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**APPENDIX J1**

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**ACTIVE INSTITUTIONAL CONTROLS DURING POST-CLOSURE**



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**TABLE OF CONTENTS**

List of Figures .....	J1-ii
Acronyms .....	J1-ii
Introduction.....	J1-1
Purpose.....	J1-2
Scope.....	J1-2
Background.....	J1-3
J1.1 Active Institutional Controls.....	J1-4
J1.1.1 Repository Footprint Fencing .....	J1-6
J1.1.2 Surveillance Monitoring .....	J1-6
J1.1.3 Maintenance and Remedial Actions .....	J1-7
J1.1.4 Control and Clean-up of Releases.....	J1-7
J1.1.5 Groundwater Monitoring .....	J1-8
J1.2 Additional Post-Closure Activities .....	J1-8
J1.3 Quality Assurance .....	J1-8
References.....	J1-9

1  
2  
3  
4  
5  
6  
7  
8  
9  
10  
11  
12  
13  
14  
15  
16  
17

**List of Figures**

<b>Figure</b>	<b>Title</b>
Figure J1-1	Spatial View of WIPP Surface and Underground Facilities
Figure J1-2	Standard Waste Box and Seven-Pack Configuration
Figure J1-3	Typical Shaft Sealing System
Figure J1-4	Perimeter Fenceline and Roadway

**Acronyms**

CH	contact-handled
CFR	Code of Federal Regulations
DOE	U.S. Department of Energy
EPA	U.S. Environmental Protection Agency
LWA	Land Withdrawal Act
SWB	standard waste box
TRU	transuranic
WIPP	Waste Isolation Pilot Plant

1 **APPENDIX J1**

2 **ACTIVE INSTITUTIONAL CONTROLS DURING POST-CLOSURE**

3 Introduction

4 Under the requirements of 20.4.1.500 NMAC (incorporating 40 CFR §264.118(b), the following  
5 activities identified as active institutional controls during post-closure are incorporated into the  
6 Post-Closure Plan.

7 The post-closure requirements of this permit include 20.4.1.500 NMAC, incorporating:

- 8 • 40 CFR §264.117(a)(1), which requires that

9 “Post-closure care for each hazardous waste management unit subject to the requirements of  
10 §264.117 through 264.120 must begin after completion of closure of the unit and continue for  
11 30 years after that date...”

- 12 • 40 CFR §264.601, which requires that

13 “A miscellaneous unit must be...maintained and closed in a manner that will ensure  
14 protection of human health and the environment...”

- 15 • and 40 CFR §264.603, which requires that

16 “A miscellaneous unit that is a disposal unit must be maintained in a manner that complies  
17 with §264.601 during the post-closure care period.”

18 The containment requirements for a disposal system for transuranic (**TRU**) radioactive wastes  
19 are defined in Title 40 CFR §191.13 (U.S. Environmental Protection Agency [**EPA**] 1993). 40  
20 CFR §191.14 is titled Assurance Requirements. With regard to the active institutional controls  
21 aspect of Assurance Requirements, 40 CFR §191.14 states the following:

22 “To provide the confidence needed for long-term compliance with the requirements  
23 of §191.13, disposal of spent fuel or high-level or transuranic wastes shall be  
24 conducted in accordance with the following provisions... (a) Active institutional  
25 controls over disposal sites should be maintained for as long a period of time as is  
26 practicable after disposal; however, performance assessments that assess isolation of  
27 the wastes from the accessible environment shall not consider any contribution from  
28 active institutional controls for more than 100 years after disposal... “

29 40 CFR §191.12 states the following:

30 “Active institutional controls mean:

- 31 1) controlling access to a disposal site by any means other than passive  
32 institutional controls,

- 1        2)        performing maintenance operations or remedial actions at a site,
- 2        3)        controlling or cleaning up releases from a site, or
- 3        4)        monitoring parameters related to disposal system performance.”

4        **Purpose:** This Permit Attachment describes the design of a system that the Permittees will  
5        implement for compliance with the requirements of 20.4.1.500 NMAC (incorporating 40 CFR  
6        §264.118(b)) and 40 CFR §191.14(a) to control access to the Waste Isolation Pilot Plant (**WIPP**)  
7        disposal site and implement maintenance and remedial actions pertaining to the site access  
8        controls. In addition, this Permit Attachment addresses the scheduling process for control of  
9        inspection, maintenance, and periodic reporting related to long-term monitoring. Long-term  
10       monitoring addresses the monitoring of disposal system performance, as required by 40 CFR  
11       §191.14(b), and environmental monitoring, in accordance with this Permit and the Consultation  
12       and Cooperation Agreement between the U.S. Department of Energy (**DOE**) and the state of  
13       New Mexico. The scheduling process will also address evaluation of testing activities related to  
14       the permanent marker system design contained within the passive institutional controls (not  
15       required by this permit).

