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RENEWAL APPLICATION
CHAPTER I
CLOSURE PLAN

**RENEWAL APPLICATION
 CHAPTER-I**

CLOSURE PLAN

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1 impacts of methane flammable gas buildup and deflagration impacts that may be are postulated for
2 some closed panels. Renewal Application Chapter J (Post-Closure Plan) includes the
3 implementation of institutional controls to limit access to the disposed waste and groundwater
4 monitoring to assess disposal system performance. Until final closure is complete and has been
5 certified in accordance with 20.4.1.500 NMAC (incorporating 40 CFR §264.115), a copy of the
6 approved Closure Plan and all approved revisions will be on file at the WIPP facility and will be
7 available to the Secretary of the NMED ~~or the EPA Region VI Administrator~~ upon request.

8 I-1 Closure Plan

9 This Closure Plan is prepared in accordance with the requirements of 20.4.1.500 NMAC
10 (incorporating 40 CFR §264 Subparts G, I, and X), Closure and Post-Closure, Use and
11 Management of Containers, and Miscellaneous Units. The WIPP underground HWDUs,
12 including Panels 1 through 7 on Figure I-1, will be closed under this permit to meet the
13 performance standards in 20.4.1.500 NMAC (incorporating 40 CFR §264.601). The WIPP
14 surface facilities, including ~~Waste Handling Building Container Storage~~ WHB Unit and the
15 ~~Parking Area Container Storage Unit~~ Parking Area Unit, will be closed in accordance with
16 20.4.1.500 NMAC (incorporating 40 CFR §264.178). The Permittees may perform partial closure
17 of the WHB and or Parking Area Unit PAU HWMUs prior to final facility closure and
18 certification. For final facility closure, this plan also includes closure of future waste disposal
19 areas including Panels 8 through and 10, and closure and sealing of the facility shafts in
20 accordance with 20.4.1.500 NMAC (incorporating 40 CFR §264.601).

21 Following completion of waste emplacement in each underground HWDU, the HWDU will be
22 closed. The Permittees will notify the NMED of the closure of each underground HWDU as
23 specified in the schedule in Figure I-2. For the purpose of this Closure Plan, panel closure is
24 defined as the process of rendering underground HWDUs in the repository inactive and closed
25 according to the facility Closure Plan. Renewal Application Chapter J addresses requirements for
26 future monitoring that are deemed necessary for the post-closure period, including monitoring
27 closed panels prior to final facility closure.

28 For the purposes of this Closure Plan, final facility closure is defined as closure that will occur
29 when all waste disposal areas are filled or when the WIPP facility achieves its capacity of 6.2
30 million cubic feet (ft³) (175,600 cubic meters (m³)) of TRU waste. At final facility closure, the
31 surface container storage areas will be closed, and equipment that can be decontaminated and used
32 at other facilities will be cleaned and sent off site. Equipment that cannot be decontaminated, as
33 well as ~~plus~~ any derived waste resulting from decontamination will be placed in the last open
34 underground HWDU. Stockpiled salt may be placed in the underground; it may be used as the
35 core material for the berm component of the permanent marker system; or it must be otherwise
36 disposed of in accordance with Sections 2 and 3 of the Minerals Act of 1947 (30 U.S.C. §§602 and
37 603). In addition, shafts and boreholes that ~~which~~ lie within the WIPP Site Boundary and that

degradation of organic matter in the waste. Consequently, the emissions after panel closure are a direct function of
pressurization processes and rates within the panel.

1 penetrate the Salado **Formation** will be plugged and sealed, and surface and subsurface facilities
2 and equipment will be decontaminated and removed. Final facility closure will be completed to
3 demonstrate compliance with the Closure Performance Standards contained in 20.4.1.500 NMAC
4 (incorporating 40 CFR §264.111, 178, and 601).

5 In the event the Permittees fail to obtain an extension of the hazardous waste permit in accordance
6 with 20.4.1.900 NMAC (incorporating 40 CFR §270.51) or fail to obtain a new permit in
7 accordance with 20.4.1.900 NMAC (incorporating 40 CFR §270.10(h)), the Permittees will seek a
8 modification to this Closure Plan in accordance with 20.4.1.900 NMAC (incorporating 40 CFR
9 §270.42) to accommodate a contingency closure. Under contingency closure, storage units will
10 undergo clean closure in accordance with 20.4.1.500 NMAC (incorporating 40 CFR §264.178); ~~w~~
11 **W**aste handling equipment, shafts, and haulage ways will be inspected for hazardous waste
12 residues (using, among other techniques, radiological surveys to indicate potential hazardous
13 waste releases as described in Renewal Application Appendix I3-**(Radiological Surveys to Indicate**
14 **Potential Hazardous Waste Releases)** and decontaminated as necessary. ~~;~~ ~~and~~ ~~u~~ **U**nderground
15 HWDUs that contain radioactive mixed waste will be closed in accordance with the panel closure
16 design described in this Closure Plan. Final facility closure, however, will be redefined and a
17 request for a time extension for final closure will be requested. A copy of this Closure Plan will
18 be maintained by the Permittees at the WIPP facility and at the Department of Energy (**DOE**)
19 Carlsbad Field Office. The primary contact person at the WIPP facility is:

20 Manager, Carlsbad Field Office
21 U.S. Department of Energy
22 Waste Isolation Pilot Plant
23 P. O. Box 3090
24 Carlsbad, New Mexico 88221-3090
25 (505) **(575)** 234-7300
26

27 I-1a Closure Performance Standard

28 The closure performance standard specified in 20.4.1.500 NMAC (incorporating 40 CFR
29 §264.111), states that the closure shall be performed in a manner that minimizes the need for
30 further maintenance; that minimizes, controls, or eliminates the escape of hazardous waste; and
31 that conforms to the closure requirements of **40 CFR** §264.178 and **40 CFR** §264.601. These
32 standards are discussed in the following paragraphs.

33 I-1a(1) Container Storage Units

34 Final or partial closure of the permitted container storage units (the ~~Waste Handling~~
35 ~~Building~~ **WHB** Unit and Parking Area Unit) will be accomplished by removing all waste and waste
36 residues. Indication of waste contamination will be based, among other techniques, on the use of
37 radiological surveys as described in Renewal Application Appendix I3 **(Radiological Surveys to**
38 **Indicate Potential Hazardous Waste Releases)**. Radiological surveys use very sensitive radiation
39 detection equipment to indicate if there has been a potential release of TRU mixed waste,
40 including hazardous waste components, from a container. This allows the Permittees to indicate

1 potential releases that are not detectable from visible evidence such as stains or discoloration.
2 Visual inspection and operating records will also be used to identify areas where decontamination
3 is necessary. Contaminated surfaces will be decontaminated until radioactivity is below free
4 release limits². Once surfaces are determined to be free of radioactive waste constituents, they will
5 be tested for hazardous waste contamination. These surface decontamination activities will ensure
6 the removal of waste residues to levels protective of human health and the environment. ~~The~~
7 ~~facility is expected to require no~~ No decontamination of the WIPP facility is expected at closure
8 because any waste spilled or released during operations will be contained and removed
9 immediately. ~~Solid waste management units associated described in Permit Module VII will be~~
10 ~~subject to closure.~~ In the event areas portions of these units which that require decontamination
11 cannot be decontaminated, these portions will be removed and the resultant wastes will be
12 managed as appropriately.

13 Once the container storage units are decontaminated and certified by the Permittees to be clean, no
14 further maintenance is required. The facilities and equipment in these units will be reused for
15 other purposes as needed.

16 I-1a(2) Miscellaneous Unit

17 Post-closure migration of hazardous waste or hazardous waste constituents to ground or surface
18 waters or to the atmosphere, above levels that will harm human health or the environment, will not
19 occur due to facility engineering and the geological isolation of the unit. The engineering aspects
20 of closure are centered on the use of panel closures on each of the underground HWDUs and final
21 facility seals placed in the shafts. The design of the panel closure system is based on the criteria
22 that the closure system for closed underground HWDUs will prevent migration of hazardous waste
23 constituents in the air pathway in concentrations above health-based levels beyond the WIPP land
24 withdrawal boundary during the ~~thirty-five (35)~~ year operational and facility closure period, and
25 ~~to~~ will withstand any flammable gas deflagration that may occur prior to final facility closure.

26 Consistent with the definitions in 20.4.1.100+ NMAC (incorporating 40 CFR §260.10), the
27 process of panel closure is considered partial closure because it is a process of rendering a part of
28 the repository inactive and closed according to the approved underground HWDU partial closure
29 plan. Panel closure will be complete when the panel closure system is emplaced and operational,
30 when that underground HWDU and related equipment and structures have been decontaminated
31 (if necessary), and when the NMED has been notified of the closure.

32 Shaft seals are designed to provide effective barriers to the inward migration of ~~ground~~
33 ~~water~~ groundwater and the outward migration of gas and contaminated brine over two discrete time
34 periods. Several components become effective immediately and are expected to function for ~~one~~
35 ~~hundred (100)~~ years. Other components become effective more slowly, but provide permanent

² The free release criteria for items, equipment, and areas is < 20 ~~dpm~~ disintegrations per minute (dpm)/per 100 square
centimeters (cm²) for alpha radioactivity and < 200 dpm/100 cm² for beta-gamma radioactivity.

1 isolation of the waste. The final shaft seal design is specified in Renewal Application Appendix I2
2 (Waste Isolation Pilot Plant Shaft Sealing System Compliance Submittal Design Report).

3 The facility will be finally closed (i.e., decontaminated and decommissioned) to minimize the need
4 for continued maintenance. Protection of human health and the environment includes, but is not
5 limited to:

- 6 • Prevention of any releases that may have adverse effects on human health or the
7 environment due to the migration of waste constituents in the groundwater or in the
8 subsurface environment {(20.4.1.500 NMAC, incorporating 40 CFR §264.601(a))}.
- 9 • Prevention of any releases that may have adverse effects on human health or the
10 environment due to migration of waste constituents in surface water, in wetlands, or on the
11 soil surface {(20.4.1.500 NMAC, incorporating 40 CFR §264.601(b))}.
- 12 • Prevention of any release that may have adverse effects on human health or the
13 environment due to migration of waste constituents in the air {(20.4.1.500 NMAC,
14 incorporating 40 CFR §264.601(c))}.

