Copy

New York State Department of Environmental Conservation
Division of Environmental Remediation, Region 2
Spill Prevention and Response
47-40 21ST Street, Long Island City, NY 11101-5407
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2001 AUG 27 PM 1:21

Erin M. Crotty
Commissioner

August 23, 2001

Mr. Neale Bedrock
Director of Remediation
Consolidated Edison of New York, Inc.
31-01 20th Avenue
Long Island City, New York 11105

Re: Earthen Sump Sampling in Subsurface Structures

Dear Mr. Bedrock:

At the Department's request in September 1999, Con Edison began sampling and analyzing earthen sumps in subsurface structures impacted by spills for VOCs (via EPA Method 8260 + 10 TICs), SVOCs (via EPA Method 8270 + 20 TICs) and PCBs (if the concentration in the spilled material was greater than 50 ppm). Con Ed has recently submitted the results for approximately 80 sump samples for the Department's review. In addition, the Department is reviewing the Electric Power Research Institute's (EPRI) report entitled "Mineral Insulating Oils Used in the Power Industry - Chemical Composition and Dissolution Characteristics" dated September 2000.

This letter serves as notification to suspend the sump sampling program for VOCs and SVOCs until the Department has had the opportunity to complete this review. Soil samples from sumps shall continue to be taken for PCB analysis if the PCB concentration of the spilled material is greater than 50 ppm.

Please call if you have any questions or comments regarding this letter.

Sincerely,

Jane O'Connell

Jane O'Connell
Engineering Geologist 2

cc: Frank Peduto
Kerry Foley
Abraham Rodriguez
Andrew Fiore - Con Ed

CC596

Con Edison
Consolidated Edison Company of New York, Inc.
31-01 20th Avenue, L.I.C., New York 11105-2048

July 20, 2000

Ms. Jane Healy O'Connell
Engineering Geologist
Division of Environmental Remediation
New York State Department of
Environmental Conservation
47-40 21st Street
Long Island City, New York 11101

Re: EPRI Transformer Oil Study
Con Edison Sample Results

Dear Ms. O'Connell:

As you know, Con Edison is participating in a nationwide study by the Electric Power Research Institute (EPRI) to supplement information that EPRI previously reported concerning the characteristics of electrical insulating oil (i.e., transformer oil). As part of this supplemental study, Con Edison sent 5 non-PCB (<50 ppm) transformer oil samples to EPRI's contractor, META Environmental, Inc., (META) for analysis. EPRI has not yet issued a final report of the study results. However, we are providing you with a copy of the laboratory data package that META provided to Con Edison for our 5 samples. In addition to transmitting this laboratory package, we have summarized the results, compared the results to constituent levels found in other types of oil, and evaluated the results in view of DEC soil cleanup objectives.

The META results indicate that levels of target volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), and metals found in our 5 transformer oil samples do not generally pose a risk to human health or the environment. We, therefore, propose that DEC not require Con Edison to conduct post-cleanup sampling for these constituents for oil spills from transformers and other mineral oil-containing equipment onto soil, including spills from the Company's distribution cable systems into earthen sumps located in vaults and manholes.

Background

EPRI Studies

EPRI issued a 2-volume report *"Insulating Oil Characteristics,"* (EPRI Report TR-106898), December 1996, which Con Edison previously provided to you. Volume 1 reported the oil characterization results, and Volume 2 provided a fate and transport evaluation. This report included analytical results for two oils (Shell Diala A and Exxon Univolt 60) from a limited geographical area and a limited range of equipment manufacture dates. EPRI subsequently decided to analyze additional samples in an effort to cover a range of oil types, ages, and geographical areas. META solicited oil samples from participating utilities. It is our understanding that META received a total of 24 samples, including 5 from Con Edison. In December 1999, EPRI issued an interim report , *"Mineral Oils Used in the Power Industry – Chemical Composition and Dissolution Characteristics,"* (TR-114129). This report provided partial results for 12 samples, none of which were from Con Edison. A copy of this interim report was provided to you in January 2000.

Con Edison Samples for EPRI Study

At a September 13, 1999 meeting, Con Edison informed you that we intended to take the following 5 samples for EPRI's supplemental study:

- 1 sample of new oil.
- 1 sample of reconditioned oil.
- 1 sample from a power plant transformer.
- 1 sample from a power distribution transformer.
- 1 sample from a substation transformer.

At that time, it was our intent to take at least one sample from a transformer with 50-499 ppm PCBs and to take samples from transformers that represent varying ages and manufacturers. This was memorialized in your September 27, 1999 letter to Troy Meyer. On October 19, 1999, Barry Cohen informed you by telephone that we substituted an overhead transformer oil sample for a power plant transformer oil sample. This was done because overhead transformers are much more prevalent in Con Edison's system and power plant transformers are generally similar to substation transformers. At that time, he also informed you that we could not send a sample containing 50-499 ppm PCB oil to META, because META informed Con Edison that the EPRI study only addresses non-PCB (<50 ppm) oils. Because of time constraints imposed by META, all samples were taken from transformers and tanks located at Con Edison's Astoria site. Information concerning Con Edison's 5 samples for the EPRI study is provided below:

1) Substation Transformer Oil Sample – This sample was taken from transformer location TR2-MB in the North Queens Substation at Con Edison's Astoria site. The sample is designated as sample North Queens S/S TR2-MB in the laboratory data package and as NQSS TR2-MB in Table 1 attached to this letter. This transformer was manufactured in 1994 by North American (now Waukesha Electric Systems). Its serial number is 70505, it was manufactured with Shell Diala A oil, and contains <1 ppm PCBs.

2) Overhead Transformer Oil Sample – This sample was taken from an overhead transformer (serial number 94A511984) that was manufactured by Westinghouse (now ABB) in 1994, and was under the control of the Astoria Transformer Shop (Bldg. 82) at the time of sampling. The sample is designated as sample BLDG 82 Overhead 94A511984 in both the laboratory package and Table 1. ABB could not provide us with the specific type of oil added during manufacture of this unit. According to ABB, the oil could have come from any of six suppliers approved by Westinghouse in 1994. Because the unit was manufactured after the date the EPA banned the use of PCBs (July 2, 1979), and since overhead transformers are sealed units, we assume that this particular unit contains <1 ppm PCBs.

3) Network Distribution Transformer Oil Sample – This sample was taken from a network transformer (serial number D512267) that was manufactured by GE in 1960 and was under the control of the Astoria Transformer Shop (Bldg. 82) at the time of sampling. This sample is designated as sample BLDG 82 TR-D512267 in both the laboratory package and in Table 1. According to GE, the oil used to fill the unit during manufacture was Exxon Univolt 60. Con Edison retrofilled this unit in the 1990s, but the manufacturer of the refill oil is unknown. Previous PCB results for this unit were 201 ppm in 1993, 14 ppm in 1997, and 13 ppm in 1999.

4) New Transformer Oil Sample – This sample was taken from a new oil tank (Tank #11) at the Astoria Transformer Shop. It is designated as sample BLDG 82 New Oil Tank #11 in both the laboratory package and Table 1. The oil in this tank was Exxon Univolt 60.

5) Reconditioned Transformer Oil – This sample was taken from a reconditioned oil tank (tank #8) at the Astoria Transformer Shop. It is designated as BLDG 82 Recon. Oil Tank #8 in both the laboratory package and Table 1 attached to this letter. This tank stores <10 ppm PCB oil that has been removed from transformers of varying manufacturers and vintages, and then filtered for future reuse.

DEC Post-Cleanup Soil Sampling Requirements for Transformer Oil Spills

During a September 13, 1999 meeting, representatives from Con Edison and DEC agreed that we would analyze soil samples for the following chemicals after we clean up transformer oil spills that have occurred in vaults with earthen sumps:

- VOCs + 10 Tentatively Identified Compounds (TICs) using EPA Method 8260,
- SVOCs + 20 TICs using EPA Method 8270, and
- PCBs (only if the spill involved oil containing 50 ppm or greater PCBs).

In December 1999, Con Edison agreed to extend this sampling program to oil spills in manholes with earthen sumps. In addition, Con Edison has performed post-excavation sampling for transformer oil spills outside underground structures when such sampling

2) Overhead Transformer Oil Sample – This sample was taken from an overhead transformer (serial number 94A511984) that was manufactured by Westinghouse (now ABB) in 1994, and was under the control of the Astoria Transformer Shop (Bldg. 82) at the time of sampling. The sample is designated as sample BLDG 82 Overhead 94A511984 in both the laboratory package and Table 1. ABB could not provide us with the specific type of oil added during manufacture of this unit. According to ABB, the oil could have come from any of six suppliers approved by Westinghouse in 1994. Because the unit was manufactured after the date the EPA banned the use of PCBs (July 2, 1979), and since overhead transformers are sealed units, we assume that this particular unit contains <1 ppm PCBs.

3) Network Distribution Transformer Oil Sample – This sample was taken from a network transformer (serial number D512267) that was manufactured by GE in 1960 and was under the control of the Astoria Transformer Shop (Bldg. 82) at the time of sampling. This sample is designated as sample BLDG 82 TR-D512267 in both the laboratory package and in Table 1. According to GE, the oil used to fill the unit during manufacture was Exxon Univolt 60. Con Edison retrofilled this unit in the 1990s, but the manufacturer of the refill oil is unknown. Previous PCB results for this unit were 201 ppm in 1993, 14 ppm in 1997, and 13 ppm in 1999.

4) New Transformer Oil Sample – This sample was taken from a new oil tank (Tank #11) at the Astoria Transformer Shop. It is designated as sample BLDG 82 New Oil Tank #11 in both the laboratory package and Table 1. The oil in this tank was Exxon Univolt 60.

5) Reconditioned Transformer Oil – This sample was taken from a reconditioned oil tank (tank #8) at the Astoria Transformer Shop. It is designated as BLDG 82 Recon. Oil Tank #8 in both the laboratory package and Table 1 attached to this letter. This tank stores <10 ppm PCB oil that has been removed from transformers of varying manufacturers and vintages, and then filtered for future reuse.

DEC Post-Cleanup Soil Sampling Requirements for Transformer Oil Spills

During a September 13, 1999 meeting, representatives from Con Edison and DEC agreed that we would analyze soil samples for the following chemicals after we clean up transformer oil spills that have occurred in vaults with earthen sumps:

- VOCs + 10 Tentatively Identified Compounds (TICs) using EPA Method 8260,
- SVOCs + 20 TICs using EPA Method 8270, and
- PCBs (only if the spill involved oil containing 50 ppm or greater PCBs).

In December 1999, Con Edison agreed to extend this sampling program to oil spills in manholes with earthen sumps. In addition, Con Edison has performed post-excavation sampling for transformer oil spills outside underground structures when such sampling

has been required by DEC on a case-by-case basis. It is our understanding that DEC would await the results of the 5 Con Edison transformer oil samples under the EPRI project before deciding whether to require post-excavation soil sampling for transformer oil spills outside underground structures, and whether to continue to require post-cleanup sampling for VOCs and SVOCs in earthen sumps.

Con Edison Sample Results – Summary of Results and Con Edison's Evaluation

Con Edison's oil samples were analyzed by META for target compound list volatile and semivolatile organic compounds, volatile petroleum hydrocarbons, and extractable petroleum hydrocarbons. Commercial Testing & Engineering Company analyzed these samples for target analyte list metals. The results are summarized in Table 1 for those VOC, SVOCs, and metals that were detected in at least one of the five samples. Since the results for metals indicate non-detect or very low concentrations, they are not a potential cause for concern and are not discussed further.

