G-000-104.16

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PERMIT TO OPERATE APPLICATIONS FOR ANALYTICAL LABORATORY FACILITIES EXHAUST SYSTEMS - FERNALD ENVIRONMENTAL MANAGEMENT PROJECT (FEMP)

11/08/91

DOE-276-92
DOE-FN/SOAP
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LETTER

Department of Energy
Fernald Environmental Management Project
P.O. Box 398705
Cincinnati, Ohio 45239-8705
(513) 738-6357

3833

NOV 0 8 1991
DOE-276-92

Mr. Harry Schwietering
Southwestern Ohio Air Pollution
Control Agency
1632 Central Parkway
Cincinnati, Ohio 45210

Dear Mr. Schwietering

PERMIT TO OPERATE APPLICATIONS FOR ANALYTICAL LABORATORY FACILITIES EXHAUST SYSTEMS - FERNALD ENVIRONMENTAL MANAGEMENT PROJECT (FEMP)

Reference: Letter, DOE-1148-92, G. W. Westerbeck to H. Schwietering, "Air Permit Actions," dated April 17, 1991

Enclosed for your review and approval are Ohio Environmental Protection Agency Permit to Operate applications for new and existing laboratory hoods and ventilation (vent) points. These facilities have been installed or modified as part of a site analytical facilities upgrade/renovation.

Exhaust from the hoods/vents are directed through two distinct systems which are identified as follows: "MEPA/HEPA Exhaust System" and the "General Exhaust System." Two applications are provided with this submittal. Permits to Install have not been prepared based on the exemption provided by OAC Rule 3745-31-03 (.A) (.1) (.f). The enclosed applications have been expanded to include information deemed necessary for complete definition of the processes involved. Also enclosed is a check in the amount of $30.00 to cover application fees.

In accordance with the referenced letter, we will continue to provide laboratory support needed for monitoring and/or directing ongoing activities at the FEMP. This will require operating the new and existing laboratory hoods as they become available during the construction project.

Recycled and Recyclable

If you have any questions, please contact Behram Shroff at (513) 738-6003.

Sincerely,

for R. E. Tiller
Manager

FO:Shroff

Enclosures: As Stated
(1) Check for $30.00
(2) Applications

cc w/enclosures (2).:

M. Humphries, SE-31, ORFO
S. M. Beckman, WEMCO
P. B. Spotts, WEMCO

PERMIT TO OPERATE APPLICATION

ANALYTICAL LABORATORY FACILITIES MEPA/HEPA EXHAUST SYSTEM

FMPC ID# 15-001

OHIO ENVIRONMENTAL PROTECTION AGENCY
\PPLICATION FOR A PERMIT TO OPE' 'E
AN AIR CONTAMINANT SOURCE

3833

D.O.E.-Fernald Environmental Management Project
Facility Name

Mr. Behram Shroff
Person to Contact

7400 Willey Road
Facility Address

Post Office Box 398705
Mailing Address

Fernald Hamilton 45030
City County Zip

Cincinnati OH 45239-8705
City State Zip

(513) 738-6200
Telephone Area Number

(513) 738-6003
Telephone

(Application no., if this is a renewal application)

2819
Std. Ind. Class. Code

1. Complete and attach any of the following appendices most appropriate to the air contaminant source. In addition, a compliance time schedule form is to be attached when applicable. Check as appropriate the following:

XXAppendix A, Process
__Appendix B, Fuel-Burning Equipment
__Appendix C, Incinerator
__Appendix D, Surface Coating or Printing Operation
__Appendix E, Storage Tank
__Appendix H, Gasoline Dispensing Facility
__Appendix J, Loading Rack at Bulk Gasoline Plant or Terminal
__Appendix K, Surface Coating Line or Printing Line
__Appendix L, Solvent Metal Cleaning
__Appendix M, Fugitive Dust Emission Sources _____ (Specify Appendix No.)
__Appendix N, Rubber Tire Manufacturing
__Appendix O, Dry Cleaning Facility
__Appendix P, Landfills
__Other Appendix_____
__Compliance Time Schedule

2. Description of Source (same as used on appendix): Analytical Laboratory Facilities MEPA/HEPA System

3. Your identification for Source (same as used on appendix): 15-001

I, being the individual specified in Rule 3745-35-02(B) of the Ohio Administrative Code, hereby apply for a Permit to Operate the air contaminant source(s) described herein. As required, the following additional documents are submitted as part of this application (describe all attachments):

1) General Process Description
2) Process Description
3) Appendix A - Process Data
4) Attachment I

R.E. Tiller
Authorized Signature*
R. E. Tiller
Manager, Fernald Office
Title

11/8/91
Date 11/8/91

*Pursuant to OAC Rule 3745-35-02(B) (Permit to Operate), operation of an air contaminant source without an effective permit to operate is prohibited to 3704.05 Ohio Revised Code.

EPA-3161

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PERMIT TO OPERATE
ANALYTICAL LABORATORY FACILITIES
MULTI-POINT VENTILATION CONTROL SYSTEM

GENERAL PROCESS DESCRIPTION

The analytical laboratory facilities at the Fernald Environmental Management Project (FEMP) were constructed and first occupied in 1952 as part of supporting facilities for the production of high purity uranium metal. In 1989, renovation were initiated to provide quality control laboratories in support of the production facilities. The changes have been implemented in the existing Analytical Laboratory Building #15. The FEMP is a Government-owned facility for the production of uranium metal products for the U. S. Department of Energy (DOE). It is located at 7400 Willey Road near Fernald, Ohio and has the OEPA facility number of 1431110128.

In 1991 the U. S. Department of Energy announced a change of policy for the FEMP. Along with renaming of the facilities, new priorities were implemented emphasizing environmental clean up and site restoration. With the change in mission, changes have occurred in the composition of materials being processed through the laboratories. This application has been developed to demonstrate that all laboratory operations will be conducted in such a manner to assure no adverse impact to the immediate and surrounding environments. In addition a NESHAPs determination was provided on January 18, 1991 by the USEPA. The determination was made that this renovation did not constitute a modification under NESHAPs based on no increase in emission rates.

Included in the renovation is the implementation of Best Available Control Technology (BACT) for control of emissions from the various sources which produce air contaminants. The majority of these sources are laboratory scale operations where quantitative/qualitative analyses are preformed. Remaining sources are development facilities. Usually, only small quantities of product are involved, (10 grams or less). Historically the laboratory was involved in analysis of samples containing high concentrations of uranium or radionuclide bearing materials. With the re-emphasis from a production facility to environmental remediation and clean up, processing of material containing high concentrations is greatly reduced. The concentration values used in the MEPA/HEPA system examples for emissions determination is a 85% weight fraction for uranium as it exists in uranium oxide, (U_3O_8). Samples containing up to 100% uranium may on occasion be processed, however, this occurrence will be infrequent. Therefore, the higher value was not used in emission determination.

For each point ventilated, a process description, hood ID number, ventilation air flow rate and the materials processed have been compiled in table form. In addition to the tables, calculations have been prepared to determine average and maximum emissions expected. Generally, emission estimates have been determined using an average rate of air flow for each of the vent points and a dust loading concentration factor. Where available, historical information and/or known operational data is used. Normally this information is provided as part of the Permit to Install submittal; however, based on the exemption identified in the OAC rule 3745-31-03 item (A)(1)(f), no PTI has been prepared. Therefore, the information listed in OAC 3745-35-02-B6 deemed necessary by the Agency and normally submitted with the PTI, has been provided as part of the PTO application. This preparation is in conformance with the requirements of OAC 3745-31-05.

The methodology adopted for the determination of expected particulate loading and ultimate release rates is based on the use of dust load concentration factors. The numbers selected are believed to be a reasonable approximation of the anticipated conditions encountered in a working laboratory. A negative pressure will be maintained in the area by use of air locks at the entrances and the control of conditioned make-up air. Make-up air will be drawn in from the outside through a prefilter and a final filter. This filtered air supply will be relatively free of any external dust load. Hood face velocities have been established at 150 FPM. These velocities will drop off in passing through the hood and when entering the hood throat will be accelerated to the transport velocity for the duct work. The relative velocity through the hood will be low. As a result only the smaller particles will be entrained. A load factor of 0.005 grains per cubic foot of air handled is used to determine particulate loading from processes which have a propensity for a greater dust load. This number represents an average concentration normally encountered in an industrial work room environment. For sources which have a lesser probability of dust entrainment, a dust load concentration factor of 0.00005 grains per cubic feet of air handled is used. This is the expected dust concentration found in unfiltered outside air at the bottom of the range for city air and the top of the range for rural air. The numbers chosen are described in Figure 11-14 of the American Conference of Governmental & Industrial Hygienists, Industrial Ventilation Manual, 15th edition, dated 1978. These values represent a best estimate of dust load concentration factors anticipated in the ventilation stream during actual operations and are used in this preparation as the bases for emissions determination. Where available, historical information has been used in lieu of the concentration factors.

All hoods and room exhausts identified in this application are operated on the variable volume exhaust principle. A velocity controller located in the hood exhaust duct work shall reduce the exhaust air volume, while maintaining constant (150 FPM) hood velocity when the hood face opening is partially closed. In the hood exhaust systems the controller shall operate a discharge damper. This distribution and control system along with filtered outside make-up air shall provide pressure differentials between the clean and controlled areas of the building. Air locks shall maintain the pressure differential such that exfiltration from the controlled area will be maintained at a minimum.

Basic operations at the various hoods shall be analytical work on a laboratory scale. Materials used will be in small quantities with concentration of contaminants ranging from a maximum high of 85% by weight to trace quantities below detection limits. Average radionuclide concentrations normally do not exceed 100 ppm. Strict quality control measures in the form of SOPs are implemented to control the routing and ultimate processing of samples. For radionuclide bearing samples, separation will be accomplished by the determination of radiation counts per unit time. A cut off value of 20,000 dpm is used as the bases. Using 100% U^{238} as a standard, the 20,000 dpms is converted to 2.68% as the limiting radionuclide concentration value. Samples with concentrations exceeding this limit will be routed to the MEPA/HEPA system for processing. Samples where concentrations are below the set value will be processed in the general exhaust system.

PROCESS DESCRIPTION FEMP ID# 15-001 (MEPA/HEPA EXHAUST SYSTEM)

A new system design is provided for processes where the potential for release of radionuclides exists. As such, Best Available Technology (BAT) requires centralized ventilation through MEPA/HEPA filter. The centralized ventilation system is made up of modular filter housings, hoods, duct runs, fan, stack and system controls. These components make up the control equipment which services the sources. Discharge from the system is exhausted to the atmosphere through a new stack which is equipped with continuous sampling and monitoring. This stack is identified as EP15-001. Since the system fan will operate at a constant volume, automatic dampers and baffles are provided at each hood or designated pick-up point. These controls will automatically adjust to maintain a constant face velocity of 150 FPM at the enclosures. Due to number of ventilated points and the intermittent nature of their operation, the flow from a given point will be indistinguishable. The individual points which feed into the overall system are shown schematically on the attached flow diagram. Point identification will be provided by labeling the various fume hoods, canopy hoods, slot hoods, and room exhausts. Completion of the laboratory renovation/expansion project has provided 31 such labeled sources and a high vacuum subsystem, (32 in total). Points which involve like materials and have similar processes have been grouped as shown on TABLE "A". These groups are: the analytical laboratories; the demonstration laboratories; the multi-use technology laboratories and a service vacuum subsystem with drum filling station. Definition for each group has been prepared and is provided as follows.

ANALYTICAL LABORATORIES

The largest group is the analytical laboratories with a total of 19 hoods. Work conducted in these hoods will be the sample analysis of soils, oils, water, waste water, uranyl nitrate solutions, sludges, filter cakes and various residues. Analytes will normally be one of the following: uranium, thorium, barium, lead, silver, ammonia, nitrates, fluorides, cadmium, chromium, copper, nickel, zinc, iron, arsenic, calcium, sodium, potassium, mercury, selenium, greases and oils, Ph and various radionuclides. Due to the varying nature of analytical work and the indeterminate future work load, actual description of a scheduled laboratory work load would be assumptive at best. Therefore, the methodology used for emissions estimates has been based on the volume of air handled, a dust load concentration factor for particulate and a 85% weight fraction for radionuclides. On an average, about 6 samples will be processed per 8 hour day for the determination of the above noted analytes. Normal concentrations found are at trace levels and frequently many are below detectable limits. A typical example considered for analysis would be as follows: for soils, a 2 gram sample is processed in a 100 ml deionized water, HNO_3 and HCL solution, or for a 100 ml water samples, the deionized water is not needed but the other reagents remain the same. The prepared sample is then reduced by 75% in a ventilated hood by a digestion process. After digestion, a 1 to 2 ml fraction of the residual solution is destructively tested by spectroscopic methods. This fraction is lost up the stack as an atomized gas. The unused portion is retained as scrap waste. Except for the fraction that is destructively tested, sample losses are maintained at a minimum. The accuracy of results is dependent on minimization of analyte losses.

The above information will be used to provide an evaluation of "Toxic Air Contaminants", see air toxics evaluation at end of this section. In addition to the air toxics, an evaluation of particulate and radionuclide emissions are also provided. Used in the preparation for this determination is a dust load concentration factor, the volume of air exhausted and a weight fraction for radionuclides, (see emissions calculations).

DEMONSTRATION LABORATORIES

The demonstration laboratories, with 4 dedicated hoods, are used for various prototype developmental work. This will include experimental work in the following types of processes: digestion, extraction, solidification, precipitation, filtration and bench scale models of wastes, wastewater and water treatment. Work will involve the following types of materials: acids, salts, solvents, water/wastewater, soils, sludges/residues, debris, flyash, cements and pozzolanic materials. Due to the limited number of available hoods, the number of processes ongoing simultaneously will be limited accordingly. Losses from these hoods will be estimated using the volume of air ventilating the process, a dust load concentration factor for particulate and a 85% weight fraction for radionuclides.

MULTI-USE TECHNOLOGY LABORATORIES

The multi-use technology laboratories have not been assigned specific functions. There are 7 associated hoods. One is specified as a room exhaust and another is a canopy hood. The remaining 5 have not been defined and consist of duct runs terminated with automatic control dampers only. Specific usage will be defined at some future date. However, to insure that a total system is defined under this permit, calculations are provided using the volume of air handled and the above stated concentration factor and weight fraction. The calculations provided include all of the stated hoods. See attached emissions calculations for determination of particulate and radionuclide discharge rates.

SERVICE VACUUM SUBSYSTEM WITH DRUMMING STATION

The high vacuum subsystem in the analytical laboratories provides service vacuum at 18 different hoods or work stations. General use will be for housecleaning and the clean up of radionuclide bearing spills. This subsystem is equipped with its own HEPA which filters the service vacuum exhaust prior to its discharge into the main MEPA/HEPA system. Not all of the points which are serviced by the high vacuum subsystem are ventilated by the main MEPA/HEPA system. These are identified on the flow diagram and are permitted under a separate application. Located on the floor directly beneath the high vacuum subsystem is an enclosed drumming station where residues from the subsystem's cyclone separator and cartridge filters are collected. Ventilation air from this enclosure is exhausted into the main MEPA/HEPA system. Particulate loading rates are determined using the stated dust load concentration factor and weight fraction multiplied by the system's rated flow.

