Department of Energy
Carlsbad Field Office
P. O. Box 3090
Carlsbad, New Mexico 88221

SEP 8 2015

Mr. John E. Kieling, Chief
Hazardous Waste Bureau
New Mexico Environment Department
2905 Rodeo Park Drive East, Building 1
Santa Fe, New Mexico 87505-6303

Subject: Notification of Class 2 Permit Modification Request to the Waste Isolation Pilot Plant Hazardous Waste Facility Permit Number: NM4890139088-TSDF

Dear Mr. Kieling:

Enclosed is the following Class 2 Permit Modification Request consisting of the following item:

- Revise Volatile Organic Compound Monitoring Procedures

We certify under penalty of law that this document and the attachments were prepared under our direction or supervision according to a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on our inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of our knowledge and belief, true, accurate, and complete. We are aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

If you have any questions, please contact Mr. George T. Basabilvazo at (575) 234-7488.

Sincerely,

Original Signatures on File

Dana C. Bryson, Acting Manager
Carlsbad Field Office

Philip J. Breidenbach, Project Manager
Nuclear Waste Partnership LLC

Enclosure

cc: w/enclosure

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Class 2 Permit Modification Request

Revise Volatile Organic Compound Monitoring Procedures

Waste Isolation Pilot Plant
Carlsbad, New Mexico

WIPP Permit Number - NM4890139088-TSDF

September 2015

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Acronyms and Abbreviations

ARA	additional requested analyte
CFR	Code of Federal Regulations
COC	concentration of concern
DOE	U.S. Department of Energy
DRVMP	Disposal Room VOC Monitoring Program
EPA	U.S. Environmental Protection Agency
HI	hazard index
MRL	method reporting limit
NMAC	New Mexico Administrative Code
NMED	New Mexico Environment Department
MSHA	Mine Safety and Health Act
OSHA	Occupational Safety and Health Administration
PASK	passive air sampling kit
Permit	Hazardous Waste Facility Permit
PMR	Permit Modification Request
ppmv	parts per million by volume
RAA	running annual average
RVMP	Repository VOC Monitoring Program
scfm	standard cubic feet per minute (ft^3/min)
TCE	trichloroethylene
TIC	tentatively identified compound
TRU	transuranic
VOC	volatile organic compound
WIPP	Waste Isolation Pilot Plant

Overview of the Permit Modification Request

This document contains a Class 2 Permit Modification Request (**PMR**) for the Waste Isolation Pilot Plant (**WIPP**) Hazardous Waste Facility Permit (**Permit**) Number NM4890139088-TSDF.

This PMR is being submitted by the U.S. Department of Energy (**DOE**) and Nuclear Waste Partnership LLC, collectively referred to as the Permittees, in accordance with the Permit, Part 1, Section 1.3.1. (20.4.1.900 New Mexico Administrative Code (**NMAC**) incorporating Title 40 of the Code of Federal Regulations (**CFR**) §270.42(b)). The modification is to revise the volatile organic compound (**VOC**) monitoring procedures. It provides for the following changes:

- Add trichloroethylene (**TCE**) to the VOC target analyte list for VOC monitoring
- Change the repository VOC monitoring locations
- Change the type of sampling equipment for VOC monitoring
- Change the sampling durations for VOC monitoring
- Revise the method of determining compliance with the surface non-waste worker environmental performance standard for air emissions
- Remove the minimum running annual average (**RAA**) mine ventilation exhaust rate
- Some editorial changes

This PMR addresses Permit-required VOC monitoring to protect the non-waste surface worker and the underground waste worker. The changes in this PMR do not reduce the ability of the Permittees to provide continued protection of human health and the environment.

The requested modification to the Permit and related supporting documents are provided in this PMR. The proposed modification to the text of the Permit has been identified using red text and double underline and a ~~strikeout~~ font for deleted information. All direct quotations are indicated by italicized text. The following information specifically addresses how compliance has been achieved with the Permit, Part 1, Section 1.3.1. for submission of this Class 2 PMR.

1. 20.4.1.900 NMAC (incorporating 40 CFR 270.42(b)(1)(i)) requires the applicant to describe the exact change to be made to the permit conditions and supporting documents referenced by the Permit.

As stated above, the Permittees are proposing changes to the WIPP facility VOC Monitoring Program. These are described as Topics 1 through 7.

Topic 1: On March 18, 2013, the Permittees requested TCE be added to the target analyte list in a Class 3 PMR[1]. This request was made because the Permittees identified that the current list of target analytes underestimates the risk to non-waste surface workers and that adding

[1] Notification of a Class 3 Permit Modification to the Hazardous Waste Facility Permit, Permit Number: NM4890139088-TSDF. Letter to Mr. John E. Kieling, Chief, Hazardous Waste Bureau, New Mexico Environment Department. March 18, 2013.

TCE would rectify the situation. On February 14, 2014, the New Mexico Environment Department (**NMED**) issued a draft Permit that included TCE in the target analyte list[2]. The draft Permit was withdrawn on March 21, 2014[3]. In the May 12, 2014, Administrative Order[4], the NMED added TCE to the target analyte list and requested that TCE be added to the Permit by the Permittees in a subsequent PMR. In response to the May 12, 2014, Administrative Order, the Permittees are proposing to add TCE to the target analyte list for the Repository VOC Monitoring Program (**RVMP**) and Disposal Room VOC Monitoring Program (**DRVMP**).

Topic 2: The Permittees are proposing to use surface locations for repository VOC monitoring instead of the underground locations specified in the Permit. The Permit currently requires the Permittees to sample at two locations in the underground repository. These locations are termed Station VOC-A and Station VOC-B (see Permit Attachment N, Figure N-1). The new locations are proposed to be termed Station VOC-C and Station VOC-D (see proposed Permit Attachment N, Figure N-1).

Topics 3 and 4: The Permittees are proposing to change the type of sampling equipment and sample durations used for the **RVMP** and the **DRVMP**.

Topic 5: Instead of revising the concentration of concern (**COC**) for each target analyte to accommodate the addition of TCE, the Permittees are revising the methodology for demonstrating compliance with the non-waste surface worker environmental performance standards and to establish associated action levels for the repository. This revised methodology relies on the determination of the actual risk to the receptor from the target VOCs. Reporting will be based on the allowable total risk to the non-waste surface worker. This risk has been established by the NMED as one excess cancer death in 100,000 (i.e., 10^{-5}) for exposure to carcinogens and a hazard index (**HI**) greater than 1.0 (i.e., HI>1.0) for exposure to non-carcinogens.[5] This revised methodology affects the RVMP only. This proposed change does not revise the methodology for the DRVMP. The methodology for determining compliance with the environmental performance standards for underground waste workers, as measured by the DRVMP, remains the same because these exposures are based on acute exposure limits determined by the U.S. Occupational Safety and Health Administration (**OSHA**) and they have not changed. The Permittees are proposing the use of alternative remedial actions should the action levels in Permit Part 4 be reached.

Topic 6: The Permittees are proposing to remove the minimum RAA mine ventilation exhaust rate of 260,000 standard ft^3 per minute (**scfm**) in order to address underground ventilation system filtration mode.

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[2] Draft Hazardous Waste Permit for Waste Isolation Pilot Plant. February 14, 2014.

[3] RE: Waste Isolation Pilot Plan, EPA I.D. Number NM4890139088: Notification of Draft Permit Withdrawal Regarding the Class 3 Permit Modification Request for 3 Items: Item 1, Modifications to the WIPP Panel Closure; Item 2, Repository Reconfiguration of Panels 9 and 10; Item 3, Revise Volatile Organic Compound (VOC) Target Analyte List and Other Changes to the VOC Monitoring Program.

[4] Administrative Order under the New Mexico Hazardous Waste Act § 74-4-13, Waste Isolation Pilot Plant, Hazardous Waste Facility Permit Number: NM4890139088-TSDF. Ryan Flynn, Secretary of Environment. May 12, 2014.

[5] The NMED rationale for establishing the environmental performance standards is provided in the NMED Direct Testimony Regarding Regulatory Process and Imposed Conditions, submitted for the record in the 1999 WIPP Permit Hearing, Section “VOC Concentrations,” page 10 of 15. This modification does not propose to change these standards.

Topic 7: Some minor editorial changes are also being made, for example: some acronyms are being added and/or corrected where required; in Attachment N, Section N-5a(3) the “EPA, 1994” citation is being corrected to “EPA, 1991”; the title of Attachment N, Section N-4d is being changed from “Sampler Maintenance” to “Maintenance of Sample Collection Units” to better reflect the contents of this section; and some references are being added and/or corrected to Attachment N, Section N-7. These and other editorial changes are needed to correct and clarify Permit text. These changes are not discussed as a separate topic in Section 3 below because they are minor changes.

The Table of Changes (Appendix A) describes each change that is being proposed and the Proposed Revised Permit Text (Appendix B) shows the changes to the Permit text in redline strikeout.

2. 20.4.1.900 NMAC (incorporating 40 CFR 270.42(b)(1)(ii)), requires the applicant to identify that the modification is a Class 2 modification.

This PMR is classified as a Class 2 modification for the reason indicated below:

> 20.4.1.900 NMAC (incorporating 40 CFR 270.42, Appendix I, Item A. “*General Permit Previsions, 4. Changes in the frequency of or procedures for monitoring, reporting, sampling, or maintenance activities by the permittee: b. Other changes…2*”

Topic 1 proposes to change the procedure for monitoring by adding a target analyte to the VOC target analyte list. This is required in Paragraph 19 of the May 12, 2014, Administrative Order. This is not a change to provide more frequent reporting, sampling, or maintenance, therefore it falls into the category of other changes.

Topic 2 proposes to change the procedure for monitoring by changing the RVMP monitoring locations from the underground to the surface. Moving the repository VOC monitoring locations to the surface will continue to protect the non-waste surface worker and provide an equivalent RVMP. The Permittees are requesting the use of VOC sampling locations on the surface since the logistics of accessing the current underground locations are complicated due to radioactive contamination. These logistic complications are addressed by monitoring on the surface as described in Section 3 of this PMR. This is not a change to provide more frequent reporting, sampling, or maintenance, therefore it falls into the category of other changes.

Topic 3 proposes to change the procedure for sampling by changing the type of sampling equipment used in the RVMP and DRVMP. The passive air sampling kit (**PASK**) has been reliably used to collect VOC samples in the underground that are used by the Permittees for assessment purposes unrelated to the Permit. The sampling assembly has been used in the hydrogen and methane monitoring and in the ongoing disposal room monitoring program for short-duration, time-integrated samples. This is not a change to provide more frequent reporting, sampling, or maintenance, therefore it falls into the category of other changes.

Topic 4 proposes to change the procedure for sampling by changing the sampling duration for the RVMP. The Permittees are proposing to increase the sampling duration from 6-hour time-integrated samples to 24-hour time-integrated samples. Experience has shown that during a typical work day at the WIPP facility, VOC concentrations are affected by ventilation changes in the repository throughout the day. Twenty-four hour samples are less likely to be affected by these changes than shorter-duration samples. The DRVMP sample locations are not subject to the same degree of variability that is experienced in the RVMP; therefore, long-duration samples are not necessary. The Permittees are proposing to change the DRVMP sample duration to short-duration time-integrated samples. This is not a change to provide more frequent reporting, sampling, or maintenance, therefore it falls into the category of other changes.

Topic 5 proposes to change the procedure for reporting VOC concentrations for the RVMP by determining compliance with the non-waste surface worker environmental performance standard for air emissions using a direct calculation of risk instead of the indirect method in the Permit. The determination of risk in the Permit uses concentrations of concern to relate underground VOC concentrations to non-waste surface worker risk. Concentrations of concern were determined by the NMED by back-calculating the underground concentration associated with a specific risk at the surface. This indirect method has assumptions regarding dispersion in the atmosphere and dilution in the underground ventilation air stream. The proposed method measures the VOC concentrations on the surface, near the point of exposure, after dispersion and dilution have occurred, and, therefore, are not assumed. The proposed method uses U.S. Environmental Protection Agency (**EPA**) risk methodology and recommended risk factors to calculate risk. The EPA methodology is the same that was used by the NMED in establishing the concentrations of concern, however, the Permittees are updating information that was provided in the original Permit Application to satisfy the requirements of 20.4.1.900 NMAC (incorporating 40 CFR 270.23 (c) and (e)). This information is being updated based on changes to human health risk factors recommended by the EPA. The Permittees are proposing to revise procedures that are used to determine if the risk to the non-waste surface worker exceeds the risk limits established by the Permit. The Permittees are not proposing risk limits that are different than those established by the Permit. The proposed process for calculating risk incorporates risk from both the non-carcinogenic and carcinogenic effects for each compound. This process makes the risk determination more realistic than the current practice of using COCs for determining risk. This is not a change to provide more frequent reporting, sampling, or maintenance, therefore it falls into the category of other changes.

Topic 6 proposes to change the procedure for monitoring and reporting the minimum running annual average (RAA) mine ventilation exhaust rate. The requirements to monitor in order to maintain a minimum RAA mine ventilation rate are no longer needed since risk to the disposal rooms and surface receptors is monitored directly. This rate is determined by monitoring required by Attachment O of the Permit. The NMED used the requirement to monitor and report the minimum running annual average mine ventilation rate to assure the risk standards for the non-waste surface worker would be met. The proposed revised method for calculating risk to the non-waste surface worker is based on VOC monitoring results and will prevent the exceedance of the risk levels and, therefore, monitoring to maintain and report a minimum mine ventilation flow rate is no longer required. This is not a change to provide more frequent reporting, sampling, or maintenance, therefore it falls into the category of other changes.

The Permittees are not requesting a reduction in the amount of VOC sampling performed nor propose to substantially alter the facility or its operations. These changes can be implemented without substantially changing design specifications and management practices in the Permit.

3. 20.4.1.900 NMAC (incorporating 40 CFR 270.42(b)(1)(iii)), requires the applicant to explain why the modification is needed.

The following text provides an overview explaining why the changes are needed. Please see each topic listed below for respective explanations. The Permit requires two types of monitoring to protect workers either in the underground or on the surface from VOC emissions. The monitoring program that protects underground workers that is necessary during waste emplacement activities is referred to as the DRVMP. This program involves monitoring active waste panels during waste emplacement activities. The DRVMP is currently suspended since no waste emplacement activities are underway. When waste emplacement activities resume, the monitoring will resume in accordance with the Permit. This PMR only changes the equipment that will be used for the DRVMP. Separate from the Permit, workers in the underground who are participating in recovery activities are protected under worker protection programs consistent with the standards issued by the American Conference of Governmental Industrial Hygienists and the regulations of the MSHA. This monitoring is ongoing and is effective in protecting workers underground from harmful doses of VOCs. This PMR does not impact these programs.

Unlike underground waste workers who are required by the Permit to be protected using the DRVMP only when waste emplacement is underway, non-waste surface workers must be protected at all times. Currently, the monitoring locations used to ensure this protection are underground and are in areas that are radiologically contaminated. One station, Station VOC-A, is situated in the exhaust air from the entire disposal area. Because of this, Station VOC-A will be subjected to ongoing risk of radiological contamination arising from activities in Panel 7. This does not make monitoring impossible, but it significantly complicates it since adequate radiological protection will be needed for workers who collect samples and maintain the equipment. Care will have to be exercised to ensure no radiologically contaminated VOC samples are brought out of the mine and sent to the contract laboratory. Radiological protection for workers can be cumbersome, can limit the time a worker can spend in an area, and can make some work activities difficult.

The Permittees have demonstrated that these logistic problems can be addressed by moving the monitoring stations to the surface and locating them in the vicinity of the potentially most exposed individual (i.e., Building 489). The Permittees have been performing surface monitoring since February 2014 and reporting analytical results under an Administrative Order issued by the NMED on February 28, 2014. Surface monitoring has been successful as reported in the semi-annual VOC monitoring reports submitted to NMED in April and October of each year since surface monitoring was initiated. Due to this success, the Permittees are proposing to make surface monitoring the permanent replacement for underground monitoring to protect the non-waste surface worker. This proposal addresses the logistical problems that will face the monitoring personnel once recovery is completed and underground waste operations resume.

Surface monitoring is facilitated by two improvements in monitoring technology. First, sampling methods are simpler, have fewer connections and parts, and are more reliable. These sampling methods are proposed as a change in this PMR. Second, the contract laboratory is able to achieve lower detection levels so that concentrations of target analytes can be reliably measured. These lower detection levels are proposed in this PMR.

The Permittees are proposing these changes at this time to coincide with recovery activities. When recovery is complete, the Permittees intend to continue surface monitoring to protect the non-waste surface worker and limit personnel access to radiologically contaminated areas in the underground. This is consistent with DOE operational philosophy to maintain personnel radiological exposures to as low a reasonably achievable. At that time, the DRVMP will be resumed in the underground as specified in the Permit. The DRVMP sampling stations are not as likely to be in areas that are radiologically contaminated or they can be moved to clean areas.

The Permittees are not proposing to change any of the environmental performance standards established by the NMED when the Permit was issued in 1999. These standards were to protect non-waste surface workers and underground waste workers. These standards remain the same and the NMED arguments for their establishment in 1999 remain relevant and are not being revisited in this PMR. The NMED established a minimum RAA mine ventilation flow rate at the time the environmental performance standards were established. The NMED used ventilation flow rates in calculating COCs and provided a formula in the Permit for normalizing to these flow rates. However, the methodology to demonstrate compliance with the environmental performance standards no longer relies on the flow rate. The minimum flow rates are required by MSHA (30 CFR 57 Subpart D) and are adequate to protect underground workers. Finally, the minimum rate is not consistent with operating the underground ventilation system in filtration mode, which requires reduced flow rates. In written testimony submitted by the NMED during the Permit hearings, the NMED stated:[6]

> *The minimum mine ventilation exhaust rate condition is based on the direct relationship between the minimum mine ventilation exhaust rate and the concentration of volatile organic compounds (VOCs) at the top of the Waste Isolation Pilot Plant (WIPP) exhaust shaft. Any decrease in the minimum mine ventilation exhaust rate would result in an increase in the concentration of VOCs at the top of the WIPP exhaust shaft, possibly causing a violation of NMED's specified environmental performance standard…*
>
> *The specification of a minimum running annual average mine ventilation exhaust rate will ensure long-term compliance with NMED's specified environmental performance standard, …*

The likelihood of a violation of an environmental performance standard is minimized because the Permittees are proposing to measure concentrations after they have left the Exhaust Shaft and compare those emissions to the environmental performance standards.

In establishing that they could comply with the environmental performance standards, the Permittees submitted a risk assessment to the NMED as Appendix D9 of the original Permit Application. This risk assessment made certain assumptions (e.g., exposure duration) regarding the human receptors both in the environment (public) and within the facility (workers). Justifications for these assumptions are presented in the application and have not changed. The NMED accepted these as reasonable and used the same assumptions in determining the acceptable risk levels (e.g., 10^{-5}) and Permit limits. With regard to exposure factors for the non-waste surface worker, the NMED acknowledged that the Permittees could exert control over these employees, if necessary, should it be necessary to protect them from harmful exposures to VOCs. This PMR does not revisit these assumptions nor does it propose to change them. One facet of the risk assessment that was not based on assumption was the air dispersion modeling. Originally the modeling was based on high ventilation flows (up to 425,000 scfm) and two emission points on the surface. Current conditions are different. Flows are lower (currently 60,000 scfm and expected to go to 114,000 scfm with interim ventilation) and the emission point is a single stack north of the previous points. Because of this the Permittees re-ran the air dispersion modeling to locate the expected point of maximum ground concentration for VOC emissions which was used to determine the point where surface monitoring would be most effective. The point selected is the air intake to Building 489 (Training Building). This is the

[6] NMED Direct Testimony Regarding Regulatory Process and Imposed Conditions, submitted for the record in the 1999 WIPP Permit Hearing, Section "Mine Ventilation Rate."

location closest to the maximum emission concentration that is occupied by workers on a permanent basis. The air modeling is summarized in Appendix D.

Topic 1: Add TCE to the VOC target analyte list for VOC monitoring

The Permittees are proposing to add TCE to the VOC target analyte list as required in Paragraph 19 of the May 12, 2014, Administrative Order.

> *Consistent with this Order, the Permittees shall begin monitoring for the VOC trichloroethylene (**TCE**) as a target analyte. The room-based concentration limit for TCE shall be 48,000 parts per million by volume (**ppmv**). The 50% Action Level shall be 24,000 ppmv and the 95% Action Level shall be 45,600 ppmv. If the value of TCE in any active open room or closed room reaches the 95% Action Level, another sample will be taken to confirm the existence of such a condition. If the second sample confirms that TCE in any active open room or closed room has reached the 95% Action Level, the active open room shall be abandoned, ventilation barriers shall be installed as specified in Permit Part 4, Section 4.5.3.3, and monitoring of the subject closed room shall continue at a frequency of once per week until commencement of panel closure. Prior to reaching the 95% Action Level in any active open room or closed disposal room, the Permittees may propose an alternative remedial action to implement in the event the 95% Action Level is reached. This alternative remedial action must be approved by the NMED prior to implementation.*

Consistent with the NMED direction in the May 12, 2014, Administrative Order, the concentration limit of 48,000 parts per million by volume (**ppmv**) is being added to Table 4.4.1 and the corresponding 50 percent and 95 percent action levels are being added to Table 4.6.3.2 for TCE.

The Permittees are not proposing a COC for TCE for the RVMP. This is for two reasons. First, establishing a COC would require reallocation of risk among the various target analytes, including dropping some analytes from the list of targets. This activity is beyond the scope of the PMR. Second, the Permittees are proposing to demonstrate compliance with the environmental performance standards by using risk calculations as opposed to comparison to COC values. This is discussed in Topic 5 of this PMR. Repository COC values are not needed for risk calculations. This is because risk calculations rely on measured VOC concentrations at the receptor location. The proposed risk calculation method is as protective of human health as the COC method in the Permit.

This change is needed to respond to the Administrative Order and to ensure the monitoring program is protective of human health.

Topic 2: Change the repository VOC monitoring locations

The Permittees are proposing to establish surface locations for the repository VOC monitoring, in lieu of underground Station VOC-A and Station VOC-B. Currently, the underground sampling locations for Station VOC-A and Station VOC-B pose additional risk to sampling personnel due to radiological contamination. If VOC samples were to become radiologically contaminated, it may be necessary to dispose of contaminated sampling equipment. Because the underground ventilation system is being operated solely in filtration mode, periodic filter replacements are expected. During filter replacement operations the underground facility is not accessible for VOC monitoring. The proposed surface sampling locations avoid these radiological contamination risks and are expected to be accessible at all times. These locations are used to protect the non-waste surface worker.

Currently, underground workers are protected by the WIPP Industrial Hygiene (IH) program in accordance with 10 CFR Part 851 and DOE G 440.1-3. This PMR does not alter the level or amount of monitoring provided by the IH program for underground workers. Routine work in the underground (with the exception of certain Permit required inspections and ground control) is typically performed upstream from exhaust air so that workers do not receive chronic doses of VOCs.

Both RVMP sampling locations VOC-A (S-1300, E-300) and VOC-B (currently at S-2520, W-170), as well as Panel 7 disposal room sampling equipment, are in areas contaminated by the release. The activity to address the contamination in the affected areas is estimated to be completed in the last quarter of 2015. This cannot be accomplished sooner because operational emphasis was being placed on completing the prerequisite activities required to install closures in Panel 6 and in Panel 7, Room 7 and ongoing fixing/decontamination activities in Panel 7. VOC sampling equipment must be replaced and meteorological equipment will need to be recalibrated once the affected areas are cleared for access to monitoring personnel. This is anticipated to take between one and two months. Procedures will need to be updated to address monitoring in contaminated areas, including the management of samples that become contaminated, and personnel will require additional training with regard to entering and working in contaminated areas. Based on these activities, the earliest expected date for resuming Permit-related underground VOC sampling activities would be no sooner than the first quarter of 2016. Even if this were possible by this date, ongoing sampling is still susceptible to radiological contamination if radionuclides become airborne from Panel 7 as waste emplacement proceeds. Contamination could render samples unusable, challenging the completeness Quality Assurance Objective for the monitoring activity.

In order to compensate for the limited access to the underground, the delay in restarting the underground monitoring programs, potential loss of data, and to ensure protection of the non-waste surface worker following the February 5, 2014 fire event, the Permittees have been conducting surface sampling for VOCs. By moving these locations to the surface, the Permittees have determined:

- Sampling at these locations is more protective of worker health because underground sampling locations are in radiologically contaminated areas,

- Sample results provide actual VOC concentrations at the receptor location for determining risk,

- Conducting VOC sampling at these locations does not rely on the completion of underground recovery activities,

- Collecting information necessary to protect non-waste surface workers does not rely on recovery of the underground facility,

- Conducting VOC sampling at surface locations will not be impacted by periodic underground ventilation system filter change out, and

- Sampling equipment and samples at these locations cannot become contaminated by radiological particulate released from the underground.

The Permittees are proposing that the new sampling locations be termed Station VOC-C and Station VOC-D. Station VOC-C would permanently replace Station VOC-A and Station VOC-D would permanently replace Station VOC-B. Station VOC-C is proposed to be stationed at the west air intake of Building 489 and Station VOC-D is proposed to be stationed at WQSP-4. These locations are depicted in Permit Attachment D, Figure D-1 and Attachment L, Figure L-6. One major advantage of Stations VOC-C and VOC-D are they do not require entry into areas of the facility contaminated with radionuclides as the result of the February 2014 release event. This is protective of workers who have to routinely retrieve the samples and perform maintenance on installed equipment. The viability of the new stations has been established by two separate means. First, the Permittees have conducted sampling at these locations since the February event.[7] Data indicate the monitoring system is capable of detecting underground emissions since carbon tetrachloride has been detected above the method reporting limit (**MRL**). The source of this carbon tetrachloride is the disposed waste in the underground. Previously, underground sampling was used in order to account for the dilution that occurs in the ventilation exhaust air and the dispersion that occurs in the atmosphere, which render the concentrations of interest extremely low on the surface. At the time the VOC program was established, sampling and analytical methods did not have the needed sensitivity to distinguish these low concentrations. Contract laboratories are now able to detect concentrations in parts per trillion, making surface monitoring viable. Samples analyzed at these sensitivity levels are reported in the semi-annual VOC monitoring report for the period July 1, 2014 through December 31, 2014. Coupled with this change, the Permittees have established a lower MRL for surface monitoring in Permit Attachment N, Table N-2. The other Quality Assurance Objectives remain the same. An evaluation of the feasibility for using surface monitoring is provided in Appendix C.

Second, the Permittees performed air dispersion modeling to locate the expected point of maximum ground concentration for VOC emissions. This modeling indicated that the best location to monitor is the air intake to Building 489 since this location best matches the modeling assumptions and represents the closest resident population. The air dispersion modeling is attached as Appendix D, *Air Quality Analysis for the DOE Waste Isolation Pilot Plant (WIPP) Repository Vent Stack Modeling.*

Stations VOC-C and VOC-D represent reasonable locations for performing VOC repository monitoring to protect non-waste surface workers during recovery operations since the collection of underground samples at Stations VOC-A and VOC-B pose an unnecessary risk to personnel due to radiological contamination in the underground. The surface locations provide some logistical advantages relative to access, inspections, and maintenance that provide benefits both during and after recovery. Additionally, Station VOC-C provides actual concentration values at the receptor location that can readily be converted to risk (see Topic 5) instead of relying on computer-generated air dispersion factors. The proposed locations (Stations VOC-C and VOC-D) would permanently replace the underground repository sampling locations (Stations VOC-A and VOC-B).

The Permittees evaluated the option of monitoring in the emission stack that vents the filtered air from the underground. The Permittees have determined to defer this approach at this time for several reasons. First, in order to obtain a representative sample, the sampling port would have to be reconfigured or a new port installed and testing would have to be performed. The

[7] The initial report of surface monitoring results is contained in the weekly report as required by Item 14 of the February 27, 2014 NMED Administrative Order. Jose R. Franco, Manager, Carlsbad Field Office, and M.F. Sharif, Project Manager, Nuclear Waste Partnership LLC. March 14, 2014.

expense of reconfiguration is not justifiable since an alternative measurement point at Station VOC-C is available. Second, installation of the interim ventilation system over the next six to twelve months will interfere with in-stack monitoring. Third, underground ventilation system filter changes could impact sampling activities.

This change is needed to facilitate ongoing monitoring of the non-waste surface workers during and after recovery of the facility from the February 14, 2014 event.

Topic 3: Change the type of sampling equipment for VOC monitoring

The Permittees are proposing to use the PASK with a 6-liter passivated canister for repository VOC monitoring and a sampling assembly (different than the PASK) with a 6-liter passivated canister for disposal room VOC monitoring instead of the currently used methods. Both of these samplers use the subatmospheric sampling technique. Experience with the subatmospheric sampling technique at the WIPP facility has shown to be reliable, and the sampling devices are inherently simpler without the use of pumps and pump controllers and the need for an independent power supply. In addition, both types of subatmospheric samplers have fewer fittings and connections and are less likely to develop leaks. The PASK has been reliably used to collect VOC samples in the underground that are used by the Permittees for assessment purposes unrelated to the Permit. The PASK has been used for surface sampling in lieu of repository monitoring since February 2014. The sampling assembly has been used in the hydrogen and methane monitoring and in the ongoing disposal room monitoring program for short-duration, time-integrated samples. Finally, the subatmospheric sampling approach is widely used for ambient air monitoring[8].

In addition to the proposal to change the sampling method, the Permittees are proposing editorial comments to remove the trade name “Summa” from the text and replacing it with the generic term “passivated.” This editorial change is to provide for greater operational flexibility.

These changes are needed to ensure reliable measurements of low concentration emissions in order to protect the non-waste surface worker.

Topic 4: Change in the sampling duration for VOC Monitoring

The Permittees are proposing to change the sampling duration for RVMP from two 6-hour time-integrated samples per week to two 24-hour time-integrated samples per week.

Method TO-15 refers to time-integrated samples as having 1 to 24 hour durations. Generally, samples to identify occupational exposures have a duration on the order of a work shift, typically six to eight hours. Samples for determining chronic effects to public receptors are longer in duration, typically 24 hours in duration, to average out the variability that may occur during the sampling period. Experience has shown that during a typical work day at the WIPP facility, VOC concentrations are affected by ventilation changes in the repository throughout the day. Twenty-four hour samples are less likely to be affected by these changes than shorter-duration samples. The 24-hour samples may remove some of the variability that is observed in the VOC results.

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[8] Volatile Organic Compounds in Air. Occupational and Health Administration (OSHA), 2003. Method Number: PV2120. Control Number: T-PV2120-01-0305-ACT. Chemist: Patrick Hearty. Applied IH Chemistry Team. Program Support Division. OSHA Salt Lake Technical Center. Sandy, Utah 84070.

Currently six-hour samples are collected using the pressurized sampling method for the DRVMP. The DRVMP sample locations are not subject to the same degree of variability that is experienced in the RVMP; therefore, long-duration samples are not necessary. The Permittees are proposing to change the DRVMP sample duration to short-duration time-integrated samples. The actual duration is determined by sampling conditions and is addressed in the sampling standard operating procedure to ensure the quality of the sample.

These changes are needed to ensure reliable measurements of low concentration emissions in order to protect the non-waste surface worker.

Topic 5: Revise the method of determining compliance with the non-waste surface worker environmental performance standard

The Permit establishes an environmental performance standard with regard to the VOC emissions from containers of transuranic (**TRU**) mixed waste for non-waste surface worker and for waste workers in the underground. The NMED established three risk levels[9]:

- For a resident living at the WIPP site boundary, the total individual excess cancer risk from exposure to carcinogens and potential carcinogens shall be one in one million (10^{-6});

- For a WIPP non-waste surface worker, the total individual excess cancer risk from exposure to carcinogens and potential carcinogens shall be one in one hundred thousand (10^{-5}); and

- For the persons listed above, the acceptable risk level for exposure to non-carcinogens shall be a HI of less than or equal to 1.0.

The risk level for the non-waste surface worker has been established by the NMED. The NMED justified the higher risk level for non-waste surface workers because the Permittees could exert control over the occupational exposures of these workers at the WIPP site. As "employees" these workers are covered by the OSHA occupational exposure standards and health and safety regulations of MSHA. A change to this risk level is not being proposed in this PMR. The NMED also identified the surface non-waste worker as the receptor that could receive the greatest chronic dose from emissions in the underground. This receptor (a worker in the WIPP facility Building 489) was chosen as the receptor for compliance with the environmental performance standards for VOC emissions from the underground.[10]

The environmental performance standards for waste workers in the underground are established to prevent an acute exposure to VOCs. These are determined based on the lesser of the lower explosive limit or the concentration that would result in a dose that is considered immediately dangerous to life and health.

Environmental performance standards have been established for the emission of VOCs from the underground repository, a miscellaneous unit pursuant to 40 CFR Part 264, Subpart X. These standards are represented by a specific list of nine target VOCs and associated COCs

[9] NMED Direct Testimony Regarding Regulatory Process and Imposed Conditions, submitted for the record in the 1999 WIPP Permit Hearing, Section "VOC Concentrations," page 9 of 15.
[10] NMED Direct Testimony Regarding Regulatory Process and Imposed Conditions, submitted for the record in the 1999 WIPP Permit Hearing, Section "VOC Concentrations," page 10 of 15.

for each. The COCs ensure protection of human health and the environment by requiring specific actions by the Permittees should the COCs be exceeded. The VOCs and their associated RVMP COCs are shown in Permit Part 4, Table 4.6.2.3.

The Permittees re-evaluated the risk assessment and air dispersion modeling and submitted the re-evaluation in the Class 3 PMR[11]. The goal of this re-evaluation was to determine potential human health risks associated with VOC emissions from the WIPP facility to above-ground receptors, based on information that updated the original air dispersion modeling. Based on the re-evaluation the compound TCE was identified as a compound that should be added to the Permit as a target analyte. Topic 1 on the PMR proposes adding TCE. However, adding a new target raises the question of identifying an appropriate action level for that compound for inclusion in Permit Part 4, Table 4.6.2.3. When this table was issued in the Permit in November 2010, available risk was apportioned by the NMED to the various compounds in order to establish individual COCs at Station VOC-A in the underground. The new target compound proposed in this modification would require further risk apportionment. Risk apportionment is beyond the scope of this PMR because it would require the deletion of some targets that contribute less than one percent to the overall risk and is not needed if direct calculation of risk at the receptor is used.

The Permittees are proposing to replace COCs with actual risk calculations based on the concentrations measured with the RVMP. The process to calculate risk is as follows:[12]

- Determine the concentration in milligram per cubic meter (**mg/m^3**) of target VOCs in the ambient atmosphere based on measurements at Stations VOC-C and VOC-D.

- Subtract the results of background Station VOC-D from the results at Station VOC-C.

- Calculate the risk for each carcinogenic and non-carcinogenic target VOC using the method and equations proposed in this PMR. The exposure duration of 10 years is based on typical work practices for employees at the WIPP site.

- Calculate the RAA of the resulting total carcinogenic and non-carcinogenic risks.

- Compare the RAA-based risk to 10^{-5} for carcinogens and the RAA for HI to 1.0 for non-carcinogens.

For carcinogenic risk:

$$R_{VOCj} = \frac{Conc_{VOCj} \times EF \times ED \times IUR_{VOCj} \times 1000}{AT} \qquad (1)$$

Where:

R_{VOC_j} *= Risk due to exposure to target* VOC_j

[11] Notification of a Class 3 Permit Modification to the Hazardous Waste Facility Permit, Permit Number: NM4890139088 TSDF, March 18, 2013.
[12] Resource Conservation and Recovery Act Part B Permit Application for the Waste Isolation Pilot Plant, 1996, Appendix D9.

$Conc_{VOC_j}$ = *Concentration target* VOC_j *at the receptor* (mg/m^3)

EF = *Exposure frequency (hours per year) = 1,920 hours per year*

ED = *Exposure duration, years = 10 years*

IUR_{VOCj} = *Inhalation unit risk factor from Table 4.6.2.3 (microgram per cubic meter* (**$\mu g/m^3$**)$^{-1}$)

AT = *Averaging time for carcinogens = 613,200 hours based on 70 years*

1,000 = µg/mg

The total carcinogenic risk is then the sum of the risk due to each carcinogenic target VOC.

$$\text{Total Carcinogenic Risk} = \sum_{j=1}^{m} R_{VOC_j} \quad (2)$$

Where:

Total Risk must be less than 10^{-5}

m = the number of carcinogenic target VOCs

The formula for non-carcinogenic hazard is similar:

$$HI_{VOC_j} = \frac{Conc_{VOC_j} \times EF \times ED}{AT \times RfC_{VOC_j}} \quad (3)$$

Where:

HI_{VOC_j} = *Hazard Index for exposure to target* VOC_j

$Conc_{VOC_j}$ = *Concentration target* VOC_j *at the receptor* (mg/m^3).

