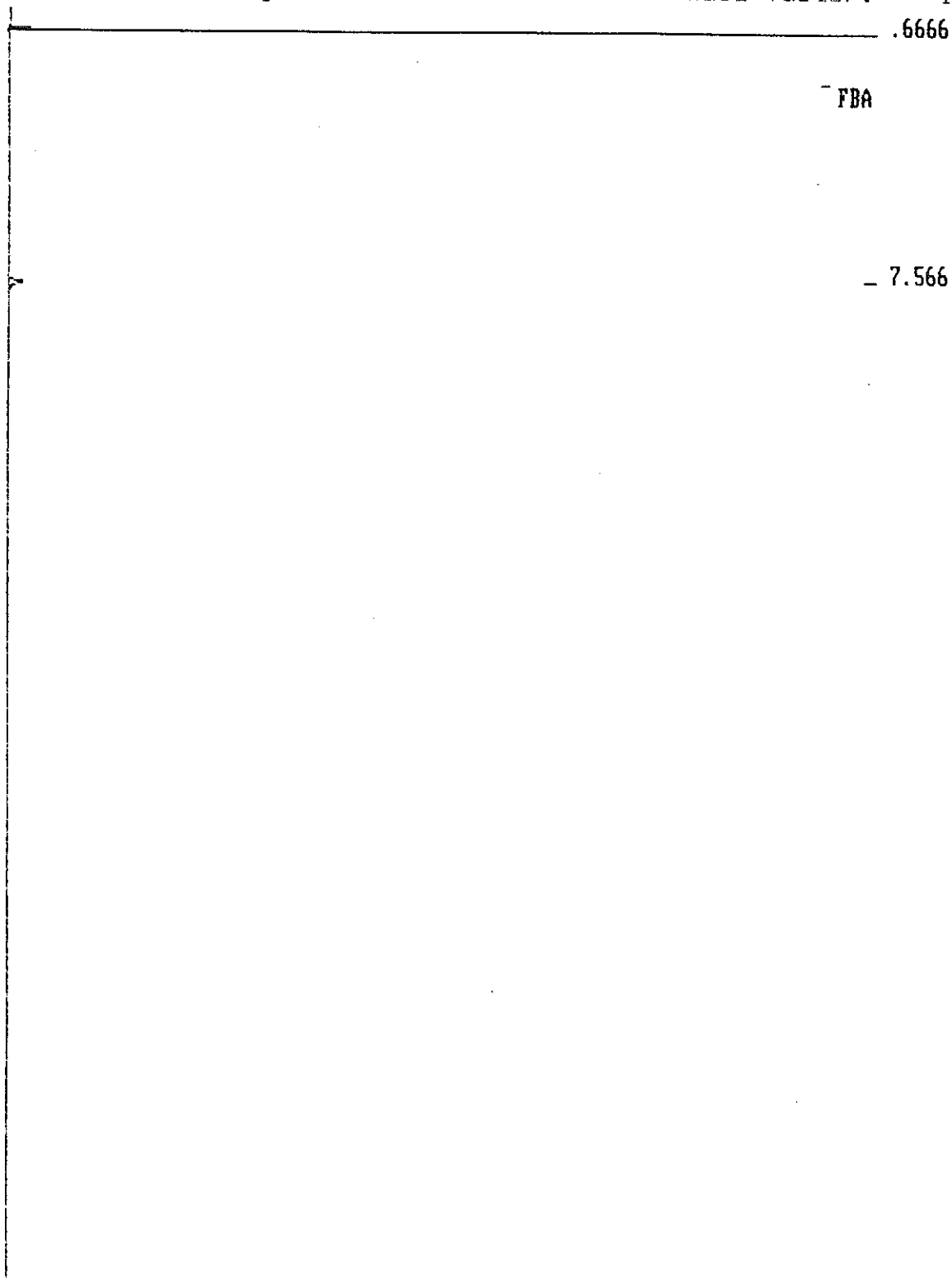
****
Sample Name: DIURON 50 NG/UL
Amount Injected: 1.5 uL
Filename:J:A05FE20 Date & Time of data upload: 02-06-1991 08:33:27 Acq.
sition Method: M:DTMPLOT
Interface#: 2 Cycle#: 20
****
Instrument: HP5890 Column Type: CAPILLARY
Detector: ECD This analysis was performed on Column #2
COL1:DB608 COL2:DB5
Mobile phase: HELIUM
Operating conditions: 60deg-1min-25deg/min-200deg-4deg/min-275deg-15m.
****
Peaks with area less than 1500 are not listed below.

Peak#		Ret. Time	ng/uL	Area	Height
1		0.95		7,427,749	954,646
2		1.98		86,322	38,325
3		2.45		37,793	8,803
4		2.90		42,386	7,924
5		3.15		158,245	15,506
6		3.33		82,465	12,840
7		3.43		67,530	14,820
8		3.57		3,415,906	953,315
9		3.98		93,737	16,582
10		4.60		24,077	5,752
11		4.85		18,419	4,755
12		5.12		12,290	4,030
13		5.40		10,782	5,260
14		5.52		2,388,323	879,341
15		5.80		384,672	42,135
16		6.62		686,180	32,079
17		7.10		361,139	19,817
18		7.23		21,714	6,641
19		7.35		34,979	6,139
20		7.57		296,190	47,072
21		10.33		30,741	2,456
22		11.73		43,475	7,137
23	Diuron	12.43	50	5,702,083	871,197
24		14.08		110,554	15,[illegible]
25		14.82		208,985	36,1[illegible]
26		17.22		406,186	63,0[illegible]
27	DBC	17.93	0.1	753,537	114,65[illegible]

Form-VIII information saved to disk as INTF-13A.LOG in the NEL3DN subdirectory. J:A05FE20.PTS

QC BLANKS RAW DATA

WQCBLANK Processed: 02-01-1991 19:06:43, segment 6, cycle 6
RAW DATA SAVED IN FILE E:A01FE6.PTS
ersion 4.0, Nelson Analytical Chromatography Software, 02-01-1991 19:06:46
areas, times, and heights stored in: E:A01FE6.ATB
Start time: 0.00 Stop time: 35.00 Offset: 0
Low Value: 5352 High Value: 950607 Scale factor: 1



Sample: WQCBLANK DUPONT
Filename: E:A01FE6.PTS
TIME OF ANALYSIS (data upload): 02-01-1991 19:06:45

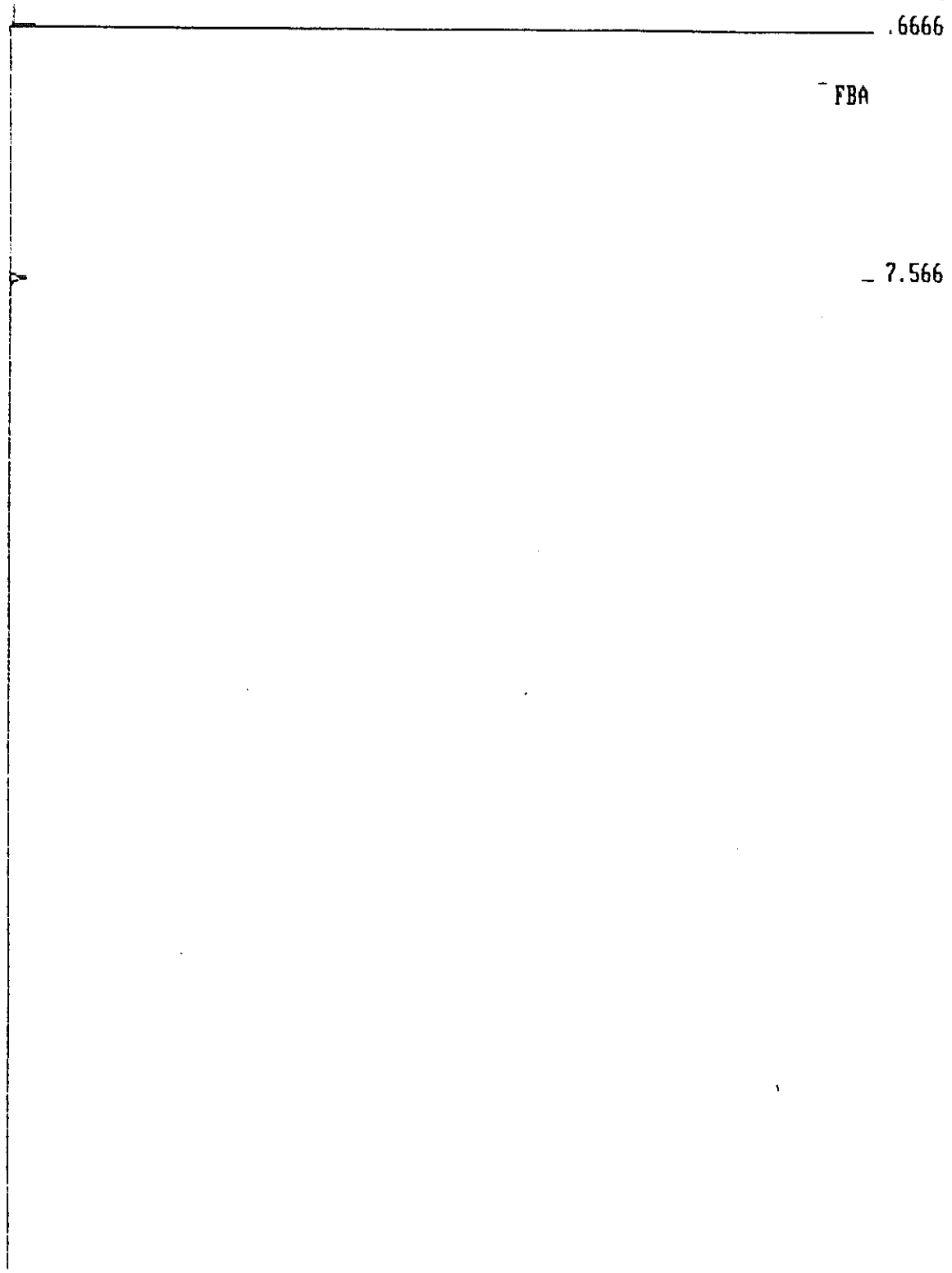
****
Sample Name: WQCBLANK DUPONT
Amount injected: 1.5 uL
Filename:E:A01FE6 Date & Time of data upload: 02-01-1991 19:06:45 Acq
sition Method: M:SASPEST
Interface#: 0 Cycle#: 6
****
Instrument: HP5890 Column Type: CAPILLARY-DB5
Detector: 0 This analysis was performed on Column #1

Mobile phase: Helium
Operating conditions: 60-0.5MIN-30DEG/MIN-270DEG-2.5DEG/MIN-270DEG-10MIN
****
Peaks with area less than 10000 are not listed below.

Peak#	Ret. Time	Area	Height
1	0.67	701,280	944,706
2	7.57 FAMFUR	108,433	14,307

Form-VIII information saved to disk as INTF-13A.LOG in the NELSON subdirectory. E:A01FE6.PTS

WQC BLANK Processed: 02-02-1991 01:08:22, segment 13, cycle 13
W DATA SAVED IN FILE E:A01FE13.PTS
ersion 4.0, Nelson Analytical Chromatography Software, 02-02-1991 01:08:25
Areas, times, and heights stored in: E:A01FE13.ATB
Start time: 0.00 Stop time: 35.00 Offset: 0
Low Value: 5339 High Value: 894252 Scale factor: 1



Sample: WQC BLANK DUPONT

Filename: E:A01FE13.

TIME OF ANALYSIS (data upload): 02-02-1991 01:08:24

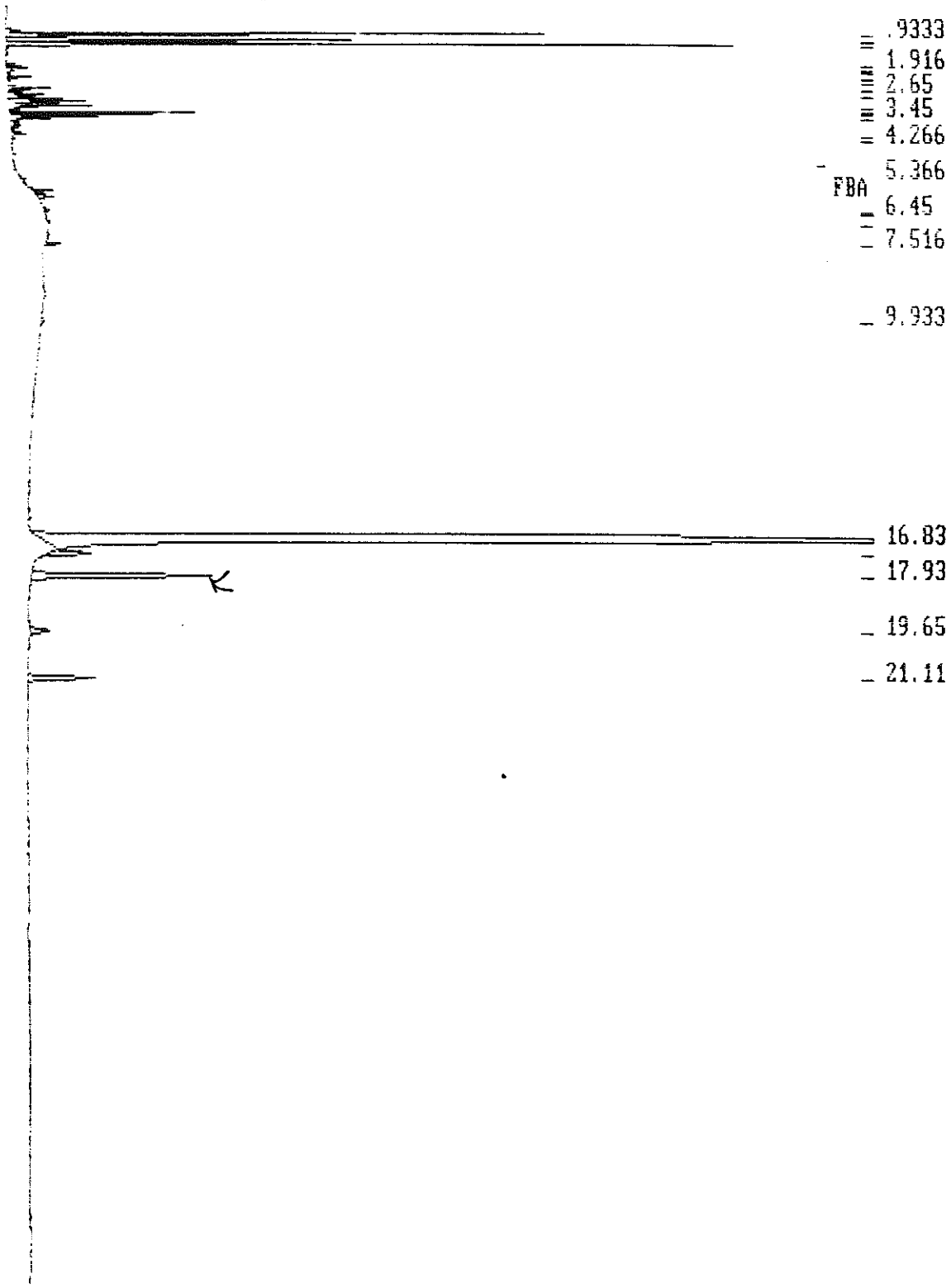
****
Sample Name: WQC BLANK DUPONT
Amount injected: 1.5 uL
Filename:E:A01FE13 Date & Time of data upload: 02-02-1991 01:08:24 Acqui
sition Method: M:SASPEST
Interface#: 0 Cycle#: 13
****
Instrument: HP5890 Column Type: CAPILLARY-DB5
Detector: 0 This analysis was performed on Column #1

Mobile phase: Helium
Operating conditions: 60-0.5MIN-30DEG/MIN-270DEG-2.5DEG/MIN-270DEG-10MIN
****
Peaks with area less than 10000 are not listed below.

Peak#	Ret. Time	Area	Height
1	0.67	702,970	888,216
2	7.57 Camfur	127,368	16,909

Form-VIII information saved to disk as INTF-13A.LOG in the NELSON subdirectory. E:A01FE13.PTS

WQCBLANK D Processed: 02-05-1991 20:28:22, segment 6, cycle 6
RAW DATA SAVED IN FILE J:A05FE6.PTS
Version 4.0, Nelson Analytical Chromatography Software, 02-05-1991 20:28:31
Areas, times, and heights stored in: J:A05FE6.ATB
Start time: 0.00 Stop time: 40.00 Offset: 0
Low Value: 16839 High Value: 976884 Scale Factor: 1



Sample: WQCBLANK DUPONT
Filename: J:A05FE6.PTS
TIME OF ANALYSIS (data upload): 02-05-1991 20:28:29

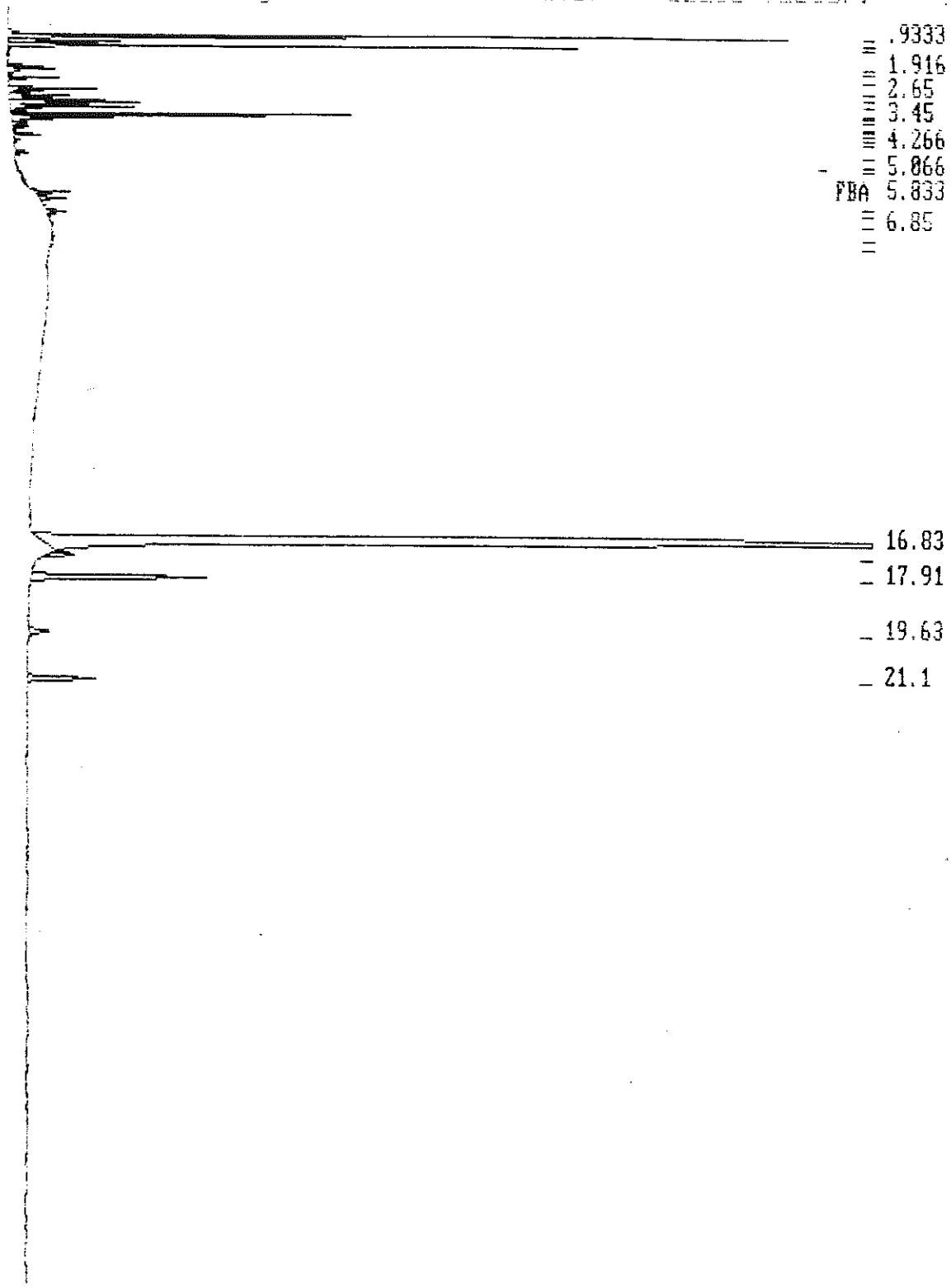
****
Sample Name: **WQCBLANK DUPONT**
Amount injected: 1.5 uL
Filename:J:A05FE6 Date & Time of data upload: 02-05-1991 20:29:39 Acquisition Method: M:DTMPLOT

Interface#: 2 Cycle#: 6
****
Instrument: HP5890 Column Type: CAPILLARY
Detector: ECD This analysis was performed on Column #2
COL1:DB608 COL2:DB5
Mobile phase: HELIUM
Operating conditions: 60deg-1min-25deg/min-200deg-4deg/min-275deg-15min
****
Peaks with area less than 1500 are not listed below.

Peak#	Ret. Time	Area	Height
1	0.93	1,674,146	592,169
2	1.13	1,578,016	380,516
3	1.27	2,336,661	802,568
4	1.92	27,618	9,535
5	1.90	62,054	24,219
6	2.08	46,224	9,755
7	2.32	69,622	28,494
8	2.45	14,529	3,759
9	2.65	171,647	47,156
10	2.85	217,982	39,638
11	3.18	566,244	91,351
12	3.37	42,125	11,147
13	3.45	503,454	204,439
14	3.57	302,316	97,[illegible]
15	4.08	51,051	14,277
16	4.27	9,699	3,323
17	5.37	3,328	1,678
18	5.52	16,537	3,151
19	5.83	85,059	24,072
20	6.07	77,154	18,290
21	6.45	16,714	6,400
22	6.55	8,495	4,321
23	6.87	13,641	2,373
24	7.52	45,404	15,737
25	9.93	16,449	3,586
26	16.83	14,390,023	916,[illegible]
27	17.22	293,785	45,135
28	17.93 DBC	1,317,677	198,77[illegible]
29	19.65	162,335	21,127
30	21.12	440,400	72,[illegible]

Form-VIII information saved to disk as INTF-13A.LOG in the NELSON subdirectory. J:A05FE6.PTS

WQC BLANK Processed: 02-06-1991 03:22:04, segment 14, cycle 14
RAW DATA SAVED IN FILE J:A05FE14.FTS
Version 4.0, Nelson Analytical Chromatography Software, 02-06-199[illegible]
Areas, times, and heights stored in: J:A05FE14.ATS
[illegible]t time: 0.00 Stop time: [illegible] Offset: 0
[illegible] Value: 16782 High Value: 976967 Scale Factor: [illegible]



[illegible]mple: WQC BLANK DUPONT

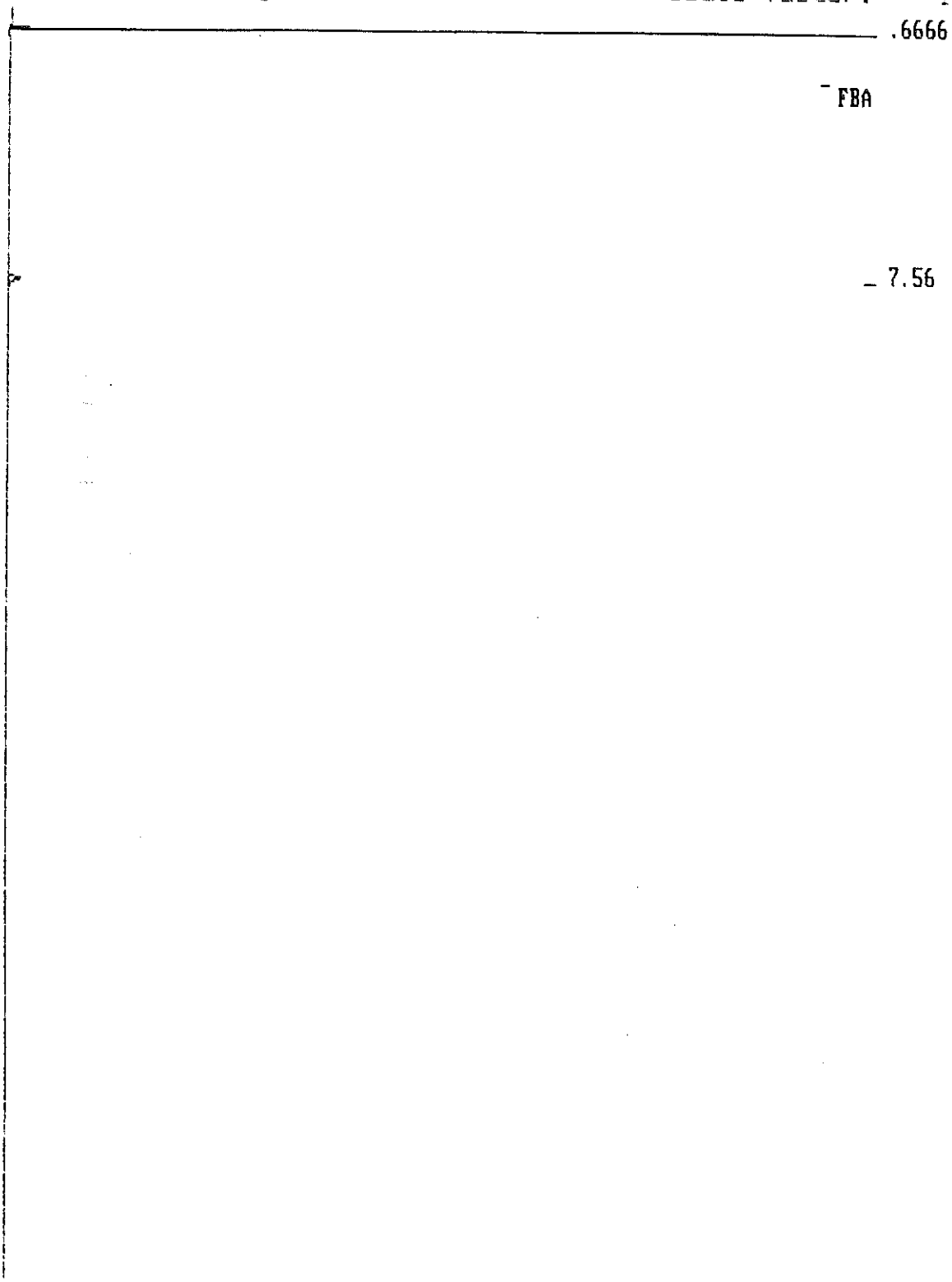
Filename: J:A05FE14.[illegible]
TIME OF ANALYSIS (data upload): 02-0[illegible] 03:22:10

****
Sample Name: **WQC BLANK DUPONT**
Amount injected: 1.5 uL
Filename:J:A05FE14 Date & Time of data upload: 02-06-199[illegible] 03:22:10 Acq[illegible]
sition Method: M:DTMPLOT
Interface#: 2 Cycle#: 14
****
Instrument: P5890 Column Type: CAPILLARY
Detector: ECD This analysis was performed on Column #2
COL1:DB608 COL2:DB5
Mobile phase: HELIUM
Operating Conditions: 60deg-1min-25deg/min-200deg-4deg/min-270deg-15m[illegible]
****
Peaks with area less than 1500 are not listed below.

Peak#	Ret. Time	Area	Height
1	0.93	2,337,403	862,713
2	1.13	532,296	124,866
3	1.27	1,740,522	630,675
4	1.92	48,981	16,645
5	2.00	139,914	52,931
6	2.32	130,216	56,817
7	2.65	320,104	98,852
8	2.85	325,[illegible]	66,362
9	3.05	886,220	144,[illegible]
10	3.37	59,965	17,166
11	3.45	905,354	372,507
12	3.57	364,068	112,971
13	3.73	81,462	17,708
14	3.85	55,706	17,348
15	4.00	6,846	2,6[illegible]
16	4.08	83,343	30,272
17	4.27	18,981	7,369
18	4.63	34,414	14,842
19	4.93	3,483	1,7[illegible]
20	5.07	5,145	2,042
21	5.27	7,580	2,2[illegible]
22	5.55	22,[illegible]79	[illegible]
23	5.83	161,146	42,7[illegible]
24	6.07	102,658	30,[illegible]
25	6.27	6,952	[illegible]
26	6.47	83,160	[illegible]
27	6.85	11,566	[illegible]
28	7.27	6,669	[illegible]
29	7.52	12,102	[illegible]
30	16.83	14,377,470	91[illegible]
31	17.22	181,139	[illegible]
32	17.92 DBC	1,274,041	17[illegible]
33	19.63	160,845	[illegible]
34	21.10	465,[illegible]	[illegible]

Form-VIII information [illegible]d to disk as INTF-13A.LOG in the WELSON subdirectory. J:A0[illegible]E14.PTS

SOIL BLANK Processed: 02-05-1991 21:14:47, segment 6, cycle 6
RAW DATA SAVED IN FILE E:A05FE6.PTS
Version 4.0, Nelson Analytical Chromatography Software, 02-05-1991 21:14:50
Areas, times, and heights stored in: E:A05FE6.ATB
Start time: 0.00 Stop time: 35.00 Offset: 0
Low Value: 5330 High Value: 929316 Scale factor: 1



Sample: SOIL BLANK

Filename: E:A05FE6.

TIME OF ANALYSIS (data upload): 02-05-1991 21:14:48

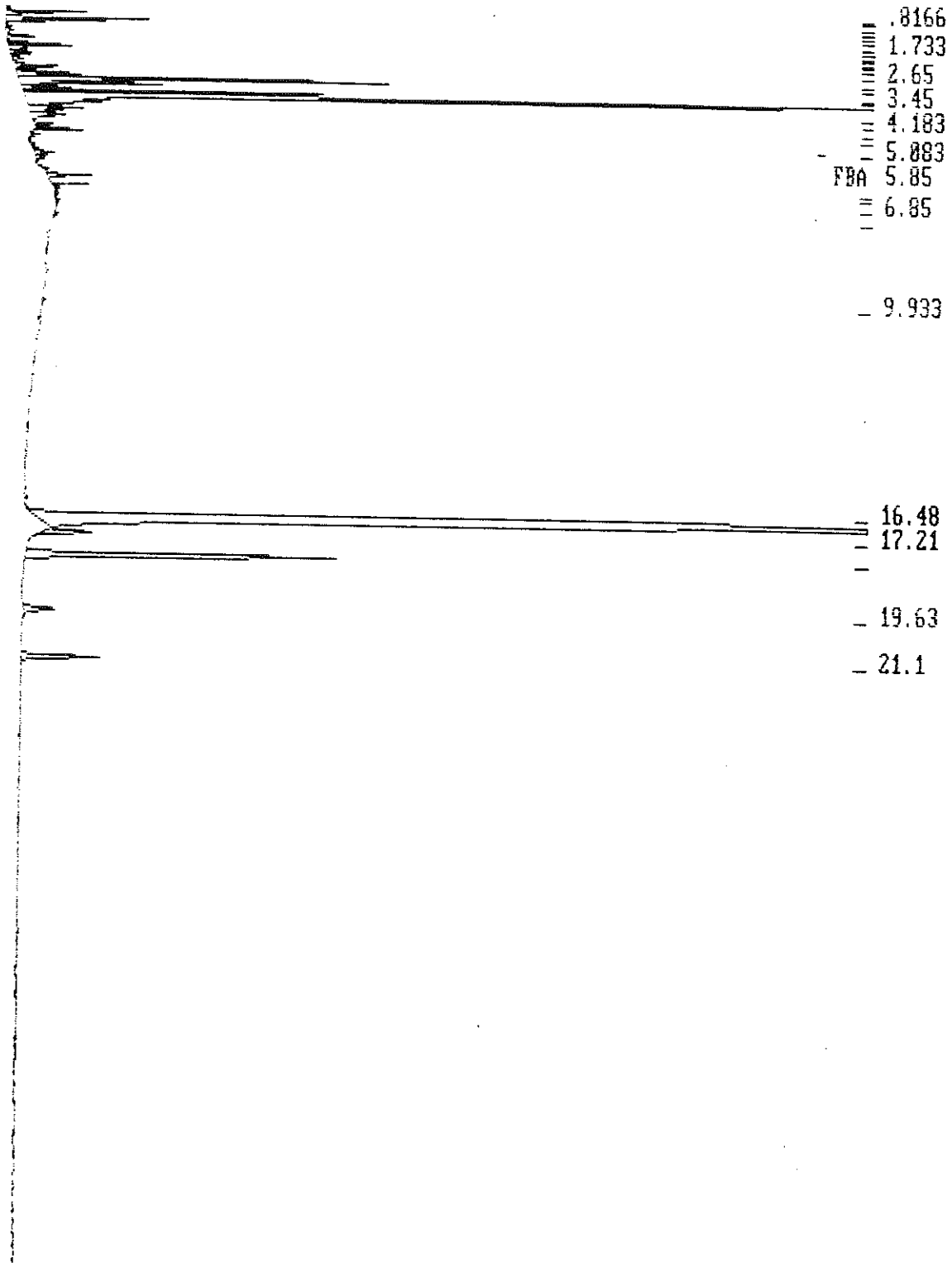
****
Sample Name: SOIL BLANK
Amount injected: 1.5 uL
Filename:E:A05FE6 Date & Time of data upload: 02-05-1991 21:14:48 Acquisition Method: M:SASPEST
Interface#: 0 Cycle#: 6
****
Instrument: HP5890 Column Type: CAPILLARY-DB5
Detector: 0 This analysis was performed on Column #1

Mobile phase: Helium
Operating conditions: 60-0.5MIN-30DEG/MIN-270DEG-2.5DEG/MIN-270DEG-10MIN
****
Peaks with area less than 10000 are not listed below.

