DOE/WIPP 91-036

Brine Sampling and Evaluation Program 1990 Report

Waste Isolation Pilot Plant

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BRINE SAMPLING AND EVALUATION PROGRAM
1990 REPORT

DOE-WIPP 91-036

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List of Abbreviations/Acronyms

A	archived
$BaSO_4$	barite
BSEP	Brine Sampling and Evaluation Program
Ca/SO_4	calcium/sulfate
CaF_7	fluorite
$CaMg(CO_3)_2$	dolomite
$CaSO_4 \cdot 2H_2O$	gypsum
cfm	cubic feet per minute
CH-TRU	contact-handled transuranic
cm	centimeter
DOE	U.S. Department of Engery
DRZ	disturbed rock zone
EATF	Engineered Alternatives Task Force
$Fe(OH)_2$	amakinite
g/kg	grams per kilogram
g/L	grams per liter
HMW	Harvey-Moeller-Weare
IAP	ion activity product
IT	IT Corporation
K/Mg	potassium/magnesium
$K_2Ca(SO_4)_2 \cdot H_2O$	syngenite
$K_2Ca_2Mg(SO_4)_4 \cdot 2H_2O$	polyhalite
kg/L	kilograms per liter
Ksp	mineral solubility product
L	liter(s)
L/s	liters per second
m	meter(s)
$Ma_2Ca(SO_4)_2$	glauberite
MB 139	Marker Bed 139
mg/L	milligrams/liter
$MgCO_3$	magnesite
MPa	megapascals
mV	millivolts
NA	nonarchived
Na/Cl	sodium/chloride
ppm	parts per million
ppt	parts per thousand
PVC	polyvinyl chloride
RCRA	Resource Conservaiton and Recovery Act
SI	saturation index
SNL/NM	Sandia National Laboratories/New Mexico
SPDV	Site Preliminary Design Validation
$SrSO_4$	celesite
TDS	total dissolved solids

List of Abbreviations/Acronyms *(Continued)*

TIC	total inorganic carbon
TOC	total organic carbon
UNC	United Nuclear Corporation
VOC	volatile organic compounds
Westinghouse	Westinghouse Electric Corporation
WIPP	Waste Isolation and Pilot Plant
°C	degrees Celsius

Acknowledgments

Dr. Dwight Deal provides the overall direction of the Brine Sampling and Evaluation Program (BSEP). Dr. Rich Abitz coordinates the geochemical analyses. Mr. John Case is responsible for the overall direction of the modeling of brine seepage into long subhorizontal drill holes. Dr. Saeid Saeb, Mr. Mike Wallace (now with Re-Spec, Albuquerque, New Mexico), and Ms. Kathy Verhage supported the numerical modeling and associated quality control.

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Dr. Jon Myers provided input on the importance of the BSEP to the assessment of long-term facility performance, as well as critical reading and editorial assistance.

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Mr. Dave Belski is responsible for the routine collection of brine from the drill holes in the repository, sample measuring, processing and data analyses. Mr. Belski spent tedious hours scraping brine encrustations from the ribs of the repository. Mr. Mel Balderrama and Ms. Merrie Martin assisted with the underground and surface procedures.

Ms. Martin and Mr. Jeffrey Clark are responsible for the data entry and analyses of the brine sampling. Mr. Belski is responsible for the data entry and analyses of the moisture content of the brine weeps.

Ms. Kathi McKenna and Ms. Pamela James Lipponer coordinated the word processing and drafting at the IT-Albuquerque office. Many thanks to the staff of the Word Processing, Technical Editing, and Drafting Departments of the IT-Albuquerque office for their many hours of professional support.

Executive Summary

The data presented in this report are the result of Brine Sampling and Evaluation Program (BSEP) activities at the Waste Isolation Pilot Plant (WIPP) during 1990. When excavations began in 1982, small brine seepages (weeps) were observed on the walls. These brine occurrences were initially described as part of the Site Validation Program. Brine studies were formalized in 1985. The BSEP activities document and investigate the origins, hydraulic characteristics, extent, and composition of brine occurrences in the Permian Salado Formation and seepage of that brine into the excavations at the WIPP. The brine chemistry is important because it assists in understanding the origin of the brine and because it may affect possible chemical reactions in the buried waste after sealing the repository. The volume of brine and the hydrologic system that drives the brine seepage also need to be understood to assess the long-term performance of the repository.

After more than eight years of observations (1982–1990), no credible evidence exists to indicate that enough naturally occurring brine will seep into the WIPP excavations to be of practical concern. The detailed observations and analyses summarized herein and in previous BSEP reports confirm the evidence apparent during casual visits to the underground workings—that the excavations are remarkably dry.

Previous BSEP reports (Deal and Case, 1987; Deal and others, 1987; Deal and others, 1989; Deal and others, 1991) described the results of ongoing activities that monitor brine inflow into boreholes in the facility, moisture content of the Salado Formation, brine geochemistry, and brine weeps and crusts. The information provided in this report updates past work and describes progress made during calendar year 1990.

During 1990, BSEP activities focused on three major areas to describe and quantify brine activity: (1) monitoring of brine inflow, e.g., measuring brines recovered from holes drilled downward from the underground drifts (downholes), upward from the underground drifts (upholes), and subhorizontal holes; (2) further characterizing the brine geochemistry; and (3) modeling of brine flow into long boreholes with an emphasis on attempts to distinguish between near-field versus far-field flow.

Monitoring Brine Inflow. The 1990 results of the relative amounts of brine seepage between downholes, upholes, and subhorizontal holes continue trends found in earlier reports. Typically, upholes produce significantly smaller amounts of brine than the downholes and

tend to cease production after two to three years. Vertical holes yield inconsistent data, even when closely spaced. Subhorizontal holes continue to have very low brine inflow rates and remain dry when they are older than two and a half years. Horizontal holes provide consistent and comparable data sets.

Brine recovery from downholes substantially differs from holes drilled in other orientations. Downholes tend to produce brine over extended periods of time and sometimes show increased seepage rates for several months to a year or more. Closely spaced holes may have seepage rates, volumes, and brine levels varying by two orders of magnitude or more. Many downholes, such as the one in Waste Storage Panel 1 at S1950-E1320, receive water introduced to the underground from sources other than the Salado Formation. Throughout the facility, much of the brine in downholes appears to be a mixture of Salado Formation brine and construction water spread upon the floors for salt-dust control or roadway consolidation.

Weeps (small moist areas and salt encrustations formed by their evaporation) form slowly on vertical surfaces. Eighteen weep areas that were described and mapped in November 1982 were relocated and rephotographed. All areas were dry after five and a half years.

The south exploratory drift slopes southward to a dead end, with little air exchange due to restricted ventilation. If significant amounts of brine were seeping into the south exploratory drift, there should be some evidence of moisture. Inspection during 1989 found this to be a dry area. There was no detectable moisture on the ribs or floor and only a few salt encrustations were found. Although these data are difficult to quantify, it seems that significant quantities of brine seeping into this drift over the six years since its construction in 1983 would be shown by much more evidence of moisture than has been observed.

Observations were made of Marker Bed 139 and the fractured zone that develops beneath the floor of the WIPP excavations in the sumps of the Salt Handling Shaft and the Waste Handling Shaft. Fractures were observed, but no brine was seeping into the shafts. Since both of these shafts are downslope from extensive parts of the workings that are known to be underlain by brine-filled fractures, the observation argues strongly that a hydrologically connected macrofracture system has not developed beneath those drifts. One of those drifts is the E0 drift, which is one of the widest (7.6 meters [m]) and oldest (seven years, excavated in 1984) drifts at the WIPP. It is possible that the typical width of the entry drifts (less than 7.6 m) is too narrow to allow the development of the type of fracturing observed beneath the 10-m-wide storage rooms.

The relative importance of these two systems needs to be determined. For example, if there is sufficient far-field flow into the repository, then enough brine may come into the excavations to completely corrode the metal in the waste and the waste drums; therefore, the potential for hydrogen generation due to corrosion will be limited by the total metal inventory. If brine seepage is a purely local phenomena due to redistribution of brine in the immediate vicinity of the excavations, there may be insufficient brine available to cause much corrosion after closure. In the latter case, hydrogen generation will be limited by brine availability and may not be a potential problem. Calculations indicate that it will take approximately 220,000 liters (L) of brine per room to corrode all of the metals contained in the waste and waste drums emplaced in each waste storage room.

If no far-field flow exists, and radial flow occurs in a vertical plane toward a waste storage room, then release of brine from the DRZ around the excavations due to depressurization is estimated to produce about 150,000 L of brine. This volume is on the same order of magnitude as the volume of brine (220,000 L) necessary to corrode all the metal in the waste and waste storage drums in a waste storage room. Anoxic corrosion will consume brine and produce metal oxides and hydrogen. If the volume of brine entering the repository is less than that required to completely corrode the metal, then all of the brine that comes in contact with metal will be consumed.

There is good evidence that the assumption of radial flow in a vertical plane does not hold for the WIPP. The undisturbed clear halite units have such low permeability (or none at all) that flow is probably constrained and occurs only horizontally, parallel to bedding. Brine may only be able to drain from that part of the DRZ horizontally adjacent to the storage room. The volume of rock involved is about 7 percent of that involved in the estimate above. Assuming that the growth of fractures will tap a slightly thicker stratigraphic interval, including some strata above and below the 4-m-high storage room, an estimate of about 10 percent seems reasonable. In that case, less than one-tenth of the 150,000 L estimated above may enter the repository to react with the metal emplaced there and produce hydrogen gas by corrosion. If compaction of the clays is the major source of the brine rather than release of brine from the DRZ due to depressurization, then even less brine may enter the repository. In that case, the generation of large quantities of hydrogen gas is unlikely or even impossible.

The predicted consequences of human-intrusion events, the fate of waste-generated gases, and the migration of the hazardous constituents during undisturbed performance are all sensitive to brine inflow assumptions, even if both of the proposed systems yield similar volumes of brine during the pressurization phase after sealing. If the far-field model is valid, a human-intrusion event (drilling into the sealed repository at some future date) will lower fluid pressure in the waste storage rooms, create pressure gradients toward the rooms, and reinstate far-field flow. This will lead to a greater release of radionuclides from the repository as the inflowing brine infiltrates through the waste and flows up the drill hole. Alternatively, if the near-field model is valid, the only brine available for transport of radionuclides is the volume of brine that is trapped in the room at the time of sealing.

Predicting the fate of waste-generated gases is also dependent upon the hydrologic system assumed to be operational. If brine can flow through the far-field, excess gas pressure can probably be dissipated through the host rock; but if far-field flow is not a viable concept, gas generation from microbial or radiolytic decomposition of organic materials may yield very high local pressures. Analysis by the WIPP Engineered Alternatives Task Force has shown that predicted peak pressures are highly dependent upon the assumed mechanisms by which fluids can flow through the undisturbed host rock.

Another long-term performance concern is the migration of Resource Conservation and Recovery Act listed hazardous constituents from the repository. If far-field flow is valid, the generation of excess gas pressure within the repository may force gas, possibly contaminated with volatile organic compounds (VOC), across the RCRA unit boundary. However, if the far-field flow does not occur, there will be less of a potential for VOC migration.

Future Work. Although much is known about the brine seepages at the WIPP, there are still areas that need further examination. As stated above, the idea of far-field flow seems unlikely or hypothetically impossible but remains an important modeling concept that has not been disproved. The relative importance of near-field versus far-field flow remains an item of significant importance and should be resolved. The following questions need to be answered:

- Does the clay contain enough brine that can be squeezed out by vertical loading to explain all of the brine seepage observed at the WIPP?

- Is there enough volume present in void spaces and fractures in the DRZ beneath the floors of the excavations to hold large quantities of brine out of sight, and are those fractures connected well enough to allow brine (or gas) to flow downgradient and beneath potential seals?

- Does any far-field component of flow exist?

1.0 Introduction

The Waste Isolation Pilot Plant (WIPP), a U.S. Department of Energy (DOE) research facility, was established to demonstrate the safe disposal of defense-generated radioactive waste in the United States. The WIPP facility is 42 kilometers east of Carlsbad, New Mexico (Figure 1-1). The repository is approximately 655 meters (m) below the surface (Figure 1-2) in the Salado Formation. The Salado Formation and underlying Castile Formation make up an evaporite sequence over 1,000 m thick (Figure 1-3). An extensive program of site characterization was initiated in 1976 (Powers and others, 1978; Bechtel, 1983) and continued through 1990 (Deal and others, 1991). The hydrogeological activities of the Brine Sampling and Evaluation Program (BSEP) is part of a continuing effort to refine the understanding of the repository geology. The data in this report constitute updates of previous studies (Deal and Case, 1987; Deal and others, 1987; Deal and others, 1989; Deal and others, 1991).

Brine studies began in 1982 as part of the Site Validation Program (Black and others, 1983) and were formalized in 1985 by Morse and Hassinger. The focus of BSEP is the origin, hydraulic characteristics, extent, and chemical composition of brine in the Salado Formation at the repository horizon and seepage of that brine into the excavations at the WIPP. Although the repository is dry, brine weeps from exposed surfaces, accumulates in drill holes, and forms encrustations on the ribs. The chemistry of the brine may affect chemical reactions that might occur in the buried waste, and the volume of brine and the hydrologic system that drive the brine seepage need to be understood to assess the long-term performance of the repository after closure.

Possible brine inflow systems have been discussed in previous BSEP reports. There are basically two systems: one in which far-field flow occurs through undisturbed rock outside of the zone of rock deformation (Disturbed Rock Zone [DRZ]) and a local near-field system where brine is redistributed within the DRZ. Additional effects, such as gas exsolution, development of enhanced porosity and permeability within the DRZ, and preferential flow along bedding planes may modify brine inflow, but it is fundamentally important to distinguish between far-field sources and local, relatively limited redistribution of brine in the immediate vicinity of the WIPP excavations. In both cases the driving mechanism is the pressure gradient caused by the excavation of the underground openings. Flow pathways are through permeable interbeds, along stratigraphic discontinuities, or through fractures.

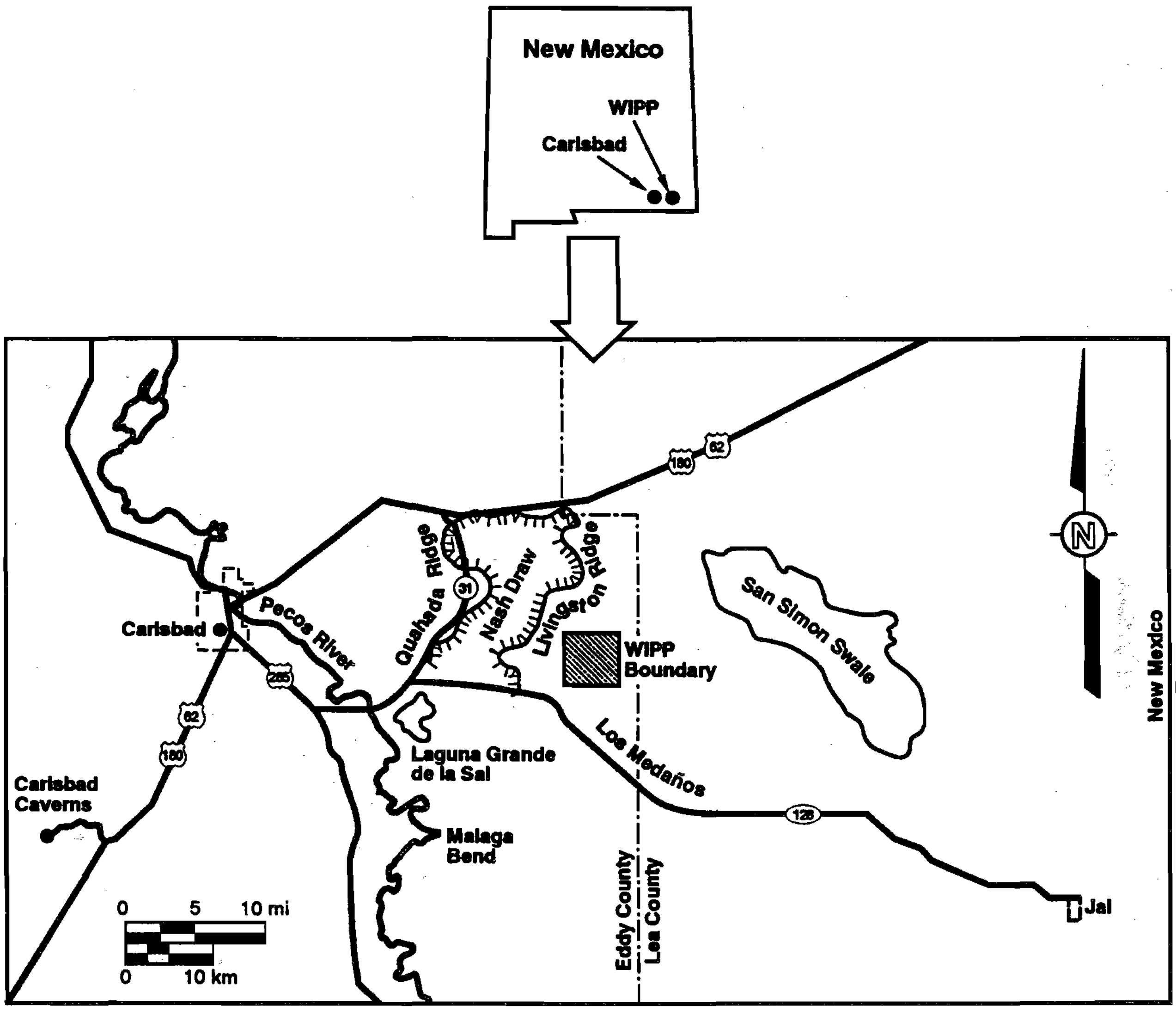

Figure 1-1
WIPP Location in Southeastern New Mexico

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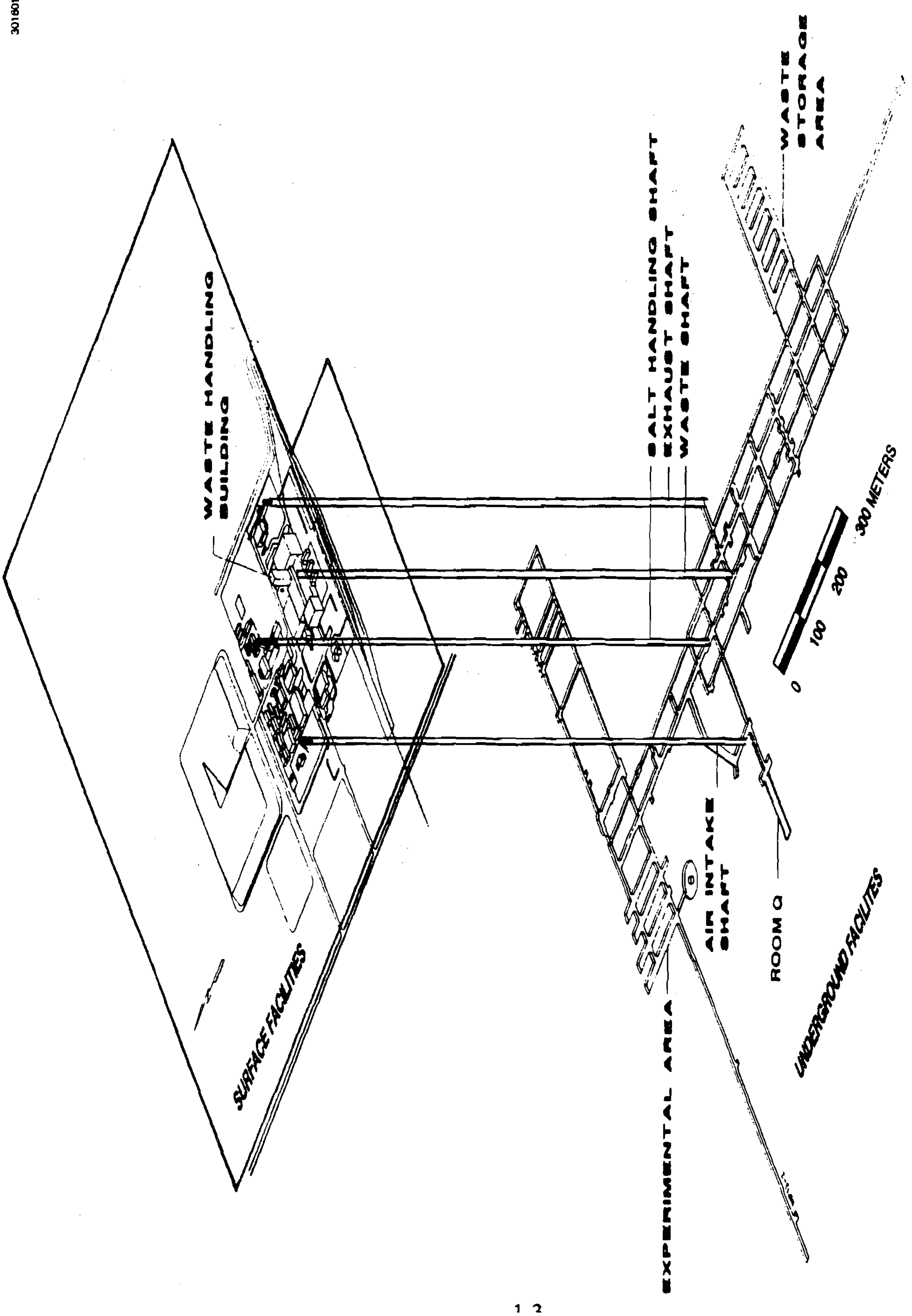

Figure 1-2
Surface and Underground Layout of the WIPP Facility

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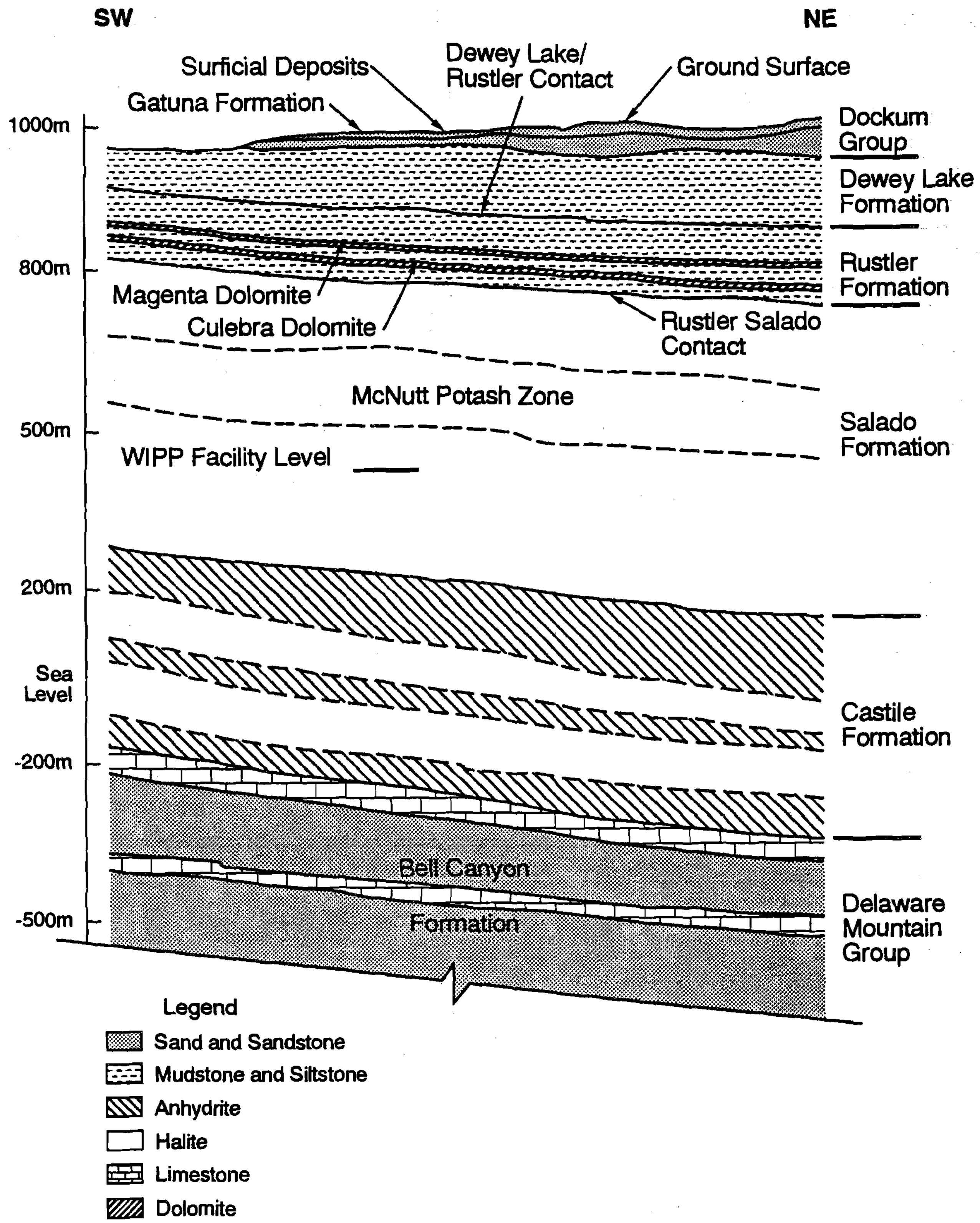


Figure 1-3

Generalized Stratigraphic Cross Section
(Modified from Figure 1-2, Deal and Case, 1987)

The relative importance of these two systems needs to be determined. For example, if there is sufficient far-field flow into the repository, then enough brine may come into the excavations to completely corrode the metal in the waste and the waste drums; therefore, the potential for hydrogen generation due to the corrosion will be limited by the total metal inventory. If brine seepage is a purely local phenomena due to redistribution of brine in the immediate vicinity of the excavations, there may be insufficient brine available to cause much corrosion after closure. In the latter case, gas generation will be limited by brine availability and may not be a potential problem.

The predicted consequences of human-intrusion events, the fate of the waste-generated gases, and the migration of the hazardous constituents during undisturbed performance are all sensitive to brine inflow assumptions, even if both of the proposed systems yield similar volumes of brine during the pressurization phase. If the far-field model is valid, a human-intrusion event (drilling into the sealed repository at a future date) will lower fluid pressure in the waste storage rooms, create pressure gradients toward the rooms, and reinstate far-field flow. This will lead to a greater release of radionuclides from the repository as the inflowing brine infiltrates through the waste and flows up the drill hole. Alternatively, if the near-field model is valid, the only brine available for transport of radionuclides is the volume of brine that is trapped in the room at the time of sealing.

Predicting the fate of waste-generated gases is also dependent upon the hydrologic system assumed to be operational. If brine can flow through the far-field, then excess gas pressure can probably be dissipated through the host rock; however, if far-field flow is not a viable concept, gas generation from microbial or radiolytic decomposition of organic materials may yield very high local pressures. Analysis by the WIPP Engineered Alternatives Task Force (EATF) has shown that predicted peak pressures are highly dependent upon the mechanisms by which fluids can flow through the undisturbed host rock (DOE, 1991).

Another long-term performance concern is the migration of Resource Conservation and Recovery Act (RCRA) listed hazardous constituents from the repository. If far-field flow is valid, the generation of excess gas pressure within the repository may force gas, possibly contaminated with volatile organic compounds (VOC), across the RCRA unit boundary. However, if the far-field flow does not occur, there will be less potential for VOC migration.

Certain collection techniques and general observations should be considered when evaluating the BSEP data. These are listed in Table 1-1. Care should also be exercised when

Table 1-1

Points to be Considered When Evaluating BSEP Data

1. Many of the downholes are contaminated with water spread on the floor for construction purposes or salt-dust control.

2. All downholes were originally pumped with a bailer on a two-week interval. During 1989, pressure-suction moisture collection devices were installed in the holes. These devices have a capacity of less than 1 liter, and the sampling frequency was increased to once a week. The limited capacity of the collection device requires sampling on the following day for quantities of a half-liter or more. The two-day total is then averaged (see Appendix A).

3. Brine seepages are small and chemically distinct from brines in the Rustler Formation and Castile Formation.

4. Brine occurrences, particularly those evidenced as halite efflorescences, are ubiquitous on ribs (walls) but not the back (roof) in recently mined areas throughout the WIPP underground.

5. Brine seepage rates into test drillholes are low, usually on the order of a few hundredths of a liter per day or less.

6. Although small when measured in terms of liters per day at any given location, cumulative seepage volumes may be significant when measured in terms of the entire repository over many years.

7. Brine seepage into downholes can vary several orders of magnitude between locations, even when locations are less than 1 meter apart.

8. Upholes and downholes show a pattern of an initial, maximum flow rate that reduces to a steadier (or much more slowly declining) flow rate over the time period during which measurements have been made. Many of the upholes dry up completely.

9. Vertical drill holes yield inconsistent data, but horizontal drill holes provide consistent and comparable data sets.

10. The details of flow in these very low-permeability units are quite complex, have very low velocities, appear to involve small volumes of brine, and require testing over long periods of time during which the very properties being tested change; therefore, they are difficult to quantify.

interpreting the various diagrams of drill hole lengths and stratigraphic thicknesses. Although the strata at the WIPP are remarkably uniform in both composition and thickness, some variation occurs. As a result, there are significant, albeit small, differences from north to south and from east to west within the WIPP excavations. To facilitate the modeling of excavation performance, a meeting was held in 1983 with DOE; Bechtel National, Inc.; Sandia National Laboratories/New Mexico (SNL/NM); and the technical services contractor (Westinghouse Electric Corporation [Westinghouse] and IT Corporation [IT]) to develop a consensus on the average thicknesses and rock properties that exist near the excavations (Krieg, 1984). The resulting 1983 reference stratigraphy is not an actual measured section and is defined in relation to distances above and below clay G, which is located at the base of anhydrite "b," approximately 2 m above the roof of the repository level excavations (Table 1-2).

Table 1-2 compares that reference stratigraphy to the stratigraphy observed in two sets of drill holes: A1X01 and A1X02 in Room A1 in the northeastern part of the repository excavations and DH35 and DH36 in Room G in the northwestern part of the excavations. The distances from the drill hole data are used in the discussions in Chapter 2 of this report. If the precise relationship between the stratigraphy and a given drill hole is important, the drilling log and/or core from the specific hole should be consulted.

Activities in 1990 provided additional information on the brine inflow in the repository (Chapter 2), geochemical properties of the brine (Chapter 3), and numerical modeling of seepage into long, small-diameter subhorizontal drill holes (Chapter 4). Chapter 5 is a summary, not only of the 1990 work, but of all work to date.

Appendix A provides detailed information of the brine inflow from drill holes monitored for this program. The information includes drill hole, date, time, liters (L) removed, days since January 1, 1985 (an arbitrary reference date), the cumulative L collected, inflow rates in L per day, and a remarks column. Appendix B contains graphs of the data from Appendix A, presented as an 11-point moving average of the data. This averaging reduces noise introduced by collection techniques and presents a more accurate picture of the real variations in brine seepage rates than would be presented by plots of raw data. Appendix C shows the analytical results of the chemical analyses, including ion concentration in milligrams per liter (mg/L), pH, specific conductivity, and alkalinity. Appendix D summarizes the statistical analyses of the geochemical data. Appendix E is an activity plan proposed to provide additional brine seepage data. This report constitutes a permanent quality assurance record

Table 1-2

Stratigraphy in North End of the WIPP Underground Workings Based on Room A1 and G Drill Holes

Reference distances above and below clay G at the base of anhydrite "b"

	Reference (1)		Northeast Portion (2)				Northwest Portion (3)			
Stratigraphic Horizon	SNL 1983 Reference Stratigraphy SAND 83-1908		A1X01 (Downhole) From Clay G Collar to Clay G = Approx. -2.0 ft		A1X02 (Uphole) From Clay G Collar to Clay G = +16.9 ft		DH36 (Downhole) From Clay G Collar to Clay G = -16.0 ft		DH35 (Uphole) From Clay G Collar to Clay G = -6.2 ft	
	Feet	Meters	Feet	Meters	Feet	Meters	Feet	Meters	Feet	Meters
Top of Drillhole					75.9	23.13			45.8	13.96
Anhydrite					71.7	21.85				
Clay N					64.0	19.51				
Clay M-2					59.8	18.23				
Clay M-1					51.8	15.79			Not reached	
Clay L	44.6	13.58			40.7	12.40			44.2	13.47
Clay K	30.0	9.16			28.6	8.70			30.3	9.24
Clay J	22.0	6.71			21.8	6.64			26.3	8.02
Clay I	14.0	4.27			16.7	5.09			17.8	5.43
Clay H (Anhyd. "a")	6.9	2.10			6.1	1.86			7.0	2.13
Clay G (Anhyd. "b")	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Clay F	-9.5	-2.90	-13.6	-4.16					-6.6	-2.01
Orange Band			-16.7	-5.09					-12.6	-3.84
Clay E (MB 139)	-28.3	-8.63	-27.2	-8.29			-26.4	-8.05		
Clay D	-37.3	-11.37	-41.7	-12.71			-34.6	-10.55		
Clay B (Anhyd. "c")	-53.8	-16.41	-51.8	-15.77			-51.5	-15.70		
Clay (unnamed)	-70.5	-21.50	Not reached				Not reached			
Clay (unnamed)	-72.8	-22.20								
Bottom of Drillhole			-51.8	-15.77			-67.5	-20.57		

References:
(1) R. D. Krieg, 1984, Reference Stratigraphy and Rock Properties for the Waste Isolation Pilot Plant (WIPP), SAND83-1908
(2) J. Gallerani, 1985, Field Notes, Bechtel National, Inc., BSEP Files
(3) Bechtel National, Inc., 1985, Quarterly Geotechnical Field Data Report, June 1985, WIPP-DOE-213

and will be retained for this purpose, as stipulated in the quality assurance sections of the Geotechnical Engineering Program plans and procedures.

2.0 Monitoring of Brine Inflow Parameters

2.1 Introduction

Brine seepage observations in underground locations at the WIPP began as early as 1982. Information regarding the inflow of brine was derived from observations and mapping of moist areas and measurements of brine seeping into holes drilled downward from the floor, upward from the back (roof), and subhorizontally from the rib (wall) of the facility. The locations of the BSEP observation holes are shown in Figure 2-1, superimposed on a map of the facility as it existed on December 31, 1990. The underground locations of these boreholes are listed in Table A-1 of Appendix A. Appendix A lists the quantity of brine removed, calculated inflow rates in L per day, and cumulative L for all the boreholes monitored in 1990. The brine accumulations from these boreholes at the repository horizon and the stratigraphy of the Salado Formation have been discussed in previous reports (Deal and Case, 1987; Deal and others, 1987; Deal, 1988; Deal and Roggenthen, 1989; Deal and others, 1989; and Deal and Roggenthen, 1991; and Deal and others, 1991). In addition to recording 1990 BSEP activities, some observations made in previous years but not noted in earlier reports are included in this document.

2.2 Brine Seepage on Vertical Surfaces (Weeps)

2.2.1 Observations When Surfaces Were Newly Excavated

The initial mining of the East 0 drift began October 14, 1982, with a continuous mining machine. Small moist areas began to appear on freshly mined surfaces (TSC-D'Appolonia, 1983a; TSC-D'Appolonia, 1983b). Alcorn (1983) summarized that work and documented the occurrences with a number of photographs and detailed maps. Effervescing moist areas on newly mined surfaces were described by Deal and Case (1987):

> "Small quantities of gas are associated with some weeps. Slowly bubbling wet areas, usually about 2 to 3 centimeters in diameter, are occasionally very noticeable within a few minutes of mining. The bubbling usually decreases within an hour or two after mining, and the rate of inflow to freshly mined surfaces of both brine and gas decreases rapidly."

2.2.2 Growth of Encrustations with Time

In November 1982, 18 weep areas were described and marked with a tag fixed to the salt bedrock with a ram-set nail to allow repeat observations of exactly the same area. By April 1983, three of those areas were destroyed by mining, nine appeared dry, four were moist but

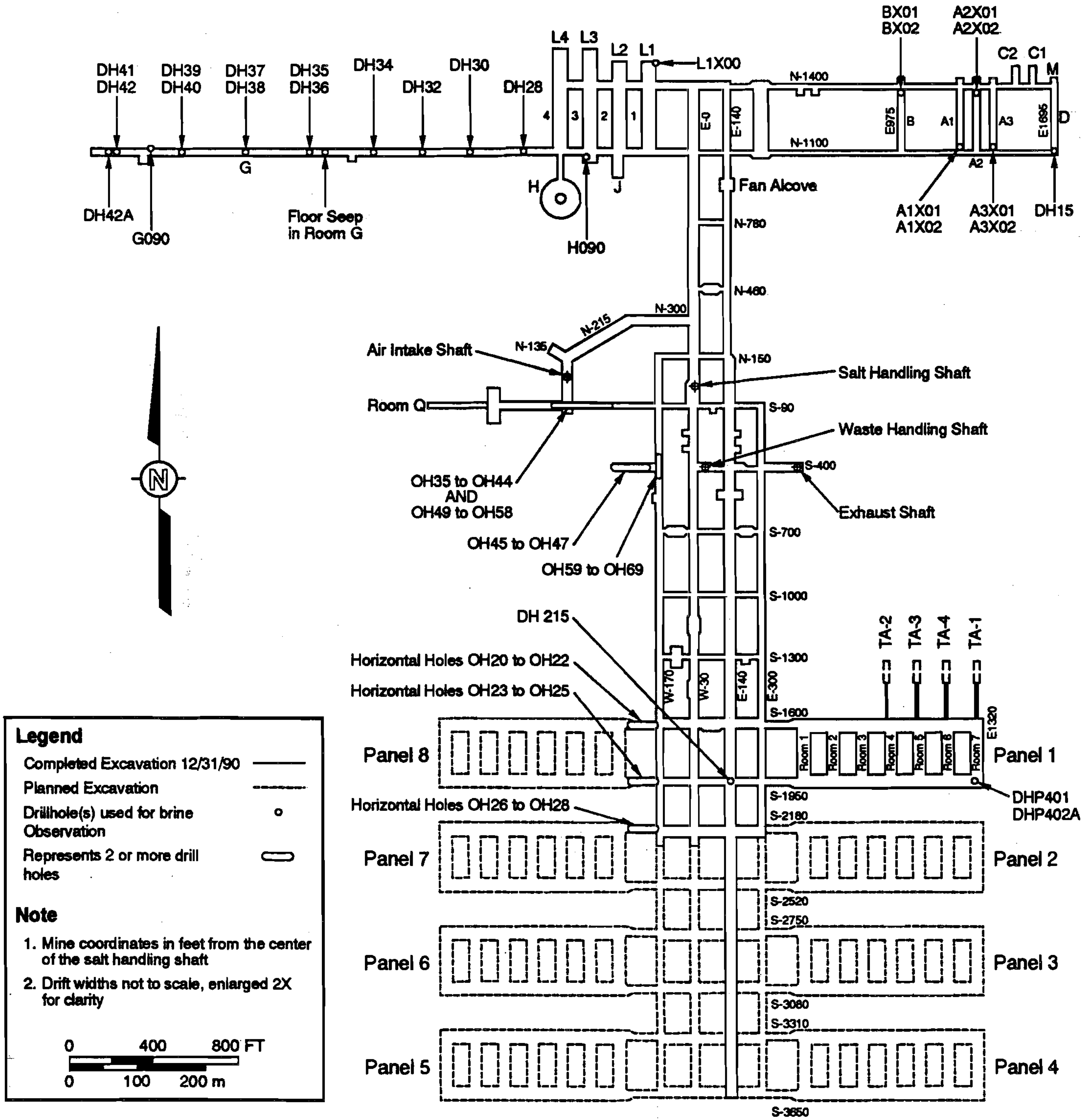


Figure 2-1

Map of WIPP Underground Working Showing BSEP Observation Locations as of December 31, 1990

lacking encrustations, and two were forming encrustations. Eight locations photodocumented in November 1982 were rephotographed in February 1988—five and a half years later. These photos show areas of the west wall of the E0 drift, at N164.4, N171.5, N174.2, N177.0, N183.5, S328.0, S398.7, and S400. These locations were dry by 1988.

The pattern of moisture release varies with time. After initial bubbling ceases, additional moisture appears slowly over periods of hours or days (Figure 2-2) (Deal and Case, 1987). Several months after mining, moist areas on vertical surfaces have become common and often remain moist for another year (Figure 2-3). Moist areas are concentrated at and below the orange band (Map unit 1) and the clay seam that separates Map Units 4 and 5 (clay F) (Figure 2-4). Clay G, just below anhydrite "a," appears to contain more brine (Figure 2-5) but is not exposed in most of the WIPP excavations. Evidence of moisture and the presence of weeps varies directly with clay content of the strata (Alcorn, 1983; Deal and others, 1989). The greater the clay content, the more persistent and greater the number of weeps. There appears to be a slightly greater clay content in the repository-horizon strata exposed in Room G, which is probably the reason that there are more salt encrustations on the walls of Room G than in most other parts of the excavations. Weeps have been observed on all exposed vertical surfaces at the repository horizon, including clear halite (Deal and Case, 1987).

Small, white encrustations of precipitated salt form between the damp areas (Figure 2-6). A few months after excavation, most appear dry on the surface, but are damp within. This indicates that the brine inflow has decreased in volume and not ceased entirely (Deal and Case, 1987). The encrustations cease to grow a few years after excavation.

When an aged excavation is slightly enlarged, weeping and encrustation growth is renewed. As the DRZ develops around the excavations (Deal and Roggenthen, 1991), porosity and permeability close as the excavation increases. There may be a relative increase in permeability of 40 percent or more (refer to Section 4.3; Deal and other, 1989, Section 5.8.2.2). When the aged surface is trimmed, the stress gradient close to the excavation is readjusted. The increased permeability with respect to initial conditions allows brine seepage to be rejuvenated on the trimmed surface.

The chemical analyses (Krumhansl and others, 1987) of weep encrustations are magnesium deficient relative to typical brine geochemistries due to precipitation in an open system where there is a continual input of brine (refer to Section 3.2.1). The ambient air at the repository horizon is incapable of evaporating all of the brine that seeps into the excavations

Figure 2-2

Mining machine cutting the S90 drift west of W170 on October 16, 1987. New drift shows progression of weep development. The first 4 m on the left is 4 days old, and the next 4 m is 3 days old.

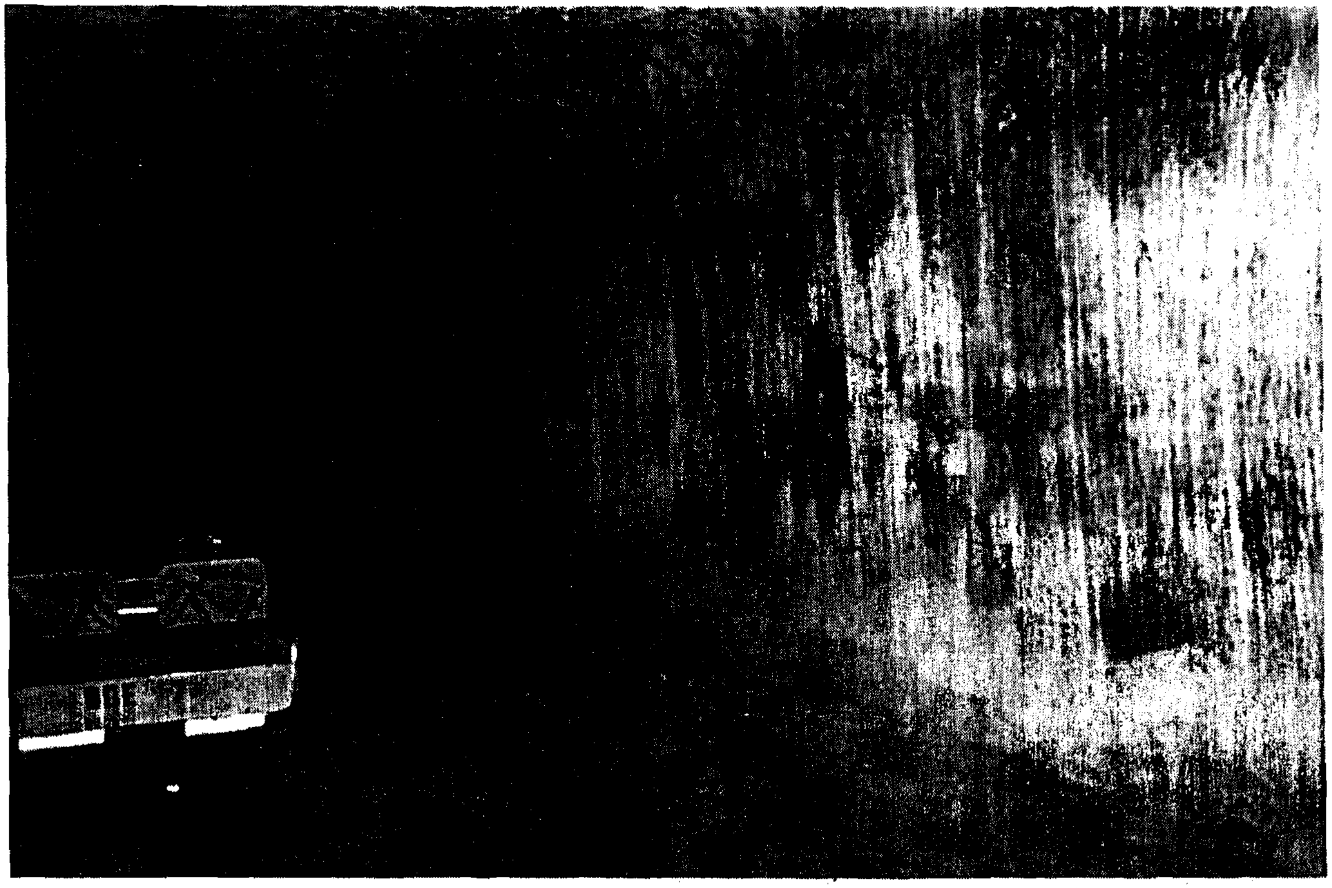
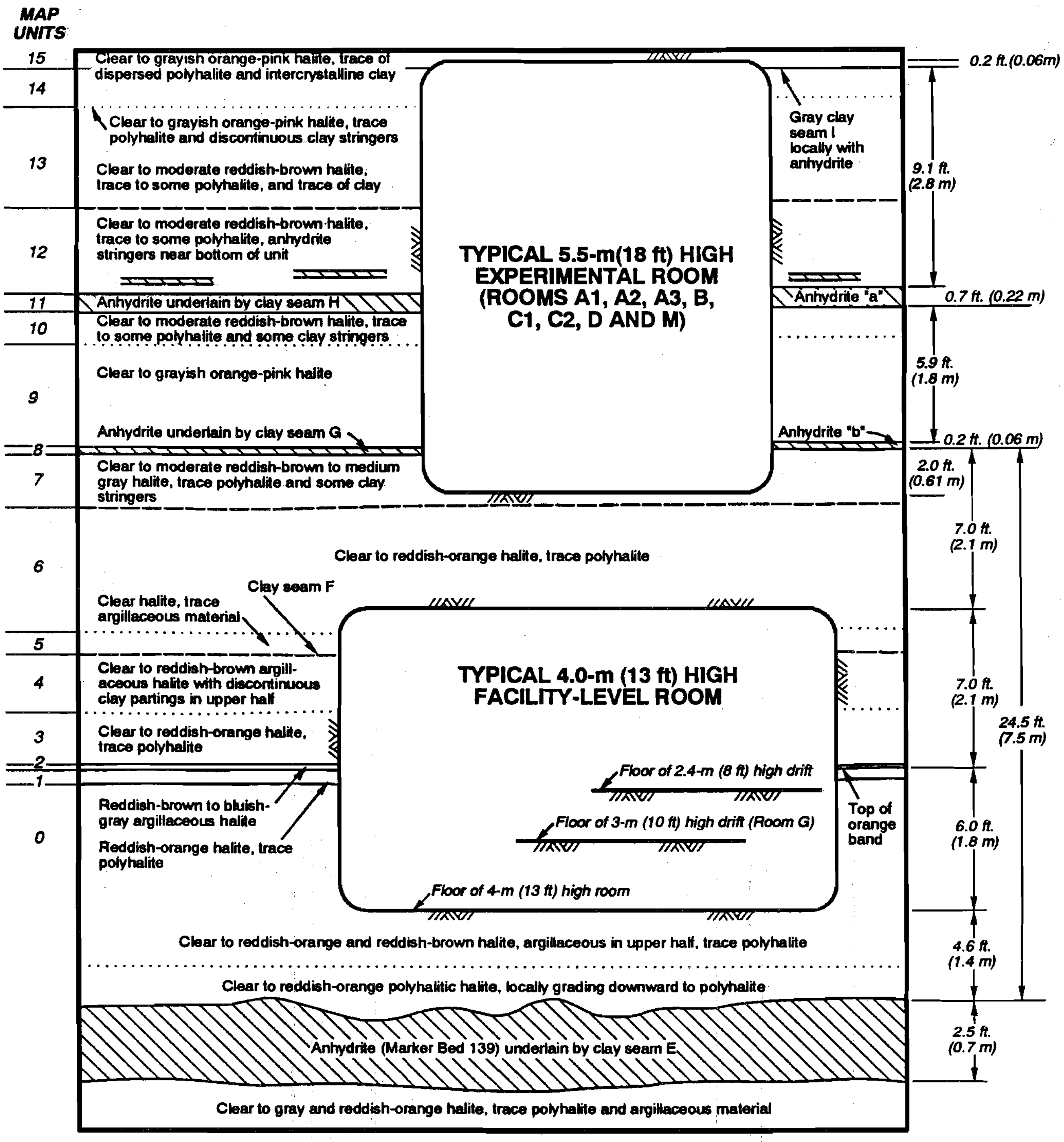


Figure 2-3

West rib of W170 between S1600 and S1950 showing moist areas below clay F and along the orange band. Photograph taken March 1987, about 15 months after excavation.



NOTES:

1. Dimensions and lithologic descriptions are derived primarily from corehole and geologic mapping data from the four test rooms and experimental area.
2. Unit thicknesses are approximate and vary slightly.
3. Room dimensions have changed with time due to salt-creep closure.

(After Deal and Case, 1987)

Figure 2-4

Geologic Cross Section of the Facility with Unit Number Designations (Modified from Bechtel, 1985)

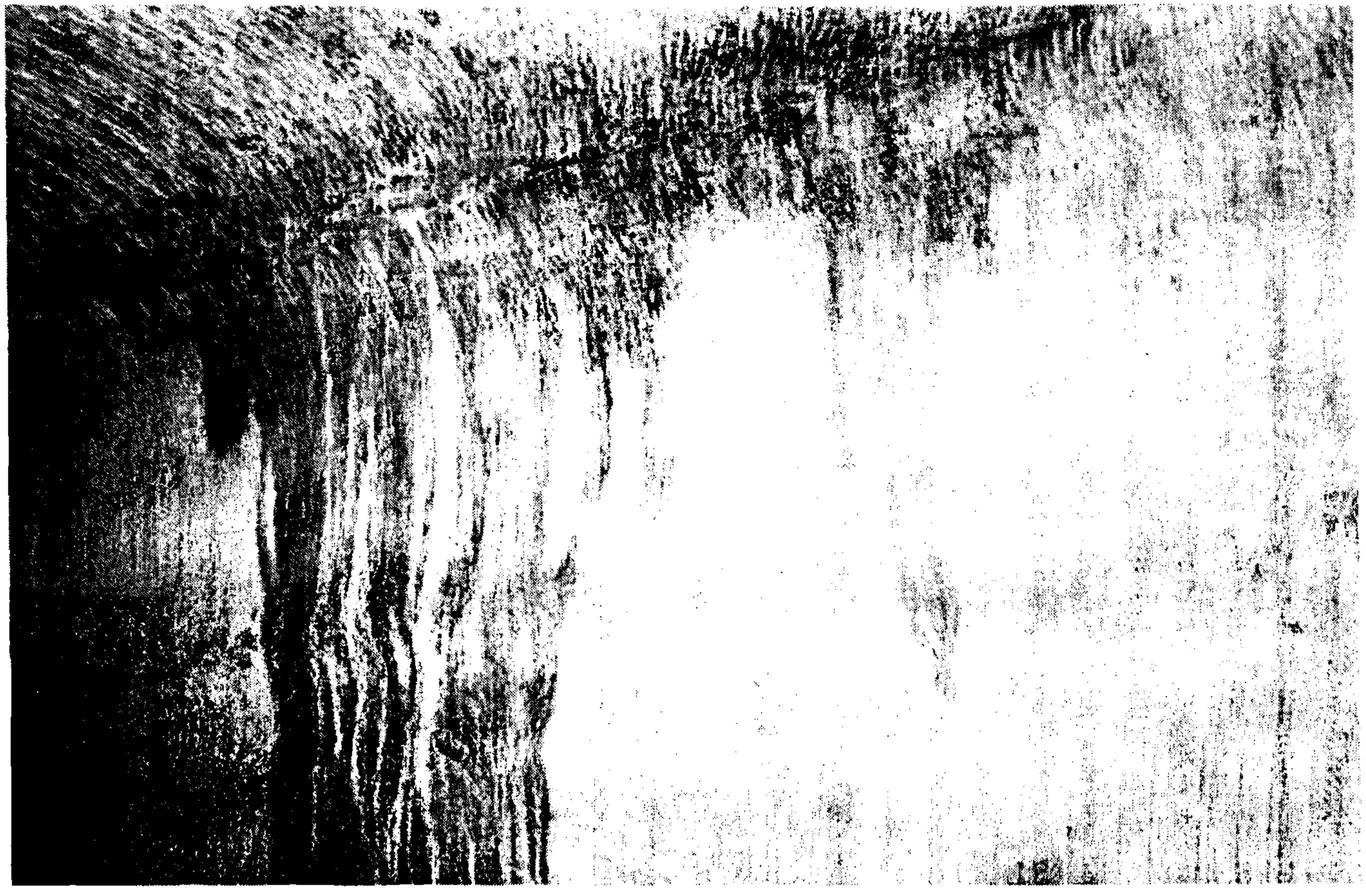


Figure 2-5

Brine weeping from clay G at the base of anhydrite "a." This clay is about 2 m above the ceiling of most of the repository-level excavations and is the likely source of the moisture that seeps down roof bolts in drifts at that level. This photograph was taken in the Air Intake Shaft station on February 24, 1988.

Figure 2-6
White salt encrustations forming above and below the orange band In Room 6, Panel 1

(Krumhansl and others, 1987; Deal and others, 1989), particularly the high-magnesium brines resulting from concentration by precipitation of halite. The salt dilates and becomes more porous as it creeps into the excavations; preliminary modeling around room-size (shaft-size) excavations indicates an approximately 40 percent relative increase in porosity near the excavations (refer to Section 4.3; Deal and others, 1989, Section 5.8.2.2). The brine remaining after evaporation may occupy the increased porosity in the zone of dilatancy behind the walls, collect on the floor, or seep into fractures or pores below the drifts.

2.3 Brine Seepage from the Back

Weeps and salt encrustations are more common and persistent on the ribs than on the back of the excavation (see Table 1-1, point 4) (Deal and Case, 1987; Deal and others, 1987; Deal and others, 1989). This strongly suggests that the brine flows horizontally along bedding with little vertical flow across bedding, at least until open fractures develop that permit the brine to drain downward (Deal and Roggenthen, 1991). The clear halite units may be effectively impermeable. State-of-the-art testing (Beauheim and Holt, 1990; Beauheim and Howarth, 1991) was unable to measure any permeability, indicating that if it exists at all, intrinsic permeability of the clear halite units is less than 1×10^{-23} m^2 (0.01 nanodarcy), the limit of the test equipment. Consequently, the clear halite units (map units 0 [lower part], 3, 6, 9, 13, and the clear halite below clay B) prohibit vertical brine flow in the undisturbed Salado Formation (Figure 2-7). Clay seams and partings further inhibit flow across bedding. The only observed brine seeps from the ceiling occur when drill holes cut the clear halite in the roof, clay seams (Figure 2-5), and interbeds above them. In these cases, brine from upholes seeps to the collar and forms salt stalactites (Deal and Case, 1987, Section 3.1.2.2).

2.4 Summary of Rib and Back Observations

A DRZ develops around newly mined openings in salt where deviatoric stress can provide a driving mechanism for brine seepage (Deal and Case, 1987). The first few hours after the excavation of a new opening, a DRZ develops a short distance into the surrounding rocks with a high deviatoric stress close to the opening. Gas exsolving from the brine is also driven toward the opening, and bubbling moist spots appear along the mined face.

Within a day, the DRZ extends farther from the excavated surface; the decreased stress gradients reduce the rate of brine and gas flow. Brine is preferentially associated with those lithologic units that contain the most clay (clay F and the clays above and below the orange band). Brine gradually becomes evident along these units, and patches of brine often extend downward from them (Figures 2-2 and 2-3). These patches are most apparent for a year or

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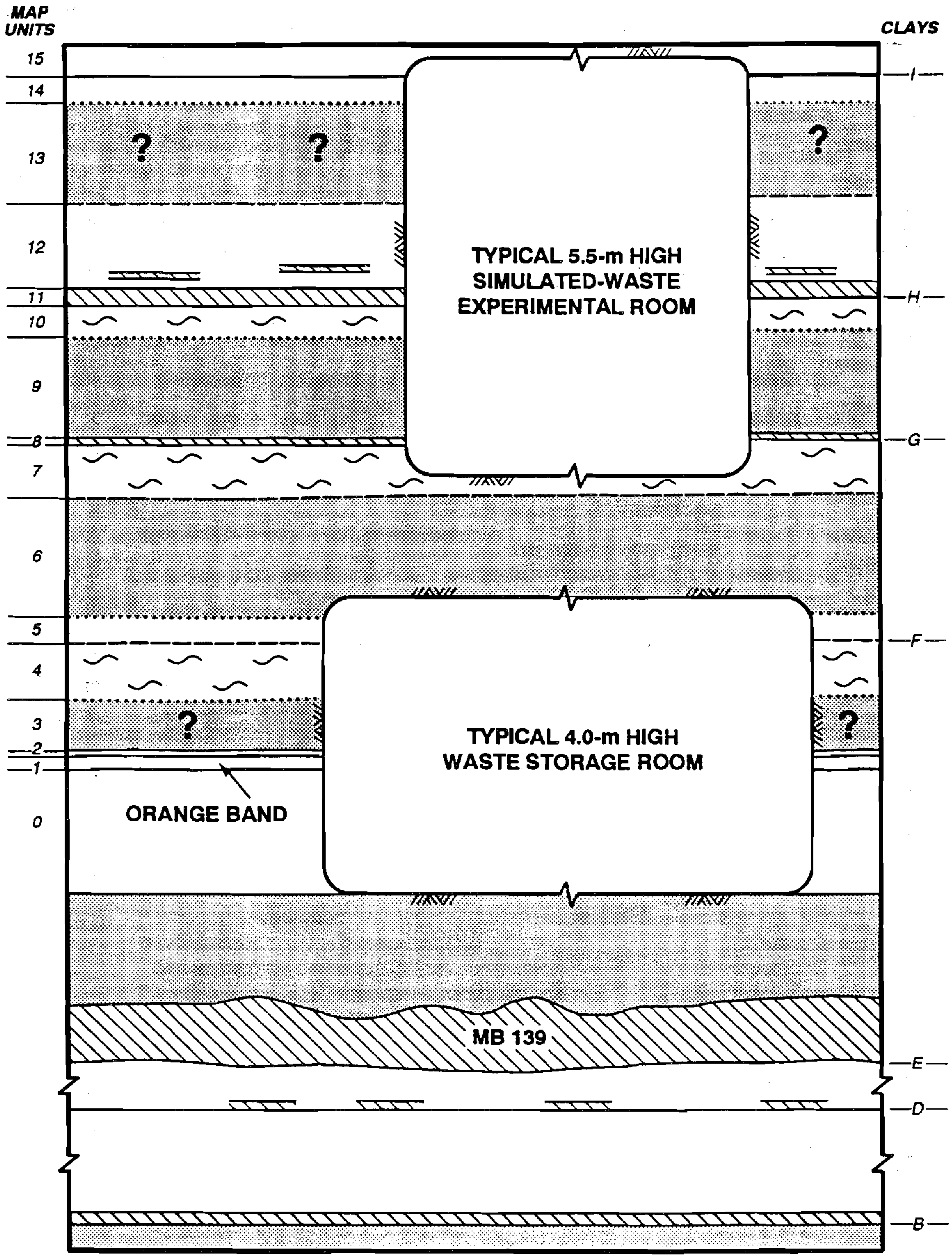

Figure 2-7

Clear Halite Beds with No Measurable Permeability (Less than 1 x 10^{-23} m^2) Constrain Brine Flow. Tested Beds Shown as a Shaded Pattern, Question Marks Indicate Untested Beds with Same Lithology (from Beauheim and Howarth, 1991).

two after excavation. Salt encrustations form due to brine evaporation in the repository atmosphere.

Stress gradients decrease toward the openings with age. Dish-shaped fractures develop in the ribs (Figures 2-8 and 2-9), interdicting additional subhorizontal flow toward the openings (Deal and Roggenthen, 1991). The accumulation of moisture and the growth of weep encrustations on vertical surfaces in the WIPP usually ceases one and a half to two years after excavation.

2.5 Damp or Wet Areas on Floors

Moist areas on the floor have been discussed previously by Deal and Case (1987), Deal and others (1987), Deal and others (1989), and Deal and others (1991). A brine seep on the floor of Room G (known as GSEEP), located at approximately N1100 W1140, is the only persistently moist area in the WIPP excavations. Inflow data for GSEEP is contained in Appendix A with a smoothed graph of the data in Appendix B. A description of the location and a discussion of the seepage history through December 1988 is contained in Deal and others (1989). The seepage rate reached a maximum of 0.75 L per day in April 1989 but declined to 0.4 L per day by December 1990. A total of 875 L have been collected, and more has evaporated into the air circulated through the WIPP workings.

The brine chemistry of GSEEP differs from uncontaminated downholes (refer to Chapter 3). The chemical differences indicate some dilution by dissolving Salado salt in fresher water and/or partial evaporation. The dilution was probably accomplished by mixing normal Salado Formation brine with artificial brine spread on the floors for salt-dust control (refer to Section 3.3). Although water has not been spread for construction purposes in Room G, such water has been spread in the G Access drift, the Site Preliminary Design Validation (SPDV) Rooms, and E0 drift. Examination of the structural contour map (Figure 2-10), with the assumption that gravity flow can only take place beneath the drifts after fracturing has occurred (not down-dip in unfractured rock), shows that the location of GSEEP corresponds to a small flexure, which could channel brine toward the GSEEP location. Water spread on floors as far away as N1400 and E0 or used in experiments in Room J are possible sources for the brine. These sources are unlikely because this would require that water from these locations move downslope through fractures in the DRZ to the structural low point (the approximate location of GSEEP) and then find its way to the surface of Room G. This movement of brine apparently does not occur, primarily because sizeable air-filled fractures are intersected by a large- (91-centimeter [cm]) diameter, 3.6-m-deep drill hole at the intersection of SPDV Room 4 and the N1100 drift. Additionally, drill hole DH36, located

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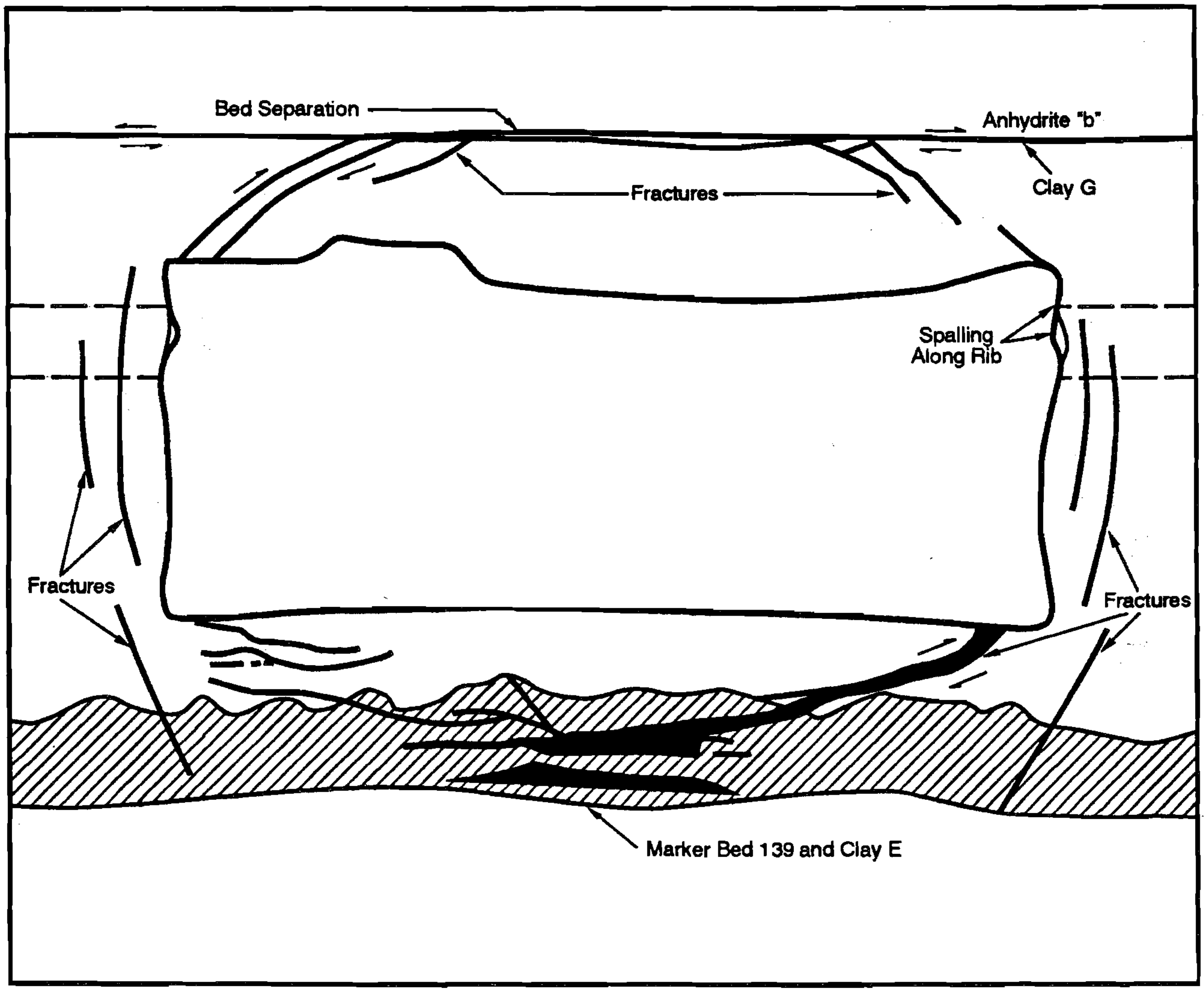

Figure 2-8
Cross Section of Fracturing Around a 4-m-High, 10-m-Wide Waste Storage Room at the WIPP

Figure 2-9
Part of a near-vertical dish-shaped fracture exposed in the east rib of Room 7, Panel 1.

13.7 m west of GSEEP, contains brine with normal chemistry. The top and bottom of Marker Bed 139 (MB 139) can be observed in DH36, and although fractures occur in the upper several meters, walls of the hole within a few meters of the floor of the drift are dry. No brine is seeping into DH36 from fractures immediately beneath the floor of Room G. It is doubtful that fracturing beneath the floor could route brine moving some distance from the east to the surface at GSEEP and not also provide a pathway for it to flow the additional distance westward to DH36. Chemical analyses of brines collected from drill holes occurring between GSEEP and Room J are discussed in Chapter 3, Section 3.3 and show it to be unlikely that brine is moving from Room J to GSEEP.

Examination of the local topography (WIPP underground survey maps, WIPP mining engineering files) shows that the G Access drift, the drift immediately east of the GSEEP location, slopes westward toward GSEEP and that the GSEEP location is at a topographically low spot. Artificial brine has been spread in the G Access drift (WIPP underground operations files) and could readily seep downslope, either on the drift floor or through the layer of unconsolidated muck that blankets the floor. It is unlikely that this brine would move westward, slightly upslope, to the location of downhole DH36, which contains brine with normal chemistry. Therefore, it is probable that the GSEEP brines originated as brines of normal Salado brine composition seeping out of map unit O (Figure 2-4), diluted by a component of artificial brine spread on the floor of the G Access drift and modified by partial evaporation.

As noted in Section 2.2.2, Room G appears to have more weeps (salt encrustations) and more clay than other parts of the excavations, which suggests that this northwesterly part of the facility is slightly more moist than the rest. The floor of Room G is also stratigraphically about 1 m higher than the SPDV or waste storage rooms and is cut in map unit O. Brine that seeps out of the lower part of the ribs and forms encrustations elsewhere would be beneath the floor of Room G and a potential source for the GSEEP brine. Additionally, the ventilation in Room G is approximately 15,000 cubic feet per minute (cfm) compared to the 45,000 (1 fan) to 75,000 (2 fans) cfm in N1100 and N1420. Room G maintains a constant flow rate of 15,000 cfm with two booster fans, regardless of the air flow in the adjoining drifts. Occasionally, the 15,000 cfm decreases to 3,000 cfm with only one booster fan operating. The possibility of reduced air flow in Room G may result in reduced evaporation rates, which coupled with a slightly greater moisture content in the rocks in the vicinity may allow the accumulation of moisture near the floor in GSEEP.

2.6 South Exploratory Drift

The WIPP repository is excavated stratigraphically with respect to the orange band (Figure 2-4). These beds (and therefore the underground workings) dip 2 to 3 degrees, dropping over 6.5 m in elevation to the southeast (Figure 2-10; Francke and others, 1990). The South Exploratory Drift (E140) was excavated January 1983 to confirm the geology of the southern part of the disposal area. The southern 500 m of this drift is seldom visited and slopes southward to a dead end; therefore, if significant amounts of brine were seeping into this drift, the minimal evaporation and sloping nature of the floor should result in the accumulation of brine at the south end of the drift. In November 1987, almost five years after excavation and in May 1989, six years and four months after excavation, this drift was inspected for evidence of brine or brine seepage. The floor was dry, and the only evidence of moisture was the presence of a few salt encrustations on the ribs. If much brine flowed downslope to the south end and evaporated, salt crusts should be evident. No such salt crusts or brine pools existed (Figure 2-11). No detectable moisture was found on the ribs or floor. Overall, the area was dry. Although this data is difficult to quantify, only nonsignificant quantities of brine have been seeping into this drift over six years; otherwise, there would have been more evidence of moisture.

2.7 Downholes and Brine Beneath the Floor

Deal and Case (1987; Table 3-1) discussed brine inflow in 13 downholes with observations beginning in late 1984 and early 1985. December 31, 1990, marked six years of observation. Four downholes (A1X01, A3X01, DH40, and DH42A) showed steady inflow; one (OH46) was increasing; and six (A2X01, BX01, DH36, DH38, DH42, and DHP402A) were decreasing. Four (IG201, IG202, L1X00, and NG252) of the original 13 could no longer be observed. Table 2-1 summarizes the most important data obtained from the downholes, with additional information in Appendix A.

The first nine downholes in Table 2-1 are of particular interest because they are located in areas where water has not been spread during construction in the six years of observation; therefore, the brine collected from these holes was derived totally from within the Salado Formation. Brine chemistries from these holes differ from chemical signatures associated with construction brines. Many downholes have been observed during the BSEP program (Appendix A, Table A-1) but in most cases, contamination with non-Salado water is known or suspected, making interpretations of natural processes difficult. This has been confirmed in most holes by the chemical composition of the brine, which clearly indicates the mixing of waters with discrete and different chemical signatures (Chapter 3 of this report; Deal and

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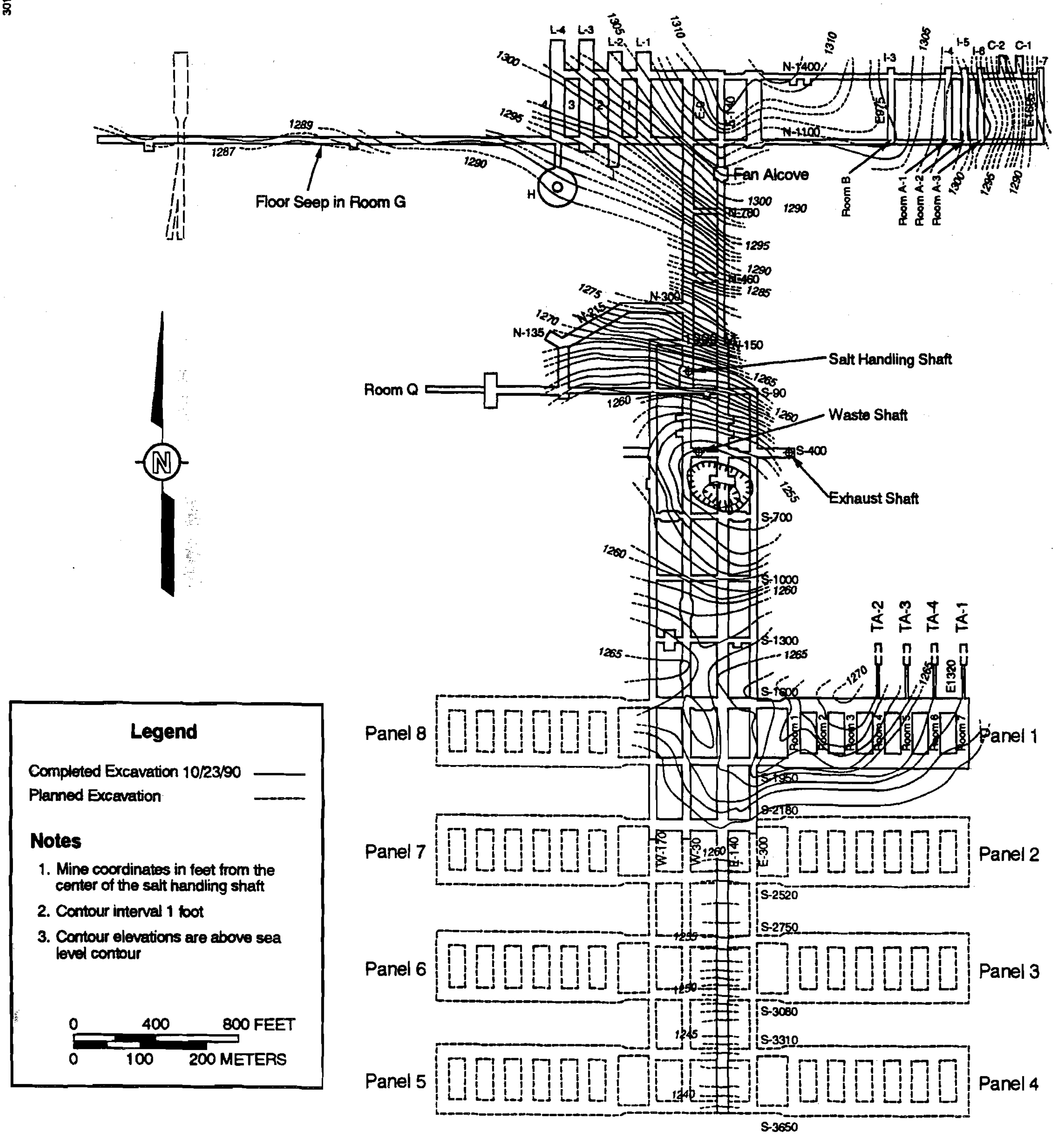

Figure 2-10
Structure Contour Map on the Top of the Orange Band. Contour Interval is 1 Foot, and Elevations are in Feet (Francke and Others, 1990).

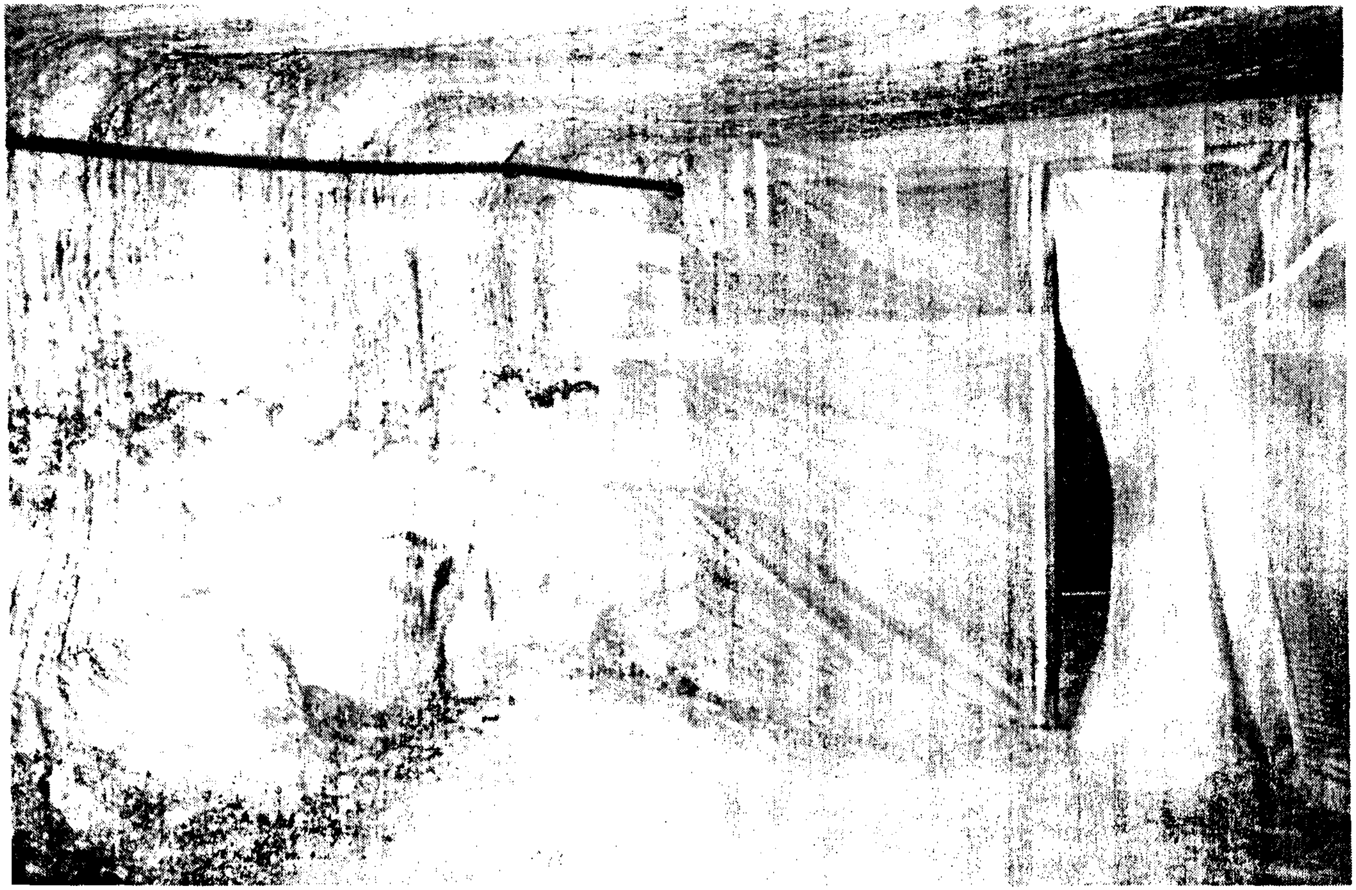

Figure 2-11

South end of the south exploratory drift (E140 at about S3630) on November 13, 1987. This drift was excavated in January 1983, about five years prior to this photograph. Clay F is exposed in the rib, and the area is very dry. There are almost no salt encrustations and no evidence that much brine has ever seeped into this area.

