Overview of the WIPP Effluent Monitoring Program

Compliance with Title 40 CFR Part 191, Subpart A
Environmental Standards for Management and Storage

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INTRODUCTION

This document provides an overview of the effluent air monitoring activities at the Waste Isolation Pilot Plant (WIPP), in Carlsbad, New Mexico. The WIPP Effluent Monitoring Program is designed to comply with the U.S. Environmental Protection Agency (EPA) radiation protection standards for management and storage of spent nuclear fuel, high-level radioactive waste and transuranic (TRU)-waste at the WIPP. The standards issued by the EPA are contained in Title 40 Code of Federal Regulations (CFR), Part 191, Subpart A. The standards require the U.S. Department of Energy (DOE) to minimize radiation doses to any member of the public within the surrounding vicinity of the facility. This document includes the regulatory history of the program, a description of the sampling and analysis process, accomplishments and improvements to the effluent monitoring system, and perspectives from independent evaluations of WIPP's effluent monitoring compliance.

The WIPP facility is now in its seventh year of operation. The first shipment of TRU waste was safely transported, delivered, and emplaced on March 26, 1999. As of March 26, 2005, the WIPP has safely handled 3,480 shipments and emplaced approximately 27,500 m^3 of contact-handled (CH) TRU waste in the repository.

BACKGROUND

The WIPP Facility is located in southeastern New Mexico about 26 miles east of Carlsbad, New Mexico. The WIPP is located on approximately 10,244 acres in Eddy County (See Figure 1). The land has been withdrawn from public use by Public Law 102-579, referred to as the WIPP Land Withdrawal Act (WIPP LWA). The WIPP Project is authorized to demonstrate the safe disposal of radioactive waste materials generated by atomic energy defense activities. The DOE is the owner of the WIPP facility. The facility is designed for the disposal of TRU mixed-waste (a combination of hazardous and radioactive waste).

The WIPP underground repository is excavated in the middle of a massive bedded salt formation located 2,150 feet below the land surface (See Figure 2). The WIPP repository utilizes a "room and pillar" design that allows containerized solids or solidified waste to be placed in the underground excavations called panels. Each waste panel consists of seven rooms and two access drifts. Each room is approximately 300 feet (91 meters) long, 33 feet (10 meters) wide. There are a total of ten panels planned and three of the panels have already been excavated; of the excavated panels the first one has been closed, the second is nearly filled to capacity, and the third has started the process of filling with TRU waste. The excavations of the panels are coordinated with waste receipt, minimizing the number of panels that are opened at any one time.

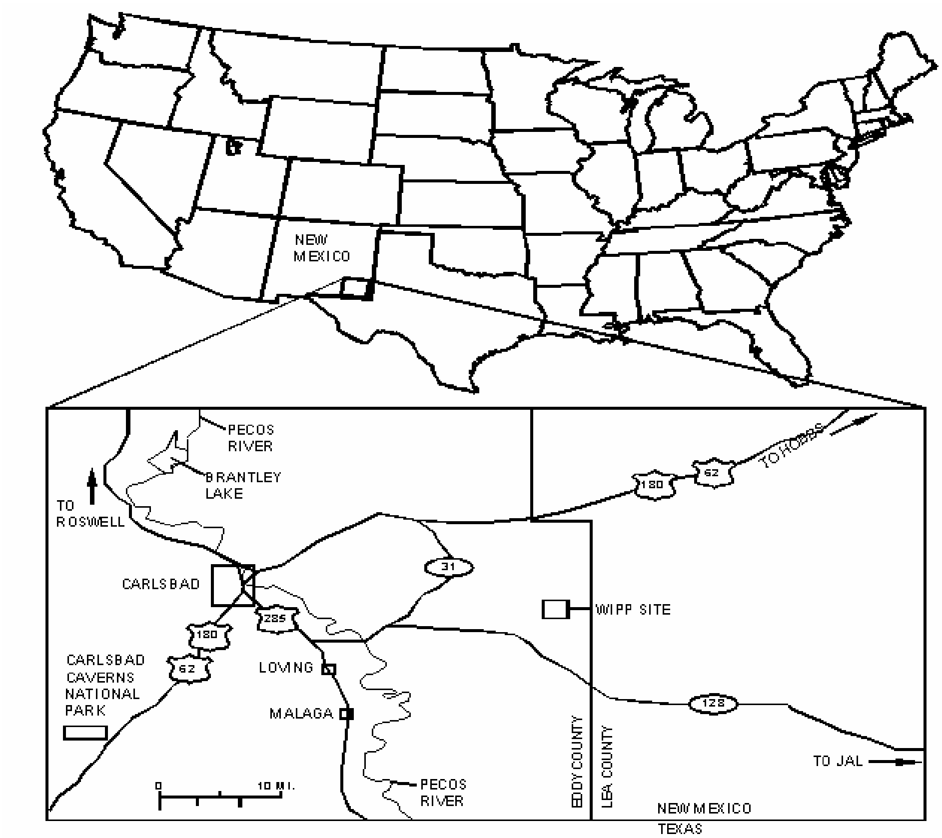

Figure 1. The Waste Isolation Pilot Plant Located in Eddy County (New Mexico)

The underground ventilation system is split into four separate ventilation circuits. A dedicated ventilation circuit (or air flow pathway) provides air to the disposal panels inhibiting the spread of contamination in the unlikely event radioactive material becomes airborne. Separation of the air flows is maintained by the use of a series of ventilation bulkheads until all air flows are recombined at the bottom of the exhaust shaft. A pressure differential (separating low and high pressures) is maintained between the ventilation circuits to ensure that air will flow from the non-radiation areas (locations where radioactive waste is prohibited, and the least contamination potential) to the radioactive materials areas (locations immediately next to the waste that have the highest contamination potential).