AIR TOXICS EVALUATION

This evaluation is prepared in accordance with the OEPA "Review of New Sources of Air Toxic Emissions" guidance manual 2nd draft dated February, 1991 which establishes policy for the permitting of new sources of toxic air emissions. Some of elements or compounds which are identified in this application have listed TLVs or are listed in Table I of the draft Guidance Manual. Therefore, an air toxic emission review is provided. Due to the small quantities of material handled, all compounds will be present in concentrations below the "de minimis levels", therefore no further review of carcinogens are considered.

The following example is provided to demonstrate that the maximum ground-level concentration (MAGLC) of the select contaminant is less than the appropriate MAGLC outside the property line of the facility. Take, for example, the previously stated 2 gram sample of soil used for elemental determination. Assuming that an elemental constituent exists at a weight fraction of 85%. Then the 2 gram sample digested in 25 ml of solution would have a concentration of 68 grams per liter. If a 2 ml fraction of this solution was atomized and exhausted out the stack, then the vapor in the stack exhaust would be 0.136 grams suspended in the volume of air exhausted. Using the systems fan rated flow of 24000 CFM as dilution air and a sample processing rate of 6 per day, MAGLC compliance can be demonstrated as follows.

ESTIMATED SAMPLE MAGLC

(0.136 gm X 6 samples/day) / (24000 ft^3/min X 60 min/hr X 24 hr/day) X 1000 mg/gm X 35.314 ft^3/m^3 = 8.34 X 10^{-4} mg/m^3.

CALCULATED MAXIMUM ALLOWABLE MAGLC

For a worst case example of an air toxic, using the ACGIH, 1988-1989, TLV of 0.05 mg/m^3 for mercury then:

MAGLC = (0.05 mg/m^3) / 42 = 1.19 X 10^{-3} mg/m^3

NOTE: The number used in the denominator for the above equation is based on anticipated impact on workers at the source. Increasing this number by 1.66% to account for impact on elderly and children is not considered due to the magnitude of the distance to the nearest property fence line, (approximately 850 meters).

Since the estimated sample MAGLC number is 8.34 X 10^{-4} mg/m^3 and the calculated allowable is 1.19 X 10^{-3} mg/m^3), no further actions are deemed necessary to demonstrate adequate control of air toxics emissions.

APPENDIX A

ANALYTICAL LABORATORY FACILITIES MEPA/HEPA EXHAUST SYSTEM

CONTENTS

PROCESS DATA SHEETS

PROCESS FLOW DIAGRAM

TABLE "A"

For Official Use Only

Premise No.__/__/__/
Source No.__/__
Application No.__/__

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APPENDIX A, PROCESS

A-1

OEPA NO. 1431110128

FEMP ID NO. 15-001

PROCESS DATA

1. Name of process Analytical Laboratory Facilities MEPA/HEPA Exhaust System (FEMP #15-001)
2. End product of this process Analytical and Technology Demonstation Services
3. Primary process equipment Analytical Equipment and Laboratory Facilities

Your identification See TABLE "A" Year Installed 1991

4. Manufacturer N/A Make or Model N/A

5. Capacity of equipment (lbs./hr): Rated N/A Max. N/A
6. Method of exhaust ventilation: [X] Stack [ ] Window fan [ ] Roof vent
[ ] Other, describe

Are there multiple exhausts? [ ] Yes [X] No

OPERATING DATA

7. Normal operating schedule: 24 hrs./day, 5 days/wk., 52 wks./year.

8. Percent annual production (finished units) by season:
Winter 25 Spring 25 Summer 25 Fall 25

9. Hourly production rates (lbs.): Average N/A Maximum N/A

10. Annual production (indicate units) N/A
projected percent annual increase in production N/A

11. Type of operation: [ ] Continuous [X] Batch

12. If batch, indicate Minutes per cycle Varies Minutes between cycles Varies

13. Materials used in process:

List of Raw Materials	Principle Use	Amount (lbs./hr.)
SEE PROCESS DESCRIPTION	ANALYTICAL AND	LABORATORY SCALE
	DEMONSTRATION	
	TECHNOLOGIES	

14. A PROCESS FLOW DIAGRAM MUST BE INCLUDED WITH THIS APPENDIX. Show entry and exit points of all raw materials, intermediate products, by products and finished products. Label all materials including airborne contaminants and other waste materials. Label the process equipment.

CONTROL EQUIPMENT

OEPA NO. 1431110128
FEMP ID NO. 15-001

Control Equipment Code:

(A) Settling Chamber
(B) Cyclone
(C) Multiple Cyclone
(D) Electrostatic Precipitator
(E) Fabric Filter
(F) Spray Chamber
(G) Cyclonic Scrubber
(H) Impingement Scrubber
(I) Orifice Scrubber
(J) Venturi Scrubber
(K) Plate or Tray Tower
(L) Packing Tower
(M) Adsorber
(N) Condenser
(O) Afterburner - Catalytic
(P) Afterburner - Thermal
(Q) Other, Describe
Q1 MEPA
Q2 HEPA

15. Control Equipment Data:

Item	Primary Collector	Secondary Collector
(a) Type (See above Code)	Q1	Q2
(b) Manufacturer	CHARCOAL SERVIES INC.	CHARCOAL SERVICES INC.
(c) Model No.	1H2W-012-1NA-35	1H2W-012-1NA-35
(d) Year Installed	1991	1991
(e) Your Identification	NONE	NONE
(f) Pollutant Controlled	Particulate Radionuclides	Particulate Radionuclides
(g) Controlled pollutant emission rate (if known)	See Attached Emissions Calculations	See Attached Emissions Calculations
(h) Pressure Drop	3-5 Inch W.C.	1 Inch W.C.
(i) Design efficiency	98.00% @ 1.0 Micron	99.97% @0.3 Micron
(j) Operating efficiency	95.00% @ 1.0 Micron	99.9% @0.3 Micron

STACK DATA

16. Your Stack Identification EP15 - 001

17. Are other sources vented to this stack? [ ] Yes [X] No
If yes, identify sources SEE TABLE "A" FOR IDENTIFICATION OF VENT POINTS.

18. Type: [X] Round, top inside diameter dimension 36 Inch
[ ] Rectangular, top inside dimensions (L)_____ X (W)_____

19. Height: Above roof 18.7 ft., above ground 48.4 ft.

20. Exit gas: Temp. Ambient °F, Volume 24,000 ACFM, Velocity 3395 ft./min.

21. Continuous monitoring equipment: [X] Yes [ ] No
If yes, indicate : Type PANCAKE G-M , Manufacturer LUDLUM

Make or Model #177-62 Monitor, #44-9 Detector, Pollutant(s) monitored Particulate & Radionuclides

22. Emission data: Emissions from this source have been determined and such data is included with this appendix: [X] Yes [ ] No
If yes, check method: [ ] Stack Test [X] Emission Factor [ ] Material Balance
Completed by Robert Boring, Date 9/25/91

ANALYTICAL FACILITIES BUILDING #15

RG 6/21/91

MEPA/HEPA VENTILATION CONTROL SYSTEM FLOW DIAGRAM

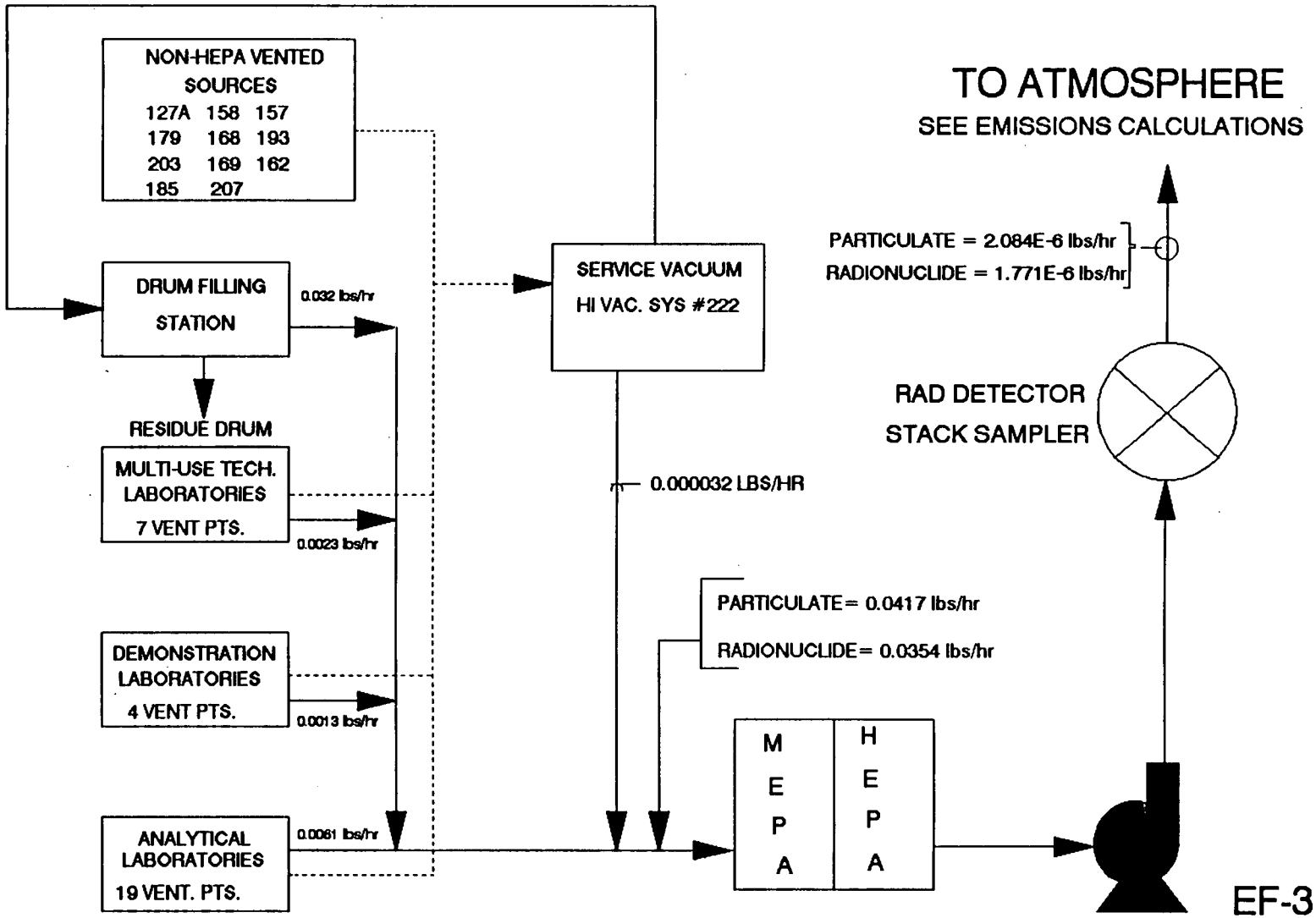

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TABLE "A"
FEMP SOURCE ID# 15-001
EMISSION POINT ID# EP15-001

GROUPS	PROCESS	HOOD ID NO'S	HOOD CFM	MATERIALS PROCESSED
Analytical Laboratories	Mass Spectrometry	FH-128A CH-128A	100-1900 500	s. *l. & g. containing U isotopics
Analytical Laboratories	AAS/ICP Application	CH-163E CH-163F CH-163G CH-163H	350 350 350	s. & *l. analysis for heavy metals
Analytical Laboratories	Environmental	CH-165A	500	metals analysis
Analytical Laboratories	Sample Preparation	FH-167A ER-174B	100-1675 0-575	s. l. & g. basic sample prep. only
Analytical Laboratories	ICPMS X Ray Spectroscopy of soils, sludges & liquids	FH-142E	100-1900	relative elemental ID's of solids
Analytical Laboratories	Materials Control of NPDES RCRA Wastes	FH-169A	100-1500	s. & l. NH_3, Ph, TSS Fluorides & NO_3
Analytical Laboratories	Sample Preparation	FH-147A FH-147B FH-147C FH-147D	100-1150 100-1150 100-1150 100-1150	s. l. & g. basic sample prep. only

* - Desulvation methods

TABLE "A" (CONTINUED)
FEMP SOURCE ID# 15-001
EMISSIONS POINT ID# EP15-001

GROUPS	PROCESS	HOOD ID NO'S	HOOD CFM	MATERIALS PROCESSED
Analytical Laboratories	Sample Preparation	FH-175A E-175B E-175C	600-1500 250 250	s. l. & g. basic sample prep. only
Analytical Laboratories (Isotopic)	Radiometric	SH-209A	100-1500	s. l. & g. Ra & Th bearing materials
Demonstration Laboratories	Lab Scale Projects	FH-190A E-190B ER-190C SH-190AA	100-2250 400 0-800 2000	soils
Drumming Station	Process Residual	E-166A	600	process residual
High Vacuum System	Lab Service Vacuum For: FH-190A FH-190B ER-190C SH-190AA	222	700	process residual
Multi-use Laboratories	Rad. Lab. Isotopic Sample Preparation	E-184A ER-184C E-184B	900 700-1500 1000	rad. isotopic
Multi-use Laboratories	Sample Prep.	CH-180A E-180B E-180C E-180D	300 100 350 400	soils

FH -Fume Hood, CH - Canopy Hood, SH - Slot Hood, ER - Room Exhaust
E - Equipment, s - solid, l - liquid, g - gas

ATTACHMENT I

ANALYTICAL LABORATORY FACILITIES MEPA/HEPA EXHAUST SYSTEM
AIR EMISSIONS CALCULATIONS
FEMP SOURCE # 15-001

TABLE OF CONTENTS

A. Assumptions

B. Particulate Loading Rates (Uncontrolled)

C. Uncontrolled Emissions Rates to Filter

D. Estimated Stack Discharge Rate

E. Estimated Annual Stack Discharge Rate (Uncontrolled)

F. Compliance Determination (Particulate)

G. Effective Dose Equivalent Calculations
   Table A Radionuclide Values
   Table b Radionuclide Conversions

A. ASSUMPTIONS

1. Assume particulate removal efficiency of MEPA prefilter is 95.0% for particulate larger than 1 microns in diameter.

2. Assume overall particulate removal efficiency of HEPA filtration is 99.9% for particulate larger than 0.3 microns in diameter.

3. Assume maximum work schedule of 24 hours per day, 7 days per week and 52 weeks per year, (8760 Hr/Yr) and an average work schedule of 24 hours per day, 5 days per week and 50 weeks per year, (6000 Hr/Yr).

4. Assumed dust load concentration factors for particles 10 microns or less in diameter:

   a. 0.005 grains per cubic foot of air handled (average dust load in industrial work room air).

   b. 0.00005 grains per cubic feet of air handled (average dust load in outside air).