Table 2-1

Brine Accumulation Summary For Downholes

Hole	Room Or Location	Date Area Excavated	Date Hole Drilled	Date First Observed	Approx. Maximum Inflow (L/Day)[a]	Approx. Inflow 12/90 (L/Day)	Inflow Trend 12/90 (I.S.D.)[b]	Approx. Total Vol. Removed by 12/90 (L)
A1X01	A1	10/84	2/85	3/85	0.05	0.03	S	60
A2X01	A2	7/84	2/85	2/85	0.12	0.02	D	54
A3X01	A3	11/84	1/85	2/85	0.03	0.02	S	48
BX01	B	6/84	1/85	1/85	0.03	0.03	D	94
DH36	G	12/84	1/85	1/85	0.28	0.09	D	354
DH38	G	12/84	1/85	1/85	0.18	0.03	D	95
DH40	G	12/84	1/85	1/85	0.04	0.004	S	9
DH42	G	12/84	1/85	1/85	0.05	0.02	D	49
DH42A	G	12/84	1/85	1/85	0.2	0.06	S	178
DHP402A	S1950/E1330	10/86	12/86	12/86	4.0	0.3	D	605
OH46	S390/W320	5/89	6/89	7/89	0.04	0.01	I	9

Brine Accumulation Summary for Upholes

Hole	Room Or Location	Date Area Excavated	Date Hole Drilled	Date First Observed	Approx. Maximum Inflow (L/Day)[a]	Approx. Inflow 12/90 (L/Day)	Inflow Trend 12/90 (I.S.D.)[b]	Approx. Total Vol. Removed by 12/90 (L)
A1X02	A1	10/84	3/85	3/85	0.09	0.03	D	64
DH15	N1104/E1688	3/84	3/84	5/86	0.01	0	DRY	4
DH35	G	12/84	1/85	2/85	0.02	0	DRY	4
DH37	G	12/84	1/85	2/85	0.01	0	DRY	1
DH39	G	12/84	1/85	2/85	Trace	0	DRY	0
DH41	G	12/84	1/85	2/85	Trace	0	DRY	0
DH215	S1960/E153	1/83	2/83	4/84	0.09	0	DRY	18
DHP401	S1950/E1330	10/86	1/87	3/87	0.008	0	DRY	2
OH47	S390/W320	5/89	7/89	8/89	0.030	0.005	S	4

Brine Accumulation Summary for Subhorizontal Holes

Hole	Room Or Location	Date Area Excavated	Date Hole Drilled	Date First Observed	Approx. Maximum Inflow (L/Day)[a]	Approx. Inflow 12/90 (L/Day)	Inflow Trend 12/90 (I.S.D.)[b]	Approx. Total Vol. Removed by 12/90 (L)
OH20	S1600/W170	9/85	3/89	3/89	0.02	0.01	S	7
OH21	S1600/W170	9/85	12/88	2/89	0	0	DRY	0
OH22	S1600/W170	9/85	12/88	2/89	0	0	DRY	0
OH23	S1950/W170	12/85	2/89	2/89	0.06	0.01	D	13
OH24	S1950/W170	12/85	3/89	3/89	0.002	0	DRY	0.2
OH25	S1950/W170	12/85	3/89	3/8	0.001	0	DRY	0.01
OH26	S2150/W170	8/86	3/89	3/89	0.04	0.02	D	11
OH27	S2150/W170	8/86	4/89	4/89	0.001	0	DRY	0.2
OH27A	S2150/W170	8/86	4/89	4/89	0.02	0	DRY	0.3
OH28	S2150/W170	8/86	4/89	4/89	0.008	0.003	D	1
OH45	S390/W325	5/89	6/89	6/89	0.03	0.001	D	3

[a]Liters (L) per day.
[b]Data summarized and rounded from Appendices A and B. I = Increasing; S = Steady; D = Decreasing.

others, 1989; Deal and others, 1991). In some cases inflow rates vary directly with known water-spreading practices.

2.7.1 Macrofractures Beneath the Floor and Observations in the Shaft Sumps

As the excavations age, a zone of macrofractures form beneath the floor of the drifts, locally forming relatively high permeability zones (Figure 2-8; Deal and others, 1991; Deal and Roggenthen, 1991). In some cases (e.g., EES12B, EES21B, L2C03, L2C25, NG252, OH36, OH37, OH41, and OH42), brine could be seen flowing into the holes from open fractures. A local increase in permeability results in significant increases in inflow, especially in those parts of the workings where construction waters are spread on the floor. A high variability in seepage exists in some of these holes, even when closely spaced, e.g., MIIT holes (Deal and Case, 1987) and L1S holes (Deal and others, 1989).

The presence of the brittle anhydrite MB 139 exacerbates the fracturing beneath the floor (Bechtel, 1983, 1986; Deal and Roggenthen, 1991). It has been observed that interconnected fracture systems occur beneath the floor in some parts of the WIPP workings (Bechtel, 1986; Deal and others, 1991). Hydrologic testing of brine-filled macrofractures in the vicinity of the Air Intake Shaft at W620 and S90 was accomplished successfully (Deal and others, 1991, Section 4). These observations and test results have shown that interconnected fractures can occur at drift intersections and have led to speculation that a continuously connected system of large fractures may develop with time and provide a pathway for brine movement beneath the floor of the excavation, possibly bypassing efforts to seal certain drifts or contaminating naturally occurring brine with introduced, artificial brines (see discussion of GSEEP and Room J in Sections 2.5 and 3.3 of this report). However, the existence of such a large-scale interconnected fracture system has not been proved.

Large quantities (thousands of liters) of brine are known to have been spread in the E0, N1100, and N1420 drifts for dust control (WIPP construction files), and fractures under intersections in the northern part of the excavations are brine-filled (WIPP Geotechnical Engineering, Excavation Effects Files). Enough undersaturated brine was spread in the vicinity of E0 and N1100 so that solution took place in instrumented downholes, the instrument anchors were loosened by dissolution, and the instruments failed and were removed (WIPP Geotechnical Engineering, Geotechnical Instrumentation Maintenance Files).

Inspection of the structural contour map on top of the orange band (Figure 2-10) or the elevation map of the floor of the WIPP workings (WIPP Engineering Files) shows that most of the northern part of the excavations slope southward to the Salt Handling Shaft.

Additionally, that slope continues southward toward the Waste Handling Shaft, which happens to be located near a structural low spot, centered at approximately S600 E140. Perhaps not coincidentally, a downhole at S850 flowed brine for a number of months until it was plugged during the excavations that lowered the floor (Deal and Case, 1987, Section 3.1.2.1).

If a hydrologically connected macrofracture system has developed beneath the E0 drift, then brine should be driven southward by gravity and discharged into the 45-m deep sumps at the Salt Handling and Waste Handling Shafts. Periodic inspections of these shaft sumps show that fractured anhydrite and salt are exposed beneath the drift floors but that these fractures are dry (Figure 2-12). The fact that no brine is seeping out of the fractures into the shaft sumps argues strongly that a hydrologically connected macrofracture system has not developed beneath the E0 drift, which is one of the widest (7.6 m) and oldest (seven years, excavated in 1984) drifts at the WIPP. The degree of fracturing is a function of drift width and age (Deal and others, 1991). It is possible that the typical width of the entry drifts (less than 7.6 m) is too narrow to allow the type of fracturing observed beneath the 10-m-wide waste storage rooms (Bechtel, 1986) or S90 E640 intersection (Deal and others, 1991, Section 4.4.1) to develop. Additional testing has been proposed to determine hydrologic conductivity beneath the E0 drift.

2.7.2 Moisture Content

Moisture content of the rocks exposed in drill holes varies directly with clay content (Deal and others, 1989). Preliminary hydraulic testing of the beds near the repository level has found that the hydraulic conductivity of relatively pure halite is immeasurably low; argillaceous halite ranges from 1×10^{-9} to 2×10^{-8} m/day; and anhydrite MB 139 ranges from 3×10^{-8} to 6×10^{-7} m/day (Beauheim and Holt, 1990). From this and other data, Deal and Roggenthen (1991) concluded that brine seepage is more likely from clay seams, partings, and along interbeds (especially anhydrite) than through massive, clear halite. Relative moisture content has been calculated from direct measurement and geophysical induction logging techniques (Deal and others, 1989, Chapter 4 and Appendix H). The calculated moisture content shows that clays at depth (clays B and D) are more moist than the orange band and clay F, which are exposed in the facility horizon excavations; therefore, extrapolating inflow estimates based on drill holes is expected to yield higher brine seepage rates and volumes than will be experienced in real waste storage rooms.

2.7.3 Data from the Heated Experimental Area and Room G

The nine downholes mentioned previously that seem to remain uncontaminated are located in the northern part of the repository (Figure 2-1). The first four are in the northeastern heated

Figure 2-12

Photograph of dry subhorizontal fracture approximately 5 mm wide exposed in the Waste Handling Shaft, just below the floor of the station.

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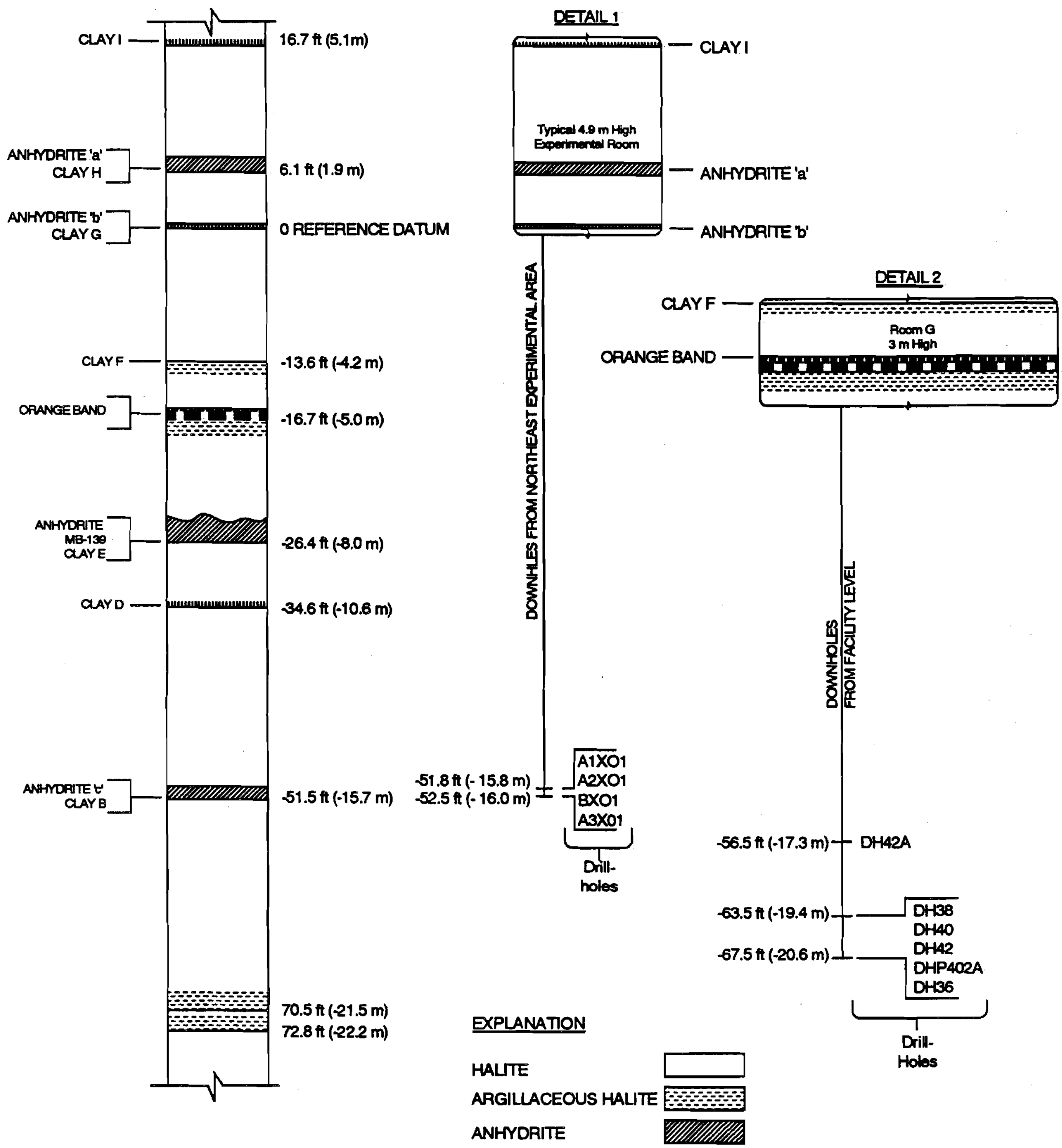


NOTE: See Table 1.2. Distances above and below anhydrite "b" (clay G) vary from place to place in the WIPP excavations due to natural changes in stratigraphic thickness. This figure has been adjusted to represent thicknesses in the northern part of the workings. Distances from clay E down are from Room G and from the orange band up are from Room A1.

Figure 2-13

Correlation of the Stratigraphy with Downholes in the Northern Part of the Facility

experimental area and the last five are in Room G, the northwesternmost room. Eight of the holes are about 15 m deep, and DH42A is 12 m deep. All of these holes have a similar six-year seepage pattern (Appendix B), although these holes are at different stratigraphic horizons and penetrate slightly different units (Figure 2-13). The seepage rate varies more than two orders of magnitude between these downholes. These holes were drilled into relatively undisturbed salt shortly after the drift or room was excavated and monitored from the time of drilling. The following conclusions, first reached in 1986 (Deal and Case, 1987), have been confirmed:

- Immediately after drilling a hole, a few days elapse where little or no brine seeps into the hole.
- After the initial no-flow or low-flow period, brine seepage quickly reaches a maximum and then begins to decline.
- Seepage rates decrease over a period of several months to steadier, long-term trends.

The overall pattern (Appendix B) of the long-term trends varies between holes. BX01, DH36, DH38, DH42, and DH42A have decreasing seepage rates, although DH42A appears to be steady in 1990 (Table 2-1). A1X01 and A3X01 were fairly steady through the middle of 1989, but suggest a slightly increasing seepage rate over the last one and a half years. Both appeared fairly steady in 1990 (Table 2-1). A2X01 was steady until 1990, when seepage began to decrease. The very small amount of brine seepage into DH40 makes it difficult to determine a trend.

2.7.3.1 Downholes in the Northeastern Heated Experimental Area

A1X01, A2X01, A3X01, and BX01 in the northeastern heated experimental area (Figure 2-1) are about 15 m deep. Since the floor of these rooms is at a stratigraphic level approximately 5.5 m higher than the typical floor at the repository level, a slightly different stratigraphic sequence is penetrated here than in Room G (Figure 2-13). The downholes in the northeastern experimental area intersect clay F at approximately 4.2 m, clay D at 10.6 m, and all intersect anhydrite "c" and clay B at the bottom of the hole. Clay B is more than 1 cm thick in A1X01 and is a probable source of brine.

The halo of deformation (the DRZ) (Deal and Roggenthen, 1991) that develops around the WIPP excavations involves a different stratigraphic section at the higher experimental level than at the repository level. Fracturing beneath the floor in the experimental area develops in fairly pure halite. MB 139 occurs at a depth of 8 m and is unlikely to experience the degree of fracturing seen beneath the facility level excavations, where it typically occurs about 2 m beneath the floor.

Room A1 was excavated in October 1984, and hole A1X01 was drilled in the south end in February 1985. This experimental room was heated from October 2, 1985, to July 14, 1990. Brine seepage showed no obvious response to the heaters being turned on or off.

Room A2 was excavated in July 1984, and A2X01 was drilled in the north end in February 1985. Heaters for the experiments were turned on October 10, 1985. Seepage remained fairly steady until May 1990, when the rate started to decline. This decline may or may not be associated with a rock fall that occurred June 19, 1990, which broke the power line to the heaters and turned them off. Brine seepage showed no obvious response to the heaters being turned on.

Room A3 was excavated in November 1984, and hole A3X01 was completed in the south end in January 1985. The experiments were heated from October 2, 1985 to August 23, 1990. Brine seepage rates showed no response to turning the heaters on. A decline in the seepage rate occurred about the same time the heaters were turned off but may have been coincidental.

Room B was excavated in June 1984, and hole BX01 was drilled in the north end in January 1985. The experiments were heated from April 23, 1985, to January 30, 1989. Brine seepage showed no obvious response to the heaters being turned on or off.

2.7.3.2 Downholes in Room G

Room G was completed in December 1984 and is the northwestern-most room in the experimental section of the repository. Room G is only 10 ft high; as a result, the floor is about 1 m higher (stratigraphically) than the repository level. DH36, DH38, DH40, and DH42 are evenly spaced 15-m downholes (Figure 2-1) drilled in January 1985. DH42A, 12 m deep and 2 m west of DH42, is the westernmost hole drilled in the WIPP workings. These holes intersect anhydrite MB 139 between 2.7 and 3.7 m, clay D at 5.7 m, and anhydrite "c" and clay B at 10.8 m (Figure 2-13). Clay B is more than 1 cm thick. Clays B and D are probably the source of most of the brine seeping into these holes.

2.7.4 Discussion of Data Acquisition and Analyses

It has been a challenge to collect small quantities of brine from the bottom of the 15-m downholes (Deal and Case, 1987). The difficulty lies in uniformly collecting the very small amounts of brine that have seeped into the hole since the last time the hole was sampled. Several different sampling methods have been used, and each technique has unique problems. The change in sampling methods are sometimes reflected as apparent variations in seepage rates (Appendix B).

To compensate for sampling-induced apparent variations in seepage rates, the graphs of the seepage data presented in Appendix B have been smoothed for most locations using an 11-point moving average (the average of the data point and the five points on each side of the data point) and a standard statistical software package (Statgraphics, Version 4.0). At the beginning and end of each curve, the trend is distorted by the smoothing function because the number of data points falls below five on one side of the averaging point; therefore, unsmoothed data appears for the first few points at the beginning and end of each curve for a more accurate graphical representation of the seepage trends. Figures 2-14, 2-15, and 2-16 show the effect of the smoothing on the actual data.

For the first four years of the sampling program, the usual downhole sampling technique employed a bailer with a check-valve on the end of a single 20-m length of tubing (Deal and Case, 1987). A hand-powered high-volume, low-vacuum pump designed to inflate and deflate rubber life rafts was connected to the tubing. The bailer was lowered to the bottom of the drill hole. The hand pump was used to draw brine into the bailer. The bailer was then pulled out of the hole, emptied into a container, and the brine measured. The technician examined the hole to verify that all the brine was evacuated, a major advantage of this technique. Occasionally the suction line or check valve failed and brine was released back into the drill hole, but it was recovered the next time the hole was sampled. The data for that sampling period would appear to show anomalously low brine seepage, but would be followed by an anomalously high value. This is illustrated in the plot of the data for DH38 (Figure 2-14). On February 28, 1986 (day 423 on the plot), the remarks (Appendix A) indicated a substantial volume was emptied into the hole due to a break in the suction line. Figure 2-14 shows the result, with a low seepage rate calculated for day 423 followed by a high value for day 429. A similar event occurred on days 449 and 456.

The bailer currently is used only to evacuate holes when weekly sampling is impossible and fairly large quantities of brine (more than one-half L) have to be removed. The sampling technique was changed in the downholes in October 1989 (approximately day 1,740). The development of unstable back conditions in the heated experimental rooms (A1, A2, A3, and B) necessitated this change to allow sampling from a safe location. A pressure-suction moisture collecting device was installed. These are standard soil moisture collection devices

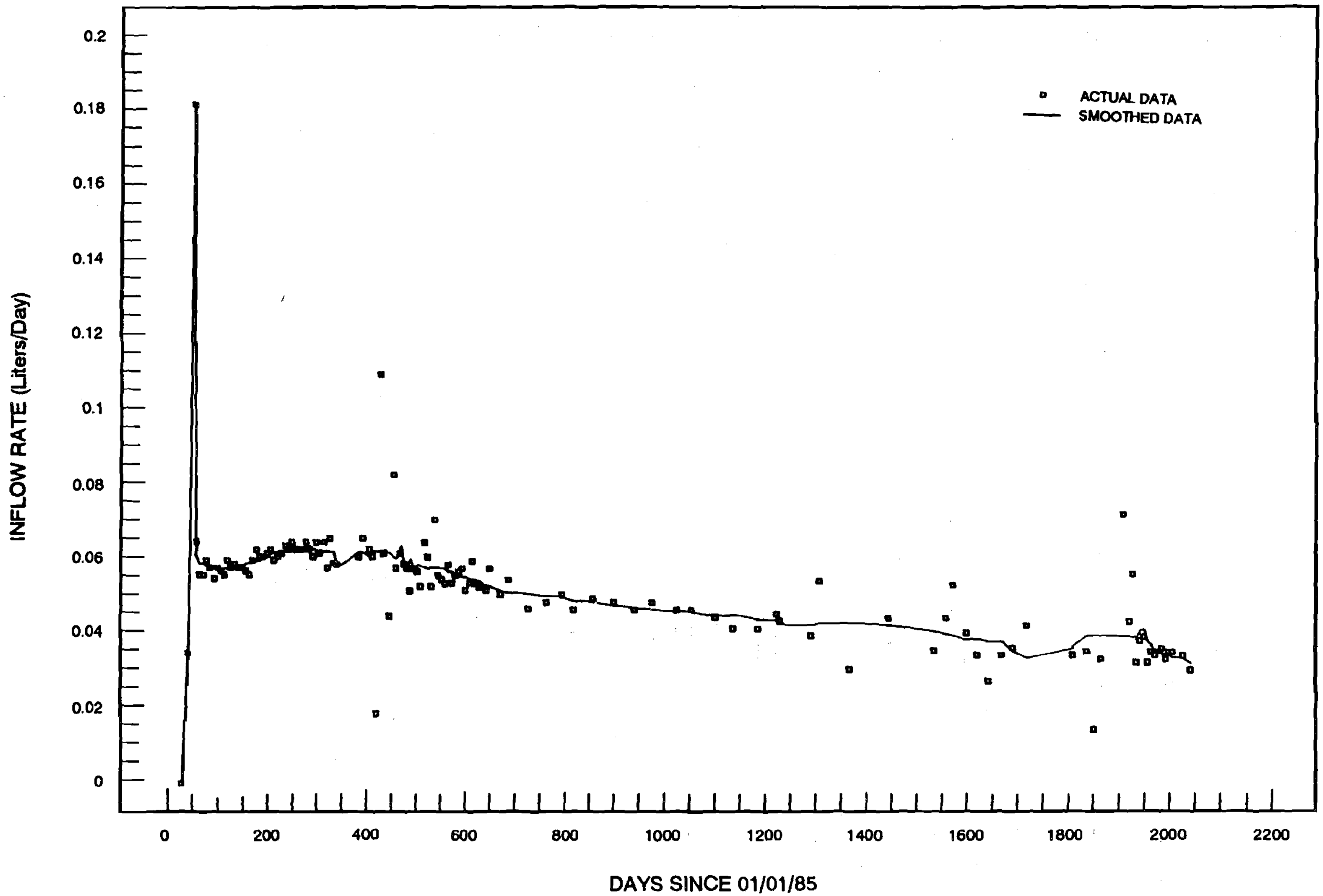


Figure 2-14
Eleven-Point Average Versus Actual Data for Hole DH38

301601.09/fld A32

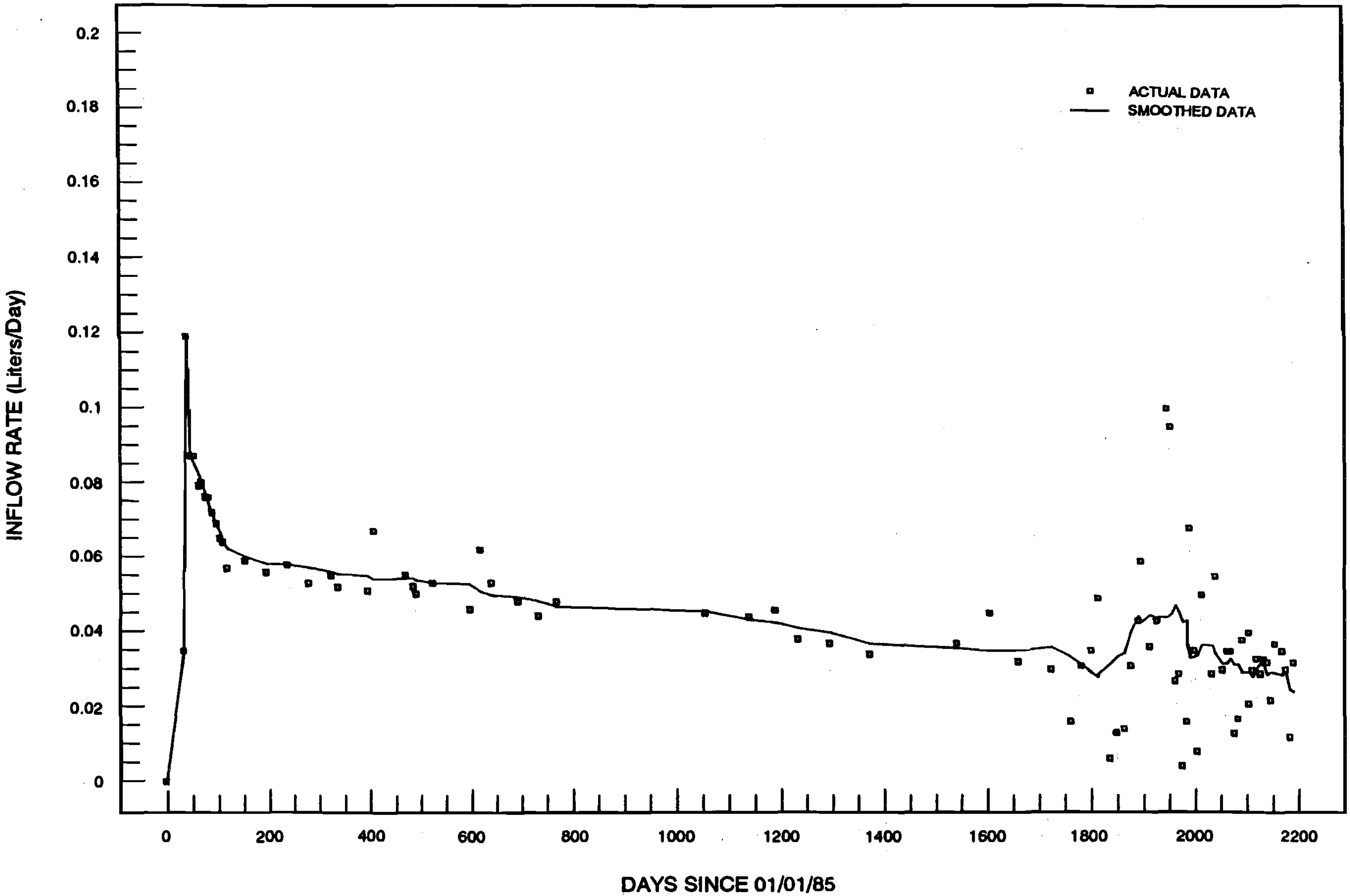


Figure 2-15
Eleven-Point Average Versus Actual Data for Hole BX01

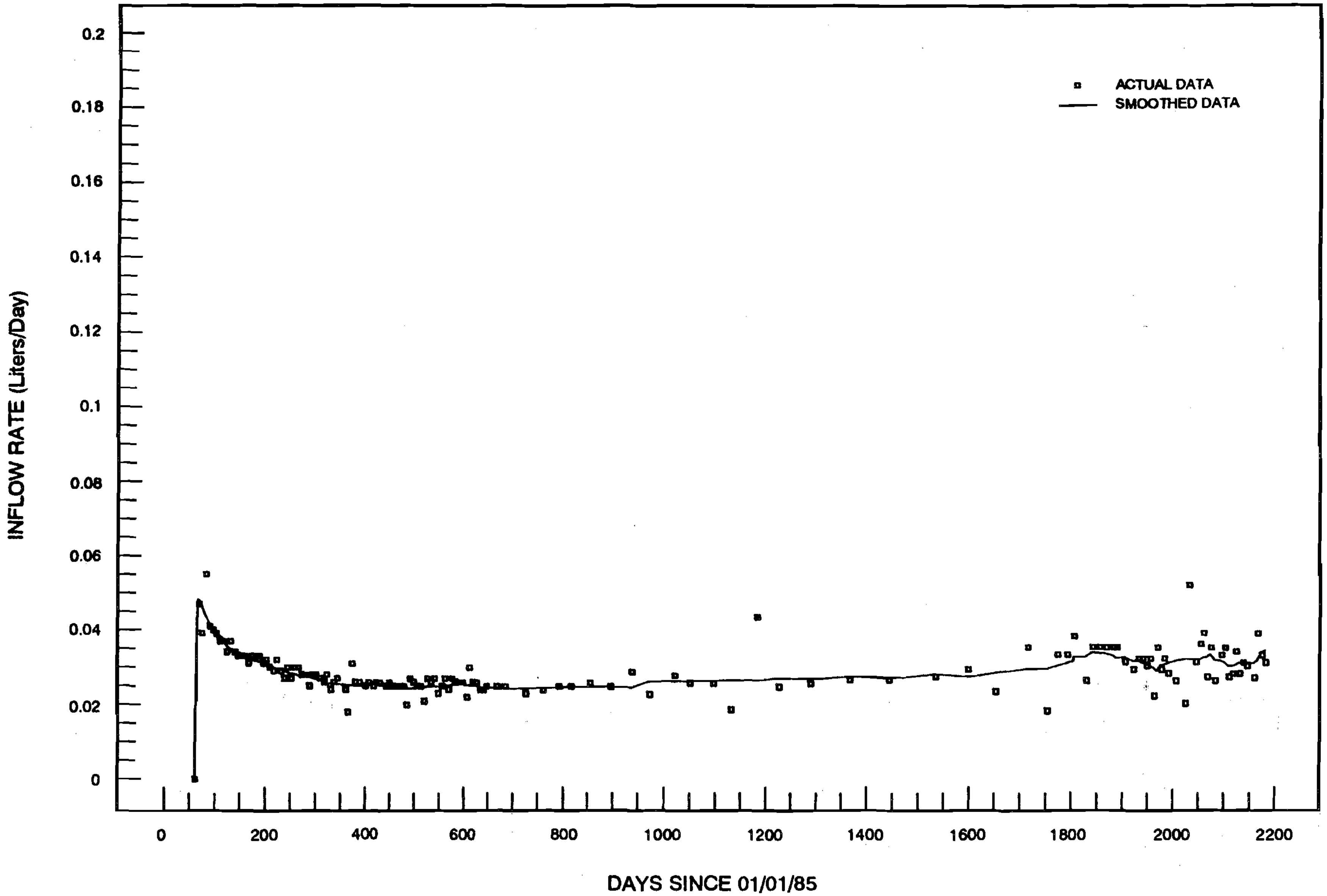


Figure 2-16
Eleven-Point Average Versus Actual Data for Hole A1X01

consisting of a short length of polyvinyl chloride (PVC) pipe with a porous cup attached to the bottom and two lengths of flexible tubing entering the top through a two-hole stopper. One tube extends to the bottom of the porous cup and the other ends just inside the stopper. The sampler is placed in the bottom of the hole, and a hand-pump is used to lower the pressure approximately 50 centibars below atmospheric. The partial vacuum draws brine through the porous cup into the PVC pipe during the sampling interval. At the time of sampling, the vacuum is released and air is pumped down the short tube, which forces brine up the longer tube to the collecting point. The maximum capacity of most of the devices is approximately 0.8 L (a few have longer PVC collection pipes and hold about 1 L). If the volume collected is more than 0.5 L, there is a possibility that not all of the brine that has accumulated in the hole has been collected in the sampler. The technician establishes the vacuum, returning the next day to continue collection activities.

Several advantages to the soil moisture collection devices are: the collar of the drill hole can be sealed, which prevents loss of brine due to evaporation; the chance of sample contamination is reduced; and sampling can occur from a remote, safe location. Disadvantages include: the volume is limited by the size of the sampler; loss of vacuum; clogged tubes; the ceramic cup is easily broken; and, for inaccessible holes, the inability to visually verify the complete evacuation of the brine. These devices work quite well but require weekly, rather than monthly, sampling so that accumulations do not exceed the capacity of the collecting device. For ease of routine sampling, these devices are currently used in all locations.

Plots of the brine seepage data for those holes producing much more than 0.5 to 0.8 L per week show a decrease in seepage rates shortly after the samplers were installed (about 1,740 days on Figures 2-14, 2-15, and 2-16). The drill holes had previously been evacuated only once a month with the bailer. The soil moisture devices are too small to accumulate all of the brine in some of the drill holes. Brine was left in the holes, resulting in an apparent decrease in seepage rates. In January 1990 (day 1,830), the sampling frequency was increased to once a week, which eliminated that problem (Figure 2-15). The scatter of the data points also increased at 1,740 days for the downholes after the change in the sampling technique. This is evident in the case of BX01 (Figure 2-15), which is now inaccessible. It is impossible to visually verify that all the brine accumulating in BX01 was collected by the sampling device.

Other locations are accessible to visually verify complete sampling, repair, and maintenance of the devices. If visual inspection indicates incomplete removal of the brine, repeated sampling is done until all of the brine is collected. This is reflected in Figure 2-14, where the scatter in the data was reduced in the latter part of 1990. The change in sampling technology has resulted in an irregular shape of the smoothed data curve (after day 1,740 in Figures 2-14, 2-15, and 2-16).

2.7.5 Data Interpretation

The maximum seepage into new drill holes in new drifts occurs one to three weeks after drilling the hole. In relation to later flow, the graphical representation of that maximum varies from a pronounced spike (Appendix B; DH38, A2X01, BX01, and DH40) to a less prominent peak (Appendix B; A3X01 and DH42). The reason for the consistent presence of this early inflow peak is explained by a phenomenon associated with brine weeps. Observations of weeps on newly mined surfaces (Section 2.2.1) show that exsolving gas plays an important early time role in their formation.

Gas exsolving from the brine may provide a driving mechanism that could explain this early time seepage behavior in the drill holes. This hypothesis assumes that the early-time flow is dominated by the relatively sudden discharge of gas in the drill hole that results from lowering the confining pressure from about 15 megapascals (MPa) to atmospheric. The initial discharge would be mostly gas without much fluid (explaining the week or two of no detectable brine seepage), followed by gas-driven brine during the next several months. This is somewhat analogous to uncorking a warm bottle of champagne: gas flows out of the bottle followed by the head. Another factor in the lack of early-time flow is probably that the rock is dilating rapidly in the DRZ due to stress release and that brine has to fill up the dilating pores around the drill hole before excess brine can flow out.

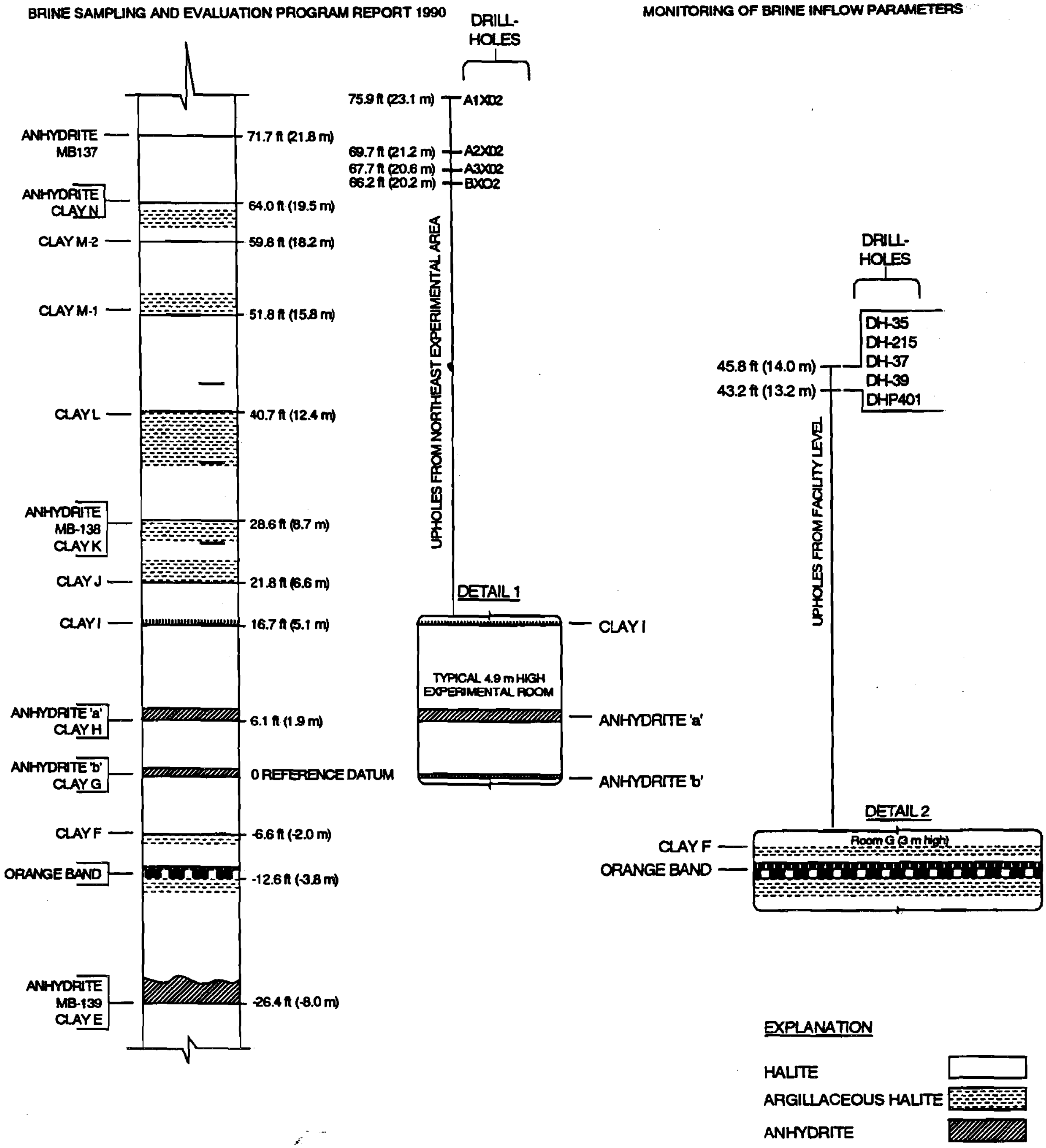
After the gas has dissipated, flow becomes dominated by compaction of the clays near the drill hole or by the deviatoric stress on the liquid fraction, and brine seeps into the drill hole at a more constant rate. In the deforming salt environment, porosity and permeability close to the excavations change dramatically with time (Deal and Roggenthen, 1991), and after a few years, new plumbing systems developed by macrofracturing dominates. Local variations in fracturing can make large differences in the seepage behavior of a given downhole (see discussion of the L1S holes in Deal and others, 1989). The fracturing becomes quite noticeable a year after the excavation and is well developed after two years.

The graph for DH38 (Figure 2-14) has an anomalous bulge in the plot of the seepage rate approximately one to two years after the room was excavated (200 to 500 days). Examination of the graphs of downholes in Room G indicated that a similar phenomenon is evident in DH36 and DH42A and less pronounced in DH40 and DH42 (Appendix B). However, similar bulges in the plots of the downholes in the northeastern heated experimental area (A1X01, A2X01, A3X01, and BX01) are not evident. The increase in the seepage rate in DH38 occurring approximately one to one and a half years after excavation of the room may be the result of an increase in porosity, permeability, and macrofracturing that occurs in the DRZ during this time. MB 139, a brittle anhydrite about 3 m below the floor of Room G, exacerbates the development of the macrofracturing, providing an enhanced delivery system for brine inflow. A similar increase in the seepage rate is not seen in downholes drilled in the experimental area, perhaps because MB 139 is 8 m below the floor and much less affected by the development of the DRZ.

2.8 Upholes and Brine Above the Back

Upholes characteristically produce less brine for shorter periods of time than downholes. Part of this can be attributed to greater evaporation caused by less effective sealing of upholes (Deal and Case, 1987) and loss of moisture by dispersion from the hole collar into the salt. Loss of moisture by evaporation is evident from salt crust buildup in and around most of the upholes. Chemical data (Deal and others, 1989; Abitz and others, 1990), which confirms compositional differences between brine samples from upholes and downholes, can be explained by the partial evaporation of a brine with typical downhole composition to produce the uphole brine. Although the stratigraphy exposed in the upholes (Figure 2-17) is slightly different from that exposed in the downholes, it is unclear whether this contributes significantly to the differences in either brine quantity or chemistry (Deal and others, 1989). Summary data for selected upholes are presented in Table 2-1. Of nine upholes listed in 1985, only A1X02 continues to produce brine. (Upholes A2X02, A3X02, and BX02 are no longer monitored.) As discussed in Deal and others (1989), A1X02 is longer than any of the other upholes (18 m) and intersects an additional anhydrite unit not penetrated by any other uphole. No associated clay was observed in the core, but clay commonly occurs below anhydrite stringers and may be discontinuous at this horizon. Additional data are presented in Appendix A.

Drill holes in the back that intersect overlying clay layers (clays J and K and argillaceous halite between the two clays), including those for the placement of rock bolts, commonly drip brine for a period of several months, often forming halite stalactites. Seepage is particularly notable when the drifts are allowed to age for several years, allowing bed separations to form prior to drilling. This has been noted in the heated experimental area, as discussed below.



NOTE: See Table 1.2. Distances above and below anhydrite "b" (clay G) vary from place to place in the WIPP excavations due to natural changes in stratigraphic thickness. This figure has been adjusted to represent thicknesses in the northern part of the workings. Distances below the zero datum (clay G) are from Room G, distances above clay G are from Room A1.

Figure 2-17

Correlation of the Stratigraphy with Upholes in the Northern Part of the Facility

2.8.1 Observations of Brine Seepage from Rock Bolts in Rooms C1 and C2

Small salt stalactites and moist areas developed around the heads of rock bolts installed in the summer of 1990 in Rooms C1 and C2. The seepage appears similar to that which was observed in 1987 and 1988 in Room D, in the A Rooms, and in Room B. The interpretation of the seepage information regarding the A Rooms and B Room is affected by the heaters used in them.

Rooms D, C1, and C2 were all excavated in March and April 1984 (Bechtel, 1985) and were allowed to age for a number of years prior to bolting. Bed separations developed in the back after a few years. Although moisture can accumulate in the resultant gaps, many years of observations document that spontaneous seepage to the back is rare. Stalactites and moist areas in the back almost always occur in association with drill holes placed for observation, geological investigations, installation of instrumentation, or roof bolts.

Roof bolts, 2 m in length, were installed in Room D in March 1987, about three years after mining. Approximately a month after bolting, seepage began at the bolt heads, and stalactites of salt began to form. By February 1988, the back in Room D was festooned with salt stalactites hanging from the bolt heads. Moist areas on the back around the bolts were obvious. Gradually, over the spring and summer of 1988, the seepage slowed and by the following winter, the back had become noticeably dryer. However, some seepage has continued through 1990, especially at the south end of the room. The summary observation is that the back of Room D became noticeably moist for the year or so following bolting and then began to dry up. The back of Room D also appeared to be more moist than the back of other rooms excavated at the lower facility level (the SPDV Rooms and Panel 1), which also had been roof bolted some time after excavation.

The observations in Room D parallel those made by the experimental operations geotechnicians working in heated experimental Rooms A1, A2, A3, and B. As noted above, however, the fact that these rooms were heated makes it more difficult to compare brine seepage and other events to unheated areas of the WIPP excavations.

Rooms C1 and C2 were bolted with 2.4-m roof bolts in July 1990, about six years after excavation. The bolt heads apparently had started to become moist in August 1990, and stalactites had started to form. By December 1990, several stalactites had become fairly long, and obvious moist areas around the bolt heads had developed.

Moisture content of the Salado Formation beds near the facility horizon at WIPP are known to correlate directly with clay content (Deal and others, 1989, Sections 4.1 and 4.2). Bolts placed in the back at this higher experimental level penetrate clay J and the argillaceous halite above it (between clay J and clay K, which is at the base of MB 138), known to be one of the most moist of the strata near the facility horizon at the WIPP. The moisture content of this unit appears to be approximately twice that of clay G (Deal and others, 1989, Appendix H), the moisture-bearing horizon about 2 m above the back at the facility horizon (SPDV Room and Panel 1).

The undisturbed back in the workings at the WIPP rarely show evidence of brine seeps or weeps. Drill holes, however, provide a route for brine to move across effectively impermeable clear halite beds, and seepage from drill holes in the back is a common occurrence at the WIPP. Typically, upholes start to show evidence of brine seepage a month or so after drilling, exhibit their most active seepage for the following year or so, and then gradually dry up. Rooms C1 and C2 show this very typical behavior.

Roof bolts placed into the back of Rooms A1, A2, A3, B, C1, C2, and D will penetrate clay J, the argillaceous halite above it, and clay K. Roof bolts placed into the back of the facility horizon (SPDV rooms and Panel 1) will penetrate clay G (at the base of anhydrite "b"). Since there is good evidence that clays J and K are significantly more moist than clay G (Deal and others, 1989, Appendix H), bolts placed in the higher experimental area are likely to develop more brine seepage than bolts placed in the back of the facility level. The amount of seepage that occurred in Rooms C1 and C2 in 1989 and 1990 probably cannot occur in the waste storage rooms because the source of the moisture (clay J, the argillaceous halite above it, and clay K) is more than 8.5 m above the back of the storage rooms and will not be penetrated by the boreholes normally used for bolting (4 m or less).

2.9 Subhorizontal Holes

During 1989, 11 subhorizontal brine sampling holes were drilled to investigate the brine seepage from the WIPP facility stratigraphic horizon. The holes are oriented slightly downward from the opening to accumulate brine at the end of the hole where it can be collected and measured without loss to fractures near the excavations. Ten of the 11 holes were drilled westward from the W170 drift at the location of future entries to Panels 7 and 8 at S1600, S1950, and S2150 (Figure 2-1). This part of the W170 was excavated in September 1985 at S1950; December 1985 at S1900; and in August 1986 at S2150 and is considered to have a mature DRZ developed around it. Three of the holes (OH20, OH23, and OH26), which are 46 m long and 7.6 cm in diameter, started in the clayey halite (map unit 4) above the orange band and angled downward (Figures 2-18, 2-19, and 2-20), so that they end in the clear halite (map unit 0) below the orange band (Figure 2-4). The 46-m holes reached the orange band about 15 m into the holes. Hole OH27A was started at the initial location for OH27 but was terminated at a depth of 1.2 m due to drilling problems. The six remaining 15-m holes were drilled either above or below the orange band. One 15-m hole (OH45) was drilled in a newer excavation in May 1989 at S400 that cuts the same stratigraphic interval as the three 46-m holes.

The holes are monitored for brine inflow. When tubing was removed from the 46-m holes for maintenance of the moisture collection devices, dry tubing was observed for about the first 15 m. In OH23, the device was pulled twice. Both times, approximately 12 to 15 m of tubing was dry. It is not known conclusively what rock unit is encountered at that depth in the holes (these holes were not cored) nor whether there is brine inflow from deeper than 15 m.

Several of the holes have produced measurable quantities of brine (Table 2-1, Appendix A). The 46-m holes provide the most uniform and comparable set of measurements yet obtained in the BSEP and have all produced orders of magnitude more brine than the 15-m holes. The longer holes are still producing, while the shorter holes are dry—or essentially dry—with one exception. The exception is OH45, a 15-m hole that cuts the same stratigraphic interval as the 46-m-long holes, which was drilled in a more recently mined area at W170, over 300 m north of OH20, OH23, and OH26. Lateral variation may play a minor role in the difference in brine seepage. This is considered to be unlikely, as Deal and others (1989) found no significant lateral variation in moisture content for any of the stratigraphic units exposed in the excavations.

Two explanations can be offered for the brine seepage observations: (1) The longer holes are tapping an area that is not dewatered, because they extend past the relatively old W170 drift DRZ. As a result, they may only tap about 30 m of undisturbed salt (in this case, the one 15-m hole would still produce brine because it was drilled from a young excavation where a significant DRZ had not yet developed). (2) Brine flows preferentially along stratigraphic boundaries, so the clay units at the top and bottom of the orange band may be the only significant source of brine (see discussion in Section 2.3). Therefore, only the four holes (OH20, OH23, OH26, and OH45) that cut the orange band accumulate brine.

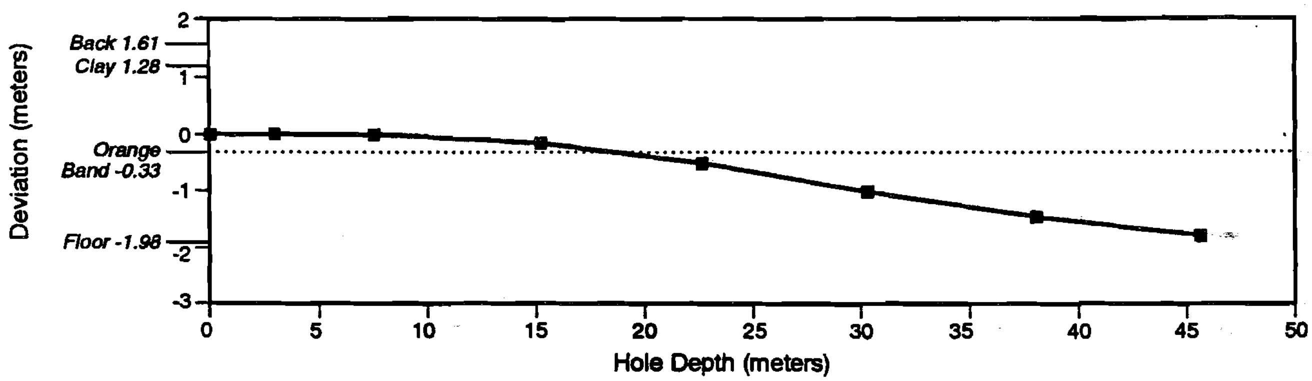


Figure 2-18
Profile of Long Drill Hole OH20

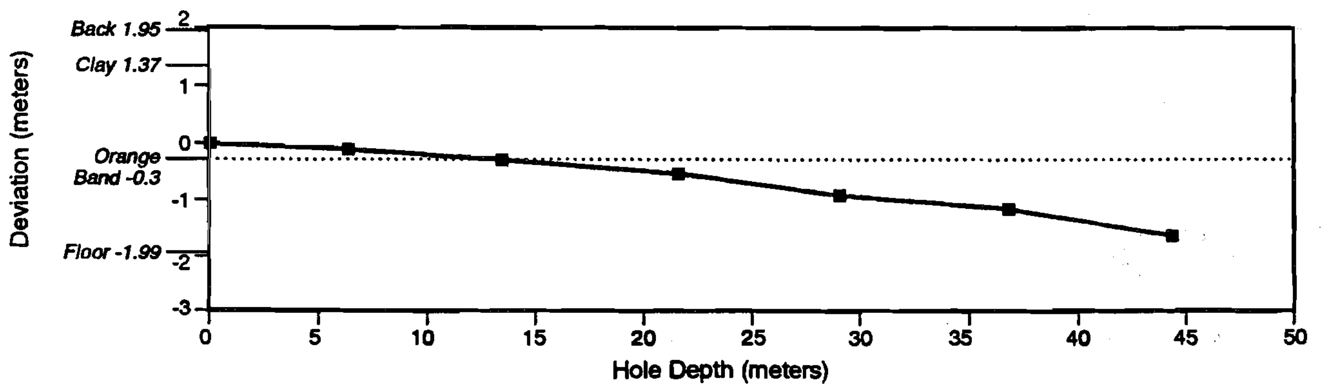


Figure 2-19
Profile of Long Drill Hole OH23

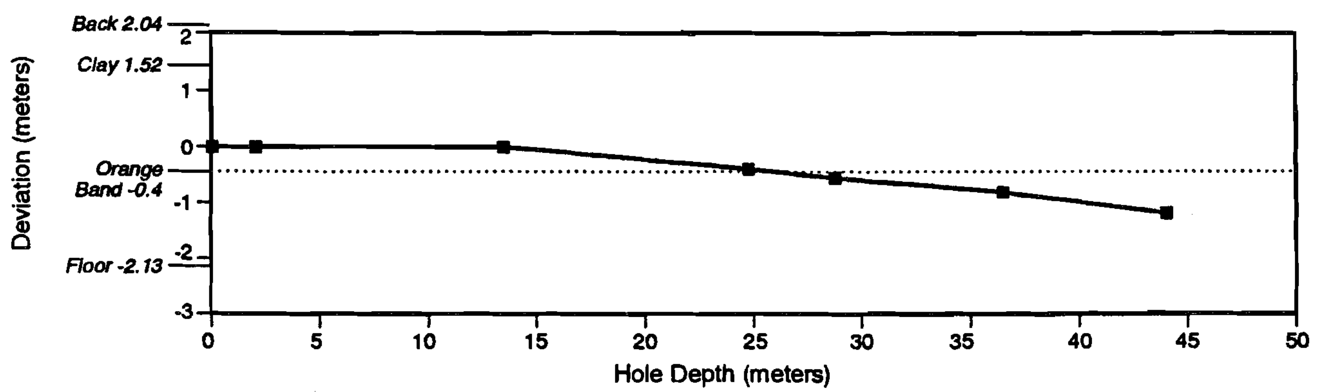


Figure 2-20
Profile of Long Drill Hole OH26

NOTE: *These holes were not cored. The position of the orange band is projected, and the actual point at which the drill hole crosses the orange band is unknown.*

To improve the understanding of the mechanisms that affect brine seeping from the Salado Formation at the WIPP site, an additional BSEP drilling program has been proposed (Appendix E) to discriminate between the possibilities considered in this report.

3.0 Geochemistry of BSEP Brines

The geochemistry of brines recovered from the WIPP repository horizon have been the subject of numerous studies (Stein and Krumhansl, 1986; Krumhansl and Stockman, 1987; Stein and Krumhansl, 1988; Deal and others, 1989; Abitz and others, 1990; Krumhansl and others, 1991), and the reader should refer to these publications for background information and more detailed discussions of the interpretation and origin of WIPP brines. The following discussion will be limited to the geochemical data obtained on brines collected during the 1989 and 1990 calendar years as part of the BSEP. The intent of this chapter is to:

- Present simple statistics on the 1989 and 1990 BSEP chemical analyses of brine recovered from down, up, and subhorizontal holes
- Compare the 1989 and 1990 BSEP chemical data to chemical data obtained from brine weeps (Krumhansl and others, 1991)
- Discuss analytical results on archived brine samples
- Address the issue raised in Deal and others (1989) on the possibility of migration of synthetic brine out of Room J along fractures beneath the floor to the GSEEP sampling location.

Chemical analyses of brine obtained in 1989 are reported in Deal and others (1991), and data obtained in 1990 are reported in Appendix C of this report.

A statistical analysis of BSEP brine compositions was last presented in Deal and others (1989). Many of the holes discussed in Deal and others (1989) are no longer producing brine, and new holes have been added to locations being sampled for brine. Therefore, simple statistics (Appendix D) were prepared to summarize the 1989 and 1990 data for the 31 holes currently producing a sufficient volume of brine for analysis.

Histograms, element-ratio plots, and solubility diagrams were constructed using the mean values calculated from analyses obtained from each drill hole location (Figure 2-1). Analytical data on the major elements in brine weeps (Krumhansl and others, 1991) collected from the WIPP repository are presented along with the BSEP data. The histograms illustrate the distribution of a given parameter in Salado Formation brines for up to three independent laboratories: United Nuclear Corporation (UNC), IT, and SNL/NM. Element-ratio plots are similar to those presented in Stein and Krumhansl (1988), Deal and others (1989), Abitz and others (1990), and Krumhansl and others (1991) to allow comparisons of data collected prior to 1989 with the 1989 and 1990 data. Solubility diagrams have been constructed for halite, anhydrite, magnesite, and celestite using the geochemical speciation/solubility code EQ3NR (Wolery, 1983).

During the 1990 calendar year, brine was collected (March 21, 1990) from drill hole DHP402A and was archived to evaluate the affect of storage on the chemical composition of the brine. The archived brine was analyzed approximately three, six, and nine months after collection. The reported results are similar to those obtained on DHP402A samples collected and analyzed in March of 1990.

Deal and others (1989) questioned whether synthetic brine may have migrated out of Room J along fractures beneath the floor to GSEEP. In 1989 and 1990, analysis for cesium and iodide was performed as part of a fluid-mixing analysis to determine whether a component of synthetic brine was present at GSEEP. Cesium and iodide are present in the synthetic brine at concentrations one to three orders of magnitude greater than in most naturally occurring Salado Formation brines; therefore, they are excellent indicators of the presence of the synthetic brine. No abnormally high values for cesium or iodide were found at GSEEP.

3.1 Simple Statistics for 1989 and 1990 Analytical Results

Analytical data (Appendix C) were obtained for samples collected from 31 BSEP drill holes (see Figure 2-1 for drill hole locations) that produced a sufficient volume of brine for analysis in 1989 and 1990. The identification and orientation of the holes are given in Table 3-1. Of these, 30 had multiple analyses. The calculated simple statistics appear in Appendix D. UNC was chosen as the principal analytical laboratory when limited sample volumes warranted use of only a single laboratory. Therefore, several drill holes are represented solely by UNC analytical results. The choice to use UNC as the principal laboratory was based on their capability to analyze a larger suite of parameters and the greater sensitivity of their analytical techniques.

Mean values were calculated for each drill hole (Appendix D) using UNC and IT analytical results from 1989 and 1990 (Appendix C) and are summarized in histograms presented in the following sections. For UNC and IT data, subhorizontal holes (OH20, OH23, OH26, and OH45), upholes (A1X02 and OH47), and downholes suspected to contain a component of spread water (e.g., G090, GSEEP, H090, OH66, OH67, and L1X00) are indicated on the histograms to show their distribution relative to downholes (Table 3-1).

Table 3-1
Drill Holes Sampled for Brine in 1989 and 1990

Downholes[a]	Suspect[b] Downholes	Upholes	Subhorizontal Holes
A1X01	DH28	A1X02	OH20
A2X01	DH30	OH47	OH23
A3X01	DH32		OH26
BX01	DH34		OH28
DH36	DHP402A		OH45
DH38	G090		
DH40	GSEEP		
DH42	H090		
DH42A	L1X00		
NG252	OH62		
OH46	OH63		
	OH66		
	OH67		

[a]These downholes are not separately indicated on the following histograms. Data from them clusters tightly and makes the dominant pattern. Suspected downholes, upholes, and subhorizontal holes are noted on the histograms to show their distribution relative to the downholes.
[b]Suspect holes may be contaminated with water spread on drift floor for roadbed consolidation.

Upholes and suspect downholes generally fall in outlier areas, relative to the modes shown in Figures 3-1 to 3-8. However, there is no strong indication that subhorizontal holes recover brines with chemistry greatly different than uncontaminated downholes, as the subhorizontal data lie close to or in the range observed for the mode of a given parameter. Histograms that summarize major-element distribution for UNC and IT data also show SNL/NM analytical data obtained on brine-weep samples (Krumhansl and others, 1991).

The SNL/NM data represent analyses obtained from brine weeps recovered at three locations in the underground workings. The first weep array was located near the corner of the Room Q entryway. The second array was located at the south end of the repository across from Panel 1, Room 1; and the third array was installed at the north end of the repository in Room L-4. The SNL/NM brine-weep data have not been statistically reduced because each analysis represents a distinct location, and analyses from each weep array (i.e., SNL/NM-1, SNL/NM-2, and SNL/NM-3) are depicted separately on the histograms.

Additionally, the SNL/NM data were reported in parts per thousand (ppt) or grams per kilogram (g/kg), without density data to convert to grams per liter (g/L). An average density value of 1.22 kilograms per liter (kg/L) was used to convert ppt to g/L so that UNC and IT data could be compared to SNL/NM data. This density value was chosen based on the most common specific-gravity value reported for BSEP samples.

3.1.1 Major-Element Composition of BSEP Brines and Brine Weeps

The principal constituents in samples recovered from drill holes (UNC and IT data) and brine weeps (SNL/NM data) are, in decreasing abundance, chloride, sodium, magnesium, potassium, sulfate, boron, bromide, and calcium. Each histogram discussed below shows the frequency distribution of the given parameter for UNC and IT mean values, while the individual analyses for each weep array have been charted for the SNL/NM data. The y-axis corresponds to the number (i.e., frequency) of observations that fall into the parameter range given along the x-axis. For UNC and IT, the total number of observations will be equal to 31 and 23, respectively, which represents the number of drill holes with calculated mean values. For SNL/NM weep arrays 1 through 3, the number of observations corresponds to the number of individual analyses obtained on each weep array (SNL/NM-1 = 30, SNL/NM-2 = 23, SNL/NM-3 =24).

Chloride. Mean values for chloride are concentrated in the greater than 190 to 195 g/L range for UNC and the greater than 195 to 200 g/L range for IT (Figure 3-1). Both the IT

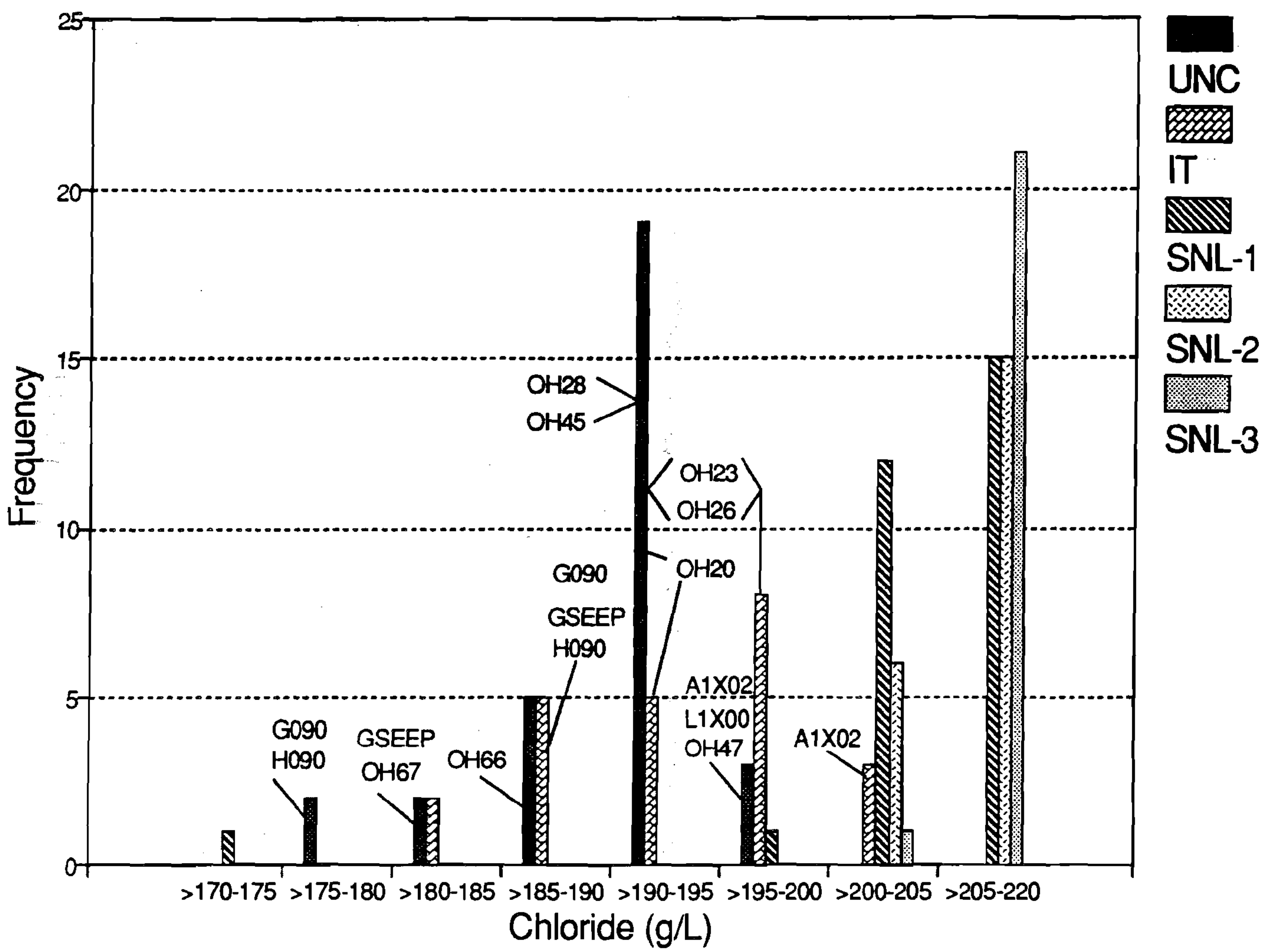


Figure 3-1

Distribution of chloride in Salado Formation brines recovered from underground locations at the WIPP. Note that the highest group along the x-axis represents a greater range of chloride values relative to other groups. Drill hole indicators for UNC and IT data are discussed in the text.

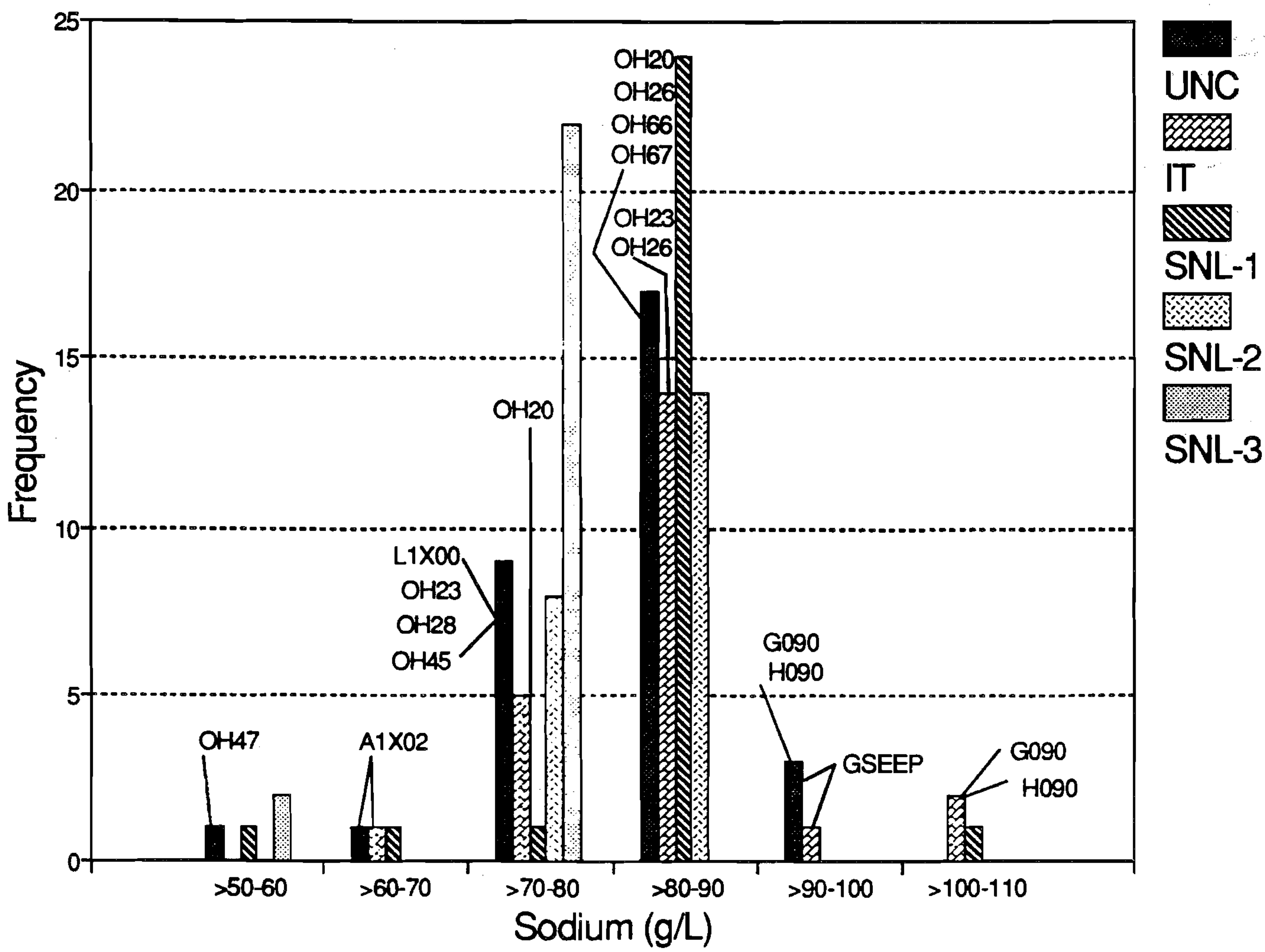


Figure 3-2

Distribution of sodium in Salado Formation brines recovered from underground locations at the WIPP. Drill hole indicators for UNC and IT data are discussed in the text.

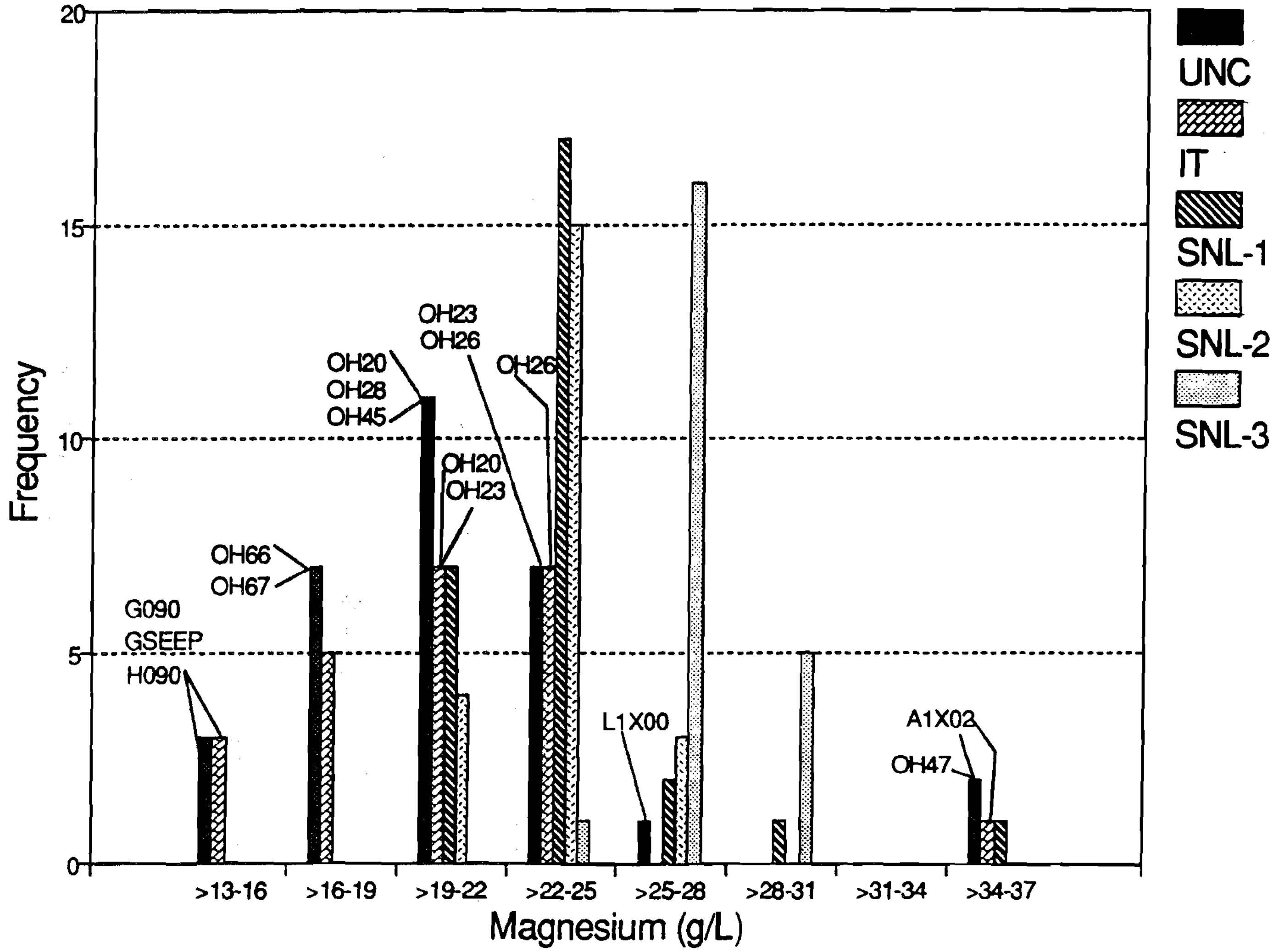


Figure 3-3

Distribution of magnesium in Salado Formation brines recovered from underground locations at the WIPP. Drill hole indicators for UNC and IT data are discussed in the text.

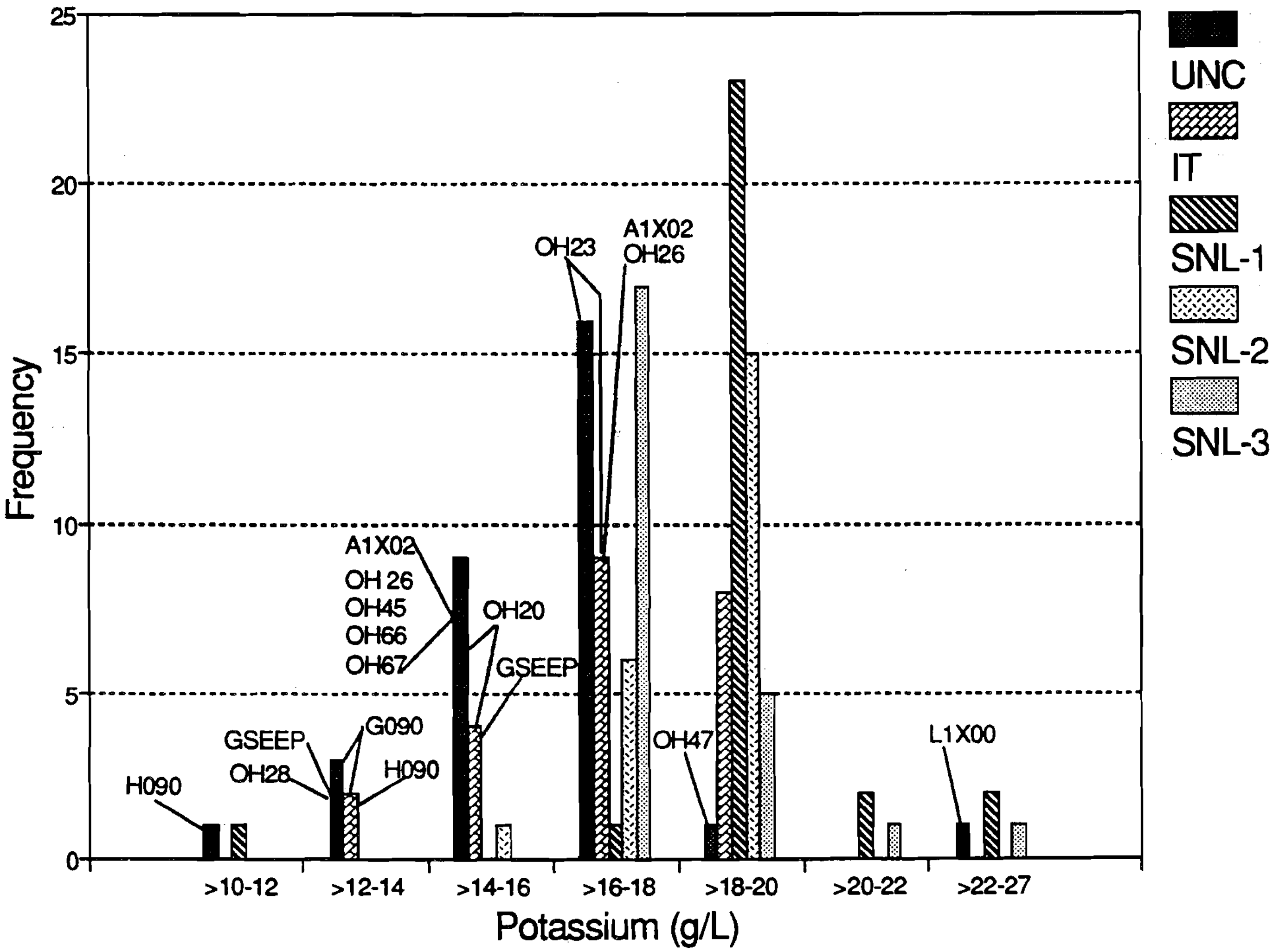


Figure 3-4

Distribution of potassium in Salado Formation brines recovered from underground locations at the WIPP. Note that the highest group along the x-axis represents a greater range of potassium values relative to other groups. Drill hole indicators for UNC and IT data are discussed in the text.

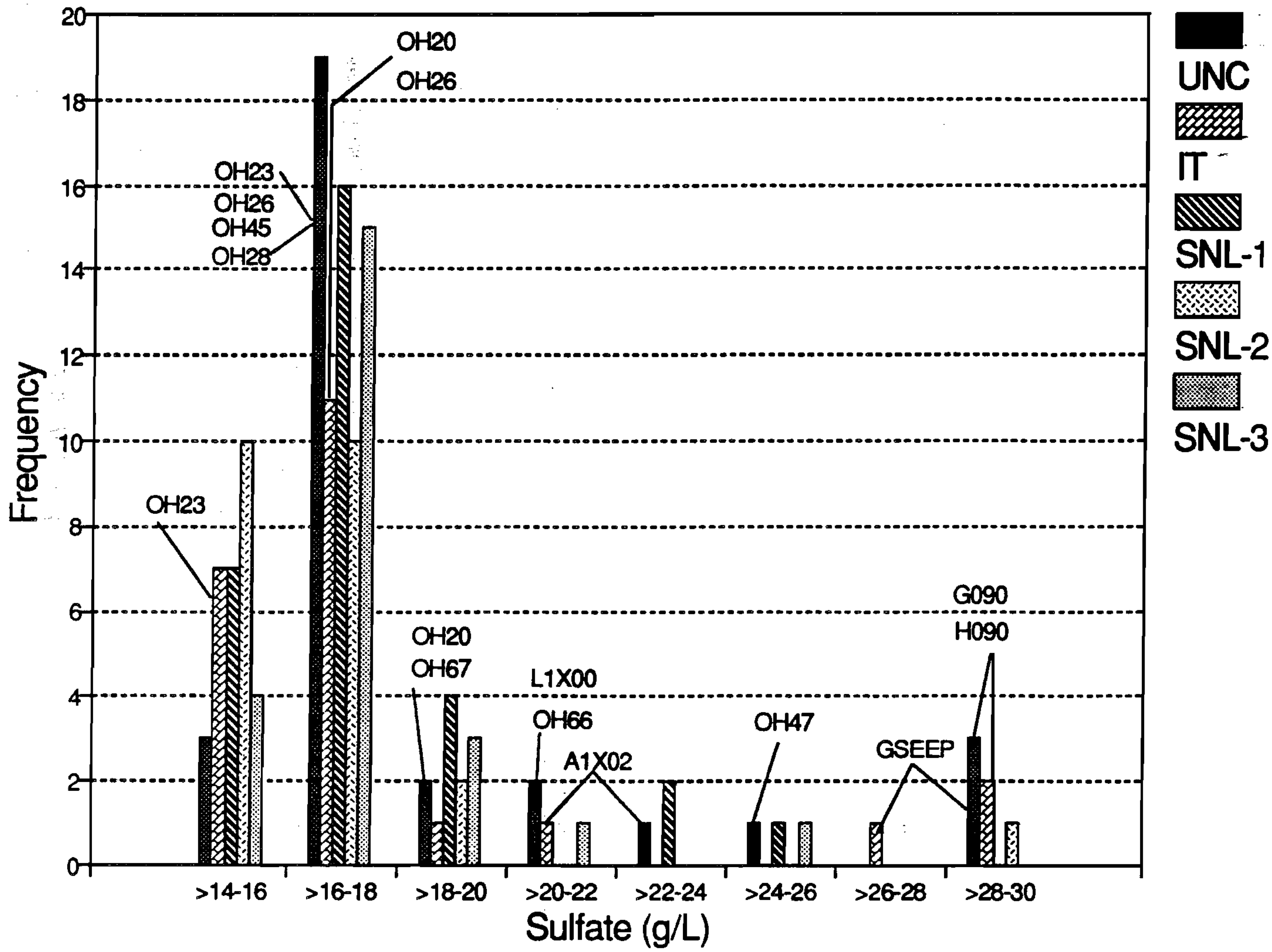


Figure 3-5

Distribution of sulfate in Salado Formation brines recovered from underground locations at the WIPP. Drill hole indicators for UNC and IT data are discussed in the text.

