APPENDIX DATA

ATTACHMENT A: DELAWARE BASIN DRILLING SURVEILLANCE DATA

This page intentionally left blank

Table of Contents

List of Figures

List of Tables

1 This page intentionally left blank

DATA-A-1.0 DELAWARE BASIN DRILLING SURVEILLANCE PROGRAM

The Delaware Basin Drilling Surveillance Program (DBDSP) is designed to monitor drilling activities in the vicinity of the Waste Isolation Pilot Plant (WIPP). The Environmental Protection Agency (EPA) requires the Department of Energy (DOE) to demonstrate the expected performance of the disposal system using a probabilistic risk assessment or performance assessment (PA). The PA must show that the expected repository performance will not release radioactive material above limits set by the EPA's standard and must consider inadvertent drilling into the repository horizon at some future time. The EPA regulations also state that current drilling practice, which is monitored by the DBDSP, should be assumed for future inadvertent intrusions.

The DOE continues to provide surveillance of the drilling activity in the Delaware Basin in accordance with the criteria established in 40 CFR § 194.33. This activity will continue until the DOE and the EPA mutually agree that no benefit can be gained from continued surveillance. The results of the ongoing surveillance activity will be used to determine if a significant change has occurred which would be detrimental to the performance of the disposal system.

DATA-A-2.0 QUALITY ASSURANCE

Because the DBDSP collects information only, the program's Quality Assurance (QA) process is not required to comply with Nuclear Quality Assurance (NQA) standards. Information collected from the various agencies and commercial sources is on an "as is" basis. However, QA is maintained by ensuring that the information collected is verified between the various sources for accuracy, to the extent possible. Also, any discrepancies noted are verified against the extant records at the state offices. As each well is completed, a copy of the drilling report is made from the records submitted to state offices in New Mexico and kept on file by the DBDSP. Before changes are made to any of the records in the databases, a paper copy is used to verify the change being made.

DATA-A-3.0 COLLECTION TIME PERIOD

The DBDSP collects the drilling-related information to be used for future PA calculations. The information collected during the first recertification monitoring period (July 1995 through September 2002) was added to the existing information maintained by the DBDSP. The information is collected weekly from Internet sites provided by the New Mexico Oil Conservation Division (OCD) for the entire state and from a commercial source for Southeastern New Mexico and Texas Railroad Commission, Oil and Gas Division, District 8. This information is then reviewed to determine which wells are within the Delaware Basin and need to be added to the databases. Other sources of information include the Bureau of Land Management (BLM) and the New Mexico Institute of Mining and Technology. The drilling-related activities monitored during the first recertification period by the DBDSP include:

- Drilling-related parameters/data, such as drilling rate, drill bit diameter, drill collar diameter and length, surface casing diameter, drill pipe diameter, speed of drill string rotation, penetration rate through the Salado Formation, type and characteristics (e.g.,

density, viscosity, etc.) of drilling mud, quantity of drilling fluid used, and occurrences of air drilling;

- Castile brine-related parameters/data, such as number of encounters of pressurized brine within the Castile Formation, Castile brine reservoir pressure and volume, and shortest and longest time until well shut-in occurs after a pressure encounter;

- Borehole plug-related parameters/data, such as pattern of plugs, plug materials and lengths; total number, location, and depth of abandoned boreholes; and type of steel alloy in the well casing;

- Enhanced recovery data, including occurrences of fluid injection (water flood) within the nine-township area, carbon dioxide (CO_2) miscible flooding, salt water disposal within the nine-township area, and volume (barrels) of fluid injected near WIPP within the nine-township area;

- Gas storage data, including occurrences of gas storage (cavern and/or reservoir) near WIPP;

- Solution mining data, including occurrences of solution mining within the Delaware Basin;

- Potash mining data, including changes in existing leases within the nine-township area; and

- Seismic data including history of relevant events, e.g., earthquake (natural or human induced) activity, relation of epicenters with geologic structures, geologic setting, etc.

DATA-A-4.0 COMPLIANCE MONITORING PARAMETERS

Two of the ten parameters monitored by the DBDSP are the drilling rate and the probability of encountering a Castile brine reservoir. Both parameters will continue to be monitored during postclosure.

Performance assessment is required by regulation to consider disturbed case scenarios that include intrusions into the repository by inadvertent and intermittent drilling for resources. The probability of these intrusions was based on a future drilling rate of 46.8 boreholes as used in the Compliance Certification Application (CCA) per square kilometer per 10,000 years. This rate is based on consideration of the past record of drilling events in the Delaware Basin.

Two different types of boreholes are considered: those that penetrate a pressurized brine reservoir in the underlying the Castile Formation and those that do not. While the presence of pressurized brine under the repository is speculative, it cannot be completely ruled out based on available information. The primary consequence of contacting pressurized brine is the introduction of an additional source of brine beyond that which is assumed to be released into the repository from the Salado. The human intrusion scenario models are based on extensive field data sets collected by the DOE.

The basis for the drilling rate to be used in PA for this Compliance Recertification Application (CRA) is shown in Table DATA-A-1. The drilling rate is calculated using wells that are deeper than 655 m (2,150 ft) below the surface since a well drilled to that depth would breach the repository horizon.

Table DATA-A-1. Wells in the Delaware Basin Deeper Than 655 m (2,150 ft)

Data collected from 1903 through September 2002

Well Type	Texas	New Mexico	Totals
Core Hole	5	0	5
Dry Hole	2,173	841	3,014
Gas Well	832	611	1,443
Injection Well	248	71	319
Junked and Abandoned Well	56	15	71
Oil Well	3,821	1,805	5,626
Oil and Gas Well	92	5	97
Plugged Gas Well	176	127	303
Plugged Injection Well	0	20	20
Plugged Oil Well	508	278	786
Plugged Oil and Gas Well	36	0	36
Plugged Brine Well	0	1	1
Plugged Salt Water Disposal Well	0	7	7
Drilling or Waiting on Paperwork	20	8	28
Brine Well	5	0	5
Salt Water Disposal Well	5	103	108
Service Well	101	3	104
Stratigraphic Test Hole	43	2	45
Sulfur Core Hole	85	0	85
Potash Core Hole	0	19	19
WIPP Core Hole	0	11	11
Other (Mine Shafts, Gnome Project Wells)	0	6	6
Totals	8,206	3,933	12,139

The drilling rate is calculated as follows: number of deep holes (12,139) × 10,000 years/ Delaware Basin surface area (23,102.1 km^2 [8921.7 mi^2])/100 years. The drilling rate is 52.5 boreholes per square kilometer over 10,000 years. This is an increase from the 46.8 boreholes per square kilometer reported in the CCA. This number is anticipated to rise for quite a few years before it begins to drop. This is because of the 100-year time frame used for drilling results. As new wells are added to the count, wells older than 100 years are dropped. It will be 2011 before any wells are dropped from the count while a number of new wells are expected to be added due to increased oil and gas activity, thus driving up the count.

Castile brine encounters are shown in Table DATA-A-2. The table shows the original encounters used in the CCA and the new brine encounters that occurred from July 1995 through September 2002.

