UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
Washington, DC 20460

November 14, 2022

OFFICE OF
AIR AND
RADIATION

Mr. Reinhard Knerr, Manager
Carlsbad Field Office
U.S. Department of Energy
P.O. Box 3090
Carlsbad, New Mexico 88221-3090

Dear Mr. Knerr:

The U.S. Environmental Protection Agency (EPA or the Agency) conducted inspections at the Waste Isolation Pilot Plant (WIPP) on May 24-26, 2022, as part of the Agency's continuing oversight of the facility. These inspections were performed under the authority of 40 CFR 194.21 and 40 CFR part 191, Subpart A. The EPA team inspected both the WIPP surface and underground facilities, using established inspection checklists. This letter transmits the EPA's inspection reports.

Based on the activities documented in the enclosed reports, the EPA inspection team found that the U.S. Department of Energy (DOE) Carlsbad Field Office (CBFO) and its contract staff at the WIPP continue to meet commitments and regulatory requirements to track waste, monitor the disposal system, measure any radioactive releases, calculate potential dose to the public and document the results of these activities. WIPP site personnel were attentive and accommodating. Some minor areas for improvement were noted. In the course of the Emplacement Inspection, the inspection team encountered procedural issues that led to an inspection concern associated with the tracking of magnesium oxide (MgO) in the Waste Data System (WDS). EPA noted a discrepancy between the calculated MgO excess factor in the WDS and the Summary of Waste Emplacement Inventory Reports generated in the WDS. EPA shared this concern with DOE and requested a response. DOE has committed to correct the error.

Copies of the enclosed reports will be placed in the EPA public dockets at http://www.regulations.gov. If you have any questions regarding the enclosed reports, please contact Jonathan Walsh at (202) 343-9238 or walsh.jonathan@epa.gov.

Sincerely,

Lee Ann B. Veal
Director
Radiation Protection Division

Enclosures (3)

cc: George Basabilvazo, DOE/CBFO
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EPA WIPP Team
Lea Anderson, EPA OGC
John Averback, EPA OGC
EPA Docket

E-DOCKET: EPA-HQ-OAR-2001-0012-0767

2022 – Monitoring Inspection Report

INSPECTION OF THE
WASTE ISOLATION PILOT PLANT
May 24–26, 2022

U. S. ENVIRONMENTAL PROTECTION AGENCY
Office of Radiation and Indoor Air
Center for Waste Management and Regulations
1200 Pennsylvania Avenue, NW
Washington, DC 20460

November 2022

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List of Abbreviations

CBFO	Carlsbad Field Office
CCA	Compliance Certification Application
CFR	*Code of Federal Regulations*
COMP	Compliance Monitoring Parameter
CRA	Compliance Recertification Application
DOE	U.S. Department of Energy
EPA	U.S. Environmental Protection Agency
NWP	Nuclear Waste Partnership
ORIA	Office of Radiation and Indoor Air
PA	performance assessment
RES	Regulatory and Environmental Services
RPD	U.S. Environmental Protection Agency's Office of Radiation and Indoor Air Radiation Protection Division
SNL	Sandia National Laboratories
WDS	Waste Data System
WIPP	Waste Isolation Pilot Plant

1.0 Executive Summary

The U.S. Environmental Protection Agency (EPA or the Agency) conducted an inspection of the U.S. Department of Energy's (DOE or the Department) Waste Isolation Pilot Plant (WIPP) from May 24 to 26, 2022, as part of the Agency's continuing WIPP oversight program. The purpose of this inspection was to verify that DOE continues to adequately monitor ten parameters listed in the 1996 Compliance Certification Application (CCA), Volume 1, Section 7.0, in particular Table 7-7. The monitoring inspection examines the monitoring of geomechanical, hydrological, waste activity, drilling-related and subsidence parameters. Attachments A and B contain the inspection plan and the checklist used by EPA inspectors. Attachment C lists documents reviewed by EPA. EPA conducted its most recent prior inspection from May 14 to 16, 2019 (EPA-HQ-OAR-2001-0012-0700).

EPA inspectors toured locations where measurements are taken and were given demonstrations on how personnel conduct measurements. EPA also examined data and reviewed documents and procedures that direct these monitoring activities. The inspection checklist in Attachment B provides details of these inspection activities. EPA found that the site has continued to effectively implement the monitoring programs at WIPP for all areas reviewed. The inspectors also confirmed that the results of DOE monitoring programs are included in annual reports. The inspection team did not identify any findings or concerns.

2.0 Scope

The EPA WIPP Compliance Criteria require DOE to "conduct an analysis of the effects of disposal system parameters on the containment of waste in the disposal system" (Title 40 of the *Code of Federal Regulations* Section 194.42(a) [40 CFR 194.42(a)]) and use the results of the analysis to develop pre-closure and post-closure monitoring requirements. The results of this analysis were included in the 1996 CCA and confirmed most recently in the 2019 Compliance Recertification Application (CRA).

DOE documents the analysis of monitoring parameters in Volume 1, Section 7.0 of the CCA. Table 7-7 of the CCA lists the ten parameters that the Department determined may affect the disposal system. These parameters are grouped into major categories and listed in Table 1. EPA accepted these ten monitoring parameters in the 1998 certification decision and confirmed them in the 2022 recertification decision for the CRA-2019.

This inspection was performed under authority of 40 CFR 194.21, which authorizes EPA to verify the continued effectiveness of the parameter monitoring program at the WIPP. Inspection activities included an examination of monitoring and sampling equipment on site, off site and in the underground. The Agency also reviewed sampling procedures and measurement techniques and verified that monitoring data are collected using defined procedures with quality assurance oversight (see the document list in Appendix C).

Table 1. Monitored Parameters (taken from Vol. 1, Section 7 of the CCA)

Parameter Category	Parameters
Geomechanical*	Creep closure Extent of deformation Initiation of brittle deformation Displacement of deformation features
Hydrological	Culebra groundwater composition Change in Culebra groundwater flow direction
Subsidence	Surface subsidence
Drilling-Related+	Drilling rate Probability of encountering a Castile brine reservoir
Waste Activity	Waste Activity

*These monitored geomechanical parameters are related to various properties of the Salado formation that DOE has determined could have an effect on the performance of the repository.

+The drilling rate here references the Deep drilling rate for resources in the Delaware Basin.

3.0 Inspection Team, Observers and Participants

The inspection team consisted of six EPA staff physically present for the inspection, as well as two EPA staff who joined parts of the inspection remotely through phone and video conferencing. The EPA inspection team is listed in Table 2. Numerous DOE staff and contractors participated in the inspection; Table 3 includes a partial list of participants taken from a sign-in sheet generated during the opening meeting.

Table 2. Inspection Team

Inspection Team Member	Position	Affiliation
Tom Peake	Director, Radiation Protection Division (RPD) Center for Waste Management and Regulations	EPA Office of Radiation and Indoor Air (ORIA)
Jonathan Walsh	Lead Inspector	EPA ORIA
Joe Rustick	Inspector	EPA ORIA
Xinyue Tong	Inspector	EPA ORIA
Erik Christiansen	Inspector	EPA Region 6
Jerry Ellis	Observer, RPD Quality Assurance Manager	EPA ORIA
Jon Major	Inspector (remote)	EPA ORIA
Jay Santillan	Inspector (remote)	EPA ORIA

Table 3. Inspection Participants

Participant	Affiliation
Anderson Ward	DOE-Carlsbad Field Office (CBFO)
Judy McLemore	Regulatory and Environmental Services (RES)
Ricardo Hernandez	RES
Darren Jolley	DOE-CBFO Quality Assurance Program
Amber Gellis	New Mexico Environment Department (NMED)
Joe Lopez	DOE-CBFO Quality Assurance Program
Cassie Marrs	RES
Rey Carrasco	Nuclear Waste Partnership (NWP)
Rob Watson	RES
Ashley Urquidez	RES
Stewart Jones	RES
Rick Salness	RES
Ty Zimmerly	NWP
Tom McGuire	NWP
Jared Sorensen	NWP
Hannah Cleek	NWP
Brent Blunt	Blunt Consulting LLC
Leslie Oberbeck	NWP
Dorothy Thomas	NWP
Jessica Timbrel	WIPP Labs
Justin Marble	DOE Office of Environmental Management (remote)
Russ Patterson	DOE support contractor (remote)
Natalie LaClair	RES (remote)
Keith Stone	NWP (remote)
Rick Chavez	RES (remote)
Shawn Otto	Los Alamos National Laboratory-Carlsbad Office (LANL-CO)
Doug Weaver	LANL-CO
Mark Bollinger	DOE-CBFO (remote)

The inspection began on Tuesday morning, May 24. Prior to entering the controlled areas of the WIPP site, the inspection team observed groundwater sampling in the field. An opening meeting

took place at the WIPP site in the late morning, in which program managers briefly summarized the changes that had taken place to their programs since the most recent inspection. That afternoon, the inspection team went underground to inspect accessible areas of the repository. This underground tour showed routes of movement for waste emplacement and the experimental areas. The tour included observing the collection of convergence measurements by members of the geotechnical monitoring program. After leaving the underground, the inspection team met with members of the geotechnical program in their offices for a discussion on the analysis of geotechnical measurements taken in the underground.

On the morning of May 25, the inspection team began by observing filter changes at the various National Emission Standards for Hazardous Air Pollutants air sampling points (see the Subpart A inspection report for more information, E-Docket EPA-HQ-OAR-2001-0012-0767). The afternoon session began with a discussion on waste handling followed by a walk-through of the waste handling building. The inspectors then met with engineering staff responsible for monitoring surface subsidence by conducting topographic surveys at the WIPP site.

On the morning of May 26, the inspection team met with the Waste Data System (WDS) team at the Skeen-Whitlock Building in Carlsbad to discuss the monitoring of waste parameters. This was followed by a meeting at the Cascades Building in Carlsbad to discuss the Delaware Basin Surveillance Program, which monitors well drilling to calculate drilling rates and the incidence of brine encounters. On the afternoon of May 26, the inspection team visited WIPP Laboratories to observe the preparation and radiochemical analysis of sampled material taken from WIPP. This was followed by a discussion of the 2021 Compliance Monitoring Parameter (COMP) Assessment analysis at the Cascades Building. The inspection closeout meeting was held during the afternoon of May 26 at the Skeen-Whitlock Building.

EPA inspectors reviewed three fundamental areas to verify continued implementation of the monitoring program during the pre-closure phase: (1) written plans and procedures, (2) quality assurance procedures and records, and (3) results of the monitoring program in the form of raw data and final reports.

4.0 Monitoring of Geomechanical Parameters

DOE committed to measuring four geomechanical parameters of the mined areas in the Salado in the CCA: creep closure, extent of deformation, initiation of brittle deformation, and displacement of deformation features. These parameters are monitored through convergence monitoring, deformation monitoring, and stratigraphic and fracture mapping, respectively.

The geomechanical inspection occurred in two parts: a demonstration of how measurements are taken during the WIPP underground tour and a discussion of the data entry and analysis. Under typical conditions, geotechnical measurements of underground convergence are completed by hand for all accessible areas of the repository every six weeks, and automated extensometer data are reviewed weekly. However, the frequency of measurement is increased if convergence accelerates.

For the measurement demonstration at the WIPP underground, Jared Sorensen and geotechnical staff collected convergence measurements at E-140, N-686 using a tape extensometer (see Figure 1). Geotechnical staff demonstrated their methodology (WP 07-EU1301, Rev. 13). An extension pole of a known length is attached to an anchor in the ceiling, and then the extensometer is connected between the extension pole and the anchor point in the floor. This method allowed technicians to measure the total distance from floor to ceiling without the need for ladders.

