ENGINEERING TECTONICS, P.A.
ENGINEERS • GEOLOGISTS • HYDROLOGISTS
Post Office Box I, Winston-Salem, NC 27108

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Alleghany County Landfill

ENGINEERING TECTONICS, P.A.
ENGINEERS • GEOLOGISTS • HYDROLOGISTS
P.O. Box I, Winston-Salem, NC 27108 (919) 724-6994

August 12, 1992

Alleghany County Landfill
Attn: Mr. Dan McMillan
P.O. Box 366
Sparta, NC 38675

Dear Mr. McMillan:

Enclosed are copies of laboratory reports of analysis for three groundwater samples collected from monitoring wells at the Alleghany County Landfill on June 23, 1992. I apologize in the delay in providing these results to you. The cause for the delay was an error in the original laboratory analyses which required that the samples be re-analyzed for cadmium and mercury to meet state required detection limits. A copy of the original laboratory report is included for your information only. A copy of the revised report dated August 5, 1992 has been submitted to the NC Department of Environment, Health & Natural Resources, Division of Health Services on your behalf.

Also enclosed is an invoice for the collection and analysis of these samples. The invoice exceeds the amount of our original proposal because of the additional analyses which were required by the state. It is my understanding that Jeff Wyatt, of our office, verbally informed you of the cost of the additional analyses.

A review of the laboratory results indicates that the groundwater in the area of well MW-1 has been degraded. Although pH, Iron, and Manganese concentrations in wells MW-2 and MW-3 exceed the NC Drinking Water Limits, they are well within normally occurring concentrations in groundwater.

Two semi-volatile organic compounds were detected and quantified in the groundwater sample from MW-1. Diethyl Phthalate was present at a concentration of 24 parts per billion (ppb). This compound is a solvent and could have been placed in the landfill in almost any form. Asphalt, paints, wood preservatives, plastics, cleaning fluids, and solvent mixtures are possible sources. Bis(2-ethylhexyl)Phthalate was detected at a concentration of 10 ppb. This compound is known to leach from many plastics. Based on the presence of this compound in the method blank (a sample of distilled water which is analyzed in the same manner as the samples) and in each of the other samples analyzed, it is likely that this compound was not present in the groundwater at the landfill but was introduced at the laboratory during the analytical procedures. Although neither of these semi-volatile compounds is included in the list of compounds which have specific concentrations specified in Water Quality Standards Applicable to the Groundwaters of North Carolina (Commonly known as the 2L standards which are NC Administrative Code, Title 15, Subchapter 2L), the 2L standards specify that "substances which are not naturally occurring and for which no standard is specified shall not be permitted in detectable concentrations".

Several volatile organic compounds were detected and quantified in the groundwater sample from MW-1. Of the volatile organics quantified, Methylene Chloride at a concentration of 30 ppb is the only one which exceeds the 2L standard of 5 ppb. Methylene Chloride is also a solvent which could have been placed in the landfill in many different forms. The other volatile organic compounds which were detected in the groundwater sample from MW-1 include Toluene, Ethylbenzene, and Xylenes which are all petroleum hydrocarbons. These hydrocarbons are most commonly associated with fuels such as gasoline, kerosene, diesel fuel, and heating oil.

Metals detected in the groundwater samples from the landfill were limited to Iron and Manganese for which limits have been set to protect the aesthetic qualities of drinking water including taste, odor or appearance. Iron and Manganese are naturally occurring in the soils and leach into the groundwater. The fact that the concentrations are much higher in well MW-1 than in the other wells may be due to the presence of other compounds or may simply be due to natural variations in the soil composition.

The indicator parameters generally do not reflect the presence of a hazard, but include low cost tests to indicate the possible presence of hazardous compounds which would require that more extensive analysis be performed to determine whether hazardous compounds are present.

Total Organic Halogens include all organic compounds which contain chlorine, iodine, bromine and fluorine. Many organic halogens are toxic including Methylene Chloride, most halogenated hydrocarbons, and PCBs, but there are some relatively harmless ones. Total

Organic Carbon tests for all organic compounds.

Conductivity is a measure of how well a substance conducts electricity. Although water is fair conductor of electricity, when other compounds are dissolved in the water it may become a much better conductor. The fact that the conductivity in MW-1 is much greater than the conductivity in the other wells at the landfill is probably due to the chloride concentration.