EF = *Exposure frequency (hours/year) = 1,920 hours per year*

ED = *Exposure duration, years = 10 years*

RfC_{VOC_j} = *Reference concentration from Table 4.6.2.3* (mg/m^3)

AT = *Averaging time for non-carcinogens = 87,600 hours based on exposure duration*

The total hazard is then the sum of the HI due to each non-carcinogenic target VOC.

$$\text{Total Hazard Index} = \sum_{j=1}^{m} HI_{VOC_j} \quad (4)$$

Where:

Hazard Index must be less than or equal to 1.0

m = the number of non-carcinogenic target VOCs

This approach offers advantages over the existing approach that uses COCs for repository monitoring. First, because the EPA periodically evaluates the health effects of organic compounds, future changes that the EPA makes to the risk factors will be handled using a Class 1 Permit Modification Notification annually (in October), if needed. Adjustments to COCs will not be necessary. Second, if new target compounds are identified as the result of the tentatively identified compound (**TIC**) process, they can be added as target analytes and included in the risk calculations without having to adjust COCs. Addition of new targets, if needed, would also be handled using a Class 1 Permit Modification Notification annually (in October). This PMR clarifies how the TIC process is implemented in order to ensure the identification of VOCs that are to be added to the target analyte list. Third, reporting will be greatly simplified since a single exceedance of a COC by any particular compound will no longer have to be reported unless it is high enough to cause the overall risk or HI to exceed the action levels. Fourth, the methodology provides a more comprehensive assessment of health impacts since it considers both the carcinogenic and non-carcinogenic effects of compounds, making the risk calculations more protective of human health than the use of the COCs.

The Permittees are proposing to revise Table 4.6.2.3 to update the list of target analytes consistent with the proposed changes in Topic 1 and to include the current recommended EPA risk factors. The formula for calculating risk is proposed to be added to Permit Attachment N. Action levels are the same as in the Permit; however, instead of being VOC-specific, they are established relative to the 10^{-5} risk level for carcinogens and the HI of 1.0 for non-carcinogens. Specifically, as currently required for individual VOCs, the Permittees will have to report to the NMED any instance when the risk, based on the validated results from the monitoring system, or the RAA-based risk exceeds 10^{-5} or HI of 1.0. If the RAA-based risk exceeds either of the limits, the Permittees will have the option of closing the active contact-handled TRU waste room and putting ventilation barriers in place or proposing an alternative remedial action to the Secretary for approval. If the RAA-based risk exceedance continues for six consecutive months, the affected underground hazardous waste disposal unit will be closed or an alternative remedial action will be proposed to the Secretary for approval.

The Permittees proposal for use of alternative remedial actions is based on several factors. First, as indicated above, the NMED anticipated that the Permittees could exert control over employees to ensure they do not receive chronic exposures to VOCs. This means that instead of closing portions of the repository, it may be more appropriate to move the affected employees so that continued exposure does not occur. Second, the Permittees may be able to remediate the emissions by managing waste emplacement activities. The Permit text changes provide for the submittal, NMED approval, and implementation of the alternative remedial actions.

The Permittees have determined that this method is preferred for comparing the surface monitoring results to the environmental performance standards for non-waste surface workers over a method that attempts to compare a surface measurement to an underground COC by back calculating. This method is proposed as a permanent replacement for the method involving repository COCs in the Permit once the facility resumes normal operations. The historical COCs were developed solely to be protective of the non-waste surface worker. The proposed changes, as discussed above, will be the new method of protecting the non-waste surface workers from chronic exposures to VOCs.

With regard to VOC chronic exposures to underground workers, IH has methods in place to protect these workers in accordance with guidelines established by the American Conference of Governmental Industrial Hygienists. These methods are not required by the Permit and are not affected by this PMR.

The method for adding compounds to the list of target analytes is proposed in Attachment N, Section N-3b. Non-target compounds (i.e., compounds not listed in Table 4.6.2.3) may appear in the VOC analytical results as TICs, which means the measured concentrations are approximate since they are not targets in the analysis. Requirements in the Permit indicate when TICs must be added to the analytical suite so that their concentrations are more accurately determined. Some non-targets may be included on the laboratory's target analyte list as additional requested analytes (**ARAs**) at the Permittees request to gain a better understanding of potential concentrations and associated risk. The Permittees will report ARAs in the annual report. When new analytes are added as targets they will also be evaluated to determine if they have an impact on the risk calculation. If the ARA contributes to more than one percent of the risk, requirements are proposed to add these compounds to Table 4.6.2.3 during the annual update and to include their respective risk factors. These analytes are also added to the risk calculations. Recordkeeping and reporting for these compounds remains the same.

This change is needed to ensure that significant risk factors are considered in the protection of the non-waste surface worker and to facilitate updating risk-related factors as the EPA reassess risk from VOCs.

Topic 6: Remove the minimum running annual average mine ventilation exhaust rate

When the COCs in Permit Part 4, Tables 4.4.1 and 4.6.2.3 and the action levels in Table 4.6.3.2 were established for the VOC monitoring program it was necessary for the NMED to distribute risk among the various VOCs being evaluated. In order to distribute the risk and establish a COC, a simple numerical model of the emissions from the underground was developed. The model started with the VOC concentration that resulted in an acceptable risk to the non-waste surface worker and applied an air dispersion factor to calculate the concentration at the top of the Exhaust Shaft. A corresponding concentration was calculated at the bottom the Exhaust Shaft by assuming a repository ventilation flow rate of 425,000 scfm. Because the measurement point, known as Station VOC-A is some 1,300 feet south of the base of the Exhaust Shaft, a corresponding concentration was calculated assuming a disposal circuit ventilation rate of 130,000 scfm. The resulting concentrations became the COCs for each compound. The values in Table 4.6.2.3 are the acceptable concentrations if the repository and disposal circuit ventilation rates are 425,000 and 130,000 scfm, respectively. Since in practice, these rates vary, the NMED established Equation N-1 in Permit Attachment N as the method for normalizing the actual ventilation conditions to the conditions assumed in Table 4.6.2.3.

The development of the COC values in Table 4.4.1 for disposal room monitoring was different because the NMED could establish a concentration that either resulted in an exposure to a waste worker that is equivalent to the OSHA immediately dangerous to life and health concentration or the lower explosive limit for flammable compounds. Since, at the time, the VOCs ultimately were sampled at Station VOC-A, it was necessary to show that the COC values in Table 4.4.1 for concentrations in filled disposal rooms were compatible with the COC values in Table 4.6.2.3. In order to do this, another numerical model was applied which simulated the movement of VOCs from disposed containers to the monitoring station at VOC-A. This numerical model has inherent assumptions about disposal room and disposal circuit ventilation flow rates.

Through a process of iterative calculations[13], the NMED arrived at a risk allocation for the surface worker that was compatible with the COCs for the underground waste worker. Unlike the case with the non-waste surface worker, compliance with the underground disposal room COCs is based on measurements of the concentrations in the disposal room before they are diluted by the ventilation system. Although the ventilation rates played a role in the development of compatible limits, no normalization is needed for disposal room measurements. As a result, the ventilation rates do not matter in the demonstration of compliance to the values in Table 4.4.1.

In 2006, the Permittees modified the Permit to change the manner in which compliance with the COCs in Table 4.4.1 is demonstrated. In lieu of individual headspace gas measurements on each container and specification of the container filter vent characteristics, direct measurement of filled disposal room concentrations was instituted. This action broke the tie between disposal room concentrations and concentrations at Station VOC-A since compliance with one can now be managed independently of the other and the numerical model simulating the flow from the container to the monitoring station is no longer relevant. Since this model, including its assumptions regarding minimum flow rates is no longer needed, the minimum repository ventilation flow rate of 260,000 scfm is likewise no longer necessary to protect human health or the environment. In fact, the minimum rate can potentially conflict with other requirements for ventilation of the underground facility, such as those related to operating in filtration mode (e.g., 60,000 scfm).

Examination of Permit Attachment N, Section N-3e(1) shows that normalization uses a repository exhaust rate of 425,000 scfm and the disposal circuit flow rate of 130,000 scfm to normalize concentrations taken at Station VOC-A for comparison to the repository COC values in Table 4.6.2.3. The 260,000 scfm minimum annual exhaust rate is not the standard used in this calculation; therefore, it is not relevant to demonstrating compliance. Furthermore, the revised methodology discussed in Topic 5 does not rely on a fixed mine ventilation exhaust rate or a sample taken at Station VOC-A. It calculates the risk based on sampling events taken at the receptor location on the surface.

The NMED stipulated monitoring to determine and maintain the 260,000 scfm rate to ensure adequate dilution of VOCs that exit the repository such that the environmental performance standards affecting a non-waste surface worker (i.e., one excess cancer death in 100,000 and HI greater than 1.0) will not be violated. Direct monitoring at the non-waste surface worker location and the proposed action levels in the Permit (Table 4.6.3.2.) will provide the same assurance.

The Permittees are proposing to remove the monitoring and reporting requirements associated with the minimum RAA mine ventilation exhaust rate set forth in the Permit because it does not impact the Permittees ability to protect human health and the environment.

Previously, when the Permit was modified, the Permittees did not propose changing or eliminating this requirement since under operating practices at the time, maintaining the flow rate did not pose a concern. However, when the Permittees reconfigure the underground for continued operations after recovery from the radiological release event of February 14, 2014, limited amounts of ventilation air will be available. It is anticipated that this will be less than the amount of air needed to maintain the minimum RAA exhaust rate in the Permit. The standards

[13] Memorandum to File by Steve Zappe, November 19, 1998, “NMED Calculations for VOC Concentrations in the WIPP Underground HWDUs”, page 8.

that will apply to reconfiguration will be those established by MSHA for protecting workers underground and those established by DOE Orders for protecting workers and the public from radioactive releases. In addition, the DRVMP will ensure protection of the underground waste worker during waste disposal operations.

The minimum RAA ventilation rate does not address the underground ventilation system filtration mode. Due to VOC monitoring, this underground ventilation monitoring and reporting associated with the minimum exhaust rate is not needed to ensure the protection of human health. This change is needed to address long-term operation in filtration mode.

4. 20.4.1.900 NMAC (incorporating 40 CFR 270.42 (b)(1)(iv)), requires the applicant to provide the applicable information required by 40 CFR 270.13 through 270.21, 270.62 and 270.63.

The regulatory crosswalk describes those portions of the WIPP Permit that are affected by this PMR. Where applicable, regulatory citations in this modification reference Title 20, Chapter 4, Part 1, NMAC, revised March 9, 2009, incorporating 40 CFR Parts 264 and 270. 40 CFR §§270.16 through 270.21, 270.62, and 270.63 are not applicable at WIPP. They are not listed in the regulatory crosswalk table.

5. 20.4.1.900 NMAC (incorporating 40 CFR 270.11(d)(1) and 40 CFR 270.30(k)), requires that any person signing under paragraph a and b must certify the document in accordance with 20.4.1.900 NMAC.

The transmittal letter for this PMR contains the signed certification statement in accordance with Permit Part 1, Section 1.9.

Regulatory Crosswalk

Regulatory Citation(s) 20.4.1.900 NMAC (incorporating 40 CFR Part 270)	Regulatory Citation(s) 20.4.1.500 NMAC (incorporating 40 CFR Part 264)	Description of Requirement	Added or Clarified Information		
			Section of the Permit or Permit	Yes	No
§270.13		Contents of Part A permit application	Attachment B, Part A		✓
§270.14(b)(1)		General facility description	Attachment A		✓
§270.14(b)(2)	§264.13(a)	Chemical and physical analyses	Attachment C		✓
§270.14(b)(3)	§264.13(b)	Development and implementation of waste analysis plan	Attachment C		✓
	§264.13(c)	Off-site waste analysis requirements	Attachment C		✓
§270.14(b)(4)	§264.14(a-c)	Security procedures and equipment	Part 2.6		✓
§270.14(b)(5)	§264.15(a-d)	General inspection requirements	Attachment E		✓
	§264.174	Container inspections	Attachment E		✓
§270.23(a)(2)	§264.602	Miscellaneous units inspections	Attachment E		✓
§270.14(b)(6)		Request for waiver from preparedness and prevention requirements of Part 264 Subpart C	NA		✓
§270.14(b)(7)	264 Subpart D	Contingency plan requirements	Attachment D		✓
	§264.51	Contingency plan design and implementation	Attachment D		✓
	§264.52 (a) & (c-f)	Contingency plan content	Attachment D		✓
	§264.53	Contingency plan copies	Attachment D		✓
	§264.54	Contingency plan amendment	Attachment D		✓
	§264.55	Emergency coordinator	Attachment D		✓
	§264.56	Emergency procedures	Attachment D		✓
§270.14(b)(8)		Description of procedures, structures or equipment for:	Part 2.10		✓
§270.14(b)(8) (i)		Prevention of hazards in unloading operations (e.g., ramps and special forklifts)	Part 2.10		✓
§270.14(b)(8) (ii)		Runoff or flood prevention (e.g., berms, trenches, and dikes)	Part 2.10		✓
§270.14(b)(8) (iii)		Prevention of contamination of water supplies	Part 2.10		✓
§270.14(b)(8) (iv)		Mitigation of effects of equipment failure and power outages	Part 2.10		✓
§270.14(b)(8) (v)		Prevention of undue exposure of personnel (e.g., personal protective equipment)	Part 2.10		✓
§270.14(b)(8) (vi) §270.23(a)(2)	§264.601	Prevention of releases to the atmosphere	Part 4 Attachment A2 Attachment N	✓	
	264 Subpart C	Preparedness and Prevention	Part 2.10		✓
	§264.31	Design and operation of facility	Part 2.10		✓
	§264.32	Required equipment	Part 2.10 Attachment D		✓
	§264.33	Testing and maintenance of equipment	Attachment E		✓
	§264.34	Access to communication/alarm system	Part 2.10		✓
	§264.35	Required aisle space	Part 2.10		✓

Regulatory Citation(s) 20.4.1.900 NMAC (incorporating 40 CFR Part 270)	Regulatory Citation(s) 20.4.1.500 NMAC (incorporating 40 CFR Part 264)	Description of Requirement	Added or Clarified Information		
			Section of the Permit or Permit	Yes	No
	§264.37	Arrangements with local authorities	Attachment D		✓
§270.14(b)(9)	§264.17(a-c)	Prevention of accidental ignition or reaction of ignitable, reactive, or incompatible wastes	Part 2.10		✓
§270.14(b) (10)		Traffic pattern, volume, and controls, for example: Identification of turn lanes Identification of traffic/stacking lanes, if appropriate Description of access road surface Description of access road load-bearing capacity Identification of traffic controls	Attachment A4		✓
§270.14(b) (11)(i) and (ii)	§264.18(a)	Seismic standard applicability and requirements	Part B, Rev. 6 Chapter B		✓
§270.14(b) (11)(iii-v)	§264.18(b)	100-year floodplain standard	Part B, Rev. 6 Chapter B		✓
	§264.18(c)	Other location standards	Part B, Rev. 6 Chapter B		✓
§270.14(b) (12)	§264.16(a-e)	Personnel training program	Part 2 Attachment F		✓
§270.14(b) (13)	264 Subpart G	Closure and post-closure plans	Attachment G & H		✓
§270.14(b)(13)	§264.111	Closure performance standard	Attachment G		✓
§270.14(b)(13)	§264.112(a), (b)	Written content of closure plan	Attachment G		✓
§270.14(b)(13)	§264.112(c)	Amendment of closure plan	Attachment G		✓
§270.14(b)(13)	§264.112(d)	Notification of partial and final closure	Attachment G		✓
§270.14(b)(13)	§264.112(e)	Removal of wastes and decontamination/dismantling of equipment	Attachment G		✓
§270.14(b)(13)	§264.113	Time allowed for closure	Attachment G		✓
§270.14(b)(13)	§264.114	Disposal/decontamination	Attachment G		✓
§270.14(b)(13)	§264.115	Certification of closure	Attachment G		✓
§270.14(b)(13)	§264.116	Survey plat	Attachment G		✓
§270.14(b)(13)	§264.117	Post-closure care and use of property	Attachment H		✓
§270.14(b)(13)	§264.118	Post-closure plan; amendment of plan	Attachment H		✓
§270.14(b)(13)	§264.178	Closure/ containers	Attachment G		✓
§270.14(b)(13)	§264.601	Environmental performance standards-Miscellaneous units	Attachment G		✓
§270.14(b)(13)	§264.603	Post-closure care	Attachment G		✓
§270.14(b)(14)	§264.119	Post-closure notices	Attachment H		✓
§270.14(b)(15)	§264.142	Closure cost estimate	NA		✓
	§264.143	Financial assurance	NA		✓
§270.14(b)(16)	§264.144	Post-closure cost estimate	NA		✓
	§264.145	Post-closure care financial assurance	NA		✓
§270.14(b)(17)	§264.147	Liability insurance	NA		✓

Regulatory Citation(s) 20.4.1.900 NMAC (incorporating 40 CFR Part 270)	Regulatory Citation(s) 20.4.1.500 NMAC (incorporating 40 CFR Part 264)	Description of Requirement	Added or Clarified Information		
			Section of the Permit or Permit	Yes	No
§270.14(b)(18)	§264.149-150	Proof of financial coverage	NA		✓
§270.14(b)(19)(i), (vi), (vii), and (x)		Topographic map requirements Map scale and date Map orientation Legal boundaries Buildings Treatment, storage, and disposal operations Run-on/run-off control systems Fire control facilities	Attachment B Part A		✓
§270.14(b)(19)(ii)	§264.18(b)	100-year floodplain	Attachment B Part A		✓
§270.14(b)(19)(iii)		Surface waters	Attachment B Part A		✓
§270.14(b)(19)(iv)		Surrounding Land use	Attachment B Part A		✓
§270.14(b)(19)(v)		Wind rose	Attachment B Part A		✓
§270.14(b)(19)(viii)	§264.14(b)	Access controls	Attachment B Part A		✓
§270.14(b)(19)(ix)		Injection and withdrawal wells	Attachment B Part A		✓
§270.14(b)(19)(xi)		Drainage on flood control barriers	Attachment B Part A		✓
§270.14(b)(19)(xii)		Location of operational units	Attachment B Part A		✓
§270.14(b)(20)		Other federal laws Wild and Scenic Rivers Act National Historic Preservation Act Endangered Species Act Coastal Zone Management Act Fish and Wildlife Coordination Act Executive Orders	Attachment B Part A		✓
§270.15	§264 Subpart I	Containers	Attachment A1		✓
	§264.171	Condition of containers	Attachment A1		✓
	§264.172	Compatibility of waste with containers	Attachment A1		✓
	§264.173	Management of containers	Attachment A1		✓
	§264.174	Inspections	Attachment E Attachment A1		✓
§270.15(a)	§264.175	Containment systems	Attachment A1		✓
§270.15(c)	§264.176	Special requirements for ignitable or reactive waste	Part 2		✓
§270.15(d)	§264.177	Special requirements for incompatible wastes	Part 2		✓
	§264.178	Closure	Attachment G		✓
§270.23	264 Subpart X	Miscellaneous units	Attachment A2		✓
§270.23(a)	§264.601	Detailed unit description	Attachment A2		✓
§270.23(b)	§264.601	Hydrologic, geologic, and meteorological assessments	Part 5 Attachment L		✓

Regulatory Citation(s) 20.4.1.900 NMAC (incorporating 40 CFR Part 270)	Regulatory Citation(s) 20.4.1.500 NMAC (incorporating 40 CFR Part 264)	Description of Requirement	Added or Clarified Information		
			Section of the Permit or Permit	Yes	No
§270.23(c)	§264.601	Potential exposure pathways	Part 4 Attachment A2 Attachment N	✓	
§270.23(d)		Demonstration of treatment effectiveness	NA		✓
	§264.602	Monitoring, analysis, inspection, response, reporting, and corrective action	Part 2 Part 4 Part 5 Attachment A2 Attachment N	✓	
	§264.603	Post-closure care	Attachment H Attachment H1		✓
	264 Subpart E	Manifest system, record keeping and reporting	Part 2 Attachment C		✓

Appendix A
Table of Changes

Table of Changes

Affected Permit Section	Explanation of Change
Permit Table of Contents	Deleted “s” from “Rates.”
Part 4, Table 4.4.1	Added commas in nine places. (Editorial change) Added “Trichloroethylene” to the compound column and “48,000” to ppmv column.
Part 4, Section 4.5.3.2	Deleted “a minimum running annual average mine ventilation exhaust rate of 260,000 standard ft^3/min and” from first sentence. Added a comma after “Description)” to read “Description),” (Editorial change)
Part 4, Section 4.6.2.3	Added new paragraph “After each sampling event for the compounds listed in Table 4.6.2.3, the Permittees shall calculate the total and running annual averages for the carcinogenic and the total non-carcinogenic risk to the non-waste surface worker, using the methodology in Attachment N and the recommended EPA risk factors listed in Table 4.6.2.3.” Replaced “concentration of any VOC specified in Table 4.4.1 exceeds the concentration of concern specified in Table 4.6.2.3 below.” with “total and/or the running annual average carcinogenic risk to the non-waste surface worker exceeds 10^{-5} or the total and/or the running annual average non-carcinogenic risk as measured by the hazard index exceeds 1.0.” in next paragraph. Deleted paragraph “The Permittees shall notify the Secretary in writing, within seven calendar days of obtaining validated analytical results, whenever the running annual average concentration (calculated after each sampling event) for any VOC specified in Table 4.4.1 exceeds the concentration of concern specified in Table 4.6.2.3 below.” Added paragraph “The Permittees shall review EPA risk factors and the tentatively identified compound list annually and update Table 4.6.2.3 as needed as a Class 1 permit modification notification.”
Part 4, Table 4.6.2.3	Replaced title of table “VOC Concentrations of Concern” with “Recommended EPA Risk Factors.” Deleted “Drift E-300 Concentration” from Heading Row. Replaced “ug/m3” with “Carcinogenic IUR $(ug/m^3)^{-1}$” in 2nd column and “ppbv” with “Non-carcinogenic RfC (mg/m^3)” in 3rd column of heading row. Replaced the following by row in the second column: “6040” with “6.0×10^{-6}” “1015” with “N/A” “890” with” 6.0×10^{-6}” “410” with N/A” “175” with” 2.6×10^{-5}” “6700” with “1.0×10^{-8}” “350” with “5.8×10^{-5}” “715” with “N/A” “3200 with “N/A” Replaced the following by row in the third column: “960” with “1.0×10^{-1}” “220” with “5.0×10^{-2}” “180” with “9.8×10^{-2}” “100” with “2.0×10^{-1}” “45” with “7.0×10^{-3}” “1930” with “6.0×10^{-1}” “50” with “N/A” “190” with “5.0” “590” with “5.0” Added new row containing “Trichloroethylene” “4.1×10^{-6}” and “2.0×10^{-3}” Added the following table notes:

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	IUR = Inhalation Unit Risk from EPA Integrated Risk Information System (IRIS) Database RfC = Reference Concentration from EPA IRIS Database N/A = not applicable (No value published in the IRIS Database)
Part 4, Section 4.6.2.4	Replaced “concentration for a” with “for the total carcinogenic risk due to releases of” Added “s” to “VOC” Replaced “4.4.1” with “4.6.2.3” Replaced “the concentration of concern specified in Table 4.6.2.3” with “10^{-5}, or if the running annual average for the total non-carcinogenic hazard index due to releases of VOCs specified in Table 4.6.2.3 exceeds 1.0” Added “waste” after “CH” to read “CH waste” (Editorial change) Added “Alternatively, prior to reaching the action level, the Permittees can propose an alternative remedial action to the Secretary. The Permittees may implement such plans in lieu of closing the active room only after approval by the Secretary.” Replaced “concentration for a” with “for the total carcinogenic risk due to releases of” Added “s” to “VOC” Replaced “4.4.1” with “4.6.2.3” Replaced “the concentration of concern specified in Table 4.6.2.3” to “10^{-5} or if the running annual average for the total non-carcinogenic hazard index due” with releases of VOCs specified in Table 4.6.2.3 exceeds 1.0” Added “Alternatively, prior to reaching the action level, the Permittees can propose an alternative remedial action to the Secretary. The Permittees may implement such plans in lieu of closing the active HWDU only after approval by the Secretary.”
Part 4, Table 4.6.3.2	Added new row containing “Trichloroethylene” “24,000” and “45,600.”
Part 4, Section 4.6.4.3	Replaced “The Permittees shall calculate the running annual average mine ventilation exhaust rate on a monthly basis. In addition, t” with “T.” Replaced “have” with “has.”
Part 4, Section 4.8.3	Deleted “s” on “rates.”
Part 4, Table of Contents	Deleted “s” from “Rates.”
Attachment A2, Section A2-1	Replaced “A” with “C” in two places. Replaced “concentration of concern” with “action levels (10^{-5} for carcinogens and HI>1 for non-carcinogens).” Added “, Section 4.6.2.3” to last sentence.
Attachment A2, Section A2-2a(3)	Added “ute” to “min” to read “minute” (Editorial change) Replaced “SCFM” with “scfm” in three places. (Editorial change) Added a comma after “mode” to read “mode,” (Editorial change) Replaced “are capable of being employed during” with “can be operated in” (Editorial change) Deleted sentence “In order to ensure the miscellaneous unit environmental performance standards are met, a minimum running annual average exhaust rate of 260,000 SCFM will be maintained.” Under the Underground Ventilation System Description subsection.
Attachment G, Section G-1d(1)	Deleted the parenthesis around “95% Action Level” (Editorial change) Lower cased the word “Action Level” to read “action level” (Editorial change) Added “given” before “in Permit Part” to read “given in Permit Part” (Editorial change) Replaced “closure of that panel by installing the 12-foot explosion-isolation wall as

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	described in Section G-1e(1) and submit a Class 1* permit modification request to extend closure of that panel, if necessary.” with “remedial actions as required by Permit Part 4, Section 4.6.3.3.”
Attachment H, Section H-1	Replaced “concentrations of concern” with “action levels (10^{-5} for carcinogens and HI>1 for non-carcinogens) Added “, Section 4.6.2.3” after Permit part 4 and deleted “and Permit Attachment N, Table N-3.1” Replaced “collect air samples upstream of all open and closed panels, and down stream of Panel 1” with “operate the VOCMP” Moved a period into the parenthesis after Operations. (Editorial change) Replaced “4” with “2” in last paragraph. Added a comma after “Program” to read “Program,” (Editorial change)
Attachment N, Table of Contents	Replaced “**SUMMA®**” with “Sample” in title of N-4a(1). (Editorial change) Replaced “Volatile Organic Compound Canister Samplers” with “Sampling Collection Units” in title of N-4a(2). Deleted “Sampler” and added “of Sample Collection Units” to title of N-4d.
Attachment N, List of Tables	Replaced “A” with “C” and “B” with “D” in title of Table N-1. Added “VOC” to title of Table N-1.
Attachment N, List of Figures	Replaced “Panel Area Flow” with “Repository VOC Monitoring Locations” in title of Figure N-1. Added “Typical” to beginning of the figure title and “Locations” to the end of the title for Figure N-3. Replaced “VOC” with “Disposal Room” in title of Figure N-4.
Attachment N, Acronyms and Abbreviations	Replaced title “Acronyms and Abbreviations” with “Acronyms, Abbreviations, and Units” (Editorial change) Added the following to the acronym list: (Editorial change) ARA additional requested analyte CFR Code of Federal Regulations DRVMP Disposal Room VOC Monitoring Program EDD electronic data deliverable HI hazard index IUR inhalation unit risk L liter mm millimeter mtorr millitorr NMAC New Mexico Administrative Code NMED New Mexico Environment Department PASK passive air sampling kit ppmv parts per million by volume QAPjP Quality Assurance Project Plan RfC reference concentration RH remote-handled RVMP Repository VOC Monitoring Program Deleted the following from the acronym list. CLP Contract Labor Program COC concentration of concern QAPD Quality Assurance Program Description RCRA Resource Conservation and Recovery Act Deleted “(Permit Section 1.5.3) from the acronym definition for MOC. Replaced “Testing” with “Technology” for the acronym NIST. Replaced “Transuranic” with “transuranic” for the acronym TRU.

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Attachment N, Section N-1	Replaced “as follows;” with a “:” (Editorial change) Added “Program (RVMP)” Replaced “Table 4.6.2.3” with “Permit Part 4, Section 4.6.2.3” Added “Program (DRVMP) (includes ongoing disposal room VOC monitoring)” Replaced “performance standards” with “action levels” Added “Permit Part 4,”
Attachment N, Section N-1a	Added an “s” to the word “location” and replaced “of the ambient mine air monitoring stations” with “for sampling” in last bullet of element 1. Replaced “The location of the monitoring stations” with “Sampling locations” in second bullet of element 2. Deleted “The implementation schedule for the” and changed “programs’ to “schedule” in the 5th bullet of element 2. Replaced “The equipment used at the monitoring stations” with “Sampling equipment” in the 6th bullet of element 2. Deleted the word “used” from the 7th bullet of element 2. Replaced “Action” with “Notification and action” and deleted “if limits are approached” to the last bullet of element 2.
Attachment N, Section N-1b	Added the word “may” to first paragraph. In first bullet the following changes were made: Added the word “running” Replaced “concentration of” with “risk to the non-waste surface worker due to” Replaced “VOC concentrations of concern (COC)” with “action levels” Replaced the word “Table” with “Section” in two places Added “and calculated from measured VOC concentrations using risk factors identified in Table 4.6.2.3” Replaced “limits” with “action levels” Made the following changes to the second bullet: Added “Part 4” after the word “Permit” Replaced “Action Levels” with “original sample results are greater than or equal to the action levels” Deleted the words “are reached” at end of bullet.
Attachment N, Section N-2	Replaced “A” with “C” and “B” with “D” in first paragraph.
Attachment N, Section N-3	Replaced “Sampling equipment includes the WIPP VOC canister samplers” with “Subatmospheric sample collection units are” Deleted the word “both” Added the sentence “These sample collection units are described in greater detail in Section N-4a(2).”
Attachment N, Section N-3a	Replaced “in” with “at” Replaced “underground” with “WIPP Facility”
Attachment N, Section N-3a(1)	Replaced “The initial configuration for the repository VOC monitoring stations is shown in Figure N-1. All mine” with “Mine” Added a comma after “air” to read “air,” (Editorial change) Added a comma after “8” to read “8,” (Editorial change) Replaced “pass monitoring Station VOC-A, located in the E-300 drift as it flows to the exhaust shaft” with “exit the underground through the Exhaust Shaft. Building 489 has been identified as the location of the maximum non-waste surface worker exposure” Replaced “at two locations in the facility“ with “In the vicinity of the air intake for

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	Building 489 (Figure N-1)” Replaced “airborne VOC concentrations. VOC concentrations attributable to VOC emissions from open and closed panels containing TRU mixed waste will be measured by placing one VOC monitoring station just downstream from Panel 1 at VOC-A. The location of Station VOC-A will remain the same throughout the term of this Permit. The second station (Station VOC-B) will always be located upstream from the open panel being filled with waste (starting with Panel 1 at monitoring Station VOC-B (Figure N-1). In this configuration, Station VOC-B will measure VOC concentrations attributable to releases from the upstream sources and other background sources of VOCs, but not releases attributable to open or closed panels. The location of Station VOC-B will change when disposal activities begin in the next panel. Station VOC-B will be relocated to ensure that it is always upstream of the open panel that is receiving TRU mixed waste. Station VOC-A will also measure upstream VOC concentrations measured at Station VOC-B, plus any additional VOC concentrations resulting from releases from the closed and open panels. A sample will be collected from each monitoring station on designated sample days. For each quantified target VOC, the concentration measured at Station VOC-B will be subtracted from the concentration measured at Station VOC-A to assess the magnitude of VOC releases from closed and open panels.” with “VOCs in the ambient air. Background VOCs will be measured by sampling at groundwater pad WQSP-4 (Figure N-1). This pad is located approximately one mile southeast (upwind based on the predominant wind direction) of the Exhaust Shaft within the WIPP facility.” Deleted entire second paragraph.
Attachment N, Section N-3b	Deleted the word “nine” before VOCs. Added “VOC” after the word room. Replaced “compounds” with “target analytes” Added “(i.e., non-target VOCs) after the word compounds. Added the word “also” between will and be. Replaced “investigated” with “monitored” Added sentence “Some non-target VOCs may be included on the laboratory’s target analyte list as additional requested analytes (**ARAs**) to gain a better understanding of potential concentrations and associated risk.” Added “calibrate for ARAs, when necessary. The analytical laboratory will also be directed to” between the words to and classify. Replaced “all of these compounds” with “other non-target VOCs” Replaced “Tentatively Identified Compounds” with “tentatively identified compounds” (Editorial change) Added “when tentative identification can be made. The evaluation of TICs in original samples will include those concentrations that are ≥10 percent of the relative internal standard. The evaluation of ARAs only includes concentrations that are greater than or equal to the MRLs listed in Table N-2.” to end of paragraph. Replaced “TICs” with “Non-target VOCs classified as ARAs or TICs meet the following criteria: (1) are listed in Appendix VIII of 40 Code of Federal Regulations (**CFR**) Part 261 (incorporated by reference in 20.4.1.200 New Mexico Administrative Code (**NMAC**)), and (2) are” Replaced “%” with “percent” Added “original” before the word VOC. Deleted “(exclusive of those collected from Station VOC-B) that are VOCs listed in Appendix VIII of 20.4.1.200 NMAC (incorporating 40 CFR §261),” after the word samples. Deleted “running” before 12-month. Replaced “,” with “. Non-target VOCs” (Editorial change) Added “, as applicable” after the word added.