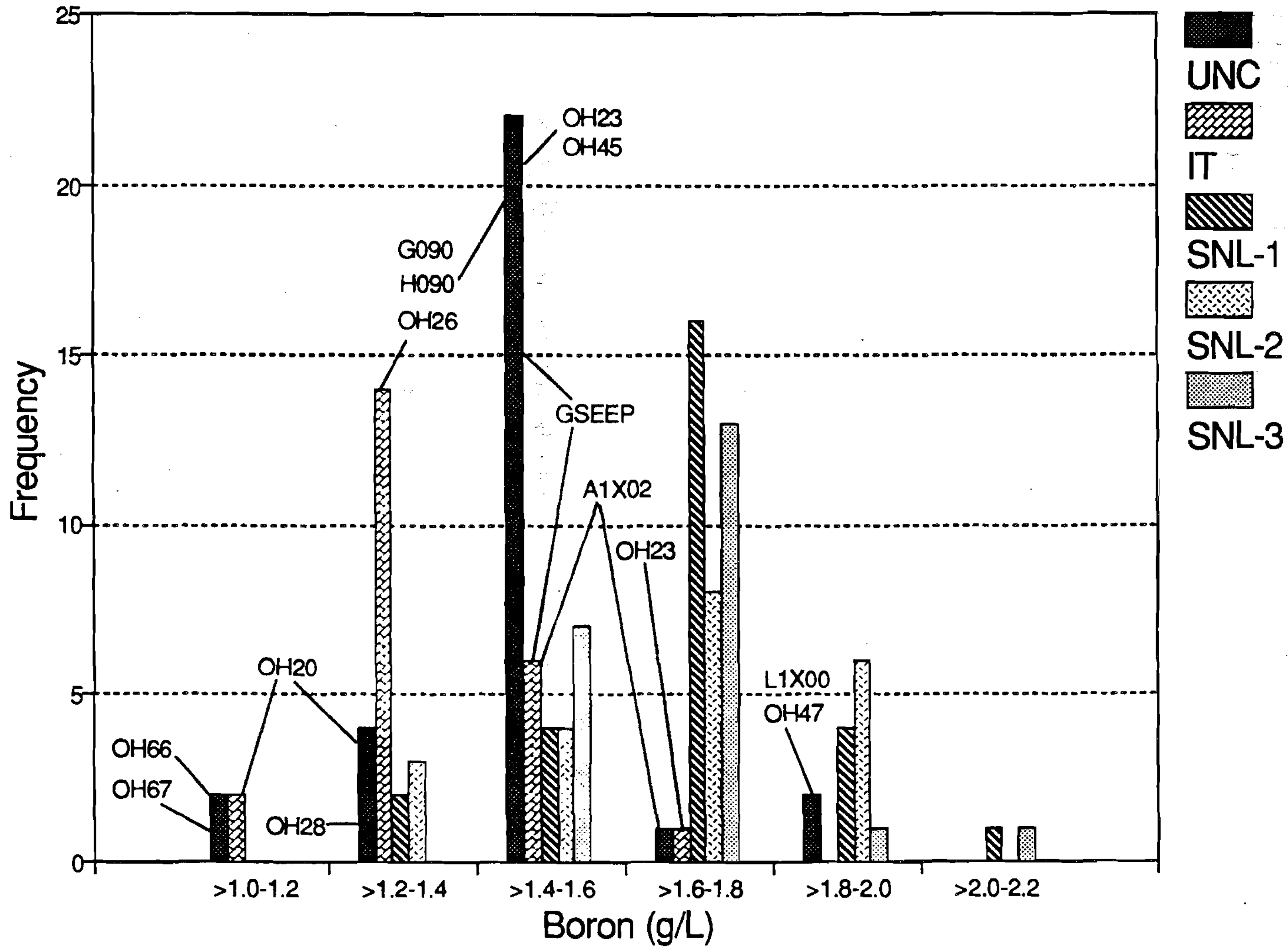


Figure 3-6

Distribution of boron in Salado Formation brines recovered from underground locations at the WIPP. Drill hole indicators for UNC and IT data are discussed in the text.

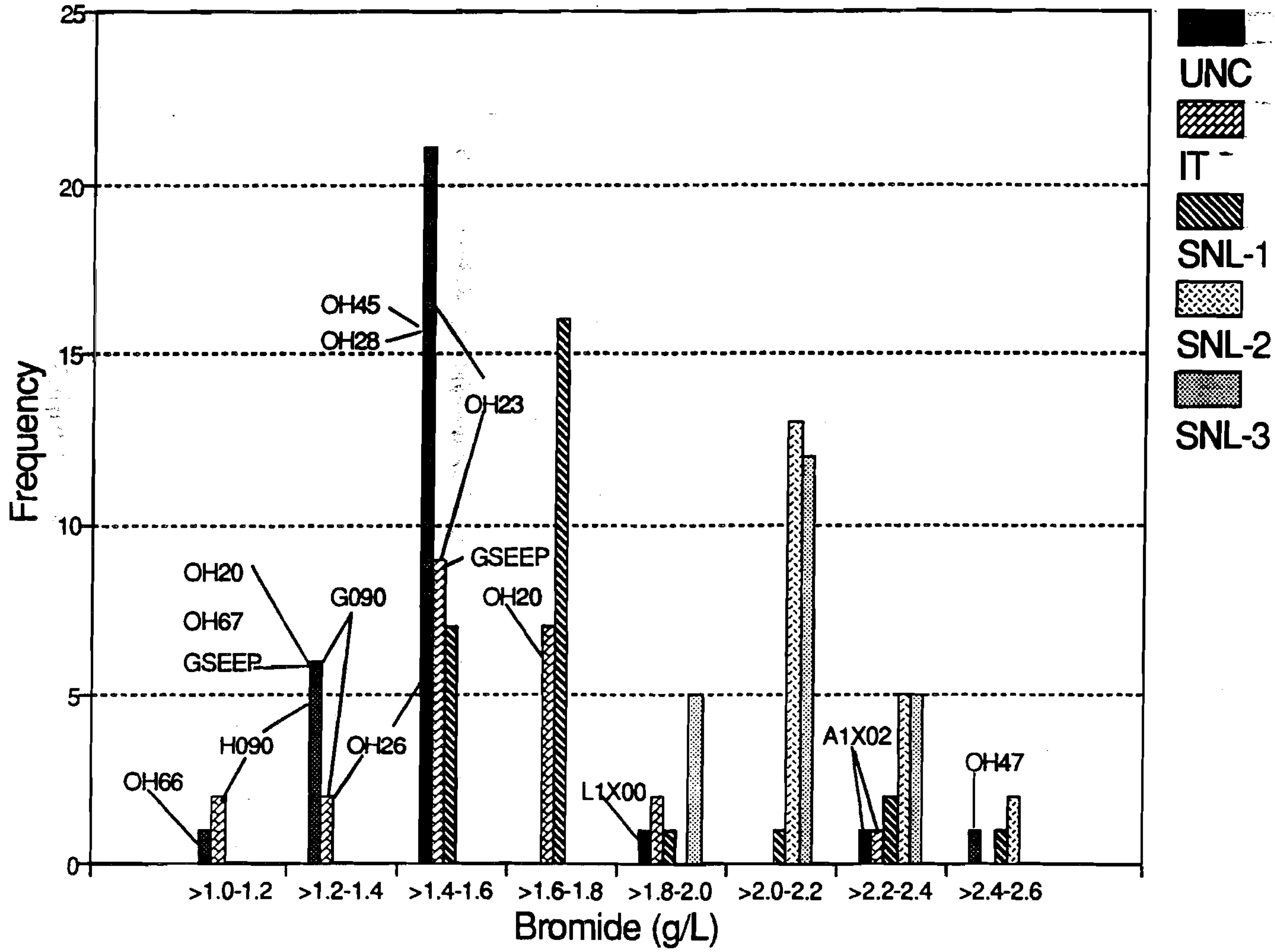


Figure 3-7

Distribution of bromide in Salado Formation brines recovered from underground locations at the WIPP. Drill hole indicators for UNC and IT data are discussed in the text.

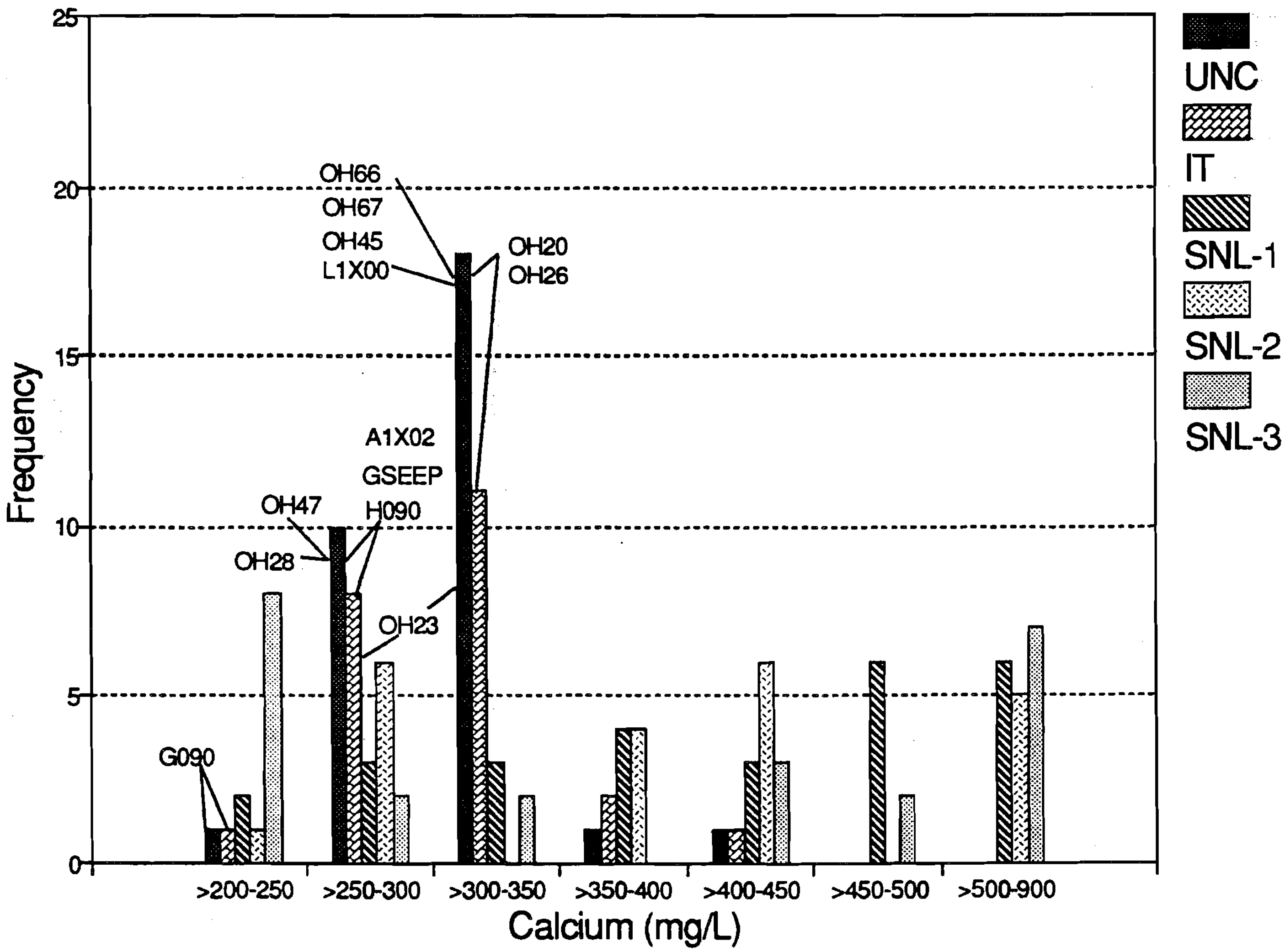


Figure 3-8

Distribution of calcium in Salado Formation brines recovered from underground locations at the WIPP. Note that the highest group along the x-axis represents a greater range of calcium values relative to other groups. Drill hole indicators for UNC and IT data are discussed in the text.

and UNC distributions are skewed toward lower chloride values. SNL/NM analytical results are markedly higher than IT and UNC mean values, with all three weep-array modes lying in the range of greater than 205 to 220 g/L (note the greater range for chloride reported in this cell).

Sodium. Plotted results for sodium (Figure 3-2) show IT and SNL/NM-1 to have nearly normal distributions and modes that lie at greater than 80 to 90 g/L. UNC, SNL/NM-2, and SNL/NM-3 data are skewed toward lower values, with UNC and SNL/NM-2 modes similar to IT and SNL/NM-1. The mode for SNL/NM-3 lies in a lower range of greater than 70 to 80 g/L.

Magnesium. Statistical results for magnesium (Figure 3-3) show UNC data to have a nearly normal distribution if the two outlier points at greater than 34 to 37 g/L are omitted. UNC data have a mode between greater than 19 to 22 g/L, while the mode for IT values falls over a broader range between greater than 19 to 25 g/L. Statistical data for IT is skewed toward lower magnesium values, with the exception of one outlier at greater than 34 to 37 g/L. The SNL/NM arrays tend to show normal distributions but with modes occurring at greater than 22 to 25 g/L (SNL/NM-1 and SNL/NM-2) and greater than 25 to 28 g/L (SNL/NM-3).

Potassium. The frequency distribution diagram for potassium (Figure 3-4) indicates UNC and IT data are skewed to lower values, with a UNC outlier at greater than 22 to 27 g/L. SNL/NM-1 and SNL/NM-3 are skewed toward higher values and SNL/NM-2 toward lower values. SNL/NM-1 and SNL/NM-2 have a higher mode value than SNL/NM-3, UNC, and IT. UNC, IT, and SNL/NM-3 have mode values in the greater than 16 to 18 g/L range, while SNL/NM-1 and SNL/NM-2 have modes occurring at greater than 18 to 20 g/L.

Sulfate. All analytical laboratories have most of their sulfate values bracketed between greater than 16 to 18 g/L (Figure 3-5), with distributions slightly skewed to higher sulfate values.

Boron. The frequency distribution for boron (Figure 3-6) is nearly normal for all analytical laboratories and appears normal when all laboratories are considered simultaneously. UNC results indicate that the mode lies at greater than 1.4 to 1.6 g/L, while IT results show a mode in the range of greater than 1.2 to 1.4 g/L. Analyses from SNL/NM weep arrays show the mode to lie at higher values of greater than 1.6 to 1.8 g/L, relative to UNC and IT values.

Bromide. Statistical and analytical results for bromide (Figure 3-7) indicate that the mode for UNC and IT data falls at greater than 1.4 to 1.6 g/L. Results for IT suggest a near normal distribution, while UNC results are skewed toward higher values. SNL/NM-1 has a mode that lies in the range of greater than 1.6 to 1.8 g/L, and SNL/NM-2 and SNL/NM-3 have mode values falling in the range of greater than 2.0 to 2.2 g/L. SNL/NM-1 and SNL/NM-2 are skewed toward higher values, while SNL/NM-3 shows a normal distribution.

Calcium. UNC and IT statistical results for calcium show a nearly normal distribution, with their modes lying in the greater than 300 to 350 mg/L range (Figure 3-8). The data for SNL/NM-2 and SNL/NM-3 plot as bimodal distributions; less than 300 mg/L and greater than 350 mg/L for SNL/NM-2 and less than 350 mg/L and greater than 400 mg/L for SNL/NM-3. SNL/NM-1 data is distributed across all divisions rather evenly. About half of all SNL/NM values lie at greater than 500 to 900 mg/L (note the greater range for calcium reported in this cell).

Discussion. The frequency distributions in Figures 3-1 through 3-8 suggest chloride, magnesium, potassium, boron, bromide, and calcium values in SNL/NM weep arrays tend toward higher concentrations, relative to UNC and IT data obtained on brine samples from drill holes. This difference may be attributed to not knowing the true density of the weep brines, thus yielding values in g/L that are too high if the assumed density of 1.22 kg/L is too great. Alternatively, with the exception of calcium, the increase in these parameters is expected when brine is evaporated prior to collection and analysis. Calcium is not expected to increase during evaporation because the brines are saturated with anhydrite and evaporation will result in precipitation of anhydrite, with concomitant lowering of the calcium concentration. This is demonstrated by the increase in these parameters, except calcium, for uphole samples collected and analyzed as part of the UNC and IT data (note values for A1X02 and OH47 in Figures 3-1 through 3-8).

Likewise, many of the skewed trends toward higher or lower values can result from evaporation or dilution of the brine prior to collection and analysis. Evaporation is most likely to produce a skewed trend toward higher values for bromide, chloride, sulfate, boron, magnesium, and potassium, and a skewness toward lower values for calcium and sodium due to precipitation of anhydrite and halite. Dilution of the brine by construction waters spread on the drift floors for roadway consolidation can produce a skewness toward lower values for all parameters, except chloride and sodium. Chloride and sodium are not expected to be diluted because the spread water is undersaturated with halite, and it will readily dissolve the halite along the roadbed surface. SNL/NM weep arrays are not affected by construction waters, but the large dilution factors involved in the recovery of brine absorbed on filter paper and polyethylene sponges placed in the weep arrays could produce skewed patterns toward lower or higher concentration values.

3.1.2 Physical and Additional Chemical Parameters of BSEP Brines

BSEP brines have been characterized by UNC and IT for specific gravity, total dissolved solids (TDS), pH, extended alkalinity, total inorganic carbon (TIC), ammonium, fluoride, iodide, nitrate, manganese, silicon, and strontium, and solely by UNC for total organic carbon (TOC), phosphorus, aluminum, arsenic, barium, cesium, iron, and rubidium. The latter parameters were analyzed exclusively by UNC because IT could not reach the required detection sensitivity (due to large dilution factors) to report meaningful results.

3.1.2.1 UNC and IT Parameters

Specific Gravity—Mean values for specific gravity (Figure 3-9) indicate a nearly normal distribution for IT results and a slight skewness toward higher values for UNC data. Both analytical groups have mode values at greater than 1.21 to 1.22.

Total Dissolved Solids—The frequency distribution for TDS (Figure 3-10) shows UNC values to have a near normal distribution and IT data to have a skewness toward higher values. Mode values are markedly different (see Section 3.1.2.3) for the two groups; UNC at greater than 370 to 380 g/L and IT at greater than 350 to 360 g/L.

pH—Results for pH (Figure 3-11) reveal a bimodal distribution, with values less than 5.7 and greater than 5.9. UNC and IT data show similar mode values at greater than 6.0 to 6.1, and a slight skewness toward higher values for data greater than 5.9.

Extended Alkalinity—Extended alkalinity was measured to an endpoint pH of 2.5, and is reported as equivalent bicarbonate (HCO_3^-). The results (Figure 3-12) are normally distributed for IT and skewed toward higher values for UNC. The mode for both groups occurs at greater than 800 to 900 mg HCO_3^-/L.

Total Inorganic Carbon—UNC and IT results for TIC (Figure 3-13) are reported as equivalent bicarbonate, and they show a skewness toward higher values. The mode for UNC lies at greater than 4 to 6 mg HCO_3^-/L, and for IT it is less than 4 mg HCO_3^-/L.

Ammonium—The frequency distribution for ammonium (Figure 3-14) indicates that UNC and IT data have a near normal distribution, with both modes occurring at greater than 140 to 160 mg/L.

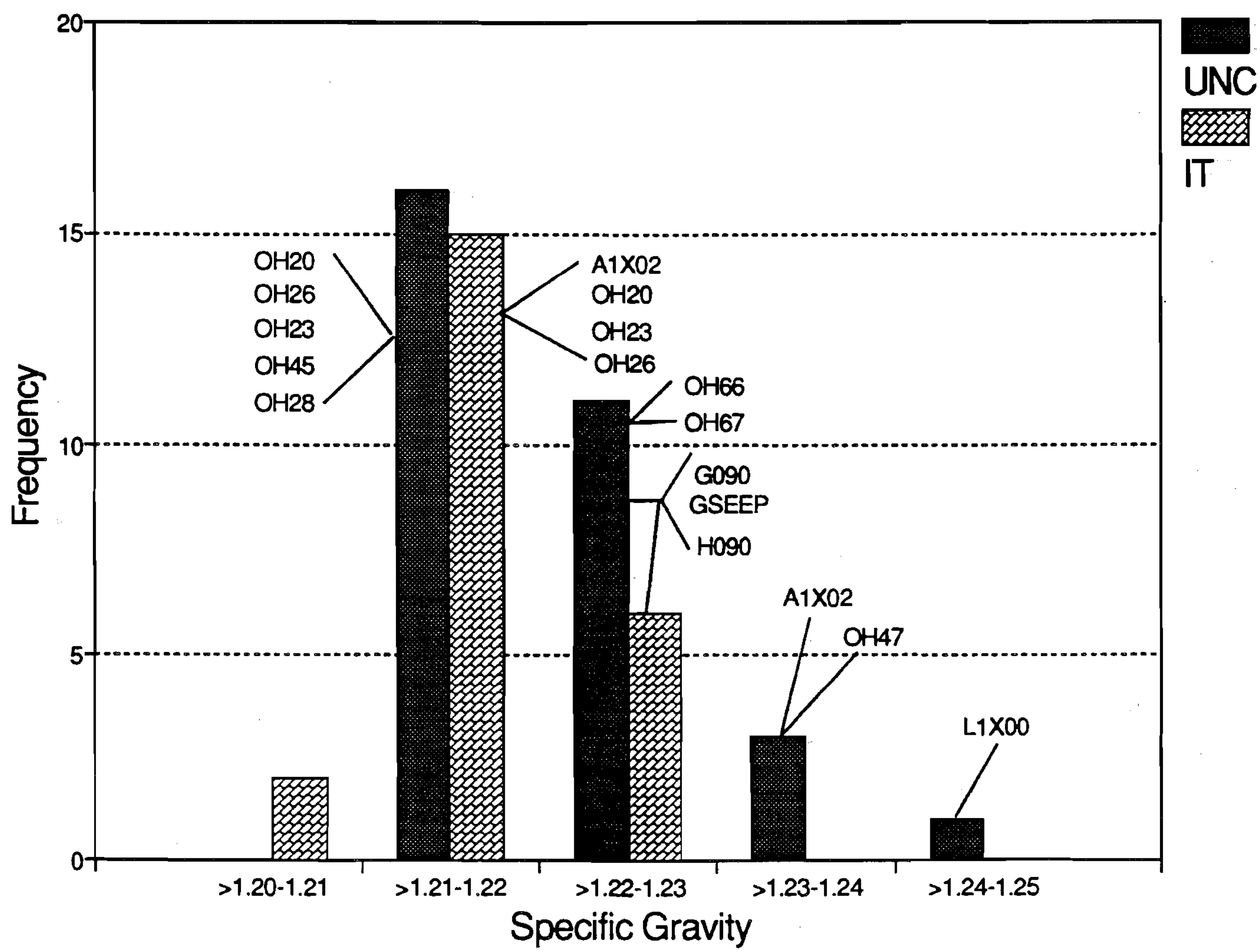


Figure 3-9

Distribution of specific gravity in Salado Formation brines recovered from underground locations at the WIPP. Drill hole indicators are discussed in the text.

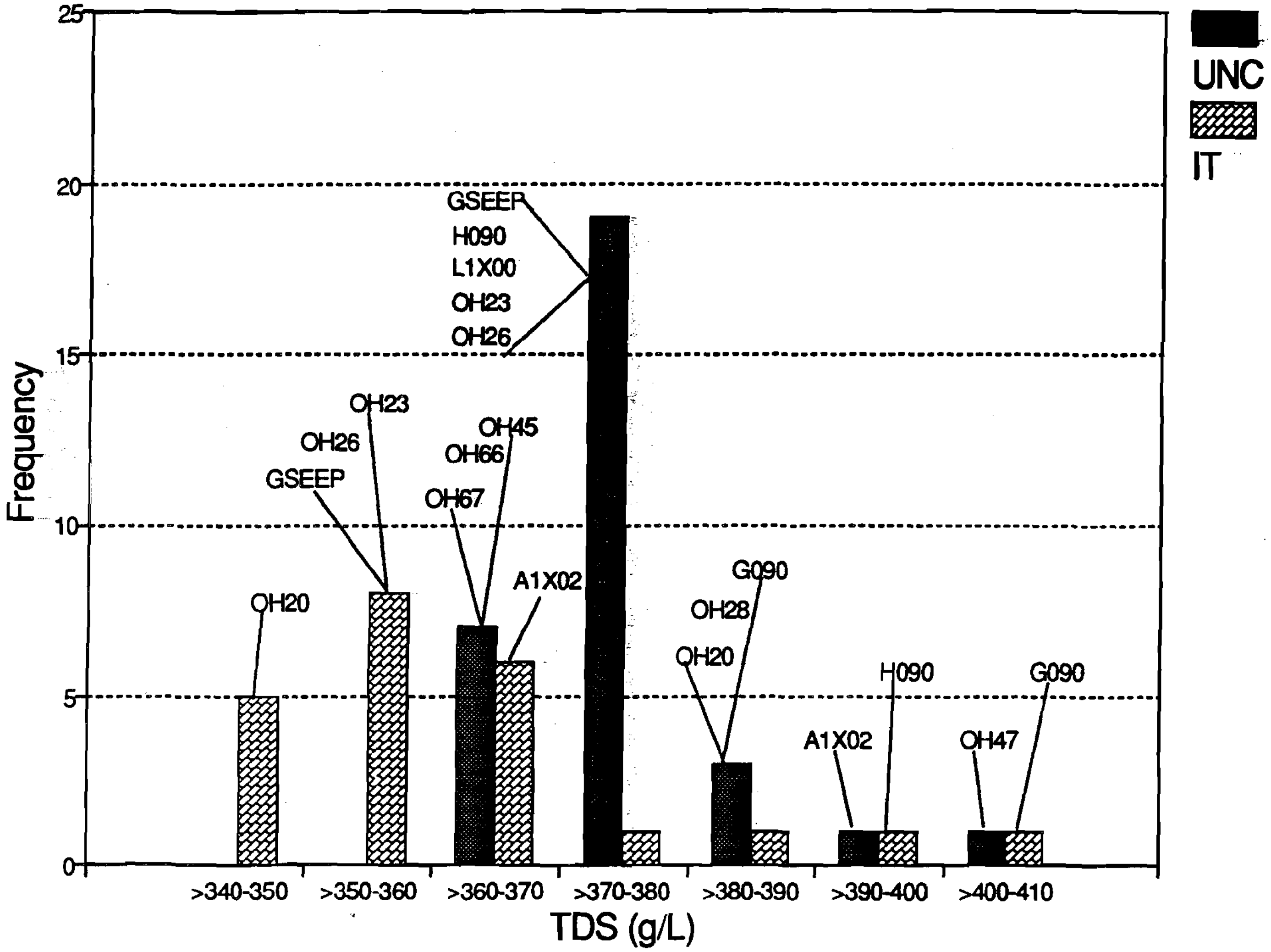


Figure 3-10

Distribution of total dissolved solids in Salado Formation brines recovered from underground locations at the WIPP. Drill hole indicators are discussed in the text.

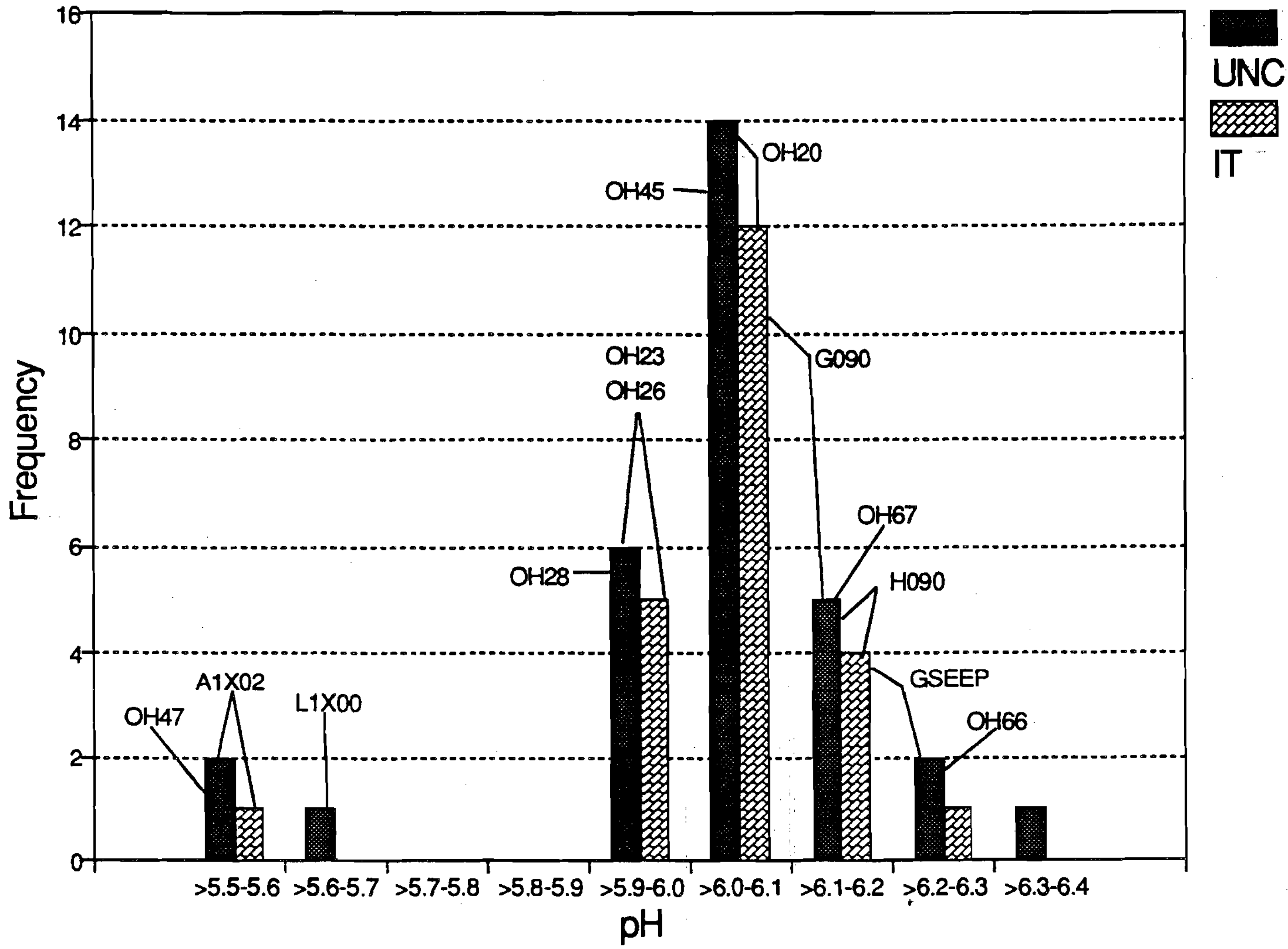


Figure 3-11

Distribution of pH in Salado Formation brines recovered from underground locations at the WIPP. Drill hole indicators are discussed in the text.

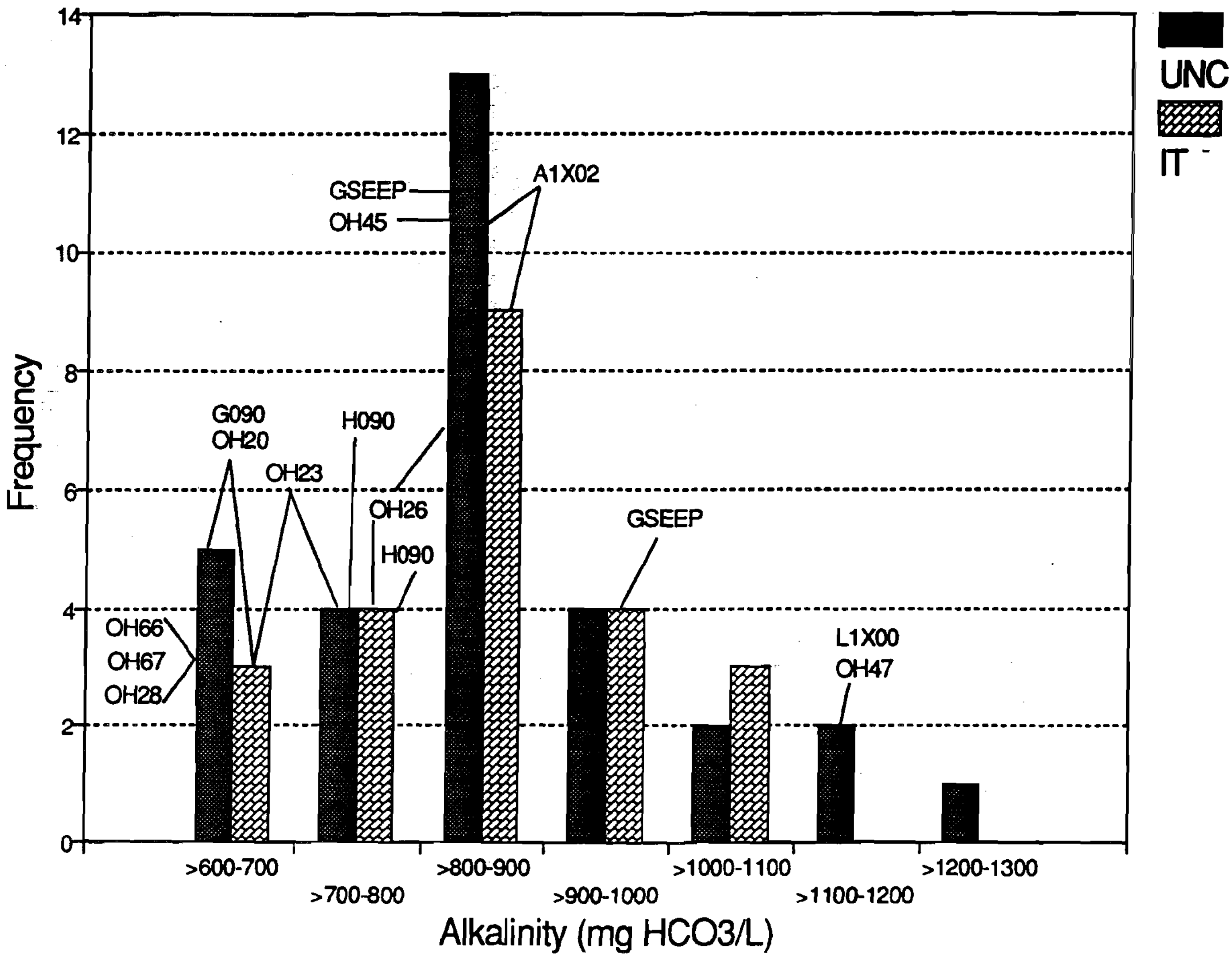


Figure 3-12

Distribution of alkalinity in Salado Formation brines recovered from underground locations at the WIPP. Drill hole indicators are discussed in the text.

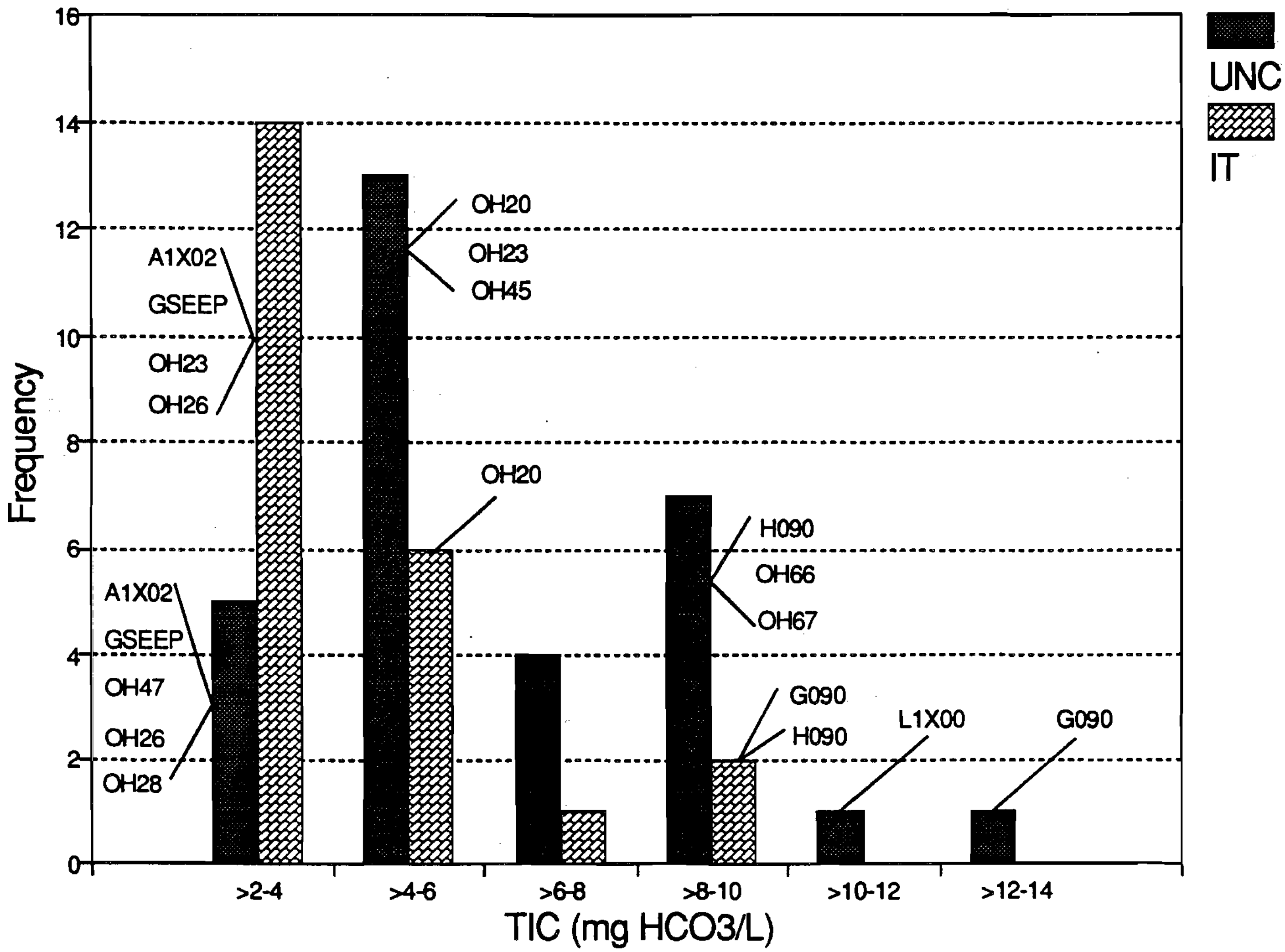


Figure 3-13

Distribution of total inorganic carbon in Salado Formation brines recovered from underground locations at the WIPP. Drill hole indicators are discussed in the text.

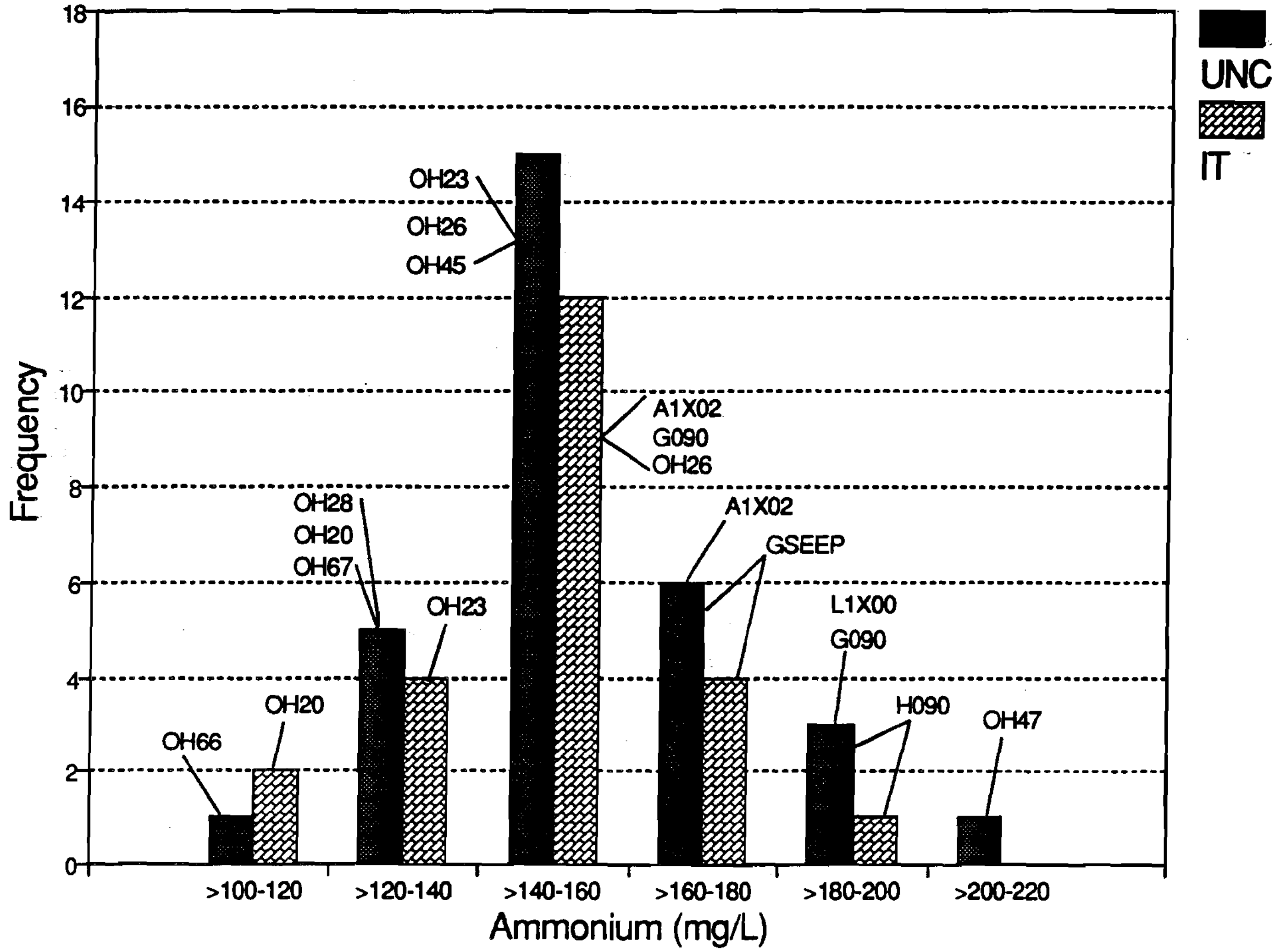


Figure 3-14

Distribution of ammonium in Salado Formation brines recovered from underground locations at the WIPP. Drill hole indicators are discussed in the text.

Fluoride—Fluoride results (Figure 3-15) reveal UNC data as skewed toward higher values and IT data as weakly bimodal. UNC has its mode occurring at greater than 3 to 4 mg/L, and IT has two modes at greater than 4 to 5 mg/L and greater than 6 to 7 mg/L.

Iodide—Plotted results for iodide (Figure 3-16) show the UNC and IT distributions as nearly normal, with both modes occurring at greater than 15 to 17 mg/L.

Nitrate—Mean values for nitrate (Figure 3-17) indicate UNC and IT data to be skewed toward higher values. The mode for IT occurs at less than 0.5 mg/L and at greater than 0.5 to 1.0 mg/L for UNC. This distribution is due to reported analytical results at the lower limit of detection, which is dependent on sample dilution and varies from 0.1 to 0.5 mg/L for IT and 0.5 to 1.0 mg/L for UNC.

Manganese—The frequency distribution for manganese (Figure 3-18) reveals a slight skewness toward higher values for both analytical groups, with UNC and IT modes lying in the greater than 1 to 2 mg/L range.

Silicon—Silicon distribution (Figure 3-19) is nearly normal for UNC and skewed to lower values for IT, but the modes are markedly different due to differences in the analytical techniques (Deal and others, 1989). UNC has a mode at greater than 1.5 to 2.0 mg/L and IT at greater than 0.5 to 1.0 mg/L.

Strontium—The frequency distribution for strontium (Figure 3-20) shows UNC and IT data to be skewed toward higher concentrations. The mode for UNC falls at greater than 1 to 2 mg/L and for IT at greater than 2 to 3 mg/L.

3.1.2.2 UNC Parameters

The frequency distributions for phosphorus, (Figure 3-21), aluminum (Figure 3-22), arsenic (Figure 3-23), barium (Figure 3-24), iron (Figure 3-25), and TOC (Figure 3-26) are skewed toward higher concentrations, with modes corresponding to less than (all values) 0.1, 0.2, 0.005, 0.04, 1, and 5 mg/L, respectively.

Cesium and rubidium results (Figures 3-27 and 3-28) show nearly normal distributions, with some skewness towards higher concentrations for rubidium. The cesium mode occurs at greater than 0.25 to 0.30 mg/L and the rubidium mode at greater than 15 to 16 mg/L.

3.1.2.3 Discussion

Skewed distributions in the UNC and IT data are most likely to arise from reporting detection limit values on the histograms and evaporation or dilution of brine prior to collection and analysis. Detection limit values are plotted in the lowest value cell, which will tend to skew results towards higher values (e.g., nitrate in Figure 3-17). Brine recovered from downholes may be diluted by water spread on the roadbed to consolidate the surface. A component of

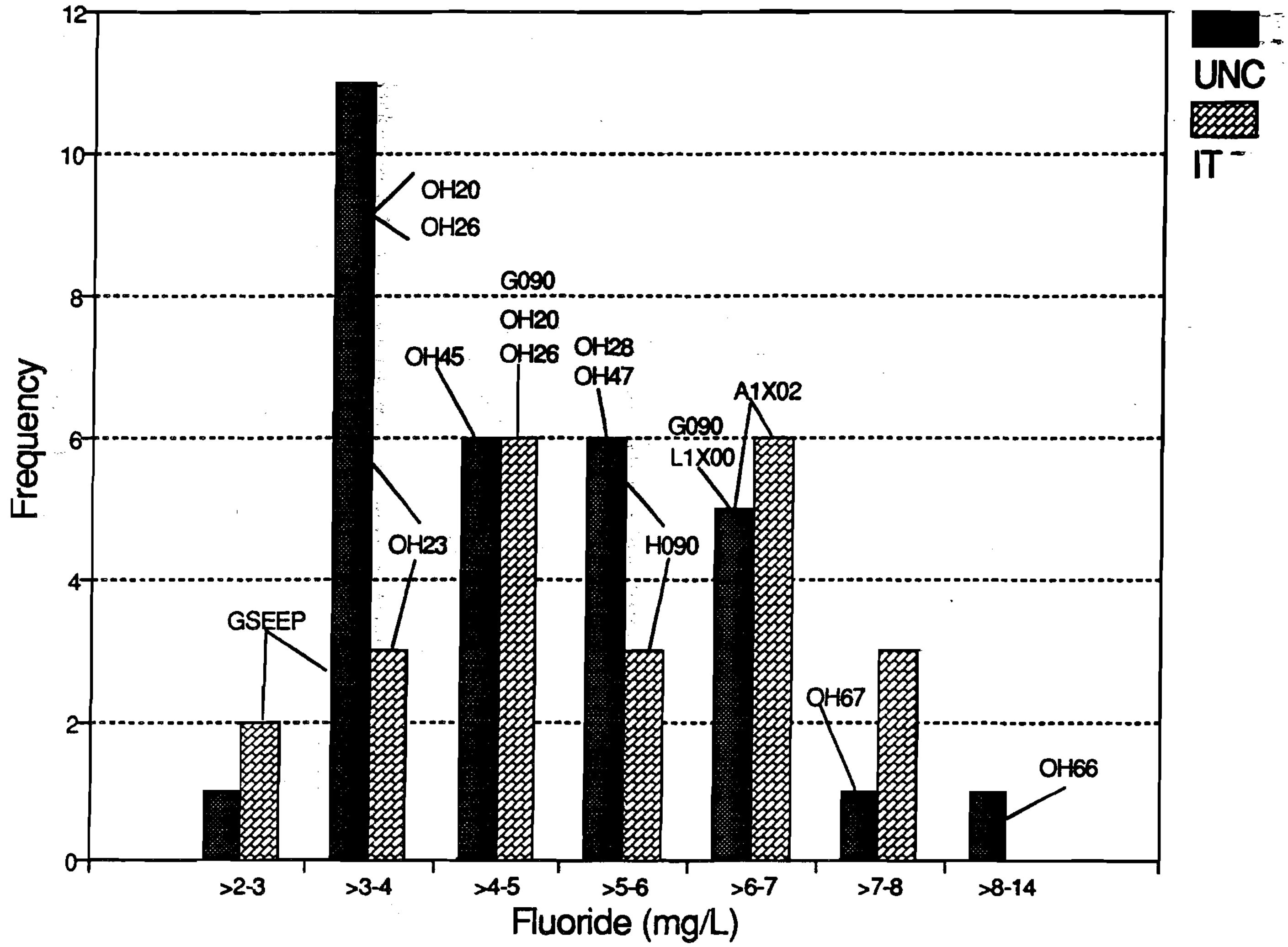


Figure 3-15

Distribution of fluoride in Salado Formation brines recovered from underground locations at the WIPP. Drill hole indicators are discussed in the text.

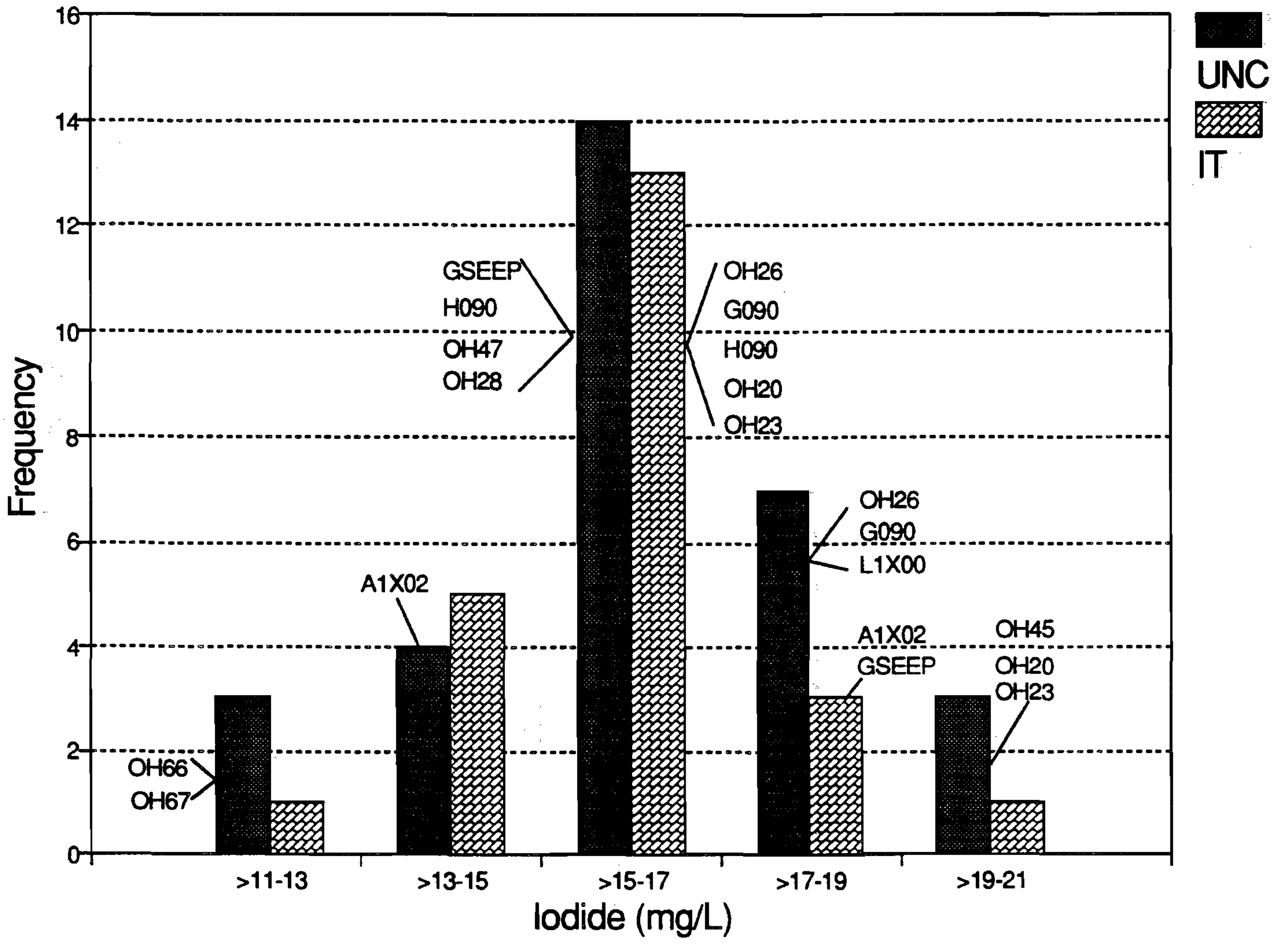


Figure 3-16

Distribution of iodide in Salado Formation brines recovered from underground locations at the WIPP. Drill hole indicators are discussed in the text.

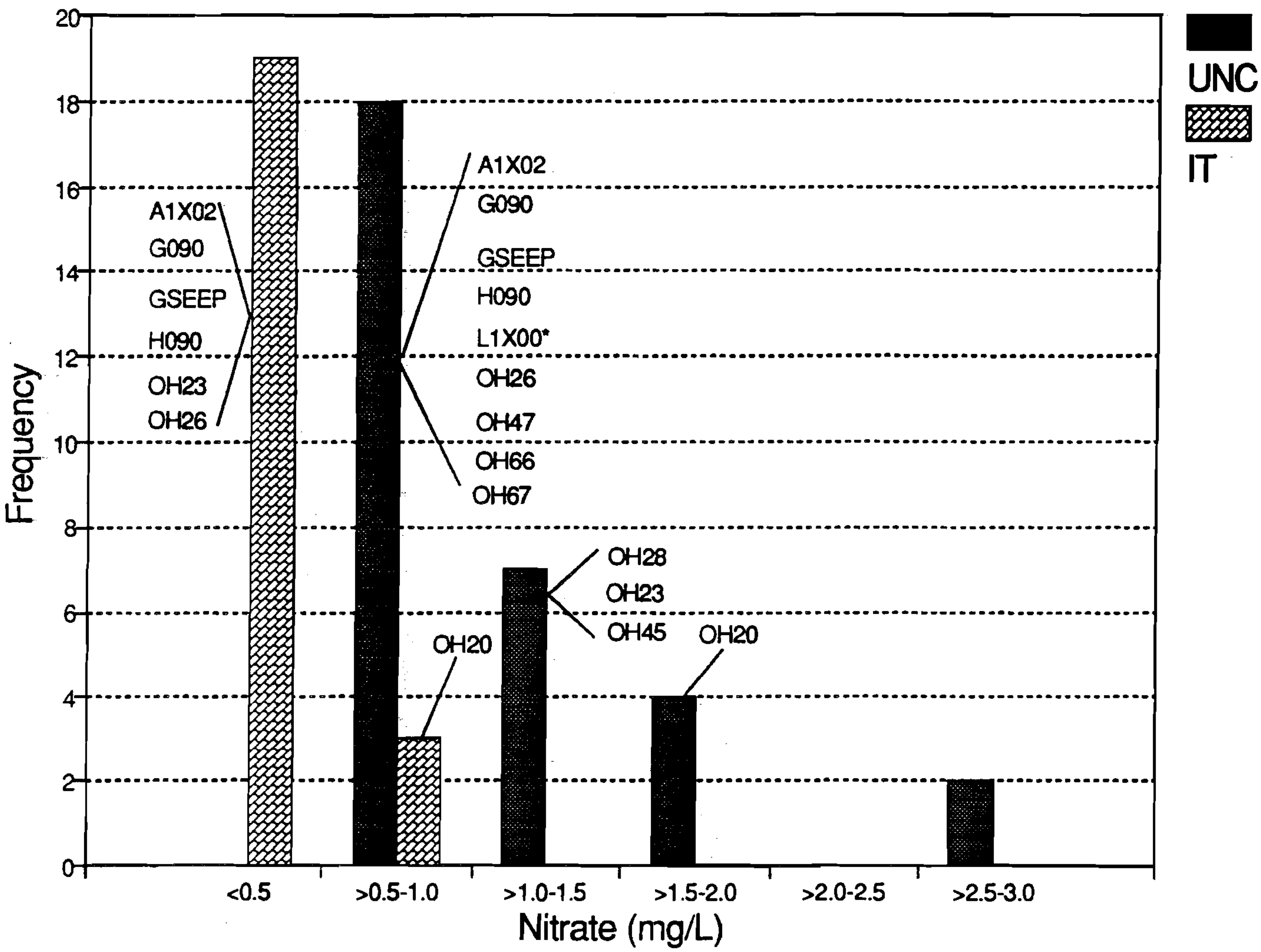


Figure 3-17

Distribution of nitrate in Salado Formation brines recovered from underground locations at the WIPP. Asterisk following drill hole identification indicates a detection limit value. Drill hole indicators are discussed in the text.

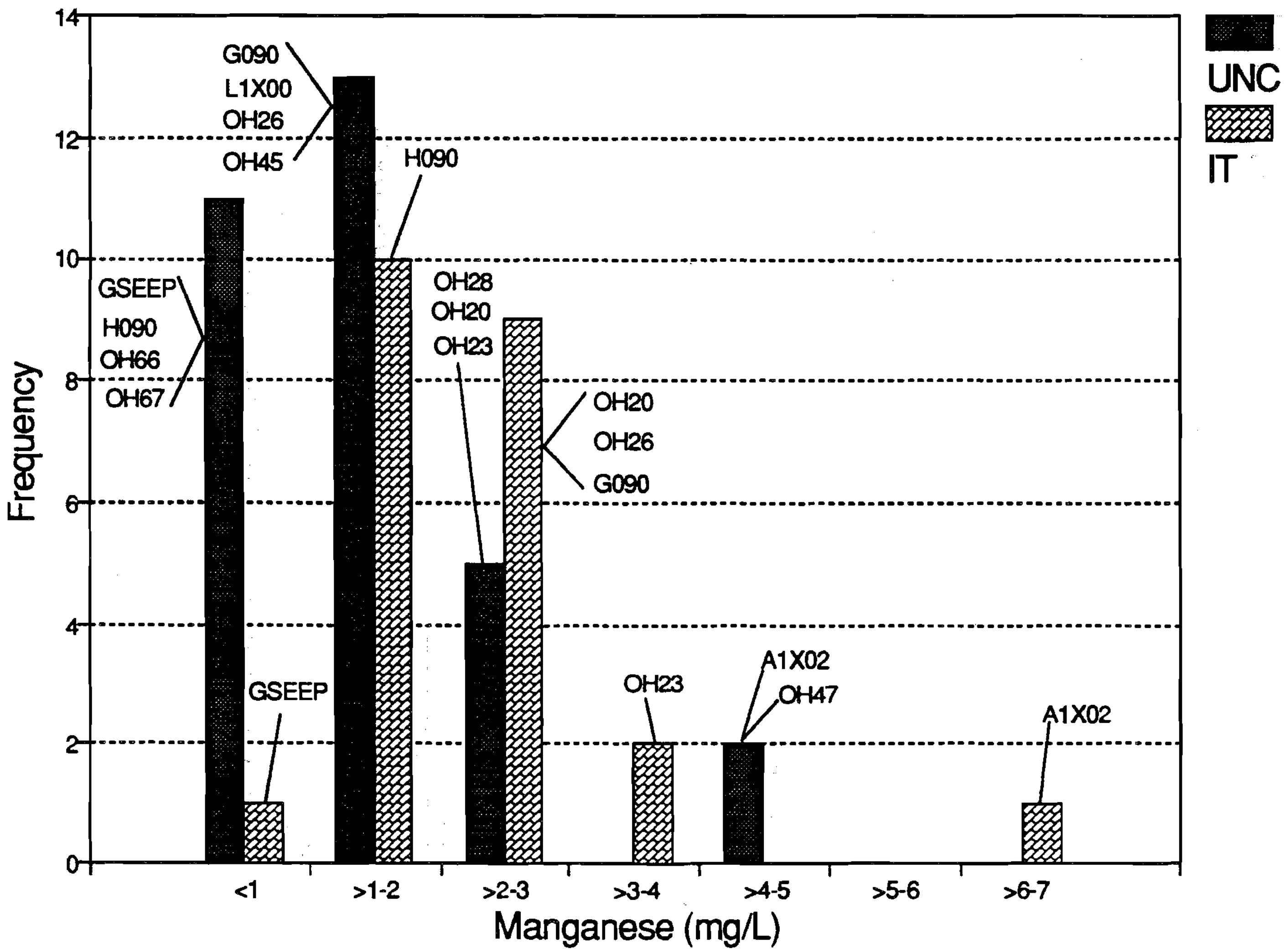


Figure 3-18

Distribution of manganese in Salado Formation brines recovered from underground locations at the WIPP. Drill hole indicators are discussed in the text.

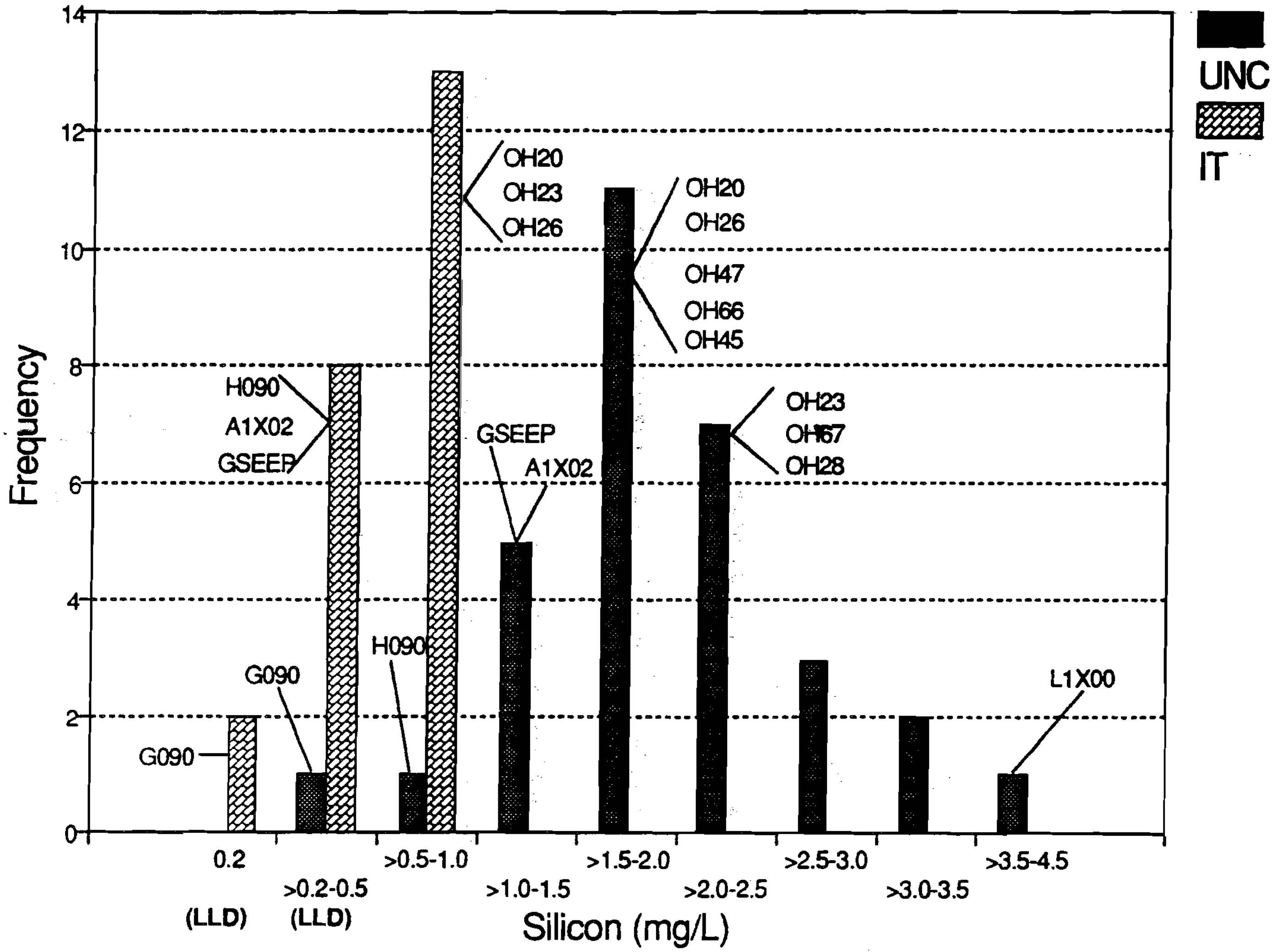


Figure 3-19

Distribution of silicon in Salado Formation brines recovered from underground locations at the WIPP. LLD noted for IT (0.2) and UNC (0.5) data. Note that the highest group along the x-axis represents a greater range of silicon values relative to other groups. Drill hole indicators are discussed in the text.

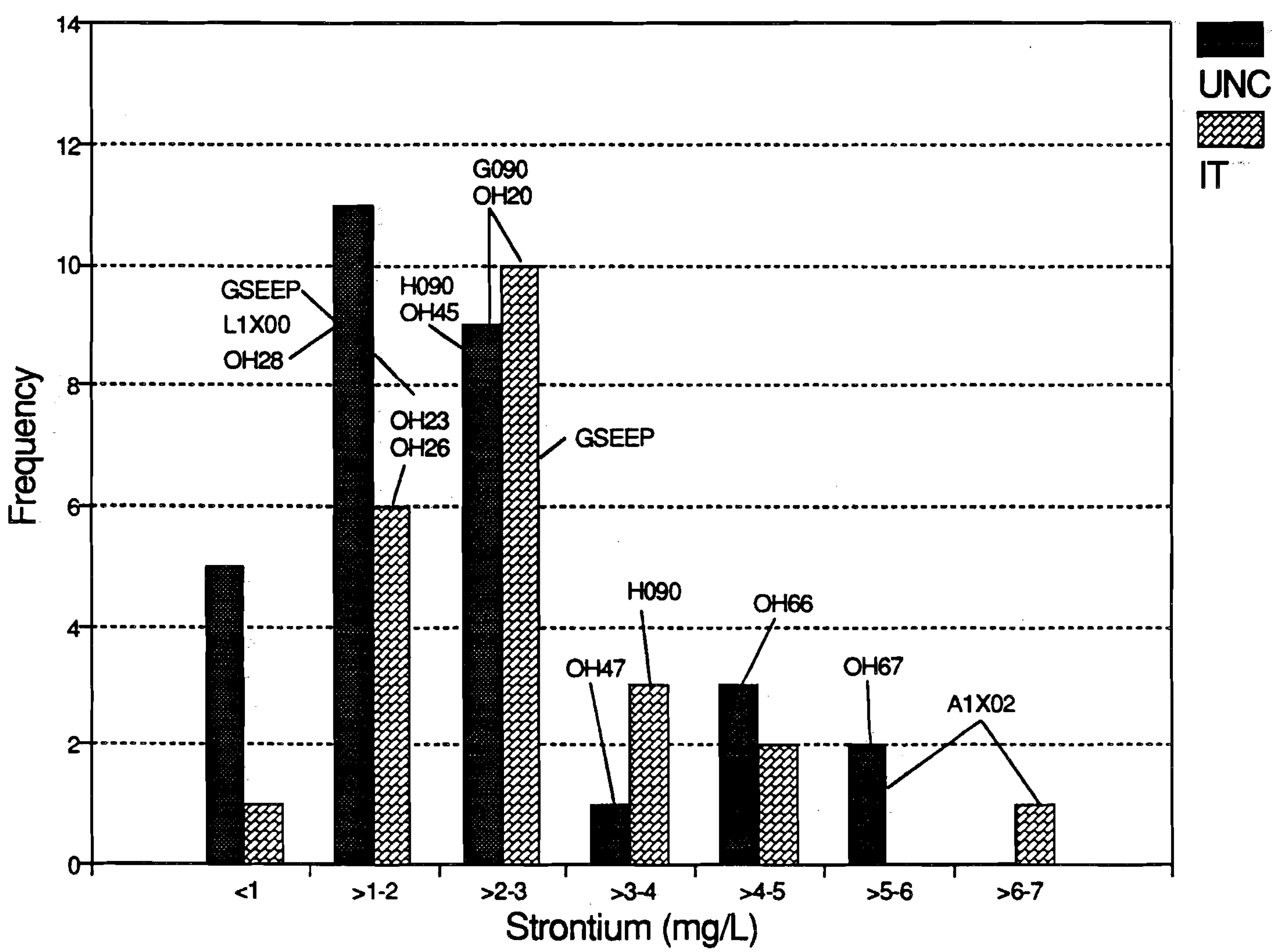


Figure 3-20

Distribution of strontium in Salado Formation brines recovered from underground locations at the WIPP. Drill hole indicators are discussed in the text.

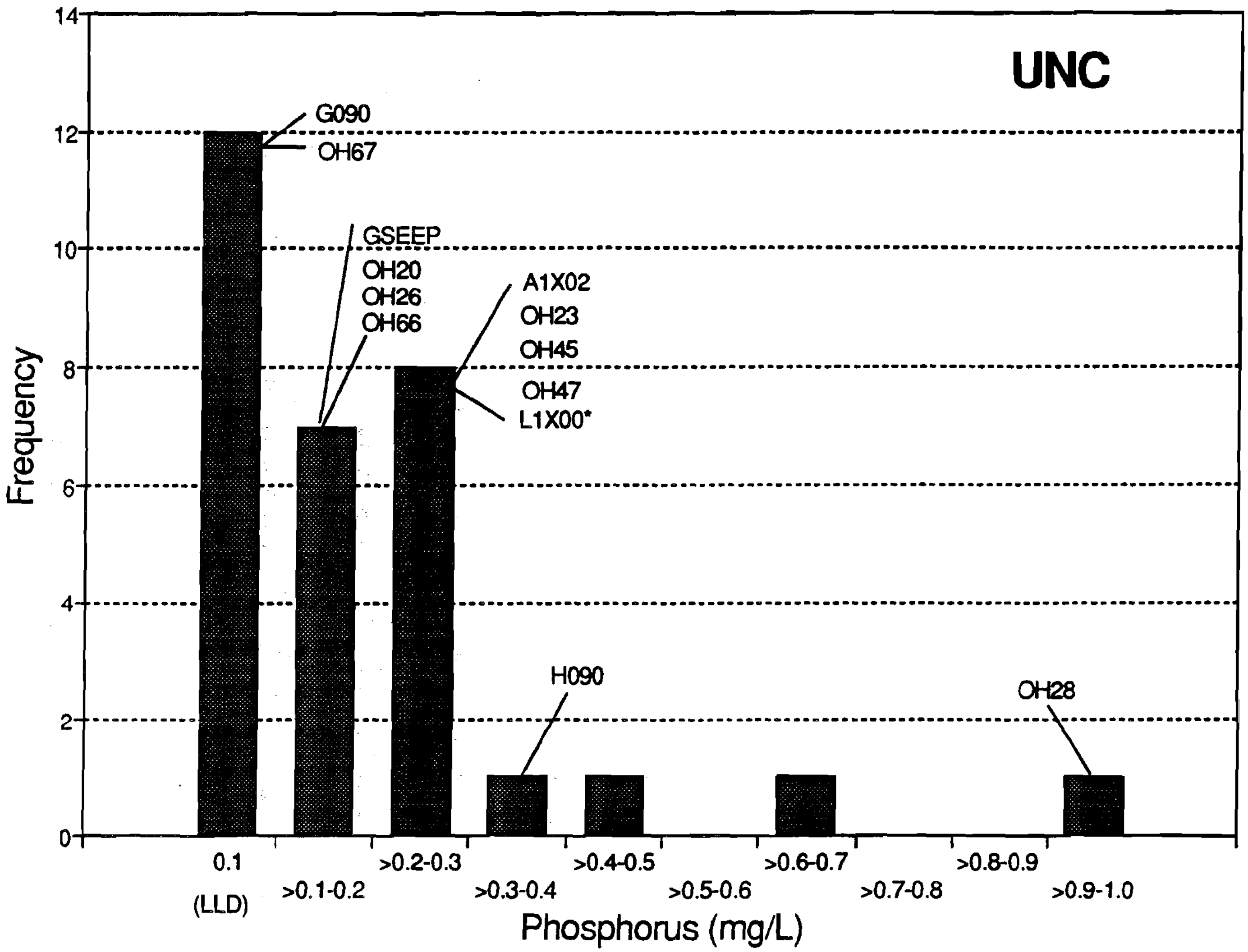


Figure 3-21

Distribution of phosphorous in Salado Formation brines recovered from underground locations at the WIPP. Note most observations lie at the LLD. Asterisk following drill hole identification indicates a higher detection limit value. Drill hole indicators are discussed in the text.

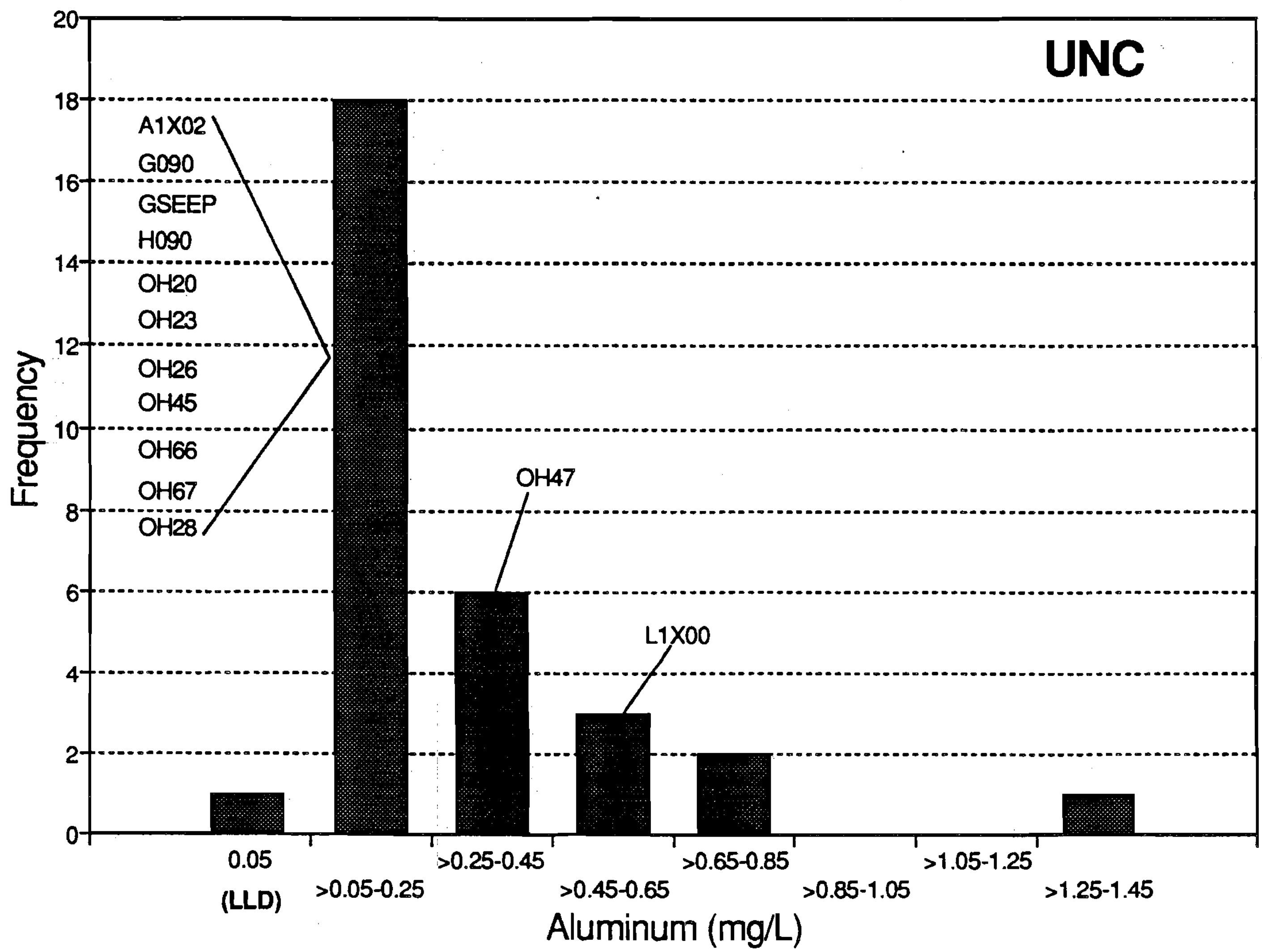


Figure 3-22

Distribution of aluminum in Salado Formation brines recovered from underground locations at the WIPP. Note LLD. Drill hole indicators are discussed in the text.

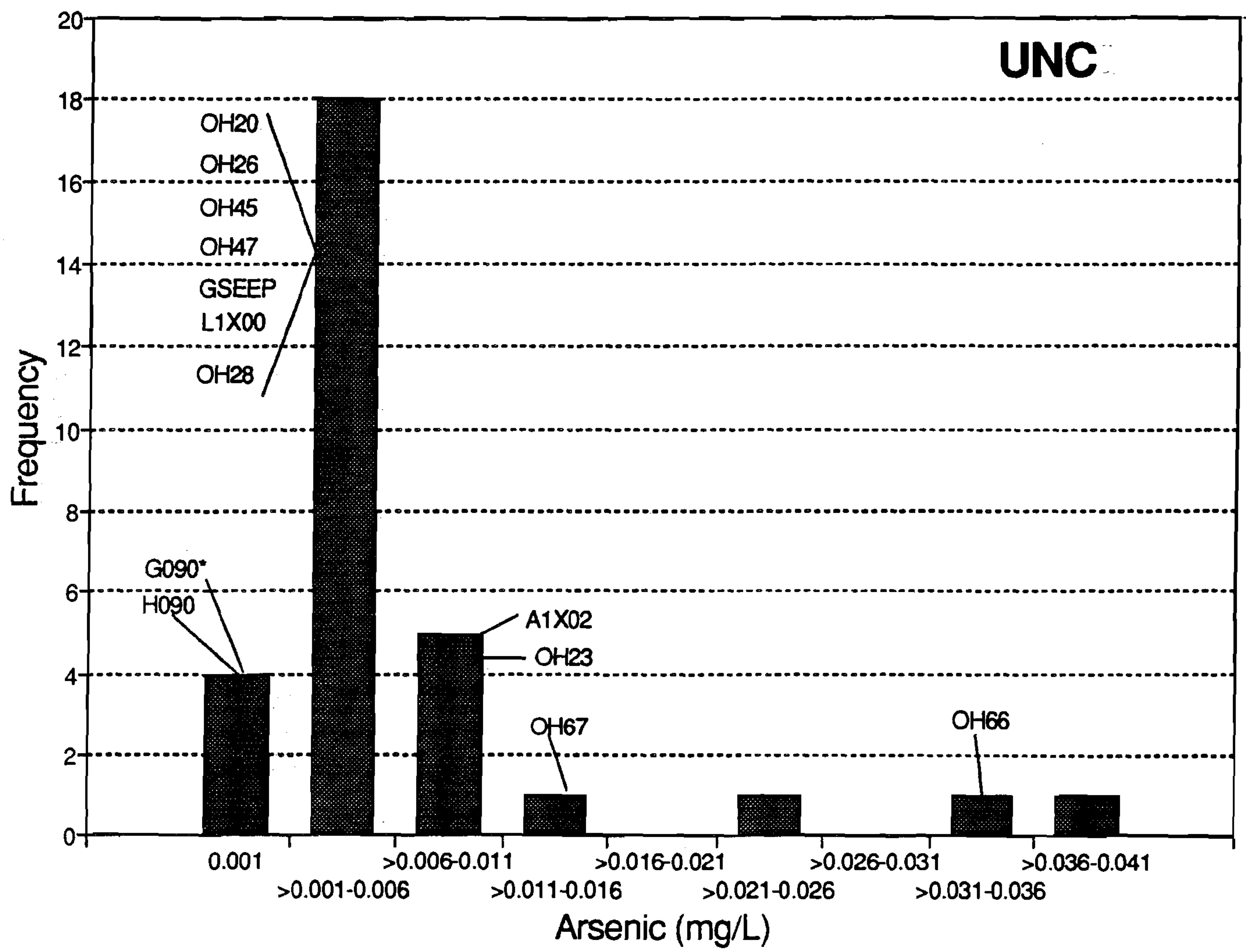


Figure 3-23

Distribution of arsenic in Salado Formation brines recovered from underground locations at the WIPP. Asterisk following drill hole identification indicates a detection limit value. Drill hole indicators are discussed in the text.