Table 2 presents the range of concentrations reported by META for detected VOCs and SVOCs. It compares those results to the average concentrations of these compounds reported for gasoline, kerosene, diesel, lube/motor oil, #2 fuel oil, and #6 fuel oil in The Total Petroleum Hydrocarbon Criteria Working Group Series Volume II, "*Composition of Petroleum Materials," May 1998*. This document can be found at the Association for the Environmental Health of Soils' web site at http://www.aehs.com. Data presented in Table 2 indicate that the concentrations of detected VOC and SVOC constituents in Con Edison's transformer oil are typically several orders of magnitude less than the concentration of these compounds in the other oils listed. The only detected compounds for which the concentrations are similar to, or within an order of magnitude of, those in the listed oils are fluorene and phenanthrene.

Table 3 presents the range and averages of concentrations reported by META for detected VOCs and SVOCs and compares those results to human health-based, and groundwater-protection-based, soil cleanup objectives for individual compounds specified in the DEC's 1994 Technical and Administrative Guidance Memorandum 4046: *Determination of Soil Cleanup Objectives and Cleanup Levels*. In order to compare the results to the soil cleanup objectives specified in TAGM 4046, it is important to understand how they were derived. Soil cleanup objectives for human health protection are based on children eating soil and an excess cancer risk of one in a million for carcinogens. Therefore, Con Edison believes that these guidance values would apply to surface soil. Soil cleanup objectives for groundwater protection are based on soil/water partition factors, an assumed dilution attenuation factor, and an assumption that the groundwater is a potable water source (Class GA groundwater). Con Edison believes that these guidance values would apply to subsurface soil. TAGM 4046 does not provide soil cleanup objectives for several of the compounds detected in Con Edison's transformer oil samples (this is indicated by "NA" in the soil cleanup objectives columns of the table).

The data presented in Table 3 indicate that

1) the concentrations of detected compounds in Con Edison's transformer oil samples are several orders of magnitude below the health-based soil cleanup objectives specified for those compounds; and
2) the concentrations of detected compounds in Con Edison's transformer oil samples are similar to (some slightly higher, some slightly lower) the groundwater protection-based soil cleanup objectives specified for those compounds.

The above analysis compares concentrations of transformer oil constituents to DEC's cleanup objectives for soil. In reality, if the oil spills onto soil, the concentrations of detected compounds will be much lower in the soil than in the oil. For example, if the relative amount of spilled oil in soil is 1% (equivalent to 10,000 ppm), the concentration of a compound in soil would be one hundredth of its concentration in oil. Using the information presented in Table 3, the only detected constituents in Con Edison's transformer oil samples that exceeded DEC's soil cleanup objectives were toluene, xylene, phenol, and dibenzofuran. The factors by which the maximum oil concentration exceeded DEC's soil cleanup objectives ranged from 1.3 for toluene to 52 for phenol. However, if the amount of oil in soil is 1% (10,000 ppm), the concentrations of these constituents in the soil would be reduced by a factor of 100. The resulting soil concentrations of these constituents would be less than their corresponding soil cleanup objectives. For example, the maximum phenol concentration in the soil would be 1.55 ppm divided by 100 (0.0155 ppm), which is less than DEC's 0.03 ppm soil cleanup objective.

Conclusions and Recommendations

Based on the results of Con Edison's transformer oil samples analyzed for the EPRI study and our evaluation presented above, the levels of detected compounds in Con Edison's transformer oil will not cause exceedances of the conservative soil cleanup objectives specified in TAGM 4046. Therefore, Con Edison believes that it is unnecessary to perform post-excavation sampling for VOCs and SVOCs to determine if transformer oil spills have been properly cleaned up. Instead, we believe that it would be more appropriate for DEC and Con Edison (and other interested electrical equipment owners) to jointly develop appropriate transformer oil cleanup guidance after EPRI issues their final report. We expect that this report will be issued in late spring or early summer.

Pending development of appropriate cleanup guidance, Con Edison proposes that DEC not require post-cleanup VOC/SVOC sampling for oil spills from transformers and similar electrical equipment that contain mineral oil. We also propose that DEC no longer require post-cleanup VOC/SVOC sampling for distribution cable oil spills into earthen sumps. Con Edison has been collecting post-cleanup data for VOC/SVOC plus tentatively identified compounds in earthen sumps for several months. We are awaiting copies of the chromatograms from the laboratories before submitting a complete package (e2mis reports, VOC/SVOC results, PCB results if applicable, and gas chromatograms) to

you for various spills into earthen sumps. However, based on the data and the evaluation provided in this letter and the fact that earthen sumps tend to collect pollutants from non-Con Edison sources (e.g., motor oil, gasoline, diesel), we propose that DEC withdraw the requirement to perform VOC/SVOC sampling in earthen sumps.

Con Edison looks forward to discussing these results with you and working with the DEC to develop appropriate cleanup criteria for transformer oil spills. After you have an opportunity to review this information, we would like to meet with you to discuss future actions.

If you have any questions or would like additional information, please call me at 718-204-4292.

Very truly yours,

for Neale R. Bedrock
Director, Remediation
Environment, Health & Safety

Enclosures
Tables 1-3
EPRI Laboratory Data Package

Cc. Mr. Frank Peduto, NYSDEC Albany

Table 1

Con Edison Mineral Oil
EPRI Study Results
Analytical Summary

Sample ID	NQSS TR2-MB[a]	Bldg. 82 Recon. Oil[b] Tank #8	Bldg. 82 New Oil[c] Tank #11	Bldg. 82 Overhead 94A511984[d]	Bldg. 82 TR-D512267[e]
Date Sampled	9/30/99	9/30/99	9/30/99	9/30/99	9/30/99
Units	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
VOCs and SVOCs					
Toluene	0.41	1.09	2.02	0.91	1.75
Ethylbenzene	0.19 U	0.79	1.41	0.48 U	0.61
m/p-Xylene	0.27	1.98	3.07	1.49	1.33
o-Xylene	0.39 U	0.83	1.11	1.93	2.37
Isopropylbenzene	0.77 U	0.49	1.93 U	1.93 U	1.92
1,3,5-Trimethylbenzene	3.10 U	3.88 U	7.72 U	4.15	7.69 J
Phenol	1.55	1.94 U	3.86 U	0.08	0.83
1-2-4-Trimethylbenzene	1.28	4.25	5.11	7.43	8.51
sec-Butylbenzene	0.39 U	5.07	8.15	0.96 U	2.07
p-Isopropyltoluene	0.77 U	1.79	3.07	1.24 J	9.56
4-Methylphenol (p-cresol)	0.06	0.14	0.12	0.08 U	0.67
n-Butylbenzene	1.55 U	1.88	3.48	3.86 U	3.27
3-Methylphenol (o-cresol)	0.08 U	0.05 J	0.04 J	0.08 U	0.46
2,4-Dimethylphenol	0.16	0.31	0.31	0.13	1.80
Naphthalene	2.90	2.63	5.62	1.68	4.36
2-Methylnaphthalene	0.39 U	6.84	12.6	22.7	5.70
Dibenzofuran	1.95 U	0.97 U	1.93 U	1.93 U	19.8
Fluorene	0.98 U	29.8	63.5	0.96 U	0.96 U
Phenanthrene	0.98 U	3.93	25.4	0.96 U	11.5
METALS					
Antimony, Sb	<0.1	<0.1	0.2	<0.1	<0.1
Calcium, Ca	<5.0	2.2	5.0	<0.5	1.7
Copper, Cu	<0.5	<0.5	<0.5	<0.5	1.0
Iron, Fe	<0.5	1.3	0.6	1.6	1.1
Lead, Pb	<0.1	0.2	0.1	<0.1	0.2
Selenium, Se	<0.1	<0.1	0.2	<0.1	<0.1
Sodium, Na	16	15	16	<5.0	23
Vanadium, V	<0.6	<0.5	<0.5	1.6	1.0

Notes:

Only compounds detected in one or more samples are listed in this table.

mg/kg = milligrams per kilogram = parts per million (PPM)

U = analyte not detected at or above quantitation limit

J = estimated value

a = Transformer no. TR2-MB (serial #70505) at the North Queens Substation (NQSS).

b = Reconditioned oil from Tank #8 at the Astoria Transformer Shop (Building 82).

c = New oil from Tank #11 at the Astoria Transformer Shop (Building 82).

d = Overhead transformer (serial #94A511984) at the Astoria Transformer Shop (Building 82).

e = Network transformer (serial #D512267) at the Astoria Transformer Shop (Building 82).

Table 2

Con Edison Mineral Oil
EPRI Study
Comparison (VOCs and SVOCs)

Compound	Percentage of Detects[a]	Range of Detects	Gasoline	Kerosene	Diesel	Lube/ otor Oil	#2 Fuel Oil	#6 Fuel Oil
	%	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
VOCs and SVOCs								
Toluene	100	0.41 – 2.02	81,000		1,800	2,200	620	
Ethylbenzene	60	0.61 – 1.41	17,000		680		340	
m/p-Xylene	100	0.27 – 3.07	65,000		2,200	3,400	2,300	
o-Xylene	80	0.83 – 2.37	25,000		430			
Isopropylbenzene	40	0.49 – 1.92						
1,3,5-Trimethylbenzene	40	4.15 – 7.69	9,800		1,800			
Phenol	60	0.08 – 1.55						
1-2-4-Trimethylbenzene	100	1.28 – 8.51	30,000					
sec-Butylbenzene	60	2.07 – 8.15						
p-Isopropyltoluene	80	1.79 – 9.56						
4-Methylphenol (p-cresol)	80	0.06 – 0.67						
n-Butylbenzene	60	1.88 – 3.48			380			
3-Methylphenol (o-cresol)	60	0.04 – 0.46						
2,4-Dimethylphenol	100	0.13 – 1.80						
Naphthalene	100	1.68 – 5.62	2,500	3,100	2,600	590	2,200	42
2-Methylnaphthalene	80	5.70 – 22.7	1,800	11,000	8,900		6,800	
Dibenzofuran	20	19.8						
Fluorene	40	29.8 – 63.5		42	1,860	45	190	
Phenanthrene	60	3.93 – 25.4		580	880	79	790	210

Notes:

a = percentage of detects out of five samples analyzed.

Only compounds detected in one or more samples are listed in this table.

Blank means data not provided.

mg/kg = milligrams per kilogram = parts per million (PPM)

Comparison values based on the average concentrations specified in: The Total Petroleum Hydrocarbon Criteria Working Group Series, Volume II, "*Composition of Petroleum Materials," prepared by Thomas L. Potter and Kathleen E. Simmons, published by Amherst Scientific Publishers, Amherst MA, May 1998.* Available on the web at: The Association for the Environmental Health of Soils (AEHS), http://www.aehs.com

Table 3

Con Edison Mineral Oil
EPRI Study
Comparison (VOCs and SVOCs)

Compound	Percentage of Detects[a]	Average of Detects	Range of Detects	DEC Soil Cleanup Objectives[b]	
				Groundwater Protection	Health Based
	%	mg/kg	mg/kg	mg/kg	mg/kg
VOCs and SVOCs					
Toluene	100	1.24	0.41 – 2.02	1.5	20,000
Ethylbenzene	60	0.94	0.61 – 1.41	5.5	8,000
m/p-Xylene	100	1.63	0.27 – 3.07	1.2	200,000
o-Xylene	80	1.56	0.83 – 2.37		
Isopropylbenzene	40	1.21	0.49 – 1.92	NA	NA
1,3,5-Trimethylbenzene	40	5.92	4.15 – 7.69	NA	NA
Phenol	60	0.82	0.08 – 1.55	0.03	50,000
1-2-4-Trimethylbenzene	100	5.32	1.28 – 8.51	NA	NA
sec-Butylbenzene	60	5.10	2.07 – 8.15	NA	NA
p-Isopropyltoluene	80	3.92	1.79 – 9.56	NA	NA
4-Methylphenol (p-cresol)	80	0.25	0.06 – 0.67	0.9	4,000
n-Butylbenzene	60	2.88	1.88 – 3.48	NA	NA
3-Methylphenol (o-cresol)	60	0.18	0.04 – 0.46	NA	NA
2,4-Dimethylphenol	100	0.54	0.13 – 1.80	NA	NA
Naphthalene	100	3.44	1.68 – 5.62	13	300
2-Methylnaphthalene	80	11.96	5.70 – 22.7	36.4	NA
Dibenzofuran	20	19.80	19.8	6.2	NA
Fluorene	40	46.65	29.8 – 63.5	350	3,000
Phenanthrene	60	13.61	3.93 – 25.4	220	NA

Notes:

Only compounds detected in one or more samples are listed in this table.

mg/kg = milligrams per kilogram = parts per million (PPM).

a = percentage of detects out of five samples analyzed.

b = Based on guidance values provided in DEC's 1994 TAGM 4046: Determination of soil cleanup objectives and cleanup levels.