15 As part of final facility closure, surface recontouring and reclamation will establish a stable
16 vegetative cover, and further surface maintenance will not be necessary to protect human health
17 and the environment. Prior to cessation of active controls, monuments will be emplaced to serve
18 as long-term site markers to discourage activities that would penetrate the facility or impair the
19 ability of the salt formation to isolate the waste from the surface environment for at least 10,000
20 years. The Federal government will maintain administrative responsibility for the repository site
21 in perpetuity and will limit future use of the area.

22 If, during panel or final facility closure activities, unexpected events require modification of this
23 Closure Plan to demonstrate compliance with closure performance standards, a Closure Plan
24 amendment will be submitted in accordance with 20.4.1.900 NMAC (incorporating 40 CFR
25 §270.42).

26 I-1a(3) Post-Closure Care

27 The post-closure care period will begin after completion of the first panel closure and will
28 continue for ~~thirty~~ (30) years after final facility closure. The post-closure care period may be
29 shortened or lengthened at the discretion of the regulatory agency based on evidence that human
30 health and the environment are being protected or that they are at risk. During the post-closure
31 period, the WIPP facility shall be maintained in a manner that complies with the environmental
32 performance standards in 20.4.1.500 NMAC (incorporating 40 CFR §264.601). Post-closure
33 activities are described in Renewal Application Chapter J.

34 I-1b Requirements

35 The Permit specifies a sequential process for the closure of individual HWMUs at the WIPP
36 facility. Each underground HWDU will undergo panel closure when waste emplacement in that

1 panel is complete. Following waste emplacement in each underground HWDU, construction-side
2 ventilation will be terminated, and waste-disposal-side ventilation will be established in the next
3 underground HWDU to be used, and the underground HWDU containing the waste will be closed.
4 The Permittees will notify the NMED of the closure of each of the underground HWDUs as they
5 are sequentially filled on a HWDU-by-HWDU basis. The HWMUs in the WHB and in the
6 parking area Parking Area Unit will be closed as part of final facility closure of the WIPP facility.

7 The Permittees will notify the Secretary of the NMED in writing at least ~~sixty (60)~~ days prior to
8 the date on which closure activities are scheduled to begin.

9 I-1c Maximum Waste Inventory

10 The WIPP will receive no more than 6.2 million ft³ (175,600 m³) of TRU mixed waste, which may
11 include up to 250,000 ft³ (7,080 m³) of remote-handled (**RH**) TRU mixed waste. Excavations are
12 mined as permitted when needed during operations to maintain a reserve of disposal areas. The
13 amount of waste placed in each room is limited by structural and physical considerations of
14 equipment and design. Waste volumes include waste received from ~~off-site generator locations~~
15 TRU waste sites as well as derived waste from disposal and decontamination operations. ~~The~~
16 ~~maximum volume of TRU mixed waste in a disposal panel is established in Module IV, Table~~
17 ~~IV.A.1~~ For closure planning purposes, a maximum achievable volume of 685,100 ft³ (19,400 m³)
18 of TRU mixed waste per panel is used. This equates to 662,150 ft³ (18,750 m³) of contact-handled
19 (**CH**) TRU mixed waste and 22,950 ft³ (650 m³) of RH TRU mixed waste per panel.

20 The maximum extent of operations during the term of this p~~e~~Permit is expected to be Panels 1
21 through ~~7~~8 as shown on Figure I-1, the WHB ~~Container Storage Unit~~, and the Parking Area
22 ~~Container Storage Unit~~Parking Area Unit. Note that panels 8, 9, and 10 are scheduled for
23 excavation only under the initial term of this p~~e~~Permit. If other waste management units are
24 permitted during the Disposal Phase, this Closure Plan will be revised to include the ~~additional~~
25 waste management units. At any given time during disposal operations, it is possible that multiple
26 rooms may be receiving TRU mixed waste for disposal at the same time. Underground HWDUs
27 in which disposal has been completed (i.e., in which CH and RH TRU mixed waste emplacement
28 activities have ceased) will undergo panel closure.

29 I-1d Schedule for Closure

30 For the purpose of establishing a schedule for closure, an operating and closure period of no more
31 than ~~thirty-five (35)~~ years (~~twenty-five (25)~~ years for disposal operations and ~~ten (10)~~ years for
32 closure) ~~is assumed~~. This operating period may be extended or shortened depending on a number
33 of factors, including the rate of waste approved for shipment to the WIPP facility and the
34 schedules of TRU mixed waste generator sites the certified characterization programs, and future
35 decommissioning activities.

36 I-1d(1) Schedule for Panel Closure

37 The anticipated schedule for the closure of the underground HWDUs known as Panels ~~3~~1 through
38 8 is shown in Figure I-2. This schedule assumes there will be little contamination within the

1 exhaust drift of the panel. Underground HWDUs should be ready for closure according to the
2 schedule in Table I-1. These dates are estimates for planning and permitting purposes. Actual
3 dates may vary depending on the availability of waste from the ~~generator sites~~ certified
4 characterization programs.

5 In the schedule in Figure I-2, notification of intent to close occurs ~~thirty (30)~~ days before placing
6 the final waste in a panel. Once a panel is full, the Permittees will initially block ventilation
7 through the panel as described in Renewal Application Appendix M2 (Geologic Repository), and
8 then will assess the closure area for ground conditions and contamination so that a definitive
9 schedule and closure design can be determined. If as the result of this assessment the Permittees
10 determine that a panel closure cannot be emplaced in accordance with the schedule in this Closure
11 Plan, a modification will be submitted requesting an extension to the time for closure.

12 ~~The Permittees will initially block ventilation through Panel 2 as described in Renewal~~
13 ~~Application Appendix M2 once Panel 2 is full to ensure continued protection of human health and~~
14 ~~the environment. The Permittees will then install the~~ Closure has been initiated in Panels 1 and 2
15 and the explosion-isolation wall portion of the panel closure system that is described in Renewal
16 Application Appendix I1, (Detailed Design Report for an Operation Phase Panel Closure System)
17 Section 3.3.2, Explosion- and Construction-Isolation Walls has been certified. Further closure
18 activities are delayed pending the approval of a new closure design. Construction of the
19 explosion-isolation wall will not exceed 180 days after the last receipt of waste in Panel 2. Final
20 closure of Panels 1 and 2 will be completed as specified in this Permit no later than January 31,
21 2016.

22 ~~To ensure continued protection of human health and the environment,~~ Beginning with Panel 3 and
23 until the end of hydrogen/methane data collection and approval of a new panel closure design, the
24 Permittees will initially block ventilation ~~through Panel 3~~ as described in Renewal Application
25 Appendix M2, Section M2-2a(3), after waste disposal ~~in Panel 3~~ has been completed and will
26 initiate hydrogen/methane monitoring per Renewal Application Appendix N1. The Permittees
27 shall continue VOC monitoring ~~in Panel 3~~ until final panel closure. If the measured
28 concentration, as confirmed by a second sample, of any VOC ~~in Panel 3~~ exceeds the “95% Action
29 Level” in ~~Module IV, Table IV.F.3.b~~ Renewal Application Chapter N, the Permittees will initiate
30 closure of ~~a panel~~ Panel 3 by installing the 12-foot explosion-isolation wall as described in Section
31 I-1e(1) ~~and submit a Class 1* permit modification request to extend Panel 3 closure, if necessary.~~
32 Regardless of the outcome of disposal room VOC monitoring, final closure of filled panels Panel
33 3 will be completed as specified in this Permit no later than January 31, 2016.

34 I-1d(2) Schedule for Final Facility Closure

35 The Disposal Phase for the WIPP facility is expected to require a period of ~~twenty-five (25)~~ years
36 beginning with the first receipt of TRU waste at the WIPP facility, which occurred on March 26,
37 1999, and followed by a period ranging from seven to ~~ten (7-10)~~ years for decontamination,
38 decommissioning, and final closure. ~~Assuming the first waste receipt occurs in July 1998,~~ The
39 Disposal Phase may extend until 2023, and so the latest expected year of final closure of the WIPP
40 facility (i.e., date of final closure certification) would be 2033. If, as is currently projected, the

1 WIPP facility is dismantled at closure, all surface and subsurface facilities (except the hot cell
2 portion of the WHB, which will remain as an artifact of the Permanent Marker System-[PMS])
3 will be disassembled and either salvaged or disposed in accordance with applicable standards. In
4 addition, asphalt and crushed caliche that was used for paving will be removed, and the area will
5 be recontoured and revegetated in accordance with a land management plan. A detailed closure
6 schedule will be submitted in writing to the Secretary of the NMED, along with the notification of
7 closure. Throughout the closure period, all necessary steps will be taken to prevent threats to
8 human health and the environment in compliance with all applicable Resource Conservation and
9 Recovery Act (RCRA) permit requirements. Figure I-3 presents the best estimate of a final
10 facility closure schedule.

11 The schedule for final facility closure is considered to be a best estimate because closure of the
12 facility is driven by policies and practices established for the decontamination, if necessary, and
13 decommissioning of radioactively contaminated facilities. These required activities include
14 extensive radiological contamination surveys and hazardous constituent surveys using, among
15 other techniques, radiological surveys to indicate potential hazardous waste releases. Both types
16 of surveys will be performed at all areas of the WIPP site where hazardous waste were managed.
17 These surveys, along with historical radiological survey records, will provide the basis for release
18 of structures, equipment, and components for disposal or decontamination for release off site.
19 Specifications will be developed for each structure to be removed. A cost benefit analysis will be
20 needed to evaluate decontamination options if extensive decontamination is necessary. Individual
21 equipment surveys, structure surveys, and debris surveys will be required prior to disposition.
22 Size-reduction techniques may be required to dispose of mixed or radioactive waste at the WIPP
23 facility site. Current DOE policy, as reflected in the WIPP facility Safety Analysis Report (SAR)
24 (DOE 1997), requires the preparation of a final decommissioning and decontamination (D&D)
25 plan immediately prior to final facility closure. A final decommissioning and decontamination
26 (D&D) plan will be prepared in accordance with DOE policy to reflect In this way, the specific
27 conditions of the facility at prior to the time D&D is initiated will be addressed. Section I-1e(2)
28 provides a more detailed discussion of final facility closure activities.

