

WP 12-HP3500

Revision 21

Airborne Radioactivity

Technical Procedure

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CHANGE HISTORY SUMMARY

REVISION NUMBER	ISSUED DATE	DESCRIPTION OF CHANGES
19	01/24/12	<ul style="list-style-type: none"> • Editorial changes made throughout the document. • Step 1.1.9 made as a Note before section 1.0. • Steps 3.3, 3.3.1, and 3.3.2 added information for turning in air monitoring filters to WIPP Labs and completing Attachment 4 for NESHAP and Non-NESHAP filters.
20	08/17/15	<ul style="list-style-type: none"> • Complete rewrite to align with current practices.
21	11/24/15	<ul style="list-style-type: none"> • Replaced NESHAPS filters with lapel air sample filters throughout document. • Added to bullet under step 3.1, the count rate for both Tennelec and portable counters. • Deleted in bullet four, beneath Precautions and Limitations, material regarding background for portable counters. • Deleted bullet beneath step 3.3, regarding attachment of a map. • Changed five (5) minutes to one (1) hour in step 3.4 and substep 3.4.1. • Changed five (5) and ten (10) minutes to thirty (30) minutes in step 3.5. • Replaced in substep 3.11.1, “each of these” with “exposed.” • Added to Note above step 1.3, information regarding surgeon gloves. • Deleted steps 1.13 and 1.15 regarding check weight serial number. • Changed in step 1.17, “calibration test” to “operability check.” • Added to end of step 1.20, “and attachment 3 of 12-HP1305.” • Added to end of step 3.3, “or other format approved by the RC & DM.” • Added to bullet beneath step 3.3, information regarding counting the filter. • Added bullets beneath step 3.3 regarding sample count and Airborne Concentration. • Deleted bullet beneath step 3.3 regarding map.

INTRODUCTION

This procedure provides instructions for analyzing and reporting results of particulate air samples for airborne radioactivity. Radiological Assessment Filter (RAF) processing is NOT covered in this procedure.

Performance of this procedure generates the following record(s), as applicable. Any records generated are handled in accordance with departmental Records Inventory and Disposition Schedules (RIDS).

- Attachment 1, *Gravimetrics, Volume, and Activity Statistics*
- Attachment 2, *Airborne Sample Results*
- Attachment 3, *DAC-hour Tracking*
- Attachment 4, *Mettler Balance Operability Check*
- Attachment 5, *Request for Analysis/Chain-of-Custody Record*

REFERENCES			
DOCUMENT NUMBER AND TITLE	BASELINE DOCUMENT	REFERENCED DOCUMENT	KEY STEP
Title 10 <i>Code of Federal Regulations</i> (CFR) Part 835, " <i>Occupational Radiation Protection</i> "	✓		
40 CFR Part 61, Subpart H, " <i>National Emission Standards for Emissions of Radionuclides Other Than Radon from Department of Energy Facilities</i> "	✓		
40 CFR Part 191, Subpart A, " <i>Environmental Standards for Management and Storage</i> "	✓		
Agreement for Consultation and Cooperation Between the Department of Energy and the State of New Mexico on the Waste Isolation Pilot Plant	✓		
DOE-EH-0173T, <i>Environmental Regulatory Guide for Radiological Effluent Monitoring and Environmental Surveillance</i>	✓		
Health Physics 64: 434-435, <i>Standardizing Minimum Detectable Amount Formulations</i> , Brodsky, A., 1993	✓		
METTLER AE240 <i>Dual Range Balance Operating Instructions</i>	✓		
PSD No. 17, <i>The Minimum Detectable Activity Concept</i> , EG&G Ortec Systems <i>Application Studies</i> , Lochamy, J. C., September 1981	✓		

REFERENCES			
DOCUMENT NUMBER AND TITLE	BASELINE DOCUMENT	REFERENCED DOCUMENT	KEY STEP
Radiation Protection Management Vol. 13, No. 4, Detection and Quantification Limits of Field Survey Instrumentation (Part 1), Jamieson, M., 1996	✓		
Radiation Protection Management Vol. 13, No. 5, Detection and Quantification Limits of Field Survey Instrumentation (Part 2), Jamieson, M., 1996	✓		
DOE/WIPP 97-2238, <i>Periodic Confirmatory Measurement Protocol for the Waste Isolation Pilot Plant</i>	✓		
WP 10-WC3002, <i>Corrective Maintenance</i>	✓		
WP 12-5, <i>Waste Isolation Pilot Plant Radiation Safety Manual</i>	✓		
WP 12-HP1100, <i>Radiological Surveys</i>	✓		
WP 12-HP1245, <i>Tennelec Series 5 XLB Low Background Alpha/Beta Counting System Operation</i>		✓	
WP 12-HP1305, <i>Air Sampling Equipment</i>		✓	
WP 12-HP1307, <i>Portable Instrument and Portal Monitor Operability Checks</i>		✓	
WP 12-HP1500, <i>Radiological Posting and Access Control</i>	✓		
WP 12-HP2001, <i>Abnormal Radiological Conditions</i>	✓		
WP 12-HP4000, <i>Emergency Radiological Control Responses</i>	✓		
WP 13.1, <i>Nuclear Waste Partnership Quality Assurance Program</i>	✓		

