Title 40 CFR Part 191 Compliance Certification Application for the Waste Isolation Pilot Plant

Appendix DMP

United States Department of Energy
Waste Isolation Pilot Plant

Carlsbad Area Office
Carlsbad, New Mexico

Delaware Basin Drilling Monitoring Plan

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FIGURES

TABLES

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ACRONYMS

BLM	Bureau of Land Management
CAO	Carlsbad Area Office
DOE	Department of Energy
EPA	Environmental Protection Agency
OCD	Oil Conservation Division
WIPP	Waste Isolation Pilot Plant

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APPENDIX DMP

DMP.1 Purpose

The purpose of the Delaware Basin Drilling Monitoring Plan is to provide for active monitoring of drilling activities within the Delaware Basin, with specific emphasis on the nine-township area that includes the Waste Isolation Pilot Plant (WIPP) Site (Figure DMP-1). This monitoring plan will be in place during the operational phase of the WIPP and will continue until the Department of Energy (DOE) and the Environmental Protection Agency (EPA) agree that no further benefit can be gained from continued monitoring. The monitoring of drilling activities will build on the database established for the DOE's Compliance Certification Application. This baseline is documented in Appendix DEL. Information contained in Appendix DEL was used to develop modeling assumptions for performance assessment. The collection of additional information about drilling patterns and practices in the Delaware Basin will provide information to define whether the drilling scenarios in this application continue to be valid at each five year recertification time for the WIPP.

DMP.2 Background

The EPA environmental standards for the management and disposal of transuranic (TRU) radioactive waste are codified in 40 CFR Part 191 (EPA 1993). Subparts B and C of the standard address the disposal of radioactive waste. The standard requires that the DOE demonstrate through the use of a probabilistic risk assessment that the disposal system will function to contain radioactivity below specified release limits considering the effects of reasonably expected human-initiated and natural processes and events. This includes the consideration of inadvertent drilling into the repository at some future time.

The EPA has provided criteria in 40 CFR Part 194 (EPA 1996) that address the implementation of the drilling scenario. These criteria lead to the formulation of conceptual models that incorporate the effects of these activities. These conceptual models use parameter values drawn from the databases in Appendix DEL.

EPA criteria concerning future drilling: With respect to consideration of future drilling, in the preamble to 40 CFR Part 194 (EPA 1996), the EPA ". . . reasoned that while the resources drilled for today may not be the same as those drilled for in the future, the present rates at which these boreholes are drilled can nonetheless provide an estimate of the future rate at which boreholes will be drilled" (61 FR 5233). Criteria concerning the consideration of future deep and shallow drilling in performance assessments are provided in 40 CFR § 194.33. These criteria state that, to calculate future drilling rates, the DOE should examine the historical rate of drilling for resources in the Delaware Basin. Historical drilling for purposes other than resource exploration and recovery (such as WIPP site investigation) need not be considered in determining future drilling rates.

In particular, in calculating the frequency of future deep drilling, 40 CFR § 194.33(b)(3)(i) (EPA 1996) states that the DOE should

> identify deep drilling that has occurred for each resource in the Delaware Basin over the past 100 years prior to the time at which a compliance application is prepared.

Oil and gas are the only known resources below 2,150 feet (656 meters) that have been exploited over the past 100 years in the Delaware Basin. However, some potash and sulfur exploration boreholes have been drilled in the Delaware Basin to depths in excess of 2,150 feet (656 meters) below the surface relative to where the drilling occurred. Thus, consistent with 40 CFR § 194.33(b)(3)(i), the DOE has used the historical record of deep drilling associated with oil, gas, potash, and sulfur exploration, and oil and gas exploitation in the Delaware Basin in calculations to determine the rate of deep drilling within the controlled area and throughout the basin in the future, as discussed in Appendix DEL.

The EPA also provides criteria for calculating drilling rates for shallow drilling (drilling to depths less than 2150 feet [656 meters]); however, the DOE has used language in the criteria to screen out shallow holes from further consideration in performance assessment (see Chapter 6.0, Section 6.2.5.2).

EPA criteria regarding future drilling practices: The EPA provides further criteria concerning the analysis of the consequences of future drilling events in performance assessments in 40 CFR § 194.33(c) (EPA 1996):

> Performance assessments shall document that in analyzing the consequences of drilling events, the Department assumed that:
> (1) Future drilling practices and technology will remain consistent with practices in the Delaware Basin at the time a compliance application is prepared. Such future drilling practices shall include, but shall not be limited to: the types and amounts of drilling fluids; borehole depths, diameters, and seals; and the fraction of such boreholes that are sealed by humans; and
> (2) Natural processes will degrade or otherwise affect the capability of boreholes to transmit fluids over the regulatory time frame.