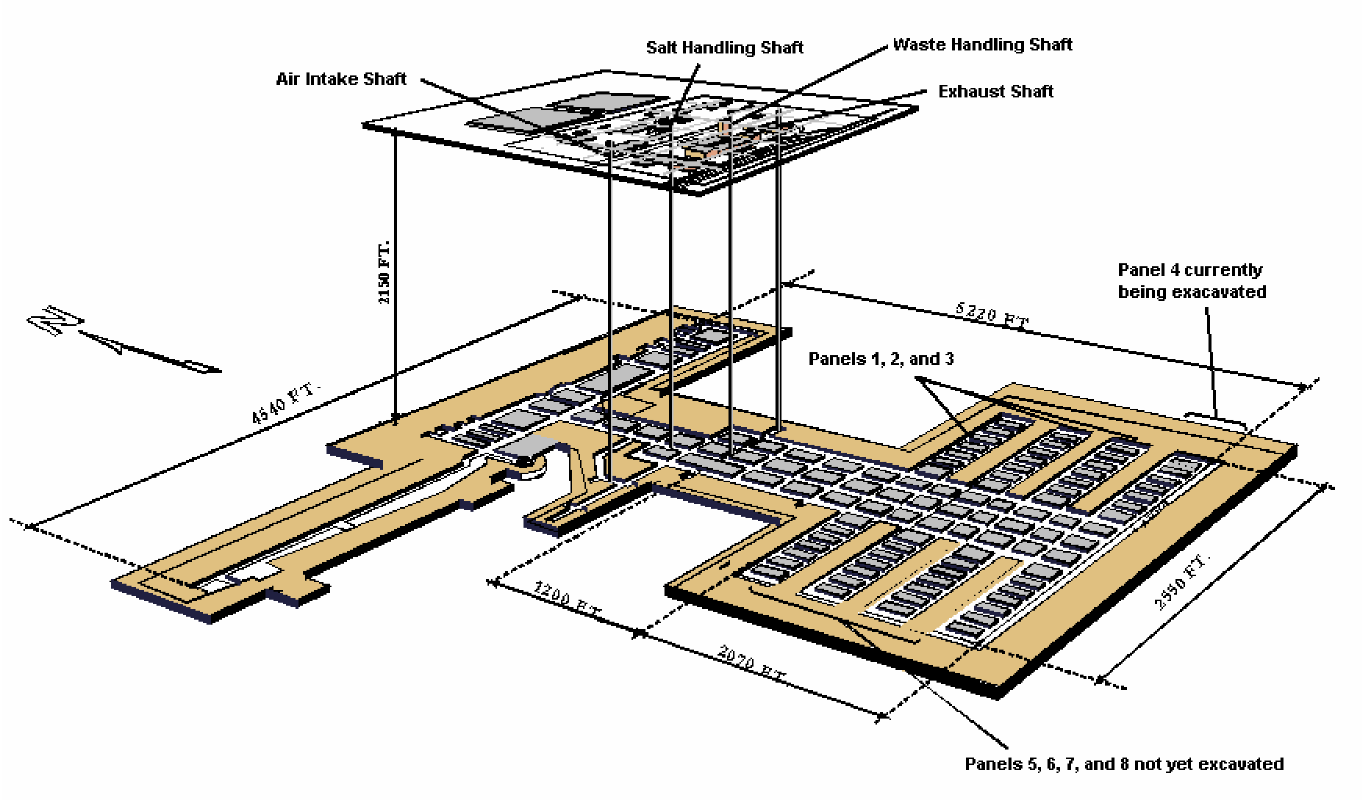

Figure 2. WIPP Layout

High efficiency particulate air (HEPA) filtration maintains a negative pressure differential between the outside environment and the waste handling environment. This provides a secondary confinement barrier against the release of radionuclides to the environment, where the waste containers themselves are considered the primary barrier. The negative pressure differential ensures that any leaks into the WHB structure will result in an inflow of outside air, which inhibits the release of airborne contamination from inside the WHB to the environment.

During the operational period, WIPP is subject to regulation under Title 40 CFR, Part 191, Subpart A, per the enactment of the WIPP LWA in October 1992 (PL 102-579). The WIPP LWA was amended in September 1996 (PL 104-201, Subtitle F). Section 9(a)(1) states the applicability requirements, "Beginning on the date of the enactment of this Act, the Secretary [the Secretary of DOE] shall comply with respect to WIPP, with: (A) the regulations issued by the Administrator [of the EPA] establishing the generally applicable environmental standards for the management and storage of spent nuclear fuel, high-level radioactive waste, and transuranic radioactive waste and contained in Subpart A of Part 191 of Title 40, Code of Federal Regulations." Section 9(a)(2) describes the periodic oversight duties of the administrator and state, "The Secretary shall, not later than 2 years after the date of the enactment of this Act, and biennially thereafter, submit documentation of continued compliance with the laws, regulations, and permit requirements described in paragraph (1) to the Administrator, and with the law described in paragraph (1) (C), to the State." The DOE is in compliance with the WIPP LWA requirements.

The DOE continues to comply with the EPA radiation protection standards for management and storage of TRU mixed-waste at the WIPP. The standard relevant to this document was issued by the EPA in 1985 and is contained in Title 40 CFR, Section 191.03(b). The standard requires the DOE to provide both whole body radiation dose and critical organ radiation dose for the maximally exposed individual. The standard states that "The combined annual dose equivalent to any member of the public in the general environment resulting from discharges of radioactive material and direct radiation from such management and storage shall not exceed 25 millirems (mrem) to the whole body and 75 millirems to any critical organ. The combined annual dose equivalent to any member of the public is calculated by using a combination of the site-specific data and the EPA CAP88-PC computer model output data for the maximally exposed individual (EPA, 2000).

The DOE has implemented radiation protection standards for the management and storage of transuranic waste at the WIPP. On December 30, 1994, the EPA granted approval to the WIPP on use of the shrouded probe technology for effluent monitoring (U.S. EPA, 1994). This approval letter was received from the EPA Assistant Administrator for Air and Radiation and grants DOE the approval to use the alternate approach based single-point sampling and the shrouded probe. The original shrouded probes and their transport assemblies were installed in 1988 by Westinghouse Electric Corporation personnel. The shrouded probes sample effluent air as it exhausted from the WIPP underground repository.

The DOE directed the cooperative effort of the Los Alamos National Laboratory and Texas A&M University in spear-heading the initial research and development of the shrouded probe technology, as well as being instrumental in developing the technical documentation necessary for a regulatory evaluation.

WIPP EFFLUENT MONITORING PROGRAM

The WIPP facility has three effluent air monitoring stations. These are known as Stations A, B, and C (see Figure 3). At Station A, unfiltered air is exhausted from the repository to the atmosphere. At Station B, HEPA filters are first used to filter the exhaust from the repository.   When in *filtration mode*, Stations A and B are mutually exclusive (i.e., when air is exhausted from one Station, none is exhausted from the other Station). Stations A and B sample the same air when operating in the *maintenance bypass*, *reduced*, or *minimum* mode. Station C is used to sample the exhaust from the WHB. Prior to sampling activities at Station C and then venting to the atmosphere, the collective air passes through HEPA filters.

