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LOS ALAMOS NATIONAL LABORATORY
CARLSBAD OPERATIONS

Standard Analysis Report
INV-SAR-80, Revision 0

Cellulose, Plastic, and Rubber Emplacement and Operational Materials 2023 Estimates for Interim State Performance Assessment of the Waste Isolation Pilot Plant

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ACRONYMS AND ABBREVIATIONS

CBFO	Carlsbad Field Office
CCO	Criticality Control Overpack
CH	contact-handled
CID	Comprehensive Inventory Database
CPR	cellulose, plastic, and rubber
DOE	U.S. Department of Energy
gal	gallon(s)
kg	kilogram(s)
LANL-CO	Los Alamos National Laboratory-Carlsbad Operations
m^3	cubic meter(s)
MgO	magnesium oxide
POC	Pipe Overpack Containers
QA	quality assurance
RH	remote-handled
SAR	standard analysis report
SCA	Shielded Container Assembly
SLB2	Standard Large Box 2
SWB	Standard Waste Box
TDOP	Ten Drum Overpack
TRU	transuranic
WDS	Waste Data System
WIPP	Waste Isolation Pilot Plant
WTS	Washington TRU Solutions

1.0 Introduction

This standard analysis report (SAR) provides the estimates for cellulose, plastic, and rubber (CPR) emplacement and operational materials in the Waste Isolation Pilot Plant (WIPP) with a data collection cut-off date of December 31, 2023. Emplacement materials are materials used for the emplacement of waste that are not included as a waste or container material. Emplacement materials include items such as slip sheets, reinforcing plates, plastic stretch wrap, and supersacks. Operational materials are materials used during operational activities in the repository and will remain in the repository at closure. Operational materials are not considered transuranic (TRU) waste but contain CPR that must be accounted for since it may affect the behavior of the disposal system. The data from this analysis will be included in a Performance Assessment Inventory Report developed for the U.S. Department of Energy (DOE) performance assessment scaled to an interim state WIPP repository configuration in support of the Compliance Recertification Application-2026.

2.0 Objective

This analysis uses container information reported in the Comprehensive Inventory Database (CID), data version D.23.IS.PA with a cutoff date of December 31, 2023 (LANL-CO 2025) to calculate the total emplacement materials. The operational CPR material is obtained directly from a query request from the WIPP Waste Data System (WDS) manager (Standiford 2024). Operational materials used at WIPP include CPR; however, only cellulose and plastic are used for emplacement of waste.

This analysis includes the number of contact-handled (CH) TRU containers of emplaced waste at the WIPP and waste stored at TRU generator site facilities. To account for an interim state repository, all projected waste and stored RH-TRU is scaled. Low activity remote-handled (RH) TRU waste [Shielded Container Assembly (SCA) yield a surface dose rate of less than 200 millirem per hour at the surface] will be placed on the floor of the repository in the same configuration as other CH-TRU waste but will count towards the volume of RH-TRU waste. The remaining RH-TRU waste emplacement process does not result in a contribution to the weights of CPR in the repository and does not affect the CH-TRU waste stacking configurations. Therefore, the RH-TRU waste emplaced into the walls in horizontal boreholes of the repository is not included in this analysis.

This analysis is defined as a task as specified in INV-AP-01, *Analysis Plan for Transuranic Waste Inventory* (LANL-CO 2024a). This analysis was conducted and reported under the Los Alamos National Laboratory-Carlsbad Operations (LANL-CO) Quality Assurance (QA) Program according to LCO-QP9-1, *Analyses* (LANL-CO 2024b). The LANL-CO QA Program complies with the DOE Carlsbad Field Office (CBFO) *Quality Assurance Program Document* (DOE 2023). The CID is a DOE CBFO database that contains quality level one data and is qualified under the LANL-CO QA Program.

3.0 Computer Hardware and Software Used for Analysis

This analysis was conducted on the computer workstation, described below:

Hardware:	HP Z4 GS Workstation Desktop PC Intel® Zeon® w2-2425 CPU @ 3.00 GHz 128 GB RAM 943 GB HD PN2400123
Operating System:	Microsoft® Windows 11 Enterprise Version 21H2 64-bit OS
Software:	Microsoft® Office Excel® 2016

4.0 Emplacement Materials

4.1 Assumptions

The waste container types used in this analysis are derived from WIPP-approved containers identified in the CID, data version D.23.IS.PA. These containers include the 55-gallon (gal) drum, 85-gal drum, 100-gal drum, Ten Drum Overpack (TDOP), Standard Waste Box (SWB), Standard Large Box 2 (SLB2), and SCA.

Pipe Overpack Containers (POC) and Criticality Control Overpacks (CCO) will be emplaced in the repository as 55-gal drums. It is also assumed that 80-gal drums and 83-gal drums are equivalent to 85-gal drums. The values used for the relevant calculations reflect these assumptions. The applicable waste emplacement units and configurations are: 55-gal, 7-packs; 85-gal, 4-packs; 100-gal, 3-packs (3-Pack_{100}); SWB; TDOP; and SLB2 for CH-TRU waste and SCA, 3-Packs (3-Pack_{SCA}) packaged with RH-TRU waste. Placement of all other RH-TRU waste in a rib of the repository does not require any emplacement materials. The RH-TRU waste in SCAs will be placed on the floor like CH-TRU and not in horizontal boreholes located in the walls of the repository. It is also important to note that there is no rubber contribution incidental to the CH- or RH-TRU waste emplacement process.

In the past, magnesium oxide (MgO) has been placed on top of waste stacks in varying configurations. To maintain a conservative estimate for the calculation of CPR associated with the use of MgO supersacks, this analysis will assume an MgO supersack will be placed on every stack in every row except for the SCA.

