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Allen, Pam, NMENV

From: Maestas, Ricardo, NMENV
Sent: Wednesday, August 13, 2014 9:56 AM
To: Allen, Pam, NMENV
Subject: FW: WIPP Information - For Call Today
Attachments: NMED Questions about the ventilation 4_3_2014_rev 11 + NMED comments.docx

Email and att for April

From: Kliphuis, Trais, NMENV
Sent: Tuesday, April 15, 2014 10:05 AM
To: Holmes, Steve, NMENV
Cc: Maestas, Ricardo, NMENV; Smith, Coleman, NMENV
Subject: FW: WIPP Information - For Call Today

Steve,

Please review these responses carefully and write an internal memo identifying the deficiencies. Please pay close attention to the places where there should be references and there are not. See my comment as an example. Let me know if you have questions.

Thanks.

DRAFT Response to NMED Questions

Questions about the ventilation/filtrations system, 3/12/2014

1. ***What is the control efficiency (CE) for the filtration system as a whole including the CE with the leaking dampers and CE after the foaming of those leaking dampers?***

   A search of design, construction and acceptance testing records has failed to turn up information regarding the as-installed system efficiencies. Research is ongoing. The design specification for the butterfly valves, Specification 15103-019, required that the dampers (valves) meet the following performance specifications:

Normal Air Flow	210,000 CFM
Normal Velocity	2,690 FPM
Allowable leakage at DP of 10 in. W. G.	1,000 CFM
Max pressure drop in open position	0.1 in. W. G.

   According to Section 3.6 of Specification 15103-019, the valves were required to be shop tested for leakage. However, field testing for leakage was not required by Section 4 of Specification 15103-019. There is indication that the applicable leak test procedure was ANSI-N509 which would have used a pressure decay method. No documentation of the actual tests has been located. Based on the specifications, the design efficiency can be calculated as the ratio of the allowable leakage to the normal flow velocity to be no less than 99.95 percent. After sealing the valves, the in-service testing of the HEPA filters confirms filter efficiency is in the desired range.

   Without documentation of the installed efficiency, system efficiency can be estimated from the data collected from effluent stations A and B during filtration and prior to sealing the valves. There are three relevant data sets for this analysis. The use of three data sets maintains consistency between the analytical techniques and laboratories that have been used to measure alpha counts and ensures that radon and its daughter products do not make a significant contribution to the alpha counts. Data set 1 compares the concentration of alpha emitters determined by radiochemical analysis at the WIPP Labs of Station A and Station B filters that were installed over roughly the same time frame. Data set 2 is a similar analysis performed by the lab at CEMRC. Data set 3 involves comparing the initial gross alpha counts for Station A and B filters over similar sample periods. The data sets are summarized below in Table 1 and 2.

   Beta counts have not been used in this analysis because they often fall below the minimum detectable activity at the time of final count, making it more difficult to estimate the contribution from radon and its daughter products to the initial beta counts.

TABLE 1 Data Set 1 (Blue Highlight) and 3 (Green Highlight) from WIPP Facility Effluent Monitoring Locations