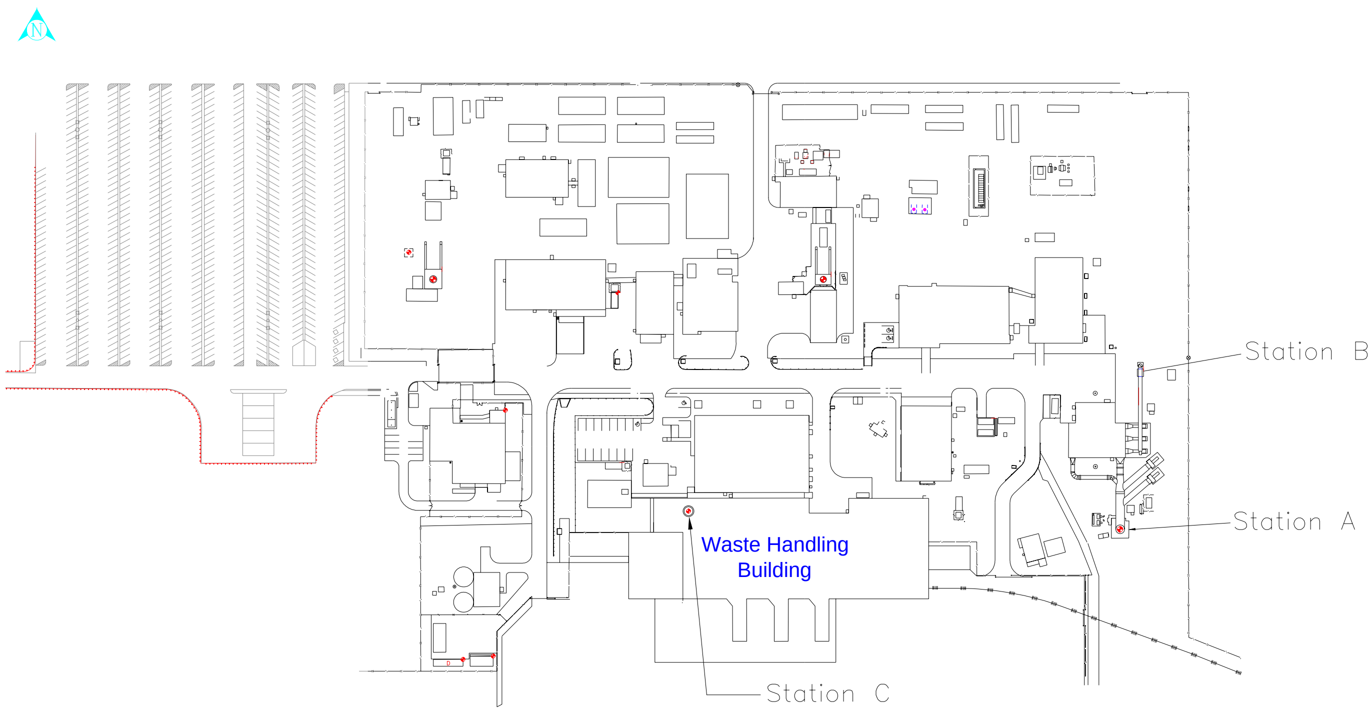

Figure 3. WIPP Effluent Air Monitoring Stations (Station A, Station B, and Station C)

Station A is located at the top of the exhaust shaft and contains openings in the floor to permit access to the exhaust shaft. The openings are designated A1, A2, A3, and A4, which contains the weather probe. The three sampling lines (A1, A2, and A3) extract air from the exhaust shaft as illustrated in Figure 4. The sampling lines are fitted with shrouded probes, which has an inner probe located concentrically within a cylindrically shaft shroud (see Figure 5).

Additional fixed-air samplers (FASs) and continuous air monitors (CAMs) are maintained at strategic locations in the WHB and in the underground repository to monitor the levels of airborne radioactivity for operational purposes. Readouts from the underground CAMs are displayed in the Central Monitoring Room, a continuously occupied location from which WIPP facility operations are monitored.