16       Implementation of active institutional controls at the WIPP will commence when final facility  
17       closure is achieved, as specified in Module II and Permit Attachment I. Implementation of active  
18       institutional controls marks the transition from the active life of the facility (which ends upon  
19       certification of closure) to the post-closure care period, as specified in 20.4.1.500 NMAC  
20       (incorporating 40 CFR §264 Subpart G). The Permittees will continue the imposition of active  
21       institutional controls under this Permit until NMED approves the post-closure certification  
22       specified in Module VI and Permit Attachment J.

23       Decommissioning activities include decontamination and site restoration. The decontamination  
24       effort will be completed prior to sealing of the shafts to allow disposal of all derived waste  
25       (radioactive and/or mixed waste derived from TRU/TRU-mixed waste received at the WIPP)  
26       into the repository. The implementation of active institutional controls upon certification of  
27       facility closure will prevent human intrusion into the repository. The Permittees’ restoration  
28       efforts will return the land disturbed by the WIPP activities to a stable ecological state that will  
29       assimilate with the surrounding undisturbed ecosystem. Necessary exceptions to returning the  
30       site to its full pre-WIPP condition include measurements associated with long-term monitoring.

31       **Scope:** The active institutional control requirements include a means of controlling access to the  
32       site of the repository’s surface footprint (the repository area projected to the surface) and  
33       maintenance, including corrective actions, for access control system components. Active control  
34       of access to the site will be exercised by the Permittees for the duration of the post-closure care  
35       period. Although the Permittees are only required to maintain active institutional controls until  
36       approval of the post-closure certification by NMED, the Permittees will continue active  
37       institutional controls for at least one hundred (100) years after final facility closure to satisfy  
38       other regulatory requirements. Control of access will prevent intrusion into the disposed waste by  
39       deep drilling or mining for natural resources. This Permit Attachment also specifies a process for  
40       scheduling activities related to the long-term monitoring of the repository. Some of the activities  
41       supporting the monitoring programs will be initiated during the active life of the facility to

1 establish databases. These activities are planned to continue beyond closure through the time  
2 after removal of the site structures and return of the land disturbed by the WIPP activities to a  
3 stable ecological state that will assimilate with the surrounding undisturbed ecosystem. Long-  
4 term monitoring requirements will be necessarily integrated with efforts toward returning the  
5 land to a stable ecological state.

6 **Background:** The WIPP was sited and designed as a research and development facility to  
7 demonstrate the safe disposal of radioactive wastes. The wastes are derived from DOE defense-  
8 related activities. Specifically, the mission of the WIPP project is to conduct research,  
9 demonstration, and siting studies relevant to the permanent disposal of TRU wastes. Most of  
10 these wastes will be contaminated with hazardous constituents, making them mixed wastes.

11 The LWA addresses the disposal phase of the WIPP project, the period following closure of the  
12 site, and the removal of the surface facilities. The LWA set aside 10,240 acres (4,144 hectares)  
13 located in Eddy County, 26 miles (42 kilometers) east of Carlsbad, New Mexico, as the WIPP  
14 site. A 277-acre (112-hectare) portion within the 10,240 acres (4,144 hectares) is bounded by a  
15 barbed wire fence. This fenced area contains the surface facilities and the mined salt piles for the  
16 WIPP site. Figure J1-1 is a cutaway illustrating the spatial relationship of the surface facilities  
17 and the underground repository.

18 Upon receipt of the necessary certifications and permits from the EPA and the New Mexico  
19 Environment Department, the Permittees will begin disposal of contact-handled (**CH**) and  
20 remote-handled (**RH**) TRU and TRU mixed waste in the WIPP. This waste emplacement and  
21 disposal phase will continue until the regulated capacity of the repository of 6,200,000 cubic feet  
22 (175,588 cubic meters) of TRU and TRU mixed waste has been reached, and as long as the  
23 Permittees comply with the requirements of the Permit. For the purposes of this Permit  
24 Attachment, this time period is assumed to be 25 years. The waste will be shipped from DOE  
25 facilities across the country in specially designed transportation containers certified by the  
26 Nuclear Regulatory Commission. The transportation routes from these facilities to the WIPP  
27 have been predetermined. The CH TRU mixed waste will be packaged in 55-gallon (208-liter),  
28 85-gallon (320-liter), 100-gallon (379-liter) steel drums, standard waste boxes (**SWBs**), and/or  
29 ten drum overpacks (**TDOPs**). An SWB is a steel container having a free volume of  
30 approximately 65 cubic feet (1.8 cubic meters). Figure J1-2 shows the general arrangement of a  
31 seven-pack of drums and an SWB as received in a Contact-Handled Package. RH TRU mixed  
32 waste inside a Remote-Handled Package is contained in one or more of the allowable containers  
33 described in Permit Attachment M1.