Date	Date & Time Installed	Date & Time Removed	Filter ID	INITIAL COUNT		FINAL COUNT	
				Alpha (dpm)	Beta (dpm)	Alpha (dpm)	Beta (dpm)
Data Set 1: STATION A EFFLUENT MONITORING FILTERS							
2/14/14	2/14/14 0742	2/15/14 0630	A230214140742	4.4M**	1.2M	8.2M*	<MDA
2/15/14	2/15/14 0630	2/15/14 0840	A230215140630	225K	46.8K	213K*	<MDA
Data Set 1: STATION B EFFLUENT MONITORING FILTERS							
2/14/14	2/14/14 0754	2/15/14 0835	B130214140754	28.2K	5877	57K*	<MDA
Data Set 3: STATION A EFFLUENT MONITORING FILTERS							
2/15/14	2/15/14 0840	2/15/14 1510	A230215140840	285K	54K	N/A	N/A
2/15/14	2/15/14 1510	2/15/14 2330	A230215141510	124K	24481	N/A	N/A
2/15/14	2/15/14 2330	2/16/14 0850	A230215142330	47.3K	10558	46.3K	8749
2/16/14	2/16/14 0850	2/16/14 1648	A230216140850	12.3K	2842	12.2K	2306
Data Set 3: STATION B EFFLUENT MONITORING FILTERS							
Date	Date Time Installed	Date Time Removed	Filter ID	INITIAL COUNT		FINAL COUNT	
				Alpha (dpm)	Beta (dpm)	Alpha (dpm)	Beta (dpm)
2/15/14	2/15/14 0835	2/15/14 1445	B130215140835	36.2K	7340	N/A	N/A
2/15/14	2/15/14 1445	2/15/14 2305	B130215141445	671	142	875*	N/A
2/15/14	2/15/14 2305	2/16/14 0904	B130215142305	300	152	258*	N/A
2/16/14	2/16/14 0904	2/16/14 1705	B130216140904	144	67	128*	N/A

MDA = Minimum Detectable Activity
N/A = not analyzed
* Result is from isotopic analysis of sample filter
** Initial activity is inaccurate due to debris filter loading

TABLE 2 Data Set 2 CEMRC WIPP Facility Effluent Monitoring Locations

CEMRC WIPP EFFLUENT FILTER SAMPLES STATION A					
Date Time Installed	Date Time Removed	241 Am Bq/m^3	239/240 Pu Bq/m^3	238 Pu Bq/m^3	Total Alpha Bq/m^3
2/14/14 07:43	2/15/14 06:30	4,336	672	30.3	5,038.3
2/15/14 06:30	2/15/14 08:40	1,176	187	9.8	1,372.8
2/15/14 08:40	2/15/14 23:30	232	18.1	0.78	250.88
2/16/14 08:50	2/16/14 16:50	8.4	0.66	0.05	9.11
2/16/14 16:50	2/17/14 00:15	2.9	0.24	0.16	3.3
2/17/14 00:15	2/17/14 08:20	2.1	0.18	0.02	2.3
2/17/14 08:20	2/17/14 16:20	0.78	0.07	0.005	0.855
2/17/14 16:20	2/18/14 00:10	1.4	0.07	0.003	1.473
2/18/14 00:10	2/18/14 8:20	0.46	0.03	0.001	0.491
2/18/14 8:20	2/18/14 16:05	0.35	0.03	0.002	0.382
CEMRC WIPP EFFLUENT FILTER SAMPLES STATION B					
Date Time Installed	Date Time Removed	241 Am Bq/m^3	239/240 Pu Bq/m^3	238 Pu Bq/m^3	Total Alpha Bq/m^3
2/14/14 07:55	2/18/14 16:55	2.3	0.23	0.03	2.56

Data Set 1 is restricted to two isotopic analysis results from Station A covering the period from before the radiological release event until 8:40 am the following day and a single Station B filter covering roughly the same time period. Because the time periods are similar and the flow rates in the samplers are the same (2 ft^3/min) the datasets should be comparable. In addition, the fact that the results are isotopic analyses instead of raw counts should remove any bias due to self-shielding associated with debris filter loading on the high count filters. This dataset yields an apparent efficiency[1] of 99.32 percent.

Data Set 2 is the CEMRC data set that is equivalent to Data Set 1. However, the initial Station B filter was not removed until 16:55 on February 18. This time period is spanned by 11 Station A filters, one of which could not be processed due to bad recovery. Because of the varying time periods associated with each CEMRC Station A filter, the concentration calculated by CEMRC is used instead of the counts per sample. Data Set 2 results in an efficiency of 99.96 percent, based on the Station B measurement divided by the sum of the Station A measurements.