Chloride is the ionic form of chlorine. By itself, chloride is not a serious health concern, but it can cause a salty or metallic taste in water, is very reactive with other substances and is present in many toxic chemicals. Chloride also increases the conductivity of water.

pH is an indication of the acidity or alkalinity of water. pH levels below 7 are acidic, with lower pH levels indicating greater acidity.

Total Dissolved Solids indicate the amount of solids which are dissolved in the water. This does not indicate that the solids which are dissolved are in any way harmful, however, if the total amount dissolved is high this may indicate that the water is acidic or contains solvents.

The amount of Nitrate-Nitrogen indicates the amount of nitrates present in the water. Although nitrates are not generally harmful to adults unless ingested in extremely high quantities, nitrates can cause health problems for young children.

Biochemical Oxygen Demand indicates the amount of oxygen used by living organisms in the water. If the BOD concentration is high, this would indicate a need for testing for harmful bacteria prior to using the water as a source of drinking water.

Chemical Oxygen Demand indicates the amount of oxygen used by chemical reactions occurring in the water. If the COD concentration is high, additional analyses should be performed to determine whether the reactions involve toxic chemicals.

As far as what this means for the future, a strict interpretation of the law requires you to either "demonstrate, through predictive calculations or modeling, that natural site conditions, facility design and operational controls will prevent a violation of standards" at the property boundary or a boundary established 500 feet from the fill, whichever is closer to the fill, OR "assess the cause, significance and extent of the violation of groundwater quality standards and submit the results of the investigation and a plan for groundwater quality restoration". I have personally never seen this enforced. What is likely to happen is that the county will be required by the state to do additional analyses, which may include testing for volatile and semi-volatile organics each time the water is tested, testing the water more frequently, and/or installing additional monitoring wells at the landfill.

New federal regulations have been passed which will begin to be phased in during 1993. The state has proposed regulation which is expected to be more specific than the federal regulations. At this point in time, no one knows exactly what impact the state regulations will have, or how quickly they will be phased in. The federal regulations require testing for volatile and semi-volatile organics at all landfills twice a year, determination of groundwater flow direction during each sample collection event, and a determination of hydraulic conductivity on an annual basis. We estimate that the additional requirements will increase the cost of water quality monitoring by a factor of 2 to 2.5 times the current cost.

Should you have any questions concerning this correspondence, or if I may be of any further assistance, please do not hesitate to contact me.

Sincerely:

ENGINEERING TECTONICS, P.A.

Julianne M. Braun
Staff Geochemist

Enclosures:
- Laboratory Report - July 8, 1992
- Laboratory Report - August 5, 1992
- Table - Summary of Lab Results
- Copy - Letter to Bobby Lutfy, NC DHS Solid Waste Branch

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ENGINEERS • GEOLOGISTS • HYDROLOGISTS
P.O. Box I, Winston-Salem, NC 27108 (919) 724-6994

August 12, 1992

NC Department of Environment, Health & Natural Resources
Division of Health Services
Solid Waste Branch
Attn: Mr. Bobby Lutfy
P.O. Box 27687
Raleigh, North Carolina 27611-7687

Dear Mr. Lutfy:

Enclosed is a copy of the laboratory report of analyses performed on 3 groundwater samples collected from the Alleghany County Sanitary Landfill on June 23, 1992. I apologize for not having these to you sooner. The reason for the delay is that the samples had to be re-run for cadmium and mercury to obtain acceptable detection limits.

Should you have any questions concerning this correspondence, the analytical results, or the manner of sample collection or analysis, please do not hesitate to contact me or Jeff Wyatt at the letterhead address.

Sincerely:

ENGINEERING TECTONICS, P.A.

Julianne M. Braun

Julianne M. Braun
Staff Geochemist

cc: Mr. Dan McMillan, Alleghany County
ET files

AnalytiKEM *An American NuKEM Company*

AnalytiKEM Inc.
454 S. Anderson Road, BTC 532
Rock Hill, SC 29730
803/329-9690
Fax: 803/324-3982

TEST REPORT NO. A82387, Revised

August 5, 1992

Prepared for:

Engineering Tectonics
P.O. Box 11846
1720 Vargrave
Winston Salem, NC 27107

Attention: Jeffrey Wyatt

Project: Alleghany County

Reviewed &
Approved by: [signature]

Name: Carmine M. Fioriglio

Title: QA/QC Manager

TABLE OF CONTENTS

AnalytiKEM

I. Certification

AnalytiKEM, Inc.
Current Certifications/Regulatory Approvals

Tabulated below are the current laboratory certifications that are held by each AnalytiKEM Laboratory. Analyses performed at multiple AnalytiKEM locations will be noted in the test report.