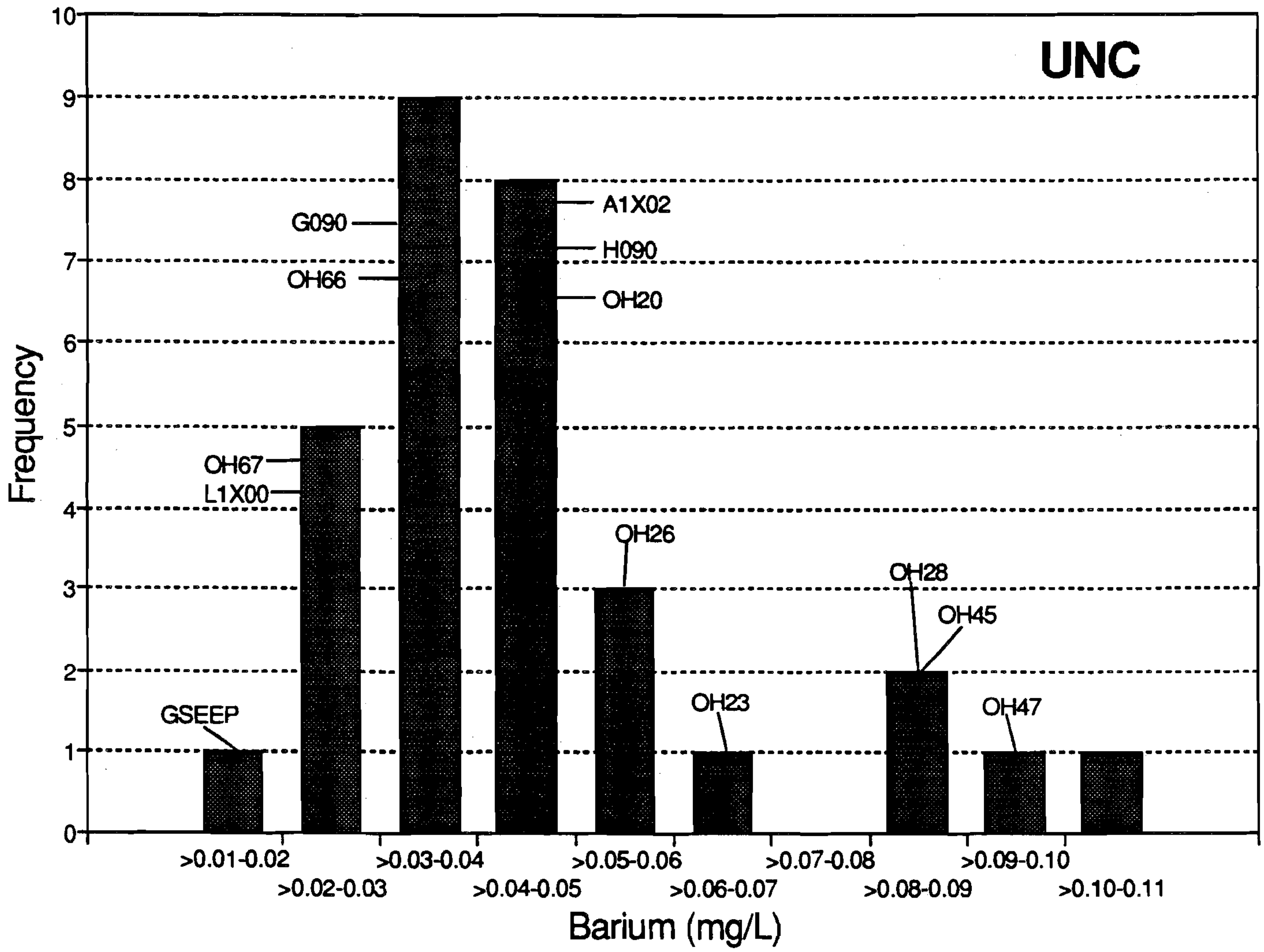


Figure 3-24

Distribution of barium in Salado Formation brines recovered from underground locations at the WIPP. Drill hole indicators are discussed in the text.

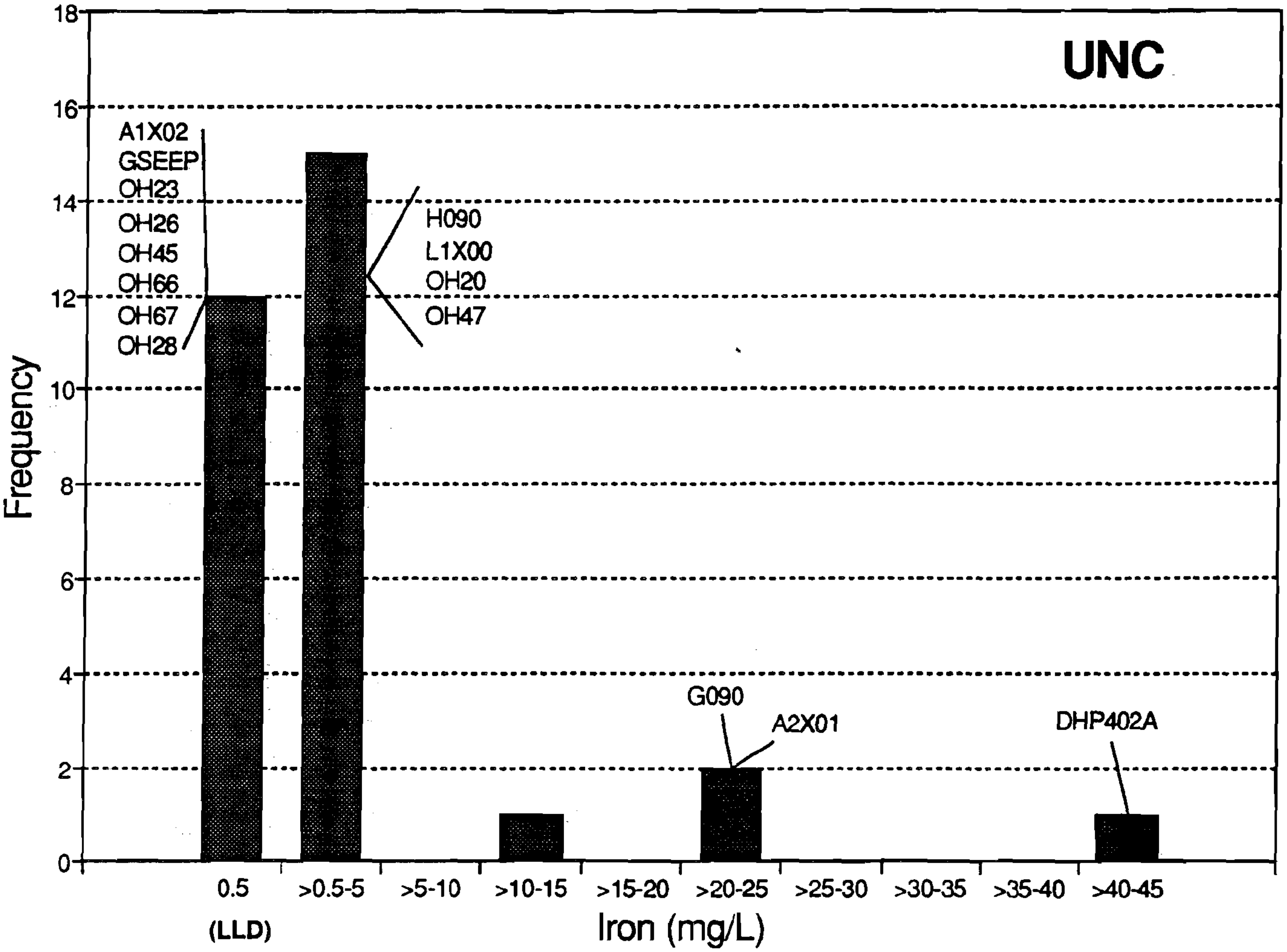


Figure 3-25

Distribution of iron in Salado Formation brines recovered from underground locations at the WIPP. Note LLD. Hole DHP402A has a steel rod wedged in the bottom, G090 contains steel instrumentation, and A2X01 has a pair of scissors in the bottom. Other drill hole indicators are discussed in the text.

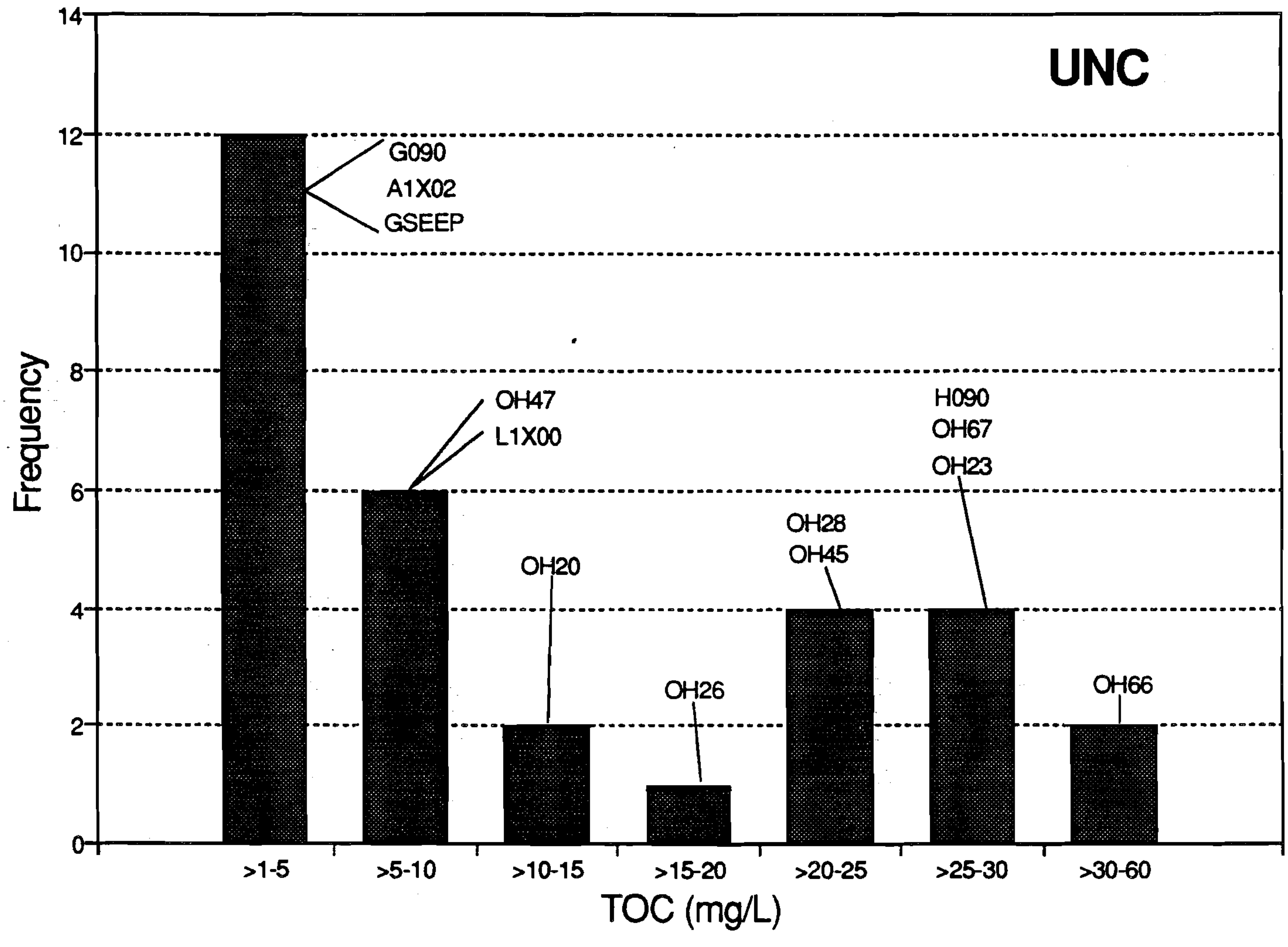


Figure 3-26

Distribution of TOC in Salado Formation brines recovered from underground locations at the WIPP. Note that the highest group along the x-axis represents a greater range of TOC values relative to other groups. Drill hole indicators are discussed in the text.

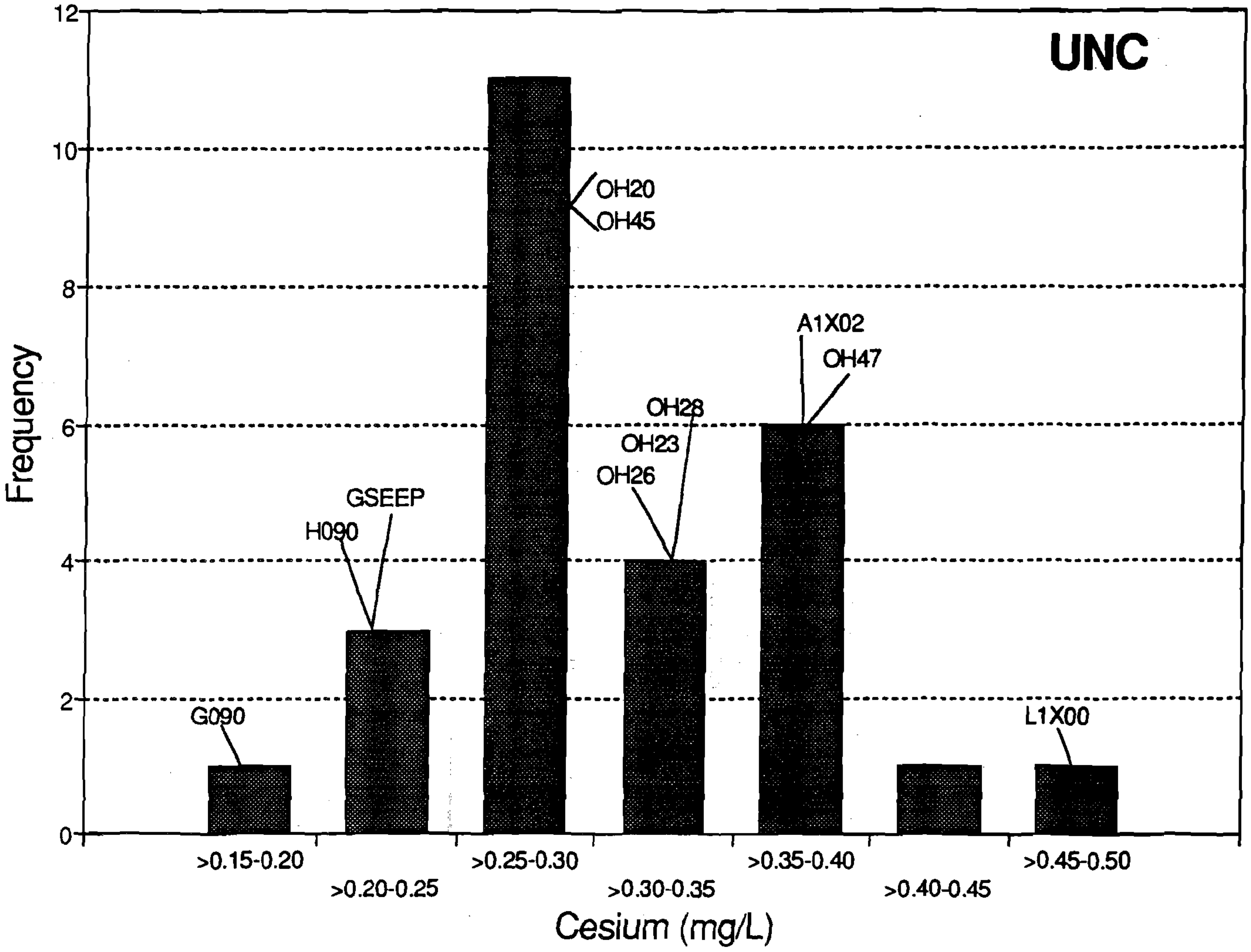


Figure 3-27

Distribution of cesium in Salado Formation brines recovered from underground locations at the WIPP. Drill hole indicators are discussed in the text.

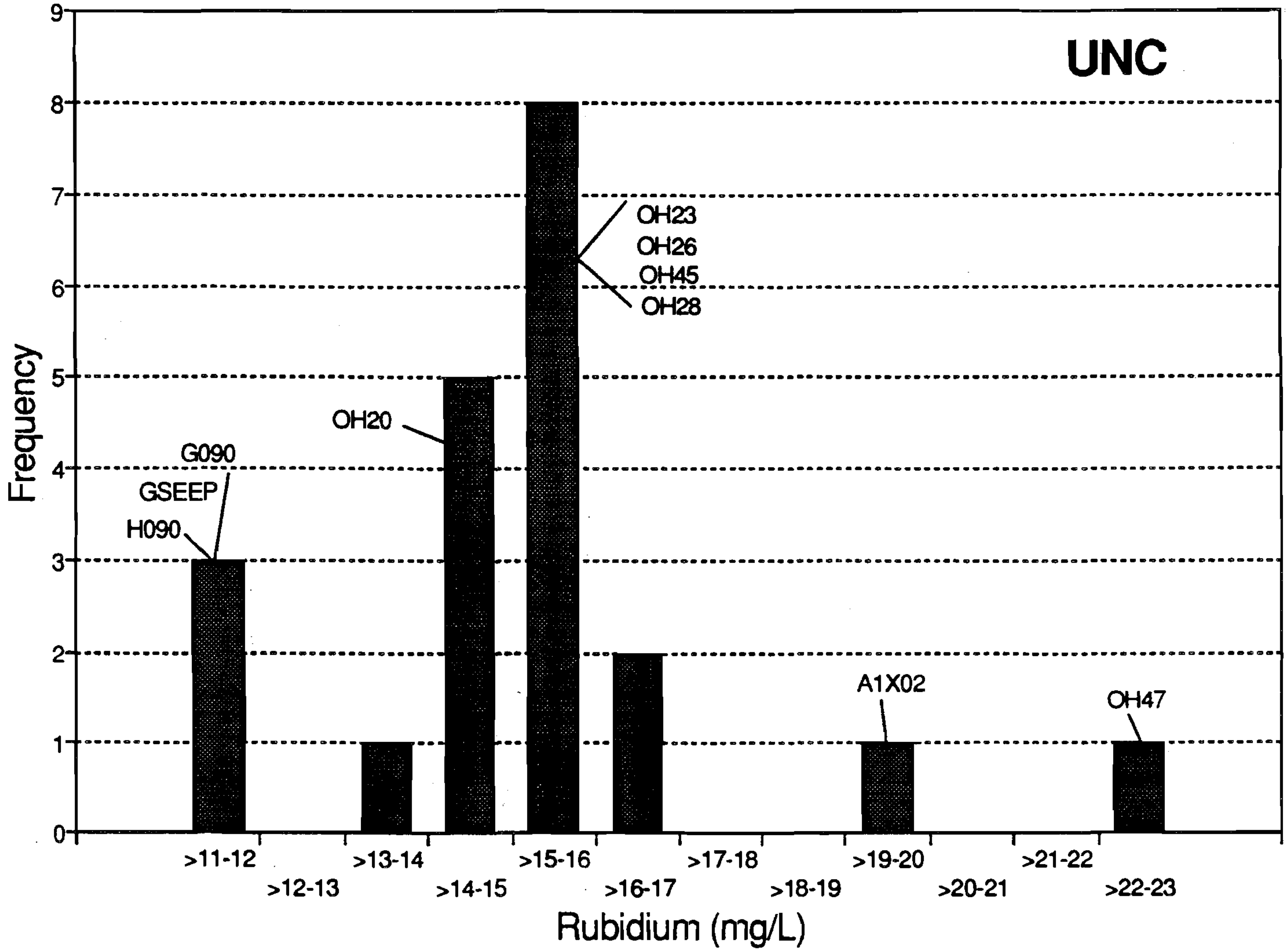


Figure 3-28

Distribution of rubidium in Salado Formation brines recovered from underground locations at the WIPP. Drill hole indicators are discussed in the text.

the spread water is derived from the overlying Culebra Dolomite, and this component skews results for suspect downholes to higher values for TIC (Figure 3-13). For some of the suspect downholes, pH and strontium distributions (Figures 3-11 and 3-20) may also be affected. Evaporation of brine will skew most distributions toward higher values and pH toward lower values. The bimodal distribution for pH (Figure 3-11) arises from upholes plotting at lower pH values due to evaporation and concentration of the hydrogen ion in uphole samples.

In some instances, marked differences in the modes between UNC and IT data can be linked to different laboratory procedures. As noted in Deal and others (1989), the difference in TDS results (Figure 3-10) is due to the temperature of determination for TDS; 105 degrees Celsius (°C) for UNC and 180°C for IT. The higher temperature used in the IT procedure results in the decomposition of hydrated salts (e.g., $MgCl_2 \cdot 6H_2O$), yielding a lower TDS measurement. Fluoride, nitrate, silicon, and strontium modes (Figures 3-15, 3-17, 3-19, and 3-20) may be different because each laboratory uses a slightly different analytical method (Deal and others, 1989).

Figures 3-9 through 3-20 also identify the distribution of UNC and IT data on subhorizontal holes (OH20, OH23, OH26, and OH45), upholes (A1X02 and OH47), and some suspect downholes (G090, GSEEP, H090, OH66, OH67). Data on upholes fall into outlier areas for pH, specific gravity, and TDS and infrequently for alkalinity, ammonium, and manganese. Suspect downholes are in outlier areas for pH, specific gravity, TDS, TIC, ammonium, silicon, and strontium. Some subhorizontal holes plot in outlier areas for TDS, alkalinity, iodide, and ammonium. The iodide outliers for UNC can be traced to values that are anomalously high for data received on brine samples collected in the fall of 1989 (see analyses for OH20 and OH23 in Appendix C).

The skewness toward higher concentrations for phosphorous, aluminum, arsenic, barium, and TOC is due to detection-limit values for these parameters lying in the range of the low value shown on the appropriate frequency distribution. A slight skewness observed in the rubidium distribution is correlated to high concentrations reported for brines sampled from upholes. Three of the holes high in iron—A2X01, G090, and DHP402A—are known to contain steel or iron scissors, instrumentation, or rods.

Figures 3-21 through 3-28 also identify the distribution of UNC data on subhorizontal holes, upholes, and suspect downholes. Data on upholes fall into outlier areas for rubidium and infrequently for barium. Suspect downholes infrequently lie in outlier regions for arsenic, cesium, and TOC. However, there is no strong indication that subhorizontal holes recover brines with chemistry greatly different than uncontaminated downholes, as the subhorizontal data lie close to or in the range observed for the mode of a given parameter.

3.1.3 Results for Archived DHP402A Samples

Brine collected from DHP402A during the 1990 first-quarter sampling round (March 21) was split into samples shipped for immediate analysis and samples archived for three to nine months. The elapsed time between initial sampling and subsequent shipments of archived brine to the analytical laboratory is given in Table 3-2 with UNC mean values for nonarchived (samples shipped March 21) and archived samples.

Results presented in Table 3-2 indicate that holding times may be important for aluminum and iron. Aluminum and iron are normally present only in very small concentrations in the WIPP brines, but instruments placed in the holes or equipment dropped in downholes may increase these concentrations. None of the principal constituents in DHP402A brine appear to be affected by holding times of up to nine months. The concentrations of aluminum and iron are decreased in archived brine, relative to freshly sampled and analyzed brine. This observation suggests that oxyhydroxide precipitates lower aluminum and iron concentrations when the brine is removed from the hole and archived for extended periods of time.

For example, the aluminum concentration of in situ brine may be controlled by the solubility of clay or oxyhydroxide minerals present in the Salado Formation or by the dissolution of aluminum metal present as instruments in some holes. However, when the brine is collected and archived, an oxyhydroxide with a lower free energy than those present in the Salado Formation may precipitate and lower the aluminum concentration in the archived sample.

The high iron concentration in nonarchived DHP402A brine is attributed to a rock bolt that was accidently dropped into the hole and is now wedged in the bottom. After archived samples have been removed from contact with the steel rock bolt, the iron concentration will probably be controlled by the solubility of an iron oxyhydroxide, rather than the dissolution of the steel rock bolt. Precipitation of iron oxyhydroxide will decrease the iron concentration in the archived brine. A noticeable orange precipitate in the bottom of archived brine samples indicates that iron oxyhydroxide forms in these samples.

Table 3-2
Comparison of Mean Values (mg/L Except for SG and pH) for UNC-Geotech Nonarchived (NA) and Archived (A) DHP402A Samples

	NA	A	A	A
Elapsed Time (days)	0	93	183	274
SG	1.22	1.22	1.22	1.23
TDS	387,000	381,000	383,000	374,000
pH	6.0	6.0	5.9	6.0
Ext Alk[a]	756	744	745	726
TIC[b]	5.8	4.4	3.0	5.1
TOC	2	3	2	3
Br	1,600	1,530	1,520	1,560
Cl	190,000	189,000	198,000	199,000
F	6	4	7	6
I	13.0	13.1	12.8	13.4
NH_4^+	130	150	131	121
NO_3^-	0.9	1.4	1.2	0.5
P	<0.1	<0.1	<0.1	<0.1
SO_4^{-2}	18,000	17,100	17,700	17,800
Al	0.093	0.078	<0.05	<0.05
As	<0.001	<0.001	<0.001	<0.001
B	1,340	1,190	1,310	1,300
Ba	0.031	0.098	0.085	0.044
Ca	313	296	304	295
Cs	0.355	0.373	0.335	0.367
Fe	87.5	<0.5	<0.5	<0.5
K	14,100	13,200	13,700	15,000
Mg	25,100	23,700	23,800	24,500
Mn	2.71	2.55	2.52	2.72
Na	80,000	75,300	75,500	76,100
Rb	16.3	15.6	16.7	14.8
Si	<0.5	<0.5	<0.5	<0.5
Sr	4.14	4.04	3.92	4.18

[a]Extended alkalinity (endpoint pH = 2.5) values reported as equivalent HCO_3^-.
[b]Total inorganic carbon reported as equivalent HCO_3^-.

3.2 Element-Ratio and Solubility Diagrams

Insight into the origin of BSEP brines is provided by examining element-ratio and solubility diagrams. Element-ratio diagrams for Na/Cl versus potassium/magnesium (K/Mg) and Na/Cl versus calcium/sulfate (Ca/SO_4) were chosen to summarize the major-element chemistry of the BSEP and weep-array brines, as these diagrams can readily be compared to previous plots for fluid inclusions, brine weeps, and BSEP brines (Stein and Krumhansl, 1988; Deal and others, 1989; Abitz and others, 1990; Krumhansl and others, 1991).

Solubility diagrams were constructed using the mean values calculated from 1989 and 1990 BSEP brine data, SNL/NM weep-array data (Krumhansl and others, 1991), and the geochemical code EQ3NR (Wolery, 1983). Diagrams for halite, anhydrite, magnesite, and celestite were constructed because these minerals are observed in the Salado Formation (Stein and Krumhansl, 1988), and the saturation fields are easily represented on two-dimensional plots.

3.2.1 Element-Ratio Diagrams

Plotted ratios (by weight) of Na/Cl versus Ca/SO_4 (Figure 3-29) reveal several trends for the UNC, IT, and SNL/NM data. The SNL/NM evaporation trend was obtained from Krumhansl and others (1991), and represents the evaporation of a brine sample collected from a floor hole near the Room Q entry. An Na/Cl ratio of 0.2 corresponds to the evaporation of about 40 percent (by weight) of the sample. Some of the SNL/NM weep-array data (Krumhansl and others, 1991) parallel the evaporation trend at higher Na/Cl values. Brine samples recovered from upholes (filled circles and square) straddle the evaporation trend, because some evaporation of the brine takes place prior to collection. Figure 3-29 indicates anhydrite ($CaSO_4$) may precipitate with halite (NaCl) during the evaporation of up-hole brine, as Na/Cl and Ca/SO_4 ratios decrease with increasing evaporation.

The NaCl mixing line in Figure 3-29 was constructed by assuming that a solution saturated with halite only (Na/Cl = 0.64; Ca/SO_4 = 0) is mixed with the SNL/NM brine sample collected in Room Q access (Krumhansl and others, 1991). UNC and IT data for suspect holes G090, GSEEP, and H090 cluster along the upper segment of this line. These drill holes may contain a component of the indicated artificial brine that was derived from water spread on drift floors to reconsolidate the halite or, in the case of G090, artificial brine that was used as drilling fluid for a hydrofracture experiment. Addition of this spread water to BSEP brines would result in some dilution of the brine and probably decrease the ammonium, boron, magnesium, potassium, and sulfate concentrations of the original brine. However, the

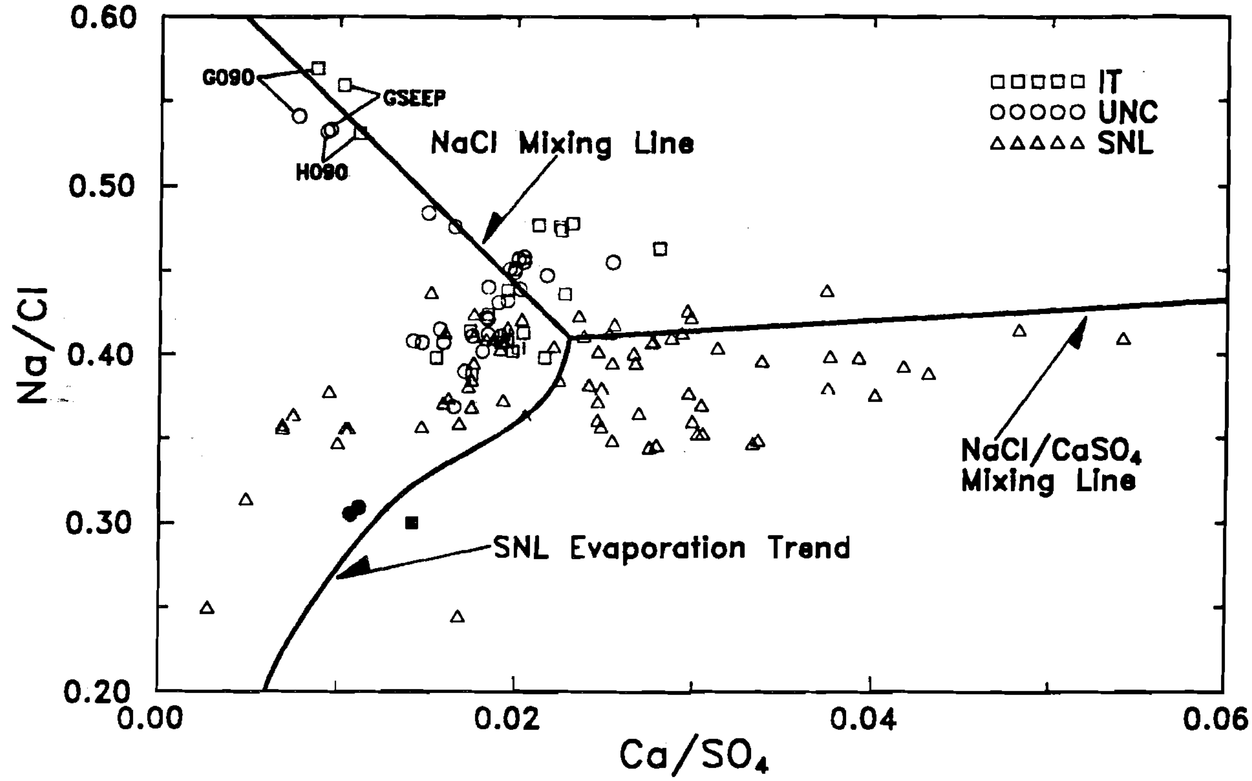


Figure 3-29

Variation of Na/Cl and Ca/SO_4 weight ratios in Salado Formation brines recovered from underground locations at the WIPP. Filled symbols indicate upholes. See text for discussion of mixing lines and evaporation trend.

statistical data for holes G090, GSEEP, and H090 (Appendix D) indicate concentrations of ammonium and boron are similar to those observed in most downholes, magnesium and potassium concentrations are relatively lower, and sulfate concentrations are relatively higher. The statistical data suggest that if spread water is mixing with BSEP brines, the composition of the spread water is more complex than a simple solution saturated with halite, and/or evaporation and precipitation processes are acting on the mixture to influence the composition of the mixture.

The $NaCl/CaSO_4$ mixing line in Figure 3-29 was constructed by assuming that a saturated halite and anhydrite solution (Na/Cl = 0.64; Ca/SO_4 = 0.42) is mixed with the SNL/NM brine sample collected in Room Q access. About half of the SNL/NM weep-array data lie near or along this line, suggesting that a component derived from a solution saturated with halite and anhydrite is present in the weep-array brine samples. This saturated solution could be derived from any of several anhydrite interbeds. However, the SNL/NM arrays were designed to sample distinct stratigraphic horizons present at the repository level, and no anhydrite beds are exposed in the sampled stratigraphic interval. Therefore, high Ca/SO_4 ratios may arise from reported concentrations of calcium (see Figure 3-8) that are too high. Among the major elements in BSEP and weep-array brines, calcium is least abundant; and large dilution factors prior to analysis will affect the accuracy of reported calcium values to a greater extent than chloride, sodium, and sulfate results. The calcium concentrations in weep-array brines are further discussed in Section 3.2.2.

Variation of the Na/Cl ratio with increasing K/Mg ratios (by weight) is shown in Figure 3-30 with the SNL/NM evaporation trend and a hypothetical mixing line. In contrast to the data in Figure 3-29, few data points lie along the SNL/NM evaporation trend. UNC and IT data collected from upholes (filled circles and square) have K/Mg ratios that lie well left of the trend. The difference between the data from upholes, which are affected by evaporation prior to collection, and the SNL/NM evaporation trend may be due, respectively, to open and closed evaporation scenarios.

In an open system approximated by upholes, continual input to the reservoir of brine in the collection container will prevent extreme evaporation conditions that lead to the precipitation of potassium/magnesium salts. Under these conditions, potassium may precipitate as sylvite or substitute in the halite structure to lower the K/Mg ratio relative to the SNL/NM evaporation trend. In contrast, the K/Mg ratio will decrease less in a closed system where both potassium and magnesium are removed by the precipitation of bittern salts. For the brine

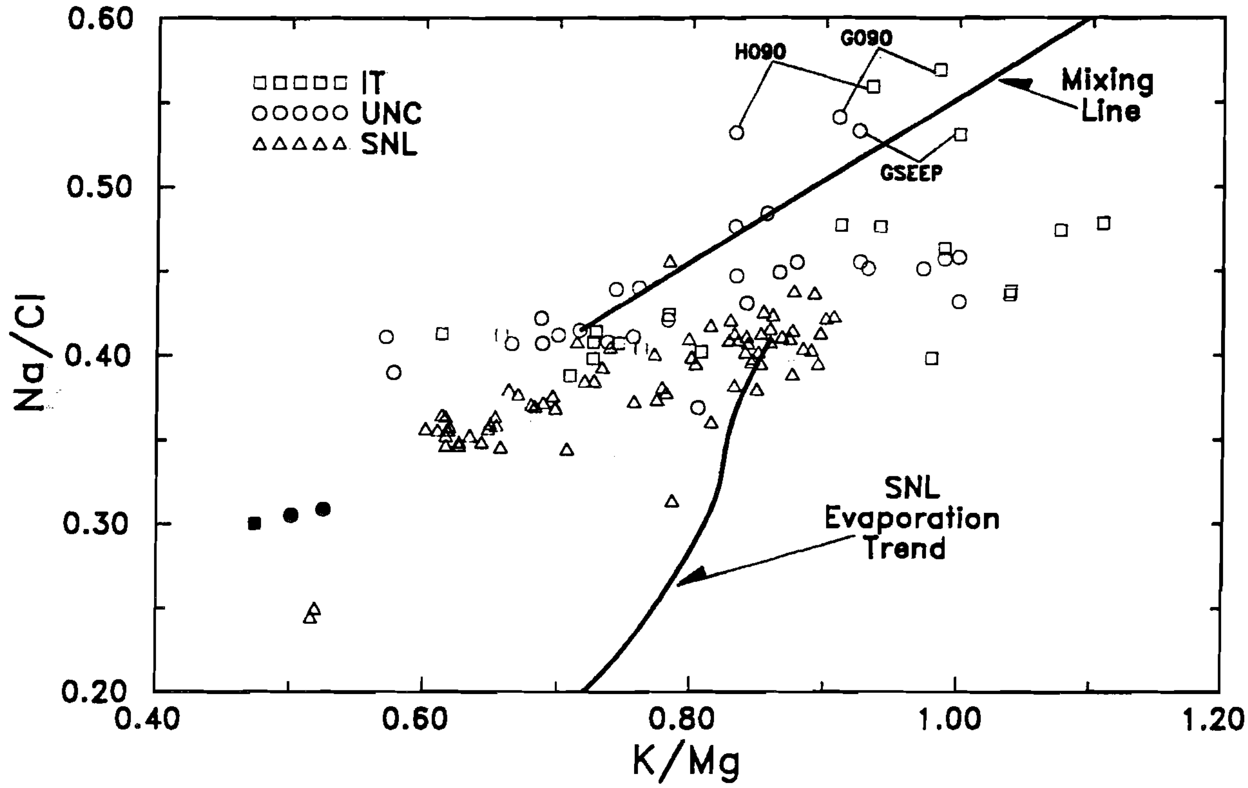


Figure 3-30

Variation of Na/Cl and K/Mg weight ratios in Salado Formation brines recovered from underground locations at the WIPP. Filled symbols indicate upholes. See text for discussion of mixing lines and evaporation trend.

recovered from upholes, a steady-state condition is probably attained where only halite, sylvite, and anhydrite are actively precipitating. This hypothesis is consistent with the SNL/NM evaporation trends and data presented in Figures 3-29 and 3-30.

In Figure 3-29, the NaCl mixing line was proposed to account for the increasing Na/Cl and decreasing Ca/SO_4 trend displayed by some data. These same data straddle the hypothetical mixing line in Figure 3-30, which illustrates the mixing of a solution saturated with halite that contains potassium and magnesium (Na/Cl = 0.65; K/Mg = 1.2) with brine recovered from BX01. If the saturated solution is derived from water spread on the drift floors, potassium and magnesium are expected to be present because there is limited substitution of these elements in the halite structure. Dean (1978) reported major-element compositions for halite, and the average composition yields Na/Cl and K/Mg ratios of 0.65 and 1.2, respectively. The mixing line in Figure 3-30 has been drawn assuming the halite noted above is dissolved to form a saturated solution with identical Na/Cl and K/Mg ratios.

3.2.2 Results of EQ3NR Modeling and Solubility Diagrams

Aqueous-speciation and mineral-solubility modeling were carried out with the EQ3NR geochemical code using the Pitzer option (Wolery, 1983). Computer runs utilized both the Pitzer and Harvie-Moeller-Weare (HMW) databases for ion-interaction parameters, because all of the available analytes are not incorporated into a single database. Input files for the Pitzer runs contained the analytes pH, ammonium, bromide, chloride, fluoride, iodide, nitrate, sulfate, barium, calcium, magnesium, manganese, potassium, sodium, and strontium. Eh was estimated using the ammonium/nitrate couple, which yielded a bounding upper limit of about 400 millivolts (mV). For the HMW database, the input files contained analytical results for pH, bicarbonate (as converted total inorganic carbon), chloride, sulfate, calcium, magnesium, potassium, and sodium. Eh was entered as 400 mV, based on the results generated with the ammonium/nitrate couple using the Pitzer database.

Solubility results generated from the EQ3NR runs are given in Tables 3-3 (UNC) and 3-4 (IT). Minerals are listed with their saturation index (SI), which is defined as:

$$SI = \log (IAP/Ksp)$$

where

IAP = ion activity product
Ksp = the mineral solubility product.

In general, undersaturation, saturation, and supersaturation of a mineral are indicated by negative, zero, and positive SI values, respectively. However, uncertainty associated with the thermodynamic data results in a range of saturation of -0.364 to +0.364 SI at 27°C. That is, minerals are supersaturated above an SI = +0.364 and undersaturated below an SI = -0.364. SI values reported in Tables 3-3 and 3-4 were obtained from runs that used the HMW ion-interaction parameters, except for the minerals barite, celestite, and fluorite. The SI values for the latter three minerals were obtained with the Pitzer ion-interaction parameters, because barium, strontium, and fluoride interaction parameters are absent in the HMW database.

The modeling results (Tables 3-3 and 3-4) indicate that the compositions of WIPP brines reflect equilibration with evaporite salts. SI derived from EQ3NR runs with the UNC sulfate analyses (Table 3-3) reveal that all WIPP brines are saturated or supersaturated with anhydrite ($CaSO_4$), barite ($BaSO_4$), fluorite (CaF_2), glauberite ($Na_2Ca(SO_4)_2$), gypsum ($CaSO_4 \cdot 2H_2O$), and halite (NaCl), and some brines are saturated with dolomite ($CaMg(CO_3)_2$) and magnesite ($MgCO_3$). SI values for celestite ($SrSO_4$), polyhalite ($K_2Ca_2Mg(SO_4)_4 \cdot 2H_2O$), and syngenite ($K_2Ca(SO_4)_2 \cdot H_2O$) are saturated for brines recovered from several drill holes. For EQ3NR runs based on the IT analytical results (Table 3-4), SI values indicate all brines are saturated or supersaturated with anhydrite, fluorite, and halite—most with respect to glauberite and gypsum—and several drill holes are saturated with respect to celestite.

Modeling results reported in Tables 3-3 and 3-4 are in agreement with the observed mineralogy present at the WIPP repository horizon. At this level, Salado Formation mineralogy consists primarily of halite with thin horizons of anhydrite and trace amounts of quartz, polyhalite, gypsum, magnesite, and clay minerals (Stein and Krumhansl, 1988). Barite, celestite, dolomite, glauberite, and syngenite have not been identified in the predominantly halitic samples studied to date. Although barite and celestite may be present in the anhydrite interbeds, glauberite and syngenite are not as likely to be found in the anhydrite, because the high Mg concentrations in the intergranular brines would favor the formation of polyhalite. The saturation fields for halite, anhydrite, celestite, and magnesite (evaluated at pH = 6.1) have been plotted in Figures 3-31 through 3-34, along with the UNC, IT, and SNL/NM (halite and anhydrite only) data.

Halite—With the exception of a single SNL/NM data point in the supersaturated field (Figure 3-31), all data plot in the saturated field. UNC and IT upholes fall below the main cluster of UNC and IT data points because halite is actively precipitating from brine collected in uphole containers. Active halite precipitation will lower the Na/Cl weight ratio because a

Table 3-3
Saturation Indices (SI)[a] Based on EQ3NR Modeling Results Using UNC Brine Analyses

	A1X01-d	A1X02-U	A2X01-d	A3X01-d	BX01-d	DH28-d
anhydrite	-0.145 s	0.011 s	-0.160 s	-0.163 s	-0.179 s	-0.067 s
barite[b]	0.638 ss	0.767 ss	0.781 ss	0.616 ss	0.636 ss	0.556 ss
bassanite	-0.848 us	-0.699 us	-0.861 us	-0.864 us	-0.880 us	-0.768 us
celestite[b]	-0.613 us	0.029 s	-0.920 us	-0.630 us	-0.595 us	-0.678 us
dolomite	-1.356 us	-3.060 us	-1.111 us	-1.230 us	-1.169 us	-0.642 us
fluorite[b]	1.071 ss	1.058 ss	1.057 ss	1.201 ss	1.200 ss	0.618 ss
glauberite	-0.164 s	-0.051 s	-0.229 s	-0.234 s	-0.248 s	-0.093 s
gypsum	-0.285 s	-0.158 s	-0.290 s	-0.295 s	-0.308 s	-0.196 s
halite	0.000 s	0.019 s	-0.037 s	-0.029 s	-0.037 s	-0.022 s
magnesite	-0.587 us	-1.324 us	-0.486 us	-0.542 us	-0.522 us	-0.350 s
polyhalite	-0.850 us	-0.107 s	-0.946 us	-0.975 us	-1.030 us	-0.830 us
sylvite	-0.683 us	-0.607 us	-0.705 us	-0.707 us	-0.711 us	-0.694 us
syngenite	-0.880 us	-0.666 us	-0.909 us	-0.936 us	-0.940 us	-0.780 us
thenardite	-0.877 us	-0.919 us	-0.927 us	-0.929 us	-0.926 us	-0.883 us

	DH30-d	DH32-d	DH34-d	DH36-d	DH38-d	DH40-d
anhydrite	-0.107 s	-0.119 s	0.016 s	-0.133 s	-0.118 s	-0.104 s
barite[b]	0.580 ss	0.469 ss	0.584 ss	0.443 ss	0.452 ss	1.030 ss
bassanite	-0.808 us	-0.820 us	-0.684 us	-0.832 us	-0.818 us	-0.804 us
celestite[b]	-0.508 us	-0.536 us	-0.287 s	-0.767 us	-0.942 us	-1.084 us
dolomite	-1.087 us	-1.133 us	-0.682 us	-1.190 us	-0.639 us	-0.003 s
fluorite[b]	0.841 ss	0.840 ss	0.978 ss	0.840 ss	0.878 ss	1.082 ss
glauberite	-0.126 s	-0.140 s	0.011 s	-0.167 s	-0.140 s	-0.154 s
gypsum	-0.238 s	-0.249 s	-0.111 s	-0.259 s	-0.246 s	-0.230 s
halite	-0.014 s	-0.012 s	-0.021 s	-0.028 s	-0.016 s	-0.036 s
magnesite	-0.554 us	-0.583 us	-0.426 us	-0.613 us	-0.344 s	-0.021 s
polyhalite	-0.883 us	-0.946 us	-0.658 us	-0.972 us	-0.924 us	-0.876 us
sylvite	-0.674 us	-0.679 us	-0.687 us	-0.681 us	-0.667 us	-0.674 us
syngenite	-0.791 us	-0.818 us	-0.664 us	-0.815 us	-0.784 us	-0.773 us
thenardite	-0.876 us	-0.877 us	-0.862 us	-0.891 us	-0.879 us	-0.907 us

Refer to notes at end of table.

Table 3-3 *(Continued)*
Saturation Indices (SI)[a] Based on EQ3NR Modeling Results Using UNC Brine Analyses

	DH42-d	DH42A-d	DHP402A-d	G090-d	GSEEP-d	H090-d
anhydrite	-0.142 s	-0.115 s	-0.056 s	-0.095 s	-0.025 s	-0.045 s
barite[b]	0.505 ss	0.450 ss	0.734 ss	0.631 ss	0.372 ss	0.726 ss
bassanite	-0.841 us	-0.816 us	-0.759 us	-0.790 us	-0.723 us	-0.741 us
celestite[b]	-0.974 us	-0.992 us	-0.233 s	-0.475 us	-0.490 us	-0.354 s
dolomite	-0.832 us	-1.227 us	-1.417 us	-0.617 us	-1.266 us	-0.761 us
fluorite[b]	0.863 ss	1.095 ss	1.127 ss	1.185 ss	0.768 ss	1.094 ss
glauberite	-0.182 s	-0.127 s	-0.074 s	0.194 s	0.259 s	0.212 s
gypsum	-0.264 s	-0.245 s	-0.195 s	-0.204 s	-0.142 s	-0.154 s
halite	-0.037 s	-0.007 s	0.001 s	-0.057 s	-0.030 s	-0.064 s
magnesite	-0.451 us	-0.648 us	-0.656 us	-0.323 s	-0.666 us	-0.416 us
polyhalite	-1.037 us	-0.940 us	-0.768 us	-0.894 us	-0.673 us	-0.828 us
sylvite	-0.691 us	-0.664 us	-0.738 us	-0.902 us	-0.844 us	-0.913 us
syngenite	-0.830 us	-0.785 us	-0.899 us	-0.829 us	-0.706 us	-0.820 us
thenardite	-0.897 us	-0.869 us	-0.875 us	-0.568 us	-0.573 us	-0.600 us

	L1X00-d	NG252-d	OH20-h	OH23-h	OH26-h	OH28-h
anhydrite	0.001 s	-0.182 s	-0.016 s	-0.066 s	-0.095 s	-0.100 s
barite[b]	0.368 ss	0.372 ss	0.693 ss	0.839 ss	0.706 ss	0.941 ss
bassanite	-0.703 us	-0.880 us	-0.718 us	-0.768 us	-0.797 us	-0.801 us
celestite[b]	-0.592 us	-0.756 us	-0.375 us	-0.747 us	-0.798 us	-0.757 us
dolomite	-1.601 us	-1.018 us	-1.078 us	-1.502 us	-1.642 us	-1.687 us
fluorite[b]	1.244 ss	0.945 ss	0.887 ss	0.816 ss	0.799 ss	1.169 ss
glauberite	-0.059 s	-0.284 s	0.022 s	-0.097 s	-0.129 s	-0.157 s
gypsum	-0.141 s	-0.301 s	-0.151 s	-0.204 s	-0.230 s	-0.231 s
halite	-0.033 s	-0.067 s	0.002 s	-0.004 s	-0.008 s	-0.022 s
magnesite	-0.738 us	-0.503 us	-0.546 us	-0.716 us	-0.788 us	-0.806 us
polyhalite	-0.173 s	-1.115 us	-0.660 us	-0.721 us	-0.853 us	-0.991 us
sylvite	-0.547 us	-0.712 us	-0.713 us	-0.680 us	-0.706 us	-0.776 us
syngenite	-0.436 us	-0.911 us	-0.754 us	-0.799 us	-0.870 us	-1.009 us
thenardite	-0.917 us	-0.959 us	-0.818 us	-0.889 us	-0.891 us	-0.914 us

Refer to notes at end of table.

Table 3-3 *(Continued)*
Saturation Indices (SI)[a] Based on EQ3NR Modeling Results Using UNC Brine Analyses

	OH45-h	OH46-d	OH47-u	OH62-d	OH63-d	OH66-d
anhydrite	-0.300 s	-0.123 s	0.089 s	-0.138 s	-0.132 s	-0.049 s
barite[b]	0.764 ss	0.837 ss	1.166 ss	0.446 ss	0.638 ss	0.569 ss
bassanite	-0.989 us	-0.825 us	-0.622 us	-0.837 us	-0.830 us	-0.746 us
celestite[b]	-0.625 us	-0.586 us	-0.090 s	-0.485 us	-0.482 us	-0.210 s
dolomite	-1.289 us	-1.154 us	-2.770 us	-1.391 us	-1.455 us	-0.357 s
fluorite[b]	0.646 ss	0.997 ss	0.985 ss	0.957 ss	0.776 ss	1.832 ss
glauberite	-0.581 us	-0.177 s	0.063 s	-0.215 s	-0.220 s	0.048 s
gypsum	-0.384 us	-0.257 s	-0.081 s	-0.260 s	-0.252 s	-0.164 s
halite	-0.228 s	-0.015 s	0.012 s	-0.056 s	-0.065 s	-0.055 s
magnesite	-0.651 us	-0.547 us	-1.193 us	-0.695 us	-0.732 us	-0.219 s
polyhalite	-1.595 us	-0.871 us	0.254 s	-1.026 us	-0.996 us	-0.791 us
sylvite	-0.851 us	-0.668 us	-0.552 us	-0.727 us	-0.722 us	-0.791 us
syngenite	-1.148 us	-0.827 us	-0.429 us	-0.898 us	-0.873 us	-0.762 us
thenardite	-1.138 us	-0.910 us	-0.883 us	-0.934 us	-0.946 us	-0.760 us

	OH67-d
anhydrite	-0.087 s
barite[b]	0.464 ss
bassanite	-0.783 us
celestite[b]	-0.159 s
dolomite	-0.593 us
fluorite[b]	1.382 ss
glauberite	-0.049 s
gypsum	-0.201 s
halite	-0.068 s
magnesite	-0.332 s
polyhalite	-0.900 us
sylvite	-0.780 us
syngenite	-0.807 us
thenardite	-0.819 us

Letters following drill hole identification indicate orientation of hole as up (u), down (d), or subhorizontal (h).
Letters following the SI number indicate undersaturation (us), saturation (s), or supersaturation (ss).
[a]SI = [log(ion-activity product/solubility product)].
[b]Mineral SI obtained with the Pitzer thermodynamic database; all others with the Harvie-Moller-Weare database.

Table 3-4
Saturation Indices (SI)[a] Based On EQ3NR Modeling Results Using IT Brine Analyses

	A1X01-d	A1X02-u	A2X01-d	A3X01-d	BX01-d	DH30-d
anhydrite	-0.072 s	0.058 s	-0.161 s	-0.140 s	-0.172 s	-0.119 s
bassanite	-0.776 us	-0.653 us	-0.862 us	-0.840 us	-0.872 us	-0.818 us
celestite[b]	-0.474 us	0.070 s	-0.835 us	-0.515 us	-0.556 us	-0.478 us
dolomite	-1.500 us	-2.961 us	-1.605 us	-1.449 us	-1.617 us	-1.633 us
fluorite[b]	1.400 ss	1.155 ss	1.205 ss	1.355 ss	1.246 ss	0.543 ss
glauberite	-0.084 s	-0.054 s	-0.246 s	-0.265 s	-0.250 s	-0.137 s
gypsum	-0.216 s	-0.110 s	-0.291 s	-0.268 s	-0.302 s	-0.240 s
halite	0.013 s	0.010 s	-0.039 s	-0.054 s	-0.029 s	-0.048 s
magnesite	-0.679 us	-1.314 us	-0.751 us	-0.670 us	-0.772 us	-0.854 us
polyhalite	-0.624 us	-0.027 s	-0.957 us	-0.928 us	-1.016 us	-0.893 us
sylvite	-0.647 us	-0.582 us	-0.685 us	-0.699 us	-0.675 us	-0.674 us
syngenite	-0.757 us	-0.599 us	-0.880 us	-0.900 us	-0.888 us	-0.728 us
thenardite	-0.869 us	-0.969 us	-0.941 us	-0.982 us	-0.936 us	-0.875 us

	DH32-d	DH34-d	DH36-d	DH38-d	DH42-d	DH42A-d
anhydrite	-0.174 s	-0.067 s	-0.139 s	-0.057 s	-0.156 s	-0.108 s
bassanite	-0.873 us	-0.762 us	-0.838 us	-0.758 us	-0.854 us	-0.812 us
celestite[b]	-0.591 us	-0.437 us	-0.709 us	-0.853 us	-0.840 us	-0.859 us
dolomite	-1.777 us	-0.969 us	-1.419 us	-0.916 us	-1.236 us	-1.342 us
fluorite[b]	0.774 ss	0.891 ss	1.076 ss	1.291 ss	1.363 ss	1.146 ss
glauberite	-0.228 s	-0.161 s	-0.235 s	-0.059 s	-0.205 s	-0.081 s
gypsum	-0.296 s	-0.176 s	-0.263 s	-0.188 s	-0.275 s	-0.251 s
halite	-0.041 s	-0.092 s	-0.042 s	-0.009 s	-0.044 s	0.054 s
magnesite	-0.919 us	-0.590 us	-0.749 us	-0.492 us	-0.681 us	-0.721 us
polyhalite	-1.069 us	-0.919 us	-1.016 us	-0.721 us	-1.108 us	-0.946 us
sylvite	-0.660 us	-0.708 us	-0.656 us	-0.647 us	-0.682 us	-0.613 us
syngenite	-0.806 us	-0.727 us	-0.805 us	-0.680 us	-0.819 us	-0.766 us
thenardite	-0.911 us	-0.952 us	-0.953 us	-0.859 us	-0.907 us	-0.830 us

Refer to notes at end of table.

Table 3-4 *(Continued)*
Saturation Indices (SI)[a] Based On EQ3NR Modeling Results Using IT Brine Analyses

	DHP402A-d	G090-d	GSEEP-d	H090-d	NG252-d	OH20-h
anhydrite	-0.083 s	0.041 s	-0.042 s	0.091 s	-0.155 s	-0.068 s
bassanite	-0.783 us	-0.663 us	-0.739 us	-0.613 us	-0.854 us	-0.765 us
celestite[b]	-0.299 s	-0.253 s	-0.423 us	-0.143 s	-0.590 us	-0.430 us
dolomite	-1.597 us	-0.843 us	-1.698 us	-0.544 us	-1.200 us	-1.310 us
fluorite[b]	1.251 ss	1.070 ss	0.531 ss	1.269 ss	1.453 ss	1.033 ss
glauberite	-0.160 s	0.490 ss	0.191 s	0.508 ss	-0.324 s	-0.184 s
gypsum	-0.209 s	-0.104 s	-0.156 s	-0.051 s	-0.278 s	-0.182 s
halite	-0.050 s	0.094 s	-0.041 s	0.079 s	-0.070 s	-0.094 s
magnesite	-0.781 us	-0.452 us	-0.906 us	-0.326 s	-0.603 us	-0.674 us
polyhalite	-0.871 us	-0.481 us	-0.759 us	-0.395 us	-0.958 us	-0.871 us
sylvite	-0.741 us	-0.794 us	-0.825 us	-0.803 us	-0.633 us	-0.758 us
syngenite	-0.886 us	-0.637 us	-0.713 us	-0.605 us	-0.790 us	-0.848 us
thenardite	-0.934 us	-0.408 us	-0.624 us	-0.440 us	-1.026 us	-0.974 us

	OH23-h	OH26-h	OH46-6	OH-63-d
anhydrite	-0.146 s	-0.087 s	-0.030 s	-0.021 s
bassanite	-0.846 us	-0.789 us	-0.732 us	-0.723 us
celestite[b]	-0.764 us	-0.737 us	-0.488 us	-0.257 s
dolomite	-2.059 us	-1.874 us	-1.456 us	-1.726 us
fluorite[b]	0.792 ss	1.025 ss	1.244 ss	1.100 ss
glauberite	-0.254 s	-0.157 s	-0.080 s	-0.038 s
gypsum	-0.275 s	-0.221 s	-0.165 s	-0.157 s
halite	-0.038 s	-0.017 s	-0.013 s	-0.002 s
magnesite	-0.999 us	-0.915 us	-0.721 us	-0.880 us
polyhalite	-1.018 us	-0.859 us	-0.631 us	-0.672 us
sylvite	-0.704 us	-0.700 us	-0.662 us	-0.677 us
syngenite	-0.931 us	-0.870 us	-0.725 us	-0.734 us
thenardite	-0.966 us	-0.927 us	-0.907 us	-0.873 us

Letters following drill hole identification indicate orientation of hole as up (u), down (d), or subhorizontal (h).

Letters following the SI number indicate undersaturation (us), saturation (s), or supersaturation (ss).

[a]SI = [log(ion-activity product/solubility product)].

[b]Mineral SI obtained with the Pitzer thermodynamic database; all others with the Harvie-Moller-Weare database.

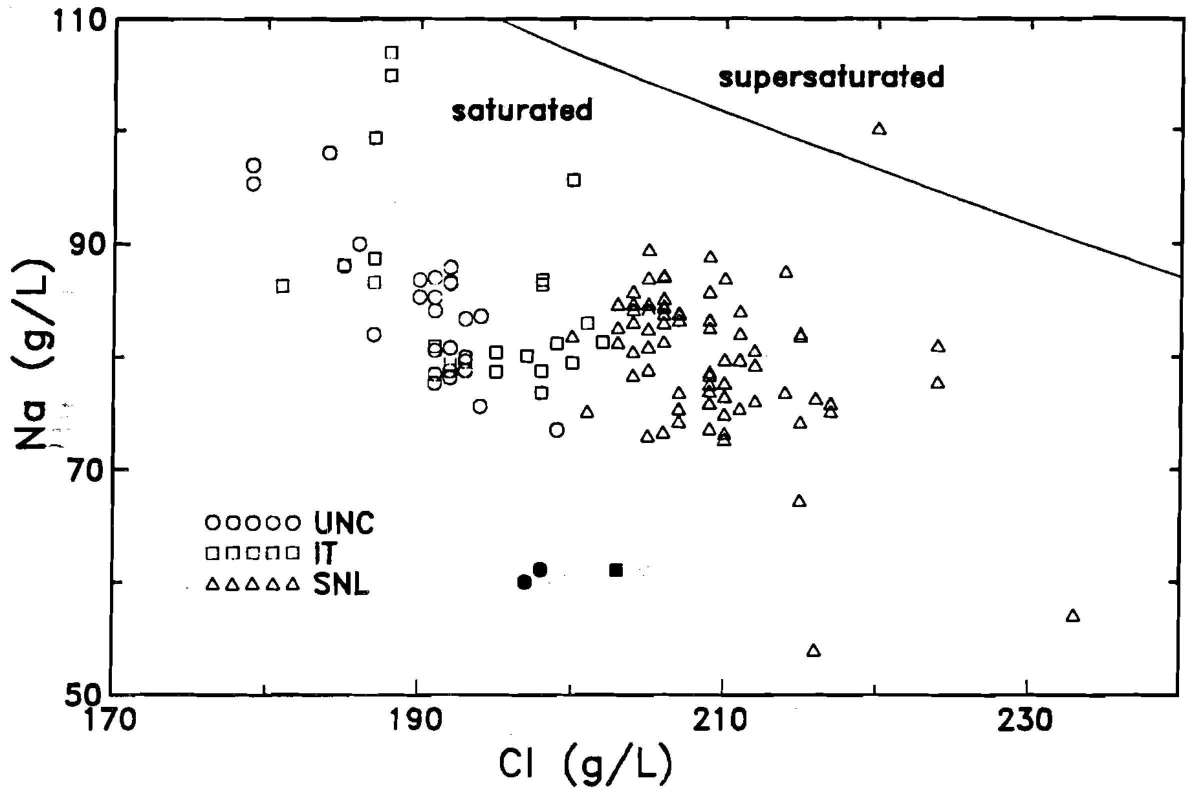


Figure 3-31

Variation of Na and Cl in Salado Formation brines recovered from underground locations at the WIPP. Filled symbols indicate upholes. Halite saturation field determined with the EQ3NR geochemical code using brine compositions.

larger mass fraction of the initial sodium concentration is removed relative to chloride.

Anhydrite—Data displayed on the anhydrite saturation diagram (Figure 3-32) display two strikingly different trends. UNC and IT data have similar calcium concentrations and variable sulfate values, which places this data in the saturated field. SNL/NM data have similar sulfate values and variable calcium concentrations, placing the data in all three fields. The SNL/NM data are inconsistent with UNC and IT data because trends in Figure 3-32 should parallel the saturated field (similar to UNC and IT data), rather than cross cut the field boundary between the saturated and supersaturated fields. SNL/NM calcium data in the supersaturated field probably represent values with a large positive bias. This uncertainty may have been introduced from large dilution factors (Krumhansl and others, 1991), which decrease the detection-limit sensitivity and accuracy of the analytical technique.

Celestite—The saturation diagram for celestite (Figure 3-33) shows a fairly complex trend for the UNC and IT data. Strontium and sulfate concentrations appear to correlate positively until they cross into the saturated field. Within the saturated field, increases in sulfate concentrations may result in decreasing strontium values to maintain solubility constraints, or a limited amount of strontium may substitute into anhydrite. Data for upholes (filled circles and square) suggest evaporation drives the initial strontium and sulfate concentrations into the saturated field, where further evaporation can continue to concentrate sulfate, but strontium will decrease to maintain solubility constraints. This inverse behavior arises because the sulfate concentration is nearly four-orders of magnitude greater than the strontium concentration.

Downholes lying in the saturated field may indicate some brine evaporation has occurred prior to collection. Alternatively, these holes may have received a component of Culebra water (about 30 mg/L strontium) that was spread on the drift floor for road consolidation. There is some evidence for the latter hypothesis for holes OH66 and OH67 (downholes with highest strontium concentrations), as their relatively low bromide and boron concentrations (Appendix D) suggest mixing with a diluted solution has taken place.

Magnesite—Magnesite saturation has been evaluated at a pH of 6.0, 6.1,and 6.2 (Figure 3-34). The unsaturated/saturated boundary in Figure 3-34 shifts to the right at lower pH values and to the left for higher pH values. Half-filled symbols represent downholes that are calculated to be saturated with magnesite (Tables 3-3 and 3-4), and the filled symbols represent upholes. The half-filled symbols lying in the unsaturated field have pH values

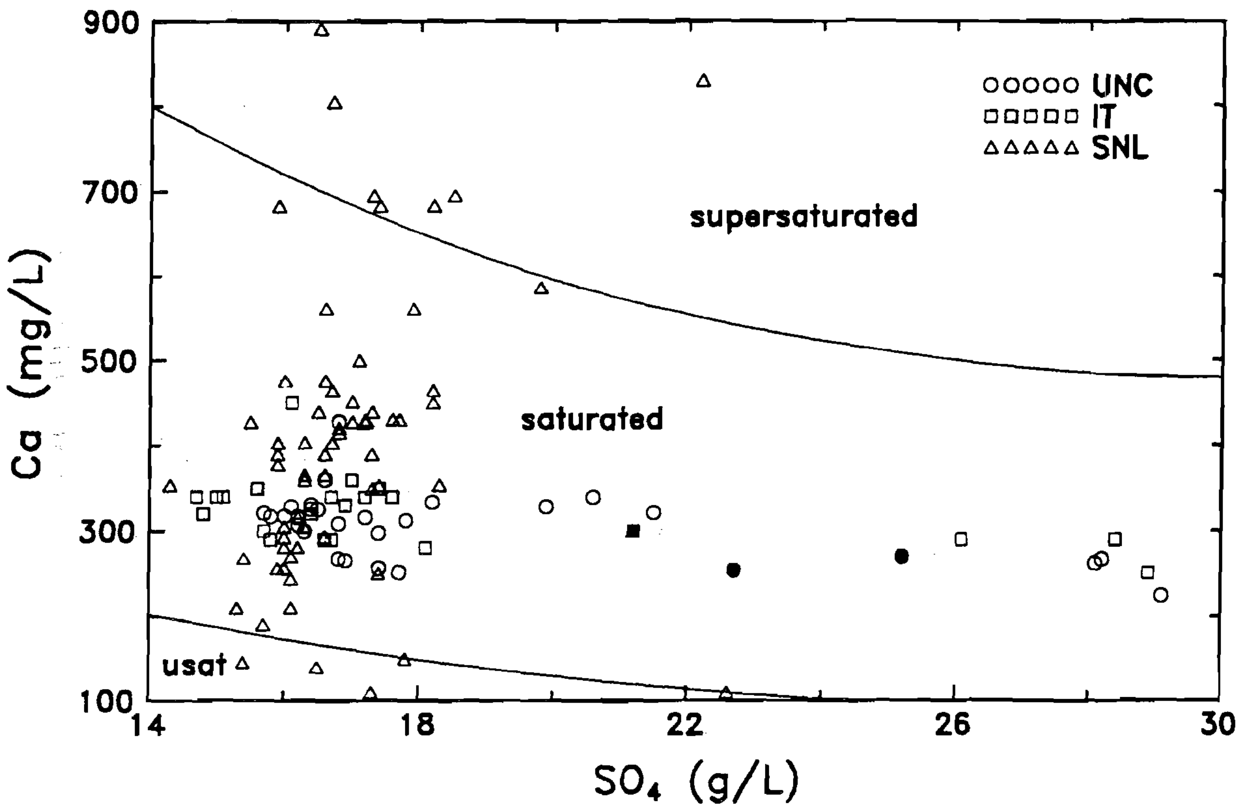


Figure 3-32

Variation of Ca and SO_4 in Salado Formation brines recovered from underground locations at the WIPP. Filled symbols indicate upholes. Anhydrite saturation field determined with the EQ3NR geochemical code using brine compositions.

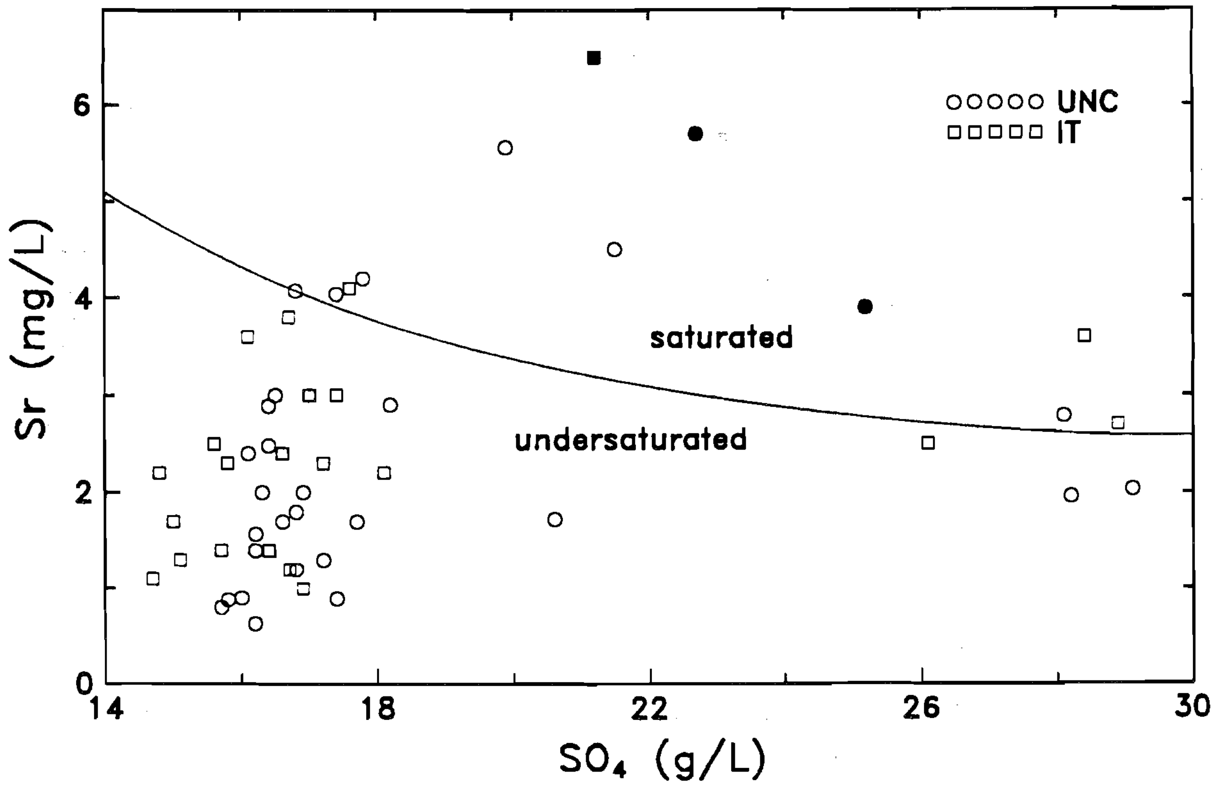


Figure 3-33

Variation of Sr and SO_4 in Salado Formation brines recovered from underground locations at the WIPP. Filled symbols indicate upholes. Celestite saturation field determined with the EQ3NR geochemical code using brine compositions.

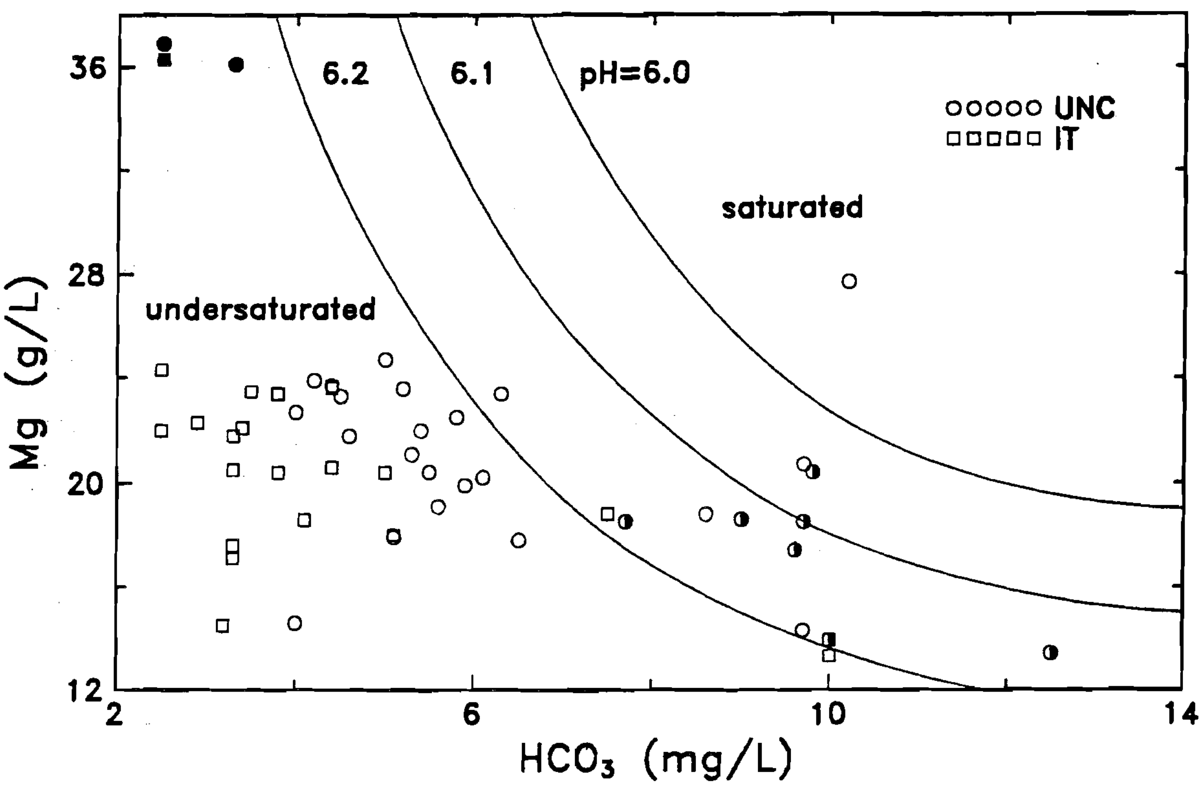


Figure 3-34

Variation of Mg and HCO_3 in Salado Formation brines recovered from underground locations at the WIPP. Filled symbols indicate upholes. Half-filled symbols indicate samples that are saturated with magnesite. Magnesite saturation field determined at a pH of 6.0, 6.1, and 6.2 with the EQ3NR geochemical code using brine compositions. See text for discussion of pH boundaries.

greater than 6.1, and the open symbols in the saturated field have pH values less than 6.1; consistent with the boundary shifts noted above. The point in the upper right, just below the word saturated, is from L1X00 and has a pH of 5.7 to 5.8. At that low pH, the brine is undersaturated with magnesite.

3.3 Evaluation of the Migration of Synthetic Brine to the GSEEP Location

Deal and others (1989) questioned whether synthetic brine migrated out of a pit in Room J along MB 139 to GSEEP. Room J is the site of the SNL/NM Drum Durability Tests (DDT), where different grades of steel drums are placed in an excavated pit filled with artificial brine to evaluate corrosion. As part of the tests in Room J, SNL/NM had spiked the synthetic brine used in the corrosion experiments with elevated levels of iodide and cesium. The levels of iodide and cesium in the synthetic brine were, respectively, one to three orders of magnitude greater than the average concentrations observed in BSEP brines, making them excellent tracers to monitor the flow of this synthetic brine out of the Room J DDT pit and into GSEEP. Data on brine obtained from GSEEP and Room J are reported in Table 3-5. A brief analysis of this data shows that GSEEP brine does not contain a detectable amount of the synthetic brine introduced into the Room J pit.

Brine has been recovered and analyzed from GSEEP since September 1987 and continues to be sampled on a quarterly basis as part of the WIPP BSEP monitoring. All BSEP analyses of the GSEEP chemistry for 1989 are presented in Deal and others (1991), and 1990 analytical results are given in Appendix C of this report. These analyses provide results from two independent laboratories (IT and UNC). Table 3-5 shows the results from the March 1989 BSEP sampling of synthetic brine in the Room J pit and SNL/NM analyses of the synthetic brine (May 1986 to October 1986).

When comparing Appendix C (Deal and others, 1991) and Table 3-5 in this report, several observations should be noted:

- The concentrations of bromide and iodide reported by the IT laboratory for the September 14, 1989, sampling round are anomalously low and high relative to historical analytical results on the GSEEP brine, respectively.

- The IT results for bromide are anomalously high for one sample analyzed from the December 12, 1989, round and the March 21, 1990, round. These anomalous results have been traced to analytical difficulties in the IT laboratory

Table 3-5
Composition of Brines Recovered from Room J and GSEEP

Sample ID/Date	Br^- (ppm)[a]	Cl^- (ppt)[b]	I^- (ppm)	SO_4^{-2} (ppt)	Ca^{+2} (ppt)	Cs (ppm)	K^+ (ppt)	Mg^{+2} (ppt)	Na^+ (ppt)
JB1[c] (05/28/86)	21.2	134	195	2.2	0.51	75	0.50	0.35	100
JB2 (06/10/86)[d]	25.9	129	175	2.4	0.58	77	0.57	0.39	97
JB3 (08/21/86)	55.4	136	244	2.5	1.06	106	1.28	0.82	98
JB8 (10/07/86)	80.6	133	277	5.2	0.96	110	1.70	1.15	100
JRM (03/14/89)[e]	396	156	423	8.0	0.36	115	5.52	5.49	89
GSEEP[d]	1,110	150	13.8	22.9	0.22	0.17	11.0	11.9	79.7

[a]ppm = parts per million.

[b]ppt = parts per thousand.

[c]JB samples taken from Krumhansl and Stockman (1987).

[d]Heaters turned on after collection of JB2.

[e]Average values for UNC analytical results (Appendix C in Deal and others, 1990) converted to ppt and ppm using a density of 1.22 kg/L.

[d]Statistical results for UNC analyses (Appendix D) converted to ppt and ppm using a density of 1.23 kg/L.

and occur for all brine samples analyzed by IT on the above indicated sampling dates.

- Cesium analysis of brine samples was initiated in March of 1989 to support the investigation into contamination of GSEEP brine by synthetic brine introduced in the Room J pit. However, cesium analysis was discontinued after March 1989 for samples sent to the IT laboratory because they could not achieve a low enough detection limit to be useful to the objectives of this investigation.

BSEP analytical results on brine obtained from the Room J pit are available from the March 1989 sampling round. Results are fairly consistent between the IT and UNC laboratories, except for bromide and iodide. The concentrations reported by IT for these two halogens are greater than and less than UNC results, respectively. Because bromide and iodide have been traced to analytical problems in the IT laboratory in the past, the UNC values are taken as more representative of the bromide and iodide concentrations in the Room J pit. Limited data on the chemical constituents in the Room J pit are available from SNL/NM for the period May 1986 to October 1986, and these have been tabulated with the average UNC analytical results for March 1989 in Table 3-5. Note that the UNC data in Table 3-5 is not identical to the data reported in Appendix C, because mg/L concentrations in the Appendix have been converted to mg/kg or g/kg (ppm or ppt) to allow comparison with the SNL/NM data on the Room J brine.

Focusing on the UNC laboratory results (Table 3-5), the average concentration of iodide and cesium in the synthetic brine is 423 ppm and 115 ppm, respectively; while 1989 and 1990 data for GSEEP are 13.8 ppm and 0.17 ppm, respectively. The average iodide and cesium concentrations of 423 ppm and 115 ppm in the synthetic brine would increase the iodide and cesium concentrations in GSEEP brine by about 4.2 ppm and 1.2 ppm for every 1 percent of synthetic brine present in GSEEP. Since the analytical precision for iodide and cesium is about ±10 percent (i.e., 13.8 ±1.4 ppm and 0.17 ±0.02 ppm), an increase of 4.2 ppm iodide and 1.2 ppm cesium (i.e., 1 percent synthetic brine) in GSEEP brine would be readily detectable and significant. Since March 1989, reported iodide and cesium concentrations from UNC analyses have never exceeded 16.6 ppm (20.2 mg/L) and 0.19 ppm (0.23 mg/L) in the GSEEP brine (Appendix C in Deal and others, 1990; and this report), indicating that if a component of Room J brine is present, it is less than 1 percent of the brine sampled at GSEEP.

Turning to the data reported by SNL/NM on Room J brine (Table 3-5) and UNC data on GSEEP brine prior to March 1989 (Deal and others, 1989), an analysis of the data similar to that above can be made with iodide (cesium data is not available for GSEEP brine prior to March 1989). However, in this analysis, the lower iodide concentrations reported by SNL/NM for Room J brine (195 to 277 ppm) and slightly higher concentrations for iodide in GSEEP brine prior to March 1989 (average 14.7 ppm for 14 samples) indicate that at least 2 percent of the synthetic brine would have to be present in the GSEEP brine for detection.

The geochemical analysis presented above cannot unequivocally rule out the presence of synthetic brine from Room J in GSEEP brine. However, based on the iodide and cesium concentrations, it shows that the volume percent of synthetic brine in GSEEP would have to be less than 2 percent. At the present time, this uncertainty is the best that can be obtained. To achieve a lower uncertainty, tracer tests would have to be performed to evaluate the dilution of synthetic brine as it enters MB 139 and the flow of the resulting mixed brine through MB 139. Quarterly sampling and analysis of brine from the GSEEP locality will continue as part of the BSEP; and if a component of synthetic brine is detected, the possibility of movement of brine through hundreds of feet of fractured rock beneath the floor should be reevaluated.

The evidence presented in Section 3.2.1 shows that three brine sampling locations—GSEEP, G090, and H090—have probably experienced mixing with an artificial brine because their compositions plot on the mixing line on the element-ratio diagrams (Figures 3-29 and 3-30). A probable source of the artificial brine component is known for G090 and H090. A similar component is indicated for GSEEP, and since it does not appear that the Room J brines are the source, the next most likely source are brines spread for floor consolidation in the G Access drift, just east of GSEEP, that flowed westward down the slope of the floor, possibly through unconsolidated muck on the drift floor, to the GSEEP location.