In emplacement operations, there are many different stacking configurations of the container types that are allowed. For this analysis, it is assumed that container types are always stacked in specific configurations to simplify the calculations of the emplacement materials. The following assumptions apply to each type of CH-TRU waste emplacement unit configuration listed:

- 7-packs, 4-packs, and 3-packs are emplaced with plastic stretch wrap around them, a plastic reinforcing plate on top, and a plastic slip sheet on the bottom
- 7-packs are comprised of 55-gal drums
- 7-packs are stacked 3 high to make a waste stack
- 7-packs are stacked on top of other 7-packs and TDOPs

- 4-packs are comprised of 85-gal drums
- 4-packs are stacked 3 high to make a waste stack
- 4-packs are stacked on top of other 4-packs
- 3-packs$_{100}$ are comprised of 100-gal drums
- 3-packs$_{100}$ are stacked 3 high to make a waste stack
- 3-packs$_{100}$ are stacked on top of other 3-packs$_{100}$
- 3-packs$_{SCA}$ are composed of shielded containers
- 3-packs$_{SCA}$ are stacked 2 high to make a waste stack
- 3-packs$_{SCA}$ are stacked on top of other 3-packs$_{SCA}$
- SWBs are emplaced with a cardboard (cellulose) slip sheet on the bottom
- SWBs are stacked 3 high to make a waste stack
- SWBs are stacked on top of other SWBs and SLB2s
- TDOPs are emplaced with a cardboard slip sheet on the bottom
- TDOPs are emplaced with one 7-pack stacked on top to make a waste stack
- SLB2s are emplaced without a slip sheet
- SLB2s are emplaced with one SWB stacked on top to make a waste stack
- Each waste stack, regardless of specific configuration, has one supersack of MgO placed on top except for SCA
- MgO supersack contains a cardboard stabilizer and is emplaced with a plastic slip sheet on the bottom

4.2 Data

Container information is obtained from the CID, data version D.23.IS.PA, with a cutoff date of December 31, 2023 (LANL-CO 2025).

4.2.1 Number of Containers by Type

The CID has calculated scaling factors for CH-TRU and RH-TRU waste such that when applied to the projected waste volume and the stored RH-TRU waste volume, the scaled projected and scaled stored RH-TRU waste volume combined with the emplaced and stored CH-TRU waste volumes represent a filled interim state repository configuration. The volume capacity for this configuration was calculated to be 157,831.92 m^3 with limits of 1,584.80 m^3 for RH-TRU waste and 156,247.12 m^3 for CH-TRU waste (Wagner 2025). These same scaling factors were used to scale the projected portion of container counts. For this interim state repository scenario, the scaling factor was also applied to the RH-TRU stored container counts, due to the fact that the emplaced and stored RH portions combined exceed the defined interim state RH-TRU volume limit. The stored, projected, emplaced container counts were derived from the CID, data version D.23.IS.PA (see Attachment 1). The scaled projected container counts were calculated in Attachment 1 by multiplying the unscaled CH-TRU and RH-TRU by their respective

scaling factors. The scaled stored container counts only apply to RH-TRU waste and were calculated by multiplying the unscaled RH-TRU stored container counts by the RH-TRU scaling factor. Scaling factors calculated by the CID and used for this analysis are approximately 1.11 for CH-TRU and 0.59 for RH-TRU (rounded to two decimal places).

Table 1 shows the results of the calculations determined in Attachment 1 by container type and totals all like containers. Any non-whole values for the scaled projected and RH stored container count in Attachment 1 were rounded up to the next whole number. The totals of all like containers in Table 1 were calculated by summing all like container categories, e.g., 55-gal, 85-gal, 100-gal, SCA, SLB2, SWB and TDOP.

Table 1. Total Container Count

Container Type	Emplaced Container Count	Stored Container Count[2]	Scaled Projected Container Count	Total Container Count	Total Sum of Containers
100-gal Drum Dir Ld w/o Liner	37,452	370	0	37,822	37,822
55-gal CCO w/ Liner	714	1,687	151,027	153,428	581,455
55-gal Drum Dir Ld w/ Liner	89,608	47,622	80,513	217,743	
55-gal Drum Dir Ld w/o Liner	25,369	1,895	128,372	155,636	
55-gal POC - 12" w/ Liner	28,531	509	23,299	52,339	
55-gal POC - 6" w/ Liner	0	70	1,203	1,273	
55-gal S100 POC - 6" w/ Liner	936	7	0	943	
55-gal S300 POC - 12" w/ Liner	75	18	0	93	
85-gal Drum Dir Ld w/o Liner	0	26	0	26	31
85-gal Drum w/ 1 - 55-gal Drum w/ Liner	5	0	0	5	
RH SCA-30G1 w/ Liner	8	4,212	1,206	5,426	5,668
RH SCA-30G1 w/o Liner	75	0	4	79	
RH SCA-30G3 w/ Liner	0	3	0	3	
RH SCA-55G1 w/ Liner	0	3	0	3	
RH SCA-55G1 w/o Liner	0	121	8	129	
RH SCA-55G2 w/o Liner	0	28	0	28	
SLB2 Dir Ld	239	388	256	883	883
SWB Dir Ld w/ Liner	1	4,081	2,937	7,019	25,410
SWB Dir Ld w/o Liner	7,513	200	260	7,973	
SWB w/ 2 - 100-gal Drums w/o Liners	1	2,937	0	2,938	
SWB w/ 4 - 55-gal Drums w/ Liners[1]	4,947	59	755	5,761	
SWB w/ 4 - 55-gal Drums w/o Liners[1]	1,718	1	0	1,719	
TDOP Dir Ld	28	4	0	32	7,910
TDOP w/ 1 SWB w/o Liners	4	0	0	4	
TDOP w/ 10 - 55-gal Drums w/ Liners	6,457	520	0	6,977	
TDOP w/ 10 - 55-gal Drums w/o Liners	261	0	0	261	
TDOP w/ 6 - 85-gal Drums w/ Liners[1]	136	196	0	332	
TDOP w/ 6 - 85-gal Drums w/o Liners[1]	172	132	0	304	

Note: Information from CID Data Version D.23.IS.PA with a Cutoff Date of December 31, 2023.
[1] Emplaced container counts rounded from CID data.
[2] RH Stored Container Counts are scaled.

4.2.2 Cellulose Component Weights

Weights of components that contribute to the total amount of cellulose are listed below based on their relationship to a defined waste emplacement unit. These emplacement material values were reported from the WDS, which is the database of record (see Attachment 2).

- Each SWB unit cardboard slip sheet – 3.73 kilograms (kg)
- Each TDOP unit cardboard slip sheet – 3.73 kg
- Each supersack cardboard stabilizer – 3.45 kg

4.2.3 Plastic Component Weights

Weights of components that contribute to the total amount of plastic are listed below based on their relationship to a defined waste emplacement unit (Batchelder 2017). The weight of the supersack slip sheet, not included in the WDS document, came from the 2004 email from John Jackson to Bill McInroy (see Attachment 3).