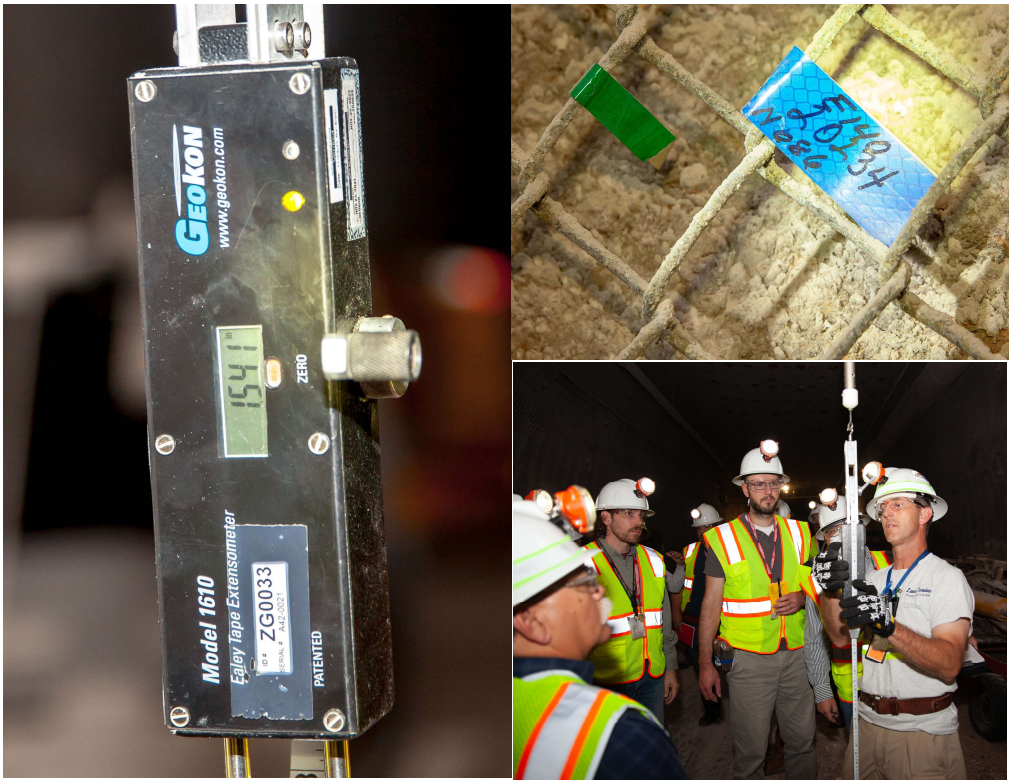


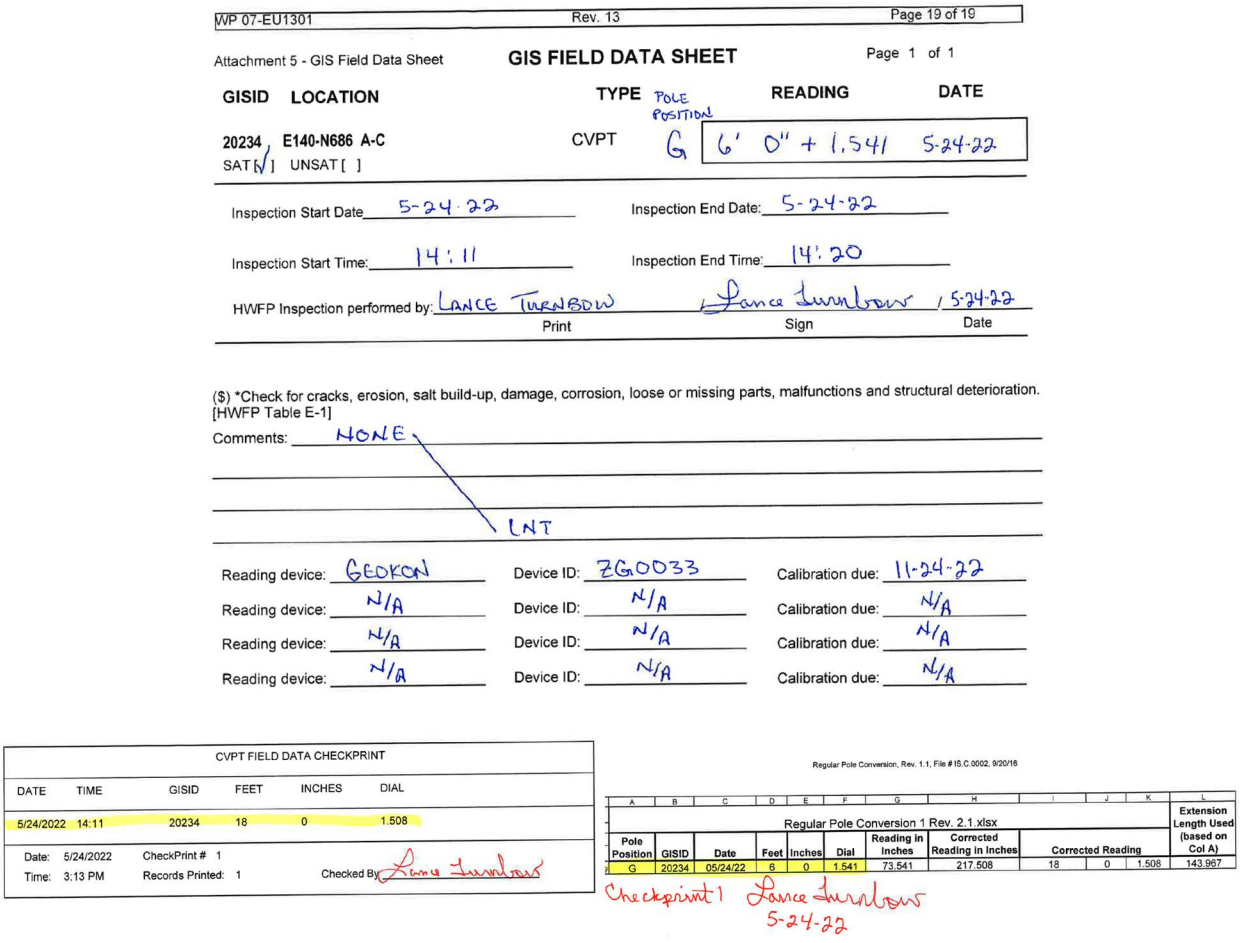
Figure 1. Clockwise from left: Extensometer at E-140, N-686; Location tag on Rib; Inspectors observing measurement in progress.

Activities took place the afternoon of May 24.
Photos provided by DOE.

Technicians discussed the level of precision of the extensometers, which can reach to ten-thousandths of an inch but are most useful at one-hundredths of an inch. Instruments are calibrated yearly by an outside vendor. Extension poles are periodically measured to ensure they are the same length, and damage to the poles would be immediately evident upon the collection of data.

The inspection team met with Jared Sorensen later in the afternoon of May 24 and discussed how the geotechnical staff entered and analyzed data from measurements (WP 07-EU1303, Rev. 11). One important application of the geotechnical measurements is for ground control, i.e., to monitor convergence and determine when bolt installation is warranted to prevent roof falls and ensure safety in the underground. Staff demonstrated how data are entered into the system, with

an emphasis on quality control checks. Inspectors observed as WIPP staff input extensometer data collected earlier in the underground and conducted the procedure for quality control checks on the same data. Inspectors observed the recorded data (see Figure 2). Further, WIPP staff provided EPA with a discussion on how data are analyzed using Junior GIS, a program developed by site contractor staff in-house. Staff provided a visualization of the data collected by looking at total convergence and displacement rates. Convergence rates of 5 to 10 inches/year (12.7 to 25.4 centimeters/year) or beyond would typically initiate action such as the installation of new bolts. Staff also shared with inspectors a Junior GIS graph of S2180-W985 (Figure 3). This location had experienced a roof fall event, and staff showed how this was anticipated through the large increase in displacement rate.



WP 07-EU1301 Rev. 13 Page 19 of 19

Attachment 5 - GIS Field Data Sheet **GIS FIELD DATA SHEET** Page 1 of 1

GISID	LOCATION	TYPE	POLE POSITION	READING	DATE
20234	E140-N686 A-C	CVPT	G	6' 0" + 1.541	5-24-22

SAT [✓] UNSAT [ ]

Inspection Start Date: 5-24-22 Inspection End Date: 5-24-22

Inspection Start Time: 14:11 Inspection End Time: 14:20

HWFP Inspection performed by: LANCE TURNBOW (Print) Lance Turnbow (Sign) 5-24-22 (Date)

($) *Check for cracks, erosion, salt build-up, damage, corrosion, loose or missing parts, malfunctions and structural deterioration. [HWFP Table E-1]

Comments: NONE LNT

Reading device:	GEOKON	Device ID:	ZG0033	Calibration due:	11-24-22
Reading device:	N/A	Device ID:	N/A	Calibration due:	N/A
Reading device:	N/A	Device ID:	N/A	Calibration due:	N/A
Reading device:	N/A	Device ID:	N/A	Calibration due:	N/A

CVPT FIELD DATA CHECKPRINT

DATE	TIME	GISID	FEET	INCHES	DIAL
5/24/2022	14:11	20234	18	0	1.508

Date: 5/24/2022 CheckPrint # 1

Time: 3:13 PM Records Printed: 1 Checked By: Lance Turnbow

Regular Pole Conversion, Rev. 1.1, File #15.C.0002, 9/20/16

Regular Pole Conversion 1 Rev. 2.1.xlsx

Pole Position	GISID	Date	Feet	Inches	Dial	Reading in Inches	Corrected Reading in Inches	Corrected Reading			Extension Length Used (based on Col A)
G	20234	05/24/22	6	0	1.541	73.541	217.508	18	0	1.508	143.967

Checkprint 1 Lance Turnbow 5-24-22

Figure 2. Data sheets observed by inspectors the afternoon of May 24 showing the input of the previous observed geotechnical measurements, along with quality control checks and DOE staff signatures.

Document reproduced and provided by DOE.

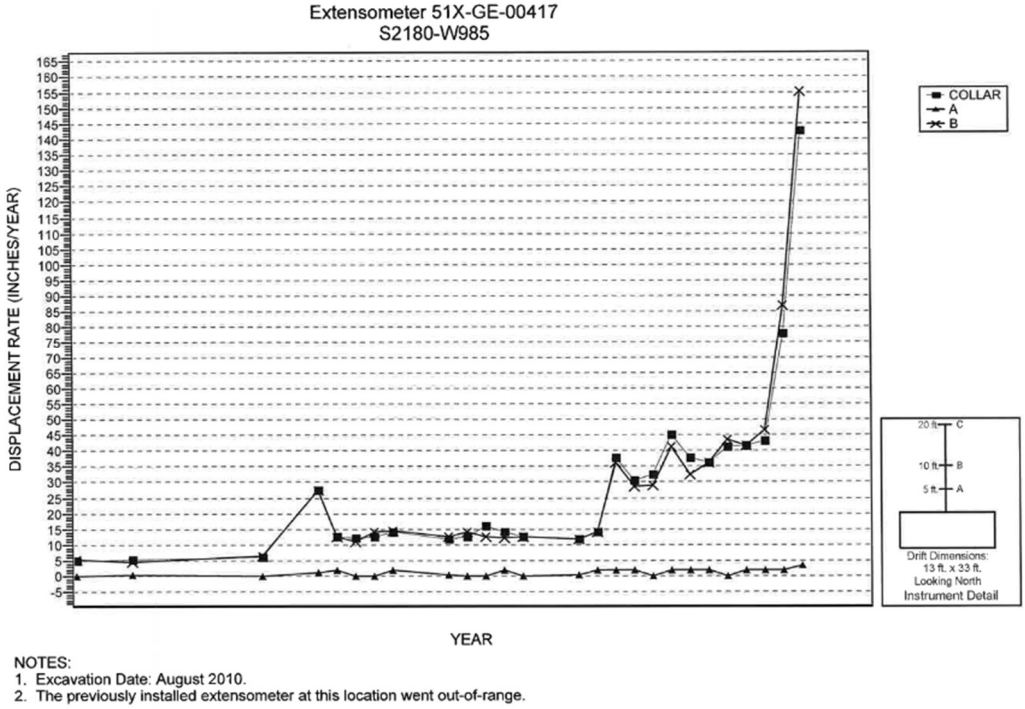


Figure 3. Displacement rate data from S-2180, W-985.
Chart observed by inspection team on the afternoon of May 24.

Reproduction provided by DOE.

5.0 Monitoring of Hydrological Parameters

DOE committed to measuring two hydrological parameters in the CCA: (1) Culebra groundwater composition and (2) changes in the Culebra groundwater flow direction. Culebra flow direction is determined by using annual measurements of Culebra freshwater heads as inputs to a calibrated potentiometric map. Programmatic functions and responsibilities are outlined in the *WIPP Groundwater Monitoring Program Plan*, WP 02-1, Rev. 17. These functions have not changed since the last inspection, though the document has been modified to include minor language changes and updated well numbers. Results of this program are published in the *WIPP Annual Site Environmental Report* (DOE-WIPP-21-3591).

On the morning of May 24, Rick Salness and staff of the WIPP groundwater surveillance program met with EPA inspectors. Staff demonstrated their methods by sampling well WQSP-5, a central, downgradient well from the WIPP. Staff demonstrated methods according to WP 02-EM1010, Rev. 4. Discussions with staff indicated that all laboratory equipment used for the monitoring is calibrated prior to each sampling day, with spot checks between samples to ensure the equipment remains calibrated.

For sampling, water is pumped from the well into a mobile laboratory. In the mobile laboratory, water samples are collected in bottles and sent to a contract laboratory for analyses of volatile organic compounds, radionuclides, cations, anions, and other geochemical parameters. Sample bottles are supplied by the analyzing laboratory and are prepared for each parameter to be analyzed, e.g., sample bottles used for cation analyses contain nitric acid as a preservative.

Prior to sample collection, indicator parameters of the well (e.g., pH, specific conductance, temperature, and specific gravity) water are measured using a probe in a flowthrough cell. This is done in order to make sure that samples are taken of formation water that has not been chemically altered by contact with the well. Specific gravity is measured by taking four samples before instrument calibration. The samples are left to sit for an hour to reduce the amount of dissolved air in the sample. Stabilization of the well's chemistry is determined when differences in pH, conductivity, temperature, and density are less than 5 percent after three successive readings.

Samples are collected after water chemistry stabilizes, or after three well bore volumes have been purged from the well. A 0.45 micron filter is attached to the flowthrough cell and samples are collected into sample bottles. Two technicians perform the sampling in order to perform Quality Control checks and to verify each other's documentation, with one person sampling and the other recording. Two untreated bulk samples are collected for general measurements such as alkalinity and anions, followed by preserved (acidified) samples for specific analytes. For each sample, the time and method (regular, preserved, etc.) are recorded. All samples need to ship at 4 degrees Celsius. Both trip blanks supplied by the laboratory and field blanks are included, the latter from a supply of deionized water from the mobile lab. EPA inspectors observed while WIPP staff calibrated their instruments for pH/conductivity/temperature and observed measurements of specific gravity from samples that had been pulled earlier that morning.



Figure 4. Inspectors observing groundwater sample collection at WQSP-5 during the morning of May 24, 2022. Photo provided by DOE.

Inspectors then observed one staff member collect samples while the other recorded data for each sample (Figure 4).

5.1 Monitoring of Waste Activity Parameters

In the CCA, DOE committed to monitoring the total radioactivity of waste emplaced in the WIPP. Waste activity is recorded for each container shipped to and stored in the facility. A database tracks total radioactivity as well as other components in waste emplaced in the WIPP (e.g., ferrous and non-ferrous metals, organic materials and magnesium oxide). Requirements for the WDS are discussed in the *WIPP Waste Data System Program and Data Management Plan*, WP 08-NT.01, Rev. 35.

On the morning of May 26, inspectors met with WDS staff, who answered questions and generated reports, including the current total activities of the ten tracked radionuclides (identified in CCA Appendix WCL). Following the meeting, inspectors were provided with a Summary of Waste Emplacement Inventory Report which provided data for emplaced waste materials, including total activities of the ten radionuclides, as of May 26, 2022. The waste activities are included in Table 4, adapted from Table WCL-1 from Appendix WCL of the CCA.

EPA inspectors did not identify any concerns or findings related to the monitoring of waste activity.

Table 4. Waste Data System Nuclide Report for all Rooms and Panels (as of May 26, 2022)

Radionuclide	Repository Contact-Handled Activity (Ci)	Repository Remote-Handled Activity (Ci)	Total Repository Activity (Ci)
AM-241 Americium 241	2.746E+05	6.222E+02	2.752E+05
CS-137 Cesium 137	2.248E+01	1.446E+04	1.449E+04
PU-238 Plutonium 238	5.187E+05	7.303E+02	5.194E+05
PU-239 Plutonium 239	3.486E+05	3.855E+02	3.490E+05
PU-240 Plutonium 240	8.617E+04	2.811E+02	8.645E+04
PU-242 Plutonium 242	2.906E+01	3.828E-01	2.944E+01
SR-90 Strontium 90	1.163E+01	7.614E+03	7.730E+03
U-233 Uranium 233	7.690E+00	3.848E-01	8.074E+00
U-234 Uranium 234	9.286E+01	1.147E+00	9.400E+01
U-238 Uranium 238	1.865E+01	3.922E-02	1.869E+01
Totals:	**1.228E+06**	**2.410E+04**	**1.252E+06**

5.2 Monitoring of Drilling-Related Parameters

DOE committed in the CCA to tracking two parameters related to commercial drilling in the Delaware Basin: the drilling rate and the probability of encountering a Castile brine reservoir. Data are collected through a program that is described in the *Delaware Basin Drilling Surveillance Plan*, WP 02-PC.02, Rev. 10 (06/21/2021). The results of the surveillance program are documented quarterly and reported annually. The most recent *Delaware Basin Monitoring Annual Report* (DOE/WIPP-21, September 2021) was provided in the inspection documentation.