3.4 Conclusions

Simple statistics have been presented for analytical data obtained on brines collected in 1989 and 1990. Histograms were constructed to summarize the parameter variation and compare data obtained on BSEP drill holes to SNL/NM data obtained from weep arrays. In general, the SNL/NM analytical values for brine weeps were greater than data on BSEP drill holes for all compared parameters except sulfate. Additionally, statistics on archived DHP402A brine samples showed no significant difference in major-element chemistry of recently collected and archived brine samples.

Variation diagrams of Na/Cl versus Ca/SO_4 and Na/Cl versus K/Mg examined the evaporation and mixing trends displayed by BSEP and SNL/NM weep-array brines. Trends exhibited by BSEP data in Na/Cl-Ca/SO_4 space were attributed to precipitation of halite and anhydrite as brine evaporated prior to collection and possible mixing between a solution saturated with halite and indigenous brine. SNL/NM data also followed the SNL/NM Room Q brine evaporation trend, and about half of the data points plotted along a mixing line with a solution saturated with halite and anhydrite. The evaporation trend in the Na/Cl-K/Mg plot was not followed by BSEP data, and few SNL/NM data plotted along the trend. Some BSEP data points plotted along a hypothetical mixing line with a saturated solution derived from dissolution of halite with Na/Cl and K/Mg ratios of 0.65 and 1.2, respectively.

Solubility calculations were conducted with the EQ3NR geochemical code, and all BSEP brines were found to be saturated or supersaturated with halite, anhydrite, gypsum, glauberite, fluorite, and barite. Some samples were also saturated with celestite, magnesite, and polyhalite. Solubility diagrams were constructed for halite, anhydrite, celestite, and magnesite, and SNL/NM weep-array data were plotted with BSEP results for halite and anhydrite. The SNL/NM and BSEP data all plotted in the halite saturation field, but only BSEP data were entirely constrained to the anhydrite saturation field. SNL/NM data plotted in the undersaturated, saturated, and supersaturated fields for anhydrite, which is attributed to analytical errors introduced by large dilution factors prior to analysis of weep-array brines.

Mixing between a synthetic brine in Room J and brine collected at GSEEP was investigated using analyses on iodide and cesium. The results of this analysis show that less than 1 percent, if any, of the synthetic brine in Room J is present in GSEEP samples collected during 1989 and 1990; and less than 2 percent, if any, in GSEEP samples collected prior to 1989. The unusual composition of the GSEEP brines is probably the result of mixing with artificial brines spread on the floor for dust control in the G Access drift upslope from GSEEP, with subsequent modification by evaporation.

4.0 Modeling and Analysis—Long Horizontal Drill Holes

4.1 Introduction

This chapter presents a preliminary analysis of predicted brine seepage into hypothetical 46-m subhorizontal drill holes excavated in salt at the WIPP repository horizon. The near-field and far-field analyses presented in this chapter are designed to assist in determining the relative importance of near-field redistribution of brine and possible far-field flow to the repository. One of the more important questions in assessing the brine seepage into the WIPP is to determine whether there is any component contributed by the far field.

Near an excavation or drill hole, the processes of salt creep and fluid flow are coupled in a complex manner (Deal and others, 1989; Deal and Roggenthen, 1991). As brine flows into the rooms or drill holes, the rock salt around these openings creeps into the excavation. The creep of the intact salt will modify the permeability and porosity of the salt and results in changes in fluid pressure. The change in fluid pressure in the rock pores then affects stresses in the rock and, consequently, the salt creep rate. Because detailed experimental data on these coupling effects are not available at the present time, the relative importance of each mechanism is not completely understood.

Previous work (Deal and Case, 1987; Deal and others, 1987; Deal and others, 1989; Deal and others, 1991; Deal and Roggenthen, 1991) developed the following technical approach. Salt deformation and fluid flow are modeled simultaneously using the following assumptions:

- The Salado Formation, predominantly halite with minor amounts of clay, anhydrite, and polyhalite, is modeled as a continuous media.
- The salt is modeled as an elastoviscoplastic material exhibiting time-dependent deformation, where the presence of brine does not affect the creep rate or the elastic deformation of the rock; i.e., the effective stress is nearly identical to the total stress, as evidenced by low-porosity measurements (.0156) (Deal and others, 1988; see discussion Section 4.2.3).
- The permeability and porosity of the rock are affected by salt creep, where stresses are redistributed around the opening.
- The brine is uniformly distributed through the salt and flows according to Darcy's Law under saturated conditions as fluid pressure is reduced at the opening due to development of brine seepage.

- Nitrogen in the brine is assumed to exsolve rapidly following excavation. The precise gas content is unknown, though estimates based on the solubility of nitrogen in sea water yield volumetric changes of 20 percent for a saturated brine that is depressurized (Roggenthen, 1988).

Previous analyses of a shaft-sized excavation (Deal and others, 1989) used identical assumptions. The assumption of modeling the salt as a continuous media is perhaps more appropriate for the small (less than 0.5 m in diameter) horizontal drill hole than the larger 3.6-m-diameter shaft due to a smaller disturbed zone (0.27 m versus 12.0 m) and since the presence of large fractures associated with clay seam separation and pillar deformation are absent near the drill hole scale excavations. Since the modeling was done, physical measurements of the permeability and hydraulic conductivity of various stratigraphic units in and near the WIPP workings show large variations between the effective impermeable clear halite, the argillaceous halite, and the anhydrite interbeds (refer to Section 2.3), suggesting preferential flow of brine parallel to bedding. The assumption that the salt is an isotropic, continuous, and uniform media may not be as appropriate as previously thought, but does allow comparison between models of a small (7.6-cm-diameter) drill hole (this report) and a 3.6-m-diameter shaft (Deal and others, 1989).

4.2 Model Descriptions

In these analyses, several models were used to simulate far-field and near-field effects. These models included a detailed finite-element model (VISCOT/BISCITS) used to perform stress and fluid-flow analyses and a less detailed finite-difference model used to evaluate boundary conditions.

4.2.1 VISCOT/BISCITS Analysis

The detailed finite-element model was evaluated using the computer codes VISCOT (Intera, 1983) for salt-creep analysis and the BISCITS program, which is a modified version of the program SUTRA (Voss, 1984) for the fluid-flow analysis (Deal and others, 1988; Wallace and others, 1990).

Other than the smaller drill hole geometry, the physical aspects of modeling salt creep and brine inflow into the long horizontal drill holes are the same as in the previous 3.6-m-diameter shaft model. The analysis ignores the effects of surrounding excavations. The finite-element models consist of one quadrant with boundary conditions identical to those for the shaft model, as illustrated in Figure 4-1. For stress analysis, the far-field boundaries were fixed, and the lateral boundaries were constrained. The BISCITS model is a far-field model

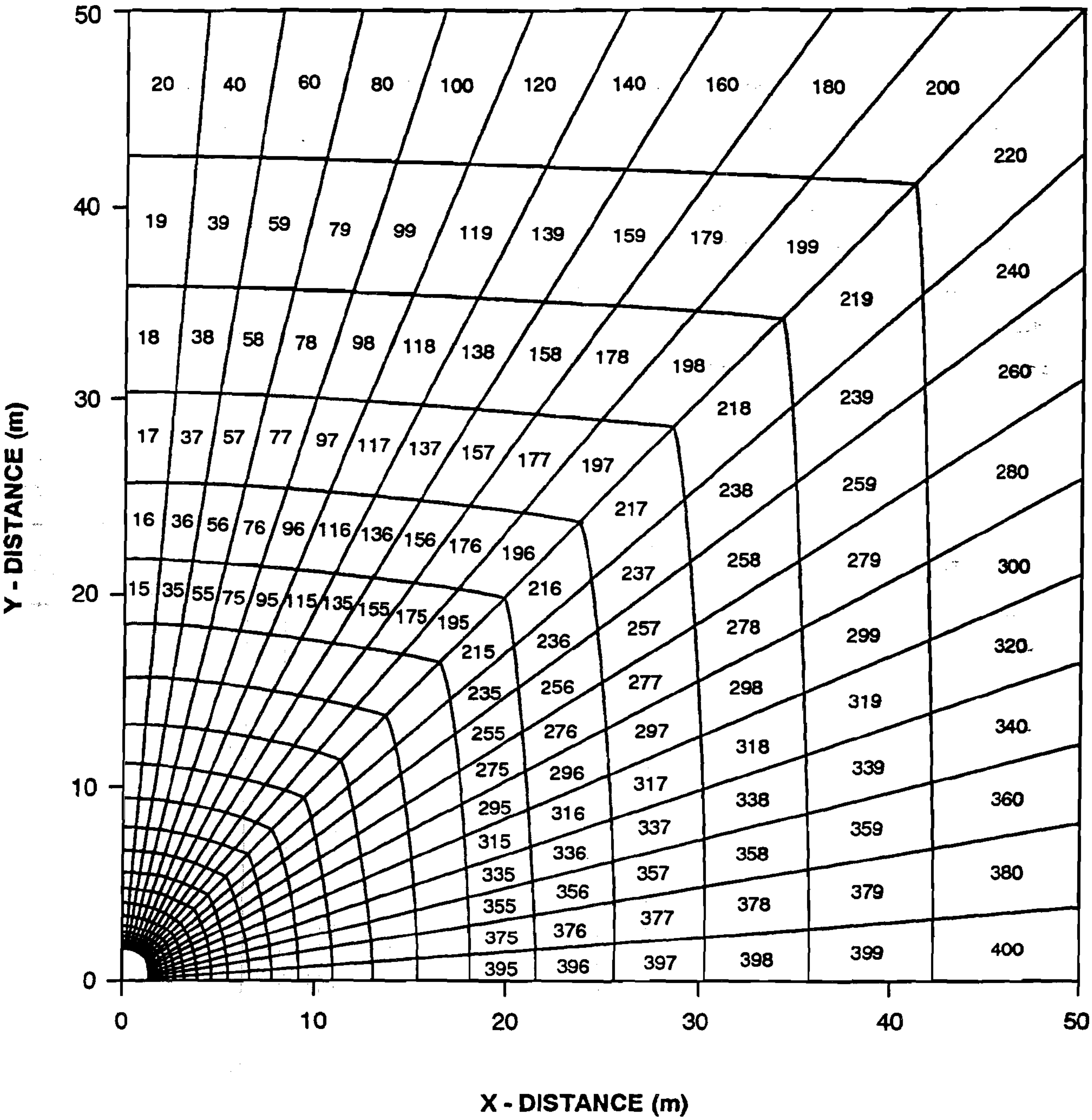


Figure 4-1
Finite-Element Mesh for a 7.6-cm-Diameter Subhorizontal Borehole Model

that takes into account the increase in porosity and permeability, as described subsequently, in the DRZ close to the drill hole. A question of concern is whether far-field flow occurs or if flow only occurs within the DRZ. Evaluation of the near-field flow model of a 3.6-m-diameter shaft indicated a 30-year observation period would be necessary before a distinction between near-field and far-field flow could be developed (Deal and others, 1989, Section 5).

4.2.2 Simplified Finite-Difference Analysis

To assess the 7.6-cm-diameter drill hole, a radial, one-dimensional finite-difference model was used to evaluate alternate boundary conditions. In this model, the second-order diffusion equation with radial symmetry was solved using the explicit finite-difference method. For the far-field model, the pressure boundaries were fixed at the inner and outer boundaries that correspond to the boundary conditions for the more detailed finite-element model. For the near-field model, the inner-pressure boundary was set to zero, and the outer boundary corresponding to the edge of the DRZ was treated as a no-flow boundary.

4.2.3 Model Input Properties

The material properties for performing the coupled analysis include the elastic and secondary creep properties of the salt, the compressibility of the brine, and the best estimate for permeability (more precisely, intrinsic permeability) of the undisturbed rock salt. These properties are summarized in Table 4-1.

Two properties were modified from the previous shaft analysis (Deal and others, 1989, Section 5, hereafter referred to as the previous analysis). A determination was made of the moisture content of the Salado salt at the WIPP (Deal and others, 1989) that showed that the facility horizon is about 1.56 percent brine by volume (0.6 percent by weight), which must occupy that much pore space. The value is higher than the previously estimated value of 0.001 (0.1 percent), which was assumed by Peterson and others (1985) in curve-fitting gas flow data. Predictions using the stress-permeability relations developed by Lai (1971) have been made based upon the revised porosity. The porosity-permeability relationship presented by Lai was written in logarithmic form as:

$$\log \left[\frac{\phi^3}{(1-\phi)^2} \right] = a \log k - \log b$$

Table 4-1
Salt/Brine Material Constitutive Properties

Parameter	Base Case Value	Units
Salt		
Activation Energy, Q	12,000	Calories/mole
Stress Exponent, n	4.9	
Empirical Constant, A	0.126	$MPa^{-4.9}$/day
Universal Gas Constant, R	1.987	Calories/(mole K)
Salt Temperature, T	300	°K
Young's modulus, E	31,000	MPa
Poisson's Ratio, v	0.25	
Salt Far-Field Stress, P_o	15	MPa
Brine Compressibility, β	5×10^{-10}	1/Pa
Salt Porosity, ϕ	0.0156	
Brine Viscosity, μ	1.6	Centipois
Intact Salt-Intrinsic Permeability, k	0.1–1.0	Nanodarcy
Hydraulic Conductivity, K	10^{-15}–10^{-14}	m/s

where

ϕ = porosity
k = intrinsic permeability
a and b = empirical constants.

The empirical constant "a" is related to the relative changes in permeability with respect to porosity and represents the slope in the above relationship. This linear relationship with the selected constant "a" from Lai presented above may be used with the measured porosity of 1.56 percent to predict changes in permeability.

Lappin (1988) and Lappin and others (1989) have noted the difficulty in measuring in situ permeabilities in halite. In cases cited by Lappin and others (1989), the undisturbed salt permeability could have been lower than the limitations of various equipment used in the tests. The lowest permeability calculated from Peterson and others (1987) is 1 nanodarcy (1×10^{-21} m^2). In this discussion, the units are reported in nanodarcies for intrinsic permeability. The conversion to hydraulic conductivity for brine is equivalent to 10^{-14} m/s. Calculations from brine-flow experiments and more direct in situ permeability measurements show that the far-field permeability of the Salado Formation may be several orders of magnitude smaller than previously estimated (Lappin and others, 1989).

4.3 Results of VISCOT Analysis

The results of the VISCOT analysis for radial-tangential stress development are similar to the results of previous analysis. At the excavation, the boundary or tangential stress increases to approximately twice the value of the in situ stress, while the radial stress is reduced to zero. In the absence of creep, this stress would be maintained throughout time. However, in response to the high deviatoric stress, the salt will creep inward, and the radial and tangential stresses will relax with time.

As in the previous analyses (Deal and others, 1989), the stress relaxation is essentially complete after approximately 1,100 days. There is no change in porosity or permeability immediately after excavation (Figure 4-2). As boundary stresses relax and the stress abutment zone moves outward into the salt, a distinct zone of enhanced porosity develops. The maximum increase in porosity around the 7.6-cm drill hole (approximately 2 percent) is much smaller than the relative increase of 40 percent in the previous analysis of the DRZ for a 3.6-m-diameter shaft. The development of permeability with time is illustrated in

Figure 4-3. At the earliest time shown, there is very little permeability enhancement over 1 nanodarcy. This result follows from the Kirsch solution in that the sum of normal strains (the first strain invariant) is dependent on the first stress invariant, which enters into the porosity calculation described previously. As in the case of porosity, the sum of normal strains also does not change immediately after excavation.

As salt creep relaxes the built-up stresses, the sum of the strains is no longer constant, and porosity and permeability increase with time. Because only the tangential stresses relax significantly over time, the changes in permeability in the model may be attributed chiefly to reductions in tangential stress. The results of the analysis suggest that the DRZ extends only two-tenths of a meter from the drill hole after 1,100 days (as compared to about 12 m for the shaft model) and that the maximum increase in permeability is about 3 percent from 1 nanodarcy (as compared to about 40 percent for the shaft model).

4.4 BISCITS Analysis

Flow rates and cumulative outflow for the far-field model are determined from the BISCITS analysis and are presented in Figures 4-4 and 4-5. When this coupled model was previously used to estimate flow into a shaft (Deal and others, 1989), the porosity in the far-field model increased in the disturbed zone around the shaft faster than brine could be supplied from the surrounding salt. This analysis predicts the development of a small DRZ around the drill hole with a smaller relative change in predicted porosity that remains saturated in the far-field flow model. The results predict that a maximum flow rate (10^{-5} liters per second [L/s]) occurs immediately after excavation and declines to 10^{-6} L/s after a year (Figure 4-4). The cumulative brine inflow predicted for one year is about 10 L (Figure 4-5).

4.5 One-Dimensional Finite-Difference Analysis

The simple finite-difference models were used to evaluate near-field versus far-field effects and variations in the intrinsic permeability of salt. The results of the far-field model for two intrinsic permeabilities (1 nanodarcy and 0.1 nanodarcy) are presented in Figures 4-6 through 4-11 as the radial hydraulic potential distribution, flow rate versus time, and cumulative flow versus time, respectively. The results using a higher intrinsic permeability (1 nanodarcy or 10^{-21} m^2) are comparable to the more detailed finite-element model presented in Section 4.4, which also used an intrinsic permeability of 10^{-21} m^2 and indicate that near steady-state flow is established within about 100 days at 0.08 L per day. For the lower intrinsic permeability (0.1 nanodarcy or 10^{-22} m^2), the results indicate that steady-state flow is established after about 400 days at 0.01 L per day.

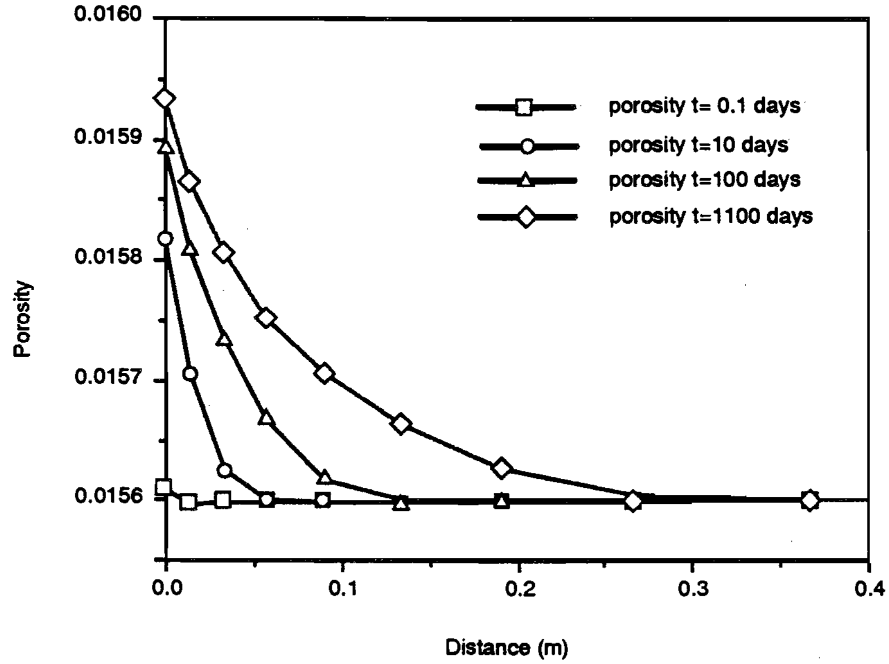


Figure 4-2
Porosity Versus Radial Distance of a 7.6-cm-Diameter Drill Hole

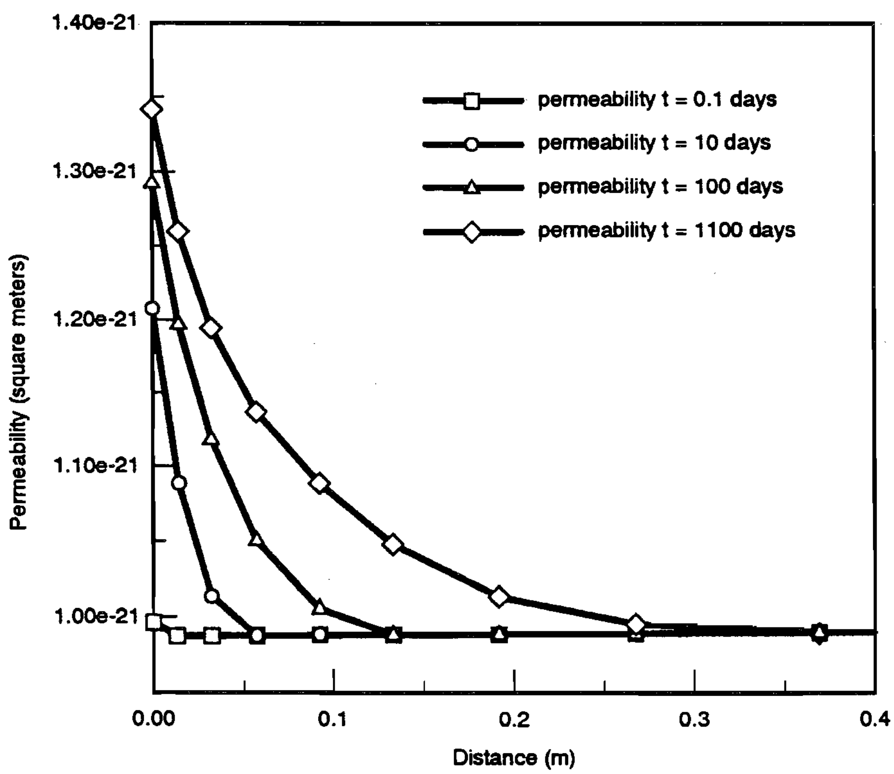


Figure 4-3
Permeability Versus Radial Distance of a 7.6-cm-Diameter Drill Hole

301601.09/ef A45

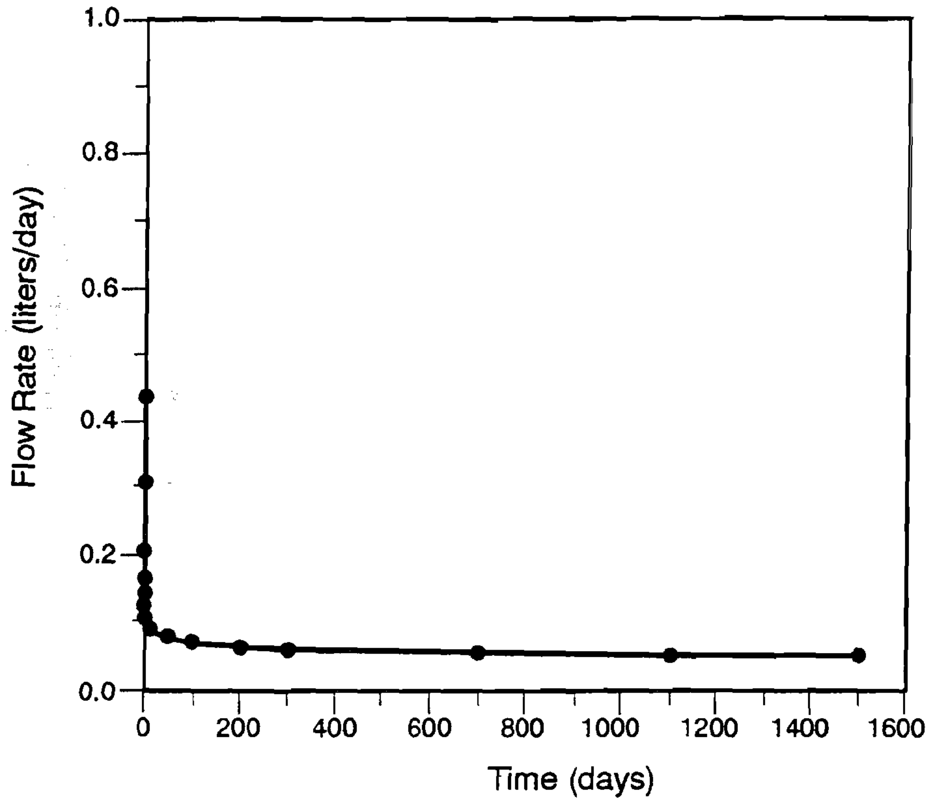


Figure 4-4
Flow Rate Versus Time for the BISCITS Model for a 7.6-cm-Diameter Drill Hole for Far-Field Flow

301601.09/tg A29

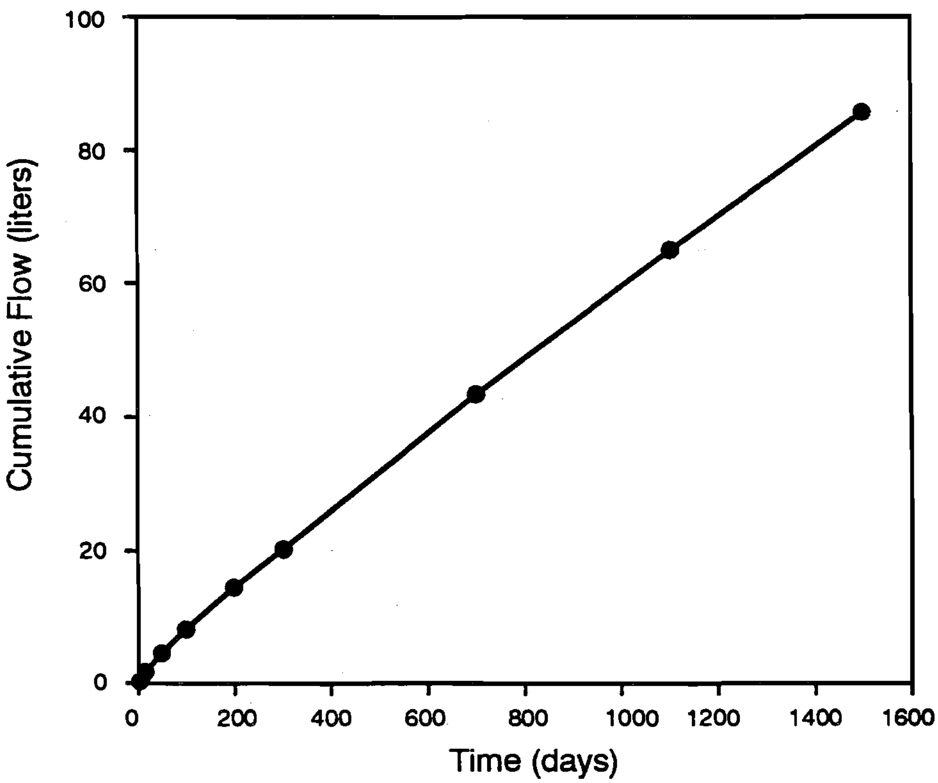


Figure 4-5
Cumulative Flow Versus Time for the BISCITS Model for a 7.6-cm-Diameter Drill Hole for Far-Field Flow

301601.09/tg A40

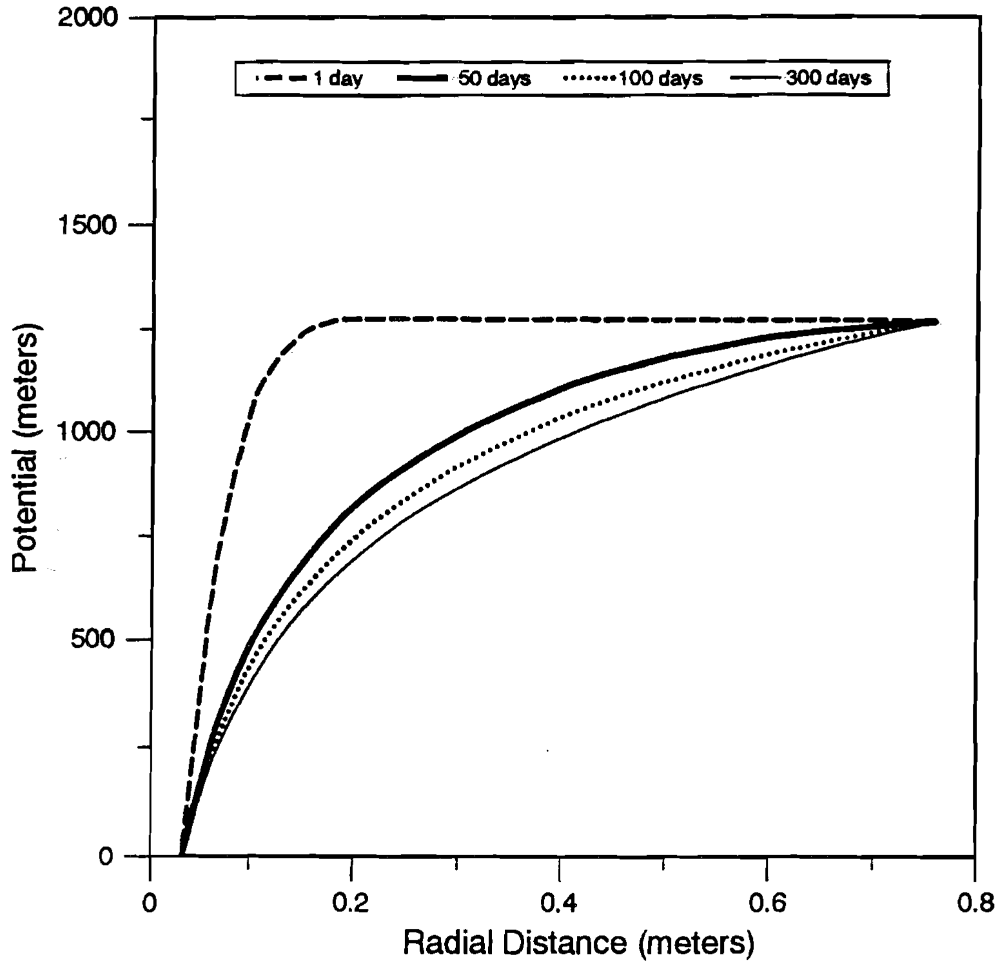


Figure 4-6
Potential Distribution for the Far-Field, High-Intrinsic Permeability (1 nanodarcy, $10^{-21}m^2$), Finite-Difference Model for a 7.6-cm-Diameter Drill Hole

301601.09/tg A41

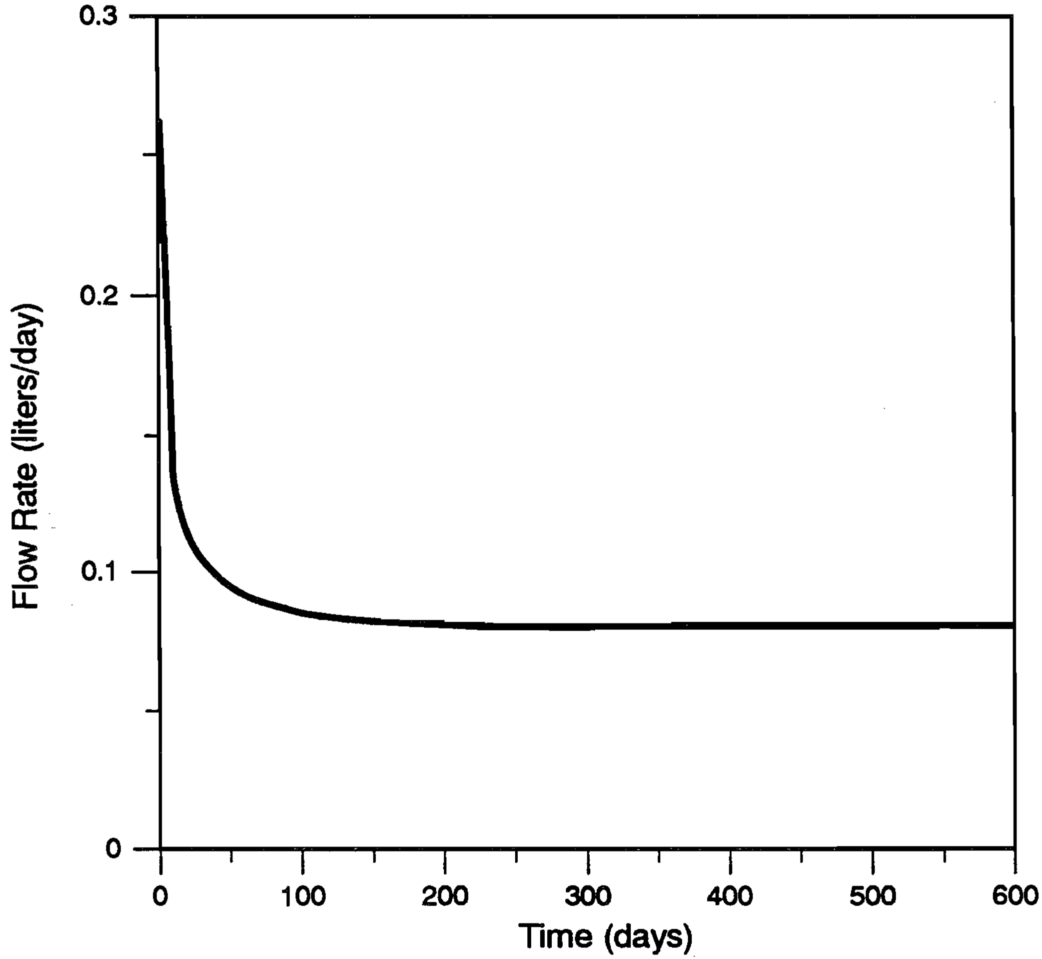


Figure 4-7
Flow Rate Versus Time for the Far-Field, High-Intrinsic Permeability (1 nanodarcy, $10^{-21} m^2$), Finite-Difference Model for a 7.6-cm-Diameter Drill Hole

301601.09/fg A42

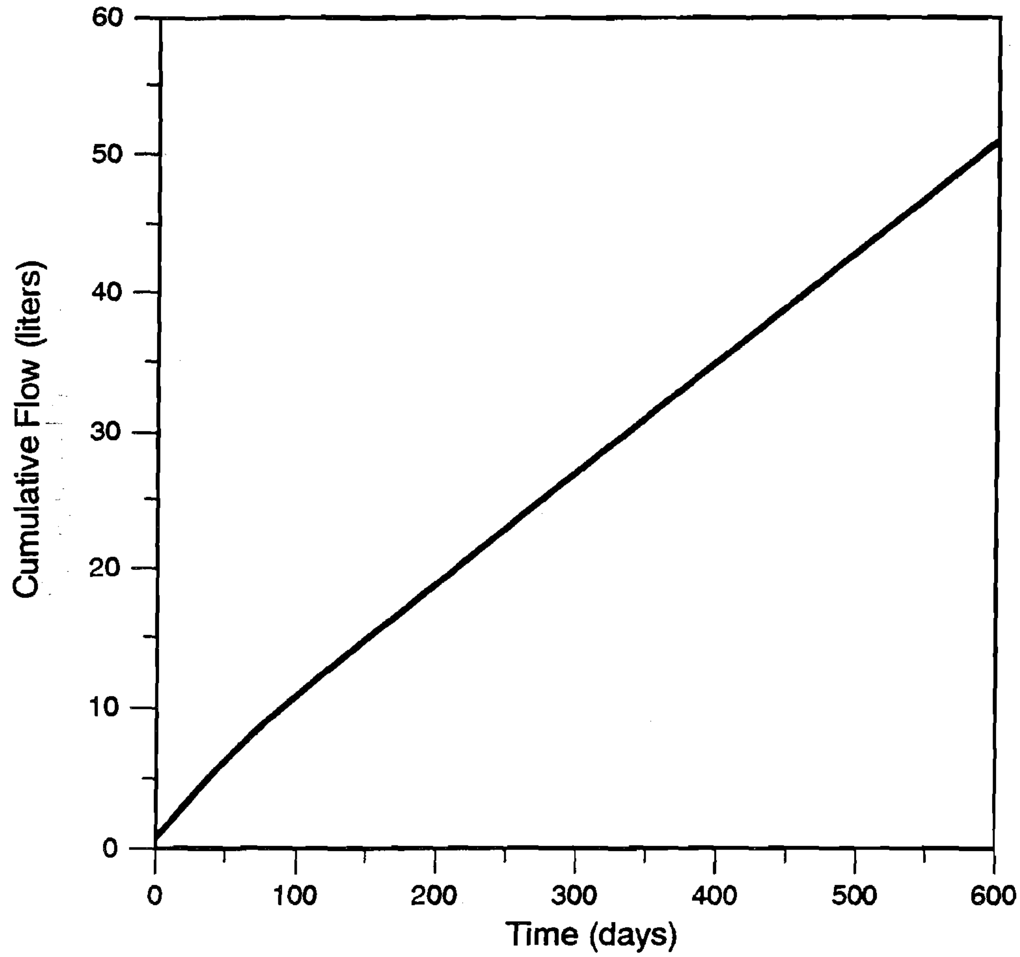


Figure 4-8
Cumulative Flow Versus Time for the Far-Field, High-Intrinsic Permeability (1 nanodarcy, $10^{-21} m^2$), Finite-Difference Model for a 7.6-cm-Diameter Drill Hole

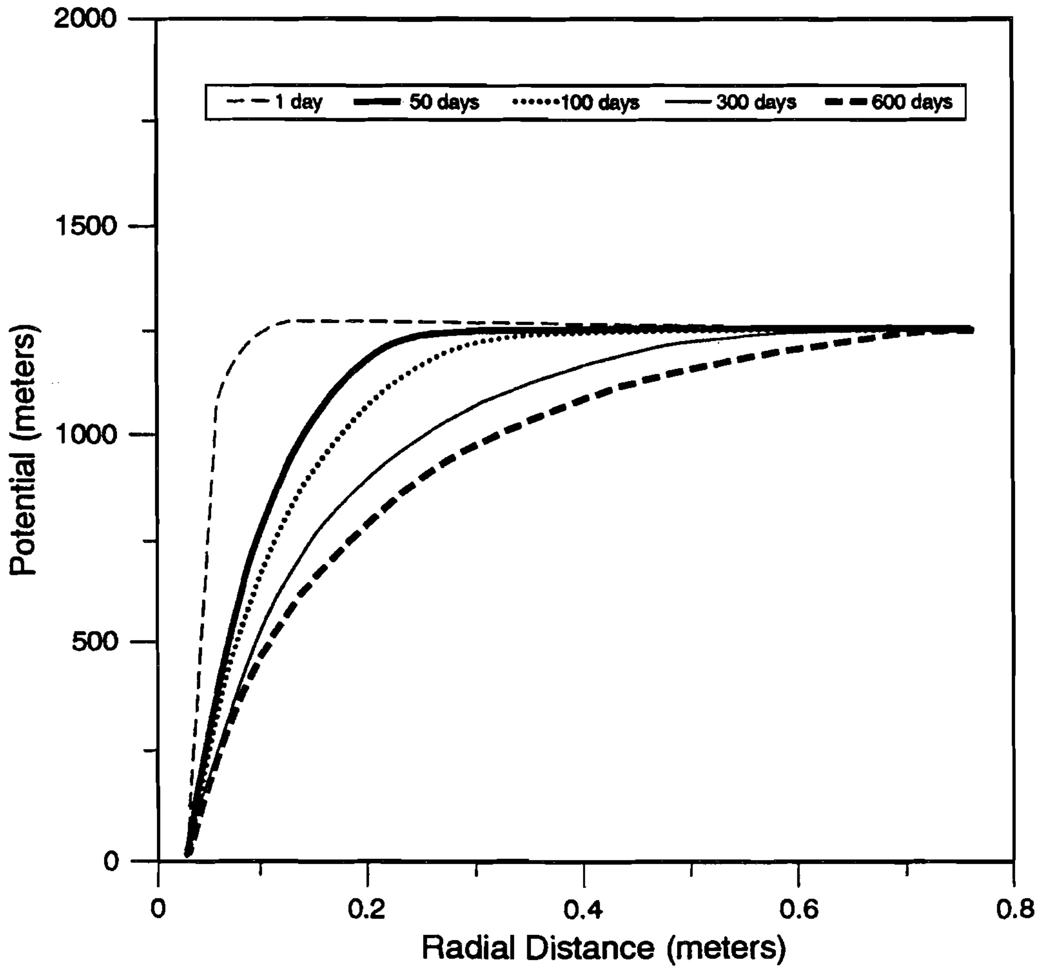


Figure 4-9
Potential Distribution for the Far-Field, Low-Intrinsic Permeability (0.1 nanodarcy, $10^{-22}m^2$), Finite-Difference Model for a 7.6-cm-Diameter Drill Hole

301601.09/1g A38

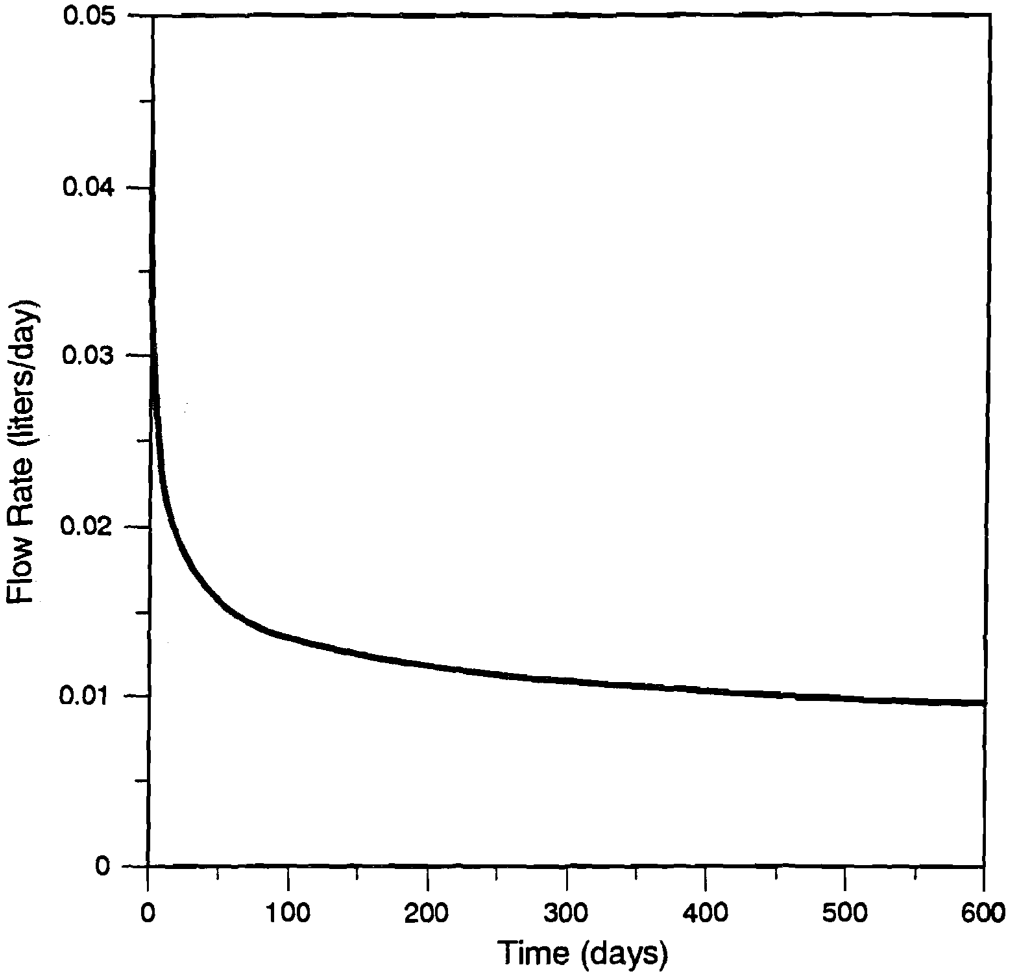


Figure 4-10
Flow Rate Versus Time for the Far-Field, Low Intrinsic Permeability (0.1 nanodarcy, $10^{-22}m^2$) Finite-Difference Model for a 7.6-cm-Diameter Drill Hole

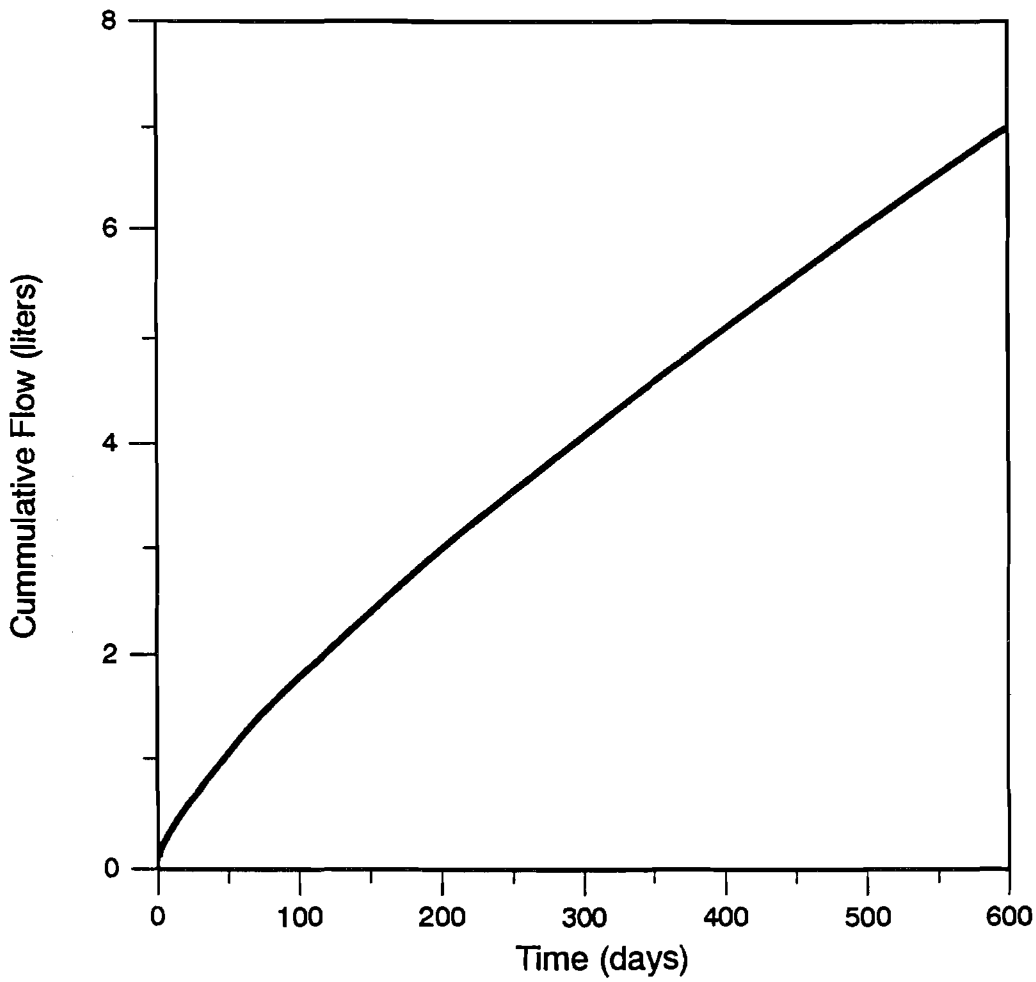


Figure 4-11
Cumulative Rate Versus Time for the Far-Field, Low-Intrinsic Permeablity (0.1 nanodarcy,$10^{-22}m^2$), Finite-Difference Model for a 7.6-cm-Diameter Drill Hole

The results of the near-field model for two intrinsic permeabilities (1 nanodarcy and 0.1 nanodarcy) are presented in Figures 4-12 through 4-17 as the radial hydraulic potential distribution, flow rate versus time, and cumulative flow versus time, respectively. For the higher intrinsic permeability (1 nanodarcy), there is a rapid depressurization of the DRZ in about 150 days with about 6 L of brine released. For the lower intrinsic permeability (0.1 nanodarcy), the depressurization occurs less rapidly, and the flow rates are still decreasing after 600 days (Figure 4-16). The lower the intrinsic permeability, the more slowly the brine will be released but the total amount of brine will be the same (5 L; Figures 4-14 and 4-17).

In comparing the near-field versus far-field models, there is little difference in flow rates for a period of 50 to 150 days; thereafter, the inflow rates are smaller for the near-field models, as expected. Previous analyses indicated that tens of years would be required for a room-scale (Room Q) or shaft-scale excavation to show a distinction between near- and far-field effects. This suggests the utility of smaller drill hole scale experiments to address the far-field flow versus near-field flow question. The selection of a lower intrinsic permeability is consistent with discussions made by Lappin (1988) and Lappin and others (1989) on salt permeability measurements and on the permeability data for the clear halite at the WIPP, which is immeasurably low (see the discussion in Section 2.3).

However, the current model provides a crude estimate of the extent of the DRZ around a drill hole. A larger DRZ would result in a proportionately greater amount of brine release due to depressurization (Figure 4-17). The following discussion evaluates variation in the size (radius) of the DRZ.

4.6 Release of Brine from the DRZ Due to Depressurization

Several processes may be contributing to the flow of brine into the excavation. These processes include:

- Expansion of the brine as it experiences a decrease in pressure. This process will tend to push brine into the excavation and is controlled by brine compressibility.
- Exsolution of dissolved gases as the brine experiences a decrease in pressure. This process will provide an extra gas drive that will tend to push brine into the excavation and is controlled by the amount of dissolved gases in the brine.

301601.08/tg A19

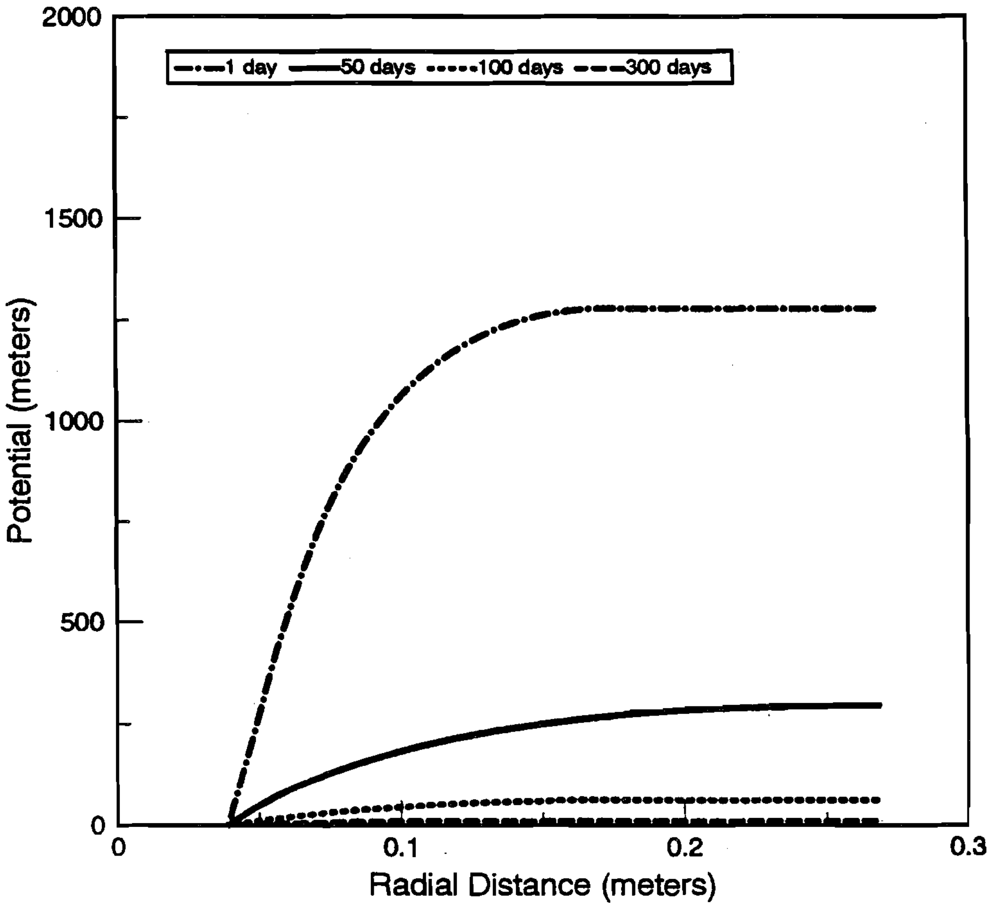


Figure 4-12
Potential Distribution for the Near-Field, High-Intrinsic Permeability (1 nanodarcy, $10^{-21}m^2$), Finite-Difference Model for a 7.6-cm-Diameter Drill Hole

301601.09/tg A20

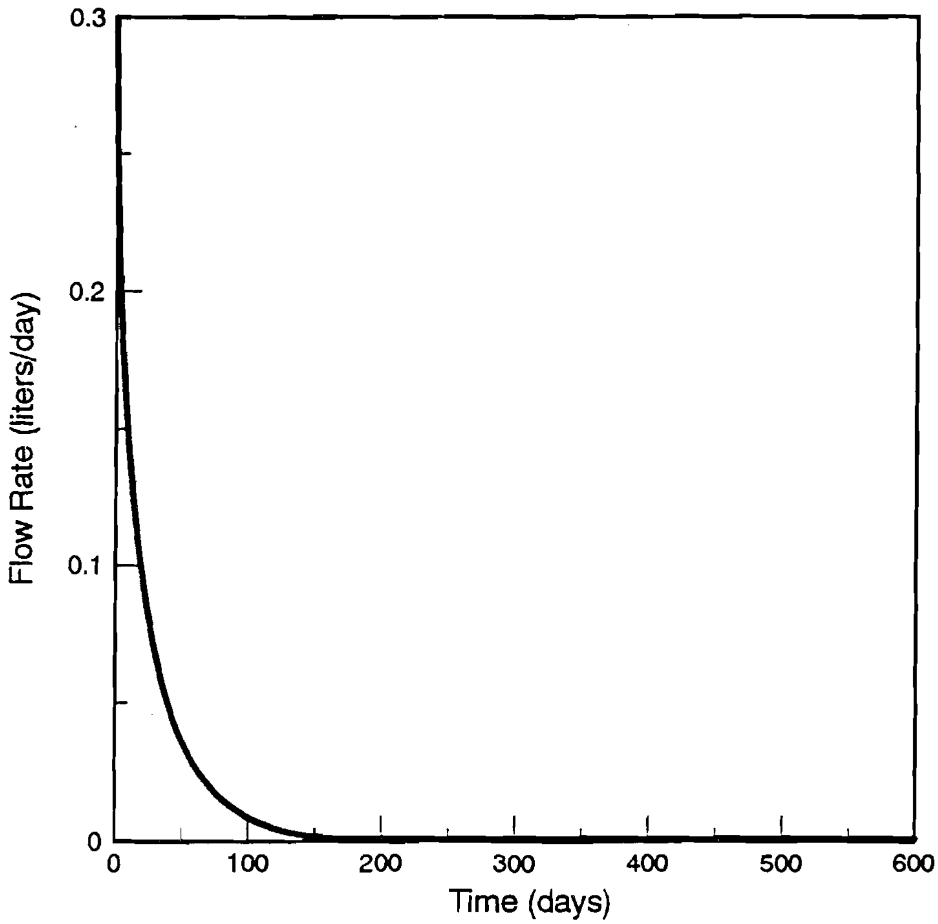


Figure 4-13
Flow Rate Versus Time for the Near-Field, High-Intrinsic Permeability (1 nanodarcy, $10^{-21}m^2$), Finite-Difference Model for a 7.6-cm-Diameter Drill Hole

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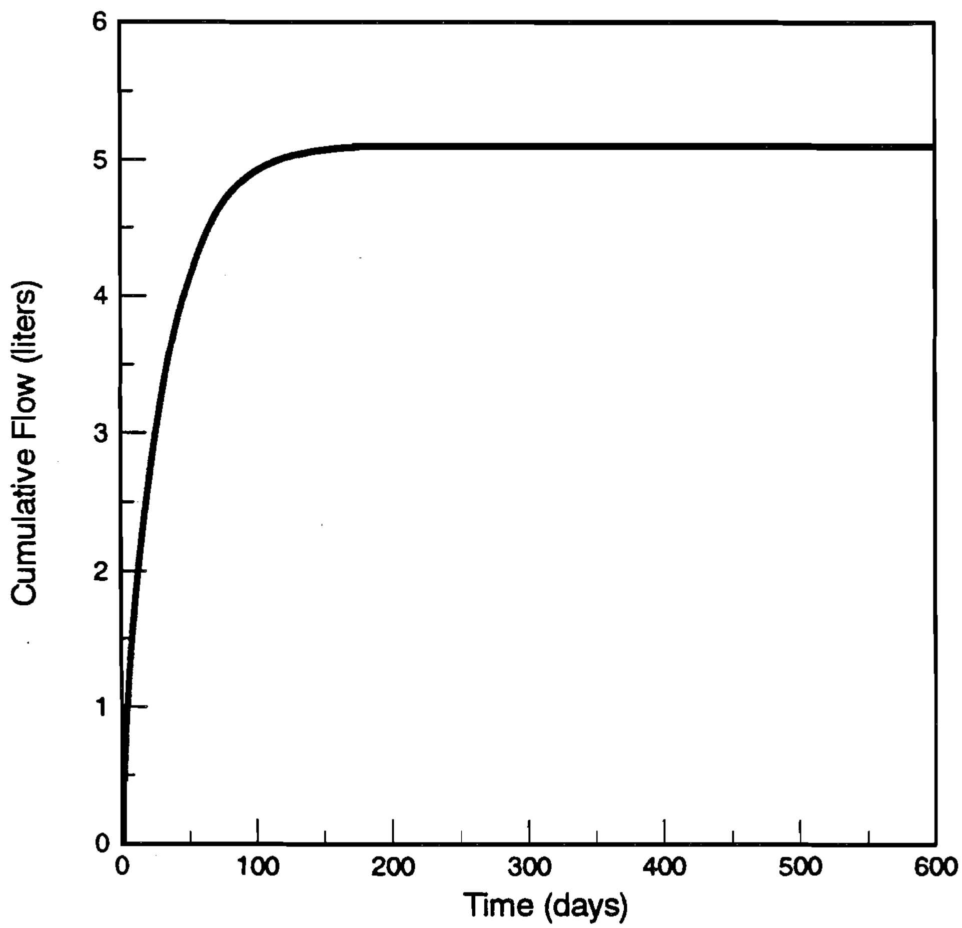

Figure 4-14
Cumulative Flow Versus Time for the Near-Field, High-Intrinsic Permeability (1 nanodarcy, 10^{-21} m^2), Finite-Difference Model for a 7.6-cm-Diameter Drill Hole

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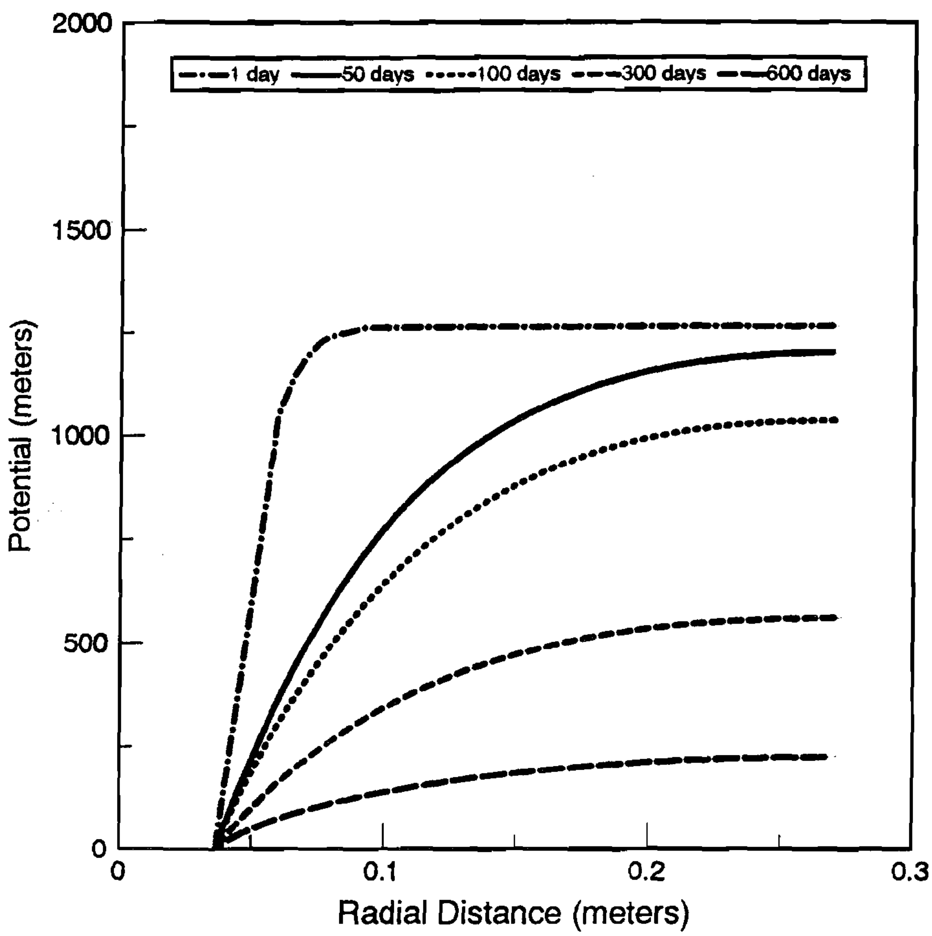

Figure 4-15
Potential Distribution for the Near-Field, Low-Intrinsic Permeability (0.1 nanodarcy, $10^{-22}m^2$), Finite-Difference Model for a 7.6-cm-Diameter Drill Hole

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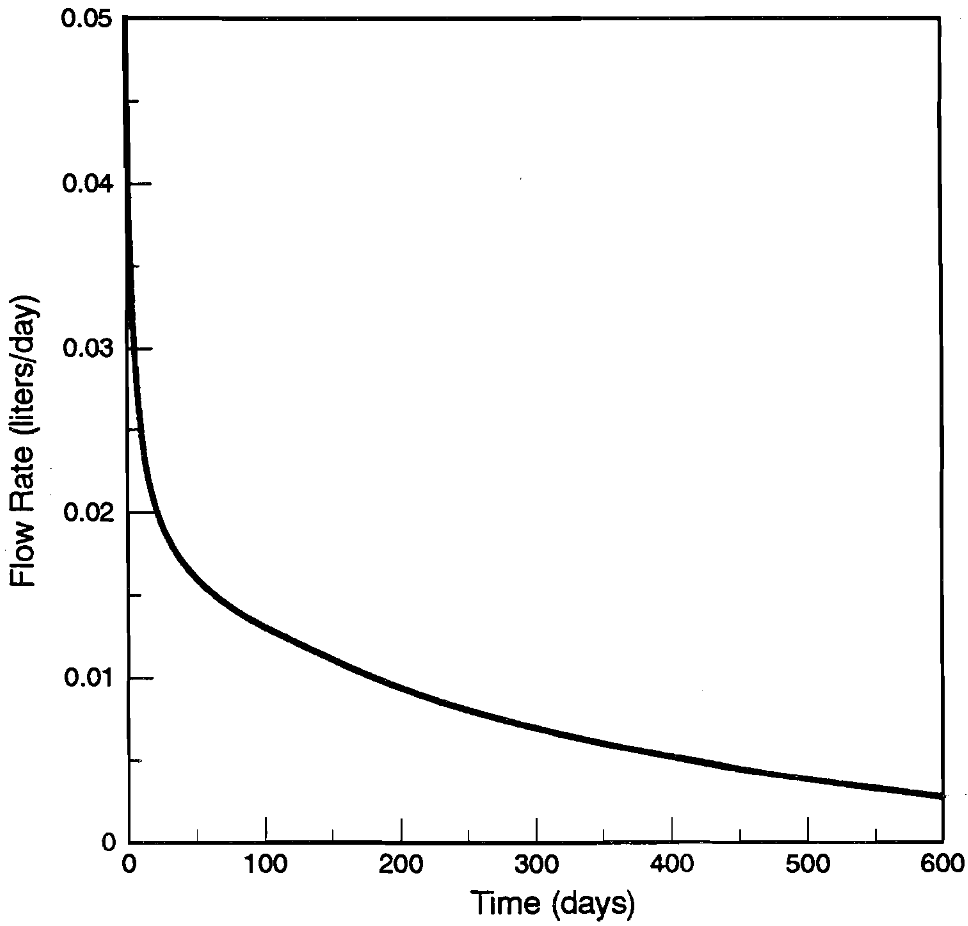

Figure 4-16
Flow Rate Versus Time for the Near-Field, Low-Intrinsic Permeability (0.1 nanodarcy, $10^{-22}m^2$), Finite-Difference Model for a 7.6-cm-Diameter Drill Hole

301601.09/tg A24

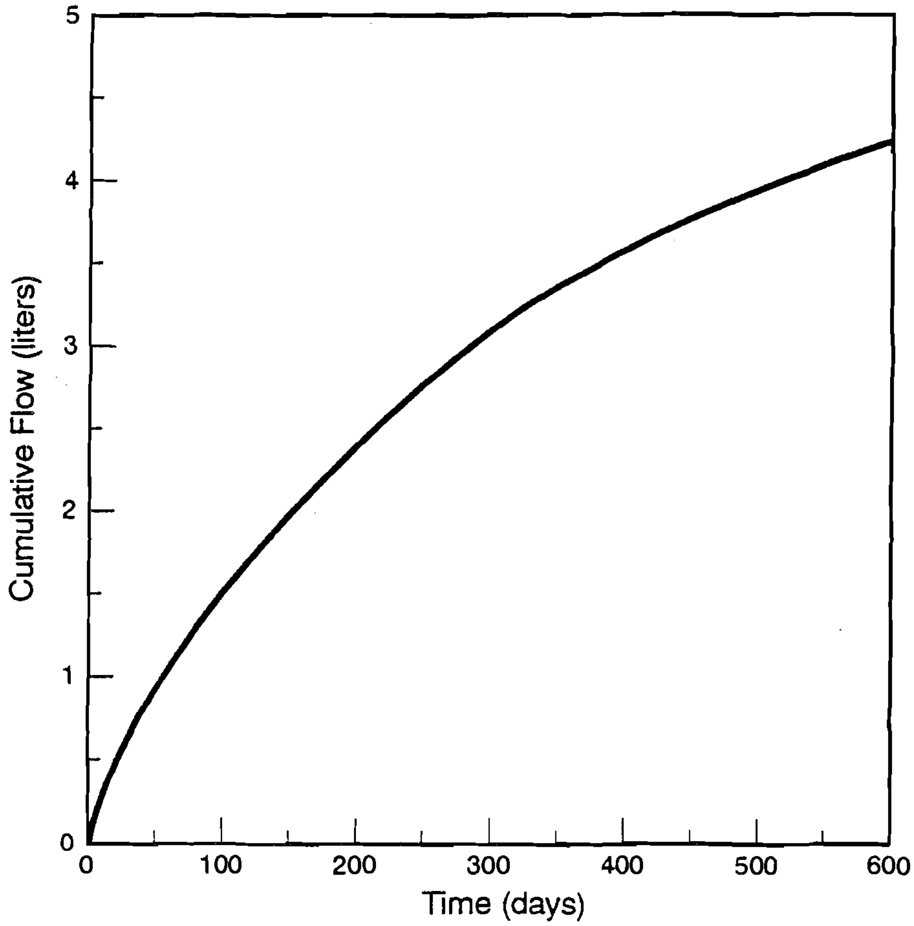

Figure 4-17
Cumulative Flow Versus Time for the Near-Field, Low-Intrinsic Permeability (0.1 nanodarcy, $10^{-22} m^2$), Finite-Difference Model for a 7.6-cm-Diameter Drill Hole

- Development of enhanced porosity within the DRZ. If the porosity increases at a greater rate than the rate at which the brine can fill the voids, then brine will tend to stay within the DRZ and flow into the excavation will be inhibited.

Assuming that expansion of brine is the dominant driving force for flow into the excavation, the amount of brine released from a homogeneous DRZ for various size DRZs may be calculated by applying the relationship (Freeze and Cherry, 1979):

$$\frac{\Delta V}{V_o} = \rho\, g\, (\alpha + \phi \beta)\, \Delta h$$

where

ΔV = Change in fluid volume
V_o = Rock volume of the DRZ
ρ = Fluid mass density
g = Gravitational acceleration
α = Solid compressibility
ϕ = Porosity
β = Fluid compressibility
Δh = Change in potential.

The above relationship predicts the total amount of brine to be released from a given DRZ, assuming no contribution from the far-field, without regard to the depressurization rate. The depressurization rate depends on the flow rate, which in turn depends on permeability (see previous section), but the cumulative amount of brine released due to depressurization is independent of flow rate. After depressurization is essentially complete, brine may flow downward under gravity drive and accumulate below the floor of the drill hole or drift. The above relationship provides an approximate value for the volume of brine released to a drill hole at WIPP, assuming a homogeneous medium with the specified compressibility properties and that those properties apply for the entire length of the drill hole.

The volume of the DRZ varies with excavation size. For a 7.6-cm-diameter drill hole, the VISCOT analysis predicts that the DRZ is essentially mature after about 1,100 days at a radius of 0.27 m (Figure 4-3). From Figure 4-18, a 0.27-m DRZ along a length of 46 m will release about 10 L of brine. For a 3.6-m-diameter shaft (or Room Q), the previous VISCOT analysis predicts that the DRZ would mature at a radius of about 12 m after 1,000 days (Deal and others, 1989, Figure 5-7). From Figure 4-19, a 12-m DRZ along a length of 91.4 m (300 ft) will release about 30,000 L of brine. An equivalent 46-m segment would therefore release about 15,000 L of brine.

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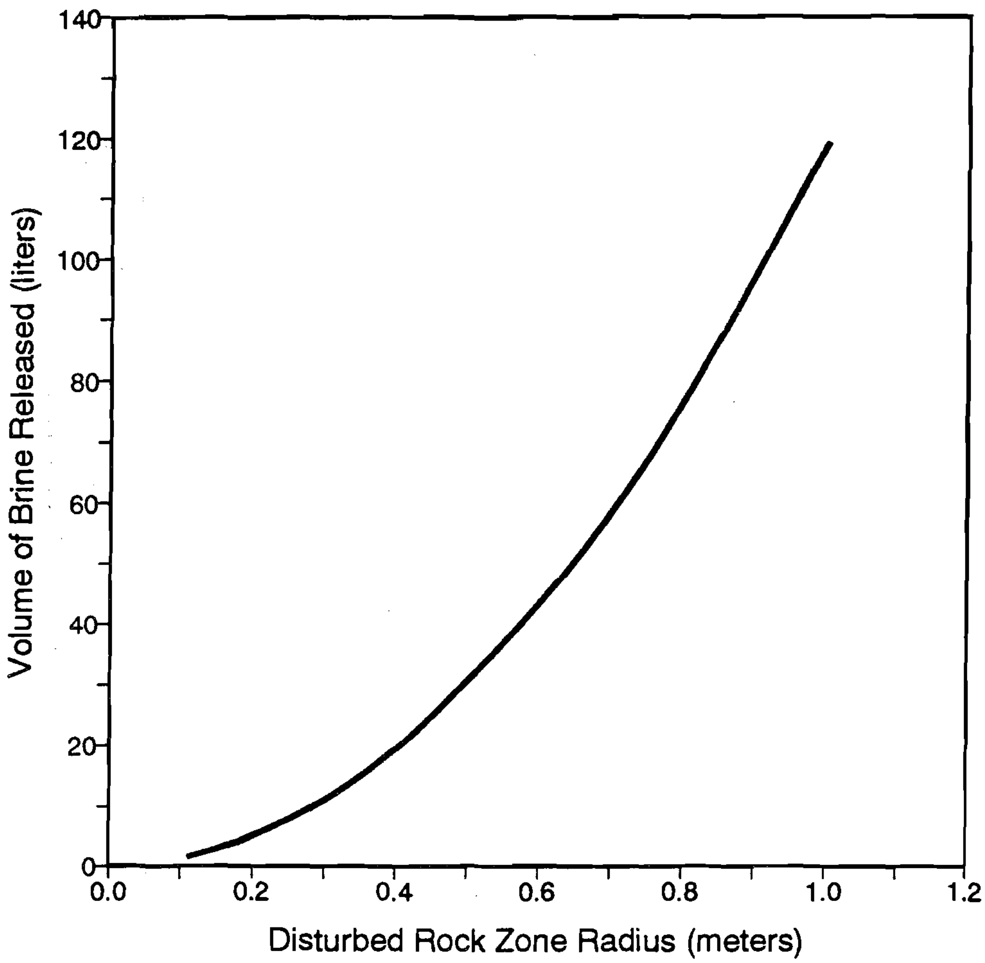

Figure 4-18
Volume of Brine Released from the DRZ for a Borehole-Sized Excavation 46 m Long

301601.09/tg A26

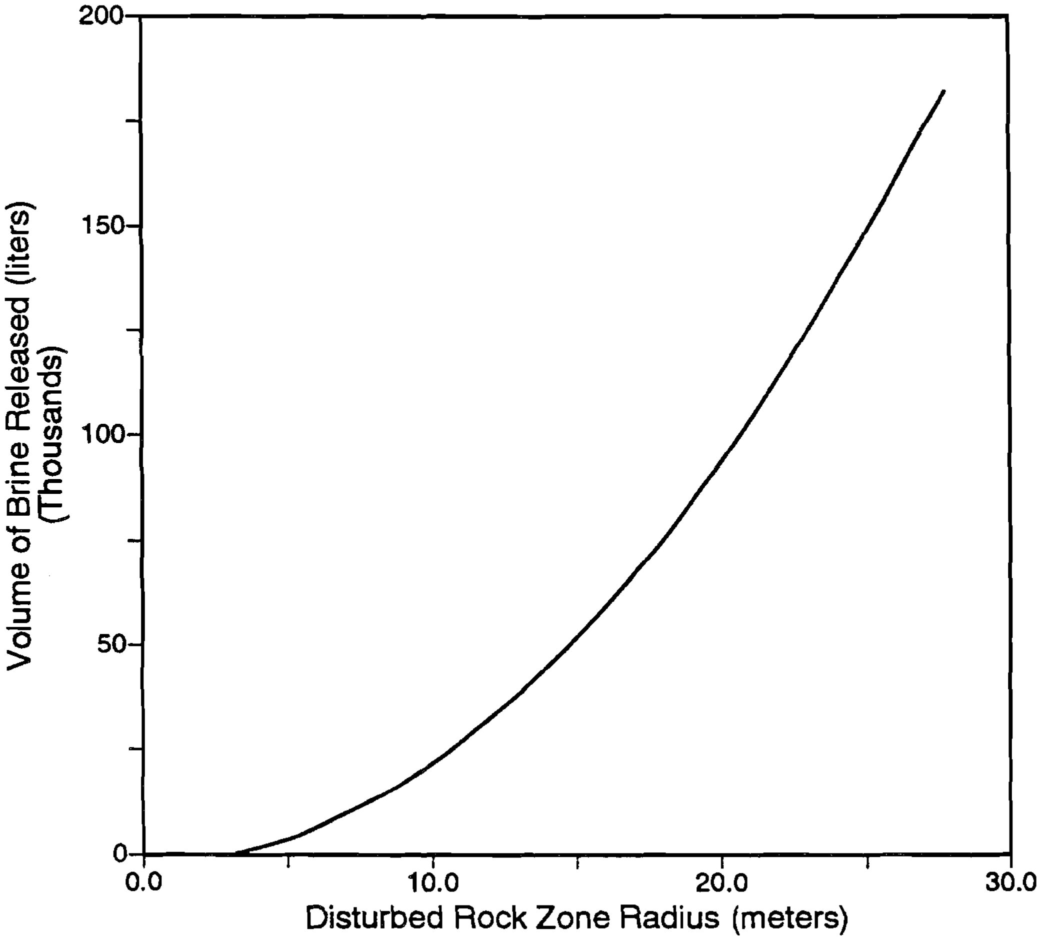

Figure 4-19
Volume of Brine Released from the DRZ for a Shaft-Sized or a Room-Sized Excavation 91.4 m(300 ft.) Long

For a WIPP waste storage room with a 4-m-high by 10-m-wide rectangular cross section, the equivalent radius is about 5.4 m. If the DRZ is five times the radius of the excavation, the DRZ around a typical waste storage room would have a radius of about 27 m and a length of 91.4 m (300 ft). From Figure 4-19, a 27-m DRZ will release about 150,000 L of brine.

The WIPP EATF postulated that the corrosion of iron, steel, and aluminum alloys requires and consumes brine and if sufficient brine is present, represents a potential source of gas in the repository after closure (DOE, 1991). An analysis was performed for this report (Myers, 1991) of the amount of brine necessary to corrode all of the iron, steel, and aluminum alloys in the drums and waste to be stored in a typical WIPP waste storage room. Assuming that amakinite ($Fe[OH]_2$) is the corrosion product, approximately 220,000 L of brine will be necessary to completely corrode all of the susceptible metal emplaced in each waste storage room.

The analysis presented above suggests that there may be insufficient brine to corrode all the susceptible metal in the storage rooms or, more specifically, that the available brine limits corrosion, which in turn limits hydrogen product. The EATF analysis (DOE, 1991) shows that the rate-controlling factor for the generation of hydrogen is the availability of the brine, not the rate of the corrosion reaction. This means that the brine is consumed as soon as it contacts the metal and gas pressures build up, further reducing brine seepage.

4.7 Comparison of Predicted Seepage and Field Observations

The modeling was initiated in 1987 (Deal and others, 1989) and extended to consider long drill holes in the fall of 1989, when the long drill holes were drilled. Much has been learned since 1987 about the occurrence of brine in the Salado salt and the possible mechanisms that might be driving brine seepage at the WIPP. As a result, some of the assumptions that underlie the modeling may be less appropriate than originally thought. Those assumptions include:

- Flow may be constrained to a relatively few, fairly discrete, bedding planes and radial flow in a vertical plane toward an excavation or drill hole may not occur (Sections 2.3, 2.8, and 4.1).

- Brine preferentially occurs in the more argillaceous beds and is not uniformly distributed throughout the salt (Deal and others, 1989).

- The undisturbed porosity of the salt is much greater than initially thought (Section 4.2.3).
- The overall permeability of the Salado Formation may be much lower than initially thought (Lappin, 1988; Lappin and others, 1989).
- The permeability of the Salado Formation varies significantly from unit to unit, and the clear halite units may have no measurable intrinsic permeability (Beauheim and Holt, 1990; Beauheim and Howarth, 1991).
- The pore spaces in some of the units may be so small that surface tension forces become significant and Darcy's Law may have to be applied in a modified form (Deal and others, 1989, Figure J-2) or may not hold at all.
- Some previously unsuspected flow mechanism may be acting, such as compaction in the pillars driving brine out of the clays (Deal and Roggenthen, 1991).

One of the more important questions in assessing the brine seepage into the WIPP is to determine what, if any, is the component of brine from the far-field. Two sets of calculations were made using a finite-difference model (refer to Section 4.3). One set of calculations considered far-field flow only (Figures 4-6 through 4-11), and the other set considered near-field flow only (Figure 4-12 through 4-17). For each case, two different permeabilities were selected, a higher intrinsic permeability (1.0 nanodarcy, 10^{-21} m^2) and a lower intrinsic permeability (0.1 nanodarcy, 10^{-22} m^2).

For far-field flow only, a steady-state inflow rate is eventually reached. This can be seen as a constant inflow rate on the graphs of flow rate versus time (Figure 4-7 and 4-10) and as a uniform slope on the cumulative brine inflow graphs (Figure 4-8 and 4-11). The effect of changing the permeability an order of magnitude is to change the steady-state flow rate an order of magnitude; from 0.1 L per day for the higher intrinsic permeability to 0.01 L per day for the lower intrinsic permeability.

For near-field flow only, brine inflow would eventually cease entirely. The same total amount of brine (about 5 L) is produced from the DRZ (refer to Section 4.5), as shown in Figures 4-14 and 4-17, which is probably too low a value. Using a more accurate method (Section 4.6), the predicted value is about 10 L. The higher the permeability, the quicker the DRZ drains. For the higher permeability, inflow ceases after about 200 days (Figure 4-13), while for the lower permeability, flow is still occurring after 600 days (Figure 4-16).