EQUIPMENT LIST

None

PRECAUTIONS AND LIMITATIONS

- When requested by Stakeholders and Engineering, and/or as directed by the Radiological Control Supervisor (RCS)/Radiological Control Engineer (RCE)/Radiological Control Manager (RCM), Gravimetrics (the weighing of air sample filters) is performed on specific Continuous Air Monitors (CAMs) and Fixed Air Samplers (FASs) to evaluate the effect of salt, diesel, water, or any other substances that could interfere with the collection and analysis of radioactive particulate.
- National Emission Standards for Hazardous Air Pollutants (NESHAP) filters (Station B and Station C [FAS-157] samples), and designated NESHAP backup filter samples may be retained by Site Environmental Compliance (SEC) for analysis and determination as periodic confirmatory samples.
- WIPP Radiological Controls organization is responsible for the review, and trend analysis, if needed, of the analyzed FAS filter samples. SEC will determine if the actual filters are to be maintained for NESHAPs back up and, if required, retain the filters, Chain of-Custody records, and associated analysis data package(s) of non-NESHAP FAS filter samples.
- Routine air monitoring filter samples, and NESHAP filter samples, will NOT be analyzed for record purposes prior to 72 hours after filter collection to allow naturally occurring isotopes to decay.
- Only RCTs who have completed the appropriate Job Performance Measures (JPMs) may perform the steps directed to RCTs in this procedure.
- The required Derived Air Concentration (DAC) sensitivity is 0.1 DAC for radiological areas and 0.02 DAC for Controlled Areas (or as designated by the Radiological Controls and Dosimetry Manager [RC&DM]/DEPUTY/DESIGNEE).
- Air samples will be a minimum of 300 cubic feet (unless otherwise designated by the RCS/RCE/RCM) for the measurement of air concentrations in Radiological Areas to achieve an Minimum Detectable Concentration (MDC) that is less than or equal to (\leq) the required DAC sensitivity. When these samples are collected for the coverage of specific jobs, the time period of air sample collection should extend throughout the duration of the job for that shift (unless otherwise designated by the RCS/RCE/RCM). As long as the minimum volume per sample is collected, this may also be achieved by collecting several air samples in succession or even with the use of overlapping time periods that cover the entire duration of the job for that shift.
- ONLY VERSAPOR®3000 Membrane filters with 3.0 μm pore size will be used in fixed and portable air samplers utilized in connection with monitoring individual radiological job activities. This restriction does NOT apply to CAMs or lapel air sample filters.

REFERENCE USE

- For measurement of air concentrations in Controlled Areas, air sample volume will be a minimum of 1000 cubic feet (unless otherwise designated by the RCS/RCE/RCM) and will be counted on a TENNELEC or an instrument of equal or greater sensitivity.
- NESHAP filter samples will be kept in a locked cabinet or locked room, OR in the possession of a qualified Radiological Control Technician (RCT), Radiological Engineer, SEC, or Waste Isolation Pilot Plant (WIPP) Laboratories personnel.
- Filter samples submitted to WIPP Laboratories will be submitted with the completed Request for Analysis/Chain-of-Custody record, and this must occur within three of the Laboratories' normal working days after the filter is collected unless otherwise directed by the RCS/RCE/RCM.
- Radioactivity analysis of air monitoring filter samples may be performed one (1) of two (2) ways, as directed by RCS/RCE/RCM: (1) RCT may perform the air filter sample analysis, or (2) Per RCS/RCE/RCM, RCT may send air monitoring filter samples to WIPP Laboratories for analysis.
- Sample identification numbers (SID#s) are assigned utilizing the following logic: FAS, PAS, or CAM number, followed by the date the filter was placed on the FAS or CAM. For example, a filter placed on CAM 146A on August 8th, 2004, would be assigned a SID# of 146A080804. If a filter is changed more than once a day, the time of installation (24 hour format) should be added to the SID# (e.g., for the example given, if installation took place at 8:30 p.m., the SID# would be 146A0808042030).
- Use good Radiological Work practices when handling used filters (i.e.: wear surgeon gloves, ensure frisk is performed prior to touching face or other clean surface).