Table DATA-A-2. Castile Brine Encounters

#	Location	Well Name	Spud Date	Status	Well Information
Original CCA-related Castile Brine Encounters – 1896 Through June 1995					
1	21S-31E-26	Federal #1	10/31/1979	P&A	Identified as encountering Castile Brine.
2	21S-31E-35	ERDA-6	06/13/1975	P&A	Identified as encountering Castile Brine.
3	21S-31E-35	Federal "FI" #1	09/25/1981	P&A	Identified as encountering Castile Brine.
4	21S-31E-36	Lost Tank "AIS" State #1	12/07/1991	Oil Well	Identified as encountering Castile Brine.
5	21S-31E-36	Lost Tank "AIS" State #4	11/19/1991	Oil Well	Identified as encountering Castile Brine.
6	21S-32E-31	Lost Tank SWD #1	11/12/1991	SWD	Identified as encountering Castile Brine.
7	22S-29E-09	Danford Permit #1	05/18/1937	P&A	Identified as encountering Castile Brine.
8	22S-31E-01	Unocal "AHU" Federal #1	04/02/1991	Oil Well	Identified as encountering Castile Brine.
9	22S-31E-01	Molly State #1	09/25/1991	Oil Well	Identified as encountering Castile Brine.
10	22S-31E-01	Molly State #3	10/20/1991	Oil Well	Identified as encountering Castile Brine.
11	22S-31E-02	State "2" #3	11/28/1991	Oil Well	Identified as encountering Castile Brine.
12	22S-31E-11	Martha "AIK" Federal #3	05/06/1991	Oil Well	Identified as encountering Castile Brine.
13	22S-31E-11	Martha "AIK" Federal #4	09/02/1991	Oil Well	Identified as encountering Castile Brine.
14	22S-31E-12	Federal "12" #8	03/28/1992	Oil Well	Identified as encountering Castile Brine.
15	22S-31E-13	Neff "13" Federal #5	02/04/1991	Oil Well	Identified as encountering Castile Brine.
16	22S-31E-17	WIPP-12	11/17/1978	Monitoring	Identified as encountering Castile Brine.
17	22S-32E-05	Bilbrey "5" Federal #1	11/26/1981	Oil Well	Identified as encountering Castile Brine.
18	22S-32E-15	Lechuza Federal #4	12/29/1992	Oil Well	Identified as encountering Castile Brine.
19	22S-32E-16	Kiwi "AKX" State #1	04/28/1992	Oil Well	Identified as encountering Castile Brine.
20	22S-32E-25	Covington "A" Federal #1	02/07/1975	Oil Well	Identified as encountering Castile Brine.
21	22S-32E-26	Culberson #1	12/15/1944	P&A	Identified as encountering Castile Brine.
22	22S-32E-34	Red Tank "34" Federal #1	09/23/1992	Oil Well	Identified as encountering Castile Brine.
23	22S-32E-36	Richardson State #1	07/20/1962	P&A	Identified as encountering Castile Brine.
24	22S-32E-36	Shell State #1	02/22/1964	Oil Well	Identified as encountering Castile Brine.
25	22S-33E-20	Cloyd Permit #1	09/07/1937	P&A	Identified as encountering Castile Brine.
26	22S-33E-20	Cloyd Permit #2	06/22/1938	P&A	Identified as encountering Castile Brine.
27	23S-30E-01	Hudson Federal #1	02/25/1974	SWD	Identified as encountering Castile Brine.
New CRA-related Castile Brine Encounters – July 1995 Through September 2002					
1	21S-31E-35	Lost Tank "35" State #4	09/11/2000	Oil Well	Estimated several hundred barrels per hour. Continued drilling.
2	21S-31E-35	Lost Tank "35" State #16	02/06/2002	Oil Well	At 2,705 ft, encountered 1,000 B/H. Shut-in to get room in reserve pit with pressure of 180 psi. Shut in next day with pressure at 100 psi and waterflow of 450 B/H. Two days later no water flow and full returns.
3	22S-31E-02	Graham "AKB" State #8	04/12/2002	Oil Well	Estimated 105 barrels per hour. Continued drilling.
4	23S-30E-01	James Ranch Unit #63	12/23/1999	Oil Well	Sulfur water encountered at 2,900 ft. 35 PPM was reported but quickly dissipated to 3 PPM in a matter of minutes. Continued drilling.
5	23S-30E-01	Hudson "1" Federal #7	01/06/2001	Oil Well	Estimated initial flow at 400 to 500 barrels per hour with a total volume of 600-800 barrels. Continued drilling.

No official documentation of New Mexico state records exists for the five new Castile brine encounters. Four were reported by WIPP site personnel during discussions with area drillers,

while the fifth was reported by one of the operators on the Annual Survey performed by the DBDSP. The Annual Survey is sent to regional area operators requesting information that is not available through other means.

All five wells were drilled in areas where Castile brine was previously encountered during the drilling process. Three wells were drilled in the vicinity of Well #ERDA-6 and the other two were southwest of the WIPP site. All were located in the nine-township area. During this time period, 345 wells were drilled in the nine-township area.

DATA-A-5.0 SUMMARY OF INFORMATION

DATA-A-5.1 Drilling-Related Parameters/Data

Tables DATA-A-3 through DATA-A-6 provide these drilling-related parameters/data: drill bit diameter, drill collar diameter and length, surface casing diameter, drill pipe diameter, speed of drill string rotation, penetration rate through the Salado, type and characteristics (density, viscosity, etc.) of drilling mud, quantity of drilling fluid used, and occurrences of air drilling.

Table DATA-A-3 lists drill bit sizes for the various wells drilled in the nine-township area during the recertification monitoring period. Currently, an 11" bit would be used to drill the same depth as the repository but in the CCA a 12 ¼" bit was modeled.

Table DATA-A-3. Nine-Township Area Bit Sizes

Three-String Hole

Bit Size	Surface Hole	Intermediate Hole	Production Hole	Totals
17 ½"	79	0	0	79
14 ¾"	25	0	0	25
14"	1	0	0	1
12 ¼"	0	16	0	16
11"	0	77	0	77
9 ⅞"	0	12	0	12
8 ⅞"	0	0	1	1
8 ¾"	0	0	3	3
7 ⅞"	0	0	89	89
6 ¾"	0	0	12	12
Totals	105	105	105	315

Note: Bit size information was available on 114 holes out of 345 that were spudded in the nine-township area from July 1995 through September 2002. Of the 114 holes completed, 105 were drilled using a three-string setup.

Two-String Hole

Bit Size	Surface Hole	Production Hole	Totals
12 ¼"	4	0	4
11"	5	0	5
7 ⅞"	0	9	9
Totals	9	9	18

Note: Of the 114 holes with available bit size information, nine holes were completed using a two-string setup.

Table DATA-A-4 lists the different casing sizes for wells drilled in the nine-township area during the recertification monitoring period. Information for casing sizes is acquired from

commercial sources and thus is readily available while drill bit size is acquired from state records which are not available until several months after a well has been completed.

Table DATA-A-4. Nine-Township Area Casing Sizes

Three-String Hole

Casing Size	Surface Casing	Intermediate Casing	Production Casing	Totals
20"	1	0	0	1
13 ⅜"	203	1	0	204
11 ¾"	44	0	0	44
10 ¾"	54	0	0	54
9 ⅞"	0	1	0	1
9 ⅝"	3	12	1	16
8 ⅝"	0	236	0	236
7 ⅞"	0	2	0	2
7 ⅝"	0	50	1	51
7"	0	3	6	9
5 ½"	0	0	235	235
4 ½"	0	0	62	62
Totals	305	305	305	915

Note: There were 345 wells drilled in the nine-township area from July 1995 through September 2002. Casing size information was available on 305 wells which used a three-string casing assembly to complete the well.

Two-String Hole

Casing Size	Surface Casing	Production Casing	Totals
10 ¾"	1	0	1
9 ⅝"	1	0	1
8 ⅝"	17	0	17
7"	0	1	1
5 ½"	0	18	18
Totals	19	19	38

Note: There were 19 wells completed as a two-string assembly out of the 345 wells drilled in the nine-township area during the recertification monitoring period.

Table DATA-A-5 lists these drilling related parameters: drill collar diameter and length, drill pipe diameter, speed of drill string rotation, penetration rate through the Salado, type and characteristics (density, viscosity, etc.) of drilling mud, and quantity of drilling fluid. This information was acquired from the annual surveys of area well operators performed each year during the recertification monitoring period.

Table DATA-A-5. Nine-Township Drilling Survey Information

#	Well Name and No.	Drill Pipe	Rotation Speed	Penetration Rate	Mud Density	Mud Viscosity	Mud Yield	Collar Diameter	Collar Length	Number of Collars
1	Lucy "ALC" State #3	4 ½"	75-85 RPM	35.4 ft/HR	10 PPG	28 SEC/QT	No Report	S=8 1/16 I=7 ½ P=6 ½	No Report	S=25 I=27 P=27
2	Jacque "AQJ" State #5	4 ½"	75-90 RPM	60 ft/HR	10 PPG	28 SEC/QT	No Report	S=7 15/16 I=7 ½ P=6 ⅝	No Report	S=16 I=27 P=27
3	Graham "AKB" State #5	4 ½"	40-90 RPM	68.7 ft/HR	10 PPG	28 SEC/QT	No Report	S=7 11/16 I=8 P=6	No Report	S=18 I=33 P=33
4	Graham "AKB" State #8	4 ½"	50-80 RPM	68 ft/HR	9.9-10.2 PPG	28 SEC/QT	No Report	S=8 I=8 P=6	No Report	S=18 I=33 P=33
5	Flora "AKF" State #3	4 ½"	60-105 RPM	65 ft/HR	10 PPG	28 SEC/QT	No Report	S=7 ⅞ I=7 ⅞ P=6	No Report	S=18 I=33 P=33
6	Remuda Basin State #9	4 ½"	No Report	91.6 ft/HR	8.3 PPG	38 SEC/QT	No Report	S=8	S=30 ft	No Report
7	Remuda Basin State #10	4 ½"	No Report	105 ft/HR	8.7 PPG	29 SEC/QT	No Report	S=8	S=30 ft	No Report
8	Remuda Basin State #11A	4 ½"	No Report	37.9 ft/HR	8.3 PPG	38 SEC/QT	No Report	S=8	S=30 ft	No Report
9	Barclay Federal #15	4 ½"	110 RPM	No Report	10 PPG	29 SEC/QT	No Report	S=8 and 6 I=8 and 6 P=6	S=31 ft I=31 ft P=31 ft	S=14 I=14 P=26
10	Barclay Federal #10	4 ½"	110 RPM	No Report	10 PPG	29 SEC/QT	No Report	S=8 and 6 I=8 and 6 P=6	S=31 ft I=31 ft P=31 ft	S=14 I=14 P=26
11	Barclay Federal #21	4 ½"	115 RPM	28 ft/HR	8.6 PPG	33 SEC/QT	No Report	S=8 and 6 I=8 and 6 P=8 and 6	S=813 ft I=781 ft P=782 ft	No Report
12	Barclay Federal #18	4 ½"	120 RPM	28 ft/HR	8.6 PPG	33 SEC/QT	No Report	S=8 and 6 I=8 and 6 P=8 and 6	S=812 ft I=780 ft P=783 ft	No Report