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	Added “analytical laboratory” before the word target. Added “ir” to “the” to read “their” (Editorial change) Deleted “s” from the word lists in one place. Deleted “from the target analyte list(s)” (Editorial change) Added sentence “Non-target VOCs reported as “unknown” by the analytical laboratory are not evaluated due to indeterminate identifications.” to end of paragraph. Added “Additional requested analytes and” to beginning of third paragraph. Replaced “NMED” with “the New Mexico Environment Department (**NMED**)” Added “Part 4” after the word Permit. Added “As applicable, the Permittees will also report the justification for exclusion from the target analyte list (e.g., the compound does not contribute to more than one percent of the risk; the compound persists in the background samples at similar concentrations). If new targets are required, the Permittees will submit a Class 1 Permit Modification Notification annually (in October) in accordance with 20.4.1.900 NMAC (incorporating 40 CFR 270.42(a)) to update Table 4.6.2.3 to include the new analyte and associated recommended U.S. Environmental Protection Agency (**EPA**) risk values for the inhalation unit risk (**IUR**) and reference concentration (**RfC**). Added compounds will be included in the risk assessment described in Section N-3e(1).” to end of third paragraph.
Attachment N, Section N-3c	Deleted “for VOC measurements” after documentation in first paragraph. Made the following changes in the second paragraph: Added “sampling” before the word method. Added “s” to the word method. Added “s” to the word concept. Deleted “of pressurized sample collection” Replaced “sampling is” with “monitoring are” Deleted “U.S. Environmental Protection Agency” and removed the parenthesis from around the word EPA. Deleted “SUMMA®” after the word liter. (Editorial change) Deleted “(or equivalent)” after the word passivated. Made the following changes in the third paragraph: Replaced “integrated samples, or grab” with “subatmospheric” Replaced “, and” with “as well as” Deleted sentence “The sampling system can be operated unattended but requires detailed operator training.” Added “also” before the word viable. Made the following changes in the fourth paragraph: Replaced “The field sampling systems will be operated in the pressurized mode. In this mode, air is drawn through the inlet and sampling system with a pump. The air is pumped into” with “For subatmospheric sampling, air is collected in” Deleted “SUMMA®” after the word evacuated. (Editorial change) Deleted “(or equivalent)” after the word passivated. Replaced “by the sampler, which regulates the rate and duration of sampling. The treatment of tubing and canisters used for VOC sampling effectively seals the inner walls and prevents compounds from being retained on the surfaces of the equipment. By the end of each sampling period, the canisters will be pressurized to about two atmospheres absolute. In the event of shortened sampling periods or other sampling conditions, the final pressure in the canister may be less than two atmospheres absolute. Sampling duration will be approximately six hours, so that a complete sample can be collected during a single work shift.” with **"** When the canister is opened to the atmosphere, the differential pressure causes the sample

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	to flow into the canister. Flow rate and duration are regulated with a flow-restrictive inlet and flow controller. The air will pass through a particulate filter to prevent sample and equipment contamination. Passive sampling equipment components are used to inhibit adsorption of compounds on the surfaces of the equipment." Made the following changes in the fifth paragraph: Replaced "The canister sampling system and GC/MS analytical method are particularly appropriate for the VOC Monitoring Programs because a relatively large sample volume is collected, and multiple dilutions and reanalyses can occur to ensure identification and quantification of target VOCs within the working range of the method 5. The contract-required quantitation limits (**CRQL**) for Repository Monitoring are" with "For the RVMP, the maximum allowable Method Reporting Limit (**MRL**) is 0.2" Added a semicolon after "(ppbv)" to read "(ppbv);" Deleted ", or less for the nine target compounds." and lower cased the word consequently. Replaced "CRQLs are the EPA-specified levels of quantitation proposed for EPA contract laboratories that analyze canister samples by GC/MS For the purpose of this plan, the CRQLs will be defined as the method reporting limits (**MRL**)." with "The maximum allowable MRL for DRVMP is 500 ppbv (0.5 parts per million by volume (**ppmv**)) to allow for reliable quantitation" Deleted "The MRL for Disposal Room Monitoring is 500 ppbv or less for the nine target compounds." Made the following changes in the last paragraph: Replaced "Disposal room VOC monitoring system in open panels" with "The DRVMP" Replaced "the same canister sampling method as used in the repository VOC monitoring" with "sample collection units that will provide a subatmospheric sample within a short duration" Deleted "or equivalent" after the word Passivated. Replaced "once" with "(to the degree possible) after" Added a comma after "closed" to read "closed," (Editorial change) Replaced "the individual sampler" with "a sampling manifold" Replaced "the access drift to the disposal panel. The air will pass through dual particulate filters to prevent sample and equipment contamination" with "an area accessible to sampling personnel"
Attachment N, Section N-3d	Replaced "evaluate whether the monitoring systems and analytical methods are functioning properly. The assessment period will be determined by the Permittees. with "perform sampling on the following schedule in accordance with standard operating procedures."
Attachment N, Section N-3d(1)	Deleted "Repository VOC sampling at Stations VOC-A and VOC-B will begin with initial waste emplacement in Panel 1. Sampling will continue until the certified closure of the last Underground HWDU." at beginning of first paragraph. Replaced "sampling" with "collection of a 24-hour time-integrated sample" Added sentence "The RVMP sampling will continue until the certified closure of the last Underground HWDU." to end of first paragraph.
Attachment N, Section N-3e(1)	Added to first paragraph "original surface VOC monitoring sample obtained during an" Replaced "COCs. The COCs for each of the nine target VOCs are presented" with "action Levels" Replaced "Table" with "Section" Replaced "presented" with "calculated" Replaced "micrograms per cubic meter (µg/m3) and ppbv" with "risk of excess

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	cancer death for compounds believed to be carcinogenic and hazard index (HI) for non-carcinogens as follows:" Replaced the text "The COCs were calculated assuming typical operational conditions for ventilation rates in the mine. The typical operational conditions were assumed to be an overall mine ventilation rate of 425,000 standard cubic feet per minute and a flow rate through the E-300 Drift at Station VOC-A of 130,000 standard cubic feet per minute. Since the mine ventilation rates at the time the air samples are collected may be different than the mine ventilation rates during typical operational conditions, the Permittees will measure and/or record the overall mine ventilation rate and the ventilation rate in the E-300 Drift at Station VOC-A that are in use during each sampling event. The Permittees shall also measure and record temperature and pressure conditions during the sampling event to allow all ventilation rates to be converted to standard flow rates. If the air samples were collected under the typical mine ventilation rate conditions, then the analytical data will be used without further manipulation. The concentration of each target VOC detected at Station VOC-B will be subtracted from the concentration detected at Station VOC-A. The resulting VOC concentration represents the concentration of VOCs being emitted from the open and closed Underground HWDUs upstream of Station VOC-A (or the Underground HWDU VOC emission concentration). If the air samples were not collected under typical mine ventilation rate operating conditions, the air monitoring analytical results from both Station VOC-A and Station VOC-B will be normalized to the typical operating conditions. This will be accomplished using the mine ventilation rates in use during the sampling event and the following equation: $$NVOC_{AB} = VOC_{AB} * \left(\frac{425{,}000_{scfm} / 130{,}000_{scfm}}{V_{O\ scfm} / V_{E-300\,scfm}} \right) \quad \text{(N-1)}$$ Where: *$NVOC_{AB}$ = Normalized target VOC concentration from Stations VOC-A or VOC-B* *VOC_{AB} = Concentration of the target VOC detected at Station VOC-A or VOC-B under non-typical mine ventilation rates* *scfm = Standard cubic feet per minute* *Vo = Sampling event overall mine ventilation rate (in standard cubic feet per minute)* *VE-300 = Sampling event mine ventilation rate through the E-300 Drift (in standard cubic feet per minute)* The normalized concentration of each target VOC detected at Station VOC-B will be subtracted from the normalized concentration detected at Station VOC-A. The resulting concentration represents the Underground HWDU VOC emission concentration." with "Calculate the carcinogenic risk (for each target VOC) using the following equation: $$R_{VOCj} = \frac{Conc_{VOCj} \times EF \times ED \times IUR_{VOCj} \times 1000}{AT} \quad \text{(N-1)}$$ Where: R_{VOCj} *= Risk due to exposure to target VOC_j*

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	$Conc_{VOC_j}$ = *Concentration target VOC$_j$ at the receptor (mg/m^3)* *EF = Exposure frequency (hours/year) = 1,920 hours per year* *ED = Exposure duration, years = 10 years* IUR_{VOCj} = *Inhalation unit risk factor from Table 4.6.2.3 (µg/m^3)$^{-1}$* *AT = Averaging time for carcinogens, = 613,200 hours based on 70 years* *1,000 = µg/mg* The total carcinogenic risk is then the sum of the risk due to each carcinogenic target VOC: $$\text{Total Carcinogenic Risk} = \sum_{j=1}^{m} R_{VOC_j} \quad \text{(N-2)}$$ Where: *Total Risk must be less than 10^{-5}* *m = the number of carcinogenic target VOCs* The formula for non-carcinogenic hazard is similar: $$HI_{VOC_j} = \frac{Conc_{VOC_j} \times EF \times ED}{AT \times RfC_{VOC_j}} \quad \text{(N-3)}$$ Where: HI_{VOC_j} = *Hazard Index for exposure to target VOC$_j$* $Conc_{VOC_j}$ = *Concentration target VOC$_j$ at the receptor (mg/m^3)* *EF = Exposure frequency (hours/year) = 1,920 hours per year* *ED = Exposure duration, years = 10 years* RfC_{VOC_j} = *Reference concentration from Table 4.6.2.3 (mg/m^3)* *AT = Averaging time for non-carcinogens, = 87,600 hours, based on exposure duration* The total hazard is the sum of the hazard index due to each non-carcinogenic target VOC: $$\text{Total Hazard Index} = \sum_{j=1}^{m} HI_{VOC_j} \quad \text{(N-4)}$$ Where: *Hazard Index must be less than or equal to 1.0* *m = the number of non-carcinogenic target VOCs"* Replaced "Underground HWDU" with "total carcinogenic risk (Equation N-2) and the total HI (Equation N-4) calculated from the surface" Deleted "emission" after VOC. Added "s" to the word concentration. Deleted "for each target VOC that is calculated" Replaced "its COC listed" with "the action levels" Replaced "Table" with "Section"

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	Replaced “COCs” with “risk and Hi action levels” Replaced “concentrations of any target VOC listed in” with “risk or HI” Replaced “concentration of concern” with “action levels” Replaced “Table with “Section” Replaced “Underground HWDU” with “surface” Deleted “emission” after VOC. Added “s” to the word concentration. Replaced “Underground HWDU” with “surface” Deleted “emission” after VOC. Replaced “For the first year of air sampling” with “The running annual average risk and HI will be compared to action levels specified in Permit Part 4, Section 4.6.2.3. When a VOC is added to the target analyte list,” Deleted “ each target VOC” Replaced “all of the previously collected” with “available” Replaced “concentration” with “risk or HI” Deleted “for any target VOC” after event Replaced “concentration of concern’ with “action levels” Replaced “Table with “Section” Deleted “If the results obtained from an individual air sampling event do not trigger the notification requirements of Permit Part 4, then” and capitalized the “T” in the word “the”
Attachment N, Section N-3e(2)	Replaced “N-5a, within 14 calendar days of receiving the laboratory analytical data” with “N-5d” Replaced “After obtaining” with “The” (Editorial change) Deleted “from an air sampling event, the data” (Editorial change) Replaced “Disposal Room Monitoring” with “DRVMP”
Attachment N, Section N-4a	Deleted “the following:” (Editorial change) Replaced “SUMMA®”” with “passivated” (Editorial change) Replaced “VOC canister samplers, treated” with “PASKs, subatmospheric sampling assemblies, passivated” Replaced “stainless steel” with “stainless-steel” (Editorial change) Replaced “a dual” with “one or more in-line” Added “s” to the word filter and deleted the word housing after the word filter”
Attachment N, Section N-4a(1)	Replaced ““SUMMA®” with “Sample” in heading. (Editorial change) Deleted ““SUMMA®” before the word passivated. (Editorial change) Deleted “and store all” after the word collect. Replaced “gas” with “disposal room” Added “(batch certification acceptable)” and the word certified. Replaced “the required reporting limits for the VOC analytical method” with “0.2 ppbv” Deleted “(see Table N-2)” after the word VOCs. Replaced “samplers” with “canisters” Replaced “at the sampler” with “as adequate” Added “as described in standard operating procedures (**SOPs**). The sample canisters are initially evacuated at the analytical laboratory to <0.05 mm Hg (50 mtorr)” at end of paragraph.
Attachment N, Section N-4a(2)	Replaced “Volatile Organic Compound Canister Samplers” with “Sample Collection Units” in heading.

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	Replaced "A conceptual diagram of the VOC sample collection units are provided in Figure N-2. Such units will be used at monitoring Stations VOC-A and VOC-B and at sampling locations for disposal room measurements. The sampling unit consists of a sample pump, flow controller, sample inlet, inlet filters in series to remove particulate matter, vacuum/pressure gauge, electronic timer, inlet purge vent, two sampling ports, and sufficient collection canisters so that any delays attributed to laboratory turnaround time and canister cleaning and certification will not result in canister shortages. Knowledge of sampler flow rates and duration of sampling will allow calculation of sample volume. The set point flow rate will be verified before and after sample collection from the mass flow indication. Prior to their initial use and annually thereafter, the sample collection units will be tested and certified to demonstrate that they are free of contamination above the reporting limits of the VOC analytical method (see Section N-5). Ultra-high purity humidified zero air will be pumped through the inlet line and sampling unit and collected in previously certified canisters as sampler blanks for analysis. The cleaning and certification procedure is derived from concepts contained in the EPA Compendium Method TO-15 (EPA, 1999)." with "The sample collection unit for surface VOC samples is a commercially available PASK comprised of components that regulate the rate and duration of air flow into a sample canister. It can be operated either manually, using canister valves, or unattended using a programmable timer. The sample collection unit for disposal room VOC monitoring is a subatmospheric sampling assembly that regulates the rate and duration of air flow into a sample canister. The subatmospheric sampling assembly also allows for purging of sample lines to ensure that a representative sample is collected. Sample collection units will use passivated components for the sample flow path. When sample canisters installed on sample collection units are opened to the atmosphere, the differential pressure causes the sample to flow into the canister at a regulated rate. By the end of each sampling period, the canisters will be near atmospheric pressure. Detailed instructions on sample collection will be given in SOPs. A conceptual diagram of a VOC sample collection unit is provided in Figure N-2"
Attachment N, Section N-4a(3)	Replaced "Treated stainless steel" with "The" Deleted "is" after tubing Replaced "from the desired sample point to the sample collection unit. This tubing is treated" with "is comprised of passivated stainless-steel" Replaced "absorbing contaminants" with "adsorbing sample constituents"
Attachment N, Section N-4b	Added paragraph "Sample collection for VOCs at the WIPP facility will be conducted in accordance with written SOPs that are kept on file at the facility. These SOPs will specify the steps necessary to ensure the collection of samples that are of acceptable quality to meet the applicable data quality objectives in Section N-5." Replaced "Six" with "Repository VOC samples will be 24" Added "time-" after the word hour. Replaced "will be collected on" with "for" Replaced "sample day" with "sampling events" Replaced "experimental" with "assessment" Replaced "The VOC canister sampler at each location will sample ambient air on the same programmed schedule. The sample pump will be programmed to sample continuously over a six-hour period during the workday. The units will sample at a nominal flow rate of 33.3 actual milliliters per minute over a six-hour sample period. This schedule will yield a final sample volume of approximately 12 L. Flow rates and sampling duration may be modified as necessary for experimental purposes and to meet the data quality objectives." with "and to meet the data quality

Affected Permit Section	Explanation of Change
	objectives. The selection of sampling days will be specified in SOPs and will be alternated from week-to-week in order to avoid potential bias created by plant operations." Added "for PASK" after the word flow. Replaced "checked each sample day" with "set" Replaced "Testing" with "Technology" (Editorial change) Deleted "Upon initiation of waste disposal activities in Panel 1, samples will be collected twice each week (at Stations VOC-A and VOC-B). Samples collected at the panel locations should represent the same matrix type (i.e., elevated levels of salt aerosols)." Deleted "by the same sampler" after the word simultaneously" Replaced "from" with "for" Replaced "sampling station (Stations VOC-A VOC-B) during the first sampling event and" with "VOC monitoring program" Added "at least" before the words 5 percent and deleted the word "thereafter" after the words 5 percent. Deleted "particularly" (Editorial change) Deleted the sentence "The repository samples do not require this action due to the short lengths of tubing required at these locations."
Attachment N, Section N-4c	Replaced ". No potentially" with ", which will ensure that" Added the word "not" after the word will. Replaced "No samples" with "Samples" Added the word "not" after the word will. Replaced the space between "tamper" and "free" with a hyphen.
Attachment N, Section N-4d	Changed title from "Sampler Maintenance" to "Maintenance of Sample Collection Units" Replaced "canister samplers" with "sample collection units" Replaced "during each cleaning cycle" with "as needed" Replaced "will" with "may" Replaced "but not be limited to" with "cleaning" Replaced "without compromising the integrity of the sampler" with "and" Deleted ", and instrument calibration" after the word testing. Added "sample collection" after the work spare. Deleted "At a minimum, canister samplers will be certified for cleanliness initially and annually thereafter upon initial use, after any parts that are included in the sample flow path are replaced, or any time analytical results indicate potential contamination. All sample canisters will be certified prior to each usage."
Attachment N, Section N-5a	Renumbered equation number from "N-2" to "N-5"
Attachment N, Section N-5a(1)	Changed year on EPA reference from "1994" to "1991" (Editorial change)
Attachment N, Section N-5a(2)	Added "at least" before the words 5 percent. Replaced "both" with "each VOC" Replaced "locations" with "program" Added "field" before the word duplicate.
Attachment N, Section N-5a(3)	Changed year on EPA reference from "1994" to "1991" (Editorial change)

Affected Permit Section	Explanation of Change
Attachment N, Section N-5a(4)	Replaced “intake manifold of the sampling systems” with “sample inlet of these sample collection units” Added “Up to two filters, inert to VOCs, will be installed in the sample flow path to minimize particulate interference.” to end of first paragraph. Deleted ”nine” before the word target. Replaced “compounds” with “VOCs” Added a comma after “136” to read “136,” (Editorial change)
Attachment N, Section N-5d	Replaced “A dedicated logbook will be maintained by the operators. This logbook” with “Field sampling data sheets” Deleted “Sample collection conditions, maintenance, and calibration activities will be included in this logbook. Additional data collected by other groups at WIPP, such as ventilation airflow, temperature, pressure, etc., will be obtained to document the sampling conditions.” in first paragraph. Replaced “forms and sampling logbooks will be checked” with “sheets” Deleted “routinely” after the word reviewed, Added the words “analytical laboratory” before QA officer. Added the word “analytical” before the word laboratory. Added “at a frequency of at least 10 percent” after the word supervisor. Added “Permit Part 4,” before the word Table. Added “VOC” before the word monitoring. (Editorial change) Added a comma after the word data. (Editorial change) Replaced “concentrations of concern in Table” with “the action levels specified in Permit Part 4, Section” Deleted “fourteen” and the associated parentheses. (Editorial change)
Attachment N, Section N-5e	Added “The Permittees will evaluate whether the monitoring systems and analytical methods are functioning properly through performance and system audits. The assessment period will be determined by the Permittees.” to beginning of first paragraph. Added “certifications for” before the word canister. Added “s” to the word canister. Replaced “sampler certification” with “measurement and test equipment” Deleted “to” after the word after. (Editorial change) Deleted “and sampler” after the word canister in second paragraph. Added “s” to the word certification and added “and measurement and test equipment” Added “, as applicable” after the word sheets. Replaced “weekly” with “during data validation”
Attachment N, Section N-5f	Replaced “Sampler maintenance” with “Maintenance of sample collection units” and added the word “laboratory” before SOP.
Attachment N, Section N-5g	Replaced “samplers” with “sample collection units.” Added “measurement and” before test equipment. Added “will be” after the word standard. (Editorial change) Replaced “are an indication of potential” with “may indicate” (Editorial change)
Attachment N, Section N-7	Added the following references: “40 CFR Part 136, "Guidelines Establishing Test Procedures for the Analysis of Pollutants." (Editorial change) Section 310 of Public Law 108-447 of the Consolidated Appropriations Act of 2005. (Editorial change)

Affected Permit Section	Explanation of Change
	U.S. Environmental Protection Agency, 1991. Contract Laboratory Program, Volatile Organics Analysis of Ambient Air in Canisters (Draft), EPA540/R-94-085, December 1991, Washington, D.C." (Editorial change) Replaced "3rd" with "Third" in EPA 1996 reference. (Editorial change) Replaced "Mas" with "Mass" and added "GC/MS)" to EPA 1999 reference. (Editorial change) Deleted "U.S. Environmental Protection Agency. 2000. *Guidance for the Data Quality Objectives Process*, QA/G-4. EPA 600/R-96/055, August 2000, Washington, D.C." (Editorial change) Replaced "Guidance" with "Requirements" and "G" with "R-5" in EPA 2001 reference. Replaced "EPA Requirements" with "Guidance", "R-5" with "G-5" and ""01" with "02" in EPA 2002 reference. (Editorial change) Replaced "2004" with "2003" in Washington Regulatory and Environmental Services reference. (Editorial change)
Attachment N, Table N-1	Replaced "A" with "C" and "B" with "D" in the title and added "VOC" to title. Deleted the space between the hyphen and the chemical name in two places. (Editorial change) Added "Trichloroethylene" to the Target Analyte column. Replaced a hyphen with a comma in footnote a. (Editorial change) Replace the period with an "l" in footnote b. (Editorial change)
Attachment N, Table N-2	Replaced "Compound" with "Target Analyte" in heading row. Added "Surface" before Monitoring in heading row. Made the following changes to the Required Repository Surface Monitoring MRL (ppbv) column by row. Replaced "2" with "0.2" Replaced "2" with "0.2" Replaced "2" with "0.2" Replaced "5" with "0.2" Replaced "2" with "0.2" Replaced "5" with "0.2" Replaced "2" with "0.2" Replaced "5" with "0.2" Replaced "5" with "0.2" Added one row "Trichloroethylene" "60 to 140" "25" "35" "0.2" "500" "95"
Attachment N, Figures	Replaced Figure N-1 with a new drawing and renamed the title from "Panel Area Flow" to "Repository VOC Monitoring Locations." Replaced Figure N-2 with a new drawing. Added second page to new Figure N-2. Replaced Figure N-3 with updated drawing and added "Typical" to beginning of the figure title and "Locations" to the end of the title. Replaced Figure N-4 with updated drawing and replaced "VOC" with "Disposal Room" in figure title.
Attachment O, Table of Contents	Deleted entry "O-3b(2) Calculation of the Running Annual Average of Total Mine Airflow" section is being deleted. Deleted "Running Annual Average of the."
Attachment O, Section O-2	Deleted first bullet "Maintaining an annual running average of 260,000 scfm through the underground repository"
Attachment O, Section O-3	Deleted second bullet "Monitoring and calculation of the Running Annual Average of the Total Mine Airflow to verify achievement of the 260,000 scfm minimum

Affected Permit Section	Explanation of Change
	requirement”
Attachment O, Section O-3b	Deleted “Running Annual Average of the.”
Attachment O, Section O-3b(2)	Entire section was deleted.
Attachment O, Section O-5a	Deleted “calculate the running annual average mine ventilation rate on a monthly basis and.” Deleted the extra period from the end of the paragraph. (Editorial change) Added “to” after “report.” (Editorial change) Replaced “have” with “has.”
Attachment O, Section O-5b	Delete “The underground facility running annual average mine ventilation rate on a monthly basis.”
Attachment O, Section O-6	Deleted “both underground and.” Added “rooms” after “disposal.” Deleted “software used to calculate the monthly and annual running averages and the.”

Appendix B
Proposed Revised Permit Text

Proposed Revised Permit Text:

Table 4.4.1 - VOC Room-Based Limits	
Compound	**VOC Room-Based Concentration Limit (PPMV)**
Carbon Tetrachloride	9,625
Chlorobenzene	13,000
Chloroform	9,930
1,1-Dichloroethylene	5,490
1,2-Dichloroethane	2,400
Methylene Chloride	100,000
1,1,2,2-Tetrachloroethane	2,960
Toluene	11,000
1,1,1-Trichloroethane	33,700
Trichloroethylene	48,000

4.5.3.2. Ventilation

The Permittees shall maintain ~~a minimum running annual average mine ventilation exhaust rate of 260,000 standard ft^3/min and~~ a minimum active room ventilation rate of 35,000 standard ft^3/min in each active room when waste disposal is taking place and workers are present in the room, as specified in Permit Attachment A2, Section A2-2a(3), "Subsurface Structures (Underground Ventilation System Description)," and as required by 20.4.1.500 NMAC (incorporating 40 CFR §264.601(c)).

4.6.2.3. Notification Requirements

After each sampling event for the compounds listed in Table 4.6.2.3, the Permittees shall calculate the total and running annual averages for the carcinogenic and the total non-carcinogenic risk to the non-waste surface worker, using the methodology in Attachment N and the recommended EPA risk factors listed in Table 4.6.2.3.

The Permittees shall notify the Secretary in writing, within seven calendar days of obtaining validated analytical results, whenever the total and/or the running annual average carcinogenic risk to the non-waste surface worker exceeds 10^{-5} or the total and/or the running annual average non-carcinogenic risk as measured by the hazard index exceeds 1.0.~~concentration of any VOC specified in Table 4.4.1 exceeds the concentration of concern specified in Table 4.6.2.3 below.~~

~~The Permittees shall notify the Secretary in writing, within seven calendar days of obtaining validated analytical results, whenever the running annual average concentration (calculated after each sampling event) for any VOC specified in Table 4.4.1 exceeds the concentration of concern specified in Table 4.6.2.3 below.~~

The Permittees shall post a link to any exceedance notice transmittal letter on the WIPP Home Page and inform those on the e-mail notification list as specified in Permit Section 1.11.

The Permittees shall review EPA risk factors and the tentatively identified compound list annually and update Table 4.6.2.3 as needed as a Class 1 permit modification notification.

Table 4.6.2.3 – Recommended EPA Risk Factors~~VOC Concentrations of Concern~~

Compound	~~Drift E-300 Concentration~~	
	Carcinogenic IUR $(ug/m^3)^{-1}$~~ug/m3~~	**Non-carcinogenic RfC (mg/m^3)~~ppbv~~**
Carbon Tetrachloride	6.0×10^{-6}~~6040~~	1.0×10^{-1}~~960~~
Chlorobenzene	N/A~~1015~~	5.0×10^{-2}~~220~~
Chloroform	6.0×10^{-6}~~890~~	9.8×10^{-2}~~180~~
1,1-Dichloroethylene	N/A~~410~~	2.0×10^{-1}~~100~~
1,2-Dichloroethane	2.6×10^{-5}~~175~~	7.0×10^{-3}~~45~~
Methylene Chloride	1.0×10^{-8}~~6700~~	6.0×10^{-1}~~1930~~
1,1,2,2-Tetrachloroethane	5.8×10^{-5}~~350~~	N/A~~50~~
Toluene	N/A~~715~~	5.0~~190~~
1,1,1-Trichloroethane	N/A~~3200~~	5.0~~590~~
Trichloroethylene	4.1×10^{-6}	2.0×10^{-3}

IUR = Inhalation Unit Risk from EPA Integrated Risk Information System (IRIS) Database

RfC = Reference Concentration from EPA IRIS Database

N/A = not applicable (No value published in the IRIS Database)

4.6.2.4. Remedial Action

If the running annual average for the total carcinogenic risk due to releases of~~concentration for a~~ VOCs specified in Table 4.6.2.3~~4.4.1~~ exceeds 10^{-5}, or if the running annual average for the total non-carcinogenic hazard index due to releases of VOCs specified in Table 4.6.2.3 exceeds 1.0~~the concentration of concern specified in Table 4.6.2.3~~, the Permittees shall cease disposal in the active CH waste disposal room and install ventilation barriers as specified in Permit Section 4.5.3.3. Alternatively, prior to reaching the action level, the Permittees can propose an alternative remedial action to the Secretary. The Permittees may implement such plans in lieu of closing the active room only after approval by the Secretary.

If the running annual average for the total carcinogenic risk due to releases of~~concentration for a~~ VOCs specified in Table 4.6.2.3~~4.4.1~~ exceeds 10^{-5} or if the running annual average for the total non-carcinogenic hazard index due to releases of VOCs specified in Table 4.6.2.3 exceeds 1.0~~the concentration of concern specified in Table 4.6.2.3~~ for six consecutive months, the Permittees shall close the affected Underground HWDU as specified in Permit Section 4.9.1. Alternatively, prior to reaching the action level, the Permittees can propose an alternative remedial action to the Secretary. The Permittees may implement such plans in lieu of closing the active HWDU only after approval by the Secretary.

Table 4.6.3.2 - Action Levels for Disposal Room Monitoring		
Compound	**50% Action Level for VOC Constituents of Concern in Any Closed Room, ppmv**	**95% Action Level for VOC Constituents of Concern in Active Open or Immediately Adjacent Closed Room, ppmv**
Carbon Tetrachloride	4,813	9,145
Chlorobenzene	6,500	12,350
Chloroform	4,965	9,433
1,1-Dichloroethylene	2,745	5,215
1,2-Dichloroethane	1,200	2,280
Methylene Chloride	50,000	95,000
1,1,2,2-Tetrachloroethane	1,480	2,812
Toluene	5,500	10,450

1,1,1-Trichloroethane	16,850	32,015
Trichloroethylene	24,000	45,600

4.6.4.3. Notification Requirements

~~The Permittees shall calculate the running annual average mine ventilation exhaust rate on a monthly basis. In addition, t~~The Permittees shall evaluate compliance with the minimum active room ventilation rate specified in Permit Section 4.5.3.2 on a monthly basis. The Permittees shall report to the Secretary in the annual report specified in Permit Section 4.6.4.2 whenever the evaluation of the mine ventilation monitoring program data identifies that the ventilation rate~~s~~ specified in the Permit Section 4.5.3.2 ~~have~~ has not been achieved.

4.8.3. Ventilation Rate~~s~~

The Permittees shall maintain, in the operating record, a record identifying any non-conformance to the ventilation rate~~s~~ specified in Permit Section 4.5.3.2.

A2-1 Description of the Geologic Repository

Panels 1 through 8 will consist of seven rooms and two access drifts each. Panels 9 and 10 have yet to be designed. Access drifts connect the rooms and have the same cross section (see Section A2-2a(3)). The closure system installed in each HWDU after it is filled will prevent anyone from entering the HWDU and will restrict ventilation airflow. The point of compliance for air emissions from the Underground is Sampling Station VOC-~~A~~C, as defined in Permit Attachment N (Volatile Organic Compound Monitoring Plan). Sampling Station VOC-~~A~~ C is the location where the concentration of volatile organic compounds (VOCs) in the air emissions from the Underground HWDUs will be measured and then compared to the VOC action levels (10^{-5} for carcinogens and HI>1 for non-carcinogens) ~~concentration of concern~~ as required by Permit Part 4, Section 4.6.2.3.

A2-2a(3) Subsurface Structures

Underground Ventilation System Description

The underground ventilation system consists of six centrifugal exhaust fans, two identical HEPA-filter assemblies arranged in parallel, isolation dampers, a filter bypass arrangement, and associated ductwork. The six fans, connected by the ductwork to the underground exhaust shaft so that they can independently draw air through the Exhaust Shaft, are divided into two groups. One group consists of three main exhaust fans, two of which are utilized to provide the nominal air flow of 425,000 standard ft^3 per minute (~~SCFM~~scfm) throughout the WIPP facility underground during normal operation. One main fan may be operated in the alternate mode to provide 260,000 ~~SCFM~~ scfm underground ventilation flow. These fans are located near the Exhaust Shaft. The second group consists of the remaining three filtration fans, and each can provide 60,000 ~~SCFM~~ scfm of air flow. These fans, located at the Exhaust Filter Building, ~~are capable of being employed during~~ can be operated in the filtration mode, where exhaust is diverted through HEPA filters, or in the reduced or minimum ventilation mode, where air is not drawn through the HEPA filters. ~~In order to ensure the miscellaneous unit environmental performance standards are met, a minimum running annual average exhaust rate of 260,000 SCFM will be maintained.~~

G-1d(1) Schedule for Panel Closure

To ensure continued protection of human health and the environment, the Permittees will initially block ventilation through Panels 3 through 7 as described in Permit Attachment A2, Section A2-2a(3), after waste disposal in each panel has been completed. The Permittees shall continue VOC monitoring in such panels until final panel closure. If the measured concentration, as confirmed by a second sample, of any VOC in a panel exceeds the ~~"~~95% ~~A~~action ~~L~~level~~"~~ given in Permit Part 4, Table 4.6.3.2, the Permittees will initiate remedial actions as required by Permit Part 4, Section 4.6.3.3.~~closure of that panel by installing the 12-foot explosion-isolation wall as described in Section G-1e(1) and submit a Class 1* permit modification request to extend closure of that panel, if necessary.~~ Regardless of the outcome of disposal room VOC monitoring, final closure of Panels 3 through 7 will be completed as specified in this Permit no later than January 31, 2016.

H-1 Post-Closure Plan

These monitoring programs will be carried out during the period between the closure of the first panel and the initiation of final facility closure for the underground facility. The Permittees have prepared a Volatile Organic Compound Monitoring Plan (**VOCMP**) which will be implemented to confirm that the annual average concentration of volatile organic compounds (**VOCs**) in the air emissions from the underground HWDUs do not exceed the VOC action levels (10^{-5} for carcinogens and HI>1 for non-carcinogens) ~~concentrations of concern~~ listed in Permit Part 4, Section 4.6.2.3 ~~and Permit Attachment N, Table N-3.1~~. The VOCMP is provided in Attachment N. The VOCMP includes monitoring design, sampling and analysis procedures and quality assurance objectives. This plan is required to demonstrate compliance with 20.4.1.500 and .900 NMAC (incorporating 40 CFR §264.602 and §270.23(a)(2)).

The Permittees will operate the VOCMP ~~collect air samples upstream of all open and closed panels, and down stream of Panel 1~~ until after certification of the closure of the last underground HWDU.

The VOCMP uses EPA Compendium Method TO-15. The Permittees have had success with TO-15 at the WIPP if care is taken in placing the sampler to avoid high dust and if stringent cleaning requirements are imposed for the clean canisters. This is necessary because of the extremely low concentrations that are being monitored.

The VOCMP will be implemented under a Quality Assurance Plan that conforms to the document entitled “EPA Requirements for Quality Assurance Project Plans for Environmental Data Operations,”~~.~~ Quality Assurance criteria required for the target analytes are presented in Table N-4 2 in Permit Attachment N. Definitions of these criteria are given in Permit Attachment N along with a discussion of other requirements of the Quality Assurance Program, including sample handling, calibration, analytical procedures, data reduction, validation and reporting, performance and system audits, preventive maintenance, and corrective actions.

ATTACHMENT N

VOLATILE ORGANIC COMPOUND MONITORING PLAN

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LIST OF TABLES

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ACRONYMS<u>,</u> ~~AND~~ ABBREVIATIONS<u>, AND UNITS</u>

<u>ARA</u>	<u>additional requested analyte</u>
BS/BSD	blank spike/blank spike duplicate
<u>CFR</u>	<u>Code of Federal Regulations</u>
CH	Contact-handled
~~CLP~~	~~Contract Laboratory Program~~
~~COC~~	~~concentration of concern~~
CRQL	contract-required quantitation limit
DOE	U.S. Department of Energy
<u>DRVMP</u>	<u>Disposal Room VOC Monitoring Program</u>
<u>EDD</u>	<u>electronic data deliverable</u>
EPA	U.S. Environmental Protection Agency
ft	feet
GC/MS	gas chromatography/mass spectrometry
<u>HI</u>	<u>hazard index</u>
HWDU	Hazardous Waste Disposal Unit
<u>IUR</u>	<u>inhalation unit risk</u>
<u>L</u>	<u>liter</u>
LCS	laboratory control sample
m	meter
MDL	method detection limit
<u>mm</u>	<u>millimeter</u>
MOC	Management and Operating Contractor ~~(Permit Section 1.5.3)~~
MRL	method reporting limit
<u>mtorr</u>	<u>millitorr</u>
NIST	National Institute of Standards and <u>Technology</u>~~Testing~~
<u>NMAC</u>	<u>New Mexico Administrative Code</u>
<u>NMED</u>	<u>New Mexico Environment Department</u>
<u>PASK</u>	<u>passive air sampling kit</u>
ppbv	parts per billion by volume
<u>ppmv</u>	<u>parts per million by volume</u>
QA	quality assurance
~~QAPD~~	~~Quality Assurance Program Description~~
<u>QAPjP</u>	<u>Quality Assurance Project Plan</u>
QC	quality control
~~RCRA~~	~~Resource Conservation and Recovery Act~~

RfC	reference concentration
RH	remote-handled
RPD	relative percent difference
RVMP	Repository VOC Monitoring Program
SOP	standard operating procedure
TIC	tentatively identified compound
TRU	transuranic~~Transuranic~~
VOC	volatile organic compound
WIPP	Waste Isolation Pilot Plant

ATTACHMENT N

VOLATILE ORGANIC COMPOUND MONITORING PLAN

N-1 Introduction

This Permit Attachment describes the monitoring plan for volatile organic compound (**VOC**) emissions from mixed waste that may be entrained in the exhaust air from the U.S. Department of Energy (**DOE**) Waste Isolation Pilot Plant (**WIPP**) Underground Hazardous Waste Disposal Units (**HWDUs**) during the disposal phase at the facility. The purpose of VOC monitoring is to ensure compliance with the VOC limits specified in Permit Part 4. This VOC monitoring plan consists of two programs: ~~as follows;~~ (1) Repository VOC Monitoring Program (**RVMP**), which assesses compliance with the environmental performance standards in Permit Part 4, Section 4.6.2.3~~Table 4.6.2.3~~; and (2) Disposal Room VOC Monitoring Program (**DRVMP**) (includes ongoing disposal room VOC monitoring), which assesses compliance with the disposal room ~~performance standards~~action levels in Permit Part 4, Table 4.6.3.2. This plan includes the monitoring design, a description of sampling and analysis procedures, quality assurance (**QA**) objectives, and reporting activities.

N-1a Background

The Underground HWDUs are located 2,150 feet (ft) (655 meters [m]) below ground surface, in the WIPP underground. As defined for this Permit, an Underground HWDU is a single excavated panel consisting of seven rooms and two access drifts designated for disposal of contact-handled (**CH**) and remote-handled (**RH**) transuranic (**TRU**) mixed waste. Each room is approximately 300 ft (91 m) long, 33 ft (10 m) wide, and 13 ft (4 m) high. Access drifts connect the rooms and have the same cross section. The Permittees shall dispose of TRU mixed waste in Underground HWDUs designated as Panels 1 through 8.

This plan addresses the following elements:

1. Rationale for the design of the VOC monitoring programs, based on:

    - Possible pathways from WIPP during the active life of the facility
    - Demonstrating compliance with the disposal room performance standards by monitoring VOCs in underground disposal rooms
    - VOC sampling operations at WIPP
    - Optimum locations for sampling ~~of the ambient mine air monitoring stations~~

2. Descriptions of the specific elements of the VOC monitoring programs, including:

    - The type of monitoring conducted
    - Sampling locations~~The location of the monitoring stations~~
    - The monitoring interval
    - The specific hazardous constituents monitored
    - ~~The implementation schedule for the~~ VOC monitoring schedule~~programs~~
    - Sampling equipment~~The equipment used at the monitoring stations~~

- Sampling and analytical techniques ~~used~~
- Data recording/reporting procedures
- Notification and action ~~Action~~ levels for remedial action ~~if limits are approached~~

The technical basis for Disposal Room VOC Monitoring is discussed in detail in the Technical Evaluation Report for Room-Based VOC Monitoring (WRES, 2003).

N-1b Objectives of the Volatile Organic Compound Monitoring Plan

The CH and RH TRU mixed waste disposed in the WIPP Underground HWDUs may contain VOCs which could be released from WIPP during the disposal phase of the project. This plan describes how:

- VOCs released from waste panels will be monitored to confirm that the running annual average risk to the non-waste surface worker due to~~concentration of~~ VOCs in the air emissions from the Underground HWDUs do not exceed the action levels ~~VOC concentrations of concern (**COC**)~~ identified in Permit Part 4, Section~~Table~~ 4.6.2.3 and calculated from measured VOC concentrations using risk factors identified in Table 4.6.2.3. Appropriate remedial action, as specified in Permit Section 4.6.2.4, will be taken if the ~~limits~~ action levels in Permit Part 4, Section~~Table~~ 4.6.2.3 are reached.