NA = Guidance value not available in TAGM 4046.

META Environmental, Inc.

49 Clarendon Street
Watertown, MA 02472
TEL: (617) 923-4662
FAX: (617) 923-4610

February 7, 2000

Mr. Barry Cohen
Consolidated Edison of New York
31-02 20th Avenue, Bldg. 136
Long Island City, NY 11105

RE: Mineral Oil Data

Dear Barry:

Enclosed are the results of analyses of the five samples of transformer mineral oil that you sent to us. The samples were analyzed for VOCs, SVOCs, VPH/EPH, and metals. Quality control data, laboratory documentation, and raw GC/MS data are included with the results. However, no data packages were requested of the subcontracted laboratory that analyzed the samples for metals, so this report contains metals results only.

If you have any questions or need additional information, please call me.

Sincerely,

David M. Mauro
V. President

META Environmental, Inc.

49 Clarendon Street
Watertown, MA 02472
TEL: (617) 923-4662
FAX: (617) 923-4610

Characterization of Volatile and Semivolatile Organic Compounds in Mineral Oils

Prepared for
Electric Power Research Institute
3412 Hillview Avenue
Palo Alto, CA 94304

Sample Delivery Group Narrative

Project:	Mineral Oil Characterization
Client:	Electric Power Research Institute 3412 Hillview Avenue Palo Alto, CA 94304
Report Contact:	David Mauro, META
Date of Receipt:	9/30/99
Analyses:	Waste Dilution Volatiles and Semivolatiles by GC/MS USEPA 3585/8260B/8270C Modified Volatile and Semivolatile Aromatics by GC/MS USEPA 3585/3630C/8260B/8270C Modified Semivolatile Acids and Bases by GC/MS USEPA 3585/3650B/8260B/8270C Modified Volatile and Extractable Petroleum Hydrocarbons by GC/FID MADEP VPH & EPH Method Revision 0, 1/98 Modified (see Addendum)

Sample Summary:

Client Sample Identification	Laboratory Sample Identification
North Queens S/S TR2-MB	MO991005-01
BLDG 82 Recon. Oil Tank #8	MO991005-02
BLDG 82 New Oil Tank #11	MO991005-03
BLDG 82 Overhead 94A511984	MO991005-04
BLDG 82 TR-D512267	MO991005-05

META Project Number: E01019-02

Chain of Custody

Samples were received in good condition. The custody seal was intact. The internal temperature of the shipment container was 5.9°C.

Internal chain of custody procedures were followed after sample receipt. Samples were stored in a locked refrigerator. A sample custody logbook contains the record of sample removal from the secure sample storage area to the sample preparation laboratory. The custody record for the sample extracts is present on the sample extraction logbook page.

The disposal of samples and extracts will be authorized 3 months after the release of this data report. Sample disposal will be documented.

Methods

Two hundred milligrams of mineral oil were diluted to 1 mL in dichloromethane (EPA 3585 Modified). The sample dilution was spiked with internal standard and analyzed by a gas chromatograph equipped with a mass spectrometer operated in the scan mode. The instrument was tuned and calibrated for volatile organics and semivolatile organics using a minimum of 5 concentration levels and the internal calibration technique (EPA 8260B and 8270C Modified). Daily tunes and continuing calibration standards were run to check the continued linearity of the initial calibration curve.

Twenty five grams of mineral oil were diluted to 50 mL with pentane (EPA 3585 Modified). Five forty microliter aliquots of the sample dilution were fractionated separately on 5 g of silica gel (EPA 3630C). The aliphatic material was eluted with 20 mL of pentane and the aromatic compounds were eluted with 25 mL of dichloromethane (DCM). The aromatic fractions were combined and concentrated to 0.5 mL, spiked with internal standard, and analyzed as described above.

Two ten milliliter aliquots of the sample diluted in pentane were subjected to an acid-base partitioning cleanup (EPA 3650B). Acid compounds were back-extracted with pH 14 deionized water (DIW), acidified, and extracted with DCM. Base compounds were back-extracted with pH 2 DIW, basified, and extracted with DCM. The DCM extracts were combined, concentrated to 1 mL, spiked with internal standard, and analyzed as described above.

Results

Sample results were presented in summary forms followed by a CLP-like raw data package. Target analytes detected in the samples were boxed for ease of recognition.

Quality Control

Analyte Flags

The detection limits were determined as the sample equivalent of the lowest linear initial calibration standard. Analytes measured between 50% and 100% of the lowest standard were reported as "estimated" and flagged with the letter "J." No value was reported above the calibration range. Undetected analytes were flagged with the letter, "U." Analytes marked with a "B" were detected in the associated blank and should be reviewed for a possible positive bias. None of these deviations were thought significant enough to compromise the integrity of the reported values.

Holding Times

Holding times did not strictly apply to this sample matrix. Nevertheless, all samples were stored at 4°C ± 2°C during the three months required to characterize the material. All extracts were analyzed within 40 days of sample preparation.

Surrogate Spikes

All fractionation and acid-base surrogate spikes were recovered within the acceptable QC limits. The waste dilution was not spiked with surrogate. The DCM fraction was spiked with the fractionation surrogate, 2-bromonaphthalene. The QC limits for this surrogate were 40% to 140%. The acid-base fraction was spiked with acid surrogates (2-fluorophenol, phenol-d5, and 2,4,6-tribromophenol) and base/neutral surrogates (nitrobenzene-d5, 2-fluorobiphenyl, p-terphenyl-d14). The QC limits for the acid surrogates were adopted from the USEPA SOW for CLP semivolatiles in soil:

Surrogate Compound	QC Limits
2-fluorophenol	25-121
phenol-d5	24-113
2,4,6-tribromophenol	19-122

The base neutral surrogate recoveries were expected to be low. All samples satisfied these criteria. The method blank and method blank spike for the acid-base fraction yielded anomalous surrogate recoveries. The reason for these outliers was not known.

Fractionation Spikes
All target analyte spikes were recovered within the acceptable QC limits (40%-140%).

Acid-Base Partitioning Blank Spikes
All target analyte spikes were recovered within the acceptable QC limits (40%-140%) for the aromatic fractionation. The following target analytes were recovered below this range for the acid-base cleanup procedure: phenol, chlorophenol, bis(2-chloroisopropyl)ether, 2-nitrophenol, 2,6-dichlorophenol, 2,4-dichlorophenol, n-nitroso-di-n-butylamine, trichlorophenols, 4-nitrophenols, tetrachlorophenols, 4-chlorophenyl-phenylether, 4,6-dinitro-2-methylphenol, n-nitrosodiphenylamine, 4-bromophenylphenylether, and pentachlorophenol. These acid-base partitioning data may reflect a negative bias for these analytes.

Blanks
The aromatic fractions (DCM Fractions) of all samples were associated with a blank containing low levels of toluene. The only affected sample was BLDG 82 TR-D512267 for which the toluene concentration was flagged with the letter "B". The concentration of toluene in this sample was more than 5 times greater than that in the blank. Consequently, the potential of a positive bias was deemed slight.

Internal Standards
All internal standards were recovered within acceptable QC limits (50%-200%) relative to the average of the initial calibration standards with exceptions. Internal standard recoveries were presented in the raw data. Analytes associated with a internal standard outliers due to the high concentration of mineral oil (see the straight waste dilutions) were not reported. No other analytes were affected by internal standard outliers.

Initial Calibration (11/18/99)
The instrument tune passed all QC criteria. Target analytes passed the QC criteria for linearity and response (RSD $\leq$ 30% and RRF $>$ 0.1) with exceptions. The following compounds exhibited $>$30 %RSD: n-nitrosomethylamine, indeno(1,2,3-cd) pyrene, dibenzo(a)pyrene, and benzo(g,h,i)perylene. These analytes may exhibit a negative bias at low concentrations. Although these analytes were not detected, this performance may have affected the measurement of aromatic analytes in the DCM Fraction of all samples.

Continuing Calibration (11/30/99)
The instrument tune passed all QC criteria. The continuing calibrations were also acceptable (%D $\leq$ 30% and RRF $>$ 0.1) with exceptions. The analytes bromodichloromethane and bromoform exhibited a positive bias. The analytes, n-nitrosodimethylamine, nitroaniline, 4,6-dinitro-2-methylphenol, pentachlorophenol, and dinoseb exhibited a negative bias. None of these deviations affected the samples.

Initial Calibration (12/6/99)
The instrument tune passed all QC criteria. Target analytes passed the QC criteria for

linearity and response (RSD $\leq$ 30% and RRF > 0.1) with exceptions. The following compounds exhibited >30 %RSD: 4-nitrophenol, 4,6-dinitro-2-methylphenol, and Dinoseb. These analytes may exhibit a negative bias at low concentrations. Although these analytes were not detected, this performance may have affected the measurement of analytes in the straight waste dilution and acid-base fractions.

Continuing Calibration (12/9/99)
The instrument tune passed all QC criteria. The continuing calibrations were also acceptable (%D $\leq$ 30% and RRF > 0.1).

Continuing Calibration (12/15/99)
The instrument tune passed all QC criteria. The continuing calibrations were also acceptable (%D $\leq$ 30% and RRF > 0.1) with exceptions. The analytes benzyl alcohol and 2-nitroaniline exhibited a positive bias. No samples were affected.

Continuing Calibration (1/4/00)
The instrument tune passed all QC criteria. The continuing calibrations were also acceptable (%D $\leq$ 30% and RRF > 0.1). The internal standards were greater than 200% of the average internal standard area of the initial calibration standards. However, the relative response factors were unaffected and the samples exhibited internal standard recoveries within the QC limits (50%-200% recovery). Therefore, no samples were deemed adversely affected by this outlier.

Certification

I certify that this 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 Director, as verified by the following signature.

Stephen Emsbo-Mattingly
Laboratory Director, META Environmental, Inc.