On the morning of May 26, inspection staff met with CBFO staff and contractors involved in the Delaware Basin Surveillance Program at the Cascades Building in Carlsbad. Rob Watson and Natalie LaClair presented slides and maps summarizing information from the database tracking drilling activities over the past 100 years. They discussed recent trends in the data and brought up comments and questions raised by EPA during the CRA-2019 completeness review. They explained the internal and external reviews and other improvements (e.g., checklists) they have recently implemented and mentioned their transition to a semi-automated data collection process to reduce the possibility of human errors. They also talked about the process of adding new boreholes to the database and a new effort undertaken to review boreholes located in New Mexico that are already included in the database for accuracy, particularly for brine encounters not recorded in the database. The deep drilling rate calculated as of March 2022 is 129 boreholes per square kilometer over 10,000 years, a significant increase from 99 boreholes used in CRA-2019 performance assessment (PA) calculations. The increase in the drilling rate is attributed to both an actual increase in oil drilling and to delays in reviewing data sources, which means that wells drilled in previous years have only recently been included in the database. Three Castile brine encounters that were not previously included in the database were added after reviewing New Mexico Oil Conservation Division records from prior years (2005, 2009, and 2013). One issue that came out of discussions was the need to look at the borehole data to determine how well pads with multiple wells and directional drilling are being counted in the database and used to calculate the deep borehole drilling rate.

6.0 Monitoring of Subsidence Parameters

In the CCA, DOE committed to measuring subsidence of the ground surface at the WIPP site. This parameter is measured using procedures documented as part of the *WIPP Underground and Surface Surveying Program*, WP 09-ES.01, Rev. 8. No significant updates have been made in these procedures since EPA's previous inspection. DOE performs subsidence surveys at the site annually during pre-closure operations. The most recent survey results are provided in the *WIPP Subsidence Monument Leveling Survey 2018*, DOE/WIPP-18-3604. The report shows that survey loop vertical closures and accuracies meet the standards set by the National Geodetic Survey for Second Order Class II surveys and fulfills the requirement that the subsidence parameter be measured and reported on a yearly basis.

On the afternoon of May 25, the inspection team met with Ty Zimmerly and members of the Surface Subsidence Monitoring Program. Mr. Zimmerly and his team explained field procedures to the EPA inspection team and demonstrated the use of surveying equipment to collect data in the field. Xavier Valenzuela then demonstrated the processing of field data, using a survey loop

completed earlier in the year and procedure WP 09-ES4001, Rev. 6. Mr. Valenzuela downloaded and processed data that had been collected on the mock survey loop. The Level Summary Report showed a total misclosure of -.0024 feet, complying with the vertical control requirements for a Second Order, Class II survey by an order of magnitude.

7.0 Sandia Compliance Monitoring Parameter Analysis

EPA Inspectors engaged in a discussion of the most recent COMP analysis on the afternoon of May 26 with staff from Sandia National Laboratories (SNL). The purpose of this effort is to identify any deviations of monitored parameters from the results that are expected, based on the site conceptual models or PAs. SNL establishes numerical "trigger values" for each monitored parameter, to identify when monitoring results indicate the need for additional investigation. Results from each of the monitoring programs are reported to SNL, which then performs the COMP analysis. Following the inspection, the text of the COMP report was reviewed by the inspectors. For the 2021 cycle, no monitoring data submitted by the site exceeded any of SNL's established trigger values, and no additional analysis was necessary.

8.0 Conclusions

Based on program documents, interviews, and field demonstrations during the inspection, EPA concludes that the monitoring program adequately covers the ten monitoring parameters required by the Agency's 1998 certification decision. This inspection determined that monitoring sample collection and sample/data analysis procedures were complete and appropriate, staff were adequately trained and implemented the procedures effectively, and appropriate quality assurance measures are applied. EPA continues to find that DOE has maintained sufficient parameter monitoring during the past year and has the procedures and requirements in place to sustain the program into the next year.

Appendix A: EPA WIPP Monitoring Inspection Plan for 2022

Purpose:
The purpose of this inspection is to verify that the Waste Isolation Pilot Plant (WIPP) is collecting monitoring data in accordance with commitments made in the Compliance Certification Application (EPA Air Docket A-93-02, Item II-G-01), in particular Volume 1, Section 7.2, Table 7.7 and Appendix MON. The U.S. Environmental Protection Agency (EPA) is performing this inspection under the authority of Title 40 of the *Code of Federal Regulations* Section 194.21 (40 CFR 194.21), Inspections, and Section 194.42, Monitoring.

Scope:
This scope of this inspection includes the activities that DOE undertakes to monitor the performance of the disposal system. Inspection activities will include an examination of monitoring and sampling equipment and activities both on and off site, and in the underground. A review of sampling procedures and measurement techniques may be conducted. Quality assurance procedures and documentation for each of these activities will also be reviewed.

EPA will meet with staff from the WIPP Geotechnical Engineering Program, the WIPP Groundwater Monitoring Program, the WIPP Underground and Surface Surveying Program, the Delaware Basin Drilling Surveillance Program, and WDS administrators. EPA will review procedures used and data and reports produced by each group as they relate to monitored parameters at WIPP.

Focal Areas of This Year's Inspection:
EPA is interested in any changes made to the monitoring program since the most recent site inspection held in May 2019.

Location:
This inspection will be held at DOE's WIPP facility location twenty-six miles southeast of Carlsbad, New Mexico and at office locations in Carlsbad, as needed.

Duration:
EPA expects to complete the on-site portion of its inspection in three days. An opening meeting will be held on the first morning of the inspection, and a closing meeting held after the conclusion of site inspection activities.

Expected Dates:
May 24–26, 2022.

Documents for Review:
DOE has electronically provided EPA inspection staff with the latest versions of procedures and reports related to parameter monitoring. The inspection team will identify and request additional records during the inspection.

Appendix B: 2022 Monitoring Inspection Checklist

Table B-1. 2022 Monitoring Inspection Checklist

Question No.	Question Category	Question	Comments and Objective Evidence	Results
1	Geomechanical	Does the U.S. Department of Energy (DOE) demonstrate that it has implemented plans, programs, and/or procedures to measure the following aspects during the pre-closure phase of operations as specified in the Compliance Certification Application (CCA, Volume 1, Table 7-7; Appendix MON, Table MON-1 40 CFR 194.42 (c) and (e))? (a) Creep Closure, (b) Extent of Deformation, (c) Initiation of Brittle Deformation, and (d) Displacement of Deformation Features	*WIPP Geotechnical Engineering Program Plan*, WP 07-01, Rev. 8, effective April 12, 2017, documents plans to measure and report and adhere to the quality assurance requirements related to these activities. Section 3.0 of WP 07-01 documents the geomechanical monitoring program and records the activities associated with this program. Section 4.0 of WP 07-01 documents the quality assurance requirements for these activities. Geotechnical staff demonstrated the adequacy of the program. Inspectors reviewed their methods and data and verified that the geomechanical parameters continued to be appropriately monitored by the DOE. Results of this program are documented annually in the *Geotechnical Analysis Report* for each reporting period (DOE/WIPP-21-3610).	Satisfactory
2	Geomechanical	Does DOE demonstrate that it has implemented an effective quality assurance program for item 1 above? 40 CFR 194.22	Yes. Details of the program are found in the Nuclear Waste Partnership, LLC *Quality Assurance Program Description*, WP 13-1, Rev. 40, effective May 25, 2021.	Satisfactory

Question No.	Question Category	Question	Comments and Objective Evidence	Results
3	Geomechanical	Does DOE demonstrate that the results of the geotechnical investigations are reported annually? (CCA, App. MON, Page MON-10)	WP 07-01, Rev. 8, Section 3.2 requires that analysis be performed annually, and results be published in the annual *Geotechnical Analysis Report*. The report for calendar year 2020 was provided and reviewed by inspectors (DOE/WIPP-21-3610).	Satisfactory
4	Hydrologic	Does DOE demonstrate it has implemented plans, programs, and/or procedures to measure— (a) Culebra Groundwater Composition; (CCA, Volume 1, Table 7-7; App MON, Table MON-1) 40 CFR 194.42 (c) and (e) (b) Change in Culebra Groundwater Flow Direction during the pre-closure phase of operations as specified in the CCA? (CCA, Volume 1, Table 7-7; App MON, Table MON-1) 40 CFR 194.42 (c) and (e)	Yes. See *WIPP Groundwater Monitoring Program Plan*, WP 02-1, Rev. 17, effective July 19, 2021. Yes. See *WIPP Groundwater Monitoring Program Plan*, WP 02-1, Rev. 17; *Waste Isolation Pilot Plant Annual Site Environmental Report for 2020*, DOE/WIPP-21-3591; and the *Annual Culebra Groundwater Report,* RES 21-814, November 2021.	Satisfactory
5	Hydrologic	Does DOE demonstrate that it has implemented an effective quality assurance program for Item 1 above? (CCA, App MON, Page MON-17) 40 CFR 194.22	Yes. See *WIPP Groundwater Monitoring Program Plan,* WP 02-1, Rev. 17, effective July 19, 2021, Sections 5 and 9.	Satisfactory
6	Hydrologic	Does DOE demonstrate that the results of the groundwater monitoring program are reported annually? (CCA, App. MON, Page MON-18)	Yes. See *Waste Isolation Pilot Plant Annual Site Environmental Report for 2020*, DOE/WIPP-21-3591.	Satisfactory
7	Waste Activity	Does the DOE demonstrate that it has implemented plans, programs, and/or procedures to measure waste activity? (CCA, Volume 1, Table 7-7; App MON, Table MON-1) 40 CFR 194.42 (c) and (e)	*WIPP Waste Data System Program and Data Management Plan*, WP 08-NT.01, Rev. 35, effective February 1, 2019, describes the programmatic plan used to monitor and store waste activity information.	Satisfactory

Question No.	Question Category	Question	Comments and Objective Evidence	Results
8	Waste Activity	Does the DOE demonstrate it has an effective quality assurance program for Item 1? (CCA, App WAP, page C-30) 40 CFR 194.22	Yes. See Nuclear Waste Partnership, LLC *Quality Assurance Program Description*, WP 13-1, Rev. 40, effective May 25, 2021, and *Waste Data System Software Quality Assurance Plan*, WP 08-NT.04, Rev. 28, effective July 17, 2019.	Satisfactory
9	Waste Activity	Does the DOE demonstrate that the results of the waste activity parameters are reported annually? (CCA Volume 1, Section 7.2.4 Reporting)	Results have not changed since the last inspection. The most recent version of this is found in the *Annual Transuranic Waste Inventory Report and Annual Change Report – 2021*, DOE/TRU-21-3425, Rev. 0.	Satisfactory
10	Drilling-Related	Does the DOE demonstrate that it has implemented plans, programs, and/or procedures to measure— (a) Drilling Rate; and (b) Probability of Encountering a Castile Brine Reservoir? (CCA, Volume 1, Table 7-7; App MON, Table MON-1) 40 CFR 194.42 (c) and (e)	The *Delaware Basin Drilling Surveillance Plan,* WP 02-PC.02, Rev. 10, effective June 14, 2021. documents the program to measure, record and report, as well as the quality assurance requirements for these activities. The *Delaware Basin Drilling Database Upgrade Process* WP 02-EC3002, Rev. 11, effective June 14, 2021, documents the process used to update databases with information from various commercial and state sources.	Satisfactory
11	Drilling-Related	Does the DOE demonstrate that it has implemented an effective quality assurance program for Item 1 above? (CCA, App DMP, page DMP-9) 40 CFR 194.22	Quality assurance requirements are documented in Section 7.0 of WP 02-PC.02, Rev. 11.	Satisfactory
12	Drilling-Related	Does the DOE demonstrate that the results of the drilling-related parameters are reported annually? (CCA Volume 1, Section 7.2.4 Reporting; App DMP, page DMP-9)	Yes. Parameter updates are reported in the *Delaware Basin Monitoring Annual Report,* DOE/WIPP-21-2308, September 2021.	Satisfactory

Question No.	Question Category	Question	Comments and Objective Evidence	Results
13	Subsidence	Does the DOE demonstrate that it has implemented plans/programs/ procedures to measure subsidence? (CCA, Volume 1, Table 7-7; App MON, Table MON-1) 40 CFR 194.42 (c) and (e)	Yes. See *WIPP Underground and Surface Surveying Program,* WP 09-ES.01, Rev. 8, effective February 11, 2019.	Satisfactory
14	Subsidence	Does the DOE demonstrate that it has implemented an effective quality assurance program for Item 1 above? (CCA, App DMP, page DMP-9) 40 CFR 194.22	Yes. See *WIPP Underground and Surface Surveying Program,* WP 09-ES.01, Rev. 8, Section 4.	Satisfactory
15	Subsidence	Does the DOE demonstrate that the results of the subsidence measurements are reported annually? (CCA Volume 1, Section 7.2.4, Reporting)	The results of this program are reported annually in the *WIPP Subsidence Monument Leveling Survey*, DOE/WIPP-18-3604.	Satisfactory

Appendix C: Documents Reviewed

Table C-1. Documents Reviewed: Geomechanical Parameters

Document	ID	Source
Geotechnical Analysis Report for July 2019 – June 2020, Volumes 1–2, October 2021	DOE/WIPP-21-3610	DOE/WIPP
WIPP Geotechnical Engineering Program Plan	WP 07-1, Rev. 8	DOE/WIPP
Nuclear Waste Partnership, LLC Quality Assurance Program Description	WP 13-1, Rev. 40	DOE/WIPP