Cherry Hill, NJ		Rock Hill, SC		Houston Analytical, Tx	
State	Cert #	State	Cert #	State	Cert #
Arkansas	*	S. Carolina	46067	N. Dakota	R-006
Connecticut	PH-0715	N. Carolina	316	Oklahoma	8403
Florida	880985G	New Jersey	79795	Texas Water Commission *	
Massachusetts	NJ117			Louisiana *	
New Jersey	04012				
New York	10815				
N. Carolina	258				
N. Dakota	R-038				
Pennsylvania	68366				
S. Carolina	94004				
Tennessee	02908				
Vermont	*				

* No certification numbers are issued for these states.

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II. Definition of Terms

Term	Definition
D	Detected; result must be greater than zero.
DI	Deionized Water
J	Compound was detected at levels below the practical quantitation limit. The level reported is approximate.
MS/MSD	Matrix Spike/Matrix Spike Duplicate.
NA	Analysis not applicable to the sample matrix.
ND	Not Detected
NR	Not Requested
NTU	Nephelometric Turbidity Units
RPD	Relative Percent Difference
RSD	Relative Standard Deviation
U	Compound was analyzed for but not detected. The preceding number is the practical quantitation limit for the compound.
ppb	Parts-per-billion; may be converted to ppm by dividing by 1,000.
ppm	Parts-per-million; may be converted to ppb by multiplying by 1,000.
ug/l	Micrograms of constituent per liter of sample; equivalent to parts-per-billion.
ug/kg	Micrograms of constituent per kilogram of sample; equivalent to parts-per-billion.
ug/kg dw	Micrograms of constituent per kilogram of sample reported on a dry weight basis.
CCC	Calibration Check Compound; used to verify the precision of a GC/MS calibration curve.
SPCC	System Performance Check Compound; used to verify the correct operation of a GC/MS instrument.
PQL	Practical Quantitation Limit; the minimum level at which compounds can be dependably quantitated.
B	Analyte detected in associated blank as well as the sample. It indicates possible/probable blank contamination.

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III. Sample Designations

AnalytiKEM Designation	Client Designation	Matrix	Date Sampled
A82387-1	MW-1	Aqueous	6/23/92
A82387-2	MW-2	Aqueous	6/23/92
A82387-3	MW-3	Aqueous	6/23/92

Note: Samples will be held for 30 days beyond the test report date unless otherwise requested.

IV. Methodology

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Volatiles

Method 5030, Purge and Trap, Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW846, Second Edition, USEPA,

Method 8240, Gas Chromatography/Mass Spectrometry for Volatile Organics, Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW846, Second Edition, USEPA,

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IV. Methodology (Cont'd)

Semivolatiles

Method 3510, Separatory Funnel Liquid-Liquid Extraction, Test Methods for Evaluating Solid Waste, Physical Chemical Methods, SW846, Second Edition, USEPA,

Method 8270, Gas Chromatography/Mass Spectrometry for Semivolatile Organics: Capillary Column Technique, Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW846, Second Edition, USEPA.

General Chemistry

Method 405.1, Oxygen Demand (Biochemical), Methods for Chemical Analysis of Water and Wastes, EPA-600/4-79-020, USEPA, 1979.

Methods 410.1, 410.2, 410.3, Chemical Oxygen Demand, Methods for Chemical Analysis of Water and Wastes, EPA-600/4-79-020, USEPA, 1979.

Method 9252, Chloride (Titrimetric, Mercuric Nitrate), Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW846, Third Edition, USEPA, 1986, with all promulgated revisions.

Method 9200, Nitrate, Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW846, Third Edition, USEPA, 1986, with all promulgated revisions.

Method 9040, pH Electrometric Measurement, Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW846, Third Edition, USEPA, 1986, with all promulgated revisions.

Method 9038, Sulfate (Turbidimetric), Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW846, Third Edition, USEPA, 1986, with all promulgated revisions.

Method 160.1, Total Dissolved Solids (Dried at 180 degrees C), Methods for Chemical Analysis of Water and Wastes, EPA-600/4-79-020, USEPA, 1979.

Method 9060, Total Organic Carbon, Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW846, Third Edition, USEPA, 1986, with all promulgated revisions.

Method 340.2, Fluoride (Potentiomentric, Ion Selective Electrode), Methods for Chemical Analysis of Water and Wastes, EPA-600/4-79-020, USEPA, 1979.