29 Figure I-3 shows the schedule for the final facility closure consisting of decontamination, as
30 needed, of the TRU waste-handling equipment; and ~~of the aboveground equipment and facilities;~~
31 ~~including~~ closure of surface HWMUs; decontamination of the shaft and haulage ways; disposal of
32 decontamination-derived wastes in the last open underground HWDU; and subsequent closure of
33 this underground HWDU. Subsequent activities will include installation of repository shaft seals.

34 An overall schedule for final facility closure, showing currently scheduled dates for the start and
35 end of final facility closure activities is shown in Table I-2. The dates ~~assume~~ reflect a start up
36 date of March 1999 and hazardous waste permit effective dates of September 1999, September
37 2009, and September 2019. Details for panel closures are shown on Table I-1.

38 I-1d(3) Extension for Closure Time

39 As indicated by the closure schedule presented in Figure I-3, the activities necessary to perform
40 facility closure of the WIPP facility will require more than ~~one hundred eighty (180)~~ days to
41 complete because of additional stringent requirements for managing radioactive materials.

1 Therefore, the Permit provides an extension of the 180-day final closure requirement in
2 accordance with 20.4.1.500 NMAC (incorporating 40 CFR §264.113). During the extended
3 closure period, the Permittees will continue to demonstrate compliance with applicable permit
4 requirements and will take all steps necessary to prevent threats to human health and the
5 environment as a result of TRU mixed waste management at the WIPP facility including all of the
6 applicable measures in Renewal Application Chapter E (Preparedness and Prevention).

7 In addition, according to the schedules in Figure I-3, the final derived wastes that are generated as
8 the result of decontamination activities will not be disposed of for ~~sixteen~~ (16) months after the
9 initiation of final facility closure. In accordance with 20.4.1.500 NMAC (incorporating 40 CFR
10 §264.113(a)), the Permit provides an extension of the 90-day limit to dispose of final derived
11 waste resulting from the closure process. This provision is necessitated by the fact that the
12 radioactive nature of the derived waste makes placement in the WIPP facility the best disposition,
13 and the removal of these wastes will, by necessity, take longer than ~~ninety~~ (90) days in accordance
14 with the closure schedules. During this extended period of time, the Permittees will take all steps
15 necessary to prevent threats to human health and the environment, including compliance with all
16 applicable permit requirements. These steps include all of the applicable preparedness and
17 prevention measures in Renewal Application Chapter E.

18 Finally, in the event the hazardous waste permit is not renewed as assumed in the schedule, the
19 Permittees will submit to the NMED for approval a modification to the Closure Plan to implement
20 a contingency closure that will allow the Permittees to continue to operate for the disposal of non-
21 mixed TRU waste. This modification will include a request for an extension of the time for final
22 facility closure. ~~This modified Closure Plan will be submitted to the NMED for approval.~~

23 I-1d(4) Amendment of the Closure Plan

24 If it becomes necessary to amend the Closure Plan for the WIPP facility, the Permittees will
25 submit, in accordance with 20.4.1.900 NMAC (incorporating 40 CFR §270.42), a written
26 notification of or request for a permit modification describing any change in operation or facility
27 design that affects the Closure Plan. The written notification or request will include a copy of the
28 amended Closure Plan for approval by the NMED. The Permittees will submit a written
29 notification of or request for a permit modification to authorize a change in the approved plan, if:

- 30 • There are changes in operating plans or in the waste management unit facility design that
31 affect the Closure Plan
- 32 • There is a change in the expected year of closure
- 33 • Unexpected events occur during panel or final facility closure that require modification of
34 the approved Closure Plan
- 35 • Changes in State or Federal laws affect the Closure Plan
- 36 • Permittees fail to obtain permits for continued operations as discussed above

1 The Permittees will submit a written request for a permit modification with a copy of the amended
2 Closure Plan at least ~~sixty (60)~~ days prior to the proposed change in facility design or operation or
3 within ~~sixty (60)~~ days of the occurrence of an unexpected event that affects the Closure Plan. If
4 the unexpected event occurs during final closure, the permit modification will be requested within
5 ~~thirty (30)~~ days of the occurrence. If the Secretary of the NMED requests a modification of the
6 Closure Plan, a plan modified in accordance with the request will be submitted within ~~sixty (60)~~
7 days of notification or within ~~thirty (30)~~ days, if the change in facility condition occurs during
8 final closure.

9 I-1e Closure Activities

10 Closure activities include those instituted for panel closure (i.e., closure of filled underground
11 HWDUs), contingency closure (i.e., closure of surface HWMUs and decontamination of other
12 waste handling areas), and final facility closure (i.e., closure of surface HWMUs, D&D of surface
13 facilities and the areas surrounding the WHB, and placement of repository shaft seals). Panel
14 closure systems will be emplaced to separate areas of the facility and to isolate panels. Renewal
15 Application Appendices I1 and I2 provide panel closure system and shaft seal designs. All closure
16 activities will meet the applicable quality assurance (QA)/quality control (QC) program standards
17 in place at the WIPP facility. Facility monitoring procedures in place during operations will
18 remain in place through final closure, as applicable.

19 I-1e(1) Panel Closure

20 Following completion of waste emplacement in each underground HWDU, disposal-side
21 ventilation will be established in the next panel to be used, and the panel containing the waste will
22 be closed. A panel closure system will be emplaced in the panel access drifts, in accordance with
23 the design in Renewal Application Appendix I1 and the schedule in Figure I-2 and Table I-1. The
24 panel closure system is designed to meet the following requirements that were established by the
25 DOE for the design to comply with 20.4.1.500 NMAC (incorporating 40 CFR §264.601(a)):

- 26 • the panel closure system shall limit the migration of VOCs to the compliance point so that
27 compliance is achieved by at least one order of magnitude
- 28 • the panel closure system shall consider potential flow of VOCs through the disturbed rock
29 zone (**DRZ**) in addition to flow through closure components
- 30 • the panel closure system shall perform its intended functions under loads generated by
31 creep closure of the tunnels
- 32 • the panel closure system shall perform its intended function under the conditions of a
33 postulated methane explosion
- 34 • the nominal operational life of the closure system is ~~thirty-five (35)~~ years
- 35 • the panel closure system for each individual panel shall not require routine maintenance
36 during its operational life

- 1 • the panel closure system shall address the most severe ground conditions expected in the
2 waste disposal area
- 3 • the design class of the panel closure system shall be ~~IIIb (which means that it is to be built~~
4 ~~to~~ generally accepted national design and construction standards)
- 5 • the design and construction shall follow conventional mining practices
- 6 • structural analysis shall use data acquired from the WIPP underground
- 7 • materials shall be compatible with their emplacement environment and function
- 8 • treatment of surfaces in the closure areas shall be considered in the design
- 9 • thermal cracking of concrete shall be addressed
- 10 • during construction, a QA/QC program shall be established to verify material properties
11 and construction practices
- 12 • construction of the panel closure system shall consider shaft and underground access and
13 services for materials handling

14 The performance standard for air emissions from the WIPP facility is established in Module IV
15 and Renewal Application Appendix M2. Releases shall be below these limits for the facility to
16 remain in compliance with standards to protect human health and the environment. The following
17 panel closure design has been shown, through analysis, to meet these standards, if emplaced in
18 accordance with the specifications in Renewal Application Appendix I1.

19 The approved design for the panel closure system calls for a composite panel barrier system
20 consisting of a rigid concrete plug with removal of the DRZ, and an explosion-isolation wall. The
21 design basis for this closure is such that the migration of hazardous waste constituents from closed
22 panels during the operational and closure period would result in concentrations well below health-
23 based standards. The source term used as the design basis included the average concentrations of
24 VOCs from CH waste containers as measured in headspace gases through January 1995. The
25 VOCs are assumed to have been released by diffusion through the container vents and are
26 assumed to be in equilibrium with the air in the panel. Emissions from the closed panel occur at a
27 rate determined by gas generation within the waste and creep closure of the panel.

28 ~~Figures I-4 and I-5 show a of the panel closure design and installation envelopes.~~ Renewal
29 Application Appendix I1 provides the detailed design and the design analysis for the panel closure
30 system. Although the permit application proposed several panel closure design options,
31 depending on the gas generated by wastes and the age of the mined openings, the NMED and U.S.
32 Environmental Protection Agency (EPA) determined that only the most robust design option
33 (Option D) would be approved. This decision does not prevent the Permittees from continuing to
34 collect data on the behavior of the wastes and mined openings, or proposing a modification to the
35 Closure Plan in the future, using the available data to support a request for reconsideration of one

1 or more of the original design options. If a design different from Option D as defined in Renewal
2 Application Appendix I1 is proposed, the appropriate permit modification will be sought.

3 I-1e(2) Decontamination and Decommissioning

4 Decontamination is defined as those activities ~~that~~ which are performed to remove contamination
5 from surfaces and equipment that are not intended to be disposed of at the WIPP facility. The
6 policy at the WIPP facility will be to decontaminate as many areas as possible, consistent with
7 radiation protection policy. Decontamination is part of all closure activities and is a necessary
8 activity in the clean closure of the surface container management units. Decontamination
9 determinations are based upon radiological and hazardous constituent surveys.

10 Decommissioning is the process of removing equipment, facilities, or surface areas from further
11 use and closing the facility. Decommissioning is part of final facility closure only and will
12 involve the removal of equipment, buildings, closure of the shafts, and establishing active and
13 passive institutional controls for the facility. Passive institutional controls are not included in the
14 Permit.

15 The objective of D&D activities at the WIPP facility is to return the surface to as close to the
16 preconstruction condition as reasonably possible, while protecting the health and safety of the
17 public and the environment. Major activities required to accomplish this objective include, but are
18 not limited to the following:

- 19 1. Review of operational records for historical information on releases
- 20 2. Visual examination of surface structures for evidence of spills or releases
- 21 3. Performance of site contamination surveys
- 22 4. Decontamination, if necessary, of usable equipment, materials, and structures including
23 surface facilities and areas surrounding the WHB.
- 24 5. Disposal of equipment/materials that cannot be decontaminated but that meet the
25 treatment, storage, and disposal facility waste acceptance criteria (~~TSDF-WAC~~) in an
26 underground HWDU
- 27 6. Emplacement of final panel closure system
- 28 7. Emplacement of shaft seals³

³ For the purposes of planning, the conclusion of shaft sealing is used by the DOE as the end of closure activities and the beginning of the Post-Closure Care Period.