- Each 7-pack unit (top reinforcing plate, bottom slip sheet and stretch wrap) – 16.80 kg
- Each 4-pack unit (top reinforcing plate, bottom slip sheet and stretch wrap) – 14.80 kg
- Each 3-pack$_{SCA}$ unit (top reinforcing plate, bottom slip sheet and stretch wrap) – 14.10 kg
- Each 3-pack$_{100}$ unit (top reinforcing plate, bottom slip sheet and stretch wrap) – 14.55 kg
- Each woven polypropylene supersack – 3.45 kg
- Each supersack bottom slip sheet – 7.89 kg

4.3 Calculations

To calculate the weight of the emplacement materials, data were obtained from the CID, data version D.23.IS.PA. The following sections of this report describe the methods used to calculate the number of emplacement units, stacks, and supersacks to determine the total weight of the CPR emplacement materials.

4.3.1 Calculation of the Number of Emplacement Units, Stacks, and Supersacks

Using the assumptions listed in Section 4.1 and the information from Table 1, the number of emplacement units and waste stacks were calculated using Equations 1 through 11. From the number of waste stacks, the number of supersacks was calculated using Equation 12. Table 2 shows the results of equations 1 through 12.

4.3.1.1 Total 7-pack units and 7-pack stacks

The total number of 7-pack units is calculated by dividing the total number of 55-gal drums by seven since there are seven drums in each 7-pack unit as shown in Equation 1. To calculate the number of 7-pack stacks, first subtract the number of

TDOP units from the total number of 7-pack units. This will ensure that the appropriate number of 7-pack units is available to stack on top of each TDOP unit. Since 7-pack units are stacked three high, this number is divided by three as shown in Equation 2.

$$TU_{7\text{-pack}} = TD_{55} / 7 \quad \text{(Eq. 1)}$$

$$TS_{7\text{-pack}} = (TU_{7\text{-pack}} - TU_{TDOP}) / 3 \quad \text{(Eq. 2)}$$

Where

$TU_{7\text{-pack}}$ is the total number of 7-pack units,
TD_{55} is the total number of 55-gal drums,
$TS_{7\text{-pack}}$ is the total number of 7-pack stacks, and
TU_{TDOP} is the total number of TDOP units

4.3.1.2 Total 4-pack units and 4-pack stacks

The total number of 4-pack units is calculated by dividing the total number of all 85-gal drums by four since there are four drums in each 4-pack unit as shown in Equation 3. It is assumed for this analysis that the 4-pack units will be stacked three high, one on top of the other, to make a stack as shown in Equation 4.

$$TU_{4\text{-pack}} = TD_{85} / 4 \quad \text{(Eq. 3)}$$

$$TS_{4\text{-pack}} = TU_{4\text{-pack}} / 3 \quad \text{(Eq. 4)}$$

Where

$TU_{4\text{-pack}}$ is the total number of 4-pack units,
TD_{85} is the total number of 85-gal drums, and
$TS_{4\text{-pack}}$ is the total number of 4-pack stacks

4.3.1.3 Total 3-pack units and 3-pack stacks

The 3-pack units and 3-pack stacks include both the 100-gal drums and SCAs. This section will separate the two because 3-pack$_{100}$ stacks are stacked three high and 3-pack$_{SCA}$ stacks are stacked two high.

4.3.1.3.1 Total 3-pack$_{100}$ units and 3-pack$_{100}$ stacks

The total number of 3-pack$_{100}$ units is calculated by dividing the number of 100-gal drums by three since there are three drums in each 3-pack$_{100}$ unit as shown in Equation 5. It is assumed for this analysis that the 3-pack$_{100}$ units will be stacked three high on top of other 3-pack$_{100}$ units to make a waste stack as shown in Equation 6.

$$TU_{3-\text{pack}_{100}} = TD_{100} / 3 \quad \text{(Eq. 5)}$$

$$TS_{3-\text{pack}_{100}} = TU_{3-\text{pack}_{100}} / 3 \quad \text{(Eq. 6)}$$

Where

$TU_{3-\text{pack}_{100}}$ is the total number of 3-pack$_{100}$ units,
TD_{100} is the total number of 100-gal drums, and
$TS_{3-\text{pack}_{100}}$ is the total number of 3-pack$_{100}$ stacks

4.3.1.3.2 Total 3-pack$_{SCA}$ units and 3-pack$_{SCA}$ stacks

The total number of 3-pack$_{SCA}$ units is calculated by dividing the number of SCA by three since there are three drums in each 3-pack$_{SCA}$ unit as shown in Equation 7. It is assumed for this analysis that the 3-pack$_{SCA}$ units will be stacked two high on top of other 3-pack$_{SCA}$ units to make a waste stack as shown in Equation 8.

$$TU_{3-pack_{SCA}} = T_{SCA} / 3 \quad \text{(Eq. 7)}$$

$$TS_{3-pack_{SCA}} = TU_{3-pack_{SCA}} / 2 \quad \text{(Eq. 8)}$$

Where

$TU_{3-pack_{SCA}}$ is the total number of 3-pack$_{SCA}$ units,
T_{SCA} is the total number of SCAs, and
$TS_{3-pack_{SCA}}$ is the total number of 3-pack$_{SCA}$ stacks

4.3.1.4 Total SWB units and SWB stacks

The SWB units are emplaced as individual units in stacks three high. The total number of SWB units is shown in Table 2. The total number of SWB stacks is calculated by subtracting the total number of all SLB2 units from the total number of all SWB units to ensure there will be an SWB unit to place on top of each SLB2. This number is then divided by three, since SWB units will be stacked three high as shown in Equation 9.

$$TS_{SWB} = (TU_{SWB} - TU_{SLB2}) / 3 \quad \text{(Eq. 9)}$$

Where

TS_{SWB} is the total number of SWB stacks,
TU_{SWB} is the total number of SWB units, and
TU_{SLB2} is the total number of SLB2 units

4.3.1.5 Total TDOP units and TDOP stacks

The TDOP units are emplaced as individual units with a 7-pack placed on top to form a waste stack, as described in Section 4.1. The total number of TDOP units is shown in Table 2. The 7-pack units were mathematically set aside in Equation 2 to ensure there would be one 7-pack unit for each TDOP stack. The number of TDOP stacks is equal to the number of TDOP units as shown in Equation 10.