Table DATA-A-5. CRA Nine-Township Drilling Survey Information — Continued

#	Well Name and No.	Drill Pipe	Rotation Speed	Penetration Rate	Mud Density	Mud Viscosity	Mud Yield	Collar Diameter	Collar Length	Number of Collars
13	Barclay Federal #20	4 ½"	115 RPM	28 ft/HR	8.6 PPG	33 SEC/QT	No Report	S=8 and 6 I=8 and 6 P=8 and 6	S=813 ft I=780 ft P=782 ft	No Report
14	Barclay Federal #27		120 RPM	20 ft/HR	8.6 PPG	33 SEC/QT	No Report	S=8 and 6 I=8 and 6 P=8 and 6	S=810 ft I=785 ft P=780 ft	No Report
15	Barclay Federal #28	4 ½"	115 RPM	28 ft/HR	No Report	33 SEC/QT	No Report	S=8 and 6 I=8 and 6 P=8 and 6	S=812 ft I=784 ft P=782 ft	No Report
16	Barclay State #7	4 ½"	120 RPM	28 ft/HR	8.6 PPG	33 SEC/QT	No Report	S=8 and 6 I=8 and 6 P=8 and 6	S=810 ft I=781 ft P=780 ft	No Report
17	Barclay State #9	4 ½"	115 RPM		8.6 PPG	33 SEC/QT	No Report	S=8 and 6 I=8 and 6 P=8 and 6	S=815 ft I=785 ft P=786 ft	No Report
18	Barclay Federal #8	4 ½"	110 RPM	No Report	10 PPG	29 SEC/QT	No Report	S=8 and 6 I=8 and 6 P=6	S=31 ft I=31 ft P=31 ft	S=13 I=27 P=26
19	Barclay Federal #11	4 ½"	115 RPM	28 ft/HR	8.6 PPG	33 SEC/QT	No Report	S=8 and 6 I=8 and 6 P=8 and 6	S=810 ft I=780 ft P=784 ft	No Report
20	Barclay Federal #13	4 ½"	110 RPM	No Report	10 PPG	29 SEC/QT	No Report	S=8 and 6 I=8 and 6 P=6	S=31 ft I=31 ft P=31 ft	S=13 I=27 P=26
21	Barclay Federal #17	4 ½"	110 RPM	No Report	10 PPG	29 SEC/QT	No Report	S=8 and 6 I=8 and 6 P=6	S=31 ft I=31 ft P=31 ft	S=13 I=27 P=26
22	Barclay Federal #19	4 ½"	110 RPM	No Report	10 PPG	29 SEC/QT	No Report	S=8 and 6 I=8 and 6 P=6	S=31 ft I=31 ft P=31 ft	S=13 I=27 P=26
23	Barclay Federal #25	4 ½"	118 RPM	29 ft/HR	8.6 PPG	33 SEC/QT	No Report	S=8 and 6 I=8 and 6 P=8 and 6	S=815 ft I=784 ft P=782 ft	No Report

Note: Under the columns for Collars, the "S" indicates surface string, the "I" indicates intermediate string, and the "P" indicates production string. Also, under the Collar Diameter the production string on some wells indicates 8- and 6-in. collars. This is obviously an error since the hole diameter for that portion of the well is 7 ⅞ inches.

Table DATA-A-6 lists the known instances of air drilling that have occurred in the New Mexico portion of the Delaware Basin since hydrocarbon drilling has been performed. During the 100 years of drilling used for the CCA, there were 15 suspected cases where air may have been used to drill some portion of a well. During the recertification monitoring period, there was one proven incidence of air drilling, although not through the salt section, which occurred near the airport in Carlsbad 40.23 km (25 mi) west of the WIPP site.

Table DATA-A-6. Air-Drilled Wells

#	Location	Well Name and No.	Spud Date	Status	Well Information
Wells Drilled Prior to Submittal of the CCA With Some Portion Drilled by Air					
1	21S-28E-33	Richardson & Bass #1	07/27/1961	P&A	Air drilled through the salt. Between 2,545 and 2,685 encountered water and changed from air to mud based drilling.
2	21S-32E-26	Lincoln Federal Unit #1	04/01/1991	P&A	Lost circulation at 1290. Hole was dry drilled to 1,792. Supposedly air drilled from 2,984 to 4,725.
3	23S-26E-17	Exxon "17" Federal #1	08/01/1989	Gas Well	Air drilled through the salt from 575 to 2,707.
4	23S-28E-11	CP Pardue #1	10/28/1958	P&A	Air drilled through the salt from 390 to 2,620.
5	23S-28E-11	Amoco Federal #1	08/04/1979	Oil Well	Air drilled from 475 to 9,700.
6	23S-28E-11	Amoco Federal #3	02/28/1980	Oil Well	Air drilled from 6271 to 9,692.
7	23S-28E-23	South Culebra Bluff Unit #3	01/21/1979	Oil Well	Air drilled from 6345 to 8,000.
8	23S-28E-23	South Culebra Bluff Unit #4	08/09/1979	Oil Well	Air drilled from 450 to 9,802.
9	24S-31E-03	Lilly "ALY" Federal #2	05/01/1994	Oil Well	Air drilled conductor hole to 40.
10	24S-31E-03	Lilly "ALY" Federal #4	05/16/1994	Oil Well	Air drilled conductor hole to 40.
11	24S-34E-04	Antelope Ridge Unit #2	09/13/1962	Gas Well	Attempted to drill with gas. Had to convert to water at 1,035. Tried again several times at different depths.
12	24S-34E-09	Federal "9" Com #1	12/3/1963	Gas Well	Hit water while gas drilling at 4,865.
13	24S-34E-13	Federal Johnson #1	06/23/1958	P&A	Proposed to drill with air but no information in the records indicate air drilling.
14	26S-32E-20	Russell Federal #1	03/16/1966	Oil Well	Drilled with air to 1,330.
15	26S-32E-36	North El Mar Unit #44	02/19/1959	Oil Well	Proposed to drill with air but no information in the records indicate air drilling.
Wells Drilled After Supplemental Information Provided to the Docket					
1	22S-26E-28	Sheep Draw "28" Federal #13	07/01/1997	Oil Well	Air drilled the first 358 ft.

Note: The research on "air drilling" is a continuous effort since every new well drilled is checked to determine if any portion of the well was drilled by air. A copy of all completion reports are on file for all wells completed within the New Mexico portion of the Delaware Basin.

DATA-A-5.2 Borehole Plug-Related Parameters/Data

Borehole plug-related parameters/data including pattern of plugs; plug materials and lengths; total number, location, and depth of abandoned boreholes; and type of well casing steel alloy are shown in Table DATA-A-7.