PREREQUISITE ACTIONS

NONE

PERFORMANCE

NOTE

Section 1.0, *Gravimetrics*, is performed when requested by the RCS/RCE/RCM.

1.0 GRAVIMETRICS

- 1.1 RCT, **VERIFY** current calibration stickers exist for balance and calibration weights **AND RECORD** calibration information on attachment 4.
 - 1.2 RCT, **IF** balance calibration is due within one month of due date, **THEN NOTIFY** RCS/RCE/RCM.
-

NOTE

Check weights are calibrated annually. Surgeon gloves (or equivalent) should be worn when handling the weights in order to avoid skin contamination, oil, dirt, etc. that could affect the calibration.

- 1.3 RCT, **ENSURE** balance is level by determining if bubble is in center of circle (located just in front of weighing pan) **AND RECORD** information on attachment 4.
- 1.4 RCT, **IF** bubble is NOT located in center of circle, **THEN LEVEL** balance by adjusting leveling screws located underneath rear section of balance.
- 1.5 RCT, **ENSURE** balance is powered on AND indicates a lighted display of "0.0000."
- 1.6 RCT, **IF** display is not "0.0000," **THEN PRESS** the control bar briefly **AND ENSURE** display is "8.8.8.8.8.8.8.8," followed by "0.0000."
- 1.7 RCT, **PRESS AND HOLD** control bar UNTIL "r n g" appears **AND ENSURE** balance is in 200 range as indicated by display showing "200."
- 1.8 RCT, **IF** balance is NOT in the 200 range, **THEN PUSH** (tap) control bar UNTIL it reads 200.
- 1.9 RCT, **PLACE** a tare container on weighing pan (if one is not already present) **AND CLOSE** sliding glass doors.

- 1.10 RCT, **PRESS** control bar briefly with tare container in place, TO ZERO balance.
- 1.11 RCT, **DON** gloves **AND PLACE** a 2 gram calibrated weight in the tare container **AND CLOSE** the sliding glass door.
- 1.12 RCT, **RECORD** the mass measurement indicated by the scale AND the calibrated weight of the standard on attachment 4.
- 1.13 RCT, **REPLACE** the 2 gram calibrated standard with a calibrated standard of 10 grams in the tare container **AND CLOSE** the sliding glass door.
- 1.14 RCT, **RECORD** the mass measurement indicated by the scale AND the calibrated weight of the standard on attachment 4.
- 1.15 RCT, **IF** standards are within 0.02 milligrams (mg) of the calibrated weight AND the balance is operating correctly, **THEN RECORD** "Sat" for Sat/Unsat and sign attachment 4.
- 1.16 RCT, **IF** the balance fails the calibration test, **THEN TAG** balance out of service (OOC), **RECORD** "Unsat", **AND SIGN** attachment 4.
- 1.17 RCT, **IF** the balance fails the operability check, **THEN NOTIFY** RCS/RCE/RCM.

NOTES

1. Periodic Gravimetrics data performed on NESHAP and designated NESHAP backup filter samples are recorded on attachment 3, NESHAP Particulate Air Filter Sample Form, of WP 12-HP1305, *Air Sampling Equipment*.
2. Calculations necessary to determine volume and mg/m^3 are found on attachment 1.

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- 1.18 RCT, **ENSURE** a clean filter has desiccated for a minimum of 24 hours.
 - 1.19 RCT, **ASSIGN** a unique SID# to the filter.
 - 1.20 RCT, **RECORD** the SID# on the filter, the container, and attachment 3 of 12-HP1305.
 - 1.21 RCT, **RECORD** the desiccation date, time, AND RCT printed name AND signature on attachment 3 of WP 12-HP1305.