Total Number of TDOP stacks = Total Number of all TDOP units (Eq. 10)

4.3.1.6 Total SLB2 units and SLB2 stacks

The SLB2 units are emplaced as individual units with a SWB placed on top to form a waste stack, as described in Section 4.1. The total number of SLB2 units is shown in Table 2. The SWB units were mathematically set aside in Equation 9 to ensure there would be one SWB unit for each SLB2 stack. The number of SLB2 stacks is equal to the number of SLB2 units as shown in Equation 11.

Total Number of SLB2 stacks = Total Number of all SLB2 units (Eq. 11)

4.3.1.7 Total number of Supersacks

The total number of supersack emplacement units is the sum of the number of waste stacks minus the number of 3-pack$_{SCA}$ stacks as shown in Equation 12. The sum of stacks for each container type is listed in Table 2.

$$TU_{Supersack} = T_{WS} - TS_{3-pack_{SCA}} \quad \text{(Eq. 12)}$$

Where

$TU_{Supersack}$ is the total number of Supersack emplacement units,
T_{WS} is the total number of all waste stacks, and
$TS_{3-pack_{SCA}}$ is the total number of 3-pack$_{SCA}$ stacks

Table 2. Total Number of Containers, Emplacement Units, Stacks and Supersacks

Container Type	Total Sum of Containers	Type of Emplacement Unit	Number of Emplacement Units	Number of Stacks
100-gal Drum	37,822	3-pack$_{100}$	12,608	4,203
55-gal Drum	581,455	7-pack	83,065	25,052
85-gal Drum	31	4-pack	8	3
SCA	5,668	3-pack$_{SCA}$	1,890	945
SLB2	883	SLB2	883	883
SWB	25,410	SWB	25,410	8,176
TDOP	7,910	TDOP	7,910	7,910
		Supersacks	46,227	

Note: Values represent the total count of units and stacks. Any non-whole number has been rounded up to the next whole number.

4.3.2 Calculation of Emplacement Materials

The following sections of this report discuss in detail the calculations needed to produce the cellulose and plastic contribution for each emplacement unit as well as the total weight of the cellulose and plastic contributions of emplacement materials.

4.3.2.1 Cellulose

The weight of cellulose components used in the assembly of an emplacement unit is multiplied by the number of emplacement units as shown in Equation 13 to arrive at the total weight of cellulose contribution for these units.

For cellulose materials:

$$C_{Cellulose} = W_{Cellulose} \times N_{Units} \quad \text{(Eq. 13)}$$

Where

$C_{Cellulose}$ is the cellulose contribution for emplacement unit,
$W_{Cellulose}$ is the cellulose component weight, and
N_{Units} is the number of emplacement units

For example, the weight of cellulose contributed by the total number of SWB emplacement units is:

Cellulose Contribution for SWB Emplacement Units = SWB Unit Cellulose Component Weight × Number of SWB Units

All emplacement units, including supersacks that have a cellulose component weight are calculated using Equation 13. The cellulose contribution for each emplacement unit is shown in Table 3.

4.3.2.2 Plastic

The weight of plastic components used in the assembly of an emplacement unit is multiplied by the number of emplacement units as shown in Equation 14 to arrive at the total weight of plastic for these units.

$$C_{Plastic} = W_{Plastic} \times N_{Units} \quad \text{(Eq. 14)}$$

Where

$C_{Plastic}$ is the plastic contribution for emplacement unit,
$W_{Plastic}$ is the plastic component weight, and
N_{Units} is the number of emplacement units

For example, the weight of plastic contributed by the total number of 7-pack units is:

Plastic Contribution for 7-pack Emplacement Units = 7-pack Unit Plastic Component Weight × Number of 7-pack Units

All emplacement units including supersacks that have a plastic component weight are calculated using Equation 14. The plastic contribution for each emplacement unit is shown in Table 3.

4.3.2.3 Cellulose and Plastic

The total cellulose and plastic contributions from waste emplacement units were calculated by summing their respective contributions associated with each type of waste emplacement unit, as shown in Equation 15 and 16.

$$T_{Cellulose} = \sum C_{Cellulose} \quad \text{(Eq. 15)}$$

$$T_{Plastic} = \sum C_{Plastic} \quad \text{(Eq. 16)}$$

Where

$T_{Cellulose}$ is the total cellulose contribution from waste emplacement units,
$\sum C_{Cellulose}$ is the sum of all cellulose contribution associated with each type of waste emplacement unit,
$T_{Plastic}$ is the total plastic contribution from waste emplacement units, and
$\sum C_{Plastic}$ is the sum of all plastic contribution associated with each type of waste emplacement unit

Table 3. Cellulose and Plastic Contributions for Emplacement Materials

Type of Emplacement Unit	Number of Emplacement Units	Cellulose Component Weight (kg) [1]	Plastics Component Weight (kg) [1]	Cellulose Contribution (kg) [1]	Plastics Contribution (kg) [1]
3-pack_{100}	12,608	0.00	14.55	0.00	183,446.40
7-pack	83,065	0.00	16.80	0.00	1,395,492.00
4-pack	8	0.00	14.80	0.00	118.40
3-pack_{SCA}	1,890	0.00	14.10	0.00	26,649.00
SLB2	883	0.00	0.00	0.00	0.00
SWB	25,410	3.73	0.00	94,779.30	0.00
TDOP	7,910	3.73	0.00	29,504.30	0.00
Supersacks	46,227	3.45	11.34	159,483.15	524,214.18
Total Weight of Emplacement Materials				**283,766.75**	**2,129,919.98**

[1] Values are displayed to 2 decimal places.

5.0 Operational Materials

5.1 Assumptions

The following assumptions apply to operational materials:

- Operational materials are used during the operational phase of WIPP and will remain in the repository at closure.
- Operational materials are not considered TRU waste but contain CPR that may affect the behavior of the disposal system.

5.2 Data

Information on emplaced CPR material is compiled in Attachment 4 with data which are from a query request from the WIPP WDS (Standiford 2024). Operational material is provided in Attachment 4 and is summarized in Table 4 below.