Consistent with these criteria, the following parameters regarding drilling are included in the performance assessment as documented in Appendix DEL:

- types of drilling fluids
- amounts of drilling fluids
- borehole depths
- borehole diameters
- borehole plugs

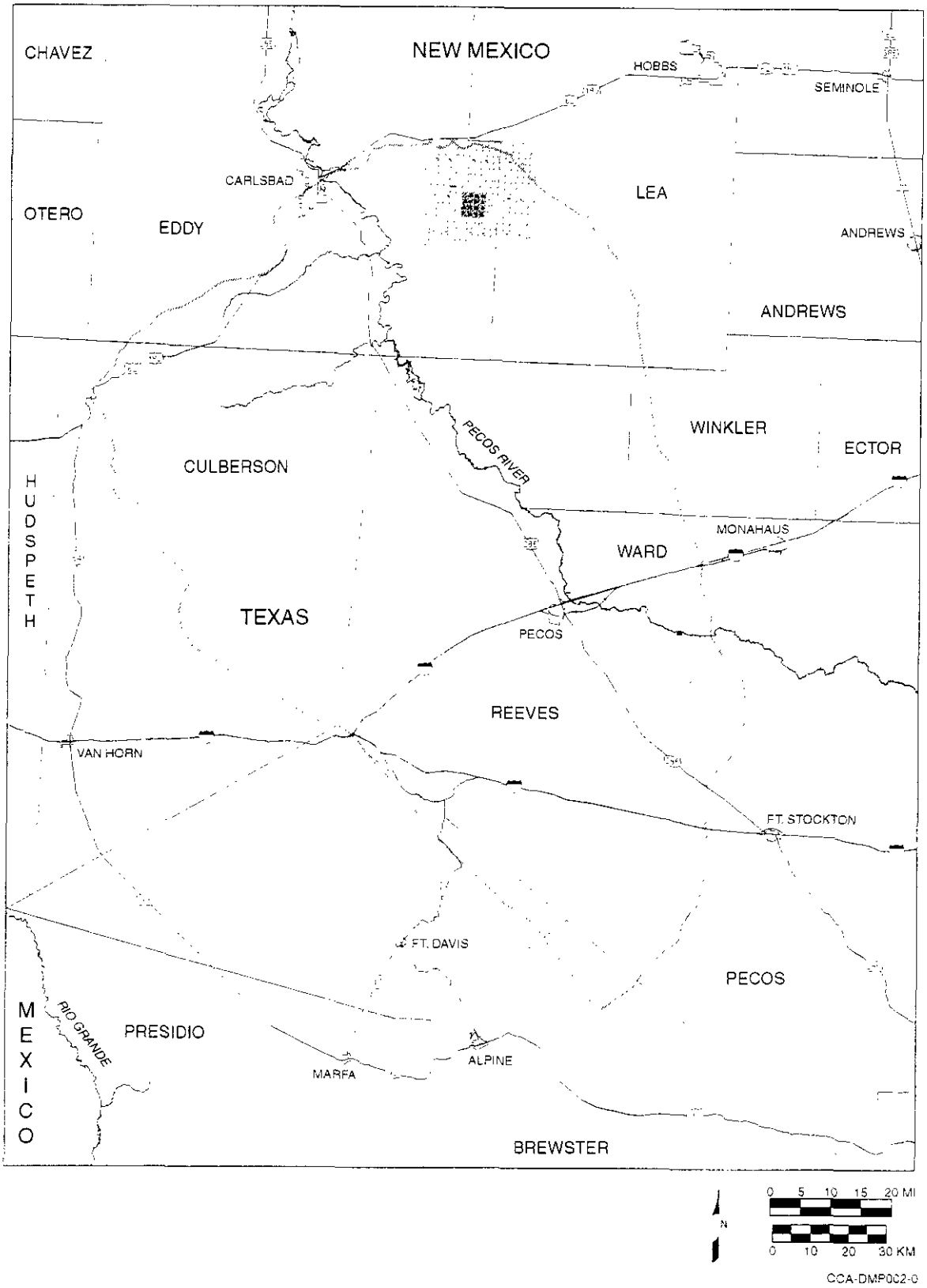

Figure DMP-1. Nine-Township Study Area in Relationship to the Delaware Basin

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- fraction of such boreholes that are sealed by humans
- natural processes that will degrade plugs

It is the purpose of this monitoring program to periodically update this database and to detect any substantial and detrimental deviations from the assumptions that were used in the performance assessment. If substantial and detrimental deviations are identified, they will be evaluated using the performance assessment methodology.

Table DMP-1 is a listing of parameter values that were used in the performance assessment. All were treated as fixed values derived from information in the database.

Table DMP-1. Parameters Related to Deed Drilling Used in the Performance Assessment in the WIPP Compliance Certification Application.