34 Upon receipt and inspection of the waste containers in the waste handling building, the  
35 containers will be moved into the repository 2,150 feet (655 meters) below the surface. The  
36 containers will then be transported to a disposal room. (See Figure J1-1 for room and panel  
37 arrangement.) The initial seven disposal rooms are in Panel 1. Panel 1 is the first of eight panels  
38 planned to be excavated. Special supports and ground control corrective actions have been  
39 implemented in Panel 1 to ensure its stability. Upon filling an entire panel, that panel will be  
40 closed to isolate it from the rest of the repository and the ventilation system. During the period of  
41 time it takes to fill a given panel, an additional panel will be excavated. Sequential excavation of

1 Panels 2 through 8 will ensure that these individual panels remain stable during the entire time a  
2 panel is being filled with waste. Ground control maintenance and evaluation with appropriate  
3 corrective action will be required to ensure that Panels 9 and 10 (ventilation and access drifts in  
4 the repository) remain stable.

5 Decontamination of the WIPP facility will commence with a detailed radiation survey of the  
6 entire site. Contaminated areas and equipment will be evaluated and decontaminated in  
7 accordance with applicable requirements. Where decontamination efforts identify areas that meet  
8 clean closure standards for permitted container storage units and are below radiological release  
9 criteria, routine dismantling and salvaging practices will determine the disposition of the material  
10 or equipment involved. Material and equipment that do not meet these standards and criteria will  
11 be emplaced in the access entries (Panels 9 and/or 10). Upon completion of emplacement of the  
12 contaminated facility material, the entries will be closed and the repository shafts will be sealed.  
13 Final repository closure includes sealing the shafts leading to the repository. Figure J1-3  
14 illustrates the shaft sealing arrangement. Certification of closure will end disposal operations and  
15 initiate the post-closure care period for implementation of active institutional controls.

#### 16 J1.1 Active Institutional Controls

17 Active institutional controls during post-closure consist of three elements:

- 18 • controlling access to a disposal site,
- 19 • performing maintenance operations or remedial actions at a site, and
- 20 • controlling or cleaning up releases from a site.

21 The LWA has removed the WIPP site from public use as a site for mining and other types of  
22 mineral resource extraction. Since any type of exploration activity would require authorization,  
23 the issuance of approval to intrude upon the repository is precluded by the LWA. The existence  
24 of the LWA as law permits meeting the requirements of the first element above by implementing  
25 low technology barriers. These barriers include a posted fence and active surveillance at a  
26 frequency that denies sufficient time for an individual or organization to intrude into the  
27 repository undetected using today's drilling technology. Maintenance and remedial actions at the  
28 WIPP site will be conducted by the Permittees at the time of implementing the access controls  
29 for the site. The control or cleanup of releases from the site will be conducted as part of the  
30 operational program prior to sealing of the shafts. This is necessary to ensure that all derived  
31 waste is disposed of within the repository prior to shaft sealing.

32 The Permittees shall maintain the access controls. This requirement includes the maintenance  
33 and corrective actions necessary to ensure that the fence and patrol requirements (surveillance)  
34 are met. The active institutional controls to be implemented by the Permittees after final closure  
35 are the following:

- 1 1. A fence line will be established to control access to the repository footprint area on the  
2 surface. A standard four-strand (three barbed and one unbarbed, in accordance with the  
3 Bureau of Land Management specifications) wire fence will be erected along the  
4 perimeter of the repository surface footprint. To provide access to the repository footprint  
5 during construction of the berm (which may be built in multiple sections simultaneously),  
6 the fence will have gates placed approximately midway along each of the four sides.  
7 these gates will remain locked with access controlled by the Permittees. The western gate  
8 will be 20 feet (6 meters) wide. The remaining three gates will each be 16 feet (4.9  
9 meters) wide. Additional fencing will be constructed where appropriate for remote  
10 locations that are used for disposal system monitoring. Such fences will meet the same  
11 construction specifications as the repository footprint perimeter fence.
- 12 2. Unpaved roadways 16 feet (4.9 meters) wide will be established along the perimeter of  
13 the barbed wire fence as well as along the WIPP site boundary. These roadways will be  
14 constructed so as to provide ready vehicle access to any point around the fenced  
15 perimeter and the site boundary. These roadways will facilitate inspection and  
16 maintenance of the fenceline and will allow visual observation of the repository footprint  
17 and the site boundary to the extent permitted by the lay of the land. These roadways will  
18 connect to the paved south access road. Roads to remote sites will also be constructed and  
19 maintained where appropriate.
- 20 3. The fence line will be posted with signs having, as a minimum, a legend reading  
21 "Danger—Unauthorized Personnel Keep Out" (20.4.1.500 NMAC (incorporating 40  
22 CFR §264.14[c])) and warning against entering the area without specific permission of  
23 the Permittees. The legend must be written in English and Spanish. The signs must be  
24 legible from a distance of at least 25 feet (7.6 meters). The size of the visual warning and  
25 the spacing of the warning signs will be sufficiently large and close to ensure that one or  
26 more of the signs can be seen from any approach prior to an individual actually making  
27 contact with the fence line. In no case will the spacing be greater than 300 feet (91.5  
28 meters).
- 29 4. The Permittees will ensure that periodic inspection and expedited corrective maintenance  
30 are conducted on the fence line, its associated warning signs, and roadways.
- 31 5. The Permittees will provide for routine periodic patrols and surveillance of all areas  
32 controlled by or under the authority of the Permittees by personnel trained in security  
33 surveillance and investigation.
- 34 6. The Permittees will implement the periodic monitoring requirements of the long-term  
35 monitoring system.
- 36 7. The Permittees will submit a Permit modification request for any proposed modifications  
37 to the active institutional controls appropriate for access control, as specified in  
38 20.4.1.900 NMAC (incorporating 40 CFR 270.42).

- 1        8. The Permittees will immediately take appropriate action to address abnormal conditions  
2        identified during periodic surveillance and inspections. Abnormal conditions include any  
3        natural or human-caused conditions which would affect the integrity of the active  
4        institutional controls.
- 5        9. Reports addressing activities associated with the performance of the active access  
6        controls after final closure will be prepared periodically according to applicable  
7        requirements by the Permittees for submittal to the appropriate regulatory and legislative  
8        authorities.

9        J1.1.1 Repository Footprint Fencing

10       Access to an area approximately 2,780 feet by 2,360 feet (875 meters by 720 meters) will be  
11       controlled by a four-strand barbed wire fence. A single gate will be included along each side of  
12       the fence for access. These gates will remain locked with access controlled by the Permittees.  
13       Around the perimeter of the fence, an unpaved roadway 16 feet (4.9 meters) wide will be cut to  
14       allow for patrolling of the perimeter. Figure J1-4 is an illustration of the fence line in relation to  
15       the repository footprint. Patrolling of the perimeter is based upon the need to ensure that no  
16       mining or well drilling activity is initiated that could threaten the integrity of the repository.

17       Fencing off an area larger than the disposal area footprint would not significantly reduce the risk  
18       of intrusion but would interfere with cattle grazing established prior to the LWA. The LWA  
19       states that the Secretary of Energy can allow grazing to continue where it was established prior to  
20       enactment of the LWA. Based upon current drilling technologies, discussions with local well  
21       drilling organizations, and observation of well drilling activities in the WIPP vicinity, it typically  
22       requires at least two to three days for a driller to set up a deep drilling rig and commence actual  
23       drilling operations. Attaining the 2,150-foot (655-meter) depth that would approach the  
24       repository horizon takes at least another week to 10 days. Based upon current drilling practices,  
25       patrolling the fenced area two to three times weekly would identify any potential drilling activity  
26       well before any breach of the repository could occur. Therefore, the perimeter fence will be  
27       patrolled three times weekly after final closure.

28       Construction of access control systems using higher technology than described is not required.  
29       Likewise, continuous surveillance whether human or electronic is not required.

30       J1.1.2 Surveillance Monitoring

31       The Permittees will conduct periodic surveillance of the site and the repository footprint during  
32       the post-closure period. Unpaved roadways around the WIPP site boundary and around the  
33       repository footprint will facilitate such surveillance. Contractual arrangements with a local  
34       organization such as the Eddy County Sheriff's Department may be established which would  
35       provide some distinct advantages. Among the advantages are the following:

- 36       • deputies are trained in patrol and surveillance activities,

- 1 • deputies are authorized to arrest members of the general public who are found to be  
2 violating trespassing laws,
- 3 • the liability associated with apprehension, attempted apprehension, or circumstances  
4 arising from attempts would remain with the Sheriff's Department, and
- 5 • the general area to be patrolled is already a part of the Sheriff's area of responsibility.

6 Surveillance will consist of drive-by patrolling around the fenced perimeter a minimum of three  
7 times per week. In the course of the patrol, particular note will be taken of the fence integrity. In  
8 addition, the locked condition of each gate will be checked to ensure that gate integrity is  
9 maintained and there is no evidence of tampering. Surveillance will also include visual  
10 observation of the entire enclosed area for any signs of human activity. Additionally,  
11 surveillance patrols will be conducted around the site boundary's perimeter for signs of  
12 unauthorized human activities. A routine summary of each month's surveillance activity will be  
13 prepared documenting the date and time of each patrol and any unusual circumstances that may  
14 have been observed. This surveillance routine will continue throughout the post-closure care  
15 period.