Table C-2. Documents Reviewed: Hydrological Parameters

Document	ID	Source
WIPP Annual Site Environmental Report for 2020	DOE-WIPP-21-3591	DOE/WIPP
WIPP Groundwater Monitoring Program Plan	WP 02-1, Rev. 17	DOE/WIPP
Waste Isolation Pilot Plant Environmental Monitoring Plan	DOE/WIPP-99-2194, Rev. 12	DOE/WIPP
Data Review for the Annual Culebra Groundwater Report	WP 02-EM1025, Rev. 6	DOE/WIPP
Shallow Subsurface Water Potentiometric Surface Map Construction	WP 02-EM1027, Rev. 6	DOE/WIPP
Annual Culebra Groundwater Report	RES 2-814	DOE/WIPP
Semi-Annual Groundwater Surface Elevation Report Water Level Monitoring Program Data Collection – September 2021 – February 2022	RES 22-805	DOE/WIPP
Sandia National Laboratories Compliance Monitoring Parameter Assessment For 2021	WBS 4.3.1	SNL

Table C-3. Documents Reviewed: Drilling-Related Parameters

Document	ID	Source
Delaware Basin Drilling Surveillance Plan	WP 02-PC.02, Rev. 11	DOE/WIPP
Delaware Basin Drilling Database Upgrade Process	WP 02-EC3002, Rev. 11	DOE/WIPP
Delaware Basin Monitoring Annual Report 2021	DOE-WIPP-21-2308	DOE/WIPP

Table C-4. Documents Reviewed: Subsidence Parameters

Document	ID	Source
WIPP Underground and Surface Surveying Program	WP 09-ES.01, Rev. 8	DOE/WIPP
WIPP Panel Closure Survey Plan	WP 09-ES.02, Rev. 4	DOE/WIPP
WIPP Subsidence Monument Leveling Survey 2018	DOE/WIPP-18-3604	DOE/WIPP

Table C-5. Documents Reviewed: Waste Activities

Document	ID	Source
WIPP Waste Data System Program and Data Management Plan	WP 08-NT.01, Rev. 35	DOE/WIPP
Waste Stream Profile Form Review and Approval Program	WP 08-NT.03, Rev. 19	DOE/WIPP
Waste Data System User's Manual	DOE/WIPP-09-3427, Rev. 19	DOE/WIPP
Waste Data System Software Quality Assurance Plan	WP 08-NT.04, Rev. 28	DOE/WIPP
Nuclear Waste Partnership, LLC Quality Assurance Program Description	WP 13-1, Rev. 40	DOE/WIPP
Annual Transuranic Waste Inventory Report – 2021	DOE/TRU-21-3425, Rev. 0	DOE/WIPP
Annual Change Report 2020/2021	None	DOE/WIPP

E-DOCKET: EPA-HQ-OAR-2001-0012-0767

2022 – Emplacement Inspection Report

INSPECTION OF THE
WASTE ISOLATION PILOT PLANT
May 24–26, 2022

U. S. ENVIRONMENTAL PROTECTION AGENCY
Office of Radiation and Indoor Air
Center for Waste Management and Regulations
1200 Pennsylvania Avenue, NW
Washington, D.C. 20460

November 2022

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List of Abbreviations

ACR	Annual Change Report
ALS	ALS Environmental-Fort Collins
ANL-E	Argonne National Lab – East
BRT	"Big Red Thing" magnesium oxide supersack stand
CBFO	Department of Energy Carlsbad Field Office
CCA	Compliance Certification Application
CFR	*Code of Federal Regulations*
CH	contact-handled
CPR	cellulosic, plastic, and rubber material
DOE	U.S. Department of Energy
DOECAP	U.S. Department of Energy Consolidated Audit Program
EPA	U.S. Environmental Protection Agency
HQ	headquarters
INL	Idaho National Laboratory
kg	kilogram
LANL	Los Alamos National Laboratory
LWA	Land Withdrawal Act
MgO	magnesium oxide
NWP	Nuclear Waste Partnership
ORIA	Office of Radiation and Indoor Air
Pu	plutonium
RES	Regulatory and Environmental Services
RH	remote-handled
RPD	U.S. Environmental Protection Agency's Office of Radiation and Indoor Air Radiation Protection Division
SCA	Shielded Container Assembly
SLB2	standard large box
SNL	Sandia National Laboratories
SWB	standard waste box
TDOP	ten-drum overpack
TMW	transuranic mixed waste
TRU	transuranic

WDS	Waste Data System
WHB	Waste Handling Building
WIPP	Waste Isolation Pilot Plant
WWIS	WIPP Waste Information System

1.0 Executive Summary

The U.S. Environmental Protection Agency (EPA or the Agency) conducted an inspection of the U.S. Department of Energy's (DOE or the Department) Waste Isolation Pilot Plant (WIPP) near Carlsbad, New Mexico, from May 24 to May 26, 2022, in accordance with Title 40 of the *Code of Federal Regulations* Section 194.21 (40 CFR 194.21). The WIPP is a disposal facility for defense-related transuranic (TRU) waste as defined by the WIPP Land Withdrawal Act. EPA first certified that the WIPP complies with the Agency's radioactive waste disposal regulations (Subparts B and C of 40 CFR part 191) on May 18, 1998. Attachment A includes the waste emplacement inspection plan. This inspection was performed in parallel with the monitoring and Subpart A inspections, which are documented in separate reports.

The WIPP has continued to emplace waste since the last inspection in May 2019. The inspection began with an opening meeting which included presentations on waste emplacement and underground experiments. During this inspection, the facility was emplacing waste in Room 1 of Panel 7 using emplacement procedures that assure worker safety in a potentially contaminated environment. Due to the extensive training required to enter potentially contaminated areas in Panel 7, the inspection team did not visit the current area of waste emplacement and was unable to directly observe waste emplacement procedures in the underground. Instead, a review of photographs of emplaced waste provided by the site and available records provided objective evidence that waste emplacement is taking place according to procedure. EPA additionally reviewed experiments in the WIPP underground and found that there are multiple test activities currently taking place.

EPA concluded that DOE's waste emplacement activities are adequate based on interviews with the contractors and documentation provided by the DOE Carlsbad Field Office (CBFO). EPA confirmed that cellulosic, plastic, and rubber material (CPR) is appropriately tracked and recorded, and magnesium oxide (MgO) balances are calculated properly and the required excess factor is maintained in each room of the repository. EPA noted a discrepancy between the calculated MgO excess factor in the Waste Data System (WDS) and the Summary of Waste Emplacement Inventory Reports generated in WDS. EPA shared this concern with DOE and requested a response. DOE provided a complete explanation of the problem and committed to correct the error via an October 31, 2022 letter from Michael Gerle to Tom Peake. A full description of this issue in included in Section 5.0 of this report, Magenesium Oxide Backfill.

This inspection is the first since an updated DOE-CBFO policy went into effect which introduces a different accounting method for the volume of TRU waste disposed of at WIPP. This method, referred to as the "volume of record", excludes the volume of empty containers emplaced within payloads (dunnage) and volume added by overpacking waste containers within larger containers. The older method, which includes this empty space, is referred to as the "TRU mixed waste volume". The updated method (the "volume of record") is officially referred to as the "Land Withdrawal Act (LWA) TRU waste volume". Both values are calculated within the WDS and are available to be displayed and compared in various WDS reports.

One additional item relating to waste emplacement discussed during the inspection was a leaking waste package received from Idaho National Lab (INL) in April 2022. Shipment TP-148 was found with liquid containing radionuclides at the bottom of the TRUPACT container. Emergency

procedures were activated to prevent further contamination, and the container was sealed and returned to INL for repackaging. EPA reviewed analytical data and other information related to the incident.

2.0 Scope

The purpose of this annual inspection is to verify that contact-handled (CH) and remote-handled (RH) TRU waste sent to WIPP since May 2019 has been emplaced in the underground facility in the manner specified in the DOE's Compliance Certification Application (CCA) (EPA Air Docket A-93-02, Item II-G-01) and other approvals. EPA performed this inspection under the authority of 40 CFR 194.21, which authorizes the Agency to inspect WIPP during its operational period to verify continued compliance with EPA's WIPP Compliance Criteria and the certification decision of May 18, 1998. Emplacement of waste and MgO backfill are relevant to compliance because the emplaced amounts support the chemistry model that DOE uses for the WIPP performance assessment.

Activities within the scope of this inspection included reviewing the WIPP site's ability to receive, process, and emplace CH and RH TRU wastes within the repository. It also involved confirming that the WIPP can emplace the MgO backfill to fulfill certification requirements and other approvals. Finally, EPA verified that the WIPP can maintain relevant waste handling records, including the electronic WDS. The review and examination of documents and procedures related to these activities is an important part of the inspection process. At the time of this inspection, the WIPP site has been operated by the Nuclear Waste Partnership (NWP) under contract to DOE, and waste handling and tracking activities are described by or controlled through NWP procedures.

3.0 Inspection Team, Observers and Participants

The inspection team consisted of six EPA staff physically present for the inspection, as well as two EPA staff who joined parts of the inspection remotely through phone and video conferencing. The EPA inspection team is listed in Table 1. A photo of the underground inspection participants is in Figure 1. Numerous DOE staff and contractors participated in the inspection; Table 2 includes a partial list of participants taken from a sign-in sheet generated during the opening meeting.

Table 1. Inspection Team

Inspection Team Member	Position	Affiliation
Tom Peake	Director, Radiation Protection Division (RPD) Center for Waste Management and Regulations	EPA Office of Radiation and Indoor Air (ORIA)
Jonathan Walsh	Lead Inspector	EPA ORIA
Joe Rustick	Inspector	EPA ORIA
Xinyue Tong	Inspector	EPA ORIA

Inspection Team Member	Position	Affiliation
Erik Christiansen	Inspector	EPA Region 6
Jerry Ellis	Observer, RPD Quality Assurance Manager	EPA ORIA
Jon Major	Inspector (remote)	EPA ORIA
Jay Santillan	Inspector (remote)	EPA ORIA

Table 2. Inspection Participants

Participant	Affiliation
Anderson Ward	DOE-CBFO
Judy McLemore	Regulatory and Environmental Services (RES)
Ricardo Hernandez	RES
Darren Jolley	DOE-CBFO Quality Assurance Program (QA)
Amber Gellis	New Mexico Environment Department
Joe Lopez	DOE-CBFO QA
Cassie Marrs	RES
Rey Carrasco	NWP
Rob Watson	RES
Ashley Urquidez	RES
Stewart Jones	RES
Rick Salness	RES
Ty Zimmerly	NWP
Tom McGuire	NWP
Jared Sorensen	NWP
Hannah Cleek	NWP
Brent Blunt	Blunt Consulting LLC
Leslie Oberbeck	NWP
Dorothy Thomas	NWP
Justin Marble	DOE Office of Environmental Management (remote)
Russ Patterson	DOE support contractor (remote)
Natalie LaClair	RES (remote)

Participant	Affiliation
Keith Stone	NWP (remote)
Rick Chavez	RES (remote)
Shawn Otto	Los Alamos National Laboratory – Carlsbad Office (LANL-CO)
Doug Weaver	LANL-CO
Mark Bollinger	DOE-CBFO (remote)



Figure 1. Photo of the WIPP inspection participants in the underground on May 24, 2022.
Photo provided by DOE.

The inspection took place from May 24 through 26, 2022, at CBFO's facilities in Carlsbad, New Mexico, and the WIPP site, which is located approximately 26 miles southeast of the city. The opening meeting with CBFO, RES, and NWP personnel was held on the morning of May 24, 2022. The primary focus of the emplacement inspection was to document the nature and extent of changes in emplacement activities and documentation since the last inspection in May 2019.

On the afternoon of May 24, EPA inspectors and observers visited the underground repository. EPA inspectors viewed the areas of the repository that are accessible without extensive training, including the boundary where waste is transferred from uncontaminated equipment to a contaminated forklift for transport within contaminated areas, bulkheads restricting personnel access to the southern waste panels, and the northern experimental area. The EPA inspection team did not enter any areas where access is restricted because of either potential radiological contamination or lack of ground control to prevent rock falls. On May 25, the EPA inspectors viewed the Waste Handling Building (WHB) and associated areas, including the storage of MgO backfill.

Inspectors reviewed records documenting that waste emplacement and MgO tracking were conducted in accordance with procedures. NWP personnel answered questions from the inspection team about how waste is handled and emplaced. Inspectors selected one container (Table 3), and both paper and electronic records for this container were examined for complete waste tracking and emplacement information. The inspection team presented preliminary observations at a close-out meeting on the afternoon of May 26, 2022.

Table 3. Waste Container Information Reviewed During Inspection

Container Number	Emplacement Location	Container Type
LASB02360	Panel 7, Room 1, Row 32, Column 4	Standard Waste Box (SWB)

4.0 Waste Emplacement/Waste Data System

Wastes received at the repository since the most recent inspection include CH and RH TRU wastes generated[1] from Argonne National Laboratory – East (ANL-E), Advanced Mixed Waste Treatment Project at INL, Los Alamos National Laboratory (LANL), Lawrence Livermore National Laboratory, Mound Plant, Rocky Flats Environmental Technology Site, Sandia National Laboratories (SNL), Savannah River Site, and Oak Ridge National Laboratory. Waste shipments were halted following the 2014 radiological and fire incidents and resumed in 2017; however, the COVID-19 pandemic again slowed shipment and emplacement activities starting in FY20 and continued to slow activities at the time of the inspection (see Figure 2). Wastes are received and emplaced in several configurations: standard waste boxes (SWBs), 55-gallon drums assembled in groups of seven called a "seven-pack", 100-gallon drums for super-compacted waste, ten-drum overpacks (TDOPs), and standard large boxes (SLB2s). Since 2014, RH wastes from ANL-E and SNL have been placed in Shielded Container Assemblies (SCAs) and emplaced on the repository floor as though they were CH waste, though the waste is tracked as RH.

[1] The generator sites listed here are from WDS searches with time window from May 16th, 2019, to May 26th, 2022.