5. Assume 85% of total particulate load as radionuclides, a worst case assumption based on weight percent of uranium in U_3O_8.

6. Based on a fan flow rating of 24000 CFM and a total of 32 pick up points, use an average rate of air flow for each pick up point of:

   24000 ft^3/min / 32 = 750 ft^3/min.

B. PARTICULATE LOADING RATES

1. SERVICE VACUUM, HIGH VACUUM SUBSYSTEM
   a. Particulate Loading Rate.

      750 ft^3/min X 0.005 grains/ft^3 X 60 min/hr X lbs/7000 grains = 0.032 lbs/hr.

   b. Exhaust Air Particulate Load to MEPA/HEPA Filters.

      0.032 lbs/hr X (1 - 99.9%) filter efficiency = 0.000032 lbs/hr.

2. DRUMMING STATION
   a. Particulate Load.

      750 ft^3/min X 0.005 grains/ft^3 X 60 min/hr X lbs/7000 grains = 0.032 lbs/hr.

3. DEMONSTRATION LABORATORIES
   a. Particulate Load.

      4 hoods @ 750 ft^3/min = 3000 ft^3/min.
      0.00005 grains/ft^3 X 3000 ft^3/min X 60 min/hr X lbs/7000 grains
      = 0.0013 lbs/hr.

4. MULTI-USE TECHNOLOGY LABORATORIES
   a. Particulate Load.

      7 hoods @ 750 ft^3/min = 5250 ft^3/min.
      0.00005 grains/ft^3 X 5250 ft^3/min X 60 min/hr X lbs/7000 grains
      = 0.00225 lbs/hr.

5. ANALYTICAL LABORATORIES
   a. Particulate Load.

      19 hoods @ 750 ft^3/min = 14250 ft^3/min.
      0.00005 grains/ft^3 X 14250 ft^3/min X 60 min/hr X lbs/7000 grains
      = 0.00611 lbs/hr.

SUMMARY TABLE PARTICULATE
UNCONTROLLED LOAD TO MEPA/HEPA FILTERS

SOURCES	LOAD LBS/HR
Service Vacuum, High Vacuum Subsystem *	0.000032
Drumming Station	0.032
Demonstration Laboratories	0.0013
Multi-use Technology Laboratories	0.00225
Analytical Laboratories	0.00611
TOTAL	0.041692

C. UNCONTROLLED EMISSION RATES TO FILTERS

1. PARTICULATE = 0.0417 lbs/hr.

2. RADIONUCLIDE = 0.0417 LBS/HR x 85% = 0.0354 lbs/hr.

D. ESTIMATED STACK DISCHARGE RATE

1. Hourly Particulate Emissions.

   0.0417 lbs/hr X .05 X .001 = 2.084E-6 lbs/hr.

2. Hourly Radionuclide Emissions.

   2.084E-6 lbs/hr X 85% = 1.771E-6 lbs/hr.

* - Load from service high vaccum subsystem is the controlled discharge from the high vaccum's HEPA filters.

E. ESTIMATED ANNUAL ACK DISCHARGE RATE (UNCONTROLL).

1. Average Annual Particulate Emissions.

   2.084E-6 lbs/hr X 6000 hr/yr = 0.013 lbs/yr
   or
   0.013 lbs/yr X ton/2000 lbs = 6.252E-6 ton/yr.

2. Maximum Annual Particulate Emissions.

   2.084E-6 lbs/hr X 8760 hr/yr = 0.018 lbs/yr
   or
   0.018 lbs/yr X ton/2000 lbs = 9.127E-6 ton/yr.

3. Average Annual Radionuclide Emissions.

   1.771E-6 lbs/hr X 6000 hr/yr = 0.0106 lbs/yr
   or
   0.0106 lbs/yr X ton/2000 lbs = 5.314E-6 ton/yr.

4. Maximum Annual Radionuclide Emissions.

   1.771E-6 lbs/hr X 8760 hr/yr = 0.0155 lbs/yr
   or
   0.0155 lbs/yr X ton/2000 lbs = 7.756E-6 ton/yr.

SUMMARY TABLE STACK DISCHARGE

	PARTICULATE		RADIONUCLIDES	
	LBS/YR	TONS/YR	LBS/YR	TONS/YR
AVERAGE	0.013	6.252E-6	0.0106	5.314E-6
MAXIMUM	0.018	9.127E-6	0.0155	7.756E-6

F. COMPLIANCE DETERMINATION (PARTICULATE)

Allowable rate of particulate emissions based on process weight rate at maximum capacity, Table I, OAC 3745-17-11:

From OAC 3745-17-11 the allowable rate of particulate emissions
$E = 4.10P^{0.67}$
where: P is the process weight rate at maximum capacity in tons per hour.

then: $P = (0.0417 \text{ lbs/hr})/(2000 \text{ lbs/ton}) = 0.000021$ ton/hr.
and: $E = 4.10(0.000021)^{0.67} = 0.002996$ lbs/hr.

Comparison of calculated (E) with values found in the above referenced table, where P is between zero and 0.05, a value of E = 0.551 lbs/hr can be used.

Since the calculated particulate load discharged to the atmosphere, as shown in section D of the air emission calculation, is on the order of 10^{-6} lbs/hr and the allowable rate (E) as determined above is three orders of magnitude larger (10^{-3} lbs/hr), operation of this source will be in compliance with OAC rule 3745-17-11, See Table I below.

TABLE I

	Allowable Rate Per Table I, OAC 3745-17-11	Calculated Rate (maximum)
Particulate	0.551 lbs/hr	2.084E-6 lbs/hr
Particulate	Best Available Technology OAC rule 3745-31-05(A)(3)	MEPA/HEPA Filtration

G. EFFECTIVE DOSE EQUIVALENT CALCULATIONS

40 CFR Part 61
National Emission Standards
for Hazardous Air Pollutants

REPORT ON COMPLIANCE WITH

THE CLEAN AIR ACT LIMITS FOR RADIONUCLIDE EMISSIONS

FROM THE COMPLY CODE, VERSION 1.4

ANALYTICAL LABORATORY FACILITIES MEPA/HEPA EXHAUST SYSTEM

Prepared by:

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Prepared for:

U.S. Department of Energy
Fernald Environmental Management Project
Fernald, Ohio 45030

REPORT ON COMPLIANCE WITH THE CLEAN AIR ACT LIMITS FOR RADIONUCLIDE EMISSIONS

SCREENING LEVEL 2

DATA ENTERED:

Nuclide		Release Rate (curies/YEAR)
U-234	Y	2.400E-06
U-235	Y	1.080E-07
U-236	Y	2.240E-08
U-238	Y	2.330E-06
PU-239	W	3.090E-09
PU-238	W	6.370E-10
NP-237	W	2.090E-09
TH-234	Y	1.080E-05
TH-232	W	1.080E-08
TH-230	W	1.440E-07
TH-228	Y	1.400E-08
RA-228	W	1.710E-09
RA-226	W	9.560E-09
CS-137	D	7.940E-08
RU-106	Y	1.380E-08
TC-99	W	3.400E-07
SR-90	Y	1.050E-08

Release height 14 meters.

Building height 9 meters.

The source and receptor are not on the same building.

Distance from the source to the receptor is 912 meters.

Building width 79 meters.

Default mean wind speed used (2.0 m/sec).

NOTES:

Input parameters outside the "normal" range:

Receptor is unusually FAR.

RESULTS:

Effective dose equivalent: 1.6E-03 mrem/yr.

*** Comply at level 2.

This facility is in COMPLIANCE.

It may or may not be EXEMPT from reporting to the EPA.

You may contact your regional EPA office for more information.

********** END OF COMPLIANCE REPORT **********

NOTES:

Per 40 CFR 61.93.a, Subpart H, "DOE facilities for which the maximally exposed individual lives within 3 kilometers of all sources of emissions in the facility, may use EPA's COMPLY model and associated procedures for determining dose for purpose of compliance". The above determined effective dose equivalent when compared with 0.1 mrem/yr standard specified in Subpart H, indicates that this source is NOT subject to the emission measurement requirement. It should be noted that the most conservative input parameters were used. Based on this conservative approach, the calculations indicate that the dose value remain below stated standards.

Source information relating to the radionuclide data used in this preparation is appended as TABLES A and B.

TABLE A RADIONUCLIDE VALUES*

Radionuclides	Quantity (Ci/Kg U)	Solubility
U-234	3.42E-04	Y
U-235	1.53E-05	Y
U-236	3.18E-05	Y
U-238	3.32E-04	Y
Pu-239+240	4.39E-07	Y
Pu-238	9.06E-08	Y
Np-237	2.90E-07	Y
Th-234	1.54E-03	Y
Pa-234m	6.79E-04	Y
Th-232	1.49E-06	Y
Th-230	2.05E-05	Y
Th-228	2.14E-06	Y
Ra-228	2.43E-07	Y
Ra-226	1.36E-06	Y
Cs-137	1.13E-05	D
Ru-106	1.96E-06	W
Tc-99	4.83E-05	Y
Sr-90	1.49E-06	D
Ba-137m	1.13E-05	Y

*Extract from Application for determination of a modification under 40 CFR 61, National Emission Standards for Hazardous Air Pollutants (NESHAP), Analytical Facility Upgrade. Application Submitted for USEPA approval November 27, 1990, See Appendix B Table 3.

TABLE B RADIONUCLIDE CONVERSIONS

From Air Emissions Calculations Estimated Annual Stack Discharge Rates, Summary Table, Maximum Radionuclide Discharge Rate=0.0155 lbs/yr or 0.0155 lbs/yr x kg/2.205 lbs. = 0.0070 kg U/yr

Radionuclides	Quantity Ci/Kg U)	Rate Kg U/yr	Release Rate Ci/yr
U-234	3.42E-04	0.0070	2.40E-6
U-235	1.53E-05	0.0070	1.08E-7
U-236	3.18E-05	0.0070	2.24E-8
U-238	3.32E-04	0.0070	2.33E-6
Pu-239+240	4.39E-07	0.0070	3.09E-9
Pu-238	9.06E-08	0.0070	6.37E-10
Np-237	2.90E-07	0.0070	2.09E-9
Th-234	1.54E-03	0.0070	1.08E-5
Th-232	1.49E-06	0.0070	1.08E-8
Th-230	2.05E-05	0.0070	1.44E-7
Th-228	2.14E-06	0.0070	1.40E-8
Ra-228	2.43E-07	0.0070	1.71E-9
Ra-226	1.36E-06	0.0070	9.56E-9
Cs-137	1.13E-05	0.0070	7.94E-8
Ru-106	1.96E-06	0.0070	1.38E-8
Tc-99	4.83E-05	0.0070	3.40E-7
Sr-90	1.49E-06	0.0070	1.05E-8

PERMIT TO OPERATE APPLICATION

ANALYTICAL LABORATORY FACILITIES GENERAL EXHAUST SYSTEM

FEMP ID# 15-002

OHIO ENVIRONMENTAL PROTECTION AGENCY
APPLICATION FOR A PERMIT TO OPERATE AN AIR CONTAMINANT SOURCE

3833

D.O.E.-Fernald Environmental Management Project
Facility Name

Mr. Behram Shroff
Person to Contact

7400 Willey Road
Facility Address

Post Office Box 398705
Mailing Address

Fernald Hamilton 45030
City County Zip

Cincinnati OH 45239-8705
City State Zip

(513) 738-6200
Telephone Area Number

(513) 738-6003
Telephone

(Application no., if this is a renewal application)

2819
Std. Ind. Class. Code

1. Complete and attach any of the following appendices most appropriate to the air contaminant source. In addition, a compliance time schedule form is to be attached when applicable. Check as appropriate the following:

XX Appendix A, Process
__ Appendix B, Fuel-Burning Equipment
__ Appendix C, Incinerator
__ Appendix D, Surface Coating or Printing Operation
__ Appendix E, Storage Tank
__ Appendix H, Gasoline Dispensing Facility
__ Appendix J, Loading Rack at Bulk Gasoline Plant or Terminal
__ Appendix K, Surface Coating Line or Printing Line
__ Appendix L, Solvent Metal Cleaning
__ Appendix M, Fugitive Dust Emission Sources _____ (Specify Appendix No.)
__ Appendix N, Rubber Tire Manufacturing
__ Appendix O, Dry Cleaning Facility
__ Appendix P, Landfills
__ Other Appendix _____
__ Compliance Time Schedule

2. Description of Source (same as used on appendix): Analytical Laboratory General Exhaust System

3. Your identification for Source (same as used on appendix): 15-002

I, being the individual specified in Rule 3745-35-02(B) of the Ohio Administrative Code, hereby apply for a Permit to Operate the air contaminant source(s) described herein. As required, the following additional documents are submitted as part of this application (describe all attachments):

1) General Process Description
2) Process Description
3) Appendix A - Process Data
4) Attachment I
5) Attachment II

R. E. Tiller
Authorized Signature
R. E. Tiller
Manager, Fernald Office
Title
11/8/91
Date

*Pursuant to OAC Rule 3745-35-02(B) (Permit to Operate), operation of an air contaminant source without an effective permit to operate is prohibited to 3704.05 Ohio Revised Code.

EPA-3161

27

PERMIT TO OPERATE
ANALYTICAL LABORATORY FACILITIES
MULTI-POINT VENTILATION CONTROL SYSTEM

GENERAL PROCESS DESCRIPTION

The analytical laboratory facilities at the Fernald Environmental Management Project (FEMP) were constructed and first occupied in 1952 as part of supporting facilities for the production of high purity uranium metal. In 1989, renovation were initiated to provide quality control laboratories in support of the production facilities. The changes have been implemented in the existing Analytical Laboratory Building #15. The FEMP is a Government-owned facility for the production of uranium metal products for the U. S. Department of Energy (DOE). It is located at 7400 Willey Road near Fernald, Ohio and has the OEPA facility number of 1431110128.

In 1991 the U. S. Department of Energy announced a change of policy for the FEMP. Along with renaming of the facilities, new priorities were implemented emphasizing environmental clean up and site restoration. With the change in mission, changes have occurred in the composition of materials being processed through the laboratories. This application has been developed to demonstrate that all laboratory operations will be conducted in such a manner to assure no adverse impact to the immediate and surrounding environments. In addition a NESHAPs determination was provided on January 18, 1991 by the USEPA. The determination was made that this renovation did not constitute a modification under NESHAPs based on no increase in emission rates.

Included in the renovation is the implementation of Best Available Control Technology (BACT) for control of emissions from the various sources which produce air contaminants. The majority of these sources are laboratory scale operations where quantitative/qualitative analyses are preformed. Remaining sources are development facilities. Usually, only small quantities of product are involved, (10 grams or less). Historically the laboratory was involved in analysis of samples containing high concentrations of uranium or radionuclide bearing materials. With the re-emphasis from a production facility to environmental remediation and clean up, processing of material containing high concentrations is greatly reduced.