Peak#	Ret. Time	Area	Height
1	0.67	670,726	923,359
2	7.56 Famfos	92,475	12,194

Form-VIII information saved to disk as INTF-13A.LOG in the NELSON subdirectory. E:A05FE6.PTS

SOIL BLANK Processed: 02-06-1991 05:57:13, segment 17, cycle 17
RAW DATA SAVED IN FILE J:A05FE17.FTS
Version 4.0, Nelson Analytical Chromatography Software. 02-06-1991 05:57:13
Areas, times, and heights stored in: J:A05FE17.ATB
Start time: 0.00 Stop time: 40.00 Offset: 0
Low Value: 17207 High Value: 776993 Scale Factor: 1



mple: SOIL BLANK LLS DUPONT
Filename: J:A05FE17
TIME OF ANALYSIS (data upload): 02-06-1991 05:57:20

****
Sample Name: SOIL BLANK LLS DUPONT
Amount injected: 1.5 uL
Filename:J:A05FE17 Date & Time of data upload: 02-06-1991 05:57:20
sition Method: M:DTMPLOT
Interface#: 2 Cycle#: 17
****
Instrument: HP5890 Column Type: CAPILLARY
Detector: ECD This analysis was performed on Column #2
COL1:DB60S COL2:DB5
Mobile phase: HELIUM
Operating conditions: 60deg-1min-25deg/min-200deg-4deg/min-275deg-15min
****
Peaks with area less than 1500 are not listed below.

Peak#	Ret. Time	Area	Height
1	0.82	13,529	5,169
2	0.93	273,147	88,358
3	1.13	704,770	157,532
4	1.27	91,084	38,907
5	1.43	20,837	7,272
6	1.53	41,175	7,446
7	1.73	96,431	31,199
8	1.92	61,805	22,098
9	2.00	215,184	70,577
10	2.12	95,479	19,678
11	2.22	97,516	[illegible]
12	2.32	48,721	21,14[illegible]
13	2.45	60,139	13,213
14	2.65	247,416	50,376
15	2.92	405,107	[illegible]
16	3.05	1,881,691	407,554
17	3.37	198,786	54,924
18	3.45	916,211	331,527
19	3.58	5,661,370	936,333
20	3.98	389,504	[illegible]
21	4.18	175,458	37,342
22	4.47	41,338	[illegible]
23	4.63	241,521	[illegible]
24	5.08	28,550	[illegible]
25	5.22	17,629	[illegible]
26	5.38	85,809	[illegible]
27	5.53	58,216	[illegible]
28	5.77	8,307	[illegible]
29	5.85	38,416	[illegible]
30	6.07	155,049	[illegible]
31	6.33	100,677	[illegible]
32	6.47	32,274	[illegible]
33	6.55	15,030	[illegible]
34	7.27	15,467	[illegible]
35	9.93	17,001	[illegible]
36	16.48	9,334	[illegible]
37	16.82	14,320,715	[illegible]

Continued...

****

Sample Name: SOIL BLANK LLS DUPONT

Count Injected: 1.5 uL

Filename: J:A05FE17 Date & Time of data upload: 02-06-1991 05:57:[illegible]

Method: M:DTMPLOT

Interface#: 2 Cycle#: [illegible]

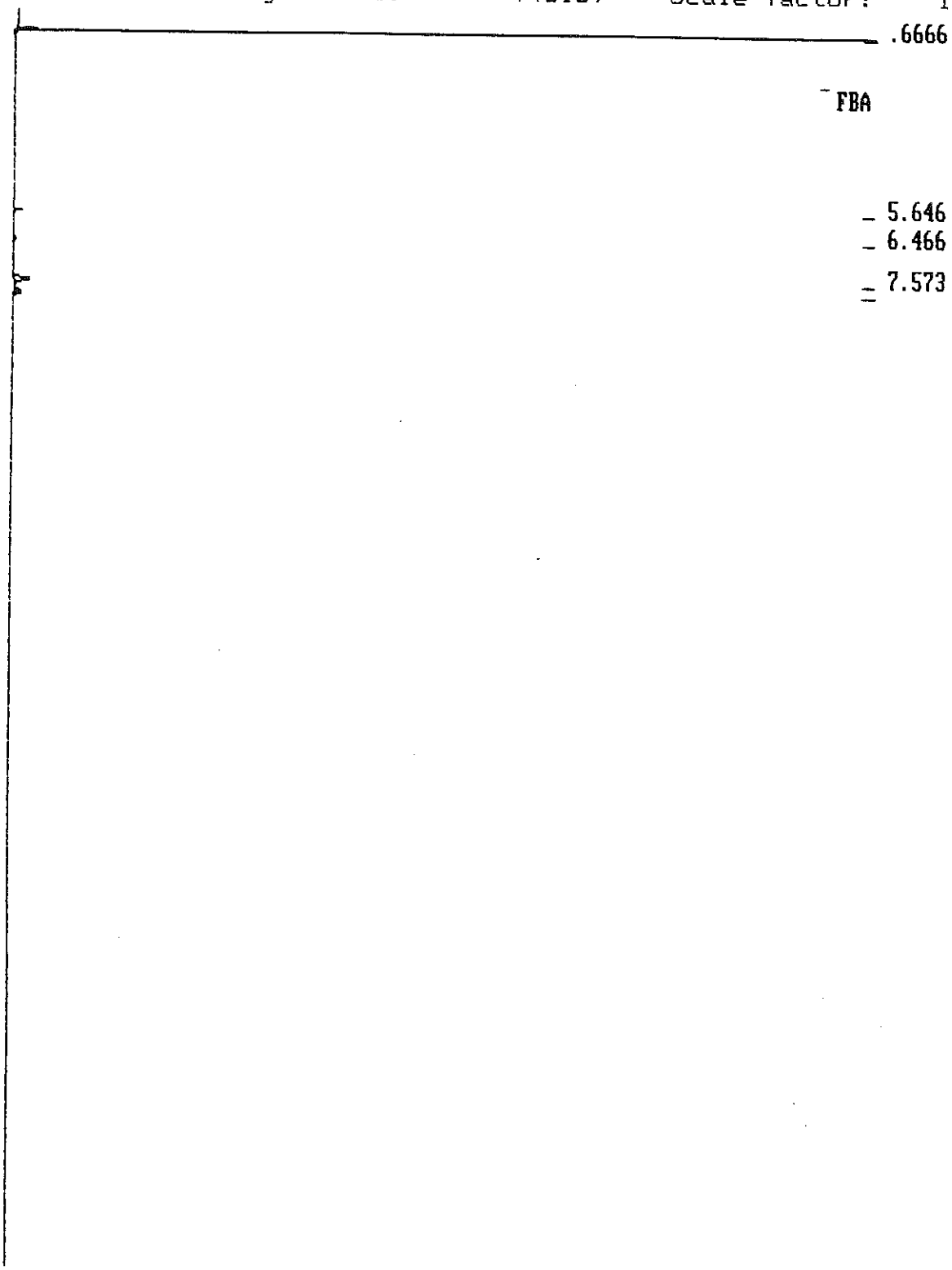
****

Peak#	Ret. Time	Area	Height
38	17.22	333,987	[illegible]
39	17.92 DBL	2,280,479	[illegible]
40	19.63	241,555	[illegible]
41	21.10	503,828	85,6[illegible]

Form-VIII information saved to disk as INTF-13A.LOG in the NELSON subdirectory. J:A05FE17.PTS

QC SPIKE RAW DATA

WQC-MS DU Processed: 02-01-1991 22:33:24, segment 10, cycle 10
RAW DATA SAVED IN FILE E:A01FE10.PTS
rsion 4.0, Nelson Analytical Chromatography Software, 02-01-1991 22:33:27
A as, times, and heights stored in: E:A01FE10.ATB
Start time: 0.00 Stop time: 35.00 Offset: 0
Low Value: 5355 High Value: 940109 Scale factor: 1



Sample: WQC—MS DUPONT

Filename: E:A01FE10.PTS
TIME OF ANALYSIS (data upload): 02-01-1991 22:33:25

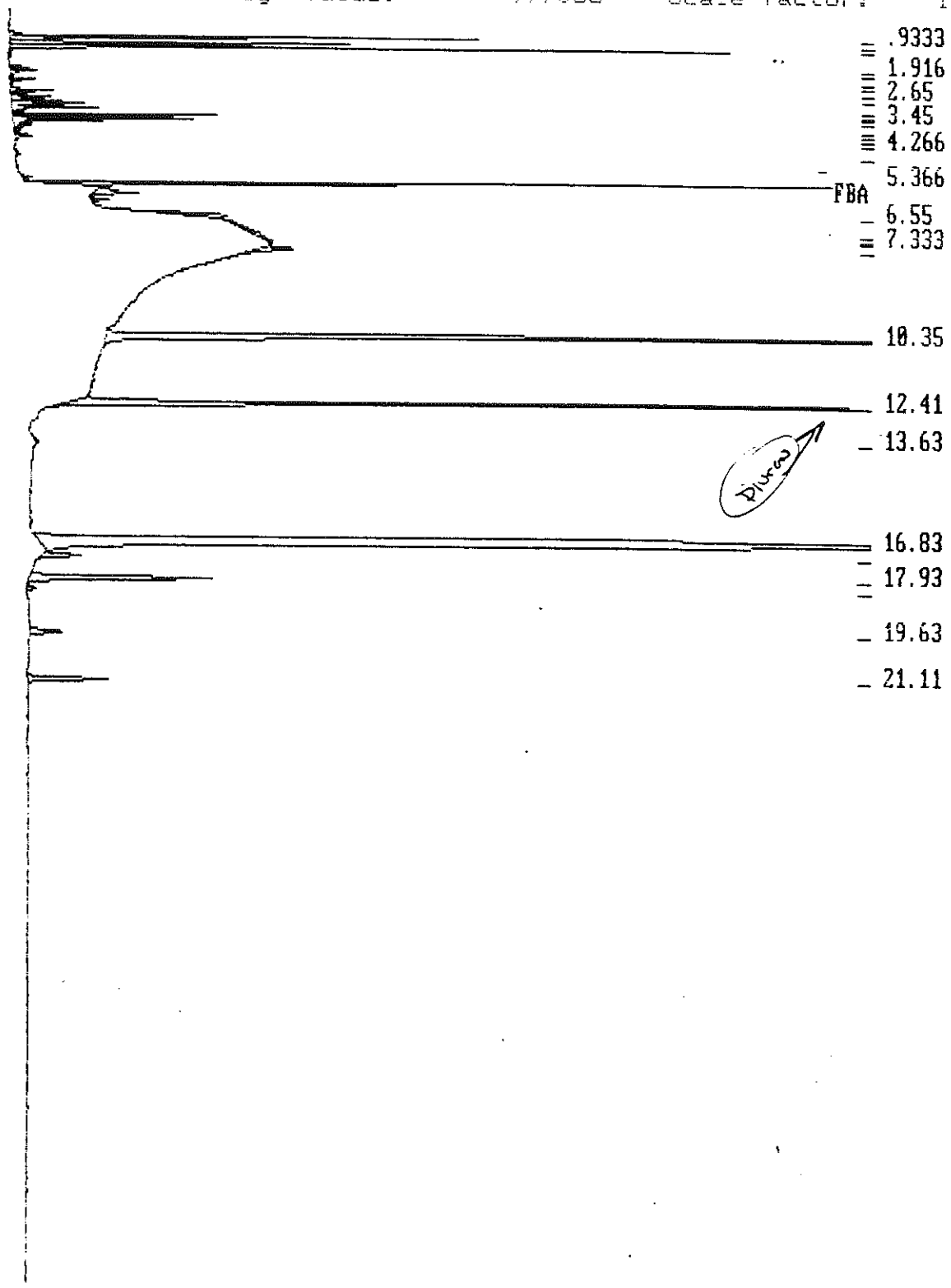
****
Sample Name: WQC—MS DUPONT
Amount injected: 1.5 uL
Filename:E:A01FE10 Date & Time of data upload: 02-01-1991 22:33:25 Acquisition Method: M:SASPEST
Interface#: 0 Cycle#: 10
****
Instrument: HP5890 Column Type: CAPILLARY-DB5
Detector: 0 This analysis was performed on Column #1

Mobile phase: Helium
Operating conditions: 60-0.5MIN-30DEG/MIN-270DEG-2.5DEG/MIN-270DEG-10MIN
****
Peaks with area less than 10000 are not listed below.

Peak#	Ret. Time	Area	Height
1	0.67	698,062	934,086
2	0.74	10,052	2,392
3	5.65 Linuron	20,934	7,974
4	6.47 Siduron	17,685	2,717
5	7.57 FAMFUR	124,829	16,744
6	7.92 Velpar	57,260	8,305

Fora-VIII information saved to disk as INTF-13A.LOG in the NELSON subdirectory. E:A01FE10.PTS

WQC-MS DU Processed: 02-05-1991 23:55:14, segment 10, cycle 10
RAW DATA SAVED IN FILE J:A05FE10.PTS
Version 4.0, Nelson Analytical Chromatography Software, 02-05-1991 23:55:22
Areas, times, and heights stored in: J:A05FE10.ATB
S t time: 0.00 Stop time: 40.00 Offset: 0
Low Value: 17078 High Value: 977058 Scale factor: 1



ample: WQC-MS DUPONT

Filename: J:A05FE10
TIME OF ANALYSIS (data upload): 02-05-1991 23:55:21

****
Sample Name: **WQC-MS DUPONT**
Amount injected: 1.5 uL
Filename:J:A05FE10 Date & Time of data upload: 02-05-1991 23:53:31 Acquisition Method: M:DTMPLOT

Interface#: 2 Cycle#: 10
****
Instrument: HP5890 Column Type: CAPILLARY
Detector: ECD This analysis was performed on Column #2
COL1:DB608 COL2:DB5

Mobile phase: HELIUM
Operating conditions: 60deg-1min-25deg/min-200deg-4deg/min-275deg-15min
****
Peaks with area less than 1500 are not listed below.

Peak#	Ret. Time		Area	Height
1	0.93		1,543,517	520,034
2	1.13		1,603,609	376,970
3	1.27		2,432,971	797,156
4	1.92		36,939	12,490
5	2.00		113,513	30,877
6	2.32		69,342	28,736
7	2.45		16,480	4,079
8	2.65		187,766	48,198
9	2.85		243,023	44,870
10	3.18		578,446	76,897
11	3.37		48,942	12,816
12	3.45		564,457	224,387
13	3.57		735,802	199,257
14	3.87		27,587	8,878
15	4.00		25,872	5,448
16	4.08		86,047	20,207
17	4.27		7,249	2,559
18	4.63		14,287	5,986
19	5.37		37,969	11,433
20	5.52		2,721,482	878,275
21	5.83		287,583	47,665
22	6.07		55,586	19,557
23	6.55		387,855	34,9[illegible]
24	7.08		216,210	9,[illegible]
25	7.22		15,906	6,[illegible]
26	7.33		32,973	6,[illegible]
27	7.55		234,866	35,[illegible]
28	10.35		6,388,396	849,[illegible]
29	12.42	Diuron	4,641,488	891,[illegible]
30	13.63		17,273	3,[illegible]
31	16.83		14,353,287	920,[illegible]
32	17.22		262,622	40,[illegible]
33	17.93	DBC	1,334,846	200,[illegible]
34	18.27		63,242	1[illegible]
35	19.63		234,947	3[illegible]
36	21.12		528,147	8[illegible]

18.2413
x10 = 500x100
50 ppb

Form-VIII information saved to disk as INTF-13A.LOG in the NELSON subdirectory. J:A05FE10.PTS

CUSTODY FORMS

SwRI Sample Control Record

___BNA ___WET ___OTHER: _____
X PEST ___MET ___OTHER: _____
___HERB ___INORG ___OTHER: _____

Location: Freezer 24

Project: 01-3784-032
Case : DUPONT
Client : Re-Run

___SAMPLES
___EXTRACTS

Date:	2-5-91	2-5-91	2-5-91						
Time:	5:15pm	520pm	1800						
Initials:	VS	MK	WAA						
Reason:	in	analysis							

	Sample I.D.	Matrix	LOCATION LOG-IN	LOCATION OUT	LOCATION IN	LOCATION OUT	LOCATION IN	LOCATION OUT	LOCATION IN	Disc
1	SMB	SOIL	RACK XI B1	MK	Rack XI B-1					
2	DE-CON-B(Comp)		↓	↓	↓					
3	REC. STD.		↓	↓	↓					
4	— last entry —									
5										
6										
7										
8										
9										
10										
11										
13										
14										
15										
16										
17										
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24										
25										
26										
27										
29										

For Change of Custody Record refer to the back of this page.

Revised 25

SwRI Sample Control Record

X BNA / PEST / HERB — WET / MET / INORG — OTHER: / OTHER: / OTHER:

Location: Freezer #24

Project: 01-37-84-032
Case :
Client : DUPONT

X SAMPLES / EXTRACTS

Date:	1-28-91	2-1-91	2-1-91	2-5-91	2-5-91			
Time:	12:45pm	1300	1545	16:00	18:00			
Initials:	LML	WAA	WAA	WAA	WAA			
Reason:		analysis		analysis				

	Sample I.D.	Matrix	LOG-IN	LOCATION OUT	LOCATION IN	LOCATION OUT	LOCATION IN	LOCATION OUT	LOCATION IN	Disp
1	WQC BLK	WATER	RACK I B-5	RACK I B-5	RACK I B-5	RACK I B-5	RACK I B-5			
2	DE-SP-A	↓	↓	↓	↓	↓	↓			
3	DE-SP-B	↓	↓	↓	↓	↓	↓			
4	DE-MW3-A	↓	↓	↓	↓	↓	↓			
5	WQC-MS	↓	↓	↓	↓	↓	↓			
6										
7										
8										
9										
10										
11										
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28										
29										

For Change of Custody Record refer to the back of this page.

Revised 05/

SwRI Sample Control Record

___BNA ___WET ___OTHER:
X PEST ___MET ___OTHER:
___HERB ___INORG ___OTHER:

Location: Freezer #24 Rack XVI C-4

Project: 01-3784-032
Case :
Client : DUPONT

___SAMPLES
X EXTRACTS

		Date:	2/1/91	2/1/91	2/1/91	2-5-91	2-5-91				
		Time:	19:00	19:30	19:50	16:00	18:00				
		Initials:	HE	WAA	WAA	WAA	WAA				
		Reason:	—	analysis		analysis					
			LOCATION			LOCATION		LOCATION			Disc
	Sample I.D.	Matrix	LOG-IN	OUT	IN	OUT	IN	OUT	IN		
1	WQC BIK	WATER	XVI-C,4	XVI-C,4	XVI-C,4	XVI-C,4	XVI-C,4				
2	DE-CON-A	↓	↓	↓	↓	↓	↓				
3	END										
4											
5											
6											
7											
8											
9											
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28											

For Change of Custody Record refer to the back of this page.

Rev sed 05/

CH2M HILL QUALITY ANALYTICS

CHAIN OF CUSTODY RECORD

PROJECT NUMBER	PROJECT NAME
CHI 28770.B0.SP	SEEP CHARACTERIZATION

CLIENT NAME: CH2M HILL REPRESENTING DU PONT - EAST CHICAGO, IN

PROJECT MANAGER: PIXIE NEWMAN / CHI

COPY TO: JOHN FLEISSNER / GLO

REQUESTED COMP. DATE:

SAMPLING REQUIREMENTS: SDWA ☐ NPDES ☐ RCRA ☐ OTHER ____

CLIENT ADDRESS AND PHONE NUMBER: CH2M HILL 1890 MAPLE AVENUE STE 200, EVANSTON, IL 60016

ANALYSES REQUESTED

STA NO.	DATE	TIME	COMP	GRAB	SOIL	SAMPLE DESCRIPTIONS (12 CHARACTERS)	# OF CONTAINERS	HEXAZINONE	SIDURON	LINURON	KARMEX (DIURON)							LAB ID	REMARKS
	1-23-91	09:15		X		DE-SP-A	2	X	X	X	X								Good
	↓	09:40		X		DE-SP-B	2	X	X	X	X								↓
	↓	08:28		X		DE-MW3-A	2	X	X	X	X								

FOR LAB USE ONLY: LAB#, LAB#, PROJECT NO., ACK, QUOTE#, NO. OF SAMP, PG

COOLER # 31

SWRI # B1-3784-032

SAMPLED BY AND TITLE	DATE/TIME	RELINQUISHED BY	DATE/TIME
Erik R. Spande	1/23/91 11:09	Erik R. Spande	1/23/91 11:10
RECEIVED BY:	DATE/TIME	RELINQUISHED BY:	DATE/TIME
RECEIVED BY:	DATE/TIME	RELINQUISHED BY:	DATE/TIME
RECEIVED BY LAB: Robin R. Recorff	DATE/TIME 01-24-91 10:00	SAMPLE SHIPPED VIA: UPS BUS FED-EX HAND OTHER ____	AIR BILL# 6352149171

HAZWRAP/NEESA Y N

QC LEVEL 1 2 3

COC | ICE

ANA REQ | TEMP

CUST SEAL | Ph

SAMPLE COND.

REMARKS: SHIPPED PRIORITY - ONE

ENTERED INTO LIMS ____ COC REVIEWED ____

SOUTHWEST RESEARCH INSTITUTE

CUSTODY TRANSFER FORM

01-3784-032

Sampling Site	Sample Type (Air, Water, etc.)	Ship To: E.I. DuPONT de Nemours ATTN: DR O. J. MEYER 5215 KENNEDY AVE E. CHICAGO, IND 46312
E.I. DuPONT EAST CHICAGO, IN		
Sampling Personnel DAVID SHEIKOSKI ERIC SPANDE (name) (phone) (date) (time)	**Sample Condition (pH, Temp, etc.)**	Name of Shipper: HERB SCHATTENB SWRI 6220 CALEBRA RD Address: SAN ANTONIO, TX 7823 Telephone: 512-522 3051 Date Shipped: 01-21-91 Air Bill No. SWI 162724

Sample ID	Description	Sample Condition on Receipt (temperature, breakage, etc.)
8	1 LITTER AMBER BTLS	OK
	w/1 COOLER #31	

Additional Information:

Received by: [signature]

Date: 1-22-91

SWRI Lab rec'd

Time: [signature] 1/24/91 10:00

CH2M HILL QUALITY ANALYTICS

CHAIN OF CUSTODY RECORD

PROJECT NUMBER	PROJECT NAME
CHI28770.B6SP	SEED CHARACTERIZATION

CLIENT NAME: DU PONT EAST CHICAGO

PROJECT MANAGER: PIXIE NEWMAN/CHI

COPY TO: JOAN FLEISSNER/GLO

REQUESTED COMP. DATE:

SAMPLING REQUIREMENTS: SDWA ☐ NPDES ☐ RCRA ☐ OTHER ____

CLIENT ADDRESS AND PHONE NUMBER: CH2M HILL, 1890 MAPLE AVE, SUITE 200, EVANSTON, IL 60016

ANALYSES REQUESTED

STA NO.	DATE	TIME	COMP	GRAB	SOIL	SAMPLE DESCRIPTIONS (12 CHARACTERS)	# OF CONTAINERS	HEXAZINONE	SIDURON	LINURON	KARMEX (DIVRON)	FINURON						LAB ID	REMARKS
	1/30/91	2:00		X		DE-CON-A	2	X	X	X	X	X							DE-CON-B IS A SOIL SAMPLE. PLEASE COMPOSITE 4 SAMPLES IN ANALYSIS OF ~~FOUR~~ FIVE PESTICIDES.
	1/30/91	2:00		X		DE-CON-B	4	X	X	X	X	X							

FOR LAB USE ONLY: LAB#, LAB#, PROJECT NO., ACK, QUOTE#, NO. OF SAMP, PO, CF

SAMPLED BY AND TITLE	DATE/TIME	RELINQUISHED BY	DATE/TIME
Erik D. Spande	1/30/91 2:00	Erik D. Spande	1/30/91 2:50
RECEIVED BY:	DATE/TIME	RELINQUISHED BY:	DATE/TIME
RECEIVED BY:	DATE/TIME	RELINQUISHED BY:	DATE/TIME
RECEIVED BY LAB: Rollin R. Freeman	DATE/TIME 01-31-91 09:30	SAMPLE SHIPPED VIA: UPS BUS FED-EX HAND OTHER ____	AIR BILL# 6352149263

HAZWRAP/NEMA Y N

QC LEVEL 1 2 3

COC | ICE

ANA RING | TEMP

CUST SEAL | Ph

SAMPLE COND.

REMARKS

ENTERED INTO LIMS ____ COC REVIEWED ____

REV 6/89 FORM 340

G1-3784-032

VTSR 1/24/91

CH2M HILL

CUSTODY SEAL

1/23/91

Date

Signature

CH2M HILL

CUSTODY SEAL

1/23/91

Date

Signature

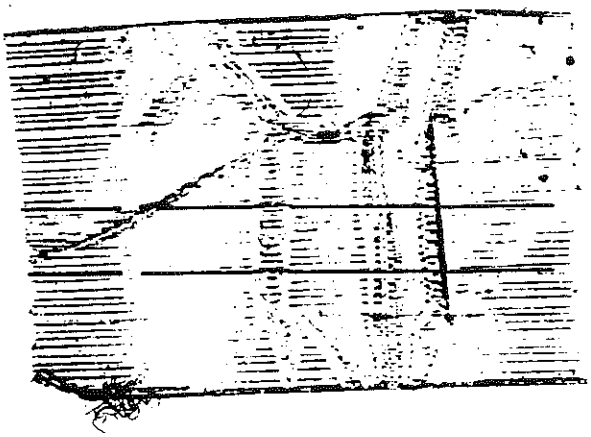
01-3784-032

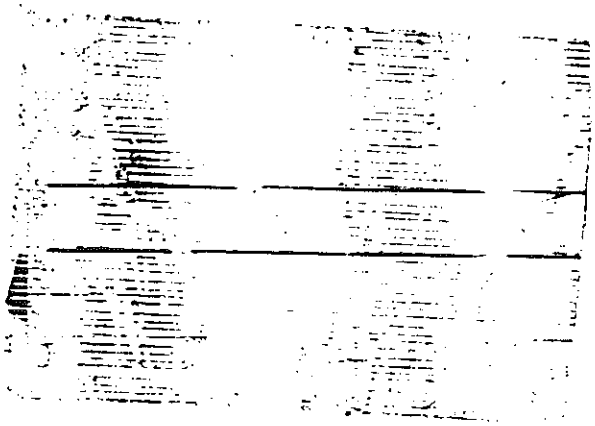
CUSTODY SEAL

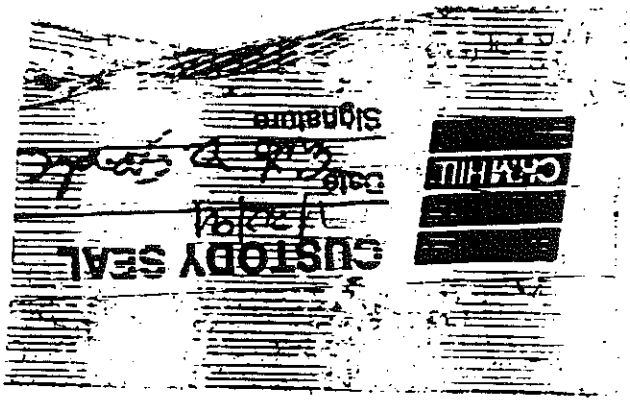
CH2M HILL

Date 11-20/97

Signature







01-3784-032 VTSR 01-31-91

FEDERAL EXPRESS

QUESTIONS? CALL 800-238-5355 TOLL FREE.

AIRBILL
PACKAGE TRACKING NUMBER 6352149263

13M 6352149263

RECIPIENT'S COPY 9/20

Date

From (Your Name) Please Print: DAVID L. SHEKOSKI

Your Phone Number (Very important): 414-272-2425

Department/Floor No.

Company: CH2M HILL

Street Address: 310 W WISCONSIN AVE STE 700

City: MILWAUKEE State: WI ZIP Required: 53203

To (Recipient's Name) Please Print: HERB SCHATTENBERG

Recipient's Phone Number (Very Important)

Department/Floor No.

Company: SOUTHWEST RESEARCH INSTITUTE

Exact Street Address (We Cannot Deliver to P.O. Boxes or P.O. Zip Codes.): 6220 CULEBRA ROAD

City: SAN ANTONIO State: TX ZIP Required: 78228

YOUR INTERNAL BILLING REFERENCE INFORMATION (First 24 characters will appear on invoice.): CHI-28770.B4.SP

IF HOLD FOR PICK-UP, Print FEDEX Address Here

Street Address: 1-31-91

City: Smith State: TC ZIP Required:

PAYMENT 1 [X] Bill Sender 2 [ ] Bill Recipient's FedEx Acct. No. 3 [ ] Bill 3rd Party FedEx Acct. No. 4 [ ] Bill Credit Card 5 [ ] Cash

SERVICES (Check only one box)

Priority Overnight Service (Delivery by next business morning†)
11 [X] YOUR PACKAGING
16 [ ] FEDEX LETTER *
12 [ ] FEDEX PAK *
13 [ ] FEDEX BOX
14 [ ] FEDEX TUBE

Standard Overnight Service (Delivery by next business afternoon†)
51 [ ]
56 [ ] FEDEX LETTER *
52 [ ] FEDEX PAK *
53 [ ] FEDEX BOX
54 [ ] FEDEX TUBE

Economy Service (formerly Standard Air) (Delivery by second business day†)
30 [ ] ECONOMY SERVICE

Heavyweight Service (for Extra Large or any package over 150 lbs.)
70 [ ] HEAVYWEIGHT **
80 [ ] DEFERRED HEAVYWEIGHT **

†Delivery commitment may be later in some areas.
*Declared Value Limit $100.
**Call for delivery schedule.