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V. Analytical Results

Volatile Organics

Parameter	Method Blank	A82387-1 MW-1	A82387-2 MW-2	A82387-3 MW-3
		Sample Designation		
Chloromethane -	< 10	< 10	< 10	< 10
Bromomethane -	< 10	< 10	< 10	< 10
Vinyl Chloride .015	< 10	< 10	< 10	< 10
Chloroethane -	< 10	< 10	< 10	< 10
Methylene Chloride 5	< 5.0	30	< 5.0	< 5.0
2-Propanone (Acetone) 700	< 100	< 100	< 100	< 100
Carbon Disulfide -	< 5.0	< 5.0	< 5.0	< 5.0
1,1-Dichloroethene 7	< 5.0	< 5.0	< 5.0	< 5.0
1,1-Dichloroethane 700	< 5.0	< 5.0	< 5.0	< 5.0
trans-1,2-Dichloroethene 70	< 5.0	< 5.0	< 5.0	< 5.0
Chloroform .19	< 5.0	< 5.0	< 5.0	< 5.0
1,2-Dichloroethane .38	< 5.0	< 5.0	< 5.0	< 5.0
2-Butanone (MEK) 170	< 100	< 100	< 100	< 100
1,1,1-Trichloroethane 200	< 5.0	< 5.0	< 5.0	< 5.0
Carbon Tetrachloride 0.3	< 5.0	< 5.0	< 5.0	< 5.0
Vinyl Acetate -	< 50	< 50	< 50	< 50
Bromodichloromethane —	< 5.0	< 5.0	< 5.0	< 5.0
1,2-Dichloropropane 0.56	< 5.0	< 5.0	< 5.0	< 5.0
trans-1,3-Dichloropropene -	< 5.0	< 5.0	< 5.0	< 5.0
Trichloroethene 2.8	< 5.0	< 5.0	< 5.0	< 5.0
Dibromochloromethane -	< 5.0	< 5.0	< 5.0	< 5.0
1,1,2-Trichloroethane -	< 5.0	< 5.0	< 5.0	< 5.0
Benzene 1	< 5.0	< 5.0	< 5.0	< 5.0
cis-1,3-Dichloropropene -	< 5.0	< 5.0	< 5.0	< 5.0
2-Chloroethyl Vinyl Ether -	< 10	< 5.0	< 5.0	< 5.0
Bromoform 0.19	< 5.0	< 5.0	< 5.0	< 5.0
4-Methyl-2-Pentanone (MIBK) -	< 50	< 50	< 50	< 50
Hexanone -	< 50	< 50	< 50	< 50
Tetrachloroethene 0.7	< 5.0	< 1.0	< 5.0	< 5.0
1,1,2,2-Tetrachloroethane -	< 5.0	< 5.0	< 5.0	< 5.0
Toluene 1000	< 5.0	56	< 5.0	< 5.0
Chlorobenzene -	< 5.0	< 5.0	< 5.0	< 5.0
Ethylbenzene 29	< 5.0	6.5	< 5.0	< 5.0
Styrene 100	< 5.0	< 5.0	< 5.0	< 5.0
Total 530 { m,p-Xylene	< 5.0	21	< 5.0	< 5.0
o,p-Xylene	< 5.0	57	< 5.0	< 5.0
Units	(ug/l)	(ug/l)	(ug/l)	(ug/l)

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V. Analytical Results (Cont'd)

Semivolatile Organics (Page 1 of 2)