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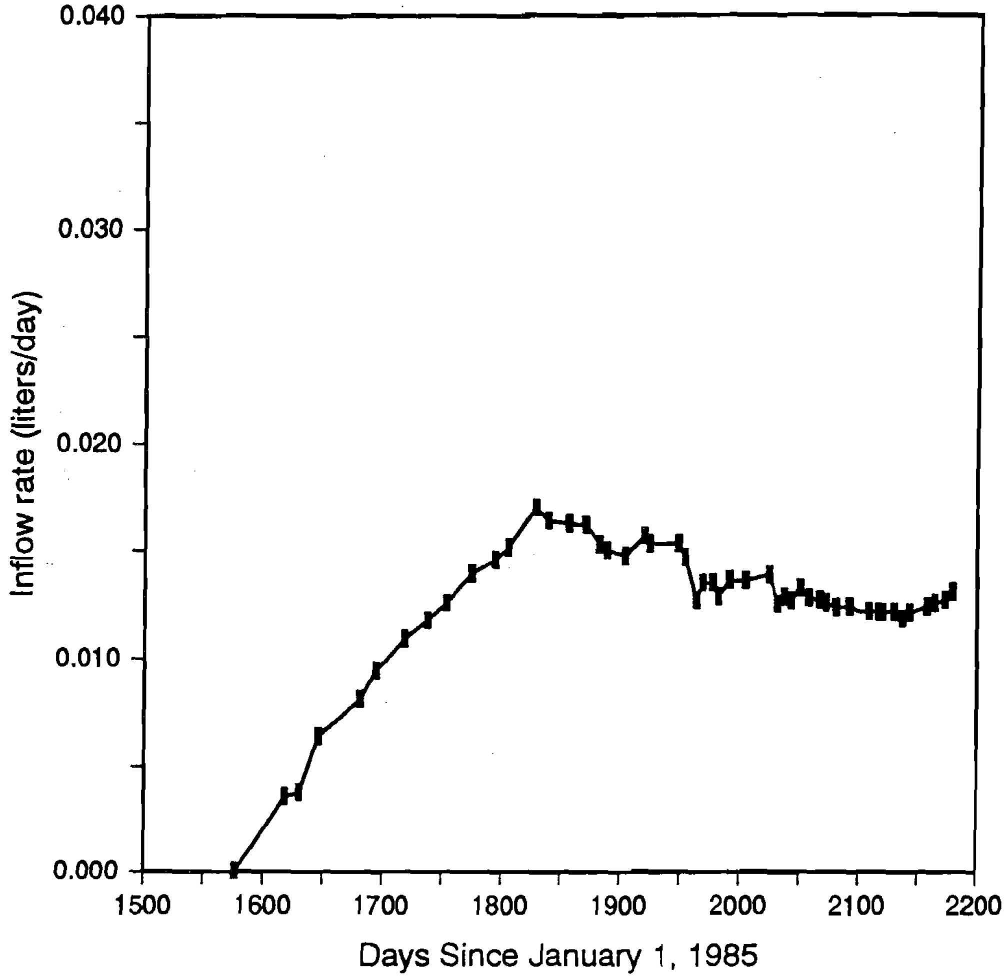

Figure 4-20
Horizontal Drill Hole OH20
Brine Inflow Rate
Simple 11-Point Moving Average

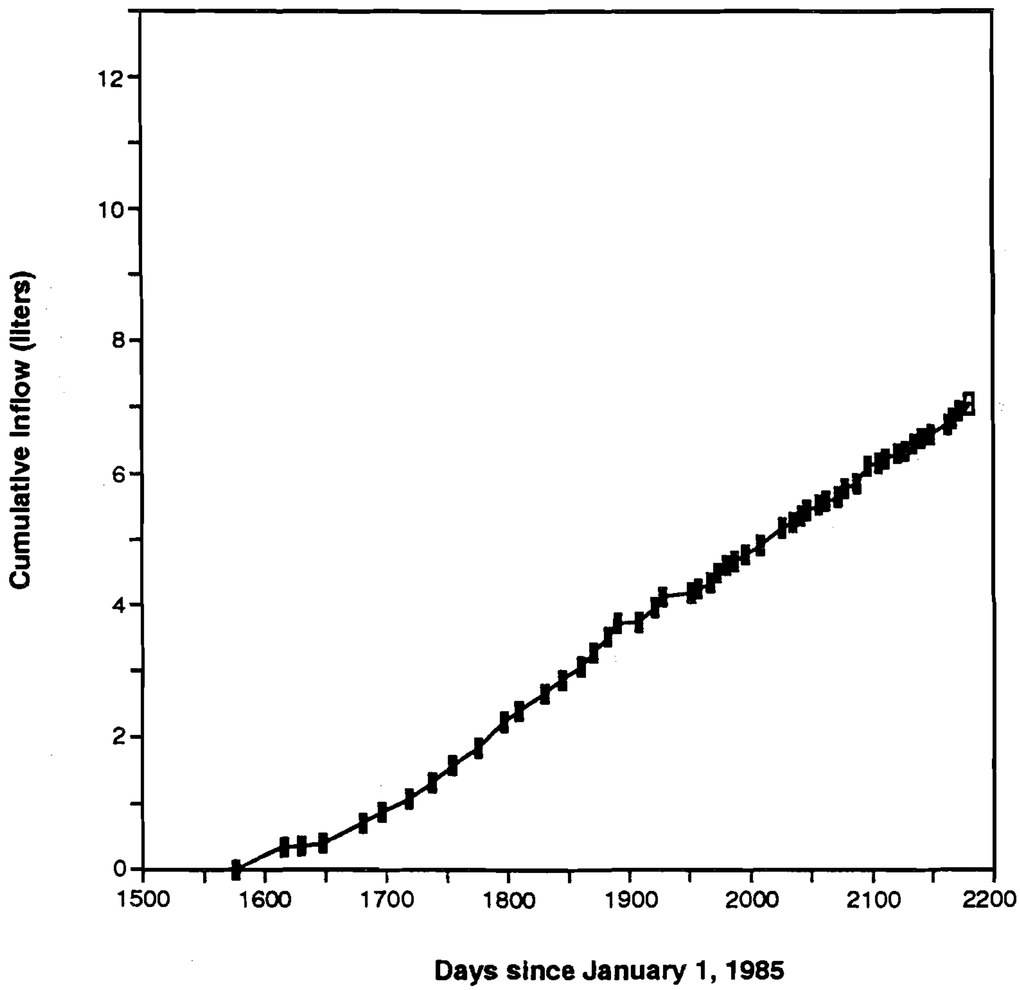

Figure 4-21
Horizontal Drill Hole OH20
Cumulative Brine Inflow

301601.09/ld A36

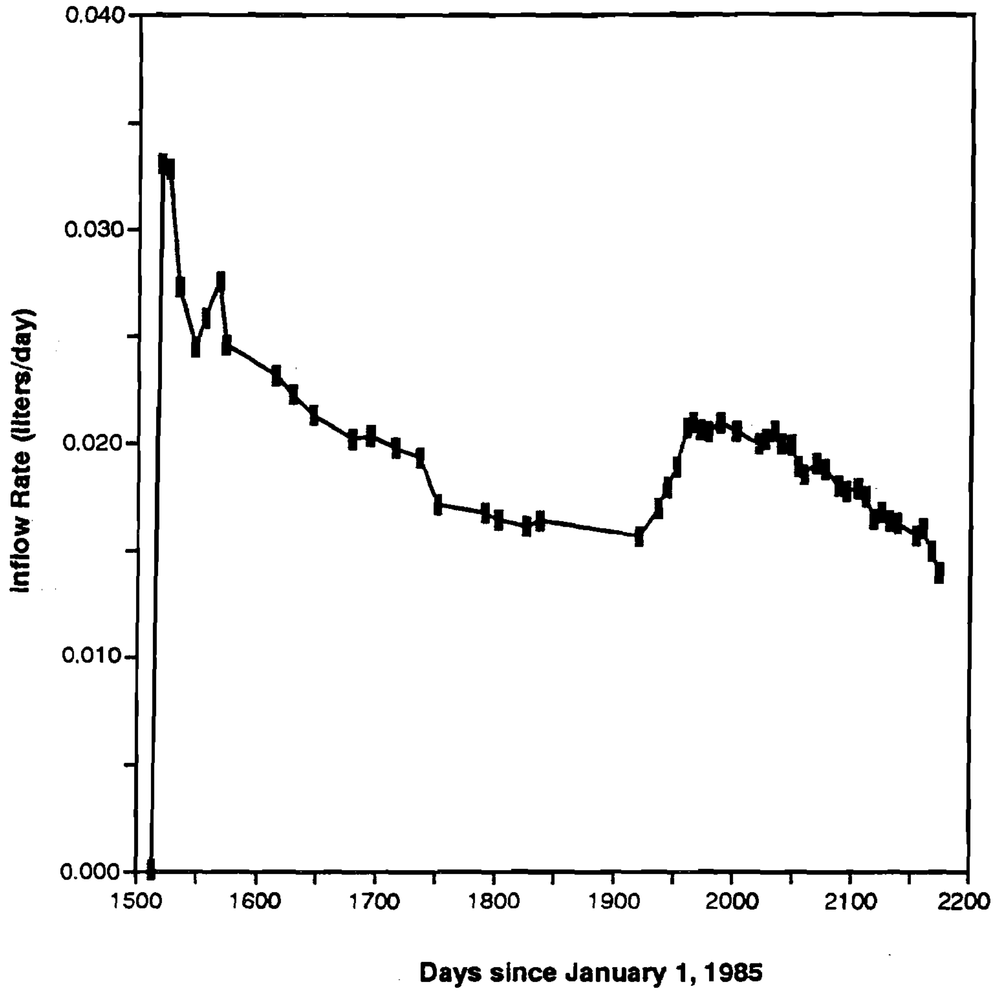

Figure 4-22
Horizontal Drill Hole OH23
Brine Inflow Rate
Simple 11-Point Moving Average

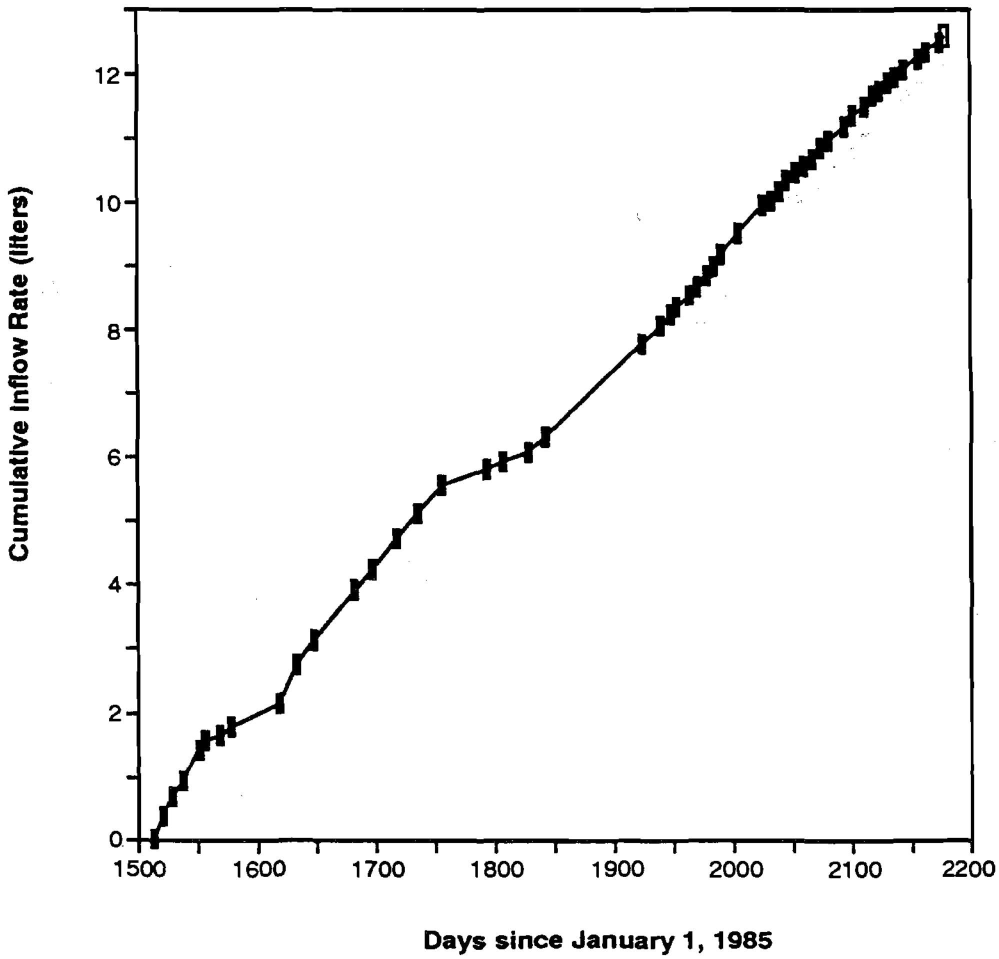

Figure 4-23
Horizontal Drill Hole OH23
Cumulative Brine Inflow

301601.09/fd A33

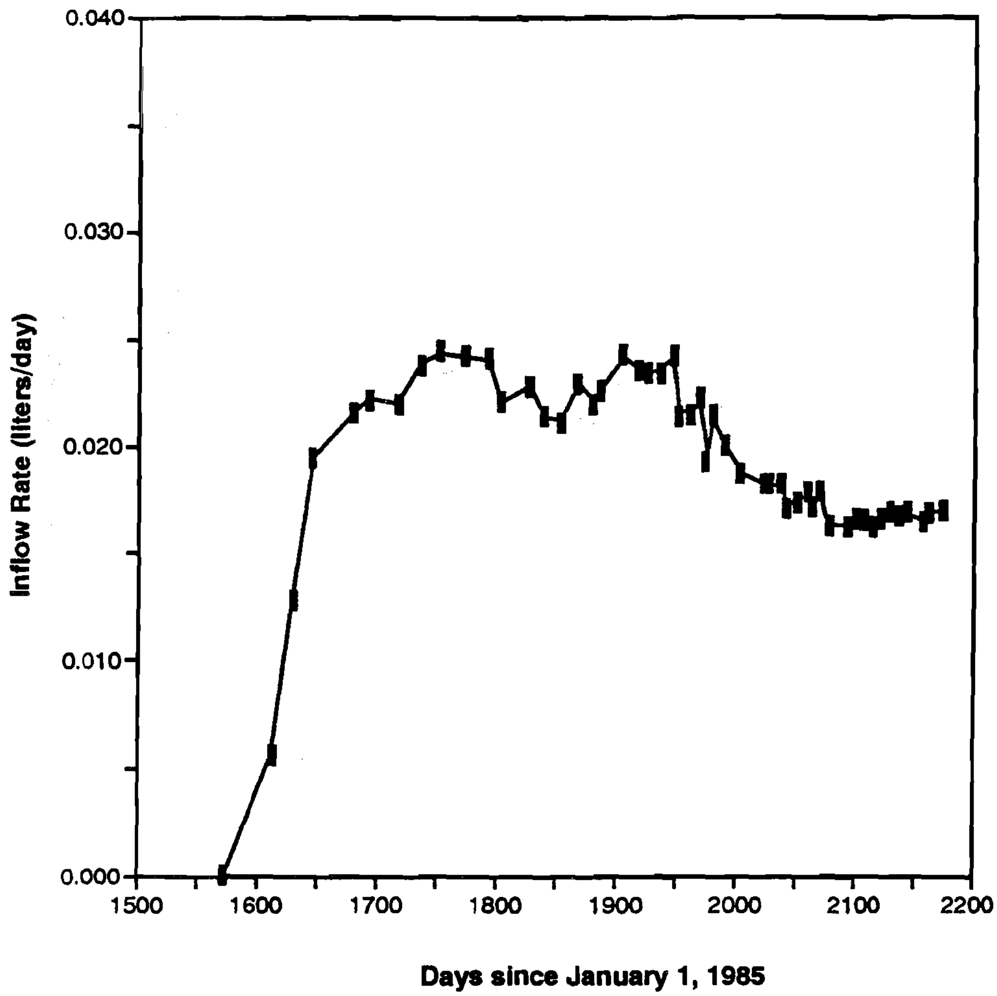

Figure 4-24
Horizontal Drill Hole OH26
Brine Inflow Rate
Simple 11-Point Moving Average

301601.09/fd A34

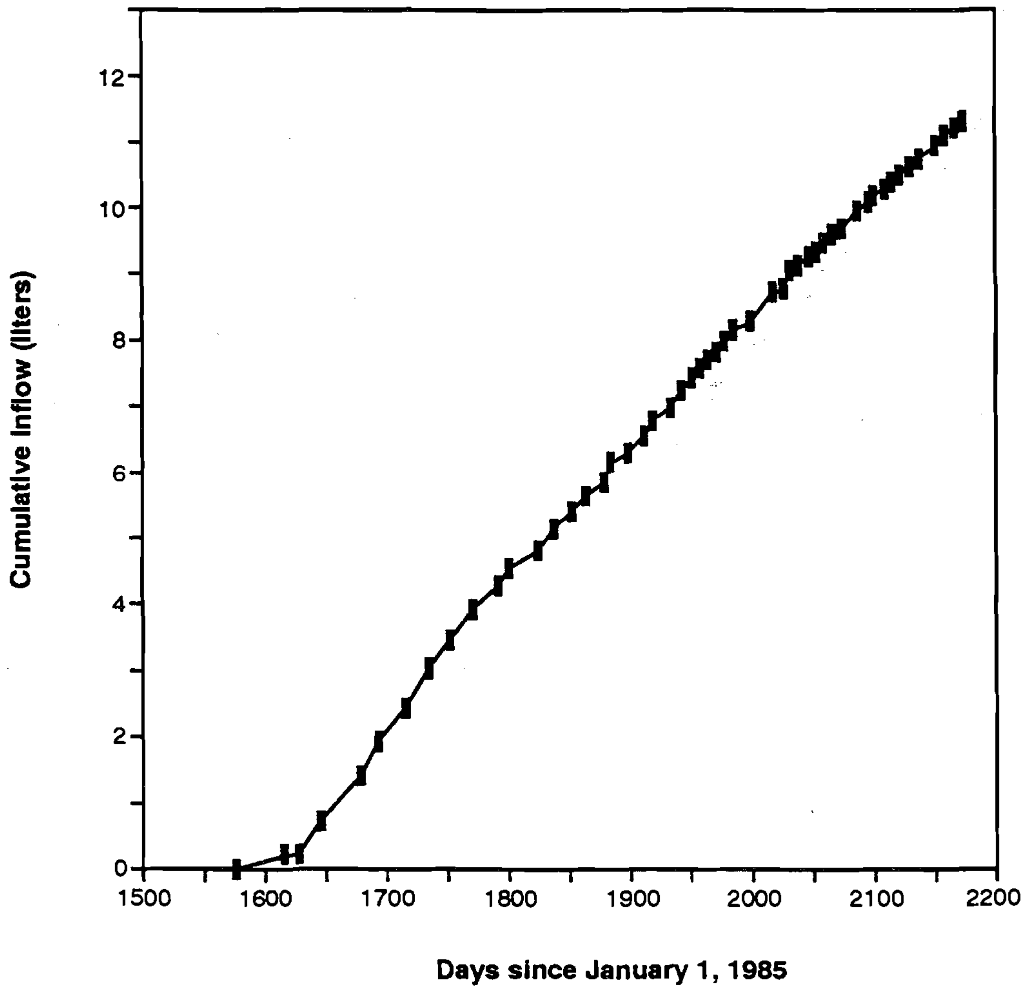

Figure 4-25
Horizontal Drill Hole OH26
Cumulative Brine Inflow

Inflow data for the three 46-m drill holes are presented in Appendices A and B. Inflow rate versus time and cumulative brine inflow are shown on an enlarged scale for OH20 (Figures 4-20 and 4-21), OH23 (Figures 4-22 and 4-23), and OH26 (Figures 4-24 and 4-25). Data span more than 600 days but remain inconclusive. The irregularity shown between day 1,753 and 1,925 on the graphs of OH23 (anomalously low values on Figures 4-22 and 4-23) are the result of incomplete brine collection followed by collection of the residual brine that remained in the hole (refer to OH23 data in Appendix A).

It is clear that inflow is not dropping off as rapidly as predicted by the modeling, even in the case of near-field flow only at the lower permeability (Figure 4-16), and that the total volume of brine is greater than expected for near-field flow only. It is possible that even the lowest permeability value used in the modeling is still too high to reasonably represent the conditions at the WIPP. In addition to the fact that the flow mechanisms are more complicated than initially expected, these holes angle downward through several stratigraphic units and the geological complications discussed in Section 2.9 undoubtedly affect the data. Realistically, seepage into the holes may be restricted to only that length of the hole that intersects the orange marker and the thin clay layers above and below it. This thin unit may be more compressible and porous than the values that were used in modeling.

Data will continue to be collected from these locations as a routine part of the BSEP. If there is a far-field component to the brine seepage, then the inflow to these holes should eventually reach steady-state. If there is no far-field component, then seepage should eventually cease. Additional observation holes have been proposed to resolve some of the remaining uncertainties and to consider various relevant aspects separately (Appendix E).

4.8 Conclusions

Several models have been developed for evaluating brine seepage into long subhorizontal drill holes to provide assistance in interpreting brine flow mechanisms. The measurements from the three 46-m subhorizontal drill holes provide the most uniform and comparable set of measurements yet obtained in the BSEP. The VISCOT modeling results suggest a DRZ extending several tenths of a meter from the drill hole, with only slight increases in porosity and permeability. The BISCITS and simple finite-difference modeling results suggest that flow occurs from the near-field over a period of about 50 to 150 days, after which flow is dominant from the far-field. The estimated time period necessary to distinguish between far-field only and near-field only flow is of the order of years at the drill hole scale rather than tens of years at the room scale.

Since a period of about 600 days has elapsed and flow rates are becoming relatively constant, comparisons between predicted and measured flow rates suggest that the far-field model with a lower permeability may be appropriate. It is premature to conclude this, however, as the extent of the DRZ is estimated, and a larger DRZ would require a greater amount of time before flow was dominant from the far field. It is also possible that even the lowest permeability value used in the modeling is too high to reasonably represent the conditions at the WIPP. Using a lower permeability value would result in lower inflow rates and a longer time needed to distinguish between far-field and near-field flow. Additionally, there are enough concerns about the appropriateness of some of the modeling assumptions, so that the observed discrepancies between the observed data and the modeling predictions may fall within the modeling error. As better data become available from ongoing experiments at the WIPP, the modeling predictions will become more accurate.

5.0 Summary and Conclusions

After more than eight years of observations (1982–1990), no credible evidence exists to indicate that enough naturally occurring brine will seep into the WIPP excavations to be of practical concern. The detailed observations and analyses summarized herein and in previous BSEP reports confirm the evidence apparent during casual visits to the underground workings—that the excavations are remarkably dry.

5.1 Brine Observations

There are traces of brine within the host rock that seep into new excavations, but all evidence indicates that such seeps are most active in the first year or two after excavation of a new opening (refer to Section 2.2). After the drifts and rooms have been open for a few years, very little brine, if any, continues to seep into them. Most of the brine on the surfaces is evaporated into the air circulated for ventilation. This fact is documented by the lack of evidence of significant moisture in the south exploratory drift (refer to Section 2.6), the cessation of both brine weeps and growth of salt encrustations on vertical surfaces (refer to Sections 2.2 and 2.3), and the overall evidence of general dryness throughout the workings. Modeling of a shaft-sized opening (or a horizontal tunnel the size of Room Q) predicts that the porosity of the salt increases in the DRZ faster than brine can flow in to fill the pores (Deal and others, 1989, Section 5.11), that much visible brine inflow is unlikely, that brine can accumulate in the expanded pores beneath drift floors, and that it is impossible to distinguish between far-field and near-field flow until more than 30 years of inflow observations have been made. The modeling predicts that close to the walls of the shaft or Room Q, the relative increase in porosity is about 40 percent. Fracturing around the WIPP excavations (Figure 2-8) further increases the pore spaces in the DRZ available to store brine (the so-called hidden brine beneath the floor) (refer to Section 2.7.1). Chemical evidence, however, indicates that much of the brine observed in downholes beneath the floor of the repository has been introduced during construction activities to control the salt dust for health and human safety considerations (Deal and others, 1989; Deal and Roggenthen, 1991) and is not brine that has seeped out of the host rocks. There is one location in Room G (refer to Section 2.5) where a brine seep has occurred, but this brine has probably been diluted by artificial brine spread to control salt dust in the G Access drift and has been modified by partial evaporation.

Small amounts of brine continue to seep into downholes where no water has been spread for dust control (refer to Section 2.7). Seepage rates into these locations, especially the larger producers, are declining. Seepage rates into downholes may be misleadingly high when compared to expected seepage into waste storage rooms, because downholes cut stratigraphic units that are more moist than the units exposed at the facility horizon (refer to Section 2.7.2).

Fractures are common in the WIPP underground, and fracture systems locally connect brine-filled drill holes at some drift intersections (Deal and others, 1991, Section 4.4.1); however, extensive, large-scale hydrologically interconnected fracture systems apparently do not exist under much of the WIPP excavation, as evidenced by the fact that brine stands at different levels in closely spaced drill holes in the floor (Morse and Hassinger, 1985; Deal and Case, 1987, Appendix D, Section 3.5; Deal and others, 1989, Section 2.1.2.6) and that brine is not seeping out of fractures observed in the Salt Handling Shaft and Waste Handling Shaft sumps (refer to Section 2.7.1). Most of the north end of the workings (the experimental area) slopes down toward these two sumps, and considerable brine (thousands of liters) has been spread over that area (with the exception of Rooms A1, A2, A3, B, D, and G) for salt-dust control and floor consolidation. This observation that no brine is seeping out of the fractures observed in the sumps also confirms that little brine has seeped out of the host rock into the fracture system under the experimental part of the excavations. That fracture system has, on occasion, been filled to the level of the floor by construction water. No brine is draining out of the downslope fractures, and there is little evidence of brine in the E0 drift north of the Salt Handling Shaft. If additional brine seeped out of the host rock, it would be expected that some of that brine would come to the surface of the E0 drift to form more wet areas and salt crusts than exist. The implication that little brine seeps out of the host rock is corroborated by the fact that there is practically no evidence of moisture in the south exploratory drift (refer to Section 2.6).

5.2 Origin of the Brine

Brine is present in the host rocks between crystals (both salt and clay), within fractures and pores, as fluid inclusions inside crystals, and as bound water of hydration. A fundamental question is whether these brines originated as residual, connate water or as infiltrating groundwater. Major-element composition (Stein and Krumhansl, 1986, 1988; Deal and others, 1989; Abitz and others, 1990; Deal and Roggenthen, 1991) of the WIPP brines indicates an origin from evaporating sea water that had precipitated salts (largely gypsum, anhydrite, and halite). The residual fluids were then modified over geologic time by digenetic reactions with rock-forming minerals (mostly gypsum, hydrous magnesium salts, and polyhalite) and by ion-exchange with clay minerals. High magnesium and bromine content argue persuasively that these brines originated as residual fluids, not as infiltrating groundwater that subsequently dissolved salt. If Salado salt is dissolved in fresh water, the resultant brine is low in magnesium and bromine because there are essentially none of those compounds in the salt; those ions remained behind in the Permian sea as the halite was precipitated.

The major-element composition of brines recovered from downholes is distinct from that of fluid inclusions in WIPP halite (Stein and Krumhansl, 1986 and 1988), suggesting no mixing and little movement of the brines. This observation also indicates that the brine recovered in downholes is largely intergranular fluid, and not intragranular fluid released by migration of fluid inclusions to grain boundaries by stress relief. This interpretation is supported by the field observations that the fluid inclusion brines remain stationary, except in the very rare case when macrofracturing intersects an inclusion. Estimates of the amount of fluid-inclusion brine range from 0.22 weight percent (Black and others, 1983) to 0.6 weight percent (Stein, 1985) and are clearly a minor portion of the WIPP host rocks. Macrofractures generally occur as discrete and fairly wide-spaced fractures (refer to Section 2.7.1; Bechtel, 1986) and intersect relatively few fluid inclusions. The total volume of brine expected to be released from fluid inclusions by fracturing when compared to the volume of the excavations appears minuscule.

Water is also present in the WIPP host rocks as bound water of hydration, especially in clay and hydrous magnesium salts. The contact-handled transuranic (CH-TRU) waste that will be emplaced at the WIPP will produce only very small amounts of heat and will not raise the ambient temperature high enough to liberate water of hydration or cause significant thermally driven migration of brine inclusions toward the storage rooms. No significant heat sources presently exist at the WIPP, so neither of these two processes are sources for the moisture in the WIPP brine seeps.

Water is also present within the clays between individual crystals. The clays within the Salado Formation are underconsolidated (Deal and Roggenthen, 1991) and may contain over 20 percent moisture by volume. The compositional difference between the brine seeps and the fluid-inclusion brines support the interpretation that the two different brines have been in contact with different geologic materials. This is consistent with the concept that the brine that seeps into the excavations is squeezed out of the underconsolidated clays in the host rocks (Deal and Roggenthen, 1991).

Some clear halite units with no clay produce at least some brine when the confining pressure is reduced. Deal and Case (1987, Appendix D, Section 3.3.7) describe a core from Room B where a clear halite unit below MB 139 was visibly wet when removed from the core barrel. Brine then dripped from the fresh core. This brine was not associated with clays and was probably intergranular brine residing in spaces between salt crystals or was from microfractures within crystals. The release of this brine was probably gas-driven and not simply due to depressurization of the salt and brine. This observation indicates that some brine not associated with clay can seep into the excavations.

5.3 Hydrologic Systems

Possible brine inflow systems have been discussed in previous BSEP reports and in Chapter 1 of this report. There are basically two systems: one in which far-field flow occurs through undisturbed rock outside of the zone of rock deformation (DRZ) and a local near-field system where brine is redistributed within the DRZ. Additional effects—such as gas exsolution, development of enhanced porosity and permeability within the DRZ, and preferential flow along bedding planes—may modify brine inflow, but it is fundamentally important to distinguish between far-field sources and local, relatively limited redistribution of brine in the immediate vicinity of the WIPP excavations (refer to Chapter 1). In both cases, the driving mechanism is the pressure gradient caused by the excavation of the underground openings. Flow pathways are through permeable interbeds, along stratigraphic discontinuities, or through fractures.

There is no evidence for far-field flow toward the WIPP repository. Not only is it unlikely due to the plastic nature of the salt (Deal and Roggenthen, 1991), but the chemistry of the brine seeps shows that they could not originate from infiltrating fresh water (refer to Section 5.1). If there is no far-field component of flow, then the volume of brine available to seep into the WIPP is finite, and seepage is limited. It has long been recognized that in fine-grained materials with low permeability, Darcy's Law (a linear, empirical relationship) no longer holds (Swartzendruber, 1962; Bolt and Groenevelt, 1969). WIPP host rocks have very low permeability, which are below detection limits in the clear halite units. It has also been suggested that there may be a threshold hydraulic gradient below which flow is not possible in low permeability materials (Freeze and Cherry, 1979; Deal and Roggenthen, 1991). The driving gradients around a newly excavated opening decrease rapidly with time (Deal and others, 1989, Chapter 4) and may reach values below the threshold within a few years, limiting brine seepage to the operational phase. Ventilation of the underground openings during operations will remove most of that brine by evaporation.

Observations to date suggest that the WIPP brine seeps are part of a system dominated by near-field effects and involving compaction of underconsolidated clays. The clear halite beds in the WIPP host rocks are effectively impermeable (refer to Section 2.3; Beauheim and Holt, 1990; Beauheim and Howarth, 1991). Deal and Roggenthen (1991) suggested that because the clay minerals in the Salado Formation were quickly sealed within impermeable halite beds, normal compaction as a result of increased lithostatic pressure with continued burial was limited until the excavations were created. Deformation due to salt-creep dilation enhanced permeability and allowed the underconsolidated clay to lose water to the excavations. This hypothesis assumes that stress redistribution as a result of excavation increases vertical loading (which may exceed twice lithostatic) in the pillars between the excavated rooms and drives brine out of the clays. The brine then moves along generally horizontal flow paths to the openings at atmospheric pressure.

5.4 Development of the Deformational Environment

At repository depth, salt deforms plastically. Studies undertaken during the BSEP (Deal and Case, 1987; Deal and others, 1987; Deal, 1988; Deal and others, 1989; Deal and Roggenthen, 1989; Deal and others, 1991; and Chapter 4 of this report) were directed primarily toward the environment in and directly adjacent to the underground excavations. These studies and others (Bechtel, 1986; Borns and Stormont, 1988; Francke and others, 1989; Francke and others, 1990) show that the rock immediately surrounding the excavation has been significantly altered from its original state due to the deformation induced by the excavation and the movement of salt toward the excavation. There is no evidence that flow has occurred prior to the excavation of the WIPP openings. The excellent exposures in the WIPP underground show delicate sedimentary structures in near-horizontal beds, essentially undisturbed since Permian time. If deviatoric stress (necessary to move fluids laterally through these beds) had existed any time since burial, the salt itself would have deformed laterally under that same deviatoric stress because the salt is plastic. This has not occurred; therefore, no fluid migration has occurred prior to the development of deviatoric stress accompanying excavation.

The deviatoric stress causes the salt to creep into the new excavations and for a halo of deformation to form around them, whether they are rectangular or circular in cross section. Borns and Stormont (1988) and Deal and Roggenthen (1991) discuss how this halo of deformation develops around underground excavations at the WIPP. The deformation is commonly described as the DRZ. Deal and Roggenthen (1991) indicate that there are generally two parts to the deformational envelope around underground excavations in salt: an outer zone with plastic deformation, dilatency, microfracturing, and pore pressures above atmospheric (zone C in Figure 5-1), and an inner zone characterized by elastic deformation, macrofracturing, and pore spaces where the pressures are at or close to atmospheric (zone B in Figure 5-1). Some authors treat the inner zone, which includes the volume of rock that has separated (decoupled) from the host rock, as simply a growing part of the excavation comprising the active opening (or actual opening) (Mraz, 1980). A transition from plastic to elastic deformation occurs (Karman, 1911; Jaeger and Cook, 1969) at the C-B boundary, and brittle failure occurs in zone B. This is analogous to glaciers with plastic flow at a depth and a brittle surface skin where crevasses form. Brine moving toward the excavation behaves differently in the B and C zones, and it is important to consider both of them when discussing brine seepage into the WIPP excavations.

The deformational pattern is complicated by the effects of geometry and stratigraphy. The salt at the WIPP originated as a stratified and bedded sedimentary rock and consists of alternating sequences of halite, argillaceous halite, polyhalitic halite, clay layers, and thin anhydrite beds (Figure 2-4). As a result of this depositional history, there are numerous stratigraphic discontinuities. There are clay partings and thin (1 to 3 cm) clay beds, as well as beds of anhydrite ranging from a few millimeters to 1 meter or so in thickness. The anhydrite beds are brittle and do not deform plastically at repository depths. Typical storage rooms are 4 m (13 ft) high and 10 m (33 ft) wide.

There is clear evidence that the excavation geometry around the openings at the WIPP is modified during deformation by these discontinuities and inhomogeneities. Roof and floors fail by heaving, separation along clay seams, and the development of macrofractures in ribs (Bechtel, 1986; Francke and others, 1990; Deal and Roggenthen, 1991). The pattern of fracturing and deformation observed at the WIPP is shown in Figure 2-8, and the effect on the development of zones B and C is shown in Figure 5-2.

5.5 Flow Conditions

As indicated in Section 2.3, the unfractured clear halite beds are essentially impermeable. State-of-the-art permeability testing (Beauheim and Holt, 1990; Beauheim and Howarth, 1991) was unable to measure any permeability, indicating that if it exists at all, intrinsic permeability of the clear halite units is less than 1×10^{-23} m^2 (0.01 nanodarcy). Those halite units that contain a small percentage of clay are more permeable, typically less than 1×10^{-20} m^2 (10 nanodarcies). The permeability of the interbedded anhydrite units is several orders of magnitude greater, typically between 1×10^{-19} and 1×10^{-18} m^2.

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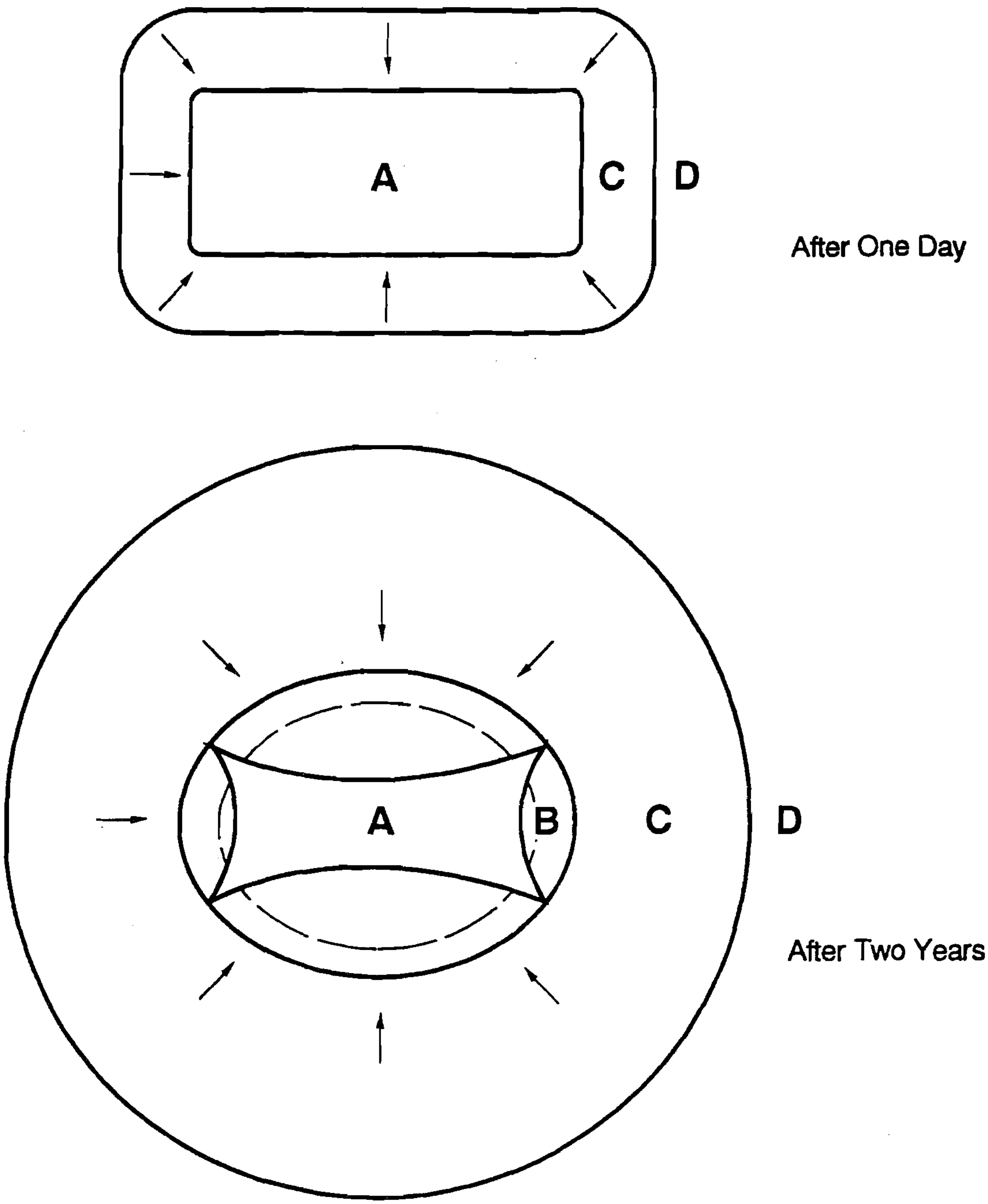

Figure 5-1
Diagrammatic vertical cross sections of a rectangular excavation in homogeneous salt one day and two years after mining. Zone A is the mined opening, zone B is the zone of elastic deformation, brittle failure, and macrofracturing with atmospheric pore pressures, zone C is the zone of plastic deformation and dilatency with pore pressures increasing from atmospheric to lithostatic, and zone D is undisturbed salt with lithostatic pore pressures. The DRZ is composed of both zone B and zone C.

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A WIPP STORAGE ROOM IN BEDDED SALT

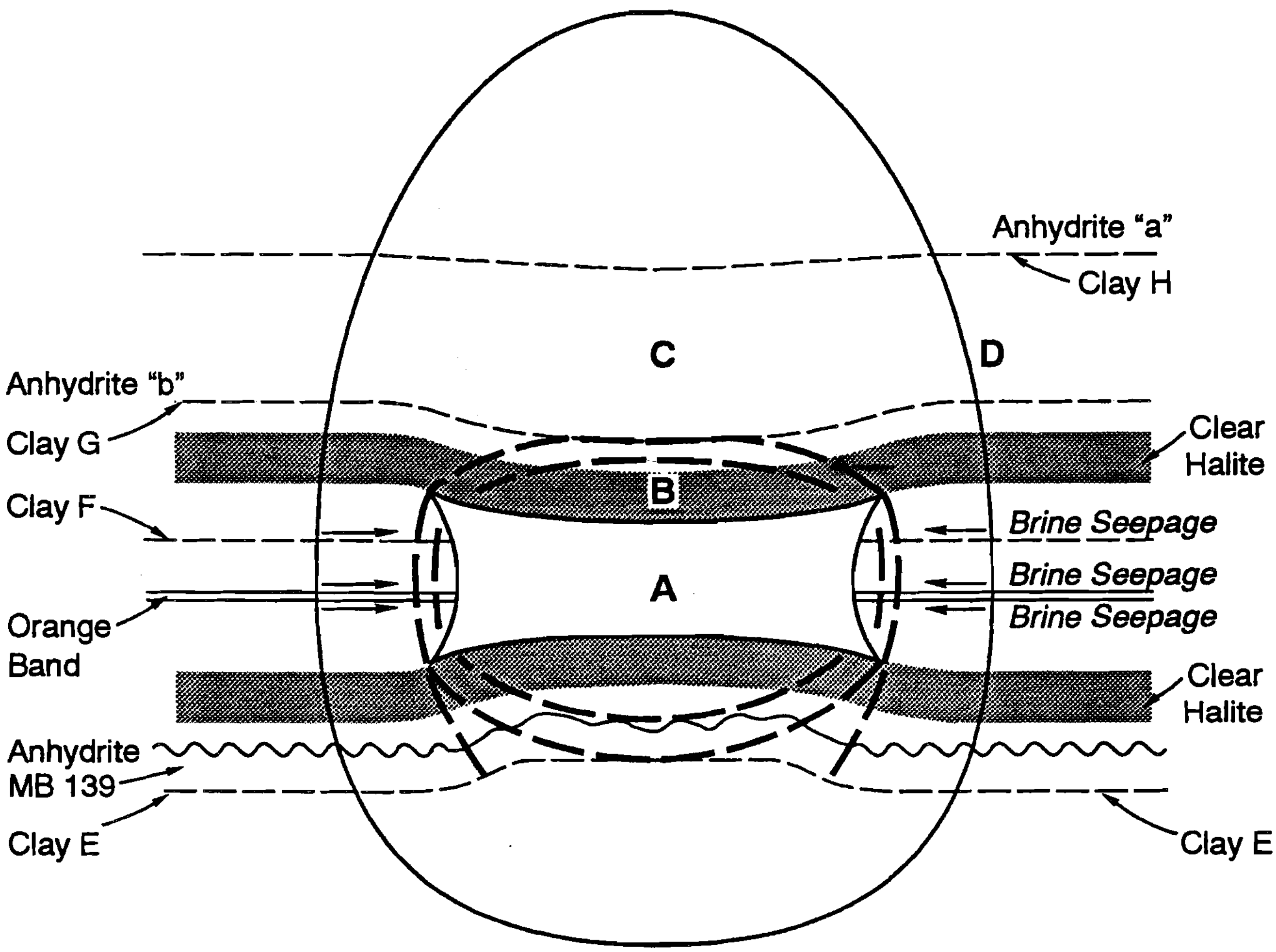

Figure 5-2
Diagrammatic vertical cross-section of a WIPP storage room in bedded salt, approximately six years after mining. Zones A, B, C and D are the same as in Figure 5-1. Arrows indicate brine seepage as a result of compaction of clays at clay F and above and below the orange band.

The details of flow in these very low-permeability units are quite complex, have very low velocities, involve small volumes of brine, and require testing over long periods of time during which the very properties being tested change; they are, therefore, difficult to quantify. Vertical drill holes yield inconsistent inflow data, even when closely spaced, but horizontal drill holes provide consistent and comparable data sets (refer to Section 2.9). Flow may be constrained to a relatively few, fairly discrete bedding planes, and radial flow (in a vertical plane), as assumed in most modeling, toward a horizontal excavation or drill hole may not occur. Fluid is preferentially stored in the more argillaceous beds and is not uniformly distributed throughout the salt (Deal and others, 1989). The pore spaces in some units may be so small that surface tension forces become significant and Darcy's Law may not hold at all or may have to be applied in a modified form, such as the piece-wise method suggested by Deal and others (1989). Additionally, some previously unsuspected flow mechanism may be acting, such as compaction in the pillars driving brine out of poorly compacted clays (Deal and others, 1989). The brine contains dissolved gas (mostly nitrogen) that exsolves as the confining pressure is lowered. This gas is an additional driving mechanism for brine movement, especially in the first few days and weeks following mining, and it may locally modify flow.

A number of modeling efforts have been attempted to predict seepage into the WIPP excavations. Seepage into a horizontal drill hole 7.6 cm (3 in.) in diameter and 46 m (150 ft) long is predicted to be on the order of 0.01 L per day if a permeability of 1×10^{-22} m^2 (0.1 nanodarcy) is used for the undisturbed salt. Three drill holes of that dimension have been monitored for over two years, and all three accumulate fluids at seepage rates of 0.01 to 0.02 L per day. For reasons discussed in Section 2.9, the holes have not been monitored long enough to provide definitive data.

The brine seeps at the WIPP are consistent with redistribution of brine in the DRZ as a result of the mining activities. Far-field flow, however unnecessary, has not been disproved. The way in which the flow rate varies with time is important. If the flow rate eventually reaches a steady rate, then there may be some far-field brine that flows through the body of the undisturbed rocks to reach the repository excavations. If the flow rate continues to decrease and eventually ceases, then no significant amount of brine can be derived from the far field, and only brine released from the DRZ due to depressurization will enter the repository excavations. Studies are currently being conducted or are being planned at the WIPP to determine which of these conditions exist and include the three drill holes mentioned above, which have not yet provided definitive data (refer to Section 2.9 and Appendix E).

The WIPP EATF proposed that the corrosion of iron, steel, and aluminum alloys requires and consumes brine, and if sufficient brine is present, the corrosion represents a potential source of gas in the repository after closure (DOE, 1991). Calculations (refer to Section 4.6) indicate that it will take approximately 220,000 L of brine to corrode all of the metals contained in the waste and waste drums emplaced in each waste storage room.

If no far-field flow exists, and radial flow occurs in a vertical plane toward a waste storage room, then release of brine from the DRZ around the excavations due to depressurization (Figure 5-3a) is estimated to produce about 150,000 L of brine (refer to Section 4.6). This volume is on the same order of magnitude as the volume of brine (220,000 L) necessary to corrode all the metal in the waste and waste storage drums in a waste storage room. Anoxic corrosion will consume brine and produce metal oxides and hydrogen. If the volume of brine entering the repository is less than that required to completely corrode the metal, then all of the brine that comes in contact with metal will be consumed.

There is good evidence that the assumption of radial flow in a vertical plane does not hold for the WIPP. The unfractured clear halite units have such low permeability (or none at all) that flow is probably constrained and occurs only horizontally, parallel to bedding. Brine may only be able to drain from that part of the DRZ horizontally adjacent to the storage room (Figure 5-3b). The volume of rock involved is about 7 percent of that involved in the estimate above (Figure 5-3a). Assuming that the growth of fractures in zone B will tap a slightly thicker stratigraphic interval, including some strata above and below the 4-m-high storage room, an estimate of about 10 percent seems reasonable. In that case, less than one-tenth of the 150,000 L estimated above may enter the repository to react with the metal emplaced there and produce hydrogen gas by corrosion. As brine reacts with the metal and gas pressure builds up, brine inflow will be additionally retarded.

If compaction of the clays is the major source of the brine rather than release of brine from the DRZ due to depressurization, then even less brine may enter the repository. This situation is shown in Figure 5-2 by the brine-flow arrows shown restricted to clay F and the thin clay units immediately above and below the orange band.

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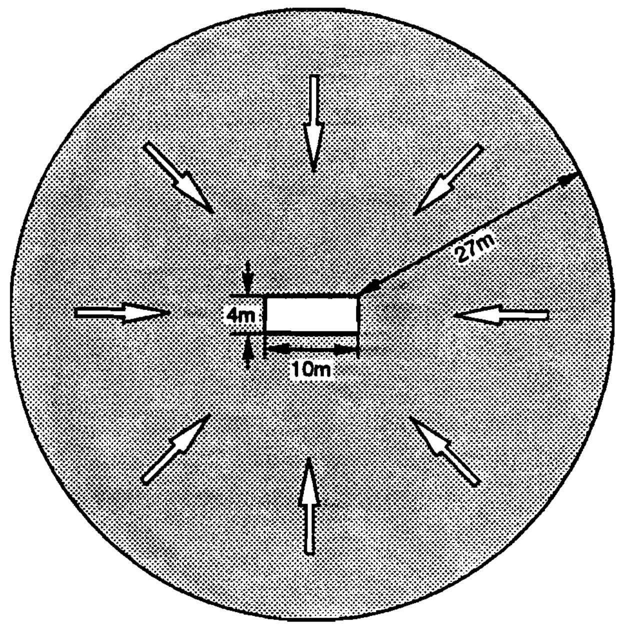
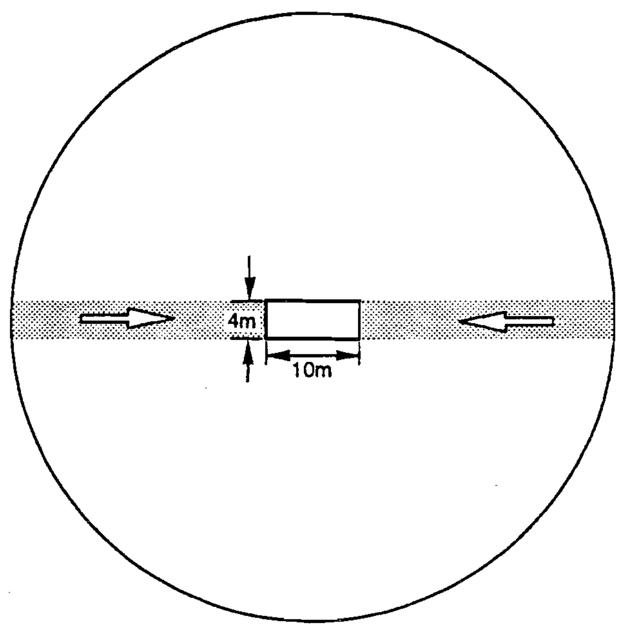


A. Radial Flow Dewatering a Cross Section Approximately 3258 m² in Area



B. Horizontal Flow Dewatering Facility Horizon Strata Approximately 220 m² in Area

Figure 5.3
Vertical Cross Section Through a Mature DRZ Around a WIPP Waste Storage Room 4 m-High and 10 m-Wide

5.6 Implications

The relative importance of far-field flow versus local redistribution of brine in the DRZ needs to be determined (refer to Chapter 1). For example, if there is sufficient far-field flow into the repository, then enough brine may come into the excavations to completely corrode the metal in the waste and the waste drums; therefore, the potential for hydrogen generation due to corrosion will be limited by the total metal inventory. If brine seepage is a purely local phenomena due to redistribution of brine in the immediate vicinity of the excavations, there may be insufficient brine available to cause much corrosion after closure. In the latter case, gas generation will be limited by brine availability and may not be a problem.

The predicted consequences of human intrusion events, the fate of the waste-generated gases, and the migration of the hazardous constituents during undisturbed performance are all sensitive to brine inflow assumptions, even if both of the proposed systems yield similar volumes of brine during the pressurization phase after sealing and closure. If the far-field model is valid, a human intrusion event (drilling into the sealed repository at some future date) will lower fluid pressure in the waste storage rooms, create pressure gradients toward the rooms, and reinstate far-field flow. This will lead to a greater release of radionuclides from the repository as the inflowing brine infiltrates through the waste and flows up the drill hole. Alternatively, if the near-field model is valid, the only brine available for transport of radionuclides is the volume of brine that is trapped in the room at the time of sealing.

Predicting the fate of waste-generated gases is also dependent upon the hydrologic systems assumed to be operational. If brine can flow through the far field, excess gas pressure can probably be dissipated through the host rock; but if far-field flow is not a viable concept, gas generation from microbial or radiolytic decomposition of organic materials may yield very high local pressures. Analyses by the WIPP EATF have shown that predicted peak pressures are highly dependent upon the assumed mechanisms by which fluids can flow through the undisturbed host rock (DOE, 1991).

Another long-term performance concern is the migration of RCRA-listed hazardous constituents from the repository. If far-field flow is valid, the generation of excess gas pressure within the repository may force gas, possibly contaminated with VOCs, across the RCRA unit boundary. However, if far-field flow does not occur, there will be less of a potential for VOC migration.

5.7 Further Investigations

Although much is known about the brine seepages at the WIPP, there are still areas that need further examination. As stated above, the idea of far-field flow seems unlikely or impossible but remains an important modeling concept that has not been disproved. The relative importance of near-field versus far-field flow remains an item of significant importance and should be resolved.

The following questions need to be answered:

- Does the clay contain enough brine that can be squeezed out by vertical loading to explain all of the brine seepage observed at the WIPP?
- Is there enough volume present in void spaces and fractures in the DRZ beneath the floors of the excavations to hold large quantities of brine out of sight, and are those fractures connected well enough to allow brine (or gas) to flow downgradient and beneath potential seals?
- Does any far-field component of flow exist?

The following activities are proposed to address these questions:

- Clay samples have been collected from the WIPP underground and are being subjected to laboratory testing. Preliminary results indicate that the clay is quite wet and may contain 20 percent or more brine by volume. After quantification, this work will be reported in the BSEP 1991 annual report. If available brine volumes seem to be in the right order of magnitude to explain the brine seepages, additional testing will be needed to assess the rate of seepage and volumes that might realistically enter a waste storage room.
- Plans for additional testing to determine the hydrologic characteristics of fracture porosity developing in the DRZ beneath the floor of the workings have been approved. This is an extension of the work reported in Deal and others (1991, Section 4) and will include testing in the E0 drift north of the Salt Handling Shaft, which may shed light on why no brine has been observed seeping out of open fractures in the Salt Handling Shaft sump. Additional tests need to be devised to address the issue of total fracture volume.
- A testing program to drill additional horizontal and subhorizontal brine seepage observation holes has been proposed (Appendix E). This program has three phases and will answer questions about the stratigraphic variability of brine seepage and the effect it has had on past brine inflow observations, the effect of the DRZ on past brine inflow observations, and whether there is any detectable component of far-field flow.

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APPENDIX A
BRINE ACCUMULATION

PART I—LIST OF UNDERGROUND LOCATIONS WHERE BRINE OCCURRENCES WERE OBSERVED AND MONITORED

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APPENDIX A
BRINE ACCUMULATION

PART I— LIST OF UNDERGROUND LOCATIONS WHERE BRINE OCCURRENCES WERE OBSERVED AND MONITORED

PART II— BRINE ACCUMULATION DATA TABLES

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TABLE A-1

LIST OF UNDERGROUND LOCATIONS WHERE BRINE OCCURRENCES WERE OBSERVED AND MONITORED THROUGH DECEMBER, 1990 AS PART OF THE BRINE SAMPLING AND EVALUATION PROGRAM AT WIPP

Hole Number	Room or Location	Survey Accuracy S=Surveyed A=Approximate	North-South Coordinates*	East-West Coordinates*	Elevation m	Dia. cm	Length m	Direction U=Up D=Down H=Horiz.	Angle in Degrees	References**	Remarks
A1X01	A1	S	N1147.02	E1254.40	400.28	10	15.2	D	90	B, D, E	Monitored as part of the BSEP since it was drilled in 3/85.
A1X02	A1	S	N1146.88	E1254.24	405.78	10	18	U	90	B, D, E	Monitored as part of the BSEP since it was drilled in 3/85.
A2X01	A2	S	N1393.72	E1338.88	399.65	10	15.3	D	90	B, D, E	Monitored as part of the BSEP from 2/85 to 10/90.
A2X02	A2	S	N1393.65	E1338.89	405.03	10	16.1	U	90	B, D, E	Monitored as part of the BSEP from 2/85 to 9/89.
A3X01	A3	S	N1137.94	E1406.84	399.22	10	15.4	D	90	B, D, E	Monitored as part of the BSEP since it was drilled in 1/85. Drillers did not report any moisture while drilling. Hole started producing brine a few weeks later.
A3X02	A3	S	N1138.00	E1406.89	404.75	10	15.5	U	90	B, D, E	Monitored from 1/85 to 9/89. Drillers did not encounter moisture while drilling. Hole started producing brine a few weeks later.
BTPA1	S1620/W170	A	S1638	W162	384	7.6	1.6	D	90	B	Open from 0 to 1.6 m. Drilled for the BSEP study 7/86 and monitored until 12/02/88.
BTPA2	S1620/W170	A	S1638	W166	384	7.6	2.8	D	90	B	Cased from 0 to 1.6 m. Open from 1.6 to 2.8 m. Drilled for the BSEP study 7/86 and monitored until 12/02/88.
BTPA3	S1620/W170	A	S1638	W170	384	7.6	4.1	D	90	B	Cased from 0 to 3.1 m. Open from 3.1 to 4.1 m. Drilled for the BSEP study 7/86 and monitored until 12/02/88.
BTPA4	S1620/W170	A	S1638	W166	388	7.6	1.4	U	90	B	Open from 0 to 1.4 m. Drilled for the BSEP study 7/86 and monitored until 9/27/88. Dry.
BTPA5	S1620/W170	A	S1638	W170	388	7.6	1.6	U	90	B	Open from 0 to 1.6 m. Drilled for the BSEP study 7/86 and monitored until 9/27/88. Dry.

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(Continued)

Hole Number	Room or Location	Survey Accuracy S=Surveyed A=Approximate	North-South Coordinates*	East-West Coordinates*	Elevation m	Dia. cm	Length m	Direction U=Up D=Down H=Horiz.	Angle in Degrees	References**	Remarks
BTPB1	S1620/W170	A	S1636	W162	384	7.6	1.6	D	90	B	Open from 0 to 1.6 m. Drilled for the BSEP study 7/86 and monitored until 9/27/88.
BTPB2	S1620/W170	A	S1636	W166	384	7.6	2.9	D	90	B	Cased 0 to 1.8 m. Open from 1.8 to 2.9 m. Drilled for the BSEP study 7/86 and monitored until 9/27/88.
BTPB3	S1620/W170	A	S1636	W170	384	7.6	4.1	D	90	B	Cased 0 to 3.1 m. Open from 3.0 to 4.1 m. Drilled for the BSEP study 7/86 and monitored until 9/27/88.
BTPB4	S1620/W170	A	S1636	W166	388	7.6	3.0	U	90	B	Cased 0 to 2.1 m. Open from 2.1 to 3.0 m. Drilled for the BSEP study 7/86 and monitored until 9/27/88.
BTPB5	S1620/W170	A	S1636	W170	388	7.6	3.1	U	90	B	Cased 0 to 1.9 m. Open from 1.9 to 3.1 m. Drilled for the BSEP study 7/86 and monitored until 9/27/88.
BTPC1	S1620/W170	A	S1634	W162	384	7.6	1.5	D	90	B	Open from 0 to 1.5 m. Drilled for the BSEP study 7/86 and monitored until 9/27/88.
BTPC2	S1620/W170	A	S1634	W166	384	7.6	3.0	D	90	B	Cased from 0 to 1.7 m. Open from 1.8 to 3.0 m. Drilled for the BSEP study 8/86 and monitored until 9/27/88.
BTPC3	S1620/W170	A	S1634	W170	384	7.6	4.4	D	90	B	Cased from 0 to 3.0 m. Open from 3.0 to 4.4 m. Drilled for the BSEP study 8/86 and monitored until 9/27/88.
BTPC4	S1620/W170	A	S1634	W166	388	7.6	5.4	U	90	B	Cased from 0 to 4.2 m. Open from 4.2 to 5.4 m. Drilled for the BSEP study 7/86 and monitored until 9/27/88.
BTPC5	S1620/W170	A	S1634	W170	388	7.6	5.5	U	90	B	Cased from 0 to 4.3 m. Open from 4.3 to 5.5 m. Drilled for the BSEP study 7/86 and monitored until 9/27/88. Dry.

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(Continued)

Hole Number	Room or Location	Survey Accuracy S=Surveyed A=Approximate	North-South Coordinates*	East-West Coordinates*	Elevation m	Dia. cm	Length m	Direction U=Up D=Down H=Horiz.	Angle in Degrees	References**	Remarks
BTR1	S1950/E100	A	S1942	E98	387	8.3	0.3	H	5	B	Hole slightly declined below horizontal. Collar above upper clay seam, about 0.3 m below back. Drilled 6/86 and monitored until 9/27/88. Dry.
BTR2	S1950/E100	A	S1942	E100	387	8.3	1.0	H	5	B	Hole slightly declined below horizontal. Collar above upper clay seam, about 0.3 m below back. Drilled 6/86 and monitored until 12/02/88.
BTR3	S1950/E100	A	S1942	E101	387	8.3	1.0	H	5	B	Hole slightly declined below horizontal. Collar above upper clay seam, about 0.3 m below back. Drilled 6/86 and monitored until 12/02/88.
BTR4	S1950/E100	A	S1942	E98	386	8.3	0.3	H	5	B	Hole slightly declined below horizontal. Collar in halite about 1.1 m below back. Drilled 6/86 and monitored until 12/02/88.
BTR5	S1950/E100	A	S1942	E100	386	8.3	0.9	H	5	B	Hole slightly declined below horizontal. Collar in halite about 1.1 m below back. Drilled 6/86 and monitored until 12/02/88.
BTR6	S1950/E100	A	S1942	E101	386	8.3	0.9	H	5	B	Hole slightly declined below horizontal. Collar in halite about 1.1 m below back. Drilled 6/86 and monitored until 12/02/88.
BTR7	S1950/E100	A	S1942	E98	386	8.3	0.3	H	5	B	Hole slightly declined below horizontal. Collar just above orange band. Drilled 6/86 and monitored until 12/02/88. Dry.
BTR8	S1950/E100	A	S1942	E100	386	8.3	0.9	H	5	B	Hole slightly declined below horizontal. Collar just above orange band. Drilled 6/86 and monitored until 12/02/88.
BTR9	S1950/E100	A	S1942	E101	386	8.3	0.9	H	5	B	Hole slightly declined below horizontal. Collar just above orange band. Drilled 6/86 and monitored until 12/02/88.

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Hole Number	Room or Location	Survey Accuracy S=Surveyed A=Approximate	North-South Coordinates*	East-West Coordinates*	Elevation m	Dia. cm	Length m	Direction U=Up D=Down H=Horiz.	Angle in Degrees	References**	Remarks
BTR10	S1950/E100	A	S1942	E98	385	8.3	0.4	H	5	B	Hole slightly declined below horizontal. Collar about 0.8 m above floor. Drilled 6/86 and monitored until 12/02/88. Dry.
BTR11	S1950/E100	A	S1942	E100	385	8.3	0.9	H	5	B	Hole slightly declined below horizontal. Collar about 0.8 m above floor. Drilled 6/86 and monitored until 12/02/88.
BTR12	S1950/E100	A	S1942	E101	385	8.3	0.9	H	5	B	Hole slightly declined below horizontal. Collar about 0.8 m above floor. Drilled 6/86 and monitored until 12/02/88.
BX01	B	S	N1384.68	E982.33	401.56	10	15.3	D	90	B, E	Monitored as part of the BSEP since it was drilled in 1/85. Core moist from 10.6 to 11.1 m in coarsely crystalline clear halite. MB139 at 7.1 to 7.9 m.
BX02	B	S	N1384.44	E982.87	407.05	10	15.0	U	90	B, E	Monitored as part of the BSEP from 1/85 to 12/89.
DH15	N1140/E1689	A	N1140	E1688.5	402	7.6	15.5	U	90	B	Moisture noticed at collar in 4/86. Collecting device installed 5/86 and monitored as part of the BSEP since then.
DH35	G	A	N1102	W1882	395	8.9	15.8	U	90	A3, B	Monitored as part of the BSEP since 2/85. At present no brine is collected because of insufficient inflow.
DH36	G	A	N1102	W1882	392	8.9	15.7	D	90	A3, B	Monitored as part of the BSEP since 1/85.
DH37	G	A	N1101	W2182	396	8.9	15.7	U	90	A3, B	Monitored as part of the BSEP since 1/85. At the present no brine is collected because of insufficient inflow.
DH38	G	A	N1101	W2182	392	8.9	14.5	D	90	A3, B	Monitored as part of the BSEP since 1/85.

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(Continued)

Hole Number	Room or Location	Survey Accuracy S=Surveyed A=Approximate	North-South Coordinates*	East-West Coordinates*	Elevation m	Dia. cm	Length m	Direction U=Up D=Down H=Horiz.	Angle in Degrees	References**	Remarks
DH39	G	A	N1101	W2482	395	8.9	14.5	U	90	A3, B	Monitored as part of the BTP since 2/85. At the present no brine is collected because of insufficient inflow.
DH40	G	A	N1101	W2482	392	8.9	15.5	D	90	A3, B	Monitored as part of the BSEP since 1/85.
DH41	G	A	N1101	W2782	395	8.9	15.2	U	90	A3, B	Monitored as part of the BSEP since 2/85. At the present no brine is collected because of insufficient inflow.
DH42	G	A	N1101	W2782	392	8.9	15.6	D	90	A3, B	Monitored as part of the BSEP since 2/85.
DH42A	G	A	N1101	W2789	392	8.9	12.6	D	90	A3, B	Monitored as part of the BSEP since 2/85.
DH215	S1960/E153	A	S1960	E153	388	7.6	15.8	U	90	A1, B	Gas releases had been observed in this hole. Monitored as part of the BSEP since 1/85.
DH216	S1960/E153	A	S1960	E153	385	7.6	16.5	D	90	A1, B	Gas releases had been observed in this hole. Monitored as part of the BSEP from 1/85 to 6/85 when collar was destroyed and hole plugged by mining.
DH317	S1600/W30	A	S1600	W33	388	7.6	15.3	U	90	A2, B	Stalactite growth monitored as part of the BSEP from 5/85 to 2/86.
DH317A	S1600/W30	A	S1600	W28	388	7.6	1.5	U	90	A2, B	Stalactite growth monitored as part of the BSEP from 5/85 to 2/86.
DH317B	S1600/W30	A	S1597	W27	388	8.9	15.5	U	90	A2, B	Gas pocket at 14.0 m. Brine seeped from hole after drill rods were broken at end of run at depth of 5 m. Probable source was anhydrite "a". Stalactite growth monitored as part of the BSEP from 5/85 to 2/86.
DHP401	S1950/E1330	A	S1950	E1330	387	10	15.1	U	90	B	Drilled 1/87, observed as part of the BSEP since 3/87.

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(Continued)

Hole Number	Room or Location	Survey Accuracy S=Surveyed A=Approximate	North-South Coordinates*	East-West Coordinates*	Elevation m	Dia. cm	Length m	Direction U=Up D=Down H=Horiz.	Angle in Degrees	References**	Remarks
DHP402A	S1950/E1330	A	S1950	E1330	383	10	15.2	D	90	B	Drilled 12/86, observed as part of the BSEP since 12/86. Hole offset at 13.7 m. There may be a rock bolt or piece of steel in hole.
EES12B	N1430/E0140	A	N1430	E140	398	4.7	3	D	90	K	Drilled 6/86 as part of the Excavation Effects Study. Observed as part of the BSEP from date of drilling until 12/86. Rapid brine and gas inflow through open fractures.
EES21B	S0700/E0066	A	S700	E66	381	4.7	2.7	D	90	K	Drilled 7/86 as part of the Excavation Effects Study. Observed as part of the BSEP since drilling until 12/86. Rapid brine and gas inflow through fractures.
GSEEP	G	A	N1095	W1837	391					B	Damp area on the floor of Room G, near south rib, approximately 13.7 m east of DH35. Seep noticed 8/85. Damp area larger in 11/85. Monitored as part of the BSEP since 11/85. 40 cm diameter collecting sump drilled 9/87.
IG201	2	S	N1275.54	W379.51	394.71	7.3	16.4	D	90	A3, B, H, J	Monitored as part of the BSEP from 11/84 to 9/87 when shear closure pinched hole shut so that sampler would not go to bottom.
IG202	1	S	N1264.79	W246.11	395.17	7.3	14.7	D	90	A3, B, H, J	Monitored as part of the BSEP from 11/84 to 7/87 when shear closure pinched hole shut so that sampler would not go to bottom. Last BSEP brine data collected in 3/87.
JV8	J	S	N1067	W374	393	91	2.5	D	90	D, F, G	Drilled 8/08/85; drillers reported water at 2.4 m.
JV9	J	S	N1067	W378	393.3	91	2.5	D	90	D, G	Brine in bottom of pilot hole on 8/20/85.
L1S25	L1	A	N1524	W218	400	10	3.6	D	90	B, H	Monitored as part of the BSEP from 8/85 to 6/89.
L1S26	L1	A	N1524	W220	400	10	3.6	D	90	B, H	Monitored as part of the BSEP from 8/85 to 6/89.

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(Continued)

Hole Number	Room or Location	Survey Accuracy S=Surveyed A=Approximate	North-South Coordinates*	East-West Coordinates*	Elevation m	Dia. cm	Length m	Direction U=Up D=Down H=Horiz.	Angle in Degrees	References**	Remarks
L1S27	L1	A	N1524	W222	400	10	3.6	D	90	B, H	Monitored as part of the BSEP from 8/85 to 6/89.
L1S28	L1	A	N1524	W224	400	10	3.7	D	90	B, H	Monitored as part of the BSEP from 8/85 to 6/89.
L1S29	L1	A	N1524	W226	400	10	3.7	D	90	B, H	Monitored as part of the BSEP from 8/85 to 6/89.
L1S30	L1	A	N1524	W228	400	10	3.7	D	90	B, H	Monitored as part of the BSEP from 8/85 to 6/89.
L1S31	L1	A	N1524	W235	400	10	3.6	D	90	B, H	Monitored as part of the BSEP from 8/85 to 6/89.
L1S32	L1	A	N1524	W237	400	10	3.6	D	90	B, H	Monitored as part of the BSEP from 8/85 to 6/89.
L1S33	L1	A	N1524	W239	400	10	3.6	D	90	B, H	Monitored as part of the BSEP from 8/85 to 6/89.
L1S34	L1	A	N1524	W241	400	10	3.7	D	90	B, H	Monitored as part of the BSEP from 8/85 to 6/89.
L1S35	L1	A	N1524	W243	400	10	3.8	D	90	B, H	Monitored as part of the BSEP from 8/85 to 6/89.
L1S36	L1	A	N1524	W245	400	10	3.7	D	90	B, H	Monitored as part of the BSEP from 8/85 to 6/89.
L1X00	L1	A	N1538.5	W225	400	10	3.8	D	90	B, H	Drillers found water in hole at 3 m, 5/13/84. Monitored as part of the BSEP from 10/84 to 4/89.
L2C03	L2	A	N1510	W365	400	41	3.7	D	90	B, H	Drilled 4/85 overcoring and destroying L2C25. Brine and gas enters hole quickly through open fractures. Monitored intermittently as part of the BSEP from 12/85 through 12/86.
L2C25	L1	A	N1510	W365	400	12.7	3.5	D	90	B, H	L2C25 is a 12.7 cm overcore of a previously grouted SNL/NM test hole. The overcore was drilled 3/85 and air and brine was blown through fractures into hole L2C29, 1.2 m to the north. In 4/85, a 40 cm overcore was made destroying this hole. The larger hole is designated L2C03.
MIIT2	J	S	N1088.03	W377.02	393.44	8.3	0.9	D	90	B, D, G	Brine since drilled; monitored from 10/84 to 4/85.

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** For references, see footnote at end of table.

TABLE A-1

LIST OF UNDERGROUND LOCATIONS WHERE BRINE OCCURRENCES WERE OBSERVED AND MONITORED THROUGH DECEMBER, 1990 AS PART OF THE BRINE SAMPLING AND EVALUATION PROGRAM AT WIPP
(Continued)

Hole Number	Room or Location	Survey Accuracy S=Surveyed A=Approximate	North-South Coordinates*	East-West Coordinates*	Elevation m	Dia. cm	Length m	Direction U=Up D=Down H=Horiz.	Angle in Degrees	References**	Remarks
MIIT4	J	S	N1086.05	W377.13	393.44	8.3	1.0	D	90	B, D, G	Brine since drilled; monitored from 10/84 to 4/85.
MIIT6	J	S	N1084.16	W377.15	393.36	8.3	1.0	D	90	B, D, G	Brine since drilled; monitored from 10/84 to 4/85.
MIIT8	J	S	N1082.08	W377.24	393.34	8.3	1.0	D	90	B, D, G	Brine since drilled; monitored from 10/84 to 4/85.
MIIT10	J	S	N1079.98	W377.23	393.31	8.3	1.0	D	90	B, D, G	Brine since drilled; monitored from 10/84 to 4/85.
MIIT12	J	S	N1078.11	W377.21	393.25	8.3	1.0	D	90	B, D, G	Brine since drilled; monitored from 10/84 to 4/85.
MIIT14	J	S	N1076.18	W377.30	393.14	7.6	1.0	D	90	B, D, G	Brine since drilled; monitored from 10/84 to 4/85.
MIIT16	J	S	N1074.17	W377.18	392.95	7.6	1.0	D	90	B, D, G	Brine since drilled; monitored from 10/84 to 4/85.
MIIT17	J	S	N1072.03	W379.10	393.29	7.6	1.0	D	90	B, D, G	Brine since drilled; monitored from 10/84 to 4/85. SNL/NM filled hole with Brine A 4/30/85 and plugged with rubber cork.
MIIT18	J	S	N1071.91	W377.18	393.27	7.6	1.0	D	90	B, D, G	Brine since drilled; monitored from 10/84 through 4/85. SNL/NM experiment filled hole with Brine A 4/20/85 and plugged hole with rubber cork.
MIIT20	J	S	N1069.84	W377.22	393.30	7.6	1.8	D	90	B, D, G	Brine noted 10/84; monitored from 10/84 through 4/85.
MIIT22	J	S	N1067.93	W377.23	393.30	7.6	1.8	D	90	B, D, G	Brine noted 10/84; monitored from 10/84 through 4/85.
MIIT24	J	S	N1065.79	W377.21	393.42	7.6	1.8	D	90	B, D, G	Brine noted 10/84; monitored 10/84 through 4/85, Sandia experiment added Brine A to hole 4/30/85 and plugged with rubber cork.
MIITP	J	A	N1067	W378	393	3.8	2.7	D	90	B, F	Brine since drilled; pilot hole for 0.9-m-diameter hole that was never completed. Monitored from 4/02/85 through 4/23/85.

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TABLE A-1

LIST OF UNDERGROUND LOCATIONS WHERE BRINE OCCURRENCES WERE OBSERVED AND MONITORED THROUGH DECEMBER, 1990 AS PART OF THE BRINE SAMPLING AND EVALUATION PROGRAM AT WIPP

(Continued)

Hole Number	Room or Location	Survey Accuracy S=Surveyed A=Approximate	North-South Coordinates*	East-West Coordinates*	Elevation m	Dia. cm	Length m	Direction U=Up D=Down H=Horiz.	Angle in Degrees	References**	Remarks
NG252	2	S	N1275.86	W381.05	394.68	3.8	2.3	D	90	A3, B, H, J	Monitored as part of the BSEP from 11/84 to 4/89. This hole constantly produced gas. First time noticed was before 10/84. Room closed 6/89.
OH20	S1600/W170	S	S1610.36	W177.16	386.22	8.9	47.2	H	0-3	L	Collared about 0.3 m above the orange band, bottoms in Map Unit 0 below the orange band. Monitored as part of the BSEP since it was drilled 3/89.
OH21	S1600/W170	S	S1605.36	W177.16	385.50	8.9	16.2	H	0-3	L	Collared about 0.3 m below the orange band. Monitored for the BSEP since it was drilled 12/88.
OH22	S1600/W170	S	S1615.36	W177.16	386.65	8.9	15.1	H	0-3	L	Collared about 0.6 m above the orange band. Monitored for the BSEP since it was drilled 12/88.
OH23	S1950/W170	S	S1950.41	W178.86	384.94	8.9	46.0	H	0-3	L	Collared about 0.3 m above the orange band, bottoms in Map Unit 0 below the orange band. Monitored for the BSEP since it was drilled 2/89.
OH24	S1950/W170	S	S1945.41	W178.86	384.11	8.9	15.2	H	0-3	L	Collared about 0.3 m below the orange band. Monitored for the BSEP from 3/89 to 8/90.
OH25	S1950/W170	S	S1955.41	W178.86	385.27	8.9	15.2	H	0-3	L	Collared about 0.6 m above the orange band. Monitored for the BSEP from 3/89 to 8/90.
OH26	S2180/W170	S	S2183.01	W177.14	384.70	8.9	45.7	H	0-3	L	Collared about 0.3 m above the orange band, bottoms in Map Unit 0 below the orange band. Monitored for the BSEP since it was drilled 3/89.
OH27	S2180/W170	S	S2178.01	W177.14	385	8.9	15.1	H	0-3	L	Collared about 0.6 m above the orange band. Monitored for the BSEP since it was drilled 4/89.
OH27A	S2180/W170	S	S2177.01	W177.14	385	8.9	1.2	H	0-3	L	Short offset hole to OH27. Collared about 0.6 m above the orange band. Monitored for the BSEP since it was drilled 4/89.

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** For references, see footnote at end of table.

TABLE A-1

LIST OF UNDERGROUND LOCATIONS WHERE BRINE OCCURRENCES WERE OBSERVED AND MONITORED THROUGH DECEMBER, 1990 AS PART OF THE BRINE SAMPLING AND EVALUATION PROGRAM AT WIPP

(Continued)

Hole Number	Room or Location	Survey Accuracy S=Surveyed A=Approximate	North-South Coordinates*	East-West Coordinates*	Elevation m	Dia. cm	Length m	Direction U=Up D=Down H=Horiz.	Angle in Degrees	References**	Remarks
OH28	S2180/W170	S	S2188.01	W177.14	383.78	8.9	15.1	H	0-3	L	Collared about 0.3 m below the orange band. Monitored for the BSEP since it was drilled 4/89.
OH35	AIS/S90	S	S100.73	W628.97	383.45	8.9	3.1	D	90	M	Drilled for Marker Bed 139 hydrologic testing. Not a part of routine BSEP sampling.
OH36	AIS/S90	S	S96.71	W623.11	383.39	8.9	3.1	D	90	M	Drilled for Marker Bed 139 hydrologic testing. Not a part of routine BSEP sampling.
OH37	AIS/S90	S	S97.66	W609.39	383.35	8.9	3.1	D	90	M	Drilled for Marker Bed 139 hydrologic testing. Not a part of routine BSEP sampling.
OH38	AIS/S90	S	S97.35	W595.62	383.36	8.9	3.1	D	90	M	Drilled for Marker Bed 139 hydrologic testing. Not a part of routine BSEP sampling.
OH39	AIS/S90	A	S97	W540	383	8.9	3	D	90	M	Drilled for Marker Bed 139 hydrologic testing. Not a part of routine BSEP sampling.
OH40	AIS/S90	S	S96.91	W485.10	383.02	8.9	3	D	90	M	Drilled for Marker Bed 139 hydrologic testing. Not a part of routine BSEP sampling.
OH41	AIS/S90	S	S110.52	W622.79	383.44	8.9	3.5	D	90	M	Drilled for Marker Bed 139 hydrologic testing. Not a part of routine BSEP sampling.
OH42	AIS/S90	S	S43.44	W622.54	383.62	8.9	3.2	D	90	M	Drilled for Marker Bed 139 hydrologic testing. Not a part of routine BSEP sampling.
OH43	AIS/S90	S	S124.01	W622.52	383.45	8.9	3.7	D	90	M	Drilled for Marker Bed 139 hydrologic testing. Not a part of routine BSEP sampling.
OH44	AIS/S90	S	S134.53	W622.31	383.46	8.9	3.4	D	90	M	Drilled for Marker Bed 139 hydrologic testing. Not a part of routine BSEP sampling.
OH45	Core Library	S	S391.51	W326.35	384.15	8.9	14.9	H	0-3	L	Monitored for the BSEP since it was drilled 6/89.