#### 16 J1.1.3 Maintenance and Remedial Actions

17 Anticipated maintenance and remedial action issues during the post-closure care period are  
18 minimal and should encompass such issues as

- 19 • fence and road maintenance,
- 20 • repair of any damage that occurs,
- 21 • response to evidence of potential erection of drilling equipment, and
- 22 • response to unauthorized entry into prohibited areas.

23 The Permittees will provide maintenance services within a reasonable time after the need is  
24 identified during routine patrolling activity. Any observed vandalism or unauthorized entry will  
25 be investigated and action will be taken as the circumstances warrant.

#### 26 J1.1.4 Control and Clean-up of Releases

27 The decontamination process and disposal of the derived waste will be completed prior to sealing  
28 the shafts and final facility closure. With the location of the WIPP repository at 2,150 feet (655  
29 meters) below the surface and with panels closed and shafts sealed, the potential for releases of  
30 radioactive material or hazardous constituents following the sealing of the shafts is precluded.  
31 There will be no credible pathway for releases from the repository other than human intrusion.  
32 Routine patrols in accordance with access control requirements will preclude human intrusion  
33 into the repository during the post-closure period.

1 J1.1.5 Groundwater Monitoring

2 Groundwater monitoring is the only monitoring program required by the Permit that will be  
3 conducted throughout the post-closure care period. The post-closure groundwater monitoring  
4 requirements are specified in Permit Module VI and Permit Attachment L.

5 J1.2 Additional Post-Closure Activities

6 With the certification of closure of WIPP and return of the land disturbed by the WIPP activities  
7 to a stable ecological state that will assimilate with the surrounding undisturbed ecosystem,  
8 continuous occupancy of the site for operational and security purposes will cease. Any additional  
9 activities will be imposed through the Post-Closure Care Permit issued by NMED after  
10 certification of closure.

11 J1.3 Quality Assurance

12 The quality assurance and quality control plan will be applied to the procurement of materials for  
13 and the erection of the fencelines enclosing the repository footprint. In particular, quality control  
14 inspection of the placement and tensioning of the barbed wire and chain link fabric will be  
15 applied and utilized to provide reasonable assurance that the fencing structures will function  
16 during the post-closure care period with normal maintenance.

17 Quality assurance and quality control will also be applied to the sampling and analyses  
18 supporting the environmental monitoring program. Contractors collecting samples and  
19 laboratories conducting analyses for the Permittees shall be qualified in accordance with  
20 guidelines prescribed in the most current edition of the Permittees' quality assurance program  
21 document at the time that the contracts are awarded.

1

## References

- 2 EPA (U.S. Environmental Protection Agency). 1993. 40 CFR Part 191 Environmental Radiation  
3 Protection Standards for the Management and Disposal of Spent Nuclear Fuel, High-Level and  
4 Transuranic Radioactive Waste; Final Rule. *Federal Register*, Vol. 58, No. 242, pp. 66398-  
5 66416, December 20, 1993. Office of Radiation and Indoor Air, Washington, D.C.
- 6 U.S. Congress. 1992. Waste Isolation Pilot Plant Land Withdrawal Act. Public Law 102-579,  
7 106 Stat. 4777, October 1992. 102nd Congress, Washington, D.C.