2/4/00
Date

VOLATILES AND SEMIVOLATILES
Method EPA 3585/8260/8270 Modified
Client: EPRI Project: Mineral Oil

Field ID:	North Queens S/S TR2-MB		North Queens S/S TR2-MB		North Queens S/S TR2-MB	
Lab ID	MO991005-01R2W		MO991005-01DF		MO991005-01ABF	
Sample Preparation Method:	Waste Dilution		DCM Fraction (EPA3630C)		Acid/Base Fraction (EPA3650B)	
Sample Analysis Method:	GC/MS/Scan		GC/MS/Scan		GC/MS/Scan	
cis-1,2-Dichloroethene	1.55	U				
2,2-Dichloropropane	1.55	U				
Chloroform	0.77	U				
1,1,1-Trichloroethane	1.55	U				
1,2-Dichloroethane	1.55	U				
1,1-Dichloropropene	1.55	U				
Benzene	0.77	U	0.49	U		
Carbon Tetrachloride	0.77	U				
1,2-Dichloropropane	6.20	U				
Trichloroethene	3.10	U				
Dibromomethane	6.20	U				
Bromodichloromethane	1.55	U				
cis-1,3-Dichloropropene	3.10	U				
N-nitrosodimethylamine	12.4	U				
Toluene	0.41		0.98	U		
trans-1,3-Dichloropropene	1.55	U				
1,1,2-Trichloroethane	3.10	U				
1,3-Dichloropropane	1.55	U				
Dibromochloromethane	1.55	U				
1,2-Dibromoethane	1.55	U				
Tetrachloroethene	1.55	U				
N-nitrosomethylethylamine	12.4	U			0.62	U
Chlorobenzene	0.77	U				
1,1,1,2-Tetrachloroethane	1.55	U				
Ethylbenzene	0.19	U	0.49	U		
m/p-Xylenes	0.27		0.49	U		
Bromoform	1.55	U				
Styrene	12.4	U	1.95	U		
o-Xylene	0.39	U	0.49	U		
N-nitrosodiethylamine	6.20	U			0.31	U
1,1,2,2-Tetrachloroethane	1.55	U				
1,2,3-Trichloropropane	0.77	U				
Isopropylbenzene	0.77	U	1.95	U		
Bromobenzene	1.55	U				
2-Chlorotoluene	1.55	U				
Propylbenzene	3.10	U	7.80	U		
4-Chlorotoluene	1.55	U				
1,3,5-Trimethylbenzene	3.10	U	7.80	U		
Pentachloroethane	1.55	U				
Phenol	1.55	U			0.08	U
bis(2-Chloroethyl)ether	0.77	U			0.04	U
Aniline	1.55	U			0.08	U
2-Chlorophenol	1.55	U			0.08	U
tert-Butylbenzene	0.77	U	1.95	U		
1,2,4-Trimethylbenzene	1.28		1.95	U		
1,3-Dichlorobenzene	0.39	U				
sec-Butylbenzene	0.39	U	0.98	U		
1,4-Dichlorobenzene	0.39	U				

VOLATILES AND SEMIVOLATILES
Method EPA 3585/8260/8270 Modified
Client: EPRI Project: Mineral Oil

Field ID:	North Queens S/S TR2-MB		North Queens S/S TR2-MB		North Queens S/S TR2-MB	
Lab ID	MO991005-01R2W		MO991005-01DF		MO991005-01ABF	
Sample Preparation Method:	Waste Dilution		DCM Fraction (EPA3630C)		Acid/Base Fraction (EPA3650B)	
Sample Analysis Method:	GC/MS/Scan		GC/MS/Scan		GC/MS/Scan	
p-Isopropyltoluene	0.77	U	1.95	U		
Benzyl Alcohol	3.10	U				
2-Methylphenol (m-cresol)	6.20	U			0.31	U
1,2-Dichlorobenzene	0.39	U				
4-Methylphenol (p-cresol)	1.55	U			0.06	J
bis(2-chloroisopropyl)ether	1.55	U			0.08	U
n-Butylbenzene	1.55	U	3.91	U		
3-Methylphenol (o-cresol)	1.55	U			0.08	U
N-nitrosopyrrolidine	6.20	U			0.31	U
N-nitroso-di-n-propylamine	3.10	U			0.16	U
N-nitrosomorpholine	1.55	U			0.08	U
Hexachloroethane	1.55	U				
1,2-Dibromo-3-Chloropropane	1.55	U				
N-nitrosopiperidine	6.20	U			0.31	U
2-Nitrophenol	6.20	U			0.31	U
2,4-Dimethylphenol	1.55	U			0.16	
bis(2-Chloroethoxy)methane	1.55	U			0.08	U
2,6-Dichlorophenol	3.10	U			0.16	U
1,2,4-Trichlorobenzene	0.77	U				
Naphthalene	2.90		0.98	U		
4-Chloroaniline	3.10	U			0.16	U
2,4-Dichlorophenol	3.10	U			0.16	U
Hexachloropropene	1.55	U				
Hexachlorobutadiene	0.77	U				
1,2,3-Trichlorobenzene	1.55	U				
N-nitrosodi-n-butylamine	3.10	U			0.16	U
4-Chloro-3-methylphenol	3.10	U			0.16	U
2-Methylnaphthalene	0.39	U	0.98	U		
1,2,4,5-Tetrachlorobenzene	0.77	U				
Hexachlorocyclopentadiene						
2,4,6-Trichlorophenol					0.16	U
2,4,5-Trichlorophenol					0.16	U
2-Chloronaphthalene						
2-Nitroaniline					0.62	U
Dimethylphthalate						
Acenaphthylene			1.95	U		
3-Nitroaniline					0.62	U
Acenaphthene			1.95	U		
4-Nitrophenol					0.62	U
Dibenzofuran			1.95	U		
Pentachlorobenzene						
2,3,4,6-Tetrachlorophenol					0.31	U
Diethylphthalate						
4-Chlorophenyl-phenylether					0.08	U
Fluorene			0.98	U		
4-Nitroaniline					0.62	U
4,6-Dinitro-2-methylphenol					0.62	U
n-Nitrosodiphenylamine					0.16	U

VOLATILES AND SEMIVOLATILES
Method EPA 3585/8260/8270 Modified
Client: EPRI Project: Mineral Oil

Field ID: Lab ID Sample Preparation Method: Sample Analysis Method:	North Queens S/S TR2-MB MO991005-01R2W Waste Dilution GC/MS/Scan	North Queens S/S TR2-MB MO991005-01DF DCM Fraction (EPA3630C) GC/MS/Scan	North Queens S/S TR2-MB MO991005-01ABF Acid/Base Fraction (EPA3650B) GC/MS/Scan
4-Bromophenyl-phenylether			0.16 U
Hexachlorobenzene			
Pentachlorophenol			0.62 U
Phenanthrene		0.98 U	
Dinoseb (DNBP)			
Anthracene		0.98 U	
Di-n-butylphthalate			
Fluoranthene		1.95 U	
Pyrene		1.95 U	
Butylbenzylphthalate			
Benz[a]anthracene		1.95 U	
Chrysene		1.95 U	
bis(2-Ethylhexyl)phthalate			
Di-n-octylphthalate			
Benzo[b]fluoranthene		3.90 U	
Benzo[k]fluoranthene		3.90 U	
Benzo[a]pyrene		7.80 U	
Indeno[1,2,3-cd]pyrene		7.80 U	
Dibenz[a,h]anthracene		7.80 U	
Benzo[g,h,i]perylene		7.80 U	
Concentration Units:	**mg/kg**	**mg/kg**	**mg/kg**
Surrogates:			
2-Fluorophenol	na	na	45%
Phenol-d5	na	na	38%
Nitrobenzene-d5	na	na	5%
2-Fluorobiphenyl	na	na	1%
2,4,6-Tribromophenol	na	na	50%
p-Terphenyl-d14	na	na	1%
2-Bromonaphthalene (FSUR)	na	89%	na

D = Values from a diluted sample extract
E = Estimated value, above calibration range
I = Interference
J = Estimated value
na = Not applicable
L = Coeluted with compound listed above
U = Not detected at quantitation limit shown
Soil results reported in dry weight.

VOLATILES AND SEMIVOLATILES
Method EPA 3585/8260/8270 Modified
Client: EPRI Project: Mineral Oil

Field ID:	BLDG 82 Recon.OilTank #8		BLDG 82 Recon.OilTank #8		BLDG 82 Recon.Oil Tank #8	
Lab ID	MO991005-02R2WD		MO981005-02DF		MO991005-02ABF	
Sample Preparation Method:	Waste Dilution		DCM Fraction (EPA3630C)		Acid/Base Fraction (EPA3650B)	
Sample Analysis Method:	GC/MS/Scan		GC/MS/Scan		GC/MS/Scan	
cis-1,2-Dichloroethene	1.94	U				
2,2-Dichloropropane	1.94	U				
Chloroform	0.97	U				
1,1,1-Trichloroethane	1.94	U				
1,2-Dichloroethane	1.94	U				
1,1-Dichloropropene	1.94	U				
Benzene	0.97	U	0.57	U		
Carbon Tetrachloride	0.97	U				
1,2-Dichloropropane	7.77	U				
Trichloroethene	3.88	U				
Dibromomethane	7.77	U				
Bromodichloromethane	1.94	U				
cis-1,3-Dichloropropene	3.88	U				
N-nitrosodimethylamine	15.5	U				
Toluene	1.09		1.15	U		
trans-1,3-Dichloropropene	1.94	U				
1,1,2-Trichloroethane	3.88	U				
1,3-Dichloropropane	1.94	U				
Dibromochloromethane	1.94	U				
1,2-Dibromoethane	1.94	U				
Tetrachloroethene	1.94	U				
N-nitrosomethylethylamine	15.5	U			0.73	U
Chlorobenzene	0.97	U				
1,1,1,2-Tetrachloroethane	1.94	U				
Ethylbenzene	0.79		0.57	U		
m/p-Xylenes	1.98		2.40			
Bromoform	1.94	U				
Styrene	15.5	U	2.30	U		
o-Xylene	0.83		0.57	U		
N-nitrosodiethylamine	7.77	U			0.37	U
1,1,2,2-Tetrachloroethane	1.94	U				
1,2,3-Trichloropropane	0.97	U				
Isopropylbenzene	0.49	J	2.30	U		
Bromobenzene	1.94	U				
2-Chlorotoluene	1.94	U				
Propylbenzene	3.88	U	9.17	U		
4-Chlorotoluene	1.94	U				
1,3,5-Trimethylbenzene	3.88	U	9.17	U		
Pentachloroethane	1.94	U				
Phenol	1.94	U			0.09	U
bis(2-Chloroethyl)ether	0.97	U			0.05	U
Aniline	1.94	U			0.09	U
2-Chlorophenol	1.94	U			0.09	U
tert-Butylbenzene	0.97	U	2.30	U		
1,2,4-Trimethylbenzene	4.25		2.30	U		
1,3-Dichlorobenzene	0.49	U				
sec-Butylbenzene	5.07		8.85			
1,4-Dichlorobenzene	0.49	U				
p-Isopropyltoluene	1.79		4.51			

VOLATILES AND SEMIVOLATILES
Method EPA 3585/8260/8270 Modified
Client: EPRI Project: Mineral Oil

Field ID:	BLDG 82 Recon.OilTank #8		BLDG 82 Recon.OilTank #8		BLDG 82 Recon.Oil Tank #8	
Lab ID	MO991005-02R2WD		MO981005-02DF		MO991005-02ABF	
Sample Preparation Method:	Waste Dilution		DCM Fraction (EPA3630C)		Acid/Base Fraction (EPA3650B)	
Sample Analysis Method:	GC/MS/Scan		GC/MS/Scan		GC/MS/Scan	
Benzyl Alcohol	3.88	U				
2-Methylphenol (m-cresol)	7.77	U			0.37	U
1,2-Dichlorobenzene	0.49	U				
4-Methylphenol (p-cresol)	1.94	U			0.14	
bis(2-chloroisopropyl)ether	1.94	U			0.09	U
n-Butylbenzene	1.88	J	3.11	J		
3-Methylphenol (o-cresol)	1.94	U			0.05	J
N-nitrosopyrrolidine	7.77	U			0.37	U
N-nitroso-di-n-propylamine	3.88	U			0.18	U
N-nitrosomorpholine	1.94	U			0.09	U
Hexachloroethane	1.94	U				
1,2-Dibromo-3-Chloropropane	1.94	U				
N-nitrosopiperidine	7.77	U			0.37	U
2-Nitrophenol	7.77	U			0.37	U
2,4-Dimethylphenol	1.94	U			0.31	
bis(2-Chloroethoxy)methane	1.94	U			0.09	U
2,6-Dichlorophenol	3.88	U			0.18	U
1,2,4-Trichlorobenzene	0.97	U				
Naphthalene	2.63		3.68			
4-Chloroaniline	3.88	U			0.18	U
2,4-Dichlorophenol	3.88	U			0.18	U
Hexachloropropene	1.94	U				
Hexachlorobutadiene	0.97	U				
1,2,3-Trichlorobenzene	1.94	U				
N-nitrosodi-n-butylamine	3.88	U			0.18	U
4-Chloro-3-methylphenol	3.88	U			0.18	U
2-Methylnaphthalene	6.84		27.4			
1,2,4,5-Tetrachlorobenzene	0.97	U				
Hexachlorocyclopentadiene	3.88	U				
2,4,6-Trichlorophenol	3.88	U			0.18	U
2,4,5-Trichlorophenol	3.88	U			0.18	U
2-Chloronaphthalene	0.97	U				
2-Nitroaniline	15.5	U			0.73	U
Dimethylphthalate	1.94	U				
Acenaphthylene	0.97	U	2.30	U		
3-Nitroaniline	15.5	U			0.73	U
Acenaphthene	0.97	U	2.30	U		
4-Nitrophenol	15.5	U			0.73	U
Dibenzofuran	0.97	U	2.30	U		
Pentachlorobenzene	1.94	U				
2,3,4,6-Tetrachlorophenol	7.77	U			0.37	U
Diethylphthalate	1.94	U				
4-Chlorophenyl-phenylether	1.94	U			0.09	U
Fluorene	29.8		28.1			
4-Nitroaniline	15.5	U			0.73	U
4,6-Dinitro-2-methylphenol	15.5	U			0.73	U
n-Nitrosodiphenylamine	3.88	U			0.18	U
4-Bromophenyl-phenylether	3.88	U			0.18	U
Hexachlorobenzene	3.88	U				