For each point ventilated, a process description, hood ID number, ventilation air flow rate and the materials processed have been compiled in table form. In addition to the tables, calculations have been prepared to determine average and maximum emissions expected. Generally, emission estimates have been determined using an average rate of air flow for each of the vent points and a dust loading concentration factor. Where available, historical information and/or known operational data is used. Normally this information is provided as part of the Permit to Install submittal; however, based on the exemption identified in the OAC rule 3745-31-03 item (A)(1)(f), no PTI has been prepared. Therefore, the information listed in OAC 3745-35-02-B6 deemed necessary by the Agency and normally submitted with the PTI, has been provided as part of the PTO application. This preparation is in conformance with the requirements of OAC 3745-31-05.

The methodology adopted for the determination of expected particulate loading and ultimate release rates is based on the use of dust load concentration factors. The numbers selected are believed to be a reasonable approximation of the anticipated conditions encountered in a working laboratory. A negative pressure

will be maintained in the area by use of air locks at the entrances and the control of conditioned make-up air. Make-up air will be drawn in from the outside through a prefilter and a final filter. This filtered air supply will be relatively free of any external dust load. Hood face velocities have been established at 150 FPM. These velocities will drop off in passing through the hood and when entering the hood throat will be accelerated to the transport velocity for the duct work. The relative velocity through the hood will be low. As a result only the smaller particles will be entrained. A load factor of 0.005 grains per cubic foot of air handled is used to determine particulate loading from processes which have a propensity for a greater dust load. This number represents an average concentration normally encountered in an industrial work room environment. For sources which have a lesser probability of dust entrainment, a dust load concentration factor of 0.00005 grains per cubic feet of air handled is used. This is the expected dust concentration found in unfiltered outside air at the bottom of the range for city air and the top of the range for rural air. The numbers chosen are described in Figure 11-14 of the American Conference of Governmental & Industrial Hygienists, Industrial Ventilation Manual, 15th edition, dated 1978. These values represent a best estimate of dust load concentration factors anticipated in the ventilation stream during actual operations and are used in this preparation as the bases for emissions determination. Where available, historical information has been used in lieu of the concentration factors.

All hoods and room exhausts identified in this application are operated on the variable volume exhaust principle. A velocity controller located in the hood exhaust duct work shall reduce the exhaust air volume, while maintaining constant (150 FPM) hood velocity when the hood face opening is partially closed. In the hood exhaust systems the controller shall operate a discharge damper. This distribution and control system along with filtered outside make-up air shall provide pressure differentials between the clean and controlled areas of the building. Air locks shall maintain the pressure differential such that exfiltration from the controlled area will be maintained at a minimum.

Basic operations at the various hoods shall be analytical work on a laboratory scale. Average radionuclide concentrations normally do not exceed 100 ppm. Strict quality control measures in the form of SOPs are implemented to control the routing and ultimate processing of samples. For radionuclide bearing samples, routing will be controlled by the determination of radiation counts per unit time. A cut off value of 20,000 dpm is used as the basis for determining which system will be used to process a sample. Using 100% U^{238} as a standard, the 20,000 dpms is converted to 2.68% uranium as the limiting radionuclide concentration value. Samples with concentrations exceeding this limit will be routed to the MEPA/HEPA system for processing. Samples where concentrations are below the set value will be processed in the general exhaust system. Since the general exhaust system is equipped with neither filtration control equipment nor stack monitoring, compliance determination will be accomplished by USEPA methods used for stack testing.

PROCESS DESCRIPTION FEMP ID# 15-002 (GENERAL EXHAUST SYSTEM)

FEMP source number 15-002 is a multi functional collection of hoods and room exhausts. A major portion of the analytical work is in the processing of materials having low to trace levels of contaminants. As a result, a large number of hoods are provided. These are serviced by a ventilation system that is deemed compatible with the materials to be processed. It is anticipated that the bulk of the future laboratory workload will be accomplished in this system. There are a total of 120 vent points exhausted through two separate fans. The fans, which are numbered EF-1 and EF-2, exhaust to the atmosphere via individual stacks, numbered EP15-002 and EP15-003 respectively. Grouping together as one source is possible due to the physical properties of processes involved and the small volumes of materials processed batchwise in the hoods. Fan EF-1 has a maximum flow rating of 50000 CFM and EF-2's maximum rating is 37500 CFM. The dual system provides greater flexibility in laboratory work load planning and periodic system maintenance scheduling. Since the vent points have built in adjustable air flow controllers to maintain system balance, actual flows can only be determined by physical measuring. Therefore an average value of 730 CFM at each pick up point is used in the calculations for emissions determinations.

As stated above, source # 15-002 is made up of two subsystems. The subsystem serviced by EF-1 has 64 individual vent points which are broken down into 5 groups. These groups are as follows: analytical laboratories with 36 vent points, demonstration laboratories with 14 vent points, welding laboratories with 3 vent points, a miscellaneous group with 5 vent points and an area exhaust air group with 6 vent points. Each are shown on the flow diagram and are defined in TABLE "A", both attached. The second subsystem serviced by EF-2 has 56 vent points and is broken down into 4 groups. These groups are as follows: organic laboratories with 9 vent points, analytical laboratories with 28 vent points, a miscellaneous group with 15 vent points and the area exhaust air group with 4 vent points. Each of these are as shown on the flow diagram and are as defined in the attached TABLE "B". One flow diagram is provided showing both subsystem.

ANALYTICAL LABORATORIES

The analytical laboratories with a total of 64 vent points from each of the two subsystems will provide the facilities for identifying targeted contaminants contained in a sample, (see TABLES "A" and "B") . Typically, samples will be of the following types: soils, oils, water, waste water, uranyl nitrate solutions, sludges, filter cakes, residues and various mixtures containing VOC's. Analytes will normally be one of the following: uranium, thorium, barium, cadmium, chromium, copper, nickel, zinc, iron, arsenic, calcium, sodium, potassium, mercury, selenium, greases and oils and various VOC's. Due to the varying nature of analytical work and the indeterminate future work load, actual description of a scheduled laboratory work load would be assumptive at best. Therefore, the methodology used for emissions estimates has been based on the volume of air handled, a dust load concentration factor for particulate and a 2.68% weight fraction of the total particulate load for radionuclides. Normal concentrations found are at trace levels and frequently may be below detectable limits. A typical example considered for analysis would be as follows: for soils, this would consist of a 2 gram sample in a 100 ml deionized water, HNO_3 and HCL solution, or for a 100 ml water samples, the deionized water is not required but

the reagents remain the same. The prepared sample is then reduced by 75% in a ventilated hood by a digestion process. The digestion process is accomplished in one of the perchloric acid hoods. Perchloric acid hoods are permitted under a separate application. After digestion, a 1 to 2 ml fraction of the residual solution is destructively tested by methods used for spectroanalysis. This fraction is lost up the stack as an atomized gas. The unused portion is retained as scrap waste. Throughout the analytical process, loss of materials is maintained at a minimum. Accuracy of analytical results are dependent on the minimization of analyte loss.

DEMONSTRATION LABORATORIES

The demonstration laboratory, with 14 dedicated hooded work areas, will be used for various prototype developmental work. Materials will be processed in the subsystem that will be exhausted through EP15-002, (see TABLE "A"). This will include experimental work in the following types of processes: digestion, extraction, solidification, precipitation, filtration, and bench scale models for waste and wastewater water treatment. Work will involve the following types of materials: acids, salts, solvents, water/wastewater, soils, sludges/residues, debris, flyash, cements and pozzolanic materials, glassified waste and volatile organic compounds. Losses from these hoods was estimated using the volume of air ventilating the process, a dust load concentration factor for particulate and a 2.68% maximum weight fraction of total load for radionuclides.

ORGANIC LABORATORIES

Work conducted in the organic laboratories is accomplished at 9 hooded work areas. Materials are processed in the subsystem which exhausts through EP15-003, (see TABLE "B"). Normal anticipated work load will consist of processing samples at a rate of 40 per week. A normal week will consist of 5 days with 8 hours each day. Emission estimates are based on this and where noted, historical operating data. The following types of activities will be performed in the hoods: sample extractions, sample concentrations, sample cleanup, standard and reagent preparation and glassware rinsing. These methods will be used to determine what volatile, semivolatile and pesticide/aroclor concentrations may be present in any one of the following sample types: soil, water, residues, salts, sludges/oils, acids/bases, organic solvents, mixed waste and multi-media samples. Analytes in these samples will be found on the target compound list, [see attachment II air emissions calculations, Target Compound List (TCL)]. This list is not indicative of contaminants found at the FEMP but rather as definition of analytical capabilities of the laboratory. Various solvents will be used in the analytical process. An estimated emission rate and compliance demonstration is provided in Sections H and I of the emissions calculations. Particulate and radionuclide emission rates have been determined in addition to the VOC's and are included in the overall losses summary.

WELDING LABORATORIES

A new welding laboratory with three dedicated hoods will be operated in the renovated facilities (for identification of hoods see TABLE "A"). These hoods will collect emissions from the various processes and exhaust to the atmosphere through general exhaust emission point EP15-002. Welding and related activities will be for the purposes of training, technology demonstration and development. These activities will include: shielded metal arc (SMAW), gas metal arc (GMAW), flux core arc (FCAW), gas tungsten arc (GTAW) and submerged arc (SAW).
Other methods used will be oxygen-acetylene welding (OFGW), brazing and silver soldering. Metals to be joined will be carbon steel, stainless steel, monel, alloy steels and aluminum. Shielding of welds will be accomplished using argon, helium or carbon dioxide. These gasses will be used alone or in combination. All welding will be performed with small diameter electrodes, maximum diameter to be 5/32", normal size will be 1/8" or less. The majority of the work will be accomplished on test coupons. As such, the test coupons will be subjected to destructive testing using grinding, abrasive cutting, burning and acid etching. Acid etching will be small scale surface applications normally applied with a swab and then neutralized in the laboratory sink. Burning will be accomplished by using either the plasma arc or oxy-acetylene cutting method.

Only training and certification will be performed in the welding laboratory. Generally this will consist of training exercises and in no case will any radionuclide bearing materials be present or used. The anticipated schedule of actual welding operation will be two hours per day, five days a week average. The maximum operating period would be eight hours per day, five days per week. Emissions estimates are based on an average flow rate of ventilation air and a dust load concentration factor. Radionuclides are not present, therefore they are not included in the emissions summary.

MISCELLANEOUS MULTI-USE LABORATORIES

There are 20 vent points that have been identified as miscellaneous multi-use technology laboratories. No specific job functions have been assigned. As future workloads may dictate, these could be used on an as needed basis. Usage would be for processes defined in this application. Of the 20 hoods, 5 will be exhausted through EP15-002; the remaining 15 will be exhausted through EP15-003, (see TABLES "A" and "B" respectively for additional information). To insure that a total system is defined with this submittal, calculations have been provided based on the volume of air handled and previously stated concentration factors. These are included in the overall emissions summary of particulate and radionuclides.

AREA EXHAUST AIR

The last group is identified as area exhausts. There are 10 such ventilated areas associated with FEMP source number 15-002. 6 are exhausted through EP15-002 and the remaining 4 are exhausted through EP15-003, (for additional information, see TABLES "A" and "B"). The air from area ventilation will be relatively free of contaminants and will be of variable volume. However, in the determination of emissions to the atmosphere the full rated flow in conjunction with 0.00005 grains per cubic foot air dust load factor is used. Both particulate and radionuclides are included in the emissions summary.

APPENDIX A

ANALYTICAL LABORATORY FACILITIES GENERAL EXHAUST SYSTEM

CONTENTS

PROCESS DATA SHEETS

PROCESS FLOW DIAGRAM

TABLE "A" & TABLE "B"

For Official Use Only

Premise No.__/__/__/
Source No.__/__
Application No.__/__

APPENDIX A, PROCESS

OEPA NO. 1431110128
FEMP ID NO. 15-002

PROCESS DATA

1. Name of process Analytical Laboratory Facilities General Exhaust System (FEMP #15-002)

2. End product of this process Analytical and Technology Demonstation Services
3. Primary process equipment Analytical Equipment and Laboratory Facilities

Your identification See TABLES "A"and "B" Year Installed 1991

4. Manufacturer N/A Make or Model N/A

5. Capacity of equipment (lbs./hr): Rated N/A Max. N/A
6. Method of exhaust ventilation: [X] Stack [ ] Window fan [ ] Roof vent
[ ] Other, describe

Are there multiple exhausts? [X] Yes [ ] No

OPERATING DATA

7. Normal operating schedule: 24 hrs./day, 5 days/wk., 52 wks./year.

8. Percent annual production (finished units) by season:
Winter 25 Spring 25 Summer 25 Fall 25

9. Hourly production rates (lbs.): Average N/A Maximum N/A

10. Annual production (indicate units) N/A
projected percent annual increase in production N/A

11. Type of operation: [ ] Continuous [X] Batch

12. If batch, indicate Minutes per cycle Varies Minutes between cycles Varies

13. Materials used in process:

List of Raw Materials	Principle Use	Amount (lbs./hr.)
SEE PROCESS DESCRIPTION	ANALYTICAL AND	LABORATORY SCALE
	DEMONSTRATION	
	TECHNOLOGIES	

14. A PROCESS FLOW DIAGRAM MUST BE INCLUDED WITH THIS APPENDIX. Show entry and exit points of all raw materials, intermediate products, by products and finished products. Label all materials including airborne contaminants and other waste materials. Label the process equipment.