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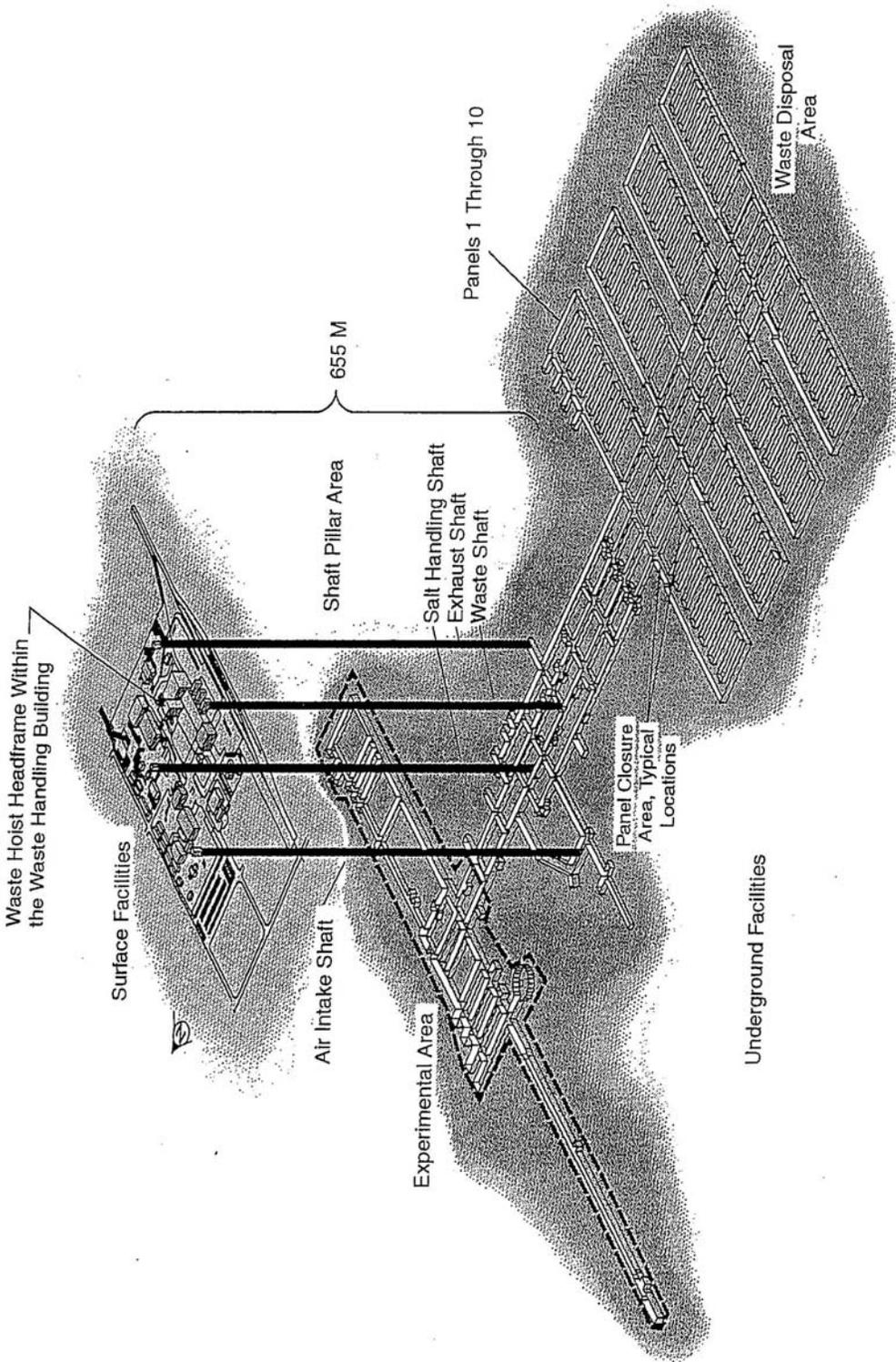
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**FIGURES**

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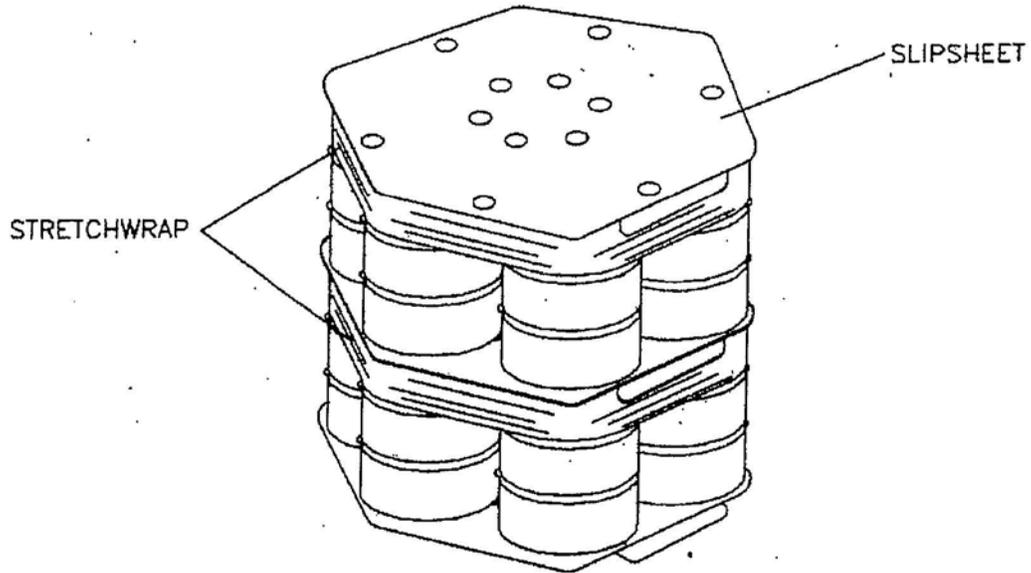
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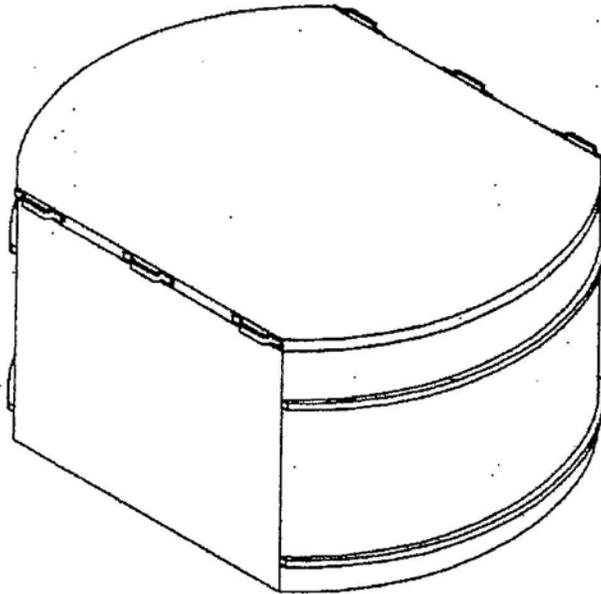