VOLATILES AND SEMIVOLATILES
Method EPA 3585/8260/8270 Modified
Client: EPRI Project: Mineral Oil

Field ID:	BLDG 82 Recon.OilTank #8		BLDG 82 Recon.OilTank #8		BLDG 82 Recon.Oil Tank #8	
Lab ID	MO991005-02R2WD		MO981005-02DF		MO991005-02ABF	
Sample Preparation Method:	Waste Dilution		DCM Fraction (EPA3630C)		Acid/Base Fraction (EPA3650B)	
Sample Analysis Method:	GC/MS/Scan		GC/MS/Scan		GC/MS/Scan	
Pentachlorophenol	15.5	U			0.73	U
Phenanthrene	3.93		19.0			
Dinoseb (DNBP)	15.5	U				
Anthracene	0.49	U	1.15	U		
Di-n-butylphthalate	3.88	U				
Fluoranthene	0.97	U	2.30	U		
Pyrene	0.97	U	2.30	U		
Butylbenzylphthalate						
Benz[a]anthracene			2.30	U		
Chrysene			2.30	U		
bis(2-Ethylhexyl)phthalate						
Di-n-octylphthalate						
Benzo[b]fluoranthene			4.59	U		
Benzo[k]fluoranthene			4.59	U		
Benzo[a]pyrene			9.17	U		
Indeno[1,2,3-cd]pyrene			9.17	U		
Dibenz[a,h]anthracene			9.17	U		
Benzo[g,h,i]perylene			9.17	U		
Concentration Units:	mg/kg		mg/kg		mg/kg	
Surrogates:						
2-Fluorophenol	na		na		48%	
Phenol-d5	na		na		37%	
Nitrobenzene-d5	na		na		7%	
2-Fluorobiphenyl	na		na		1%	
2,4,6-Tribromophenol	na		na		64%	
p-Terphenyl-d14	na		na		0%	
2-Bromonaphthalene (FSUR)	na		95%		na	

D = Values from a diluted sample extract
E = Estimated value, above calibration range
I = Interference
J = Estimated value
na = Not applicable
L = Coeluted with compound listed above
U = Not detected at quantitation limit shown
Soil results reported in dry weight.

VOLATILES AND SEMIVOLATILES
Method EPA 3585/8260/8270 Modified
Client: EPRI Project: Mineral Oil

Field ID:	BLDG 82 NewOilTank #11		BLDG 82 NewOilTank #11		BLDG 82 NewOil Tank #11	
Lab ID	MO991005-03R2WD		MO991005-03DF		MO981005-03ABF	
Sample Preparation Method:	Waste Dilution		DCM Fraction (EPA3630C)		Acid/Base Fraction (EPA3650B)	
Sample Analysis Method:	GC/MS/Scan		GC/MS/Scan		GC/MS/Scan	
cis-1,2-Dichloroethene	3.86	U				
2,2-Dichloropropane	3.86	U				
Chloroform	1.93	U				
1,1,1-Trichloroethane	3.86	U				
1,2-Dichloroethane	3.86	U				
1,1-Dichloropropene	3.86	U				
Benzene	1.93	U	0.49	U		
Carbon Tetrachloride	1.93	U				
1,2-Dichloropropane	15.4	U				
Trichloroethene	7.72	U				
Dibromomethane	15.4	U				
Bromodichloromethane	3.86	U				
cis-1,3-Dichloropropene	7.72	U				
N-nitrosodimethylamine	30.9	U				
Toluene	2.02		1.70			
trans-1,3-Dichloropropene	3.86	U				
1,1,2-Trichloroethane	7.72	U				
1,3-Dichloropropane	3.86	U				
Dibromochloromethane	3.86	U				
1,2-Dibromoethane	3.86	U				
Tetrachloroethene	3.86	U				
N-nitrosomethylethylamine	30.9	U			0.62	U
Chlorobenzene	1.93	U				
1,1,1,2-Tetrachloroethane	3.86	U				
Ethylbenzene	1.41		0.49	U		
m/p-Xylenes	3.07		2.33			
Bromoform	3.86	U				
Styrene	30.9	U	1.95	U		
o-Xylene	1.11		0.49	U		
N-nitrosodiethylamine	15.4	U			0.31	U
1,1,2,2-Tetrachloroethane	3.86	U				
1,2,3-Trichloropropane	1.93	U				
Isopropylbenzene	1.93	U	1.95	U		
Bromobenzene	3.86	U				
2-Chlorotoluene	3.86	U				
Propylbenzene	7.72	U	7.80	U		
4-Chlorotoluene	3.86	U				
1,3,5-Trimethylbenzene	7.72	U	7.80	U		
Pentachloroethane	3.86	U				
Phenol	3.86	U			0.08	U
bis(2-Chloroethyl)ether	1.93	U			0.04	U
Aniline	3.86	U			0.08	U
2-Chlorophenol	3.86	U			0.08	U
tert-Butylbenzene	1.93	U	1.95	U		
1,2,4-Trimethylbenzene	5.11		4.30			
1,3-Dichlorobenzene	0.96	U				

VOLATILES AND SEMIVOLATILES
Method EPA 3585/8260/8270 Modified
Client: EPRI Project: Mineral Oil

Field ID:	BLDG 82 NewOilTank #11		BLDG 82 NewOilTank #11		BLDG 82 NewOil Tank #11	
Lab ID	MO991005-03R2WD		MO991005-03DF		MO981005-03ABF	
Sample Preparation Method:	Waste Dilution		DCM Fraction (EPA3630C)		Acid/Base Fraction (EPA3650B)	
Sample Analysis Method:	GC/MS/Scan		GC/MS/Scan		GC/MS/Scan	
sec-Butylbenzene	8.15		7.85			
1,4-Dichlorobenzene	0.96	U				
p-Isopropyltoluene	3.07		3.87			
Benzyl Alcohol	7.72	U				
2-Methylphenol (m-cresol)	15.4	U			0.31	U
1,2-Dichlorobenzene	0.96	U				
4-Methylphenol (p-cresol)	3.86	U			0.12	
bis(2-chloroisopropyl)ether	3.86	U			0.08	U
n-Butylbenzene	3.48	J	2.74	J		
3-Methylphenol (o-cresol)	3.86	U			0.04	J
N-nitrosopyrrolidine	15.4	U			0.31	U
N-nitroso-di-n-propylamine	7.72	U			0.16	U
N-nitrosomorpholine	3.86	U			0.08	U
Hexachloroethane	3.86	U				
1,2-Dibromo-3-Chloropropane	3.86	U				
N-nitrosopiperidine	15.4	U			0.31	U
2-Nitrophenol	15.4	U			0.31	U
2,4-Dimethylphenol	3.86	U			0.31	
bis(2-Chloroethoxy)methane	3.86	U			0.08	U
2,6-Dichlorophenol	7.72	U			0.16	U
1,2,4-Trichlorobenzene	1.93	U				
Naphthalene	5.62		3.30			
4-Chloroaniline	7.72	U			0.16	U
2,4-Dichlorophenol	7.72	U			0.16	U
Hexachloropropene	3.86	U				
Hexachlorobutadiene	1.93	U				
1,2,3-Trichlorobenzene	3.86	U				
N-nitrosodi-n-butylamine	7.72	U			0.16	U
4-Chloro-3-methylphenol	7.72	U			0.16	U
2-Methylnaphthalene	12.6		2.20			
1,2,4,5-Tetrachlorobenzene	1.93	U				
Hexachlorocyclopentadiene	7.72	U				
2,4,6-Trichlorophenol	7.72	U			0.16	U
2,4,5-Trichlorophenol	7.72	U			0.16	U
2-Chloronaphthalene	1.93	U				
2-Nitroaniline	30.9	U			0.62	U
Dimethylphthalate	3.86	U				
Acenaphthylene	1.93	U	1.95	U		
3-Nitroaniline	30.9	U			0.62	U
Acenaphthene	1.93	U	1.95	U		
4-Nitrophenol	30.9	U			0.62	U
Dibenzofuran	1.93	U	1.95	U		
Pentachlorobenzene	3.86	U				
2,3,4,6-Tetrachlorophenol	15.4	U			0.31	U
Diethylphthalate	3.86	U				
4-Chlorophenyl-phenylether	3.86	U			0.08	U

VOLATILES AND SEMIVOLATILES
Method EPA 3585/8260/8270 Modified
Client: EPRI Project: Mineral Oil

Field ID:	BLDG 82 NewOilTank #11		BLDG 82 NewOilTank #11		BLDG 82 NewOil Tank #11	
Lab ID	MO991005-03R2WD		MO991005-03DF		MO981005-03ABF	
Sample Preparation Method:	Waste Dilution		DCM Fraction (EPA3630C)		Acid/Base Fraction (EPA3650B)	
Sample Analysis Method:	GC/MS/Scan		GC/MS/Scan		GC/MS/Scan	
Fluorene	63.5		28.1			
4-Nitroaniline	30.9	U			0.62	U
4,6-Dinitro-2-methylphenol	30.9	U			0.62	U
n-Nitrosodiphenylamine	7.72	U			0.16	U
4-Bromophenyl-phenylether	7.72	U			0.16	U
Hexachlorobenzene	7.72	U				
Pentachlorophenol	30.9	U			0.62	U
Phenanthrene	25.4		19.0			
Dinoseb (DNBP)	30.9	U				
Anthracene	0.96	U	0.98	U		
Di-n-butylphthalate	7.72	U				
Fluoranthene	1.93	U	1.95	U		
Pyrene	1.93	U	1.95	U		
Butylbenzylphthalate						
Benz[a]anthracene			1.95	U		
Chrysene			1.95	U		
bis(2-Ethylhexyl)phthalate				U		
Di-n-octylphthalate						
Benzo[b]fluoranthene			3.90	U		
Benzo[k]fluoranthene			3.90	U		
Benzo[a]pyrene			7.80	U		
Indeno[1,2,3-cd]pyrene			7.80	U		
Dibenz[a,h]anthracene			7.80	U		
Benzo[g,h,i]perylene			7.80	U		
Concentration Units:	mg/kg		mg/kg		mg/kg	
Surrogates:						
2-Fluorophenol	na		na		49%	
Phenol-d5	na		na		38%	
Nitrobenzene-d5	na		na		8%	
2-Fluorobiphenyl	na		na		1%	
2,4,6-Tribromophenol	na		na		66%	
p-Terphenyl-d14	na		na		0%	
2-Bromonaphthalene (FSUR)	na		87%		na	

D = Values from a diluted sample extract
E = Estimated value, above calibration range
I = Interference
J = Estimated value

na = Not applicable
L = Coeluted with compound listed above
U = Not detected at quantitation limit shown
Soil results reported in dry weight.