Table 4. Cellulose, Plastic, and Rubber Contributions for Operational Materials

Material Type	Cellulose Contribution (kg)	Plastic Contribution (kg)	Rubber Contribution (kg)
Absorbent Boom (WI-PINKPIG)	45	315	0
Equipment (WI-EQUIP1 & 2)	0	799	2,350.6
Equipment (WI-PANEL9-CPR)	0	4,640	2,499
Total Weight of Operational Materials	**45**	**5,754**	**4,849.6**

6.0 Results

It is important to note once again that there are currently no rubber emplacement materials and the placement of RH-TRU waste in a horizontal borehole in the wall of the repository does not require any emplacement materials.

Table 5 shows the total weight of cellulose, plastic, and rubber for operational and emplacement materials.

Table 5. Total Weight of Emplacement and Operational Materials

Type of Material	Cellulose Contribution (kg)	Plastic Contribution (kg)	Rubber Contribution (kg)
Emplacement Material	283,766.75	2,129,919.98	0.00
Operational Material	45.00	5754.00	4849.60
Total Weight of Emplacement and Operational Materials	**283,811.75**	**2,135,673.98**	**4,849.60**

Note: All values are displayed to 2 decimal places.

7.0 References

Batchelder, T. 2017. Email to Bill McInroy (Subject: Emplacement material weights.) May 31, 2017. Carlsbad, NM: Nuclear Waste Partnership, LLC, Waste Isolation Pilot Plant.

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Standiford, D. 2024. Email to Amy Lopez (Subject: RE: WDS Data Request [1 Attachment].) September 12, 2024. Carlsbad, NM: U.S. Department of Energy Carlsbad Field Office.

U.S. Department of Energy (DOE). 2023. Quality Assurance Program Document, DOE/CBFO-94-1012, Revision 14. Carlsbad, NM: U.S. Department of Energy Carlsbad Field Office.

Wagner, S. 2025. Letter to Anderson Ward (Subject: Sandia's WIPP Inventory Needs for Compliance Recertification Application 2026 12 Panel Performance Assessment) April 1, 2025. Carlsbad, NM: Sandia National Laboratories.

Attachment 1: Container Count by Type from CID Pivot Table

Data derived from the Comprehensive Inventory Database (CID)

Data Version	D.23.IS.PA
Inventory Date	12/31/2023
Query Date	03/19/2025
Status	(Multiple Items)
Cntr Form	(Multiple Items)
Empl Location	Floor

Handling	Scaling Factor
CH	1.11
RH	0.59

Values

Container Type	Handling	Sum of Empl Ct	Sum of Stor Ct	Sum of Proj Ct	Applicable Scaling Factor	Scaled Proj Ct	Scaled Stor Ct (RH)
100-gal Drum Dir Ld w/o Liner	CH	37452	370	0	1.11	0.00	0.00
55-gal CCO w/ Liner	CH	714	1687	136037	1.11	151,026.97	0.00
55-gal Drum Dir Ld w/ Liner	CH	89608	47622	72521	1.11	80,512.12	0.00
55-gal Drum Dir Ld w/o Liner	CH	25369	1895	115630	1.11	128,371.32	0.00
55-gal POC - 12" w/ Liner	CH	28531	509	20986	1.11	23,298.46	0.00
55-gal POC - 6" w/ Liner	CH	0	70	1083	1.11	1,202.34	0.00
55-gal S100 POC - 6" w/ Liner	CH	936	7	0	1.11	0.00	0.00
55-gal S300 POC - 12" w/ Liner	CH	75	18	0	1.11	0.00	0.00
85-gal Drum Dir Ld w/o Liner	CH	0	26	0	1.11	0.00	0.00
85-gal Drum w/ 1 - 55-gal Drum w/ Liner	CH	5	0	0	1.11	0.00	0.00
RH SCA-30G1 w/ Liner	RH	8	7173	2053	0.59	1,205.35	4211.38
RH SCA-30G1 w/o Liner	RH	75	0	6	0.59	3.52	0.00
RH SCA-30G3 w/ Liner	RH	0	4	0	0.59	0.00	2.35
RH SCA-55G1 w/ Liner	RH	0	5	0	0.59	0.00	2.94
RH SCA-55G1 w/o Liner	RH	0	205	13	0.59	7.63	120.36
RH SCA-55G2 w/o Liner	RH	0	46	0	0.59	0.00	27.01
SLB2 Dir Ld	CH	239	388	230	1.11	255.34	0.00
SWB Dir Ld w/ Liner	CH	1	4081	2645	1.11	2,936.45	0.00
SWB Dir Ld w/o Liner	CH	7513	200	234	1.11	259.78	0.00
SWB w/ 2 - 100-gal Drums w/o Liners	CH	1	2937	0	1.11	0.00	0.00
SWB w/ 4 - 55-gal Drums w/ Liners	CH	4947.25	59	680	1.11	754.93	0.00
SWB w/ 4 - 55-gal Drums w/o Liners	CH	1717.75	1	0	1.11	0.00	0.00
TDOP Dir Ld	CH	28	4	0	1.11	0.00	0.00
TDOP w/ 1 SWB w/o Liners	CH	4	0	0	1.11	0.00	0.00
TDOP w/ 10 - 55-gal Drums w/ Liners	CH	6457	520	0	1.11	0.00	0.00
TDOP w/ 10 - 55-gal Drums w/o Liners	CH	261	0	0	1.11	0.00	0.00
TDOP w/ 6 - 85-gal Drums w/ Liners	CH	135.67	196	0	1.11	0.00	0.00
TDOP w/ 6 - 85-gal Drums w/o Liners	CH	172.33	132	0	1.11	0.00	0.00

Calculations performed independent of the CID

Attachment 2: Emplacement Material Weights from WDS (Batchelder 2017)

Mcinroy, Bill

From: Batchelder, Terry - NWP <Terry.Batchelder@wipp.ws>
Sent: Wednesday, May 31, 2017 2:22 PM
To: Mcinroy, Bill
Subject: RE: Emplacement material weights

Good afternoon Bill,

A SLB2 is emplaced into the waste array on the floor with a 13 Ton diesel forklift. There is no slip-sheet associated with this container.

If you have any questions please call.