DELIVERY AND SPECIAL HANDLING
1 [ ] HOLD FOR PICK-UP (Fig in Box H)
2 [X] DELIVER WEEKDAY
3 [ ] DELIVER SATURDAY (Extra charge) (Not available to all locations)
4 [ ] DANGEROUS GOODS (Extra charge) (CSS not available for Dangerous Goods Shipments)
5 [ ] CONSTANT SURVEILLANCE SVC. (CSS) (Extra charge) (Release Signature Not Applicable)
6 [ ] DRY ICE ___ Lbs.
7 [ ] OTHER SPECIAL SERVICE
8 [ ]
9 [ ] SATURDAY PICK-UP (Extra charge)
10 [ ]
11 [ ]
12 [ ] HOLIDAY DELIVERY (If offered) (Extra charge)

PACKAGES	WEIGHT in Pounds Only	YOUR DECLARED VALUE	OVER SIZE
Total	Total	Total	

DIM SHIPMENT (Heavyweight Services Only) [ ] lbs.

Received At: 1 [ ] Regular Stop 2 [ ] On-Call Stop 3 [ ] Drop Box 4 [ ] BSC 5 [ ] Station

FedEx Emp No

Emp. No. Date

[ ] Cash Received
[ ] Return Shipment
[ ] Third Party [ ] Chg. To Dat. [ ] Chg. To Hold

Street Address

City State Zip

Received By: X Rollin R. [signature]

Date/Time Received: 01-31-91 FedEx Employee Number: 09:30

Release Signature:

Date/Time

Federal Express Use
Base Charges
Declared Value Charge
Other 1
Other 2
Total Charges

REVISION DATE 11/89
PART #119501 FXEM
FORMAT #014
014
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FIELD ASSESSMENT PROCEDURES

OUTLINE

Section

1.0 INTRODUCTION

2.0 STRATIGRAPHY SOUNDING

3.0 SOIL SAMPLING

4.0 WATER SAMPLING

5.0 FIELD QUALITY CONTROL PROGRAM

6.0 SAMPLE PRESERVATION, HANDLING, AND DOCUMENTATION

7.0 ON-SITE LABORATORY ANALYSIS

8.0 HEALTH AND SAFETY

Attachment 1 Subsurface Environmental Assessment Laboratory (SEAL) Statement of Capabilities

Attachment 2 Field Activity Log Sheet

Attachment 3 Chain-of-Custody Form

Attachment 4 Sample Preparation and Analysis Methods for Metals

Attachment 5 SEAL Health and Safety Plan

FIELD ASSESSMENT PROCEDURES

1.0 INTRODUCTION

Procedures to be used for sample collection, screening, and analysis of groundwater and soil during the field assessment are described in this section. The Du Pont East Chicago Plant Phase III subsurface investigation will use Conoco's Subsurface Environmental Assessment Laboratory (SEAL). Conoco Inc. is a wholly owned subsidiary of E. I. du Pont de Nemours & Company, Inc. (Du Pont).

SEAL, which uses traditional cone penetrometer technology, was developed to provide a state-of-the-art field investigation system for subsurface environmental projects. Unique designs and sampling innovations provide quality environmental sampling along with on-board analytical capabilities for obtaining physical and chemical data for groundwater and soil. The specific operating procedures and capabilities of the SEAL unit are discussed in Attachment 1.

SEAL was chosen for this investigation because of its ability to gather high quality soil and groundwater samples quickly, efficiently, and safely. SEAL can also operate in temperatures below freezing. SEAL's on-board gas chromatograph (GC) will be used to screen samples for volatiles, but only for a portion of the work. The bulk of the samples taken by SEAL will require a metals analysis. For this reason, Conoco's Mobile Lab will be on-site and fitted with an Atomscan Sequential ICP. The ability to generate "same day" screening results will allow for optimizing SEAL and its workplan since it can take many samples in a short period of time. This will become especially important during plume delineation.

Deviations from the procedures provided in this section may be required due to circumstances arising during the course of the field assessment. Any deviations from the specified program and the purpose for the deviation will be clearly documented in the daily field activity logs. Deviations will be closely scrutinized to determine what additional work may be necessary to complete the goals of this investigation.

2.0 STRATIGRAPHY SOUNDING

Prior to sampling, SEAL will be used to determine the shallow geology across the East Chicago Plant site. Earlier studies show that in some locations, the shallow geology is mostly fine-grained loose sand underlaid by a confining clay at a depth of 25-30 feet. The water table is from zero to eight feet below surface and varies within the plant site. A site-wide investigation is needed to better understand and define the local geology and groundwater conditions.

Stratigraphy will be determined using an electronic piezocone deployed by SEAL. This device, which measures about 1.44 inches in diameter, uses metallic strain gauges to measure tip and sleeve friction resistances. These resistances are influenced by the type of geology encountered as the cone is hydraulically deployed by SEAL's 20-ton ram assembly. A computer records resistance data and calculates an accurate description of the subsurface strata. These data can be immediately printed and

plotted on SEAL to provide preferred sampling depth information as well as cross sectional plots. An example printout and plot is shown in Attachment 1.

The electronic piezocone also provides pore pressure data and is useful for determining the water table and future water sampling depths.

To better characterize the site geology, at least thirty site-wide locations will undergo stratigraphy sounding. More locations may be required if it is found that the geology changes significantly between locations. All locations will be surveyed for elevation. All stratigraphy soundings will be advanced through the upper sand and at least two feet into the confining clay layer.

3.0 SOIL SAMPLING

SEAL will also be used to collect soil samples in the vadose zone. At least two 2-foot cores will be taken between zero and eight feet below surface. The intervals chosen for sampling will be field selected using the data generated during the stratigraphy sounding. The purposes of this sampling are to identify and eventually delineate local "hot spots" and to determine potential groundwater contamination sources. Initially, all sample locations will be set up on a 200-foot grid system across several areas of the site.

SEAL's unique soil sampling techniques and equipment allow for discrete samples to be taken from the selected intervals. A two-foot-long, one-inch diameter sample chamber remains sealed as it is deployed to the top of the desired interval. The conical tip along with the sealing "O"-ring is unlocked at the sampling depth by slightly retracting the connecting rods. A tremie line is then lowered through the hollow connecting rods and will lock onto the sampler's tip so that it can be removed. Soil is collected in the two-foot chamber as the sampler is advanced an additional two feet. The cutting edge of the sampler is fitted with a self-sealing sand catcher to prevent loss of the sample.

The sample is retrieved by fully retracting the connecting rods and removing the sample chamber. The sample is then separated into two one-foot sections by unscrewing the two-foot sample chamber. The sample may need to be extruded, but in most cases, will fall out since the cutting edge is slightly smaller than the sample chamber. When feasible, the sample will be shaved prior to being transferred into appropriate sample containers.

The entire procedure will be repeated for deeper sampled intervals using a clean sampler. Decontamination procedures are discussed in Section 5.0. It may be necessary to use a larger 1.5-inch diameter sampler to collect enough sample for analysis. The larger sampler is simply a scaled-up version of the one mentioned above.

4.0 WATER SAMPLING

Groundwater samples will also be collected using SEAL. Using the pore pressure and stratigraphic data, two depths from each location will be selected for groundwater

sampling. It is desired to know the conditions of groundwater near the top and bottom of the conductive zone, therefore, two depths at each location will be sampled.

SEAL is capable of collecting groundwater samples by several methods depending upon the analytical needs and the type of strata where the samples are to be taken. All methods employ the use of a retractable screen which remains sealed as it is deployed to the desired sampling depth. The screen is then exposed to the formation by retracting the connecting rods a distance equal to the length of the screen. Water can then be removed by three different methods.

The first and most popular method is to use a septum-top evacuated tube which contacts a septum on the sampler through a double needle. The evacuated tube then fills with water. The second method is to use a bailer through the hollow connecting rods in a manner similar to bailing a screened well. The third method is to pump the water using a peristaltic pump. Of course this is limited to shallow (<25 feet) depths. The plan is to pump the water, but field conditions may require another method.

The water samples will be taken from the same hole as the soil samples. After sampling water from the top of the aquifer, the screen will be fully retracted and the rods will be fitted with a clean sealed sampler to be deployed to the bottom of the aquifer. Water samples will be transferred to the appropriate sample containers and immediately sent to the on-site mobile lab for analysis which is described in Section 7.0. Appropriate documentation will accompany each sample as discussed in Section 6.0.

5.0 FIELD QUALITY CONTROL PROGRAM

To ensure and maintain high quality data, several measures are necessary before, during, and after each sampling event. These measures include:

- Documentation
- Equipment Decontamination
- Sampling Equipment Blanks
- Equipment Calibration
- Field Blanks and Duplicates

5.1 Documentation

The SEAL operator will maintain a field log for all SEAL activities. This log will include sample locations, depths, sampling time, and procedures for sampling. It will also be used to log sample descriptions, weather conditions, and any anomalies noted during the activities. A copy of the field activity log sheet is shown in Attachment 2.

In addition to the field log, sample chain-of-custody forms will accompany all samples delivered to the field lab or shipped to an outside laboratory. The next section discusses this in more detail. The chain-of-custody form the will be used is shown in Attachment 3.

Stratigraphy data, interpretations, plots, and the field activity log will be kept in loose leaf binders and indexed by location number. Additional information or notes may be added throughout the project.

5.2 Equipment Decontamination

To ensure sample integrity, all sampling equipment will be decontaminated prior to its use. Soil and water samplers will be dismantled and thoroughly washed using a five step decontamination procedure:

1. Water/Alconox detergent scrub to remove visible solids.

2. DI water/Alconox detergent brushing

3. DI water/mild acid rinse

4. DI water rinse

5. Methanol rinse

Disposable PVC gloves will be used to handle all samplers and will be discarded after each sampling event.

5.3 Sampling Equipment Blanks

To verify the effectiveness of the decontamination procedure, periodic equipment blanks will be taken. This will be accomplished by randomly selecting and subjecting clean samplers to rinseate samples or equipment blanks. The blanks will undergo analysis for the same parameters of the soil and water samples. The results will be documented in the field activity log sheet.

All equipment or solutions that could create a pathway for cross contamination will be subject to random blanks. This includes soil and water samplers, pump hose, sample handling tools, and decontamination rinse water.

5.4 Equipment Calibration

SEAL utilizes few pieces of equipment that require calibration. The reliability or calibration of the electronic piezocone will be verified prior to any stratigraphy soundings. This equipment will check tip and sleeve friction resistances.

Buffer solutions for pH and specific conductance will be used daily to check and calibrate the instruments.

Analytical standards will be run on both the SEAL GC and the ICP. These are discussed in detail in Section 7.0 and in Attachment 4.

5.5 Field Blanks and Duplicates

Periodic duplicate samples of both soil and water will be taken to further establish confidence in the sampling and analytical methods. The duplicate samples will be given a unique identification number to distinguish them from the primary samples.

During sampling, occasional field blanks will be collected to determine potential absorption of contaminants from the air or contaminated containers. Only DI water will be used for the blanks. Field blank vials will be filled at the sampling location by pouring the water directly into the vial. The sample will be logged on the chain-of-custody of analyzed using SEAL's GC.

6.0 SAMPLE PRESERVATION, HANDLING, AND DOCUMENTATION

6.1 Preservation

Sample preservation is needed to retard biological action and hydrolysis, and to reduce absorption effects. Preservation methods include pH control, preservative agents, refrigeration, and protection from light. The methods to be used for this investigation are as follows:

Water Samples

- Volatiles - 40 ml VOA with Sodium thiosulfate and refrigerate to 4°C.
- Metals - 125 ml darkened polyethylene bottle with nitric acid to pH<2 and refrigerate to 4°C.

Soil Samples

- Volatiles - 125 ml glass widemouth, no preservative
- Metals - 125 ml glass widemouth, no preservative

Soil samples will be preserved in the field immediately after sample collection by placing the samples in SEAL's on-board refrigerator. Most samples will be immediately delivered to the on-site lab for analysis.

Samples that are selected for analysis by a contract laboratory will be transferred into an insulated ice chest containing ice.

6.2 Documentation

Proper documentation includes items other than just the chain-of-custody. To prevent misidentification of samples, legible labels will be affixed to each sample container. These labels will remain durable and legible even when wet and will contain the following information:

Project name or ID number
Sampling point ID
Initials of collector
Date of collection
Analysis required

Samples delivered for immediate on-site analysis will also be labeled but may not carry all of the above information.

In cases where samples will be shipped off-site, a security seal will be placed on the sample container and on the shipping container to ensure the samples are not disturbed during transportation. Seals will not be necessary for samples being analyzed on-site.

A field log book containing sampling information will be maintained for all sample collection activities. This information will include:

- Sampling point ID
- Sampling interval depth
- Sampling procedures or methods
- Containers used, type
- Climatic conditions
- Sampling start and end time, military
- Field observations
- Sample observations (color,odor,etc.)

A chain-of-custody form will be employed that allows for the possession and handling of samples to be retraced from the time of collection through contract laboratory analysis. All sample containers will be labeled to prevent misidentification.

Chain-of-custody form will be used for all samples, even those delivered on-site for immediate analysis. This allows for maximum flexibility in deciding which samples need to shipped to a contract laboratory. Attachment 3 presents a chain-of-custody form that will be used. Persons relinquishing and receiving the samples will sign and date the form.

A copy of the chain-of-custody will be placed in the loose leaf binder in a dedicated section.

A logbook or a computerized log will be maintained in the on-site laboratory in order to document the processing steps applied to the sample. All information relevant to the preparation and analysis of the sample will be noted including time and date. Results of standards will also be maintained.

The results of on-site analytical work will be transferred to the loose leaf binder on a daily basis. Each results report will show only results for samples taken at a single location. More than one report can be generated for each location. This will facilitate keeping the data indexed by location only. Duplicate reports will also be kept by the analyst.

7.0 ON-SITE LABORATORY ANALYSES

The sampling plan calls for two soil and two water samples to be taken from each location. Measurements of pH, temperature, and specific conductance will be completed for water immediately after the sample is taken. In nearly all cases, both soil and water samples will be analyzed for metals using the on-site mobile laboratory. It is expected that some samples will be analyzed using both the mobile lab and SEAL's on-board GC. Selected samples will be sent to an outside contract lab for confirmation analyses.

Instrumentation for the metals analysis will include microwave digestion and a Thermo Jarrell Ash AtomScan 16 Sequential ICP Spectrometer. The metals to be analyzed are:

Aluminum	Chromium
Antimony	Lead
Arsenic	Nickel
Barium	Zinc
Cadmium	

Attachment 4 gives the details on sample preparation and analysis methods for metals.

Some samples from the old Trichlorofluoromethane plant area will be analyzed/ screened using SEAL's on-board GC. Compounds for screening include:

1,2-Dichloroethane	Trichlorofluoromethane
1,1,2-Trichloroethane	Benzene
Perchloroethylene	Ethylbenzene
Trichloroethylene	Toluene
Carbontetrachloride	Xylene

SEAL's GC is a HP 5890 Series II GC connected to a Tekmar 7050 carousel head-space autosampler. For chlorinated organics screening, an ELCD detector will be used. Volatile aromatic compounds (BTEX) will use a PID detector. By taking sample splits, several samples will be run before switching detectors. The detection limits achievable depend upon the standards and project demands. For this work,

detection limits will be about 50 ppb. Standards are run on a daily basis to ensure the screening integrity.

Both water and soil samples are placed in pre-weighed 20 ml septum-top headspace vials. The vials are heated and sampled by the headspace autosampler. The sampled vapor is then automatically carried through the GC column. The printout from the integrator can be compared to the standard and concentrations calculated.

All information generated during the analysis will be kept in the loose leaf binder and indexed by location. Data from standards will be kept in a separate section in the loose leaf binder.

Both the GC and ICP will be used to run equipment rinseate blanks and field blanks. These will be indexed on a location basis.

8.0 HEALTH AND SAFETY

The most important concern for any site assessment is that the work is carried out in a safe manner. There are risks associated with any physical activities, especially when heavy equipment is involved. Add in the potential for toxic exposure and the risks increase significantly. SEAL was designed to minimize these risks. This is evident in nearly all of the ancillary equipment on-board the truck. In addition, all personnel have had many hours of safety training, including the OSHA 1910.120 40-hour class. Safety will not be compromised for any reason. Independent audits are welcome. Attachment 5 is the Health and Safety Plan for SEAL.

8.1 SEAL'S Safety Features

A unique rod decontamination device is used to clean the outside of the rods as they are retracted and pulled from the ground. This device effectively wipes, washes, and rinses the rod to reduce the potential for contact and vaporization of the contaminants. The wastewater from this unit is collected and transferred to the on-board stainless steel waste disposal tank.

Since some work occurs beneath the cabin of the truck, a video camera is set up below and the monitor is near the truck operator in the cabin. This is to ensure that any hydraulic movement that occurs while working under the truck is directed by the person doing the work.

The floor of the truck's cabin is nearly six feet off of the ground. A ladder is used to enter the truck and a handrail and grab rails are located on the truck's door and near the door.

A grounding rod located at the rear of the truck will be driven into the ground at each location during threatening weather. Work will cease during local lightning storms.

A combustible gas monitor along with an hydrogen sulfide gas monitor will be used to sniff the area where the rod enters the ground. The alarms are located in the cabin.

A hood is also in the cabin and is used for sample handling when volatile contamination is potentially present.

Local emergency phone numbers will be posted inside the cabin. A cellular telephone will also be available on-board SEAL.

MSDS sheets for all chemical materials are available and found in the bookshelf and on the wall of the support vehicle. A copy of SEAL's Health and Safety Plan is also located on the bookshelf.

First aid kits are located on SEAL and in the support vehicle. An eyewash station, fire extinguishers, and three five minute escape pack respirators are also located on SEAL.

8.2 Personnel Protection

Approved safety glasses with non-flexible side shields and steel-toed boots are the required personnel protection. Hard hats will be worn in the required areas and in areas where overhead hazards exist. Hard hats are not required inside SEAL's cabin.

Disposable PVC gloves will be worn when handling rods and samples. For added wear protection, leather gloves can be worn over the PVC gloves. Other types of gloves are available for decontamination washing etc.

Tyvek coveralls and long-term breathing equipment are not stock items on SEAL. The use of these is expected to be very limited. Nomex coveralls are available.

8.3 Pre-Sampling Safety Requirements

Great forces and pressures are generated as the cone rod is deployed by SEAL. Because of this it is necessary to probe each location before sampling. Also, the appropriate site excavation permit will be obtained prior to field work. In areas where the presence of pipelines is unknown, it may be necessary to use a metal detector to locate nearby metallic obstructions.

The height of the truck is 13'6". In some plants, overhead pipe racks are a problem. This should be explored prior to mobilization. The weight of the truck is nearly 50,000 lbs and does require a firm base. Sampling on inclines is not recommended. The decision of what an unsafe surface is is left up to the truck operator.

amr/jfw924

ATTACHMENT 1

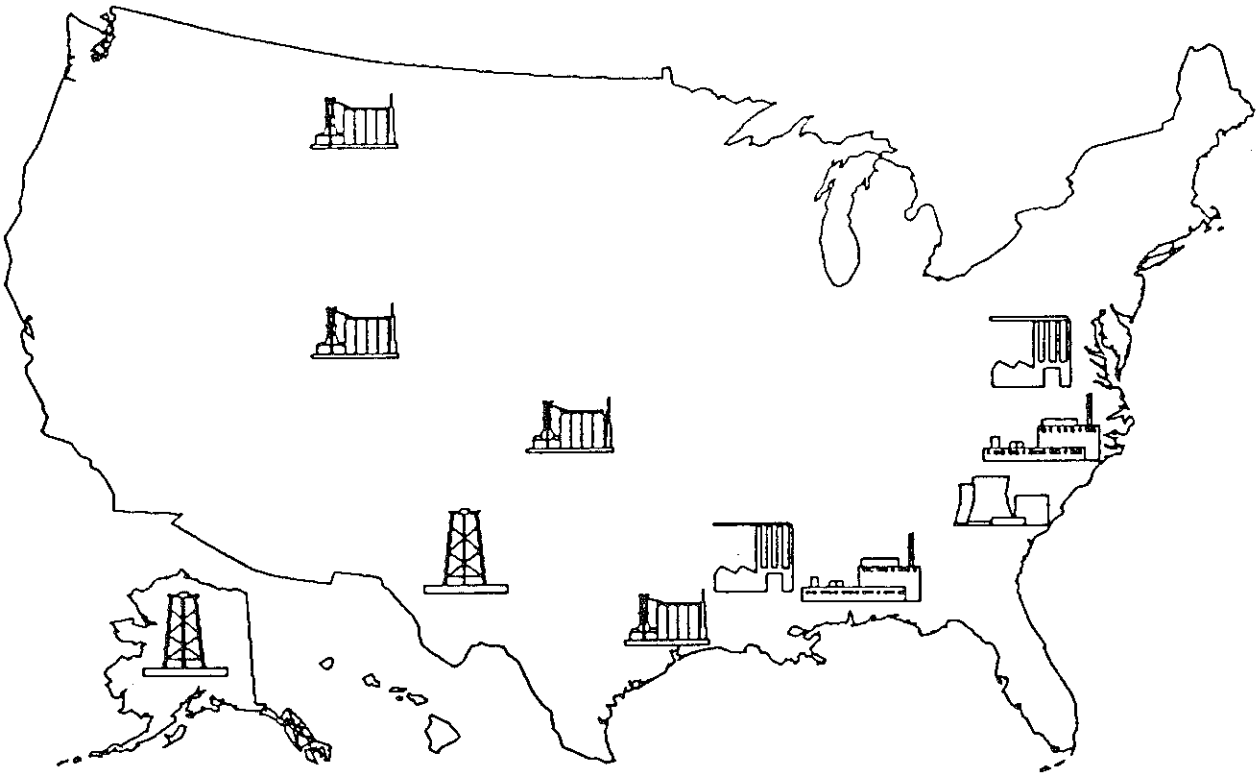
Subsurface Environmental Assessment Laboratory

(SEAL)

Statement of Capabilities

SUBSURFACE ENVIRONMENTAL ASSESSMENT LABORATORY

(SEAL)



CONOCO'S COMMITMENT

TO THE

ENVIRONMENT

STATEMENT OF CAPABILITIES

INTRODUCTION

Conoco Inc. has developed a state-of-the-art field investigation system which has coupled cone penetrometer technology with quality environmental sampling and on-board analytical capabilities that provide on-site, subsurface screenings and characterization in addition to environmental assessments for remediation.

Due to various factors, such minimal waste generation costs, quality in-situ sampling, and on-site analyses/screening, the use of our technology and expertise in the field of cone penetrometry and sample analysis can reduce the time required and, therefore, the overall cost, especially when compared to conventional drilling rigs or other subsurface investigative tools.

ON-SITE SERVICES

- Geologic/Geophysical Characterization
- Groundwater Flow Characterization
- Environmental Sampling (Water, Soil, Vapor)
- Monitoring (Long- or Short-Term)
- Analytical Chemistry
- Data Interpretation (Geological and Chemical)

OFF-SITE CONOCO ENVIRONMENTAL SERVICES

- Conoco-Ponca City backup offers expertise in Geotechnical Interpretations.
- Conoco-Ponca City backup offers expertise in the analysis of samples.
- Confidentiality is maintained within Du Pont.

APPLICATIONS

- Detect, delineate, and monitor subsurface contamination.
- Collect discrete, depth-specific, quality soil, water, or vapor samples.
- Provide increased accuracy and efficiency in the placement of monitoring systems.
- Installation of monitoring systems.
- Identification and quantification of contamination.
- Immediate in-depth backup support

METHODS

Location Safety Evaluation

Prior to penetration of the surface at all locations, each site is surveyed for possible subsurface obstructions. The methods used to locate buried objects are: 1) studying maps of the area, 2) communications with supervisory personnel, 3) hand probing to six feet, and 4) use of an industrial metal detector.

STRATIGRAPHY

Stratigraphic information is generated with an electronic cone that measures tip resistance, friction resistance, inclination, temperature, and in certain instances, dynamic pore pressure. A hydraulic ram pushes the cone and steel support rods into the ground at 2 cm/sec. A computer records and produces an immediate printout of all measured data, via link to the cone by a threaded cable. Tip and friction resistance values are used to calculate soil behavior type, and in some cases, dynamic pore pressure data is also generated. Pore pressure data allows for a more precise determination of water tables and can be used to determine groundwater flow direction in an aquifer. Pore pressure dissipation tests can also be completed using the Piezocone to help determine hydraulic conductivity.

As soundings occur, the computer collects and records data at 5 cm intervals. An interpretive software program calculates soil type every 25 cm based on an average of the 5 cm interval data points. Example data are located in the appendices.

GROUNDWATER SAMPLING

Groundwater samples are collected by one of two methods depending upon the customers needs and types of soils where the samples are to be collected. The BAT Groundwater Monitoring System is used when samples are collected from distinct water producing zones. The sampling system consists of a sleeve-covered hollow tip enclosed by a 40-micron filter. After the tip has been pushed to the proper depth, the rods are retracted just enough to remove the cover from the filter. A 35 or 150 ml evacuated vial with a double ended needle connected is lowered through the rods by cable to connect with the septum located on the hollow tip. The system is purged accordingly to ensure the collection of a representative sample. The second method is utilized when collection of water is required from less porous saturated soils. This system consists of a sleeve-covered 1 meter length of perforated pipe fitted with the appropriate mesh sized screen that is pushed to the proper depth. The screen is then exposed by retracting the push rods. A stainless steel bailer is used to collect the sample after proper purging.

The sample is then placed in appropriate containers and sealed. Conductivity, pH, and temperature readings are recorded immediately. When analyses are to be conducted on SEAL, a representative portion of the water collected is placed in a headspace vial.

SOIL SAMPLING

Soil samples of all types can be collected with the Conoco Soil Sampling Device. Two basic core sizes, either 1- or 1.75-inch diameter by any length up to 6 feet, can be collected. The water tight sealed sampler is pushed to the desired depth and retracted to release the tip

which opens the sampler. The hollow sampler is then pushed the required distance to collect the sample. A sand catcher developed by Conoco is used to ensure the collection and containment of very fluid types of soils.

The soil sample cores are removed from the collection tube and placed in sample jars and sealed. When analyses are to be conducted using SEAL, a representative portion of the core is placed in a headspace vial.

SOIL VAPOR SAMPLING

Both systems for groundwater sampling are also used for soil vapor collection. The BAT system is for small volumes of vapor needed for screening. The larger screen device is used if a large volume is collected into air bags.

MONITOR WELL INSTALLATION

Current capabilities enable SEAL to set 1-inch O.D. slotted PVC to any depth penetrable. Slot sizes available are .006-, .008-, and .010-inch.

Steel rods containing the PVC rods are pushed to the desired depth and then retracted, leaving the PVC rods in place and the slotted PVC exposed. If needed, the annulus produced by the removal of the steel rods can be sealed between the screen and ground surface by our special grout mixture and/or bentonite. The top of the PVC is covered with a threaded cap. When no longer needed, the PVC is removed below ground level and the remaining in-ground PVC is cemented full.

SEAL ANALYTICAL

Field analyses by SEAL are intended for screening purposes only. Approved laboratory analysis is suggested for obtaining EPA protocol reportable data.

A Hewlett-Packard 5790 Gas Chromatograph equipped with a Flame Ionization Detector (FID) and Photo Ionization Detector (PID) in series with a Hewlett-Packard 19395A Headspace Extractor is used for obtaining qualitative and quantitative data. The same set-up is also utilized for quick-screening of samples by utilizing direct injection.

For each soil analysis, a weighted aliquot of soil (approximately 10 gm) is placed into a pre-weighed headspace vial. For each water analysis, 10 ml of water is placed in a headspace vial. The vials are septa-capped, headspace extraction vials. For soil vapor analysis, direct injection to the GC is utilized specifically, using a gas-tight syringe. Minimum detection limits for most hydrocarbons is 50 ppb. Standards are run each day that analyses are run. These standards are utilized for qualitative as well as quantitative results.

QUALITY CONTROL

Numerous field blanks and equipment blanks are analyzed daily to define any problems that might arise concerning cross contamination. Cleaning of all equipment is accomplished by washing with Alconox detergent, acid rinsing, double rinsing with distilled water, and rinsing with methanol. Samples are stored in an on-board refrigerator. EPA approved sample containers and handling methods are used.

ROD DECONTAMINATION SYSTEM

A decontamination system, developed by Conoco, is used to remove soil and contamination from the surface of the down-hole rods and sampling equipment as they are withdrawn from the ground. The decontamination system consists of hydraulic driven brushes that remove gross contamination (soil), a hot water wash, and a rinse to remove chemical contamination. A vacuum line collects the spent water and soil for proper disposal. This system minimizes the spillage of soil and water and provides protection for the operators.

GROUTING SYSTEM

A unique grouting system seals the holes from the bottom up, ensuring hydraulic integrity. Grouting rods are immediately inserted down an existing hole created by the sounding routine or sampling procedure. Grout is pumped, by a positive displacement pump, through tubing threaded inside the rods, then the rods are retracted slowly, allowing the grout to fill the hole, then the holes are sealed off by hand. The non-shrinking grout used is a mixture of Portland Cement, an accelerator (calcium chloride), a fluid loss additive (D-73), and a dispersant (D-65). This grout mixture has been approved by all states currently utilizing SEAL.