1 8. Regrading the surface to approximately original contours

2 9. Initiation of active controls

3 This Closure Plan will be amended prior to the initiation of closure activities to specify the
4 methods to be used.

5 Health and Safety

6
7 Before final closure activities begin, health physics personnel will conduct a hazards survey of the
8 unit(s) being closed. A release of radionuclides could also indicate a release of hazardous
9 constituents. If radionuclides are not detected, sampling for hazardous constituents will still be
10 performed if there is documentation or visible evidence that a spill or release has occurred. The
11 purpose of the hazards survey will be to identify potential contamination concerns that may
12 present hazards to workers during the closure activities and to specify any control measures
13 necessary to reduce worker risk. This survey will provide the information necessary for the health
14 physics personnel to identify worker qualifications, personal protective equipment (**PPE**), safety
15 awareness, work permits, exposure control programs, and emergency coordination that will be
16 required to perform closure related activities.

17 I-1e(2)(a) Determine the Extent of Contamination

18 The first activities performed as part of decontamination include those needed to determine the
19 extent of any contamination that needs to be removed prior to decommissioning a facility. This
20 includes activities 1, ~~2, and 3~~ above, and, ~~As~~ can be seen by the schedules in Figures I-3~~2~~ and
21 I-4~~3~~ (Items B and C), these surveys are anticipated to take ~~ten~~ (10) months to perform, including
22 obtaining the results of any sample analyses. The process of identifying areas that require
23 decontamination include three sources of information. First, operating records will be reviewed to
24 determine where contamination has previously been found as the result of historical releases and
25 spills. Even though releases and spills will have been cleaned up at the time of occurrence, newer
26 equipment and technology may allow further cleaning. Second, surfaces of facilities and
27 structures will be examined visually for evidence of spills or releases. Finally, extensive detailed
28 contamination surveys will be performed to document the level of cleanliness for all surface
29 structures and equipment. If equipment or areas are identified as contaminated, the Permittees will
30 notify NMED as specified in Permit Module I, and a plan and procedure(s) will be developed and
31 implemented to address decontamination-related questions, including such as:

- 32
- 33 • Should the component be decontaminated or disposed of as waste?
 - 34 • What is the most cost-effective method of decontaminating the component?
 - Will the decontamination procedures adequately contain the contamination?

35 Radiological and hazardous constituent surveys will be used in determining the presence of
36 hazardous waste and hazardous waste residues in areas where spills or releases have occurred.
37 Radiological surveys are described in Renewal Application Appendix I3. Once cleanup of the
38 radioactivity has been completed, the surface will be sampled for hazardous constituents specified

1 in Renewal Application Part A to determine that they, too, have been cleaned up. Sampling and
2 analysis protocols will be consistent with EPA's document SW-846 (EPA, 1996).

3 I-1e(2)(b) Decontamination Activities

4 Once the extent of contamination is known, decontamination activities will be planned and
5 performed. Radiological control and the control of hazardous waste residues are the primary
6 criteria used in the design of decontamination activities. Radiation control procedures require that
7 careful planning and execution be used in decontamination activities to prevent the exposure of
8 workers beyond applicable standards and to prevent the further spread of contamination. Careful
9 control of entry, cleanup, and ventilation are vital components of radiation decontamination. The
10 level of care mandated by DOE ~~Orders~~ and occupational protection requirements results in
11 closure activities that will exceed the ~~one hundred eighty (180)~~ days allowed in 20.4.1.500 NMAC
12 (incorporating 40 CFR §264.113(b)). Decontamination activities are included as item 4 above and
13 are shown on the schedules for contingency closure and final facility closure (Figures I-3~~2~~ and I-
14 4~~3~~) as activities D, E, and F. These activities are anticipated to have a duration of ~~twenty (20)~~
15 months for both contingency closure and for final facility closure. The result of these activities is
16 the clean closure of the surface container management units. Under contingency closure, the other
17 areas that have been decontaminated will not be closed. Instead they will remain in use for
18 continued waste management activities involving non-mixed waste. Under final facility closure,
19 other areas that are decontaminated are eligible for closure.

20 The "Start Clean—Stay Clean" operating philosophy of the WIPP Project will provide for
21 minimum need for decontamination. However, the need for decontamination techniques may
22 arise. Decontamination activities will be coordinated with closure activities so that areas that have
23 been decontaminated will not be recontaminated. ~~All waste~~ **Waste** resulting from decontamination
24 activities will be surveyed and analyzed for the presence of radioactive contamination and
25 hazardous constituents specified in Renewal Application, Part A Application. The waste will be
26 characterized as hazardous, mixed, or radioactive and will be packaged and handled appropriately.
27 Mixed and radioactive waste will be classified as TRU mixed waste managed in accordance with
28 the applicable Permit requirements. Derived mixed waste collected during decontamination
29 activities that are generated before repository shafts have been sealed will be emplaced in the
30 facility, if appropriate, or will be managed together with decontamination derived waste collected
31 after the underground is closed. This waste will be classified and shipped off site to an
32 appropriate, permitted facility for treatment, if necessary, and for disposal.

33 Removal of Hazardous Waste Residues

34 Because of the type of waste management activities that will occur at the WIPP facility, waste
35 residues that may be encountered during the operation of the facility and at closure may include
36 derived waste. Derived wastes result from the management of the waste containers or may be
37 collected as part of the closure activities (such as those during which wipes were used to sample
38 the containers and equipment for potential radioactive contamination or those involving solidified
39 decontamination solutions, the handling of equipment designated for disposal, and the handling of
40 residues collected as a result of spill cleanup). Derived wastes collected during the operation and
41 closure of the WIPP facility will be identified and managed as TRU mixed wastes. These wastes

1 will be disposed in the active underground HWDU. **The** D&D derived wastes and equipment
2 designated for disposal will be placed in the last underground HWDU panel before closure of that
3 unit.

4 Surface Container Storage Units

5 The procedures employed for waste receipt at the WIPP facility minimize the likelihood for any
6 waste spillage to occur outside the WHB. TRU mixed waste is shipped to the WIPP facility in
7 approved shipping containers (i.e., ~~Contact-Handled~~ **CH** or ~~Remote-Handled~~ **RH** Packages) that are
8 not opened until they are inside the WHB. Therefore, it is unlikely that soil in the Parking Area
9 Unit or elsewhere in the vicinity of the WHB will become contaminated with TRU mixed waste
10 constituents as a result of TRU mixed waste management activities. An evaluation of the soils in
11 the vicinity of the WHB will only be necessary if a documented event resulting in a release has
12 occurred outside the WHB.

13 The “Start Clean—Stay Clean” operating philosophy of the WIPP Project will minimize the need
14 for decontamination of the WHB during decommissioning and closure. Procedures for opening
15 shipping packages ~~containers~~ in the WHB limit the opportunity for waste spillage.

16 Should the need for decontamination of the WHB arise, the following methods may be employed,
17 as appropriate, for the hazardous constituent/contaminant type and extent:

- 18 • Chemical cleaning (e.g., water, mild detergent cleanser, and polyvinyl alcohol)
- 19 • Nonchemical cleaning (e.g., sandblasting, grinding, high-pressure water spray, scabblor
20 pistons and needle scalers, ice-blast technology, dry-ice blasting)
- 21 • Removal of contaminated components such as pipe and ductwork

22 Waste generated as a result of WHB decontamination activities will be managed as derived waste
23 in accordance with applicable permit requirements and will be emplaced in the last open
24 underground HWDU for disposal.

25 Waste Handling Equipment~~and~~

26 The waste shaft conveyance and associated waste handling equipment will be decontaminated to
27 background or be disposed as derived waste as part of both contingency and final facility closure.
28 Procedures for detection and sampling will be as described above. Equipment cleanup will be as
29 above using chemical or nonchemical techniques.

30 Personnel Decontamination

31 **Personal Protective Equipment** PPE worn by personnel performing closure activities in areas
32 determined to be contaminated will be disposed of appropriately. Disposable PPE used in such
33 areas will be placed into containers and managed as TRU mixed waste. Non-disposable PPE will

1 be decontaminated, if possible. Non-disposable PPE that cannot be decontaminated will be
2 managed as ~~TRU mixed~~ derived waste.

3 In accordance with DOE policy, TRU mixed waste PPE will be considered to be contaminated
4 with all of the hazardous waste constituents contained in the containers that have been managed
5 within the unit being closed. Wastes collected as a result of closure activities and that may be
6 contaminated with radioactive and hazardous constituents will be considered TRU mixed wastes.
7 These wastes will be managed as derived wastes, as described in Renewal Application Appendix
8 M2. Such waste, collected as the result of closure of the WIPP facility, will be disposed of in the
9 final open underground HWDU.

10 Cleanup Criteria

11 Radiation decontamination will be less than or equal to the following levels, or to whatever lesser
12 levels that may be established by DOE Order at the time of cleanup:

13 <u>Contamination Type</u>	<u>Loose</u> ⁴
14	
15	<u>Fixed plus removable</u>
16	
17 alpha contamination (α)	20 dpm/100 cm ²
18	500 dpm/100 cm ²
19 beta-gamma contamination (β - γ)	200 dpm/100 cm ²
20	1000 dpm/100 cm ²
21	

22 Hazardous waste decontamination will be conducted in accordance with standards in 20.4.1.500
23 NMAC (incorporating 40 CFR §264.111) or as incorporated into the Permit.

24 Final Contamination Sampling and Quality Assurance

25 Verification samples will be analyzed by an approved laboratory that has been qualified by the
26 DOE according to a written program with strict criteria. The QA requirements of EPA/SW-846,
27 “*Test Methods for Evaluating Solid Waste, Physical/Chemical Methods*”²² (EPA, 1986 1996), will
28 be met for hazardous constituent sampling and analyses.

29 Quality Assurance/Quality Control

30 Because decisions about closure activities may be based, in part, on analyses of samples of
31 potentially contaminated surfaces and media, a program to ensure reliability of analytical data is
32 essential. Data reliability will be ensured by following a QA/QC program that mandates adequate
33 precision and accuracy of laboratory analyses. Field documentation will be used to document the

⁴ The unit “dpm” stands for “disintegration per minute” and is the rate of emission by radioactive material as determined by correcting the counts per minute observed by an appropriate detector for background, efficiency, and geometric factors associated with the instrumentation.