Table DATA-A-7. Plugged Wells in the Nine-Township Area of the Delaware Basin – July 1995 Through September 2002

#	Location	Well Name and No.	Plug Date	R-111-P	Depth	No. Plugs	Plug Length	No. Sacks	Cement	Steel Alloy
1	21S-30E-33	Kaleidoscope "AKO" #1	03/13/1996	Yes	7,340	5	35 ft 50ft 100 ft 227 ft 264 ft	35 ft 10 Sacks 25 Sacks 25 Sacks 80 Sacks	Class C	S=J-55 I=J-55 P=J-55
2	21S-30E-34	Julia "AJL" Federal #4	03/19/1996	Yes	7,455	6	35 ft 100 ft 100 ft 185 ft No Report 50 ft	35 ft 25 Sacks 25 Sacks 25 Sacks 65 Sacks 5 Sacks	Class C	S=J-55 I=J-55 P=J-55
3	21S-32E-22	Bilbrey North "22" Federal #1	07/29/1998	Yes	15,020	5	330 ft 180 ft 150 ft 2,150 ft 50 ft	35 Sacks 180 ft 150 ft 750 Sacks 5 Sacks	No Report	S=J-55 I=N-80 P=P-110
4	21S-32E-31	Luke Federal #2	04/26/1998	Yes	8,585	4	No Report 100 ft 424 ft 50 ft	6 Sacks 11 Sacks 362 Sacks 50 Sacks	Class C	S=H-40 I=K-55 P=K-55
5	21S-32E-35	Anderson #1	07/27/1995	No	8,763	5	40 ft No Report 297 ft 197 ft 50 ft	40 ft 15 Sacks 70 Sacks 50 Sacks 10 Sacks	Class C	S=K-55 I=J-55 P=J-55
6	22S-32E-14	Prohibition Federal #5	05/24/1996	No	8,914	6	No Report 192 ft 336 ft 154 ft 125 ft 60 ft	25 Sacks 20 Sacks 50 Sacks 40 Sacks 65 Sacks 40 Sacks	Unknown Unknown Unknown Class C Class C Class C	S=J-55 I=J-55 P=J-55/N-80
7	22S-32E-22	Cercion Federal #8	03/25/1998	No	8,900	6	200 ft 100 ft 100 ft 100 ft 100 ft 20 ft	70 Sacks 50 Sacks 100 Sacks 35 Sacks 35 Sacks 20 Sacks	Class H Class H Class C Class C Class C Class C	No Report

Table DATA-A-7. Plugged Wells in the Nine-Township Area of the Delaware Basin – July 1995 Through September 2002 — Continued

#	Location	Well Name and No.	Plug Date	R-111-P	Depth	No. Plugs	Plug Length	No. Sacks	Cement	Steel Alloy
8	23S-32E-09	Aracanga Federal #2	02/04/1998	No	8,985	4	No Report 100 ft 100 ft 430 ft	35 Sacks 25 Sacks 25 Sacks 112 Sacks	No Report	S=H-40 I=J-55 P=J-55
9	23S-32E-12	Pronghorn Federal "12" #1	02/18/1999	No	9,200	7	50 ft 100 ft 100 ft 150 ft 100 ft 100 ft 50 ft	50 ft 50 Sacks 40 Sacks 60 Sacks 35 Sacks 35 Sacks 15 Sacks	Class H Class C Class C Class C Class C Class C Class C	No Report
10	23S-32E-15	Codorniz Federal #2	12/31/1996	No	9,039	5	100 ft 100 ft 100 ft 100 ft 60 ft	50 Sacks 50 Sacks 50 Sacks 50 Sacks 20 Sacks	Class H	S=H-40 I=J-55/S-80 P=K-55
11	23S-32E-18	Sand "18" Federal #2	05/24/1996	No	8,800	4	200 ft 265 ft 141 ft 75 ft	55 Sacks 180 Sacks 45 Sacks 57 Sacks	Class H	S=WC-40 I=WC-50 P=K-55/L-80
12	23S-32E-24	Red Deer "24" Federal #1	05/27/1997	No	9,101	4	216 ft 115 ft 180 ft 730 ft	50 Sacks 25 Sacks 35 Sacks 140 Sacks	Class C	S=K-55 I=K-55
13	23S-32E-35	Red Ruby "35" Federal #1	08/17/1997	No	9,100	6	202 ft 101 ft 125 ft 110 ft 110 ft 15 ft	60 Sacks 45 Sacks 70 Sacks 30 Sacks 30 Sacks 15 Sacks	No Report	S=J-55 I=NS-80

Note: Under the column for Steel Alloy the "S" indicates surface casing, the "I" indicates intermediate casing, and the "P" indicates production casing. The plugging regulations in New Mexico have not changed since the 1996 CCA.

DATA-A-5.3 Enhanced Recovery Data

Enhanced recovery data, including occurrences of fluid injection (water flood) within the nine-township area; CO_2 miscible flooding; salt water disposal within the nine-township area; and volume (barrels) of fluid injected near WIPP within the nine-township area are shown in the following Figure DATA-A-1 and Table DATA-A-8.

DATA-A-5.3.1 CO_2 Flooding

There are no secondary or tertiary recovery projects in the vicinity of the WIPP site utilizing carbon dioxide flooding as a means to recover oil. The nearest operation of this type is located 40.23 km (25 mi) to the south in Loving County, Texas.

There are no CO_2 pipelines to any of the oil fields in the New Mexico portion of the Delaware Basin where secondary recovery is ongoing. The one field near the WIPP site (El Mar) where secondary recovery is ongoing is located approximately 40.23 km (25 mi) from the CO_2 flooding operation in Loving County, Texas.

DATA-A-5.4 Gas Storage Data

Gas storage data including occurrences of gas storage (cavern and/or reservoir) near WIPP are shown in Table DATA-A-9.

A common underground gas storage facility is a cavern solution mined from the salt formations underlying the surface. They are made by dissolving the salt with fresh water and then pumping the brine to the surface, leaving a cavity that can be used for storage of hydrocarbons while a depleted reservoir storage system utilizes a reservoir from which most or all economically recoverable hydrocarbons have been produced.

In 1992, there were six gas storage facilities permitted in the state of New Mexico. Five were located in Southeast New Mexico, with one being inside the boundaries of the Delaware Basin and of interest to the WIPP site. The Washington Ranch Storage Project, located in the Delaware Basin about 79.03 km (46 mi) to the southwest of the WIPP site, is a multiwell system in a depleted gas reservoir, storing produced natural gas at a depth of approximately 1981.2 to 2133.6 m (6,500 to 7,000 ft). It is still in operation at this time, although at a much reduced level than in 1992.

Of the five facilities located in southeast New Mexico, only three are cavern-type facilities solution mined from the salt. All three store liquefied petroleum gas and are between 53.1 and 56.33 km (33 and 35 mi) from the WIPP site. The two that store produced natural gas do so in a depleted gas reservoir with the nearest facility located 32.19 km (20 mi) from the WIPP site, leaving the Washington Ranch Storage Project the furthest from the site at 79.03 km (46 mi).

At this time, there are no known underground gas storage facilities in the Texas portion of the Delaware Basin.