Parameter	Method Blank	A82387-1 MW-1	A82387-2 MW-2	A82387-2 MW-3
		Sample Designation		
N-Nitrosodimethylamine –	< 5.0	< 10	< 10	< 10
Phenol –	< 5.0	< 10	< 10	< 10
Bis(2-chloroethyl) Ether –	< 5.0	< 10	< 10	< 10
2-Chlorophenol 0.1	< 5.0	< 10	< 10	< 10
1,3-Dichlorobenzene 620	< 5.0	< 10	< 10	< 10
1,4-Dichlorobenzene 75	< 5.0	< 10	< 10	< 10
Benzyl Alcohol –	< 5.0	< 10	< 10	< 10
1,2-Dichlorobenzene 620	< 5.0	< 10	< 10	< 10
2-Methylphenol –	< 5.0	< 10	< 10	< 10
Bis(2-chloroisopropyl) Ether –	< 5.0	< 10	< 10	< 10
3,4-Methylphenol –	< 5.0	< 10	< 10	< 10
N-Nitrosodipropylamine –	< 5.0	< 10	< 10	< 10
Hexachloroethane –	< 5.0	< 10	< 10	< 10
Nitrobenzene –	< 5.0	< 10	< 10	< 10
Isophorone –	< 5.0	< 10	< 10	< 10
2-Nitrophenol –	< 5.0	< 10	< 10	< 10
2,4-Dimethylphenol –	< 5.0	< 10	< 10	< 10
Benzoic Acid –	< 25	< 50	< 50	< 50
Bis(2-chloroethoxy)methane –	< 5.0	< 10	< 10	< 10
2,4-Dichlorophenol –	< 5.0	< 10	< 10	< 10
1,2,4-Trichlorobenzene –	< 5.0	< 10	< 10	< 10
Naphthalene –	< 5.0	< 10	< 10	< 10
4-Chloroaniline –	< 5.0	< 10	< 10	< 10
Hexachlorobutadiene –	< 5.0	< 10	< 10	< 10
4-Chloro-3-methylphenol –	< 5.0	< 10	< 10	< 10
Hexachlorocyclopentadiene –	< 5.0	< 10	< 10	< 10
4-Chloro-3-methylphenol	< 5.0	< 10	< 10	< 10
2-Methylnapthalene –	< 5.0	< 10	< 10	< 10
Hexachlorocyclopentadiene –	< 5.0	< 10	< 10	< 10
2,4,6-Trichlorophenol –	< 5.0	< 10	< 10	< 10
2,4,5-Trichlorophenol –	< 25	< 50	< 50	< 50
2-Chloronaphthalene –	< 5.0	< 10	< 10	< 10
2-Nitroanline –	< 25	< 50	< 50	< 50
Dimethyl Phthalate –	< 5.0	< 10	< 10	< 10
Acenaphthylene –	< 5.0	< 10	< 10	< 10
3-Nitroaniline –	< 25	< 50	< 50	< 50
Acenaphthene –	< 5.0	< 10	< 10	< 10
2,4-Dinitrophenol –	< 25	< 50	< 50	< 50
Units	(ug/l)	(ug/l)	(ug/l)	(ug/l)

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V. Analytical Results (Cont'd)

Semivolatile Organics (Page 2 of 2)

		Sample Designation		
Parameter	Method Blank	A82387-1 MW-1	A82387-2 MW-2	A82387-3 MW-3
4-Nitrophenol	< 25	< 50	< 50	< 50
Dibenzofuran	< 5.0	< 10	< 10	< 10
2,4-Dinitrotoluene	< 5.0	< 10	< 10	< 10
2,6-Dinitrotoluene	< 5.0	< 10	< 10	< 10
Diethyl Phthalate 5000	< 5.0	24	< 10	< 10
4-Chlorophenyl Phenyl Ether	< 5.0	< 10	< 10	< 10
Fluorene	< 5.0	< 10	< 10	< 10
4-Nitroaniline	< 25	< 50	< 50	< 50
4,6-Dinitro-2-methylphenol	< 25	< 50	< 50	< 50
N-Nitrosodiphenylamine	< 5.0	< 10	< 10	< 10
4-Bromophenyl Phenyl Ether	< 5.0	< 10	< 10	< 10
Hexachlorobenzene 0.02	< 5.0	< 10	< 10	< 10
Pentachlorophenol 0.3	< 5.0	< 10	< 10	< 10
Phenanthrene	< 5.0	< 10	< 10	< 10
Anthracene	< 5.0	< 10	< 10	< 10
Dibutyl Phthalate 700	< 5.0	< 10	< 10	< 10
Fluoranthene	< 5.0	< 10	< 10	< 10
Benzidine	< 25	< 50	< 50	< 50
Pyrene	< 5.0	< 10	< 10	< 10
Butylbenzyl Phthalate	< 5.0	< 10	< 10	< 10
3,3'-Dichlorobenzidine	< 10	< 20	< 20	< 20
Benzo(a)anthracene	< 5.0	< 10	< 10	< 10
Bis(2-ethylhexyl) Phthalate	9.8	10	10	21
Chrysene	< 5.0	< 10	< 10	< 10
Dioctyl Phthalate	< 5.0	< 10	< 10	< 10
Benzo(b)fluoranthene	< 5.0	< 10	< 10	< 10
Benzo(k)fluoranthene	< 5.0	< 10	< 10	< 10
Benzo(a)pyrene	< 5.0	< 10	< 10	< 10
Indeno(1,2,3-cd)pyrene	< 5.0	< 10	< 10	< 10
Dibenzo(a,h)anthracene	< 5.0	< 10	< 10	< 10
Benzo(g,h,i)perylene	< 5.0	< 10	< 10	< 10
Units	(ug/l)	(ug/l)	(ug/l)	(ug/l)