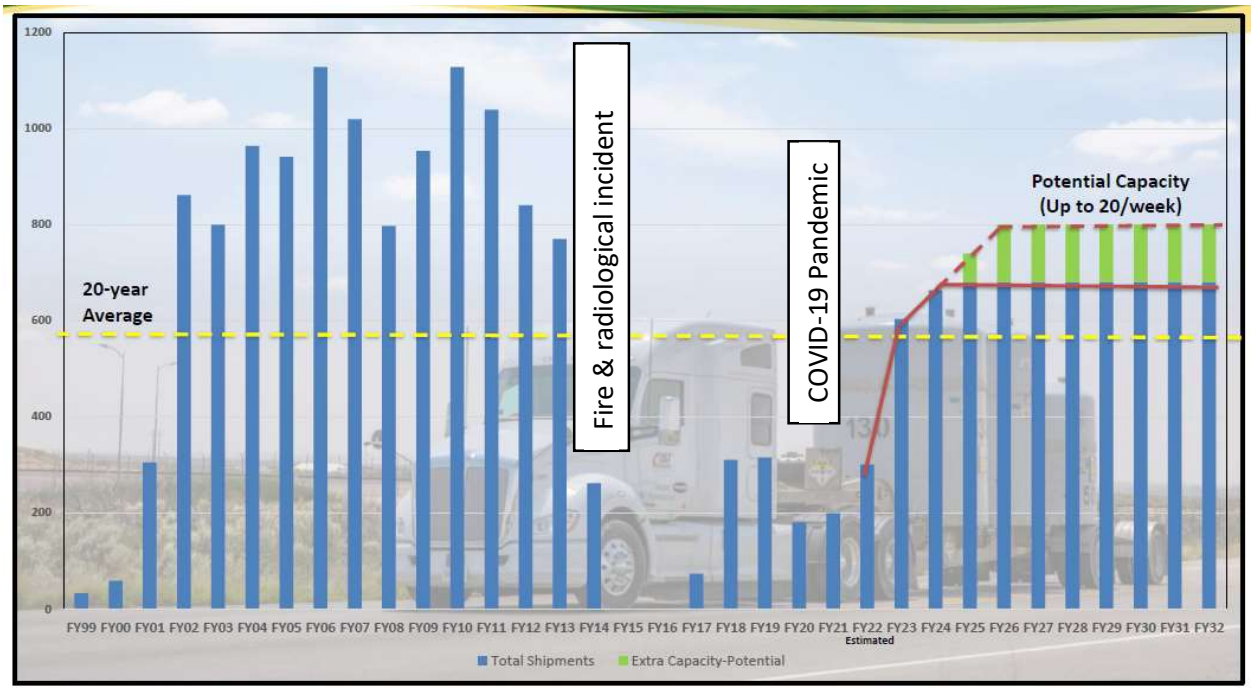


Figure 2. Waste shipments over time at WIPP from the opening in 1999 to the present and projected into future years.

Modified from DOE slides shared at the WIPP Community Forum in Santa Fe, July 7, 2022.

CH waste containers include SWBs, drum packs, TDOPs, and SLB2s (as seen in Figure 3). They are stacked in columns (waste stacks) of up to three waste assemblies. TDOPs and SLB2s are only emplaced in the bottom position, with another assembly stacked on top. SWBs and drums may be emplaced in any order. SCAs consist of an assembly of three shielded containers, and two assemblies may be stacked on top of one another, with a total configuration of six containers. SCAs may not be stacked together with CH waste packages. Waste columns are configured in a series of staggered rows. Each row of three columns within a disposal room is given a discrete number (Figure 4).

The repository is subdivided into panels, with each panel consisting of seven rooms (see Figure 5). At the time of inspection, waste emplacement was being conducted in Room 1 of Panel 7. Room 2 last received waste on January 18, 2022, based on the WDS Emplacement History Overview Report for Panel 7.

EPA inspectors visited the WHB on the afternoon of May 25. Because the facility was undergoing a planned maintenance outage, no waste containers were being unloaded for downloading and emplacement during the visit. Based on photographs provided by the site (e.g., Figure 3), the inspection team collected and examined the records created during waste emplacement (Figure 4). A photograph of the selected container is in Figure 6. On the morning of May 26 at CBFO, inspectors met with administrators of the WDS and requested container reports for the selected waste. All electronic records were found to contain the required information including waste stream, container contents, and status.

During the visit to the WHB, inspectors and waste handling personnel discussed a recent incident involving a leaking package that arrived within a waste shipment from INL. On April 9, 2022, WIPP staff opened shipment TP-148 in the WHB. Visual surveys noted a small amount of free-standing liquid at the bottom of the container, which was then sampled and determined to contain low levels of radionuclides. The site enacted its emergency procedures, including pausing all operations, evacuating the CH bay, and activating the WIPP Emergency Operations Center. Radiological Control Technicians collected sample swabs to determine that the contamination had not spread beyond the shipping container. The waste shipment was put back into the TRUPACT-II container and the container was re-sealed and returned to INL for further examination and repackaging. DOE stated there was no risk of radiological releases nor risk to the public or the environment. Inspectors requested more information on the incident, and DOE provided copies of analytical and other reports. These documents show that plutonium (Pu)-239 was the primary radionuclide detected. Standard waste handling and emergency procedures prevented further contamination from taking place. EPA expects that a more thorough summary or report will be provided to the Agency once DOE has completed further investigations into the root causes at the generator site.



Figure 3. Photo of the active waste face during the week of the inspection, dated May 24, 2022.
DOE photo.



Figure 4. Underground emplacement map with selected waste dated May 18, 2022.
DOE-provided scan of paper copy.

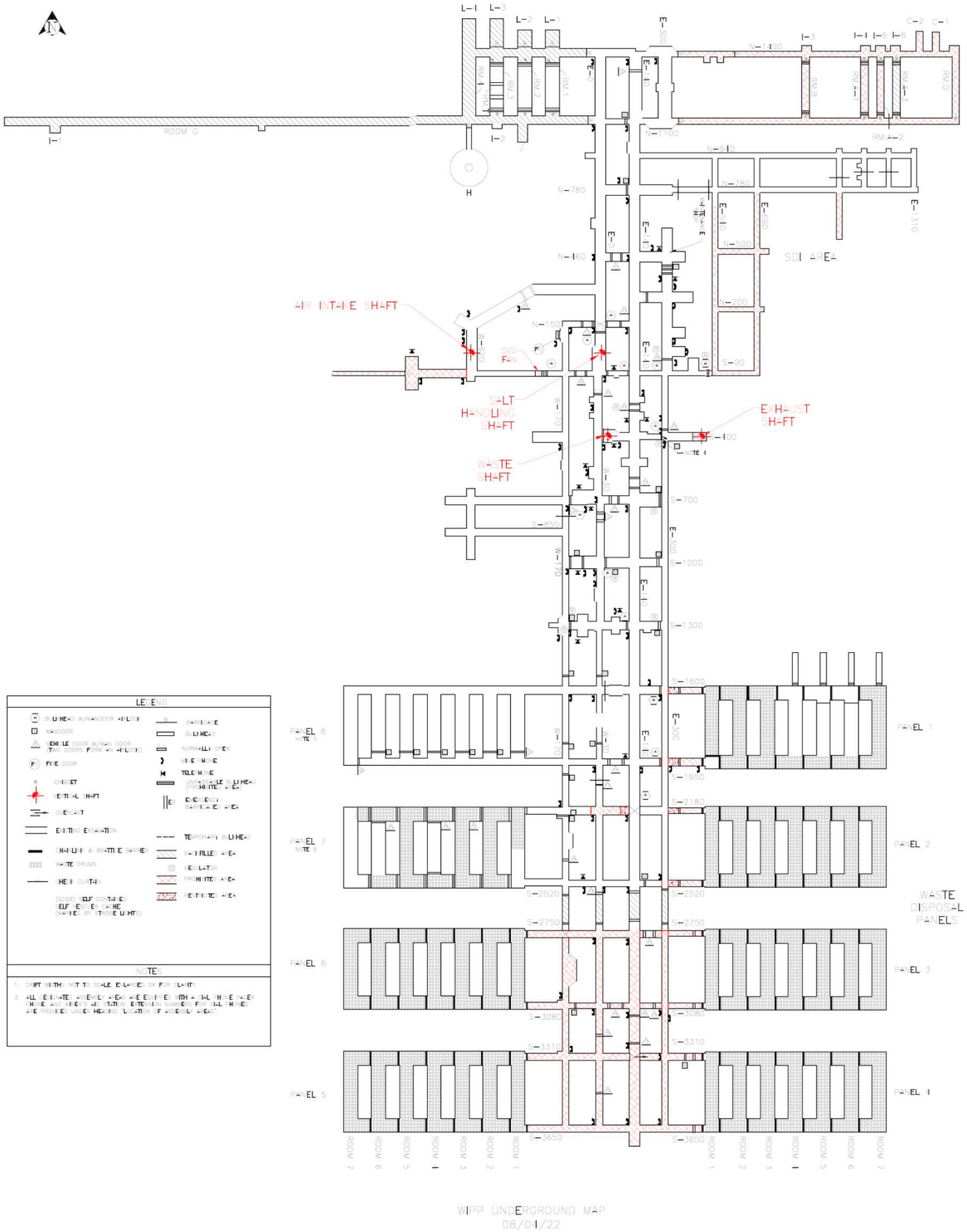
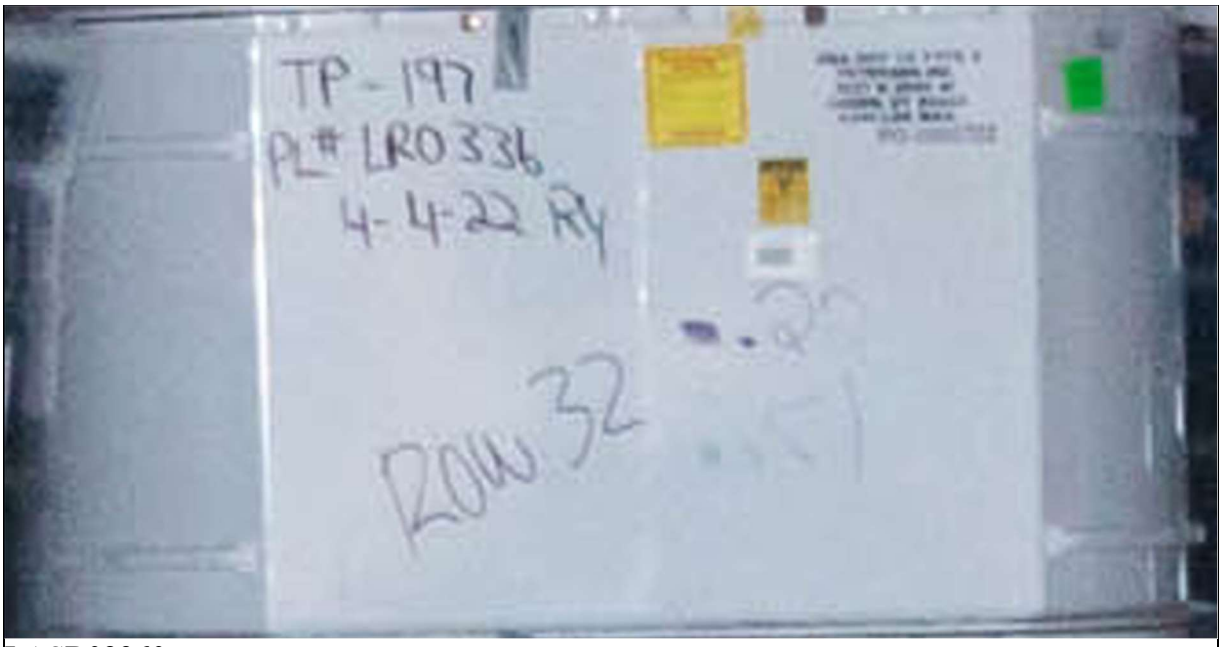


Figure 5. Underground map showing emplaced waste canisters (as of August 4, 2022) as gray areas.
Note that waste panel 7 is nearly filled.
DOE-provided figure.



LASB02360

Figure 6. Selected waste container LASB02360 (see Table 3 for emplacement locations). Photo provided by DOE.

5.0 Magnesium Oxide Backfill

Magnesium oxide is the engineered barrier used in the repository as backfill, specified in the DOE's CCA. EPA requires DOE to maintain a MgO excess factor (safety factor) to ensure that adequate MgO is chemically available to control the chemistry of each room after closure. The Agency approved an excess factor of 1.2 (that is, emplacement of sufficient MgO to react with 1.2 times the amount of carbon present in the repository) in February 2008. Conditions of EPA's agreement stipulate that DOE must ensure a minimum reactivity of 96 percent for the MgO emplaced and maintain the excess factor on a room-by-room basis.

Table 4 shows the MgO excess factor for Panel 7 as documented in the WDS Emplacement History Overview Report for Panel 7, dated May 26, 2022. The Summary of Waste Emplacement Inventory Report for all panels and rooms (dated May 26, 2022) also contains the MgO excess factor information. Both documents are found in Attachment D. EPA inspectors found inconsistent values of the MgO excess factor between those two reports and raised the discrepancy with WDS administrators (see Appendix E for the full correspondence). The email response from NWP Waste Information Tracking Systems Team Lead, Michael Walentine, states that "It appears that the Summary of Waste Emplacement Inventory Report has an error in reporting the MgO excess factor that causes it to report the excess factor for the room corresponding to the panel number for all rooms in a given panel. We are invoking our problem reporting process to address that. The values given on the Emplacement History Overview are correct". EPA requested a formal response from CBFO, and in an letter from Michael Gerle to Tom Peake dated October 31, 2022, CBFO committed to resolve the error. The full correspondence on this topic is included in Appendix E of this report. For purposes of the inspection, EPA concludes that MgO emplacement is being correctly tracked, and that DOE is

ultimately able to demonstrate that safety factor is met in each room of the repository. The error in the Summary of Waste Emplacement Inventory Report adds confusion to a topic that is important for compliance. EPA inspectors will examine the resolution of this issue no later than the next inspection.

Inspectors observed the MgO supersack storage area (Figure 7) on the morning of May 25, 2022. During the inspection, NWP staff told EPA inspectors that on May 19, 2022, DOE was notified that ALS Environmental-Fort Collins (ALS), the lab that performs analyses of MgO used in supersacks, was suspended from its Department of Energy Consolidated Audit Program (DOECAP) accreditation as of May 18, 2022. As a result, DOE suspended its procurements to ALS, and MgO supersacks tested by ALS were suspended for emplacement as shown by the note on the supersack pictured in Figure 7. A notice entitled *Lift of Suspension Notification ALS-Fort Collins* was provided to EPA in June, informing that the suspension was lifted on June 1, 2022 (see Attachment D). ALS submitted a corrective action plan to the accreditation body to address the non-conformities detected during its May 2022 reassessment.

Table 4. MgO-Related Information from Waste Data System

Panel	Room	MgO (kg)	Waste (kg)	CPR (kg)	Adjusted CPR (kg)*	Excess Factor
7	1	127,082	195,387	51,924	66,448	1.28
7	2	555,112	849,866	218,639	295,297	1.26
7	3	321,088	930,341	110,875	165,515	1.3
7	4	161,905	445,712	32,436	51,632	2.1
7	5	315,646	934,715	76,186	117,359	1.8
7	6	99,320	111,871	28,853	36,391	1.83
7	7	57,692	127,168	15,900	21,926	1.76

*Adjusted CPR - plastic component multiplied by a factor of 1.7.