CONTROL EQUIPMENT

A-2A

OEPA NO. 1431110128 ___
FEMP ID NO.15-002

Control Equipment Code:

(A)	Settling Chamber	(G)	Cyclonic Scrubber	(M)	Adsorber
(B)	Cyclone	(H)	Impingement Scrubber	(N)	Condenser
(C)	Multiple Cyclone	(I)	Orifice Scrubber	(O)	Afterburner - Catalytic
(D)	Electrostatic Precipitator	(J)	Venturi Scrubber	(P)	Afterburner - Thermal
(E)	Fabric Filter	(K)	Plate or Tray Tower	(Q)	Other, Describe_____
(F)	Spray Chamber	(L)	Packing Tower		None

15. Control Equipment Data:

Item	Primary Collector	Secondary Collector
(a) Type (See above Code)	None	None
(b) Manufacturer		
(c) Model No.		
(d) Year Installed		
(e) Your Identification		
(f) Pollutant Controlled	Particulate, VOC's and Radionuclides	Particulate, VOC's and Radionuclides
(g) Controlled pollutant emission rate (if known)	See Attached Emissions Calculations	See Attached Emissions Calculations
(h) Pressure Drop	N/A	N/A
(i) Design efficiency	N/A	N/A
(j) Operating efficiency	N/A	N/A

STACK DATA

16. Your Stack Identification EP15 - 002

17. Are other sources vented to this stack? [ ] Yes [X] No
    If yes, identify sources See TABLES "A" and "B" FOR IDENTIFICATION OF VENT POINTS

18. Type: [X] Round, top inside diameter dimension 52 inches
    [ ] Rectangular, top inside dimensions (L)_____ X (W)_____

19. Height: Above roof 25.33 ft., above ground 55.08 ft.

20. Exit gas: Temp. Ambient °F, Volume 50000 Max. ACFM, Velocity 3390 Max. ft./min.

21. Continuous monitoring equipment: [X] Yes [ ] No
    If yes, indicate : Type N/A, Manufacturer N/A
    Make or Model N/A, Pollutant(s) monitored N/A

22. Emission data: Emissions from this source have been determined and such data is included with this appendix: [X] Yes [ ] No
    If yes, check method: [ ] Stack Test [X] Emission Factor [ ] Material Balance
    Completed by [signature], Date 9/25/91

CONTROL EQUIPMENT

A-2B

OEPA NO. 1431110128
FEMP ID NO. 15-002

Control Equipment Code:

(A)	Settling Chamber	(G)	Cyclonic Scrubber	(M)	Adsorber
(B)	Cyclone	(H)	Impingement Scrubber	(N)	Condenser
(C)	Multiple Cyclone	(I)	Orifice Scrubber	(O)	Afterburner - Catalytic
(D)	Electrostatic Precipitator	(J)	Venturi Scrubber	(P)	Afterburner - Thermal
(E)	Fabric Filter	(K)	Plate or Tray Tower	(Q)	Other, Describe
(F)	Spray Chamber	(L)	Packing Tower		None

15. Control Equipment Data:

Item	Primary Collector	Secondary Collector
(a) Type (See above Code)	None	None
(b) Manufacturer		
(c) Model No.		
(d) Year Installed		
(e) Your Identification		
(f) Pollutant Controlled	Particulate, VOC's and Radionuclides	Particulate, VOC's and Radionuclides
(g) Controlled pollutant emission rate (if known)	See Attached Emissions Calculations	See Attached Emissions Calculations
(h) Pressure Drop	N/A	N/A
(i) Design efficiency	N/A	N/A
(j) Operating efficiency	N/A	N/A

STACK DATA

16. Your Stack Identification EP15 - 003

17. Are other sources vented to this stack? [ ] Yes [X] No
If yes, identify sources See TABLE "A" and "B" FOR IDENTIFICATION OF VENT POINTS

18. Type: [X] Round, top inside diameter dimension 48 inches
[ ] Rectangular, top inside dimensions (L)_____ X (W)_____

19. Height: Above roof 23.67 ft., above ground 53.42 ft.

20. Exit gas: Temp. Ambient °F, Volume 37500 Max. ACFM, Velocity 2984 Max. ft./min.

21. Continuous monitoring equipment: [X] Yes [ ] No
If yes, indicate : Type N/A, Manufacturer N/A
Make or Model N/A, Pollutant(s) monitored N/A

22. Emission data: Emissions from this source have been determined and such data is included with this appendix: [X] Yes [ ] No
If yes, check method: [ ] Stack Test [X] Emission Factor [ ] Material Balance
Completed by [illegible], Date 9/25/91

ANALYTICAL FACILITIES BUILDING #15
GENERAL EXHAUST SYSTEM FLOW DIAGRAM

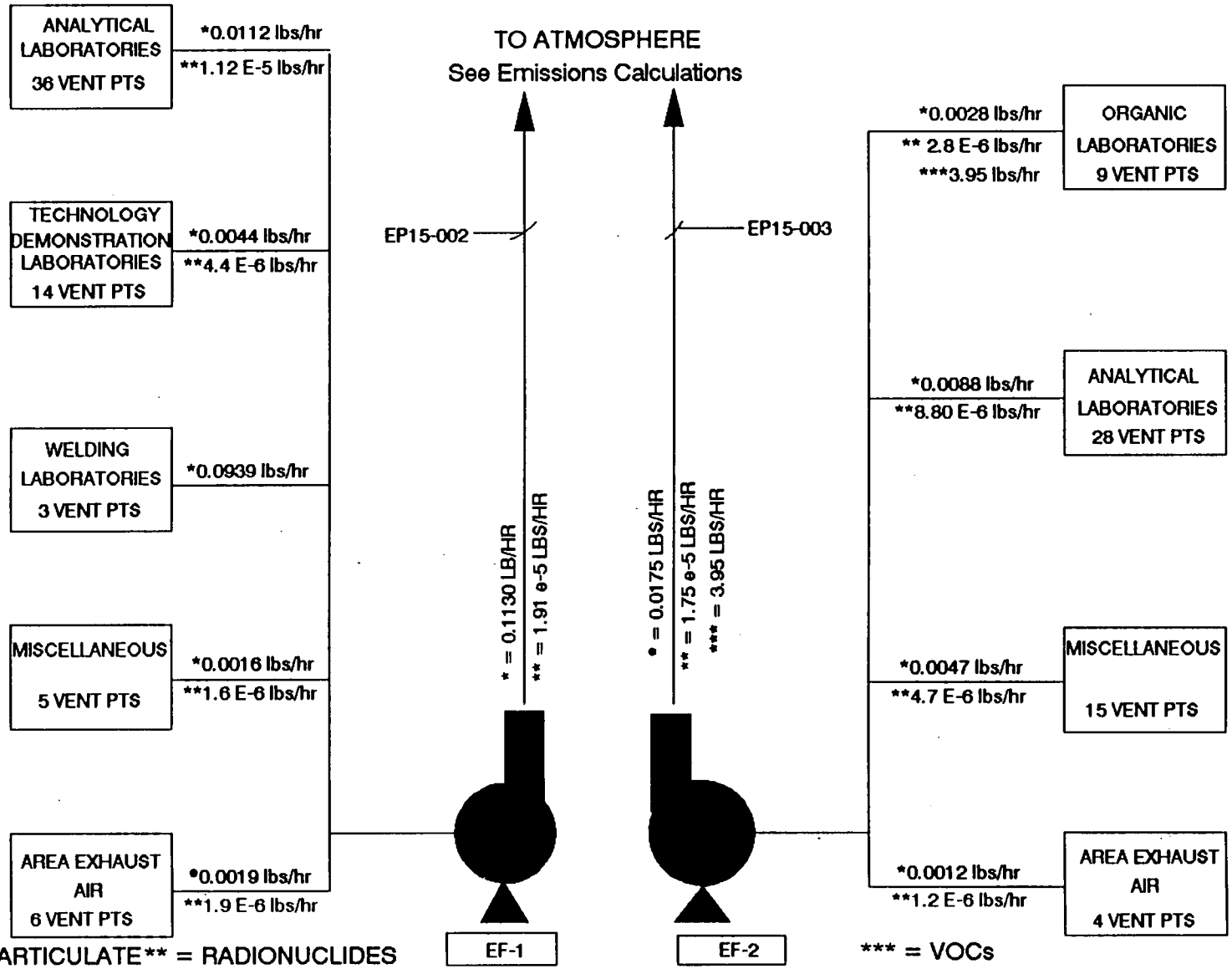

TABLE "A"
FMPC SOURCE ID# 15-002
EMISSION POINT EP15-002

GROUPS	PROCESS	HOOD ID NO'S	HOOD CFM	MATERIALS PROCESSED
Analytical Laboratories	X-Ray Fluorescence	FH-127 A FH-127B FH-127C ER-127D	100-1900 100-1900 100-1900 0-2940	s. & l. Containing U, Th, trace TRUs & VOC's
Analytical Laboratories	Mass Spectrometry	FH-128C FH-128D ER-128G FH-128E FH-128B	100-1900 100-1900 0-2080 100-1900 100-1900	s. l. & g. Containing U, trace TRUs & VOC's
Analytical Laboratory	Optical Emissions	FH-142A FH-142B FH-142C FH-142D *-142CA *-142CB *-142CC ER-142F	100-1500 100-1500 100-1500 100-1500 100 175 75 100-1580	s. & l. Containing U, Th, trace TRUs & VOC's
Analytical Laboratories	Sample Preparation	ER-147G FH-147E FH-147F CH-147A CH-147B	0-1240 100-1500 100-1900 950 500	s. l. & g. basic sample prep.
Analytical Laboratories	Q.C. Laboratory	FH-191A FH-191B CH-191A ER-191D	100-1500 100-1500 300 0-940	prep. organic, inoganic & radionuclide standards
Analytical Laboratories Colorimetric Analysis	Material Control	FH-168A FH-168B CH-168A CH-168B CH-168C ER-168D CH-168D	100-1500 100-1500 300 300 300 0-1120 300	Waste s. l. & g. containing < 10% U & any other organic/ inorganic or radionuclide matrix

TABLE "A" (CONTINUED)
FMPC SOURCE ID# 15-002
EMISSION POINT EP15-002

GROUPS	PROCESS	HOOD ID NO'S	HOOD CFM	MATERIALS PROCESSED
Analytical Laboratories Colorimetric Analysis	Process Materials Control	FH-169B FH-169C ER-169D	100-1500 100-1500 0-1750	Waste s. & l. containing < 10% U & any other organic/ inorganic or radionuclide matrix
Demonstration	Development	ER-148F FH-148A FH-148B FH-148C FH-148D OD-148E	0-1840 100-2100 100-1900 100-1900 100-1900 1000	s. & l.
Demonstration	Development Testing	ER-149C FH-149A FH-149B	0-1280 100-1900 100-1900	s. & l.
Demonstration	Research Technology	ER-156B CH-156A	0-700 300	s. & l.
Demonstration	Chemical Engineering	FH-179A FH-179B ER-179C	100-1900 100-1900 0-1450	s. & l.
Welding Laboratory	Welding Lab	FH-185A SH-185A WH-185B	500-1500 450 4000	welding process & materials
Miscellaneous	Glass Blowing	SH-152A	750	glass
Miscellaneous	Metals Analysis	FH-157A FH-157B CH-157A ER-157D	100-1500 100-1500 600 0-1100	metals

TABLE "A" (CONTINUED)
FMPC SOURCE ID# 15-002
EMISSION POINT EP15-002

GROUPS	PROCESS	HOOD ID NO'S	HOOD CFM	MATERIALS PROCESSED
Room Exhaust	Change Out	ER-143A	1000	Area Vent.
Room Exhaust	Lab Storage	ER-150A	240-600	Area Vent.
Room Exhaust	Acid Storage	ER-172A	700	Area Vent.
Room Exhaust	Optical Microscopy	ER-189A	840-1800	Area Vent.
Room Exhaust	Electronics	ER-186A	600-1400	Area Vent.
Room Exhaust	X-Ray/Electron Microscopy	ER-187A	800-1700	Area Vent.

FH - Fume Hood
CH - Canopy Hood
SH - Slot Hood
ER - Room Exhaust
OD - Open Duct
WH - Welding Hood
* - Blank
s - solid
l - liquid
g - gas

TABLE "B"
FMPC SOURCE ID# 15-002
EMISSION POINT EP15-003

GROUPS	PROCESS	HOOD ID NO'S	HOOD CFM	MATERIALS PROCESSED
Organic Laboratories	Organic	CH-203A ER-203D FH-203A FH-203B SH-203A	500 0-880 100-1900 100-1900 450	s. & l. for Volatiles, Semivolatiles, Pesticides/ Aroclors
Organic Laboratories	Organic	CH-220A ER-220D FH-220A FH-220B	500 0-1140 100-1900 100-1900	s. & l. for Volatiles, Semivolatiles, Pesticides/ Aroclors
Analytical Laboratories (Isotopic)	Radiometric	ER-204C FH-204A SH-204A	0-530 100-1900 450	s. l. & g. for U, Th, VOC's, trace metals & radionuclides
Analytical Laboratories (Isotopic)	Radiometric	ER-206C FH-206A SH-206A	0-1280 100-1900 450	s. l. & g. for U, Th, VOC's, trace metals & radionuclides
Analytical Laboratories (Isotopic)	Radiometric	CH-207C ER-207F FH-207A FH-207B FH-207C FH-207D SH-207A	300 0-1550 100-1900 100-1900 100-1900 100-1900 450	s. l. & g. for U, Th, VOC's, trace metals & radionuclides
Analytical Laboratories (Isotopic)	Radiometric	ER-209E FH-209A FH-209B SH-209A	0-1850 100-1500 100-1500 450	s. l. & g. for U, Th, VOC's, trace metals & radionuclides

TABLE "B" (CONTINUED)
FMPC SOURCE ID# 15-002
EMISSION POINT EP-003

GROUPS	PROCESS	HOOD ID NO'S	HOOD CFM	MATERIALS PROCESSED
Analytical Laboratories (Isotopic)	Radiometric	ER-213B	0-1220	s. l. & g. for U, Th, VOC's, trace metals & radionuclides
Analytical Laboratories (Isotopic)	Radiometric	ER-213AC FH-213A FH-213AA SH-213AA	0-620 100-1500 100-1500 450	s. l. & g. for U, Th, VOC's, trace metals & radionuclides
Analytical Laboratories	Analytical Electronics	ER-214B FH-214A	0-620 100-1500	equipment
Analytical Laboratories	AAS/ICP Application Prod.	CH-163A CH-163B CH-163C FH-163A	300 300 300 100-1900	s. & l. for U, Th, VOC's, trace metals & radionuclides
Miscellaneous	Q.A. Laboratory	CH-158A ER-158D FH-158A FH-158B	300 0-1040 100-1500 100-1500	prep. organic, inorganic & radionuclide standards
Miscellaneous	Environmental Analysis	ER-162C FH-162A FH-162B	0-2000 100-1500 100-1900	inorganics
Miscellaneous	Furnace Room Ashing	CH-164A CH-164B	500 500	inorganics
Miscellaneous	Environmental Analysis	ER-165D FH-165A FH-165B	0-2160 100-1900 100-1900	inorganics

TABLE "B" (CONTINUED)
FMPC SOURCE ID# 15-002
EMISSION POINT EP15-003

GROUPS	PROCESS	HOOD ID NO'S	HOOD CFM	MATERIALS PROCESSED
Miscellaneous	Environmental Analysis	ER-193C FH-193A FH-193B	0-1840 100-1500 100-1500	inorganics
Room Exhaust	Change Out	ER-161A	1000	Area Vent.
Room Exhaust	Organic	ER-205A	650-1340	Area Vent.
Room Exhaust	Organic	ER-208A	880-1900	Area Vent.
Room Exhaust	Radiometric	ER-212A	640-1300	Area Vent.