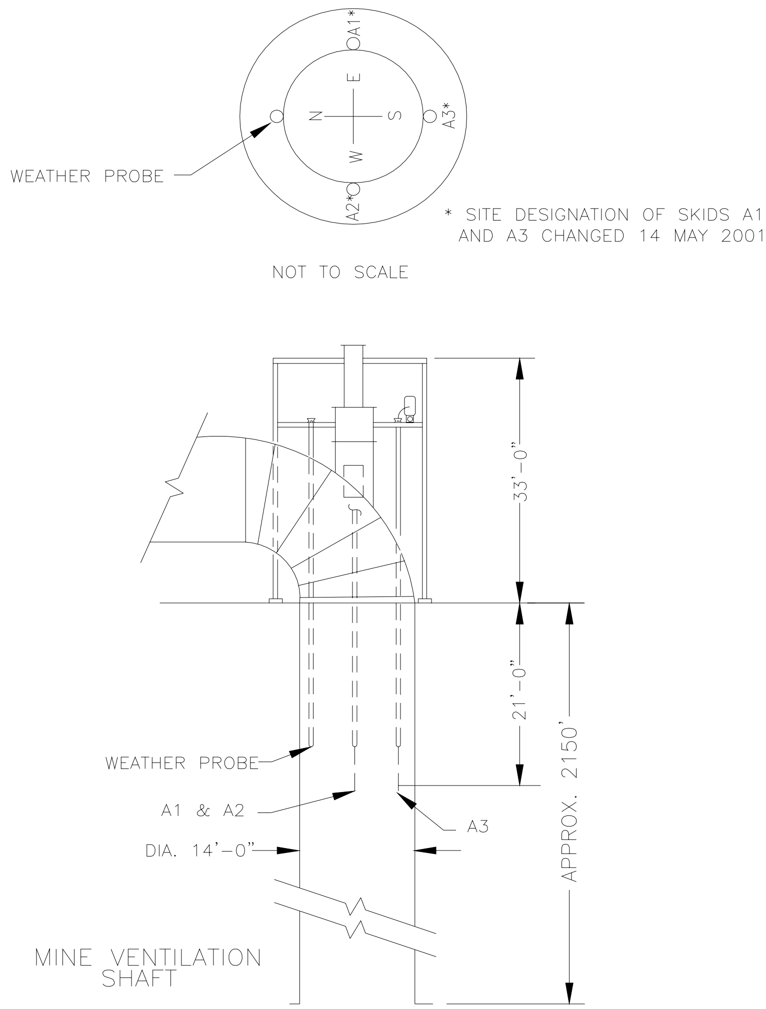

Figure 4. Top and Side View of Exhaust Shaft and Station A

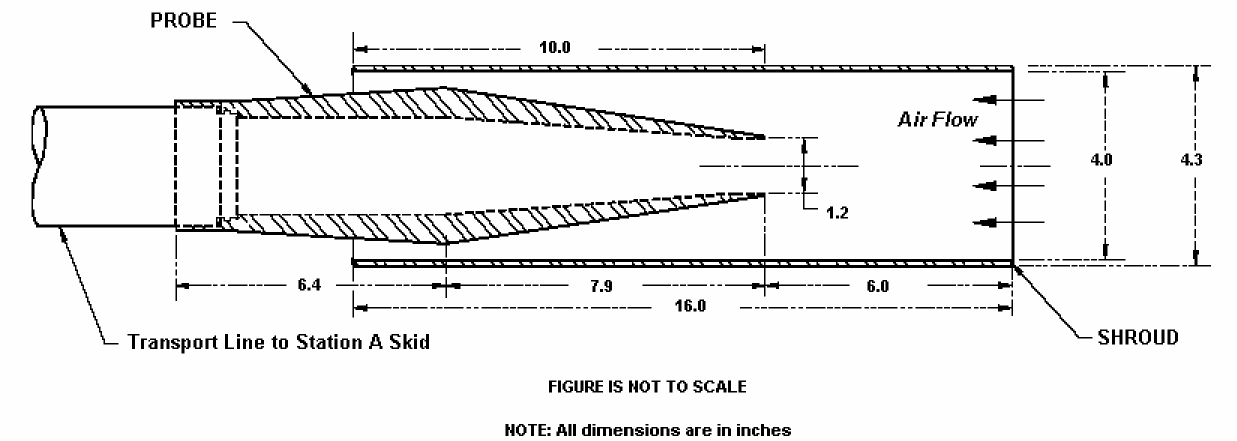

Figure 5. Schematic of Shrouded Probe (used at Stations A and B)

The WIPP facility uses skid-mounted FASs at each effluent air monitoring station (Stations A, B, and C) to collect representative samples of airborne particulates (See Figure 6). A FAS consists of two independent vacuum pumps; one vacuum pump supplies the vacuum and the other functions as a backup. In the event of an external power failure, an uninterruptible power supply provides sufficient power to operate all FASs for approximately 30 minutes. Diesel generators are available to supply electrical power should the electrical outage last longer than 30 minutes. A formal preventive maintenance program includes monthly shrouded probe cleaning activities, and when necessary, a more extensive transport line inspection and cleaning in-place. The monthly preventive maintenance and the shrouded probe conditions are observed, reviewed and evaluated by the WIPP oversight groups. Non-routine maintenance is also performed during the months when salt encrustation and moisture is most prominent. The inspection and maintenance activities, and the pass/fail criteria are described in the Station A preventive maintenance procedure. The criteria of the salt buildup on the Station A probes is stated in the WTS Preventive Maintenance procedure, PM364005, Inspection and Cleaning of Station "A" Sample Probes BLDG. 364 that states, "The limit of salt buildup at the probe inlet should be no more than 2/3 of that area. The buildup of salt blocking the shroud exhaust should be limited to no more than 1/3 of that area." The "as found" and "as left" conditions of the shrouded probe are documented after each preventive maintenance activity. The shrouded probe that provides the sample of record for Station A has always been found "acceptable," per the technical basis used to ensure a representative sample at the exhaust discharge (DOE/WIPP 93-043, 1993).

Controlled operating procedures are used at the WIPP facility to ensure uniform methods are used to collect, package, and transport FAS filters. The use of such procedures provides a means for demonstrating quality assurance of air emission data. At Station A, a FAS filter sample is collected, each working shift or more frequently as needed in order to assure a representative sample. At Station B, a FAS filter sample is collected weekly or as needed. At Station C, a FAS filter sample is collected weekly or as needed. Appropriate chain of custody is established and implemented for each filter sample to record sample traceability throughout the sampling and analysis process.

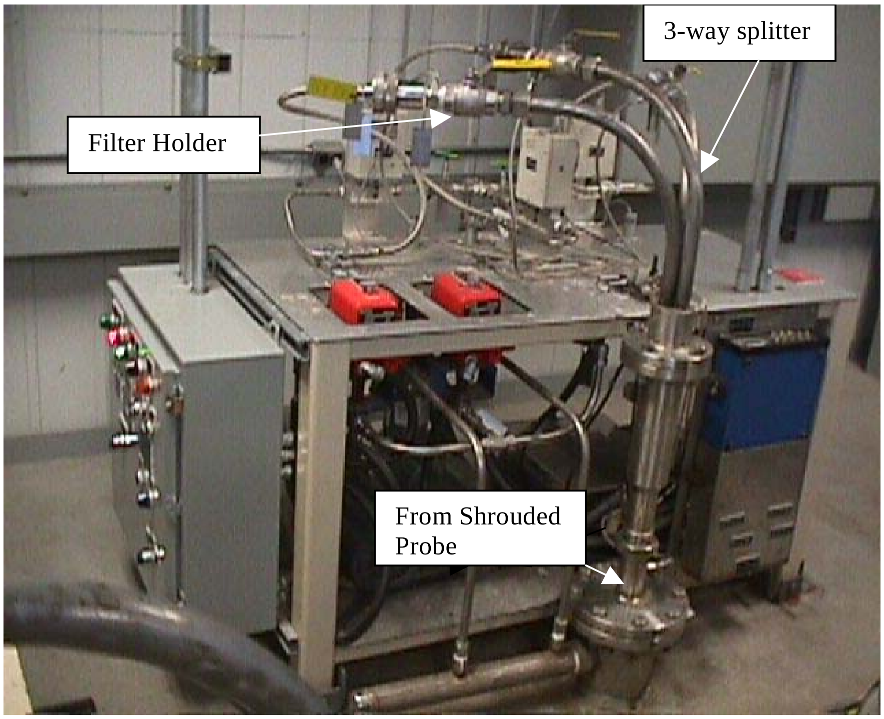

Figure 6. WIPP Station A Sample of Record Skid (Skid A-3)

Filter samples from all three stations are routinely analyzed for ^{238}Pu, $^{239/240}$Pu, ^{241}Am, and ^{90}Sr. The filter samples are composited each quarter for Stations B and C. Because of the large number of samples from Station A, these samples are composited monthly. Prior to the samples being submitted for composite isotopic analysis, all compliance filter samples undergo an initial gross alpha and gross beta analysis. The processing and documentation time for a gross alpha and gross beta analysis averages one week. After review and validation of the analytical data package for the filter samples, the samples are resubmitted to the WIPP Laboratories for a composite isotopic analysis to be performed. The WIPP Laboratories processing and documentation time is typically 30 to 35 business days.