ADVANTAGES OF SEAL

- Complete one-stop service
- In-depth technical backup
- Fast and reliable
- Eliminates well drilling problems and costs
- Data is immediately available
- Accurate and detailed data
- Reproducible
- No excess wastes for disposal
- More economical than conventional methods
- More data for the dollar

For More Information Contact:

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Ponca City, OK 74603

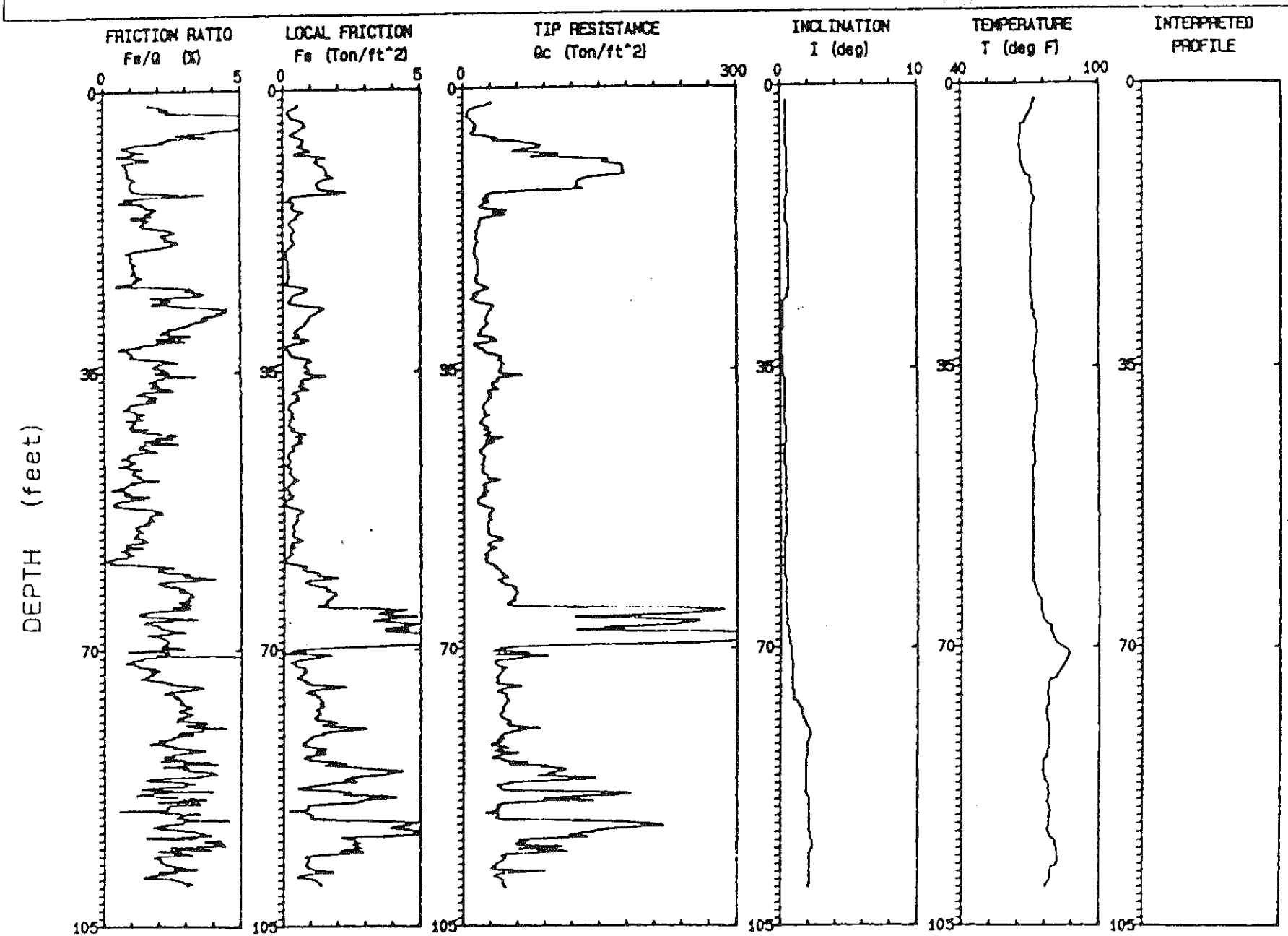
amr/dlr1491

Conoco Inc.

Operator : MIKE KASL
Location : LOCATION #8

CPT Date : 03-06-90 14:27
Cone Used : 0291

Sounding : LCV-63 Pg 1 / 1
Job No. : HOLE-01



Depth Increment : .05 m

Max Depth : 100.07 ft

Conoco Inc.

Operator :MIKE KASL
On Site Loc:LOCATION #8
Job No. :HOLE-01
Tot. Unit Wt. (avg) : 150 pcf

CPT Date :03-06-90 14:27
Cone Used :0291
Water table (meters) : 1.2

DEPTH (meters)	(feet)	Qc (avg) (tsf)	Fs (avg) (tsf)	Rf (avg) (%)	SIGV' (tsf)	SOIL BEHAVIOUR TYPE	Eq - Dr (%)	PHI deg.	SPT N	Su tsf
0.75	2.46	22.00	0.44	2.00	0.09	sandy silt to clayey silt	UNDFND	UNDFD	8	2.1
1.00	3.28	5.60	0.21	3.71	0.22	clay	UNDFND	UNDFD	5	.5
1.25	4.10	6.80	0.51	7.53	0.28	clay	UNDFND	UNDFD	7	.6
1.50	4.92	13.00	0.74	5.68	0.32	clay	UNDFND	UNDFD	12	1.2
1.75	5.74	11.60	0.40	3.48	0.36	silty clay to clay	UNDFND	UNDFD	7	1.1
2.00	6.56	28.00	0.66	2.35	0.39	sandy silt to clayey silt	UNDFND	UNDFD	11	2.7
2.25	7.38	74.40	0.66	0.89	0.43	sand to silty sand	70-80	42-44	18	UNDEFINED
2.50	8.20	71.00	0.70	0.99	0.46	sand to silty sand	60-70	42-44	17	UNDEFINED
2.75	9.02	111.00	1.28	1.16	0.50	sand to silty sand	70-80	44-46	27	UNDEFINED
3.00	9.84	163.80	1.39	0.85	0.54	sand	80-90	44-46	31	UNDEFINED
3.25	10.66	176.20	1.59	0.90	0.57	sand	>90	44-46	34	UNDEFINED
3.50	11.48	154.00	1.63	1.06	0.61	sand to silty sand	80-90	44-46	37	UNDEFINED
3.75	12.30	126.20	1.27	1.00	0.64	sand to silty sand	70-80	42-44	30	UNDEFINED
4.00	13.12	108.80	1.75	1.60	0.68	silty sand to sandy silt	70-80	42-44	35	UNDEFINED
4.25	13.94	27.40	0.42	1.52	0.72	sandy silt to clayey silt	UNDFND	UNDFD	10	2.6
4.50	14.76	24.40	0.33	1.34	0.75	sandy silt to clayey silt	UNDFND	UNDFD	9	2.3
4.75	15.58	29.00	0.49	1.70	0.79	sandy silt to clayey silt	UNDFND	UNDFD	11	2.7
5.00	16.40	34.80	0.47	1.36	0.82	silty sand to sandy silt	<40	36-38	11	UNDEFINED
5.25	17.22	18.00	0.27	1.51	0.86	sandy silt to clayey silt	UNDFND	UNDFD	7	1.6
5.50	18.04	15.40	0.37	2.42	0.89	clayey silt to silty clay	UNDFND	UNDFD	7	1.4
5.75	18.86	14.20	0.33	2.34	0.93	clayey silt to silty clay	UNDFND	UNDFD	7	1.2
6.00	19.69	15.00	0.36	2.40	0.97	clayey silt to silty clay	UNDFND	UNDFD	7	1.3
6.25	20.51	12.40	0.14	1.13	1.00	sandy silt to clayey silt	UNDFND	UNDFD	5	1.0
6.50	21.33	13.60	0.14	1.01	1.04	sandy silt to clayey silt	UNDFND	UNDFD	5	1.2
6.75	22.15	16.00	0.18	1.10	1.07	sandy silt to clayey silt	UNDFND	UNDFD	6	1.4
7.00	22.97	16.00	0.18	1.13	1.11	sandy silt to clayey silt	UNDFND	UNDFD	6	1.4
7.25	23.79	14.80	0.19	1.26	1.15	sandy silt to clayey silt	UNDFND	UNDFD	6	1.3
7.50	24.61	17.20	0.29	1.69	1.18	sandy silt to clayey silt	UNDFND	UNDFD	7	1.5
7.75	25.43	21.80	0.73	3.35	1.22	clayey silt to silty clay	UNDFND	UNDFD	10	1.9
8.00	26.25	12.20	0.28	2.31	1.25	clayey silt to silty clay	UNDFND	UNDFD	6	1.0
8.25	27.07	21.00	0.61	2.90	1.29	clayey silt to silty clay	UNDFND	UNDFD	10	1.9
8.50	27.89	30.40	1.34	4.39	1.33	silty clay to clay	UNDFND	UNDFD	19	2.8
8.75	28.71	26.00	0.97	3.75	1.36	silty clay to clay	UNDFND	UNDFD	17	2.3
9.00	29.53	25.60	0.78	3.05	1.40	clayey silt to silty clay	UNDFND	UNDFD	12	2.3
9.25	30.35	21.00	0.49	2.32	1.43	clayey silt to silty clay	UNDFND	UNDFD	10	1.8
9.50	31.17	23.20	0.59	2.55	1.47	clayey silt to silty clay	UNDFND	UNDFD	11	2.0
9.75	31.99	24.40	0.40	1.64	1.51	sandy silt to clayey silt	UNDFND	UNDFD	9	2.2
10.00	32.81	20.60	0.19	0.91	1.54	sandy silt to clayey silt	UNDFND	UNDFD	8	1.8

Dr - All sands (Jamiolkowski et al. 1985) PHI - Robertson and Campanella 1983 Su: Nk= 10

**** Note: For interpretation purposes the PLOTTED CPT PROFILE should be used with the TABULATED OUTPUT from CPTINTR1 (v 3.04) ****

Conoco Inc.

Operator :MIKE KASL On Site Loc:LOCATION #8 Page No. 2

DEPTH meters)	(feet)	Qc (avg) (tsf)	Fs (avg) (tsf)	Rf (avg) (%)	SIGV' (tsf)	SOIL BEHAVIOUR TYPE	Eq - Dr (%)	PHI deg.	SPT N	Su tsf
10.25	33.63	38.00	0.64	1.69	1.58	sandy silt to clayey silt	UNDFND	UNDFD	15	3.5
10.50	34.45	42.00	0.86	2.05	1.61	sandy silt to clayey silt	UNDFND	UNDFD	16	3.9
10.75	35.27	40.80	0.89	2.18	1.65	sandy silt to clayey silt	UNDFND	UNDFD	16	3.8
11.00	36.09	47.60	1.14	2.39	1.68	sandy silt to clayey silt	UNDFND	UNDFD	18	4.4
11.25	36.91	35.20	0.65	1.84	1.72	sandy silt to clayey silt	UNDFND	UNDFD	13	3.2
11.50	37.73	33.20	0.66	1.98	1.76	sandy silt to clayey silt	UNDFND	UNDFD	13	3.0
11.75	38.55	28.40	0.47	1.66	1.79	sandy silt to clayey silt	UNDFND	UNDFD	11	2.5
12.00	39.37	26.00	0.36	1.37	1.83	sandy silt to clayey silt	UNDFND	UNDFD	10	2.3
12.25	40.19	21.80	0.21	0.94	1.86	sandy silt to clayey silt	UNDFND	UNDFD	8	1.8
12.50	41.01	24.20	0.32	1.31	1.90	sandy silt to clayey silt	UNDFND	UNDFD	9	2.1
12.75	41.83	20.40	0.21	1.04	1.94	sandy silt to clayey silt	UNDFND	UNDFD	8	1.7
13.00	42.65	23.40	0.27	1.15	1.97	sandy silt to clayey silt	UNDFND	UNDFD	9	2.0
13.25	43.47	25.60	0.57	2.24	2.01	sandy silt to clayey silt	UNDFND	UNDFD	10	2.2
13.50	44.29	31.40	0.62	1.98	2.04	sandy silt to clayey silt	UNDFND	UNDFD	12	2.8
13.75	45.11	25.80	0.37	1.45	2.08	sandy silt to clayey silt	UNDFND	UNDFD	10	2.2
14.00	45.93	19.20	0.22	1.13	2.12	sandy silt to clayey silt	UNDFND	UNDFD	7	1.5
14.25	46.75	22.40	0.21	0.95	2.15	sandy silt to clayey silt	UNDFND	UNDFD	9	1.6
50	47.57	21.00	0.20	0.95	2.19	sandy silt to clayey silt	UNDFND	UNDFD	8	1.7
75	48.39	22.20	0.26	1.15	2.22	sandy silt to clayey silt	UNDFND	UNDFD	9	1.8
15.00	49.21	31.00	0.42	1.34	2.26	sandy silt to clayey silt	UNDFND	UNDFD	12	2.7
15.25	50.03	24.40	0.15	0.61	2.29	silty sand to sandy silt	<40	<30	8	UNDEFINED
15.50	50.85	23.20	0.22	0.95	2.33	sandy silt to clayey silt	UNDFND	UNDFD	9	1.9
15.75	51.67	18.40	0.16	0.86	2.37	sandy silt to clayey silt	UNDFND	UNDFD	7	1.4
16.00	52.49	19.80	0.19	0.98	2.40	sandy silt to clayey silt	UNDFND	UNDFD	8	1.5
16.25	53.31	30.80	0.59	1.92	2.44	sandy silt to clayey silt	UNDFND	UNDFD	12	2.6
16.50	54.13	28.80	0.48	1.65	2.47	sandy silt to clayey silt	UNDFND	UNDFD	11	2.4
16.75	54.95	26.80	0.35	1.29	2.51	sandy silt to clayey silt	UNDFND	UNDFD	10	2.2
17.00	55.77	27.40	0.35	1.26	2.55	sandy silt to clayey silt	UNDFND	UNDFD	10	2.3
17.25	56.59	37.00	0.52	1.40	2.58	silty sand to sandy silt	<40	30-32	12	UNDEFINED
17.50	57.41	29.40	0.28	0.96	2.62	silty sand to sandy silt	<40	<30	9	UNDEFINED
17.75	58.23	29.60	0.24	0.82	2.65	silty sand to sandy silt	<40	<30	9	UNDEFINED
18.00	59.06	24.80	0.09	0.35	2.69	silty sand to sandy silt	<40	<30	8	UNDEFINED
18.25	59.88	29.80	0.50	1.69	2.73	sandy silt to clayey silt	UNDFND	UNDFD	11	2.5
18.50	60.70	39.40	0.99	2.50	2.76	sandy silt to clayey silt	UNDFND	UNDFD	15	3.4
18.75	61.52	44.20	1.46	3.31	2.80	clayey silt to silty clay	UNDFND	UNDFD	21	3.9
19.00	62.34	44.80	1.08	2.41	2.83	sandy silt to clayey silt	UNDFND	UNDFD	17	4.0
19.25	63.16	57.60	1.73	3.00	2.87	sandy silt to clayey silt	UNDFND	UNDFD	22	5.2
19.50	63.98	56.80	1.74	3.07	2.91	sandy silt to clayey silt	UNDFND	UNDFD	22	5.2
19.75	64.80	52.40	1.55	2.96	2.94	sandy silt to clayey silt	UNDFND	UNDFD	20	4.7
20.00	65.62	241.40	3.86	1.60	2.98	sand to silty sand	70-80	40-42	>50	UNDEFINED
20.25	66.44	183.20	3.95	2.16	3.01	silty sand to sandy silt	60-70	38-40	>50	UNDEFINED
20.50	67.26	237.40	4.42	1.86	3.05	sand to silty sand	70-80	38-40	>50	UNDEFINED

Dr - All sands (Jamiolkowski et al. 1985) PHI - Robertson and Campanella 1983 Su: Nk= 10

*** Note: For interpretation purposes the PLOTTED CPT PROFILE should be used with the TABULATED OUTPUT from CPTINTR1 (v 3.04) ****

Conoco Inc.

Operator :MIKE KASL On Site Loc:LOCATION #8

DEPTH (meters)	DEPTH (feet)	Qc (avg) (tsf)	Fs (avg) (tsf)	Rf (avg) (%)	SIGV' (tsf)	SOIL BEHAVIOUR TYPE	Eq - Dr (%)	PHI deg.	SPT N	Su tsf
20.75	68.08	195.00	4.34	2.22	3.08	silty sand to sandy silt	60-70	38-40	>50	UNDEFINED
21.00	68.90	364.20	7.85	2.15	3.12	sand to silty sand	80-90	40-42	>50	UNDEFINED
21.25	69.72	239.00	5.46	2.28	3.16	silty sand to sandy silt	70-80	38-40	>50	UNDEFINED
21.50	70.54	47.20	0.67	1.41	3.19	silty sand to sandy silt	<40	30-32	15	UNDEFINED
21.75	71.36	67.00	1.23	1.83	3.23	silty sand to sandy silt	<40	30-32	21	UNDEFINED
22.00	72.18	35.80	0.39	1.10	3.26	silty sand to sandy silt	<40	<30	11	UNDEFINED
22.25	73.00	43.20	0.79	1.82	3.30	sandy silt to clayey silt	UNDFND	UNDFD	17	3.7
22.50	73.82	38.60	0.62	1.60	3.34	sandy silt to clayey silt	UNDFND	UNDFD	15	3.3
22.75	74.64	40.00	1.06	2.65	3.37	sandy silt to clayey silt	UNDFND	UNDFD	15	3.4
23.00	75.46	47.20	1.43	3.04	3.41	sandy silt to clayey silt	UNDFND	UNDFD	18	4.1
23.25	76.28	46.60	1.23	2.64	3.44	sandy silt to clayey silt	UNDFND	UNDFD	18	4.0
23.50	77.10	47.80	1.39	2.91	3.48	sandy silt to clayey silt	UNDFND	UNDFD	16	4.2
23.75	77.92	44.00	1.30	2.95	3.52	sandy silt to clayey silt	UNDFND	UNDFD	17	3.8
24.00	78.74	41.60	1.23	2.96	3.55	sandy silt to clayey silt	UNDFND	UNDFD	16	3.5
24.25	79.56	49.20	1.63	3.32	3.59	clayey silt to silty clay	UNDFND	UNDFD	24	4.3
24.50	80.38	64.80	2.31	3.57	3.62	clayey silt to silty clay	UNDFND	UNDFD	31	5.8
24.75	81.20	44.60	1.24	2.78	3.66	sandy silt to clayey silt	UNDFND	UNDFD	17	3.8
25.00	82.02	38.80	0.79	2.05	3.70	sandy silt to clayey silt	UNDFND	UNDFD	15	3.2
25.25	82.84	40.00	1.25	3.12	3.73	clayey silt to silty clay	UNDFND	UNDFD	19	3.3
25.50	83.66	44.60	1.13	2.53	3.77	sandy silt to clayey silt	UNDFND	UNDFD	17	3.8
25.75	84.48	49.60	1.60	3.23	3.80	clayey silt to silty clay	UNDFND	UNDFD	24	4.3
26.00	85.30	89.60	2.58	2.88	3.84	sandy silt to clayey silt	UNDFND	UNDFD	34	8.3
26.25	86.12	97.40	3.71	3.81	3.87	clayey silt to silty clay	UNDFND	UNDFD	47	9.0
26.50	86.94	109.60	2.30	2.10	3.91	silty sand to sandy silt	40-50	34-36	35	UNDEFINED
26.75	87.76	41.60	0.92	2.21	3.95	sandy silt to clayey silt	UNDFND	UNDFD	16	3.5
27.00	88.58	134.80	2.46	1.82	3.98	silty sand to sandy silt	50-60	34-36	43	UNDEFINED
27.25	89.40	105.60	3.14	2.97	4.02	sandy silt to clayey silt	UNDFND	UNDFD	40	9.8
27.50	90.22	39.40	1.03	2.60	4.05	sandy silt to clayey silt	UNDFND	UNDFD	15	3.2
27.75	91.04	35.00	0.81	2.32	4.09	sandy silt to clayey silt	UNDFND	UNDFD	13	2.8
28.00	91.86	83.00	2.54	3.06	4.13	sandy silt to clayey silt	UNDFND	UNDFD	32	7.6
28.25	92.68	196.60	4.31	2.19	4.16	silty sand to sandy silt	60-70	36-38	>50	UNDEFINED
28.50	93.50	132.80	4.71	3.55	4.20	sandy silt to clayey silt	UNDFND	UNDFD	>50	12.5
28.75	94.32	86.60	2.52	2.91	4.23	sandy silt to clayey silt	UNDFND	UNDFD	33	7.9
29.00	95.14	76.60	2.62	3.43	4.27	sandy silt to clayey silt	UNDFND	UNDFD	29	6.9
29.25	95.96	78.80	1.99	2.52	4.31	sandy silt to clayey silt	UNDFND	UNDFD	30	7.1
29.50	96.78	44.00	0.89	2.03	4.34	sandy silt to clayey silt	UNDFND	UNDFD	17	3.6
29.75	97.60	34.20	0.91	2.67	4.38	sandy silt to clayey silt	UNDFND	UNDFD	13	2.6
30.00	98.43	55.40	1.30	2.35	4.41	sandy silt to clayey silt	UNDFND	UNDFD	21	4.8
30.25	99.25	40.20	0.91	2.25	4.45	sandy silt to clayey silt	UNDFND	UNDFD	15	3.2
30.50	100.07	44.80	-13106.39	-29255.33	4.48	undefined	UNDFND	UNDFD	UDF	UNDEFINED

Dr - All sands (Jamiolkowski et al. 1985) PHI - Robertson and Campanella 1983 Su: Nk= 10

** Note: For interpretation purposes the PLOTTED CPT PROFILE should be used with the TABULATED OUTPUT from CPTINTR1 (v 3.04) ****

ATTACHMENT 2

Field Activity Log Sheet

FIELD ACTIVITY LOG SHEET

conoco

Page ___ of ___

Location: _____, Start Time: _____, End Time: _____

Site: _____, Town: _____, State: _____

Unit: _____, Operators: _____, _____, _____, _____

Proj. Consultant: _____, Company: _____

Date	Start Time	End Time	Location	File	Cone Strat.	Soil	Water	Mont. Well	Depth (ft)	Hole No.	Reason for Stopping 1. Tip Pressure 2. Predetermined Depth 3. Friction 4. Inclination 5. Hydraulic Pressure	Grouting: F - Funnel T - Tubing D - Downhole	Comments

amr/cws725

ATTACHMENT 3

Chain-of-Custody Form

Conoco Inc.
Research and Engineering

Environmental Sample Chain of Custody and Log

No. 005427

Facility Name	Transporter Name
Facility Address / Telephone No. ( ) -	Transporter Address / Telephone No. ( ) -
Facility Supervisor	Method of Shipping
Process Producing Sample	Special Shipping Instructions
Employee(s) Sampling	Remarks
Other Employee(s) Handling	

Sample I.D. No. and Description	Date	Time	Sample Type	Total Volume	Containers Type	Containers No.	Analysis Req. ▶ Preservative	

Signatures

Employee Sampling	Received by	Date/Time	Condition of samples upon arrival at final destination
Relinguished by	Received by	Date/Time	
Relinguished by	Received by	Date/Time	Signature / Date
Relinguished by	Received by	Date/Time	Temp. of samples on arrival at destination (Temp. sensitive analysis only)
Relinguished by	Received by	Date/Time	
Relinguished	Received by	Date/Time	Signature / Date

01-3[illegible]-032

UTSR 01/24/91

FEDERAL EXPRESS

QUESTIONS? CALL 800-238-5355 TOLL FREE.

AIRBILL
PACKAGE TRACKING NUMBER 6352149171

0170 3051

RECIPIENT'S COPY

13M 6352149171

Date 1-23

From (Your Name) Please Print	Your Phone Number (Very Important)	To (Recipient's Name) Please Print	Recipient's Phone Number (Very Important)
DAVID L. SHEROSKI	414-272-2426	HERB SCHATTENBERG	( )
Company: CH2M HILL	Department/Floor No.	Company: SOUTHWEST RESEARCH INSTITUTE	Department/Floor No.
Street Address: 310 W WISCONSIN AVE STE 700		Exact Street Address (We Cannot Deliver to P.O. Boxes or P.O. Zip Codes.): 6220 CULEBRA ROAD	
City: MILWAUKEE State: WI	ZIP Required: 53203	City: SAN ANTONIO State: TX	ZIP Required: 78[illegible]

YOUR INTERNAL BILLING REFERENCE INFORMATION (First 24 characters will appear on invoice.): CHI 28770.B0.SP

IF HOLD FOR PICK-UP, Print FEDEX Address Here
Street Address
City: LRG-I Chest State: ZIP Required:

PAYMENT 1 [X] Bill Sender 2 [ ] Bill Recipient's FedEx Acct. No. 3 [ ] Bill 3rd Party FedEx Acct. No. 4 [ ] Bill Credit Card 5 [ ] Cash

SERVICES (Check only one box)

Priority Overnight Service (Delivery by next morning†)
11 [ ] IR CHARGING
16 [ ] FEDEX LETTER *
12 [ ] FEDEX PAK *
13 [ ] FEDEX BOX
14 [ ] FEDEX TUBE

Standard Overnight Service (Delivery by next business afternoon†)
51 [ ]
56 [ ] FEDEX LETTER *
52 [ ] FEDEX PAK *
53 [ ] FEDEX BOX
54 [ ] FEDEX TUBE

Economy Service (formerly Standard Air) (Delivery by second business day†)
30 [ ] ECONOMY SERVICE

Heavyweight Service (for Extra Large or any package over 150 lbs.)
70 [ ] HEAVYWEIGHT **
80 [ ] DEFERRED HEAVYWEIGHT **

†Delivery commitment may be later in some areas. *Declared Value Limit $100. **Call for delivery schedule.

DELIVERY AND SPECIAL HANDLING
1 [ ] HOLD FOR PICK-UP (Fill in Box H)
2 [X] DELIVER WEEKDAY
3 [ ] DELIVER SATURDAY (Extra charge) (Not available to all locations)
4 [ ] DANGEROUS GOODS (Extra charge) (CSS not available for Dangerous Goods Shipments)
5 [ ] CONSTANT SURVEILLANCE SVC. (CSS) (Extra charge) (Release Signature Not Applicable)
6 [ ] DRY ICE ____ Lbs.
7 [ ] OTHER SPECIAL SERVICE ____
8 [ ]
9 [ ] SATURDAY PICK-UP (Extra charge)
10 [ ]
11 [ ] DESCRIPTION
12 [ ] HOLIDAY DELIVERY (Extra charge)

PACKAGES	WEIGHT In Pounds	YOUR DECLARED VALUE	OVER SIZE
1	25		
Total 1	Total 25	Total	

DIM SHIPMENT (Heavyweight Services Only)* [ ] ____ lbs.

Received At: 1 [ ] Regular Stop 2 [ ] On-Call Stop 3 [ ] Drop Box 4 [ ] BBO 5 [ ] Station

FedEx Emp. No.

Emp. No. Date
[ ] Cash Received
[ ] Return Shipment
[ ] Third Party [ ] Chg. To Del. [ ] Chg. To Hold
Street Address
City State Zip
Received By: X Rollin R. Reeves
Date/Time Received: 01-24-91 FedEx Employee Number: 10:00
Release Signature
Date/Time 1-23

Federal Express Use
Base Charges
Declared Value Charge
Other 1
Other 2
Total Charges

REVISION DATE 11/89
PART #119501 FXEM 12/89
FORMAT #014

014

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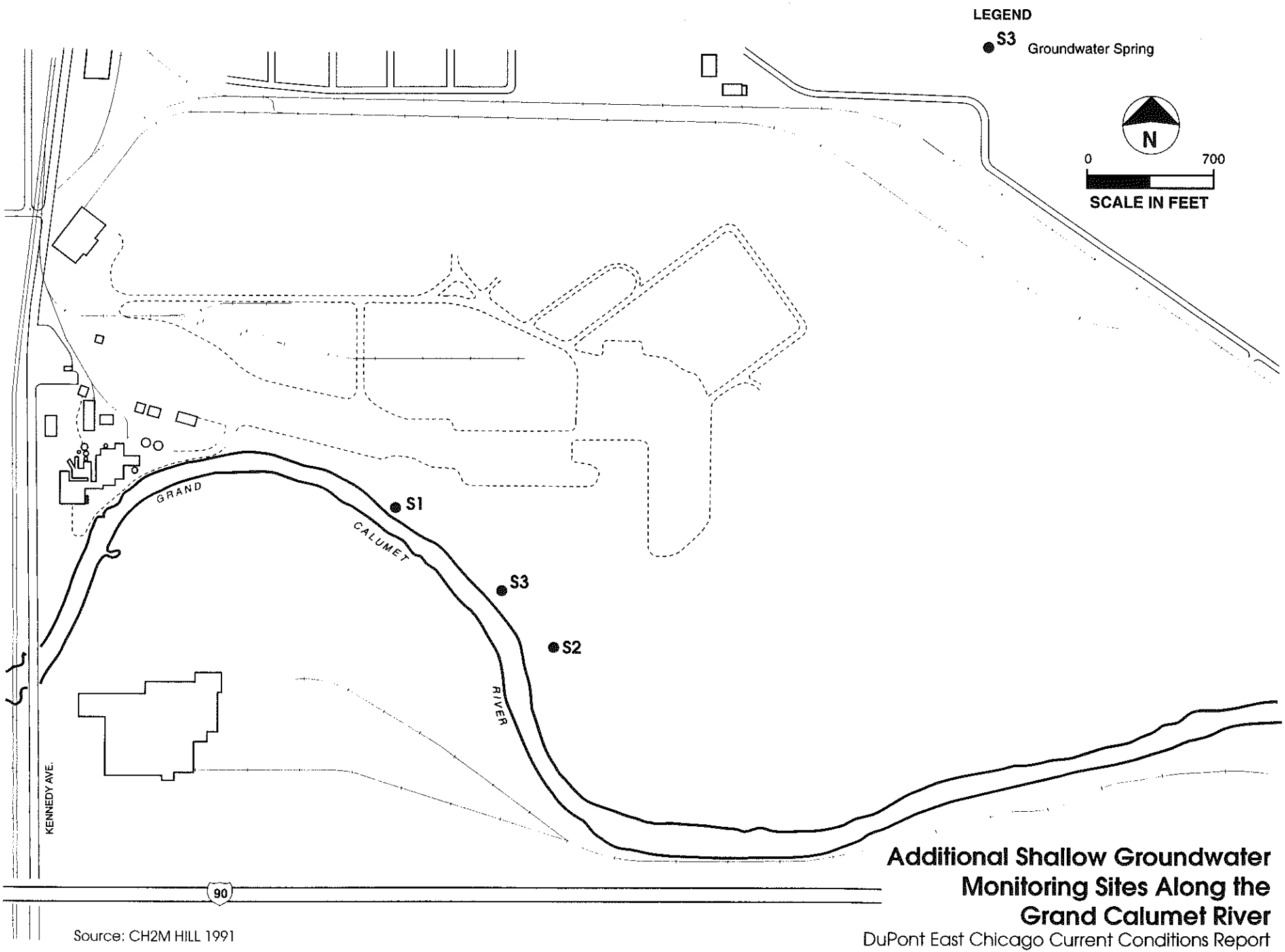

Source: CH2M HILL 1991

Additional Shallow Groundwater Monitoring Sites Along the Grand Calumet River

DuPont East Chicago Current Conditions Report

CH2MHILL

E142837.EC.CC Seeps Identified Along Gr Cal 10-16-97mms/tll

Phase III Quality Assurance Project Plan

(DERS 1992)

- Field assessment procedures
- Mobile lab ICP procedures

ATTACHMENT 4

Sample Preparation and Analysis Methods for Metals

ENVIRONMENTAL SERVICES DIVISION METHOD

FALCON-3005

ACID DIGESTION OF WATERS FOR TOTAL RECOVERABLE OR DISSOLVED METALS FOR ANALYSIS BY ICP SPECTROSCOPY

1.0 SCOPE AND APPLICATION

1.1 Method 3005 is an acid digestion procedure used to prepare soils, surface water, and ground water samples for analysis by inductively coupled argon plasma spectroscopy (ICP). This procedure is used as a screening technique and does not satisfy the quality control (QC) requirements of 40 CFR 136 and SW846 ICP methods. Samples prepared by method 3005 will be analyzed by ICP for Sb (antimony).

1.2 The analysis of digestate following the 3005 procedure reflects either total recoverable metals, dissolved metals, or suspended metals, depending upon whether the sample is filtered at the time of collection, prior to acidification with nitric acid for preservation.

1.3 Method 3005, a soft digestion, is presently the only digestion procedure recommended for Sb by SW846. It yields better recoveries than either Method 3010 or 3020. There is no hard digestion for Sb approved for SW846 at this time. However, 200.7 does not make this distinction.

2.0 SUMMARY OF METHOD

2.1 Total recoverable metals (TRM): The entire sample is acidified at the time of collection with nitric acid. At the time of analysis the sample is heated with acid and substantially reduced in volume. The digestate is filtered and diluted to volume, and then is ready for analysis.