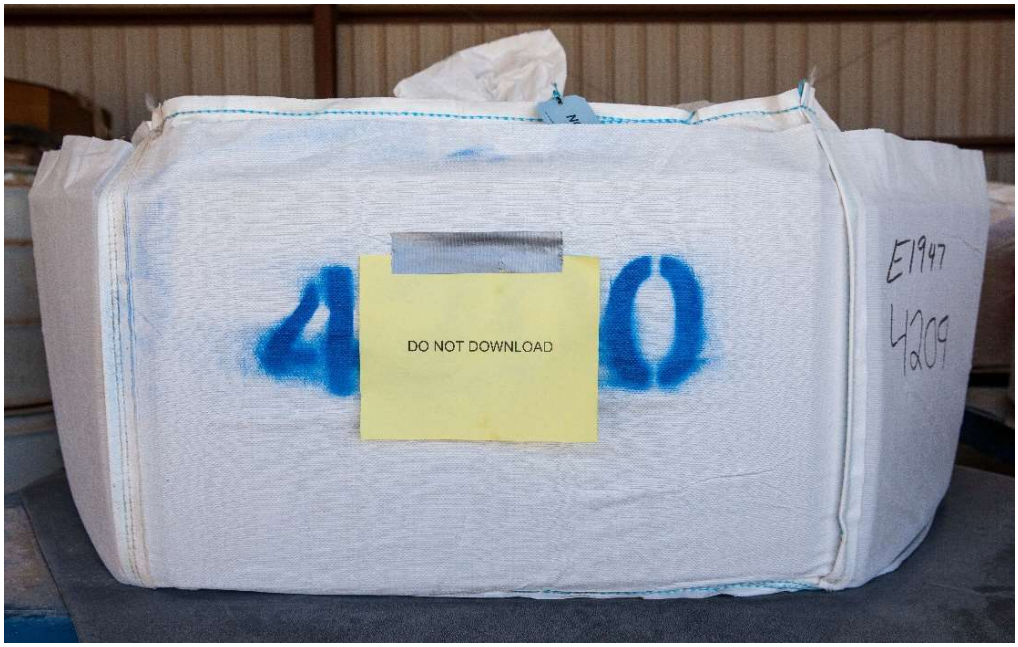


Figure 7. MgO supersack in the storage shed area
The note on the package refers to the temporary suspension of emplacement of MgO supersacks analyzed by ALS Environmental-Fort Collins as described in the text. DOE-provided photo.

6.0 Comparison with Inventory Limits

EPA establishes limits for certain waste components at WIPP by approving performance assessment inventory estimates (Table 5). The minimum limit for ferrous metals is 20 million kilograms (kg). This limit was reached in 2010. The amount of ferrous metal currently emplaced as of May 26, 2022, is 30,548,244 kg, which is 153 percent of the minimum. The other established performance limit is a maximum for CPR materials. In the original CCA, DOE calculated 2.2×10^7 kg of CPR, establishing the EPA's limit. The CPR values are tracked per container, and the total CPR (as of May 26, 2022) is 9,431,899 kg, or 42.9 percent of the limiting value. The Non-Ferrous material and other material (inorganic material and metal alloy) values are also tracked. As of May 26, 2022, there are 467,091 kg of Non-Ferrous material and 15,696,416 kg of other material emplaced in the repository.

The Summary of Waste Emplacement Inventory Report for all panels and rooms (Attachment D, as of May 26, 2022) provided data for emplaced waste, including total activities of the ten EPA-tracked radionuclides (Attachment B),[2] total weights of ferrous and non-ferrous metals, and the CPR/MgO balance by room.

The WIPP Land Withdrawal Act of 1992 limits the total waste volume to no more than 6.2 million cubic feet (175,564 cubic meters) and the total activity of the RH waste to 5.1 million curies. This is the first inspection since DOE began reporting waste volumes using the LWA TRU waste volume accounting method instead of the TRU mixed waste (TMW) volume used previously. This is in accordance with the January 16, 2019 CBFO *Policy on Implementation of a Tracking Methodology to Ensure Compliance with the Total Capacity Limit for Transuranic Waste* and cited in the Annual Change Report 2018/2019 and subsequent years.The emplaced waste volume (including non-containerized materials) as of May 26, 2022, is 71,331.24 cubic meters, or 2,519,039 cubic feet[3]. The emplaced waste volume is 38.6 percent of the maximum allowed. The RH activity as of May 26, 2022, according to the WDS Nuclide Report is 57,359 curies, which is 1.12 percent of the maximum RH activity allowed.

[2] The radionuclide inventory emplaced at WIPP is an important input to performance assessment. The cumulative activity of emplaced waste is inspected as a monitored parameter, and its tracking is addressed in EPA's Monitoring inspection report (see Docket EPA-HQ-OAR-2001-0012-0767).
[3] This is the LWA TRU waste volume. The TMW volume is 100,592.70 cubic meters or 3,552,397.68 cubic feet.

Table 5. Emplaced Materials as of May 26, 2022[4]

Material Type	Weight (kg)	Limiting Value (kg)	2022	2021	2020	2019	2018	2017	2016	2015	2014	2013	2012
CPR	9,431,899	22,000,000 (max)	42.9%	42.3%	41.4%	41.3%	40.9%	40.6%	40.5%	40.5%	40.5%	39.6%	37.4%
Ferrous Metal	30,548,244	20,000,000 (min)	153%	151%	147%	145%	142%	140%	139%	139%	139%	133%	124%

[4] Percent of limiting value emplaced for CPR and Ferrous Metal for 2021 and prior years are updated according to DOE's Annual Change Reports.

7.0 Underground Experiments

The WIPP facility provides opportunities to perform certain scientific experiments that cannot be performed at the surface. EPA's regulatory concern is whether any experimental or non-routine activity could degrade safety or long-term repository performance. The Agency has previously reviewed and approved individual experiments and inspected experiments underground. A March 11, 2003, letter [Frank Marcinowski (EPA) to Ines Triay (CBFO)] formally approved a process by which experiments that meet certain criteria may be placed underground without explicit prior approval by EPA. Key requirements of this streamlined process are that EPA must be provided notification three months before starting an experiment, experiments must not alter ventilation or introduce new hazards, and must take place in designated areas.

The COVID-19 pandemic has curtailed or put on standby several planned and ongoing experiments in the underground since the last inspection. The most significant new experiment is the Brine Availability Test in Salt (BATS), which started in 2019 and involves multiple small-scale experiments in boreholes. Report SAND2021-3497 R details the test/activity plan over 3-5 years and lists the organizations involved and their responsibilities. Information on other underground experiments is listed in Table 1 of the WIPP Annual Change Reports (ACRs) and summary slides provided to EPA. Based on these documents, it appears that the experimental activities in the WIPP underground meet EPA's approval processes and will not degrade the safety or long-term performance of the repository.

8.0 Conclusions

Using the checklist contained in Attachment C, the inspectors reviewed recovery operations, NWP procedures, and records associated with a selected stored container. The procedures for processing CH waste were reviewed and found to be adequate, according to specified plans documented in the CCA. In addition, the response to the leaking waste shipment from INL in April 2022 that activated DOE's emergency and waste handling procedures suggests that the systems and procedures at WIPP to ensure safety and prevent releases of radionuclides are adequate. EPA concludes that DOE emplacement activities and records are adequate and that CPR and MgO are appropriately tracked. EPA observed an error in the MgO excess factor displayed in certain WDS reports which DOE has committed to correct.

Appendix A: EPA WIPP Waste Emplacement Inspection Plan for 2022

Purpose:
The purpose of this inspection is to verify that waste is emplaced in the Waste Isolation Pilot Plant (WIPP) underground disposal facility in the manner specified in the Compliance Certification Application (EPA Air Docket A-93-02, Item II-G-01) and other approvals. The U.S. Environmental Protection Agency (EPA or the Agency) is performing this inspection under the authority of Title 40 of the Code of Federal Regulations Section 194.21 (40 CFR 194.21), which authorizes the Agency to inspect the WIPP during its operational period to verify continued compliance with the EPA's WIPP Compliance Criteria and the certification decision of May 18, 1998.

Scope:
The scope of this inspection includes the site's ability to receive, process, and emplace transuranic wastes within the repository; the use of magnesium oxide (MgO) backfill in appropriate amounts to fulfill the U.S. Department of Energy (DOE) commitments and requirements; and the maintenance of relevant records including the electronic WIPP Waste Data System (WDS) and the implementation of appropriate quality assurance practices. Inspection activities will include examination of the waste handling and underground facilities, and reviews of records and other procedures related to waste emplacement.

Focal Areas for this Year's Inspection:
The EPA will inspect waste that is being stored aboveground in the Waste Handling Building, and review waste tracking in the WDS. Physical inspection of the active waste face is not practical so long as waste emplacement continues to occur in potentially contaminated areas. EPA requests that the site provide recent, time-stamped photographs of the active waste emplacement face with legible container numbers, to serve as objective evidence for this inspection that waste emplacement is occurring as according to procedure.

Location:
The inspection will be held at the DOE's WIPP facility located twenty-six miles southeast of Carlsbad, New Mexico, and at office locations in Carlsbad, as needed.

Duration:
The EPA expects to complete the on-site portion of its inspection in three days. An opening meeting will be held on the first morning of the inspection, and a closing meeting held after the conclusion of site inspection activities.

Expected Dates: May 24–26, 2022.

Documents for Review:
The DOE has electronically provided the EPA inspection staff with the latest version of procedures and reports related to waste emplacement, MgO handling, and management of the WDS. The inspection team will identify and request additional records during the inspection.

Appendix B: Summary Totals Waste Data System Nuclide Report Through May 26, 2022

Table B-1. EPA-Tracked Radiological Activity Inventory
Panel: ALL Room: ALL

Radionuclide		Repository Contact-Handled Activity (Ci)	Repository Remote-Handled Activity (Ci)	Total Repository Activity (Ci)
Am-241	Americium 241	2.746E5	6.222E2	2.752E5
Cs-137	Cesium 137	2.248E1	1.446E4	1.449E4
Pu-238	Plutonium 238	5.187E5	7.303E2	5.194E5
Pu-239	Plutonium 239	3.486E5	3.855E2	3.49E5
Pu-240	Plutonium 240	8.617E4	2.811E2	8.645E4
Pu-242	Plutonium 242	2.906E1	3.828E-1	2.944E1
Sr-90	Strontium 90	1.163E1	7.614E3	7.73E3
U-233	Uranium 233	7.69E0	3.848E-1	8.074E0
U-234	Uranium 234	9.286E1	1.147E0	9.4E1
U-238	Uranium 238	1.865E1	3.922E-2	1.869E1
Total		**1.228E6**	**2.41E4**	**1.252E6**

Appendix C: EPA Emplacement Inspection Checklist, May 24–26, 2022

Table C-1. EPA Emplacement Inspection Checklist, May 24–26, 2022

Question No.	Question Category	Question	Comments and Objective Evidence	Results
1	Waste Emplacement	Is waste being emplaced in the underground facility in the manner specified in the U.S Department of Energy's (DOE) Compliance Certification/ Re-Certification or other relevant documentation?	The EPA performed this inspection under the authority of 40 CFR 194.21, which authorizes the Agency to inspect the Waste Isolation Pilot Plant (WIPP) during its operational period to verify continued compliance with the EPA's WIPP Compliance Criteria and the certification decision of May 18, 1998. Waste is being emplaced in the manner specified in DOE's *Compliance Certification Application* (EPA Air Docket A-93-02, Item II-G-01) and other approvals.	Satisfactory
2	Waste Emplacement	Are contact-handled (CH) waste containers stacked in columns appropriately given the type of container?	Inspectors were not able to access the waste face near Room 1 of Panel 7. Photographs taken by DOE personnel, paper emplacement maps, interviews, and Waste Data System (WDS) records provided evidence that waste is being stacked according to procedure.	Satisfactory
3	Waste Emplacement	Are records adequate? Randomly select one CH waste containers to verify records for waste approval, shipment and receipt. NOTE: Because waste emplacement requires access to a contaminated area, inspectors selected one container in the Waste Handling Building and followed its emplacement electronically.	Yes. *Transuranic (TRU) Waste Receipt* WP 08-NT3020 (Rev. 28-FR3, dated 09/18/19) describes the process. Records produced are the *Uniform Hazardous Waste Manifest, TRU Waste Receipt Checklist, Shipment Summary Report and Radiological Survey Report.* The EPA reviewed the records and found them to be adequate. Selected Containers: CH Waste Container Numbers: LASB02360	Satisfactory

Question No.	Question Category	Question	Comments and Objective Evidence	Results
4	Waste Emplacement	Is the DOE properly emplacing backfill material (magnesium oxide [MgO]) with the waste packages? Are super sacks placed on top of waste stacks according to procedure?	Yes, using WP 05-WH1025 (Rev. 26-FR1, dated 09/17/20), MgO is emplaced on top of the waste stacks to maintain a ratio greater than 1.2.	Satisfactory
5	Waste Emplacement	Verify documentation for the container listed in item 3—waste generator site transmittal of waste to WIPP, WIPP approval, shipment certification for transport to WIPP, shipment initiation documentation, shipment received at WIPP records, waste emplaced in the underground, and placement of engineered barrier (MgO).	Inspectors examined electronic records kept aboveground and in the WDS for the selected container. Documentation was determined to be adequate.	Satisfactory
6	Remote-Handled (RH) Waste Emplacement	Are RH containers approved for receipt, received, processed and emplaced properly?	Yes. Since the May 2019 inspections, 6.09 cubic meters of RH containers were placed in Shielded Container Assemblies (SCAs) in Room 3 and Room 2 of Panel 7 (*Emplacement History Overview Report for Panel 7*; 05/26/2022). There has been no additional RH waste emplacement in any of the other rooms in Panel 7.	Satisfactory