The DOE is also receiving data and information from the independent sample collection and monitoring of Station A performed by the Carlsbad Environmental Monitoring and Research Center (CEMRC).

Based on the WIPP monitoring results for calendar year (CY) 1999 through 2003, a summary of WIPP's annual effective dose equivalents is contained in Table 1 (DOE/WIPP 02-2171, 2002 and DOE/WIPP 00-2171, 2000). These results are well below the 25 mrem per year limit to the whole body, and the 75 mrem per year limit to any critical organ as required by 40 CFR 191, Subpart A, Section 191.03(b). To provide perspective, the BEIR V Report documents (Biological Effects of Ionizing Radiation V, 1990) that the average person in the United States receives 360 mrem/year of radiation exposure.

Table 1. Summary of WIPP's Annual Effective Dose Equivalents

Calendar Year	Location of Maximally Exposed Individual (meters)	WIPP's Annual Effective Dose Equivalent Per CAP88-PC Calculations	
		Whole Body (mrem/year)	Critical Organ (mrem/year)
1999	350	$3.05x10^{-5}$	$5.31x10^{-4}$
	7500	$2.23x10^{-6}$	$3.88x10^{-5}$
2000	350	$9.07x10^{-5}$	$1.58x10^{-3}$
	7500	$5.20x10^{-6}$	$9.05x10^{-5}$
2001	350	$9.70x10^{-5}$	$1.69x10^{-3}$
	7500	$4.37x10^{-6}$	$7.60x10^{-5}$
2002	350	$1.51x10^{-4}$	$2.46x10^{-3}$
	7500	$7.56x10^{-6}$	$1.23x10^{-4}$
2003	350	$1.15x10^{-4}$	$1.85x10^{-3}$
	7500	$5.98x10^{-6}$	$9.61x10^{-5}$

ACCOMPLISHMENTS AND IMPROVEMENTS TO THE EFFLUENT MONITORING SYSTEM

On January 2, 2001, the DOE's Carlsbad Field Office (CBFO), Washington TRU Solutions LLC (formerly Westinghouse TRU Solutions LLC) (WTS), the Environmental Evaluation Group (EEG), and the CEMRC staff jointly developed a Memorandum of Understanding (MOU) for effluent monitoring at Station A of the WIPP. The primary purpose of the MOU was to provide a cooperative process, which would enable CEMRC and EEG to independently, evaluate WIPP underground aerosol effluents. The MOU assures that the WIPP MOC to effectively, efficiently, and in compliance with applicable requirements, operate the Station A sampling/monitoring location of the underground exhaust ventilation.

The referenced MOU in turn obligated WTS, EEG, and CEMRC to sign an agreement to coordinate their independent efforts to monitor air released from the WIPP. Prior to this occurrence, there was no formal provision for notifying all parties about occurrences that could impact the integrity of the particulate filter samples taken. These notifications were completed informally. Under a revised Protocol, WTS formally notifies EEG and CEMRC as soon as possible when any of the following events occurs:

- There is a non-routine shift to filtration of the underground ventilation
- Power is secured at any time to the sample of record skid
- Filters are removed other than at prescribed times
- There's a sustained low flow of air to any channel on the "sample of record" skid

- Non-routine maintenance is performed on the sample of record skid that could possibly affect sample integrity
- Prior to a filter change requested by either EEG or CEMRC
- An event in the underground that could contaminate the filters (e.g. the discharge of a fire suppression system)

Under the Protocol, notifications are made through the WIPP Emergency Notification System.

The availability and free exchange of air monitoring and other environmental information associated with WIPP is key to enhancing public acceptance and understanding of the WIPP Project. Provisions of the protocol further strengthened the independent, oversight of WIPP performance conducted by EEG and CEMRC.

In early 2001, a group called the Air Monitoring Improvement Team (AMIT) was formed. The AMIT was comprised of WTS and DOE CBFO personnel. EEG and CEMRC were also invited to these meetings. The AMIT's primary function was to address any discrepancies identified by the organizations that were monitoring at Stations A, B, and C, and to make certain that a solution was made immediately to resolve the problem at hand. Another objective that the AMIT members undertook was to improve or redefine operation/availability of existing air monitoring systems or identify alternatives to these units. Ideas were generated and AMIT members were assigned various tasks, which required preparation of a short report determining feasibility of task. The AMIT members were requested to work with appropriate cognizant organizations to identify tasks, provide cost estimates, or cost savings, and identify changes to procedures, policies, or plans in the short report. As the meetings progressed, these ideas were discussed, some ideas were dropped and some ideas were held for additional discussions and completed.

One of these AMIT meetings discussed a project plan for development of a Station A personal computer (PC) based monitoring system. The PC based monitoring system improvement was implemented and the system replaced local flow recorders. This allowed the data to be monitored and archived. The data that is collected on each FAS consists of the date, time, flow, and differential pressure across the filter, humidity, temperature and gauge pressure.

Another idea presented by WTS would require a change in the performance of the preventive maintenance procedure/process for Station A. WTS's idea was to unscrew the shrouded probe portion from the transport line. A 1-inch threaded fitting allows the shrouded probe to be unscrewed from the end of the transport line assembly. This section hereafter will be called the probe tip. WTS's idea was that each month the entire probe tip would be changed out and installed with a clean probe tip. The probe tip that is removed would be soaked and cleaned and be ready for the next month's probe cleaning. The advantages include: the quality of probe tip cleaning would increase, maintenance time and cost would be reduced, and maintenance personnel could avoid working directly underneath the entire suspended shrouded probe. The proposed change for the cleaning process was determined to be in agreement with the American National Standards Institute (ANSI) standards. The Station A preventive maintenance procedure and process were revised and changes were implemented.