2.2 Dissolved metals (DM): The sample is filtered through a 0.5 um filter at the time of collection and the liquid phase is then acidified (in the field) with nitric acid. At the time of analysis the sample is heated with acid and substantially reduced in volume. The digestate is again filtered (if necessary) and diluted to volume. It is then ready for analysis.

3.0 INTERFERENCES

3.1 The analyst should be cautioned that this digestion procedure may not be sufficiently vigorous to destroy some metal complexes. It is for this reason that "total recoverable metals" are reported.

4.0 APPARATUS AND MATERIALS

4.1 Griffin beaker, 200 mL capacity, borosilicate glass or polypropylene (approved for hot plate use).

4.2 Graduated cylinder, 50 mL, calibrated "to deliver".

4.3 Sample bottle, 60 mL, high density polyethylene, and a phenolic cap with a polyethylene liner.

4.4 Hot plate, controllable at 90° - 95°C. Calibrate the temperature adjustment knob using a thermometer immersed in sand. Monitor the temperature on the hot plate continuously using the same technique.

4.5 Qualitative filter paper and filter funnel.

5.0 REAGENTS

5.1 Water supply purified with a Milli-Q system. The water must be monitored daily, when in use, using the conductivity meter. Records of monitoring are kept in a log book maintained for each system according to the EVSD SOP for this purpose.

5.2 Concentrated nitric acid, J. T. Baker, Instra-analyzed, or an equivalent purity is used for digestion.

5.3 Concentrated hydrochloric acid, J. T. baker, reagent grade, or an equivalent purity is used for digestion.

5.4 Refer to the ICP QC Standards Preparation SOP for instructions on how to prepare secondary spike standards.

6.0 SAMPLE COLLECTION, PRESERVATION, AND HANDLING

6.1 All sample containers used in the laboratory must be prewashed with detergent, acids, and purified water. A conventional dishwasher is used for preliminary cleaning of labware. Acid soaking and rinsing with purified water should be done just prior to use.

6.2 Sampling and preservation:

6.2.1 Total recoverable metals: All samples must be acidified at the time of collection with HNO_3 (5 mL/L).

6.2.2 Dissolved and suspended metals: All samples must be filtered through a 0.5 um filter and then acidified at the time of collection with HNO_3 (5 mL/L). The filter and/or filtrate is returned to the lab for analysis. The volume filtered must be recorded and provided to the Inorganic Prep. Lab for suspended solids assays. See step 7.8.

6.3 Safety:

6.3.1 Standard laboratory safety precautions should be adhered to at all times. Refer to the Research and Engineering Safety Manual for required procedures.

6.3.2 Assume that all samples are hazardous. The use of fume hoods, safety glasses, lab coats, and protective gloves is mandatory at all times. Concentrated acids should be stored and transported in rubber buckets. The Safety Manual discusses use of face shields, gloves, aprons, gauntlets, fume hoods, and other protective measures when handling caustic materials.

6.3.3 Do not use cracked, chipped or otherwise damaged or stressed glassware. Dispose of or have repaired any damaged glassware.

6.3.4 Material Safety Data Sheets are available in the Library for all common laboratory chemicals. Obtain an MSDS from thee supplier on any new chemicals ordered for the laboratory. Provide a copy to the Library and to the Research and Engineering Industrial Hygiene Officer. Inform your Supervisor about any new or suspected hazards which have come to your attention.

6.3.5 Follow only prescribed procedures for disposal of samples and laboratory chemicals.

7.0 PROCEDURE

7.1 Enter the customer sample I.D., the project no. and dash no., the date collected, and the due date into the digestion log book. Verify that either TRM, TDM, or TSM has been requested by the client before proceeding further.

7.2 Organize samples into batches not exceeding twenty per batch. Each batch should be composed of samples of a similar matrix type destined for analysis on a given instrument and by a given method. Note the start date, the matrix type, the digestion method, and the method of analysis in the digestion log book. Arrange sample containers and labware to be assigned to each sample neatly in columns/rows on the lab bench. Each column will correspond to one sample.

7.3 Mix the sample thoroughly prior to opening the sample container. Note the presence of suspended solids in the digestion log book (comments column). The pH of each sample is checked prior to digestion by using a disposable pipet and pH indicating paper. The pH value is recorded in the digestion log book.

7.4 Measure about 45 mL of sample into a graduated cylinder, and follow the rest of the procedure (for a soil, use a weight of 1 gram). Use a disposable pipet to bring the total volume of sample in the graduated cylinder up to the 50 mL mark. Transfer the sample aliquot into a 200 mL beaker. Mark the sample identification on the beaker with a felt tip pen.

7.5 Add 2 mL of concentrated nitric acid and 5 mL of concentrated HCl to the beaker. Use a dispenser and allow the acid to slowly run down the inside

wall of the beaker into the liquid sample. This will prevent sputtering and loss of liquid due to localized heating upon addition of acid.

7.6 Cover the beaker with a ribbed watch glass if available. Place on a hot plate located inside a fume hood which has been designated for 3005 use. Heat at 90° - 95°C until the volume has been reduced to 15 - 20 mL.

CAUTION: Do not boil. Some metal chlorides are volatile and can easily be lost during this step.

Do not allow the digestate to evaporate to dryness. Start over with fresh sample if this inadvertently occurs.

7.7 Remove the beaker and allow to cool. Pour the digestate back into the original graduated cylinder used to measure out the sample. Rinse down the beaker walls and watch glass and add this rinsate to the graduated cylinder. Filter at this step only if there is concern that insoluble materials may clog the nebulizer. The filter and funnel must be thoroughly precleaned and rinsed with 1:1 HNO_3 to prevent contamination during the filtering process. Bring the total volume up to 50 mL using a disposable pipet and purified water.

7.8 Place a sample label on the 60 mL polyethylene bottle set aside during the staging process (see 7.2). Fill this labeled bottle from the graduate cylinder containing the diluted digestate.

7.9 Note the date completed and if filtration was done in the digestion log book.

8.0 QUALITY CONTROL (QC)

8.1 Each batch must contain one method (digestion) blank (MB). The method blanks are employed with each batch of samples digested to monitor impurity levels. If the method blank assay indicates metals are present above instrument detection limits (IDL's), reagents and glassware should be checked for sources of impurities. If impurities in the method blank exceed PQL's, analyses should be suspended until the problem is corrected. Method blanks results may be control charted and posted as a Lab metric to monitor performance.

9.0 ADDITIONAL INFORMATION

9.1 Method 3005 Digestion Logbook. See Appendix A.

9.2 Chain of Custody Form. See Appendix B

REFERENCES

1. "Test Methods for Evaluating Solid Waste, SW846", 3rd Ed., Rev. 0, Sept., 1986, Method 3005.

2. 40 CFR 136, July, 1990.

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Original Issue - October 1991

amr/FA3005.hlg

ENVIRONMENTAL SERVICES DIVISION METHOD

EVSD-FALCON3015

MICROWAVE ASSISTED ACID DIGESTION OF AQUEOUS SAMPLES

1.0 SCOPE AND APPLICATION

1.1 Method 3015 is used for the preparation of aqueous samples and wastes that contain suspended solids for analysis, by graphite furnace atomic absorption spectroscopy (GFAA), by direct aspiration flame atomic absorption spectroscopy (DAAA), or by inductively coupled argon plasma spectroscopy (ICP). This procedure is given in SW846 Revision 0, November 1990.

1.2 Samples prepared by method 3015 using nitric acid digestion may be analyzed by GFAA, DAAA, or ICP for the following metals:

Aluminum	Magnesium
Antimony	Manganese
Arsenic*	Molybdenum
Barium	Nickel
Beryllium	Potassium
Cadmium	Selenium*
Calcium	Silver
Chromium	Sodium
Cobalt	Thallium
Copper	Vanadium
Iron	Zinc
Lead	

Note: 1. *Cannot be analyzed by DAAA

2.0 SUMMARY OF METHOD

2.1 Nitric acid (HNO_3) is added to the aqueous sample in a 120 mL Teflon digestion vessel. The vessel is capped and heated in a microwave unit. After cooling, the vessel contents are filtered, centrifuged, or allowed to settle in a clean sample bottle for analysis.

3.0 INTERFERENCES

3.1 Very reactive or volatile materials that may create high pressures when heated may cause venting of the vessels with potential loss of sample and analytes. Samples that contain carbonates or other carbon dioxide generating compounds may cause enough pressure to vent the vessel. If this situation is anticipated, the analyst may wish to use a smaller sample.

4.0 APPARATUS AND MATERIALS

4.1 Microwave unit providing programmable power with a minimum of 574 watts, which can be programmed to within ± 10 watts of the required power. The microwave unit cavity is corrosion resistant and well ventilated. All electronics are protected against corrosion for safe operation.

4.2 Graduated cylinder, 100 mL, calibrated "to deliver", polypropylene.

4.3 Sample bottle, 125 mL, high density polyethylene, and a phenolic cap with a polyethylene liner.

4.4 Teflon PFA digestion vessels (120 mL capacity) capable of withstanding pressures up to 7.5 ± 0.7 atm (110 ± 10 psi) and capable of controlled pressure relief at pressures exceeding 7.5 ± 0.7 atm.

4.5 A rotating turntable within the microwave unit to insure homogeneous distribution of microwave radiation. The speed of the turntable should be a minimum of 3 rpm.

4.6 Analytical balance, 300 g capacity, minimum ± 0.01 g.

4.7 Quantitative filter paper, Whatman No. 41 and disposable polypropylene filter funnel.

5.0 REAGENTS

5.1 Water supply purified with a Milli-Q system. The water must be monitored daily, when in use, using the conductivity meter. Records of monitoring are kept in a log book maintained for each system according to the EVSD SOP for this purpose.

5.2 Concentrated nitric acid, J. T. Baker, Instra-analyzed, or an equivalent purity is used for digestion.

6.0 SAMPLE COLLECTION, PRESERVATION, AND HANDLING

6.1 All digestion vessels and sample containers used in the laboratory must be prewashed with detergent, acids, and purified water, or if disposable, have been shown to be free from contamination by results from blank assays.

6.1.1 Digestion vessels should be cleaned prior to use by leaching with hot (1:1) hydrochloric acid for a minimum of two hours followed by leaching with hot (1:1) nitric acid for a minimum of two hours, rinsed with Milli-Q water, and dried in a dust free environment.

6.2 Sampling and Preservation

6.2.1 All aqueous samples must be acidified at the time of collection with HNO_3 (5 mL/L) or to a pH < 2.

6.3 Safety

6.3.1 Standard laboratory safety precautions should be adhered to at all times. Refer to the Research and Engineering Safety Manual for required procedures.

6.3.2 Assume that all samples are hazardous. The use of fume hoods, safety glasses, lab coats, and protective gloves is mandatory at all times. Containers of concentrated acid should be stored and transported in rubber buckets. The Safety Manual discusses use of face shields, gloves, aprons, gauntlets, fume hoods, and other protective measures when handling caustic materials.

6.3.3 Do not use cracked, chipped, or otherwise damaged or stressed glassware. Dispose of, or have repaired, any damaged glassware.

6.3.4 Material Safety Data Sheets are available in the Library for all common laboratory chemicals. Obtain an MSDS from the supplier on any new chemicals ordered for the laboratory. Provide a copy to the Library and to the Research and Engineering Industrial Hygiene Officer. Inform your Supervisor about any new or suspected hazards which have come to your attention.

6.3.5 Follow only prescribed procedures for disposal of samples and laboratory chemicals.

6.3.6 There is a possibility that acid gases, released when sample containers vent inside the oven, may corrode the safety devices that prevent the microwave magnetron from shutting off when the door is opened. This can result in unsafe operator exposure to microwave energy. Use only a microwave unit with corrosion resistant safety devices to prevent this from occurring.

6.3.7 Do not use sealed digestion containers without pressure relief valves for microwave digestions by this method. Only unlined PFA Teflon containers with pressure relief mechanisms are considered acceptable at present.

7.0 PROCEDURE

7.1 Enter the customer sample I.D., the project no. and dash no., the date collected, and the due date into the digestion log book. Verify that each metal assay has been requested by the client before proceeding further.

7.2 Organize samples into batches not exceeding eleven per batch. Note the start date, the matrix type, the digestion method, and the method of analysis in the digestion log book. Arrange sample containers and labware to be assigned to each sample neatly in columns/rows on the lab bench. Each column will correspond to one sample. Weigh each digestion vessel to the nearest 0.01 g.

7.3 Mix the sample thoroughly prior to opening the sample container. Note the presence of suspended solids in the digestion log book (comments column). The pH of each sample is checked prior to digestion by using a disposable pipet and pH indicating paper. The pH value is recorded in the digestion log book.

7.4 Measure about 40 mL of sample into a graduated cylinder. Use a disposable pipet to bring the total volume of sample in the graduated cylinder up to the 45 mL mark. Transfer the sample aliquot into a Teflon digestion vessel. Enter the identification number on the vessel in the digestion log for each sample.

7.5 Add 5 mL of concentrated nitric acid to each vessel. Cap and weigh each vessel to the nearest 0.01 g.

7.6 A blank sample of reagent water is treated in the same manner as the samples. When fewer than the recommended number of samples are to be digested, fill the remaining digestion vessels with 40 mL water and 5 mL nitric acid.

7.7 Set the power program to bring the samples to 160° ± 4°C in 10 minutes and to 165°-170°C during the second 10-minute interval.

7.8 At the end of the microwave program, allow the vessels to cool for at least 5 minutes in the unit before removal to avoid possible injury. When the vessels have cooled to room temperature, weigh and record the weight of each vessel assembly. If the weight has decreased by more than 10 percent, discard the sample and reprocess.

7.9 Complete the sample preparation by carefully uncapping and venting each vessel in a fume hood. Transfer the sample to a precleaned polyethylene bottle. If particulates are present, the sample may be filtered and allowed to settle prior to analysis.

7.10 Filter at this step only if there is concern that insoluble materials may clog the nebulizer. The filter and funnel must be thoroughly precleaned and rinsed with 1:1 HNO_3 to prevent contamination during the filtering process. Filter into a second precleaned polyethylene bottle.

7.11 Place a sample label on the 125 mL polyethylene bottle and set aside for analysis.

7.12 Note the date completed and if filtration was done in the digestion log book.

8.0 QUALITY CONTROL (QC)

8.1 Method blanks are employed with each batch of samples digested to monitor impurity levels. If the method blank assay indicates metals are present above instrument detection limits (IDL's), reagents and glassware should be checked for sources of impurities. If impurities in the method blank exceed PQL's, analyses should be suspended until the problem is corrected.

8.2 Other quality control measures, including duplicate and/or replicate analyses, may be done at the discretion of the analyst.

REFERENCES

1. "Test Methods for Evaluating Solid Waste, SW846", 3rd Ed., Rev. 0, November 1990, Method 3015.

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ENVIRONMENTAL SERVICES DIVISION METHOD

EVSD-FALCON3051

MICROWAVE ASSISTED ACID DIGESTION OF OILS, SEDIMENTS, SOILS AND SLUDGES

1.0 SCOPE AND APPLICATION

1.1 Method 3051 is used for the preparation of nonaqueous samples and wastes for analysis by graphite furnace atomic absorption spectroscopy (GFAA), by direct aspiration flame atomic absorption spectroscopy (DAAA), or by inductively coupled argon plasma spectroscopy (ICP). This procedure is given in SW846 Revision 0, November 1990.

1.2 Samples prepared by Method 3051 using nitric acid digestion may be analyzed by GFAA, DAAA, or ICP for the following metals:

Aluminum	Magnesium
Antimony	Manganese
Arsenic	Mercury
Barium	Molybdenum
Boron	Nickel
Beryllium	Potassium
Cadmium	Selenium
Calcium	Silver
Chromium	Sodium
Cobalt	Strontium
Copper	Thallium
Iron	Vanadium
Lead	Zinc

Note: 1. Certain elements may require addition of hydrochloric acid (e.g., Sb) for quantitative recovery. This may be done at the end of the digestion cycle with a 3-5 minute reheating period.

2.0 SUMMARY OF METHOD

2.1 Ten mL of nitric acid (HNO_3) is added to 0.5 g of sample in a Teflon digestion vessel. The vessel is capped and heated in a microwave unit. After cooling, the vessel contents are filtered, centrifuged, or allowed to settle in a clean sample bottle for analysis.

3.0 INTERFERENCES

3.1 Very reactive or volatile materials that may create high pressures when heated may cause venting of the vessels with potential loss of sample and analytes.

Samples that contain carbonates or other carbon dioxide generating compounds may cause enough pressure to vent the vessel. If this situation is anticipated, the analyst may wish to use a smaller sample.

4.0 APPARATUS AND MATERIALS

4.1 Microwave unit providing programmable power with a minimum of 574 watts, which can be programmed to within ± 10 watts of the required power. The microwave unit cavity is corrosion resistant and well ventilated. All electronics are protected against corrosion for safe operation.

4.2 Graduated cylinder, 100 mL, calibrated "to deliver," polypropylene.

4.3 Sample bottle, 125 mL, high density polyethylene, and a phenolic cap with a polyethylene liner.

4.4 Teflon PFA digestion vessels (120 mL capacity) capable of withstanding pressures up to 7.5 ± 0.7 atm (110 ± 10 psi) and capable of controlled pressure relief at pressures exceeding 7.5 ± 0.7 atm.

4.5 A rotating turntable within the microwave unit to insure homogeneous distribution of microwave radiation. The speed of the turntable should be a minimum of 3 rpm.

4.6 Analytical balance, 300 g capacity, minimum ± 0.01 g.

4.7 Quantitative filter paper, Whatman No. 41 and disposable polypropylene filter funnel.

5.0 REAGENTS

5.1 Water supply purified with a Milli-Q system. The water must be monitored daily, when in use, using the conductivity meter. Records of monitoring are kept in a log book maintained for each system according to the EVSD SOP for this purpose.

5.2 Concentrated nitric acid, J. T. Baker, Instra-analyzed, or an equivalent purity is used for digestion.

6.0 SAMPLE COLLECTION, PRESERVATION, AND HANDLING

6.1 All digestion vessels and sample containers used in the laboratory must be prewashed with detergent, acids, and purified water, or if disposable, have been shown to be free from contamination by results from blank assays.

6.1.1 Digestion vessels should be cleaned prior to use by leaching with hot (1:1) hydrochloric acid for a minimum of two hours followed by leaching with hot (1:1) nitric acid for a minimum of two hours, rinsed with Milli-Q water, and dried in a dust free environment.

6.2 Sampling and Preservation

6.2.1 All aqueous samples must be preserved at the time of collection by storing at 4°C.

6.3 Safety

6.3.1 Standard laboratory safety precautions should be adhered to at all times. Refer to the Research and Engineering Safety Manual for required procedures.

6.3.2 Assume that all samples are hazardous. The use of fume hoods, safety glasses, lab coats, and protective gloves is mandatory at all times. Containers of concentrated acid should be stored and transported in rubber buckets. The Safety Manual discusses use of face shields, gloves, aprons, gauntlets, fume hoods, and other protective measures when handling caustic materials.

6.3.3 Do not use cracked, chipped, or otherwise damaged or stressed glassware. Dispose of, or have repaired, any damaged glassware.

6.3.4 Material Safety Data Sheets are available in the Library for all common laboratory chemicals. Obtain an MSDS from the supplier on any new chemicals ordered for the laboratory. Provide a copy to the Library and to the Research and Engineering Industrial Hygiene Officer. Inform your Supervisor about any new or suspected hazards which have come to your attention.

6.3.5 Follow only prescribed procedures for disposal of samples and laboratory chemicals.

6.3.6 There is a possibility that acid gases, released when sample containers vent inside the oven, may corrode the safety devices that prevent the microwave magnetron from shutting off when the door is opened. This can result in unsafe operator exposure to microwave energy. Use only a microwave unit with corrosion resistant safety devices to prevent this from occurring.

6.3.7 Do not use sealed digestion containers without pressure relief valves for microwave digestions by this method. Only unlined PFA Teflon containers with pressure relief mechanisms are considered acceptable at present.

7.0 PROCEDURE

7.1 Enter the customer sample I.D., the project number and dash number, the date collected, and the due date into the digestion log book. Verify that each metal assay has been requested by the client before proceeding further.

7.2 Organize samples into batches not exceeding eleven per batch. Note the start date, the matrix type, the digestion method, and the method of analysis in the digestion log book. Arrange sample containers and labware to be assigned to each sample neatly in columns/rows on the lab bench. Each column will correspond to one sample. Weigh each digestion vessel to the nearest 0.001 g.

7.3 Mix the sample thoroughly prior taking an aliquot.

7.4 Weigh 0.5 g of sample to the nearest 0.001 g into a preweighed digestion vessel. Enter the identification number on the vessel in the digestion log for each sample.

7.5 Add 10.00 mL (use a Rainen pipette) of concentrated nitric acid to each vessel inside a fume hood. Cap and weigh each vessel to the nearest 0.001 g.

7.6 A blank digestion vessel is treated in the same manner as the samples with addition of 10.00 mL nitric acid. When fewer than the recommended number of samples are to be digested, fill the remaining digestion vessels with 10 mL nitric acid.

7.7 Set the power program to bring the samples to 175° $\pm$ 4°C in 5.5 minutes and to 175° - 180°C during the next 4.5-minute interval.

7.8 At the end of the microwave program, allow the vessels to cool for at least 5 minutes in the unit before removal to avoid possible injury. When the vessels have cooled to room temperature, weigh and record the weight of each vessel assembly. If the weight has decreased by more than 10 percent, discard the sample and reprocess.

7.9 Complete the sample preparation by carefully uncapping and venting each vessel in a fume hood. Add 40 mL of Milli-Q water. Transfer the diluted sample to a precleaned polyethylene bottle. If particulates are present, the sample may be filtered and allowed to settle prior to analysis.

7.10 Filter at this step only if there is concern that insoluble materials may clog the nebulizer. The filter and funnel must be thoroughly precleaned and rinsed with 1:1 HNO_3 to prevent contamination during the filtering process. Filter into a second precleaned polyethylene bottle.

7.11 Place a sample label on the 125 mL polyethylene bottle and set aside for analysis.

7.12 Note the date completed and if filtration was done in the digestion log book.

8.0 QUALITY CONTROL (QC)

8.1 Method blanks are employed with each batch of samples digested to monitor impurity levels. If the method blank assay indicates metals are present above instrument detection limits (IDL's), reagents and glassware should be checked

for sources of impurities. If impurities in the method blank exceed PQL's, analyses should be suspended until the problem is corrected.

8.2 Other quality control measures, including duplicate and/or replicate analyses, may be done at the discretion of the analyst.

REFERENCES

1. "Test Methods for Evaluating Solid Waste, SW846", 3rd Ed., Rev. 0, November 1990, Method 3051.

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ENVIRONMENTAL SERVICES DIVISION METHOD

FALCON ICP

INDUCTIVELY COUPLED PLASMA ATOMIC ABSORPTION EMISSION SPECTROSCOPY

1.0 SCOPE AND APPLICATION

1.1 Inductively coupled plasma atomic emission spectroscopy (ICP) determines trace elements including metals in solution. The method is applicable to a large number of metals. Various matrices, including ground water, aqueous samples, and soils may be analyzed. Digestion prior to analysis is required for soils.

1.2 The method is based upon SW846 Method 6010. However, EPA protocol QC is not followed. Procedures described fulfill general requirements for screening samples for trace metals. Elements for which the method are applicable are listed in Table 1. Detection limits will vary with the matrices and model of spectrometer. Conoco currently uses a Thermo Jarrell Ash Atomscan 16 Sequential ICP. Estimated LDRs provide concentration ranges for clean aqueous samples.

2.0 SUMMARY OF METHOD

2.1 Prior to analysis, soil samples will be digested using microwave techniques. Water samples will be analyzed without digestion. If aqueous samples show excessive turbidity, Method 3005 or microwave digestion may be used at discretion of analyst. Before collection of the sample, a decision must be made as to the type of data required (dissolved, total recoverable, or total) so that the appropriate preservation and pretreatment steps may be accomplished. Filtration, acid preservation, etc., are to be performed at the time the sample is collected or as soon as possible thereafter.

2.2 The method describes the sequential multielemental determination of elements by ICP. This procedure is for field screening, and does not satisfy the quality control requirements of SW846 Method 6010 (3rd Ed., Update 1, Dec., 1987) or Method 200.7 (40 CFR 136, Appendix C, July 1, 1990). Method 6010 can be reported if all EPA QC requirements must be met.

The method measures element-emitted light by optical spectrometry. Samples are nebulized and the resulting aerosol is transported to the plasma torch. Element-specific atomic-line emission spectra are produced by a radio-frequency inductively coupled argon plasma. The spectra are dispersed by a grating monochrometer, and the intensities of the lines are monitored by a photomultiplier tube. Background correction is required for trace element determination. Background must be measured adjacent to analyte lines on samples during analysis. The position selected for background measurement, on either or both sides of the analytical line, will be determined by the complexity of the spectrum adjacent to the analyte line. The position used must be free of

TABLE 1
RECOMMENDED WAVELENGTHS AND DETECTION LIMITS (UG/L)

Element	Wavelength	IDL* Est'd.	MDL Meas'd.	PQL Est'd.
Aluminum	308.215	45	20	20
Antimony	206.838	32	40	250
Arsenic	193.696	53	20	100
Boron	249.678	-	2050	
	249.773	5	-	-
Barium	493.409	-	2	20
	455.403	2	-	-
Beryllium	313.042	0.3	3	10
Bismuth	223.061	-	30	100
Cadmium	228.802	-	3	10
	226.502	4	-	-
Calcium	317.933	10	3	10
Chromium	267.716	7	5	25
Cobalt	228.616	7	5	10
Copper	324.754	6	2	10
Iron	259.940	7	10	50
Indium	230.606	-	25	250
Lithium	670.784	5	-	-
Lead	220.353	42	70	250
Magnesium	279.079	30	30	100
Manganese	257.610	2	20	25
Molybdenum	202.030	8	6	50
Nickel	231.604	15	10	100
Phosphorous	178.287	-	30	150
	213.618	51	-	-
Potassium	766.491	**	800	2500
Selenium	196.026	75	30	100
Silver	328.068	7	5	10
Silica (SiO_2)	288.158	58	8	500
Sodium	588.995	29	10	750
Strontium	421.552	-	2	25
	407.771	0.3	-	-
Titanium	334.941	-	2	25
Thallium	190.864	40	80	100
Vanadium	292.402	8	7	25
Zinc	213.856	2	2	25
Zirconium	339.192	-	3	10

Note: *EPA-600/4-79-017, "Inductively Coupled Plasma-Atomic Emission Spectroscopy-Prominent Lines." Given as a guide only.
**Highly dependent upon operating conditions and plasma position.

spectral interference and reflect the same change in background intensity as occurs at the analyte wavelength measured. Background correction is not required in cases of linebroadening where a background correction measurement would actually degrade the analytical result. The possibility of additional interferences named in Section 3.0 should also be recognized and appropriate corrections made; tests for their presence are described in Step 8.5.

3.0 INTERFERENCES

3.1 Spectral interferences are caused by : (1) overlap of a spectral line from another element; (2) unresolved overlap of molecular band spectra; (3) background contribution from continuous or recombination phenomena; and (4) stray light from the line emission of high-concentration elements. Spectral overlap can be compensated for by computer-correcting the raw data after monitoring and measuring the interfering element. Unresolved overlap requires selection of an alternate wavelength. Background contribution and stray light can usually be compensated for by a background correction adjacent to the analyte line.

Previous experience with the sample matrix, or information from a companion technique for trace metal assays, can be used to verify the absence of spectral interference from an element in a sample. Potential spectral interferences for the recommended wavelengths are given in Table 2, Reference 1. The data in Table 2 are intended as rudimentary guides for indicating potential interferences; for this purpose, linear relations between concentration and intensity for the analytes and the interferences can be assumed.

3.2 Physical interferences are effects associated with the sample nebulization and transport processes. Changes in viscosity and surface tension can cause significant inaccuracies, especially in samples containing high dissolved solids or high acid concentrations. If physical interferences are present, they must be reduced by diluting the sample or by using a peristaltic pump. Another problem that can occur with high dissolved solids is salt buildup at the tip of the nebulizer, which affects aerosol flow rate and causes instrumental drift. The problem can be controlled by wetting the argon prior to nebulization, using a tip washer or diluting the sample. Also, it has been reported that better control of the argon flow rate improves instrument performance; this is accomplished with the use of a mass flow controller.

3.3 Chemical interferences include molecular compound formation, ionization effects, and solute vaporization effects. Normally, these effects are not significant with the ICP technique. If observed, they can be minimized by careful selection of operating conditions (incident power, observation position, and so forth), by buffering the sample, by matrix matching, and standard addition procedures. Chemical interferences are highly dependent on matrix type and the specific analyte element.

4.0 APPARATUS AND MATERIALS

4.1 Thermo Jarrell Ash Atomscan 16 Sequential ICAP.

4.2 Apparatus required for digestion and sample preparation can be found in separate SOPs.

5.0 REAGENTS

5.1 Water supply purified with a Milli-Q system must be available. The water must be monitored daily, when in use, using a conductivity meter. Records of monitoring are kept in a log book maintained for each system according to the EVSD SOP for this purpose.

5.2 Concentrated nitric acid, J. T. Baker, Instra-analyzed, or an equivalent purity.

5.3 Nitric acid (1:1). Add 500 mL concentrated HNO_3 to 400 mL of Milli-Q water and dilute to 1 liter. Add acid slowly to the water with vigorous stirring. Do not allow the solution to overheat. Pour the acid down the sides of the container to avoid sputtering.

5.4 Concentrated hydrochloric acid, J. T. baker, reagent grade, or an equivalent purity.

5.5 Hydrochloric acid (1:1). Add 500 mL concentrated HCl to 400 mL of Milli-Q water and dilute to 1 liter. Add acid slowly to the water with vigorous stirring. Do not allow the solution to overheat. Pour the acid down the sides of the container to avoid sputtering.

5.6 Calibration stock standards and working standards - see the ICP Standards Preparation SOP.

5.7 Instrument check standard - see the ICP Standards Preparation SOP.

5.8 Interference check solution - see the ICP Standards Preparation SOP.

5.9 Two types of blanks are required for the analysis. The calibration blank is used in establishing the analytical curve and rinsing between samples, and the reagent blank is used to correct for possible contamination resulting from the acids used in the sample digestion

5.9.1 The calibration blank is prepared by diluting 2 mL of (1:1) HNO_3 and 10 mL of (1:1) HCl to 100 mL in water. Prepare a sufficient quantity each day to flush the system between standards and samples.

5.9.2 The reagent blank must contain all the reagents and in the same volumes as used in processing the samples. The reagent blank must be carried through the complete digestion/preparation procedure and contain the same acid concentration as the sample solution used for analysis.

6.0 SAMPLE COLLECTION, PRESERVATION, AND HANDLING

6.1 All sample containers used in the laboratory must be prewashed with Alconox detergent, acids, and purified water. Acid soaking and rinsing with purified water should be done just prior to use.

6.2 Sampling and preservation:

6.2.1 Aqueous samples for total, total recoverable, and dissolved metals must be acidified with HNO_3 (5 mL/L) or to a pH of < 2 at the time of collection.

6.2.2 Nonaqueous samples should be stored at 4°C (refrigerator or ice chests) and analyzed as soon as possible.

6.3 Safety:

6.3.1 Standard laboratory safety precautions should be adhered to at all times. Refer to the Research and Engineering Safety Manual for required procedures.