Question No.	Question Category	Question	Comments and Objective Evidence	Results
7	RH Waste Emplacement	Are RH containers appropriately tracked? Where is the information? — In the WDS, what report? — During the receipt/transfer process where is it recorded? — In the underground?	Yes. *Emplacement History Overview Report for Panel 7* (05/26/2022) shows the RH containers emplaced only in Panel 7 rooms 2 and 3 since the last inspection (May 2019). Waste *Emplacement Inventory Report for Panel 7, Room 3* (05/26/2022) and *Waste Emplacement Inventory Report for Panel 7, Room 2* (05/26/2022) show the RH containers are appropriately tracked.	Satisfactory
8	RH Waste Emplacement	Content of RH canisters.	N/A. No RH in storage; access to emplaced RH restricted. Since the May 2019 inspections, RH waste has only been placed in SCAs, and not RH canisters.	N/A
9	RH Waste Emplacement	What are the volume and mass and/or concentration of important waste components and radionuclides (RH and CH)? Are they within statutory and regulatory limits?	A detailed description of nuclide information is included in the Waste Emplacement Reports, *Waste Emplacement Inventory Report for Panel 7, Room 3* (05/26/2022), *Waste Emplacement Inventory Report for Panel 7, Room 2* (05/26/2022), *Waste Emplacement Inventory Report for Panel 7, Room 1* (05/26/2022), and *Emplacement History Overview Report for Panel 7* (05/26/2022). Yes.	Satisfactory
10	RH Waste Emplacement	Are RH boreholes closed properly? (Note: also see Item 9 for tracking of RH waste in the underground.)	N/A for this inspection. Access to RH waste emplacement is restricted. No RH waste has been emplaced in boreholes since 2014, with SCAs used for RH waste in rooms 4, 3, 2, and 1. Each SCA is placed on the floor of each room, similar to CH waste (*Emplacement History Overview Report for Panel 7*; 05/26/2022).	N/A
11	RH Waste Emplacement	Is a photographic record made of the RH canister number during emplacement and retained in the permanent record?	N/A	N/A

Question No.	Question Category	Question	Comments and Objective Evidence	Results
12	Procedures	Do the DOE procedures reflect an MgO safety factor to 1.2?	Yes. WP 05-WH1025 (Rev. 26-FR1, dated 09/17/20), *CH Waste Downloading and Emplacement*, Section 5.3, Backfill establishes procedures to maintain a safety factor of 1.2 or greater per room daily. Procedures in the *WDS User's Manual*, DOE/WIPP-09-3427, Rev. 21, Section 5 reflect the 1.2 safety factor and the use of 3,000-pound super sacks as necessary. Review of the *Summary of Waste Emplacement Inventory Report* documents a MgO Safety Factor of more than 1.2 for all rooms in each panel (*Emplacement History Overview Report for Panel 7*; 05/26/2022).	Satisfactory
13	Procedures	Are CPR materials and MgO calculated and tracked on a room-by-room basis?	Yes. WP 05-WH1025 (Rev. 26-FR1, dated 09/17/20), *CH Waste Downloading and Emplacement*, Section 5.3, Backfill establishes procedures to maintain a safety factor of 1.2 or greater per room daily. The *Summary of Waste Emplacement Inventory Report for all Panels and Rooms, dated 05/26/2022,* tracked the CPR material, MgO, and MgO Excess Factor on a room-by-room basis.	Satisfactory
14	Procedures	Are sampling and analytical procedures in place to ascertain that emplaced MgO maintains a minimum of 96% reactivity?	Yes. Specification D-0101 (Rev. 11, dated 08/12/19), *Specification for Prepackaged MgO Backfill*, Section 3.3.1 and WP 05-WH1105 (Rev. 6, dated 04/08/19), MgO Sample Records Management set forth analytical and document management procedures to verify that each shipment of MgO maintains a 96 +/- 2% reactivity. Photograph of note on MgO supersack prohibiting its downloading, and the documents provided regarding the suspension, then lifting of suspension of accreditation of ALS Environmental-Fort Collins that analyzes MgO for WIPP indicates that testing and emplacement procedures are being followed.	Satisfactory
15	Procedures	Is the acceptance of the MgO backfill material from the supplier documented?	Yes. WP 05-WH1105 (Rev. 6, dated 04/08/19), *MgO Sample Records Management*, Sec. 1.0 requires each shipment to be numbered and the MgO supplier to provide an Analysis of Shipment and a sample under Chain of Custody for each shipment.	Satisfactory

Question No.	Question Category	Question	Comments and Objective Evidence	Results
16	Procedures	For the MgO needed for high CPR, are there procedures or documentation to help site personnel identify when and where additional MgO is needed?	Yes. General procedures are found in the *WIPP Waste Handling Operation WDS User's Manual*, WP 05–WH.02 (Rev. 3, dated 10/04/17), Attachment 1, Special Requirements for Additional MgO. Section 5.3 of WP 05-WH1025 (Rev. 26-FR1, dated 09/17/20) calls for notification of the Waste Handling Manager if daily reports show the MgO safety factor of a room to be less than 1.2.	Satisfactory
17	Procedures	Is there documentation that identifies how MgO should be placed with high CPR waste?	Yes. WP 05-WH1025 (Rev. 26-FR1, dated 09/17/20), *CH Waste Downloading and Emplacement*, Attachment 3, Super Sack/BRT ["big red thing"] Emplacement Data Sheet and WP 05-WH1058 (Rev. 21, dated 01/10/19), *CH Waste Handling Abnormal Operations*, Section 5.4, Emplacement of BRT.	Satisfactory

Question No.	Question Category	Question	Comments and Objective Evidence	Results
18	Procedures	Verify documentation of procedures for abnormal operating conditions and documentation of training for contingencies.	Yes. Emergency procedures include: WP 02-EC3506 (Rev. 11, dated 03/25/21), *Environmental Incident Reporting* is the Management Control Procedure for reporting releases and includes statutory requirement charts for notifications and decision flowcharts. WP 05-WH1025 (Rev. 26-FR1, dated 09/17/20), *CH Waste Handling Abnormal Operations* includes instructions for recovering from a torn slip sheet, moving emplaced waste, returning waste to the surface, and emplacing BRTs. Specifies that "Abnormal operations of a large scope (e.g., overpack and retrieval) will have specific plans developed." DOE/WIPP-17-3573 (Rev. 0, dated 02/14/18), *WIPP Emergency Management Plan* is the top-level document outlining emergency response procedures and responsibilities and includes training requirements for response roles. WP 05-WH4401 (Rev. 6, dated 01/31/19), *Waste Handler Operator Event Response* includes alarm, alert and exit procedures. WP 12-ER3906, (Rev. 22, dated 02/22/21), *Categorization and Classification of Operational Emergencies* includes tables of procedures for emergency notifications and classification of events. WP 12-HP4000 (Rev. 11, dated 01/13/21), *Emergency Radiological Control Responses* provides guidance for responding to an actual or suspected breach of a TRU container, contamination found outside controlled areas, and/or radiation levels exceeding the limits set in WP 12-5 (Rev. 22, dated 04/30/18). DOE and its contractors appeared to have followed these procedures for the incident involving a leaking waste package in shipment TP-148 from Idaho National Lab. See discussion at the end of Section 4.	Satisfactory

Question No.	Question Category	Question	Comments and Objective Evidence	Results
19	Records/WDS	Does the WDS adequately record required information?	Reports available through the EPA Dashboard contain the container number, shipment number, emplacement data and underground location. The EPA staff queried the WDS to verify that this information is recorded correctly.	Satisfactory
20	Records/WDS	Does the WDS adequately document waste shipment and emplacements information for waste containers selected? (Item 3 above.)	Yes. The Container Query was generated, which correctly reflected container number and shipment number.	Satisfactory
21	Records/WDS	Do records verify that CH waste container surface doses fall within statutory requirements? Where are CH surface dose records maintained?	Yes. CH surface dose measurements are recorded in the Container Query.	Satisfactory
22	Records/WDS	Review a Container Query. Does this report adequately record the Waste Stream Profile information?	Yes. Inspector found the information in the Overpack data report query.	Satisfactory
23	Records/WDS	Review the Container Query. Does the report correctly record the containers shipped?	Yes, under the Transportation Data Report. By querying the shipment number, the Shipment Data Report may be generated. Inspectors verified that the report reflects the containers shipped.	Satisfactory
24	Records/WDS	Review the Waste Emplacement Report. Does this report adequately record the date of receipt and disposal locations of containers?	Yes. See Item 22.	Satisfactory

Question No.	Question Category	Question	Comments and Objective Evidence	Results
25	Records/WDS	Is the DOE assuring that the 1.2 safety factor is being maintained on a room-by-room basis? Does the WDS accurately calculate the excess factor and recommend the proper amount of MgO to emplace it?	Yes. See Items 12–17. The Summary of Waste Emplacement Report for all panels and rooms, dated May 26, 2022, shows that the excess factor of a minimum of 1.2 is maintained on a room-by-room basis. The EPA inspectors generated Emplacement History Overview reports for each panel, in which correct MgO Excess Factors were generated. As mentioned in Section 5 of this report, an error was encountered in WDS while generating the Summary of Waste Emplacement Report and has been reported as a finding for correction. EPA found that the Emplacement History Overview excess factor calculation is correct while the value reported in the Summary of Waste Emplacement Report is incorrect. This was found as part of the inspection, and NWP is working to fix the reporting error.	Satisfactory for MgO safety factor being maintained. Error in WDS Summary of Waste Emplacement Report should be corrected.

Appendix D: Documents Reviewed

Table D-1. Documents Reviewed

Document Type	ID and/or Date	Document Title	Subject Matter	Source
Referenced Report	*WP 08-NT3020 Rev. 28-FR3 (09/18/19)	TRU Waste Receipt	This procedure provides instructions for receipt of mixed or non-mixed TRU waste shipments at the WIPP.	DOE/WIPP
Referenced Report	*WP 05-WH1025 Rev. 26-FR1 (09/17/20)	CH Waste Downloading and Emplacement	Technical procedure that provides instructions for preparing the CH waste payloads for downloading and emplacement in the underground disposal area.	DOE/WIPP
Referenced Report	*D-0101 Rev. 11 (08/12/19)	Specification for Prepackaged MgO Backfill	Technical specification covering the definition of the pre-packaged backfill material to be emplaced in the underground areas at the WIPP. Includes analytical methods to ensure reactivity, and Analysis Request/Chain of custody forms.	DOE/WIPP
Referenced Report	WP 05-WH1105 Rev. 6 (04/08/19)	Magnesium Oxide Sample Records Management	This procedure provides the administrative guidance for NWP Operations personnel to maintain the records associated with MgO sampling activities.	DOE/WIPP
Referenced Report	WP 05–WH.02 Rev. 3 (10/04/17)	WIPP Waste Handling Operations WDS User's Manual	WIPP Waste Handling Operations WWIS User's Manual. For use by Waste Handling Technicians and Waste Handling Engineers.	DOE/WIPP
Referenced Report	WP 05-WH1058 Rev. 26 (07/30/20)	CH Waste Handling Abnormal Operations	This procedure provides instructions for abnormal operations that may be needed for CH Waste Handling.	DOE/WIPP
Referenced Report	WP 08-NT.01 Rev. 35 (02/21/19)	Waste Data System Program and Data Management Plan	Summarizes the functional requirements for the WDS.	DOE/WIPP NWP

Document Type	ID and/or Date	Document Title	Subject Matter	Source
Referenced Report	WP 08-NT.03 Rev. 20 (08/25/20)	Waste Stream Profile Form Review and Approval Program	Summarizes the requirements and criteria for WIPP review and approval of Waste Stream Profile Forms (WSPFs) that are prepared by generator/storage sites and submitted for approval by the permittee.	DOE/WIPP NWP
Referenced Report	WP 08-NT.04 Rev. 28 (07/17/19)	Waste Data System Software Quality Assurance Plan	Identifies the Software Quality Assurance work activities associated with the WIPP WDS.	DOE/WIPP NWP
Referenced Report	DOE/WIPP-09-3427 Rev. 21 (06/22/21)	Waste Data System User's Manual	Gives summary information to users of the WDS, including data entry, data review, searches, and producing output reports.	DOE/WIPP
Referenced Report	SAND2021-3497 R (03/2021)	Brine Availability Test in Salt (BATS) Extended Plan for Experiments in the Waste Isolation Pilot Plant (WIPP)	Details planned experiments in the WIPP underground.	DOE/WIPP
Referenced Report	05/19/2022	Overview of the WIPP URL and Science Program	Summary slides on ongoing and planned experiments and testing in the WIPP underground.	DOE/EM

Document Type	ID and/or Date	Document Title	Subject Matter	Source
Referenced Report	WP 02-EC3506 Rev. 11 (03/25/21)	Environmental Incident Reporting - Management Control Procedure	This procedure establishes actions to be performed to ensure that immediate notification and follow-up reports are made to external agencies within required time frames for the following incidents: - Releases or potential releases of hazardous substances or hazardous waste - Releases or potential releases of radionuclides from: • Waste being emplaced or emplaced waste that can lead to exceeding the expected committed doses, per Title 40 *Code of Federal Regulations* (CFR) 191.15 • Waste being emplaced or emplaced waste that causes concentrations of radionuclides or estimated doses due to radionuclides in underground sources of drinking water in the accessible environment to exceed the limits, per 40 CFR Part 191, Subpart C - Polychlorinated Biphenyl (PCB) non-compliance.	DOE/WIPP
Referenced Report	DOE/WIPP-17-3573 Rev. 0 (02/14/18)	WIPP Emergency Management Plan	This plan provides an organized process for handling significant incidents, emergency events or potential events that could threaten human health or the environment.	DOE/WIPP
Referenced Report	WP 05-WH4401 Rev. 6 (01/31/19)	Waste Handling Operator Event Response	Emergency Procedure for CAM alarms, fire, smoke, toxic gas, structural issues, or spill/release.	DOE/WIPP

Document Type	ID and/or Date	Document Title	Subject Matter	Source
Referenced Report	*WP 12-ER3906 Rev. 22 (02/22/21)	Categorization and Classification - Emergency Operating Procedure	This procedure provides guidance to the Facility Shift Manager (FSM), Crisis Manager (CM), or designee(s), on how to Categorize and Classify events that occur at the WIPP Site, Skeen Whitlock Building, Cascades, or the Records Center, in accordance with DOE 151.1C, *Comprehensive Emergency Management.*	DOE/WIPP
Referenced Report	*WP 12-HP4000 Rev. 11 (01/13/21)	Emergency Radiological Control Responses - Alarm Response Procedure	Emergency and Alarm Personnel Response Procedure.	DOE/WIPP
Referenced Report	WP 12-5 Rev. 22 (04/30/18)	Waste Isolation Pilot Plant Radiation Safety Manual	This manual discusses the radiological protection program at the WIPP.	DOE/WIPP
Referenced Report	11/13/2019, 11/13/2020, 10/19/2021	WIPP Annual Change Reports (ACR) 2018/2019, 2019/2020, 2020/2021	The DOE provides an annual report each November of applicable changes over the time period July 1 to June 30. This annual report informs the EPA of changes to information in the most recent compliance application. Significant planned changes must be reported to the EPA prior to implementation by the DOE.	DOE/WIPP
Referenced Report	4/12/2022	VSDS Standard Map Survey Report, Survey M-20220410-6, Trupact #148 Contamination	This report provides sampling and other information about the leaked liquid containing radionuclides found in the bottom of TRUPACT container #148 from a shipment of CH waste from INL.	DOE/WIPP
Referenced Report	6/9/2022	TP-148 smear Pu-spectra	Copies of output files of gamma spectra indicating presence of Pu isotopes in smear sample taken from TP-148 container leak incident.	DOE/WIPP