The handling of potentially contaminated filter samples was a concern that was brought to the AMIT members by WTS. The concern was that WIPP procedures and/or policies might not have addressed the offsite handling, release, and transportation of potentially contaminated particulate filter samples. The samples in question are those that are collected from Station A. WTS and CEMRC initiate and collect particulate filter samples from Station A on a daily basis. In a step-wise manner, the WTS filter samples are analyzed onsite for gross alpha and gross beta analysis, then the filter samples are then taken offsite for composite isotopic analysis by the WIPP Laboratories. In the period between 2001 and early 2004, both EEG and CEMRC collected filter samples and performed all analyses at facilities located in Carlsbad. This matter was further addressed by controls that stated that if there was a potential release from the WIPP facility, the Station A area would be designated a controlled area, and posted as a "Contaminated Area". This limits access to the area to only personnel who have obtained Radiological Worker II training. The control measures also dictate that if there were a potential release, any radioactivity on Station A filter samples would be under the custody of the Department of Energy.

At the time, WTS procedures allowed for the shipping of radioactive material but not for the transferring of samples to non-DOE organizations. After much discussion, both EEG and CEMRC indicated they would prefer to take custody of the filters at Station A as soon as possible. This required the development of a procedure to allow the transfer of custody of the filter samples from DOE to the NRC licensed organizations. A WTS Transportation Engineer also provided input describing the U.S. Department of Transportation requirements. Implementation of this matter required, an extensive review of the regulatory requirements, WTS to maintain and keep on file copies of EEG's and CEMRC's licenses, identification of the requirements for properly packaging a sample for transportation, and revisions to the WTS procedure stating the relinquishing process for all parties involved.

In November 2001, the bi-weekly AMIT meetings were reduced to monthly meetings. This determination was based on the fact that all identified activities were being worked. All AMIT members were in agreement with the proposed change. The AMIT was phased out in 2003 once all activities were completed.

Other notable AMIT accomplishments included:

- Expanding the Station A preventive maintenance activities to periodically flush out guide tubes to loosen the salt build-up
- Conducting joint gravimetric studies with CEMRC and EEG and the sharing of results
- Installation of Station D at a qualified location in the underground facility
- CEMRC Study on Filter Backings
- Placement of RADOS and Canberra CAMs in the underground facility for testing for improved underground monitoring efficiency

- Placing a contract with Texas A&M to re-certify the Station C main HVAC exhaust duct sampling point to the 1999 ANSI 13.1 standards; Station C is currently certified to the 1969 ANSI standard

In April 2003, a group called the Effluent Monitoring Improvement Group (EMIG) was formed to continue system improvements and continues to be an active group today. The EMIG is comprised of WTS and DOE CBFO personnel. CEMRC staff is also invited to these meetings. WTS and DOE initiated regular meetings with WIPP Oversight and CEMRC to pursue further improvements to the WIPP Effluent Monitoring Program. The discussion topics at each meeting cover concerns, ideas, potential changes, or other issues that could result in air monitoring improvements at the WIPP.

WTS and DOE have actively sought improvements to put the WIPP Effluent Monitoring Program beyond reproach. Both WTS and DOE have actively looked at alternatives. The need to examine the shrouded probes more frequently due to seasonal changes was discussed, and has resulted in instituting a more rigorous cleaning and inspection at Stations A, B, and C, during their monthly preventive maintenance activities. A further inspection of the Station A shrouded probes, transport assemblies, and their guide tubes has been included in the exhaust shaft inspections. Analyses are continuing on salt samples that were collected in the underground to determine baseline radioactivity levels.

In response to questions about the impact of salt water entering the exhaust shaft, presented by EEG at the January 30, 2003 EMIG meeting, a WTS Mine Engineer provided a presentation titled, “Brief Introduction to Shallow Seepage into the Exhaust Shaft”. A handout was provided that covered the following topics: exhaust shaft characteristics, shallow liner details, exhaust shaft atmosphere near collar, seepage alternatives, grouting cost and effectiveness, grouting benefits, grouting risks, and grouting cost/benefit. The presentation included a review and discussion of a video inspection of the exhaust shaft. In a paper presented by an EEG staff member in 2003, titled *Concerns Relating to the Effluent Air Sampling for the WIPP Exhaust Shaft*, EEG stated that WIPP should eliminate the flow of water into the exhaust shaft. Subsequent studies indicated that the chances of attaining an absolute dry shaft were remote, and it would be very expensive and require regular maintenance to eliminate some of the water. All area shafts, including those at WIPP, typically experience seepage of water. The WIPP exhaust shaft by mining standards is considered a dry shaft. WIPP agrees with the EEG conclusion that “There appears to be no inexpensive or timely solution for the water problem, therefore, EEG believes that further work to eliminate the inflow of water for the purpose of air sampling is unnecessary.”

CEMRC and WTS have initiated a study on utilization of special coatings for the shrouded probes. Many options were available and discussions of these occurred. The primary purpose of the study was to determine alternative probe coatings that would mitigate or reduce salt encrustation. The allowable limits for encrustation was discussed pointing out the differences between the ANSI N13.1999 standard and Texas A&M studies. The study involved constructing an array of stainless steel and stainless steel-coated surfaces, and was designated as the Coupon Test.

The location of the Coupon Test was inside the main exhaust duct immediately south of the location where the 700A and 700C branch ducts depart from the main duct. Further support and completion of the Coupon Test will require additional funding for procurement of one additional probe for coating and testing and technical support for completion of the tests in Fiscal Year 2005. Documentation of this activity is documented in a white paper by CEMRC.

Calendar Year (CY) 2001

During 2001, the physical location of the Station A skids were exchanged (Skid A-1 was moved to the location previously occupied by Skid A-3 and Skid A-3 was moved to the location previously occupied by Skid A-1; each skid retained its original designation, each piece of equipment also retained its original equipment number, and all conduits were reconnected per design; Skid A-1 now samples air from the east probe and Skid A-3 samples air from the south probe). The reason for exchanging the location of the skids is to place the Record of Release skid (A-3) in a sampling location that has been proven to be much less prone to plugging from salt encrustation. Since April 2001 to the present, Skid A-3 has always met the acceptable representative sampling criteria of a blockage of no more than 33% of the shroud exhaust opening area during the probe cleaning activities. This sampling criterion is established by procedure for collection of a representative sample (PM364005, Inspection and Cleaning of Station "A" Sample Probes BLDG. 364). Based on the performance of the skids, this exchange of locations has achieved its intended purpose (See Figure 7).