- VOCs released from waste containers in disposal rooms will be monitored to confirm that the concentration of VOCs in the air of closed and active rooms in active panels do not exceed the VOC disposal room limits identified in Permit Part 4, Table 4.4.1. Appropriate remedial action, as specified in Permit Part 4, Section 4.6.3.3, will be taken if the original sample results are greater than or equal to the action levels~~Action Levels~~ in Permit Part 4, Table 4.6.3.2 ~~are reached~~.

N-2 Target Volatile Organic Compounds

The target VOCs for repository monitoring (Station VOC-C~~A~~ and VOC-D~~B~~) and disposal room monitoring are presented in Table N-1.

These target VOCs were selected because together they represent approximately 99 percent of the risk due to air emissions.

N-3 Monitoring Design

Detailed design features of this plan are presented in this section. This plan uses available sampling and analysis techniques to measure VOC concentrations in air. Subatmospheric sample collection units are~~Sampling equipment includes the WIPP VOC canister samplers~~ used in ~~both~~ the Repository and Disposal Room VOC Monitoring Programs. These sample collection units are described in greater detail in Section N-4a(2).

N-3a Sampling Locations

Air samples will be collected ~~in~~ at the WIPP facility ~~underground~~ to quantify airborne VOC concentrations as described in the following sections.

N-3a(1) Sampling Locations for Repository VOC Monitoring

Mine~~The initial configuration for the repository VOC monitoring stations is shown in Figure N-1. All mine~~ ventilation air, which could potentially be impacted by VOC emissions from the Underground HWDUs identified as Panels 1 through 8, will ~~pass monitoring Station VOC-A, located in the E-300 drift as it flows to the exhaust shaft~~exit the underground through the Exhaust Shaft. Building 489 has been identified as the location of the maximum non-waste surface worker exposure. Air samples will be collected ~~at two locations in the facility~~ at the air intake for Building 489 (Figure N-1) to quantify VOCs in the ambient air. Background VOCs will be measured by sampling at groundwater pad WQSP-4 (Figure N-1). This pad is located approximately one mile southeast (upwind based on the predominant wind direction) of the Exhaust Shaft within the WIPP facility.~~airborne VOC concentrations~~. ~~VOC concentrations attributable to VOC emissions from open and closed panels containing TRU mixed waste will be measured by placing one VOC monitoring station just downstream from Panel 1 at VOC-A. The location of Station VOC-A will remain the same throughout the term of this Permit. The second station (Station VOC-B) will always be located upstream from the open panel being filled with waste (starting with Panel 1 at monitoring Station VOC-B (Figure N-1). In this configuration, Station VOC-B will measure VOC concentrations attributable to releases from the upstream sources and other background sources of VOCs, but not releases attributable to open or closed panels. The location of Station VOC-B will change when disposal activities begin in the next panel. Station VOC-B will be relocated to ensure that it is always upstream of the open panel that is receiving TRU mixed waste. Station VOC-A will also measure upstream VOC concentrations measured at Station VOC-B, plus any additional VOC concentrations resulting from releases from the closed and open panels. A sample will be collected from each monitoring station on designated sample days. For each quantified target VOC, the concentration measured at Station VOC-B will be subtracted from the concentration measured at Station VOC-A to assess the magnitude of VOC releases from closed and open panels.~~

~~The sampling locations were selected based on operational considerations. There are several different potential sources of release for VOCs into the WIPP mine ventilation air. These sources include incoming air from above ground and facility support operations, as well as open and closed waste panels. In addition, because of the ventilation requirements of the underground facility and atmospheric dispersion characteristics, any VOCs that are released from open or closed panels may be difficult to detect and differentiate from other sources of VOCs at any underground or above ground location further downstream of Panel 1. By measuring VOC concentrations close to the potential source of release (i.e., at Station VOC-A), it will be possible to differentiate potential releases from background levels (measured at Station VOC-B).~~

N-3b Analytes to Be Monitored

The ~~nine~~ VOCs that have been identified for repository and disposal room VOC monitoring are listed in Table N-1. The analysis will focus on routine detection and quantification of these target analytes~~compounds~~ in collected samples. As part of the analytical evaluations, the presence of other compounds (i.e., non-target VOCs) will also be monitored~~investigated~~. Some non-target VOCs may be included on the laboratory's target analyte list as additional requested analytes (**ARAs**) to gain a better understanding of potential concentrations and associated risk. The analytical laboratory will be directed to calibrate for ARAs, when necessary. The analytical laboratory will also be directed to classify and report other non-target

VOCs~~all of these compounds~~ as tentatively identified compounds~~Tentatively Identified Compounds~~ (**TICs**) when tentative identification can be made. The evaluation of TICs in original samples will include those concentrations that are ≥10 percent of the relative internal standard. The evaluation of ARAs only includes concentrations that are greater than or equal to the MRLs listed in Table N-2.

Non-target VOCs classified as ARAs or TICs meet the following criteria: (1) are listed in Appendix VIII of 40 Code of Federal Regulations (**CFR**) Part 261 (incorporated by reference in 20.4.1.200 New Mexico Administrative Code (**NMAC**)), and (2) are~~TICs~~ detected in 10 percent~~%~~ or more of any original VOC monitoring samples ~~(exclusive of those collected from Station VOC-B) that are VOCs listed in Appendix VIII of 20.4.1.200 NMAC (incorporating 40 CFR §261),~~ collected over a ~~running~~ 12-month timeframe.~~,~~ Non-target VOCs will be added, as applicable, to the analytical laboratory target analyte list~~s~~ for both the repository and disposal room VOC monitoring programs, unless the Permittees can justify their exclusion ~~from the target analyte list(s)~~. Non-target VOCs reported as "unknown" by the analytical laboratory are not evaluated due to indeterminate identifications.

Additional requested analytes and TICs detected in the repository and disposal room VOC monitoring programs will be placed in the WIPP Operating Record and reported to the New Mexico Environment Department (**NMED**)~~NMED~~ in the Semi-Annual VOC Monitoring Report as specified in Permit Part 4, Section 4.6.2.2. As applicable, the Permittees will also report the justification for exclusion from the target analyte list (e.g., the compound does not contribute to more than one percent of the risk; the compound persists in the background samples at similar concentrations). If new targets are required, the Permittees will submit a Class 1 Permit Modification Notification annually (in October) in accordance with 20.4.1.900 NMAC (incorporating 40 CFR 270.42(a)) to update Table 4.6.2.3 to include the new analyte and associated recommended U.S. Environmental Protection Agency (**EPA**) risk values for the inhalation unit risk (**IUR**) and reference concentration (**RfC**). Added compounds will be included in the risk assessment described in Section N-3e(1).

N-3c Sampling and Analysis Methods

The VOC monitoring programs include a comprehensive VOC monitoring program established at the facility; equipment, training, and documentation ~~for VOC measurements~~ are already in place.

The sampling methods used for VOC monitoring are~~sampling is~~ based on the concepts ~~of pressurized sample collection~~ contained in the ~~U.S. Environmental Protection Agency (~~EPA~~)~~ Compendium Method TO-15 (EPA, 1999). The TO-15 sampling concept uses 6-liter ~~SUMMA~~® passivated ~~(or equivalent)~~ stainless-steel canisters to collect integrated air samples at each sample location. This conceptual method will be used as a reference for collecting the samples at WIPP. The samples will be analyzed using gas chromatography/mass spectrometry (**GC/MS**) under an established QA/quality control (**QC**) program. Laboratory analytical procedures have been developed based on the concepts contained in both TO-15 and 8260B. Section N-5 contains additional QA/QC information for this project.

The TO-15 method is an EPA-recognized sampling concept for VOC sampling and speciation. It can be used to provide subatmospheric~~integrated samples, or grab~~ samples~~, and~~ as well as compound quantitation for a broad range of concentrations. ~~The sampling system can be operated unattended but requires detailed operator training.~~ This sampling technique is also viable for use while analyzing the sample using other EPA methods such as 8260B.

~~The field sampling systems will be operated in the pressurized mode. In this mode, air is drawn through the inlet and sampling system with a pump. The air is pumped into~~For subatmospheric sampling, air is collected in an initially evacuated ~~SUMMA®~~ passivated ~~(or equivalent)~~ canister. When the canister is opened to the atmosphere, the differential pressure causes the sample to flow into the canister. Flow rate and duration are regulated with a flow-restrictive inlet and flow controller. The air will pass through a particulate filter to prevent sample and equipment contamination. Passive sampling equipment components are used to inhibit adsorption of compounds on the surfaces of the equipment. ~~by the sampler, which regulates the rate and duration of sampling. The treatment of tubing and canisters used for VOC sampling effectively seals the inner walls and prevents compounds from being retained on the surfaces of the equipment. By the end of each sampling period, the canisters will be pressurized to about two atmospheres absolute. In the event of shortened sampling periods or other sampling conditions, the final pressure in the canister may be less than two atmospheres absolute. Sampling duration will be approximately six hours, so that a complete sample can be collected during a single work shift.~~

~~The canister sampling system and GC/MS analytical method are particularly appropriate for the VOC Monitoring Programs because a relatively large sample volume is collected, and multiple dilutions and reanalyses can occur to ensure identification and quantification of target VOCs within the working range of the method. The contract-required quantitation limits (**CRQL**) for Repository Monitoring are 5~~For the RVMP, the maximum allowable Method Reporting Limit (**MRL**) is 0.2 parts per billion by volume (**ppbv**); ~~or less for the nine target compounds.~~ ~~C~~consequently, low concentrations can be measured. ~~CRQLs are the EPA-specified levels of quantitation proposed for EPA contract laboratories that analyze canister samples by GC/MS For the purpose of this plan, the CRQLs will be defined as the method reporting limits (**MRL**).~~ The maximum allowable MRL for DRVMP is 500 ppbv (0.5 parts per million by volume (**ppmv**)) to allow for reliable quantitation. The MRL is a function of instrument performance, sample preparation, sample dilution, and all steps involved in the sample analysis process. ~~The MRL for Disposal Room Monitoring is 500 ppbv or less for the nine target compounds.~~

The DRVMP ~~Disposal room VOC monitoring system in open panels~~ will employ sample collection units that will provide a subatmospheric sample within a short duration ~~the same canister sampling method as used in the repository VOC monitoring~~. Passivated ~~or equivalent~~ sampling lines will be installed in the disposal room as described in Section N-3a(2) and maintained (to the degree possible) after ~~once~~ the room is closed, until the panel associated with the room is closed. The independent lines will run from the sample inlet point to a sampling manifold ~~the individual sampler~~ located in an area accessible to sampling personnel~~the access drift to the disposal panel. The air will pass through dual particulate filters to prevent sample and equipment contamination~~.

N-3d Sampling Schedule

The Permittees will perform sampling on the following schedule in accordance with standard operating procedures.~~evaluate whether the monitoring systems and analytical methods are functioning properly. The assessment period will be determined by the Permittees.~~

N-3d(1) Sampling Schedule for Repository VOC Monitoring

~~Repository VOC sampling at Stations VOC-A and VOC-B will begin with initial waste emplacement in Panel 1. Sampling will continue until the certified closure of the last Underground HWDU.~~ Routine collection of a 24-hour time-integrated sample ~~sampling~~ will be conducted two times per week. The RVMP sampling will continue until the certified closure of the last Underground HWDU.

N-3e Data Evaluation and Reporting

N-3e(1) Data Evaluation and Reporting for Repository VOC Monitoring

When the Permittees receive laboratory analytical data from an air sampling event, the data will be validated as specified in Section N-5d. After obtaining validated data from an original surface VOC monitoring sample obtained during an air sampling event, the data will be evaluated to determine whether the VOC emissions from the Underground HWDUs exceed the action levelsCOCs. The COCs for each of the nine target VOCs are presented in Permit Part 4, Section Table 4.6.2.3. The values are presented calculated in terms of risk of excess cancer death for compounds believed to be carcinogenic and hazard index (**HI**) for non-carcinogens as follows:micrograms per cubic meter (µg/m³) and ppbv.

Calculate the carcinogenic risk (for each target VOC) using the following equation:

$$R_{VOCj} = \frac{Conc_{VOCj} \times EF \times ED \times IUR_{VOCj} \times 1000}{AT} \quad \text{(N-1)}$$

Where:

R_{VOCj} = Risk due to exposure to target VOC_j

$Conc_{VOC_j}$ = Concentration target VOC_j at the receptor (mg/m³)

EF = Exposure frequency (hours/year) = 1,920 hours per year

ED = Exposure duration, years = 10 years

IUR_{VOCj} = Inhalation unit risk factor from Table 4.6.2.3 $(\mu g/m^3)^{-1}$

AT = Averaging time for carcinogens, = 613,200 hours based on 70 years

1,000 = µg/mg

The total carcinogenic risk is then the sum of the risk due to each carcinogenic target VOC:

$$\text{Total Carcinogenic Risk} = \sum_{j=1}^{m} R_{VOC_j} \quad \text{(N-2)}$$

Where:

Total Risk must be less than 10^{-5}

m = the number of carcinogenic target VOCs

The formula for non-carcinogenic hazard is similar:

$$HI_{VOC_j} = \frac{Conc_{VOC_j} \times EF \times ED}{AT \times RfC_{VOC_j}} \qquad \text{(N-3)}$$

Where:

HI_{VOC_j} *= Hazard Index for exposure to target VOC_j*

$Conc_{VOC_j}$ *= Concentration target VOC_j at the receptor (mg/m^3)*

EF = Exposure frequency (hours/year) = 1,920 hours per year

ED = Exposure duration, years = 10 years

RfC_{VOC_j} *= Reference concentration from Table 4.6.2.3 (mg/m^3)*

AT = Averaging time for non-carcinogens, = 87,600 hours, based on exposure duration

The total hazard is the sum of the hazard index due to each non-carcinogenic target VOC:

$$\text{Total Hazard Index} = \sum_{j=1}^{m} HI_{VOC_j} \qquad \text{(N-4)}$$

Where:

Hazard Index must be less than or equal to 1.0

m = the number of non-carcinogenic target VOCs

~~The COCs were calculated assuming typical operational conditions for ventilation rates in the mine. The typical operational conditions were assumed to be an overall mine ventilation rate of 425,000 standard cubic feet per minute and a flow rate through the E-300 Drift at Station VOC-A of 130,000 standard cubic feet per minute.~~

~~Since the mine ventilation rates at the time the air samples are collected may be different than the mine ventilation rates during typical operational conditions, the Permittees will measure and/or record the overall mine ventilation rate and the ventilation rate in the E-300 Drift at Station VOC-A that are in use during each sampling event. The Permittees shall also measure and record temperature and pressure conditions during the sampling event to allow all ventilation rates to be converted to standard flow rates.~~

~~If the air samples were collected under the typical mine ventilation rate conditions, then the analytical data will be used without further manipulation. The concentration of each target VOC detected at Station VOC-B will be subtracted from the concentration detected at Station VOC-A. The resulting VOC concentration represents the concentration of VOCs being emitted from the open and closed Underground HWDUs upstream of Station VOC-A (or the Underground HWDU VOC emission concentration).~~

~~If the air samples were not collected under typical mine ventilation rate operating conditions, the air monitoring analytical results from both Station VOC-A and Station VOC-B will be normalized to the typical operating conditions. This will be accomplished using the mine ventilation rates in use during the sampling event and the following equation:~~

$$NVOC_{AB} = VOC_{AB} * \left(\frac{425{,}000_{scfm} / 130{,}000_{scfm}}{V_{O\,scfm} / V_{E-300\,scfm}} \right) \qquad \text{(N-1)}$$

~~Where: $NVOC_{AB}$ = Normalized target VOC concentration from Stations VOC-A or VOC-B~~

~~VOC_{AB} = Concentration of the target VOC detected at Station VOC-A or VOC-B under non-typical mine ventilation rates~~

~~scfm = Standard cubic feet per minute~~

~~Vo = Sampling event overall mine ventilation rate (in standard cubic feet per minute)~~

~~VE-300 = Sampling event mine ventilation rate through the E-300 Drift (in standard cubic feet per minute)~~

~~The normalized concentration of each target VOC detected at Station VOC-B will be subtracted from the normalized concentration detected at Station VOC-A. The resulting concentration represents the Underground HWDU VOC emission concentration.~~

The total carcinogenic risk (Equation N-2) and the total HI (Equation N-4) calculated from the ~~Underground HWDU~~ surface VOC ~~emission~~ concentrations ~~for each target VOC that is calculated~~ for each sampling event will be compared directly to the action levels~~its COC listed~~ in Permit Part 4, Section~~Table~~ 4.6.2.3. This will establish whether any of the concentrations of VOCs in the emissions from the Underground HWDUs exceeded the risk and HI action levels~~COCs~~ at the time of the sampling.

As specified in Permit Part 4, the Permittees shall notify the Secretary in writing, within seven calendar days of obtaining validated analytical results, whenever the risk or HI~~concentrations of any target VOC listed in~~ exceeds the action levels~~concentration of concern~~ specified in Permit Part 4, Section~~Table~~ 4.6.2.3.

The surface~~Underground HWDU~~ VOC ~~emission~~ concentrations for each target VOC that is calculated for each sampling event will then be averaged with the ~~Underground HWDU~~surface VOC ~~emission~~ concentrations calculated for the air sampling events conducted during the previous 12 months. This will be considered the running annual average concentration for each target VOC. The running annual average risk and HI will be compared to action levels specified in Permit Part 4, Section 4.6.2.3. When a VOC is added to the target analyte list, ~~For the first year of air sampling,~~ the running annual average concentration ~~for each target VOC~~ will be calculated using ~~all of the previously collected~~available data.

As specified in Permit Part 4, the Permittees shall notify the Secretary in writing, within seven calendar days of obtaining validated analytical results, whenever the running annual average risk or HI ~~concentration~~ (calculated after each sampling event) ~~for any target VOC~~ exceeds the action levels~~concentration of concern~~ specified in Permit Part 4, Section~~Table~~ 4.6.2.3.

~~If the results obtained from an individual air sampling event do not trigger the notification requirements of Permit Part 4, then t~~The Permittees will maintain a database with the VOC air sampling data and the results will be reported to the Secretary as specified in Permit Part 4.

N-3e(2) Data Evaluation and Reporting for Disposal Room VOC Monitoring

When the Permittees receive laboratory analytical data from an air sampling event, the data will be validated as specified in Section N-5d~~N-5a, within 14 calendar days of receiving the laboratory analytical data~~. ~~After obtaining~~ The validated data ~~from an air sampling event, the data~~ will be evaluated to determine whether the VOC concentrations in the air of any closed room, the active open room, or the immediately adjacent closed room exceeded the Action Levels for ~~Disposal Room Monitoring~~ DRVMP specified in Permit Part 4, Table 4.6.3.2.

The Permittees shall notify the Secretary in writing, within seven calendar days of obtaining validated analytical results, whenever the concentration of any VOC specified in Permit Part 4, Table 4.4.1 exceeds the action levels specified in Permit Part 4, Table 4.6.3.2.

The Permittees shall submit to the Secretary the Semi-Annual VOC Monitoring Report specified in Permit Section 4.6.2.2 that also includes results from disposal room VOC monitoring.

N-4a Sampling Equipment

The sampling equipment that will be used includes ~~the following:~~ 6-liter (L) stainless-steel passivated ~~SUMMA®~~ canisters, PASKs, subatmospheric sampling assemblies, passivated ~~VOC canister samplers, treated~~ stainless~~-~~ steel tubing, and ~~a dual~~one or more in-line filters ~~housing~~. A discussion of each of these items is presented below.

N-4a(1) Sample ~~SUMMA®~~ Canisters

Six-liter, stainless-steel canisters with ~~SUMMA®~~ passivated interior surfaces will be used to collect ~~and store all~~ ambient air and disposal room ~~gas~~ samples for VOC analyses collected as part of the monitoring processes. These canisters will be cleaned and certified (batch certification acceptable) prior to their use, in a manner similar to that described by Compendium Method TO-15. The canisters will be certified clean to below 0.2 ppbv ~~the required reporting limits for the VOC analytical method~~ for the target VOCs ~~(see Table N-2)~~. The vacuum of certified clean canisters ~~samplers~~ will be verified as adequate ~~at the sampler~~ upon initiation of a sample cycle as described in standard operating procedures (**SOPs**). The sample canisters are initially evacuated at the analytical laboratory to <0.05 mm Hg (50 mtorr).

N-4a(2) Sample Collection Units~~Volatile Organic Compound Canister Samplers~~

The sample collection unit for surface VOC samples is a commercially available PASK comprised of components that regulate the rate and duration of air flow into a sample canister. It can be operated either manually, using canister valves, or unattended, using a programmable timer.

The sample collection unit for disposal room VOC monitoring is a subatmospheric sampling assembly that regulates the rate and duration of air flow into a sample canister. The subatmospheric sampling assembly also allows for purging of sample lines to ensure that a representative sample is collected.

Sample collection units will use passivated components for the sample flow path. When sample canisters installed on sample collection units are opened to the atmosphere, the differential pressure causes the sample to flow into the canister at a regulated rate. By the end of each sampling period, the canisters will be near atmospheric pressure. Detailed instructions on sample collection will be given in SOPs. A conceptual diagram of the VOC sample collection units are provided in Figure N-2.

~~A conceptual diagram of a VOC sample collection unit is provided in Figure N-2. Such units will be used at monitoring Stations VOC-A and VOC-B and at sampling locations for disposal room measurements. The sampling unit consists of a sample pump, flow controller, sample inlet, inlet filters in series to remove particulate matter, vacuum/pressure gauge, electronic timer, inlet purge vent, two sampling ports, and sufficient collection canisters so that any delays attributed to laboratory turnaround time and canister cleaning and certification will not result in canister shortages. Knowledge of sampler flow rates and duration of sampling will allow calculation of sample volume. The set point flow rate will be verified before and after sample collection from the mass flow indication. Prior to their initial use and annually thereafter, the sample collection units will be tested and certified to demonstrate that they are free of contamination above the reporting limits of the VOC analytical method (see Section N-5). Ultra-high purity humidified zero air will be pumped through the inlet line and sampling unit and collected in previously certified canisters as sampler blanks for analysis. The cleaning and certification procedure is derived from concepts contained in the EPA Compendium Method TO-15 (EPA, 1999).~~

N-4a(3) Sample Tubing

~~Treated stainless steel~~ The tubing ~~is~~ used as a sample path is comprised of passivated stainless-steel ~~, from the desired sample point to the sample collection unit. This tubing is treated~~ to prevent the inner walls from adsorbing sample constituents~~absorbing contaminants~~ when they are pulled from the sample point to the sample collection unit.

N-4b Sample Collection

Sample collection for VOCs at the WIPP facility will be conducted in accordance with written SOPs that are kept on file at the facility. These SOPs will specify the steps necessary to ensure the collection of samples that are of acceptable quality to meet the applicable data quality objectives in Section N-5.

Repository VOC samples will be 24~~Six~~-hour time-integrated samples for~~will be collected on~~ each sampling event~~sample day~~. Alternative sampling durations may be defined for assessment ~~experimental~~ purposes and to meet the data quality objectives. The selection of sampling days will be specified in SOPs and will be alternated from week-to-week in order to avoid potential bias created by plant operations. ~~The VOC canister sampler at each location will sample ambient air on the same programmed schedule. The sample pump will be programmed to sample continuously over a six-hour period during the workday. The units will sample at a nominal flow rate of 33.3 actual milliliters per minute over a six-hour sample period. This schedule will yield a final sample volume of approximately 12 L. Flow rates and sampling~~

~~duration may be modified as necessary for experimental purposes and to meet the data quality objectives.~~

Sample flow for PASK will be set~~checked each sample day~~ using an in-line mass flow controller. The flow controllers are initially factory-calibrated and specify a typical accuracy of better than 10 percent full scale. Additionally, each air flow controller is calibrated at a manufacturer-specified frequency using a National Institute of Standards and Technology ~~Testing~~ (**NIST**) primary flow standard.

~~Upon initiation of waste disposal activities in Panel 1, samples will be collected twice each week (at Stations VOC-A and VOC-B). Samples collected at the panel locations should represent the same matrix type (i.e., elevated levels of salt aerosols).~~ To verify the matrix similarity and assess field sampling precision, field duplicate samples will be collected (two canisters filled simultaneously~~ by the same sampler~~) for ~~from~~ each VOC monitoring program~~sampling station (Stations VOC-A and VOC-B) during the first sampling event and~~ at an overall frequency of at least 5 percent ~~thereafter~~ (see Section N-5a).

Prior to collecting the active open disposal room and closed room samples, the sample lines are purged to ensure that the air collected is not air that has been stagnant in the tubing. This is important in regard to the disposal room sample ~~particularly~~ because of the long lengths of tubing associated with these samples. ~~The repository samples do not require this action due to the short lengths of tubing required at these locations.~~

N-4c Sample Management

All samples will be maintained, and shipped if necessary, at ambient temperatures. Collected samples will be transported in appropriate containers. Prior to leaving the underground for analysis, sample containers may undergo radiological screening, which will ensure that ~~. No potentially~~ contaminated samples or equipment will not be transported to the surface. ~~No samples~~ Samples will not be accepted by the receiving laboratory personnel unless they are properly labeled and sealed to ensure a tamper-~~-~~free shipment.

N-4d ~~Sampler~~ Maintenance of Sample Collection Units

Periodic maintenance for sample collection units~~canister samplers~~ and associated equipment will be performed as needed~~during each cleaning cycle~~. This maintenance may ~~will~~ include cleaning, ~~but not be limited to,~~ replacement of damaged or malfunctioning parts~~ without compromising the integrity of the sampler~~, and leak testing~~, and instrument calibration~~. Additionally, complete spare sample collection units will be maintained on-site to minimize downtime because of equipment ~~sampler~~ malfunction. ~~At a minimum, canister samplers will be certified for cleanliness initially and annually thereafter upon initial use, after any parts that are included in the sample flow path are replaced, or any time analytical results indicate potential contamination. All sample canisters will be certified prior to each usage.~~

N-5a Quality Assurance Objectives for the Measurement of Precision, Accuracy, Sensitivity, and Completeness

QA objectives for this plan will be defined in terms of the following data quality parameters.

Precision. For the duration of this program, precision will be defined and evaluated by the RPD values calculated between field duplicate samples and between laboratory duplicate samples.

$$RPD = \left(\frac{(A - B)}{(A + B)/2} \right) * 100 \qquad \text{(N-5N-2)}$$

where: A = Original sample result

B = Duplicate sample result

N-5a(1) Evaluation of Laboratory Precision

Laboratory sample duplicates and blank spike/blank spike duplicates (**BS/BSD**) will be used to evaluate laboratory precision. QA objectives for laboratory precision are listed in Table N-2, and are based on precision criteria proposed by the EPA for canister sampling programs (EPA, 19911994). These values will be appropriate for the evaluation of samples with little or no matrix effects. Because of the potentially high level of salt-type aerosols in the WIPP underground environment, the analytical precision achieved for WIPP samples may vary with respect to the EPA criteria. RPDs for BS/BSD analyses will be tracked through the use of control charts. RPDs obtained for laboratory sample duplicates will be compared to those obtained for BS/BSDs to ascertain any sample matrix effects on analytical precision. BS/BSDs and laboratory sample duplicates will be analyzed at a frequency of 10 percent, or one per analytical lot, whichever is more frequent.

N-5a(2) Evaluation of Field Precision

Field duplicate samples will be collected at a frequency of at least 5 percent for each VOC both monitoring programlocations. The data quality objective for field precision is 35 percent for each set of field duplicate samples.

N-5a(3) Evaluation of Laboratory Accuracy

A blank spike or LCS is an internal QC sample generated by the analytical laboratory by spiking a standard air matrix (humid zero air) with a known amount of a certified reference gas. The reference gas will contain the target VOCs at known concentrations. Percent recoveries for the target VOCs will be calculated for each LCS relative to the reference concentrations. Objectives for percent recovery are listed in Table N-2, and are based on accuracy criteria proposed by the EPA for canister sampling programs (EPA, 19911994). LCSs will be analyzed at a frequency of 10 percent, or one per analytical lot, whichever is more frequent.

N-5a(4) Evaluation of Sensitivity

The presence of aerosol salts in underground locations may affect the MDL of the samples collected in those areas. The sample inlet of these sample collection unitsintake manifold of the sampling systems will be protected sufficiently from the underground environment to minimize salt aerosol interference. Up to two filters, inert to VOCs, will be installed in the sample flow path to minimize particulate interference.

The MDL for each of the nine target VOCscompounds will be evaluated by the analytical laboratories before sampling begins. The initial and annual MDL evaluation will be performed in accordance with 40 *Code of Federal Regulations* §136, and with EPA/530-SW-90-021, as revised and retitled, "Quality Assurance and Quality Control" (Chapter 1 of SW-846) (1996).

N-5d Data Reduction, Validation, and Reporting

Field sampling data sheets A dedicated logbook will be maintained by the operators. This logbook will contain documentation of all pertinent data for the sampling. Sample collection conditions, maintenance, and calibration activities will be included in this logbook. Additional data collected by other groups at WIPP, such as ventilation airflow, temperature, pressure, etc., will be obtained to document the sampling conditions.

Data validation procedures will include at a minimum, a check of all field data sheets forms and sampling logbooks will be checked for completeness and correctness. Sample custody and analysis records will be reviewed routinely by the analytical laboratory QA officer and the analytical laboratory supervisor at a frequency of at least 10 percent.

Electronic Data Deliverables (**EDDs**) are provided by the laboratory prior to receipt of hard copy data packages. EDDs will be evaluated within five calendar days of receipt to determine if VOC concentrations are at or above action levels in Permit Part 4, Table 4.6.3.2 for disposal room VOC monitoring data, or the action levels specified in Permit Part 4, Section concentrations of concern in Table 4.6.2.3 for repository monitoring data. If the EDD indicates that VOC concentrations are at or above these action levels or concentrations, the hard copy data package will be validated within five calendar days as opposed to the fourteen (14) calendar day time frame provided by Section N-3e(2).

N-5e Performance and System Audits

The Permittees will evaluate whether the monitoring systems and analytical methods are functioning properly through performance and system audits. The assessment period will be determined by the Permittees. System audits will initially address start-up functions for each phase of the project. These audits will consist of on-site evaluation of materials and equipment, review of certifications for canisters and measurement and test equipmentsampler certification, review of laboratory qualification and operation and, at the request of the QA officer, an on-site audit of the laboratory facilities. The function of the system audit is to verify that the requirements in this plan have been met prior to initiating the program. System audits will be performed at or shortly after to the initiation of the VOC monitoring programs and on an annual basis thereafter.

Performance audits will be accomplished as necessary through the evaluation of analytical QC data by performing periodic site audits throughout the duration of the project, and through the introduction of third-party audit cylinders (laboratory blinds) into the analytical sampling stream. Performance audits will also include a surveillance/review of data associated with canister ~~and sampler~~ certifications and measurement and test equipment, a project-specific technical audit of field operations, and a laboratory performance audit. Field logs, logbooks, and data sheets, as applicable, will be reviewed during data validation~~weekly~~. Blind-audit canisters will be introduced once during the sampling period. Details concerning scheduling, personnel, and data quality evaluation are addressed in the QAPjP.

N-5f Preventive Maintenance

Maintenance of sample collection units ~~Sampler maintenance~~ is described briefly in Section N-4d. Maintenance of analytical equipment will be addressed in the analytical laboratory SOP.

N-5g Corrective Actions

If the required completeness of valid data (95 percent) is not maintained, corrective action may be required. Corrective action for field sampling activities may include recertification and cleaning of sample collection units~~samplers~~, reanalysis of samples, additional training of personnel, modification to field and laboratory procedures, and recalibration of measurement and test equipment.

Laboratory corrective actions may be required to maintain data quality. The laboratory continuing calibration criteria indicate the relative response factor for the midpoint standard will be less than 30 percent different from the mean relative response factor for the initial calibration. Differences greater than 30 percent will require recalibration of the instrument before samples can be analyzed. If the internal standard areas in a sample change by more than 40 percent, the sample will be reanalyzed. If the 40 percent criterion is not achieved during the reanalysis, the instrument will undergo a performance check and the midpoint standard will be reanalyzed to verify proper operation. Deviations larger than 40 percent ~~are an indication of potential~~ may indicate instrument malfunction.

N-7 References

40 CFR Part 136, "Guidelines Establishing Test Procedures for the Analysis of Pollutants."

Section 310 of Public Law 108-447 of the Consolidated Appropriations Act of 2005.

U.S. Environmental Protection Agency, 1991. Contract Laboratory Program, Volatile Organics Analysis of Ambient Air in Canisters (Draft), EPA540/R-94-085, December 1991, Washington, D.C.

U.S. Environmental Protection Agency. 1996. SW-846, *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods*. Third~~3rd~~ Edition. Office of Solid Waste and Emergency Response, Washington, D.C.

U.S. Environmental Protection Agency. 1999 *Compendium Method TO-15: Determination of Volatile Organic Compounds (VOCs) In Air Collected in Specially-~~-~~Prepared Canisters and Analyzed by Gas Chromatography/Mass~~Mas~~ Spectrometry (GC/MS)*, EPA 625/R-96/010b. Center for Environmental Research Information, Office of Research and Development, Cincinnati, OH, January 1999.

~~U.S. Environmental Protection Agency. 2000. *Guidance for the Data Quality Objectives Process*, QA/G-4. EPA 600/R-96/055, August 2000, Washington, D.C.~~

U.S. Environmental Protection Agency. 2001. *EPA Requirements ~~Guidance~~ for Quality Assurance Project Plans, QA/R-5~~G~~*, EPA 240/B-01/003, March 2001, Washington, D.C.

U.S. Environmental Protection Agency. 2002. *Guidance~~EPA Requirements~~ for ~~Preparing~~ Quality Assurance Project Plans*, QA/G-5~~R-5~~, EPA 240/R-02~~01~~/009, December 2002, Washington, D.C.

Washington Regulatory and Environmental Services, 2003~~2004~~. *Technical Evaluation Report for WIPP Room-Based VOC Monitoring*.