1 conditions under which each sample is collected. The documented QA/QC program in place at the
2 WIPP facility will meet applicable RCRA QA requirements.

3 Field blanks and duplicate samples will be collected in the field to determine potential errors
4 introduced in the data from sample collection and handling activities. To determine the potential
5 for cross-contamination, rinsate blanks (consisting of rinsate from decontaminated sampling
6 equipment) will be collected and analyzed. At least one rinsate blank will be collected for every
7 20 field samples. Duplicate samples will be collected at a frequency of one duplicate sample for
8 every ten field samples. In no case will less than one rinsate blank or duplicate sample be
9 collected for a field-sampling effort. These blank and duplicate samples will be identified and
10 treated as separate samples. Acceptance criteria for QA/QC hazardous constituent sample
11 analyses will adhere to the most recent version of EPA SW-846 or other applicable EPA guidance.

12 I-1e(2)(c) Dismantling

13 Final facility closure will include dismantling of structures on the surface and in the underground.
14 These are items 6 and 7 above and are represented as Activity G in the final facility closure
15 schedule in Figure I-4~~3~~. During dismantling, priority will be given to contaminated structures and
16 equipment that cannot be decontaminated to assure these are properly disposed of in the remaining
17 open underground HWDU in a timely manner. All such facilities and equipment are expected to
18 be removed and disposed of ~~sixteen (16)~~ months after the initiation of closure. Dismantling of the
19 balance of the WIPP facility, including those structures and equipment that are not included in the
20 application and are not used for TRU mixed waste management, is anticipated to take an
21 additional ~~sixty-six (66)~~ months. It should be noted that the placement of D&D waste into the
22 final underground HWDU may, by necessity, involve the placement of uncontainerized bulk
23 materials such as concrete components, building framing, structural members, disassembled or
24 partially disassembled equipment, or containerized materials in non-standard waste boxes. Such
25 placement will only occur if it can be shown that it is protective of human health and the
26 environment and all items are described in an amendment to the Closure Plan. Identification of
27 bulk items is not possible at this time since their size and quantity will depend on the extent of
28 non-removable contamination.

29 I-1e(2)(d) Closure of Open Underground HWDU

30 The closure of the final underground HWDU is shown by Activity H in Figure I-3. This closure
31 will be consistent with the description in Section I-1e(1) and the design in Renewal Application
32 Appendix I1. Detailed closure schedules for underground HWDUs are given in Figure I-2 and
33 Table I-1.

34 I-1e(2)(e) Final Facility Closure

35 Final facility closure includes several activities designed to assure both the short-term isolation of
36 the waste and the long-term integrity of the disposal system. These include the placement of plugs
37 in boreholes that penetrate the salt and the placement of the repository sealing system. In addition,
38 the surface will be returned to as near its original condition as practicable, and will be readied for

1 the construction of markers and monuments that will provide permanent marking of the repository
2 location and contents.

3 Figure I-6 identifies where ~~ten~~ **10** existing boreholes overlie the proximate area of the repository
4 footprint. Of these ~~identified~~ boreholes in Figure I-6, all but ERDA-9 are terminated hundreds of
5 feet above the repository horizon. Only ERDA-9, which is accounted for in long-term
6 performance modeling, is drilled through the repository horizon, near the WIPP excavations.

7 To mitigate the potential for migration beyond the repository horizon, the DOE has specified that
8 borehole seals be designed to limit the volume of water that could be introduced to the repository
9 from the overlying water-bearing zones and to limit the volume of contaminated brine released
10 from the repository to the surface or water-bearing zones.

11 Borehole plugging activities have been underway since the 1970s, from the early days of the
12 development of the WIPP facility. Early in the exploratory phase of the project, a number of
13 boreholes were sunk in Lea and Eddy counties. After the WIPP site was situated in its current
14 location, an evaluation of all vertical penetrations was made by Christensen and Peterson (1981).

15 As an initial criterion, any borehole that connects a fluid-producing zone with the repository
16 horizon becomes a ~~plugging~~ candidate **for plugging**.

17 Grout plugging procedures are routinely performed in standard oil-field operations; however,
18 quantitative measurements of plug performance are rarely obtained. The Bell Canyon Test
19 reported by Christensen and Peterson (1981) was a field test demonstration of the use of
20 cementitious plugging materials and modification of existing industrial emplacement techniques to
21 suit repository plugging requirements. Cement emplacement technology was found to be
22 “generally adequate to satisfy repository plugging requirements.” Christensen and Peterson (1981)
23 also report “that grouts can be effective in sealing boreholes, if proper care is exercised in
24 matching physical properties of the local rock with grout mixtures. Further, the reduction in fluid
25 flow provided by even limited length plugs is far in excess of that required by bounding safety
26 assessments for the WIPP.” The governing regulations for plugging and/or abandonment of
27 boreholes are summarized in Table I-3.

28 The proposed repository sealing system design will prevent water from entering the repository and
29 will prevent gases or brines from migrating out of the repository. The proposed design includes
30 the following subsystems and associated principal functions:

- 31 • Near-surface: to prevent subsidence at and around the shafts
- 32 • Rustler Formation: to prevent subsidence at and around the shafts and to ensure
33 compliance with Federal and State of New Mexico groundwater protection requirements
- 34 • Salado Formation: to prevent transporting hazardous waste constituents beyond the point
35 of compliance ~~specified in Permit Module V~~

1 The repository sealing system will consist of natural and engineered barriers within the WIPP
2 repository that will withstand forces expected to be present because of rock creep, hydraulic
3 pressure, and probable collapses in the repository and will meet the closure requirements of
4 20.4.1.500 NMAC (incorporating 40 CFR §264.601 and §264.111). Renewal Application
5 Appendix I2 presents the final repository sealing system design.

6 Once shaft sealing is completed, the Permittees will consider closure complete and will provide
7 the NMED with a certification of such within ~~sixty (60)~~ days.

8 I-1e(2)(f) Final Contouring and Revegetation

9 ~~In the preparation of its Final Environmental Impact Statement (DOE, 1980), the DOE~~ The
10 Permittees have committed to restore the site to as near to its original condition as is practicable.
11 This involves removal of access roads, unneeded utilities, fences, and any other structures built by
12 the DOE to support WIPP operations. Provisions would be left for active post-closure controls of
13 the site and for the installation of long-term markers and monuments for the purpose of
14 permanently marking the location of the repository and waste. Renewal Application Chapter J,
15 Section J-1a(1) discusses the active and long-term controls proposed for the WIPP. Installation of
16 borehole seals are anticipated to take twelve (12) months, shaft seals ~~fifty-two (52)~~ months, and
17 final surface contouring ~~eight (8)~~ months.

18 I-1e(2)(g) Closure, Monuments, and Records

19 A record of the WIPP Project shall be listed in the public domain in accordance with the
20 requirements of 20.4.1.500 NMAC (incorporating 40 CFR §264.116). Active access controls will
21 be employed for at least the first ~~one hundred (100)~~ years after final facility closure. In addition, a
22 passive control system consisting of monuments or markers will be erected at the site to inform
23 future generations of the location of the WIPP repository (~~see “Permanent Marker Conceptual~~
24 ~~Design Report” [DOE, 1995b]).~~

25 This Renewal Application proposes ~~Permit requires only~~ a ~~thirty (30)~~ year post-closure period.
26 This is the maximum post-closure time frame allowed in an initial ~~Permit~~ permit for any facility, as
27 specified in 20.4.1.500 NMAC (incorporating 40 CFR §264.117(a)). The Secretary of the NMED
28 may shorten or extend the post-closure care period at any time in the future prior to completion of
29 the original post-closure period (30 years after the completion of construction of the shaft seals).
30 ~~The Permanent Marker Conceptual Design Report and other provisions during the first 100 years~~
31 ~~after closure are addressed under another Federal regulatory program.~~

32 Closure of the WIPP facility will contribute to the following:

- 33 • Prevention of the intrusion of fluids into the repository by sealing the shafts
- 34 • Prevention of human intrusion after closure
- 35 • Minimization of future physical and environmental surveillance

36 Detailed records shall be filed with local, State, and Federal government agencies to ensure that
37 the location of the WIPP facility is easily determined and that appropriate notifications and

1 restrictions are given to anyone who applies to drill in the area. This information, together with
2 land survey data, will be on record with the U.S. Geological Survey and other agencies. The
3 Federal government will maintain permanent administrative authority over those aspects of land
4 management assigned by law. Details of post-closure activities are in Renewal Application
5 Chapter J.

6 I-1e(3) Performance of the Closed Facility

7 20.4.1.500 NMAC (incorporating 40 CFR §264.601) requires that a miscellaneous unit be closed
8 in a manner that protects human health and the environment. The 1997 RCRA Part B permit
9 application addressed the expected performance of the closed facility during the ~~thirty (30)~~ year
10 post closure period. An update of this performance demonstration is provided with the Renewal
11 Application as supplemental information. Groundwater monitoring will provide information on
12 the performance of the closed facility during the post-closure care period, as specified in Renewal
13 Application Chapter J, Section J-1a(2) (Monitoring).

14 The principal barriers to the movement of hazardous constituents from the facility or the
15 movement of waters into the facility are the halite of the Salado Formation (natural barrier) and
16 the repository seals (engineered barrier). ~~Data and calculations that support this discussion were~~
17 ~~presented in the permit application.~~ The majority of the calculations performed for the repository
18 are focused on long-term performance and making predictions of performance over 10,000 years.
19 In the short term, the repository is reaching a steady state configuration where the hypothetical
20 brine inflow rate is affected by the increasing pressure in the repository due to gas generation and
21 creep closure. These three phenomena are related in the numerical modeling performed to support
22 the permit application. ~~The modeling parameters, assumptions and methodology were described~~
23 ~~in detail in the permit application.~~

24 I-2 Notices Required for Disposal Facilities

25 I-2a Certification of Closure

26 Within ~~sixty (60)~~ days after completion of closure activities for a HWMU (i.e., for each storage
27 unit and each disposal unit), the Permittees will submit to the Secretary of the NMED a
28 certification that the unit (and, after completion of final closure, the facility) has been closed in
29 accordance with the specifications of this Closure Plan. The certification will be signed by the
30 Permittees and by an independent New Mexico registered professional engineer. Documentation
31 supporting the independent registered engineer's certification will be furnished to the Secretary of
32 the NMED with the certification.