Data Set 3 relies on initial counts of the Station A and B filters. These counts are performed immediately after the filter is removed and before any of the Radon isotopes have decayed. These data are used because there is not a comparable set of radioisotope analyses for these filters. The Station B filters were counted and then analyzed, however, the Station A filters were only counted. One limitation is that when the counts decrease, the effects of non-TRU background compounds become more pronounced. For this reason, the comparison was truncated when the effects of non-TRU isotopes influence the result. Because of this, there are additional Station A and B data available after February 18; however, these data cannot be used to determine efficiency without radioanalysis to remove the effects of background alpha emitters. The second, third, and fourth points in Data Set 3 produce efficiencies[2] of 99.5 percent, 99.4 percent, and 98.8 percent, respectively, with an average value of 99.2 percent. The first point in Data Set 3 has an efficiency of 87.3 percent and appears to be anomalous.

With regard to the second part of this question, after sealing the valves, the in-service testing of the HEPA filters confirms filter efficiency is in the desired range.

2. ***It has been publically stated on numerous occasions that the filtration system worked at 99.97% control efficiency. Was this correct? If not, when was it identified?***

The public statements were primarily addressing the HEPA filters. For example the February 19, 2014, DOE news release posted on the WIPP Home page states the following: "This is consistent with the fact that HEPA filters remove at least 99.97% of contaminants from the air, meaning a minute amount still can pass through the filters."

[1] Efficiency = (1 – (57,000)/(8,200,000 + 213,000)) = (1 – 0.00678) = 0.9932 = 99.32%.
[2] Efficiency of second point = (1 – 671/124,000) = 1 – 0.00541 = 0.9946 ~ 99.5%;
Efficiency of third point = (1 – 300/47,300) = 1 – 0.00634 = 0.9937 ~ 99.4%;
Efficiency of fourth point = (1 – 144/12300) = 1 – 0.0117 = 0.9883 ~ 98.8%;

This statement is correct because it is referring to the HEPA filters only. The HEPA filters were purchased to 99.97%, and in-place tested to 99.95%.

3. ***Apparently the total CE across the filter system (taking into account the bypass leak) is different than the CE for each filter bank (99 vs. 99.97)? Why are they different and where in the design (specs and history) does it provide for a distinction?***

No design history calculations have been found that took this into consideration.

4A. The EIS for WIPP required a particulate reduction of 10^6. How does this correlate with the DSA required value of < or = 99%?

In Section 9.6 of the EIS, Mitigation of Impacts, the commitment was made to design and operate in accordance with DOE procedures that limit the amount of radioactive material released during normal operations (Section 9.3.2) and under accident conditions (Section 9.5.1). The actions in Section 9.6 became the mitigation commitments approved in the Record of Decision for the EIS and this commitment was met by the design and installation of a HEPA filtration system that would achieve an efficiency rating of 99.95 percent or greater. For the underground, Section 9.6.3 provides that "radiation monitors will be used to activate a system whereby the disposal-exhaust air will be diverted to HEPA filters if an accident releases radioactivity underground." This mitigation action was responsive to the requirement in the EIS.

4B. Does the DSA value include provisions for a leak?

The DSA recognizes that the underground filtration system (with HEPA filtration) may not provide 100% control of a release. The Emergency Planning Hazard Assessment (EPHA) for WIPP was developed in accordance with Development and Maintenance of an Emergency Planning Hazards Assessment (WP12-12) as required by Comprehensive Emergency Management System (DOE Order 151.1C). The EPHA provides the technical basis for facility emergency planning efforts and evaluates the accident scenarios considered by the DSA. The EPHA does consider a leak during filtration with the leak factor of 0.1 percent (i.e., 99.9% efficiency).

4C. Is the EIS value binding? If not, why not?

Values used in the EIS are intended to facilitate the evaluation of impacts to support decision making. These are often assumptions that are incorporated into the design (or operation) of the facility if the decision is made to proceed. NEPA analysis can be thought of as defining an envelope for acceptable design, construction and operation of a facility. An assumption may not necessarily be incorporated as evaluated in the EIS; however, the overall design will result in the level of protection required by the EIS. In other words, the EIS assumed a value for decontamination that would provide protection of human health and the environment. The Record of Decision committed to a design that is protective; however, the actual implementation was accomplished by incorporating other values into the overall design. In this case, the final design

specification for the dampers with an efficiency of 99.95 percent was established to assure the impacts of constructing and operating the facility were mitigated.