Parameter Description	Value	Units
Drill collar diameter	0.213	meters
Drill bit diameter	0.311	meters
Drill string angular velocity	7.8	rad/s
Drill collar length	182.9	meters
Drill pipe length	472.1	meters
Drill pipe diameter	0.114	meters
Drilling rate	0.00468	km^2/yr
Plugging patterns	Three per Appendix DEL	
Mud weight	10 to 10.5	pounds/gallon
Longest time till shut-in brine	72	hours
Longest time till shut-in gas	11	days
Penetration rate (Salado)	35 to 70	feet/hour

Data from Appendix DEL and Appendix PAR.

DMP.3 Study Area And Information Sources

The Delaware Basin is defined in 40 CFR 194.2 (EPA 1996) as follows:

> Delaware Basin means those surface and subsurface features which lie inside the boundary formed to the north, east and west of the [WIPP] disposal system, by the innermost edge of the Capitan Reef, and formed, to the south, by a straightline drawn from the southeastern point of the Davis Mountains to the most southwestern point of the Glass Mountains.

This area is shown in Figure DMP-2.

As described in the next section, the monitoring plan will track drilling activities within the Delaware Basin on an annual basis. Drilling activities as related to hydrocarbon resources, potash boreholes, and water wells that occur within the nine-township area will be specifically monitored on a quarterly basis.

DMP.3.1 Commercial sources of information

Currently sources that the DOE has determined to be qualified for providing information on drilling activities are Midland Map Company, Petroleum Information Incorporated (PI), and Whitestar. Electronic data will be obtained on a regular basis to assure completeness and consistency in format and presentation. Information must identify new wells or changes in status of existing wells within the Delaware Basin in a easily readable format. This information will then be transferred to the existing database that was used to prepare Appendix DEL.

DMP.3.2 Information from government agencies

There will be continued interface with the Bureau of Land Management (BLM), the Texas Railroad Commission, and the New Mexico Oil Conservation Division (OCD). These agencies maintain active records of drilling on federal, state, and private lands.

DMP.4 Activities

DMP.4.1 General Database Maintenance

Maintain the database of the Delaware Basin in an acceptable electronic format. The database is to be updated annually to reflect drilling and mining activities in the Delaware Basin. Maps of the Delaware Basin will be published as needed.

DMP.4.2 Delaware Basin Borehole Information

Maintain information on drilling activities such as new, abandoned, and converted boreholes throughout the Delaware Basin.

DMP.4.3 Nine-Township Borehole Information

Maintain within the database the following information (to the extent such information is not proprietary) regarding activity in the nine-township area in Figure DMP-2 on a quarterly basis:

- new deep drilling activities

- abandonment activities
- well conversion activities (injection, disposal, water)
- occurrences of pressurized brine within the Castile Formation
- injection well operation (disposal and secondary recovery)
- plugging and abandonment activities
- maintenance of database for incidences of non-compliance with BLM and OCD rules as information is recorded in the files maintained by the BLM/OCD
- identification of ownership (through BLM/OCD records monitoring) of all state and federal minerals and hydrocarbon leases within the area

DMP.5 Implementation

This monitoring plan as described is to be implemented no later than at the beginning of the operational phase. Annual reports will be prepared to be included with other environmental data and will be made available to the EPA. Every five years, information will be summarized for input into the recertification process as defined in 40 CFR § 194.15 (EPA 1996).

Data will be reviewed annually to assure there are no substantial and detrimental deviations from the assumptions used in the performance assessment documented in the compliance certification application. Should such substantial and detrimental deviations be identified, the DOE's Carlsbad Area Office (CAO) of the DOE will initiate an investigation of the deviation to determine potential impacts on the repository.

DMP.6 Quality Assurance

Activity will be conducted in accordance with the appropriate portions of Section 2.1. of the CAO Quality Assurance Program Document (CAO QAPD) (see Appendix QAPD). Specifically, procedures will be followed (and prepared as needed) to assure the accurate recording of information and data taken from outside sources, and the verification of any calculations performed to develop modeling parameters from field data. When possible and practical, field verification will be conducted. Field verification shall be mandatory within one mile of the WIPP site boundary. Field data will be recorded in permanent notebooks in accordance with CAO QAPD.

REFERENCES

EPA, 1993. 40 CFR Part 191: Environmental Standards for the Management and Disposal of Spent Nuclear Fuel, High-Level and Transuranic Radioactive Wastes; Final Rule. *Federal Register,* Vol. 58, No. 242, p. 66398. December 20, 1993. Office of Radiation and Air, Washington, D.C.

EPA, 1996. 40 CFR Part 194: Criteria for the Certification and Recertification of the Waste Isolation Pilot Plant's Compliance with the 40 CFR Part 191 Disposal Regulations; Final Rule. *Federal Register,* Vol. 61, pp. 5224–5245, February 9, 1996. Office of Radiation and Indoor Air, Washington, D.C.