33 I-2b Survey Plat

34 Within ~~sixty (60)~~ days of completion of closure activities for each underground HWDU, and no
35 later than the submission of the certification of closure of each underground HWDU, the
36 Permittees will submit to the Secretary of the NMED a survey plat indicating the location and
37 dimensions of hazardous waste disposal units with respect to permanently surveyed benchmarks.
38 The plat will be prepared and certified by a professional land surveyor and will contain a

1 prominently displayed note that states the Permittees' obligation to restrict disturbance of the
2 hazardous waste disposal unit. In addition, the land records in the Eddy County Courthouse,
3 Carlsbad, New Mexico, will be updated through filing of the final survey plats.

1-3 List of References

- 1
2 Christensen, C. L., and Peterson, E. W. 1981. "Field-Test Programs of Borehole Plugs in
3 Southeastern New Mexico." In *The Technology of High-Level Nuclear Waste Disposal Advances*
4 *in the Science and Engineering of the Management of High-Level Nuclear Wastes*, P. L. Hofman
5 and J. J. Breslin, eds., SAND79-1634C, DOE/TIC-4621, Vol. 1, pp. 354-369. Technical
6 Information Center of the U.S. Department of Energy, Oak Ridge, TN.
7
8 ~~DOE, see U.S. Department of Energy~~
9
10 ~~EPA, see U.S. Environmental Protection Agency~~
11
12 ~~U.S. Department of Energy, 1980, "Final Environmental Impact Statement, Waste Isolation Pilot~~
13 ~~Plant," DOE/EIS 0026, U.S. Department of Energy, Washington, D.C.~~
14
15 ~~U.S. Department of Energy, 1995b, "Permanent Marker Conceptual Design Report," from~~
16 ~~Appendix PMR of the *Draft Compliance Certification Application*, Draft DOE/CAO-2056, U.S.~~
17 ~~Department of Energy, Carlsbad, NM.~~
18
19 ~~U.S. Department of Energy, 1997, "WIPP Safety Analysis Report," DOE/WIPP-95-2065,~~
20 ~~Revision 1, U.S. Department of Energy, Carlsbad, NM.~~
21
22 U.S. Environmental Protection Agency (EPA), 1996, "*Test Methods for Evaluating Solid Waste,*
23 *Physical/Chemical Methods*," SW-846, *Third Edition*, U.S. Environmental Protection Agency
24 *Office of Solid Waste and Emergency Response*, Washington, D.C.

TABLES

1

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**TABLE I-1
 ANTICIPATED EARLIEST CLOSURE DATES FOR
 THE UNDERGROUND HWDUs**

HWDU	OPERATIONS START	OPERATIONS END	CLOSURE START	CLOSURE END
PANEL 1	3/99*	03/03*	3/03*	7/03* SEE NOTE 5
PANEL 2	3/03*	10/05*	10/05*	3/06* SEE NOTE 5
PANEL 3	4/05*	2/07*	2/07*	2/07* SEE NOTE 6
PANEL 4	1/07*	1/09	2/09	8/09 SEE NOTE 6
PANEL 5	1/09	1/11	2/11	8/11 SEE NOTE 6
PANEL 6	1/11	1/13	2/13	8/13 SEE NOTE 6
PANEL 7	1/13	1/15	2/15	8/15 SEE NOTE 6
PANEL 8	1/15	1/17	2/17	8/17
PANEL 9	1/17	1/28	2/28	SEE NOTE 4
PANEL 10	1/28	9/30	10/30	SEE NOTE 4

*Actual date

NOTE 1: Only Panels 1 to 4 will ~~may~~ be closed under the initial term of this permit ~~Permit resulting from this application~~. Closure schedules for Panels 5 through 10 are projected assuming new permits will be issued in 2009 and 2019.

NOTE 2: The point of closure start is defined as ~~sixty (60)~~ days following notification to the NMED of closure.

NOTE 3: The point of closure end is defined as ~~one hundred eighty (180)~~ days following placement of final waste in the panel.

NOTE 4: The time to close these areas may be extended depending on the nature and extent of the disturbed rock zone. The excavations that constitute these panels will have been opened for as many as ~~forty (40)~~ years so that the preparation for closure may take longer than the time allotted in Figure I-2. If this extension is needed, it will be requested as an amendment to the Closure Plan.

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May 2009

- 1 NOTE 5: The anticipated closure end date for Panels 1 and 2 is for installation of the 12-foot explosion-isolation
2 wall. Final closure of Panels 1 and 2 will be completed as specified in this Permit no later than January 31, 2016.
- 3 NOTE 6: The anticipated closure end date for Panels 3 through 7 is for initially blocking ventilation through the
4 filled panel. Final closure of Panels 3 through 7 will be completed as specified in this Permit no later than January
5 31, 2016.

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**TABLE I-2
 ANTICIPATED OVERALL SCHEDULE FOR CLOSURE ACTIVITIES**

ACTIVITY	FINAL FACILITY CLOSURE	
	START	STOP
Notify NMED of Intent to Close WIPP (or to Implement Contingency Closure)	October 2030	N/A
Perform Contamination Surveys in both Surface Storage Areas <u>WHB Unit and Parking Area Unit</u>	October 2030	April 2031
Sample Analysis	December 2030	July 2031
Decontamination as Necessary of both Surface Storage Areas <u>WHB Unit and Parking Area Unit</u>	June 2031	January 2032
Final Contamination Surveys of both Surface Storage Areas <u>WHB Unit and Parking Area Unit</u>	February 2032	September 2032
Sample Analysis	June 2032	January 2033
Prepare and Submit Container Management Unit <u>WHB Unit and Parking Area Unit</u> Closure Certification	February 2033	May 2033
Dispose of Closure-Derived Waste	November 2030	January 2032
Closure of Open Underground HWDU panel	February 2032 [*]	September 2032
Install Borehole Seals	October 2032	September 2033
Install Repository Seals	June 2033	September 2037
Recontour and Revegetate	October 2037	May 2038
Prepare and Submit Final (Contingency) Closure Certification	October 2037	May 2038
Post-closure Monitoring	July 2038	N/A

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N/A—Not Applicable

Refer to Figures I-3 and I-4 for precise activity titles.

^{*} This assumes the final waste is placed in this unit in January 2032 and notification of closure for this HWDU is submitted to the NMED in December 2031.

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**TABLE I-3
 GOVERNING REGULATIONS FOR BOREHOLE ABANDONMENT**

Federal or State Land	Type of Well or Borehole	Governing Regulation	Summary of Requirements
Both	Groundwater Surveillance	State and Federal regulation in effect at time of abandonment	Monitor wells no longer in use shall be plugged in such a manner as to preclude migration of surface runoff or groundwater along the length of the well. Where possible, this shall be accomplished by removing the well casing and pumping expanding cement from the bottom to the top of the well. If the casing cannot be removed, the casing shall be ripped or perforated along its entire length if possible, and grouted. Filling with bentonite pellets from the bottom to the top is an acceptable alternative to pressure grouting.
Federal	Oil and Gas Wells	43 CFR Part 3160, §§ 3162.3-4	The operator shall promptly plug and abandon, in accordance with a plan first approved in writing or prescribed by the authorized officer.
Federal	Potash	43 CFR Part 3590, § 3593.1	(b) Surface boreholes for development or holes for prospecting shall be abandoned to the satisfaction of the authorizing officer by cementing and/or casing or by other methods approved in advance by the authorized officer. The holes shall also be abandoned in a manner to protect the surface and not endanger any present or future underground operation, any deposit of oil, gas, or other mineral substances, or any aquifer.
State	Oil and Gas Well Outside the Oil-Potash Area	State of New Mexico, Oil Conservation Division, Rule 202 (eff. 3-1-91)	<p>B. Plugging</p> <p>(1) Prior to abandonment, the well shall be plugged in a manner to permanently confine all oil, gas, and water in the separate strata where they were originally found. This can be accomplished by using mud-laden fluid, cement, and plugs singly or in combination as approved by the Division on the notice of intention to plug.</p> <p>(2) The exact location of plugged and abandoned wells shall be marked by the operator with a steel marker not less than four inches (4") in diameter, set in cement, and extending at least four feet (4') above mean ground level. The metal of the marker shall be permanently engraved, welded, or stamped with the operator name, lease name, and well number and location, including unit letter, section, township, and range.</p>
State	Oil and Gas Wells Inside the Oil-Potash Area	State of New Mexico, Oil Conservation Division, Order No. R-111-P (eff. 4-21-88)	<p>F. Plugging and Abandonment of Wells</p> <p>(1) All existing and future wells that are drilled within the potash area, shall be plugged in accordance with the general rules established by the Division. A solid cement plug shall be provided through the salt section and any water-bearing horizon to prevent liquids or gases from entering the hole above or below the salt selection.</p> <p>It shall have suitable proportions—but no greater than three (3) percent of calcium chloride by weight—of cement considered to be the desired mixture when possible.</p>