Terry Batchelder MSM
Government Contractor
Sr. Support Waste Handling Engineer
Subcontract Technical Representive
(575) 234-8479 (desk)
(575) 234-8850 pager 155

From: Mcinroy, Bill [mailto:wmcinroy@lanl.gov]
Sent: Wednesday, May 31, 2017 2:15 PM
To: Batchelder, Terry - NWP
Subject: FW: Emplacement material weights

Terry, I work for LANL-Co and we are trying to find out if the SLB2 uses any type of slip sheet when being emplaced. According to the WDS there are no emplacement material associated with the SLB2 as shown in the table below but we want to confirm that with someone in operations.

Thank you,

Bill McInroy
Inventory Team Lead
LANL-CO, Contractor to the
United States Department of Energy
575-628-0436 (work)
575-706-0948 (cell)

From: Offner, Steve - NWP [mailto:Steve.Offner@wipp.ws]
Sent: Wednesday, May 31, 2017 12:28 PM
To: Mcinroy, Bill
Subject: RE: Emplacement material weights

Hi Bill,

There have been NO changes in the WDS to the values I provided below; however, that doesn't really prove anything. For a definitive answer, I'd suggest checking with someone who has actually seen an SLB2 emplaced. Terry Batchelder of Waste Operations (234-8479) is usually my go-to guy for questions like this.

Steve Offner
Government Contractor
WWIS/WDS Database Administrator
offners@wipp.ws
575-234-7468 (desk)
575-234-7056 (fax)
575-200-5326 (cell)

From: Mcinroy, Bill [mailto:wmcinroy@lanl.gov]
Sent: Wednesday, May 31, 2017 12:06 PM
To: Offner, Steve - NWP
Subject: RE: Emplacement material weights

Steve we are working on our emplacement material analysis that we do every few years and during the technical review a question was asked about the SLB. The technical reviewer wanted to know what documentation we had that SLBs don't use a slip sheet. We responded that based on the table that you provided us from the WDS on waste emplacement materials the SBL wasn't listed as having any emplacement materials. We have used this assumption in the last few analysis so I want to just confirm that our assumption is correct.

Thank you,

Bill McInroy
Inventory Team Lead
LANL-CO, Contractor to the
United States Department of Energy
575-628-0436 (work)
575-706-0948 (cell)

From: Offner, Steve - NWP [mailto:Steve.Offner@wipp.ws]
Sent: Thursday, February 13, 2014 2:43 PM
To: McInroy, Bill
Cc: Casey, Steve - FedNet
Subject: RE: Emplacement material weights

Does this provide what you need?

Waste Emplacement Materials (per Assembly):

Assembly Type	Cntr Count	Cellulosics (kg)	Plastics (kg)
55G Drum	7		16.80
85G Drum	4		14.80
100G Drum	3		14.55
SCA	3		14.10
SWB	1	3.73	
TDOP	1	3.73	
25-lb MgO Sack	1		.45
3000-lb MgO Sack	1	3.45	3.45
4100-lb MgO Sack	1	3.45	3.45
4200-lb MgO Sack	1	3.45	3.45

Note: The above values were initially introduced in WWIS version 5.1 in March 2005. (I'm sure they're correct, because according to the WWIS 5.1 Requirements Document, they were verified by "Senior Engineer Curtis Chester of the Integrated Waste Operations group.")

Let me know if you have any questions or need anything else.

Steve Offner
Government Contractor
WWIS/WDS Database Administrator
offners@wipp.ws
575-234-7468 (desk)
575-234-7026 (fax)
575-200-5326 (cell)

From: Steve Casey [mailto:steve.casey@cbfo.doe.gov]
Sent: Thursday, February 13, 2014 2:12 PM
To: Offner, Steve - NWP
Cc: McInroy, Bill
Subject: RE: Emplacement material weights

Steve,

Can you please send Bill the reference values for the assigned parameter weights?

From: McInroy, Bill [mailto:wmcinroy@lanl.gov]
Sent: Thursday, February 13, 2014 1:38 PM
To: Steve Casey; Steve Casey - WIPPNet
Cc: 'Offner, Steve - NWP' (Steve.Offner@wipp.ws)
Subject: RE: Emplacement material weights

Your assumption is correct. I would like the assigned value weights for the emplacement materials for the different packaging configuration for both plastic and cellulose. For example the 7-pack in our analysis has the plastic emplacement material which includes slip sheets, top reinforcing plate and stretch wrap at 16.783 kg. I just need a total mass of plastic and cellulose for the different packaging configuration and the supersack. Please let me know if I only confused the request even more.

Thank you,

Bill McInroy
Inventory Team Lead
LANL-CO, Contractor to the
United States Department of Energy
575-628-0436 (work)
575-706-0948 (cell)

From: Steve Casey [mailto:steve.casey@cbfo.doe.gov]
Sent: Thursday, February 13, 2014 12:07 PM
To: McInroy, Bill; Steve Casey - WIPPNet
Cc: 'Offner, Steve - NWP' (Steve.Offner@wipp.ws)
Subject: RE: Emplacement material weights

Bill

Can you help clarify? The message below is not clear on what you're seeking.

My interpretation is that you want to see the "assigned value weights" for added materials. But, you may be seeking total values from all sources (assigned and weighed).

From: McInroy, Bill [mailto:wmcinroy@lanl.gov]
Sent: Thursday, February 13, 2014 10:56 AM
To: Steve Casey - WIPPNet
Cc: 'Offner, Steve - NWP' (Steve.Offner@wipp.ws)
Subject: Emplacement material weights

Steve,
We are writing an analysis "Estimation of Cellulose, Plastic, and Rubber Emplacement Materials in the Waste Isolation Pilot Plant (WIPP)", which we do every recertification year for PA. I would like to see if the weights that we have been using for the different packaging configuration (i.e. 7-pack, 3-pack, SWB, etc.) for plastic and cellulose emplacement materials are equivalent to the weights that you use in the WDS and if not I would like our analysis to provide the most current data (WDS). Could you please have Steve Offner run me that query from the WDS?