FH - Fume Hood
CH - Canopy Hood
SH - Slot Hood
ER - Room Exhaust
s - solid
l - liquid
g - gas

ATTACHMENT I

ANALYTICAL LABORATORY FACILITIES GENERAL EXHAUST SYSTEM
AIR EMISSIONS CALCULATIONS
FEMP SOURCE #15-002

TABLE OF CONTENT

A. Assumptions

B. Particulate Loading Rates (Uncontrolled)

C. Estimated Hourly Discharge Rates (Particulate)

D. Estimated Annual Discharge Rates (Particulate)

E. Estimated Annual Discharge Rates (Radionuclides)

F. Compliance Determination (Particulate)

G. Best Available Technology Determination (Particulate)

H. Estimated Volatile Organic & Miscellaneous Compounds Emission Rates
   I. Methylene Chloride
   II. Acetone and Hexane
   III. Methanol
   IV. Ethyl Ether
   V. Petroleum Ether
   VI. Ethyl Acetate and Miscellaneous Solvent
   VII. Acids/Bases
   VIII. Target Compounds on Target Compound List, (TCL)
   IX. Salts
   X. Summary Table I of VOC's & Miscellaneous Compounds

I. Compliance Determination (Organic & Miscellaneous Compounds)

J. Effective Dose Equivalent Calculations
   Table A Radionuclide Values
   Table B Radionuclide Conversions (For Stack Number EP15-002)
   Table C Radionuclide Conversions (For Stack Number EP15-003)

A. ASSUMPTIONS

1. Assume maximum work schedule of 24 hours per day, 7 days per week and 52 weeks per year, (8760 hr/yr) and an average work schedule of 24 hours per day, 5 days per week and 50 weeks per year, (6000 hr/yr).

2. Assume particulate load is composed of mists and/or dust particles.

   a. 0.005 grains per cubic foot of air (average dust load in industrial work room air).

   b. 0.00005 grains per cubic feet of air (average dust load in outside air).

3. Assume maximum radionuclide load is 2.68% of particulate load.

4. Assumed average air flow at each pick up point:

   50000 + 37500 / 64 + 56 = 730 CFM / pick up point.

B. PARTICULATE LOADING RATES (Uncontrolled)

1. ANALYTICAL LABORATORIES

a. Estimated Stack #EP15-002 Losses

<u>Particulate</u>
36 hoods @ 730 ft^3/min = 26280 ft^3/min.
0.00005 grains/ft^3 X 26280 ft^3/min X 60 min/hr X lbs/7000 grains = 0.0112 lbs/hr.

<u>Radionuclide</u>
0.0112 lbs/hr X 0.0268 = 3.00E-4 lbs/hr.

b. Estimated Stack #EP15-003 Losses

<u>Particulate</u>
28 hoods @ 730 ft^3/min = 20440 ft^3/min.
0.00005 grains/ft^3 X 20440 ft^3/min X 60 min/hr X lbs/7000 grains = 0.0088 lbs/hr.

<u>Radionuclide</u>
0.0088 lbs/hr X 0.0268 = 2.36E-4 lbs/hr.

2. DEMONSTRATION LABORATORIES

a. Estimated Stack #EP15-002 Losses

Particulate
14 hoods @ 730 ft^3/min = 10220 ft^3/min.
0.00005 grains/ft^3 X 10220 ft^3/min X 60 min/hr X lbs/7000 grains
= 0.0044 lbs/hr.

Radionuclide
0.0044 lbs/hr X 0.0268 = 1.18E-4 lbs/hr.

3. ORGANIC LABORATORIES

a. Estimated Stack #EP15-003 Losses

Particulate
9 HOODS @ 730 FT^3/MIN = 6570 ft^3/min.
0.00005 grains/ft^3 X 6570 ft^3/min X 60 min/hr X lbs/7000 grains
= 0.0028 lbs/hr.

Radionuclide
0.0028 lbs/hr X 0.0268 = 7.50E-5 lbs/hr.

4. WELDING LABORATORIES

a. Estimated Stack #EP15-002 Losses

Particulate
3 hoods @ 730 ft^3/min = 2190 ft^3/min.
0.005 grains/ft^3 X 2190 ft^3/min X 60 min/hr X lbs/7000 grains
= 0.0939 lbs/hr.

5. MISCELLANEOUS MULTI-USE LABORATORIES

a. Estimated Stack #EP15-002 Losses

Particulate
5 hoods @ 730 ft^3/min = 3650 ft^3/min.
0.00005 grains/ft^3 X 3650 ft^3/min X 60 min/hr X lbs/7000 grains
= 0.0016 lbs/hr.

Radionuclide
0.0016 lbs/hr X 0.0268 = 4.29E-5 lbs/hr.

b. Estimated Stack #EP15-003 Losses

Particulate
15 hoods @ 730 ft^3/min = 10950 ft^3/min.
0.00005 grains/ft^3 X 10950 ft^3/min X 60 min/hr X lbs/7000 grains
= 0.0047 lbs/hr.

Radionuclide
0.0047 lbs/hr X 0.0268 = 1.26E-4 lbs/hr.

6. AREA EXHAUST AIR

a. Estimated Stack #EP15-002 Losses

Particulate
6 hoods @ 730 ft^3/min = 4380 ft^3/min.
0.00005 grains/ft^3 X 4380 ft^3/min X 60 min/hr X lbs/7000 grains
= 0.0019 lbs/hr.

Radionuclide
0.0019 lbs/hr X 0.0268 = 5.09E-5 lbs/hr.

b. Estimated Stack #EP15-003 Losses

Particulate
4 hoods @ 730 ft^3/min = 2920 ft^3/min.
0.00005 grains/ft^3 X 2920 ft^3/min X 60 min/hr X lbs/7000 grains
= 0.0012 lbs/hr.

Radionuclide
0.0012 lbs/hr X 0.0268 = 3.22E-5 lbs/hr.

7. SUMMARY TABLE OF PARTICULATE LOSSES (LBS/HR)

SOURCES	STACK #EP15-002	STACK #EP15-003	TOTALS
ANALYTICAL LABORATORIES	0.0112	0.0088	0.0200
DEMONSTRATION LABORATORIES	0.0044	--	0.0044
ORGANIC LABORATORIES	--	0.0028	0.0028
WELDING LABORATORIES	0.0939	--	0.0939
MISC. MULTI-USE LABORATORIES	0.0016	0.0047	0.0063
AREA EXHAUST AIR	0.0019	0.0012	0.0031
TOTALS	0.1130	0.0175	0.1305

8. SUMMARY TABLE OF RADIONUCLIDE LOSSES (LBS/HR)

SOURCES	STACK #EP15-002	STACK #EP15-003	TOTALS
ANALYTICAL LABORATORIES	3.00E-4	2.36E-4	5.4E-4
DEMONSTRATION LABORATORIES	1.18E-4	--	1.2E-4
ORGANIC LABORATORIES	--	7.50E-5	7.5E-5
WELDING LABORATORIES	--	--	--
MISC. MULTI-USE LABORATORIES	4.29E-5	1.26E-4	1.7E-4
AREA EXHAUST AIR	5.09E-5	3.22E-5	8.3E-5
TOTALS	5.12E-4	4.69E-4	9.81E-4

C. ESTIMATED HOURLY DISCHARGE RATES (PARTICULATE)

1. Hourly Particulate Emissions = 0.1305 lbs/hr.

2. Hourly Radionuclide Emissions

   (0.1305 - 0.0939) lbs/hr X 0.0268 = 9.81E-4 lbs/hr.

D. ESTIMATED ANNUAL DISCHARGE RATES (PARTICULATE)

1. Average Annual Particulate Emissions.

   0.1305 lbs/hr X 6000 hr/yr = 783 lbs/yr
   or
   783 lbs/yr X ton/2000 lbs = 0.3915 ton/yr.

2. Maximum Annual Particulate Emissions.

   0.1305 lbs/hr X 8760 hr/yr = 1143.18 lbs/yr
   or
   1143.18 lbs/yr X ton/2000 lbs = 0.5716 ton/yr.

E. ESTIMATED ANNUAL DISCHARGE RATES (RADIONUCLIDES)

1. Average Annual Radionuclide Emissions.

   9.81E-4 lbs/hr X 6000 hr/yr = 5.8853 lbs/yr
   or
   5.8853 lbs/yr X ton/2000 lbs = 2.943E-3 ton/yr.

2. Maximum Annual Radionuclide Emissions.

   9.81E-4 lbs/hr X 8760 hr/yr = 8.5925 lbs/yr
   or
   8.5925 lbs/yr X ton/2000 lbs = 4.296E-3 ton/yr.

F. COMPLIANCE DETERMINATION (PARTICULATE)

Allowable rate of particulate emissions based on process weight rate at maximum capacity, Table I, OAC 3745-17-11:

From OAC 3745-17-11 the allowable rate of particulate emissions
$E = 4.10P^{0.67}$
where: P is the process weight rate at maximum capacity in tons per hour.

then: $P = (0.1305 \text{ lbs/hr})/(2000 \text{ lbs/ton}) = 0.000065 \text{ ton/hr}$.
and: $E = 4.10(0.000065)^{0.67} = 0.0064 \text{ lbs/hr}$.

Comparison of calculated (E) with values found in the above referenced table, where P is between zero and 0.05, a value of E = 0.551 lbs/hr can be used.

Since the determined particulate load discharged to the atmosphere is 0.1305 lbs/hr and the allowable rate as determined above is two orders of magnitude smaller (10^{-3} lbs/hr), this calculation does not show compliance. However, the calculated rate of 0.1305 lbs/hr when compared to the above E value of 0.551 lbs/hr indicates that compliance with OAC rule 3745-17-11 will be achieved. See Table I below:

TABLE I

	Allowable Rate Per Table I, OAC 3745-17-11	Determined Rate (maximum)
Particulate	0.551 lbs/hr	0.1305 lbs/hr
Particulate	Best Available Technology OAC rule 3745-31-05(A)(3)	None required

G. BEST AVAILABLE TECHNOLOGY DETERMINATION (PARTICULATE)

Based on the maximum calculated annual emissions rate of 1143.18 lbs for particulate exhausted in the rated flow of the system, it is proposed that installation of additional controls would not be cost effective. To achieve an added reduction in emissions, installation of HEPA filtration would be required. If deemed necessary the same levels of reductions could be attained by the implementation of administrative controls.

H. ESTIMATED VOLATILE ORGANIC & MISCELLANEOUS COMPOUNDS EMISSIONS RATES

Analytical work to be conducted in the hoods identified as the organic group. These are as follows: FH-203A, FH-203B, FH-220A, FH-220B, CH-203A and CH-220A.

I. METHYLENE CHLORIDE

1. METHYLENE CHLORIDE LOST BY EVAPORATION DURING EXTRACTION PROCESS.

Based on historical operating information, 40 samples were processed in a 40 hour week in four hoods. The following volume of methylene chloride was used to process one sample:

Extraction	= 0.5 Liter/sample
Cleanup	= 0.2 Liter/sample
Misc.	= 0.2 Liter/sample
TOTAL	= 0.9 Liter/sample

Hoods #'s FH-203A, FH-203B, FH-220A and FH-220B will be used to process samples at a rate of one hour.

Use density methylene chloride = 1325 grams/Liter.

Average Rate:

0.9 L/sample X 1 sample/hr X 6000 hr/yr X 1325 g/L X lbs/453.59 g = 15774.16 lbs/yr.

Maximum Rate:

0.9 L/sample X 1 sample/hr X 8760 hr/yr X 1325 g/L X lbs/453.59 g = 23030.26 lbs/yr.

2. METHYLENE CHLORIDE LOST BY EVAPORATION DURING EXTRACTION PROCESS

The volume of methylene chloride used in 2 hoods, #'s CH-203A and CH-220A, in one hour to process one sample is 0.5 liter. 10% is lost to evaporation. Volumes are obtained from historic operational information.

Use density methylene chloride = 1325 grams/Liter.

Average Rate:

0.5 L/sample X sample/hr X 6000 hr/yr X 1325 g/L X lbs/453.59 g X 0.10 = 876.34 lbs/yr.

Maximum Rate:

0.5 L/sample X sample/hr X 8760 Hr/yr X 1325 g/L X lbs/453.59 g X 0.10 = 1279.46 lbs/yr.

II. ACETONE AND HEXANE

1. ACETONE LOST BY EVAPORATION DURING EXTRACTION PROCESS

From historic operating information: 200 ml acetone used per sample for extractions, (concentration by evaporation).

Assume samples are processed at a rate of one per hour in 4 hoods, #'s FH-203A, FH-203B, FH-220A and FH-220B (based on historic operating information).

Use density acetone = 818 grams/Liter.

Average Rate:

0.2 L/hr X 6000 hr/yr X 818 g/L X lbs/453.59 g = 2164.07 lbs/yr.

Maximum Rate:

0.2 L/hr X 8760 hr/yr X 818 g/L X lbs/453.59 g = 3159.54 lbs/yr.

2. HEXANE LOST BY EVAPORATION DURING EXTRACTION PROCESS

From historic operating information: 200 ml hexane used per sample for extractions, (concentration by evaporation).

Assume samples are processed at a rate of one per hour in 4 hoods, #'s FH-203A, FH-203B, FH-220A and FH-220B (based on historic operating information).

Use density hexane = 659 grams/Liter

Average Rate:

0.2 L/hr X 6000 hr/yr X 659 g/L X lbs/453.59 g = 1743.42 lbs/yr.

Maximum Rate:

0.2 L/hr X 8760 hr/yr X 659 g/L X lbs/453.59 g = 2545.40 lbs/yr.

III METHANOL

3. METHANOL LOST BY EVAPORATION DURING EXTRACTION PROCESS

From historic operating information: maximum volume used per 40 hour week = 1.5 liters. At most 5% was lost to evaporation.

Assume samples are processed at a rate of one per hour in 4 hoods, #'s FH-203A, FH-203B, FH-220A and FH-220B (based on historic operating information).

Use density methanol = 791 grams/Liter

Average Rate:

1.5 L/week X week/40 hr X 0.05 X 6000 hr/yr X 791 g/L X lbs/453.59 g = 19.62 lbs/yr.

Maximum Rate:

1.5 L/week X week/40 hr X 0.05 X 8760 hr/yr X 791 g/L X lbs/453.59 g = 28.64 lbs/yr.

IV ETHYL ETHER

1. ETHYL ETHER LOST BY EVAPORATION DURING COLUMN CLEANUP

From historic operating data: maximum volume used is 0.1 Liters per sample.

Assume samples are processed at a rate of one per hour in 4 hoods, #'s FH-203A, FH-203B, FH-220A and FH-220B (based on historic operating information).

Use density ethyl ether = 708 grams/Liter

Average Rate:

0.1 L/sample X sample/hr X 6000 hr/yr X 708 g/L X lbs/453.59 g = 936.53 lbs/yr.

Maximum Rate:

0.1 L/sample X sample/hr X 8760 hr/yr X 708 g/L X lbs/453.59 g = 1367.33 lbs/yr.

V PETROLEUM ETHER

1. PETROLEUM ETHER LOST BY EVAPORATION DURING COLUMN CLEANUP

From historic operating information: maximum volume used is 0.15 Liters per sample.

Assume samples are processed at a rate of one per hour in 4 hoods, #'s FH-203A, FH-203B, FH-220A and FH-220B (based on historic operating information).