6.3.2 Assume that all samples are hazardous. The use of fume hoods, safety glasses, lab coats, and protective gloves is mandatory at all times. Concentrated acids should be stored and transported in rubber buckets. The Safety Manual discusses use of face shields, gloves, aprons, gauntlets, fume hoods, and other protective measures when handling caustic materials.

6.3.3 Do not use cracked, chipped, or otherwise damaged or stressed glassware. Dispose of or have repaired any damaged glassware.

6.3.4 Material Safety Data Sheets are available in the Library for all common laboratory chemicals. Obtain an MSDS from the supplier of any new chemicals ordered for the Laboratory. Provide a copy to the Library and to the Research and Engineering Industrial Hygiene Officer. Inform your supervisor about any new or suspected hazards which have come to your attention.

6.3.5 Follow only prescribed procedures for disposal of samples and laboratory chemicals.

7.0 PROCEDURE

7.1 Set up the instrument with the proper operating parameters established in manufacturer's instructions. Check the Digestion Lab Log Sheet accompanying each batch of samples to determine which elements are to be analyzed. Verify that the appropriate QC samples have been included.

7.2 Initialize the instrument and verify background assignments using a mixed standard. Verify subtraction method using wavelength scans from an actual sample before proceeding with the analyses.

7.3 Calibrate the instrument using mixed calibration standards. Verify the reliability of calibrated standards periodically using standards from a separate supplier. Flush the system with the calibration blank between each standard. Use the average intensity of three exposures for both standardization and sample analysis to reduce random error. Normally, calibration (two point for each element) will be accomplished using a calibration blank (zero concentration values) and a standard blends containing each of the elements of interest at 10 ug/mL, except Ca, Al, Mg, Fe, and silver which will be at 100 and 1.0 ug/mL, respectively.

7.4 Once initial calibrations have been done and before beginning a sample run, reanalyze the high mixed calibration standards as if each were a sample. Concentration values should not deviate from actual values by more than 10 percent. If they do, follow the instrument manufacturer's instructions to correct this condition.

7.5 Flush the system with the calibration blank solution for at least 1 minute between all analyses.

7.6 Analyze the instrument check standard and the calibration blank after each 10 samples or 1 hour of operation, whichever is shorter.

7.7 The chronology of analyses should follow the following general pattern:

CAL BLK; CAL1; CAL2 (opt.); CAL3 (opt.); CALCHK; IEC; 10 Samples; CAL BLK; INSTR CHK STD; 10 Samples; CAL BLK; INSTR CHK STD.

7.8 Calculations: If dilutions were performed, the appropriate factors must be applied to sample values. All results should be reported in mg/L (liquids) to the thousandths place and up to three significant figures. Reagent blanks may be subtracted from sample results if the analyst deems it necessary.

8.0 QUALITY CONTROL

8.1 All pertinent data must be maintained in a hardcopy file with the corresponding batch file information of samples for which it was collected. This includes digestion method blanks and calibration data. Copying may be necessary to fulfill this requirement.

8.2 Dilute and reanalyze all samples which exceed the 1/2 x LDR for each element.

8.3 Employ a minimum of one method (digestion) blank (MB) per dilution batch (~20) to determine if contamination or memory effects are occurring.

It is recommended that whenever a new or unusual sample matrix is encountered, a series of tests be performed prior to analysis.

Matrix spike addition: An analyte spike added to a portion of a prepared sample, or its dilution, should be recovered to within 75 to 125 percent of the known value. The spike addition should produce a minimum level of 10 times and a maximum of 100 times the instrument detection limit. If the spike is not recovered within the specified limits, a matrix effect should be suspected.

CAUTION: Use a wavelength scan for the elements of interest to determine if spectral overlap may be occurring.

8.4 Check the instrument standardization by analyzing appropriate check standards as follows.

8.4.1 Check the instrument calibration using a calibration blank and two appropriate standards (see 7.3 and 7.6).

8.4.1.1 The results of the initial calibration verification (7.3) must agree within 10 percent.

8.4.1.2 The results of subsequent instrument check standard assays must agree within 10 percent of the expected value; if not, terminate the analysis, correct the problem, and recalibrate the instrument, and reanalyze the previous samples run since the last valid check.

8.4.1.3 The calibration blank should not show any elements at values > the reporting threshold (PQL); if not, correct the problem.

8.4.2 Interelement correction factors must be verified at the beginning of each analytical run. Do this be analyzing the interference check sample. Results should be within 20 percent of the true value obtained in 8.4.1.1.

8.4.2.1 The elements which generally are considered to be major potential interferents are aluminum, calcium, magnesium, and iron.

8.4.2.2 The daily IEC check is performed by analyzing a blend containing all elements of interest including the major interferents at a significantly higher concentration than the interferees. See 5.9. This solution is made using appropriate dilutions of Standards, containing the interferents at relatively high concentration.

8.5 A quality control sample obtained from a source independent of the calibration standards must be used periodically to verify the calibration standards. A fresh dilution of this sample should be used to monitor the standards. Periodic checks should agree within 10 percent of the true value listed on the control sample. If not prepare fresh calibration standard solutions and recheck.

9.0 ADDITIONAL INFORMATION

9.1 Instrument Run Log: Record all analyses (calibration, QC, and samples in the Log Book. A Log should be prepared for each instrument. The pages should all be signed by the analyst. Information must include sample i.d., project/dash nos., digestion methods performed, standard solutions used (referenced to Standards Prep. Log.), date of analysis, dilution factors, weights for solid samples, notebook references, and software file numbers. Other comments may be added as well, at the discretion of the analyst.

9.2 Analyst Green Notebook: Special calculations may be necessary for certain situations. These should be entered into the Analysts Green Notebook. The notebook and page number should then be entered as a reference in 7.7. Conoco R&E procedures must be followed for all Green Notebook records.

9.3 Project Files: Hardcopy of all raw data and preliminary reports must be maintained by the Lab Staff. These files will be kept on a daily basis. The Instrument Run Log may then be used to recover Project related data from the files, by referencing analysis dates and project numbers.

9.4 Digestion Lab Log Sheet. A log sheet filled out by the Digestion Lab will accompany each batch of samples to the Instrument Lab. This will reflect which method is needed for assay, and it will list the parameters to be determined. The analyst must mark samples complete on this form and return the finished samples together with the form to the Digestion Lab. The Form allows for the analyst to request rework on samples as well, if that is deemed necessary for some reason by the analyst (e.g. redigest, or redigest and spike).

9.5 Reports will be generated by the analyst using the Environmental Sample Analysis Results Load Sheet.

REFERENCES

1. "Test Methods for Evaluating Solid Waste, SW846", 3rd Ed., Revision 1, December 1987, Method 6010.

2. 40 CFR 136, Appendix C, Method 200.7, July 1, 1990.

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ATTACHMENT 5

SEAL Health and Safety Plan

4.0 SAFETY

4.1 General Information

Personnel working aboard SEAL are required to be familiar with the truck's safety features and the safety manuals provided in the Manuals Bookshelf. Most importantly, operators must be familiar and understand this document, the Operation and Safety Manual for the Subsurface Environmental Assessment Laboratory (SEAL). Personnel must also be familiar with Hazcom procedures and know how these procedures pertain to each work site.

4.2 Reporting of Accident, Injury or Illness

Personnel working on SEAL will report any accident, injury or illness to the appropriate supervisor immediately at Conoco in Ponca City. In case of accident or injury, the person in charge will accompany the employee to the medical office on-site or in instances of variable sites, to the nearest emergency room location. A cellular phone on-board SEAL can be used to contact emergency services if needed.

4.3 Hazard Communication Procedures

Personnel working on SEAL will complete and document Hazcom Training and will be familiar with all Hazcom procedures. Documentation will be available for inspection concerning any and all training required for working on specific sites including TSD sites. Employees will review MSDSs and other safety information before work begins.

4.4 Safety Equipment

4.4.1 First Aid Kit

A first aid kit is attached to the wall above the tool box by the rear exit door. The kit includes:

- Bandages
- Tape
- Skin Disinfectant
- First Aid Cream
- Instant Ice Packs

4.4.2 Eye Wash Apparatus

Two sealed, 32 oz, eye wash containers with eye cup are located for easy access on the truck. One is located on the wall by the hydraulic controls, the other is located above the sink. All personnel will be instructed as to their use. The bottles are labeled with an expiration date of approximately two (2) years. Unsealed bottles are discarded.

4.4.3 Fire Extinguishers

There are four (4) fire extinguishers on the truck. One fire extinguisher is located in the cab; two extinguishers are located inside the cabin; one in the front and one in rear of the cabin; one extinguisher is located on the outside rear of the truck next to the generator. Three are dry chemical A & B, and the fourth is a Halon A, B, and C rated (next to generator).

4.4.4 Eye Protection

Safety glasses will be required to be worn at all times while the truck is in operation. Safety glasses and/or goggles will be provided to visitors. Glasses are kept in the lockers. Safety glasses must be fitted with inflexible side shields.

4.4.5 Gloves

Appropriate gloves will provided. Nitrile rubber gloves are to be worn while handling hazardous materials. Work gloves are to be worn while operating the cone penetrometer system. Applicable gloves will be worn while operating the cone penetrometer, water, or soil sampling devices, and while grouting and decontaminating equipment.

4.4.6 Foot Protection

All personnel working on-board SEAL are required to wear steel-toed footwear.

4.4.7 Communication Radios and Telephone

A 2-way General Electric Radio is mounted in the cab. Also on board is a hand-held radio that can be carried away from the truck. A cellular telephone is located in the rear of the truck. Emergency numbers will be posted at every plant location.

4.4.8 Disposable Coveralls

Disposable coveralls are kept in the lockers located in the front portion of the cabin.

4.4.9 Hard Hats

Hard hats are kept in the lockers located in the front part of the cabin. Hard hats are not required unless required by the plant or where overhead hazards exist.

4.4.10 Truck backup alarm

When the truck's transmission is placed in reverse, the backup alarm immediately begins sounding. This alarm can be heard very easily by anyone at the rear of the truck.

4.4.11 Outside Mounted Trouble Lights

These lights are located on the exterior of SEAL. One is located at the rear of the truck next to the Onan generator. One each is located on each side of the truck above the decontamination systems location. The switch for turning these lights on is located beneath the hydraulic controls in the truck's cabin.

4.5 Truck Cabin Safety Features

The cabin has the following built-in safety features:

- Two Entrance-Exit Doors. Both doors are located on the right side of the truck and can be opened from inside or outside. Doors can be opened from inside when the truck is locked. One ladder is designated for each door and is attached to hooks immediately below doors. Each door has safety chains extending across the opening securely fastened on each side.

- Hand holds. Adjacent to each doorway are two hand holds. Each hand hold is strongly secured to the truck and facilitate the safe use of the ladders. The rear door is fitted with a handrail.

- Windows. There are four windows, two windows on each side of the truck.

- Ventilation System. The ventilation system is described in Section 3.1.3.

- Decontamination System. The decontamination system is described in Section 3.1.7.

- Model 2180 Single Channel Hydrogen Sulfide Gas Monitor 1188. Described in section 3.1.9.

- Model 480 Single Channel Combustible Gas Monitor 0689. Described in section 3.1.9.

- In-cabin hydraulic system splash guards and containment cables are in place.

4.6 Operational Safety Precautions

The following items will be part of the standard operating safety precautions:

- The Hydrogen Sulfide and Combustible Gas Monitors will be on at all times.

- Ventilation system should be operated whenever MSDS items are being handled in the cabin area, especially when working at sites of known contamination.

- Chemicals shall be properly stored in cabinets/refrigerator when not in use.

- Smoking will not be permitted on the SEAL.

- Eating must be confined to the mechanical front section of the cabin area at all times. Personnel should, however, abstain from eating on SEAL when working at probable contaminated sites and should, at these particular sites, leave the truck and eat at an appropriate facility.

- All work areas will be routinely cleaned with appropriate cleaners.

- Compressed gas cylinders are loaded aboard from the R&D West dock.

  If cylinders must be loaded or unloaded in the field, personnel will load and unload in pairs. Loading and unloading will be done from ground level without ladders, or from a truck bed.

- Checklists addressing routine procedures for the truck will be used and documented. These checklists are located in Section 8.0 of this manual. These include:

  Pre-Trip/Post-Trip Truck Maintenance and Safety Preparation
  Pre-Trip General Equipment and Safety Preparation
  SEAL Operators
  Hazcom On-Site
  Site Preevaluation
  Pre-Setup
  Pre-Operation
  Post-Operation

4.7 Literature

The following manuals are kept in the Manuals Bookshelf in the cabin of the truck and in Ponca City at 117B RE:

- SEAL Operation/Safety Manual
- MSDS Notebook
- R&D East Safety Manual
- NAP Safety Manual
- First Aid Manual
- Du Pont Physical Distribution Guidelines
- Safety Manual for Geophysical Field Operations

- Manual for Field Operations
- A Chemical Health and Safety Reference Guide
- Federal Motor Carrier Safety Regulations Pocketbook
- Driver's Pocket Guide to Hazardous Materials (Sixth Edition)
- 5890 Gas Chromatograph Reference Manual
- 5890 Gas Chromatograph User's Manual
- HP 3396A Integrator Operating and Reference Manual
- Optiflow 520 Digital Flowmeter Operation Manual
- Mettler PM4600 Delta Range Balance Operation Manual
- Mopet Motorized Pipetter Operation Manual
- HP ColorPro Graphics Plotter Operation Manual
- Okidata Microline 320 Printer Operation and Setup Manual
- TI-60 Calculator Operating Manual
- Tekmar Autosampler Manual
- ELCD Manual
- O.I. PID Manual
- O.I. FID Manual
- Cone Penetration Test Data Interpretation Routine Program Instruction Manual
- Model 1057-24 Inverter Users Manual
- Guidelines for Use and Interpretation of the Electronic Cone Penetration Test
- Extended Field Computer System Operation and Instruction Manual
- BAT Groundwater Monitoring System Instruction Handbook
- Fisher TW-6 Pipe and Cable Locator Operation Manual
- Sperry-Vickers Hydraulic Valve Components and Flow Control Valve Information and Overhaul Manual
- Chronomite Instant-flow Water Heater Manual
- Dayton Wet-Dry Vacuum Manual
- Chemgrout Mini-Grout Pump Manual
- Webasto Diesel-Powered Water Heater Manual
- Model 2180 Hydrogen Sulfide Gas Monitor 1188 Manual
- Model 480 Combustible Gas Monitor 0689 Manual

5.0 STANDARD OPERATING PROCEDURES

Immediate decisions concerning any procedures in this section can be made quickly by referencing the SEAL EVALUATION DECISION TREE (Section 7).

5.1 Site Preevaluation

Site preevaluation is the first step in standard operation of SEAL. A preevaluation consists of an on-site visit in advance to using SEAL. See step 1.0 in SEAL Evaluation Decision Tree for these procedures and steps. During the pre-site visit a complete list of compounds and the estimated concentrations that may be encountered must be provided. Also a determination must be made if samples are to be collected, and if so, what are the analyses to be run. If analyses are to be run, a complete list of the particular compounds and at what levels of detection required, must be produced for this particular work-site. This information must be evaluated and compared to the limits of SEAL's analytical system before a commitment to this particular site's work.

5.2 Site Evaluation

A site evaluation will include the following reviewed information:

- Stratigraphy maps
- Survey information
- Location of subsurface utilities, underground tanks, pipelines, and product lines.
- Location of overhead utilities and obstructions
- Additional information obtained from local personnel.

As a precautionary procedure the Fisher Metal Detector will be used to detect underground metal objects. It must be noted here that the metal detectors reliability can only be accepted if there are not any topographical metal objects within 25 feet of area that is being surveyed. Bright spray paint will be used to mark any underground hazards detected. The site sampling points will be clearly marked with paint. The location of all surface and subsurface obstacles will be so indicated on the site map. The sampling sites will be indicated on the site map. The site map will be permanently attached to the official log-book.

Overall height of the truck (13' 4") and weight (46,000 lbs) will be addressed when assessing the site.

In order to level the truck with the jacks, the slope of the surface must not exceed 6%.

5.3 Operating Procedures for Truck

5.3.1 Hydraulic System

1. Truck is set at the specific idle speed of 1400 RPM and the hydraulic system engaged.

2. Operator levels truck from inside cabin adjusting the four leveling cylinders as per instructions. It should be noted here that when the site is located on unlevel ground the truck should be parked perpendicular to the slope and not parallel and should be pointed downhill so as to keep the rear axles closer to the ground, therefore keeping the major weight of the truck closer to the ground.

3. When sounding is to begin, operator uses the hydraulic control levers to lower the ram with the jaw-locked rods into the ground.

4. Operator may elect to use hydraulic drill to break open hard surface before penetration of rods or the dummy tipped rod can be used to break through asphalt, or other hard surface material.

5. When decontamination system is to be used the hydraulic drill must be disconnected and the decontamination hydraulic lines connected in their place.

HAZARDS/RESPONSE

1. High-pressure lines leaking or breaking: Alsorb II Absorbent Sheets which are 100% polypropylene are carried on board to soak up spills of hydraulic oil. Tools are available for repairing any problem. Wherever possible, exposed hydraulic lines are covered with splash-guards. Lines are also equipped with retainers which will not allow the lines to flail freely if connections break.

2. High temperature and repeated exposure to hydraulic oils is discussed on the MSDS sheet.

3. Leveling cylinders will be secured in up position with special locking devices before moving.

5.3.2 Backing Of Truck

Whenever possible, while backing the truck the second operator will stand to the driver's side of the truck toward the rear area to help direct driver.

5.3.3 Truck Setup

1. Set emergency brake
2. Set engine idle-speed at 1400 RPM
3. Engage hydraulic pump per Truck Operating Manual
4. Turn on air line to cabin

5. Insert grounding rod into ground
6. Start Onan Generator per Generator Operating Manual
7. Turn on ventilation system and check flowmeter indicating system is operating
8. Observe all hydraulic lines outside of cabin at this time
9. Upon entering cabin turn on both Gas Monitors
10. Remove safety caps from gas cylinders, attach lines from regulators and turn on all appropriate gases to Gas Chromatograph
11. Place oil in headspace analyzer
12. Turn on all instruments except computer
13. Level truck utilizing bubble level located on ram
14. Reference now to the appropriate section for a particular operation

5.4 Operating Procedures for Standard Electronic Cone

MATERIALS

Electronic Cone
Driving Ram
Cone Rods
Computer

1. The particular cone to be used should be attached to the computer cable and allowed to warm up with the computer.

2. To begin sounding attach the appropriate rods to the cone and insert them into the holding jaws.

3. The baseline is set on the computer. If beginning baseline is appropriate, we are ready to begin the actual sounding.

4. Determination for using the decontamination system should be completed now. If the system will be needed, it should be installed in place now.

5. The insertion of the cone through the soil is carried out at a rate of 2 cm/sec. Rods are attached one at a time as the rods are lowered. When the desired depth is reached, or the maximum resistance is reached, the rods are withdrawn one at a time reversing the same method used during insertion.

6. Data obtained during sounding is printed out and recorded as it is obtained.

7. Rods are retrieved by exactly the opposite procedures for sounding. If decontamination is to be implemented, follow the decontamination procedures in Section 5.7.

8. Grouting of the hole will now be implemented using the appropriate technique. Refer to Section 5.8.

HAZARDS/RESPONSE

1. Placement of hands and location of computer cable during sounding are the most important items to be addressed by the second operator. Keep cable organized at all times. While ram is being moved up or down do not place hands in or around ram. Be aware of other operators actions at all times during sounding.

2. Handling of the cone itself is very important. The tips are pointed and sharp. Wear gloves at all times when handling the cones and rods.

3. The first 15 feet of penetration can be critical due to the unknown aspect of subsurface obstructions. During this time operators must be alert. Special attention must be given the gas detection system. Special attention must be given to the EFCS, specifically inclination and tip resistance. Gas Chromatograph runs must not be started at this time.

4. If decontamination system is being used during retrieving, be sure to turn off decontamination system before bringing cone through the system apparatus.

5. If decontamination system is being used be sure to detach computer cable-end to cone until cone has gone through the decontamination system.

5.5 Operating Procedure for Piezometer Cone

MATERIALS

Piezometer Cone
Driving Ram
Cone Rods
Computer
Filter Stones
Rubber retainer rings

1. Prior to actual assembly of the system, the filter stones must be deaired. With this process the filter stones are placed in a jar of glycerin which is placed in a small ultrasonic bath which is kept under vacuum and heated to over 100°C but not over 175°C. The filter stones must be totally submersed in the glycerin. They are allowed to deair for at least 24 hours. The top is placed immediately on the jar when completed. This operation is best completed in the home laboratory.

2. The cone should be attached to the computer cable and allowed to warm up with the computer.

3. Place cone in vice with tip end up and remove tip to expose the void chamber. This area must be deaired by flushing with a 50/50 solution of glycerin and water using a hypodermic needle.

4. Remove the cone from vice and place upside down in bucket of clean water. Remove a filter stone from storage and insert it onto tip and screw tip into void chamber.

5. Apply rubber retaining ring around the filter stone.

6. To begin sounding, remove cone from bucket and attach the appropriate rods to the cone and insert them into the holding jaws.

7. From here on follow procedures outlined in Section 5.4 on sounding.

8. Piezometer Cone Dissipation Test is now carried out pausing during penetration. The dissipation test can be performed at any depth. The rate of dissipation of excess pore pressure to a certain percentage of the equilibrium pore pressure is measured.

9. From here on follow procedures outlined in Section 5.4 on ending of sounding.

HAZARDS/RESPONSE

Refer to Section 5.4 Hazards/Response for Electronic Cone.

5.6. Sampling Procedures

1. Check sample bottles or tubes to see that labels are correct and that preservatives have been added if required. If samples are extremely contaminated refer to Section 5.6.4 on Hazcom procedures for labeling.

2. Fill field blanks.

3. Complete sampling with as little agitation as possible if liquid or gas.

4. With water samples, fill sample bottles (add preservatives for chlorine and other oxidizers if needed). Fill in the order: volatile organics, TOX, TOC, semi-volatile organics, and inorganics.

5. Measure pH, temperature and conductivity. Equipment is to be calibrated against known standards prior to use.

6. Attach security seals.

7. Record field conditions and note appearance and odor of sample on the field log sheets.

8. Rinse outside of sample bottle and place on ice.

9. Clean equipment appropriately.

5.6.1 Water Sampling Procedures

MATERIALS

BAT Sampling System
Single-ended 35 mL sample container with screw top containing flexible discs and washers
Chain of weights
Air driven vacuum pump for evacuating container
Reel of wire (50 m) with shackle and length markers
Bolt M 8 x 30 mm for removing filter tips
Double-ended hypodermic needles
Guide sleeve/spring assembly
Sample container housing
Single-ended hypodermic needles
Syringe (20 mL)
BAT Enviroprobe
BAT Sampling Rods

1. Determination of decontamination needs should be addressed before beginning, according to procedures in Section 5.7. If decontamination is required the inner washing brushes and seals in the decontamination system must be changed out with the small cone-rod size taken out and the larger BAT-rod size inserted.

2. Sample containers, which consist of the flexible disc, TEFLON washer, plastic top with septum and the single-ended glass tube itself, are prepared in the lab prior to on-site use by boiling or autoclaving for 10 minutes at 105°C.

3. The containers are evacuated on-site since the container must be at a lower pressure than the groundwater at the filters tip. This is accomplished by using the air powered vacuum pump with short tube and needle attached.

4. The sampling unit is now assembled. The stainless steel tip is attached to the appropriate rods with water sampling mechanism attached.

5. The complete mechanism is lowered to the predetermined depth using the penetrometer ram system. The rods are then retracted exposing the sampler screen.

6. The desired depth is measured using the attached numbered trigger wire mechanism.

7. Lowering of the weighted mechanism triggers the needle from the sample container to the tip itself. Filling will now take place.

8. Upon completion of filling, the mechanism is raised out of the rods.

9. The sample container is then removed from the mechanism.

10. Purging is usually required at least once, and depending on the sample characteristics as to clarity, could need purging several times before a suitable sample is collected.

11. The container is then stored appropriately until analyses are going to be run.

12. The rods are removed from the ground.

13. Grouting procedures in Section 11 should now be followed.

HAZARDS/RESPONSE

1. Hypodermic needles: Care will be taken to avoid accidents with needles. Needle tips will have covers attached and taped and placed in disposal containers.

2. Water sample vials do not pose a hazard unless broken. These containers are septa-sealed vials.

3. Contaminated rods and equipment will be cleaned with the decontamination system per Section 5.7.

4. Contaminated Piezometers will be disassembled and cleaned in the sink using proper ventilation and washing procedures.

5. Samples will be handled in the ventilation hood.

6. Special attention should be given to the decontamination system to ascertain that the brushes and seals have been changed to the BAT rod size.

5.6.2 Soil Sampling Procedures

MATERIALS

Stainless Steel Soil Tubes
Tip Assembly
Tremme Line Catch Assembly
BAT Rod Adapter

1. Be sure all sampling equipment has been properly cleaned and kept in clean storage prior to assembly of soil sampler.

2. PVC gloves are worn during assembly of sampler which is completed per SEAL instructional training. Prior determination of core length is advisable before assembly.

3. Attach assembled sampler to BAT sampling rods and prepare in ram assembly for penetrating.

4. Lower sampler to predetermined depth and retract three inches to unlock tip mechanism. Lower tremme line to retract tip to top of sampler. Push sampler to fill correct length of soil tubes.

5. Retract rods with sampler attached. Remove sample tubes and place in sealed plastic bags. PVC gloves are worn at all times while handling sample tubes.

6. Remove soil cores from tube inside the vent hood area. Samples are placed in appropriate sample containers. If field analyses are to be done, these are prepared at this time also.

7. Sampling equipment is stored in sealed bags until washed and decontaminated.

HAZARDS/RESPONSE

1. Pointed sampler tip - Always be aware of sharpness of tip.

2. Soil Sample Tubes will be open on both ends, therefore when handling, use PVC surgical gloves.

3. Contaminated rods will be cleaned with the decontamination system.

4. Soil Sampling device will be washed and decontaminated if needed using Alconox detergent and rinsed with deionized water.

5. Do not poke fingers through the sand catcher.

5.6.3 Soil-Gas Sampling Procedures

Refer to operating procedures for water sampling (Section 5.6.1).

5.6.4 Procedures for Packaging and Shipping Samples

1. Dry inside of shipping container
2. Place at least 2 layers of bubble pack on bottom of container
3. Place open drum liner inside container
4. Wrap larger bottles in bubble pack and smaller bottles in styrofoam holders. Bottles should be chilled prior to shipping.
5. Place bottles and holders inside plastic bags in the container. Bottles should be upright and packed as tightly as possible.
6. Fill the plastic bag with wet ice (do not use dry or blue ice).
7. Remove air from top portion of plastic bag, twist excess plastic tightly and wrap with ties.

8. Note sample dates and times on chain-of-custody. Finish filling out sample log sheet and chain-of-custody. Remove back copy of these forms for truck file.
9. Place chain-of-custody and sample log sheet in the plastic folders and place in the container on top, outside of the plastic bag.
10. Close container and seal tightly with strapping tape.
11. Place security seal on the strapping tape at the point where the container lid and bottom meet.
12. Ship priority-one (overnight) via Federal Express, Airborne, etc.
13. Notify laboratory destination of shipment.
14. When shipping samples that are suspected of contamination of greater than 1%, Hazcom Labels must be on the sample bottles. Hazcom procedures must be followed also when shipping.

5.7 Decontamination Procedures

1. The decontamination system will only be used when ground penetration is proceeding in areas where known toxic compounds are suspected in high concentrations.

2. The system should already be in place according to instructions when beginning sounding or sampling.

3. Attach hydraulic lines to decontamination system (DS) fittings on bulkhead on floor below hydraulic controls in cabin and beneath truck.

4. Switch on front tank water heater.

5. Switch on Wet-Vac system.

6. Turn on valve on water supply.

7. When retrieving the rods from the ground turn on the DS so it is running at the same time. Be sure system is turning in the clockwise direction by referring to directions on lever control. After one rod is above the jaws and ready to remove, turn off the DS. Continue this procedure until completed.

8. Do not run the electronic cones thru the DS. Clean the cones immediately in sink in the truck.

9. Do not run the soil sampler thru the DS. Clean the soil sampler in sink in the truck.

10. When decontamination is complete turn off water and wet-vac.

HAZARDS/RESPONSE

1. When friction reducer is being used the reducer must be removed before entering the DS housing.

5.8 Operating Procedures for Grouting

MATERIALS

Cement System Grout
- Class A-Type I Portland Cement
- Calcium Chloride
- D65 Dispersant
- D73 Fluid loss additive

Water
Stirrer
Flexible 3/8 in PVC tubing
Chemgrout Mini-Grout Pump
Mixing containers (5 gal plastic)
Disposal containers (5 gal plastic with lids)
Clamp Adapting Rods
Rubber gloves
Safety glasses
Hand spade
Dust mask

5.8.1 Mixing of Grout

Before going to the field the grout system components can be premixed into two mixing components. Twenty-five lbs of cement are mixed with .07 lb of D65 and .5 lb of Calcium Chloride. Nine-hundred fifty mLs of D73 are mixed with 1.3 gallons of water.

When SEAL is going to be away from Ponca City for extended stays, the three additives are carried on board in premeasured amounts. The D73 is carried in 1000 mL plastic containers, the .5 lb of Calcium Chloride and D65 are also carried in a sufficient sized plastic containers. The cement is purchased while on the road.

Calculations must be completed before grouting a specific hole to determine the exact amount of grout needed to fill the particular hole. This is done to ensure that there will be no voids left in the hole. The grout is mixed in a five gallon bucket. The mixing is accomplished with an air-powered drill with stirrer attached. The air line outlet is located underneath the right front cabin door. The mixing proportions should be 1.3 gallons of water for each 25 lbs of grout material. The 25 lbs of grout is equal to 3 gallons of grout. The basic formula for determining the amount of grout is very important. The grout will setup very quickly; therefore, it is very

important to mix only what is needed per opening or openings that are being grouted at one time. Approximately 3.0 gallon of mixed grout will fill a 20 ft hole.

Personnel will wear rubber gloves, safety glasses, dust mask, and long sleeved clothing. An abundance of water will be available at all times.

5.8.2 Technique No. 1

Technique No. 1 utilizes 3/8 inch PVC tubing which has been marked in meter lengths. This tubing is kept in fifty foot lengths and handled as rolls. The tubing is lowered the known depth of the hole. If the tubing mark matches the hole depth, grouting then begins. The tubing is connected to the grout pump. As the hole is filled, the tubing is pulled up slowly. Care must be taken to top off the opening properly to ensure there is no spillage on the surface. Any excess grout material is pumped into appropriate containers and the pump and tubing are flushed with water immediately. The flushing material is also collected into 5 gallon containers for disposal or can be used to mix grout for further grouting later. The disposal container is discarded according to specific site procedures and is documented.

5.8.3 Technique No. 2

This technique is utilized if it is determined the hole did collapse. This is determined by lowering the weighted tape measure down the hole from within the truck and comparing the measured depth with the computer print out depth reading. This technique is also utilized if the specific site requirements require downhole grouting. Technique No. 2 utilizes a 3/8" flexible PVC tubing threaded through sounding rods. A throw-a-way replaceable tip is inserted in the first rod. The rods are lowered down an existing hole to the desired depth. If the area is a contaminated area the rods must be inserted through the DS as described in Section 5.7. The top end is connected to the grout pump. When the desired depth is reached, the rods are backed off approximately 6 inches. Grout is then pumped down the tube to disengage the tip. The rods are raised 2 cm/sec as the grout is being pumped. Pumping is ceased as the top rod is removed. Repeat this procedure until end of rod reaches the top of the hole. Clean water is then pumped thru the system to flush out any excess grout. The excess is pumped into five gallon containers for future proper disposal according to specific site procedures and will be documented.