- 1.22 RCT, **ENSURE** balance is “zeroed” **AND PLACE** filter in tare container on the scale.
- 1.23 RCT, **RECORD** the SID#, weight, date, time, AND RCT printed name AND signature on attachment 3 of WP 12-HP1305.
- 1.24 RCT, **PLACE** weighed filter in the assigned container.
- 1.25 RCT, **REFER TO** WP 12-HP1305 (for changing air monitoring filter samples) **AND WEIGH** the loaded filter sample as soon as possible after collection.
- 1.26 RCT, **RECORD** date, time, gross and net weights, volume (mg/m^3), AND RCT printed name AND signature on attachment 3 of WP 12-HP1305.
- 1.27 RCT, **PLACE** the filter in the desiccator, **THEN REMOVE** the lid from the container **AND PLACE** it under the container.
- 1.28 RCT, **DESICCATE** the filter sample for a minimum of twenty four (24) hours, **THEN WEIGH** the filter sample.
- 1.29 RCT, **RECORD** date, time, gross and net weights, volume (mg/m^3), AND RCT printed name AND signature on attachment 3 of WP 12-HP1305.
- 1.30 RCS/RCE/RCM, **CONTACT** SEC by voice to determine which filters (if any) will be retained. In the comments section of attachment 4, **PROVIDE** the name of the person contacted and the time and date AND the ANSWER to which filters will be retained. **RETAIN** filters until SEC provides the answer via written documentation.
- 1.31 SEC, **PROVIDE** written documentation to RCS/RCE/RCM with copy to RC&DM AND Deputy regarding which filters will be retained AND which filters will be released for disposal.

NOTE

Section 2.0, *Desiccator Maintenance*, is performed when requested by the RCS/RCE/RCM.

2.0 DESICCATOR MAINTENANCE

2.1 RCT, **IF** it is known to the RCT that the desiccant was used more than (>) twice after drying,

OR

IF the desiccant is pink in color,

OR

IF the humidity gauge reads 50% or greater,

THEN REPLACE desiccant as follows:

2.1.1 **REMOVE** desiccant pan from desiccator.

2.1.2 **POUR** desiccant into a glass jar container.

2.1.3 **FILL** the pan with blue desiccant.

2.1.4 **PLACE** desiccant pan in desiccator.

3.0 RADIOACTIVITY ANALYSIS OF AIR MONITORING FILTERS

NOTES

1. Air sample activity determination may include, but is not limited to recount of air filter sample to determine natural/transuranic, half-life indication AND/OR Analysis of air sample filter with spectral analysis instrumentation.
 2. Background and sample counting times may be altered in accordance with attachment 1 when directed by the RCS/RCE/RCM.
 3. The required DAC sensitivity is 0.1 DAC for radiological areas and 0.02 DAC for Controlled Areas (or as designated by the RC&DM/DEPUTY/DESIGNEE).
 4. If available, use data from sample counter report(s) to complete the applicable blocks on attachment 2. Attachment 2 and the numerical entry required may be designated and replaced or supplemented by appropriate approved computer programs designated by the RC&DM or Deputy.
 5. Some numerical values required on attachment 2 may not automatically be reported and must (in that case) be calculated.
 6. Record the real numbers calculated, even if they are negative values, unless otherwise directed by the procedure.
 7. Do NOT indicate less than (" $<$ ") values.
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3.1 RCT, **ENSURE** the following:

- Counting system operability checks were performed in accordance with WP 12-HP1245, *Tennelec Series 5 XLB Low Background Alpha/Beta Counting System Operation*, OR WP 12-HP1307, *Portable Instrument and Portal Monitor Operability Checks*,
- Background counting time is more than or equal to (\geq) thirty (30) minutes (unless a different background counting time is specified by the RCS/RCE/RCM),
- The alpha background count rate is less than ($<$) 0.5 counts per minute (cpm) for Tennelec's and $<$ 1.0 cpm for portable counters (or as otherwise specified by the RCS/RCE/RCM) and
- The beta background count rate is less than 10 cpm for Tennelec's and 100 cpm for portable counters (or as otherwise specified by the RCS/RCE/RCM).

3.2 RCT, **COUNT** filter for a minimum of ten (10) minutes.

3.3 RCT, **RECORD** the following information on attachment 2 or other format approved by the RC & DM:

- Building/Location where air sample was collected
- Air Sample ID
- RWP Number (if any)
- Job Description
- Sampler ID
- Sampler Type
- Filter Type (such as “Versapor 3000”). For ALL fixed and portable air samplers other than CAMs or lapel air samples, use Versapor®3000 Membrane filters with 3 µm pore size.
- Date/Time ON (MM/DD/YYYY, HH:MM)
- Date/Time OFF (MM/DD/YYYY, HH:MM)
- Initial Flow Rate (cubic feet per minute (CFM)/liters per minute (LPM))
- Final Flow Rate (CFM/LPM)
- Filter Correction Factor (alpha), use 0.80 (unless otherwise designated by the RCS/RCE/RCM)
- Filter Correction Factor (beta), use 0.95 (unless otherwise designated by the RCS/RCE/RCM)
- Filter Sample Fraction “Y”. If you are counting the entire filter, record Y as 1. If you are counting a portion of the filter, seek guidance from the RE/RCS/RCM.
- Sample Collection Time (min)