TABLES

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Table N-1
Target Analytes and Methods for Repository VOC (Station VOC-CA and VOC-DB) Monitoring and Disposal Room VOC Monitoring

Target Analyte	EPA Standard Analytical Method
Carbon tetrachloride	EPA TO-15[a] EPA 8260B[b]
Chlorobenzene	
Chloroform	
1,1-Dichloroethylene	
1,2-Dichloroethane	
Methylene chloride	
1,1,2,2--Tetrachloroethane	
Toluene	
1,1,1--Trichloroethane	
Trichloroethylene	

[a] U.S. Environmental Protection Agency, 1999, Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air,- Second Edition, http://www.epa.gov/ttn/amtic/airtox.html

[b] U.S. Environmental Protection Agency, SW-846 Test Methods for Evaluation Solid Wastes, Chemical and Physical Methods, http://www.epa.gov/epaoswer/hazwaste/test/main.html

Table N-2
Quality Assurance Objectives for Accuracy, Precision, Sensitivity, and Completeness

Target Analyte~~Compound~~	Accuracy (Percent Recovery)	Precision (RPD)		Required Repository Surface Monitoring MRL (ppbv)	Required Disposal Room MRL (ppbv)	Completeness (Percent)
		Laboratory	Field			
Carbon tetrachloride	60 to 140	25	35	~~2~~0.2	500	95
Chlorobenzene	60 to 140	25	35	~~2~~0.2	500	95
Chloroform	60 to 140	25	35	~~2~~0.2	500	95
1,1-Dichloroethylene	60 to 140	25	35	~~5~~0.2	500	95
1,2-Dichloroethane	60 to 140	25	35	~~2~~0.2	500	95
Methylene chloride	60 to 140	25	35	~~5~~0.2	500	95
1,1,2,2-Tetrachloroethane	60 to 140	25	35	~~2~~0.2	500	95
Toluene	60 to 140	25	35	~~5~~0.2	500	95
1,1,1-Trichloroethane	60 to 140	25	35	~~5~~0.2	500	95
Trichloroethylene	60 to 140	25	35	0.2	500	95

MRL maximum method reporting limit for undiluted samples

RPD relative percent difference

FIGURES

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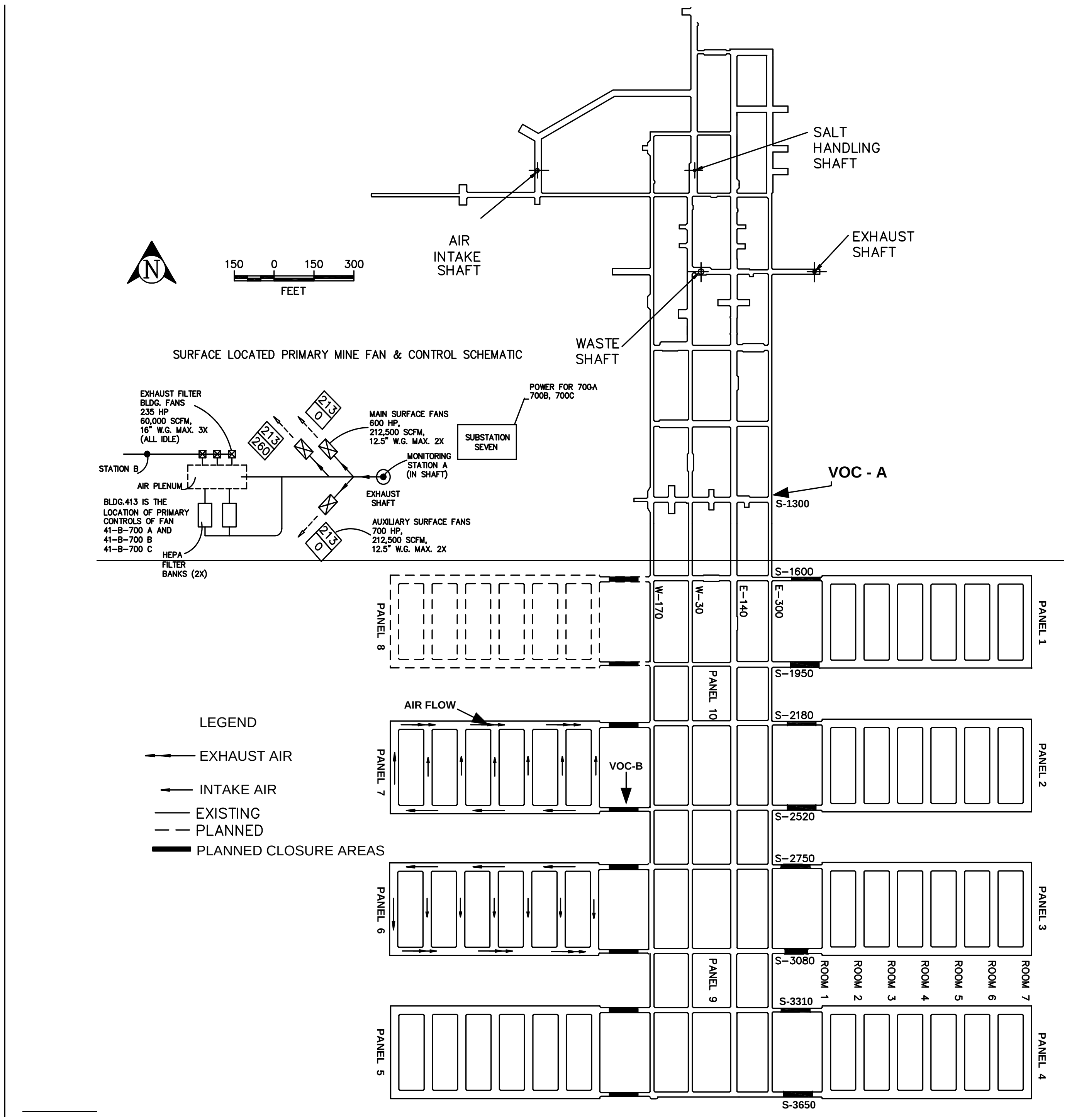
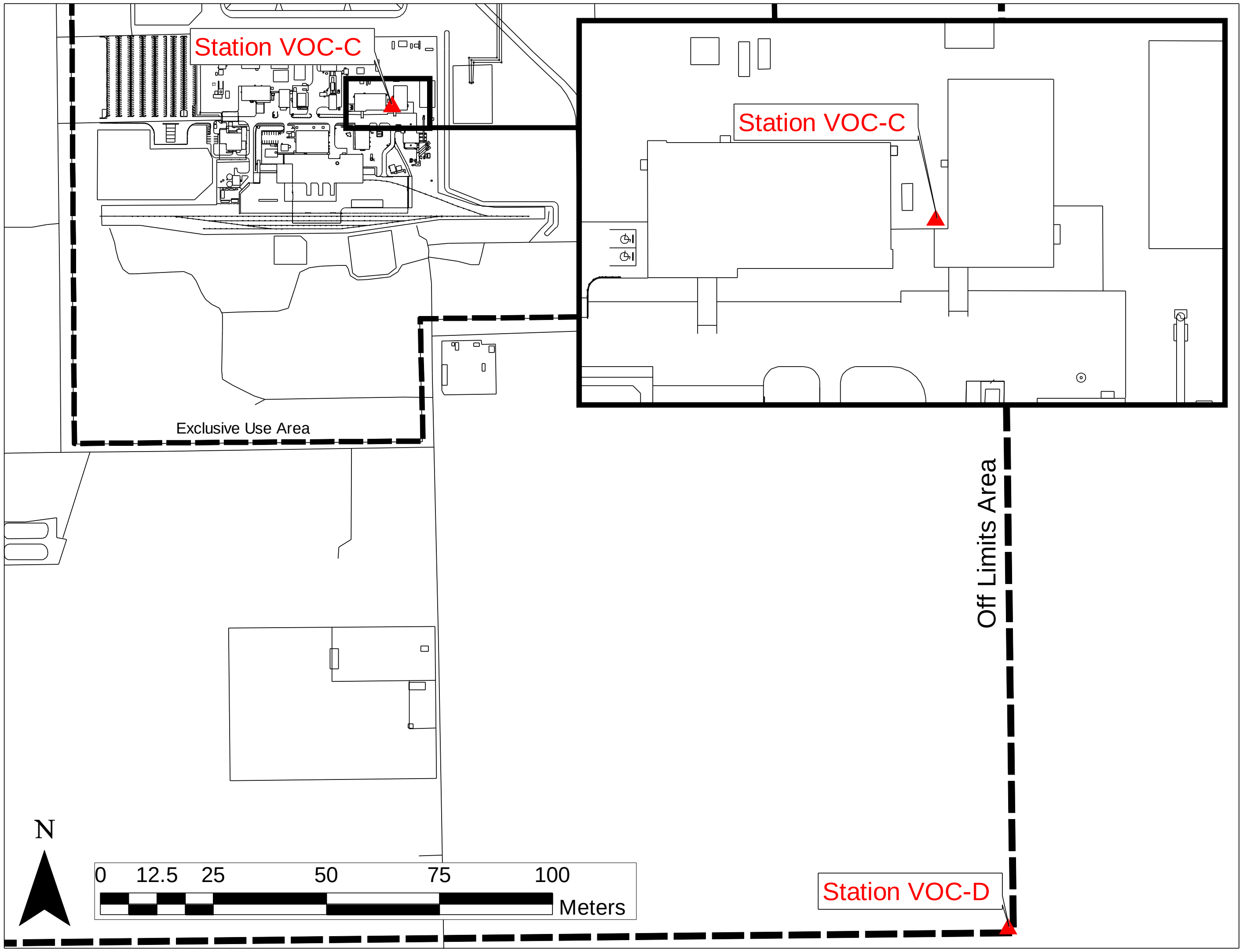
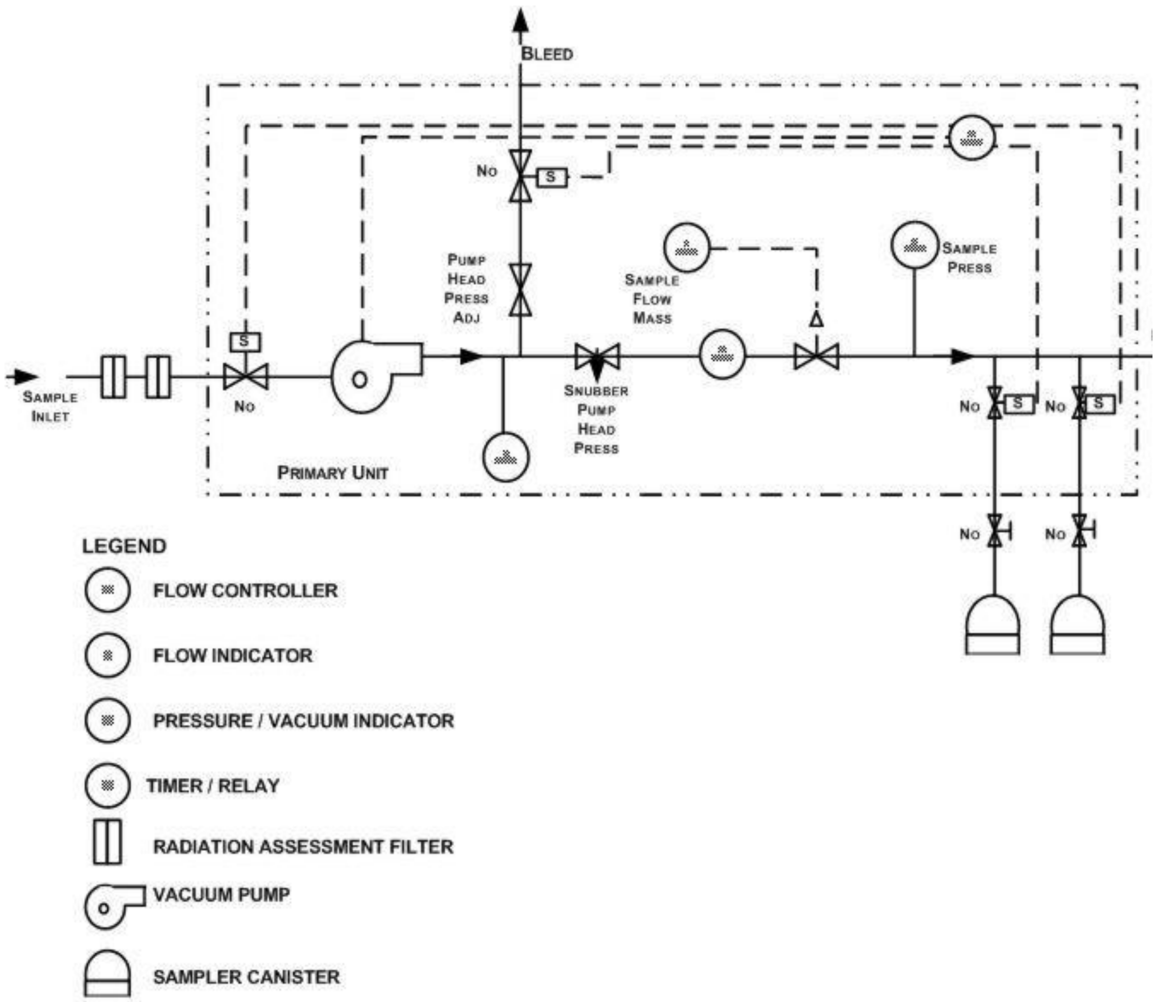

SALT HANDLING SHAFT
AIR INTAKE SHAFT
EXHAUST SHAFT
WASTE SHAFT
150 0 150 300
FEET
SURFACE LOCATED PRIMARY MINE FAN & CONTROL SCHEMATIC
EXHAUST FILTER BLDG. FANS 235 HP 60,000 SCFM, 16" W.G. MAX. 3X (ALL IDLE)
MAIN SURFACE FANS 600 HP, 212,500 SCFM, 12.5" W.G. MAX. 2X
POWER FOR 700-A 700B, 700C
SUBSTATION SEVEN
MONITORING STATION A (IN SHAFT)
STATION B
AIR PLENUM
EXHAUST SHAFT
BLDG.413 IS THE LOCATION OF PRIMARY CONTROLS OF FAN 41-B-700 A AND 41-B-700 B 41-B-700 C
AUXILIARY SURFACE FANS 700 HP, 212,500 SCFM, 12.5" W.G. MAX. 2X
HEPA FILTER BANKS (2X)
VOC - A
S-1300
S-1600
S-1950
S-2180
S-2520
S-2750
S-3080
S-3310
S-3650
W-170
W-30
E-140
E-300
PANEL 1
PANEL 2
PANEL 3
PANEL 4
PANEL 5
PANEL 6
PANEL 7
PANEL 8
PANEL 9
PANEL 10
ROOM 1
ROOM 2
ROOM 3
ROOM 4
ROOM 5
ROOM 6
ROOM 7
AIR FLOW
VOC-B
LEGEND
EXHAUST AIR
INTAKE AIR
EXISTING
PLANNED
PLANNED CLOSURE AREAS

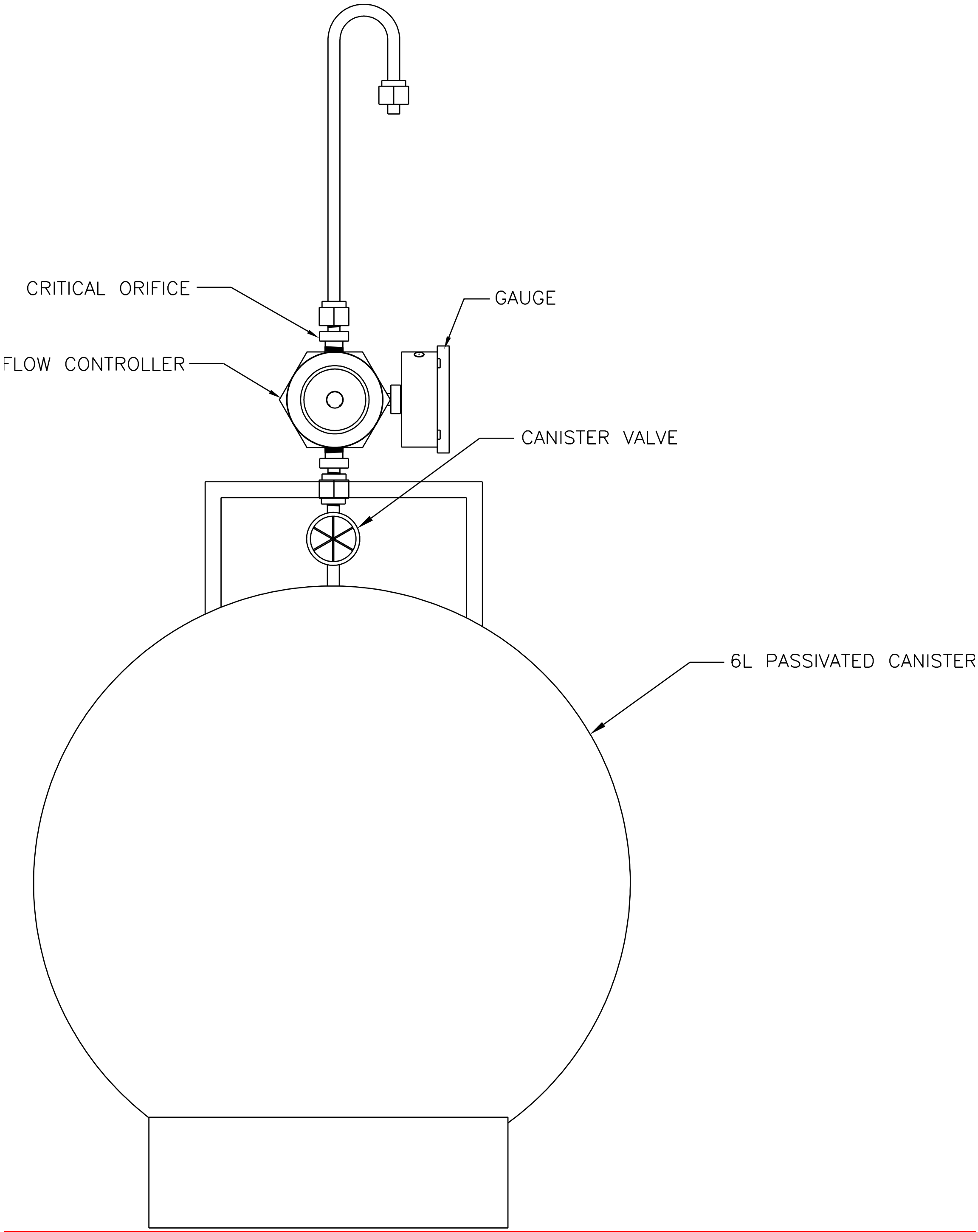


(see Figure D-1 and Figure D-1a for a detailed map and legend of the suface buildings)

Figure N-1
~~Panel Area Flow~~Repository VOC Monitoring Locations

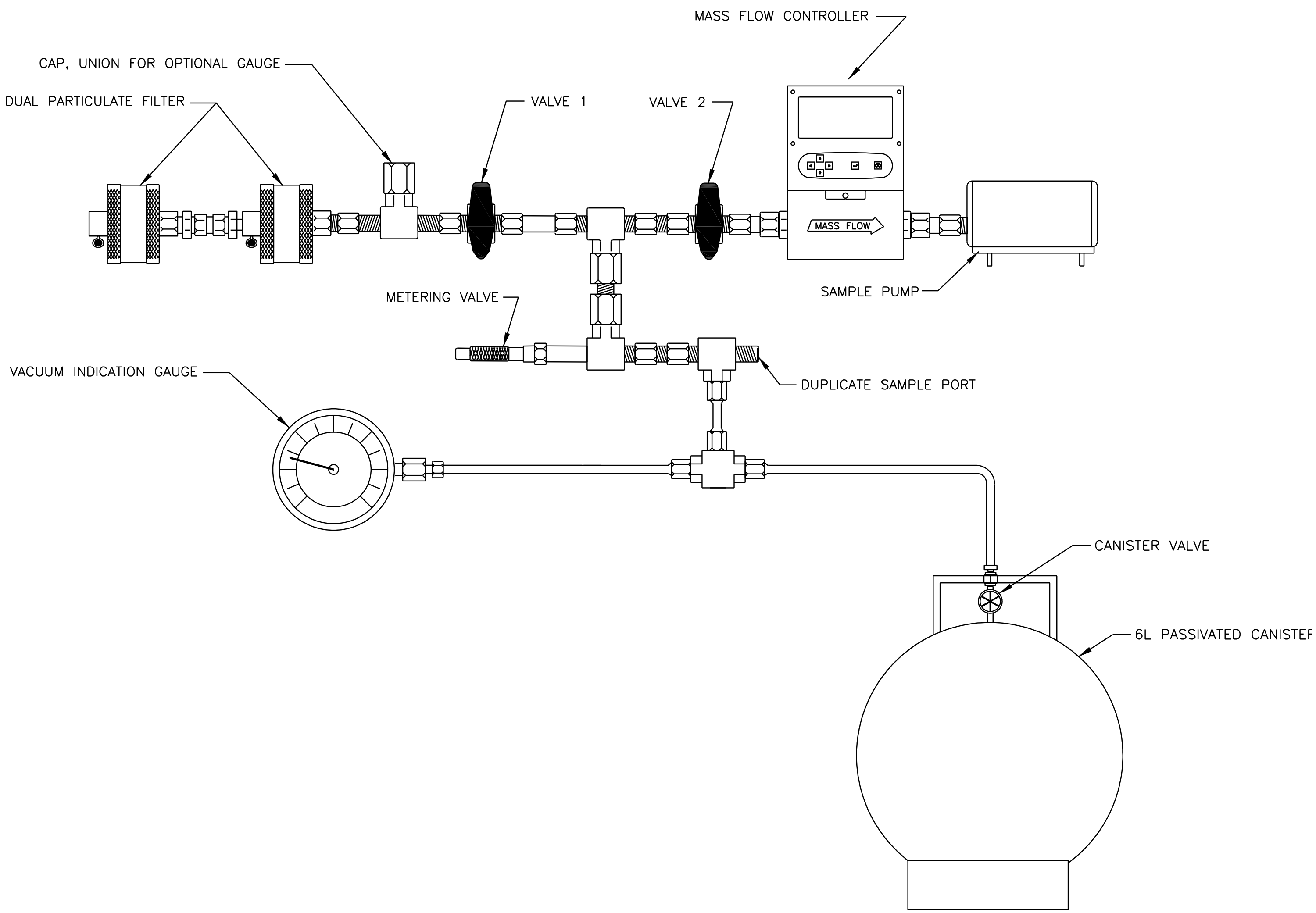


NOTE: Number and Arrangement of Components May Vary Depending on Sampling Location (i.e., confirmatory vs. Room-Based) and Number of Samples To Be Collected.



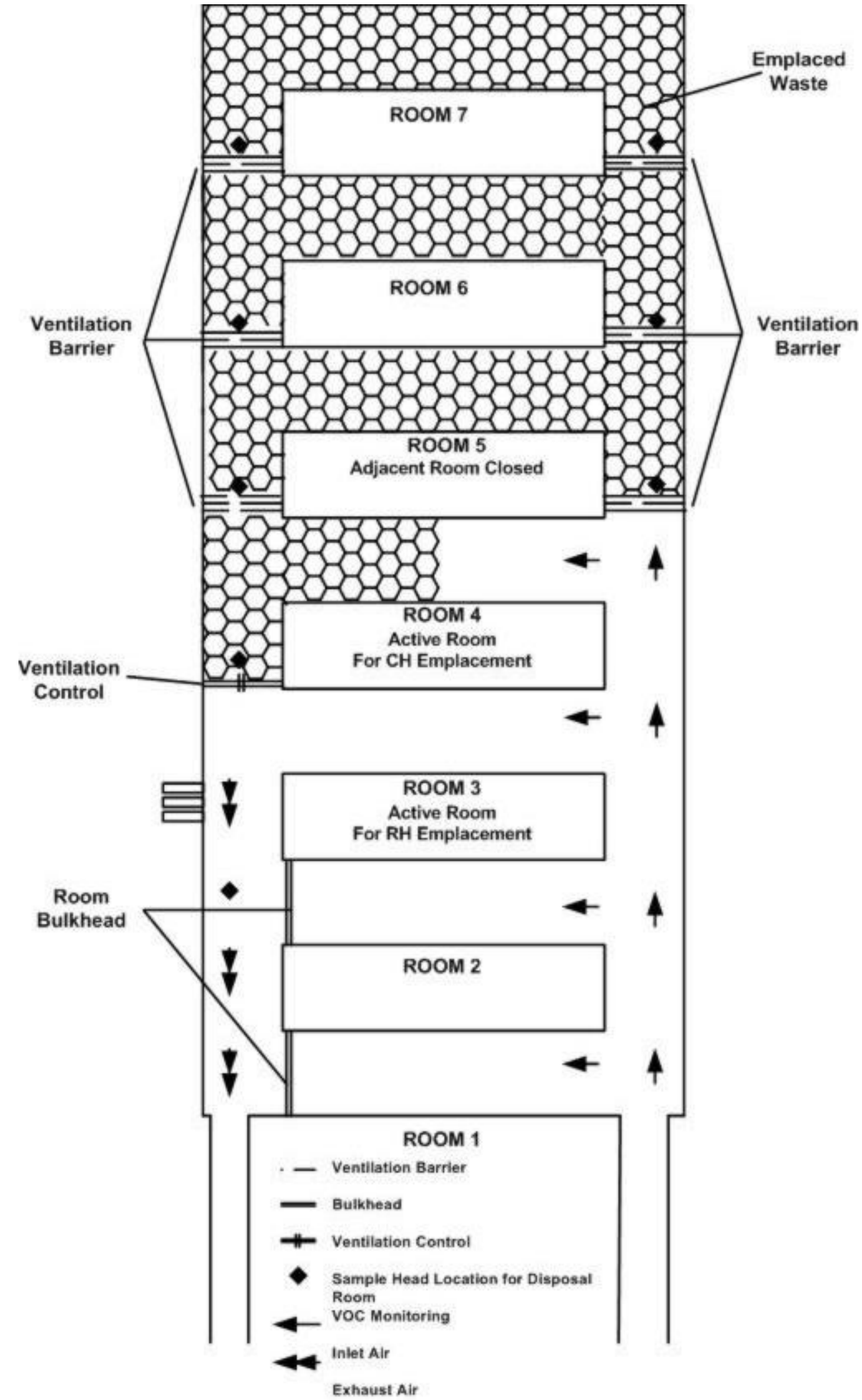
TYPICAL PASSIVE AIR SAMPLING KIT WITH CANISTER

Figure N-2
VOC Monitoring System Design



TYPICAL PASSIVE AIR SAMPLING KIT WITH CANISTER

Figure N-2
VOC Monitoring System Design (continued)


Emplaced Waste
ROOM 7
ROOM 6
Ventilation Barrier
Ventilation Barrier
ROOM 5
Adjacent Room Closed
ROOM 4
Active Room
For CH Emplacement
Ventilation Control
ROOM 3
Active Room
For RH Emplacement
Room Bulkhead
ROOM 2
ROOM 1
Ventilation Barrier
Bulkhead
Ventilation Control
Sample Head Location for Disposal Room
VOC Monitoring
Inlet Air
Exhaust Air

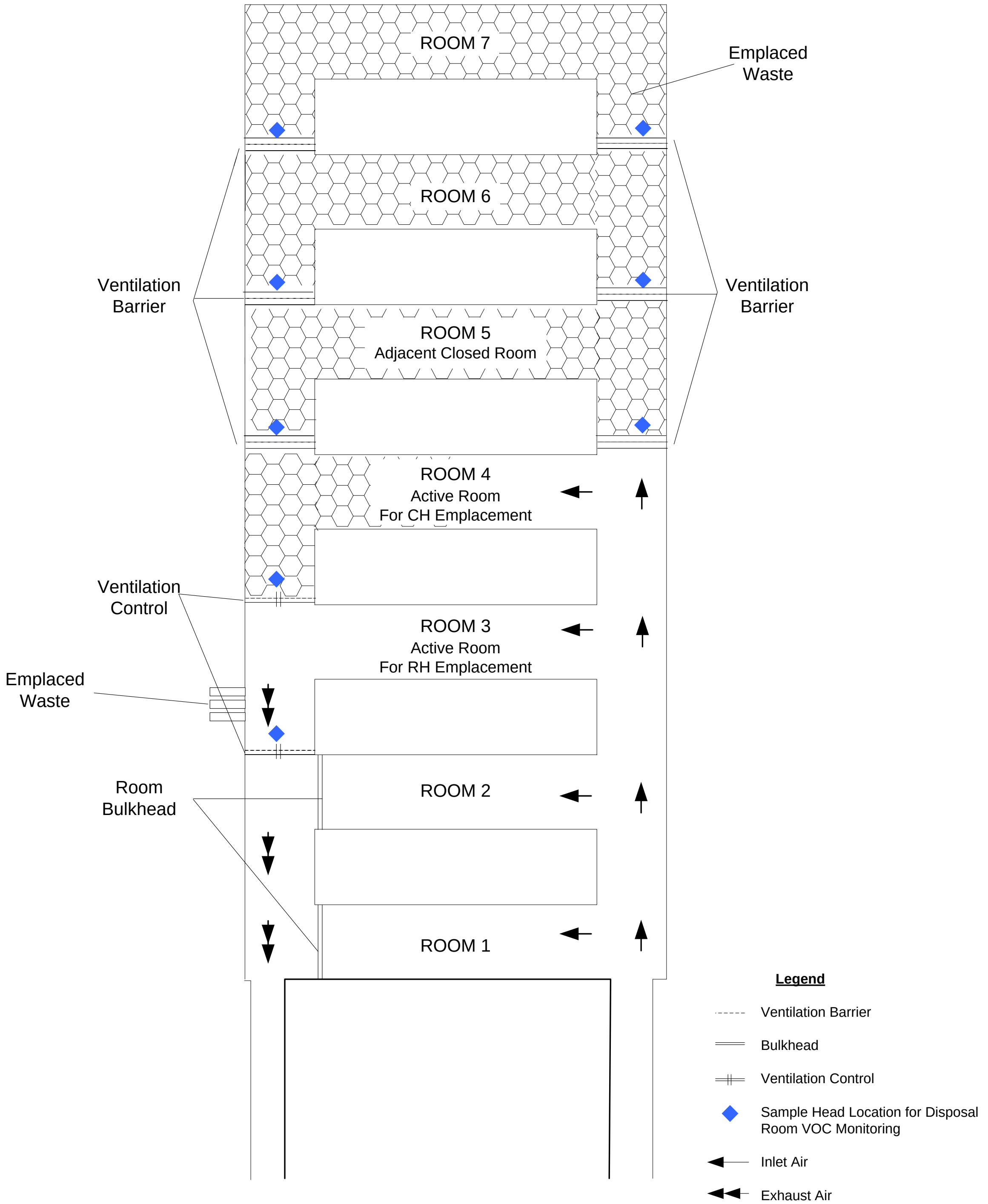
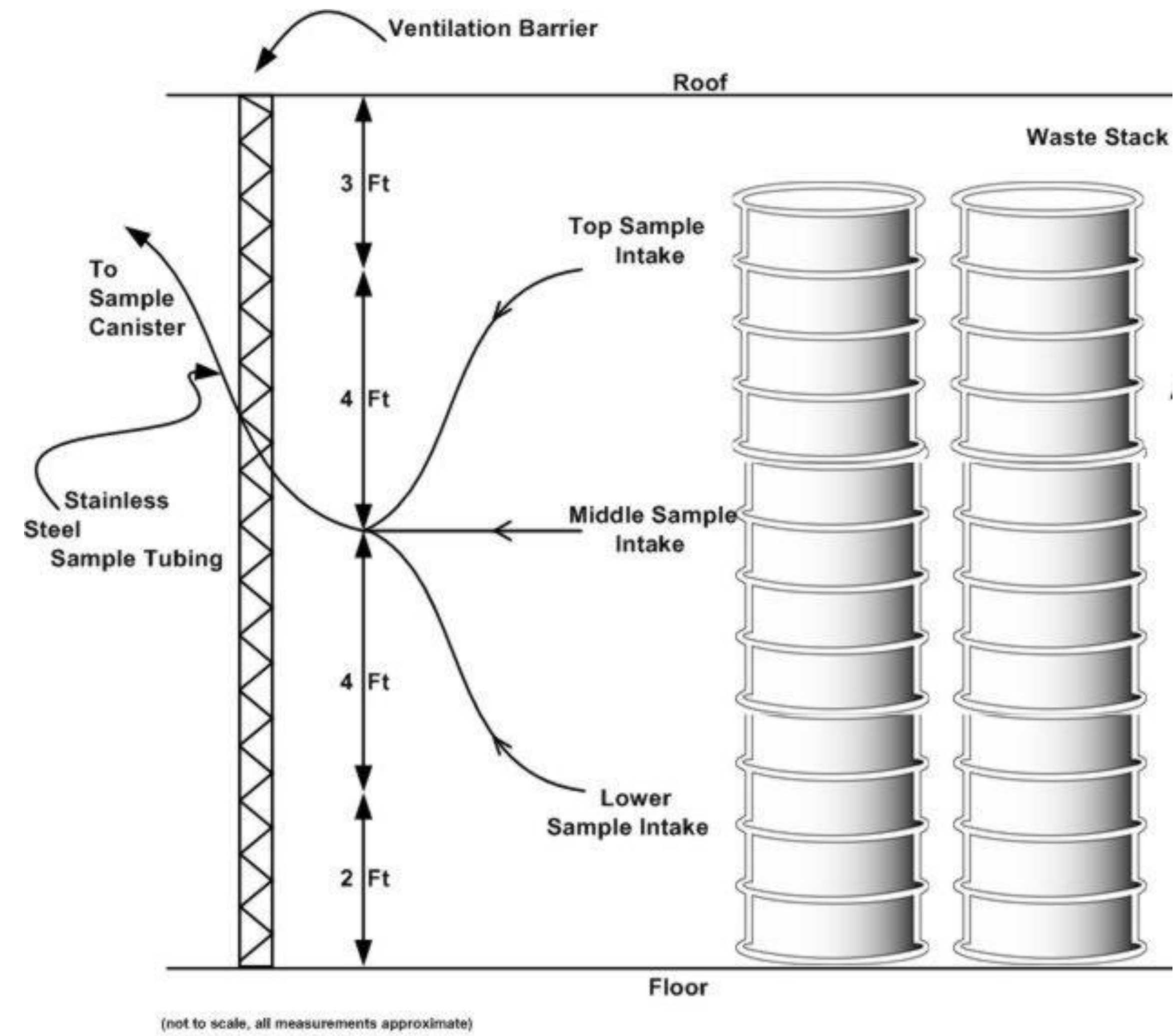


Figure N-3
Typical Disposal Room VOC Monitoring Locations


Ventilation Barrier
Roof
Waste Stack
3 Ft
Top Sample
Intake
To
Sample
Canister
4 Ft
Stainless
Steel
Sample Tubing
Middle Sample
Intake
4 Ft
Lower
Sample Intake
2 Ft
Floor
(not to scale, all measurements approximate)

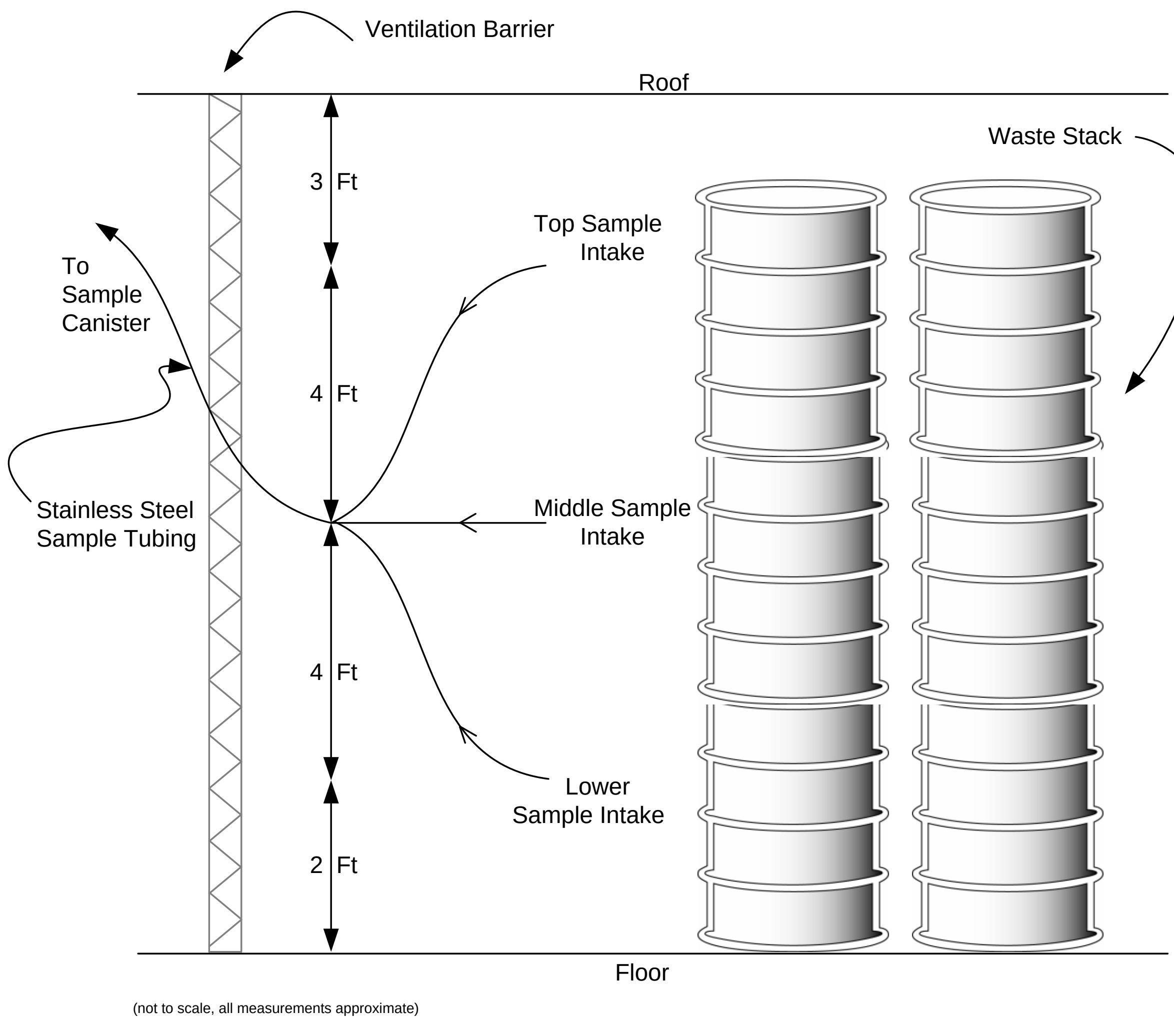


Figure N-4
~~VOC~~Disposal Room Sample Head Arrangement

ATTACHMENT O

WIPP MINE VENTILATION RATE MONITORING PLAN

TABLE OF CONTENTS

O-2 Objective

The objective of this plan is to describe how the ventilation requirements in the Permit will be met. This plan achieves this objective and documents the process by which the Permittees demonstrate compliance with the ventilation requirements by:

- ~~Maintaining an annual running average of 260,000 scfm through the underground repository~~

- Maintaining a minimum of 35,000 scfm of air through the active rooms when waste disposal is taking place and when workers are present in the rooms

This plan contains the following elements: Objective; Design and Procedures; Equipment Calibration and Maintenance; Reporting and Record Keeping; Quality Assurance.