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FIGURES

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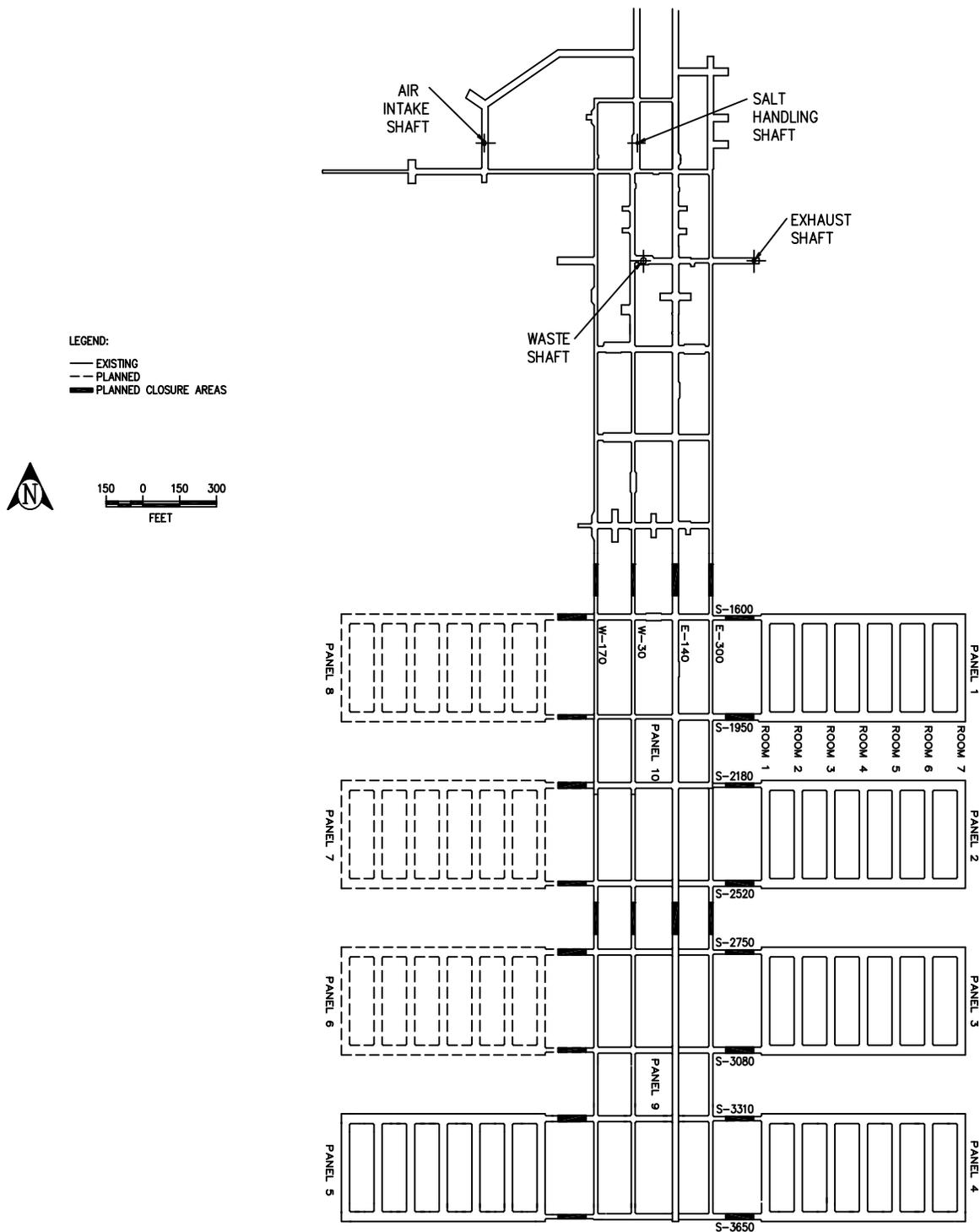