- Average Flow Rate (CFM/LPM):

$$\begin{aligned} & \text{Average Flow Rate (CFM)} \\ &= \frac{\text{Initial Flow Rate} + \text{Final Flow Rate}}{2} \frac{\text{LPM}}{28.32} \\ &= \text{CFM} \end{aligned}$$

- Total Volume (ft³)
- Counter ID (240-RI-000-####)
- Counter Type (such as TENNELEC or 3030)
- Date/Time Count Initiated (MM/DD/YY, HH:MM), using 24 hour time
- Background Counting Time (min)
- Sample Counting Time (min)
- Counter Efficiency fraction (alpha)
- Counter Efficiency fraction (beta)
- **IF** sample report(s) from the sample counter **are available**,

AND

IF the data for all four items directly below is listed,
THEN ENTER the data for the following four items from the sample report(s):

- Alpha Background Count Rate (cpm)
- Beta Background Count Rate (cpm)
- Alpha Minimum Detectable Activity (MDA) in disintegrations per minute (dpm)
- Beta MDA (dpm)

Otherwise, **ENTER** the following:

- Alpha Background Count Rate (cpm)
- Beta Background Count Rate (cpm)
- Alpha Gross Count Rate (cpm)
- Alpha Net Count Rate (cpm)
- Beta Gross Count Rate (cpm)
- Beta Net Count Rate (cpm)

REFERENCE USE

- Alpha MDA (dpm)
- Beta MDA (dpm)

- **CHECK** one of the following:
 - Initial Sample Count
 - Or
 - Decayed Sample Count
- Air Sample Activity (dpm), for both alpha and beta
- **CALCULATE** the Decision Level (dpm), for both alpha and beta

$$DL (dpm) = \frac{1.645}{(\epsilon) (C)} \sqrt{\frac{R_b}{t_s} + \frac{R_b}{t_b}}$$

- Either “Y” for “Yes” or “N” for “No” for the answer to the query “Sample Activity > Decision Level (Y/N)”, (for both alpha and beta)
- Beta activity to alpha activity ratio:

$$\text{Beta Activity to Alpha Activity Ratio} = \frac{\text{Beta Sample Activity in dpm}}{\text{Alpha Sample Activity in dpm}}$$

- MDC ($\mu\text{Ci/ml}$), for both alpha and beta
- MDC Total DAC Fraction, for the sum of the alpha and beta contributions:

$$\text{MDC Total DAC fraction} = \frac{\text{MDC for alpha}}{\text{Alpha DAC Value}} + \frac{\text{MDC for beta}}{\text{Beta DAC Value}}$$

DAC value = 5 E-12 $\mu\text{Ci/ml}$ for alpha and 7 E-9 $\mu\text{Ci/ml}$ for beta (beta-gamma), unless otherwise directed by the RC&DM/DEPUTY/DESIGNEE.

- Airborne Conc. ($\mu\text{Ci/ml}$), (airborne concentration) for both alpha and beta, AND for this data entry, **RECORD** all negative values as zero.
- Airborne Concentration ($\mu\text{Ci/ml}$) = $\frac{\text{Air Sample Activity in dpm}}{(V) (Y) (6.286 \text{ E}10)}$
- Airborne Total DAC Fraction, for the sum of the alpha and beta contributions [utilizing the “Airborne Conc. ($\mu\text{Ci/ml}$)”]:

Airborne Total DAC Fraction

$$= \frac{\textit{Airborne Concentration for alpha}}{\textit{Alpha DAC Value}} + \frac{\textit{Airborne Concentration for beta}}{\textit{Beta DAC Value}}$$

DAC value = 5 E-12 $\mu\text{Ci/ml}$ for alpha and 7 E-9 $\mu\text{Ci/ml}$ for beta (beta-gamma), unless otherwise directed by the RC&DM/DEPUTY/DESIGNEE.

- Resp. PF (respirator protection factor). When no respirator is used, the respirator protection factor = 1.
- Effective Airborne Total DAC Fraction

$$\textit{Effective Airborne Total DAC Fraction} = \frac{\textit{Airborne Total DAC Fraction}}{\textit{Respirator Protection Factor}}$$

- **ATTACH** the printed out report(s) of the sample counter for the analysis of the sample (when available).
- Signature and Date from RCT, AND any added COMMENTS
- Printed name, signature, AND date of review from the RCS/RCE/RCM

NOTE

Steps 3.4, 3.5, and 3.6 are performed concurrently.

