

WPO 47595



Westinghouse
Electric Corporation

Government and Environmental
Services Company

WS:96:03101
DA:96:11002
Waste Isolation Division

Box 2078
Carlsbad New Mexico 88221

February 23, 1996

Mr. Mel Marietta, Manager
WIPP Project Compliance Department
Sandia National Laboratories
115 N. Main Street
Carlsbad, NM 88220

Subject: PERFORMANCE ASSESSMENT PARAMETER INPUT

Dear Mr. Marietta,

MAT
10/10/97

Please find attached the result of records evaluations and regulatory analyses conducted in an effort to arrive at a value for nominal wellbore diameter to be used in the WIPP Performance Assessment.

Supporting information, records, and the study results attached should be placed in the appropriate parameter package(s) for data quality assurance purposes.

Should you have any questions you may contact me or Jim Johns of my staff at Extension 8465.

Sincerely,

B. A. Howard

B. A. Howard, Manager
Long-Term Regulatory Compliance

hmp

Attachments

cc: without attachments

P. Vaughn, SNL
R. Anderson, SNL
J. A. Mewhinney, CAO

J. Bean, SNL
G. Basabilvazo, CAO
J. Maes, CAO

234-8380 *MAT*
10/10/97
234-8465 *MAT* *10/10/97*

MAT *10/10/97*

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SWCF-A: 1.2.07.1.2: QA: PDD Correspondence

WELLBORE DIAMETER STUDY

This letter reports the results of a study conducted to determine the diameters of a typical wellbore through the Salado Formation in the Delaware Basin, specifically within the vicinity of the WIPP.

The nominal borehole diameter value determined should be used in PA calculations as it was calculated from the most recent and accurate body of relevant Delaware Basin drilling information.

Borehole diameters included in this study group are open-hole values reported prior to casing being run and cemented. Well records for wells drilled in Township 22 South, Ranges 30, 31 and 32, were obtained from Petroleum Information Corporation. The study area includes the WIPP and represents both potash, and non-potash areas, and can be referenced in table 1, attached.

Records of 276 wells from the subject study area were obtained and reviewed. Of the 276 well records, 38 well reports proved to be incomplete as they did not contain the necessary information regarding casing strings and sizes which were required for this study. These 38 wells were excluded leaving 238 wells to be considered. 205 of the remaining wells have 8 5/8 inch casing through the Salado Formation. This casing size is used predominantly in the Salado when it is not anticipated that pressured pockets of brine will be encountered. Information available from offset wells and other wells in the vicinity is used to make decisions regarding the size of casing that will be used. If other than normal drilling conditions are anticipated while drilling through the Salado Formation, the drilling companies will use 9 5/8 inch casing in their drilling plan as this sized casing offers greater well safety in pressurized conditions (Petroleum Engineering Handbook, Feb. 1992).

Oil and gas producers are required when drilling on federal leases to adhere to 43 CFR Part 3160, para. III-B, Casing and Cementing Requirements--"casing collars shall have a minimum clearance of 0.422 inches on all sides in the hole/casing annulus, with recognition that variances can be granted for justified exceptions." The outside collar diameter of 8 5/8 inch casing is 9.625 inches. 43 CFR Part 3160 requirements of 0.422 inches of clearance translates into a required borehole diameter of 10.469 inches at the collars. When drilling on state of New Mexico lease land, the state engineer, per para. 4-15.2., Rules and Regulations Governing Drilling of Wells and Appropriation and Use of Ground Water states, "In all cases the diameter of the drilled hole shall be at least two inches greater than the outside of the casing." New Mexico oil and gas producers prefer clearance on all sides of at least one inch. This diameter is necessary if during the cementing of the casing string, they are not able to circulate cement to the top of the casing string. If this occurs, it is necessary to bring cement to the surface by running one inch tubing down the annulus and pumping cement through the tubing to ensure proper and complete cementing.

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When drilling in the Salado, an 11 inch bit will provide the desired one inch of clearance when 8 5/8 inch casing is to be used and will exceed the federal and state requirements. When 9 5/8 inch casing is used, a 12 1/4 inch bit provides one inch clearance and exceeds federal and state requirements. The outside collar diameter of 9 5/8 inch casing is 10.625 inches, when the 0.422 inch requirement of 43 CFR 3160 is applied the diameter requirement is 11.472 inches (Federal Register, Vol. 53, NO 223, November 18, 1988).