Use density petroleum ether = 640 grams/Liter

Average Rate:

0.15 L/sample X sample/hr X 6000 hr/yr X 640 g/L X lbs/453.59 g = 1269.87 lbs/yr.

Maximum Rate:

0.15 L/sample X sample/hr X 8760 hr/yr X 640 g/L X lbs/453.59 g = 1854.01 lbs/yr.

VI ETHYL ACETATE AND MISCELLANEOUS SOLVENTS

Based on operating history, a maximum of 0.1 Liter was used in a one month period, (174 hours). Of this amount, 10% was lost through evaporation.

Assume samples are processed at a rate of one per hour in 4 hoods, #'s FH-203A, FH-203B, FH-220A and FH-220B (based on historic operating information).

0.1 Liter / 174 hours = 0.000575 L/hr.
Use density = 902 grams/Liter.

Average Rate:

0.000575 L/hr X 902 g/L X 6000 hr/yr X lbs/453.59 g X 0.1 = 0.69 lbs/yr

Maximum Rate:

0.000575 L/hr X 902 g/L X 8760 hr/yr X lbs/453.59 g X 0.1 = 1.00 lbs/yr

VII ACIDS/BASES

1. 10 N. SODIUM HYDROXIDE (For above listed hoods)

Based on operating history, a maximum of 1.0 Liter was used in a one month period, (174 hours). Of this amount 5% was lost through evaporation. AT VERY MOST, 5 % MAY EVAPORATE

1.0 Liter / 174 hours = 0.00571 L/hr.
Use density = 1080 grams/Liter.

Average Rate:

0.00571 L/hr X 1080 g/L X 6000 hr/yr X lbs/453.59 g X 0.05 = 4.08 lbs/yr.

Maximum Rate:

0.00571 L/hr X 1080 g/L X 8760 hr/yr X lbs/453.59 g X 0.05 = 5.95 lbs/yr.

2. CONCENTRATED SULFURIC ACID (For above listed hoods)

Based on operating history, a maximum of 0.5 Liters was used in a one month period, (174 hours). Of this amount 5% was lost through evaporation.

0.5 Liter / 174 hours = 0.00287 L/hr
Use density = 1840 grams/Liter.

Average Rate:

0.00287 L/hr X 1840 g/L X 6000 hr/yr X lbs/453.59 g X 0.05 = 3.49 lbs/yr.

Maximum Rate:

0.00287 L/hr X 1840 g/L X 8760 hr/yr X lbs/453.59 g X 0.05 = 5.10 lbs/yr.

3. GLACIAL ACETIC ACID (For above listed hoods)

Based on operating history, a maximum of 2.4 Liters was used in a one month period, (174 hours). Of this amount 5% was lost through evaporation.

2.4 Liter / 174 hours = 0.01379 L/hr.
Use density = 1049 grams/Liter.

Average Rate:

0.01379 L/hr X 1049 g/L X 6000 hr/yr X lbs/453.59 g X 0.05 = 9.57 lbs/yr.

Maximum Rate:

0.01379 L/hr X 1049 g/L X 8760 hr/yr X lbs/453.59 g X 0.05 = 13.97 lbs/yr.

4. MISCELLANEOUS ACIDS/BASES (For above listed hoods)

Based on operating history, a maximum of 0.01 Liter will be used in a one month period, (174 hours). Of this amount 5% will be lost through evaporation.

0.01 Liter / 174 hours = 0.000057 L/hr.
Use average density = 1323 grams/Liter.

Average Rate:

0.000057 L/hr X 1323 g/L X 6000 hr/yr X lbs/453.59 g X 0.05 = 0.05 lbs/yr.

Maximum Rate:

0.000057 L/hr X 1323 g/L X 8760 hr/yr X lbs/453.59 g X 0.05 = 0.07 lbs/yr.

VIII. TARGET COMPOUNDS ON TARGET COMPOUND LIST (TCL), See Attachment II.

a. The following is a break down of compounds listed in the TCL: 34 VOLATILE, 65 SEMIVOLATILE and 27 PCB'S/PESTICIDES.

b. Normal samples contain ten or less of targeted compounds. Concentrations of targeted compounds do not exceed 1% for any given sample.

c. Sample to be processed will be received in the following forms: 250 grams in sample jar, 40 ml (40 grams) in sample vials usually received in quantities of three and liquid samples received in 1 Liter containers, (1000 grams).

d. Assumed average weight of sample = (250 + 120 + 1000)/3 = 456.7 grams.

e. Samples are processed at a rate of one per hour.

f. Assume 100% target compound loss during extraction process by volatilization.

Average Rate:

456.7 g/sample X 1 sample/hr X lbs/453.59 g X 10 CPDS. X 0.01 X 6000 hr/yr = 604.11 lbs/yr.

Maximum Rate:

456.7 g/sample X 1 sample/hr X lbs/453.59 g X 10 CPDS. X 0.01 X 8760 hr/yr = 882.01 lbs/yr.

IX. SALTS

a. Salts emitted will be contained in a sample matrix.

b. Sample size same as used in above calculation for TCL's.

c. Assume concentration of salts in sample is less than 5 %.

d. Samples are processed at a rate of one per hour.

Average Rate:

456.7 g/sample X 1 sample/hr X lbs/453.59 g X 0.05 X 6000 hr/yr. = 302.06 lbs/yr.

Maximum Rate:

456.7 g/sample X 1 sample/hr X lbs/453.59 g X 0.05 X 8760 hr/yr. = 441.00 lbs/yr.

X. SUMMARY TABLE I OF ORGANIC & MISCELLANEOUS COMPOUNDS

SUMMARY TABLE I

	AVERAGE		MAXIMUM	
	LBS/YR	TONS/YR	LBS/YR	TONS/YR
METHYLENE CHLORIDE	15774.16	7.887	23030.26	11.515
METHYLENE CHLORIDE	876.34	0.438	1279.46	0.640
ACETONE	2164.07	1.082	3159.54	1.580
HEXANE	1743.42	0.872	2545.40	1.273
METHANOL	19.62	0.010	28.64	0.014
ETHYL ETHER	936.53	0.468	1367.33	0.684
PETROLEUM ETHER	1269.87	0.635	1845.01	0.923
ETHYL ACETATE & MISC.	0.69	3.45E-4	1.00	5.00E-4
SODIUM HYDROXIDE	4.08	0.002	5.95	0.003
SULFURIC ACID	3.49	0.002	5.10	0.003
ACETIC ACID	9.57	0.005	13.97	0.007
MISC. ACIDS/BASES	0.05	2.50E-5	0.07	3.50E-5
TCL'S	604.11	0.302	882.01	0.441
SALTS	302.06	0.151	441.00	0.221
TOTALS	23706.06	11.853	34607.74	17.305

I. COMPLIANCE DETERMINATION FOR ORGANIC & MISCELLANEOUS COMPOUNDS

On review of the Ohio Administrative Code, it has been determined that the materials processed in the above listed hoods are not subject to rule 3745-21-09. due to categorical exclusion. However, rule 3745-21-07 which addresses photochemical agents is applicable and therefore a compliance evaluation is provided as follows. Summary table I above lists the various materials involved. Of the bulk constituents used, methylene chloride is the largest by volume. This compound is specifically identified in rule 3745-21-01(B)(5) as being excluded. Therefore, for VOC's emission determination, the maximum annual emissions lost to the atmosphere dose not include the portion contributed as methylene chloride. As a generalization, all constituents are lost due to evaporation. The loss of most materials during the analytical process results from an increased rate of volatilization due to the addition of heat.

A review of TABLE I reveals that, of the 17.3 maximum annual tons of materials lost up the stack, 11.5 tons is methylene chloride. The remaining 5.8 maximum annual tons consists of all the remaining materials. As a worst case assumption using the total 5.8 tons as a photochemically reactive agent the following indicates that the system will be operated within the limits shown in rule 3745-21-07(G)(1), see TABLE II below.

Maximum annual loss of material in pounds per hour:

5.8 tons/yr X 2000 lbs/ton X yr/8760 hrs = 1.32 lbs/hr

TABLE II

	Allowable Rate Per OAC 3745-21-07(G)(1)	Determined Rate (maximum)
Volatile Organic Compounds	3.0 lbs/hr	1.3 lbs/hr
Volatile Organic Compounds	Best Available Technology OAC rule 3745-31-05(A)(3)	None required

J. EFFECTIVE DOSE EQUIVALENT CALCULATIONS

40 CFR Part 61
National Emission Standards
for Hazardous Air Pollutants

REPORT ON COMPLIANCE WITH

THE CLEAN AIR ACT LIMITS FOR RADIONUCLIDE EMISSIONS

FROM THE COMPLY CODE, VERSION 1.4

ANALYTICAL LABORATORY FACILITIES GENERAL EXHAUST SYSTEM

Prepared by:

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Prepared for:

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Fernald Environmental Management Project
Fernald, Ohio

SCREENING LEVEL 2

DATA ENTERED:

RELEASE RATES FOR STACK EP15-002

Nuclide		Release Rate (curies/YEAR)
U-234	Y	6.956E-04
U-235	Y	3.112E-05
U-236	Y	6.468E-05
U-238	Y	6.753E-04
PU-239	W	8.920E-07
PU-238	W	1.840E-07
NP-237	W	5.890E-07
TH-234	Y	3.132E-03
TH-232	W	3.030E-06
TH-230	W	4.170E-05
TH-228	Y	4.352E-06
RA-228	W	4.940E-07
RA-226	W	2.766E-06
CS-137	D	2.298E-05
RU-106	Y	3.986E-06
TC-99	W	9.824E-05
SR-90	Y	3.030E-06

RELEASE RATES FOR STACK EP15-003

Nuclide		Release Rate (curies/YEAR)
U-234	Y	6.372E-04
U-235	Y	2.850E-05
U-236	Y	5.924E-05
U-238	Y	6.185E-04
PU-239	W	8.170E-07
PU-238	W	1.680E-07
NP-237	W	5.400E-07
TH-234	Y	2.869E-03
TH-232	W	2.775E-06
TH-230	W	3.819E-05
TH-228	Y	3.986E-06
RA-228	W	4.520E-07
RA-226	W	1.360E-06
CS-137	D	2.105E-05
RU-106	Y	3.651E-06
TC-99	W	8.998E-05
SR-90	Y	2.775E-06

SITE DATA FOR STACK EP15-002

Release height 17 meters.

Building height 9 meters.

The source and receptor are not on the same building.

Distance from the source to the receptor is 930 meters.

Building width 79 meters.

SITE DATA FOR STACK EP15-003

Release height 16 meters.

Building height 9 meters.

The source and receptor are not on the same building.

Distance from the source to the receptor is 930 meters.

Building width 79 meters.

Default mean wind speed not used.
Mean wind speed is 4.50 m/sec.

NOTES:

Input parameters outside the "normal" range:

Receptor is unusually FAR.

RESULTS:

Effective dose equivalent: 0.4 mrem/yr.

*** Comply at level 2.

SCREENING LEVEL 4

DATA ENTERED:

SITE DATA FOR STACK EP15-002

Building length 66 meters.

STACK DISTANCES, FILE: H:\COMP\BLDG15DI

DIR	Distance (meters)
N	1330.0
NNE	1400.0
NE	1800.0
ENE	2340.0
E	1150.0
ESE	1400.0
SE	1310.0
SSE	1120.0
S	1200.0
SSW	1060.0
SW	980.0
WSW	930.0
W	2260.0
WNW	1320.0
NW	1630.0
NNW	1810.0

SITE DATA FOR STACK EP15-003

Building length 66 meters.

STACK DISTANCES, FILE: H:\COMP\BLDG15DI

DIR	Distance (meters)
N	1330.0
NNE	1400.0
NE	1800.0
ENE	2340.0
E	1150.0
ESE	1400.0
SE	1310.0
SSE	1120.0
S	1200.0
SSW	1060.0
SW	980.0
WSW	930.0
W	2260.0
WNW	1320.0
NW	1630.0
NNW	1810.0

WINDROSE DATA, FILE: H:\MET\WINDROSE.APT

Source of wind rose data: Cincinnati Metropolitan Airport
Dates of coverage: 1985 through 1989
Wind rose location: Cincinnati, Ohio
Distance to facility: 30 miles

Percent calm: 0.00

Wind FROM	Frequency	Speed (meters/s)
N	0.068	4.50
NNE	0.033	4.67
NE	0.040	4.29
ENE	0.047	4.17
E	0.065	3.58
ESE	0.036	2.92
SE	0.030	2.93
SSE	0.036	2.86
S	0.099	3.56
SSW	0.123	4.41
SW	0.111	5.09
WSW	0.072	5.47
W	0.090	5.88
WNW	0.060	6.37
NW	0.052	5.56
NNW	0.037	4.97

He produces his own VEGETABLES at home.
Stack number EP15-002

Distance from the SOURCE to the FARM producing
MILK is 500 meters. Stack number EP15-002

Distance from the SOURCE to the FARM producing
MEAT is 500 meters. Stack number EP15-002

He produces his own VEGETABLES at home.
Stack number EP15-003.

Distance from the SOURCE to the FARM producing
MILK is 500 meters. Stack number EP15-003

Distance from the SOURCE to the FARM producing
MEAT is 500 meters. Stack number EP15-003

NOTES:

The receptor exposed to the highest concentration is located
1330. meters from the source in the N sector. Stack EP15-002.

The receptor exposed to the highest concentration is located
1330. meters from the source in the N sector. Stack EP15-003.

He produces his own VEGETABLES at his home.

He gets his MEAT from a farm located
500. meters from the source in the NNE sector.

He gets his MILK from a farm located
500. meters from the source in the NNE sector.

Input parameters outside the "normal" range:

Receptor is unusually FAR.

Stack file distance is unusually FAR.

RESULTS:

Effective dose equivalent: 9.6E-02 mrem/yr.

*** Comply at level 4.

This facility is in COMPLIANCE.

It may or may not be EXEMPT from reporting to the EPA.

You may contact your regional EPA office for more information.

********** END OF COMPLIANCE REPORT **********

NOTES:

Per 40 CFR 61.93.a, Subpart H, "DOE facilities for which the maximally exposed individual lives within 3 kilometers of all sources of emissions in the facility, may use EPA's COMPLY model and associated procedures for determining dose for purpose of compliance". The above determined effective dose equivalent (EDE) when compared with the 0.1 mrem/yr standard specified in Subpart H, indicates that this source is NOT subject to the emission measurement requirement. It should be noted that the maximum anticipated values relating to operational parameters have been used in this preparation. These include maximum values of operational frequencies, product concentrations at the maximum of limits and particulate entrainment rate in excess of actual anticipated. Based on these worst case assumption, the calculated dose value remain below the stated standards.

Source information relating to the radionuclide data used is appended as TABLES A, B and C.