3.4 RCT, **IF** ALL of the following are true:

- The Airborne Total DAC Fraction is more than or equal to (\geq) the required DAC sensitivity, as listed on attachment 1, in an active working area,
- The Airborne Total DAC Fraction is more than or equal to (\geq) the MDC Total DAC Fraction,
- The air sample is counted within 1 hour of the ending time of the air sample collection (or other time period designated by the RC&DM/DEPUTY/DESIGNEE), and
- The Sample Activity beta to alpha ratio for the initial count of the air sample is outside the range of 1.5 to 3 (or other ratio range designated by the RC&DM/DEPUTY/DESIGNEE),

THEN PERFORM the following:

- RCT, **NOTIFY** the RCS/RCE/RCM by voice within one (1) hour,
- **PERFORM** spectral analysis of air sample radioactivity,
- **RECORD** analysis results in the Remarks section of attachment 2.

3.4.1 RCT, **IF** spectral analysis is performed AND the sample results indicate transuranic activity, **THEN NOTIFY** the RCS/RCE/RCM by voice within one (1) hour.

3.5 RCT, **IF** analyzing a filter due to ANY of the following:

- U/G CAM alarm,
- Loss of remote indication from U/G CAM (when remote indication exists),
- Requested by FSM,

THEN NOTIFY the RCS/RCE/RCM by voice within thirty (30) minutes, **AND THEN** RCS/RCE/RCM, **NOTIFY** FSM/CMRO (Central Monitoring Room Operator) of analysis results after they are available by voice within thirty (30) minutes.

NOTE

If there are questions regarding how to accomplish this sample recount from the guidance on attachment 1 and 2 or other questions, contact a Radiological Engineer (RE) or RCS/RCE/RCM for guidance. The RCS/RCE/RCM may instruct the RCT to skip the sample recount required within step 3.6.

- 3.6 RCT, **IF** the MDC Total DAC Fraction is more than ($>$) the required DAC sensitivity,
THEN RECOUNT the air sample in accordance with attachment 1 TO REDUCE the MDC Total DAC Fraction.
- 3.7 RCT, **SUBMIT** completed air sample data sheets to RCS/RCE/RCM for review.
- 3.8 RCS/RCE/RCM, **IF** the MDC Total DAC Fraction is more than ($>$) the required DAC sensitivity,
THEN CONSIDER RECOUNTING the air sample in accordance with attachment 1 TO REDUCE the MDC Total DAC Fraction.
- 3.9 RCS/RCE/RCM, **IF** the sample was recounted, AND the MDC Total DAC Fraction continues to be more than ($>$) the required DAC sensitivity,
THEN CONSIDER CONTACTING a Radiological Engineer for guidance.
- 3.10 RCS/RCE/RCM, **IF** MDC Total DAC Fraction is less than or equal to (\leq) the required DAC sensitivity

AND

the Sample Activity is less than ($<$) the Decision Level (for BOTH alpha and beta),

THEN the air sample results are NOT considered to be indicative of airborne program activity.

NOTE

It is preferred that TENNELEC counters with an alpha background of 0.1 cpm (or less), or other counters of equal or greater sensitivity, be utilized for the final count.

3.10.1 RCT, **IF** decayed counts of the air samples have not been performed, **THEN PERFORM** the following:

[A] **PERFORM** decayed counts of the air samples (as many as needed per the RCS/RCE/RCM) using a TENNELEC or other counter with equal or greater sensitivity, with the final count being more than or equal to (\geq) 72 hours after the ending time of the sample collection, for each sample, respectively.

[B] **GO TO** step 3.7.

NOTE

Only those sample results for which the Sample Activity (for either alpha or beta) is more than or equal to (\geq) the Decision Level need be considered for DAC-hour tracking **UNLESS** otherwise requested by an RE.

3.11 Upon request of the RC&DM or Deputy (and only for the periods of time requested), **PERFORM** DAC-hour calculations and tracking, **IF** the final decayed sample activity results (for either alpha or beta) are more than or equal to (\geq) the Decision Level

AND

the Effective Airborne Total DAC Fraction ≥ 0.02 ,

THEN PERFORM the following sub-steps:

3.11.1 RCS/RCE/RCM, **PERFORM** DAC-hour calculations for exposed individuals.

3.11.2 RCS/RCE/RCM, **SUBMIT** the original DAC-hour calculation records (using the form illustrated on Attachment 3) to a RE for review (after DAC-hour calculations have been completed for a given day).