V. Analytical Results (Cont'd)

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Metals

Parameter (mg/l / ug/l)	Method Blank	A82387-1 MW-1	A82387-2 MW-2	A82387-3 MW-3
Arsenic, total .05/50	< 10	< 10	< 10	< 10
Barium, total 2.0/2000	< 200	< 200	< 200	< 200
Cadmium, total 0.005/5	< 5.0	< 5.0	< 5.0	< 5.0
Chromium, total 0.05/50	< 50	< 50	< 50	< 50
Copper, total 1/1000	< 50	< 50	< 50	< 50
Iron, total	< 100	66,000	1,900	260
Lead, total .015/15	< 50	< 50	< 50	< 50
Maganese (Manganese)	< 15	6,400	92	< 15
Mercury, total .0011/1.1	< 1.1	< 1.1	< 1.1	< 1.1
Selenium, total .05/50	< 10	< 10	< 10	< 10
Silver, total .018/18	< 40	< 40	< 40	< 40
Zinc, total 2.1/2100	< 20	< 20	< 20	< 20
Units	(ug/l)	(ug/l)	(ug/l)	(ug/l)

Sample Designation

possible indicators

Note: The Metals analysis was performed at our Cherry Hill, NJ facility.

V. Analytical Results (Cont'd)

AnalytiKEM

General Chemistry

Sample Designation

Parameter	Method Blank	A82387-1 MW-1	A82837-2 MW-2	A82837-3 MW-3
Total Organic Halogens 100	5.0 U	76	5.0 U	5.0 U
Biochemical Oxygen Demand, 5-day 5000	1,000 U	40,000	1,000 U	2,500
Total Organic Carbon, nonpurgeable 10,000	--	24,000	1,000 U	1,000 U
Units	(ug/l)	(ug/l)	(ug/l)	(ug/l)

Sample Designation

Parameter	Method Blank	A82387-1 MW-1	A82837-2 MW-2	A82837-3 MW-3
pH, Units 6.5-8.5	--	5.78	6.31; 6.30*	5.55
Total Dissolved Solids 500,000	10,000 U	240,000	42,000	30,000; 36,000*
Conductivity, umhos/cm @25° C 1000	1 U	360	30	14; 14*
Nitrate-N 10,000	100 U	100 U	360	100 U
Sulfate 250,000	10,000 U	10,000 U	12,000	12,000
Chloride 250,000	500 U	5,900	990 U	990 U
Fluoride 2000	50 U	50 U	50 U	50 U
Chemical Oxygen Demand 25,000	5,000 U	79,000	5,000 U	29,000
Units	(ug/l)	(ug/l)	(ug/l)	(ug/l)

* Duplicate Analysis.

Note: The Biochemical Oxygen Demand, Total Organic Carbon, and Total Organic Halogens analyses were performed at our Cherry Hill, NJ facility.

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VI. Quality Control Data

Volatile Organics

Aqueous Matrix Spike/Matrix Spike Duplicate Recovery Data

Sample Spiked A82351-11

Parameter	Amount of Spike	Recovery MS	Recovery MSD	RPD	Control Limits Recovery	Control Limits Max. RPD
1,1-Dichloroethene	0.25	96	94	2	79-121	10
Trichloroethene (TCE)	0.25	92	92	0	82-120	7
Chlorobenzene	0.25	95	96	1	78-118	5
Toluene	0.25	96	96	0	74-128	15
Benzene	0.25	93	93	0	70-136	8
Units	(ug)	(%)	(%)	(%)	(%)	(%)

Recovery: 0 out of 10 outside control limits

RPD: 0 out of 5 outside control limits

AnalytiKEM

VI. Quality Control Data (Cont'd)

Volatile Organics

Aqueous Surrogate Recovery Data

Sample Designation	Surrogate Recovery 1,2-Dichloroethane-d_4 (50 ppb)	Toluene-d_8 (50 ppb)	4-Bromofluorobenzene (50 ppb)
Method Blank	101	104	101
A82351-11 Spike	93	97	91
A82351-11 Spike Dup.	93	97	92
A82387-1	97	104	103
A82387-2	97	103	103
A82387-3	99	103	101
Units	(%)	(%)	(%)
Control Limits	76-114	88-110	86-115

0 out of 18 surrogate recoveries are outside control limits.