VOLATILES AND SEMIVOLATILES
Method EPA 3585/8260/8270 Modified
Client: EPRI Project: Mineral Oil

Field ID:	BLDG 82 Overhead 94A511984		BLDG 82 Overhead 94A511984		BLDG 82 Overhead 94A511984	
Lab ID	MO991005-04R2WD		MO991005-04 DF		MO991005-04ABF	
Sample Preparation Method:	Waste Dilution		DCM Fraction (EPA3630C)		Acid/Base Fraction (EPA3650B)	
Sample Analysis Method:	GC/MS/Scan		GC/MS/Scan		GC/MS/Scan	
cis-1,2-Dichloroethene	3.86	U				
2,2-Dichloropropane	3.86	U				
Chloroform	1.93	U				
1,1,1-Trichloroethane	3.86	U				
1,2-Dichloroethane	3.86	U				
1,1-Dichloropropene	3.86	U				
Benzene	1.93	U	0.49	U		
Carbon Tetrachloride	1.93	U				
1,2-Dichloropropane	15.4	U				
Trichloroethene	7.72	U				
Dibromomethane	15.4	U				
Bromodichloromethane	3.86	U				
cis-1,3-Dichloropropene	7.72	U				
N-nitrosodimethylamine	30.9	U				
Toluene	0.91	J	0.98	U		
trans-1,3-Dichloropropene	3.86	U				
1,1,2-Trichloroethane	7.72	U				
1,3-Dichloropropane	3.86	U				
Dibromochloromethane	3.86	U				
1,2-Dibromoethane	3.86	U				
Tetrachloroethene	3.86	U				
N-nitrosomethylethylamine	30.9	U			0.62	U
Chlorobenzene	1.93	U				
1,1,1,2-Tetrachloroethane	3.86	U				
Ethylbenzene	0.48	U	0.49	U		
m/p-Xylenes	1.49		1.89			
Bromoform	3.86	U				
Styrene	30.9	U	1.95	U		
o-Xylene	1.93		2.63			
N-nitrosodiethylamine	15.4	U			0.31	U
1,1,2,2-Tetrachloroethane	3.86	U				
1,2,3-Trichloropropane	1.93	U				
Isopropylbenzene	1.93	U	1.95	U		
Bromobenzene	3.86	U				
2-Chlorotoluene	3.86	U				
Propylbenzene	7.72	U	7.80	U		
4-Chlorotoluene	3.86	U				
1,3,5-Trimethylbenzene	7.72	U	4.15	J		
Pentachloroethane	3.86	U				
Phenol	3.86	U			0.08	
bis(2-Chloroethyl)ether	1.93	U			0.04	U
Aniline	3.86	U			0.08	U
2-Chlorophenol	3.86	U			0.08	U
tert-Butylbenzene	1.93	U	1.95	U		
1,2,4-Trimethylbenzene	7.43		6.34			
1,3-Dichlorobenzene	0.96	U				
sec-Butylbenzene	0.96	U	0.98	U		
1,4-Dichlorobenzene	0.96	U				
p-Isopropyltoluene	1.24	J	1.95	U		
Benzyl Alcohol	7.72	U				
2-Methylphenol (m-cresol)	15.4	U			0.31	U
1,2-Dichlorobenzene	0.96	U				

VOLATILES AND SEMIVOLATILES
Method EPA 3585/8260/8270 Modified
Client: EPRI Project: Mineral Oil

Field ID:	BLDG 82 Overhead 94A511984		BLDG 82 Overhead 94A511984		BLDG 82 Overhead 94A511984	
Lab ID	MO991005-04R2WD		MO991005-04 DF		MO991005-04ABF	
Sample Preparation Method:	Waste Dilution		DCM Fraction (EPA3630C)		Acid/Base Fraction (EPA3650B)	
Sample Analysis Method:	GC/MS/Scan		GC/MS/Scan		GC/MS/Scan	
4-Methylphenol (p-cresol)	3.86	U			0.08	U
bis(2-chloroisopropyl)ether	3.86	U			0.08	U
n-Butylbenzene	3.86	U	3.90	U		
3-Methylphenol (o-cresol)	3.86	U			0.08	U
N-nitrosopyrrolidine	15.4	U			0.31	U
N-nitroso-di-n-propylamine	7.72	U			0.16	U
N-nitrosomorpholine	3.86	U			0.08	U
Hexachloroethane	3.86	U				
1,2-Dibromo-3-Chloropropan	3.86	U				
N-nitrosopiperidine	15.4	U			0.31	U
2-Nitrophenol	15.4	U			0.31	U
2,4-Dimethylphenol	3.86	U			0.13	
bis(2-Chloroethoxy)methane	3.86	U			0.08	U
2,6-Dichlorophenol	7.72	U			0.16	U
1,2,4-Trichlorobenzene	1.93	U				
Naphthalene	1.68		0.98	U		
4-Chloroaniline	7.72	U			0.16	U
2,4-Dichlorophenol	7.72	U			0.16	U
Hexachloropropene	3.86	U				
Hexachlorobutadiene	1.93	U				
1,2,3-Trichlorobenzene	3.86	U			0.16	U
N-nitrosodi-n-butylamine	7.72	U			0.16	U
4-Chloro-3-methylphenol	7.72	U				
2-Methylnaphthalene	22.7		42.0			
1,2,4,5-Tetrachlorobenzene	1.93	U				
Hexachlorocyclopentadiene	7.72	U			0.16	U
2,4,6-Trichlorophenol	7.72	U			0.16	U
2,4,5-Trichlorophenol	7.72	U				
2-Chloronaphthalene	1.93	U			0.62	U
2-Nitroaniline	30.9	U				
Dimethylphthalate	3.86	U				
Acenaphthylene	1.93	U	1.95	U	0.62	U
3-Nitroaniline	30.9	U				
Acenaphthene	1.93	U	1.95	U	0.62	U
4-Nitrophenol	30.9	U				
Dibenzofuran	1.93	U	1.95	U		
Pentachlorobenzene	3.86	U			0.31	U
2,3,4,6-Tetrachlorophenol	15.4	U				
Diethylphthalate	3.86	U			0.08	U
4-Chlorophenyl-phenylether	3.86	U				
Fluorene	0.96	U	0.98	U	0.62	U
4-Nitroaniline	30.9	U			0.62	U
4,6-Dinitro-2-methylphenol	30.9	U			0.16	U
n-Nitrosodiphenylamine	7.72	U			0.16	U
4-Bromophenyl-phenylether	7.72	U				
Hexachlorobenzene	7.72	U			0.62	U
Pentachlorophenol	30.9	U				
Phenanthrene	0.96	U	0.98	U		
Dinoseb (DNBP)	30.9	U				
Anthracene	0.96	U	0.98	U		
Di-n-butylphthalate	7.72	U				
Fluoranthene	1.93	U	1.95	U		

VOLATILES AND SEMIVOLATILES
Method EPA 3585/8260/8270 Modified
Client: EPRI Project: Mineral Oil

Field ID:	BLDG 82 Overhead 94A511984	BLDG 82 Overhead 94A511984	BLDG 82 Overhead 94A511984
Lab ID	MO991005-04R2WD	MO991005-04 DF	MO991005-04ABF
Sample Preparation Method:	Waste Dilution	DCM Fraction (EPA3630C)	Acid/Base Fraction (EPA3650B)
Sample Analysis Method:	GC/MS/Scan	GC/MS/Scan	GC/MS/Scan
Pyrene	1.93 U	1.95 U	
Butylbenzylphthalate			
Benz[a]anthracene		1.95 U	
Chrysene		1.95 U	
bis(2-Ethylhexyl)phthalate			
Di-n-octylphthalate			
Benzo[b]fluoranthene		3.90 U	
Benzo[k]fluoranthene		3.90 U	
Benzo[a]pyrene		7.80 U	
Indeno[1,2,3-cd]pyrene		7.80 U	
Dibenz[a,h]anthracene		7.80 U	
Benzo[g,h,i]perylene		7.80 U	
Concentration Units:	mg/kg	mg/kg	mg/kg
Surrogates:			
2-Fluorophenol	na	na	52%
Phenol-d5	na	na	43%
Nitrobenzene-d5	na	na	6%
2-Fluorobiphenyl	na	na	0%
2,4,6-Tribromophenol	na	na	50%
p-Terphenyl-d14	na	na	1%
2-Bromonaphthalene (FSUR)	na	84%	na

D = Values from a diluted sample extract
E = Estimated value, above calibration range
I = Interference
J = Estimated value

na = Not applicable
L = Coeluted with compound listed above
U = Not detected at quantitation limit shown
Soil results reported in dry weight.

VOLATILES AND SEMIVOLATILES
Method EPA 3585/8260/8270 Modified
Client: EPRI Project: Mineral Oil

Field ID:	BLDG 82 TR-D612267		BLDG 82 TR-D612267		BLDG 82 TR-D612267	
Lab ID	MO991005-05R2WD		MO991005-05DF		MO991005-05ABF	
Sample Preparation Method:	Waste Dilution		DCM Fraction (EPA3630C)		Acid/Base Fraction (EPA3650B)	
Sample Analysis Method:	GC/MS/Scan		GC/MS/Scan		GC/MS/Scan	
cis-1,2-Dichloroethene	3.85	U				
2,2-Dichloropropane	3.85	U				
Chloroform	1.92	U				
1,1,1-Trichloroethane	3.85	U				
1,2-Dichloroethane	3.85	U				
1,1-Dichloropropene	3.85	U				
Benzene	1.92	U	0.49	U		
Carbon Tetrachloride	1.92	U				
1,2-Dichloropropane	15.4	U				
Trichloroethene	7.69	U				
Dibromomethane	15.4	U				
Bromodichloromethane	3.85	U				
cis-1,3-Dichloropropene	7.69	U				
N-nitrosodimethylamine	30.8	U				
Toluene	1.75		4.39	B		
trans-1,3-Dichloropropene	3.85	U				
1,1,2-Trichloroethane	7.69	U				
1,3-Dichloropropane	3.85	U				
Dibromochloromethane	3.85	U				
1,2-Dibromoethane	3.85	U				
Tetrachloroethene	3.85	U				
N-nitrosomethylethylamine	30.8	U			0.62	U
Chlorobenzene	1.92	U				
1,1,1,2-Tetrachloroethane	3.85	U				
Ethylbenzene	0.61		3.40			
m/p-Xylenes	1.33		6.60			
Bromoform	3.85	U				
Styrene	30.8	U	1.95	U		
o-Xylene	2.37		4.76			
N-nitrosodiethylamine	15.4	U			0.31	U
1,1,2,2-Tetrachloroethane	3.85	U				
1,2,3-Trichloropropane	1.92	U				
Isopropylbenzene	1.92	U	1.95	U		
Bromobenzene	3.85	U				
2-Chlorotoluene	3.85	U				
Propylbenzene	7.69	U	7.80	U		
4-Chlorotoluene	3.85	U				
1,3,5-Trimethylbenzene	7.69	U	7.69	J		
Pentachloroethane	3.85	U				
Phenol	3.85	U			0.83	
bis(2-Chloroethyl)ether	1.92	U			0.04	U
Aniline	3.85	U			0.08	U
2-Chlorophenol	3.85	U			0.08	U
tert-Butylbenzene	1.92	U	1.95	U		
1,2,4-Trimethylbenzene	8.51		22.5			
1,3-Dichlorobenzene	0.96	U				

VOLATILES AND SEMIVOLATILES
Method EPA 3585/8260/8270 Modified
Client: EPRI Project: Mineral Oil