- 3.11.3 RE, **TRACK** Total Effective DAC-hours (the running total for each of these individuals) for the current calendar year (within the time constraints designated by the RC&DM or Deputy) **AND ENSURE** the original records are submitted to the Dosimetry Team Leader/designee.
- 3.11.4 RE, **IF** the running total for the current calendar year is more than or equal to (\geq) any positive integer multiple of four (4) Effective DAC-hrs for any individuals, **THEN PERFORM** the following for each positive integer multiple of four (4) Effective DAC-hrs:
- [A] **NOTIFY** the Dosimetry Team Leader/designee that the individuals who have initially accrued ≥ 4 Effective DAC-hours (or who have currently accrued ≥ 4 additional Effective DAC-hours) should be considered for inclusion in a bioassay program to quantify any internal dose received.
- [B] **IF** the Total Effective DAC-hours (running total) for any individual is more than or equal to (\geq) twenty (20) for the current calendar year (within the time constraints designated by the RC&DM or Deputy), **THEN NOTIFY** the RC&DM AND Deputy **AND RECOMMEND** to them that they **CONSIDER** reassignment of that individual to other activities during the current calendar year, **TO PREVENT** the individual receiving more internal dose.
- 3.11.5 Dosimetry Team Leader (DTL), **SUBMIT** originals received of DAC-hour tracking records to Dosimetry Records Coordinator (DRC).

NOTE

1. Section 4.0, *NESHAP Filters and Filters submitted to WIPP Laboratory*, is performed when requested by the RCS/RCE/RCM.
2. NESHAP and Non-NESHAP filters must be on separate Attachment 5s.
3. One blank air monitoring filter must be included for every ten air monitoring filters turned in to WIPP Laboratories.

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4.0 NESHAP FILTERS AND FILTERS SUBMITTED TO WIPP LABORATORY

- 4.1 RCT, **COMPLETE** Attachment 5 for air monitoring filter samples to be analyzed (using separate Attachment 5s for NESHAP and Non-NESHAP filters), with NESHAP filter samples identified as those from Station B AND/OR Station C (FAS-157).
- 4.2 RCT, **SUBMIT** filters to WIPP Laboratories as follows:
 - 4.2.1 **IF** WIPP Laboratories are available, **THEN SUBMIT** filters with attachment 5 **AND OBTAIN AND FILE** a copy of the attachment in the Chain-of-Custody binder **WHEN** WIPP Laboratories personnel have signed attachment 5 (as having received the filters).
 - 4.2.2 **IF** WIPP Laboratories are unavailable, **THEN PERFORM** the following:
 - [A] **ENSURE** that desiccator has been prepared according to section 2.0.
 - [B] **ENSURE** attachment 5 is completed.
 - [C] **STORE** filters in desiccator **UNTIL** WIPP Laboratories are available, **THEN SUBMIT** filters according to step 4.2.1.

Attachment 1 – Gravimetrics, Volume, and Activity Statistics

1. Gravimetric Data (mg/m^3) is Calculated as follows:

$$\text{mg}/\text{m}^3 = 1000 \text{ mg } (35.3 \text{ ft}^3/\text{m}^3)(W_{\text{net}})/V$$

where: W_{net} = Net filter weighting

V = Volume in ft^3

2. Air Sample Volume is Calculated as follows:

$$\begin{aligned} & \text{Air Sample Volume } (\text{ft}^3) \\ &= \left(\frac{\text{Initial Flow Rate} + \text{Final Flow Rate}}{2} \right) (\text{Sample Collection Time}) \end{aligned}$$

3. Activity Statistics

$$\text{Air Sample Activity } (\text{dpm}) = \frac{\text{Net cpm}}{(\epsilon) (C)}$$

$$\text{Airborne Concentration } (\mu\text{Ci}/\text{ml}) = \frac{\text{Air Sample Activity in dpm}}{(V) (Y) (6.286 \text{ E}10)}$$

$$\text{Airborne DAC fraction} = \frac{\text{Airborne Concentration } (\mu\text{Ci}/\text{ml})}{\text{DAC value}}$$

$$\text{MDA } (\text{dpm}) = \frac{3 + 3.29 \sqrt{R_b t_s \left(1 + \frac{t_s}{t_b}\right)}}{(\epsilon) (C) (t_s)}$$

$$\text{DL } (\text{dpm}) = \frac{1.645}{(\epsilon) (C)} \sqrt{\frac{R_b}{t_s} + \frac{R_b}{t_b}}$$

$$\text{MDC } (\mu\text{Ci}/\text{ml}) = \frac{\text{MDA}}{(V) (Y) (6.286 \text{ E}10)}$$

$$\text{MDC DAC fraction} = \frac{\text{MDC}}{\text{DAC value}}$$

REFERENCE USE

Attachment 1 – Gravimetrics, Volume, and Activity Statistics

- where:
- R_b = Background Count Rate in counts per minute (cpm)
 - t_s = Sample Counting Time in minutes
 - t_b = Background Counting Time in minutes
 - ϵ = Counter efficiency *fraction* (4π).
 - C = Filter Correction Factor for the filter media (such as for collection efficiency) and radiation to be detected (such as for self-absorption). Use 0.80 for alpha and 0.95 for beta, unless otherwise designated by the RC&DM/DEPUTY/DESIGNEE.
 - V = Air sample volume in ft^3
 - Y = Filter/sample fraction (d^2/D^2), where d = the diameter of the filter counted and D = diameter of the filter used for air sample collection; ($Y = 1$ if the whole filter is counted, $Y = 0.25$ if a 2 inch diameter circle is punched out of the *central area* of a 4-inch diameter filter)