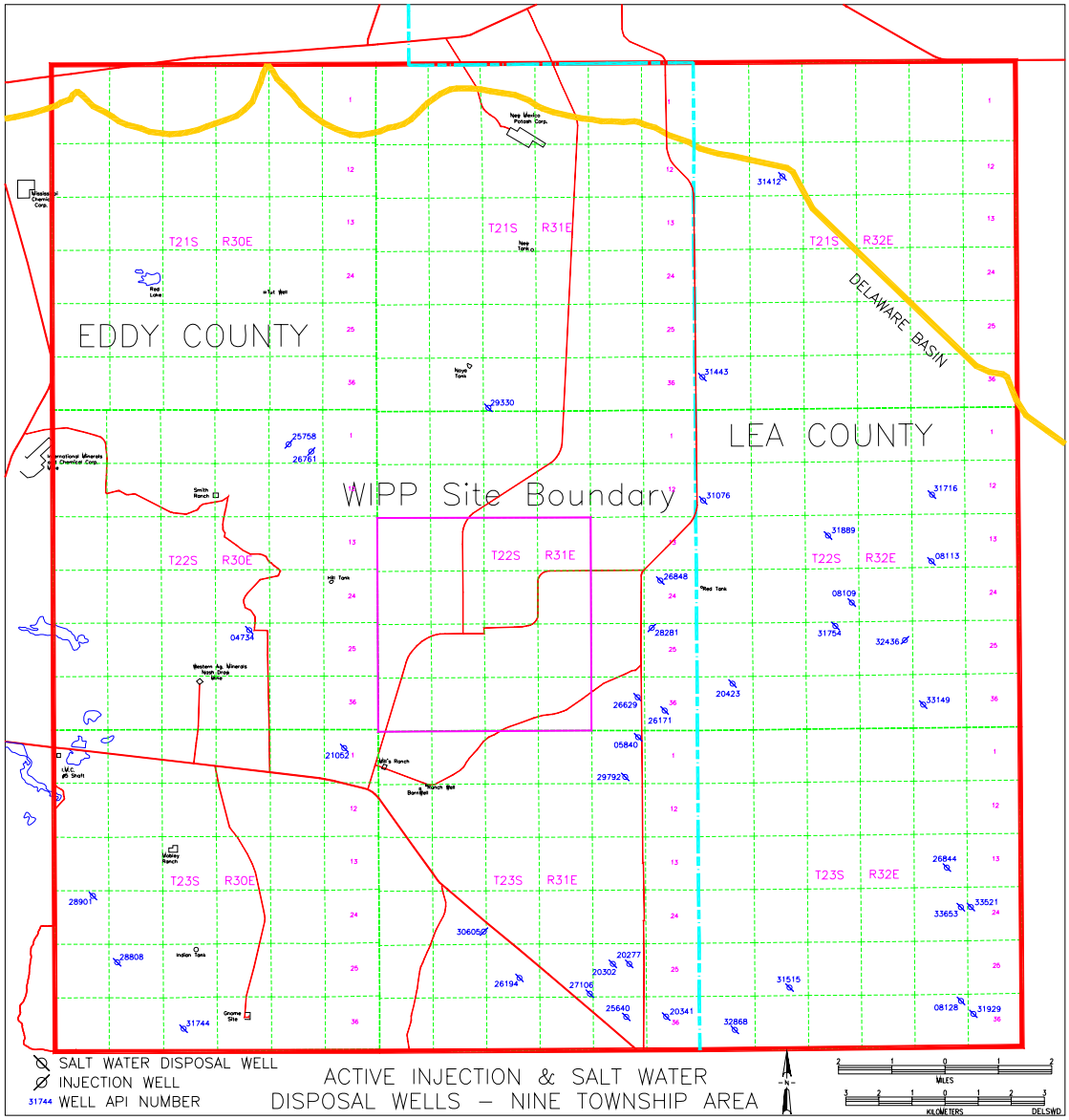

Figure DATA-A-1. Active Injection and Salt Water Disposal Wells

Table DATA-A-8. Nine-Township Injection and Salt Water Disposal (SWD) Well Information

No.	Location	Well Name and No.	Well Status	Injection Zone	1st Inj	Latest Inj	Inj Press	Cumulative Barrels
Wells Completed Prior to the Initial Certification								
1	21S-32E-08	Union "AJS" Federal #1	Salt Water Disposal	4826-5978	1991	June-2002	700 psi	4,784,288 Barrels
2	21S-32E-31	Lost Tank SWD #1	Salt Water Disposal	4618-6012	1992	June-2002	20 psi	157,463 Barrels
3	22S-30E-02	James "A" #3	Injection	7200-7264	1993	June-2002	855 psi	6,376,961 Barrels
4	22S-30E-02	James "A" #12	Injection	5600-7400	1991	June-2002	776 psi	6,758,551 Barrels
5	22S-30E-27	RH Legg Federal #1	Salt Water Disposal	3820-3915	1981	June-2002	760 psi	1,947,467 Barrels
6	22S-31E-24	Getty "24" Federal #5	Salt Water Disposal	4519-5110	1991	June-2002	No Report	4,694,840 Barrels
7	22S-31E-25	Neff Federal #3	Injection	7050-7068	1995	June-2002	600 psi	3,069,445 Barrels
8	22S-31E-35	David Ross "AIT" Federal #1	Salt Water Disposal	4500-5670	1991	June-2002	700 psi	7,791,690 Barrels
9	22S-32E-07	Flamenco Federal #1	Salt Water Disposal	4676-5814	1991	June-2002	300 psi	5,014,465 Barrels
10	22S-32E-11	Prohibition Federal #2	Salt Water Disposal	5200-8706	1994	June-2002	450 psi	915,747 Barrels
11	22S-32E-14	Red Tank "BT" Federal #2	Salt Water Disposal	4900-6080	1994	May-2002	No Report	2,564,127 Barrels
12	22S-32E-16	Kiwi "AKX" State #8	Salt Water Disposal	5240-8710	1995	June-2002	700 psi	4,750,431 Barrels
13	22S-32E-21	Gilmore Federal #1	Salt Water Disposal	4755-5110	1992	June-2002	550 psi	1,847,930 Barrels
14	22S-32E-28	Red Tank "28" Federal #3	Salt Water Disposal	4690-5800	1993	June-2002	300 psi	397,081 Barrels
15	22S-32E-31	Proximity "31" Federal #4	Salt Water Disposal	4662-5915	1993	June-2002	550 psi	2,976,033 Barrels
16	22S-32E-35	Red Tank "35" Federal #3	Salt Water Disposal	4950-6252	1995	June-2002	400 psi	2,025,597 Barrels
17	23S-30E-29	Charger "29" Federal #1	Salt Water Disposal	5479-7220	1996	June-2002	375 psi	1,587,535 Barrels
18	23S-31E-26	Todd Federal "26" #2	Salt Water Disposal	4460-5134	1992	June-2002	900 psi	3,231,147 Barrels
19	23S-31E-26	Todd Federal "26" #3	Salt Water Disposal	4390-6048	1971	June-2002	900 psi	4,460,450 Barrels
20	23S-31E-28	Sand Dunes "28" Federal #1	Salt Water Disposal	4295-5570	1993	June-2002	440 psi	2,944,921 Barrels
21	23S-31E-35	Cal-Mon #5	Salt Water Disposal	4484-5780	1993	June-2002	732 psi	2,347,175 Barrels
22	23S-31E-36	Todd "36" State #1	Salt Water Disposal	5980-6560	1994	June-2002	700 psi	6,836,860 Barrels
23	23S-32E-14	Cuervo Federal #1	Salt Water Disposal	5496-6014	1991	June-2002	550 psi	1,071,613 Barrels
24	23S-32E-29	James Federal #1	Salt Water Disposal	4844-4944	1992	June-2002	650 psi	2,882,040 Barrels
25	23S-32E-31	SDE "31" Federal #9	Salt Water Disposal	5150-5700	1996	June-2002	No Report	629,554 Barrels
26	23S-32E-35	James Federal #1A	Salt Water Disposal	5062-5100	1969	March-2002	850 psi	142,681 Barrels
27	23S-32E-36	Triste Draw "36" State #1	Salt Water Disposal	5364-6138	1995	May-2002	No Report	1,035,920 Barrels

Table DATA-A-8. Nine-Township Injection and Salt Water Disposal (SWD) Well Information — Continued

No.	Location	Well Name and No.	Well Status	Injection Zone	1st Inj	Latest Inj	Inj Press	Cumulative Barrels
Wells Completed Since the Initial Certification								
28	21S-31E-33	Lost Tank "33" Federal #2	Salt Water Disposal	4166-5160	1998	June-2002	360 psi	1,383,513 Barrels
29	22S-31E-36	Medano State Commercial #1	Salt Water Disposal	4500-5700	1998	Sept-2001	950 psi	2,500,628 Barrels
30	22S-32E-27	Prize Federal #4	Injection	6831-8388	1998	April-1999	No Report	No Report
31	23S-30E-01	Hudson Federal #1	Salt Water Disposal	4040-4825	2001	June-2002	800 psi	561,873 Barrels
32	23S-30E-19	Remuda Basin "19" Federal #2	Salt Water Disposal	3402-4609	1997	No Report	No Report	No Report
33	23S-30E-33	Poker Lake Unit #170	Salt Water Disposal	4546-6760	2002	No Report	No Report	No Report
34	23S-31E-02	Conoco State AA-2 #1	Salt Water Disposal	4489-5670	1997	Sept-2001	1010 psi	3,726,488 Barrels
35	23S-31E-02	Barclay State #4	Salt Water Disposal	4500-5850	1998	Sept-2001	1030 psi	2,908,070 Barrels
36	23S-31E-20	Pure Gold "B" Federal #20	Injection	7740-7774	2001	Dec-2001	No Report	244,642 Barrels
37	23S-31E-27	Todd "27" Federal	Salt Water Disposal	4694-5284	1998	No Report	No Report	No Report
38	23S-32E-23	Diamondtail "23" Federal #2	Salt Water Disposal	5954-6064	?	May-2001	420 psi	911,167 Barrels
39	23S-32E-24	Diamondtail "24" Federal #1	Salt Water Disposal	5925-6042	?	June-2002	No Report	732,490 Barrels

Note: Information collected from OCD offices in Artesia and Hobbs. Also, Cumulative Barrels information is collected from the New Mexico Oil & Gas Engineering Committee, Inc. and is valid through June 2002.