O-3 Design and Procedures

This section describes the four basic processes that make up the mine ventilation rate monitoring plan:

- Test and Balance, a periodic re-verification of the satisfactory performance of the entire underground ventilation system and associated components

- ~~Monitoring and calculation of the Running Annual Average of the Total Mine Airflow to verify achievement of the 260,000 scfm minimum requirement~~

- Monitoring of active room(s) to ensure a minimum flow of 35,000 scfm whenever waste disposal is taking place and workers are present in the room

- Quarterly verification of the total mine airflow

O-3b ~~Running Annual Average of the~~ Total Mine Airflow

~~O-3b(2) Calculation of the Running Annual Average of Total Mine Airflow~~

~~The Permittees shall calculate the running average flow rate on a monthly basis. The Permittees shall use the logged runtime data for various modes of operation (as described in O-3b(1)) and the nominal design flow-rates for the various modes presented in Table O-1 to calculate the average monthly flow rate for the facility.~~

~~The average monthly mine flow rate is computed monthly using the following formula:~~

~~Monthly Average Flow Rate = {[Normal Mode Run-time (hrs.) x 425,000 scfm]~~
~~+ [Alternate Mode Run-time (hrs.) x 260,000 scfm]~~
~~+ [Maintenance Bypass Run-time (hrs.) x 260,000 scfm]~~
~~+ [Reduced Mode Run-time (hrs.) x 120,000 scfm]~~
~~+ [Minimum Mode Run Time (hrs.) x 60,000 scfm]~~

~~+ [Filtration Mode Run-time (hrs.) x 60,000 scfm]}~~
~~/ 730 Hours per month.~~

~~The running annual average of total mine airflow annual average flow rate shall be calculated using the monthly averages and the following formula:~~

~~Annual Average Flow Rate = ∑ Monthly Average for Previous 12 Months / 12~~

~~The use of an average value of 730 hours per month in the monthly average calculation is reasonable, given that all the numbers involved are very large and that the final use of the monthly average flow is in an annual calculation.~~

O-5a Reporting

The Permittees shall submit an annual report to NMED presenting the results of the data and analysis of the Mine Ventilation Rate Monitoring Plan. In the years that the Test and Balance is performed, the Permittees will provide a summary of the results in the annual report.

The Permittees shall ~~calculate the running annual average mine ventilation rate on a monthly basis and~~ evaluate compliance with the minimum ventilation rate for an active room specified in Permit Section 4.5.3.2 on a monthly basis. The Permittees shall report to the Secretary in the annual report specified in Permit Section 4.6.4.2 whenever the evaluation of the mine ventilation monitoring program data identifies that the ventilation rate~~s~~ specified in Permit Section 4.5.3.2 ~~have~~ has not been achieved.~~.~~

O-5b Recordkeeping

The Permittees shall retain the following information in the Operating Record:

- The CMRO Log documenting the ventilation system operating mode.
- ~~The underground facility running annual average mine ventilation rate on a monthly basis.~~
- Active disposal room ventilation flow rate readings as documented on the Active Disposal Room Ventilation Rate Log Sheet (Table O-3).
- The quarterly flow verification check and associated documentation.

These records will be maintained in the facility Operating Record until closure of the WIPP facility.

O-6 Quality Assurance

Quality assurance associated with the Mine Ventilation Rate Monitoring Plan shall comply with the requirements of the WIPP Quality Assurance Program Description (**QAPD**). The Permittees shall verify the qualification of personnel conducting ventilation flow measurements. The instrumentation used for monitoring ~~both underground and~~ active disposal rooms shall be calibrated in accordance with the applicable provisions of the WIPP procedures. The ~~software~~

~~used to calculate the monthly and annual running averages and the~~ ventilation simulation software programs shall be controlled in accordance with the WIPP QAPD and WIPP computer software quality assurance plans.

Appendix C
Review of WIPP Above-Ground VOC Monitoring Plan

URS

Memorandum

Date: 22 September 2014

To: Wes Boatwright (NWP LLC)

From: Sandy Smith, Leslie Fifita, Bart Eklund, and Jim Garrison (URS Corporation)

Cc: Rick Chavez, Bob Kehrman, Ashley Urquidez, Rick Salness, and Dave Ganaway (NWP LLC)

Subject: **Review of WIPP Above-Ground VOC Monitoring Plan**

Introduction

Due to two recent incidents, portions of the Waste Isolation Pilot Plant (WIPP) underground facility needed to conduct underground monitoring are not accessible. Therefore, the Repository Volatile Organic Compound (VOC) monitoring program has shifted from collecting samples in the underground repository to collecting ambient air samples at above-ground locations. Repository VOC monitoring is required under the State Hazardous Waste Facility Permit (Permit) and this change in approach has been discussed with New Mexico Environment Department (NMED) staff. Above-ground data are being reported regularly to the NMED. The intended uses of the above-ground monitoring data are to evaluate the impacts of continuing VOC emissions from the repository and to demonstrate compliance with environmental performance standards, both while the WIPP facility is in the recovery operation and potentially when normal operations recommence (in lieu of resuming collection of air samples within the underground repository).

Samples are currently being collected at three above-ground locations twice each week (see Figure 1). These samples are time-integrated 24-hour VOC samples and are intended to identify VOCs of concern emitted from the underground repository and evaluate any VOC exposure that occurs at the Training Building (Building Number 489), which was determined by earlier air dispersion modeling to represent the closest occupied building to the location of maximum impact (URS, July 2010). As shown in Figure 1, the three current sample locations are: 1) at the southeast side of the Training Building; 2) at the south fenceline of the Property Protection Area (PPA); and 3) a location about a mile southeast of the Training Building. Samples at the south fenceline of the PPA are intended to represent background concentrations of VOCs. The third sampling location (WQSP-4) was added in July to collect upwind samples further from the facility.

URS Corporation (URS) was tasked to review and comment on the feasibility of the plan being developed by Nuclear Waste Partnership LLC (NWP) to conduct above-ground VOC monitoring in lieu of underground monitoring. In order to evaluate the feasibility of above-ground monitoring, our review focused on: 1) the available above-ground monitoring data collected to date; 2) the sampling equipment and methodology used to collect the above-ground samples; and 3) the current sampling locations. To assess the appropriateness of the current sampling locations, we also updated the air dispersion modeling performed in 2010 (URS, July 2010) to identify the location of maximum impact under current release conditions (which differ in stack configuration and flow rate from the assumptions used in the 2010 modeling), as well as to answer several specific questions concerning the release and dispersion of VOCs. This memorandum summarizes the results of our evaluation and provides recommendations related to the above-ground VOC monitoring program. According to the statement of work, the recommendations should address at least the following:

- Sampling locations (Are the locations appropriate for assessing impacts to personnel in the Training Building? Are there better locations?).

- Methods used for sample collection (Are the methods appropriate for the low concentrations expected and potential background VOCs? Are there better methods?).

- Utilization of the data (Can the data be applied to meet the intent of the Permit relative to personnel in the Training Building? If so, what are the appropriate methodologies and exposure limits?).

- Feasibility of continued above-ground monitoring in light of the relatively low concentrations expected and background levels of VOCs.

- New stack configurations for minimizing surface worker exposure.

Our review and recommendations are intended to support air monitoring at the WIPP facility during recovery activities, as well as determine the efficacy of above-ground VOC monitoring in lieu of collecting samples in the underground repository, as dictated by the current permit, once the facility resumes operations.

Background

Normally, compliance with the environmental performance standards is determined via regular air sampling within the repository upstream and downstream of the waste disposal areas. Until operations were disrupted, time-integrated samples were collected at Stations VOC-A and VOC-B in evacuated, stainless-steel canisters and analyzed in an off-site analytical laboratory for various VOCs, including carbon tetrachloride. The acceptable concentrations of carbon tetrachloride and other VOCs within the repository were determined based on predicted air quality impacts for above-ground receptors using an atmospheric dispersion model, long-term meteorological data, and release parameters for the repository exhaust. In essence, the acceptable concentrations within the repository were back-calculated and represent the maximum concentrations within the repository that can be shown to not result in concentrations that exceed the environmental performance standards at above-ground, downwind locations.

The repository formerly operated with an air flow of about 450,000 cubic feet per minute (cfm) (12,700 m^3/min). Since the safety-related shutdown, the exhaust from the repository has been routed through a high-efficiency particulate (HEPA) filter and is about 60,000 cfm (1,700 m^3/min). The plan is to vent the exhaust from the underground waste disposal area through a HEPA filter for the foreseeable future, but steps will be taken to increase the flow to 114,000 cfm (3,200 m^3/min). Increasing the height at which the emissions are released also has been discussed.

Above-ground Monitoring Objectives

Based on discussion with NWP staff, the potential objectives for (or components of) the ambient air monitoring plan are:

1. Measure air concentrations at the point of maximum on-site exposure (previously identified as being the Training Building);

2. Measure air concentrations at the point of maximum off-site exposure (previously identified as being a point along the north or northeast fenceline);

3. Measure upwind air concentrations to subtract out from the maximum measurements to determine the air concentrations attributable to repository emissions;

4. Identify above-ground on-site VOC sources (other than the repository) via air measurements or other methods to better understand their possible contribution to above-ground measurement results; and

5. Measure air concentrations at the repository exhaust to combine with flow rate information to allow calculation of emission rates from the repository.

Measuring air concentrations at the repository exhaust (Objective #5) is more consistent with current permit requirements than measuring air concentrations at the points of maximum on-site and off-site exposure (Objectives #1 and #2). Measuring air concentrations at above-ground receptors of interest (Objectives #1 and #2) more directly addresses potential air quality impacts. However, the acceptable VOC concentrations that trigger actions in accordance with the Permit at above-ground, downwind locations will differ from, and be lower than, those listed in the permit for Station VOC-A. The measured concentrations in ambient air will be much lower than concentrations within the repository due to dilution effects.

Measuring exhaust concentrations also circumvents the need for considering the influence of background concentrations (Objective #3) or the contribution of other on-site sources (Objective #4) since the exhaust includes only emissions from the repository. The above-ground monitoring plan that NWP ultimately implements at the WIPP facility could include components that meet all, or some combination, of the above five objectives.

Air Dispersion Modeling

To support the review of the NWP above-ground VOC monitoring plan, URS conducted air dispersion modeling of emissions from the repository vent stack at the WIPP facility. The analysis used the American Meteorological Society/U.S. Environmental Protection Agency (USEPA) Regulatory (AERMOD) model (Version 14134). Table 1 lists the source release parameters used in this modeling exercise for both the 60,000 cfm and 114,000 cfm flow rate scenarios.

Five years of meteorological data were processed using on-site data provided by NWP. Because these are site-specific data collected at the facility, they best represent the conditions at the WIPP above-ground facility. USEPA's preference for site-specific meteorological data is documented in USEPA's Guideline on Air Quality Models 40 CFR Part 51 (http://www.epa.gov/ttn/scram/guidance/guide/appw_05.pdf) (USEPA, November 2005). Section 8.3.1.2 (b) states:

> The use of 5 years of NWS [National Weather Service] meteorological data or at least l year of site specific data is required. If one year or more (including partial years), up to five years, of site specific data is available, these data are preferred for use in air quality analyses.

These data were supplemented with surface data from the National Weather Service (NWS) station in Carlsbad, NM (Station 93033), although not a lot of substitution was required since the on-site surface meteorological data set is fairly comprehensive. Upper-air data were collected from the NWS station located in El Paso, TX (Station 3020). There is an upper-air meteorological data station in Midland, Texas that is closer to the WIPP facility than El Paso. However, the data capture from the Midland monitor is less complete than the data from El Paso. Filling in upper air data can be difficult and inaccurate; therefore, the El Paso station was selected for this evaluation. All data were processed using AERMET (Version 14134).

The modeling analysis included consideration of building downwash effects, wherein the potential for emission discharges to become caught in the turbulent wakes of structures was evaluated. The analysis used Building Profile Input Program (BPIP-Prime) (Version 04112) to generate wind direction-specific downwash dimensions from downwash structures. AERMOD considers direction-specific downwash using the PRIME algorithm as evaluated in the BPIP-Prime program.

Terrain data (elevations and hill heights) were collected using AERMOD's terrain preprocessor, AERMAP (Version 11103). National Elevation Data (NED) files are uploaded to the processor, which then produces elevations and hill heights for all sources, buildings, and receptors.

A receptor grid was placed across the entire property with receptor spacing (density) dependent on distance from the source. Two additional discrete receptors were added to calculate impacts at the locations of the two closest residences, Smith Ranch and Mills Ranch.

Table 2 summarizes the predicted impacts for both air flow scenarios at four locations: 1) the location of the maximum on-site impact; 2) the location of the maximum off-site impact (on or beyond the WIPP property boundary; 3) the Smith Ranch; and 4) the Mills Ranch. A generic emission rate of 1 pound per hour (lb/hour) was used in the analysis. This value is arbitrary and is used simply for modeling purposes to predict relative impacts to surface receptors. Impacts are in units of micrograms per meter cubed ($\mu g/m^3$) of ambient concentration per lb/hour of emissions (which will differ for each VOC). Therefore, these results are not comparable to above-ground air monitoring results. To be comparable, the results need to be multiplied by the average emission rate[1] for each VOC in lb/hour from the vent stack.

The generic results demonstrate the relative differences in the magnitude of impact at each of the four receptor locations and for each of the two air flow scenarios. For example, for the 60,000 cfm (1,700 m^3/min) scenario, the maximum impact off-site is more than 100 times lower than the maximum on-site impact. The predicted impacts at the Smith Ranch and Mills Ranch are even more diluted, with impacts more than 500 times lower than the maximum on-site impact.

An increased flow rate (from 60,000 cfm to 114,000 cfm) lowers the magnitude of the maximum on-site impact by a factor of about 1.7; however, it does not substantially decrease the magnitude of the maximum off-site impact. Still, the predicted impacts at the Smith Ranch and the Mills Ranch are more than 400 times lower than the maximum on-site impact.

Figures 2 and 3 show impact contours and the location of maximum on-site impact for the 60,000 cfm (1,700 m^3/min) and 114,000 cfm (3,200 m^3/min) scenarios, respectively. As shown in the figures, the predicted location of maximum on-site impact is at the northeast corner of the Training Building for the 60,000 cfm scenario and the northwest corner of the building for the higher flow rate scenario. Of significance for the above-ground monitoring program, the Training Building is still the closest occupied building to the predicted location of maximum on-site impact. However, the Training Building monitor (Figure 1) is currently located on the southeast side of the building where predicted impacts are significantly lower (see impact contours in Figures 2 and 3) than the maximum predicted impact.

We are also using dispersion modeling to predict the changes in above-ground concentrations that result from raising the height of the point of release from its current height of 24 feet (ft) to 48 ft (7.3 m to 14.6 m). Preliminary modeling results from the 48 ft release scenario indicate that the maximum impacts are reduced more than a factor of 5 for the 60,000 cfm scenario and by a factor of 4 for the higher flow rate scenario. Furthermore, the higher release point pushes the location of maximum on-site impact to the northwest, just beyond the PPA. In addition, we are reviewing impact concentrations at the Training Building over the course of each day to determine if the impact concentrations differ considering 24 hour/day exposure versus exposure during work shift hours only.

These results, as well as the results summarized in this memorandum, are documented in a separate modeling report (URS, September 2014).

<u>Identification of Risk-Based Screening Levels</u>

Risk-based screening levels (RBSLs) are chemical-specific concentrations that correspond to specified risk levels, such as a per chemical cancer risk of 1E-6 or non-cancer hazard index (HI) of 0.1. RBSLs are typically used for quick screening of site risks and for determining if

[1] Please note that although the modeled generic emission rate was 1 lb/hr, an averaging period of 1 year (annual average) was selected in the model control options. Therefore, if the generic impact will be used to estimate pollutant-specific annual impact concentrations, an *average* hourly emission rate (not a maximum) should be used in conjunction with the generic impacts.

analytical detection limits used to monitor chemical releases are adequately low to provide useful information. As long as measured chemical concentrations remain lower than their respective RBSLs, site risks are considered acceptable, and no action is warranted. Once one or more chemical concentrations exceed their respective RBSLs, further evaluation (action) is warranted. Because the allowable cumulative risks for all chemicals combined (1E-5 for workers) is usually higher than the per chemical RBSL (1E-6), an RBSL exceedance does not necessarily mean that site risks are unacceptably high.

RBSLs can be conservative generic target concentrations, calculated using USEPA default exposure assumptions that are designed to be protective of a population that is exposed on a daily basis for many years, or more realistic site-specific concentrations that account for site-specific exposure conditions. For example, the Permit identifies concentrations of concern (C of C) for air samples taken at the underground VOC sampling stations. The C of C are essentially a type of site-specific RBSL calculated to be protective of a non-waste surface worker, accounting for the exposure frequency and duration specific to a WIPP employee, and also accounting for the dilution that occurs between the underground VOC sampling station and the surface receptor location. Exceedance of one or more C of C values will trigger an action.[2] Because underground monitoring is not possible at this time, C of Cs are no longer useful for determining if protective actions are needed, and alternative RBSLs must be developed.

As an alternative to C of Cs, which are applied at the underground VOC monitoring station, RBSLs are proposed for application at the surface monitoring stations. These proposed RBSLs correspond to a per chemical cancer risk of 1E-6 or non-cancer hazard index (HI) of 0.1. For chemicals with both carcinogenic and non-carcinogenic properties, the RBSL is based on the lower of the cancer- or non-cancer-based concentration. Although RBSLs are useful for screening, they, like C of C values, do not address the cumulative effects of multiple chemicals. For this reason, RBSLs used for quick screening are generally based on a target cancer risk and a target non-cancer HI that is an order of magnitude lower than the established acceptable cumulative cancer risk and non-cancer hazard.

USEPA provides RBSL values for a wide variety of chemicals for two generic land use scenarios, residential and industrial. The USEPA values are termed the Regional Screening Levels (RSLs). Table 3 provides the USEPA air RSLs for the ten VOCs of concern at the WIPP facility for both generic worker populations and generic residential populations, based on target per chemical cancer risk of 1E-6 and HI of 0.1.

The USEPA generic resident scenario is similar to the scenario used to evaluate off-site residents near the WIPP facility, but the generic worker scenario is not. The generic worker scenario assumes a worker is exposed to site contaminants 250 days per year for 25 years, in contrast to WIPP personnel, who are expected to be exposed 240 days per year for a maximum of 10 years. For this reason, site-specific RBSLs are also presented in Table 3, based on the WIPP non-waste surface worker scenario.

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[2] As described in the preceding paragraph for RBSLs in general, C of C do not take into account the cumulative risks of all chemicals combined. Exceedance of a few C of C values does not necessarily mean that cumulative risks are unacceptable.

As described in this report, the use of RBSLs for evaluating outdoor air at the WIPP facility is only intended for initial quick screening. They are not meant to replace the current approach for identifying allowable release levels. Specifically, RBSLs do not address cumulative effects of exposure to multiple chemicals.

For purposes of selecting an appropriate analytical method for samples collected at on-site locations, the USEPA industrial air RSLs based on a cancer risk of 1E-06 and an HI of 0.1 (the third column of Table 3) provide a good target for the detection limits to achieve. For off-site or property boundary receptor locations (if monitoring at off-site or property boundary locations ever becomes necessary), achieving detection limits that can reliably measure the USEPA residential air RSLs based on a cancer risk of 1E-06 and an HI of 0.1 (the second column in Table 3) is recommended.

For purposes of quick screening measurement results from on-site receptor locations, we recommend using the site-specific industrial air (WIPP facility surface worker) RBSLs based on a cancer risk of 1E-06 and an HI of 0.1 (the last column in Table 3) as facility Action Levels (ALs). An exceedance of an AL does not indicate that risks are unacceptably high, only that further action may be warranted. The ALs are meant to serve as an internal early warning system that will prompt an appropriate response to assure continuing compliance with permit conditions. They are not intended to instigate an exceedance report or other regulatory action.

To quick screen measurement results from off-site or property boundary locations (again, if monitoring at off-site or property boundary locations ever becomes necessary), we recommend the residential air RSLs based on a cancer risk of 1E-06 and an HI of 0.1 (the second column in Table 3).

The measure for compliance with Permit environmental performance standards is: 1) acceptable cumulative risk of 1E-05 for the maximally exposed above-ground non-waste worker; 2) acceptable cumulative risk of 1E-06 for the maximally exposed off-site resident; and 3) a cumulative non-cancer HI of 1 for both receptors. Compliance with these standards can be demonstrated by deriving cumulative risk and non-cancer hazard estimates using the running annual average concentrations.

Discussion of Air Monitoring Considerations

The main differences between collecting air samples within the repository versus collecting ambient air samples on the surface are:

- The measured concentrations in ambient air will be much lower than concentrations within the repository due to dilution effects;
- The acceptable concentrations in ambient air will be much lower than the acceptable concentrations listed in the permit for repository samples; and
- There is more potential for off-site (background) and above-ground site emission sources to contribute to the measured values for ambient air.

Given these differences, topics such as detection limits, reporting limits, blank concentrations, background concentrations, and canister cleaning procedures are of increased importance for ambient air sampling compared with sampling within the repository.

Going forward, the following considerations should be borne in mind:

Location and Number of Samplers –
The three current above-ground monitoring locations are designed to address objectives #1 and #3 listed above in the section on Above-ground Monitoring Objectives. The existing sampling location for maximum on-site exposure is based on atmospheric dispersion modeling performed using the higher flow rate during normal operations and different release locations (URS, July 2010).

The updated modeling (summarized above) indicates that the Training Building is still the closest occupied building to the predicted location of maximum on-site impact. However, the current monitor placement does not reflect the predicted location of maximum on-site impact identified by the updated modeling. Monitor placement near the northeast corner of the building would better address Training Building impacts under the 60,000 cfm scenario, while placement near the northwest corner of the building would better address impacts under the 114,000 cfm scenario. If the objective is to collect measurements at the location that best represents the ambient air contribution to the indoor air of the Training Building, it would be better to collect air samples at the air intake to the building (i.e., the samples should be collected near the louvered air intakes on the west side of the building).

The south fenceline monitor, placed to measure background VOC concentrations (see Figure 1 for monitor location), could measure concentrations that are influenced by vent emissions (see annual impact contours on Figures 2 and 3). Although located upwind of the vent most of the time, there will be periods when the wind blows southeast in the direction of the monitor. The monitor WQSP-4 is further from the vent in an upwind direction and therefore measurements collected there better represent background concentrations of VOCs in the vicinity of the WIPP facility.

The three existing monitoring locations do not address objective #2 (maximum off-site impacts), are not well-suited to address objectives #4 (characterize effect of on-site, above-ground sources), and cannot address objective #5 (repository emissions). To the extent that these other objectives are a priority, additional monitoring locations would be needed. For objective #3, the new location some distance from the facility in the predominant upwind direction should provide better data than the fenceline location.

Objective #4 can be qualitatively addressed via an emission inventory to rule out potential surface sources of VOCs at the facility. Possible emission sources include vehicles (toluene), treated tap water (chloroform), and degreasers (TCE). An inventory can be helpful in identifying chemicals that are found on the surface that might contribute to VOC concentrations detected on the surface. If surface sources were believed to be significant, however, additional measurements and/or data analysis would be necessary to determine their relative contribution versus repository sources.

To meet objective #5, samples could be collected from ducting after the HEPA filter and before the release point. One option would be to use the existing location and probes used for rad monitoring. The samples could be taken directly from the sampling line used for rad monitoring and would not bias those results (a 10-hr canister sample would be collected at a rate of <10 mL/min and the canister vacuum would be sufficient to pull a sample against whatever pump is in place). Alternatively, a dedicated sampling line could be introduced into the repository exhaust and used for sample collection. If the long-term plan is to continue with above-ground monitoring at receptor locations, some periodic sampling of the repository exhaust (e.g., quarterly) would still be helpful to provide a "fingerprint" of the emission profile to aid in evaluating the above-ground monitoring results and to determine if any new tentatively identified compounds (TICs) are an issue.

Sampling Method –
A canister–based sampling approach was used in the repository and is suitable for above-ground sampling as well. There are thousands of ambient air and indoor air studies that have been performed to measure VOCs at concentrations comparable to what is present at the WIPP facility. There is no need to develop a novel approach or validate the existing approach.

Sampling Duration and Timing –
Samples to determine maximum worker exposure should reflect the duration and timing of the work shift (at the WIPP facility the Training Building is occupied generally from around 6:00 am to 4:00 pm, or 10 hours during the day). Samples to evaluate off-site exposures should be 24-hr samples. If possible, any upwind samples should have the same duration as the regular samples they are to be compared to (i.e., to address both on-site and off-site potential exposures, separate upwind samples for each would be preferred).

To meet objective #5, exhaust vent samples should be collected for as long a time period as is feasible (e.g., 24-hr) to help ensure that the data set is representative of repository emissions.

Sampling Frequency –
Sampling should follow the USEPA sampling schedule unless there is a strong reason not to. The USEPA schedule has sampling days every 3rd day. Automatic sample collection could be used so that no one needed to be at the site to turn the canisters on and off (e.g., for a midnight to midnight sample or a weekend sample). Although not typical, it is understood that workers may be present in the Training Building on any day of the week, including weekends.

Analytical Method –
As discussed above, the USEPA RSLs serve as consensus acceptable concentrations in ambient air for residential and worker receptors. RSLs are generally used at the target risk level of 1E-06 and the target HI=0.1 to determine if the analytical method can reliably measure levels of potential concern, considering the potential for cumulative effects of exposure to multiple VOCs.

The USEPA RSLs for industrial and residential air at a target risk of 1E-06 and a target HI=0.1 are listed in Table 3. As seen in this table, when RSLs are converted from units of $\mu g/m^3$ to parts per billion by volume (ppbv), the RSLs for both the default resident and worker are <1 ppbv in many cases (i.e., are lower than what was of interest for samples collected in the repository). Therefore, to achieve the necessary sensitivity for evaluating samples from on-site and off-site or property boundary locations, a TO-15 selective ion mode (SIM) analysis will be necessary rather than the TO-15 full-scan approach used to date. The Eurofins Air Toxics laboratory in Folsom that has been used in the past offers this analytical option.

Review of Air Monitoring Results to Date

We reviewed results for air samples collected at the Training Building and at the south fenceline from February 12 to July 17 of this year. Data were available for only two days of monitoring at the location further upwind (WQSP-4) at the time of our data review. The monitoring to date provides a large enough data set for an initial evaluation. The key factor is whether the analytical method used to date is sensitive enough to determine whether or not risk-based concentrations are being met. The first few sampling events had a method reporting limit (MRL) of 2 ppbv and subsequent sampling events had a MRL of 0.4 ppbv. In general, the reporting limit is equal to the concentration of the lowest standard used for calibration. Any detections below the reporting limit are either censored or flagged with a "J" to indicate that the concentration contains more uncertainty than values above the low standard.

The necessary sensitivity is based on the risk-based concentrations. Ideally, our analytical method will be at least an order of magnitude more sensitive than the RSLs. For example, the 1E-06 level for industrial air for carbon tetrachloride is 0.32 ppbv and the value for chloroform is 0.11 ppbv. Therefore, the current MRL of 0.4 ppbv may not be adequate for our purposes (i.e., "J" or ND values may be above or below the 1E-06 level). As discussed above, more sensitive full-scan or SIM approaches should be considered. Full-scan approaches should be able to achieve 0.2 ppbv and SIM should be able to achieve 0.01 ppbv reporting limits (based on the concentration of the lowest standard).

The analysis has a target analyte list of 10 compounds. Data are reported for each of these 10 compounds for every sample. Additional results are sometimes given for other compounds identified in the analysis but not part of the target analyte list. These are referred to as tentatively identified compounds (TICs). The identification of the TICs, per the name, is tentative. The quantitation also is approximate because no calibration standards are run for TICs. The TICs include low levels of compounds often found in ambient air (e.g., hydrocarbons, Freons) and the TIC concentrations are not of interest from either a health or a nuisance odor standpoint. For samples collected at above-ground receptor locations, we don't see much value in reporting TICs for this project unless the peaks are so large as to require the analytical laboratory to dilute the samples and thereby increase the detection limits for the target analytes. The potential for new compounds to be of interest could be evaluated from drum characterization data and periodic air samples collected from within the underground repository or at the repository exhaust and analyzed for VOCs of interest and TICs.

Monitoring data to date for the 10 target analytes are summarized in Table 4. As seen in Table 4, carbon tetrachloride was detected in most of the samples and the concentrations at the Training Building were slightly higher than the concentrations at the fenceline. The carbon tetrachloride detected at both locations presumably is due to emissions from the repository (for 24-hr samples, no location within the facility will tend to be always upwind or downwind for the entire sampling period). Toluene also was detected in the samples and the concentrations are essentially identical at the Training Building and the fenceline (i.e., the measured concentrations represent background sources). 1,2-dichloroethane (ethylene dichloride, EDC) was infrequently detected, but was at the same concentration at both locations, similar to toluene.

Chloroform, methylene chloride, 1,1,1-trichloroethane (1,1,1-TCA), and trichloroethylene (TCE) were detected more frequently at the Training Building than at the fenceline (though chloroform, methylene chloride, and 1,1,1-TCA were not detected at either location on most days). The measured concentrations at the Training Building may represent a mix of sources (e.g., repository emissions, upwind (background) sources, and above-ground emissions at the WIPP facility). The most conservative approach is to assume whatever is detected at the Training Building is due to repository emissions. Two compounds were never detected (1,1,2,2-tetrachloroethane and 1,1-dichloroethylene [1,1-DCE]) and one compound (chlorobenzene) was only detected at a very low concentration (0.03 ppbv).

Table 4 also lists the site-specific industrial air (WIPP facility surface worker) RBSLs based on a cancer risk of 1E-06 and an HI of 0.1, which we have recommended for quick screening of monitoring results at the Training Building. Note that the maximum detected concentrations of TCE (at the Training Building and south fenceline) and chloroform (at the Training Building) exceed these screening levels. The median concentration of chloroform at the Training Building also exceeds the screening level, while the median TCE concentration is just slightly lower than the screening level. The screening level exceedances highlight the importance of ruling out possible on-site (non-repository) sources of TCE and chloroform in the ambient air.

The data set that was reviewed did not include any results for blank samples or duplicate (collocated) samples. No data related to laboratory quality assurance (QA) were reviewed.

Summary and Recommendations Regarding VOC Air Monitoring

Two basic approaches for above-ground VOC sampling include:

1. Sampling at or just inside the exhaust vent; and

2. Sampling at above-ground receptor locations.

Each approach individually can provide the data necessary to demonstrate compliance with permit environmental performance standards (acceptable cumulative risk of 1E-05 for the maximally exposed above-ground non-waste worker; acceptable cumulative risk of 1E-06 for the maximally exposed off-site resident; and a cumulative non-cancer HI of 1 for both receptors).

There are advantages and disadvantages to each of the two approaches. Table 5 summarizes these. Each pro and con listed in the table carries a different level of importance. While one listed disadvantage may be significant enough to preclude full implementation of the approach, another might pose an issue that can be resolved. For example, if the difficulties associated with repository access or installing a sampling port near the repository exhaust are technically or financially infeasible to resolve, the approach of directly sampling the repository exhaust is not viable.

It might also be possible to combine aspects of the two approaches to achieve the advantages of each (and mitigate some of the disadvantages). For example, the options for the WIPP facility VOC above-ground monitoring program might include:

1. Sampling at or just inside the exhaust vent only;

2. Sampling at above-ground receptor locations only;

3. Sampling at the exhaust vent regularly, supplemented with less frequent sampling at selected above-ground receptor location; and

4. Sampling at above-ground receptor locations regularly, supplemented with less frequent sampling at the exhaust vent or within the underground repository.

Our recommendations at this time are:

1. Continue the current above-ground monitoring program for the time-being with these adjustments:

    a. Move the Training Building sample location to adjacent to the air intake on the west side of the building. If it is important to demonstrate that the monitor location is adequately conservative, the predicted location of maximum on-site impact under the 60,000 cfm scenario (Figure 2) and under the 114,000 cfm scenario (Figure 3) are better locations than the current location on the southeast side of the building.

    b. Use a sample duration and timing for samples collected at the Training Building that is consistent with typical work shift hours (8 to 10 hour average). Collect samples during the typical work shift hours.

    c. If residential quarters intended for full-time, long-term occupation are planned or constructed in the vicinity of the WIPP facility property boundary, evaluate the need to add a sample location at the predicted location of maximum property boundary impact (Figure 4). If sampling at this location is warranted by the location and planned use of the structure, use a 24-hr sample duration. It may be necessary to use TO-15 SIM rather than the TO-15 full-scan approach to achieve detection limits capable of reliably measuring levels of concern for residential receptors.

    d. Eliminate the south fenceline sample location and replace it with the WQSP-4 location to better represent background concentrations. Collect two samples at each sampling event (one consistent with work shift hours and one 24-hr sample). After collecting samples at this location for at least 10 events, evaluate the utility of the data. Suspend collection of data at this location if the data has served its purpose to characterize background VOC concentrations and additional data are not needed.

e. Implement a sample collection schedule that is consistent with the USEPA sampling schedule of every 3rd day.

f. Consider meeting the permit conditions for evaluating TICs by collecting and reporting TIC data within the underground repository or at the exhaust stack at a reduced frequency (e.g., quarterly). This might obviate the need to collect and evaluate TIC data for every above-ground measurement at receptor locations.

2. Use the following risk-based screening levels to screen the above-ground results at the Training Building and at the predicted location of maximum property boundary impact (if monitoring at this location is initiated for any reason at some point in the future). As discussed earlier, an exceedance of a screening level does not indicate that risks are unacceptably high, only that further action may be warranted to assure continuing compliance with permit conditions.

Screening Levels for Comparison to Above-Ground Monitoring Results

Chemical	On-Site (Training Building) [1]		Off-Site (Location of Predicted Maximum Annual Off-Site or Property Boundary Impact) [2]	
	μg/m^3	ppbv	μg/m^3	ppbv
Carbon Tetrachloride	5.32	0.85	0.47	0.074
Toluene	2280	605	520	138
Trichloroethylene	0.913	0.17	0.21	0.039
Chloroform	1.39	0.28	0.12	0.024
Methylene Chloride	274	79	63	18
1,1,1-Trichloroethane	2280	418	520	95
1,1,2,2-Tetrachloroethane	0.551	0.08	0.048	0.007
1,2-Dichloroethane	1.23	0.30	0.11	0.027
1,1-Dichloroethylene	91.3	23	21	5.3
Chlorobenzene	22.8	4.95	5.2	1.13

[1] Site-Specific Industrial Air (WIPP Surface Worker) RBSLs based on a target risk of 1E-06 and an HI of 0.1 (last column in Table 3).
[2] Default Residential Air RSLs based on a target risk of 1E-06 and an HI of 0.1 (second column in Table 3).

3. Evaluate the technical feasibility of sampling at the exhaust vent. If technically feasible, consider replacing the collection of samples at the designated above-ground receptors with collection of exhaust vent samples, or supplementing the existing program with occasional exhaust vent samples.

4. If monitoring continues long term at above-ground receptor locations, consider developing an on-site VOC source inventory to rule out possible on-site (versus background) sources of VOCs other than the repository.

We do not at this time recommend collecting samples at the closest residences (Smith Ranch and Mills Ranch). The air dispersion modeling results demonstrate that if the WIPP worker is protected at the Training Building, there is no cause for concern regarding exposure at the closest residences to VOCs originating from the WIPP underground facility, as air concentrations at those locations are expected to be more than 400-500 times lower than at the maximum location on-site (see Table 2). As noted above, if residential quarters intended for full-time, long-term occupation are planned or constructed in the vicinity of the WIPP facility property boundary, we recommend evaluating the need to add a sample location at the predicted location of maximum property boundary impact (Figure 4). Collecting samples at an actual residence could present logistical challenges, including acquiring access agreements. Moreover, the results pose the risk of being heavily influenced by sources not related to the WIPP facility underground emissions, which then must be explained to the concerned homeowner or resident. Ambient air samples collected near residences may contain target VOCs from industrial activities in the area (e.g., toluene from oil and gas activities), toluene from cars and other mobile sources, and any natural or man-made emissions at the property, such as chloroform from tap water and other non-target VOCs from a variety of sources, including benzene, tetrachloroethylene, xylene, and acetone that could be identified as tentatively identified compounds (TICs).

The dispersion modeling results can be used, in combination with vent exhaust sampling (or underground repository sampling), to predict concentrations at the Smith Ranch and Mills Ranch, since both locations were included as discrete receptors in the modeling exercise. If sampling the vent exhaust or in the underground repository at least occasionally is not part of the final VOC monitoring program, sampling at the predicted location of maximum property boundary impact increases in importance for demonstrating compliance with permit conditions for protection of off-site residential receptors.