If implementation resulted in impacts beyond in the envelope of the EIS, additional NEPA documentation would be required. This was the case for the filtration system. In 1982, the system was redesigned as part of a DOE cost reduction proposal to resemble the system in place today. The subsequent NEPA documentation determined that system effectiveness would not be changed.

4D. If each HEPA has a manufacturer specification of 99.97% and there are two in series in each bank, why isn't the reduction efficiency multiplicative (99.9991)%?

Yes, the reduction efficiency may be considered multiplicative provided common mode failures do not occur.

5. **Is the filtration system as a whole tested or just each HEPA filter bank? If it is not tested as a system, why not?**

   Filter banks were designed with test ports upstream/downstream of the HEPA banks only. Each filter is tested per ASME testing standards and meets DOE guidelines.

6. ***There are two dampers in series. Please provide calculations with explanation of assumptions of the leak rate after the second damper at the current operating flow rates. Was this value ever discussed during the design phase? Is this considered part of the filtration system reduction (or lack thereof) efficiency? If not, why not? Also, if the data is not logged, why not?***

   No design history calculations were found that took this into consideration. However, see the response to Question 4B above regarding emergency planning assumptions.

7. ***On 3/5/2014 we were told that the dampers were leaking at 250 cfm. On 3/6/2014 we were told they were leaking at 1000 cfm. On 3/7/2014 we were told that the 1000 cfm leak rate was because of the windows cut in the ducts and were not an accurate value of the leak rate. What is the correct leaking rate prior to window cutting and repair? How was it determined?***

   These flow estimates were qualitative to determine if leakage was present and had no quality control or specifications. A flow calculation estimated a flow of 414 cfm through the dampers.

8. ***Also, if rad risk > 10E-6, is there a requirement to tell the public? If so, who will tell the public?***

   WIPP does have a trigger for notifying the public (nearest neighbors). A release of >1 rem Total Effective Does Equivalent (TEDE) at 300 meters would lead to notification. Implementation is via WIPP procedure WP 12-ER3906, *Categorization and Classification of Operational Emergencies*, which results in categorization of an emergency, making necessary notifications, and applying protective actions for the event category.

Comment [TK1]: Please reference where this statement comes from.

The cancer risk to general populations when taken as1 latent cancer fatality per 2,000 rem[3] equates to 5E-7 at the 1 mrem level. The estimated dose to the nearest residence from the February 14, 2014, event was 0.02 mrem.

9. ***Was the leak at the dampers a source of the release? If not, what was the source of the release?***

   The specific source of the radiological release has yet to be determined. The Permittees anticipate identifying the source of the release upon the manned re-entry into the hazardous waste disposal units.

   In regards to the ventilation system it is assumed that a small amount of radioactive contaminated air went through closed butterfly dampers. In other words, the dampers were initially a release pathway, but not a source. That is why the dampers were sealed.

10. ***Would you be able to provide all known differential pressures (ΔP) associated with the filtration system (running in filtration mode), including:***

    - ***ΔP across each component of each filter unit, including individual ΔPs across each roughing filter, medium filter, and each of the two series HEPA filter banks;***
      - The available ΔP is being provided periodically through the daily call and via the weekly report.
    - ***ΔP between the filter inlet plenum and the filter outlet plenum;***
      - This is not measured.
    - ***Estimated or measured ΔP across each of the series bypass dampers just before the foam sealing was performed;***
      - 2.0" wg (damper A), and 2.6" wg (damper B).
    - ***Compare total ΔP across both series bypass dampers to total ΔP across the filter inlet/outlet plenums.***
      - In line with the total ΔP (summed the individual ΔP measurements)
    - ***If the data is not logged, why not?***
      - The data inputs to our central monitoring system and is logged. It includes ΔPs and flow.

3 Note that the NCRP 116 use of these risk factors are strictly limited to use for general populations and are considered inappropriate for use on a single individual.