Table DATA-A-9. Underground Gas Storage Facilities in the Vicinity of the WIPP Site

Facility/Operator	Type of Facility	Location	Delaware Basin	Capacity	Material Stored
Washington Ranch Storage Project El Paso Natural Gas Company	Multiwell system utilizing a depleted gas reservoir found at a depth of 6,500 to 7,000 ft.	25S-24E 26S-24E Eddy County	Yes	67,253 MMCF	Produced Natural Gas
Loco Hills Arrow Gas Company	Three-well system interconnected by a cavity in the salt section at a depth of 500 to 600 ft.	17S-29E-22 Eddy County	No	235,000 to 238,000 barrels	Liquified Petroleum Gas
LPG Storage Well No. 1 Warren Petroleum Company	One-well storage facility in the salt section at a depth of 1,892 ft.	20S-36E-01 Lea County	No	168,000 barrels	Liquified Petroleum Gas
LPG Storage Well No. 2 Warren Petroleum Company	One-well storage facility in the salt section at a depth of 1,469 ft.	19S-36E-36 Lea County	No	245,000 barrels	Liquified Petroleum Gas
Grama Ridge Morrow Unit Llano, Inc.	Four-well storage facility (two injectors, two withdrawal wells) in a portion of the Grama Ridge Gas Pool at a depth of 12,700 to 13,200 ft.	21S-34E-34 22S-34E-03 Lea County	No	13,000 MMCF	Produced Natural Gas

DATA-A-5.5 Solution Mining

This section discusses occurrences of solution mining within the Delaware Basin. The discussion addresses the following four categories:

- Potash solution mining,
- Sulfur solution mining,
- Brine wells, and
- Naturally occurring radioactive materials (NORM) facilities.

DATA-A-5.5.1 Potash Solution Mining

No solution mining for potash has occurred at any of the mines located within the Delaware Basin in the vicinity of the WIPP site. The DOE is not aware of any plans being considered by any mining companies to use potash solution mining in the Delaware Basin. However, this process has occurred outside the Delaware Basin in the Carlsbad Mining District, which comprises all of the potash mines in the area. Potash can be found in the Mcnutt

The first solution mining attempt was in the late 1960s. Conoco Minerals installed a pilot scale in-situ solution mine on the AMAX lease in 19S-30E-12. This solution cavity was mapped in 1974 from the surface using radar. The cavern created was 213.36 m (700 ft) in diameter and approximately 3.04 m (10 ft) high. There were four boreholes drilled to create this cavity — one injection well and three withdrawal wells. This project was designed to test solution mining of potassium minerals, but the potash ore zone was deemed too thin to make this method economically viable. This occurred approximately 22 miles north of the WIPP Site.

The second potash solution mining endeavor is still in the initial phases and solution mining activities have not yet commenced. In May 1997, Mississippi Chemical filed a notice of intent to proceed with solution mining of potash in the Clayton Basin just to the north of the Delaware Basin. The next step in the process is for a detailed plan to be submitted to the Bureau of Land Management (BLM) for further evaluation. This plan was not submitted until March 2002. BLM approved the test plan in May 2002 for the pilot project. After the pilot phase is completed, an Environmental Impact Statement will be required before work can proceed. Currently, Mississippi Chemical has put the plan on hold due to a lack of funding. Talks with the BLM have indicated that the plan is still of a proprietary nature and the BLM will not allow anyone to review the plan without approval from Mississippi Chemical. However, BLM personnel did indicate that the facility would be located at the old Eddy Potash mine, which is located outside of the Delaware Basin and north-northwest of the WIPP site approximately 30.68 km (19 mi). The proposed plan is to pump water down the shaft into a section of the mine that has been previously mined out, circulating the water around pillars until it becomes saturated with potash, and then pumping the saturated fluid to the surface where it would be dumped into a two- to three-acre evaporation pond. The residue would then be refined. This information was acquired in a phone conversation with BLM personnel on 3/13/02.

DATA-A-5.5.2 Sulfur Solution Mining

Solution mining for sulfur has occurred in the Delaware Basin. Currently, there are no active sulfur solution mining projects within the Delaware Basin. Past activity was at the sulfur mine located west of Orla, Texas, in Culberson County. This facility utilized a number of Class III injection wells to remove sulfur from underground mineral deposits. This mine was closed in June 1999.

DATA-A-5.5.3 Brine Wells

Brine wells are classified as Class II injection wells. In the Delaware Basin, the process involves injecting fresh water through the wells into a salt formation to create a saturated brine solution, which is then extracted and utilized as a drilling agent when drilling a new well. These wells are tracked by the DBDSP on a continuing basis. Supplemental information provided to the EPA in 1997 showed 11 brine wells in the Delaware Basin. Further research showed there to be 15 brine wells. Four of these are plugged and abandoned with 11 being active (see Table DATA-A-10). One new well has been permitted in the Delaware Basin since submittal of the initial certification application (Quito West Unit #207). One well has yet to be verified and is not listed in the table below. Records indicate it has been permitted, but there are no records to indicate whether it was drilled. If records are found to verify when the well was drilled, it will be added to the databases maintained by the DBDSP and classified as a brine well.

Table DATA-A-10. Delaware Basin Brine Well Status

County	Location	API No.	Well Name and No.	Operator	Status
Eddy	22S-26E-36	3001521842	City of Carlsbad #WS-1	Key Energy Services	Brine Well
Eddy	22S-27E-03	3001520331	Tracy #3	Ray Westall	Plugged Brine Well
Eddy	22S-27E-17	3001522574	Eugenie #WS-1	I & W Inc	Brine Well
Eddy	22S-27E-17	3001523031	Eugenie #WS-2	I & W Inc	Plugged Brine Well
Loving	Blk 29-03	4230110142	Lineberry Brine Station #1	Chance Properties	Brine Well
Loving	Blk 01-82	4230130680	Chapman Ford #BR1	Herricks & Son Co.	Plugged Brine Well
Loving	Blk 33-80	4230180318	Mentone Brine Station #1D	Basic Energy Services	Brine Well
Loving	Blk 29-28	4230180319	East Mentone Brine Station #1	Permian Brine Sales, Inc.	Plugged Brine Well
Loving	Blk 01-83	4230180320	North Mentone #1	Chance Properties	Brine Well
Reeves	Blk 56-30	4238900408	Orla Brine Station #1D	Mesquite SWD Inc.	Brine Well
Reeves	Blk 04-08	4238920100	North Pecos Brine Station #WD-1	Chance Properties	Brine Well
Reeves	Blk 07-21	4238980476	Coyanosa Brine Station #1	Chance Properties	Brine Well
Ward	Blk 17-20	4247531742	Pyote Brine Station #WD-1	Chance Properties	Brine Well
Ward	Blk 01-13	4247534514	Quito West Unit #207	Seaboard Oil Co.	Brine Well
Ward	Blk 34-174	4247582265	Barstow Brine Station #1	Chance Properties	Brine Well

DATA-A-5.5.4 Naturally Occurring Radioactive Materials Facilities

NORM facilities are considered because they may be created in salt formations by solution mining to dispose of NORM wastes. According to conversations with the NORM Director for the Texas Railroad Commission, there are four permitted NORM sites in the state of Texas. Three are located in the Permian Basin but well outside of the Delaware Basin. The Andrews facility, approximately 96.56 km (60 mi) east of the WIPP Site, is operated by Lotus LLC and will eventually have a capacity of 570,000 barrels. Another facility is located near Fort Stockton by NES Permian and will have a capacity of 1,000,000 barrels. The third facility is also operated by NES Permian near Big Spring and is considerably smaller. All of these facilities are located in salt formations and were solution mined to facilitate the reinjection of NORM wastes by the oil companies. This information is tracked by the DBDSP. There is no requirement to track NORM facilities outside of the Delaware Basin, but the DBDSP does so for possible future impacts to activities within the Delaware Basin.

DATA-A-5.6 Potash Mining Data

Potash mining data include a map of current potash leases (Figure DATA-A-2) and changes in existing leases within the nine-township area (see Table DATA-A-11). A full-sized copy of Figure DATA-A-2 can be found in a pocket at the end of this volume.

DATA-A-5.7 Seismic Data

Seismic data include a history of relevant events, e.g., earthquake (natural or human induced) activity, relation of epicenters with geologic structures, geologic setting, etc. This information is provided in Figure DATA-A-3 and Table DATA-A-12. A full-sized copy of Figure DATA-A-3 can be found in a pocket at the end of this volume.