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TABLE A-1

LIST OF UNDERGROUND LOCATIONS WHERE BRINE OCCURRENCES WERE OBSERVED AND MONITORED THROUGH DECEMBER, 1990 AS PART OF THE BRINE SAMPLING AND EVALUATION PROGRAM AT WIPP
(Continued)

Hole Number	Room or Location	Survey Accuracy S=Surveyed A=Approximate	North-South Coordinates*	East-West Coordinates*	Elevation m	Dia. cm	Length m	Direction U=Up D=Down H=Horiz.	Angle in Degrees	References**	Remarks
OH46	Core Library	S	S391.51	W319.01	381.65	8.9	15.3	D	90	L	Monitored for the BSEP since it was drilled 6/89.
OH47	Core Library	S	S391.51	W319.01	385.90	8.9	15.2	U	90	L	Monitored for the BSEP since it was drilled 7/89.
PR2	S1600/E140	A	S1600	E140	388	5	6.1	U	90	B, C	Stalactite growth monitored as part of the BSEP from 5/85 to 2/86.
PR3	S1282/E140	A	S2182	E140	385	5	6.1	U	90	B, C	Stalactite growth monitored as part of the BSEP from 5/85 to 2/86.
PR4	S2748/E140	A	S2748	E140	381	5	6.1	U	90	B, C	Stalactite growth monitored as part of the BSEP from 5/85 to 2/86.
WWC1	Room C1	A	N1420			91	4.9	H	0	B	Large horizontal hole on south rib of N1420 drift, across from Room C1. Photographically monitored for salt buildup.

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TABLE A-1

LIST OF UNDERGROUND LOCATIONS WHERE BRINE OCCURRENCES WERE OBSERVED AND MONITORED THROUGH DECEMBER, 1990 AS PART OF THE BRINE SAMPLING AND EVALUATION PROGRAM AT WIPP
(Continued)

FOOTNOTE

A1	TSC-D'Appolonia, 1983 (WIPP-DOE-163)
A2	Bechtel, 1984 (WIPP-DOE-202)
A3	Bechtel, 1985 (WIPP-DOE-213)
B	Brine Sampling and Evaluation Program File
C	Records of Special Drill Holes, September 12, 1983: BSEP Files
D	As-Built Survey Calculation Sheets: BSEP Files
E	Field Notes, J. Gallerani, Bechtel: BSEP Files
F	Field Notes, D. Deal, IT Corporation: BSEP Files
G	Room J Brine Survey: BSEP Files
H	Room L1 and L2 Field Notes: BSEP Files
J	Geotechnical Instrumentation List, November 2, 1983: BSEP files
K	Excavation Effects Drilling Program, Data Transmittal August 12, 1986: Excavation Effects Files: WIPP Geotechnical Engineering Files
L	Drilling Record Log: BSEP Files
N	Survey Data Sheet: WIPP Geotechnical Engineering Files

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APPENDIX A
BRINE ACCUMULATION

PART II—BRINE ACCUMULATION DATA TABLES

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BRINE ACCUMULATION DATA TABLE
Data through December 31, 1990

Location	Date	Time	Liters removed	Days since 1/1/85	Days used for calc.	Liters per day	Cumulative liters collected	Remarks
A1X01	1984-10-10	00:00	NA	0.000	0.000	0.000	0.00	Room A1 completed.
A1X01	1985-02-26	00:00	NA	0.000	0.000	0.000	0.00	Downhole drilled 2/21/85 to 2/26/85.
A1X01	1985-03-12	12:20	00.08	70.514	1.000	0.000	0.08	First time collected.
A1X01	1985-03-20	13:30	00.38	78.562	8.048	0.047	0.46	Brine plus some muck.
A1X01	1985-03-26	11:25	00.23	84.476	5.914	0.039	0.69	Muck in hole, valve leaked, some brine drained back down hole.
A1X01	1985-04-02	12:15	00.39	91.510	7.034	0.055	1.08	
A1X01	1985-04-10	12:20	00.33	99.514	8.004	0.041	1.41	
A1X01	1985-04-17	11:30	00.28	106.479	6.965	0.040	1.69	
A1X01	1985-04-23	10:50	00.23	112.451	5.972	0.039	1.92	
A1X01	1985-04-30	13:26	00.26	119.560	7.109	0.037	2.18	
A1X01	1985-05-07	09:10	00.25	126.382	6.822	0.037	2.43	
A1X01	1985-05-14	10:06	00.24	133.421	7.039	0.034	2.67	
A1X01	1985-05-21	11:40	00.26	140.486	7.065	0.037	2.93	
A1X01	1985-05-29	10:00	00.27	148.417	7.931	0.034	3.20	
A1X01	1985-06-04	10:20	00.20	154.431	6.014	0.033	3.40	
A1X01	1985-06-11	09:40	00.23	161.403	6.972	0.033	3.63	
A1X01	1985-06-18	09:34	00.23	168.399	6.996	0.033	3.86	
A1X01	1985-06-25	09:40	00.22	175.403	7.004	0.031	4.08	
A1X01	1985-07-02	11:00	00.23	182.458	7.055	0.033	4.31	
A1X01	1985-07-09	10:00	00.23	189.417	6.959	0.033	4.54	
A1X01	1985-07-16	10:55	00.23	196.455	7.038	0.033	4.77	
A1X01	1985-07-24	10:00	00.25	204.417	7.962	0.031	5.02	
A1X01	1985-07-30	09:32	00.19	210.397	5.980	0.032	5.21	
A1X01	1985-08-06	09:37	00.21	217.401	7.004	0.030	5.42	
A1X01	1985-08-14	09:48	00.23	225.408	8.007	0.029	5.65	
A1X01	1985-08-20	10:18	00.19	231.429	6.021	0.032	5.84	
A1X01	1985-08-28	09:13	00.23	239.384	7.955	0.029	6.07	
A1X01	1985-09-04	09:46	00.19	246.407	7.023	0.027	6.26	
A1X01	1985-09-10	09:30	00.18	252.396	5.989	0.030	6.44	
A1X01	1985-09-17	09:10	00.19	259.382	6.986	0.027	6.63	
A1X01	1985-09-24	09:11	00.21	266.383	7.001	0.030	6.84	
A1X01	1985-10-01	09:23	00.21	273.391	7.008	0.030	7.05	
A1X01	1985-10-08	12:24	00.20	280.517	7.126	0.028	7.25	Room A1 heaters turned on 10/02/85.
A1X01	1985-10-15	09:43	00.19	287.405	6.888	0.028	7.44	
A1X01	1985-10-23	09:55	00.20	295.413	8.008	0.025	7.64	
A1X01	1985-10-29	11:05	00.17	301.462	6.049	0.028	7.81	
A1X01	1985-11-05	08:50	00.19	308.368	6.906	0.028	8.00	
A1X01	1985-11-13	09:15	00.22	316.385	8.017	0.027	8.22	
A1X01	1985-11-21	10:40	00.21	324.444	8.059	0.026	8.43	
A1X01	1985-11-26	10:10	00.14	329.424	4.980	0.028	8.57	
A1X01	1985-12-04	14:13	00.20	337.592	8.168	0.024	8.77	
A1X01	1985-12-10	10:40	00.15	343.444	5.852	0.026	8.92	
A1X01	1985-12-17	13:59	00.19	350.583	7.139	0.027	9.11	
A1X01	1986-01-03	09:40	00.41	367.403	16.820	0.024	9.52	
A1X01	1986-01-08	10:20	00.09	372.431	5.028	0.018	9.61	
A1X01	1986-01-16	09:50	00.25	380.410	7.979	0.031	9.86	
A1X01	1986-01-23	10:10	00.18	387.424	7.014	0.026	10.04	
A1X01	1986-01-31	11:05	00.21	395.462	8.038	0.026	10.25	
A1X01	1986-02-12	10:10	00.30	407.424	11.962	0.025	10.55	
A1X01	1986-02-19	10:55	00.18	414.455	7.031	0.026	10.73	
A1X01	1986-02-28	14:05	00.23	423.587	9.132	0.025	10.96	
A1X01	1986-03-06	10:00	00.15	429.417	5.830	0.026	11.11	
A1X01	1986-03-13	09:30	00.18	436.396	6.979	0.026	11.29	
A1X01	1986-03-26	09:20	00.33	449.389	12.993	0.025	11.62	
A1X01	1986-04-02	09:00	00.18	456.375	6.986	0.026	11.80	
A1X01	1986-04-08	09:09	00.15	462.381	6.006	0.025	11.95	
A1X01	1986-04-16	11:30	00.20	470.479	8.098	0.025	12.15	
A1X01	1986-04-24	09:35	00.20	478.399	7.920	0.025	12.35	
A1X01	1986-04-30	10:13	00.15	484.426	6.027	0.025	12.50	

BRINE ACCUMULATION DATA TABLE (Continued)
Data through December 31, 1990

Location	Date	Time	Liters removed	Days since 1/1/85	Days used for calc.	Liters per day	Cumulative liters collected	Remarks
A1X01	1986-05-06	09:40	00.12	490.403	5.977	0.020	12.62	
A1X01	1986-05-13	09:25	00.19	497.392	6.989	0.027	12.81	
A1X01	1986-05-20	10:16	00.18	504.428	7.036	0.026	12.99	
A1X01	1986-05-27	15:05	00.18	511.628	7.200	0.025	13.17	
A1X01	1986-06-03	09:28	00.17	518.394	6.766	0.025	13.34	
A1X01	1986-06-10	10:50	00.15	525.451	7.057	0.021	13.49	
A1X01	1986-06-17	09:59	00.19	532.416	6.965	0.027	13.68	
A1X01	1986-06-24	10:10	00.18	539.424	7.008	0.026	13.86	
A1X01	1986-07-01	12:46	00.19	546.532	7.108	0.027	14.05	
A1X01	1986-07-08	10:05	00.16	553.420	6.888	0.023	14.21	
A1X01	1986-07-16	09:57	00.20	561.415	7.995	0.025	14.41	
A1X01	1986-07-22	09:26	00.16	567.393	5.978	0.027	14.57	
A1X01	1986-07-29	10:05	00.17	574.420	7.027	0.024	14.74	
A1X01	1986-08-05	10:21	00.19	581.431	7.011	0.027	14.93	
A1X01	1986-08-12	09:58	00.18	588.415	6.984	0.026	15.11	
A1X01	1986-08-19	10:40	00.18	595.444	7.029	0.026	15.29	
A1X01	1986-08-26	10:07	00.18	602.422	6.978	0.026	15.47	
A1X01	1986-09-04	10:02	00.20	611.418	8.996	0.022	15.67	
A1X01	1986-09-09	10:30	00.15	616.438	5.020	0.030	15.82	
A1X01	1986-09-16	09:36	00.18	623.400	6.962	0.026	16.00	
A1X01	1986-09-23	09:41	00.18	630.403	7.003	0.026	16.18	
A1X01	1986-10-01	11:40	00.19	638.486	8.083	0.024	16.37	
A1X01	1986-10-08	10:34	00.17	645.440	6.954	0.024	16.54	
A1X01	1986-10-14	10:57	00.15	651.456	6.016	0.025	16.69	
A1X01	1986-11-05	10:30	0.55	673.438	21.982	0.025	17.24	
A1X01	1986-11-20	11:45	00.38	688.490	15.052	0.025	17.62	
A1X01	1986-12-31	12:05	00.96	729.503	41.013	0.023	18.58	
A1X01	1987-02-03	12:15	00.80	763.510	34.007	0.024	19.38	
A1X01	1987-03-06	11:55	0.79	794.497	30.987	0.025	20.17	
A1X01	1987-03-30	11:58	0.59	818.499	24.002	0.025	20.76	
A1X01	1987-05-07	10:50	0.98	856.451	37.952	0.026	21.74	
A1X01	1987-06-17	11:40	1.04	897.486	41.035	0.025	22.78	
A1X01	1987-07-28	11:45	1.17	938.490	41.004	0.029	23.95	
A1X01	1987-09-01	11:55	0.79	973.497	35.007	0.023	24.74	Hose came loose and some brine may have drained back down hole. Trace of diesel/oil in brine.
A1X01	1987-10-20	11:08	1.39	1022.460	48.963	0.028	26.13	
A1X01	1987-11-19	10:30	0.77	1052.440	29.980	0.026	26.90	
A1X01	1988-01-04	11:10	1.20	1098.470	46.030	0.026	28.10	
A1X01	1988-02-08	13:25	0.68	1133.560	35.090	0.019	28.78	Lost some brine back down into hole.
A1X01	1988-03-30	12:10	2.25	1184.510	50.950	0.044	31.03	Volume high due to lack of complete evacuation on 2/08/88.
A1X01	1988-05-12	10:10	1.09	1227.420	42.910	0.025	32.12	
A1X01	1988-07-12	09:30	1.56	1288.400	60.980	0.026	33.68	
A1X01	1988-09-27	08:25	1.82	1365.350	76.950	0.024	35.50	
A1X01	1988-12-13	09:30	2.35	1442.400	77.050	0.030	37.85	
A1X01	1989-03-14	09:30	2.54	1533.400	91.000	0.028	40.39	Check valve and hook in hole.
A1X01	1989-04-06	11:55	NA	1556.500	0.000	0.000	40.39	Room locked.
A1X01	1989-04-20	10:00	NA	1570.420	0.000	0.000	40.39	Room locked.
A1X01	1989-05-17	11:55	1.94	1597.500	64.101	0.030	42.33	
A1X01	1989-07-11	10:10	1.30	1652.420	54.927	0.024	43.63	
A1X01	1989-09-12	11:40	2.25	1715.490	63.062	0.036	45.88	
A1X01	1989-10-10	09:40	NA	743.400	0.000	0.000	45.88	Installed collection device. Collection point for brine located outside room.
A1X01	1989-10-20	10:42	0.74	1753.450	37.960	0.019	46.62	Some brine may have been left in hole.
A1X01	1989-11-10	09:56	0.72	1774.410	20.968	0.034	47.34	
A1X01	1989-11-29	12:10	0.65	1793.510	19.093	0.034	47.99	
A1X01	1989-12-12	09:10	0.50	1806.380	12.875	0.039	48.49	
A1X01	1990-01-04	10:11	0.63	1829.424	23.042	0.027	49.12	
A1X01	1990-01-17	11:29	0.30	1842.478	13.054	0.023	49.42	

BRINE ACCUMULATION DATA TABLE (Continued)
Data through December 31, 1990

Location	Date	Time	Liters removed	Days since 1/1/85	Days used for calc.	Liters per day	Cumulative liters collected	Remarks
A1X01	1990-01-31	09:56	0.15	1856.414	13.936	0.011	49.57	
A1X01	1990-02-13	09:40	0.26	1869.403	12.989	0.020	49.83	
A1X01	1990-02-27	12:11	0.64	1883.508	14.105	0.045	50.47	
A1X01	1990-03-05	11:03	0.79	1889.460	5.952	0.133	51.26	
A1X01	1990-03-21	11:26	0.52	1905.476	16.016	0.032	51.78	
A1X01	1990-04-06	10:35	0.48	1921.441	15.965	0.030	52.26	
A1X01	1990-04-17	11:49	0.37	1932.492	11.051	0.033	52.63	
A1X01	1990-04-24	10:38	0.23	1939.443	6.951	0.033	52.86	
A1X01	1990-05-02	11:47	0.25	1947.491	8.048	0.031	53.11	
A1X01	1990-05-09	11:26	0.23	1954.476	6.985	0.033	53.34	
A1X01	1990-05-16		NA	1961.000	6.524	0.000	53.34	No vacuum in sampler.
A1X01	1990-05-17	08:36	0.18	1962.358	7.882	0.023	53.52	
A1X01	1990-05-23	12:32	0.22	1968.522	6.164	0.036	53.74	
A1X01	1990-05-31	10:41	0.24	1976.445	7.923	0.030	53.98	
A1X01	1990-06-06	11:09	0.20	1982.465	6.020	0.033	54.18	
A1X01	1990-06-14	09:45	0.23	1990.406	7.941	0.029	54.41	
A1X01	1990-06-28	09:59	0.38	2004.416	14.010	0.027	54.79	
A1X01	1990-07-14	10:00	NA	2020.000				Heaters turned off.
A1X01	1990-07-17	09:52	0.39	2023.411	18.995	0.021	55.18	
A1X01	1990-07-25	08:25	0.42	2031.351	7.940	0.053	55.60	
A1X01	1990-08-07	11:10	0.42	2044.465	13.114	0.032	56.02	
A1X01	1990-08-16	11:25	0.33	2053.476	9.011	0.037	56.35	
A1X01	1990-08-22	11:44	0.24	2059.489	6.013	0.040	56.59	
A1X01	1990-08-29	12:50	0.20	2066.535	7.046	0.028	56.79	
A1X01	1990-09-05	11:45	0.25	2073.490	6.955	0.036	57.04	
A1X01	1990-09-13	09:56	0.21	2081.414	7.924	0.027	57.25	
A1X01	1990-09-25	12:05	0.34	2093.503	12.089	0.000	57.59	Partial evacuation.
A1X01	1990-09-26	10:57	0.10	2094.456	0.953	0.034	57.69	Combined with 0.34 liters from 09/25/90. Used 0.44 liters for calculation.
A1X01	1990-10-03	10:03	0.25	2101.419	6.963	0.036	57.94	
A1X01	1990-10-10	11:46	0.20	2108.490	7.071	0.028	58.14	
A1X01	1990-10-18	10:57	0.23	2116.456	7.966	0.029	58.37	
A1X01	1990-10-24	12:20	0.21	2122.514	6.058	0.035	58.58	
A1X01	1990-10-31	11:37	0.20	2129.484	6.970	0.029	58.78	
A1X01	1990-11-07	10:54	0.22	2136.454	6.970	0.032	59.00	
A1X01	1990-11-14	11:52	0.22	2143.494	7.040	0.031	59.22	
A1X01	1990-11-28	10:54	0.39	2157.454	13.960	0.028	59.61	
A1X01	1990-12-05	08:59	0.28	2164.374	6.920	0.040	59.89	
A1X01	1990-12-13	09:40	0.27	2172.403	8.029	0.034	60.16	
A1X01	1990-12-20	09:01	0.22	2179.376	6.973	0.032	60.38	
A1X02	1984-10-10	00:00	NA	0.000	0.000	0.000	0.00	Room A1 completed.
A1X02	1985-03-07	09:30	NA	65.396	1.000	0.000	0.00	Uphole drilled 2/27/85 to 3/07/85. Hit brine at 12 ft. on 2/27/85.
A1X02	1985-03-12	12:00	NA	70.500	6.104	0.000	0.00	Trace brine, deepened hole to clay seam. Moisture on back 1 ft radius.
A1X02	1985-03-20	13:00	NA	78.542	14.146	0.000	0.00	Trace brine, drip missing funnel.
A1X02	1985-03-26	11:25	NA	84.476	20.080	0.000	0.00	Repositioned funnel, collected one cup of salt crystals with trace of brine.
A1X02	1985-04-02	12:15	00.21	91.510	27.114	0.008	0.21	Some drips missing funnel.
A1X02	1985-04-10	12:20	00.22	99.514	8.004	0.027	0.43	Collection container had leak.
A1X02	1985-04-17	11:30	00.12	106.479	6.965	0.017	0.55	Some drips missing funnel.
A1X02	1985-04-23	10:50	00.12	112.451	5.972	0.020	0.67	Some drips missing funnel.
A1X02	1985-04-30	13:16	00.12	119.553	7.102	0.017	0.79	Some drips missing funnel.
A1X02	1985-05-07	09:05	00.16	126.378	6.825	0.023	0.95	
A1X02	1985-05-14	10:04	00.19	133.419	7.041	0.027	1.14	
A1X02	1985-05-21	11:35	00.13	140.483	7.064	0.018	1.27	Some drips missing funnel.
A1X02	1985-05-29	10:00	00.21	148.417	7.934	0.026	1.48	
A1X02	1985-06-04	10:25	00.17	154.434	6.017	0.028	1.65	

BRINE ACCUMULATION DATA TABLE (Continued)
Data through December 31, 1990

Location	Date	Time	Liters removed	Days since 1/1/85	Days used for calc.	Liters per day	Cumulative liters collected	Remarks
A1X02	1985-06-11	09:40	00.05	161.403	6.969	0.007	1.70	
A1X02	1985-06-18	09:30	00.08	168.396	6.993	0.011	1.78	Some drips missing funnel, big stalactite formed.
A1X02	1985-06-25	09:45	00.16	175.406	7.010	0.023	1.94	
A1X02	1985-07-02	11:00	00.10	182.458	7.052	0.014	2.04	
A1X02	1985-07-09	09:58	00.15	189.415	6.957	0.022	2.19	
A1X02	1985-07-16	10:53	00.24	196.453	7.038	0.034	2.43	
A1X02	1985-07-24	09:49	00.24	204.409	7.956	0.030	2.67	
A1X02	1985-07-30	09:30	00.15	210.396	5.987	0.025	2.82	
A1X02	1985-08-06	09:35	00.14	217.399	7.003	0.020	2.96	
A1X02	1985-08-14	09:26	00.05	225.393	7.994	0.006	3.01	
A1X02	1985-08-20	10:13	00.09	231.426	6.033	0.015	3.10	
A1X02	1985-08-28	09:08	00.06	239.381	7.955	0.008	3.16	
A1X02	1985-09-04	09:44	00.07	246.406	7.025	0.010	3.23	
A1X02	1985-09-10	09:24	00.12	252.392	5.986	0.020	3.35	
A1X02	1985-09-17	09:08	00.13	259.381	6.989	0.019	3.48	Some drips missing funnel.
A1X02	1985-09-24	09:07	00.17	266.380	6.999	0.024	3.65	
A1X02	1985-10-01	09:21	00.14	273.390	7.010	0.020	3.79	
A1X02	1985-10-08	12:19	00.16	280.513	7.123	0.022	3.95	Room A1 heaters turned on 10/02/85.
A1X02	1985-10-15	09:41	00.12	287.403	6.890	0.017	4.07	
A1X02	1985-10-23	09:43	00.19	295.405	8.002	0.024	4.26	
A1X02	1985-10-29	11:02	00.12	301.460	6.055	0.020	4.38	
A1X02	1985-11-05	08:46	00.12	308.365	6.905	0.017	4.50	
A1X02	1985-11-13	09:16	00.13	316.386	8.021	0.016	4.63	Some drips missing funnel.
A1X02	1985-11-21	10:45	00.13	324.448	8.062	0.016	4.76	Some drips missing funnel.
A1X02	1985-12-04	14:07	00.14	337.588	13.140	0.011	4.90	
A1X02	1985-12-10	10:31	00.08	343.438	5.850	0.014	4.98	
A1X02	1985-12-17	13:56	00.03	350.581	7.143	0.004	5.01	
A1X02	1986-01-03	09:40	00.01	367.403	16.822	0.001	5.02	Some drips missing funnel.
A1X02	1986-01-23	10:10	00.06	387.424	20.021	0.003	5.08	New, larger funnel since 01/17.
A1X02	1986-01-31	11:05	00.23	395.462	8.038	0.029	5.31	
A1X02	1986-02-12	10:10	00.22	407.424	11.962	0.018	5.53	
A1X02	1986-02-19	10:50	00.07	414.451	7.027	0.010	5.60	
A1X02	1986-02-28	14:00	00.02	423.583	9.132	0.002	5.62	
A1X02	1986-03-13	09:30	00.05	436.396	12.813	0.004	5.67	
A1X02	1986-03-26	09:20	00.05	449.389	12.993	0.004	5.72	
A1X02	1986-04-02	09:00	00.08	456.375	6.986	0.011	5.80	
A1X02	1986-04-16	11:30	00.10	470.479	14.104	0.007	5.90	
A1X02	1986-04-24	09:35	00.05	478.399	7.920	0.006	5.95	
A1X02	1986-04-30	10:10	00.07	484.424	6.025	0.012	6.02	
A1X02	1986-05-06	09:40	00.16	490.403	5.979	0.027	6.18	
A1X02	1986-05-13	09:25	00.02	497.392	6.989	0.003	6.20	
A1X02	1986-05-20	10:16	00.04	504.428	7.036	0.006	6.24	
A1X02	1986-05-27	15:05	00.15	511.628	7.200	0.021	6.39	
A1X02	1986-06-03	09:28	00.13	518.394	6.766	0.019	6.52	
A1X02	1986-06-10	10:50	00.10	525.451	7.057	0.014	6.62	
A1X02	1986-06-17	09:59	00.12	532.416	6.965	0.017	6.74	
A1X02	1986-06-24	10:10	00.25	539.424	7.008	0.036	6.99	
A1X02	1986-07-01	12:44	00.23	546.531	7.107	0.032	7.22	
A1X02	1986-07-08	10:05	00.11	553.420	6.889	0.016	7.33	
A1X02	1986-07-16	09:54	00.25	561.413	7.993	0.031	7.58	
A1X02	1986-07-22	09:26	00.16	567.393	5.980	0.027	7.74	
A1X02	1986-07-29	10:05	00.26	574.420	7.027	0.037	8.00	
A1X02	1986-08-05	10:19	00.22	581.430	7.010	0.031	8.22	
A1X02	1986-08-12	09:58	00.28	588.415	6.985	0.040	8.50	
A1X02	1986-08-19	10:38	00.26	595.443	7.028	0.037	8.76	
A1X02	1986-08-26	10:07	00.24	602.422	6.979	0.034	9.00	
A1X02	1986-09-04	10:01	00.35	611.417	8.995	0.039	9.35	
A1X02	1986-09-09	10:25	00.17	616.434	5.017	0.034	9.52	
A1X02	1986-09-16	09:35	00.27	623.399	6.965	0.039	9.79	

BRINE ACCUMULATION DATA TABLE (Continued)
Data through December 31, 1990

Location	Date	Time	Liters removed	Days since 1/1/85	Days used for calc.	Liters per day	Cumulative liters collected	Remarks
A1X02	1986-09-23	09:39	00.26	630.402	7.003	0.037	10.05	
A1X02	1986-10-01	11:39	00.24	638.485	8.083	0.030	10.29	
A1X02	1986-10-08	10:32	00.17	645.439	6.954	0.024	10.46	
A1X02	1986-10-14	10:53	00.13	651.453	6.014	0.022	10.59	
A1X02	1986-11-05	10:30	0.30	673.438	21.985	0.014	10.89	
A1X02	1986-11-20	11:43	00.11	688.488	15.050	0.007	11.00	
A1X02	1986-12-31	12:10	00.14	729.507	41.019	0.003	11.14	Low readings from 11/20/86 to 6/20/87 may be due to blockage in collection system.
A1X02	1987-02-03	12:16	NA	763.000	33.493	0.000	11.14	
A1X02	1987-03-06	11:55	0.05	794.497	64.990	0.001	11.19	
A1X02	1987-03-30	11:55	0.01	818.497	24.000	0.000	11.20	Tubing plugged, unable to open.
A1X02	1987-05-07	10:45	0.01	856.448	1.000	0.000	11.21	Tubing plugged, unable to open.
A1X02	1987-06-30	12:00	1.58	910.500	92.003	0.017	12.79	Removed metal funnel, which was plugged. Most of the brine collected was in the funnel. Installed a large plastic funnel.
A1X02	1987-07-28	11:45	0.85	938.490	27.990	0.030	13.64	
A1X02	1987-09-01	11:55	0.94	973.497	35.007	0.027	14.58	
A1X02	1987-10-20	10:59	1.84	1022.460	48.963	0.038	16.42	
A1X02	1987-11-19	10:30	1.09	1052.440	29.980	0.036	17.51	
A1X02	1988-01-04	11:05	3.73	1098.460	46.020	0.081	21.24	
A1X02	1988-02-08	13:17	1.65	1133.550	35.090	0.047	22.89	
A1X02	1988-03-30	12:20	4.86	1184.510	50.960	0.095	27.75	
A1X02	1988-06-14	09:00	5.15	1260.380	75.870	0.068	32.90	Removed to provide room for further collection.
A1X02	1988-07-12	09:30	1.11	1288.400	28.020	0.040	34.01	
A1X02	1988-09-15	11:00	0.18	1353.460	0.000	0.000	34.19	Not fully evacuated. Do not use for calculation.
A1X02	1988-09-27	08:30	3.00	1365.350	76.950	0.000	37.19	Used 3.18 liters for calculation (0.18 on 9/15 + 3.00 on 9/27).
A1X02	1988-12-13	09:30	2.50	1442.400	77.050	0.032	39.69	
A1X02	1989-03-14	09:30	2.96	1533.400	90.996	0.033	42.65	
A1X02	1989-04-06	11:55	NA	1556.500	0.000	0.000	42.65	Room locked.
A1X02	1989-04-20	10:00	NA	570.420	0.000	0.000	42.65	Room locked.
A1X02	1989-05-17	12:05	4.47	1597.500	155.107	0.029	47.12	
A1X02	1989-07-11	10:05	2.32	1652.420	54.917	0.042	49.44	
A1X02	1989-09-12	11:35	2.77	1715.480	63.063	0.044	52.21	
A1X02	1989-10-10	09:25	1.57	1743.390	27.909	0.056	53.78	
A1X02	1989-10-10	10:00	NA	1743.420	0.000	0.000	53.78	Repositioned collection tube from funnel. Collection point for brine located outside room.
A1X02	1989-10-20	10:44	NA	1753.450	0.000	0.000	53.78	No sample.
A1X02	1989-11-10	10:08	1.90	1774.420	31.030	0.061	55.68	
A1X02	1989-11-29	12:10	0.53	1793.510	19.085	0.028	56.21	
A1X02	1989-12-12	09:20	0.05	1806.390	12.882	0.004	56.26	
A1X02	1990-01-04	10:50	0.22	1829.451	23.062	0.010	56.48	Hose broken, some brine leaked to floor. Fixed hose, funnel full of brine.
A1X02	1990-01-17	11:35	1.20	1842.483	13.032	0.092	57.68	
A1X02	1990-01-31	10:27	0.53	1856.435	13.952	0.038	58.21	
A1X02	1990-02-13	09:53	0.29	1869.412	12.977	0.022	58.50	
A1X02	1990-02-27	12:17	0.45	1883.512	14.100	0.032	58.95	
A1X02	1990-03-05	11:11	0.58	1889.466	5.954	0.097	59.53	
A1X02	1990-03-21	11:26	0.18	1905.476	16.010	0.011	59.71	
A1X02	1990-04-06	10:40	0.34	1921.444	15.968	0.021	60.05	
A1X02	1990-04-17	11:53	0.17	1932.495	11.051	0.015	60.22	
A1X02	1990-04-24	10:40	0.01	1939.444	6.949	0.001	60.23	
A1X02	1990-05-02	11:49	0.23	1947.492	8.048	0.029	60.46	
A1X02	1990-05-09	11:13	0.19	1954.467	6.975	0.027	60.65	
A1X02	1990-05-16	10:49	0.23	1961.451	6.984	0.033	60.88	
A1X02	1990-05-23	12:32	0.20	1968.522	7.071	0.028	61.08	
A1X02	1990-05-31	10:29	0.25	1976.437	7.915	0.032	61.33	

BRINE ACCUMULATION DATA TABLE (Continued)
Data through December 31, 1990

Location	Date	Time	Liters removed	Days since 1/1/85	Days used for calc.	Liters per day	Cumulative liters collected	Remarks
A1X02	1990-06-06	11:20	0.13	1982.472	6.035	0.022	61.46	
A1X02	1990-06-14	09:51	0.11	1990.410	7.938	0.014	61.57	
A1X02	1990-06-28	10:08	0.24	2004.422	14.012	0.017	61.81	
A1X02	1990-07-14	10:00	NA	2020.000				Heaters turned off.
A1X02	1990-07-17	09:51	0.23	2023.410	18.988	0.012	62.04	
A1X02	1990-07-25	08:30	0.15	2031.354	7.944	0.019	62.19	
A1X02	1990-08-07	10:53	0.32	2044.453	13.099	0.024	62.51	
A1X02	1990-08-16	11:30	0.11	2053.479	9.026	0.012	62.62	
A1X02	1990-08-22	11:52	0.25	2059.494	6.015	0.042	62.87	
A1X02	1990-08-29	12:52	0.32	2066.536	7.042	0.045	63.19	
A1X02	1990-09-05	11:50	0.27	2073.493	6.957	0.039	63.46	
A1X02	1990-09-13	09:58	0.33	2081.415	7.922	0.042	63.79	
A1X02	1990-09-25	12:15	0.46	2093.510	12.095	0.038	64.25	
A1X02	1990-10-03	10:03	0.28	2101.419	7.909	0.035	64.53	
A1X02	1990-10-10	11:43	0.25	2108.488	7.069	0.035	64.78	
A1X02	1990-10-18	11:04	0.31	2116.461	7.973	0.039	65.09	
A1X02	1990-10-24	12:22	0.20	2122.515	6.054	0.033	65.29	
A1X02	1990-10-31	11:50	0.22	2129.493	6.978	0.032	65.51	
A1X02	1990-11-07	10:56	0.23	2136.456	6.963	0.033	65.74	
A1X02	1990-11-14	11:54	0.20	2143.496	7.040	0.028	65.94	
A1X02	1990-11-28	10:56	0.47	2157.456	13.960	0.034	66.41	
A1X02	1990-12-05	09:02	0.21	2164.376	6.920	0.030	66.62	
A1X02	1990-12-13	09:45	0.27	2172.406	8.030	0.034	66.89	
A1X02	1990-12-20	09:04	0.24	2179.378	6.972	0.034	67.13	
********								
A2X01	1984-07-25	00:00	NA	0.000	0.000	0.000	0.00	Room A2 completed.
A2X01	1985-02-09	00:00	NA	0.000	0.000	0.000	0.00	Downhole drilled 2/04/85 to 2/09/85.
A2X01	1985-02-19	13:20	NA	49.556	1.000	0.000	0.00	Moist muck. First entry.
A2X01	1985-03-07	09:30	00.29	65.396	16.840	0.017	0.29	Lots of muck, some oil.
A2X01	1985-03-12	11:30	00.62	70.479	5.083	0.122	0.91	Brine and muck.
A2X01	1985-03-20	13:04	00.52	78.544	8.065	0.064	1.43	
A2X01	1985-03-26	11:02	00.38	84.460	5.916	0.064	1.81	
A2X01	1985-04-02	11:58	00.36	91.499	7.039	0.051	2.17	
A2X01	1985-04-10	11:53	00.36	99.495	7.996	0.045	2.53	Some muck included.
A2X01	1985-04-17	11:10	00.27	106.465	6.970	0.039	2.80	
A2X01	1985-04-23	10:30	00.24	112.438	5.973	0.040	3.04	
A2X01	1985-04-30	13:50	00.29	119.576	7.138	0.041	3.33	
A2X01	1985-05-07	08:45	00.25	126.365	6.789	0.037	3.58	
A2X01	1985-05-14	09:40	00.24	133.403	7.038	0.034	3.82	
A2X01	1985-05-21	12:08	00.24	140.506	7.103	0.034	4.06	
A2X01	1985-05-29	09:00	00.26	148.375	7.869	0.033	4.32	
A2X01	1985-06-04	09:35	00.20	154.399	6.024	0.033	4.52	
A2X01	1985-06-11	09:15	00.23	161.385	6.986	0.033	4.75	
A2X01	1985-06-18	09:15	00.23	168.385	7.000	0.033	4.98	
A2X01	1985-06-25	09:15	00.23	175.385	7.000	0.033	5.21	
A2X01	1985-07-02	11:00	00.23	182.458	7.073	0.033	5.44	
A2X01	1985-07-09	09:29	00.22	189.395	6.937	0.032	5.66	
A2X01	1985-07-16	10:30	00.23	196.438	7.043	0.033	5.89	Brine effervesces.
A2X01	1985-07-24	09:39	00.24	204.402	7.964	0.030	6.13	
A2X01	1985-07-30	08:55	00.19	210.372	5.970	0.032	6.32	
A2X01	1985-08-06	09:21	00.21	217.390	7.018	0.030	6.53	
A2X01	1985-08-14	09:05	00.25	225.378	7.988	0.031	6.78	
A2X01	1985-08-20	09:50	00.19	231.410	6.032	0.031	6.97	
A2X01	1985-08-28	08:45	00.21	239.365	7.955	0.026	7.18	Valve leaked, some brine drained back down hole.
A2X01	1985-09-04	09:21	00.25	246.390	7.025	0.036	7.43	
A2X01	1985-09-10	09:09	00.18	252.381	5.991	0.030	7.61	
A2X01	1985-09-17	08:50	00.21	259.368	6.987	0.030	7.82	

BRINE ACCUMULATION DATA TABLE (Continued)
Data through December 31, 1990

Location	Date	Time	Liters removed	Days since 1/1/85	Days used for calc.	Liters per day	Cumulative liters collected	Remarks
A2X01	1985-09-24	08:48	00.21	266.367	6.999	0.030	8.03	
A2X01	1985-10-01	09:12	00.21	273.383	7.016	0.030	8.24	
A2X01	1985-10-08	12:57	00.21	280.540	7.157	0.029	8.45	Room A2 heaters turned on 10/02/85.
A2X01	1985-10-15	09:20	00.20	287.389	6.849	0.029	8.65	
A2X01	1985-10-23	09:32	00.22	295.397	8.008	0.027	8.87	
A2X01	1985-10-29	11:20	00.15	301.472	6.075	0.025	9.02	
A2X01	1985-11-05	08:28	00.21	308.353	6.881	0.031	9.23	
A2X01	1985-11-13	09:00	00.23	316.375	8.022	0.029	9.46	
A2X01	1985-11-21	10:15	00.23	324.427	8.052	0.029	9.69	
A2X01	1985-11-26	09:40	00.14	329.403	4.976	0.028	9.83	
A2X01	1985-12-04	13:45	00.20	337.573	8.170	0.024	10.03	
A2X01	1985-1210	10:56	00.16	343.456	5.883	0.027	10.19	
A2X01	1985-12-17	13:39	00.21	350.569	7.113	0.030	10.40	
A2X01	1986-01-03	09:30	00.47	367.396	16.827	0.028	10.87	
A2X01	1986-01-08	09:50	00.15	372.410	5.014	0.030	11.02	
A2X01	1986-01-16	09:20	00.22	380.389	7.979	0.028	11.24	
A2X01	1986-01-23	09:40	00.19	387.403	7.014	0.027	11.43	
A2X01	1986-01-31	10:45	00.25	395.448	8.045	0.031	11.68	
A2X01	1986-02-12	09:40	00.34	407.403	11.955	0.028	12.02	
A2X01	1986-02-19	14:20	00.12	414.597	7.194	0.017	12.14	Collection device used, some fluid was left in hole.
A2X01	1986-02-28	14:30	00.20	423.604	9.007	0.022	12.34	Collection device used, some fluid left in hole.
A2X01	1986-03-04	09:00	00.15	427.375	3.771	0.040	12.49	
A2X01	1986-03-06	09:30	00.07	429.396	2.021	0.035	12.56	Two days accumulation
A2X01	1986-03-13	09:00	00.15	436.375	6.979	0.021	12.71	
A2X01	1986-03-26	09:05	00.15	449.378	13.003	0.012	12.86	Partial evacuation, brine left in hole.
A2X01	1986-04-02	08:40	00.32	456.361	6.983	0.046	13.18	
A2X01	1986-04-08	08:50	00.19	462.368	6.007	0.032	13.37	
A2X01	1986-04-16	10:45	00.15	470.448	8.080	0.019	13.52	
A2X01	1986-04-24	09:20	00.24	478.389	7.941	0.030	13.76	Removed collection device.
A2X01	1986-04-30	09:55	00.20	484.413	6.024	0.033	13.96	Resumed sampling with bailer.
A2X01	1986-05-06	09:25	00.13	490.392	5.979	0.022	14.09	
A2X01	1986-05-13	09:10	00.20	497.382	6.990	0.029	14.29	
A2X01	1986-05-20	09:45	00.20	504.406	7.024	0.028	14.49	
A2X01	1986-05-27	14:45	00.20	511.615	7.209	0.028	14.69	
A2X01	1986-06-03	09:10	00.19	518.382	6.767	0.028	14.88	
A2X01	1986-06-10	10:34	00.19	525.440	7.058	0.027	15.07	
A2X01	1986-06-17	09:38	00.19	532.401	6.961	0.027	15.26	
A2X01	1986-06-24	09:55	00.18	539.413	7.012	0.026	15.44	
A2X01	1986-07-01	12:17	00.19	546.512	7.099	0.027	15.63	
A2X01	1986-07-08	09:37	00.19	553.401	6.889	0.028	15.82	
A2X01	1986-07-16	09:37	00.18	561.401	8.000	0.022	16.00	
A2X01	1986-07-22	09:10	00.18	567.382	5.981	0.030	16.18	
A2X01	1986-07-29	09:50	00.18	574.410	7.028	0.026	16.36	
A2X01	1986-08-05	10:03	00.13	581.419	7.009	0.019	16.49	
A2X01	1986-08-12	09:40	00.18	588.403	6.984	0.026	16.67	
A2X01	1986-08-19	10:20	00.18	595.431	7.028	0.026	16.85	
A2X01	1986-08-26	09:51	00.17	602.410	6.979	0.024	17.02	
A2X01	1986-09-04	09:41	00.15	611.403	8.993	0.017	17.17	
A2X01	1986-09-09	10:50	00.16	616.451	5.048	0.032	17.33	
A2X01	1986-09-16	09:17	00.22	623.387	6.936	0.032	17.55	
A2X01	1986-09-23	09:25	00.17	630.392	7.005	0.024	17.72	
A2X01	1986-10-01	11:21	00.32	638.473	8.081	0.040	18.04	
A2X01	1986-10-08	10:10	00.17	645.424	6.951	0.024	18.21	
A2X01	1986-10-14	10:36	00.17	651.442	6.018	0.028	18.38	
A2X01	1986-11-05	10:10	0.51	673.424	21.982	0.023	18.89	
A2X01	1986-11-20	11:05	00.29	688.462	15.038	0.019	19.18	
A2X01	1986-12-31	11:25	00.96	729.476	41.014	0.023	20.14	
A2X01	1987-02-03	11:30	00.80	763.479	34.003	0.024	20.94	

BRINE ACCUMULATION DATA TABLE (Continued)
Data through December 31, 1990

Location	Date	Time	Liters removed	Days since 1/1/85	Days used for calc.	Liters per day	Cumulative liters collected	Remarks
A2X01	1987-03-06	11:50	0.77	794.493	31.014	0.025	21.71	
A2X01	1987-03-30	11:55	0.62	818.503	24.010	0.026	22.33	
A2X01	1987-05-07	10:06	0.90	856.421	37.918	0.024	23.23	
A2X01	1987-06-17	11:15	1.05	897.469	41.048	0.026	24.28	
A2X01	1987-07-28	12:15	1.10	938.510	41.041	0.027	25.38	
A2X01	1987-09-01	11:30	0.87	973.479	34.969	0.025	26.25	
A2X01	1987-10-20	10:34	1.14	1022.440	48.961	0.023	27.39	
A2X01	1987-11-19	10:10	0.70	1052.420	29.980	0.023	28.09	
A2X01	1988-01-04	10:45	1.43	1098.450	46.030	0.031	29.52	
A2X01	1988-02-08	12:45	0.96	1133.530	35.080	0.027	30.48	
A2X01	1988-03-30	12:00	1.23	1184.500	50.970	0.024	31.71	
A2X01	1988-05-12	10:30	0.83	1227.440	42.940	0.019	32.54	
A2X01	1988-07-12	10:00	1.51	1288.420	60.980	0.025	34.05	
A2X01	1988-09-27	08:15	1.56	1365.340	76.920	0.020	35.61	Suction hose came off, some brine drained back down hole.
A2X01	1988-12-13	09:10	1.61	1442.380	77.040	0.021	37.22	Orange color.
A2X01	1989-03-14	08:55	4.04	1533.370	90.990	0.044	41.26	
A2X01	1989-04-06	11:59	NA	1556.500	0.000	0.000	41.26	Room locked.
A2X01	1989-04-20	10:00	NA	1570.420	0.000	0.000	41.26	Room locked.
A2X01	1989-05-17	11:20	2.82	1597.470	64.100	0.044	44.08	
A2X01	1989-07-11	09:40	1.00	1652.400	54.931	0.018	45.08	
A2X01	1989-09-12	11:15	1.60	1715.470	63.066	0.025	46.68	
A2X01	1989-10-11	10:00	NA	1744.420	0.000	0.000	46.68	Installed collection device. Collection point for brine located outside heated room.
A2X01	1989-10-20	10:35	0.66	1753.440	37.972	0.017	47.34	
A2X01	1989-11-10	09:10	0.64	1774.380	20.941	0.031	47.98	
A2X01	1989-11-29	11:19	0.50	1793.470	19.090	0.026	48.48	
A2X01	1989-12-12	08:55	0.33	1806.370	12.900	0.026	48.81	
A2X01	1990-01-04	09:21	0.49	1829.390	23.018	0.021	49.30	
A2X01	1990-01-17	10:19	0.30	1842.430	13.040	0.023	49.60	
A2X01	1990-01-31	09:29	0.28	1856.395	13.965	0.020	49.88	
A2X01	1990-02-13	10:00	0.31	1869.417	13.022	0.024	50.19	
A2X01	1990-02-27	11:35	0.34	1883.483	14.066	0.024	50.53	
A2X01	1990-03-05	10:30	0.30	1889.438	5.955	0.050	50.83	
A2X01	1990-03-21	11:00	0.18	1905.458	16.020	0.011	51.01	
A2X01	1990-04-06	10:16	0.36	1921.428	15.970	0.023	51.37	
A2X01	1990-04-17	11:00	0.28	1932.458	11.030	0.025	51.65	
A2X01	1990-04-24	09:35	0.20	1939.399	6.941	0.029	51.85	
A2X01	1990-05-02	11:08	0.21	1947.464	8.065	0.026	52.06	
A2X01	1990-05-09	10:49	0.17	1954.451	6.987	0.024	52.23	
A2X01	1990-05-16	10:08	0.20	1961.422	6.971	0.029	52.43	
A2X01	1990-05-23	12:43	0.21	1968.530	7.108	0.030	52.64	
A2X01	1990-06-01	10:20	0.20	1977.431	8.901	0.022	52.84	Replaced sampler.
A2X01	1990-06-06	10:58	0.16	1982.457	5.026	0.032	53.00	
A2X01	1990-06-14	09:20	0.05	1990.389	7.932	0.006	53.05	
A2X01	1990-06-19	10:00	NA	1995.000				Roof fall. Heaters turned off.
A2X01	1990-06-28	09:46	0.07	2004.407	14.018	0.005	53.12	
A2X01	1990-07-17	10:40	0.16	2023.444	19.037	0.008	53.28	
A2X01	1990-07-25	08:22	NA	2031.349			53.28	Could not evacuate, would not hold vacuum.
A2X01	1990-09-26	NA						Collection device repaired.
A2X01	1990-09-27	10:30	0.09	2095.438	71.994	0.000	53.37	
A2X01	1990-09-28	09:40	0.03	2096.403	0.965	0.002	53.40	Combined with 0.09 liters from 9/27/90. Used 0.12 liters for calculation.
A2X01	1990-10-03	09:35	0.15	2101.399	4.996	0.030	53.55	
A2X01	1990-10-10	11:25	NA	2108.476			53.55	Trace. Could not sample. Sampler does not hold vacuum. Last time sampled for BSEP.
A2X02	1984-07-25	00:00	NA	0.000	0.000	0.000	0.00	Room A2 completed.

BRINE ACCUMULATION DATA TABLE (Continued)
Data through December 31, 1990

Location	Date	Time	Liters removed	Days since 1/1/85	Days used for calc.	Liters per day	Cumulative liters collected	Remarks
A2X02	1985-02-19	13:20	NA	49.556	1.000	0.000	0.00	Uphole drilled 2/11/85 to 2/20/85, installed collection device.
A2X02	1985-03-07	09:30	00.34	65.396	16.840	0.020	0.34	Moist area 1.5 ft. around the collar.
A2X02	1985-03-12	11:30	00.21	70.479	5.083	0.041	0.55	Back wet, 5 ft diameter.
A2X02	1985-03-20	13:04	00.31	78.544	8.065	0.038	0.86	
A2X02	1985-03-26	11:02	00.14	84.460	5.916	0.024	1.00	
A2X02	1985-04-02	11:58	00.12	91.499	7.039	0.017	1.12	Significant salt buildup. 4' dia. wet spot on back.
A2X02	1985-04-10	11:53	00.11	99.495	7.996	0.014	1.23	Reset collection device.
A2X02	1985-04-23	10:30	00.01	112.438	12.943	0.001	1.24	
A2X02	1985-05-07	08:41	NA	126.362	13.924	0.000	1.24	Some drips missing funnel.
A2X02	1985-05-14	09:40	NA	133.403	20.965	0.000	1.24	Some drips missing funnel.
A2X02	1985-07-09	09:25	00.05	189.392	76.954	0.001	1.29	
A2X02	1985-07-16	10:23	00.06	196.433	7.041	0.009	1.35	
A2X02	1985-07-24	09:33	00.02	204.398	7.965	0.003	1.37	
A2X02	1985-08-06	09:22	00.01	217.390	12.992	0.001	1.38	
A2X02	1985-08-28	08:35	00.01	239.358	21.968	0.000	1.39	Some drips missing funnel.
A2X02	1985-09-04	09:18	00.08	246.387	7.029	0.011	1.47	
A2X02	1985-09-10	09:04	00.02	252.378	5.991	0.003	1.49	
A2X02	1985-09-17	08:55	00.02	259.372	6.994	0.003	1.51	
A2X02	1985-10-15	09:17	00.02	287.387	28.015	0.001	1.53	Room A2 heaters turned on 10/02/85.
A2X02	1986-01-31	10:40	00.05	395.444	108.057	0.000	1.58	
A2X02	1986-02-12	09:40	00.02	407.403	11.959	0.002	1.60	
A2X02	1986-03-13	09:00	00.01	436.375	28.972	0.000	1.61	
A2X02	1986-03-26	09:05	00.07	449.378	13.003	0.005	1.68	
A2X02	1986-04-02	08:40	00.10	456.361	6.983	0.014	1.78	High reading probably due to unplugging temporary blockage in collection tube on 3/26/86.
A2X02	1986-04-16	10:45	00.09	470.448	14.087	0.006	1.87	
A2X02	1986-04-24	09:20	00.02	478.389	7.941	0.003	1.89	
A2X02	1986-04-30	09:55	00.02	484.413	6.024	0.003	1.91	
A2X02	1986-05-06	09:25	00.02	490.392	5.979	0.003	1.93	
A2X02	1986-05-13	09:10	NA	497.382	6.990	0.000	1.93	Trace collected.
A2X02	1986-05-20	09:45	NA	504.406	7.024	0.000	1.93	Trace collected.
A2X02	1986-06-03	09:10	NA	518.382	21.000	0.000	1.93	Trace collected.
A2X02	1986-06-10	10:34	NA	525.440	28.058	0.000	1.93	Trace collected.
A2X02	1986-06-17	09:38	00.01	532.401	35.019	0.000	1.94	
A2X02	1986-06-24	09:50	00.35	539.410	7.009	0.050	2.29	Very humid air. High reading probably due to unplugging of temporary blockage in collection tube on 6/17/86.
A2X02	1986-07-01	12:15	00.28	546.510	7.100	0.039	2.57	
A2X02	1986-07-08	09:27	00.17	553.394	6.884	0.025	2.74	
A2X02	1986-07-16	09:33	00.14	561.398	8.004	0.017	2.88	
A2X02	1986-07-22	09:09	00.05	567.381	5.983	0.008	2.93	
A2X02	1986-07-29	09:50	00.12	574.410	7.029	0.017	3.05	
A2X02	1986-08-05	09:59	00.07	581.416	7.006	0.010	3.12	
A2X02	1986-08-12	09:40	00.12	588.403	6.987	0.017	3.24	
A2X02	1986-08-19	10:20	00.11	595.431	7.028	0.016	3.35	
A2X02	1986-08-26	09:50	00.07	602.410	6.979	0.010	3.42	
A2X02	1986-09-04	09:40	00.11	611.403	8.993	0.012	3.53	
A2X02	1986-09-09	10:48	00.06	616.450	5.047	0.012	3.59	
A2X02	1986-09-16	09:15	00.08	623.385	6.935	0.012	3.67	
A2X02	1986-09-23	09:23	00.07	630.391	7.006	0.010	3.74	
A2X02	1986-10-01	11:10	00.09	638.465	8.074	0.011	3.83	
A2X02	1986-10-08	10:08	00.05	645.422	6.957	0.007	3.88	
A2X02	1986-10-14	10:35	00.03	651.441	6.019	0.005	3.91	
A2X02	1986-11-05	10:08	0.10	673.422	21.981	0.005	4.01	
A2X02	1986-11-20	11:03	00.10	688.460	15.038	0.007	4.11	
A2X02	1986-12-31	11:20	00.40	729.472	41.012	0.010	4.51	
A2X02	1987-02-03	11:25	00.11	763.476	34.004	0.003	4.62	

BRINE ACCUMULATION DATA TABLE (Continued)
Data through December 31, 1990

Location	Date	Time	Liters removed	Days since 1/1/85	Days used for calc.	Liters per day	Cumulative liters collected	Remarks
A2X02	1987-03-06	11:50	0.05	794.49	331.017	0.002	4.67	
A2X02	1987-03-30	12:02	0.03	818.50	124.008	0.001	4.70	
A2X02	1987-05-07	10:04	0.50	856.419	37.918	0.013	5.20	
A2X02	1987-07-28	12:15	0.12	938.510	82.091	0.001	5.32	
A2X02	1987-09-01	11:30	0.00	973.479	34.969	0.000	5.32	Dry.
A2X02	1987-10-20	10:34	0.00	1022.440	48.961	0.000	5.32	Dry.
A2X02	1987-11-19	10:00	0.00	1052.420	29.980	0.000	5.32	Dry.
A2X02	1988-01-04	10:45	0.00	1098.450	46.030	0.000	5.32	Dry.
A2X02	1988-02-08	12:45	0.00	1133.530	35.080	0.000	5.32	Dry.
A2X02	1988-03-30	12:00	0.00	1184.500	50.970	0.000	5.32	Dry.
A2X02	1988-07-12	10:00	0.00	1288.420	103.920	0.000	5.32	Dry.
A2X02	1988-09-27	08:15	0.00	1365.340	76.930	0.001	5.36	
A2X02	1988-12-13	09:10	0	1442.380	77.040	0.000	5.36	Dry.
A2X02	1989-04-06	11:59	NA	1556.500	0.000	0.000	5.36	Room locked.
A2X02	1989-04-20	10:00	NA	1570.420	0.000	0.000	5.36	Room locked.
A2X02	1989-05-17	11:20	0	1597.470	0.000	0.000	5.36	Hole dry.
A2X02	1989-09-12	11:15	0.08	1715.470	117.997	0.001	5.44	First sample in a long time, dry two weeks ago.
A3X01	1984-11-06	00:00	NA	0.000	0.000	0.000	0.00	Room A3 completed.
A3X01	1985-01-14	00:00	NA	0.000	0.000	0.000	0.00	Downhole drilled 12/20/85 to 1/14/85.
A3X01	1985-02-05	11:10	NA	35.465	1.000	0.000	0.00	Moist muck at the bottom.
A3X01	1985-02-19	13:40	00.30	49.569	15.104	0.020	0.30	Some oil. First time collected.
A3X01	1985-02-26	13:20	00.23	56.556	6.987	0.033	0.53	Brine and oil.
A3X01	1985-03-07	09:45	00.26	65.406	8.850	0.029	0.79	
A3X01	1985-03-12	11:45	00.17	70.490	5.084	0.033	0.96	
A3X01	1985-03-20	13:14	00.19	78.551	8.061	0.024	1.15	Valve leaked, some brine drained back down hole.
A3X01	1985-03-26	11:12	00.22	84.467	5.916	0.037	1.37	
A3X01	1985-04-02	12:00	00.21	91.500	7.033	0.030	1.58	
A3X01	1985-04-10	12:00	00.23	99.500	8.000	0.029	1.81	
A3X01	1985-04-17	11:20	00.20	106.472	6.972	0.029	2.01	
A3X01	1985-04-23	10:41	00.16	112.445	5.973	0.027	2.17	
A3X01	1985-04-30	13:35	00.20	119.566	7.121	0.028	2.37	
A3X01	1985-05-07	08:55	00.20	126.372	6.806	0.029	2.57	
A3X01	1985-05-14	09:56	00.17	133.414	7.042	0.024	2.74	
A3X01	1985-05-21	12:00	00.20	140.500	7.086	0.028	2.94	
A3X01	1985-05-29	09:25	00.21	148.392	7.892	0.027	3.15	
A3X01	1985-06-04	09:55	00.16	154.413	6.021	0.027	3.31	
A3X01	1985-06-11	09:25	00.18	161.392	6.979	0.026	3.49	
A3X01	1985-06-18	09:27	00.18	168.394	7.002	0.026	3.67	
A3X01	1985-06-25	09:30	00.19	175.396	7.002	0.027	3.86	
A3X01	1985-07-02	11:00	00.19	182.458	7.062	0.027	4.05	
A3X01	1985-07-09	09:50	00.17	189.410	6.952	0.024	4.22	
A3X01	1985-07-16	10:50	00.18	196.451	7.041	0.026	4.40	Brine effervesces.
A3X01	1985-07-24	09:47	00.21	204.408	7.957	0.026	4.61	
A3X01	1985-07-30	09:30	00.15	210.396	5.988	0.025	4.76	
A3X01	1985-08-06	09:30	00.17	217.396	7.000	0.024	4.93	
A3X01	1985-08-14	09:21	00.20	225.390	7.994	0.025	5.13	
A3X01	1985-08-20	10:08	00.16	231.422	6.032	0.027	5.29	
A3X01	1985-08-28	09:05	00.21	239.378	7.956	0.026	5.50	
A3X01	1985-09-04	09:29	00.17	246.395	7.017	0.024	5.67	
A3X01	1985-09-10	09:20	00.15	252.389	5.994	0.025	5.82	
A3X01	1985-09-17	09:06	00.16	259.379	6.990	0.023	5.98	
A3X01	1985-09-24	09:03	00.17	266.377	6.998	0.024	6.15	
A3X01	1985-10-01	09:18	00.18	273.387	7.010	0.026	6.33	
A3X01	1985-10-08	12:35	00.18	280.524	7.137	0.025	6.51	Room A3 heaters turned on 10/02/85.
A3X01	1985-10-15	09:35	00.16	287.399	6.875	0.023	6.67	
A3X01	1985-10-23	09:40	00.19	295.403	8.004	0.024	6.86	

BRINE ACCUMULATION DATA TABLE (Continued)
Data through December 31, 1990

Location	Date	Time	Liters removed	Days since 1/1/85	Days used for calc.	Liters per day	Cumulative liters collected	Remarks
A3X01	1985-10-29	11:11	00.14	301.466	6.063	0.023	7.00	
A3X01	1985-11-05	08:42	00.16	308.362	6.896	0.023	7.16	
A3X01	1985-11-13	09:30	00.19	316.396	8.034	0.024	7.35	
A3X01	1985-11-21	10:30	00.19	324.438	8.042	0.024	7.54	
A3X01	1985-11-26	09:55	00.10	329.413	4.975	0.020	7.64	
A3X01	1985-12-04	14:03	00.18	337.585	8.172	0.022	7.82	
A3X01	1985-12-10	10:46	00.14	343.449	5.864	0.024	7.96	
A3X01	1985-12-17	13:55	00.14	350.580	7.131	0.020	8.10	
A3X01	1986-01-03	10:00	00.39	367.417	16.837	0.023	8.49	
A3X01	1986-01-08	10:10	00.11	372.424	5.007	0.022	8.60	
A3X01	1986-01-16	09:35	00.18	380.399	7.975	0.023	8.78	
A3X01	1986-01-23	10:00	00.15	387.417	7.018	0.021	8.93	
A3X01	1986-01-31	10:55	00.18	395.455	8.038	0.022	9.11	
A3X01	1986-02-12	10:00	00.27	407.417	11.962	0.023	9.38	
A3X01	1986-02-19	10:40	00.15	414.444	7.027	0.021	9.53	
A3X01	1986-02-28	14:20	00.22	423.597	9.153	0.024	9.75	
A3X01	1986-03-06	09:50	00.14	429.410	5.813	0.024	9.89	
A3X01	1986-03-13	09:20	00.15	436.389	6.979	0.021	10.04	
A3X01	1986-03-26	09:15	00.30	449.385	12.996	0.023	10.34	
A3X01	1986-04-02	08:50	00.16	456.368	6.983	0.023	10.50	
A3X01	1986-04-08	09:05	00.14	462.378	6.010	0.023	10.64	
A3X01	1986-04-16	11:25	00.18	470.476	8.098	0.022	10.82	
A3X01	1986-04-24	09:30	00.18	478.396	7.920	0.023	11.00	
A3X01	1986-04-30	10:00	00.14	484.417	6.021	0.023	11.14	
A3X01	1986-05-06	09:35	00.14	490.399	5.982	0.023	11.28	
A3X01	1986-05-13	09:20	00.15	497.389	6.990	0.021	11.43	
A3X01	1986-05-20	10:10	00.15	504.424	7.035	0.021	11.58	
A3X01	1986-05-27	15:00	00.16	511.625	7.201	0.022	11.74	
A3X01	1986-06-03	09:20	00.15	518.389	6.764	0.022	11.89	
A3X01	1986-06-10	10:42	00.16	525.446	7.057	0.023	12.05	
A3X01	1986-06-17	09:51	00.12	532.410	6.964	0.017	12.17	
A3X01	1986-06-24	10:05	00.16	539.420	7.010	0.023	12.33	
A3X01	1986-07-01	12:35	00.16	546.524	7.104	0.023	12.49	
A3X01	1986-07-08	09:57	00.15	553.415	6.891	0.022	12.64	
A3X01	1986-07-16	09:47	00.19	561.408	7.993	0.024	12.83	
A3X01	1986-07-22	09:23	00.14	567.391	5.983	0.023	12.97	
A3X01	1986-07-29	10:00	00.14	574.417	7.026	0.020	13.11	
A3X01	1986-08-05	10:15	00.18	581.427	7.010	0.026	13.29	
A3X01	1986-08-12	09:50	00.16	588.410	6.983	0.023	13.45	
A3X01	1986-08-19	10:35	00.16	595.441	7.031	0.023	13.61	
A3X01	1986-08-26	10:00	00.15	602.417	6.976	0.022	13.76	
A3X01	1986-09-04	09:52	00.20	611.411	8.994	0.022	13.96	
A3X01	1986-09-09	10:35	00.12	616.441	5.030	0.024	14.08	
A3X01	1986-09-16	09:29	00.14	623.395	6.954	0.020	14.22	
A3X01	1986-09-23	09:36	00.18	630.400	7.005	0.026	14.40	
A3X01	1986-10-01	11:30	00.19	638.479	8.079	0.024	14.59	
A3X01	1986-10-08	10:24	00.14	645.433	6.954	0.020	14.73	
A3X01	1986-10-14	10:47	00.12	651.449	6.016	0.020	14.85	
A3X01	1986-11-05	10:20	0.52	673.431	21.982	0.024	15.37	
A3X01	1986-11-20	11:33	00.33	688.481	15.050	0.022	15.70	
A3X01	1986-12-31	11:45	00.88	729.490	41.009	0.021	16.58	
A3X01	1987-02-03	12:00	00.73	763.500	34.010	0.021	17.31	
A3X01	1987-03-06	11:45	0.68	794.490	30.990	0.022	17.99	
A3X01	1987-03-30	12:00	0.55	818.500	24.010	0.023	18.54	
A3X01	1987-05-07	10:39	0.80	856.444	37.944	0.021	19.34	
A3X01	1987-06-17	11:25	0.89	897.476	41.032	0.022	20.23	
A3X01	1987-07-28	12:02	0.92	938.501	41.025	0.022	21.15	
A3X01	1987-09-01	11:45	0.77	973.490	34.989	0.022	21.92	
A3X01	1987-10-20	10:55	1.10	1022.450	48.960	0.022	23.02	
A3X01	1987-11-19	10:20	0.66	1052.430	29.980	0.022	23.68	

BRINE ACCUMULATION DATA TABLE (Continued)
Data through December 31, 1990

Location	Date	Time	Liters removed	Days since 1/1/85	Days used for calc.	Liters per day	Cumulative liters collected	Remarks
A3X01	1988-01-04	11:00	1.01	1098.460	46.030	0.022	24.69	
A3X01	1988-02-08	13:30	0.67	1133.560	35.100	0.019	25.36	
A3X01	1988-03-30	12:10	1.02	1184.510	50.950	0.020	26.38	
A3X01	1988-05-12	10:20	0.88	1227.430	42.920	0.021	27.26	
A3X01	1988-07-12	09:40	1.28	1288.400	60.970	0.021	28.54	
A3X01	1988-09-27	08:20		1365.350	0.000	0.000	28.54	Cannot be sampled. Room has bad back.
A3X01	1988-12-13	09:25	3.35	1442.390	153.990	0.022	31.89	
A3X01	1989-03-14	09:15	1.90	1533.380	90.993	0.021	33.79	
A3X01	1989-04-06	12:04	NA	1556.500	0.000	0.000	33.79	Room locked.
A3X01	1989-04-20	10:00	NA	1570.420	0.000	0.000	33.79	Room locked.
A3X01	1989-05-17	11:45	1.42	1597.490	64.105	0.022	35.21	
A3X01	1989-07-11	09:55	0.93	1652.410	54.923	0.017	36.14	
A3X01	1989-09-12	11:26	1.51	1715.480	63.063	0.024	37.65	
A3X01	1989-10-10	09:43	NA	1743.400	0.000	0.000	37.65	Installed collection device. Collection point for brine located outside room.
A3X01	1989-10-20	10:39	0.36	1753.440	37.968	0.009	38.01	
A3X01	1989-11-10	09:40	0.50	1774.400	20.959	0.024	38.51	
A3X01	1989-11-29	11:56	0.63	1793.500	19.094	0.033	39.14	
A3X01	1989-12-12	09:00	0.43	1806.380	12.878	0.033	39.57	
A3X01	1990-01-04	10:00	0.50	1829.417	23.042	0.022	40.07	
A3X01	1990-01-17	11:24	0.25	1842.475	13.058	0.019	40.32	
A3X01	1990-01-31	09:40	0.24	1856.403	13.928	0.017	40.56	
A3X01	1990-02-13	09:21	0.31	1869.390	12.987	0.024	40.87	
A3X01	1990-02-27	11:43	0.32	1883.488	14.098	0.023	41.19	
A3X01	1990-03-05	10:45	0.30	1889.450	5.960	0.050	41.49	
A3X01	1990-03-21	11:15	0.15	1905.470	16.021	0.009	41.64	Brine probably left in hole.
A3X01	1990-04-06	10:29	0.35	1921.440	15.968	0.022	41.99	
A3X01	1990-04-17	11:13	0.13	1932.470	11.030	0.012	42.12	
A3X01	1990-04-24	10:26	0.02	1939.430	6.968	0.000	42.14	
A3X01	1990-04-25	09:35	0.15	1940.400	0.964	0.021	42.29	Reinstalled sampler. Combined with 0.02 liters from 04/24/90. Used 0.17 liters for calculation.
A3X01	1990-05-02	11:20	0	1947.470	7.073	0.000	42.29	Could not sample.
A3X01	1990-05-16	10:26	NA	1961.430	0.000	0.000	42.29	Sampler malfunction.
A3X01	1990-05-23	12:35	0.08	1968.524	21.052	0.004	42.37	
A3X01	1990-05-31	10:51	0.14	1976.452	7.928	0.018	42.51	
A3X01	1990-06-01	10:25	NA	1977.434			42.51	Replaced sampler.
A3X01	1990-06-06	11:06	0.49	1982.462	6.010	0.082	43.00	
A3X01	1990-06-14	08:38	0.17	1990.360	7.898	0.022	43.17	
A3X01	1990-07-17	10:18	0.60	2023.429	33.069	0.000	43.77	
A3X01	1990-07-18	10:11	0.09	2024.424	0.995	0.020	43.86	Combined with 0.60 liters from 07/17/90. Used 0.69 liters for calculation.
A3X01	1990-07-25	08:20	0.70	2031.347	6.923	0.000	44.56	
A3X01	1990-08-07	11:21	0.24	2044.473	13.126	0.047	44.80	Combined with 0.7 liters from 07/25/90. Used 0.94 liters for calculation.
A3X01	1990-08-16	11:11	0.27	2053.466	8.993	0.030	45.07	
A3X01	1990-08-22	11:42	0.15	2059.488	6.022	0.025	45.22	
A3X01	1990-08-23	10:00	NA	2060.000				Heaters turned off.
A3X01	1990-08-29	12:44	0.16	2066.531	7.043	0.023	45.38	
A3X01	1990-09-05	11:35	0.15	2073.483	6.952	0.022	45.53	
A3X01	1990-09-13	09:56	0.18	2081.414	7.931	0.023	45.71	
A3X01	1990-09-25	12:34	0.25	2093.524	12.110	0.021	45.96	
A3X01	1990-09-26	11:09	0.02	2094.465	0.941	0.021	45.98	
A3X01	1990-10-03	09:50	0.16	2101.410	6.945	0.023	46.14	
A3X01	1990-10-10	11:40	0.15	2108.486	7.076	0.021	46.29	
A3X01	1990-10-18	10:53	0.16	2116.453	7.967	0.020	46.45	
A3X01	1990-10-24	12:08	0.14	2122.506	6.053	0.023	46.59	
A3X01	1990-10-31	11:35	0.16	2129.483	6.977	0.023	46.75	
A3X01	1990-11-07	10:52	0.15	2136.453	6.970	0.022	46.90	
A3X01	1990-11-14	11:50	0.15	2143.493	7.040	0.021	47.05	

BRINE ACCUMULATION DATA TABLE (Continued)
Data through December 31, 1990

Location	Date	Time	Liters removed	Days since 1/1/85	Days used for calc.	Liters per day	Cumulative liters collected	Remarks
A3X01	1990-11-28	10:51	0.30	2157.452	13.959	0.021	47.35	
A3X01	1990-12-05	08:55	0.15	2164.372	6.920	0.022	47.50	
A3X01	1990-12-13	09:35	0.17	2172.399	8.027	0.021	47.67	
A3X01	1990-12-20	08:56	0.18	2179.372	6.973	0.026	47.85	
A3X02	1984-11-06	00:00	NA	0.000	0.000	0.000	0.00	Room A3 completed.
A3X02	1985-01-22	00:00	NA	0.000	0.000	0.000	0.00	Uphole drilled 1/15/85 to 1/22/85.
A3X02	1985-02-05	11:10	NA	35.465	1.000	0.000	0.00	No drips noticed.
A3X02	1985-02-19	13:40	00.11	49.569	15.104	0.007	0.11	First time collected.
A3X02	1985-02-26	13:20	00.11	56.556	6.987	0.016	0.22	Wet spot within 1.5 ft. radius.
A3X02	1985-03-07	09:45	00.21	65.406	8.850	0.024	0.43	Moist area on back, approximately 1 ft radius.
A3X02	1985-03-12	11:45	00.11	70.490	5.084	0.022	0.54	Wet spot on back 3 ft diameter.
A3X02	1985-03-20	13:14	00.01	78.551	8.061	0.001	0.55	
A3X02	1985-03-26	11:12	00.28	84.467	5.916	0.047	0.83	Tube found plugged. Brine in tubing.
A3X02	1985-04-02	12:00	00.08	91.500	7.033	0.011	0.91	
A3X02	1985-04-10	12:02	00.05	99.501	8.001	0.006	0.96	Tube plugged.
A3X02	1985-04-17	11:20	00.11	106.472	6.971	0.016	1.07	
A3X02	1985-04-23	10:40	00.09	112.444	5.972	0.015	1.16	
A3X02	1985-04-30	13:29	00.12	119.562	7.118	0.017	1.28	
A3X02	1985-05-07	08:50	00.13	126.368	6.806	0.019	1.41	
A3X02	1985-05-14	09:53	00.13	133.412	7.044	0.018	1.54	
A3X02	1985-05-21	11:55	00.13	140.497	7.085	0.018	1.67	
A3X02	1985-05-29	09:20	00.14	148.389	7.892	0.018	1.81	
A3X02	1985-06-04	09:50	00.10	154.410	6.021	0.017	1.91	
A3X02	1985-06-11	09:20	00.13	161.389	6.979	0.019	2.04	
A3X02	1985-06-18	09:25	00.12	168.392	7.003	0.017	2.16	
A3X02	1985-06-25	09:25	00.13	175.392	7.000	0.019	2.29	
A3X02	1985-07-02	11:00	00.10	182.458	7.066	0.014	2.39	
A3X02	1985-07-09	09:44	00.02	189.406	6.948	0.003	2.41	
A3X02	1985-07-16	10:46	00.02	196.449	7.043	0.003	2.43	
A3X02	1985-07-24	09:45	00.19	204.406	7.957	0.024	2.62	High volume probably due to unplugging temporary blockage in collection tube on 7/16/85.
A3X02	1985-07-30	09:25	00.08	210.392	5.986	0.013	2.70	
A3X02	1985-08-06	09:28	00.08	217.394	7.002	0.011	2.78	
A3X02	1985-08-14	09:10	00.10	225.382	7.988	0.013	2.88	
A3X02	1985-08-20	10:00	00.08	231.417	6.035	0.013	2.96	
A3X02	1985-08-28	08:58	00.09	239.374	7.957	0.011	3.05	
A3X02	1985-09-04	09:26	00.09	246.393	7.019	0.013	3.14	
A3X02	1985-09-10	09:14	00.08	252.385	5.992	0.013	3.22	
A3X02	1985-09-17	09:05	00.09	259.378	6.993	0.013	3.31	
A3X02	1985-09-24	09:03	00.08	266.377	6.999	0.011	3.39	
A3X02	1985-10-01	09:15	00.07	273.385	7.008	0.010	3.46	
A3X02	1985-10-08	12:33	00.09	280.523	7.138	0.013	3.55	Room A3 heaters turned on 10/02/85.
A3X02	1985-10-15	09:31	00.06	287.397	6.874	0.009	3.61	
A3X02	1985-10-23	09:37	00.07	295.401	8.004	0.009	3.68	
A3X02	1985-10-29	11:09	00.08	301.465	6.064	0.013	3.76	
A3X02	1985-11-05	08:39	00.04	308.360	6.895	0.006	3.80	
A3X02	1985-11-13	09:28	00.08	316.394	8.034	0.010	3.88	
A3X02	1985-11-21	10:25	00.05	324.434	8.040	0.006	3.93	
A3X02	1985-12-04	13:56	00.10	337.581	13.147	0.008	4.03	
A3X02	1985-12-10	10:42	00.05	343.446	5.865	0.009	4.08	
A3X02	1985-12-17	13:50	00.03	350.576	7.130	0.004	4.11	
A3X02	1986-01-03	10:20	00.13	367.417	16.841	0.008	4.24	
A3X02	1986-01-08	10:10	00.03	372.424	5.007	0.006	4.27	
A3X02	1986-01-16	09:35	00.05	380.399	7.975	0.006	4.32	
A3X02	1986-01-31	10:55	00.01	395.455	15.056	0.001	4.33	Trace <0.01 liters of brine.
A3X02	1986-04-24	09:30	00.01	478.396	82.941	0.000	4.34	
A3X02	1986-05-06	09:35	00.02	490.399	12.003	0.002	4.36	

BRINE ACCUMULATION DATA TABLE (Continued)
Data through December 31, 1990

Location	Date	Time	Liters removed	Days since 1/1/85	Days used for calc.	Liters per day	Cumulative liters collected	Remarks
A3X02	1986-05-27	15:00	NA	511.625	21.226	0.000	4.36	Trace.
A3X02	1986-06-03	09:20	00.03	518.389	27.990	0.001	4.39	
A3X02	1986-06-10	10:42	NA	525.446	7.057	0.000	4.39	Trace.
A3X02	1986-06-17	09:51	NA	532.410	14.021	0.000	4.39	Trace.
A3X02	1986-07-01	12:32	00.03	546.522	28.133	0.001	4.42	
A3X02	1986-07-08	09:57	00.01	553.415	6.893	0.001	4.43	
A3X02	1986-07-29	10:00	NA	574.417	21.002	0.000	4.43	Trace.
A3X02	1986-08-12	09:50	NA	588.410	34.995	0.000	4.43	Dry.
A3X02	1986-08-19	10:33	NA	595.440	42.025	0.000	4.43	Dry.
A3X02	1986-09-04	09:50	NA	611.410	57.995	0.000	4.43	Trace.
A3X02	1986-09-23	09:33	00.00	630.398	76.983	0.000	4.43	Dry.
A3X02	1986-10-01	11:28	NA	638.478	8.080	0.000	4.43	Dry.
A3X02	1986-10-08	10:22	NA	645.432	6.954	0.000	4.43	Dry.
A3X02	1986-10-14	10:44	00.00	651.447	6.015	0.000	4.43	Dry.
A3X02	1986-11-05	10:25	NA	673.431	27.999	0.000	4.43	Dry.
A3X02	1986-11-20	11:30	NA	688.479	43.047	0.000	4.43	Dry.
A3X02	1986-12-31	11:45	NA	729.490	84.058	0.000	4.43	Dry.
A3X02	1987-02-03	12:02	NA	763.000	117.568	0.000	4.43	Dry.
A3X02	1987-03-06	11:45	NA	794.490	149.058	0.000	4.43	Dry.
A3X02	1987-03-30	12:00	0.00	818.500	24.010	0.000	4.43	Dry.
A3X02	1987-05-07	10:39	0.00	856.444	61.954	0.000	4.43	Dry.
A3X02	1987-07-28	12:02	0.00	938.501	144.011	0.000	4.43	Dry.
A3X02	1987-09-01	11:48	0.00	973.492	34.991	0.000	4.43	Dry.
A3X02	1987-10-20	10:50	0.00	1022.450	48.958	0.000	4.43	Dry.
A3X02	1987-11-19	10:20	0.00	1052.430	29.980	0.000	4.43	Dry.
A3X02	1988-01-04	11:00	0.00	1098.460	46.030	0.000	4.43	Dry.
A3X02	1988-02-08	13:30	0.00	1133.560	35.100	0.000	4.43	Dry.
A3X02	1988-03-30	12:10	0.00	1184.510	50.950	0.000	4.43	Dry.
A3X02	1988-07-12	09:40	0.00	1288.400	103.890	0.000	4.43	Dry.
A3X02	1988-09-27	08:25	0.00	1365.350	76.950	0.000	4.43	Dry.
A3X02	1988-12-13	09:25	0	1442.390	77.040	0.000	4.43	Dry.
A3X02	1989-04-06	12:04	NA	1556.500	0.000	0.000	4.43	Room locked.
A3X02	1989-04-20	10:00	NA	1570.420	0.000	0.000	4.43	Room locked.
A3X02	1989-05-17	11:45	0	1597.490	155.098	0.000	4.43	Hole dry.
A3X02	1989-09-12	11:20	0	1715.470	117.982	0.000	4.43	Hole dry.
BX01	1984-06-02	00:00	NA	0.000	0.000	0.000	0.00	Room B completed.
BX01	1985-01-27	00:00	NA	0.000	1.000	0.000	0.00	Downhole drilled 1/24/85 to 1/27/85. Wet core and brine encountered 1/26/85 at 35 to 36.5 feet.
BX01	1985-02-05	11:00	00.39	35.458	11.041	0.035	0.39	First time collected.
BX01	1985-02-11	12:00	00.72	41.500	6.042	0.119	1.11	
BX01	1985-02-19	13:00	00.70	49.542	8.042	0.087	1.81	
BX01	1985-02-26	12:45	00.61	56.531	6.989	0.087	2.42	
BX01	1985-03-07	09:15	00.70	65.385	8.854	0.079	3.12	
BX01	1985-03-12	11:45	00.41	70.490	5.105	0.080	3.53	
BX01	1985-03-20	12:50	00.61	78.535	8.045	0.076	4.14	
BX01	1985-03-26	10:45	00.45	84.448	5.913	0.076	4.59	
BX01	1985-04-02	11:44	00.51	91.489	7.041	0.072	5.10	
BX01	1985-04-10	11:38	00.55	99.485	7.996	0.069	5.65	
BX01	1985-04-17	11:00	00.45	106.458	6.973	0.065	6.10	
BX01	1985-04-23	10:05	00.38	112.420	5.962	0.064	6.48	Room B heaters turned on 4/23/85.
BX01	1985-05-01	11:40	00.46	120.486	8.066	0.057	6.94	
BX01	1985-06-04	09:30	02.00	154.396	33.910	0.059	8.94	First check in several weeks.
BX01	1985-07-16	10:15	02.34	196.427	42.031	0.056	11.28	Brine effervesces.
BX01	1985-08-26	13:56	02.38	237.581	41.154	0.058	13.66	Room temp. 98 degrees F. at collar, I03 F in center of room.
BX01	1985-10-08	12:00	02.27	280.500	42.919	0.053	15.93	
BX01	1985-11-21	10:05	02.42	324.420	43.920	0.055	18.35	

BRINE ACCUMULATION DATA TABLE (Continued)
Data through December 31, 1990

Location	Date	Time	Liters removed	Days since 1/1/85	Days used for calc.	Liters per day	Cumulative liters collected	Remarks
BX01	1985-12-04	13:35	00.69	337.566	13.146	0.052	19.04	
BX01	1986-01-31	10:25	02.95	395.434	57.868	0.051	21.99	
BX01	1986-02-12	09:30	00.80	407.396	11.962	0.067	22.79	
BX01	1986-04-16	11:00	03.45	470.458	63.062	0.055	26.24	
BX01	1986-04-30	09:45	00.73	484.406	13.948	0.052	26.97	
BX01	1986-05-06	09:18	00.30	490.387	5.981	0.050	27.27	
BX01	1986-06-10	10:20	01.85	525.431	35.044	0.053	29.12	
BX01	1986-08-19	10:50	03.21	595.451	70.020	0.046	32.33	
BX01	1986-09-09	11:00	01.30	616.458	21.007	0.062	33.63	
BX01	1986-10-01	11:08	01.16	638.464	22.006	0.053	34.79	
BX01	1986-11-05	10:00	NA	673.417	34.953	0.000	34.79	Not collected.
BX01	1986-11-20	10:39	02.40	688.444	49.980	0.048	37.19	
BX01	1986-12-30	14:10	01.75	728.590	40.146	0.044	38.94	
BX01	1987-02-03	11:00	01.67	763.458	34.868	0.048	40.61	
BX01	1987-03-06	11:50	NA	794.493	31.035	0.000	40.61	Room closed, bad back, not sampled.
BX01	1987-10-20			1022.000	0.000	0.000	40.61	Room closed, could not sample. No calculation.
BX01	1987-11-16	11:10	12.86	1049.470	286.012	0.045	53.47	
BX01	1988-01-04			1098.000	0.000	0.000	53.47	Could not sample. Room closed.
BX01	1988-02-08	12:35	3.71	1133.520	84.050	0.044	57.18	
BX01	1988-03-29	12:00	2.30	1183.500	49.980	0.046	59.48	
BX01	1988-05-12	10:44	1.67	1227.450	43.950	0.038	61.15	
BX01	1988-07-12	09:50	2.23	1288.410	60.960	0.037	63.38	
BX01	1988-09-27	08:00	2.61	1365.330	76.920	0.034	65.99	
BX01	1988-12-13	09:00	0	1442.380	0.000	0.000	65.99	Could not sample. Room locked.
BX01	1989-01-30	NA	NA	1490.000	0.000	0.000	65.99	Heaters in Room B turned off at 14:20 on 1/30/89.
BX01	1989-03-14	08:40	6.17	1533.360	168.028	0.037	72.16	
BX01	1989-04-06	11:53	NA	1556.490	0.000	0.000	72.16	Room locked.
BX01	1989-04-20	10:00	NA	1570.420	0.000	0.000	72.16	Room locked.
BX01	1989-05-17	11:00	2.90	1597.460	64.097	0.045	75.06	
BX01	1989-07-11	09:30	1.77	1652.400	54.938	0.032	76.83	
BX01	1989-09-12	10:50	1.90	1715.450	63.055	0.030	78.73	Increased buildup of salt crust on cap. No indication of leakage into hole, walls dry.
BX01	1989-10-11	10:30	NA	1744.440	0.000	0.000	78.73	Installed collection device. Collection point for brine located outside heated room.
BX01	1989-10-20	10:30	0.61	1753.440	37.987	0.016	79.34	
BX01	1989-11-10	08:50	0.65	1774.370	20.930	0.031	79.99	
BX01	1989-11-29	10:50	0.66	1793.450	19.083	0.035	80.65	
BX01	1989-12-12	08:49	0.63	1806.370	12.916	0.049	81.28	
BX01	1990-01-04	09:03	0.14	1829.377	23.010	0.006	81.42	
BX01	1990-01-17	10:10	0.17	1842.424	13.047	0.013	81.59	
BX01	1990-01-31	08:57	0.20	1856.373	13.949	0.014	81.79	
BX01	1990-02-13	10:23	0.41	1869.433	13.060	0.031	82.20	
BX01	1990-02-27	11:12	0.61	1883.467	14.034	0.043	82.81	
BX01	1990-03-05	10:24	0.35	1889.433	5.966	0.059	83.16	
BX01	1990-03-21	10:59	0.58	1905.458	16.025	0.036	83.74	
BX01	1990-04-04	10:26	0.60	1919.435	13.977	0.043	84.34	
BX01	1990-04-17	10:47	0.71	1932.449	13.014	0.000	85.05	
BX01	1990-04-24	09:45	0.63	1939.406	6.957	0.000	85.68	
BX01	1990-04-25	09:00	0.76	1940.375	0.969	0.100	86.44	Combined with 0.71 liters from 04/17/90 and 0.63 liters from 04/24/90. Used 2.1 liters for calculation.
BX01	1990-05-02	10:59	0.67	1947.458	7.083	0.095	87.11	
BX01	1990-05-09	10:39	0.19	1954.444	6.986	0.027	87.30	
BX01	1990-05-16	09:56	0.20	1961.414	6.970	0.029	87.50	
BX01	1990-05-23	12:55	0.03	1968.538	7.124	0.004	87.53	
BX01	1990-05-31	11:11	0.13	1976.466	7.928	0.016	87.66	
BX01	1990-06-01	10:15	NA	1977.427			87.66	Replaced sampler.