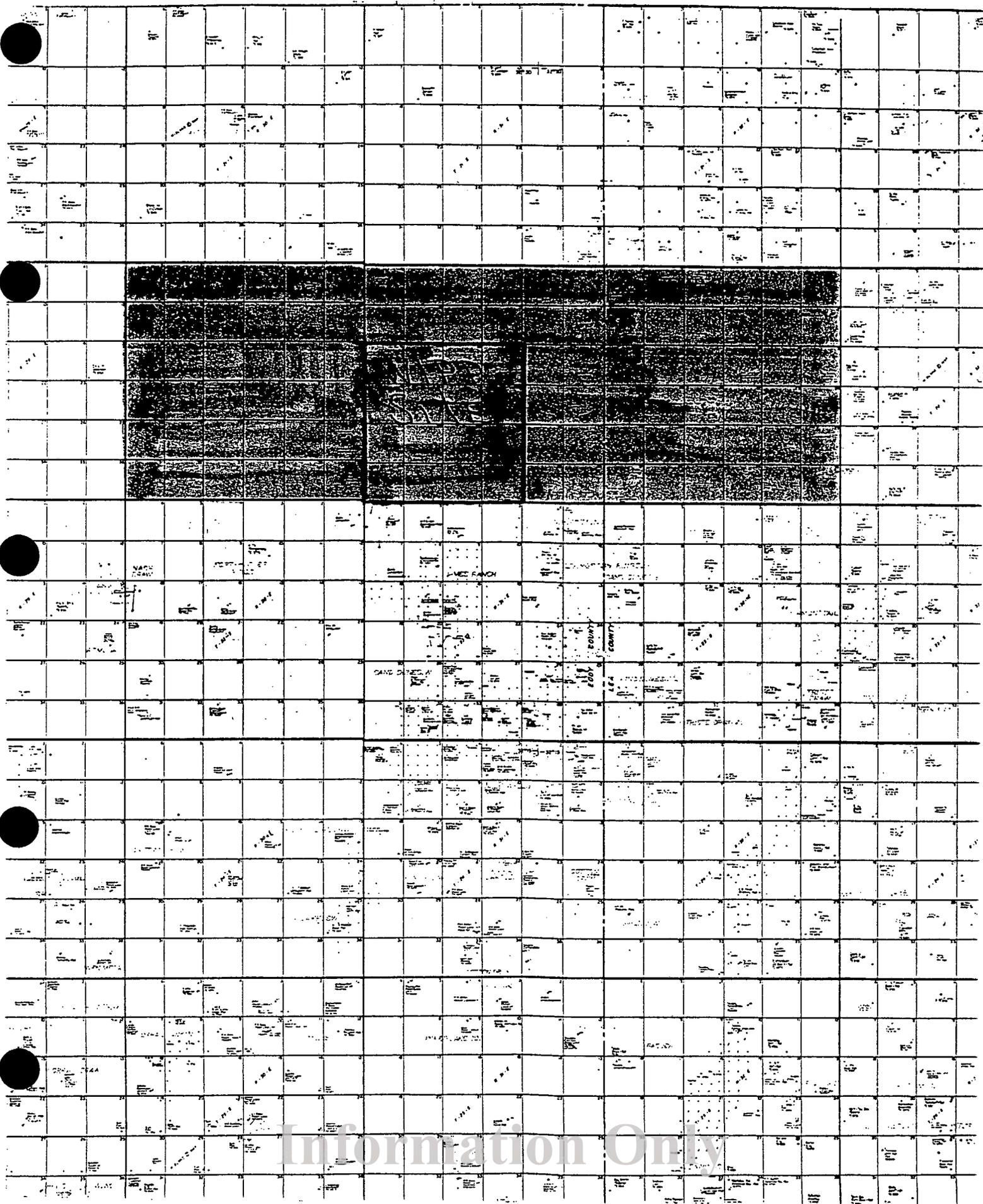
Some washout resulting in a small increase of the wellbore diameter is to be expected while drilling through the Salado, since it is a salt formation and is exposed to drilling fluids during drilling operations. Erosion of the wellbore during drilling operations is minimized through use of saturated brine with other drilling fluids while in the Salado. When and if larger washouts exist, they are not throughout the entire salt section, but rather are isolated areas occurring randomly while drilling.

The 238 complete well records provide a history of each well, from initiation of drilling activities, to completion. It was noted in the study that all of the wells were drilled through the Salado Formation with total depths ranging up to 14,000 feet. A review of the 238 well records indicates that 205 of the wells in the study area had 8 5/8 inch casing in place through the Salado Formation, while 14 wells had 9 5/8 inch casing and all 219 wells were drilled using either a 11 or 12 1/4 inch bit. These 219 wells represent 92 % of the wells in the study and have wellbore diameters that range from 11 to 12 1/4 inches, with some expected washout present. The data obtained in this study shows that 10 wells had larger than 9 5/8 inch casing (10 3/4") and these wells could have been drilled with a 12 1/4" bit and meet federal and state regulations on minimum wellbore size.

This study has reviewed a representative sample of wells drilled in the Delaware Basin, specifically the WIPP area, including potash and non-potash areas. The study has found that of the 238 wells reviewed that all 238 will most likely have a wellbore diameter not exceeding 13 inches. There will be some limited washout, but it will not be great, nor will it be throughout the wellbore. Information collected in this study provides a basis in fact that wellbore diameters in existing and future wells drilled over the next 20-30 years, will not have wellbore diameters that exceed 13 inches, based on current casing sizes now used in the Salado Formation.

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MAP OF SAMPLE AREA



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TABLE NO. 1 WELL RECORDS

<u>Surface Casing Size</u> (First String)	<u>Intermediate Casing Size</u> (Second String)	<u>Total No.Wells</u>
5 1/2"	5 1/2"	3
9 5/8"	5 1/2"	1
9 5/8"	7"	1
8 5/8"	5 1/2"	1
8 5/8"	7"	1
11 3/4"	8 5/8"	8
13 3/8"	8 5/8"	148
13 3/8"	9 5/8"	7
13 3/8"	10 3/4"	3
13 3/8"	5 1/2"	2
16"	8 5/8"	4
16"	10 3/4"	5
20"	8 5/8"	45
20"	9 5/8"	7
20"	10 3/4"	2
TOTAL WELLS		238

REFERENCES

"Petroleum Engineering Handbook," Copyright 1987 by the Society of Petroleum Engineers, 3 rd. Edition, February 1992.

"Analytical Study of an Inadvertent Intrusion of the WIPP Site," New Mexico Junior College, September 5, 1995.

"Evaluation of Mineral Resources at the Waste Isolation Pilot Plant," New Mexico Bureau of Mines and Mineral Resources, March 31, 1995.

"Drilling Operations, Final Rule," 43 CFR Part 3160, Federal Register. Vol. 53, No. 223, page 46808, November 18, 1988.

"Rules and Regulations Governing Drilling of Wells and Appropriation of Ground Water in New Mexico," State Engineer, Santa Fe, New Mexico, 1995 Edition.