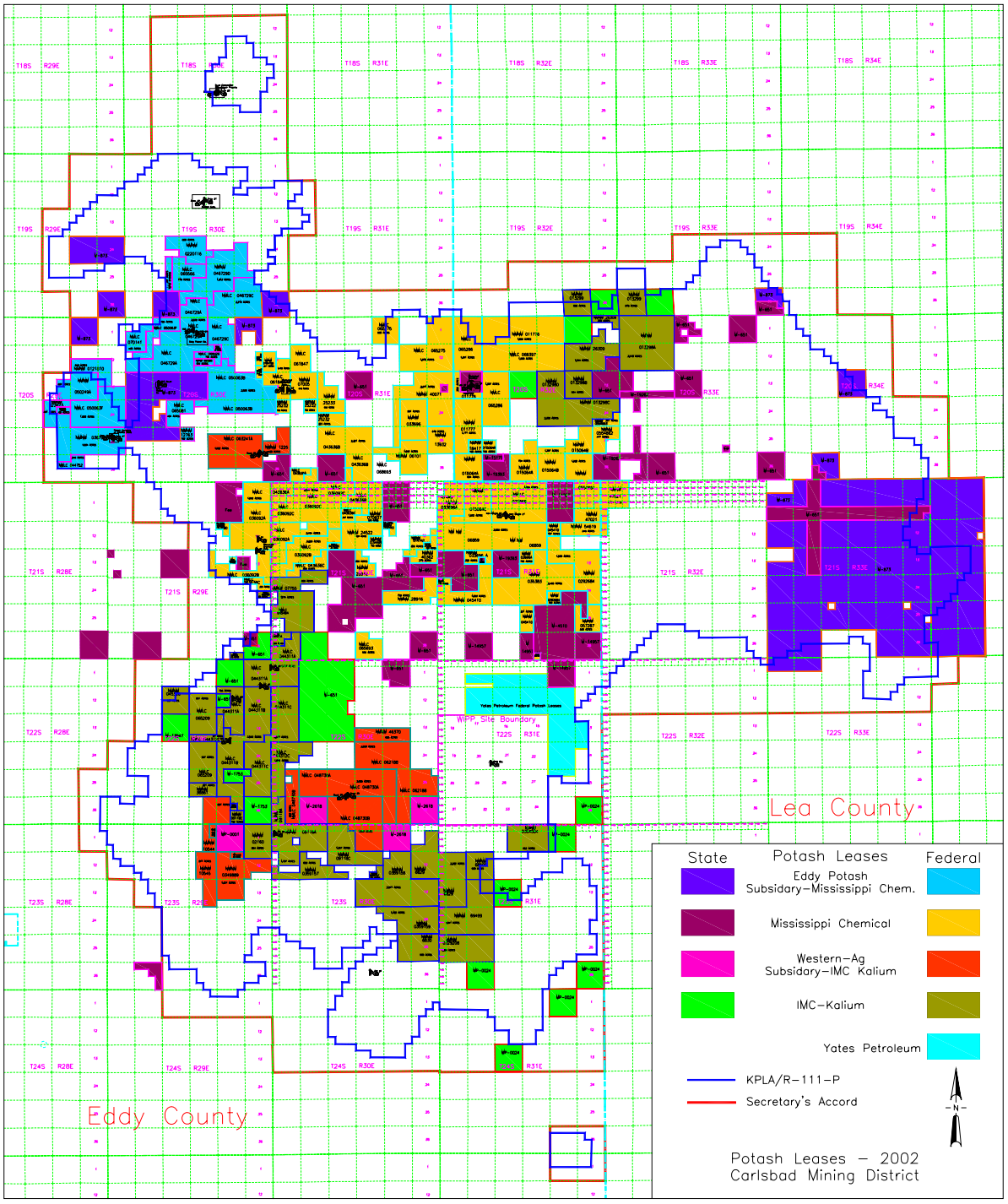

Figure DATA-A-2. Current Potash Leases

Table DATA-A-11. Potash Leases in the Vicinity of the WIPP Site

Company	1995	2002	Federal Leases	Acreage	Lease Eff. Date	State Leases	Acreage	Lease Eff. Date
Horizon Corp	Yes	No	Cancelled			Cancelled		
Eddy Potash (Subsidiary of Mississippi Chemical)	Yes	Yes	NMLC-044752 NMLC-046729A NMLC-046729C NMLC-046729D NMLC-050063B NMLC-050063F NMLC-065081-01 NMLC-065566-01 NMLC-066026-01 NMLC-070141-01 NMNM-023623-01 NMNM-036791 NMNM-050249A NMNM-088285 NMNM-0121810-01 NMNM-0135065 NMNM-0220116 NMNM-13933 NMNM-12763	240.00 2,558.76 2,279.95 1,840.00 2,560.00 2,358.36 480.00 720.00 200.00 438.91 400.00 1,840.00 880.00 120.00 640.00 200.00 800.00 80.00 160.00	09/01/1956 01/18/1933 01/18/1933 01/18/1933 040/1/1939 04/01/1939 12/06/1950 09/28/1951 09/01/1955 01/01/1959 02/01/1962 10/01/1957 09/01/1963 080/1/1960 01/01/1965 06/01/1961 12/01/1961 10/01/1971 06/01/1971	M-873	37,850.28	Unknown
Western-Ag Minerals (Subsidiary of IMC Kalium)	Yes	Yes	NMLC-048730A NMLC-048730B NMLC-062188 NMLC-063241A NMNM-0349889-01 NMNM-1225 NMNM-10544 NMNM-10545 NMNM-46370 NMNM-84935 NMNM-86720	2,560.00 2,556.40 2,520.00 1,600.00 1,400.00 480.00 240.09 800.00 640.00 160.03 640.00	08/21/1952 08/21/1952 12/01/1959 11/30/1949 11/01/1967 06/20/1932 11/01/1969 11/01/1969 02/01/1982 04/01/1991 03/01/1993	MP-001 M-2618	642.97 1,951.18	Unknown Unknown
Harroun	Yes	No	Cancelled			None		
National Potash Company	Yes	No	Owned by Mississippi			None		
New Mexico Potash	Yes	No	Owned by Mississippi			Mississippi		
IMC Global/Noranda	Yes	No	Owned by IMC Kalium			IMC Kalium		

Table DATA-A-11. Potash Leases in the Vicinity of the WIPP Site — Continued

Company	1995	2002	Federal Leases	Acreage	Lease Eff. Date	State Leases	Acreage	Lease Eff. Date
Yates Petroleum/Pogo Producing Co	Yes	Yes		5,184.72	1992	None		
IMC Kalium	Yes	Yes	NMLC-044311A NMLC-044311B NMLC-044311C NMLC-044312A NMLC-044312B NMLC-044312C NMLC-065209 NMLC-065484-01 NMNM-02160-01 NMNM-07755-01 NMNM-09118A NMNM-09118C NMNM-045326-01 NMNM-0329208-01 NMNM-0359157-01 NMNM-0359158-01 NMNM-0359159-01 NMNM-0384584-01 NMNM-6829 NMNM-6830 NMNM-36861 NMNM-69499 NMNM-68500 NMNM-013298A NMNM-013298B NMNM-013298C NMNM-013299 NMNM-26309	2,550.33 2,560.00 2,563.28 302.37 40.00 1,400.29 1,920.00 1,331.76 798.78 665.65 1,766.71 1,400.60 640.00 1,287.00 960.20 2,520.00 1,160.00 957.69 2,211.12 960.00 320.00 1,926.40 640.00 2,564.33 640.00 2,360.00 1,277.80 1,438.80	10/26/1938 10/26/1938 10/26/1938 11/15/1946 11/15/1946 11/15/1946 11/01/1949 01/5/1953 11/01/1956 060/1/1957 07/02/1951 07/02/1951 05/01/1958 03/01/1967 11/01/1967 11/01/1967 02/01/1968 11/01/1967 11/01/1967 11/01/1967 01/01/1981 03/01/1967 03/01/1967 02/24/1953 02/24/1953 02/24/1953 02/24/1953 02/24/1953	M-13947 M-1753 M-651 MP-0024 Unknown	637.05 921.33 5,734.52 4,472.90 2,517.63	Unknown Unknown Unknown Unknown Unknown