Field ID:	BLDG 82 TR-D612267		BLDG 82 TR-D612267		BLDG 82 TR-D612267	
Lab ID	MO991005-05R2WD		MO991005-05DF		MO991005-05ABF	
Sample Preparation Method:	Waste Dilution		DCM Fraction (EPA3630C)		Acid/Base Fraction (EPA3650B)	
Sample Analysis Method:	GC/MS/Scan		GC/MS/Scan		GC/MS/Scan	
sec-Butylbenzene	2.07		5.77			
1,4-Dichlorobenzene	0.96	U				
p-Isopropyltoluene	9.56		3.75			
Benzyl Alcohol	7.69	U				
2-Methylphenol (m-cresol)	15.4	U			0.31	U
1,2-Dichlorobenzene	0.96	U				
4-Methylphenol (p-cresol)	3.85	U			0.67	
bis(2-chloroisopropyl)ether	3.85	U			0.08	U
n-Butylbenzene	3.27	J	6.52			
3-Methylphenol (o-cresol)	3.85	U			0.46	
N-nitrosopyrrolidine	15.4	U			0.31	U
N-nitroso-di-n-propylamine	7.69	U			0.16	U
N-nitrosomorpholine	3.85	U			0.08	U
Hexachloroethane	3.85	U				
1,2-Dibromo-3-Chloropropane	3.85	U				
N-nitrosopiperidine	15.4	U			0.31	U
2-Nitrophenol	15.4	U			0.31	U
2,4-Dimethylphenol	3.85	U			1.80	
bis(2-Chloroethoxy)methane	3.85	U			0.08	U
2,6-Dichlorophenol	7.69	U			0.16	U
1,2,4-Trichlorobenzene	1.92	U				
Naphthalene	4.36		8.37			
4-Chloroaniline	7.69	U			0.16	U
2,4-Dichlorophenol	7.69	U			0.16	U
Hexachloropropene	3.85	U				
Hexachlorobutadiene	1.92	U				
1,2,3-Trichlorobenzene	3.85	U				
N-nitrosodi-n-butylamine	7.69	U			0.16	U
4-Chloro-3-methylphenol	7.69	U			0.16	U
2-Methylnaphthalene	5.70		27.5			
1,2,4,5-Tetrachlorobenzene	1.92	U				
Hexachlorocyclopentadiene	7.69	U				
2,4,6-Trichlorophenol	7.69	U			0.16	U
2,4,5-Trichlorophenol	7.69	U			0.16	U
2-Chloronaphthalene	1.92	U				
2-Nitroaniline	30.8	U			0.62	U
Dimethylphthalate	3.85	U				
Acenaphthylene	1.92	U	1.95	U		
3-Nitroaniline	30.8	U			0.62	U
Acenaphthene	1.92	U	1.95	U		
4-Nitrophenol	30.8	U			0.62	U
Dibenzofuran	19.8		7.81			
Pentachlorobenzene	3.85	U				
2,3,4,6-Tetrachlorophenol	15.4	U			0.31	U
Diethylphthalate	3.85	U				
4-Chlorophenyl-phenylether	3.85	U			0.08	U

VOLATILES AND SEMIVOLATILES
Method EPA 3585/8260/8270 Modified
Client: EPRI Project: Mineral Oil

Field ID:	BLDG 82 TR-D512267	BLDG 82 TR-D512267	BLDG 82 TR-D512267
Lab ID	MO991005-05R2WD	MO991005-05DF	MO991005-05ABF
Sample Preparation Method:	Waste Dilution	DCM Fraction (EPA3630C)	Acid/Base Fraction (EPA3650B)
Sample Analysis Method:	GC/MS/Scan	GC/MS/Scan	GC/MS/Scan
Fluorene	0.96 U	0.98 U	
4-Nitroaniline	30.8 U		0.62 U
4,6-Dinitro-2-methylphenol	30.8 U		0.62 U
n-Nitrosodiphenylamine	7.69 U		0.16 U
4-Bromophenyl-phenylether	7.69 U		0.16 U
Hexachlorobenzene	7.69 U		
Pentachlorophenol	30.8 U		0.62 U
Phenanthrene	11.5	39.1	
Dinoseb (DNBP)	30.8 U		
Anthracene	0.96 U	0.98 U	
Di-n-butylphthalate	7.69 U		
Fluoranthene	1.92 U	1.95 U	
Pyrene	1.92 U	1.95 U	
Butylbenzylphthalate			
Benz[a]anthracene		1.95 U	
Chrysene		1.95 U	
bis(2-Ethylhexyl)phthalate			
Di-n-octylphthalate	30.8 U		
Benzo[b]fluoranthene	3.85 U	3.90 U	
Benzo[k]fluoranthene	3.85 U	3.90 U	
Benzo[a]pyrene	7.69 U	7.80 U	
Indeno[1,2,3-cd]pyrene	7.69 U	7.80 U	
Dibenz[a,h]anthracene	7.69 U	7.80 U	
Benzo[g,h,i]perylene	7.69 U	7.80 U	
Concentration Units:	mg/kg	mg/kg	mg/kg
Surrogates:			
2-Fluorophenol	na	na	51%
Phenol-d5	na	na	45%
Nitrobenzene-d5	na	na	9%
2-Fluorobiphenyl	na	na	1%
2,4,6-Tribromophenol	na	na	76%
p-Terphenyl-d14	na	na	0%
2-Bromonaphthalene (FSUR)	na	101%	na

D = Values from a diluted sample extract
E = Estimated value, above calibration range
I = Interference
J = Estimated value

na = Not applicable
L = Coeluted with compound listed above
U = Not detected at quantitation limit shown
Soil results reported in dry weight.

VOLATILES AND SEMIVOLATILES
Method EPA 3585/8260/8270 Modified
Client: EPRI Project: Mineral Oil

Field ID:	Fractionation Blank	
Lab ID	MO991129-FBDF	
Sample Preparation Method:	DCM Fraction (EPA3630C)	
Sample Analysis Method:	GC/MS/Scan	
cis-1,2-Dichloroethene		
2,2-Dichloropropane		
Chloroform		
1,1,1-Trichloroethane		
1,2-Dichloroethane		
1,1-Dichloropropene		
Benzene	0.49	U
Carbon Tetrachloride		
1,2-Dichloropropane		
Trichloroethene		
Dibromomethane		
Bromodichloromethane		
cis-1,3-Dichloropropene		
N-nitrosodimethylamine		
Toluene	0.98	U
trans-1,3-Dichloropropene		
1,1,2-Trichloroethane		
1,3-Dichloropropane		
Dibromochloromethane		
1,2-Dibromoethane		
Tetrachloroethene		
N-nitrosomethylethylamine		
Chlorobenzene		
1,1,1,2-Tetrachloroethane		
Ethylbenzene	0.49	U
m/p-Xylenes	0.49	U
Bromoform		
Styrene	1.96	U
o-Xylene	0.49	U
N-nitrosodiethylamine		
1,1,2,2-Tetrachloroethane		
1,2,3-Trichloropropane		
Isopropylbenzene	1.96	U
Bromobenzene		
2-Chlorotoluene		
Propylbenzene	7.81	U
4-Chlorotoluene		
1,3,5-Trimethylbenzene	7.81	U
Pentachloroethane		
Phenol		
bis(2-Chloroethyl)ether		
Aniline		
2-Chlorophenol		
tert-Butylbenzene	1.96	U
1,2,4-Trimethylbenzene	1.96	U
1,3-Dichlorobenzene		

VOLATILES AND SEMIVOLATILES
Method EPA 3585/8260/8270 Modified
Client: EPRI Project: Mineral Oil

Field ID:	Fractionation Blank	
Lab ID	MO991129-FBDF	
Sample Preparation Method:	DCM Fraction (EPA3630C)	
Sample Analysis Method:	GC/MS/Scan	
sec-Butylbenzene	0.98	U
1,4-Dichlorobenzene		
p-Isopropyltoluene	1.96	U
Benzyl Alcohol		
2-Methylphenol (m-cresol)		
1,2-Dichlorobenzene		
4-Methylphenol (p-cresol)		
bis(2-chloroisopropyl)ether		
n-Butylbenzene	3.91	U
3-Methylphenol (o-cresol)		
N-nitrosopyrrolidine		
N-nitroso-di-n-propylamine		
N-nitrosomorpholine		
Hexachloroethane		
1,2-Dibromo-3-Chloropropane		
N-nitrosopiperidine		
2-Nitrophenol		
2,4-Dimethylphenol		
bis(2-Chloroethoxy)methane		
2,6-Dichlorophenol		
1,2,4-Trichlorobenzene		
Naphthalene	0.98	U
4-Chloroaniline		
2,4-Dichlorophenol		
Hexachloropropene		
Hexachlorobutadiene		
1,2,3-Trichlorobenzene		
N-nitrosodi-n-butylamine		
4-Chloro-3-methylphenol		
2-Methylnaphthalene	0.98	U
1,2,4,5-Tetrachlorobenzene		
Hexachlorocyclopentadiene		
2,4,6-Trichlorophenol		
2,4,5-Trichlorophenol		
2-Chloronaphthalene		
2-Nitroaniline		
Dimethylphthalate		
Acenaphthylene	1.96	U
3-Nitroaniline		
Acenaphthene	1.96	U
4-Nitrophenol		
Dibenzofuran	1.96	U
Pentachlorobenzene		
2,3,4,6-Tetrachlorophenol		
Diethylphthalate		
4-Chlorophenyl-phenylether		

VOLATILES AND SEMIVOLATILES
Method EPA 3585/8260/8270 Modified
Client: EPRI Project: Mineral Oil

Field ID:	Fractionation Blank	
Lab ID	MO991129-FBDF	
Sample Preparation Method:	DCM Fraction (EPA3630C)	
Sample Analysis Method:	GC/MS/Scan	
Fluorene	0.98	U
4-Nitroaniline		
4,6-Dinitro-2-methylphenol		
n-Nitrosodiphenylamine		
4-Bromophenyl-phenylether		
Hexachlorobenzene		
Pentachlorophenol		
Phenanthrene	0.98	U
Dinoseb (DNBP)		
Anthracene	0.98	U
Di-n-butylphthalate		
Fluoranthene	1.96	U
Pyrene	1.96	U
Butylbenzylphthalate		
Benz[a]anthracene	1.96	U
Chrysene	1.96	U
bis(2-Ethylhexyl)phthalate		
Di-n-octylphthalate		
Benzo[b]fluoranthene	3.91	U
Benzo[k]fluoranthene	3.91	U
Benzo[a]pyrene	7.81	U
Indeno[1,2,3-cd]pyrene	7.81	U
Dibenz[a,h]anthracene	7.81	U
Benzo[g,h,i]perylene	7.81	U
Concentration Units:	mg/kg	
Surrogates:		
Toluene-d8	na	
4-Bromofluorobenzene	na	
2-Fluorophenol	na	
Phenol-d5	na	
Nitrobenzene-d5	na	
2-Fluorobiphenyl	na	
2,4,6-Tribromophenol	na	
p-Terphenyl-d14	na	
2-Bromonaphthalene (FSUR)	96%	

D = Values from a diluted sample extract
E = Estimated value, above calibration range
I = Interference
J = Estimated value

na = Not applicable
L = Coeluted with compound listed above
U = Not detected at quantitation limit shown
Soil results reported in dry weight.