TABLE A RADIONUCLIDE VALUES*

Radionuclides	Quantity (Ci/Kg U)	Solubility
U-234	3.42E-04	Y
U-235	1.53E-05	Y
U-236	3.18E-05	Y
U-238	3.32E-04	Y
Pu-239+240	4.39E-07	Y
Pu-238	9.06E-08	Y
Np-237	2.90E-07	Y
Th-234	1.54E-03	Y
Pa-234m	6.79E-04	Y
Th-232	1.49E-06	Y
Th-230	2.05E-05	Y
Th-228	2.14E-06	Y
Ra-228	2.43E-07	Y
Ra-226	1.36E-06	Y
Cs-137	1.13E-05	D
Ru-106	1.96E-06	W
Tc-99	4.83E-05	Y
Sr-90	1.49E-06	D
Ba-137m	1.13E-05	Y

*Extract from Application for determination of a modification under 40 CFR 61, National Emission Standards for Hazardous Air Pollutants (NESHAP), Analytical Facility Upgrade. Application Submitted for USEPA approval November 27, 1990, See Appendix B Table 3.

TABLE B RADIONUCLIDE CONVERSIONS

FOR STACK NUMBER EP15-002

From Air Emissions Calculations Estimated Annual Stack Discharge Rates, Summary Table, Maximum Radionuclide Discharge Rate = 4.485 lbs U/yr or 4.485 lbs U/yr x kg/2.205 lbs. = 2.0340 kg U/yr

Radionuclides	Quantity Ci/Kg U)	Rate Kg U/yr	Release Rate Ci/yr
U-234	3.42E-04	2.0340	6.956E-4
U-235	1.53E-05	2.0340	3.112E-5
U-236	3.18E-05	2.0340	6.468E-5
U-238	3.32E-04	2.0340	6.753E-4
Pu-239+240	4.39E-07	2.0340	8.920E-7
Pu-238	9.06E-08	2.0340	1.840E-7
Np-237	2.90E-07	2.0340	5.890E-7
Th-234	1.54E-03	2.0340	3.132E-3
Th-232	1.49E-06	2.0340	3.030E-6
Th-230	2.05E-05	2.0340	4.170E-5
Th-228	2.14E-06	2.0340	4.352E-6
Ra-228	2.43E-07	2.0340	4.940E-7
Ra-226	1.36E-06	2.0340	2.766E-6
Cs-137	1.13E-05	2.0340	2.298E-5
Ru-106	1.96E-06	2.0340	3.986E-6
Tc-99	4.83E-05	2.0340	9.824E-5
Sr-90	1.49E-06	2.0340	3.030E-6

TABLE C RADIONUCLIDE CONVERSIONS

FOR STACK NUMBER EP15-003

From Air Emissions Calculations Estimated Annual Stack Discharge Rates, Summary Table. Maximum Radionuclide Discharge Rate = 4.108 lbs U/yr or 4.108 lbs U/yr x kg/2.205 lbs. = 1.8630 kg U/yr

Radionuclides	Quantity (Ci/Kg U)	Rate Kg U/yr	Release Rate Ci/yr
U-234	3.42E-04	1.8630	6.372E-4
U-235	1.53E-05	1.8630	2.850E-5
U-236	3.18E-05	1.8630	5.924E-5
U-238	3.32E-04	1.8630	6.185E-4
Pu-239+240	4.39E-07	1.8630	8.170E-7
Pu-238	9.06E-08	1.8630	1.680E-7
Np-237	2.90E-07	1.8630	5.400E-7
Th-234	1.54E-03	1.8630	2.869E-3
Th-232	1.49E-06	1.8630	2.775E-6
Th-230	2.05E-05	1.8630	3.819E-5
Th-228	2.14E-06	1.8630	3.986E-6
Ra-228	2.43E-07	1.8630	4.520E-7
Ra-226	1.36E-06	1.8630	1.360E-6
Cs-137	1.13E-05	1.8630	2.105E-5
Ru-106	1.96E-06	1.8630	3.651E-6
Tc-99	4.83E-05	1.8630	8.998E-5
Sr-90	1.49E-06	1.8630	2.775E-6

ATTACHMENT II

ANALYTICAL LABORATORY FACILITIES GENERAL EXHAUST SYSTEM
AIR EMISSIONS CALCULATIONS
FEMP SOURCE #15-002

TABLE OF CONTENT

TARGET COMPOUND LIST (TCL) pages C-2, C-4, C-5 and C-8

REGULATORY
COMPLIANCE SECTION
MAR 26

TARGET COMPOUND LIST (TCL) AND CONTRACT REQUIRED QUANTITATION LIMITS (CRQL)

Volatiles	CAS Number	Quantitation Limits* Water ug/L	Low Soil ug/Kg	Med. Soil ug/Kg	On Column (ng)
1. Chloromethane	74-87-3	10	10	1200	(50)
2. Bromomethane	74-83-9	10	10	1200	(50)
3. Vinyl Chloride	75-01-4	10	10	1200	(50)
4. Chloroethane	75-00-3	10	10	1200	(50)
5. Methylene Chloride	75-09-2	10	10	1200	(50)
6. Acetone	67-64-1	10	10	1200	(50)
7. Carbon Disulfide	75-15-0	10	10	1200	(50)
8. 1,1-Dichloroethene	75-35-4	10	10	1200	(50)
9. 1,1-Dichloroethane	75-34-3	10	10	1200	(50)
10. 1,2-Dichloroethene (total)	540-59-0	10	10	1200	(50)
11. Chloroform	67-66-3	10	10	1200	(50)
12. 1,2-Dichloroethane	107-06-2	10	10	1200	(50)
13. 2-Butanone	78-93-3	10	10	1200	(50)
14. 1,1,1-Trichloroethane	71-55-6	10	10	1200	(50)
15. Carbon Tetrachloride	56-23-5	10	10	1200	(50)
16. Bromodichloromethane	75-27-4	10	10	1200	(50)
17. 1,2-Dichloropropane	78-87-5	10	10	1200	(50)
18. cis-1,3-Dichloropropene	10061-01-5	10	10	1200	(50)
19. Trichloroethene	79-01-6	10	10	1200	(50)
20. Dibromochloromethane	124-48-1	10	10	1200	(50)
21. 1,1,2-Trichloroethane	79-00-5	10	10	1200	(50)
22. Benzene	71-43-2	10	10	1200	(50)
23. trans-1,3-Dichloropropene	10061-02-6	10	10	1200	(50)
24. Bromoform	75-25-2	10	10	1200	(50)
25. 4-Methyl-2-pentanone	108-10-1	10	10	1200	(50)
26. 2-Hexanone	591-78-6	10	10	1200	(50)
27. Tetrachloroethene	127-18-4	10	10	1200	(50)
28. Toluene	108-88-3	10	10	1200	(50)
29. 1,1,2,2-Tetrachloroethane	79-34-5	10	10	1200	(50)
30. Chlorobenzene	108-90-7	10	10	1200	(50)
31. Ethyl Benzene	100-41-4	10	10	1200	(50)
32. Styrene	100-42-5	10	10	1200	(50)
33. Xylenes (Total)	1330-20-7	10	10	1200	(50)

* Quantitation limits listed for soil/sediment are based on wet weight. The quantitation limits calculated by the laboratory for soil/sediment, calculated on dry weight basis as required by the contract, will be higher.

TARGET COMPOUND LIST (TCL) AND CONTRACT REQUIRED QUANTITATION LIMITS (CRQL)

Semivolatiles	CAS Number	Quantitation Limits* Water ug/L	Low Soil ug/Kg	Med. Soil ug/Kg	On Column (ng)
34. Phenol	108-95-2	10	330	10000	(20)
35. bis(2-Chloroethyl) ether	111-44-4	10	330	10000	(20)
36. 2-Chlorophenol	95-57-8	10	330	10000	(20)
37. 1,3-Dichlorobenzene	541-73-1	10	330	10000	(20)
38. 1,4-Dichlorobenzene	106-46-7	10	330	10000	(20)
39. 1,2-Dichlorobenzene	95-50-1	10	330	10000	(20)
40. 2-Methylphenol	95-48-7	10	330	10000	(20)
41. 2,2'-oxybis (1-Chloropropane)#	108-60-1	10	330	10000	(20)
42. 4-Methylphenol	106-44-5	10	330	10000	(20)
43. N-Nitroso-di-n-dipropylamine	621-64-7	10	330	10000	(20)
44. Hexachloroethane	67-72-1	10	330	10000	(20)
45. Nitrobenzene	98-95-3	10	330	10000	(20)
46. Isophorone	78-59-1	10	330	10000	(20)
47. 2-Nitrophenol	88-75-5	10	330	10000	(20)
48. 2,4-Dimethylphenol	105-67-9	10	330	10000	(20)
49. bis(2-Chloroethoxy) methane	111-91-1	10	330	10000	(20)
50 2,4-Dichlorophenol	120-83-2	10	330	10000	(20)
51. 1,2,4-Trichlorobenzene	120-82-1	10	330	10000	(20)
52. Naphthalene	91-20-3	10	330	10000	(20)
53. 4-Chloroaniline	106-47-8	10	330	10000	(20)
54. Hexachlorobutadiene	87-68-3	10	330	10000	(20)
55. 4-Chloro-3-methylphenol	59-50-7	10	330	10000	(20)
56. 2-Methylnaphthalene	91-57-6	10	330	10000	(20)
57. Hexachlorocyclopentadiene	77-47-4	10	330	10000	(20)
58. 2,4,6-Trichlorophenol	88-06-2	10	330	10000	(20)
59. 2,4,5-Trichlorophenol	95-95-4	50	1700	50000	(100)
60. 2-Chloronaphthalene	91-58-7	10	330	10000	(20)
61. 2-Nitroaniline	88-74-4	50	1700	50000	(100)
62. Dimethylphthalate	131-11-3	10	330	10000	(20)
63. Acenaphthylene	208-96-8	10	330	10000	(20)
64. 2,6-Dinitrotoluene	606-20-2	10	330	10000	(20)
65. 3-Nitroaniline	99-09-2	50	1700	50000	(100)
66. Acenaphthene	83-32-9	10	330	10000	(20)
67. 2,4-Dinitrophenol	51-28-5	50	1700	50000	(100)
68. 4-Nitrophenol	100-02-7	50	1700	50000	(100)

Previously known by the name bis(2-Chloroisopropyl) ether

(continued)

Semivolatiles	CAS Number	Quantitation Limits* Water ug/L	Low Soil ug/Kg	Med. Soil ug/Kg	On Column (ng)
69. Dibenzofuran	132-64-9	10	330	10000	(20)
70. 2,4-Dinitrotoluene	121-14-2	10	330	10000	(20)
71. Diethylphthalate	84-66-2	10	330	10000	(20)
72. 4-Chlorophenyl-phenyl ether	7005-72-3	10	330	10000	(20)
73. Fluorene	86-73-7	10	330	10000	(20)
74. 4-Nitroaniline	100-01-6	50	1700	50000	(100)
75. 4,6-Dinitro-2-methylphenol	534-52-1	50	1700	50000	(100)
76. N-nitrosodiphenylamine	86-30-6	10	330	10000	(20)
77. 4-Bromophenyl-phenylether	101-55-3	10	330	10000	(20)
78. Hexachlorobenzene	118-74-1	10	330	10000	(20)
79. Pentachlorophenol	87-86-5	50	1700	50000	(100)
80. Phenanthrene	85-01-8	10	330	10000	(20)
81. Anthracene	120-12-7	10	330	10000	(20)
82. Carbazole	86-74-8	10	330	10000	(20)
83. Di-n-butylphthalate	84-74-2	10	330	10000	(20)
84. Fluoranthene	206-44-0	10	330	10000	(20)
85. Pyrene	129-00-0	10	330	10000	(20)
86. Butylbenzylphthalate	85-68-7	10	330	10000	(20)
87. 3,3'-Dichlorobenzidine	91-94-1	10	330	10000	(20)
88. Benzo(a)anthracene	56-55-3	10	330	10000	(20)
89. Chrysene	218-01-9	10	330	10000	(20)
90. bis(2-Ethylhexyl)phthalate	117-81-7	10	330	10000	(20)
91. Di-n-octylphthalate	117-84-0	10	330	10000	(20)
92. Benzo(b)fluoranthene	205-99-2	10	330	10000	(20)
93. Benzo(k)fluoranthene	207-08-9	10	330	10000	(20)
94. Benzo(a)pyrene	50-32-8	10	330	10000	(20)
95. Indeno(1,2,3-cd)pyrene	193-39-5	10	330	10000	(20)
96. Dibenz(a,h)anthracene	53-70-3	10	330	10000	(20)
97. Benzo(g,h,i)perylene	191-24-2	10	330	10000	(20)

* Quantitation limits listed for soil/sediment are based on wet weight. The quantitation limits calculated by the laboratory for soil/sediment, calculated on dry weight basis as required by the contract, will be higher.

TARGET COMPOUND LIST (TCL) AND CONTRACT REQUIRED QUANTITATION LIMITS (CRQL)

Pesticides/Aroclors	CAS Number	Quantitation Limits* Water ug/L	Soil ug/Kg	On Column (pg)
98. alpha-BHC	319-84-6	0.05	1.7	5
99. beta-BHC	319-85-7	0.05	1.7	5
100. delta-BHC	319-86-8	0.05	1.7	5
101. gamma-BHC (Lindane)	58-89-9	0.05	1.7	5
102. Heptachlor	76-44-8	0.05	1.7	5
103. Aldrin	309-00-2	0.05	1.7	5
104. Heptachlor epoxide	1024-57-3	0.05	1.7	5
105. Endosulfan I	959-98-8	0.05	1.7	5
106. Dieldrin	60-57-1	0.10	3.3	10
107. 4,4'-DDE	72-55-9	0.10	3.3	10
108. Endrin	72-20-8	0.10	3.3	10
109. Endosulfan II	33213-65-9	0.10	3.3	10
110. 4,4'-DDD	72-54-8	0.10	3.3	10
111. Endosulfan sulfate	1031-07-8	0.10	3.3	10
112. 4,4'-DDT	50-29-3	0.10	3.3	10
113. Methoxychlor	72-43-5	0.50	17.0	50
114. Endrin ketone	53494-70-5	0.10	3.3	10
115. Endrin aldehyde	7421-36-3	0.10	3.3	10
116. alpha-Chlordane	5103-71-9	0.05	1.7	5
117. gamma-Chlordane	5103-74-2	0.05	1.7	5
118. Toxaphene	8001-35-2	5.0	170.0	500
119. Aroclor-1016	12674-11-2	1.0	33.0	100
120. Aroclor-1221	11104-28-2	1.0	33.0	100
121. Aroclor-1232	11141-16-5	2.0	67.0	200
122. Aroclor-1242	53469-21-9	1.0	33.0	100
123. Aroclor-1248	12672-29-6	1.0	33.0	100
124. Aroclor-1254	11097-69-1	1.0	33.0	100
125. Aroclor-1260	11096-82-5	1.0	33.0	100

* Quantitation limits listed for soil/sediment are based on wet weight. The quantitation limits calculated by the laboratory for soil/sediment, calculated on dry weight basis as required by the contract, will be higher.

There is no differentiation between the preparation of low and medium soil samples in this method for the analysis of Pesticides/Aroclors.