Table DATA-A-11. Potash Leases in the Vicinity of the WIPP Site — Continued

Company	1995	2002	Federal Leases	Acreage	Lease Eff. Date	State Leases	Acreage	Lease Eff. Date
Mississippi Potash	Yes	Yes	NMLC-036092A	2,436.85	11/21/1929	M-651	19,973.52	Unknown
			NMLC-036092B	2,025.59	11/21/1929	M-19262	1,512.52	Unknown
			NMLC-036092C	2,559.15	11/21/1929	M-14957	2,632.51	Unknown
			NMLC-043636A	1,044.03	06/20/1932	M-15171	121.13	Unknown
			NMLC-043636B	2,311.66	06/20/1932	M-19393	1,084.16	Unknown
			NMLC-043636C	920.00	06/20/1932	M-4510	2,270.97	Unknown
			NMLC-061847-01	1,115.24	07/01/1951			
			NMLC-065693-01	560.00	02/01/1958			
			NMLC-065275-01	2,550.56	01/09/1952			
			NMLC-068397	1,920.00	01/09/1952			
			NMLC-065286-01	2,553.87	01/09/1952			
			NMLC-071868-01	1,938.24	09/01/1955			
			NMNM-06101-01	1,040.00	02/01/1958			
			NMNM-03468	160.00	07/01/1958			
			NMNM-07005	636.28	01/02/1952			
			NMNM-016540-01	120.00	04/04/1960			
			NMNM-033696	960.00	03/01/1958			
			NMNM-063880	120.00	07/01/1959			
			NMNM-070607	551.70	02/01/1960			
			NMNM-0184149	80.00	01/01/1955			
			NMNM-0184150	240.00	11/30/1949			
			NMNM-13932	640.00	11/01/1974			
			NMNM-24522	800.00	03/01/1982			
			NMNM-25232	640.00	07/06/1951			
			NMNM-25233	640.00	01/02/1952			
			NMNM-25234	80.00	11/30/1949			
			NMNM-28916	880.00	08/01/1963			
			NMNM-011776	2,559.06	01/09/1952			
			NMNM-011777	1,117.64	01/09/1952			
			NMNM-40071	2,080.00	05/01/1980			
			NMNM-06859-01	2,554.24	10/26/1953			
			NMNM-014742-01	640.00	08/01/1963			
			NMNM-033696A	1,240.62	03/01/1958			
			NMNM-035383	2,400.00	01/01/1958			
			NMNM-045410	2,438.30	06/01/1958			
			NMNM-057287-01	560.00	01/01/1964			

Table DATA-A-11. Potash Leases in the Vicinity of the WIPP Site — Concluded

Company	1995	2002	Federal Leases	Acreage	Lease Eff. Date	State Leases	Acreage	Lease Eff. Date
Mississippi Potash (continued)	Yes	Yes	NMNM-015064A	1,599.76	10/26/1953			
			NMNM-015064B	1,280.00	10/26/1953			
			NMNM-015064C	1,049.40	10/25/1953			
			NMNM-0292684-01	1,720.00	12/01/1966			
			NMNM-0554862	480.00	02/24/1953			
			NMNM-0554863	200.00	02/24/1953			
			NMNM-0554864	1,250.04	02/24/1953			
			NMNM-18417	160.00	01/09/1952			
			NMNM-28915	117.94	06/01/1958			
			NMNM-40362	280.00	12/01/1980			
			NMNM-41639	120.00	07/01/1981			
			NMNM-47021	1,104.26	07/01/1982			
			NMNM-54619	565.88	03/01/1983			
			NMNM-80707	2,520.00	08/01/1963			

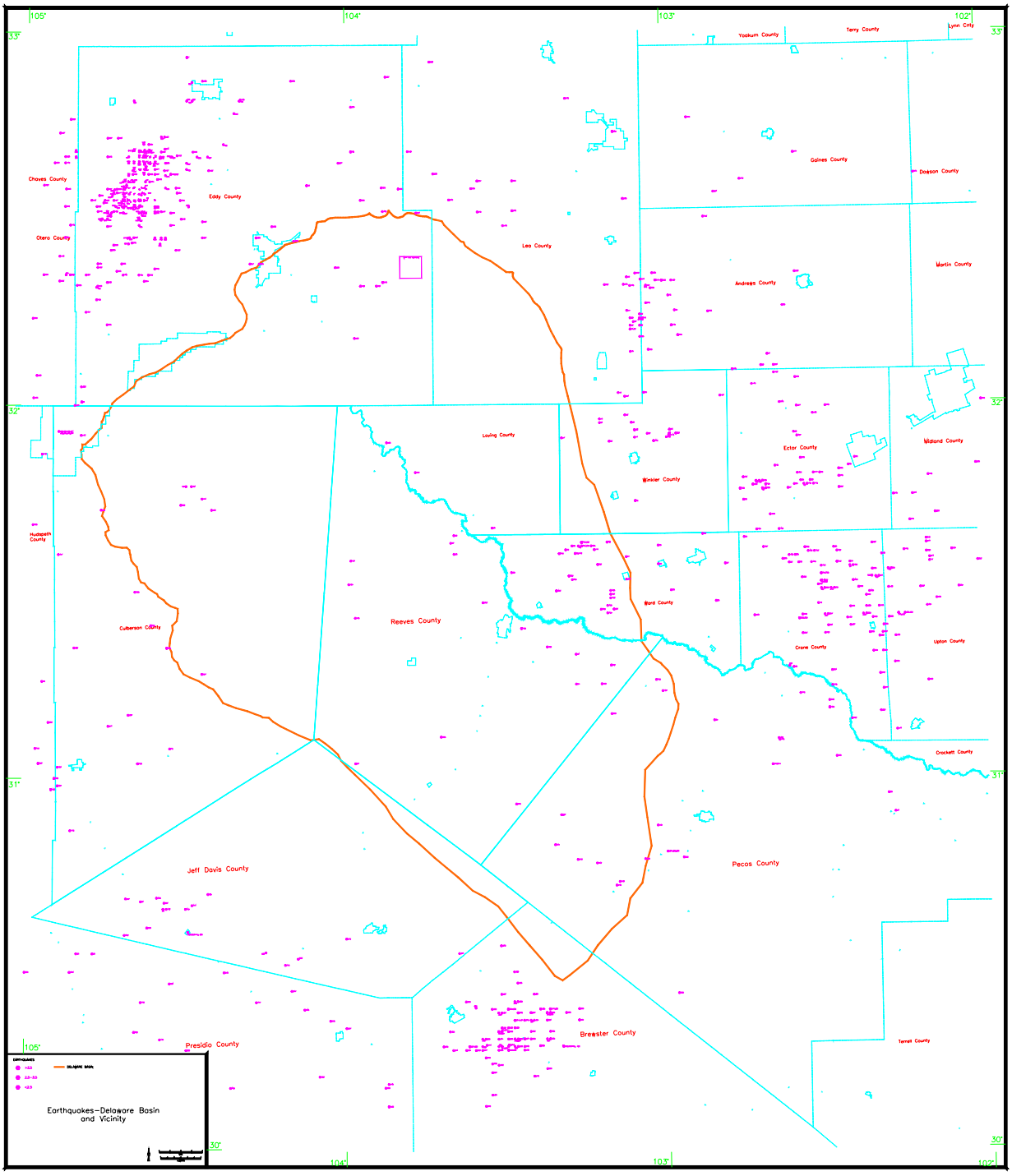

Figure DATA-A-3. Seismic Activity in the Delaware Basin

Table DATA-A-12. Earthquake Events in the Delaware Basin

County	No. of Events	Earliest Event	Latest Event	Smallest Magnitude	Largest Magnitude
Culberson	6	12/30/1997	08/04/2002	1	1.9
Eddy	5	04/24/1983	12/03/1998	1.1	3.5
Loving	3	02/04/1976	04/28/1997	1.1	1.3
Pecos	10	04/03/1977	12/22/1998	1	2.2
Reeves	16	08/03/1975	05/25/2002	1	2.5
Ward	26	09/24/1971	08/18/1984	0.8	3
Winkler	1	04/30/1976	04/30/1976	1.5	1.5
Totals	67	09/24/1971	08/04/2002	0.8	3.5

Key:

Magnitude	
Less than 2	Very seldom ever felt
2.0 to 3.4	Barely felt
3.5 to 4.2	Felt as a rumble
4.3 to 4.9	Shakes furniture; can break dishes
5.0 to 5.9	Dislodges heavy objects; cracks walls
6.0 to 6.9	Considerable damage to buildings
7.0 to 7.3	Major damage to buildings; breaks underground pipe
7.4 to 7.9	Great damage; destroys masonry and frame buildings
Above 8.0	Complete destruction; ground moves in waves

Note: Three of the five earthquake events in Eddy County can be directly attributed to mining activities. The other two remain unexplained. Most of the seismic events recorded in the vicinity of the Delaware Basin can be attributed to oil and gas activities—such as the number of events that continue to occur in the Dagger Draw or Cass Ranch area of Central Eddy County—where a large number of oil and gas activities are being conducted.

The table includes only reported data.