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USEPA, November 2005. Revision to the Guideline on Air Quality Models: Adoption of a Preferred General Purpose (Flat and Complex Terrain) Dispersion Model and Other Revisions, Final Rule, 40 CFR Part 51, Wednesday, November 9, 2005, available at: http://www.epa.gov/ttn/scram/guidance/guide/appw_05.pdf

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Table 1. Source Release Parameters

Flow Rate Scenarios	Source ID	Source Description	Easting (X) (m)	Northing (Y) (m)	Base Elevation (ft)	Stack Height (ft)	Temperature (F)	Exit Velocity (cfm)	Exit Velocity (m/s)	Stack Diameter (ft)
Scenario 1 - 60,000 cfm	V1	Release Vent	613676.6	3582349.9	3411.5	24	71	60000	10.78	6
Scenario 2 - 114,000 cfm	V1	Release Vent	613676.6	3582349.9	3411.5	24	71	114000	20.48	6

Notes: 3411.5 ft = 1,040m; 24 ft = 7.3m. 71 °F = 22 °C; 60,000 cfm = 1,700 m^3/min, 114,000 cfm = 3,200 m^3/min, and 6 ft = 1.8m

Table 2. Annual Impact Summary

Flow Rate Scenarios	Predicted Annual Impact (µg/m3 per lb/hr)			
	Maximum On-site Impact	Maximum Property Boundary Impact	Impact at Smith Ranch	Impact at Mills Ranch
Scenario 1 - 60,000 cfm	3.05953	0.02613	0.00504	0.00521
Scenario 2 - 114,000 cfm	1.84426	0.02298	0.00432	0.00413

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Table 3. Risk-Based Screening Levels Based on Target Risk of 1E-6 and Target Hazard Index of 0.1

Chemical	USEPA Regional Screening Level (RSL)*		Site-Specific Screening Level
	Default Resident ppbv (µg/m^3)	Default Worker ppbv (µg/m^3)	WIPP Surface Worker ppbv (µg/m^3)
Carbon Tetrachloride	0.074 (0.47) C	0.32 (2.0) C	0.85 (5.32) C
Toluene	138 (520) N	584 (2200) N	605 (2280) N
Trichloroethylene	0.039 (0.21)N	0.16 (0.88) N	0.17 (0.913) N
Chloroform	0.024 (0.12) C	0.11 (0.53) C	0.28 (1.39) C
Methylene Chloride	18 (63) N	75 (260) N	79 (274) N
1,1,1-Trichloroethane	95 (520) N	403 (2200) N	418 (2280) N
1,1,2,2-Tetrachloroethane	0.007 (0.048) C	0.031 (0.21) C	0.08 (0.551) C
1,2-Dichloroethane	0.027 (0.11) C	0.12 (0.47) C	0.30 (1.23) C
1,1-Dichloroethylene	5.3 (21) N	22.2 (88) N	23 (91.3) N
Chlorobenzene	1.13 (5.2) N	4.8 (22) N	4.95 (22.8) N

Value shown is the lower of the non-cancer (N) or cancer (C) based screening levels.
* RSL for EPA Default Worker and Resident from USEPA RSL Table (2014) (USEPA, May 2014).

Table 4. Ambient Air Monitoring Results to Date

Compound	Sampling Location	Summary Statistics for February – July 17, 2014 Data				Site-Specific Industrial Air RBSL (WIPP Surface Worker) (ppbv)*
		# Hits	% Detect	Maximum Concentration (ppbv)	Median Concentration (ppbv)	
Carbon Tetrachloride (CAS 56-23-5)	Training Building	45	96	0.7	0.14	0.85 (5.32 μg/m^3)
	South Fenceline	32	74	0.36	0.10	
Toluene (CAS 108-88-3)	Training Building	47	100	0.44	0.18	605 (2,280 μg/m^3)
	South Fenceline	43	100	0.36	0.18	
Trichloroethylene (TCE) (CAS 79-01-6)	Training Building	21	45	2.62	0.16	0.17 (0.913 μg/m^3)
	South Fenceline	6	14	0.82	0.041	
Chloroform (CAS 67-66-3)	Training Building	5	11	1.76	0.32	0.28 (1.39 μg/m^3)
	South Fenceline	1	2	0.044	0.044	
Methylene Chloride (CAS 75-09-2)	Training Building	7	15	0.3	0.14	79 (274 μg/m^3)
	South Fenceline	3	7	0.21	0.19	
1,1,1-Trichloroethane (CAS 71-55-6)	Training Building	8	17	0.16	0.051	418 (2,280 μg/m^3)
	South Fenceline	2	5	0.012	0.009	
1,1,2,2-Tetrachloroethane (CAS 79-34-5)	Training Building	0	0	N/A	N/A	0.080 (0.551 μg/m^3)
	South Fenceline	0	0	N/A	N/A	
1,2-Dichloroethane (EDC) (CAS 107-06-2)	Training Building	4	9	0.029	0.023	0.30 (1.23 μg/m^3)
	South Fenceline	4	9	0.03	0.024	
1,1-Dichloroethylene (CAS 75-35-4)	Training Building	0	0	N/A	N/A	23 (91.3 μg/m^3)
	South Fenceline	0	0	N/A	N/A	
Chlorobenzene (CAS 108-90-7)	Training Building	1	2	0.03	0.03	4.95 (22.8 μg/m^3)
	South Fenceline	0	0	N/A	N/A	

* Based on a target cancer risk level of 1E-06 and a non-cancer HI=0.1.

Note: A total of 47 regular samples were collected at the Training Building sampling location and analyzed, and 43 regular samples were collected at the South Fenceline Location and analyzed. Two regular samples were collected at WQSP-4 and analyzed. In addition, duplicate and blank samples have been collected and analyzed.

Table 5. Evaluation of Above-ground Monitoring Approaches

Approach	Pros	Cons
Sampling at the Exhaust Vent	1. Similar to existing permit requirements. 2. Concentrations of interest are relatively high, so analytical issues (e.g., detection limits) are not an issue. 3. No upwind or background sources to consider. 4. Only one sample required using the same sample duration for each sampling event. 5. Data can be used, in combination with dispersion modeling results, to predict the ground-level impact at any receptor location.	1. Requires repository access or installing a sampling port near the repository exhaust. 2. May require access to radiological areas. 3. May interfere with radiation monitoring. 4. Not previously tested at the WIPP facility.
Sampling at Above- Ground Receptor Locations	1. Provides a direct measure of actual exposure. 2. No added conservative factor to account for atmospheric dispersion (→ reduced chance of exceedance). 3. Samples are simple to collect (unless it is decided that sampling at actual residences is desired).	1. Much lower concentrations of interest (→ need a more sensitive analytical approach). 2. More potential for false positive results due to upwind or background sources. Ambient air samples may contain target VOCs from industrial activities in the area (e.g., toluene from oil and gas activities), toluene from cars and other mobile sources, and any natural or man-made emissions at the property, such as chloroform from tap water and other non-target VOCs from a variety of sources, including benzene, tetrachloroethylene, xylene, and acetone that could be identified as tentatively identified compounds (TICs). 3. Need to demonstrate that sample location adequately represents maximally impacted receptors (which can change with changes in the exhaust flow rate, exhaust vent height and location, and other release characteristics). 4. Different sampling duration for on-site and fenceline or off-site samples. 5. Data represent only the location where the sample is collected. 6. For sampling at off-site receptors if the closest actual residence (instead of the hypothetical maximally exposed residence) is the receptor of concern: a. Logistical challenges,

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Approach	Pros	Cons
		including potential need for access agreement. b. Potential for measurements to be heavily influenced by sources not related to WIPP.

VOC Sampling Locations

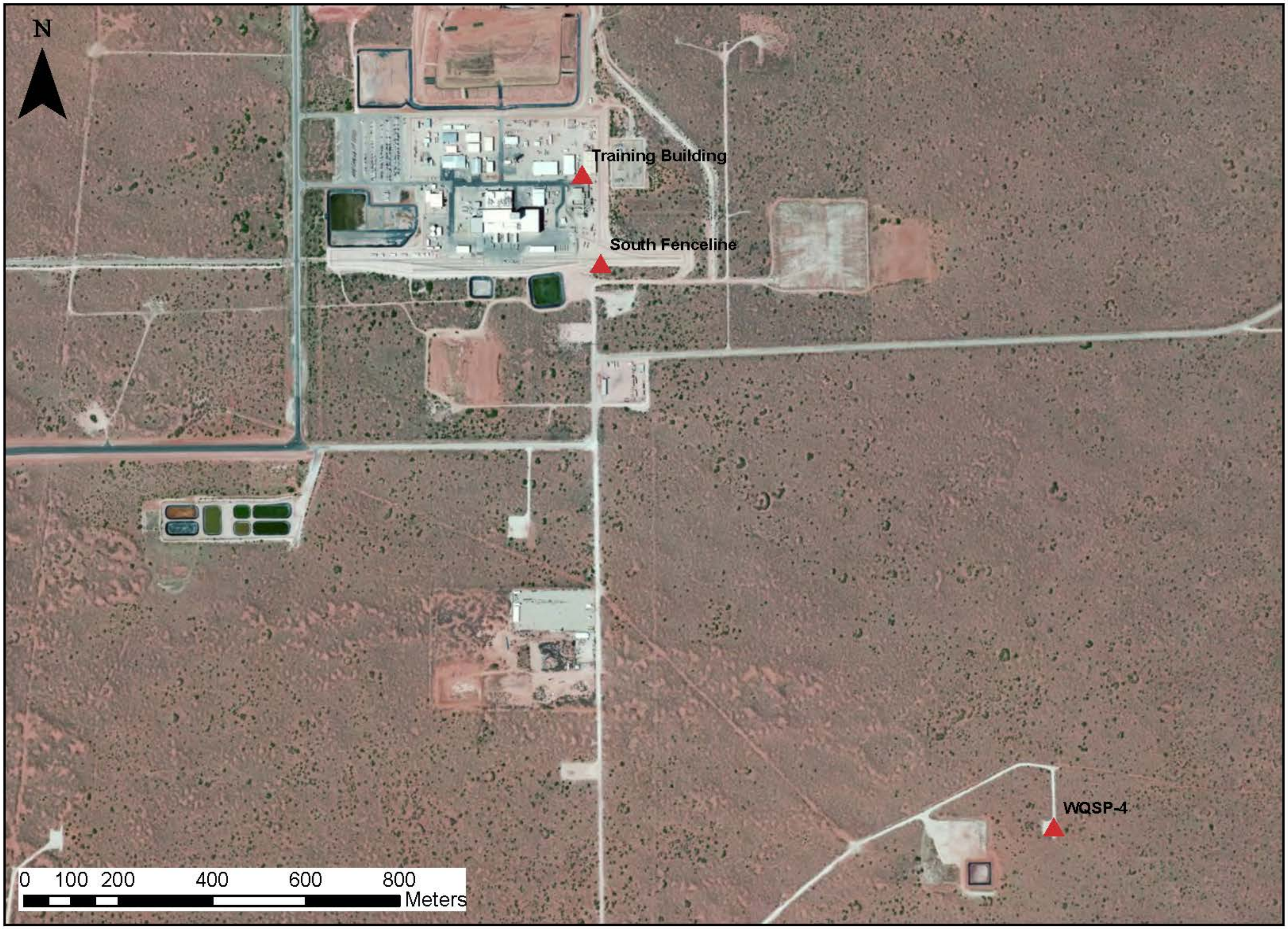

Figure 1. Surface VOC Monitoring Locations

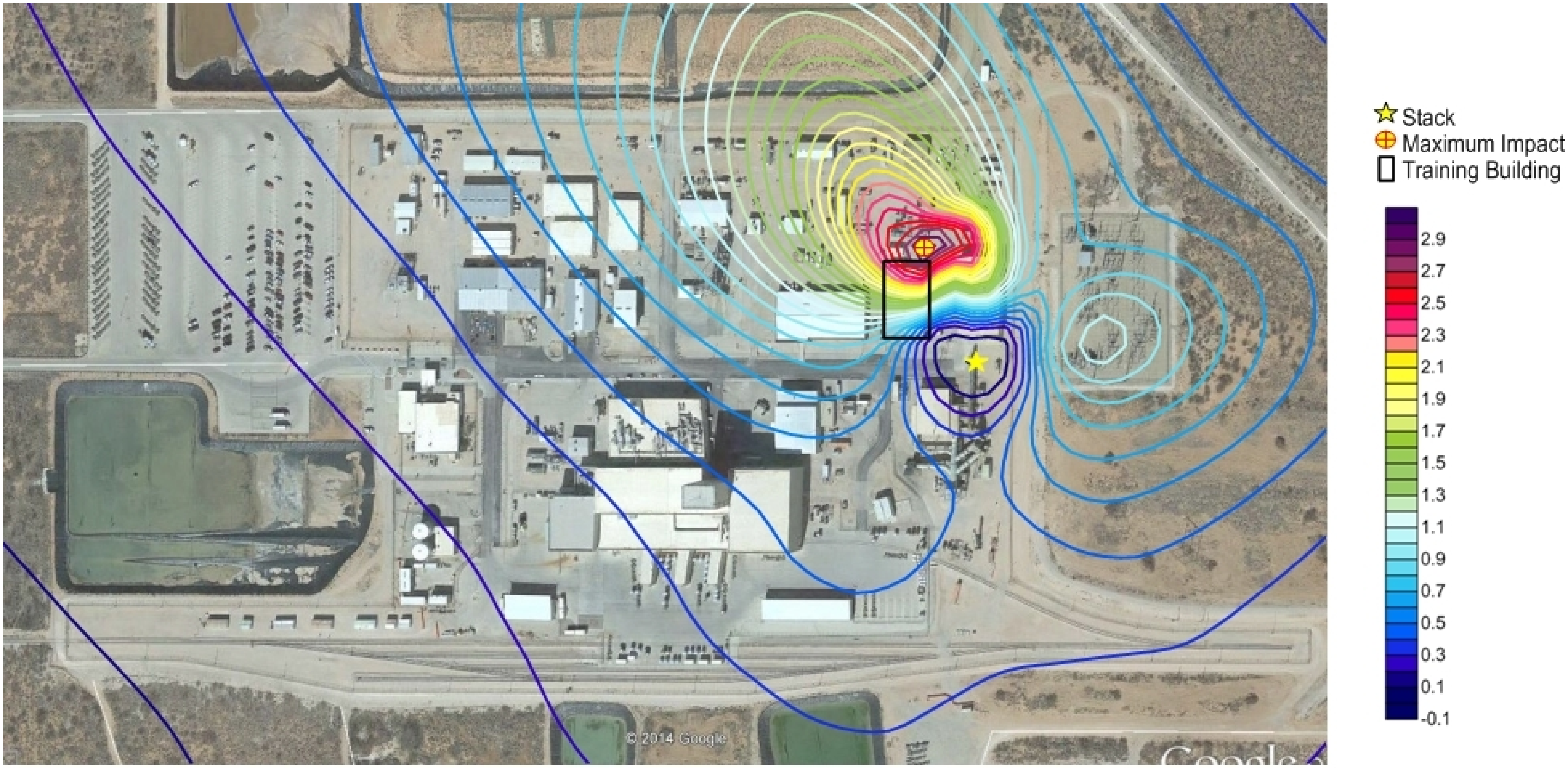

Figure 2. Contours of Annual Impact Concentrations (in µg/m^3)
From Generic 1 lb/hr Emission Rates
Assuming 60,000 cfm

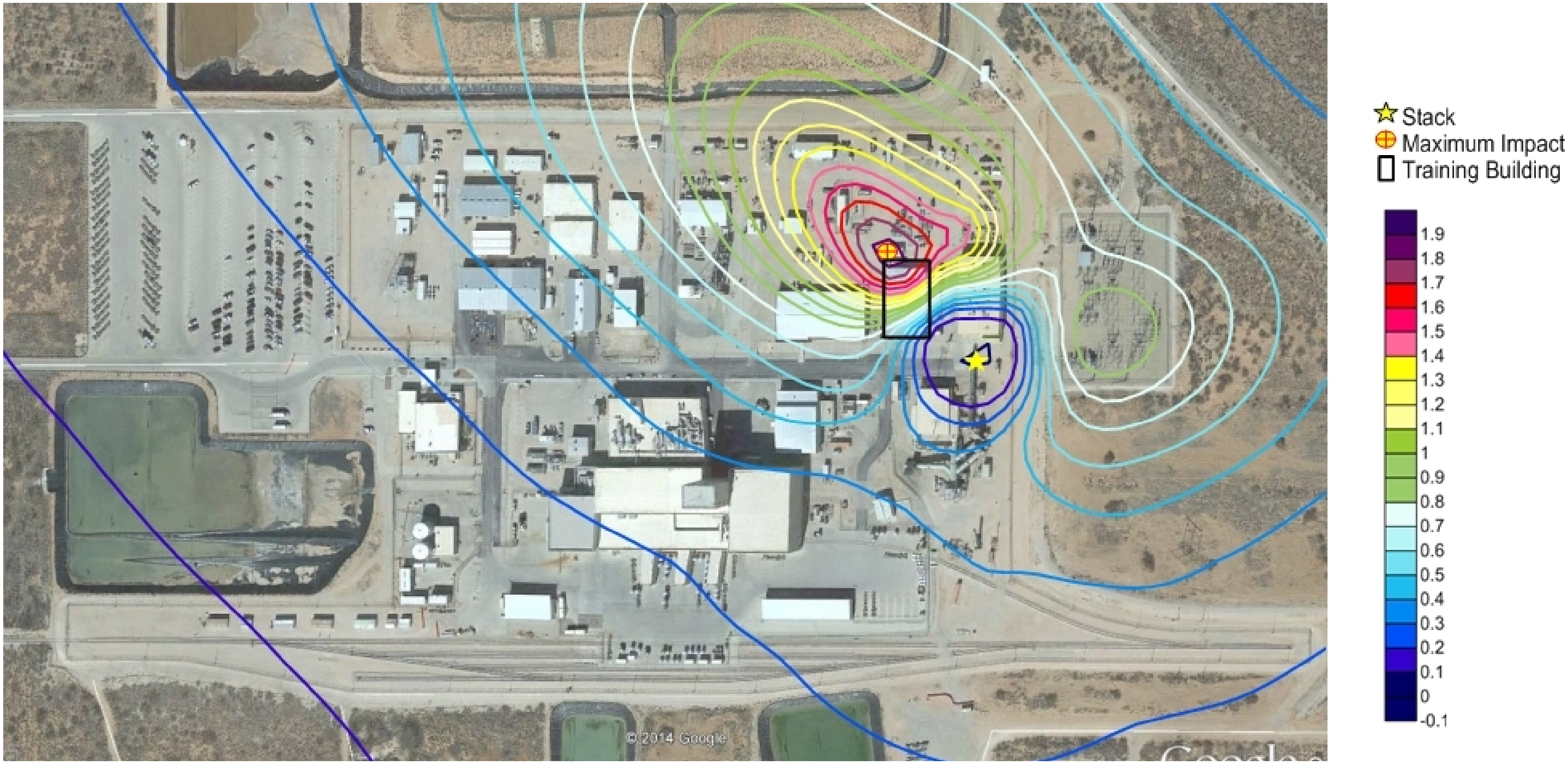

Figure 3. Contours of Annual Impact Concentrations (in µg/m^3)
From Generic 1 lb/hr Emission Rates
Assuming 114,000 cfm

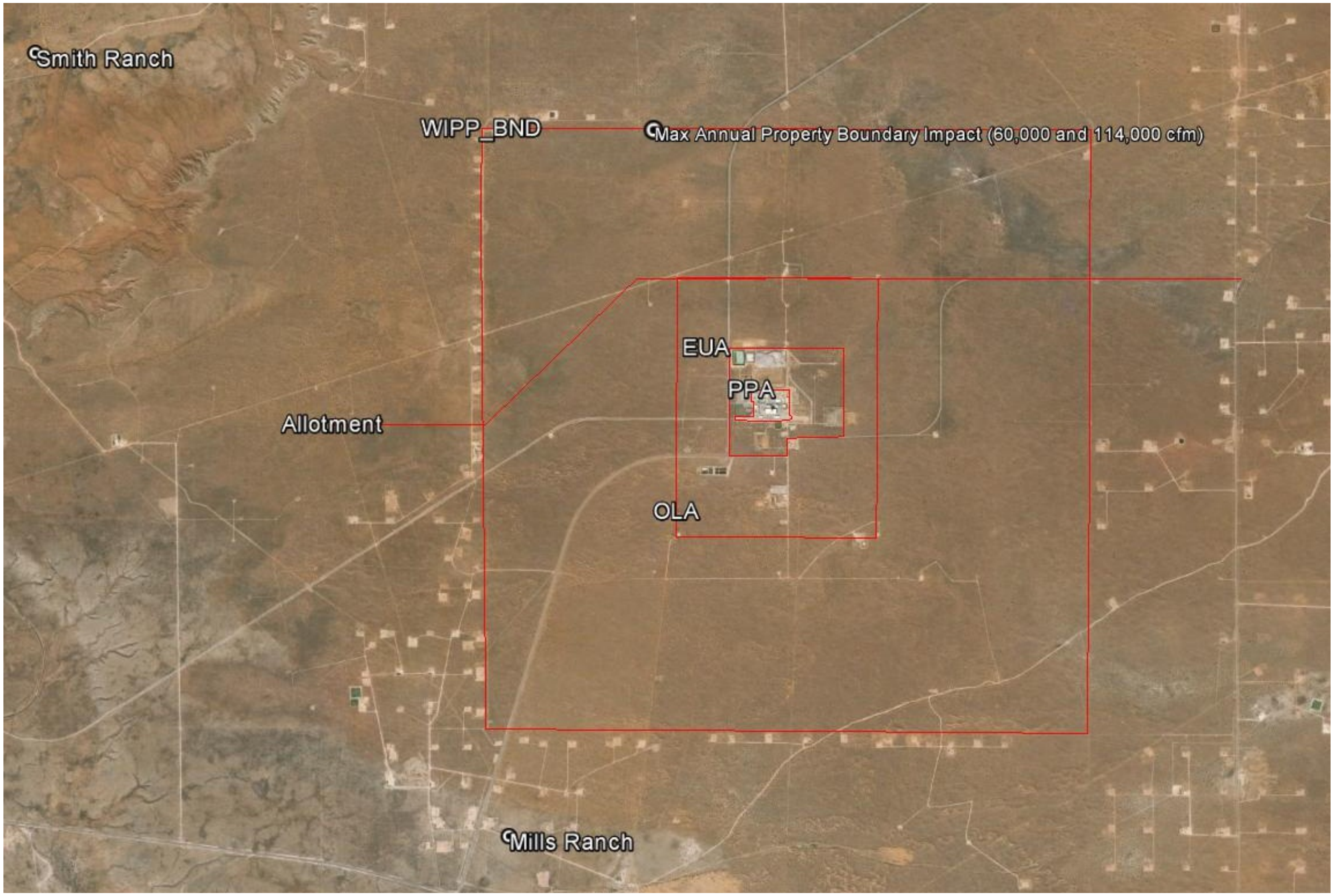

Figure 4. Location of Maximum Annual Property Boundary Impact

Appendix D
Air Quality Analysis for the DOE Waste Isolation Pilot Plant (WIPP) Repository Vent Stack Modeling

URS

Air Quality Analysis for the DOE Waste Isolation Pilot Plant (WIPP) Repository Vent Stack Modeling

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1.0 INTRODUCTION

Due to two recent incidents, the portions of the Waste Isolation Pilot Plant (WIPP) underground facility needed to conduct underground VOC monitoring are not accessible. Therefore, the Repository Volatile Organic Compound (VOC) monitoring program has shifted from collecting samples in the underground repository to collecting ambient air samples at above-ground locations. Repository VOC monitoring is required under the State Hazardous Waste Facility Permit (Permit). The intended uses of the above-ground monitoring data are to evaluate the impacts of continuing VOC emissions from the repository and to demonstrate compliance with environmental performance standards, both while the WIPP facility is in the recovery operation and potentially when normal operations recommence (in lieu of resuming collection of air samples within the underground repository).

URS Corporation (URS) was tasked to review and comment on the feasibility of the plan being developed by Nuclear Waste Partnership LLC (NWP) to conduct above-ground VOC monitoring in lieu of underground monitoring. In order to assess the appropriateness of the current sampling locations, URS updated the air dispersion modeling performed in 2010 (URS, July 2010) to identify the location of maximum impact under current release conditions (which differ in stack configuration and flow rate from the assumptions used in the 2010 modeling), as well as to answer several specific questions concerning the release and dispersion of VOCs.

This report summarizes the methodology used to perform the air dispersion modeling and documents the modeling results.

2.0 MODELING METHODOLOGY

To support the review of the Nuclear Waste Partnership LLC (NWP) above-ground VOC monitoring plan, URS conducted air dispersion modeling of emissions from the repository vent stack at the Waste Isolation Pilot Plant (WIPP) facility. The analysis used the American Meteorological Society/ U.S. Environmental Protection Agency Regulatory (AERMOD) model (Version 14134).

Nine scenarios were examined in the modeling exercise to identify the location and relative magnitude of maximum onsite and offsite impacts under current conditions (stack height of 24 ft and flow rate of 60,000 standard cubic feet per minute [scfm]) and alternate conditions involving increased stack height and flow rate. Table 2-1 lists the source release parameters used in this modeling exercise for all scenarios.

Table 2-1. Source Input Parameters

Source ID	Source Description	Easting (X)	Northing (Y)	Emission Rate (lb/hr)	Temperature (F)	Stack Diameter (ft)	Stack Height (ft)	Flow Rate (scfm)	Exit Velocity (m/s)	Scenario
V1	Repository Vent Stack	613677	3582350	1.0	71	6	24	60,000	10.78	1
							24	114,000	20.48	2
							48	60,000	10.78	3
							48	114,000	20.48	4
							24	260,000	46.71	5
							30	60,000	10.78	6
							35	60,000	10.78	7
							40	60,000	10.78	8
							45	60,000	10.78	9

Five years of meteorological data were processed using on-site data provided by NWP. Because these are site-specific data collected at the facility, they best represent the conditions at the WIPP above-ground facility. USEPA's preference for site-specific meteorological data is documented in USEPA's Guideline on Air Quality Models 40 CFR Part 51 (http://www.epa.gov/ttn/scram/guidance/guide/appw_05.pdf) (EPA, 2005). Section 8.3.1.2 (b) states:

> The use of 5 years of NWS [National Weather Service] meteorological data or at least l year of site specific data is required. If one year or more (including partial years), up to five years, of site specific data is available, these data are preferred for use in air quality analyses.

These data were supplemented with surface data from the National Weather Service (NWS) station in Carlsbad, NM (Station 93033). Upper air data were collected from the NWS station located in El Paso, TX (Station 3020). Please note that there is an upper-air meteorological data station in Midland, Texas that is closer to the WIPP facility than El Paso. However, the data capture from the Midland monitor is less complete than the data from El Paso. Filling in upper air data can be difficult and inaccurate; therefore, the El Paso station was selected for this evaluation. All data were processed using AERMET (Version 14134).

The modeling analysis included consideration of building downwash effects, wherein the potential for emission discharges to become caught in the turbulent wakes of structures was evaluated. The analysis used Building Profile Input Program (BPIP-Prime) (Version 04112) to generate wind direction-specific downwash dimensions from downwash structures. AERMOD considers direction-specific downwash using the PRIME algorithm as evaluated in the BPIP-Prime program.

Terrain data (elevations and hill heights) were collected using AERMOD's terrain preprocessor, AERMAP (Version 11103). National Elevation Data (NED) files are uploaded to the processor, which then produces elevations and hill heights for all sources, buildings, and receptors.

A receptor grid was placed across the entire property with receptor spacing (density) dependent on distance from the source. Two additional discrete receptors were added to calculate impacts at the locations of the two closest residences, Smith Ranch and Mills Ranch (see Figure 2-1).

Figure 2-1. Locations of Nearest Sensitive Receptors (Residences)

3.0 MODELING RESULTS AND CONCLUSIONS

Modeling was performed using a generic unit emission rate approach. Impacts are in units of micrograms per meter cubed ($\mu g/m^3$) of ambient concentration per lb/hour of emissions (which will differ for each VOC). The modeling results identify the location of maximum onsite and offsite impact and provide the relative magnitude of impact at receptor locations. However, the modeled impacts (in units of $\mu g/m^3$ per lb/hr) are not directly comparable to surface air monitoring results. To be comparable, the results need to be multiplied by the average emission rate for each VOC in lb/hour from the vent stack.

Table 3-1 lists modeled onsite maximum impacts for each modeling scenario. Figures 3-1 through 3-5 contain impact contours and the location of maximum on-site impact for each scenario. In general, as the flow rate is increased and stack heights are added, the predicted concentrations decrease. The only exception to this rule is Scenario 5, which has the greatest modeled flow rate of 260,000 scfm, but actually a higher predicted concentration than the same stack with a more modest 114,000 scfm flow rate. This anomaly is due to turbulence related to building downwash during this high flow condition. The increase in vent height has a bigger effect on the reduction of concentrations than the increase in flow rates. The locations of the highest impacted receptors move further to the north (away from the vent) when the release heights are raised to a height of 48 feet. The locations of the highest impacted receptors move only slightly when the flow rates are increased.

Table 3-2 lists modeled maximum impact concentrations at the property boundary. Figure 3-6 is a visual representation of the location of these impacts. The magnitudes of the concentrations at residences are as much as 600X smaller than the concentrations at the maximum affected onsite receptor. These concentrations are also similarly affected by changes in vent height and flow rate.

In addition to the scenarios already discussed, a sensitivity analysis was performed to measure impacts at varying stack heights for a flow rate of 60,000 scfm. The results of this analysis are presented in Table 3-3. Figure 3-7 shows the maximum impact location onsite for each modeled stack height. Please note that although impact concentrations decrease as the vent height increases, the magnitude of the decreases diminishes with higher release heights. For example, when six feet of vent height is added to the current 24 ft vent, the maximum impact concentration decreases by 1.21 $\mu g/m^3$. If another five or six feet of vent height is added, one might expect another 1.21 $\mu g/m^3$ decrease, but instead the model predicts only a 0.69 $\mu g/m^3$ decrease.

Table 3-1. Maximum Onsite Annual Generic Unit Impacts

Scenario	Flow Rate (scfm)	Stack Height (ft)	Easting (m)	Northing (m)	Max Onsite Modeled Impact ($\mu g/m^3$ per lb/hr)	% Decrease in Predicted Concentration Compared to Scenario 1
1	60,000	24	613650	3582420	3.06	0%
2	114,000	24	613620	3582410	1.80	41%
3	60,000	48	613550	3582500	0.55	82%
4	114,000	48	613550	3582525	0.46	85%
5	260,000	24	613640	3582410	1.94*	37%

*Increase in impacts with the 260,000 scfm flow rate is due to building downwash effects.

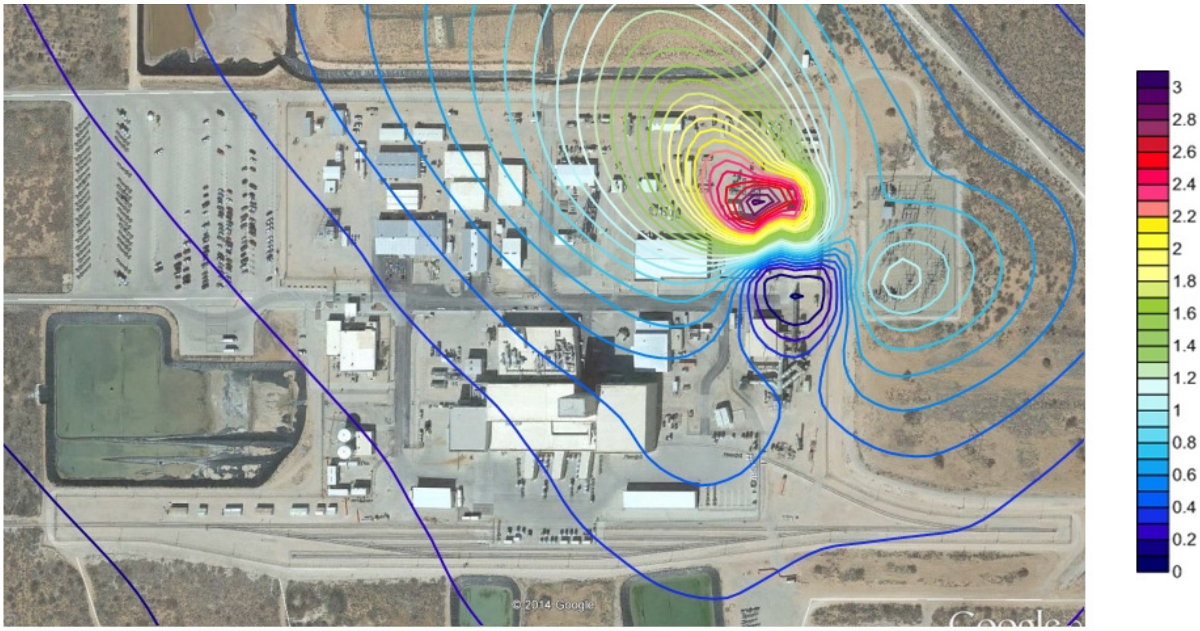

Figure 3-1. Annual Unit Impact Concentrations with 24-ft Stack and 60,000 scfm Flow Rate ($\mu g/m^3$ per lb/hr)

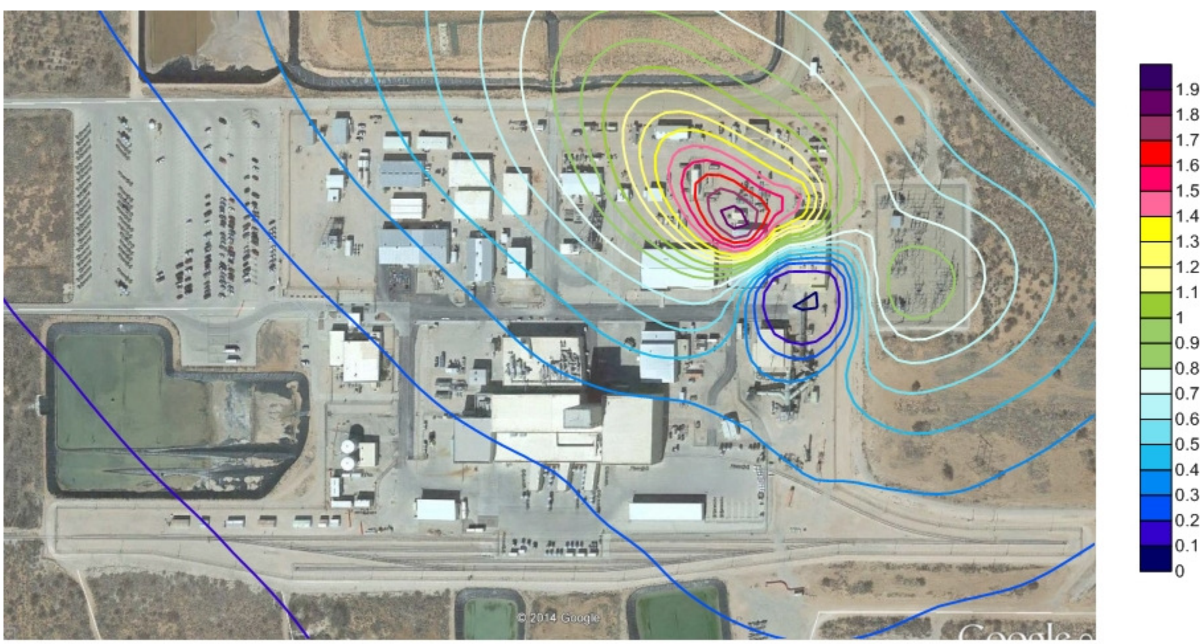

Figure 3-2. Annual Unit Impact Concentrations with 24-ft Stack and 114,000 scfm Flow Rate ($\mu g/m^3$ per lb/hr)

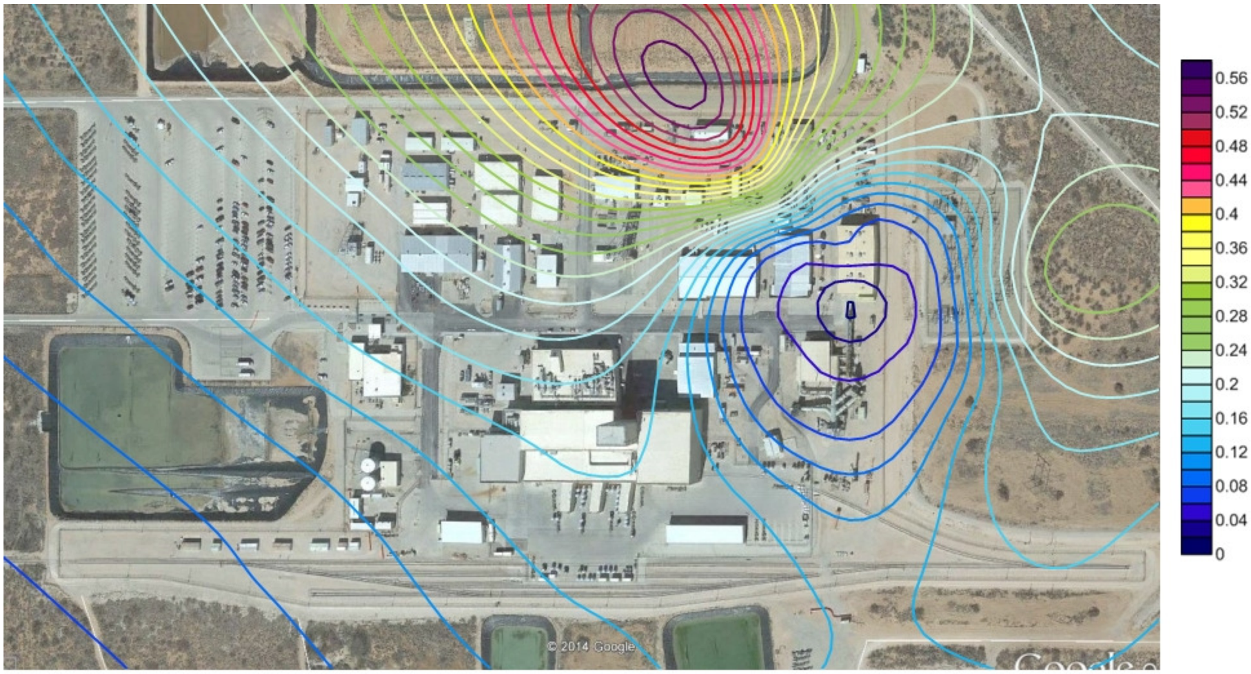

Figure 3-3. Annual Unit Impact Concentrations with 48-ft Stack and 60,000 scfm Flow Rate (μg/m³ per lb/hr)