Document Type	ID and/or Date	Document Title	Subject Matter	Source
Generated Documents	Emplacement History Overview Report for Panel 7 (05/26/2022)	WDS Emplacement History Overview Report for Panel 7	Lists amount and type of waste emplaced in Panel 7.	DOE/WIPP
Generated Documents	Summary of Waste Emplacement Inventory Report for Panel 7, Room 4 (05/26/2022)	Summary of Waste Emplacement Inventory Report; Panel 7 Room 4	Lists amount and type of waste emplaced in Panel 7, Room 4 and MgO excess factor.	DOE/WIPP
Generated Documents	Summary of Waste Emplacement Inventory Report for Panel 7, Room 3 (05/26/2022)	Summary of Waste Emplacement Inventory Report; Panel 7 Room 3	Lists amount and type of waste emplaced in Panel 7, Room 3 and MgO excess factor.	DOE/WIPP
Generated Documents	Summary of Waste Emplacement Inventory Report for Panel 7, Room 2 (05/26/2022)	Summary of Waste Emplacement Inventory Report; Panel 7 Room 2	Lists amount and type of waste emplaced in Panel 7, Room 2 and MgO excess factor.	DOE/WIPP
Generated Documents	Summary of Waste Emplacement Inventory Report for Panel 7, Room 1 (05/26/2022)	Summary of Waste Emplacement Inventory Report; Panel 7 Room 1	Lists amount and type of waste emplaced in Panel 7, Room 1 and MgO excess factor.	DOE/WIPP
Generated Documents	Summary of Waste Emplacement Inventory Report for All Panels and Rooms (05/26/2022)	WDS Emplacement History Overview Report for All Panels	Lists amount and type of waste emplaced in all panels and rooms of WIPP and the MgO excess factor for each.	DOE/WIPP
Generated Documents	Container Data Report LASB02360 (06/02/2022)	WIPP Overpack Data Report for Container LASB02360	Contains information on CH waste container selected for inspection.	DOE/WIPP

Document Type	ID and/or Date	Document Title	Subject Matter	Source
Letter	Frank Marcinowski (EPA) to Ines Triay (CBFO), March 11, 2003	No title.	Response to a letter from CBFO in December 2002 requesting general approval to allow experiments at the WIPP if they are not directly related to the disposal of TRU waste and meet certain criteria.	EPA
Letter	Ed Ziemianski (CBFO) to Jonathan Edwards (EPA), August 11, 2011	"Notification of Intent to Begin the Salt Disposal Investigations"	Regarding experiments to be carried out in the WIPP underground	DOE
Letter	Tracy Szerszen, President, Perry Johnson Laboratory Accreditation, Inc. (PJLA) to Rachel Kimmel, ALS Environmental-Fort Collins, 05/18/2022	"Suspension of lab accreditation"	The Department of Energy Consolidated Audit Program (DOECAP)-Accreditation Program of ALS Environmental-Fort Collins that analyzes MgO for WIPP was suspended by their accreditation body until it could implement corrective action. Also included is an internal email chain with involved parties at DOE, NWP, and the labs.	NWP
Letter	Tracy Szerszen, President, Perry Johnson Laboratory Accreditation, Inc. (PJLA) to Rachel Kimmel, ALS Environmental-Fort Collins, 06/01/2022	"Lift of Suspension Notification ALS-Fort Collins"	The suspension of DOECAP-Accreditation Program for ALS Environmental-Fort Collins that analyses MgO for WIPP was lifted. In the letter, PJLA acknowledged receiving and reviewing a corrective action plan, and noted that full corrective action, including cause and objective evidence of the correction should be provided by July 23, 2022, and a follow up visit planned within 60 days.	NWP

*Indicates a newer version of the report exists, but may have not been specifically reviewed

Appendix E: EPA-DOE correspondence on WDS MgO excess factor issue

a. 6/23/2022 email from Xinyue Tong (EPA) to Leslie Oberbeck (NWP) asking the reason for inconsistent MgO Excess Factor across different WDS reports,

> Good morning Leslie
>
> This is Xinyue Tong from US EPA. I was on the EPA WIPP inspection team. Thank you for generating various reports during our visit in May. We recently received those cleared documents and I found inconsistency in some values in the reports that were generated from WDS:
>
> 1. The reported MgO Excess Factor for rooms in Panel 7 is different between "SummaryWasteEmpllnvALL.pdf" and "EmplHistoryOverviewPan7.pdf".
>
> 2. Reported LWA TRU Waste Inventory (for Emplaced CH Containers) is different between "SummaryWasteEmpllnvALL.pdf" and "LWA_TMW Volumes Report viewed during inspection.pdf"
>
> Do you know what are the reasons for those inconsistent values in those WDS reports?
>
> Thanks
> Xinyue Tong

b. 6/23/2022 email from Michael Walentine (NWP) to Xinyue Tong EPA recognize the issue in WDS to report the MgO Excess Factor and the steps to resolve the error.

> -Xinyue,
>
> It appears that the Summary of Waste Emplacement Inventory Report has an error in reporting the MgO excess factor that causes it to report the excess factor for the room corresponding to the panel number for all rooms in a given panel. We are invoking our problem reporting process to address that. The values given on the Emplacement History Overview are correct.
>
> The Summary of Waste Emplacement Inventory Report that you have includes non-containerized materials (NCM). That includes all the additional materials that are not waste such as absorbent spill pads and emplacement materials that should not be included in the waste volume, but are important for the performance assessment to include the additional CPR.
>
> If you have any additional questions, please don't hesitate to ask.
>
> Thanks,
> Michael Walentine
> Waste Information Tracking Systems Team Lead Nuclear Waste Partnership
> Contractor to the U.S. Department of Energy
> (575) 200-8407

c. 8/26/2022 email from Xinyue Tong (EPA) to Anderson Ward (DOE-CBFO) to raise the attention of DOE-CBFO on the WDS MgO Excess Factor issue

Good morning Andy

As I mentioned during our conversation this morning, this is the email regarding the finding on the inconsistent MgO Excess Factors in WDS reports.

During EPA's waste emplacement inspection in Carlsbad in May, one of the topics that staff examined was the calculation and reporting of the MgO excess or safety factor (EF). During that examination, EPA inspectors identified inconsistent MgO Excess Factors being reported across different WDS-generated reports [SummaryWasteEmpllnvAll.pdf and EmplHistoryOverviewPan7.pdf]. Those reports were requested during the inspection (from May 24 to May 26, 2022) and reviewed by inspectors. EPA staff have identified that the error is in reporting the MgO excess factor in the Summary of Waste Emplacement Inventory Report. This error results in reporting the excess factor for all rooms in a panel as the numerical value of the room with the same id number of that panel. This error may propagate downstream into works that use the Summary of Waste Emplacement Inventory Report. This error was discussed with WDS admin people (Michael Walentine), he is invoking the WDS problem reporting process to address the error. EPA will track this issue as a finding that requires a formal response from DOE. Please provide documents of the error correction to EPA. EPA will close the finding and finish the inspection report after reviewing the requested documents.

While doing MgO EF calculations, an EPA inspector also identified incorrect MgO EF reported in the WIPP Annual Change Report 2020/2021 (e.g. MgO EF for Panel 1 all rooms, Panel 2 room 2 to 7, and rooms 6, 5, 4 in Panel 7). This may not be directly associated with the finding mentioned above and EPA's inspection, but DOE should investigate the root cause of those incorrect MgO EF values and let EPA know the resolution of the issue.

We appreciate DOE's prompt response to the issue. Please feel free to contact me with any questions.

Xinyue Tong

d. 9/22/2022 email from Xinyue Tong (EPA) to Michael Gerle and Anderson Ward (DOE-CFBO) to transmit the Letter that requires a written response from DOE as EPA identified this MgO excess factor issue as an inspection concern.

Good afternoon Mr. Gerle

Please see the attached concern letter request for a response regarding an error in WDS. Please let me know if you have any questions.

Regards,

Xinyue Tong
Physical Scientist, Center for Waste Management and Regulations

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
Washington, DC 20460

September 22, 2022

OFFICE OF AIR AND RADIATION

Mr. Michael Gerle
Director, Environmental Regulatory Compliance
Carlsbad Field Office
U.S. Department of Energy
P.O. Box 3090
Carlsbad, New Mexico 88221-3090

Dear Mr. Gerle:

The U.S. Environmental Protection Agency conducted an on-site inspection of the waste emplacement program at the Waste Isolation Pilot Plant from May 24 to May 26, 2022. During its post-inspection review of WIPP documentation, EPA identified an error in reporting the magnesium oxide (MgO) excess factor in the Summary of Waste Emplacement Inventory Report generated by the Waste Data System (WDS). This error results in reporting the excess factor for all rooms in a panel as the numerical value of the room with the same id number of that panel (e.g., the MgO excess factor calculated for Room 6 in Panel 6 would be assigned to all rooms in that panel). This error may propagate into documents or databases that use data from the Summary of Waste Emplacement Inventory Report.

EPA identified this MgO excess factor issue as an inspection concern requiring a written response. This error has been discussed with Carlsbad Field Office staff, and it is our understanding that WDS administrators are invoking the WDS problem reporting process to address the error. However, as of the date of this letter, the issue has not been resolved. Please provide us with information on how this error will be addressed and the time frame in which it will be addressed.

EPA will finish the inspection report upon a satisfactory review of the requested documents. If you have any questions concerning this request, please contact Xinyue Tong at (202) 343-9844 or tong.xinyue@epa.gov.

Sincerely,

Tom Peake Digitally signed by Tom Peake Date: 2022.09.22 14:43:43 -04'00'

Tom Peake
Director, Center for Waste Management and Regulations

cc: Electronic Distribution
Anderson Ward, DOE/CBFO
Judy McLemore, RES
Lee Veal, EPA/HQ
Xinyue Tong, EPA/HQ
Raymond Lee, EPA/HQ

e. 10/31/2022 email from Michelle Cook (Contractor to DOE-CBFO) to Tom Peake (EPA) to transmit a response to the Environmental Protection Agency's September 22, 2022, Letter Regarding Reporting the Magnesium Oxide Excess Factor Generated by the Waste Data System.

Good Afternoon Mr. Peake,

If you have any questions regarding the attached letter/enclosures, please contact Dr. Anderson Ward at (575) 988-5414 or at Anderson.Ward@cbfo.doe.gov.

Thank you,
Michelle Cook
Administrative Assistant
Carlsbad Technical Assistance Contractor (Navarro Research and Engineering Inc.)
Contractor to the Department of Energy
4021 National Parks Highway
Carlsbad, NM 88220
(575) 234-7154

Department of Energy
Carlsbad Field Office
P. O. Box 3090
Carlsbad, New Mexico 88221
October 31, 2022

Mr. Tom Peake, Director
Center for Waste Management and Regulations
Radiation Protection Division
William Jefferson Clinton Building, West
1301 Constitution Ave NW, Mail Code 6608T
Washington, D.C. 20004

Subject: Response to the Environmental Protection Agency's September 22, 2022 Letter Regarding Reporting the Magnesium Oxide Excess Factor Generated by the Waste Data System.

Reference: EPA letter from Tom Peake, Director, Center for Waste Management and Regulations, to Michael Gerle, Director, Environmental Regulatory Compliance, Carlsbad Field Office, dated September 22, 2022.

Dear Mr. Peake:

This letter is in response to the Environmental Protection Agency's (EPA's) request for information concerning an error in reporting the Magnesium Oxide (MgO) excess factor generated by the Waste Data System (WDS). The EPA identified this as an inspection concern requiring a written response.

The WDS team has confirmed that the MgO excess factor in one of the reports provided to the EPA had an error in which the value for a disposal room corresponding to the panel number was applied to all disposal rooms in a panel. The error was traced back and determined to be a reference to the wrong variable on the report (*i.e.*, the report query selected the excess factor for the disposal room using the panel number instead of the disposal room number). A review of the extent of condition was performed and it has been determined that the issue was limited to Panel 7, Rooms 4 through 6.

In accordance with the procedure for the WDS Software Quality Assurance Plan (WP08-NT.04), an action log (WWIS2-AL-1111, Enclosure 1) was entered, which generated an issue (WWIS2-IS-7254, Enclosure 2). Because the WDS team follows a prescribed Institute of Electrical and Electronics Engineers (IEEE) procedure for the development and testing of software revisions, each of the WDS revisions must be developed and released in a prescribed order to comply with this procedure. The software error will be corrected in the next release, WDS Release 3.5, which is currently under development and is expected in the spring of 2023.

For reporting prior to WDS release 3.5, the Carlsbad Field Office has verified the calculations and corrections have been made to documents that may have used or will use these data, particularly the Annual Change Report. Additionally, we are providing the correct disposal room MgO excess factors for Panels 1 – 7 in Enclosure 3.

If you have any questions, please contact Dr. Anderson L. Ward at (575) 988-5414.

Sincerely,

Michael Gerle Digitally signed by Michael Gerle
Date: 2022.10.31 10:45:31 -06'00'

Michael Gerle, Director
Environmental Regulatory Compliance Division
Carlsbad Field Office

Enclosures

CBFO:ERCD:MG:MC:22-0250

cc: w/enclosures
R. Lee, EPA *ED
X. Tong, EPA ED
M. Gerle, CBFO ED
A. Ward, CBFO ED
D. Standiford, CBFO ED
J. McLemore, RES ED
CBFO M&RC
*ED denotes electronic distribution

cc: w/o enclosures
J. Garza, CBFO *ED
G. Basabilvazo, CBFO ED
R. Chavez, RES ED
R. Watson, RES ED
M. Walentine, NWP ED
*ED denotes electronic distribution

CBFO:ERCD:MG:MC:22-0250