5.8.4 Technique No. 3

The truck is moved a short distance to allow ease of access to the hole. A funnel is inserted into the hole and the mixed grout is

poured down the hole until the hole is full at ground level. If the calculated amount of grout isn't accepted by the hole, insert the 3/8 inch PVC tubing down the hole and force grout down using the grout pump until hole is completely filled. Rinse funnel into liquid disposal container. If tubing is used also flush into the liquid disposal container with water until clean. The disposal container is disposed of according to the specific site procedures and will be documented.

HAZARDS/RESPONSE

1. Grouting material may be a skin irritant. Avoid prolonged exposure to skin. Wash off with water. Breathing of the dust should be avoided.

2. MSDS sheets for the grouting materials are on the truck.

3. Product or other materials may surface from the hole while grouting is in progress. Immediately clean up the material and place in five gallon buckets and seal. These will be disposed of according to the specific sites procedures and will be documented.

5.9 Analytical Procedures

5.9.1 Analysis of Water Samples

1. Personnel will be wearing PVC surgical gloves before beginning analysis.

2. Sample preparation is carried out under the fume hood located on the lab top.

3. Ten mL of sample is removed from water sampling bottle container or storage sample bottle located in the refrigerator, and placed in the 20 mL headspace vial using a pipetter. The vial is immediately sealed and placed in the Tekmar Auto-sampler. GC analysis then begins according to the particular analytical method used.

4. Unused sample is discarded into the liquid waste disposal system and the sample containers are discarded to the glass waste disposal system, or placed in storage for further analyses.

5.9.2 Analysis of Soil Samples

1. Operators will at all times be wearing PVC surgical gloves to avoid exposure and contamination of sample.

2. Sample preparation will be carried out using the ventilation system and hood.

3. Samples are removed from core tubes and placed in appropriate analysis container.

4. For on-board analysis, 10 gm of soil are placed in a 20 mL headspace vial. The vial is placed in the Tekmar autosampler. GC analysis is run according to a specific method.

5. Unused portion of sample will be discarded or resealed and stored for further analyses.

5.9.3 Analysis of Soil-Gas Samples

Refer to operating procedures for water analysis (Section 5.9.1).

HAZARDS/RESPONSE

1. Before starting up GC and autosampler, all fittings pertaining to any of the gases that are being used must be checked for leaks and be totally secured.

2. Detectors on the GC are very hot and contact with them must be avoided.

3. Hands will be kept dry when handling any cables connected to the analytical equipment.

4. 'l samples will be assumed contaminated therefore handle all samples accordingly.

5. Assorted glassware is being used therefore care will be taken to avoid broken pieces.

6. Reusable contaminated hardware and glassware will be washed in Alconox and thoroughly rinsed with deionized water.

5.10 Sampling and Stratigraphy Quality Assurance/Quality Control

In order to ensure the accuracy of stratigraphy data collected with the cone penetrometer system, correlations are made with existing soil core or well log data where they exist.

Soil samples are collected from distinct zones for visual confirmation by trained geologists.

Depth readings are made continuously with a mechanical/electronic recording device. These readings are confirmed by two methods. Rods are one meter in length and the number of rods used are counted. When soil conditions permit (non-collapsing hole) a measuring tape is lowered into the hole.

Automatic equipment decontamination is completed between samples and between holes.

Prior to collection of water samples for analyses, the equipment volume is purged and discarded.

Soil samples are collected directly into cleaned stainless steel tubes.

Equipment blanks, trip blanks, and duplicates are taken as needed, for both water and soil samples. Matrix spiked duplicates are also prepared, as needed.

Each site is flagged and staked for later survey or mapping.

6.0 REVISION AND UPDATING PROCEDURES

Continuous revisions are expected due to additions to the truck and alterations to operating procedures. Scheduled revisions will be completed yearly or as needed.

7.0 OPERATIONAL DECISION TREE

Step 1.0 Site Preevaluation

Identifying and Evaluating Physical Limitations

Height with bellows down	< 13 ft 6 in - STOP > 13 ft 6 in - CONTINUE
Height with bellows up	< 18 ft - STOP > 18 ft - CONTINUE
Weight	< 25 tons - STOP > 25 tons - CONTINUE
Width	< 8 ft - STOP > 8 ft - CONTINUE
	> 6% Grade - STOP < 6% Grade - CONTINUE

Ground surface conditions unable to support truck - STOP

Step 2.0 Site Evaluation

2.1 Stratigraphy Assessment

Ground Penetrable

Hand-Probe Penetration
< 10 ft - STOP
> 10 ft - CONTINUE

2.2 Soil/Water/Soil-gas Sampling Assessment

Probe unable to penetrate to predetermined sampling depth - STOP.

Determine if depth is sufficient for sampling.

Probe penetrates to predetermined depth - CONTINUE.

2.3 Analytical Capability Assessment

Required detection levels of components attainable - CONTINUE.

Required detection levels of components non-attainable - STOP.

Step 3.0 Subsurface Obstruction Assessment

Locations of utilities, pipelines, and tanks specifically indicated on site map - CONTINUE.

Locations not specifically indicated - STOP.

Local personnel specifically indicate locations - CONTINUE.

Local personnel do not know locations - STOP.

Assess all questionable locations using metal detection and specific assessments by SEAL personnel.

Step 4.0 On-Site Operation Evaluations

4.1 Truck Setup Preparation

Combustible gas detector siren not sounding - CONTINUE.

Combustible gas detector siren sounding - STOP.

Operate ventilation fan until detector siren stops - CONTINUE.

Upon entering cabin check hydrogen gas cylinder for leakage - CONTINUE.

Truck leveling is completed - CONTINUE.

Truck cannot be leveled - STOP.

Reposition truck - CONTINUE.

Repositioning not possible - STOP.

If relocating position too close to proximity that it will not help - ELIMINATE LOCATION.

4.2 Sounding

Computer baseline satisfactory - CONTINUE.

Unsatisfactory baseline - STOP.

Calibrate Cone - CONTINUE.

No downhole contamination suspected - CONTINUE.

Downhole contamination suspected - STOP.

Install decontamination unit and confirm operation - CONTINUE.

Immediate friction and/or tip quit indication - STOP.

Relocate to next location - CONTINUE.

Intermittent quit indications - STOP.

Damage to equipment imminent - STOP.

Quit indications due to very tight soils - CONTINUE.

Severe buckling of 1/8 in inside sleeve and/or rebounding of sounding tubes over one inch - STOP.

No buckling or rebounding CONTINUE until complete refusal.

4.3 Soil/Water/Soil-Gas Sampling

No downhole contamination suspected - CONTINUE.

Downhole contamination suspected - STOP.

Install decontamination unit and confirm operation - CONTINUE.

4.4 Grouting

Non-collapsed hole. Move truck and begin grouting using Technique I or III - CONTINUE.

Collapsed hole. Begin grouting using Technique II - CONTINUE.

Step 5.0 Emergency Evaluations and Responses

5.1 Follow these specific procedures during the first fifteen feet of ground penetration:

DO NOT LEAVE CABIN.

Keep doors shut and ladders up.

Pay close attention to rods and gas detection monitors.

5.2 Combustible or H_2S gases detected with aid of gas detection monitors.

Turn all systems off IMMEDIATELY.

Evacuate truck immediately.

Turn off generator.

Evacuate area - keep people away.

Notify proper authorities.

5.3. Subsurface obstructions detected by Cone Responses.

Remove rods from ground immediately.

Turn off all systems.

Review site problem.

8.0 CHECKLISTS

8.1 Pre-Trip General Equipment & Safety Preparation

DATE _____

SIGNATURE _____

SAFETY EQUIPMENT

( ) Fire Extinguishers (4)
( ) First Aid Kit
  Band-Aids
  Tape
  First aid cream
  Instant ice packs
  Disinfectant
  Concentrated eye wash
( ) Safety eye-wear
( ) Ear protection
( ) Foot protection
( ) Eye wash containers in date
( ) Gloves
( ) Hard hats
( ) Communication radio and batteries
( ) Extra batteries all sizes
( ) Safety cones and barrier ribbon
( ) Nomex clothing

OPERATING SUPPLIES

( ) Paper towels
( ) Detergent soap
( ) Waste containers
( ) Deionized water
( ) Syringes
( ) Scrubbers
( ) Gloves
( ) Solvents
( ) GC Standards
( ) Plumbing supplies
( ) Grouting supplies
( ) Decontamination supplies
( ) Sample bottles
( ) Chain-of-custody forms
( ) Sample labels
( ) UHP Gas cylinders
( ) General tools
( ) Snoop leak detection fluid

( ) Headspace vials and supplies
( ) Integrator paper
( ) BAT water sampling supplies
( ) PVC well setting supplies
( ) Continuous core soil sample supplies

8.2 SEAL Operators

DATE _____

SIGNATURE _____

( ) Driver log book

( ) Driver medical card

( ) Commercial drivers license

( ) Restrictions

8.3 Laboratory Hazard Communication Program Checklist

DATE _____

SIGNATURE _____

MSDS'S	YES	NO
1. Are all MSDS's received in the laboratory direct from vendors copied and sent to the R&E Industrial Hygienist?	( )	( )
2. Are all laboratory MSDS's filed in an appropriate manner, and made accessible to employees 24 hours per day?	( )	( )
3. Have employees been trained to access a MSDS?	( )	( )
4. Have employees been trained to understand the MSDS ?	( )	( )
VESSEL/CONTAINER LABELING		
1. Have Hazard Identification Tags been prepared for each vessel greater than 12 liters in vol.?	( )	( )
2. Have Hazard Identification Tags been attached to these vessels?	( )	( )
3. Have all portable containers been properly labeled (as a minimum, permanent ink covered with transparent tape)?	( )	( )
4. Are all sample containers properly labeled (as a minimum, permanent ink covered with transparent tape)?	( )	( )
5. Are all samples/containers etc., shipped with the appropriate label, and MSDS (or cover letter explaining health and physical hazards)?	( )	( )
6. Have procedures been implemented to insure that labels on incoming containers are not removed, defaced, or covered up?	( )	( )

8.4 Employee Information and Training

Training Provided By Health, Safety, and Environmental Group

	YES	NO
1. Have employees received initial generic Hazard Com. Training (available during New Employee Orientation Part A, or by request)?	( )	( )
2. Have employees received OSHA 1910.120 training and/or refresher?	( )	( )

Training Provided By Individual Group Supervisors

1. Has a training program been established to train all employees regarding each health and physical hazard in their work area?	( )	( )
2. Does the training program include provisions for training employees upon the introduction of a new hazard into the workplace?	( )	( )
3. Have employees been informed of the visual appearance or smell of the chemicals to which they may be exposed so they will know when they are being released into the atmosphere?	( )	( )
4. Have employees been informed of the measures they can take to protect themselves from chemical hazards?	( )	( )
5. Does the training program indicate specific procedures, work practices, and proper use of personal protective equipment?	( )	( )
6. Have employees been informed of R&E's vessel and container labeling procedure?	( )	( )
7. Does the training program include provisions for informing employees of hazards associated with non-routine tasks?	( )	( )
8. Do you have an outline of the training presented to employees including a listing of audiovisual aids?	( )	( )

GROUP SUPERVISOR

SIGNATURE _____ DATE _____

8.5 Site Preevaluation

DATE _____

SIGNATURE _____

( ) Stratigraphy maps
( ) Surface maps
( ) Survey information
( ) Type of service required
( ) Special problems
( ) Located water line
( ) Located gas line
( ) Located telephone line
( ) Located electrical lines
( ) Located sewer lines
( ) Located other lines
list _____
_____

( ) Metal detector survey
( ) Hand-driven rod probe survey
( ) Work locations identified with paint marks
( ) Locations accessible (See section--Decision tree)
( ) Familiar with site safety requirements
( ) Previous subsurface work on file
( ) Name and phone number of site manager
( ) Phone numbers of all utility companies
( ) Phone numbers of emergency units
( ) Potential contaminants identified
( ) Contaminants MSDS on file

8.6 Pre-Setup

DATE _____

SIGNATURE _____

( ) Utility locations identified

( ) Locations identified as to metal detection

( ) Hazcom procedures identified

( ) Identification of nearest telephones

( ) Identification of nearest emergency station

( ) Utility shutoffs identified

( ) Safety barriers erected

( ) Operational safety equipment in place

8.7 Pre-Operation Checklist
(Individual Location)

DATE _____

SIGNATURE _____

OPERATORS _____

( ) Disengage transmission

( ) Set emergency brake

( ) Turn on utility air

( ) Start generator

( ) Start diesel-powered water heater

( ) Turn on computer system

( ) Turn on gas detection system

( ) Check for air flow through gas detection system

( ) Install decontamination system

( ) Turn on compressed gases

( ) Check for leaks

( ) Startup all analytical systems

( ) Metal detector scan of area

( ) Pull up to specific site

( ) Disengage transmission

( ) Set emergency brake

( ) Engage hydraulic system and set engine speed to 1200 RPM

( ) Ground truck

( ) Release safety chains

( ) Level truck

( ) Raise bellows

*All discrepancies should be noted on reverse side

8.8 Post-Operation Checklist (Individual Location)

DATE _____

SIGNATURE _____

( ) Hole sealed

( ) Area cleared of debris

( ) Waste containers capped

( ) Equipment secured

( ) Lower bellows

( ) Lower truck

( ) Retrieve grounding rod

( ) Turn off diesel-powered water heater

( ) Disengage hydraulic system

*All discrepancies should be noted on reverse side

8.9 Completed Site Post-Operation Checklist

DATE _____

SIGNATURE _____

OPERATORS _____

( ) All truck systems off

( ) All holes sealed

( ) Waste tanks emptied

( ) All waste, liquid and solid, disposed of according to specific procedures of site (receipt and documentation must be attached)

( ) Water tanks emptied

( ) All equipment secured

( ) Remove decontamination system from beneath truck

( ) Compressed gas cylinders turned off and capped

( ) Hookup all utilities that were required off

( ) Notebooks and checklists completed

( ) Complete map with work locations

( ) Notify facility manager and safety personnel

*All discrepancies should be noted on reverse side

8.10 Pre-Trip/Post-Trip Truck Maintenance and Safety Preparation Checklist

UNIT NO. _____
MAKE _____
YEAR _____
DATE _____
MILEAGE _____

( ) General condition-exterior

( ) Cab condition-interior

( ) Radios

( ) Parking brake on-start engine

( ) Low air warning device

( ) Tractor protection valve on

( ) Tach at 1000 RPM-air pressure buildup

( ) Tractor protection valve off

( ) Engine off-compressor system air leak test

( ) Tachograph, (Tampering)?, Tachometer, Gauges, Horn, Wipers and Visors

( ) Heater-Defroster, Air-Conditioner

( ) Windshield, Cab Glass, Mirrors

( ) Foot Pedals-condition

( ) Steering wheel

( ) Safety equipment

( ) Fire extinguisher
Inspection date _____
Make _____
UL Rating _____

( ) First Aid Kit

( ) Accident reporting kit

( ) Emergency reflective triangles

( ) Spare bulbs and fuses

( ) Seat belts

( ) All wheels, lugs, and tires

( ) Headlights, turn signals, clearance, road spot lights

( ) Front suspension-alignment

( ) Fuel leaks

( ) Peep window, right door

( ) Exhaust system

( ) Battery mounts, covers, cables

( ) Fuel tank and cap

( ) Cab reflectors

( ) Deck plates

( ) Unloading or backup lights

( ) Air hoses

( ) Electrical cord and connectors

( ) Frame, suspension, cross-members and brakes

( ) License plate-bracket

( ) Tractor air tanks

( ) Cab steps and grab handle

( ) Chock blocks-secured

8.11 Gas Monitor Calibration

DATE _____

SIGNATURE _____

Calibration of H_2S and Combustible Gas Monitors.

Equipment Used: 1% propane calibration gas in air, with 0-4 liter rotometer on bottle. H_2S permeation device for H_2S sample.

This procedure to be used with system vacuum pump.

Combustible Gas:

Connect lower suction line to calibration gas bottle. Adjust rotometer for 2 liter flow. Adjust gas monitor to read 49% on meter. Disconnect calibration gas bottle and recheck zero adjustment.

H_2S Gas Detector:

A Kintec permeation type device was used to set H_2S concentration. Permeation tube characteristics determine needed flow rates for a particular H_2S concentration. Calibration information is provided with each tube.

Connect lower suction hose to Kintec gas span output. Adjust flow rate for approximately 100 ppm. Adjust upper level to desired reading. Monitor for 30 min. Disconnect Kintec. Let system air out. Reconnect Kintec again. Adjust flow rate for approximately 20% of full scale. Adjust lower level adjustment for desired reading.

Repeat procedure for confirmation of desired readings.

NOTE: Adjustment procedures are described in monitor manuals in SEAL.

Manuals show devices and calibration techniques at the sensor. Calibration with flow from the input was used to confirm that the sensor reading reflects funnel input. Calibration of the sensors directly does not ensure that the meter reading will correspond to the input of the funnel.

9.0 TRUCK LICENSING, REGISTRATION, AND INSPECTION

SEAL is Proportionally Registered in the following States with license No. P69145:

Alabama	Michigan	Texas
Arizona	Minnesota	Utah
Arkansas	Massachusetts	Virginia
California	Missouri	Washington
Colorado	Montana	West Virginia
Connecticut	Nebraska	Wisconsin
Florida	New York	Wyoming
Idaho	North Carolina	
Illinois	North Dakota	
Indiana	Oklahoma	
Iowa	Oregon	
Kansas	Pennsylvania	
Kentucky	South Carolina	
Louisiana	South Dakota	
Maryland	Tennessee	

Owned & operated by Conoco R&E, Ponca City, Oklahoma.

10.0 RECORDS

Permanent bound notebooks are maintained for the SEAL. Those being:

Operation Log
Analysis Log
Checklist Log
Reports

11.0 FIGURES

Mobile Lab ICP Procedures

HLG

ENVIRONMENTAL SERVICES DIVISION METHOD

FALCON ICP

INDUCTIVELY COUPLED PLASMA ATOMIC ABSORPTION EMISSION SPECTROSCOPY

1.0 SCOPE AND APPLICATION

1.1 Inductively coupled plasma atomic emission spectroscopy (ICP) determines trace elements including metals in solution. The method is applicable to a large number of metals. Various matrices, including ground water, aqueous samples, and soils may be analyzed. Digestion prior to analysis is required for soils.

1.2 The method is based upon SW846 Method 6010. However, EPA protocol QC is not followed. Procedures described fulfill general requirements for screening samples for trace metals. Elements for which the method are applicable are listed in Table 1. Detection limits will vary with the matrices and model of spectrometer. Conoco currently uses a Thermo Jarrell Ash Atomscan 16 Sequential ICP. Estimated LDRs provide concentration ranges for clean aqueous samples.

2.0 SUMMARY OF METHOD

2.1 Prior to analysis, soil samples will be digested using microwave techniques. Water samples will be analyzed without digestion. If aqueous samples show excessive turbidity, Method 3005 or microwave digestion may be used at discretion of analyst. Before collection of the sample, a decision must be made as to the type of data required (dissolved, total recoverable, or total) so that the appropriate preservation and pretreatment steps may be accomplished. Filtration, acid preservation, etc., are to be performed at the time the sample is collected or as soon as possible thereafter.

2.2 The method describes the sequential multielemental determination of elements by ICP. This procedure is for field screening, and does not satisfy the quality control requirements of SW846 Method 6010 (3rd Ed., Update 1, Dec., 1987) or Method 200.7 (40 CFR 136, Appendix C, July 1, 1990). Method 6010 can be reported if all EPA QC requirements must be met.

The method measures element-emitted light by optical spectrometry. Samples are nebulized and the resulting aerosol is transported to the plasma torch. Element-specific atomic-line emission spectra are produced by a radio-frequency inductively coupled argon plasma. The spectra are dispersed by a grating monochrometer, and the intensities of the lines are monitored by a photomultiplier tube. Background correction is required for trace element determination. Background must be measured adjacent to analyte lines on samples during analysis. The position selected for background measurement, on either or both sides of the analytical line, will be determined by the complexity of the spectrum adjacent to the analyte line. The position used must be free of

TABLE 1
RECOMMENDED WAVELENGTHS AND DETECTION LIMITS (UG/L)

Element	Wavelength	IDL* Est'd.	MDL Meas'd.	PQL Est'd.
Aluminum	308.215	45	20	20
Antimony	206.838	32	40	250
Arsenic	193.696	53	20	100
Boron	249.678	-	2050	
	249.773	5	-	-
Barium	493.409	-	2	20
	455.403	2	-	-
Beryllium	313.042	0.3	3	10
Bismuth	223.061	-	30	100
Cadmium	228.802	-	3	10
	226.502	4	-	-
Calcium	317.933	10	3	10
Chromium	267.716	7	5	25
Cobalt	228.616	7	5	10
Copper	324.754	6	2	10
Iron	259.940	7	10	50
Indium	230.606	-	25	250
Lithium	670.784	5	-	-
Lead	220.353	42	70	250
Magnesium	279.079	30	30	100
Manganese	257.610	2	20	25
Molybdenum	202.030	8	6	50
Nickel	231.604	15	10	100
Phosphorous	178.287	-	30	150
	213.618	51	-	-
Potassium	766.491	**	800	2500
Selenium	196.026	75	30	100
Silver	328.068	7	5	10
Silica (SiO_2)	288.158	58	8	500
Sodium	588.995	29	10	750
Strontium	421.552	-	2	25
	407.771	0.3	-	-
Titanium	334.941	-	2	25
Thallium	190.864	40	80	100
Vanadium	292.402	8	7	25
Zinc	213.856	2	2	25
Zirconium	339.192	-	3	10

Note: *EPA-600/4-79-017, "Inductively Coupled Plasma-Atomic Emission Spectroscopy-Prominent Lines." Given as a guide only.
**Highly dependent upon operating conditions and plasma position.

spectral interference and reflect the same change in background intensity as occurs at the analyte wavelength measured. Background correction is not required in cases of linebroadening where a background correction measurement would actually degrade the analytical result. The possibility of additional interferences named in Section 3.0 should also be recognized and appropriate corrections made; tests for their presence are described in Step 8.5.

3.0 INTERFERENCES

3.1 Spectral interferences are caused by : (1) overlap of a spectral line from another element; (2) unresolved overlap of molecular band spectra; (3) background contribution from continuous or recombination phenomena; and (4) stray light from the line emission of high-concentration elements. Spectral overlap can be compensated for by computer-correcting the raw data after monitoring and measuring the interfering element. Unresolved overlap requires selection of an alternate wavelength. Background contribution and stray light can usually be compensated for by a background correction adjacent to the analyte line.

Previous experience with the sample matrix, or information from a companion technique for trace metal assays, can be used to verify the absence of spectral interference from an element in a sample. Potential spectral interferences for the recommended wavelengths are given in Table 2, Reference 1. The data in Table 2 are intended as rudimentary guides for indicating potential interferences; for this purpose, linear relations between concentration and intensity for the analytes and the interferences can be assumed.

3.2 Physical interferences are effects associated with the sample nebulization and transport processes. Changes in viscosity and surface tension can cause significant inaccuracies, especially in samples containing high dissolved solids or high acid concentrations. If physical interferences are present, they must be reduced by diluting the sample or by using a peristaltic pump. Another problem that can occur with high dissolved solids is salt buildup at the tip of the nebulizer, which affects aerosol flow rate and causes instrumental drift. The problem can be controlled by wetting the argon prior to nebulization, using a tip washer or diluting the sample. Also, it has been reported that better control of the argon flow rate improves instrument performance; this is accomplished with the use of a mass flow controller.

3.3 Chemical interferences include molecular compound formation, ionization effects, and solute vaporization effects. Normally, these effects are not significant with the ICP technique. If observed, they can be minimized by careful selection of operating conditions (incident power, observation position, and so forth), by buffering the sample, by matrix matching, and standard addition procedures. Chemical interferences are highly dependent on matrix type and the specific analyte element.

4.0 APPARATUS AND MATERIALS

4.1 Thermo Jarrell Ash Atomscan 16 Sequential ICAP.

4.2 Apparatus required for digestion and sample preparation can be found in separate SOPs.

5.0 REAGENTS

5.1 Water supply purified with a Milli-Q system must be available. The water must be monitored daily, when in use, using a conductivity meter. Records of monitoring are kept in a log book maintained for each system according to the EVSD SOP for this purpose.

5.2 Concentrated nitric acid, J. T. Baker, Instra-analyzed, or an equivalent purity.

5.3 Nitric acid (1:1). Add 500 mL concentrated HNO_3 to 400 mL of Milli-Q water and dilute to 1 liter. Add acid slowly to the water with vigorous stirring. Do not allow the solution to overheat. Pour the acid down the sides of the container to avoid sputtering.

5.4 Concentrated hydrochloric acid, J. T. baker, reagent grade, or an equivalent purity.

5.5 Hydrochloric acid (1:1). Add 500 mL concentrated HCl to 400 mL of Milli-Q water and dilute to 1 liter. Add acid slowly to the water with vigorous stirring. Do not allow the solution to overheat. Pour the acid down the sides of the container to avoid sputtering.

5.6 Calibration stock standards and working standards - see the ICP Standards Preparation SOP.

5.7 Instrument check standard - see the ICP Standards Preparation SOP.

5.8 Interference check solution - see the ICP Standards Preparation SOP.

5.9 Two types of blanks are required for the analysis. The calibration blank is used in establishing the analytical curve and rinsing between samples, and the reagent blank is used to correct for possible contamination resulting from the acids used in the sample digestion

5.9.1 The calibration blank is prepared by diluting 2 mL of (1:1) HNO_3 and 10 mL of (1:1) HCl to 100 mL in water. Prepare a sufficient quantity each day to flush the system between standards and samples.

5.9.2 The reagent blank must contain all the reagents and in the same volumes as used in processing the samples. The reagent blank must be carried through the complete digestion/preparation procedure and contain the same acid concentration as the sample solution used for analysis.

6.0 SAMPLE COLLECTION, PRESERVATION, AND HANDLING

6.1 All sample containers used in the laboratory must be prewashed with Alconox detergent, acids, and purified water. Acid soaking and rinsing with purified water should be done just prior to use.

6.2 Sampling and preservation:

6.2.1 Aqueous samples for total, total recoverable, and dissolved metals must be acidified with HNO_3 (5 mL/L) or to a pH of < 2 at the time of collection.

6.2.2 Nonaqueous samples should be stored at 4°C (refrigerator or ice chests) and analyzed as soon as possible.

6.3 Safety:

6.3.1 Standard laboratory safety precautions should be adhered to at all times. Refer to the Research and Engineering Safety Manual for required procedures.

6.3.2 Assume that all samples are hazardous. The use of fume hoods, safety glasses, lab coats, and protective gloves is mandatory at all times. Concentrated acids should be stored and transported in rubber buckets. The Safety Manual discusses use of face shields, gloves, aprons, gauntlets, fume hoods, and other protective measures when handling caustic materials.

6.3.3 Do not use cracked, chipped, or otherwise damaged or stressed glassware. Dispose of or have repaired any damaged glassware.

6.3.4 Material Safety Data Sheets are available in the Library for all common laboratory chemicals. Obtain an MSDS from the supplier of any new chemicals ordered for the Laboratory. Provide a copy to the Library and to the Research and Engineering Industrial Hygiene Officer. Inform your supervisor about any new or suspected hazards which have come to your attention.

6.3.5 Follow only prescribed procedures for disposal of samples and laboratory chemicals.

7.0 PROCEDURE

7.1 Set up the instrument with the proper operating parameters established in manufacturer's instructions. Check the Digestion Lab Log Sheet accompanying each batch of samples to determine which elements are to be analyzed. Verify that the appropriate QC samples have been included.

7.2 Initialize the instrument and verify background assignments using a mixed standard. Verify subtraction method using wavelength scans from an actual sample before proceeding with the analyses.

7.3 Calibrate the instrument using mixed calibration standards. Verify the reliability of calibrated standards periodically using standards from a separate supplier. Flush the system with the calibration blank between each standard. Use the average intensity of three exposures for both standardization and sample analysis to reduce random error. Normally, calibration (two point for each element) will be accomplished using a calibration blank (zero concentration values) and a standard blends containing each of the elements of interest at 10 ug/mL, except Ca, Al, Mg, Fe, and silver which will be at 100 and 1.0 ug/mL, respectively.

7.4 Once initial calibrations have been done and before beginning a sample run, reanalyze the high mixed calibration standards as if each were a sample. Concentration values should not deviate from actual values by more than 10 percent. If they do, follow the instrument manufacturer's instructions to correct this condition.

7.5 Flush the system with the calibration blank solution for at least 1 minute between all analyses.

7.6 Analyze the instrument check standard and the calibration blank after each 10 samples or 1 hour of operation, whichever is shorter.

7.7 The chronology of analyses should follow the following general pattern:

CAL BLK; CAL1; CAL2 (opt.); CAL3 (opt.); CALCHK; IEC; 10 Samples; CAL BLK; INSTR CHK STD; 10 Samples; CAL BLK; INSTR CHK STD.

7.8 Calculations: If dilutions were performed, the appropriate factors must be applied to sample values. All results should be reported in mg/L (liquids) to the thousandths place and up to three significant figures. Reagent blanks may be subtracted from sample results if the analyst deems it necessary.

8.0 QUALITY CONTROL

8.1 All pertinent data must be maintained in a hardcopy file with the corresponding batch file information of samples for which it was collected. This includes digestion method blanks and calibration data. Copying may be necessary to fulfill this requirement.

8.2 Dilute and reanalyze all samples which exceed the 1/2 x LDR for each element.

8.3 Employ a minimum of one method (digestion) blank (MB) per dilution batch (~20) to determine if contamination or memory effects are occurring.

It is recommended that whenever a new or unusual sample matrix is encountered, a series of tests be performed prior to analysis.

Matrix spike addition: An analyte spike added to a portion of a prepared sample, or its dilution, should be recovered to within 75 to 125 percent of the known value. The spike addition should produce a minimum level of 10 times and a maximum of 100 times the instrument detection limit. If the spike is not recovered within the specified limits, a matrix effect should be suspected.

CAUTION: Use a wavelength scan for the elements of interest to determine if spectral overlap may be occurring.

8.4 Check the instrument standardization by analyzing appropriate check standards as follows.

8.4.1 Check the instrument calibration using a calibration blank and two appropriate standards (see 7.3 and 7.6).

8.4.1.1 The results of the initial calibration verification (7.3) must agree within 10 percent.

8.4.1.2 The results of subsequent instrument check standard assays must agree within 10 percent of the expected value; if not, terminate the analysis, correct the problem, and recalibrate the instrument, and reanalyze the previous samples run since the last valid check.

8.4.1.3 The calibration blank should not show any elements at values > the reporting threshold (PQL); if not, correct the problem.

8.4.2 Interelement correction factors must be verified at the beginning of each analytical run. Do this be analyzing the interference check sample. Results should be within 20 percent of the true value obtained in 8.4.1.1.

8.4.2.1 The elements which generally are considered to be major potential interferents are aluminum, calcium, magnesium, and iron.

8.4.2.2 The daily IEC check is performed by analyzing a blend containing all elements of interest including the major interferents at a significantly higher concentration than the interferees. See 5.9. This solution is made using appropriate dilutions of Standards, containing the interferents at relatively high concentration.