DAC value = $5 \text{ E-}12 \mu\text{Ci/ml}$ for alpha and $7 \text{ E-}9 \mu\text{Ci/ml}$ for beta (beta-gamma), unless otherwise directed by the RC&DM/DEPUTY/DESIGNEE.

The required DAC sensitivity is 0.1 DAC for radiological areas and 0.02 DAC for Controlled Areas (or as designated by the RC&DM/DEPUTY/DESIGNEE).

NOTE

If the calculated **sample activity** is $< \text{DL}$, then there is a 95 percent (or greater) confidence that the actual (real) sample **airborne activity** is $< \text{MDC}$, **AND IN THAT CASE** if the MDC is also less than the required DAC sensitivity, THEN the results (alpha or beta, as applicable) from the particular air sample are normally NOT considered to be indicative of program activity. The MDA, DL, MDC, and MDC DAC fraction may all be reduced (improved) by increasing background counting time, increasing sample counting time, decreasing background, and/or increasing counter efficiency. The MDC and MDC DAC fraction may also be reduced (improved) by increasing air sample volume.

Attachment 2 – Airborne Sample Results

Building/Location		Air Sample ID	
RWP Number (if any)		Job Description	
Sampler ID		Sampler Type	Filter Type
Date/Time ON (MM/DD/YYYY, HH:MM)		Date/Time OFF (MM/DD/YYYY, HH:MM)	
Initial Flow Rate (CFM)		Final Flow Rate (CFM)	
Filter Correction Factor (alpha)	Filter Correction Factor (beta)	Filter Sample Fraction "Y"	
Sample Collection Time (min)	X Average Flow Rate (CFM)	= Total Volume (ft ³)	
Counter ID (240-RI-000-####)	Counter Type:	Date/Time Count Initiated (MM/DD/YY, HH:MM)	
Background Counting Time (min)		Sample Counting Time (min)	
Counter Efficiency <i>fraction</i> (alpha)		Counter Efficiency <i>fraction</i> (beta)	

Sample Report(s) from sample counter is attached that contains each of the following: **Yes** **OR** **No**

- 1) Alpha background count rate
- 2) Beta background count rate
- 3) Alpha MDA
- 4) Beta MDA

If the answer to the query above (in this box) is **"YES,"** then provide the information in the bolded print below. Otherwise, provide ALL the additional information requested below in this box.

Alpha Background Count Rate (cpm)	Beta Background Count Rate (cpm)
Alpha Gross Count Rate (cpm)	Alpha Net Count Rate (cpm)
Beta Gross Count Rate (cpm)	Beta Net Count Rate (cpm)
Alpha MDA (dpm)	Beta MDA (dpm)

Check one of the following: **Initial Sample Count** **Decayed Sample Count**

Air Sample Activity (dpm)	Decision Level (dpm)	Sample Activity ≥ Decision Level (Y/N)	Beta to Alpha (β/α) Activity Ratio	MDC (μCi/ml)	MDC Total DAC Fraction	Airborne Conc. (μCi/ml)	Airborne Total DAC Fraction	Resp. PF	Effective Airborne Total DAC Fraction
α	α	α	β/α	α	α + β	α	α + β		α + β
β	β	β		β		β			

Attach the printed out report(s) of the sample counter for the analysis of this sample (when available).

If this filter is from a portable air sampler (including portable CAMs), attach a map indicating the location.

Printed Name, Signature, and Date from RCT, plus any added REMARKS:

Reviewed by:

RCS/RCE/RCM (Printed Name) Signature Date (MM/DD/YY)

Attachment 4 – Mettler Balance/Weight Operability Check

Balance Serial Number:				Calibration Due Date:			
Weight Serial Number:				Calibration Due Date:			
Date	Level (Y or N)	2 gram Calibrated Mass	2 gram Scale Indication	10 gram Calibrated Mass	10 grams Scale Indication	Sat/Unsat (±0.02 mg)	RCT Signature
Comments:							
Reviewed by: _____							
Printed Name			Signature			Date	