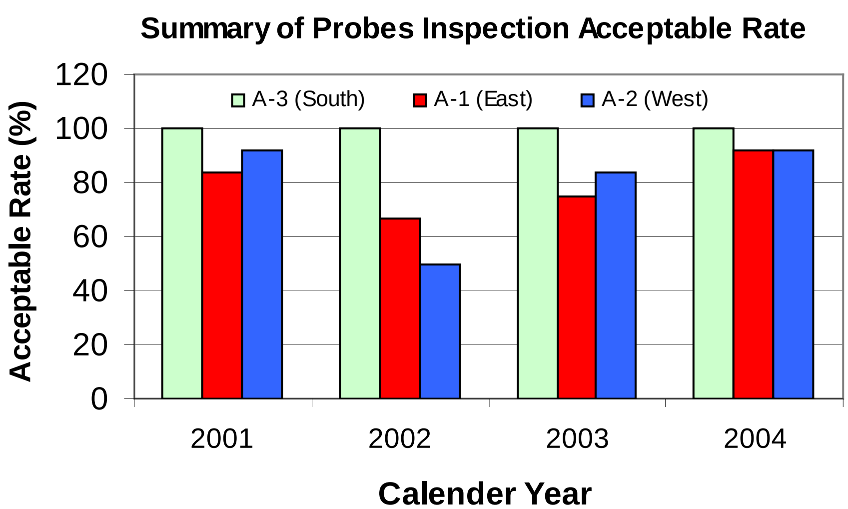

Figure 7. Monthly Probe Inspections and Cleaning (Acceptable Rate)

Also during 2001, at the request of the technicians from WTS, EEG, and the CEMRC, ball valves were installed at each effluent FAS at Station A skids, Skid A-1, Skid A-2, and Skid A-3. These ball valves were installed in series with and upstream of each FAS to provide a shut-off feature and prevent loss of particulate filter samples due to back vacuum, during the filter sample removal and change-out process (see Figure 8). This installation was successfully completed in September 19, 2001.

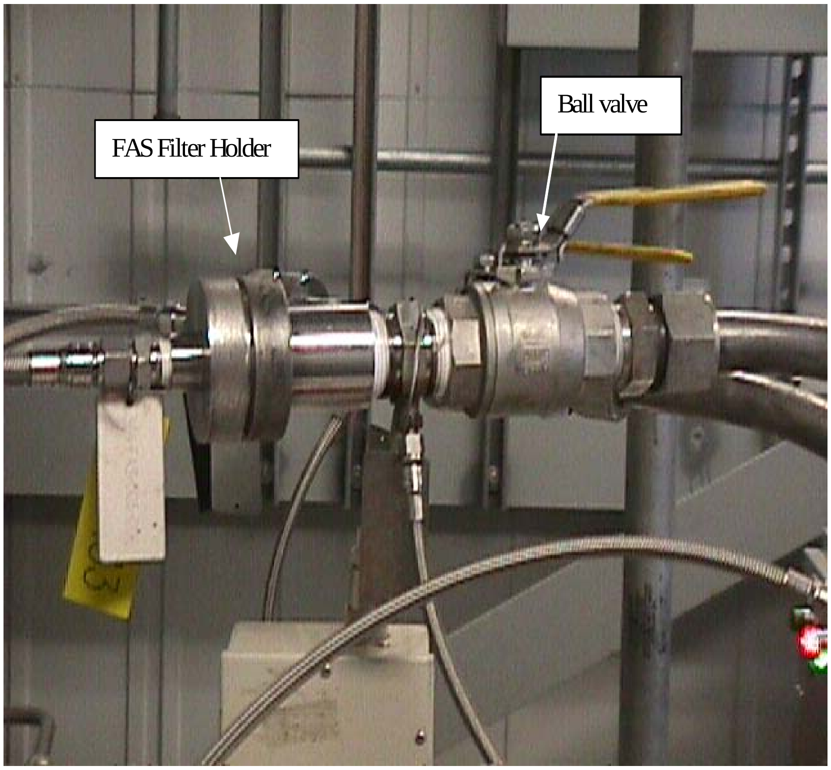

Figure 8. Sample Line Assembly Containing a Filter Holder and a Ball Valve

CY-2002

During 2002, modifications were undertaken on the Station A effluent monitoring station, Skid A-1, A-2, and A-3. New hardware was installed on each referenced skid and each skid was tested and accepted for use by the cognizant sampling groups prior to modifications being performed on the next skid. During these equipment modifications and testing, a primary and secondary sample of record was maintained. The work performed consisted of the following:

- New identification tags were fabricated for the new equipment and/or equipment whose numbers were changed.
- On each skid, a vacuum test was performed on each three-way splitter assembly and the new skid tubing and piping.
- A calibration of the flow control instrumentation was performed
- An individual pressure transmitter was installed on each skid, replacing the single differential pressure transmitter for all of the skids
- A gauge pressure transmitter was added to measure the vacuum in the transport line on each skid
- A portable computer was installed to log the data provided by the instrumentation installed on each skid
- Motor operated valves were added to Skids A-1 and A-2 to make them match the configuration of Skid A-3; this allows any of the skids to be used as the primary skid of record

- A verification of the Control and Monitoring System point numbers, such as the flow signal for Channel 3 and the differential pressure being sent to the Central Monitoring Room (CMR) was performed
- Three new Input/Output enclosures were created
- A functional test of the vacuum pumps and pressure transmitters was performed and output readings confirmed with the readings in the CMR

During April and May 2002, the Toshiba ® Uninterruptible Power Supply (UPS) units installed at the Station A sampling skids, Skid A-1, Skid A-2, and Skid A-3 were replaced. These UPS units were replaced with new backup power consisting of an inverter for the motors and a mini-UPS for the electronics. In addition, three mobile platforms were fabricated utilizing aluminum plate and casters, to allow for rolling of the platform into and out of Station A skid ends without interfering with any floor brackets. One inverter, two batteries, a 300A fuse and block were mounted on each of these platforms. The inverter inputs and outputs were wired into the terminal locations used by the previous UPS/Transfer Switch backup power system. Six nameplate tags were fabricated and attached to the new equipment, after installation. These actions further improved system reliability and minimized any down time. They also provided continuous sampling capability.