8.5 A quality control sample obtained from a source independent of the calibration standards must be used periodically to verify the calibration standards. A fresh dilution of this sample should be used to monitor the standards. Periodic checks should agree within 10 percent of the true value listed on the control sample. If not prepare fresh calibration standard solutions and recheck.

9.0 ADDITIONAL INFORMATION

9.1 Instrument Run Log: Record all analyses (calibration, QC, and samples in the Log Book. A Log should be prepared for each instrument. The pages should all be signed by the analyst. Information must include sample i.d., project/dash nos., digestion methods performed, standard solutions used (referenced to Standards Prep. Log.), date of analysis, dilution factors, weights for solid samples, notebook references, and software file numbers. Other comments may be added as well, at the discretion of the analyst.

9.2 Analyst Green Notebook: Special calculations may be necessary for certain situations. These should be entered into the Analysts Green Notebook. The notebook and page number should then be entered as a reference in 7.7. Conoco R&E procedures must be followed for all Green Notebook records.

9.3 Project Files: Hardcopy of all raw data and preliminary reports must be maintained by the Lab Staff. These files will be kept on a daily basis. The Instrument Run Log may then be used to recover Project related data from the files, by referencing analysis dates and project numbers.

9.4 Digestion Lab Log Sheet. A log sheet filled out by the Digestion Lab will accompany each batch of samples to the Instrument Lab. This will reflect which method is needed for assay, and it will list the parameters to be determined. The analyst must mark samples complete on this form and return the finished samples together with the form to the Digestion Lab. The Form allows for the analyst to request rework on samples as well, if that is deemed necessary for some reason by the analyst (e.g. redigest, or redigest and spike).

9.5 Reports will be generated by the analyst using the Environmental Sample Analysis Results Load Sheet.

REFERENCES

1. "Test Methods for Evaluating Solid Waste, SW846", 3rd Ed., Revision 1, December 1987, Method 6010.

2. 40 CFR 136, Appendix C, Method 200.7, July 1, 1990.

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ENVIRONMENTAL SERVICES DIVISION METHOD

EVSD-FALCON3015

MICROWAVE ASSISTED ACID DIGESTION OF AQUEOUS SAMPLES

1.0 SCOPE AND APPLICATION

1.1 Method 3015 is used for the preparation of aqueous samples and wastes that contain suspended solids for analysis, by graphite furnace atomic absorption spectroscopy (GFAA), by direct aspiration flame atomic absorption spectroscopy (DAAA), or by inductively coupled argon plasma spectroscopy (ICP). This procedure is given in SW846 Revision 0, November 1990.

1.2 Samples prepared by method 3015 using nitric acid digestion may be analyzed by GFAA, DAAA, or ICP for the following metals:

Aluminum	Magnesium
Antimony	Manganese
Arsenic*	Molybdenum
Barium	Nickel
Beryllium	Potassium
Cadmium	Selenium*
Calcium	Silver
Chromium	Sodium
Cobalt	Thallium
Copper	Vanadium
Iron	Zinc
Lead	

Note: 1. *Cannot be analyzed by DAAA

2.0 SUMMARY OF METHOD

2.1 Nitric acid (HNO_3) is added to the aqueous sample in a 120 mL Teflon digestion vessel. The vessel is capped and heated in a microwave unit. After cooling, the vessel contents are filtered, centrifuged, or allowed to settle in a clean sample bottle for analysis.

3.0 INTERFERENCES

3.1 Very reactive or volatile materials that may create high pressures when heated may cause venting of the vessels with potential loss of sample and analytes. Samples that contain carbonates or other carbon dioxide generating compounds may cause enough pressure to vent the vessel. If this situation is anticipated, the analyst may wish to use a smaller sample.

4.0 APPARATUS AND MATERIALS

4.1 Microwave unit providing programmable power with a minimum of 574 watts, which can be programmed to within ± 10 watts of the required power. The microwave unit cavity is corrosion resistant and well ventilated. All electronics are protected against corrosion for safe operation.

4.2 Graduated cylinder, 100 mL, calibrated "to deliver", polypropylene.

4.3 Sample bottle, 125 mL, high density polyethylene, and a phenolic cap with a polyethylene liner.

4.4 Teflon PFA digestion vessels (120 mL capacity) capable of withstanding pressures up to 7.5 ± 0.7 atm (110 ± 10 psi) and capable of controlled pressure relief at pressures exceeding 7.5 ± 0.7 atm.

4.5 A rotating turntable within the microwave unit to insure homogeneous distribution of microwave radiation. The speed of the turntable should be a minimum of 3 rpm.

4.6 Analytical balance, 300 g capacity, minimum ± 0.01 g.

4.7 Quantitative filter paper, Whatman No. 41 and disposable polypropylene filter funnel.

5.0 REAGENTS

5.1 Water supply purified with a Milli-Q system. The water must be monitored daily, when in use, using the conductivity meter. Records of monitoring are kept in a log book maintained for each system according to the EVSD SOP for this purpose.

5.2 Concentrated nitric acid, J. T. Baker, Instra-analyzed, or an equivalent purity is used for digestion.

6.0 SAMPLE COLLECTION, PRESERVATION, AND HANDLING

6.1 All digestion vessels and sample containers used in the laboratory must be prewashed with detergent, acids, and purified water, or if disposable, have been shown to be free from contamination by results from blank assays.

6.1.1 Digestion vessels should be cleaned prior to use by leaching with hot (1:1) hydrochloric acid for a minimum of two hours followed by leaching with hot (1:1) nitric acid for a minimum of two hours, rinsed with Milli-Q water, and dried in a dust free environment.

6.2 Sampling and Preservation

6.2.1 All aqueous samples must be acidified at the time of collection with HNO_3 (5 mL/L) or to a pH < 2.

6.3 Safety

6.3.1 Standard laboratory safety precautions should be adhered to at all times. Refer to the Research and Engineering Safety Manual for required procedures.

6.3.2 Assume that all samples are hazardous. The use of fume hoods, safety glasses, lab coats, and protective gloves is mandatory at all times. Containers of concentrated acid should be stored and transported in rubber buckets. The Safety Manual discusses use of face shields, gloves, aprons, gauntlets, fume hoods, and other protective measures when handling caustic materials.

6.3.3 Do not use cracked, chipped, or otherwise damaged or stressed glassware. Dispose of, or have repaired, any damaged glassware.

6.3.4 Material Safety Data Sheets are available in the Library for all common laboratory chemicals. Obtain an MSDS from the supplier on any new chemicals ordered for the laboratory. Provide a copy to the Library and to the Research and Engineering Industrial Hygiene Officer. Inform your Supervisor about any new or suspected hazards which have come to your attention.

6.3.5 Follow only prescribed procedures for disposal of samples and laboratory chemicals.

6.3.6 There is a possibility that acid gases, released when sample containers vent inside the oven, may corrode the safety devices that prevent the microwave magnetron from shutting off when the door is opened. This can result in unsafe operator exposure to microwave energy. Use only a microwave unit with corrosion resistant safety devices to prevent this from occurring.

6.3.7 Do not use sealed digestion containers without pressure relief valves for microwave digestions by this method. Only unlined PFA Teflon containers with pressure relief mechanisms are considered acceptable at present.

7.0 PROCEDURE

7.1 Enter the customer sample I.D., the project no. and dash no., the date collected, and the due date into the digestion log book. Verify that each metal assay has been requested by the client before proceeding further.

7.2 Organize samples into batches not exceeding eleven per batch. Note the start date, the matrix type, the digestion method, and the method of analysis in the digestion log book. Arrange sample containers and labware to be assigned to each sample neatly in columns/rows on the lab bench. Each column will correspond to one sample. Weigh each digestion vessel to the nearest 0.01 g.

7.3 Mix the sample thoroughly prior to opening the sample container. Note the presence of suspended solids in the digestion log book (comments column). The pH of each sample is checked prior to digestion by using a disposable pipet and pH indicating paper. The pH value is recorded in the digestion log book.

7.4 Measure about 40 mL of sample into a graduated cylinder. Use a disposable pipet to bring the total volume of sample in the graduated cylinder up to the 45 mL mark. Transfer the sample aliquot into a Teflon digestion vessel. Enter the identification number on the vessel in the digestion log for each sample.

7.5 Add 5 mL of concentrated nitric acid to each vessel. Cap and weigh each vessel to the nearest 0.01 g.

7.6 A blank sample of reagent water is treated in the same manner as the samples. When fewer than the recommended number of samples are to be digested, fill the remaining digestion vessels with 40 mL water and 5 mL nitric acid.

7.7 Set the power program to bring the samples to 160° ± 4°C in 10 minutes and to 165°-170°C during the second 10-minute interval.

7.8 At the end of the microwave program, allow the vessels to cool for at least 5 minutes in the unit before removal to avoid possible injury. When the vessels have cooled to room temperature, weigh and record the weight of each vessel assembly. If the weight has decreased by more than 10 percent, discard the sample and reprocess.

7.9 Complete the sample preparation by carefully uncapping and venting each vessel in a fume hood. Transfer the sample to a precleaned polyethylene bottle. If particulates are present, the sample may be filtered and allowed to settle prior to analysis.

7.10 Filter at this step only if there is concern that insoluble materials may clog the nebulizer. The filter and funnel must be thoroughly precleaned and rinsed with 1:1 HNO_3 to prevent contamination during the filtering process. Filter into a second precleaned polyethylene bottle.

7.11 Place a sample label on the 125 mL polyethylene bottle and set aside for analysis.

7.12 Note the date completed and if filtration was done in the digestion log book.

8.0 QUALITY CONTROL (QC)

8.1 Method blanks are employed with each batch of samples digested to monitor impurity levels. If the method blank assay indicates metals are present above instrument detection limits (IDL's), reagents and glassware should be checked for sources of impurities. If impurities in the method blank exceed PQL's, analyses should be suspended until the problem is corrected.

8.2 Other quality control measures, including duplicate and/or replicate analyses, may be done at the discretion of the analyst.

REFERENCES

1. "Test Methods for Evaluating Solid Waste, SW846", 3rd Ed., Rev. 0, November 1990, Method 3015.

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HLG

ENVIRONMENTAL SERVICES DIVISION METHOD

EVSD-FALCON3051

MICROWAVE ASSISTED ACID DIGESTION OF OILS, SEDIMENTS, SOILS AND SLUDGES

1.0 SCOPE AND APPLICATION

1.1 Method 3051 is used for the preparation of nonaqueous samples and wastes for analysis by graphite furnace atomic absorption spectroscopy (GFAA), by direct aspiration flame atomic absorption spectroscopy (DAAA), or by inductively coupled argon plasma spectroscopy (ICP). This procedure is given in SW846 Revision 0, November 1990.

1.2 Samples prepared by Method 3051 using nitric acid digestion may be analyzed by GFAA, DAAA, or ICP for the following metals:

Aluminum	Magnesium
Antimony	Manganese
Arsenic	Mercury
Barium	Molybdenum
Boron	Nickel
Beryllium	Potassium
Cadmium	Selenium
Calcium	Silver
Chromium	Sodium
Cobalt	Strontium
Copper	Thallium
Iron	Vanadium
Lead	Zinc

Note: 1. Certain elements may require addition of hydrochloric acid (e.g., Sb) for quantitative recovery. This may be done at the end of the digestion cycle with a 3-5 minute reheating period.

2.0 SUMMARY OF METHOD

2.1 Ten mL of nitric acid (HNO_3) is added to 0.5 g of sample in a Teflon digestion vessel. The vessel is capped and heated in a microwave unit. After cooling, the vessel contents are filtered, centrifuged, or allowed to settle in a clean sample bottle for analysis.

3.0 INTERFERENCES

3.1 Very reactive or volatile materials that may create high pressures when heated may cause venting of the vessels with potential loss of sample and analytes.

Samples that contain carbonates or other carbon dioxide generating compounds may cause enough pressure to vent the vessel. If this situation is anticipated, the analyst may wish to use a smaller sample.

4.0 APPARATUS AND MATERIALS

4.1 Microwave unit providing programmable power with a minimum of 574 watts, which can be programmed to within ± 10 watts of the required power. The microwave unit cavity is corrosion resistant and well ventilated. All electronics are protected against corrosion for safe operation.

4.2 Graduated cylinder, 100 mL, calibrated "to deliver," polypropylene.

4.3 Sample bottle, 125 mL, high density polyethylene, and a phenolic cap with a polyethylene liner.

4.4 Teflon PFA digestion vessels (120 mL capacity) capable of withstanding pressures up to 7.5 ± 0.7 atm (110 ± 10 psi) and capable of controlled pressure relief at pressures exceeding 7.5 ± 0.7 atm.

4.5 A rotating turntable within the microwave unit to insure homogeneous distribution of microwave radiation. The speed of the turntable should be a minimum of 3 rpm.

4.6 Analytical balance, 300 g capacity, minimum ± 0.01 g.

4.7 Quantitative filter paper, Whatman No. 41 and disposable polypropylene filter funnel.

5.0 REAGENTS

5.1 Water supply purified with a Milli-Q system. The water must be monitored daily, when in use, using the conductivity meter. Records of monitoring are kept in a log book maintained for each system according to the EVSD SOP for this purpose.

5.2 Concentrated nitric acid, J. T. Baker, Instra-analyzed, or an equivalent purity is used for digestion.

6.0 SAMPLE COLLECTION, PRESERVATION, AND HANDLING

6.1 All digestion vessels and sample containers used in the laboratory must be prewashed with detergent, acids, and purified water, or if disposable, have been shown to be free from contamination by results from blank assays.

6.1.1 Digestion vessels should be cleaned prior to use by leaching with hot (1:1) hydrochloric acid for a minimum of two hours followed by leaching with hot (1:1) nitric acid for a minimum of two hours, rinsed with Milli-Q water, and dried in a dust free environment.

6.2 Sampling and Preservation

6.2.1 All aqueous samples must be preserved at the time of collection by storing at 4°C.

6.3 Safety

6.3.1 Standard laboratory safety precautions should be adhered to at all times. Refer to the Research and Engineering Safety Manual for required procedures.

6.3.2 Assume that all samples are hazardous. The use of fume hoods, safety glasses, lab coats, and protective gloves is mandatory at all times. Containers of concentrated acid should be stored and transported in rubber buckets. The Safety Manual discusses use of face shields, gloves, aprons, gauntlets, fume hoods, and other protective measures when handling caustic materials.

6.3.3 Do not use cracked, chipped, or otherwise damaged or stressed glassware. Dispose of, or have repaired, any damaged glassware.

6.3.4 Material Safety Data Sheets are available in the Library for all common laboratory chemicals. Obtain an MSDS from the supplier on any new chemicals ordered for the laboratory. Provide a copy to the Library and to the Research and Engineering Industrial Hygiene Officer. Inform your Supervisor about any new or suspected hazards which have come to your attention.

6.3.5 Follow only prescribed procedures for disposal of samples and laboratory chemicals.

6.3.6 There is a possibility that acid gases, released when sample containers vent inside the oven, may corrode the safety devices that prevent the microwave magnetron from shutting off when the door is opened. This can result in unsafe operator exposure to microwave energy. Use only a microwave unit with corrosion resistant safety devices to prevent this from occurring.

6.3.7 Do not use sealed digestion containers without pressure relief valves for microwave digestions by this method. Only unlined PFA Teflon containers with pressure relief mechanisms are considered acceptable at present.

7.0 PROCEDURE

7.1 Enter the customer sample I.D., the project number and dash number, the date collected, and the due date into the digestion log book. Verify that each metal assay has been requested by the client before proceeding further.

7.2 Organize samples into batches not exceeding eleven per batch. Note the start date, the matrix type, the digestion method, and the method of analysis in the digestion log book. Arrange sample containers and labware to be assigned to each sample neatly in columns/rows on the lab bench. Each column will correspond to one sample. Weigh each digestion vessel to the nearest 0.001 g.

7.3 Mix the sample thoroughly prior taking an aliquot.

7.4 Weigh 0.5 g of sample to the nearest 0.001 g into a preweighed digestion vessel. Enter the identification number on the vessel in the digestion log for each sample.

7.5 Add 10.00 mL (use a Rainen pipette) of concentrated nitric acid to each vessel inside a fume hood. Cap and weigh each vessel to the nearest 0.001 g.

7.6 A blank digestion vessel is treated in the same manner as the samples with addition of 10.00 mL nitric acid. When fewer than the recommended number of samples are to be digested, fill the remaining digestion vessels with 10 mL nitric acid.

7.7 Set the power program to bring the samples to 175° $\pm$ 4°C in 5.5 minutes and to 175° - 180°C during the next 4.5-minute interval.

7.8 At the end of the microwave program, allow the vessels to cool for at least 5 minutes in the unit before removal to avoid possible injury. When the vessels have cooled to room temperature, weigh and record the weight of each vessel assembly. If the weight has decreased by more than 10 percent, discard the sample and reprocess.

7.9 Complete the sample preparation by carefully uncapping and venting each vessel in a fume hood. Add 40 mL of Milli-Q water. Transfer the diluted sample to a precleaned polyethylene bottle. If particulates are present, the sample may be filtered and allowed to settle prior to analysis.

7.10 Filter at this step only if there is concern that insoluble materials may clog the nebulizer. The filter and funnel must be thoroughly precleaned and rinsed with 1:1 HNO_3 to prevent contamination during the filtering process. Filter into a second precleaned polyethylene bottle.

7.11 Place a sample label on the 125 mL polyethylene bottle and set aside for analysis.

7.12 Note the date completed and if filtration was done in the digestion log book.

8.0 QUALITY CONTROL (QC)

8.1 Method blanks are employed with each batch of samples digested to monitor impurity levels. If the method blank assay indicates metals are present above instrument detection limits (IDL's), reagents and glassware should be checked

for sources of impurities. If impurities in the method blank exceed PQL's, analyses should be suspended until the problem is corrected.

8.2 Other quality control measures, including duplicate and/or replicate analyses, may be done at the discretion of the analyst.

REFERENCES

1. "Test Methods for Evaluating Solid Waste, SW846", 3rd Ed., Rev. 0, November 1990, Method 3051.

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ENVIRONMENTAL SERVICES DIVISION METHOD

FALCON-3005

ACID DIGESTION OF WATERS FOR TOTAL RECOVERABLE OR DISSOLVED METALS FOR ANALYSIS BY ICP SPECTROSCOPY

1.0 SCOPE AND APPLICATION

1.1 Method 3005 is an acid digestion procedure used to prepare soils, surface water, and ground water samples for analysis by inductively coupled argon plasma spectroscopy (ICP). This procedure is used as a screening technique and does not satisfy the quality control (QC) requirements of 40 CFR 136 and SW846 ICP methods. Samples prepared by method 3005 will be analyzed by ICP for Sb (antimony).

1.2 The analysis of digestate following the 3005 procedure reflects either total recoverable metals, dissolved metals, or suspended metals, depending upon whether the sample is filtered at the time of collection, prior to acidification with nitric acid for preservation.

1.3 Method 3005, a soft digestion, is presently the only digestion procedure recommended for Sb by SW846. It yields better recoveries than either Method 3010 or 3020. There is no hard digestion for Sb approved for SW846 at this time. However, 200.7 does not make this distinction.

2.0 SUMMARY OF METHOD

2.1 Total recoverable metals (TRM): The entire sample is acidified at the time of collection with nitric acid. At the time of analysis the sample is heated with acid and substantially reduced in volume. The digestate is filtered and diluted to volume, and then is ready for analysis.

2.2 Dissolved metals (DM): The sample is filtered through a 0.5 um filter at the time of collection and the liquid phase is then acidified (in the field) with nitric acid. At the time of analysis the sample is heated with acid and substantially reduced in volume. The digestate is again filtered (if necessary) and diluted to volume. It is then ready for analysis.

3.0 INTERFERENCES

3.1 The analyst should be cautioned that this digestion procedure may not be sufficiently vigorous to destroy some metal complexes. It is for this reason that "total recoverable metals" are reported.

4.0 APPARATUS AND MATERIALS

4.1 Griffin beaker, 200 mL capacity, borosilicate glass or polypropylene (approved for hot plate use).

4.2 Graduated cylinder, 50 mL, calibrated "to deliver".

4.3 Sample bottle, 60 mL, high density polyethylene, and a phenolic cap with a polyethylene liner.

4.4 Hot plate, controllable at 90° - 95°C. Calibrate the temperature adjustment knob using a thermometer immersed in sand. Monitor the temperature on the hot plate continuously using the same technique.

4.5 Qualitative filter paper and filter funnel.

5.0 REAGENTS

5.1 Water supply purified with a Milli-Q system. The water must be monitored daily, when in use, using the conductivity meter. Records of monitoring are kept in a log book maintained for each system according to the EVSD SOP for this purpose.

5.2 Concentrated nitric acid, J. T. Baker, Instra-analyzed, or an equivalent purity is used for digestion.

5.3 Concentrated hydrochloric acid, J. T. baker, reagent grade, or an equivalent purity is used for digestion.

5.4 Refer to the ICP QC Standards Preparation SOP for instructions on how to prepare secondary spike standards.

6.0 SAMPLE COLLECTION, PRESERVATION, AND HANDLING

6.1 All sample containers used in the laboratory must be prewashed with detergent, acids, and purified water. A conventional dishwasher is used for preliminary cleaning of labware. Acid soaking and rinsing with purified water should be done just prior to use.

6.2 Sampling and preservation:

6.2.1 Total recoverable metals: All samples must be acidified at the time of collection with HNO_3 (5 mL/L).

6.2.2 Dissolved and suspended metals: All samples must be filtered through a 0.5 um filter and then acidified at the time of collection with HNO_3 (5 mL/L). The filter and/or filtrate is returned to the lab for analysis. The volume filtered must be recorded and provided to the Inorganic Prep. Lab for suspended solids assays. See step 7.8.

6.3 Safety:

6.3.1 Standard laboratory safety precautions should be adhered to at all times. Refer to the Research and Engineering Safety Manual for required procedures.

6.3.2 Assume that all samples are hazardous. The use of fume hoods, safety glasses, lab coats, and protective gloves is mandatory at all times. Concentrated acids should be stored and transported in rubber buckets. The Safety Manual discusses use of face shields, gloves, aprons, gauntlets, fume hoods, and other protective measures when handling caustic materials.

6.3.3 Do not use cracked, chipped or otherwise damaged or stressed glassware. Dispose of or have repaired any damaged glassware.

6.3.4 Material Safety Data Sheets are available in the Library for all common laboratory chemicals. Obtain an MSDS from thee supplier on any new chemicals ordered for the laboratory. Provide a copy to the Library and to the Research and Engineering Industrial Hygiene Officer. Inform your Supervisor about any new or suspected hazards which have come to your attention.

6.3.5 Follow only prescribed procedures for disposal of samples and laboratory chemicals.

7.0 PROCEDURE

7.1 Enter the customer sample I.D., the project no. and dash no., the date collected, and the due date into the digestion log book. Verify that either TRM, TDM, or TSM has been requested by the client before proceeding further.

7.2 Organize samples into batches not exceeding twenty per batch. Each batch should be composed of samples of a similar matrix type destined for analysis on a given instrument and by a given method. Note the start date, the matrix type, the digestion method, and the method of analysis in the digestion log book. Arrange sample containers and labware to be assigned to each sample neatly in columns/rows on the lab bench. Each column will correspond to one sample.

7.3 Mix the sample thoroughly prior to opening the sample container. Note the presence of suspended solids in the digestion log book (comments column). The pH of each sample is checked prior to digestion by using a disposable pipet and pH indicating paper. The pH value is recorded in the digestion log book.

7.4 Measure about 45 mL of sample into a graduated cylinder, and follow the rest of the procedure (for a soil, use a weight of 1 gram). Use a disposable pipet to bring the total volume of sample in the graduated cylinder up to the 50 mL mark. Transfer the sample aliquot into a 200 mL beaker. Mark the sample identification on the beaker with a felt tip pen.

7.5 Add 2 mL of concentrated nitric acid and 5 mL of concentrated HCl to the beaker. Use a dispenser and allow the acid to slowly run down the inside

wall of the beaker into the liquid sample. This will prevent sputtering and loss of liquid due to localized heating upon addition of acid.

7.6 Cover the beaker with a ribbed watch glass if available. Place on a hot plate located inside a fume hood which has been designated for 3005 use. Heat at 90° - 95°C until the volume has been reduced to 15 - 20 mL.

CAUTION: Do not boil. Some metal chlorides are volatile and can easily be lost during this step.

Do not allow the digestate to evaporate to dryness. Start over with fresh sample if this inadvertently occurs.

7.7 Remove the beaker and allow to cool. Pour the digestate back into the original graduated cylinder used to measure out the sample. Rinse down the beaker walls and watch glass and add this rinsate to the graduated cylinder. Filter at this step only if there is concern that insoluble materials may clog the nebulizer. The filter and funnel must be thoroughly precleaned and rinsed with 1:1 HNO_3 to prevent contamination during the filtering process. Bring the total volume up to 50 mL using a disposable pipet and purified water.

7.8 Place a sample label on the 60 mL polyethylene bottle set aside during the staging process (see 7.2). Fill this labeled bottle from the graduate cylinder containing the diluted digestate.

7.9 Note the date completed and if filtration was done in the digestion log book.

8.0 QUALITY CONTROL (QC)

8.1 Each batch must contain one method (digestion) blank (MB). The method blanks are employed with each batch of samples digested to monitor impurity levels. If the method blank assay indicates metals are present above instrument detection limits (IDL's), reagents and glassware should be checked for sources of impurities. If impurities in the method blank exceed PQL's, analyses should be suspended until the problem is corrected. Method blanks results may be control charted and posted as a Lab metric to monitor performance.

9.0 ADDITIONAL INFORMATION

9.1 Method 3005 Digestion Logbook. See Appendix A.

9.2 Chain of Custody Form. See Appendix B

REFERENCES

1. "Test Methods for Evaluating Solid Waste, SW846", 3rd Ed., Rev. 0, Sept., 1986, Method 3005.

2. 40 CFR 136, July, 1990.

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Education

B.S., Biology/Chemistry, Creighton University, 1964
M.S., Chemistry, Creighton University, 1970
Ph.D., Analytical Chemistry, University of Arizona, 1973

Work History

1996-Present	DuPont, Principal Consultant - Corporate Consultant for Environmental Methods & Lab Network System Administrator
1991-1996	Conoco, Senior Consultant - Administrator/Quality Assurance Director, DuPont Laboratory Network System
1989-1991	Conoco, Research Associate - Environmental Services Division Organics Analysis Group Supervisor
1981-1989	Conoco, Research Chemist - Research and Development Dept.
1973-1981	Oklahoma State University, Chemistry Department, Assistant/Associate Professor of Analytical Chemistry
1965-1967	U.S. Army, Communications Officer, Yakima Firing Center, Yakima, WA

Professional Affiliations

Oklahoma Department of Environmental Quality Commission for Laboratory Certification
American Petroleum Institute Environmental Work Group

Memberships

American Chemical Society, Analytical Chemistry Division
Sigma Xi Research Society

Experience Summary

Over twenty-two years experience in research and development and environmental applications of methods for the determination of metal and organic analytes. Responsibilities have included establishment of corporate environmental quality assurance standards, providing technical oversight of corporate and outsourced environmental laboratory services, auditing commercial laboratories, consulting on environmental data base development, establishment of laboratory methods and procedures, facilitating group efforts in reengineering work processes, and supervision, mentoring, training, and selection of laboratory personnel.

As DuPont Laboratory Network System Administrator, accountable as a corporate resource to provide: technical and business oversight of the DuPont Laboratory Network System; and technical consulting, mediation, and advocacy activities relating to environmental analytical methodologies and corporate data usability/defensibility issues both within the company, and on behalf of the company to outside agencies on an international, national, and state level.

Experience Specifics

Assisted in development of corporate environmental laboratory network, providing technical and quality assurance expertise. As System Administrator, was responsible for establishing corporate quality standards and monitoring quality performance of network laboratories and managing an auditing program. Set policies and procedures for day-to-day business dealings with commercial laboratory service providers, to include laboratory selection, deliverables evaluation, implementation of contract specifications, etc. Acted as a resource in establishing contract language and business strategies.

Consulted in development and evolution of corporate environmental data base, particularly in terms of data structure design. Established quality assurance policies related to data base. Developed systems for laboratory performance auditing program.

Coordinated third-party data validation services for the corporation.

Provided on-site assessment and consulting for DuPont Asia-Pacific business unit during the establishment of business agreements with laboratories in China, Taiwan, and Singapore.

Assisted corporate negotiations with EPA Regions II, III, IV, V, VI, and VII.

Developed generic quality assurance project plan for corporate use as basis for customized client plans.

Selected by Oklahoma Speaker of the House to serve as member of Department of Environmental Quality Commission for Laboratory Certification. Commission membership includes only three people from industry.

Established organics and metals laboratories for Conoco Environmental Services Division. Developed corporate RCRA standard operating procedures for metals (including inductively coupled plasma spectroscopy and graphite furnace atomic absorption spectroscopy) and organics (including volatile and semivolatile organics methods by gas chromatography and gas chromatography - mass spectrometry). Acted as supervisor of the Environmental Organics Analysis Group.

Established on-site metals laboratory for remediation project at the DuPont Pompton Lakes Works in New Jersey. This included developing standard operating procedures and record-keeping procedures, selecting laboratory personnel, and training laboratory personnel.

As research chemist, worked with gas chromatography, gas chromatography - mass spectrometry, liquid chromatography - mass spectrometry, gas chromatography - Fourier transform infrared spectroscopy, and other ancillary techniques. Conducted sample analysis; developed methods; purchased, set up and operated new instrumentation; conducted training workshops; provided interface with project teams; and published five papers, twenty-one research reports, and approximately fifty technical service reports.

As professor at Oklahoma State University, conducted an active research program, taught undergraduate and graduate courses in analytical chemistry, and published sixteen papers.

Recent Awards and Recognition

- DuPont Specialty Chemicals 1995 Top Ten Achievement Award for "Establishment of a National Laboratory Program" (team effort).
- DuPont Special Achievement Award 1994 for team effort to significantly improve the efficiency of the Chambers Works Plant Groundwater Monitoring Program.
- DuPont Asia-Pacific Internal Partnering Award, 1992.
- DuPont Pontchartrain Works Certificate of Excellence Award, 1991, in recognition of quality work and customer focus.
- Conoco Special Achievement Award for "Establishment of Environmental Organics Laboratory," 1990.

Harry L. Gearhart
6/13/97

CORPORATE ENVIRONMENTAL SERVICES CONSULTANT

Basic Purpose/Accountabilities

Accountable as a corporate resource to provide:

- technical and business oversight of the commercial lab services
- provide consulting and advocacy activities relating to environmental methodologies within the company and for the company to outside agencies
- provide mediation/advocacy on corporate data usability & defensibility issues

Primary Functions/Responsibilities

Represent corporate interests in contract administration activities (i.e. ongoing business dealings) with commercial labs

Network with B.U.'s to develop corporate business strategies relating to laboratory services

Establish corporate quality standards for environmental methodologies from service providers

Establish policies and procedures for review and acceptance data/deliverables from labs

Manage/implement a laboratory audit and performance assessment program for selection and periodic review

Coordinate/implement managed outsourcing of data validation services for corporate needs

Act as corporate advocate to assist with environmental regulatory issues on an international, national, state, and regional level

Other Functions/Responsibilities

Assist in establishment of policies and procedures for Lab Service Coordinators to conduct managed outsourcing with commercial laboratories

Provide guidance in coordination of lab services, quality control review of data, and reporting

Act as technical consultant to I.S. staff for data base architecture and design

Act as resource to Corporate Procurement staff to assist with contract language and strategies

Take an active role to mentor, train, and assist/advise in career development of others