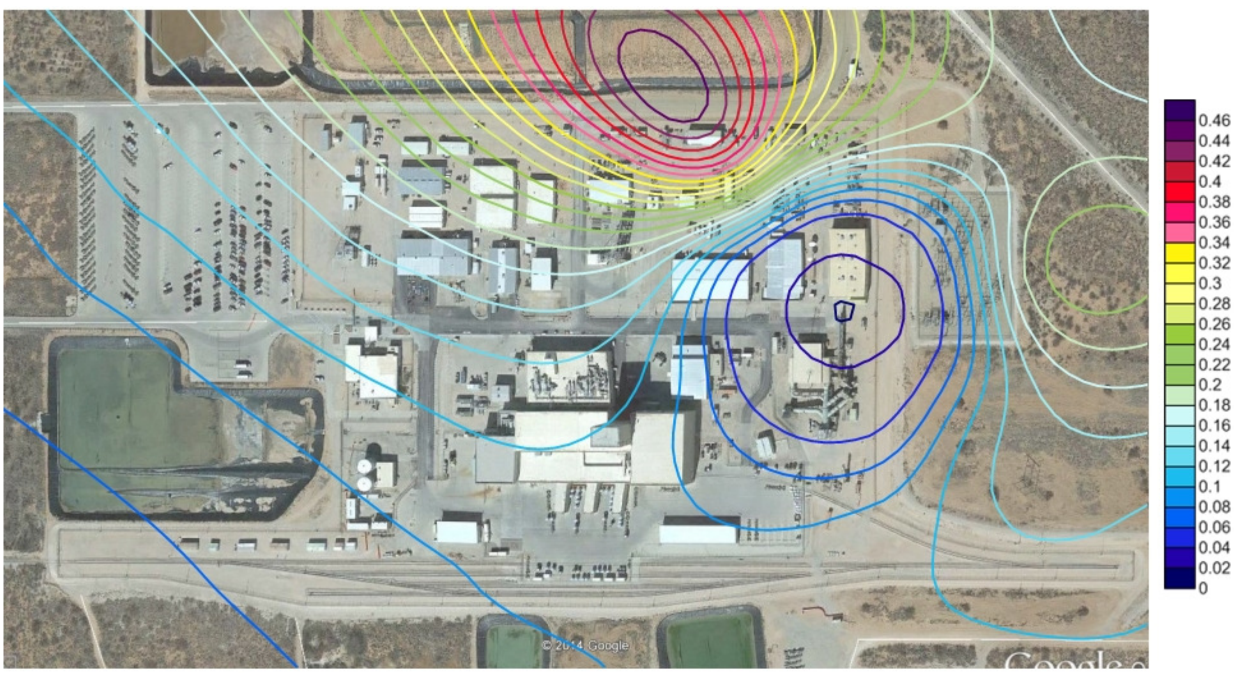

Figure 3-4. Annual Unit Impact Concentrations with 48-ft Stack and 114,000 scfm Flow Rate (μg/m³ per lb/hr)

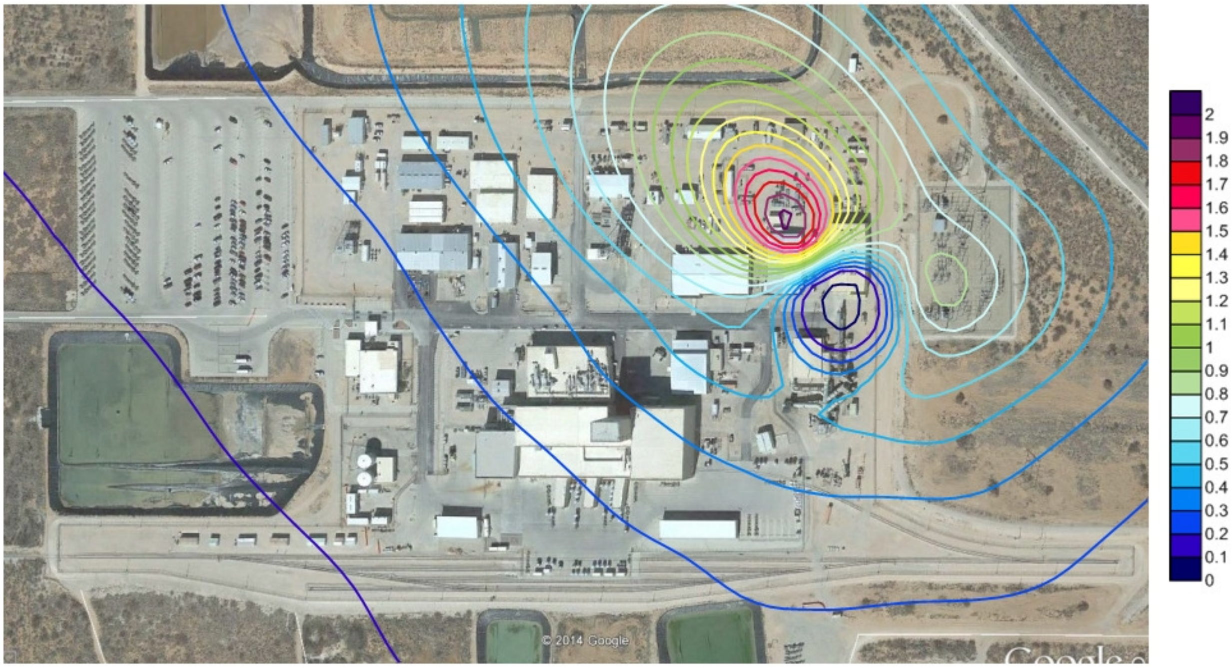

Figure 3-5. Annual Unit Impact Concentrations with 24-ft Stack and 260,000 scfm Flow Rate ($\mu g/m^3$ per lb/hr)

Table 3-2. Maximum Annual Unit Impacts at Property Boundary and Residences

Scenario	Flow Rate (scfm)	Stack Height (ft)	Property Boundary Impact (µg/m^3 per lb/hr)	Smith Ranch Impact (µg/m^3 per lb/hr)	Mills Ranch Impact (µg/m^3 per lb/hr)
1	60,000	24	0.026	0.005	0.005
2	114,000	24	0.023	0.004	0.004
3	60,000	48	0.021	0.004	0.004
4	114,000	48	0.019	0.003	0.003
5	260,000	24	0.020	0.004	0.003

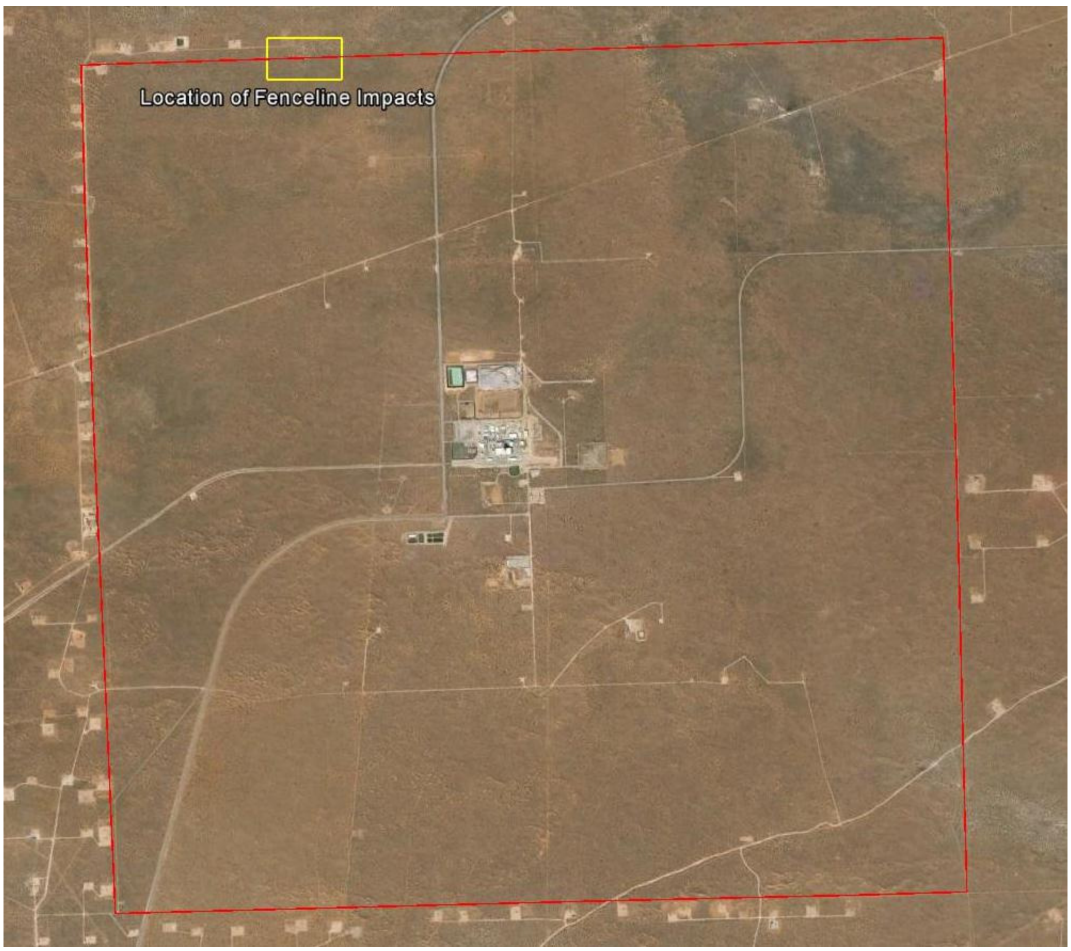

Figure 3-6. Location of Maximum Property Boundary Impacts for All Scenarios

Table 3-3. Maximum Annual Impacts at Varying Stack Heights with 60,000 scfm Flow

Scenario	Source ID	Flow Rate (cfm)	Stack Height (ft)	Annual Unit Impact Concentration (µg/m³ per lb/hr)	% Decrease in Predicted Concentration Compared To Scenario 1
1	V1_24	60,000	24	3.06	0%
6	V1_30		30	1.85	40%
7	V1_35		35	1.16	62%
8	V1_40		40	0.83	73%
9	V1_45		45	0.63	79%

Figure 3-7. Maximum Onsite Annual Unit Impacts for Varying Stack Heights with 60,000 scfm Flow Rate

An additional analysis was performed to determine the relationship between 24-hour average impact concentrations and individual 1-hour average concentrations over the course of a 24-hour period at the point of maximum annual onsite impact. Using this information, an employee's exposure during the period of a typical work shift may be compared to the average 24-hour exposure. Figures 3-8 through 3-15 graph this relationship by two different methods:

1. Averages Approach: Over the five-year period evaluated, all model predicted 24-hour average concentrations were averaged together to produce a single value (the straight red line). Model predicted 1-hour average concentrations for the five-year period were averaged together by hour of day, i.e., all 2:00 hours were averaged, all 3:00 hours were averaged, etc.
2. Maximums Approach: The same methodology as mentioned above was used, except the maximum (rather than the average) 24-hour average concentration and the respective maximum 1-hour average concentrations were plotted.

In all cases, the hourly impact concentrations predicted by the model during daylight hours are lower than the 24-hour average concentrations, while predicted nighttime hourly average concentrations are higher than the 24-hour average concentrations. This is because night-time stable atmospheric conditions limit plume dispersion. During these night-time conditions, the plume stays concentrated and the impact concentrations are relatively high when the plume returns to the ground. During the day, the solar radiation keeps the atmosphere in a more turbulent state which encourages dispersion. When emissions are released during the day, they are better mixed with ambient air before returning to the ground, resulting in lower daytime impact concentrations.

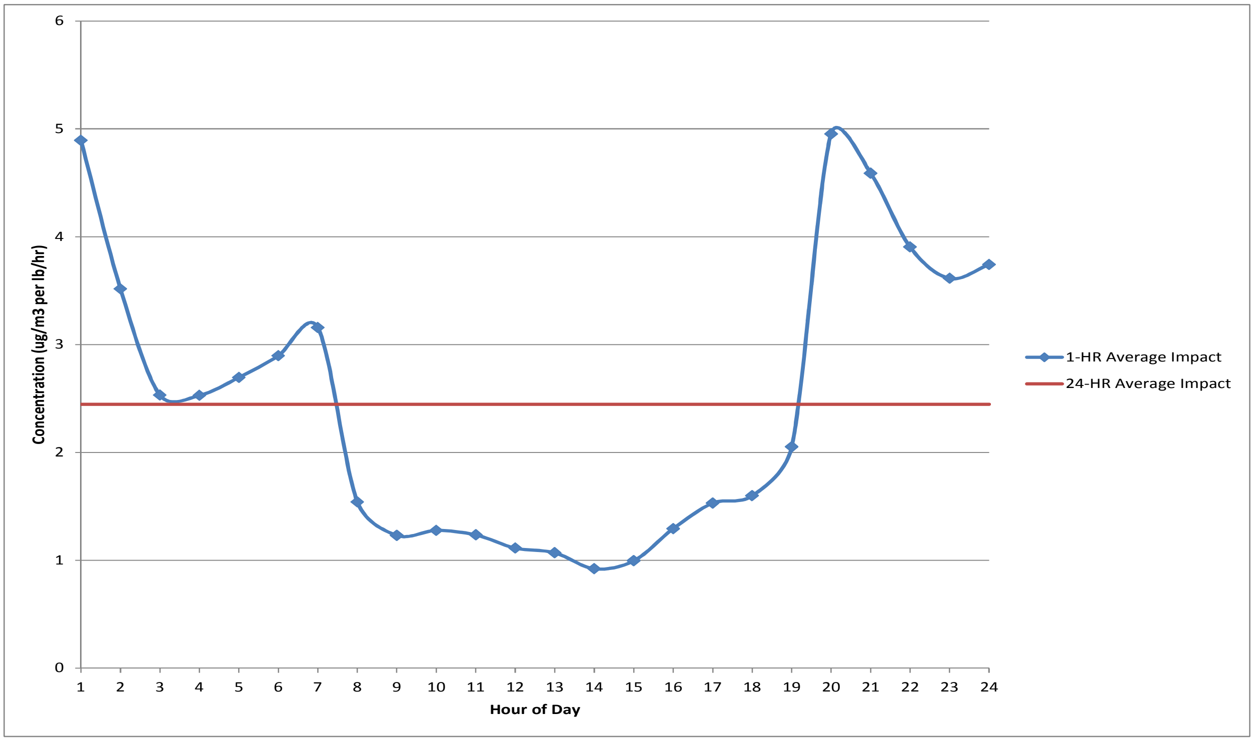

Figure 3-8. 1-HR Average Modeled Impacts by Hour of Day vs. 24-HR Average Modeled Impacts – 24-ft Stack with 60,000 scfm Flow

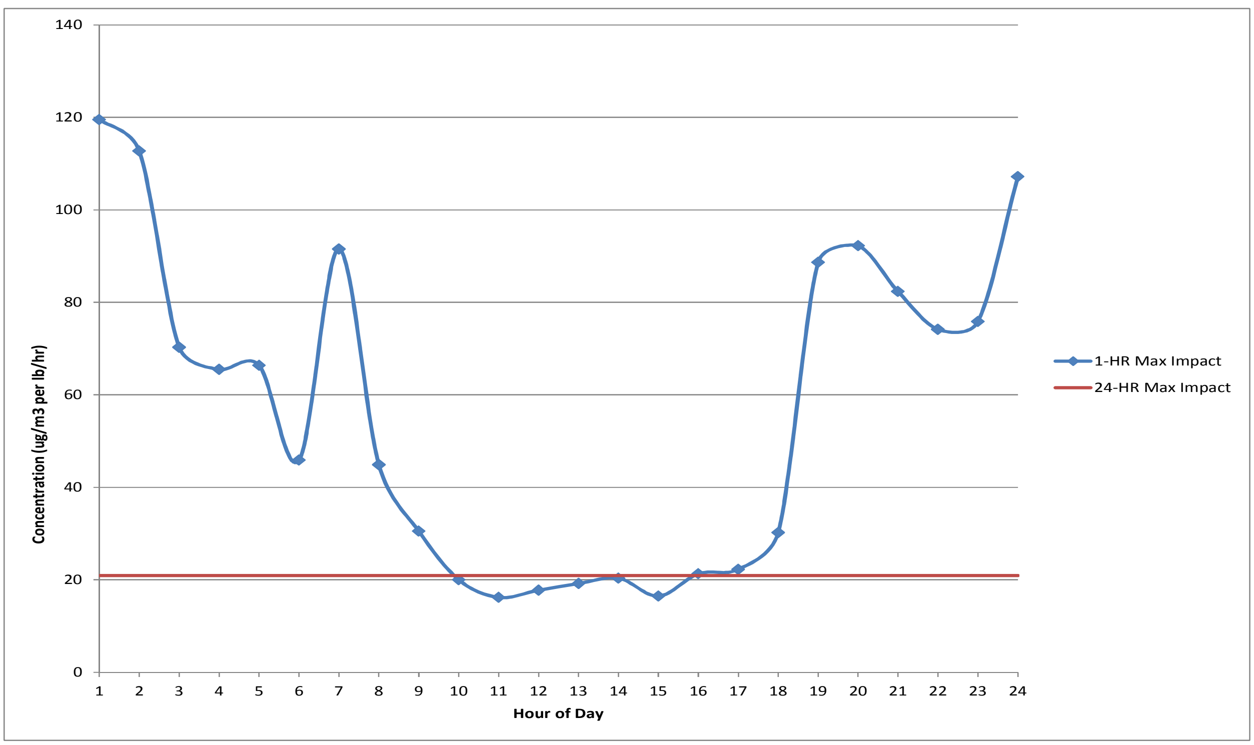

Figure 3-9. 1-HR Max Modeled Impact by Hour of Day vs. 24-HR Max Modeled Impact – 24-ft Stack with 60,000 scfm Flow

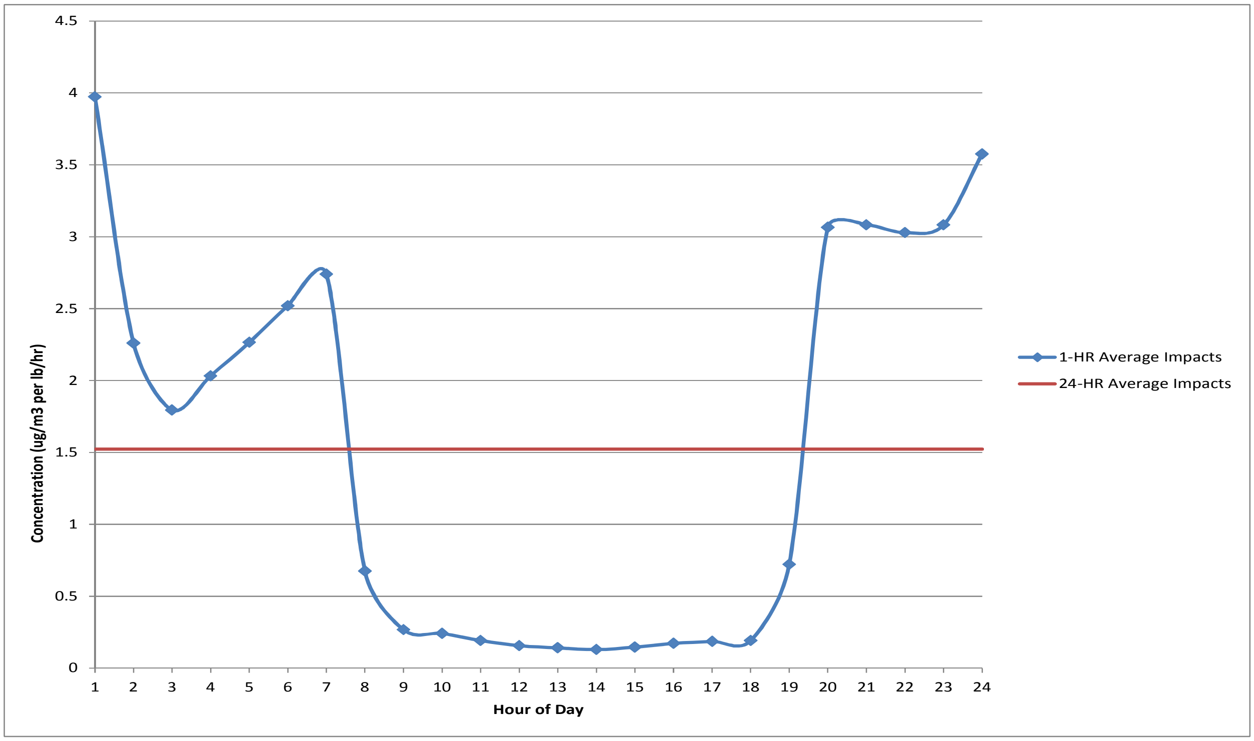

Figure 3-10. 1-HR Average Modeled Impacts by Hour of Day vs. 24-HR Average Modeled Impacts – 24-ft Stack with 114,000 scfm Flow

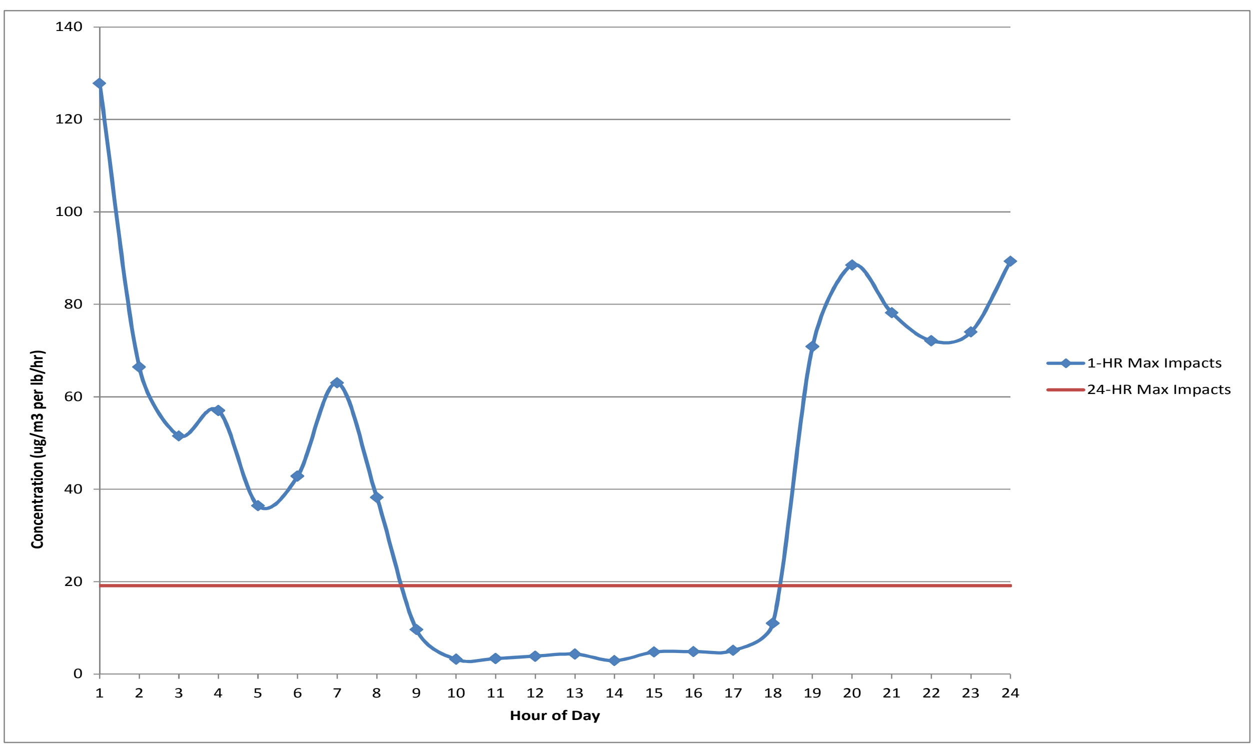

Figure 3-11. 1-HR Max Modeled Impacts by Hour of Day vs. 24-HR Max Modeled Impacts – 24-ft Stack with 114,000 scfm Flow

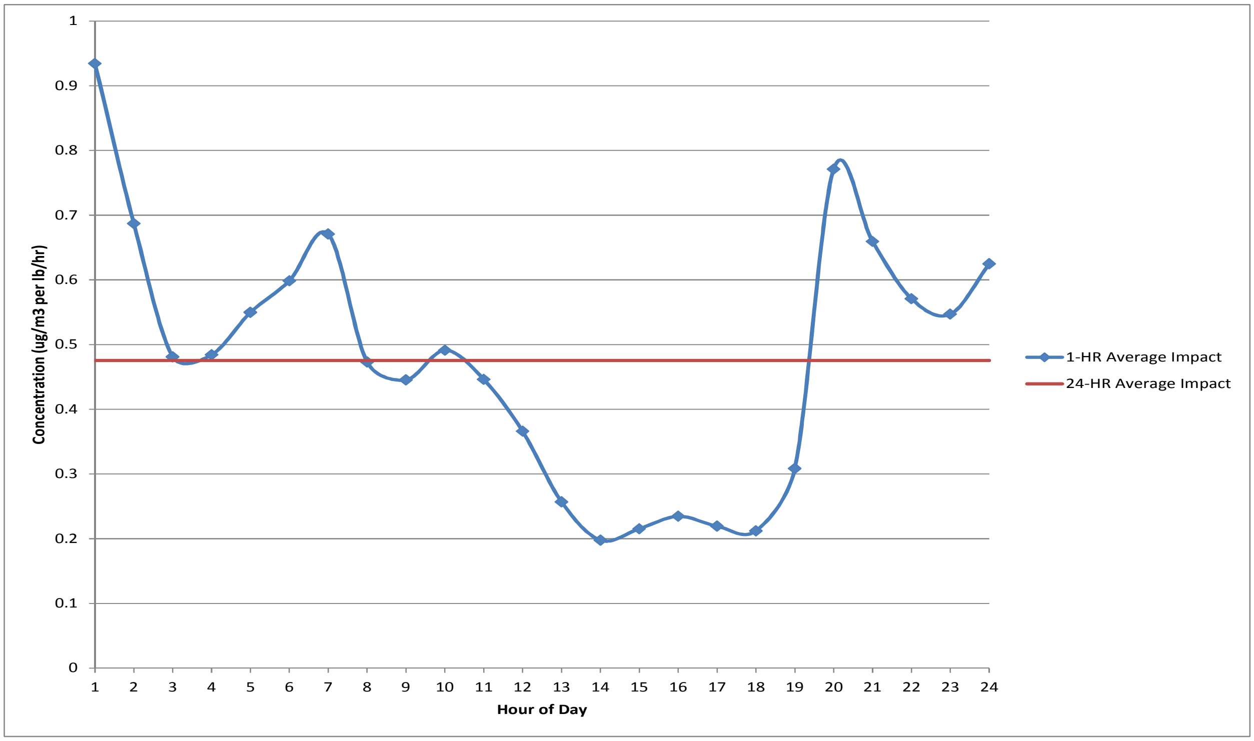

Figure 3-12. 1-HR Average Modeled Impacts by Hour of Day vs. 24-HR Average Modeled Impacts – 48-ft Stack with 60,000 scfm Flow

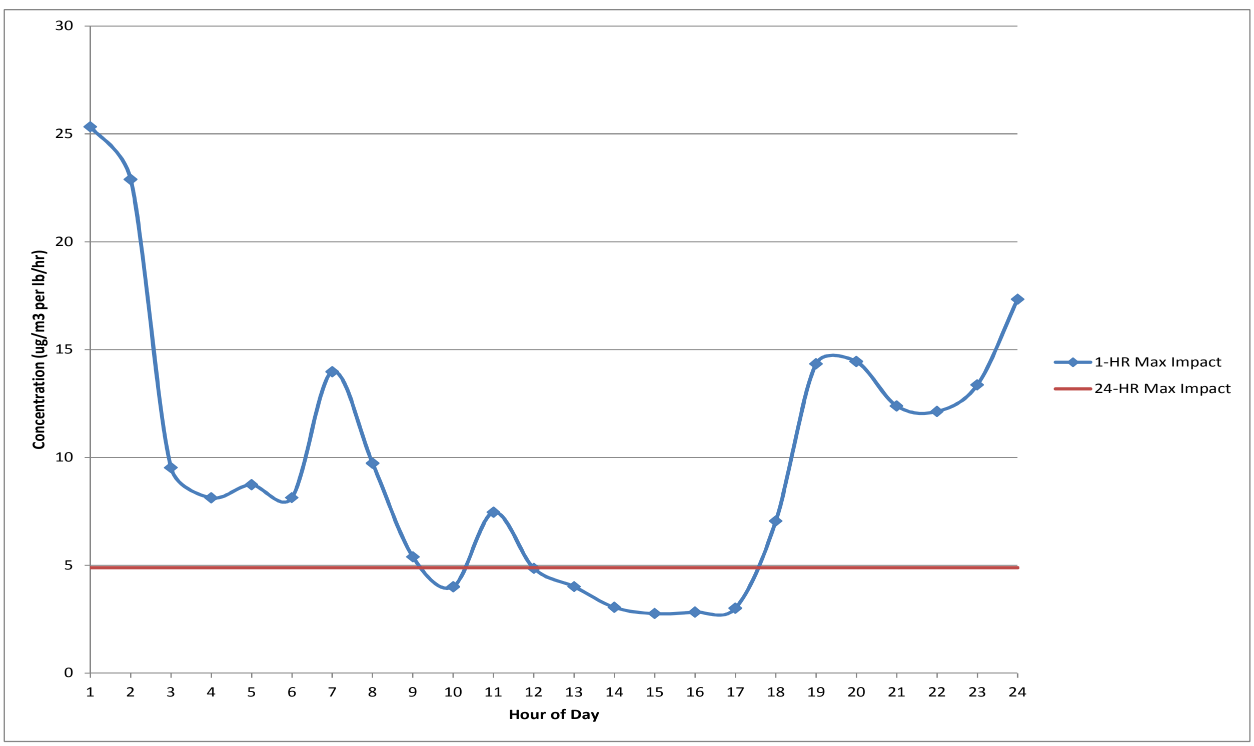

Figure 3-13. 1-HR Max Modeled Impacts by Hour of Day vs. 24-HR Max Modeled Impacts – 48-ft Stack with 60,000 scfm Flow

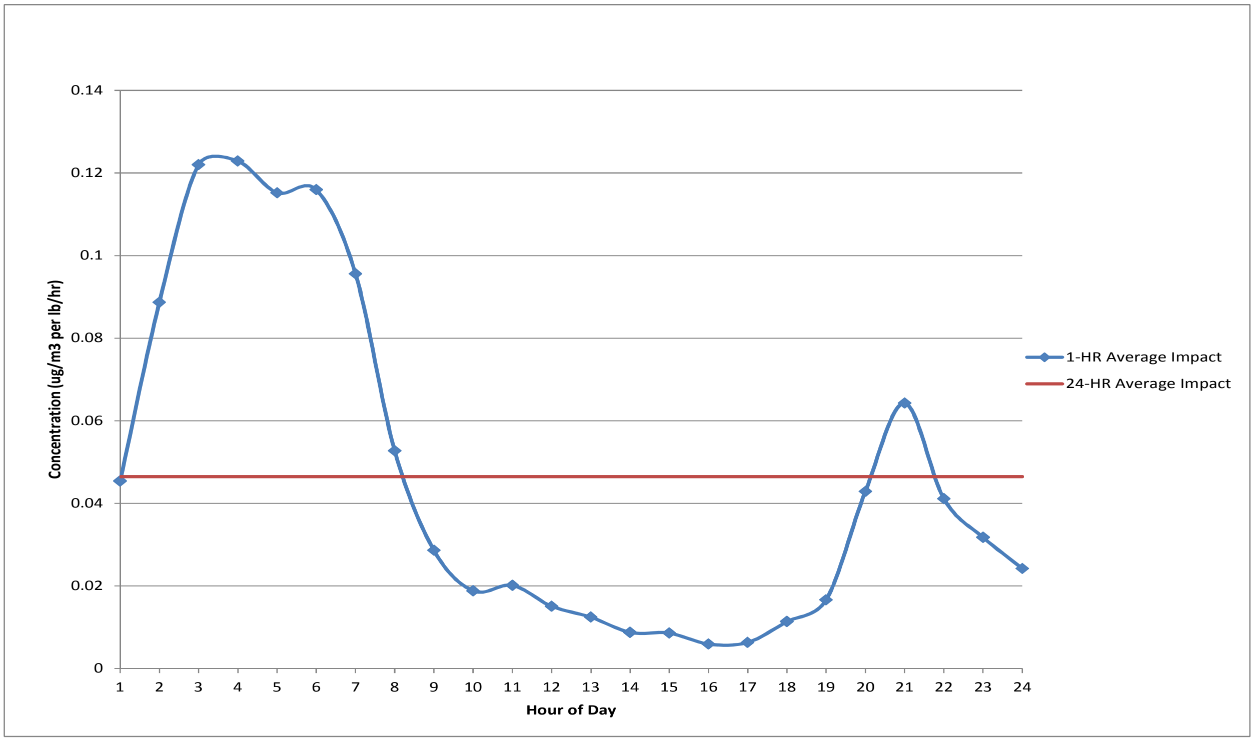

Figure 3-14. 1-HR Average Modeled Impacts by Hour of Day vs. 24-HR Average Modeled Impacts – 48-ft Stack with 114,000 scfm Flow

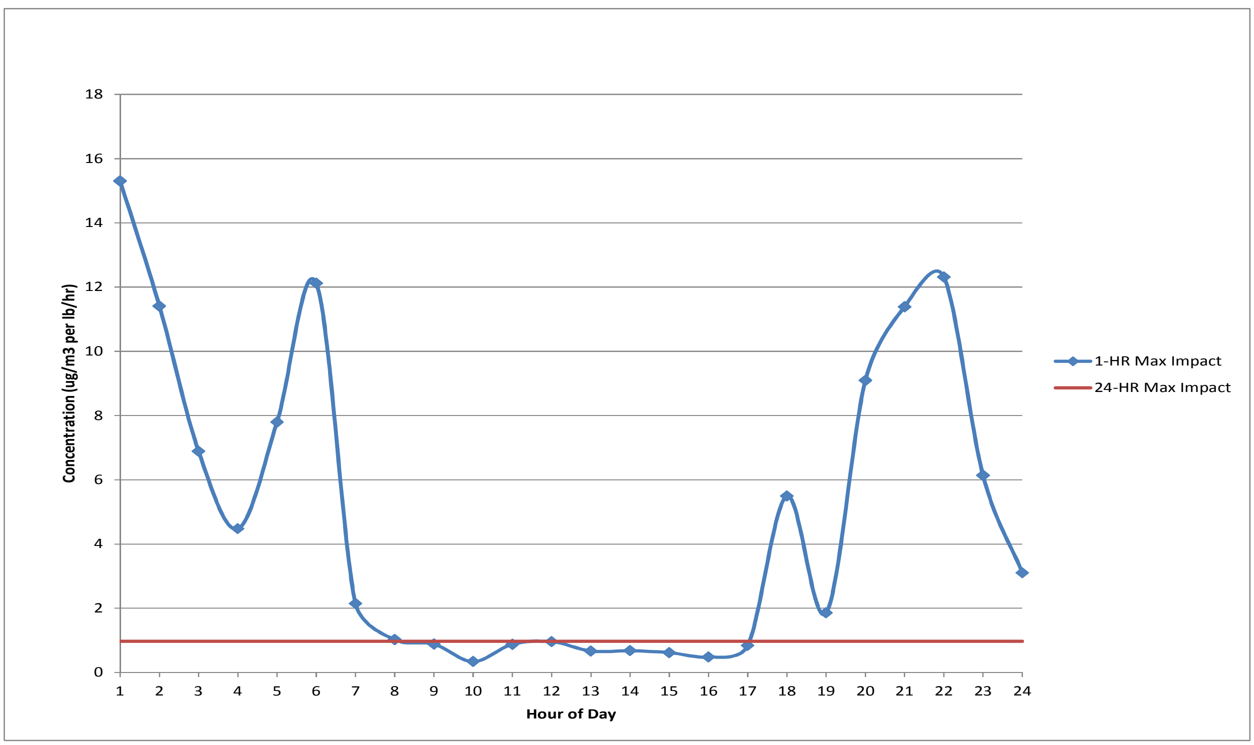

Figure 3-15. 1-HR Max Modeled Impacts by Hour of Day vs. 24-HR Max Modeled Impacts – 48-ft Stack with 114,000 scfm Flow

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