CY-2003 and CY-2004

During the 2nd quarter of 2003, the WIPP Laboratories, while performing an isotopic analysis, identified a small concentration of radioactivity (0.1 dpm) on Station A filters. This value was near the WIPP Laboratories lowest level of instrument detection. This concentration, if released every day, could give an annual dose of 5.14×10^{-6} mrem to the maximally exposed off-site individual. This result is well below the 25 mrem per year limit to the whole body, and the 75 mrem per year limit to any critical organ as required by 40 CFR, Section 191.03(b). A complete review of WIPP activities during the monitoring period was completed and there was no indication of any loss of containment from the stored waste. There was, however, similar concentrations identified in environmental samples dating back before the WIPP received any waste. An air sample, from one of the low-volume air samplers, obtained in 1997 showed a plutonium activity of 6 dpm (60 times higher than the observed value). The CEMRC 2002 Annual Report shows soil concentrations near the Project Gnome Site at about 90 dpm (900 times higher than the observed value). The Gnome Site is located less than nine miles southwest of the WIPP exclusive use area. These regional background levels can be attributed to either from the Project Gnome nuclear test, atmospheric fallout from global weapons testing, or combinations of both. The Project Gnome site activities are not associated with the WIPP site activities.

In response to the small concentration of radioactivity detected, the following actions were taken by the WIPP that continues into CY-2004:

- A background database using effluent air monitoring composite results was developed. This database makes it easier to compare background activity levels to action levels and compliance limits.

- An action plan for Station A measurement was developed. This plan lays out a sequence of events (actions) that will be performed to identify the source of measured radioactivity.
- Backup skid filter samples undergo immediate gross alpha and gross beta analysis in the event that verification of the primary filter sample is needed. This simplifies and speeds up the filter sample analysis improving the overall response time.
- Filter samples obtained from FAS's placed in strategic locations in the underground for operational purposes are routinely analyzed for gross alpha/gross beta analysis. These FAS filter samples are saved and can be analyzed if Station A filters showed positive results. These filters are continuously tracked and would be indicators of a potential release.
- A statistical analysis has been performed dating back to 1995 of environmental air samples. This analysis shows that Station A activities are probably due to environmental levels of plutonium in the absence of any operational anomalies. The plutonium contamination is in the soil, it becomes very mobile in arid regions-especially during the seasonal period of high winds (second quarter for New Mexico). See 2003 Paper by Richard Arimoto, CEMRC.

We will be pursuing further significant improvements to the WIPP Effluent Monitoring system in CY-2005. The rigorous controls of the waste emplacement process, real time monitoring during each phase of waste receipt, off-loading, transport, emplacement and in-place monitoring show that continuous monitoring at Station A is not necessary to ensure safe management of the waste. We should pursue implementation of periodic confirmatory monitoring at Station A in full compliance with 40 CFR Part 191, Subpart A requirements.

INDEPENDENT VALIDATION OF WIPP's EFFLUENT MONITORING COMPLIANCE

1. Completion of a study had been undertaken by WTS to understand the effects of naturally occurring radon gas on the WIPP underground radiological surveys. The results were published in the *Preliminary Measurement of Surface Removable NORM Activity in the WIPP Underground*, Health Phys. 82(Supplement 2): S103-S107; 2002.

2. Environmental Evaluation Group Report Numbers, EEG-88, and EEG-90 both state that for 2 micron (µm) diameter particles and below, the sample is "representative". (See Gray, D. H., EEG-88, 2003, and Gray, D. H., and Ballard, S. C., EEG-90, 2003). There is no evidence that the sample is not representative for larger particles.

   In December 2003, a study was performed by the EEG (EEG-88) involving measurements of naturally occurring atmospheric tracer radionuclides ^{7}Be and ^{210}Pb. The study support the increased level of confidence that the effluent air samples are representative for the smaller (<2-micron-diameter) aerosol particles.

While the EEG-90 publication focuses on "EEG Operational Radiation Surveillance of the WIPP Project during 2002", the statement that the WIPP effluent air samples are representative for the smaller (<2-micron-diameter) aerosol particles is repeated. EEG-90 further states that "…for the aerosol associated with ^{7}Be and ^{210}Pb, the sampling regime at the Station A skid of record (skid A-3) was relatively unaffected by the water inflow and salt encrustation problems observed between September 2001 and the present."

Note: EEG, CEMRC, and WTS collected gravimetric data during January and June of each year. For January 2002, June 2002, January 2003, and June 2003, the gravimetric data indicated good correlation among the three legs of Skid A-3. An equal split of the particulate mass among the three legs is essential to demonstrate that each sample filter receives an appropriate sample portion.

3. Environmental Evaluation Group Report Number, EEG-80 discusses issues related to salt encrustation and water inflow. (See Kenney, J. W., EEG-80, 2001). EEG-80 states that the EEG recommended improvements to the WIPP effluent air monitoring system at WIPP were already under consideration by the DOE and the management and operating contractor. EEG supported moving the sample of record skid A3 to the south side which has the least amount of water flow; monthly inspection (and cleaning as necessary) of probes; installing new hardware that provides a uniform split of particulate mass among the three legs at the Station A skids; establishing uniformity in the methodology used for desiccation and weighing of filters, and clean and refinish the interior of transport lines between the splitter block and filter housing.

4. Environmental Evaluation Group Report Numbers, EEG-73, EEG-79, EEG-81, EEG-84, and EEG-90 all concluded that WIPP operations did not result in measurable releases to the environment or radiation doses to the public during preoperational and operational radiation surveillance's. (See Kenney, J. W., Gray, D. H., Ballard, S. C., and Chaturvedi, L., EEG-73, 1999; Gray, D. H., Kenney, J. W., and Ballard, S. C., EEG-79, 2000; Gray, D. H., and Ballard, S. C., EEG-81, 2001; Gray, D. H., Ballard, S. C. and Channell, J. K., EEG-84, 2002; Gray, D. H., and Ballard, S. C., EEG-90, 2003).

5. August 21, 2003, CEMRC provided a presentation titled *Highlights of the CEMRC WIPP Environmental Monitoring (EM) Program (Ambient Aerosols & Station A)*. The aerosol study objectives were: (1) to characterize spatial and temporal variations in the concentrations of radionuclides and inorganic substances, and (2) to investigate the relationships among the substances and use meteorological information to evaluate radionuclide source(s). Summary of the results, as follows:

- No evidence for impact from the WIPP on ^{239,240}Pu and ^{241}Am.
- Seasonal cycles are evident in the concentrations of ^{239,240}Pu, ^{241}Am and Aluminum (dust) in the ambient aerosol samples.
- The ^{239,240}Pu and ^{241}Am activity concentrations are correlated with atmospheric dust loads.

- Various analytes also show seasonality at Station A.
- Not all aerosols entering the underground plate out.
- It would not be too surprising to see $^{239,240}Pu$ in the FAS samples.

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