VOLATILES AND SEMIVOLATILES
Method EPA 3585/8260/8270 Modified
Client: EPRI Project: Mineral Oil

Field ID: Lab ID Sample Preparation Method: Sample Analysis Method:	Fractionation Blank MO991202-FBDF DCM Fraction (EPA3630C) GC/MS/Scan	Fractionation Spike MO991202-FSDF DCM Fraction (EPA3630C) GC/MS/Scan
cis-1,2-Dichloroethene		
2,2-Dichloropropane		
Chloroform		
1,1,1-Trichloroethane		
1,2-Dichloroethane		
1,1-Dichloropropene		
Benzene	1.95 U	92%
Carbon Tetrachloride		
1,2-Dichloropropane		
Trichloroethene		
Dibromomethane		
Bromodichloromethane		
cis-1,3-Dichloropropene		
N-nitrosodimethylamine		
Toluene	0.64 J	128%
trans-1,3-Dichloropropene		
1,1,2-Trichloroethane		
1,3-Dichloropropane		
Dibromochloromethane		
1,2-Dibromoethane		
Tetrachloroethene		
N-nitrosomethylethylamine		
Chlorobenzene		
1,1,1,2-Tetrachloroethane		
Ethylbenzene	0.49 U	128%
m/p-Xylenes	0.49 U	90%
Bromoform		
Styrene	31.3 U	112%
o-Xylene	0.98 U	101%
N-nitrosodiethylamine		
1,1,2,2-Tetrachloroethane		
1,2,3-Trichloropropane		
Isopropylbenzene	1.95 U	
Bromobenzene		
2-Chlorotoluene		
Propylbenzene	7.81 U	
4-Chlorotoluene		
1,3,5-Trimethylbenzene	7.81 U	
Pentachloroethane		
Phenol		
bis(2-Chloroethyl)ether		
Aniline		
2-Chlorophenol		
tert-Butylbenzene	1.95 U	
1,2,4-Trimethylbenzene	1.95 U	108%
1,3-Dichlorobenzene		

VOLATILES AND SEMIVOLATILES
Method EPA 3585/8260/8270 Modified
Client: EPRI Project: Mineral Oil

Field ID: Lab ID Sample Preparation Method: Sample Analysis Method:	Fractionation Blank MO991202-FBDF DCM Fraction (EPA3630C) GC/MS/Scan	Fractionation Spike MO991202-FSDF DCM Fraction (EPA3630C) GC/MS/Scan
sec-Butylbenzene	0.98 U	
1,4-Dichlorobenzene		
p-Isopropyltoluene	1.95 U	
Benzyl Alcohol		
2-Methylphenol (m-cresol)		
1,2-Dichlorobenzene		
4-Methylphenol (p-cresol)		
bis(2-chloroisopropyl)ether		
n-Butylbenzene	3.91 U	
3-Methylphenol (o-cresol)		
N-nitrosopyrrolidine		
N-nitroso-di-n-propylamine		
N-nitrosomorpholine		
Hexachloroethane		
1,2-Dibromo-3-Chloropropane		
N-nitrosopiperidine		
2-Nitrophenol		
2,4-Dimethylphenol		
bis(2-Chloroethoxy)methane		
2,6-Dichlorophenol		
1,2,4-Trichlorobenzene	0.98 U	92%
Naphthalene		
4-Chloroaniline		
2,4-Dichlorophenol		
Hexachloropropene		
Hexachlorobutadiene		
1,2,3-Trichlorobenzene		
N-nitrosodi-n-butylamine		
4-Chloro-3-methylphenol		
2-Methylnaphthalene	0.98 U	103%
1,2,4,5-Tetrachlorobenzene		
Hexachlorocyclopentadiene		
2,4,6-Trichlorophenol		
2,4,5-Trichlorophenol		
2-Chloronaphthalene		
2-Nitroaniline		
Dimethylphthalate		
Acenaphthylene	1.95 U	112%
3-Nitroaniline		
Acenaphthene	1.95 U	104%
4-Nitrophenol		
Dibenzofuran	1.95 U	108%
Pentachlorobenzene		
2,3,4,6-Tetrachlorophenol		
Diethylphthalate		
4-Chlorophenyl-phenylether		

VOLATILES AND SEMIVOLATILES
Method EPA 3585/8260/8270 Modified
Client: EPRI Project: Mineral Oil

Field ID: Lab ID Sample Preparation Method: Sample Analysis Method:	Fractionation Blank MO991202-FBDF DCM Fraction (EPA3630C) GC/MS/Scan	Fractionation Spike MO991202-FSDF DCM Fraction (EPA3630C) GC/MS/Scan
Fluorene	0.98 U	110%
4-Nitroaniline		
4,6-Dinitro-2-methylphenol		
n-Nitrosodiphenylamine		
4-Bromophenyl-phenylether		
Hexachlorobenzene		
Pentachlorophenol		
Phenanthrene	0.98 U	106%
Dinoseb (DNBP)		
Anthracene	0.98 U	117%
Di-n-butylphthalate		
Fluoranthene	1.95 U	124%
Pyrene	1.95 U	123%
Butylbenzylphthalate		
Benz[a]anthracene	1.95 U	116%
Chrysene	1.95 U	117%
bis(2-Ethylhexyl)phthalate		
Di-n-octylphthalate		
Benzo[b]fluoranthene	3.91 U	173%
Benzo[k]fluoranthene	3.91 U	151%
Benzo[a]pyrene	7.81 U	151%
Indeno[1,2,3-cd]pyrene	7.81 U	66%
Dibenz[a,h]anthracene	7.81 U	64%
Benzo[g,h,i]perylene	7.81 U	50%
Concentration Units:	mg/kg	mg/kg
Surrogates:		
Toluene-d8	na	na
4-Bromofluorobenzene	na	na
2-Fluorophenol	na	na
Phenol-d5	na	na
Nitrobenzene-d5	na	na
2-Fluorobiphenyl	na	na
2,4,6-Tribromophenol	na	na
p-Terphenyl-d14	na	na
2-Bromonaphthalene (FSUR)	100%	112%

D = Values from a diluted sample extract
E = Estimated value, above calibration range
I = Interference
J = Estimated value

na = Not applicable
L = Coeluted with compound listed above
U = Not detected at quantitation limit shown
Soil results reported in dry weight.

VOLATILES AND SEMIVOLATILES
Method EPA 3585/8260/8270 Modified
Client: EPRI Project: Mineral Oil

Field ID:	Method Blank		Method Blank Spike
Lab ID	MO991201-MBABF		MO991201-MBSAB
Sample Preparation Method:	Acid/Base Fraction (EPA3650B)		Acid/Base Fraction (EPA3650B)
Sample Analysis Method:	GC/MC/Gcan		GC/MC/Gcan
cis-1,2-Dichloroethene			
2,2-Dichloropropane			
Chloroform			
1,1,1-Trichloroethane			
1,2-Dichloroethane			
1,1-Dichloropropene			
Benzene			
Carbon Tetrachloride			
1,2-Dichloropropane			
Trichloroethene			
Dibromomethane			
Bromodichloromethane			
cis-1,3-Dichloropropene			
N-nitrosodimethylamine	0.63	U	96%
Toluene			
trans-1,3-Dichloropropene			
1,1,2-Trichloroethane			
1,3-Dichloropropane			
Dibromochloromethane			
1,2-Dibromoethane			
Tetrachloroethene			
N-nitrosomethylethylamine	0.63	U	129%
Chlorobenzene			
1,1,1,2-Tetrachloroethane			
Ethylbenzene			
m/p-Xylenes			
Bromoform			
Styrene			
o-Xylene			
N-nitrosodiethylamine	0.31	U	119%
1,1,2,2-Tetrachloroethane			
1,2,3-Trichloropropane			
Isopropylbenzene			
Bromobenzene			
2-Chlorotoluene			
Propylbenzene			
4-Chlorotoluene			
1,3,5-Trimethylbenzene			
Pentachloroethane			
Phenol	0.08	U	22%
bis(2-Chloroethyl)ether	0.04	U	47%
Aniline	0.08	U	117%
2-Chlorophenol	0.08	U	6%
tert-Butylbenzene			
1,2,4-Trimethylbenzene			
1,3-Dichlorobenzene			

VOLATILES AND SEMIVOLATILES
Method EPA 3585/8260/8270 Modified
Client: EPRI Project: Mineral Oil

Field ID:	Method Blank		Method Blank Spike
Lab ID	MO991201-MBABF		MO991201-MBSAB
Sample Preparation Method:	Acid/Base Fraction (EPA3650B)		Acid/Base Fraction (EPA3650B)
Sample Analysis Method:	GC/MS/Scan		GC/MS/Scan
sec-Butylbenzene			
1,4-Dichlorobenzene			
p-Isopropyltoluene			
Benzyl Alcohol			
2-Methylphenol (m-cresol)	0.31	U	116%
1,2-Dichlorobenzene			
4-Methylphenol (p-cresol)	0.08	U	84%
bis(2-chloroisopropyl)ether	0.08	U	8%
n-Butylbenzene			
3-Methylphenol (o-cresol)	0.08	U	63%
N-nitrosopyrrolidine	0.31	U	114%
N-nitroso-di-n-propylamine	0.16	U	57%
N-nitrosomorpholine	0.08	U	112%
Hexachloroethane			
1,2-Dibromo-3-Chloropropane			
N-nitrosopiperidine	0.31	U	100%
2-Nitrophenol	0.31	U	0%
2,4-Dimethylphenol	0.08	U	94%
bis(2-Chloroethoxy)methane	0.08	U	41%
2,6-Dichlorophenol	0.16	U	3%
1,2,4-Trichlorobenzene			
Naphthalene			
4-Chloroaniline	0.16	U	92%
2,4-Dichlorophenol	0.16	U	3%
Hexachloropropene			
Hexachlorobutadiene			
1,2,3-Trichlorobenzene			
N-nitrosodi-n-butylamine	0.16	U	6%
4-Chloro-3-methylphenol	0.16	U	53%
2-Methylnaphthalene			
1,2,4,5-Tetrachlorobenzene			
Hexachlorocyclopentadiene			
2,4,6-Trichlorophenol	0.16	U	0%
2,4,5-Trichlorophenol	0.16	U	0%
2-Chloronaphthalene			
2-Nitroaniline	0.63	U	98%
Dimethylphthalate			
Acenaphthylene			
3-Nitroaniline	0.63	U	112%
Acenaphthene			
4-Nitrophenol	0.63	U	0%
Dibenzofuran			
Pentachlorobenzene			
2,3,4,6-Tetrachlorophenol	0.31	U	0%
Diethylphthalate			
4-Chlorophenyl-phenylether	0.08	U	0%

VOLATILES AND SEMIVOLATILES
Method EPA 3585/8260/8270 Modified
Client: EPRI Project: Mineral Oil

Lab ID Sample Preparation Method: Sample Analysis Method:	Method Blank MO991201-MBABF Acid/Base Fraction (EPA3650B) GC/MS/Scan		Method Blank Spike MO991201-MBSAB Acid/Base Fraction (EPA3650B) GC/MS/Scan
Fluorene			
4-Nitroaniline	0.63	U	103%
4,6-Dinitro-2-methylphenol	0.63	U	0%
n-Nitrosodiphenylamine	0.16	U	3%
4-Bromophenyl-phenylether	0.16	U	0%
Hexachlorobenzene			
Pentachlorophenol	0.63	U	0%
Phenanthrene			
Dinoseb (DNBP)			
Anthracene			
Di-n-butylphthalate			
Fluoranthene			
Pyrene			
Butylbenzylphthalate			
Benz[a]anthracene			
Chrysene			
bis(2-Ethylhexyl)phthalate			
Di-n-octylphthalate			
Benzo[b]fluoranthene			
Benzo[k]fluoranthene			
Benzo[a]pyrene			
Indeno[1,2,3-cd]pyrene			
Dibenz[a,h]anthracene			
Benzo[g,h,i]perylene			
Concentration Units:	mg/kg		mg/kg
Surrogates:			
2-Fluorophenol	0%		13%
Phenol-d5	0%		167%
Nitrobenzene-d5	220%		243%
2-Fluorobiphenyl	22%		19%
2,4,6-Tribromophenol	0%		0%
p-Terphenyl-d14	0%		11%
2-Bromonaphthalene (FSUR)	na		na

D = Values from a diluted sample extract
E = Estimated value, above calibration range
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J = Estimated value

na = Not applicable
L = Coeluted with compound listed above
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Soil results reported in dry weight.