VI. Quality Control Data (Cont'd)

AnalytiKEM

Semivolatile Organics

Aqueous Matrix Spike/Matrix Spike Duplicate Recovery Data

Sample Spiked A82387-1

Parameter	Amount of Spike	Recovery MS	Recovery MSD	RPD	Control Limits Recovery	Control Limits Max. RPD
1,4-Dichlorobenzene	50	47	44	6	10-110	15
N-Nitrosodipropylamine	50	52	44	17	10-151	27
1,2,4-Trichlorobenzene	50	53	50	6	20-136	24
Acenaphthene	50	65	57	13	17-120	5
2,4-Dinitrotoluene	50	45	46	2	10-175	17
Pyrene	50	77	65	17	10-175	19
Phenol	100	*	*	--	10-130	18
Phenol ϕ	100	27	--	--	10-130	18
2-Chlorophenol	100	*	*	--	47-106	16
2-Chlorophenol ϕ	100	44	--	--	47-106	16
4-Chloro-3-methylphenol	100	*	*	--	48-115	30
4-Chloro-3-methylphenol ϕ	100	51	--	--	48-115	30
4-Nitrophenol	100	9	10	12	10-175	30
4-Nitrophenol ϕ	100	12	--	--	10-175	30
Pentachlorophenol	100	12	24	67	64-118	11
Pentachlorophenol ϕ	100	48	--	--	64-118	11
Units	(ppb)	(%)	(%)	(%)	(%)	(%)

ϕ Spike performed on DI Water.

* Not recovered due to matrix interference.

Recovery: 6 out of 21 outside control limits

RPD: 2 out of 8 outside control limits

AnalytiKEM

VI. Quality Control Data (Cont'd)

Semivolatile Organics

Aqueous Surrogate Recovery Data

Sample Designation	Surrogate Recovery: 2-Fluorophenol (100 ppb Added)	Phenol-d_5 (100 ppb Added)	2,4,6-Tribromophenol (100 ppb Added)
Method Blank	38	29	56
A82387-1 Spike	*	*	*
A82837-1 Spike Dup.	*	*	*
A82837-1	*	*	*
A82837-2	28	26	53
A82837-3	42	32	58
Units	(%)	(%)	(%)
Control Limits	10-90	10-90	10-142

Sample Designation	Surrogate Recovery: Nitrobenzene-d_5 (50 ppb Added)	2-Fluorobiphenyl (50 ppb Added)	Terphenyl-d_{14} (50 ppb Added)
Method Blank	57	69	78
A82837-1 Spike	53	67	76
A82837-1 Spike Dup.	48	57	62
A82837-1	52	64	82
A82837-2	50	62	76
A82837-3	64	80	90
Units	(%)	(%)	(%)
Control Limits	10-133	10-165	10-175

* Not recovered due to matrix interference.

0 out of 27 surrogate recoveries are outside control limits.

VI. Quality Control Data (Cont'd)

AnalytiKEM

Metals

Aqueous Matrix Spike/Matrix Spike Duplicate Recovery Data

Parameter	Sample Spiked	Amount of Spike	Recovery MS	Recovery MSD	RPD	Control Limits Recovery	Control Limits Max. RPD
Arsenic	A82837-2	100	97	103	6	80-109	10
Barium	A82837-1	300	103	97	6	50-125	14
Cadmium	A82837-1	300	102	98	4	71-108	10
Chromium	A82837-1	300	104	97	7	73-109	10
Copper	A82837-1	300	98	94	4	74-107	14
Iron	A82837-1	300	95	93	2	69-112	10
Lead	A82837-1	300	101	95	6	69-107	10
Maganese	A82837-1	20	91	91	0	82-105	10
Mercury	A82837-3	300	114	105	8	75-125	20
Selenium	A82837-1	100	87	99	13	64-117	12
Selenium	DI Water	100	82	--	--	64-117	12
Silver	A27816-1	300	82	86	5	10-100	38
Zinc	A82387-1	300	104	97	7	70-105	10
Units		(ppb)	(%)	(%)	(%)	(%)	(%)

Recovery: 0 out of 25 outside control limits

RPD: 1 out of 12 outside control limits

VI. Quality Control Data (Cont'd)

AnalytiKEM

General Chemistry

Aqueous Matrix Spike/Matrix Spike Duplicate Recovery Data

Parameter	Sample Spiked	Amount of Spike	Recovery MS	Recovery MSD	RPD	Control Limits Recovery	Control Limits Max. RPD
Nitrate-N	A82361-3	500	94	110	16	75-125	25
Sulfate	A73697-C	10,000	82	97	17	67-133	19
Chloride	A82409-2	50,000	97	97	1	49-146	18
Fluoride	A82387-2	500	99	103	4	28-122	6
Chemical Oxygen Demand	A82395-6	50,000	101	112	10	70-118	11
Units		(ppb)	(%)	(%)	(%)	(%)	(%)