Figure I-1
 Location of Underground HWDUs and Anticipated Closure Locations

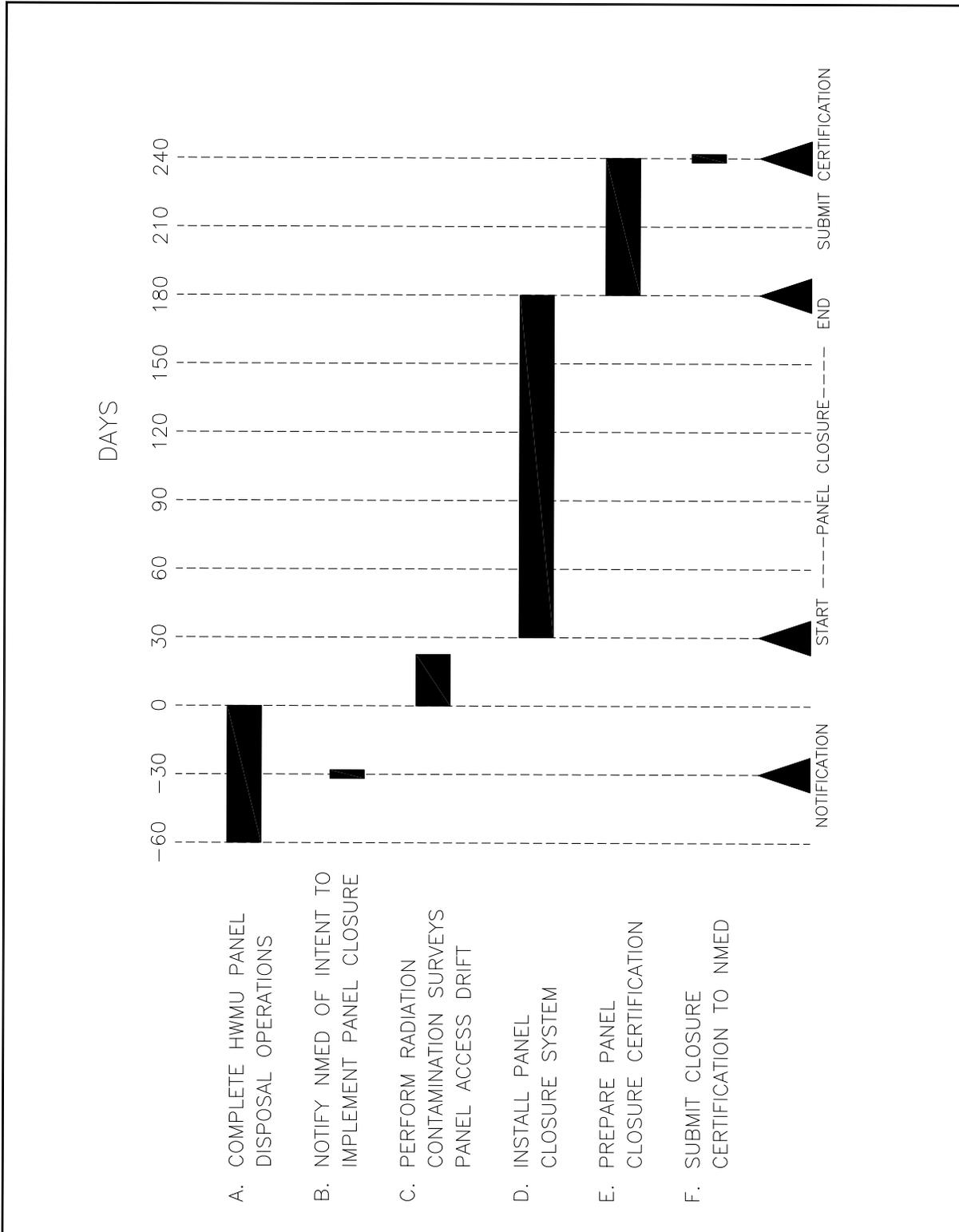


Figure I-2
 WIPP Panel Closure Schedule

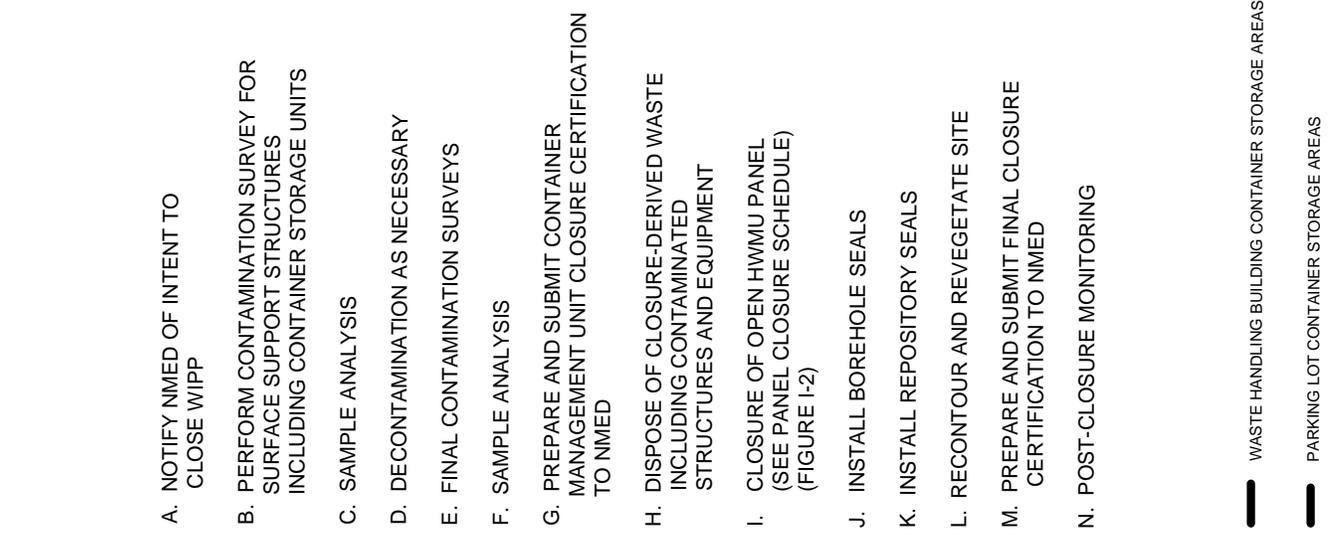


Figure I-3
 WIPP Facility Final Closure Schedule
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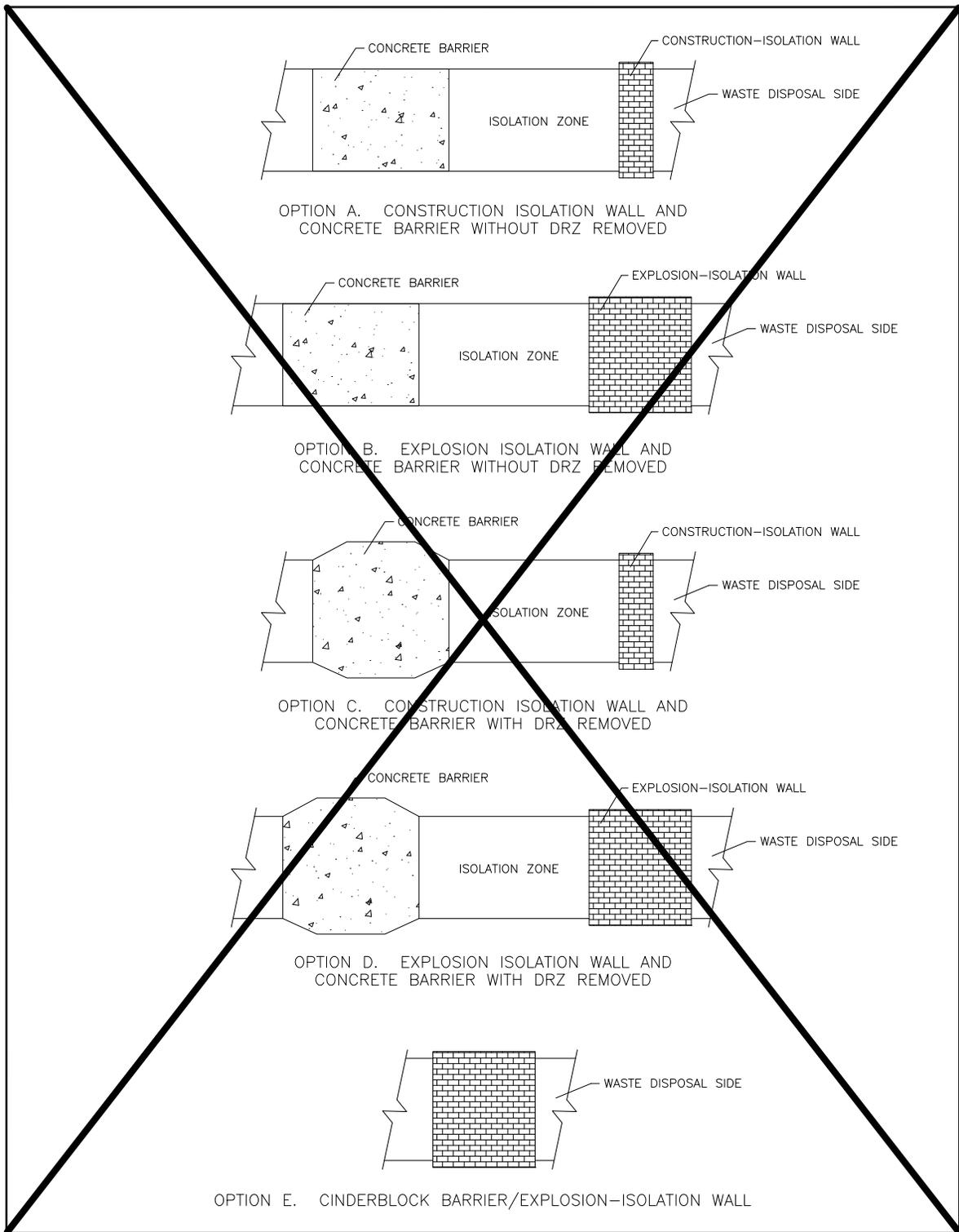


Figure I-4
Design of a Panel Closure System

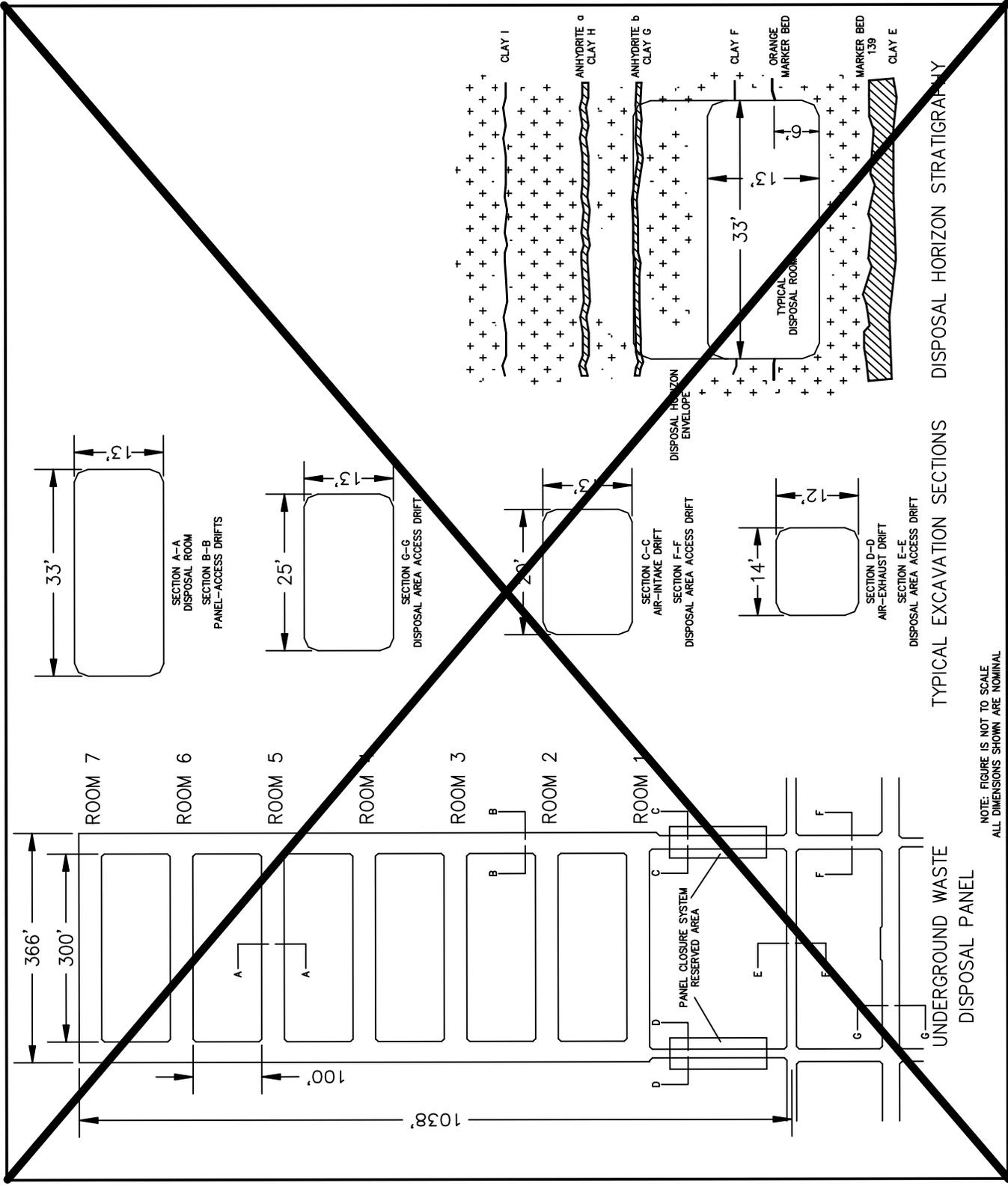


Figure I-5
 Typical Disposal Panel
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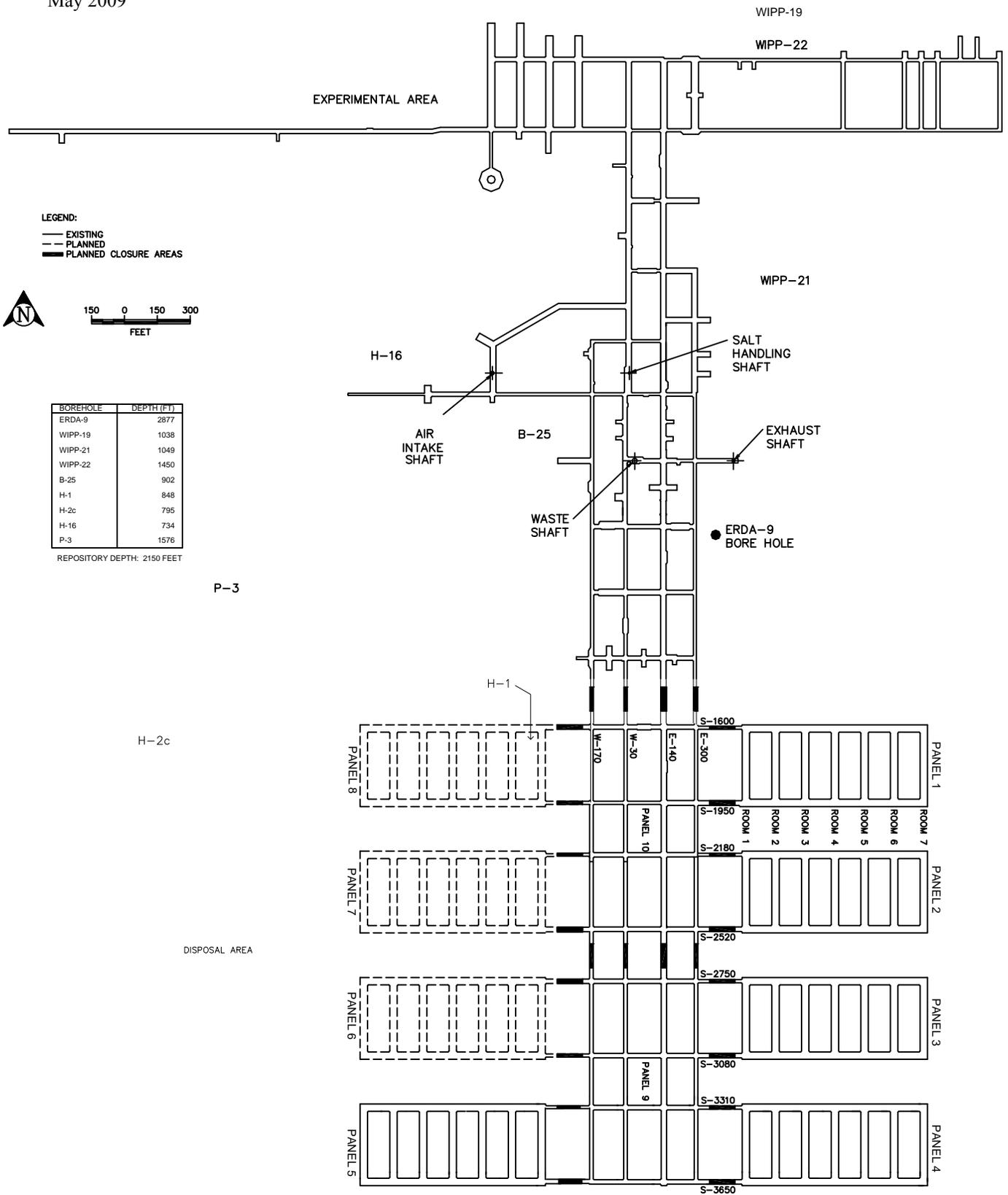


Figure I-64
 Approximate Location of Boreholes in Relation to the WIPP Underground