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Figure J1-1  
Spatial View of WIPP Surface and Underground Facilities



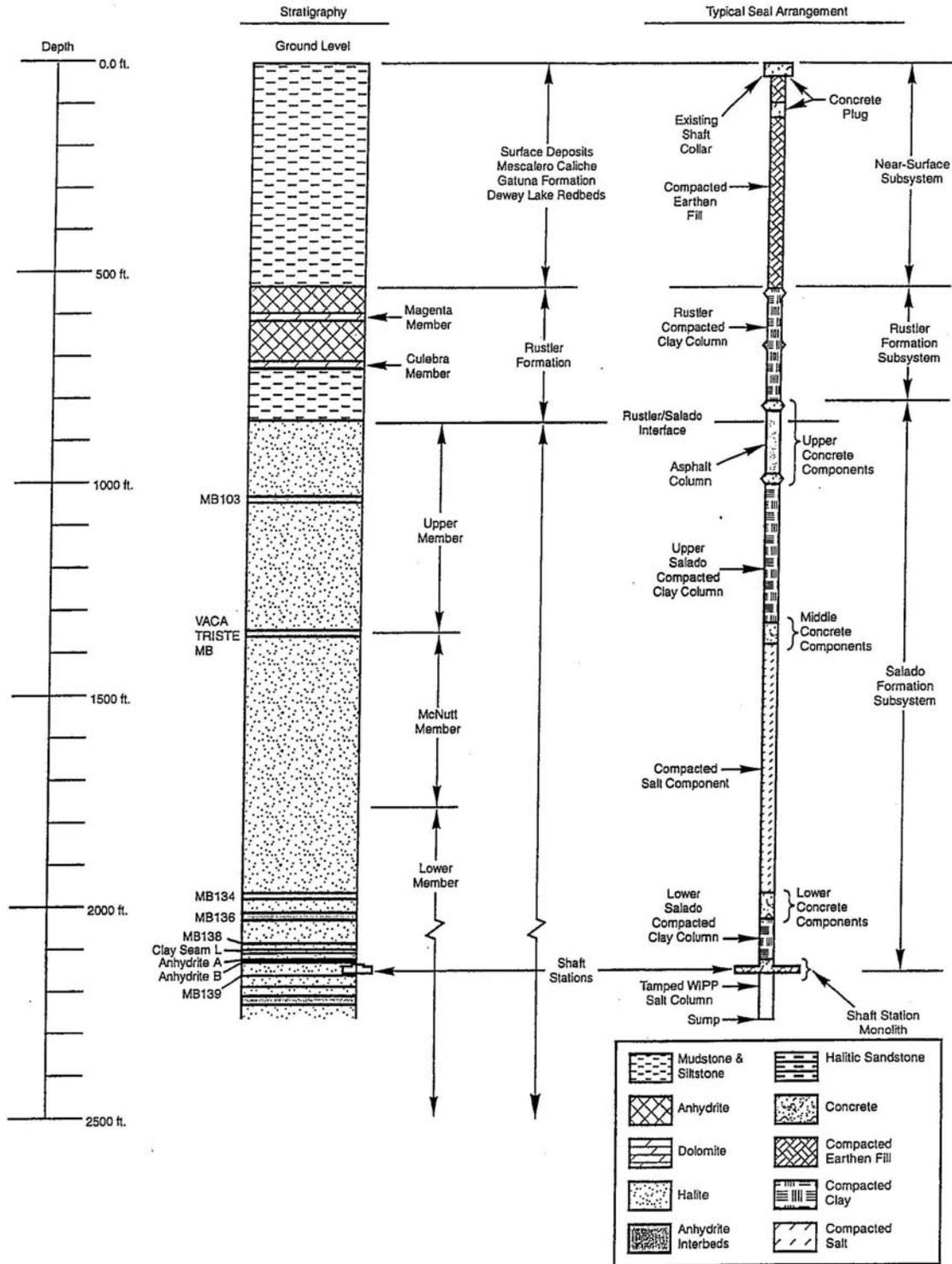
SEVEN-PACKS



STANDARD WASTE BOX

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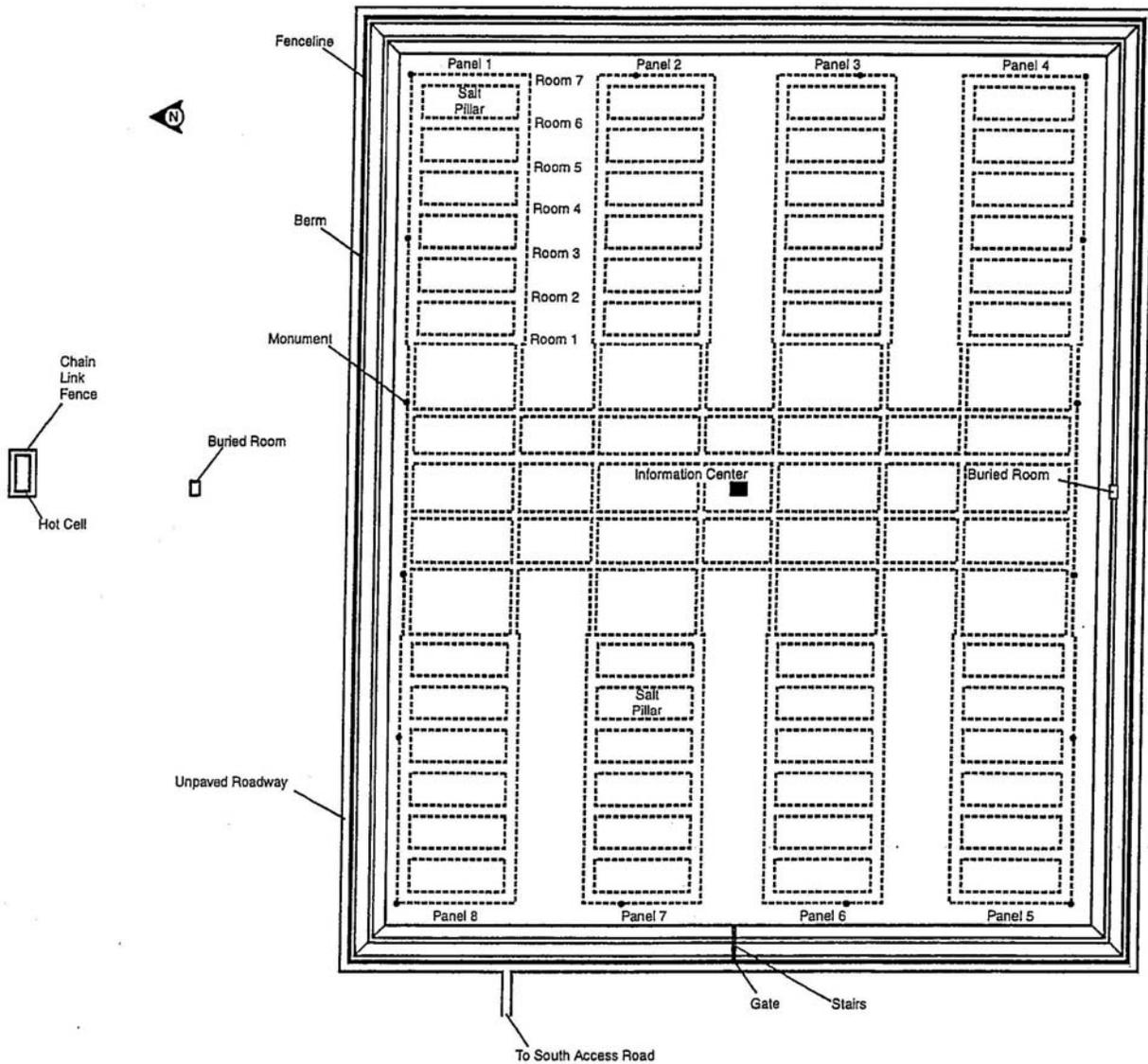
Figure J1-2  
Standard Waste Box and Seven-Pack Configuration



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Figure J1-3  
 Typical Shaft Sealing System



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Figure J1-4  
 Perimeter Fenceline and Roadway