Thank you,

Bill McInroy
Inventory Team Lead
LANL-CO, Contractor to the
United States Department of Energy
575-628-0436 (work)
575-706-0948 (cell)

Attachment 3: Emplacement Material Weights from Washington TRU Solutions (WTS) (Jackson 2004)

535553

Bill McInroy

From: Jackson, John [John.Jackson@wipp.ws]
Sent: Wednesday, May 05, 2004 9:50 AM
To: McInroy, Bill - Stoller; Strait, Anne; Leigh, Christi - SNL
Subject: FW: Supersack Material Weights

WTS Emplacement Material Weights

This should complete the list.
j

> -----Original Message-----
> From: Guy, John
> Sent: Wednesday, May 05, 2004 9:53 AM
> To: Jackson, John
> Subject: Supersack Material Weights
>
> John,
> Here are the final two measurements that you requested: Supersack Bag
> - 7.6 lbs. Cardboard Inserts (6) - 7.6 lbs.
> If there is any additional information that you need please let me know.
> John

PA CDL 05/05/04
CDL 05/05/04

~~FD~~

WPP: 1.4.1.2: ~~PA~~: QA-L: 533999

Information Only

Bill Mcinroy

From: Jackson, John [John.Jackson@wipp.ws]
Sent: Tuesday, May 04, 2004 1:09 PM
To: McInroy, Bill - Stoller
Cc: Strait, Anne; Leigh, Christi - SNL
Subject: FW: Waste configuration

Bill,
The only items left now are the supersacks and cardboard inserts for each. We should have those this week. Thanks, John

-----Original Message-----
From: Guy, John
Sent: Tuesday, May 04, 2004 1:00 PM
To: Jackson, John
Subject: RE: Waste configuration

John,
I will provide the supersack item weights as soon as the supersack supplier makes them available to us. The 7-pack weights are as follows: Reinforcement plate - 17.4 lbs. 7-pack slipsheet - 17.4 lbs. stretch wrap (18 wraps) - 2.2 lbs.

Please contact me at extension 8906 if you have any questions. John

-----Original Message-----
From: Jackson, John
Sent: Monday, May 03, 2004 10:17 AM
To: Guy, John
Subject: FW: Waste configuration

Please help with the weights below.

-----Original Message-----
From: Bill Mcinroy [mailto:bmcinroy@stoller.com]
Sent: Monday, May 03, 2004 10:12 AM
To: 'Jackson, John'
Subject: RE: Waste configuration

John, thank you for the information you provided. I still have some hole with the weight for the CPR used for operations. If you can assist me in getting this information it would be helpful but if you don't have the information or time please let me know and I will seek other sources. The following information is needed before SNL can determine the influence operation CPR has on the repository in relations to MgO.

1. Supersack
   a. Weight of the woven polypropylene supersack - ____?
   b. Weight of the cardboard stabilizer - _____?
   c. Weight of the slipsheet - 17.4 lbs. (Weights verified by Mark)

2. 7-pack
   a. Weight of the top plastic reinforcing plate - ____?
   b. Weight of the slipsheet - 20.5 lbs. (from drawing you provided but has not been verified by Mark)
   c. Weight of the stretch wrap - ____?

3. 4-pack
   a. Weight of the top plastic reinforcing plate and slipsheet - 32.6 lbs. (Weights verified by Mark)
   b. Weight of the stretch wrap - ____?

Information Only

4. 3-pack
a. Weight of the top plastic reinforcing plate and slipsheet - 32 lbs. (Weights verified by Mark)
b. Weight of the stretch wrap - ____?

5. SWB
a. Weight of the cardboard Slipsheet - 8.2 lbs (I am assuming the cardboard slipsheet that Mark provided are for the SWB and TDOP). (Weights verified by Mark)

6. TDOP
a. Weight of the cardboard Slipsheet - 8.2 lbs (I am assuming the cardboard slipsheet that Mark provided are for the SWB and TDOP. (Weights verified by Mark)

Thanks so much for your help and if you see something I am missing in regards to CPR used in operations please let me know.

Bill McInroy

-----Original Message-----
From: Jackson, John [mailto:John.Jackson@wipp.ws]
Sent: Thursday, April 29, 2004 12:03 PM
To: Strait, Anne; McInroy, Bill - Stoller; Leigh, Christi - SNL
Subject: FW: Waste configuration

> -----Original Message-----
> From: Dziamski, Mark
> Sent: Thursday, April 29, 2004 10:40 AM
> To: Jackson, John
> Subject: RE: Waste configuration
>
> John,
>
> Here are the weights as promised.
>
> Cardboard Slipsheets - 8.2 lbs
> Plastic Supersack Slipsheets - 17.4 lbs
> 85 gal 4pack set - 32.6 lbs
> 100 gal 3pack set - 32.0 lbs
>
> Mark
>
> -----Original Message-----
> From: Jackson, John
> Sent: Thursday, April 29, 2004 8:49 AM
> To: Strait, Anne; Dziamski, Mark
> Cc: McInroy, Bill - Stoller; Leigh, Christi - SNL; Guy, John
> Subject: RE: Waste configuration
>
> They have the 3-pack and 4-pack drawings. Here are the other drawings.
> The weight is not estimated on the drawing so Mark Dziamski or John Guy
> will need to weigh those. It probably wouldn't hurt to get an actual
> weight from the 3-pack and 4-pack sheets since we have those.
>
> Mark/John,
> Let me know when you can weigh the sheets and stretch wrap, I will help in
> anyway needed.

Information Only

>
> Thanks,
> John
> << File: 412F013W1.DWG >> << File: 412F013W2.dwg >> << File:
> 412F025W.DWG >>
>
> -----Original Message-----
> From: Strait, Anne
> Sent: Thursday, April 29, 2004 8:41 AM
> To: Dziamski, Mark; Jackson, John
> Cc: McInroy, Bill - Stoller; Leigh, Christi - SNL
> Subject: RE: Waste configuration
>
> Did we supply the weight of the typical 7 pack shrink wrap and
the
> cardboard associated with the MgO to Bill M. ? Also did we provide
him
> with the slip sheet drawings? Let me know. AE Strait
>
> -----Original Message-----
> From: Strait, Anne
> Sent: Thursday, April 15, 2004 10:29 AM
> To: Dziamski, Mark; Gerle, Mike - WRES; Madl, Larry
-
> WRES; Morrison, Robbie; Kessel, David S. - SNL; Jackson, John; Most,
> Wille - WRES; Leigh, Christi - SNL
> Cc: Jackson, Kim; Garcia, John; Kouba, Steve - WRES;
> Chavez, Rick - WRES; Elmore, Randy; Shoemaker, Paul - SNL; Britain,
> Randy; Bellows, Hardy; McCormick, James
> Subject: RE: Waste configuration task force
meeting
>
>
> Please attend a waste configuration task force
> meeting on Friday, April 16, at 0800 in Room 224 (located towards the
> south end of the SWB second floor). The meeting should last about an
> hour. The schedule has been updated and a new item has been added.
>
> << File: waste configuration schedule.wpd >>
>
> Thank you,
> AE Strait
> Manager, WTS Nuclear Safety
> Ext 8636
>
>
>
>

Information Only

Attachment 4: Weight of Non-Containerized CPR Material from WDS (Standiford 2024)

Lopez, Amy Lynn

From: Dan Standiford <Dan.Standiford@cbfo.doe.gov>
Sent: Wednesday, September 18, 2024 6:45 AM
To: Lopez, Amy Lynn
Cc: Andy Walker
Subject: [EXTERNAL] RE: WDS Data Request
Attachments: standid13a.xlsx

Good morning Amy,

Here is the WDS data report in the format you requested.