Recovery: 0 out of 10 outside control limits

RPD: 0 out of 5 outside control limits

VI. Quality Control Data (Cont'd)

AnalytiKEM

General Chemistry

Aqueous Matrix Spike/Matrix Spike Duplicate Recovery Data

Parameter	Sample Spiked	Amount of Spike	Recovery MS	Recovery MSD	RPD	Control Limits Recovery	Control Limits Max. RPD
Biochemical Oxygen Demand	A82387-3	200	88	89	1	68-109	5
Total Organic Carbon	DI Water	10	87	88	1	49-158	36
Total Organic Halogen	A82395-4	5	92	97	5	64-128	36
Units		(ppb)	(%)	(%)	(%)	(%)	(%)

Recovery: __0__ out of __6__ outside control limits

RPD: __0__ out of __3__ outside control limits

AnalytiKEM An American NuKEM Company

10868

Chain-of-Custody Record

Program Area: Drinking Water Wastewater (Groundwater — circled) Solid and Hazardous Waste

Client: ENGINEERING TECTONICS **Sample Collector:** RJ

Project: ALLEGHANY CO. LANDFILL **AnalytiKEM Contact:** G.W.

Laboratory
2324 Vernsdale Road
Rock Hill, South Carolina 29731
(803) 324-5310
Fax: (803) 324-8378

Sales Office
454 South Anderson Road BTC 532
Rock Hill, South Carolina 29730
(803) 329-9690
Fax: (803) 329-9689

ITEM NUMBER	SAMPLE DESIGNATION	DATE	TIME	MATRIX	Grab or Composite	40 ml vials	950 ml Org. Pres.	950 ml Unpres.	950 ml HNO_3	250 ml H_2SO4	ml NaOH	ml HCL	500 UNP	500 H_2SO_4	250 UNP	PARAMETERS
1	MW-1	6/23	2:15	H_2O	G	4		3	1	2			1	1	1	8240 8270 BOD COD
2	MW-2		2:35	↓	↓	4		3	1	2			1	1	1	TOC TOX TDS CHLORIDE
3	MW-3		2:55			4		3	1	2			1	1	1	FLOURIDE SULFATE NITRATE
4																AR BA CD CR CU FE
5																MN PB HG SE Ag ZN
6																pH SPEC. COND.
7																
8																
9																
10																

TRANSFER NUMBER	ITEM NUMBER	TRANSFERS RELINQUISHED BY	TRANSFERS ACCEPTED BY	DATE	TIME
1	1-3	R. Jeff Wyatt	Grady Lane	6-24-92	1411
2	1-3	Grady Lane	Daniel Pope	6-24-92	1626
3					
4					

REMARKS

CD 5.0 ppb DET. LIMIT
Hg 1.1 ppb DET. LIMIT

R. Jeff Wyatt

SAMPLER'S SIGNATURE

Reorder: PJ Associates 803-329-2300 White Laboratory Copy Yellow Client Copy AKEM #1 12/89

Constituent	MW-1	MW-2	MW-3	Limits
Semi-Volatile Organics				
Diethyl Phthalate	24	ND	ND	0
Bis(2-ethylhexyl)Phthalate	10	10	21	0
Volatile Organics				
Methylene Chloride	30	ND	ND	5
Toluene	56	ND	ND	1,000
Ethylbenzene	6.5	ND	ND	29
m,p-Xylene	21	ND	ND	400
o,p-Xylene	57	ND	ND	400
Metals				
Iron	66,000	1,900	260	300
Manganese	6,400	92	ND	50
Indicators				
Total Organic Halogens	76	ND	ND	100
Total Organic Carbon	24,000	ND	ND	10,000
Conductivity	360	30	14	1,000
Chloride	5,900	ND	ND	250,000
pH	5.78	6.31	5.55	6.5-8.5
Total Dissolved Solids	240,000	42,000	30,000	500,000
Nitrate-Nitrogen	ND	360	ND	10,000
Biochemical Oxygen Demand	40,000	ND	2,500	520,000
Chemical Oxygen Demand	79,000	ND	29,000	1,500,000