Let me know if anything else is needed.

Best regards,

Dan Standiford, PE
U.S. Department of Energy, Carlsbad Field Office
TRANSCOM and WDS manager
NTP Operations Division
PO Box 3090
Carlsbad, NM 88221-3090
575-725-8203 Cell

From: Lopez, Amy Lynn <amy_l@lanl.gov>
Sent: Tuesday, September 17, 2024 2:16 PM
To: Dan Standiford <Dan.Standiford@cbfo.doe.gov>
Subject: RE: WDS Data Request

Thank you

Amy L. Lopez
TRU Waste Inventory Team
Repository Science and Operations (RSO)

Phone: 575.628.0925

From: Dan Standiford <Dan.Standiford@cbfo.doe.gov>
Sent: Tuesday, September 17, 2024 2:15 PM
To: Lopez, Amy Lynn <amy_l@lanl.gov>
Subject: [EXTERNAL] RE: WDS Data Request

Good afternoon Amy,

Your welcome.

I will ask our contractor if they can provide the data to you in the previous report format.

Best regards,

Dan Standiford, PE
U.S. Department of Energy, Carlsbad Field Office
TRANSCOM and WDS manager
NTP Operations Division
PO Box 3090
Carlsbad, NM 88221-3090
575-725-8203 Cell

From: Lopez, Amy Lynn <amy_l@lanl.gov>
Sent: Tuesday, September 17, 2024 2:06 PM
To: Dan Standiford <Dan.Standiford@cbfo.doe.gov>
Cc: Young, Jerry Lee <jlyoung@lanl.gov>; Andy Walker <andy.walker@cbfo.doe.gov>
Subject: RE: WDS Data Request

Hi Dan,

Thank you! I appreciate the quick response.

Would it be possible to get the data in a format like previous reports? I've attached an older report for your reference.

Amy L. Lopez
TRU Waste Inventory Team
Repository Science and Operations (RSO)

Phone: 575.628.0925

From: Dan Standiford <Dan.Standiford@cbfo.doe.gov>
Sent: Thursday, September 12, 2024 10:55 AM
To: Lopez, Amy Lynn <amy_l@lanl.gov>
Cc: Young, Jerry Lee <jlyoung@lanl.gov>; Andy Walker <andy.walker@cbfo.doe.gov>
Subject: [EXTERNAL] RE: WDS Data Request

Hi Amy,

I have attached a file with the CPR information you requested. Let me know if you have any questions.

Dan Standiford, PE
U.S. Department of Energy, Carlsbad Field Office
TRANSCOM and WDS manager
NTP Operations Division
PO Box 3090
Carlsbad, NM 88221-3090
575-725-8203 Cell

From: Lopez, Amy Lynn <amy_l@lanl.gov>
Sent: Wednesday, September 11, 2024 2:58 PM
To: Dan Standiford <Dan.Standiford@cbfo.doe.gov>
Cc: Young, Jerry Lee <jlyoung@lanl.gov>
Subject: WDS Data Request

Hi Dan,

I am with the TRU Waste Inventory Team for LANL and am currently working on an analysis that estimates the total cellulose, plastic, and rubber emplacement and operational material that will ultimately be disposed of in the WIPP facility. Data from this analysis will be used in the performance assessment inventory report for the compliance recertification application performance assessment calculations. I am requesting a query be run in the WDS that provides the total mass (in kilograms) individually for cellulose, plastic and rubber for non-containerized material (e.g. pigs, equipment, etc.) that was in the WIPP facility as of 12/31/2023. If possible, I would like to have this information by COB 9/30/24. Please let me know if you have any questions regarding this request.

Amy L. Lopez
TRU Waste Inventory Team Member
Repository Science and Operations (RSO)

Phone: 575.628.0925

Los Alamos National Laboratory
lanl.gov

CPR Contributions of Non-Containerized Material Emplaced at WIPP:

Panel	Room	Waste Stream	Item Count	Cellulosics (kg)	Plastic (kg)	Rubber (kg)	Total CPR (kg)
5	7	WI-PINKPIG	6	3.00	21.00		**24.00**
5	6	WI-PINKPIG	6	3.00	21.00		**24.00**
5	5	WI-PINKPIG	6	3.00	21.00		**24.00**
5	4	WI-PINKPIG	6	3.00	21.00		**24.00**
5	3	WI-PINKPIG	6	3.00	21.00		**24.00**
5	2	WI-PINKPIG	6	3.00	21.00		**24.00**
5	1	WI-PINKPIG	6	3.00	21.00		**24.00**
6	7	WI-PINKPIG	6	3.00	21.00		**24.00**
6	6	WI-PINKPIG	6	3.00	21.00		**24.00**
6	5	WI-PINKPIG	6	3.00	21.00		**24.00**
6	4	WI-PINKPIG	6	3.00	21.00		**24.00**
6	3	WI-PINKPIG	6	3.00	21.00		**24.00**
6	2	WI-PINKPIG	6	3.00	21.00		**24.00**
6	1	WI-PINKPIG	6	3.00	21.00		**24.00**
7	7	WI-PINKPIG	6	3.00	21.00		**24.00**
7	6	WI-EQUIP1	6		491.00	1,748.00	**2,239.00**
7	6	WI-EQUIP2	4		143.00	539.00	**682.00**
		WI-EQUIP1	3		165.00	63.60	**228.60**
		WI-PANEL9-CPR	11		4,640.00	2,499.00	**7,139.00**
		Totals:	**114**	**45.00**	**5,754.00**	**4,849.60**	**10,648.60**