BRINE ACCUMULATION DATA TABLE (Continued)
Data through December 31, 1990

Location	Date	Time	Liters removed	Days since 1/1/85	Days used for calc.	Liters per day	Cumulative liters collected	Remarks
BX01	1990-06-06	10:53	0.41	1982.453	5.987	0.068	88.07	
BX01	1990-06-14	09:14	0.28	1990.385	7.932	0.035	88.35	
BX01	1990-06-20	08:42	0.05	1996.362	5.977	0.008	88.40	
BX01	1990-06-28	09:35	0.40	2004.399	8.037	0.050	88.80	
BX01	1990-07-17	10:20	0.12	2023.431	19.032	0.000	88.92	Partial evacuation.
BX01	1990-07-18	09:54	0.47	2024.412	0.981	0.029	89.39	Combined with 0.12 liters from 07/17/90. Used 0.59 liters for calculation.
BX01	1990-07-25	08:10	0.38	2031.340	6.928	0.055	89.77	
BX01	1990-08-07	11:40	0.40	2044.486	13.146	0.030	90.17	
BX01	1990-08-16	10:52	0.31	2053.453	8.967	0.035	90.48	
BX01	1990-08-22	11:40	0.21	2059.486	6.033	0.035	90.69	
BX01	1990-08-29	12:27	0.09	2066.519	7.033	0.013	90.78	
BX01	1990-09-05	11:10	0.12	2073.465	6.946	0.017	90.90	
BX01	1990-09-13	09:27	0.30	2081.394	7.929	0.038	91.20	
BX01	1990-09-25	12:51	0.48	2093.535	12.141	0.000	91.68	Brine probably left in hole.
BX01	1990-09-26	11:18	0.02	2094.471	0.936	0.038	91.70	Combined with 0.48 liters from 09/25/90. Used 0.50 liters for calculation.
BX01	1990-10-03	09:25	0.21	2101.392	6.921	0.030	91.91	
BX01	1990-10-10	11:10	0.23	2108.465	7.073	0.033	92.14	
BX01	1990-10-18	10:46	0.23	2116.449	7.984	0.029	92.37	
BX01	1990-10-24	12:02	0.20	2122.501	6.052	0.033	92.57	
BX01	1990-10-31	11:26	0.22	2129.476	6.975	0.032	92.79	
BX01	1990-11-07	10:49	0.15	2136.451	6.975	0.022	92.94	
BX01	1990-11-14	12:01	0.26	2143.501	7.050	0.037	93.20	
BX01	1990-11-28	10:41	0.49	2157.445	13.944	0.035	93.69	
BX01	1990-12-05	08:53	0.21	2164.370	6.925	0.030	93.90	
BX01	1990-12-13	09:30	0.10	2172.396	8.026	0.012	94.00	
BX01	1990-12-20	08:47	0.38	2179.366	6.970	0.055	94.38	

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Location	Date	Time	Liters removed	Days since 1/1/85	Days used for calc.	Liters per day	Cumulative liters collected	Remarks
BX02	1984-06-02	00:00	NA	0.000	0.000	0.000	0.00	Room B completed.
BX02	1985-02-01	00:00	NA	0.000	0.000	0.000	0.00	Uphole drilled 1/29/85 to 2/01/85.
BX02	1985-02-05	11:00	NA	35.458	1.000	0.000	0.00	No drips noticed.
BX02	1985-02-19	13:00	NA	49.542	15.084	0.000	0.00	Tubing plugged.
BX02	1985-03-12	11:45	NA	70.490	36.032	0.000	0.00	Trace, few drops in jug.
BX02	1985-03-20	12:50	00.10	78.535	44.077	0.002	0.10	
BX02	1985-03-26	10:45	00.12	84.448	5.913	0.020	0.22	
BX02	1985-04-02	11:44	00.10	91.489	7.041	0.014	0.32	
BX02	1985-04-10	11:38	00.21	99.485	7.996	0.026	0.53	
BX02	1985-04-17	11:00	00.13	106.458	6.973	0.019	0.66	
BX02	1985-04-23	10:05	00.01	112.420	5.962	0.002	0.67	Room B heaters turned on 4/23/85. Low reading probably due to partial blockage of collection tube.
BX02	1985-05-01	11:31	00.12	120.480	8.060	0.015	0.79	
BX02	1985-06-04	09:25	00.50	154.392	33.912	0.015	1.29	First check in several weeks.
BX02	1985-07-16	10:00	00.16	196.417	42.025	0.004	1.45	Changed funnel.
BX02	1985-10-08	12:00	00.04	280.500	84.083	0.000	1.49	
BX02	1986-01-17	09:00	00.26	381.375	100.875	0.003	1.75	Changed funnel.
BX02	1986-01-31	10:15	NA	395.427	14.052	0.000	1.75	
BX02	1986-04-16	11:00	NA	470.458	89.083	0.000	1.75	Trace in plastic tube, salt buildup in tube and container.
BX02	1986-08-19	10:50	NA	595.451	214.076	0.000	1.75	Dry.
BX02	1986-10-01	11:05	00.00	638.462	257.087	0.000	1.75	Dry.
BX02	1986-11-05	10:00	NA	673.417	34.955	0.000	1.75	Dry.
BX02	1986-11-20	10:37	NA	688.442	49.980	0.000	1.75	Dry.
BX02	1986-12-30	14:05	NA	728.587	90.125	0.000	1.75	Dry.
BX02	1987-02-03	NA:	NA	763.000	125.538	0.000	1.75	
BX02	1987-03-06	11:50	NA	794.493	156.031	0.000	1.75	Room locked, bad back.

BRINE ACCUMULATION DATA TABLE (Continued)
Data through December 31, 1990

Location	Date	Time	Liters removed	Days since 1/1/85	Days used for calc.	Liters per day	Cumulative liters collected	Remarks
BX02	1987-10-20			1022.000	0.000	0.000	1.75	Room locked, could not sample. No calculation.
BX02	1987-11-16	11:10		1049.470	0.000	0.000	1.75	Funnel not hooked up. No collection, no calculation.
BX02	1988-01-04			1098.000	0.000	0.000	1.75	Could not sample. Room locked.
BX02	1988-02-08	12:35	0.00	1133.520	370.520	0.000	1.75	Dry.
BX02	1988-03-30	12:00	0.00	1184.500	50.980	0.000	1.75	Dry.
BX02	1988-07-12	09:55	0.00	1288.410	103.910	0.000	1.75	Dry.
BX02	1988-09-27	08:10	0.00	1365.340	76.930	0.000	1.75	Dry.
BX02	1988-12-13	09:00	0	1442.380	0.000	0.000	1.75	Could not sample. Room locked.
BX02	1989-01-30	NA	NA	1490.000	0.000	0.000	1.75	Heaters in Room B turned off at 14:20 on 1/30/89.
BX02	1989-04-06	11:53	NA	1556.490	0.000	0.000	1.75	Room locked.
BX02	1989-04-20	NA	NA	1570.000	0.000	0.000	1.75	Room locked.
BX02	1989-05-17	11:00	0	1597.460	232.118	0.000	1.75	Hole dry.
BX02	1989-09-12	10:45	NA	1715.450	0.000	0.000	1.75	No collection device. Stalactites forming. Last time sampled for BSEP.
DH15	1984-03-13	00:00	NA	0.000	0.000	0.000	0.00	Drift excavated at N1104/E1688.5.
DH15	1984-03-21	00:00	NA	0.000	0.000	0.000	0.00	Uphole drilled 3/20/84 to 3/21/84.
DH15	1986-05-20	00:00	NA	0.000	0.000	0.000	0.00	Collection funnel and container installed.
DH15	1986-05-27	15:00	NA	511.625	1.000	0.000	0.00	Trace of brine. First time collected.
DH15	1986-06-03	09:15	00.02	518.385	7.760	0.003	0.02	
DH15	1986-06-10	10:40	00.04	525.444	7.059	0.006	0.06	
DH15	1986-06-17	09:45	00.03	532.406	6.962	0.004	0.09	
DH15	1986-06-24	10:00	00.05	539.417	7.011	0.007	0.14	Lots of clay has fallen down hole and accumulated in collection container.
DH15	1986-07-01	12:30	00.05	546.521	7.104	0.007	0.19	
DH15	1986-07-08	09:50	00.05	553.410	6.889	0.007	0.24	
DH15	1986-07-16	09:40	00.06	561.403	7.993	0.008	0.30	
DH15	1986-07-22	09:15	00.05	567.385	5.982	0.008	0.35	Clay in collection container.
DH15	1986-07-29	09:55	00.05	574.413	7.028	0.007	0.40	
DH15	1986-08-05	10:20	00.05	581.431	7.018	0.007	0.45	
DH15	1986-08-12	09:45	00.05	588.406	6.975	0.007	0.50	
DH15	1986-08-19	10:20	00.05	595.431	7.025	0.007	0.55	
DH15	1986-08-26	10:00	00.05	602.417	6.986	0.007	0.60	
DH15	1986-09-04	09:50	00.06	611.410	8.993	0.007	0.66	
DH15	1986-09-09	11:00	00.03	616.458	5.048	0.006	0.69	
DH15	1986-09-16	09:25	00.05	623.392	6.934	0.007	0.74	
DH15	1986-09-23	09:30	00.06	630.396	7.004	0.009	0.80	
DH15	1986-10-01	11:29	00.06	638.478	8.082	0.007	0.86	
DH15	1986-11-05	10:15	0.22	673.427	34.949	0.006	1.08	
DH15	1986-11-20	11:28	00.07	688.478	15.051	0.005	1.15	
DH15	1986-12-31	11:37	00.18	729.484	41.006	0.004	1.33	
DH15	1987-03-30	12:02	0.41	818.501	89.017	0.005	1.74	
DH15	1987-05-07	10:22	0.17	856.432	37.931	0.004	1.91	
DH15	1987-06-17	11:20	0.21	897.472	41.040	0.005	2.12	
DH15	1987-07-28	12:07	0.14	938.505	41.033	0.003	2.26	
DH15	1987-09-01	11:35	0.13	973.483	34.978	0.004	2.39	
DH15	1987-09-16	10:00		988.417	0.000	0.000	2.39	0.05 liter in jar not removed. No calculation.
DH15	1987-10-20	10:45	0.29	1022.450	48.967	0.006	2.68	
DH15	1987-11-19	10:15	0.15	1052.430	29.980	0.005	2.83	
DH15	1988-01-04	11:00	0.23	1098.460	46.030	0.005	3.06	
DH15	1988-02-08	12:40	0.09	1133.530	35.070	0.003	3.15	
DH15	1988-03-30	12:10	0.15	1184.510	50.980	0.003	3.30	
DH15	1988-07-12	09:50	0.21	1288.410	103.900	0.002	3.51	
DH15	1988-09-27	08:20	0.00	1365.350	76.940	0.000	3.51	Dry.
DH15	1988-12-13	09:20	0	1442.390	77.040	0.000	3.51	Dry.
DH15	1989-03-14	09:12	0	1533.380	90.994	0.000	3.51	Hole dry, funnel loose.

BRINE ACCUMULATION DATA TABLE (Continued)
Data through December 31, 1990

Location	Date	Time	Liters removed	Days since 1/1/85	Days used for calc.	Liters per day	Cumulative liters collected	Remarks
DH15	1989-04-06	11:55	0	1556.500	23.114	0.000	3.51	Hole dry.
DH15	1989-04-20	10:05	0.04	1570.420	13.923	0.003	3.55	
DH15	1989-05-17	11:40	0	1597.490	27.066	0.000	3.55	Hole dry.
DH15	1989-06-29	10:55	0	1640.450	42.969	0.000	3.55	Hole dry.
DH15	1989-07-25	11:30	0	1666.480	26.024	0.000	3.55	Hole dry.
DH15	1989-08-16	10:10	0	1688.420	21.945	0.000	3.55	Hole dry.
DH15	1989-09-12	12:00	0	1715.500	27.076	0.000	3.55	Hole dry.
DH15	1989-10-20	10:39	0	1753.440	37.944	0.000	3.55	Hole dry.
DH15	1989-11-10	09:30	0	1774.400	20.952	0.000	3.55	Hole dry.
DH15	1989-11-29	11:40	0	1793.490	19.090	0.000	3.55	Hole dry.
DH15	1989-12-12	08:56	0	1806.370	12.886	0.000	3.55	Hole dry.
DH15	1990-01-04	09:30	0.0	1829.396	23.024	0.000	3.55	Dry.
DH15	1990-01-17	11:28	0.0	1842.478	13.082	0.000	3.55	Dry.
DH15	1990-01-31	09:35	0.0	1856.399	13.921	0.000	3.55	Dry.
DH15	1990-02-13	09:58	0.0	1869.415	13.016	0.000	3.55	Dry.
DH15	1990-02-27	11:41	0.0	1883.487	14.072	0.000	3.55	Dry.
DH15	1990-03-05	10:32	0.0	1889.439	5.952	0.000	3.55	Dry.
DH15	1990-03-21	11:03	0.0	1905.460	16.021	0.000	3.55	Dry.
DH15	1990-04-04	11:00	0.0	1919.458	13.998	0.000	3.55	Dry.
DH15	1990-04-06	10:22	0.0	1921.432	1.974	0.000	3.55	Dry.
DH15	1990-04-17	11:04	0.0	1932.461	11.029	0.000	3.55	Dry.
DH15	1990-04-24	10:25	0.0	1939.434	6.973	0.000	3.55	Dry.
DH15	1990-05-02	11:20	0.0	1947.472	8.038	0.000	3.55	Dry.
DH15	1990-05-09	10:36	0.0	1954.442	6.970	0.000	3.55	Dry.
DH15	1990-05-16	10:04	0.0	1961.419	6.977	0.000	3.55	Dry.
DH15	1990-05-23	12:40	0.0	1968.528	7.109	0.000	3.55	Dry.
DH15	1990-05-31	10:54	0.0	1976.454	7.926	0.000	3.55	Dry.
DH15	1990-06-06	11:00	0.0	1982.458	6.004	0.000	3.55	Dry.
DH15	1990-06-14	09:36	0.0	1990.400	7.942	0.000	3.55	Dry.
DH15	1990-06-20	08:40	0.0	1996.361	5.961	0.000	3.55	Dry.
DH15	1990-06-28	09:56	0.0	2004.414	8.053	0.000	3.55	Dry.
DH15	1990-07-25	08:15	0.0	2031.344	26.930	0.000	3.55	Dry.
DH15	1990-08-16	10:58	0.0	2053.457	22.113	0.000	3.55	Dry.
DH15	1990-08-22	11:45	0.0	2059.490	6.033	0.000	3.55	Dry.
DH15	1990-08-29	12:30	0.0	2066.521	7.031	0.000	3.55	Dry.
DH15	1990-09-05	11:40	0.0	2073.486	6.965	0.000	3.55	Dry.
DH15	1990-09-13	09:44	0.0	2081.406	7.920	0.000	3.55	Dry.
DH15	1990-09-25	12:20	0.0	2093.514	12.108	0.000	3.55	Dry.
DH15	1990-09-26	11:20	0.0	2094.472	0.958	0.000	3.55	Dry.
DH15	1990-10-03	09:40	0.0	2101.403	6.931	0.000	3.55	Dry.
DH15	1990-10-10	11:30	0.0	2108.479	7.076	0.000	3.55	Dry.
DH15	1990-10-18	10:15	0.0	2116.427	7.948	0.000	3.55	Dry.
DH15	1990-10-24	12:06	0.0	2122.504	6.077	0.000	3.55	Dry.
DH15	1990-10-31	11:32	0.0	2129.481	6.977	0.000	3.55	Dry.
DH15	1990-11-14	11:48	0.0	2143.492	14.011	0.000	3.55	Dry.
DH15	1990-11-28	10:50	0.0	2157.451	13.959	0.000	3.55	Dry.
DH15	1990-12-05	08:54	0.0	2164.371	6.920	0.000	3.55	Dry.
DH15	1990-12-13	09:32	0.0	2172.397	8.026	0.000	3.55	Dry.
DH35	1984-11-21	00:00	NA	0.000	0.000	0.000	0.00	Approximate date this part of Room G was excavated.
DH35	1985-01-27	00:00	NA	0.000	0.000	0.000	0.00	Uphole drilled 1/26/85 to 1/27/85.
DH35	1985-02-05	11:15	NA	35.469	1.000	0.000	0.00	Started to drip.
DH35	1985-03-05	10:00	00.19	63.417	28.948	0.007	0.19	Salt crystals in container. First time collected.
DH35	1985-03-12	10:00	00.17	70.417	7.000	0.024	0.36	Salt crystals in container.
DH35	1985-03-20	10:26	00.19	78.435	8.018	0.024	0.55	
DH35	1985-03-26	09:45	00.13	84.406	5.971	0.022	0.68	
DH35	1985-04-02	10:15	00.15	91.427	7.021	0.021	0.83	Salt crystals in container.
DH35	1985-04-10	10:14	00.19	99.426	7.999	0.024	1.02	

BRINE ACCUMULATION DATA TABLE (Continued)
Data through December 31, 1990

Location	Date	Time	Liters removed	Days since 1/1/85	Days used for calc.	Liters per day	Cumulative liters collected	Remarks
DH35	1985-04-23	11:46	00.12	112.490	13.064	0.009	1.14	
DH35	1985-04-30	11:09	00.16	119.465	6.975	0.023	1.30	Clay in container.
DH35	1985-05-07	09:53	00.14	126.412	6.947	0.020	1.44	
DH35	1985-05-14	10:48	00.16	133.450	7.038	0.023	1.60	
DH35	1985-05-21	10:42	00.15	140.446	6.996	0.021	1.75	
DH35	1985-05-29	10:00	00.15	148.417	7.971	0.019	1.90	
DH35	1985-06-11	10:10	00.02	161.424	13.007	0.002	1.92	
DH35	1985-07-09	11:10	00.06	189.465	28.041	0.002	1.98	
DH35	1985-07-16	11:48	00.13	196.492	7.027	0.019	2.11	
DH35	1985-07-24	10:37	00.12	204.442	7.950	0.015	2.23	
DH35	1985-07-30	10:17	00.08	210.428	5.986	0.013	2.31	Clay in container.
DH35	1985-08-06	10:37	00.08	217.442	7.014	0.011	2.39	Clay chunks in container.
DH35	1985-08-14	10:53	00.11	225.453	8.011	0.014	2.50	
DH35	1985-08-20	11:05	00.09	231.462	6.009	0.015	2.59	
DH35	1985-08-28	10:00	00.14	239.417	7.955	0.018	2.73	
DH35	1985-09-04	10:30	00.11	246.438	7.021	0.016	2.84	
DH35	1985-09-10	10:38	00.11	252.443	6.005	0.018	2.95	
DH35	1985-09-17	09:40	00.12	259.403	6.960	0.017	3.07	
DH35	1985-09-24	09:48	00.07	266.408	7.005	0.010	3.14	
DH35	1985-10-08	10:44	00.08	280.447	14.039	0.006	3.22	
DH35	1985-10-15	10:17	00.06	287.428	6.981	0.009	3.28	
DH35	1985-10-29	09:42	00.06	301.404	13.976	0.004	3.34	
DH35	1985-11-05	09:24	00.08	308.392	6.988	0.011	3.42	
DH35	1985-11-13	10:06	00.11	316.421	8.029	0.014	3.53	
DH35	1985-11-21	11:32	00.07	324.481	8.060	0.009	3.60	
DH35	1985-11-26	11:25	00.05	329.476	4.995	0.010	3.65	Changed collection container.
DH35	1986-01-23	10:40	00.06	387.444	57.968	0.001	3.71	Clay in collection container. Entry has beem restricted since 12/10/85 due to mining activities.
DH35	1986-01-31	12:16	00.06	395.511	8.067	0.007	3.77	
DH35	1986-02-12	10:55	00.09	407.455	11.944	0.008	3.86	
DH35	1986-02-19	11:45	00.07	414.490	7.035	0.010	3.93	
DH35	1986-02-28	13:20	00.06	423.556	9.066	0.007	3.99	
DH35	1986-03-06	10:45	00.03	429.448	5.892	0.005	4.02	
DH35	1986-03-13	10:10	00.07	436.424	6.976	0.010	4.09	
DH35	1986-03-26	10:20	NA	449.431	13.007	0.000	4.09	Funnel broken, 5 inch stalactite formed from collar.
DH35	1986-04-02	09:40	NA	456.403	19.979	0.000	4.09	Installed new funnel.
DH35	1986-05-27	15:45	NA	511.656	75.232	0.000	4.09	Trace of brine.
DH35	1986-06-03	10:08	00.01	518.422	81.998	0.000	4.10	
DH35	1986-06-10	11:35	00.02	525.483	7.061	0.003	4.12	
DH35	1986-06-17	10:58	00.01	532.457	6.974	0.001	4.13	
DH35	1986-06-24	10:57	00.02	539.456	6.999	0.003	4.15	
DH35	1986-07-01	14:03	00.02	546.585	7.129	0.003	4.17	
DH35	1986-07-08	10:37	00.02	553.442	6.857	0.003	4.19	
DH35	1986-07-16	10:36	00.03	561.442	8.000	0.004	4.22	
DH35	1986-07-22	10:05	NA	567.420	5.978	0.000	4.22	Trace of brine. Cleaned soft clay out of funnel.
DH35	1986-07-29	10:35	00.01	574.441	12.999	0.001	4.23	
DH35	1986-08-05	11:13	00.03	581.467	7.026	0.004	4.26	
DH35	1986-08-12	10:35	00.03	588.441	6.974	0.004	4.29	
DH35	1986-08-19	11:35	00.01	595.483	7.042	0.001	4.30	
DH35	1986-08-26	10:38	NA	602.443	6.960	0.000	4.30	Trace collected.
DH35	1986-09-04	10:40	00.01	611.444	15.961	0.001	4.31	
DH35	1986-09-09	10:10	NA	616.424	4.980	0.000	4.31	Trace collected.
DH35	1986-09-16	10:13	NA	623.426	11.982	0.000	4.31	Trace collected.
DH35	1986-09-23	10:11	NA	630.424	18.980	0.000	4.31	Trace.
DH35	1986-10-01	12:16	0.00	638.511	27.067	0.000	4.31	Trace, none collected.
DH35	1986-10-08	11:08	NA	645.464	6.953	0.000	4.31	Small amount not collected.
DH35	1986-11-05	11:28	NA	673.478	28.014	0.000	4.31	Damp, not collected.

BRINE ACCUMULATION DATA TABLE (Continued)
Data through December 31, 1990

Location	Date	Time	Liters removed	Days since 1/1/85	Days used for calc.	Liters per day	Cumulative liters collected	Remarks
DH35	1986-11-20	NA	NA	688.000	42.536	0.000	4.31	Not sampled, looked dry.
DH35	1986-12-30	12:15	NA	728.510	83.046	0.000	4.31	
DH35	1987-02-03	NA	NA	763.000	117.536	0.000	4.31	
DH35	1987-03-06	11:25	NA	794.476	149.012	0.000	4.31	Dry.
DH35	1987-03-30	11:20	0.00	818.472	23.996	0.000	4.31	Dry.
DH35	1987-05-07	11:35	0.00	856.483	62.007	0.000	4.31	Dry.
DH35	1987-06-18	12:10	0.00	898.507	104.031	0.000	4.31	Dry.
DH35	1987-07-28	11:15	0.00	938.469	143.993	0.000	4.31	Dry.
DH35	1987-09-01	10:50	0.00	973.451	34.982	0.000	4.31	Dry.
DH35	1987-10-20	11:56	0.00	1022.500	49.049	0.000	4.31	Dry.
DH35	1987-11-19	11:30	0.00	1052.480	29.980	0.000	4.31	Dry.
DH35	1988-01-04	12:00	0.00	1098.500	46.020	0.000	4.31	Dry.
DH35	1988-02-08	11:55	0.00	1133.500	35.000	0.000	4.31	Dry.
DH35	1988-03-29	11:40	0.00	1183.490	49.990	0.000	4.31	Dry.
DH35	1988-07-12	08:50	0.00	1288.370	104.880	0.000	4.31	Dry.
DH35	1988-09-27	10:50	0.00	1365.450	77.080	0.000	4.31	Dry.
DH35	1989-03-15	10:50	0	1534.450	169.000	0.000	4.31	Hole dry.
DH35	1989-04-06	09:40	0	1556.400	21.952	0.000	4.31	Hole dry.
DH35	1989-04-20	09:40	0	1570.400	14.000	0.000	4.31	Hole dry.
DH35	1989-06-06	10:15	0	1617.430	47.024	0.000	4.31	
DH35	1989-06-29	10:35	0	1640.440	23.014	0.000	4.31	Hole dry.
DH35	1989-07-25	09:55	0	1666.410	25.972	0.000	4.31	Hole dry.
DH35	1989-08-16	09:55	0	1688.410	22.000	0.000	4.31	Hole dry.
DH35	1989-08-28	10:20	0	1700.430	12.018	0.000	4.31	Collection device removed.
DH35	1989-12-13	11:20	0	1807.470	107.041	0.000	4.31	Hole dry.
DH35	1990-01-24	10:00	0.0	1849.417	41.945	0.000	4.31	Dry.
DH35	1990-02-07	10:30	0.0	1863.438	14.021	0.000	4.31	Dry.
DH35	1990-02-21	09:48	0.0	1877.408	13.970	0.000	4.31	Dry.
DH35	1990-03-05	09:35	0.0	1889.399	11.991	0.000	4.31	Dry.
DH35	1990-03-19	10:36	0.0	1903.442	14.043	0.000	4.31	Dry.
DH35	1990-03-21	10:30	0.0	1905.438	1.996	0.000	4.31	Dry.
DH35	1990-04-04	09:56	0.0	1919.414	13.976	0.000	4.31	Dry.
DH35	1990-04-10	08:34	0.0	1925.357	5.943	0.000	4.31	Dry.
DH35	1990-04-17	10:17	0.0	1932.428	7.071	0.000	4.31	Dry.
DH35	1990-04-24	09:35	0.0	1939.399	6.971	0.000	4.31	Dry.
DH35	1990-05-02	10:30	0.0	1947.438	8.039	0.000	4.31	Dry.
DH35	1990-05-09	08:42	0.0	1954.362	6.924	0.000	4.31	Dry.
DH35	1990-05-16	08:45	0.0	1961.365	7.003	0.000	4.31	Dry.
DH35	1990-05-23	12:03	0.0	1968.502	7.137	0.000	4.31	Dry.
DH35	1990-05-31	08:40	0.0	1976.361	7.859	0.000	4.31	Dry.
DH35	1990-06-06	08:43	0.0	1982.363	6.002	0.000	4.31	Dry.
DH35	1990-06-14	08:32	0.0	1990.356	7.993	0.000	4.31	Dry.
DH35	1990-06-20	09:53	0.0	1996.412	6.056	0.000	4.31	Dry.
DH35	1990-06-28	08:38	0.0	2004.360	7.948	0.000	4.31	Dry.
DH35	1990-07-17	10:50	0.0	2023.451	19.091	0.000	4.31	Dry.
DH35	1990-07-25	09:32	0.0	2031.397	7.946	0.000	4.31	Dry.
DH35	1990-08-01	10:38	0.0	2038.443	7.046	0.000	4.31	Dry.
DH35	1990-12-13	08:50	0.0	2172.368	133.925	0.000	4.31	Dry.
DH36	1984-11-21	00:00	NA	0.000	0.000	0.000	0.00	Approximate date this part of Room G excavated.
DH36	1985-01-26	00:00	NA	0.000	0.000	0.000	0.00	Downhole drilled 1/26/85.
DH36	1985-01-28	09:00	NA	27.375	1.000	0.000	0.00	Moist muck at the bottom.
DH36	1985-02-05	11:15	02.50	35.469	9.094	0.275	2.50	About 1 ft. muck, brine and hydraulic fluid. First time bailed.
DH36	1985-02-11	11:00	01.51	41.458	5.989	0.252	4.01	Brine, muck, hydraulic fluid.
DH36	1985-02-19	12:10	01.78	49.507	8.049	0.221	5.79	Some muck.
DH36	1985-02-26	10:45	01.48	56.448	6.941	0.213	7.27	Brine and muck.
DH36	1985-03-05	10:00	01.76	63.417	6.969	0.253	9.03	

BRINE ACCUMULATION DATA TABLE (Continued)
Data through December 31, 1990

Location	Date	Time	Liters removed	Days since 1/1/85	Days used for calc.	Liters per day	Cumulative liters collected	Remarks
DH36	1985-03-12	10:00	01.55	70.417	7.000	0.221	10.58	
DH36	1985-03-20	10:26	01.59	78.435	8.018	0.198	12.17	
DH36	1985-03-26	09:45	01.35	84.406	5.971	0.226	13.52	
DH36	1985-04-02	10:15	01.58	91.427	7.021	0.225	15.10	
DH36	1985-04-10	10:25	01.71	99.434	8.007	0.214	16.81	
DH36	1985-04-17	13:30	01.49	106.562	7.128	0.209	18.30	
DH36	1985-04-23	11:46	01.45	112.490	5.928	0.245	19.75	
DH36	1985-04-30	11:21	01.49	119.473	6.983	0.213	21.24	
DH36	1985-05-07	09:58	01.55	126.415	6.942	0.223	22.79	
DH36	1985-05-14	10:54	01.77	133.454	7.039	0.251	24.56	
DH36	1985-05-21	10:45	01.61	140.448	6.994	0.230	26.17	
DH36	1985-05-29	10:00	01.50	148.417	7.969	0.188	27.67	
DH36	1985-06-04	11:33	01.40	154.481	6.064	0.231	29.07	
DH36	1985-06-11	11:15	01.55	161.469	6.988	0.222	30.62	
DH36	1985-06-18	10:17	01.58	168.428	6.959	0.227	32.20	
DH36	1985-06-25	10:40	01.43	175.444	7.016	0.204	33.63	
DH36	1985-07-02	11:00	01.59	182.458	7.014	0.227	35.22	
DH36	1985-07-09	11:15	01.54	189.469	7.011	0.220	36.76	
DH36	1985-07-16	11:50	01.58	196.493	7.024	0.225	38.34	Brine effervesces.
DH36	1985-07-24	10:46	01.78	204.449	7.956	0.224	40.12	
DH36	1985-07-30	10:20	01.39	210.431	5.982	0.232	41.51	
DH36	1985-08-06	10:43	01.70	217.447	7.016	0.242	43.21	
DH36	1985-08-14	11:02	01.58	225.460	8.013	0.197	44.79	Valve leaked. Some brine drained back down hole.
DH36	1985-08-20	11:11	01.42	231.466	6.006	0.236	46.21	
DH36	1985-08-28	10:00	01.94	239.417	7.951	0.244	48.15	
DH36	1985-09-04	10:32	01.69	246.439	7.022	0.241	49.84	
DH36	1985-09-10	10:35	01.41	252.441	6.002	0.235	51.25	
DH36	1985-09-17	09:42	01.53	259.404	6.963	0.220	52.78	
DH36	1985-09-24	09:50	01.53	266.410	7.006	0.218	54.31	
DH36	1985-10-01	09:55	01.58	273.413	7.003	0.226	55.89	
DH36	1985-10-08	10:52	01.63	280.453	7.040	0.232	57.52	
DH36	1985-10-15	10:30	01.58	287.438	6.985	0.226	59.10	
DH36	1985-10-23	10:23	01.82	295.433	7.995	0.228	60.92	
DH36	1985-10-29	09:51	01.36	301.410	5.977	0.228	62.28	
DH36	1985-11-05	09:27	01.63	308.394	6.984	0.233	63.91	
DH36	1985-11-13	10:14	01.79	316.426	8.032	0.223	65.70	
DH36	1985-11-21	11:36	01.91	324.483	8.057	0.237	67.61	
DH36	1985-11-26	11:30	01.01	329.479	4.996	0.202	68.62	
DH36	1985-12-03	13:35	01.50	336.566	7.087	0.212	70.12	
DH36	1985-12-10	12:15	01.52	343.510	6.944	0.219	71.64	
DH36	1986-01-23	11:00	09.30	387.458	43.948	0.212	80.94	Entry restricted since 12/10/85 due to mining activities.
DH36	1986-01-31	12:20	01.38	395.514	8.056	0.171	82.32	
DH36	1986-02-12	11:00	03.02	407.458	11.944	0.253	85.34	
DH36	1986-02-19	11:45	01.55	414.490	7.032	0.220	86.89	
DH36	1986-02-28	13:20	01.85	423.556	9.066	0.204	88.74	
DH36	1986-03-06	10:45	01.30	429.448	5.892	0.221	90.04	Volume was estimated.
DH36	1986-03-13	10:10	01.50	436.424	6.976	0.215	91.54	
DH36	1986-03-26	10:20	02.56	449.431	13.007	0.197	94.10	
DH36	1986-04-02	09:40	01.75	456.403	6.972	0.251	95.85	
DH36	1986-04-08	09:45	00.97	462.406	6.003	0.162	96.82	
DH36	1986-04-16	12:25	01.65	470.517	8.111	0.203	98.47	
DH36	1986-04-24	10:20	02.00	478.431	7.914	0.253	100.47	
DH36	1986-04-30	10:55	01.21	484.455	6.024	0.201	101.68	
DH36	1986-05-06	10:14	01.20	490.426	5.971	0.201	102.88	
DH36	1986-05-13	11:13	01.42	497.467	7.041	0.202	104.30	
DH36	1986-05-20	11:10	01.50	504.465	6.998	0.214	105.80	
DH36	1986-05-27	15:45	01.40	511.656	7.191	0.195	107.20	
DH36	1986-06-03	10:10	01.38	518.424	6.768	0.204	108.58	

BRINE ACCUMULATION DATA TABLE (Continued)
Data through December 31, 1990

Location	Date	Time	Liters removed	Days since 1/1/85	Days used for calc.	Liters per day	Cumulative liters collected	Remarks
DH36	1986-06-10	11:35	01.24	525.483	7.059	0.176	109.82	Valve leaked. Some brine drained back down hole.
DH36	1986-06-17	11:00	01.65	532.458	6.975	0.237	111.47	
DH36	1986-06-24	11:00	01.45	539.458	7.000	0.207	112.92	
DH36	1986-07-01	14:05	01.55	546.587	7.129	0.217	114.47	
DH36	1986-07-08	10:45	01.40	553.448	6.861	0.204	115.87	
DH36	1986-07-16	10:45	01.76	561.448	8.000	0.220	117.63	
DH36	1986-07-22	10:07	01.29	567.422	5.974	0.216	118.92	
DH36	1986-07-29	10:40	01.45	574.444	7.022	0.206	120.37	
DH36	1986-08-05	11:20	01.46	581.472	7.028	0.208	121.83	
DH36	1986-08-12	10:37	01.50	588.442	6.970	0.215	123.33	
DH36	1986-08-19	11:35	01.38	595.483	7.041	0.196	124.71	
DH36	1986-08-26	10:38	01.49	602.443	6.960	0.214	126.20	Static level not measured.
DH36	1986-09-04	10:41	01.70	611.445	9.002	0.189	127.90	
DH36	1986-09-09	10:15	01.20	616.427	4.982	0.241	129.10	
DH36	1986-09-16	10:20	01.37	623.431	7.004	0.196	130.47	
DH36	1986-09-23	10:18	01.40	630.429	6.998	0.200	131.87	
DH36	1986-10-01	12:18	01.76	638.513	8.084	0.218	133.63	
DH36	1986-10-08	11:10	01.44	645.465	6.952	0.207	135.07	Brine efferveces as it is poured into beaker.
DH36	1986-10-14	11:57	01.21	651.498	6.033	0.201	136.28	Static level not measured.
DH36	1986-11-05	11:38	4.28	673.485	21.987	0.195	140.56	
DH36	1986-11-20	12:35	03.12	688.524	15.039	0.207	143.68	
DH36	1986-12-30	12:25	01.72	728.517	0.000	0.000	143.68	Partial evacuation. No calculation. Do not plot or use zero value.
DH36	1986-12-31	12:38	6.54	729.526	41.002	0.201	151.94	Calculated using 8.26 liters in 41.002 days (1.72 l 12/30/86 plus 6.54 l 12/31/86).
DH36	1987-02-03	13:35	06.84	763.566	34.040	0.201	158.78	
DH36	1987-03-06	11:20	5.84	794.472	30.906	0.189	164.62	
DH36	1987-03-30	11:27	4.95	818.477	24.005	0.206	169.57	
DH36	1987-05-07	11:33	6.62	856.481	38.004	0.174	176.19	
DH36	1987-06-17	10:45	7.25	897.448	0.000	0.000	183.44	Some brine left in hole; no calculation.
DH36	1987-06-18	12:10	0.49	898.507	42.026	0.184	183.93	Original l/day calculation too high due to residual brine left in hole. Recalculated using 7.74 l (7.25 l 6/17/87 plus 0.49 l 6/18/87).
DH36	1987-07-28	11:27	7.76	938.477	39.970	0.194	191.69	
DH36	1987-09-01	10:50	6.99	973.451	34.974	0.200	198.68	
DH36	1987-10-20	11:56	8.58	1022.500	49.049	0.175	207.26	
DH36	1987-11-19	11:30	4.19	1052.480	29.980	0.140	211.45	
DH36	1988-01-04	11:50	6.74	1098.490	46.010	0.146	218.19	
DH36	1988-02-08	11:50	4.90	1133.490	35.000	0.140	223.09	
DH36	1988-03-29	11:35	7.25	1183.480	49.990	0.145	230.34	
DH36	1988-05-05	09:45	5.01	1220.410	36.930	0.136	235.35	
DH36	1988-05-12	09:50	1.30	1227.410	7.000	0.186	236.65	
DH36	1988-07-12	08:50	7.90	1288.370	60.960	0.130	244.55	
DH36	1988-07-28	10:25	1.50	1304.430	16.060	0.093	246.05	
DH36	1988-08-11	10:30	3.66	1318.440	14.010	0.261	249.71	
DH36	1988-08-25	09:24	2.05	1332.390	13.950	0.147	251.76	
DH36	1988-09-08	14:50		1346.620	0.000	0.000	251.76	Did not sample.
DH36	1988-09-14	08:40	2.36	1352.360	19.970	0.118	254.12	Slight orange color.
DH36	1988-09-27	10:45	1.30	1365.450	13.090	0.099	255.42	
DH36	1988-12-13	10:00	10.63	1442.420	76.970	0.138	266.05	
DH36	1989-03-14	10:10	11.16	1533.420	91.007	0.123	277.21	
DH36	1989-04-06	09:31	2.73	1556.400	22.973	0.119	279.94	
DH36	1989-04-20	09:40	1.79	1570.400	14.006	0.128	281.73	
DH36	1989-05-17	10:20	6.45	1597.430	27.028	0.239	288.18	
DH36	1989-06-06	10:10	2.62	1617.420	19.993	0.131	290.80	
DH36	1989-06-29	10:35	2.42	1640.440	23.017	0.105	293.22	
DH36	1989-07-06	09:10	1.08	1647.380	6.941	0.156	294.30	
DH36	1989-07-25	09:55	2.35	1666.410	19.031	0.123	296.65	
DH36	1989-08-16	09:27	2.75	1688.390	21.981	0.125	299.40	

BRINE ACCUMULATION DATA TABLE (Continued)
Data through December 31, 1990

Location	Date	Time	Liters removed	Days since 1/1/85	Days used for calc.	Liters per day	Cumulative liters collected	Remarks
DH36	1989-09-12	09:30	3.81	1715.400	27.002	0.141	303.21	
DH36	1989-12-13	11:10	11.07	1807.460	92.069	0.120	314.28	
DH36	1990-01-10	10:18	2.48	1835.429	27.964	0.089	316.76	
DH36	1990-01-24	09:37	2.0	1849.401	13.972	0.143	318.76	
DH36	1990-02-07	10:17	1.53	1863.428	14.027	0.109	320.29	
DH36	1990-02-21	09:50	1.75	1877.410	13.982	0.125	322.04	
DH36	1990-03-05	09:25	1.10	1889.392	11.982	0.092	323.14	
DH36	1990-03-14	12:30	NA	1898.521			323.14	Installed sampler.
DH36	1990-03-19	10:36	0.80	1903.442	14.050	0.000	323.94	Brine probably left in hole.
DH36	1990-03-21	10:16	0.57	1905.428	1.986	0.085	324.51	Combined with 0.80 liters from 03/19/90. Used 1.37 liters for calculation.
DH36	1990-04-04	09:09	1.08	1919.381	13.953	0.077	325.59	
DH36	1990-04-10	08:34	0.97	1925.357	5.976	0.162	326.56	
DH36	1990-04-17	10:17	0.85	1932.428	7.071	0.120	327.41	
DH36	1990-04-24	09:14	0.86	1939.385	6.957	0.000	328.27	
DH36	1990-04-25	08:45	0.57	1940.365	0.980	0.180	328.84	Combined with 0.86 liters from 04/27/90. Used 1.43 liters for calculation.
DH36	1990-05-02	10:24	1.37	1947.433	7.068	0.194	330.21	
DH36	1990-05-09	08:35	0.68	1954.358	6.925	0.098	330.89	
DH36	1990-05-16	08:45	0.78	1961.365	7.007	0.111	331.67	
DH36	1990-05-17	07:50	0.17	1962.326	0.961	0.177	331.84	
DH36	1990-05-23	12:02	0.68	1968.501	6.175	0.110	332.52	
DH36	1990-05-31	08:38	0.85	1976.360	7.859	0.108	333.37	
DH36	1990-06-01	11:00	0.15	1977.458	1.098	0.137	333.52	Repaired sampler, evacuated hole.
DH36	1990-06-06	08:47	0.45	1982.366	4.908	0.092	333.97	
DH36	1990-06-14	08:38	0.82	1990.360	7.994	0.103	334.79	
DH36	1990-06-20	09:53	0.59	1996.412	6.052	0.097	335.38	
DH36	1990-06-28	08:38	0.88	2004.360	7.948	0.111	336.26	
DH36	1990-07-17	10:52	0.41	2023.453	19.093	0.000	336.67	
DH36	1990-07-18	10:20	0.62	2024.431	0.978	0.051	337.29	Combined with 0.41 liters from 07/17/90. Used 1.03 liters for calculation.
DH36	1990-07-25	09:45	0.61	2031.406	6.975	0.087	337.90	
DH36	1990-08-01	10:38	0.61	2038.443	7.037	0.087	338.51	
DH36	1990-12-12	09:47	11.54	2171.408	132.965	0.087	350.05	First evacuation since 08/07/90.
DH36	1990-12-19	11:22	3.61	2178.474	7.066	0.511	353.66	Brine stored in fractures may have drained into hole after evacuation of 11.5 liters on 12/12/90.

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Location	Date	Time	Liters removed	Days since 1/1/85	Days used for calc.	Liters per day	Cumulative liters collected	Remarks
DH37	1984-12-05	00:00	NA	0.000	0.000	0.000	0.00	Approximate date this part of Room G excavated.
DH37	1985-01-26	00:00	NA	0.000	0.000	0.000	0.00	Uphole drilled 1/25/85 to 1/26/85.
DH37	1985-02-05	11:15	NA	35.469	1.000	0.000	0.00	Started to drip.
DH37	1985-03-05	10:10	00.06	63.424	28.955	0.002	0.06	Stalactite in collection container.
DH37	1985-03-12	10:00	00.06	70.417	6.993	0.009	0.12	Salt crystals in collection container.
DH37	1985-03-26	09:50	NA	84.410	13.993	0.000	0.12	Trace, none collected.
DH37	1985-04-17	13:30	00.06	106.562	36.145	0.002	0.18	
DH37	1985-04-23	11:41	00.04	112.487	5.925	0.007	0.22	
DH37	1985-04-30	10:50	00.03	119.451	6.964	0.004	0.25	
DH37	1985-05-07	09:45	00.06	126.406	6.955	0.009	0.31	
DH37	1985-05-14	10:37	00.07	133.442	7.036	0.010	0.38	
DH37	1985-05-21	10:31	00.06	140.438	6.996	0.009	0.44	
DH37	1985-05-29	10:00	00.06	148.417	7.979	0.008	0.50	
DH37	1985-06-04	11:22	00.05	154.474	6.057	0.008	0.55	
DH37	1985-06-11	10:32	00.05	161.439	6.965	0.007	0.60	
DH37	1985-06-18	10:05	00.08	168.420	6.981	0.011	0.68	Stalactites in collection container.
DH37	1985-06-25	10:44	00.05	175.447	7.027	0.007	0.73	
DH37	1985-07-02	11:00	00.04	182.458	7.011	0.006	0.77	
DH37	1985-07-09	11:00	00.03	189.458	7.000	0.004	0.80	

BRINE ACCUMULATION DATA TABLE (Continued)
Data through December 31, 1990

Location	Date	Time	Liters removed	Days since 1/1/85	Days used for calc.	Liters per day	Cumulative liters collected	Remarks
DH37	1985-07-16	11:40	00.06	196.486	7.028	0.009	0.86	
DH37	1985-07-24	10:33	00.06	204.440	7.954	0.008	0.92	
DH37	1985-07-30	10:11	00.02	210.424	5.984	0.003	0.94	
DH37	1985-08-06	10:32	00.01	217.439	7.015	0.001	0.95	
DH37	1985-08-14	10:49	00.02	225.451	8.012	0.002	0.97	
DH37	1985-08-20	10:56	00.03	231.456	6.005	0.005	1.00	
DH37	1985-08-28	09:55	00.04	239.413	7.957	0.005	1.04	
DH37	1985-09-04	10:21	00.02	246.431	7.018	0.003	1.06	
DH37	1985-09-10	10:14	00.03	252.426	5.995	0.005	1.09	
DH37	1985-09-17	09:35	00.02	259.399	6.973	0.003	1.11	
DH37	1985-09-24	09:45	00.02	266.406	7.007	0.003	1.13	
DH37	1985-10-01	09:50	00.01	273.410	7.004	0.001	1.14	
DH37	1985-10-15	10:10	00.01	287.424	14.014	0.001	1.15	
DH37	1985-10-23	10:17	00.02	295.428	8.004	0.002	1.17	
DH37	1985-10-29	09:35	00.02	301.399	5.971	0.003	1.19	
DH37	1986-07-01	14:00	00.02	546.583	245.184	0.000	1.21	
DH37	1986-11-05	11:22	NA	673.474	126.891	0.000	1.21	Dry.
DH37	1986-11-20	12:25	NA	688.517	141.934	0.000	1.21	Dry, not collected.
DH37	1986-12-30	12:00	NA	728.500	181.917	0.000	1.21	
DH37	1987-02-03	NA:	NA	763.000	216.417	0.000	1.21	
DH37	1987-03-06	11:05	NA	794.462	247.879	0.000	1.21	Dry.
DH37	1987-03-30	11:10	0.00	818.465	24.003	0.000	1.21	Dry.
DH37	1987-05-07	11:27	0.00	856.477	62.015	0.000	1.21	Dry.
DH37	1987-06-18	12:05	0.00	898.503	104.041	0.000	1.21	Dry.
DH37	1987-07-28	10:53	0.00	938.453	143.991	0.000	1.21	Dry.
DH37	1987-09-01	10:45	0.00	973.448	34.995	0.000	1.21	Dry.
DH37	1987-10-20	11:35	0.00	1022.480	49.032	0.000	1.21	Dry.
DH37	1987-11-19	11:05	0.00	1052.460	29.980	0.000	1.21	Dry.
DH37	1988-01-04	11:35	0.00	1098.480	46.020	0.000	1.21	Dry.
DH37	1988-02-08	11:40	0.00	1133.490	35.010	0.000	1.21	Dry.
DH37	1988-03-29	11:35	0.00	1183.480	49.990	0.000	1.21	Dry.
DH37	1988-07-12	08:50	0.00	1288.370	104.890	0.000	1.21	Dry.
DH37	1988-09-27	10:45	0.00	1365.450	77.080	0.000	1.21	Dry.
DH37	1988-12-13	09:55	0	1442.410	76.960	0.000	1.21	Dry.
DH37	1989-03-14	10:00	0	1533.420	91.004	0.000	1.21	Hole dry.
DH37	1989-04-06	09:45	0	1556.410	22.989	0.000	1.21	Hole dry.
DH37	1989-04-20	09:35	0	1570.400	13.993	0.000	1.21	Hole dry.
DH37	1989-05-17	10:20	0	1597.430	27.032	0.000	1.21	Hole dry.
DH37	1989-06-06	10:10	0	1617.420	19.993	0.000	1.21	Hole dry.
DH37	1989-06-29	10:30	0	1640.440	23.014	0.000	1.21	Hole dry.
DH37	1989-07-25	09:55	0	1666.410	25.975	0.000	1.21	Hole dry.
DH37	1989-08-16	09:55	0	1688.410	22.000	0.000	1.21	Hole dry.
DH37	1989-08-28	10:20	0	1700.430	12.018	0.000	1.21	Collection device removed.
DH37	1989-12-13	11:00	0	1807.460	107.027	0.000	1.21	Hole dry.
DH37	1990-01-10	10:09	0.0	1835.423	27.965	0.000	1.21	Dry.
DH37	1990-01-24	10:00	0.0	1849.417	13.994	0.000	1.21	Dry.
DH37	1990-02-07	10:30	0.0	1863.438	14.021	0.000	1.21	Dry.
DH37	1990-02-21	09:47	0.0	1877.408	13.970	0.000	1.21	Dry.
DH37	1990-03-05	09:25	0.0	1889.392	11.984	0.000	1.21	Dry.
DH37	1990-03-19	11:30	0.0	1903.479	14.087	0.000	1.21	Dry.
DH37	1990-03-21	10:30	0.0	1905.438	1.959	0.000	1.21	Dry.
DH37	1990-04-04	09:37	0.0	1919.401	13.963	0.000	1.21	Dry.
DH37	1990-04-10	08:36	0.0	1925.358	5.957	0.000	1.21	Dry.
DH37	1990-04-17	10:17	0.0	1932.428	7.070	0.000	1.21	Dry.
DH37	1990-04-24	09:30	0.0	1939.396	6.968	0.000	1.21	Dry.
DH37	1990-05-02	10:30	0.0	1947.438	8.042	0.000	1.21	Dry.
DH37	1990-05-09	08:43	0.0	1954.363	6.925	0.000	1.21	Dry.
DH37	1990-05-16	08:45	0.0	1961.365	7.002	0.000	1.21	Dry.
DH37	1990-05-23	12:03	0.0	1968.502	7.137	0.000	1.21	Dry.
DH37	1990-05-31	08:40	0.0	1976.361	7.859	0.000	1.21	Dry.

BRINE ACCUMULATION DATA TABLE (Continued)
Data through December 31, 1990

Location	Date	Time	Liters removed	Days since 1/1/85	Days used for calc.	Liters per day	Cumulative liters collected	Remarks
DH37	1990-06-06	09:40	0.0	1982.403	6.042	0.000	1.21	Dry.
DH37	1990-06-14	08:35	0.0	1990.358	7.955	0.000	1.21	Dry.
DH37	1990-06-20	09:35	0.0	1996.399	6.041	0.000	1.21	Dry.
DH37	1990-06-28	08:38	0.0	2004.360	7.961	0.000	1.21	Dry.
DH37	1990-07-17	10:59	0.0	2023.458	19.098	0.000	1.21	Dry.
DH37	1990-07-25	09:33	0.0	2031.398	7.940	0.000	1.21	Dry.
DH37	1990-08-01	10:38	0.0	2038.443	7.045	0.000	1.21	Dry.
DH38	1984-12-05	00:00	NA	0.000	0.000	0.000	0.00	Approximate date this part of Room G excavated.
DH38	1985-01-26	00:00	NA	0.000	0.000	0.000	0.00	Downhole drilled 1/25/85 to 1/26/85
DH38	1985-01-28	09:00	NA	27.375	1.000	0.000	0.00	Dry.
DH38	1985-02-05	11:15	NA	35.469	9.094	0.000	0.00	Wet at bottom
DH38	1985-02-19	12:10	00.80	49.507	23.132	0.035	0.80	Brine and fine muck.
DH38	1985-02-26	10:45	01.26	56.448	6.941	0.182	2.06	Brine and fine muck.
DH38	1985-03-05	10:00	00.45	63.417	6.969	0.065	2.51	
DH38	1985-03-12	10:00	00.39	70.417	7.000	0.056	2.90	
DH38	1985-03-20	10:37	00.45	78.442	8.025	0.056	3.35	
DH38	1985-03-26	09:50	00.36	84.410	5.968	0.060	3.71	
DH38	1985-04-02	10:25	00.41	91.434	7.024	0.058	4.12	Some muck.
DH38	1985-04-10	10:31	00.44	99.438	8.004	0.055	4.56	
DH38	1985-04-17	13:30	00.41	106.562	7.124	0.058	4.97	
DH38	1985-04-23	11:41	00.34	112.487	5.925	0.057	5.31	
DH38	1985-04-30	11:05	00.39	119.462	6.975	0.056	5.70	
DH38	1985-05-07	09:50	00.42	126.410	6.948	0.060	6.12	
DH38	1985-05-14	10:45	00.41	133.448	7.038	0.058	6.53	
DH38	1985-05-21	10:35	00.41	140.441	6.993	0.059	6.94	
DH38	1985-05-29	11:35	00.47	148.483	8.042	0.058	7.41	
DH38	1985-06-04	11:25	00.35	154.476	5.993	0.058	7.76	
DH38	1985-06-11	10:35	00.40	161.441	6.965	0.057	8.16	
DH38	1985-06-18	10:09	00.39	168.423	6.982	0.056	8.55	
DH38	1985-06-25	10:50	00.42	175.451	7.028	0.060	8.97	
DH38	1985-07-02	11:00	00.44	182.458	7.007	0.063	9.41	
DH38	1985-07-09	11:05	00.43	189.462	7.004	0.061	9.84	
DH38	1985-07-16	11:45	00.43	196.490	7.028	0.061	10.27	Brine effervesces.
DH38	1985-07-24	10:35	00.49	204.441	7.951	0.062	10.76	
DH38	1985-07-30	10:14	00.38	210.426	5.985	0.063	11.14	
DH38	1985-08-06	10:34	00.42	217.440	7.014	0.060	11.56	
DH38	1985-08-14	10:51	00.49	225.452	8.012	0.061	12.05	
DH38	1985-08-20	11:02	00.37	231.460	6.008	0.062	12.42	
DH38	1985-08-28	10:00	00.51	239.417	7.957	0.064	12.93	
DH38	1985-09-04	10:23	00.44	246.433	7.016	0.063	13.37	
DH38	1985-09-10	10:19	00.39	252.430	5.997	0.065	13.76	
DH38	1985-09-17	09:37	00.44	259.401	6.971	0.063	14.20	
DH38	1985-09-24	09:45	00.44	266.406	7.005	0.063	14.64	
DH38	1985-10-01	09:53	00.44	273.412	7.006	0.063	15.08	
DH38	1985-10-08	10:38	00.46	280.443	7.031	0.065	15.54	
DH38	1985-10-15	10:15	00.44	287.427	6.984	0.063	15.98	
DH38	1985-10-23	10:20	00.49	295.431	8.004	0.061	16.47	
DH38	1985-10-29	09:40	00.39	301.403	5.972	0.065	16.86	
DH38	1985-11-05	09:14	00.43	308.385	6.982	0.062	17.29	
DH38	1985-11-13	10:00	00.52	316.417	8.032	0.065	17.81	
DH38	1985-11-21	11:29	00.47	324.478	8.061	0.058	18.28	
DH38	1985-11-26	11:20	00.33	329.472	4.994	0.066	18.61	
DH38	1985-12-03	13:30	00.42	336.562	7.090	0.059	19.03	
DH38	1985-12-10	12:30	00.41	343.521	6.959	0.059	19.44	
DH38	1986-01-23	11:20	02.70	387.472	43.951	0.061	22.14	Entry restricted since 12/10/85 due to mining activities.
DH38	1986-01-31	12:10	00.53	395.507	8.035	0.066	22.67	

BRINE ACCUMULATION DATA TABLE (Continued)
Data through December 31, 1990

Location	Date	Time	Liters removed	Days since 1/1/85	Days used for calc.	Liters per day	Cumulative liters collected	Remarks
DH38	1986-02-12	10:50	00.75	407.451	11.944	0.063	23.42	
DH38	1986-02-19	11:40	00.43	414.486	7.035	0.061	23.85	
DH38	1986-02-28	13:15	00.37	423.552	9.066	0.041	24.22	Lost substantial volume due to break in suction line. Brine flowed back down into hole.
DH38	1986-03-06	10:35	00.45	429.441	5.889	0.076	24.67	
DH38	1986-03-13	10:05	00.43	436.420	6.979	0.062	25.10	
DH38	1986-03-26	10:10	00.59	449.424	13.004	0.045	25.69	
DH38	1986-04-02	09:35	00.58	456.399	6.975	0.083	26.27	
DH38	1986-04-08	09:40	00.35	462.403	6.004	0.058	26.62	
DH38	1986-04-16	12:10	00.50	470.507	8.104	0.062	27.12	
DH38	1986-04-24	10:12	00.47	478.425	7.918	0.059	27.59	
DH38	1986-04-30	10:50	00.35	484.451	6.026	0.058	27.94	
DH38	1986-05-06	10:14	00.31	490.426	5.975	0.052	28.25	
DH38	1986-05-13	11:05	00.41	497.462	7.036	0.058	28.66	
DH38	1986-05-20	11:05	00.40	504.462	7.000	0.057	29.06	
DH38	1986-05-27	15:40	00.38	511.653	7.191	0.053	29.44	
DH38	1986-06-03	10:05	00.44	518.420	6.767	0.065	29.88	
DH38	1986-06-10	11:22	00.43	525.474	7.054	0.061	30.31	
DH38	1986-06-17	10:50	00.37	532.451	6.977	0.053	30.68	
DH38	1986-06-24	10:52	00.50	539.453	7.002	0.071	31.18	
DH38	1986-07-01	14:01	00.40	546.584	7.131	0.056	31.58	
DH38	1986-07-08	10:30	00.38	553.438	6.854	0.055	31.96	
DH38	1986-07-16	10:34	00.43	561.440	8.002	0.054	32.39	
DH38	1986-07-22	09:58	00.35	567.415	5.975	0.059	32.74	
DH38	1986-07-29	10:40	00.38	574.444	7.029	0.054	33.12	
DH38	1986-08-05	11:10	00.39	581.465	7.021	0.056	33.51	
DH38	1986-08-12	10:30	00.40	588.438	6.973	0.057	33.91	
DH38	1986-08-19	11:30	00.41	595.479	7.041	0.058	34.32	
DH38	1986-08-26	10:32	00.36	602.439	6.960	0.052	34.68	
DH38	1986-09-04	10:35	00.49	611.441	9.002	0.054	35.17	
DH38	1986-09-09	10:00	00.30	616.417	4.976	0.060	35.47	
DH38	1986-09-16	10:11	00.38	623.424	7.007	0.054	35.85	
DH38	1986-09-23	10:10	00.37	630.424	7.000	0.053	36.22	
DH38	1986-10-01	12:07	00.43	638.505	8.081	0.053	36.65	
DH38	1986-10-08	11:30	00.36	645.479	6.974	0.052	37.01	
DH38	1986-10-14	11:45	00.35	651.490	6.011	0.058	37.36	
DH38	1986-11-05	11:26	1.10	673.476	21.986	0.050	38.46	
DH38	1986-11-20	12:27	00.82	688.519	15.043	0.055	39.28	
DH38	1986-12-30	12:15	01.87	728.510	39.991	0.047	41.15	
DH38	1987-02-03	13:15	01.72	763.552	35.042	0.049	42.87	
DH38	1987-03-06	11:05	1.58	794.462	30.910	0.051	44.45	
DH38	1987-03-30	11:13	1.17	818.467	24.005	0.049	45.62	
DH38	1987-05-07	11:20	1.89	856.472	38.005	0.050	47.51	
DH38	1987-06-17	10:45	1.91	897.448	0.000	0.000	49.42	Some brine left in hole; no calculation.
DH38	1987-06-18	12:05	0.16	898.503	42.031	0.049	49.58	Calculated using 2.07 liters (1.91 l. 6/17/87 plus 0.16 l 6/18/87).
DH38	1987-07-28	10:53	1.88	938.453	39.950	0.047	51.46	
DH38	1987-09-01	10:45	1.70	973.448	34.995	0.049	53.16	
DH38	1987-10-20	11:40	2.29	1022.490	49.042	0.047	55.45	
DH38	1987-11-19	11:05	1.42	1052.460	29.970	0.047	56.87	
DH38	1988-01-04	11:35	2.05	1098.480	46.020	0.045	58.92	
DH38	1988-02-08	11:40	1.48	1133.490	35.010	0.042	60.40	
DH38	1988-03-29	11:30	2.10	1183.480	49.990	0.042	62.50	
DH38	1988-05-05	09:55	1.70	1220.410	36.930	0.046	64.20	
DH38	1988-05-12	11:20	0.31	1227.470	7.060	0.044	64.51	
DH38	1988-07-12	08:45	2.44	1288.360	60.890	0.040	66.95	
DH38	1988-07-28	10:20	0.88	1304.430	16.070	0.055	67.83	
DH38	1988-09-27	10:30	1.92	1365.440	61.010	0.031	69.75	
DH38	1988-12-13	09:55	3.45	1442.410	76.970	0.045	73.20	

BRINE ACCUMULATION DATA TABLE (Continued)
Data through December 31, 1990

Location	Date	Time	Liters removed	Days since 1/1/85	Days used for calc.	Liters per day	Cumulative liters collected	Remarks
DH38	1989-03-14	09:55	3.25	1533.410	91.000	0.036	76.45	
DH38	1989-04-06	09:45	1.03	1556.410	22.993	0.045	77.48	
DH38	1989-04-20	09:35	0.75	1570.400	13.993	0.054	78.23	
DH38	1989-05-17	10:05	1.11	1597.420	27.021	0.041	79.34	
DH38	1989-06-06	10:00	0.70	1617.420	19.997	0.035	80.04	
DH38	1989-06-29	10:30	0.64	1640.440	23.021	0.028	80.68	
DH38	1989-07-25	10:27	0.92	1666.430	25.997	0.035	81.60	
DH38	1989-08-16	09:57	0.81	1688.410	21.980	0.037	82.41	
DH38	1989-09-12	09:20	1.16	1715.390	26.974	0.043	83.57	
DH38	1989-12-13	10:55	3.20	1807.450	92.066	0.035	86.77	
DH38	1990-01-10	10:03	1.00	1835.419	27.964	0.036	87.77	
DH38	1990-01-24	10:10	0.21	1849.424	14.005	0.015	87.98	
DH38	1990-02-07	10:30	0.48	1863.438	14.014	0.034	88.46	
DH38	1990-03-05	09:18	0.53	1889.388	25.950	0.020	88.99	
DH38	1990-03-13	14:00	NA	1897.583			88.99	Installed sampler.
DH38	1990-03-19	11:30	0.61	1903.479	14.091	0.000	89.60	Hole not completely evacuated.
DH38	1990-03-21	10:30	0.57	1905.438	1.959	0.073	90.17	Combined with 0.61 from 03/19/90. Used 1.18 liters for calculation.
DH38	1990-04-04	09:37	0.62	1919.401	13.963	0.044	90.79	
DH38	1990-04-10	08:56	0.34	1925.372	5.971	0.057	91.13	
DH38	1990-04-17	10:39	0.23	1932.444	7.072	0.033	91.36	
DH38	1990-04-24	09:30	0.27	1939.396	6.952	0.039	91.63	
DH38	1990-05-02	10:47	0.32	1947.449	8.053	0.040	91.95	
DH38	1990-05-09	09:08	0.23	1954.381	6.932	0.033	92.18	
DH38	1990-05-16	09:35	0.25	1961.399	7.018	0.036	92.43	
DH38	1990-05-23	12:03	0.25	1968.502	7.103	0.035	92.68	
DH38	1990-05-31	09:04	0.28	1976.378	7.876	0.036	92.96	
DH38	1990-06-06	09:40	0.22	1982.403	6.025	0.037	93.18	
DH38	1990-06-14	08:53	0.27	1990.370	7.967	0.034	93.45	
DH38	1990-06-20	09:49	0.22	1996.409	6.039	0.036	93.67	
DH38	1990-06-28	09:15	0.29	2004.385	7.976	0.036	93.96	
DH38	1990-07-17	11:30	0.50	2023.479	19.094	0.000	94.46	
DH38	1990-07-18	10:40	0.20	2024.444	0.965	0.035	94.66	Combined with 0.50 liters from 07/17/90. Used 0.70 liters for calculation.
DH38	1990-07-25	09:42	0.30	2031.404	6.960	0.043	94.96	
DH38	1990-08-01	10:30	0.14	2038.438	7.034	0.020	95.10	
DH39	1984-12-13	00:00	NA	0.000	0.000	0.000	0.00	Approximate date that part of Room G was excavated.
DH39	1985-01-24	00:00	NA	0.000	0.000	0.000	0.00	Uphole drilled.
DH39	1985-02-05	11:15	NA	35.469	1.000	0.000	0.00	Moist, no stalactites.
DH39	1985-02-26	10:25	NA	56.434	21.965	0.000	0.00	Wet, back wet in 1.5 ft circle.
DH39	1985-03-12	10:00	NA	70.417	35.948	0.000	0.00	Trace, salt crystals in container.
DH39	1985-03-26	09:55	NA	84.413	49.944	0.000	0.00	Trace.
DH39	1985-05-07	09:37	00.01	126.401	91.932	0.000	0.01	
DH39	1985-05-29	11:30	00.03	148.479	22.078	0.001	0.04	Stalactites in sample.
DH39	1986-11-05	11:10	NA	673.465	524.986	0.000	0.04	Dry.
DH39	1986-11-20	NA	NA	688.000	539.521	0.000	0.04	Dry.
DH39	1986-12-30	11:45	NA	728.490	580.011	0.000	0.04	
DH39	1987-02-03	NA	NA	763.000	614.521	0.000	0.04	
DH39	1987-03-06	11:00	NA	794.458	645.979	0.000	0.04	Dry.
DH39	1987-03-30	11:05	0.00	818.462	24.004	0.000	0.04	Dry.
DH39	1987-05-07	11:20	0.00	856.472	62.014	0.000	0.04	Dry.
DH39	1987-06-18	12:00	0.00	898.500	104.042	0.000	0.04	Dry.
DH39	1987-07-28	11:03	0.00	938.460	144.002	0.000	0.04	Dry.
DH39	1987-09-01	10:21	0.00	973.431	34.971	0.000	0.04	Dry.
DH39	1987-10-20	11:33	0.00	1022.480	49.049	0.000	0.04	Dry.
DH39	1987-11-19	11:00	0.00	1052.460	29.980	0.000	0.04	Dry.
DH39	1988-01-04	11:35	0.00	1098.480	46.020	0.000	0.04	Dry.

BRINE ACCUMULATION DATA TABLE (Continued)
Data through December 31, 1990

Location	Date	Time	Liters removed	Days since 1/1/85	Days used for calc.	Liters per day	Cumulative liters collected	Remarks
DH39	1988-02-08	11:35	0.00	1133.480	35.000	0.000	0.04	Dry.
DH39	1988-03-29	11:30	0.00	1183.480	50.000	0.000	0.04	Dry.
DH39	1988-07-12	08:45	0.00	1288.360	104.880	0.000	0.04	Dry.
DH39	1988-09-27	10:30	0.00	1365.440	77.080	0.000	0.04	Dry.
DH39	1988-12-13	09:50	0	1442.410	76.970	0.000	0.04	Dry.
DH39	1989-03-14	09:50	0	1533.410	91.000	0.000	0.04	Hole dry.
DH39	1989-04-06	09:50	0	1556.410	23.000	0.000	0.04	Hole dry.
DH39	1989-04-20	09:20	0	1570.390	13.979	0.000	0.04	Hole dry.
DH39	1989-05-17	10:05	0	1597.420	27.031	0.000	0.04	Hole dry.
DH39	1989-06-06	10:00	0	1617.420	19.997	0.000	0.04	Hole dry.
DH39	1989-06-29	10:25	0	1640.430	23.017	0.000	0.04	Hole dry.
DH39	1989-07-25	09:55	0	1666.410	25.979	0.000	0.04	Hole dry.
DH39	1989-08-16	09:55	0	1688.410	22.000	0.000	0.04	Hole dry.
DH39	1989-08-28	10:15	0	1700.430	12.014	0.000	0.04	Collection device removed.
DH39	1989-12-13	10:25	0	1807.430	107.007	0.000	0.04	Hole dry.
DH39	1990-01-10	10:00	0.0	1835.417	27.983	0.000	0.00	Dry.
DH39	1990-01-24	10:00	0.0	1849.417	14.000	0.000	0.00	Dry.
DH39	1990-02-07	10:30	0.0	1863.438	14.021	0.000	0.00	Dry.
DH39	1990-02-21	09:46	0.0	1877.407	13.969	0.000	0.00	Dry.
DH39	1990-03-05	09:18	0.0	1889.388	11.981	0.000	0.00	Dry.
DH39	1990-03-19	11:25	0.0	1903.476	14.088	0.000	0.00	Dry.
DH39	1990-03-21	10:25	0.0	1905.434	1.958	0.000	0.00	Dry.
DH39	1990-04-04	09:31	0.0	1919.397	13.963	0.000	0.00	Dry.
DH39	1990-04-10	08:36	0.0	1925.358	5.961	0.000	0.00	Dry.
DH39	1990-04-17	10:39	0.0	1932.444	7.086	0.000	0.00	Dry.
DH39	1990-04-24	09:30	0.0	1939.396	6.952	0.000	0.00	Dry.
DH39	1990-05-02	10:30	0.0	1947.438	8.042	0.000	0.00	Dry.
DH39	1990-05-09	08:44	0.0	1954.364	6.926	0.000	0.00	Dry.
DH39	1990-05-16	09:25	0.0	1961.392	7.028	0.000	0.00	Dry.
DH39	1990-05-23	12:06	0.0	1968.504	7.112	0.000	0.00	Dry.
DH39	1990-05-31	09:02	0.0	1976.376	7.872	0.000	0.00	Dry.
DH39	1990-06-06	09:39	0.0	1982.402	6.026	0.000	0.00	Dry.
DH39	1990-06-14	08:51	0.0	1990.369	7.967	0.000	0.00	Dry.
DH39	1990-06-20	09:33	0.0	1996.398	6.029	0.000	0.00	Dry.
DH39	1990-06-28	08:38	0.0	2004.360	7.962	0.000	0.00	Dry.
DH39	1990-07-17	11:00	0.0	2023.458	19.098	0.000	0.00	Dry.
DH39	1990-07-25	09:34	0.0	2031.399	7.941	0.000	0.00	Dry.
DH39	1990-08-01	10:30	0.0	2038.438	7.039	0.000	0.00	Dry.
DH40	1984-12-13	00:00	NA	0.000	0.000	0.000	0.00	Approximate date this part of Room G excavated.
DH40	1985-01-25	00:00	NA	0.000	0.000	0.000	0.00	Downhole drilled 1/24/85 to 1/25/85.
DH40	1985-01-28	09:00	NA	27.375	1.000	0.000	0.00	Dry.
DH40	1985-02-05	11:15	NA	35.469	9.094	0.000	0.00	Moist at bottom.
DH40	1985-03-12	10:10	NA	70.424	44.049	0.000	0.00	Moist muck.
DH40	1985-03-26	09:55	NA	84.413	58.038	0.000	0.00	Moist muck.
DH40	1985-04-17	13:30	00.98	106.562	80.187	0.012	0.98	Brine, muck, and oil.
DH40	1985-04-23	11:33	00.26	112.481	5.919	0.044	1.24	Brine and muck.
DH40	1985-04-30	10:49	00.11	119.451	6.970	0.016	1.35	Feel something spongy in bottom of hole.
DH40	1985-05-07	09:42	00.10	126.404	6.953	0.014	1.45	
DH40	1985-05-14	10:40	00.09	133.444	7.040	0.013	1.54	
DH40	1985-05-21	10:26	00.07	140.435	6.991	0.010	1.61	
DH40	1985-05-29	11:30	00.08	148.479	8.044	0.010	1.69	
DH40	1985-06-04	11:15	00.10	154.469	5.990	0.017	1.79	Contained a lot of salt muck.
DH40	1985-06-11	10:30	00.05	161.438	6.969	0.007	1.84	
DH40	1985-06-18	10:01	00.09	168.417	6.979	0.013	1.93	
DH40	1985-06-25	11:00	00.08	175.458	7.041	0.011	2.01	
DH40	1985-07-02	11:00	00.09	182.458	7.000	0.013	2.10	
DH40	1985-07-09	10:45	00.12	189.448	6.990	0.017	2.22	

BRINE ACCUMULATION DATA TABLE (Continued)
Data through December 31, 1990

Location	Date	Time	Liters removed	Days since 1/1/85	Days used for calc.	Liters per day	Cumulative liters collected	Remarks
DH40	1985-07-16	11:38	00.09	196.485	7.037	0.013	2.31	
DH40	1985-07-24	10:31	00.07	204.438	7.953	0.009	2.38	
DH40	1985-07-30	10:08	00.07	210.422	5.984	0.012	2.45	
DH40	1985-08-06	10:20	00.06	217.431	7.009	0.009	2.51	
DH40	1985-08-14	10:43	00.07	225.447	8.016	0.009	2.58	
DH40	1985-08-20	10:50	00.05	231.451	6.004	0.008	2.63	
DH40	1985-08-28	09:53	00.08	239.412	7.961	0.010	2.71	
DH40	1985-09-04	10:18	00.03	246.429	7.017	0.004	2.74	
DH40	1985-09-10	10:11	00.04	252.424	5.995	0.007	2.78	
DH40	1985-09-17	09:31	00.03	259.397	6.973	0.004	2.81	
DH40	1985-09-24	09:40	00.06	266.403	7.006	0.009	2.87	
DH40	1985-10-01	09:47	00.06	273.408	7.005	0.009	2.93	
DH40	1985-10-08	10:32	00.04	280.439	7.031	0.006	2.97	
DH40	1985-10-15	10:05	00.09	287.420	6.981	0.013	3.06	
DH40	1985-10-23	10:13	00.04	295.426	8.006	0.005	3.10	
DH40	1985-10-29	09:32	00.07	301.397	5.971	0.012	3.17	
DH40	1985-11-05	09:10	00.04	308.382	6.985	0.006	3.21	
DH40	1985-11-13	09:55	00.07	316.413	8.031	0.009	3.28	
DH40	1985-11-21	11:24	00.02	324.475	8.062	0.002	3.30	
DH40	1985-12-03	13:20	00.08	336.556	12.081	0.007	3.38	
DH40	1985-12-10	12:40	00.04	343.528	6.972	0.006	3.42	
DH40	1986-01-23	11:25	00.24	387.476	43.948	0.005	3.66	Entry restricted since 12/10/85 due to mining activities.
DH40	1986-01-31	12:10	00.02	395.507	8.031	0.002	3.68	
DH40	1986-02-19	11:20	00.14	414.472	18.965	0.007	3.82	
DH40	1986-02-28	13:10	00.05	423.549	9.077	0.006	3.87	
DH40	1986-03-13	10:00	00.02	436.417	12.868	0.002	3.89	
DH40	1986-04-24	10:05	00.13	478.420	42.003	0.003	4.02	
DH40	1986-05-20	11:05	00.10	504.462	26.042	0.004	4.12	
DH40	1986-06-03	09:58	00.20	518.415	13.953	0.014	4.32	
DH40	1986-09-16	10:05	00.34	623.420	105.005	0.003	4.66	Did not collect for several months.
DH40	1986-11-05	11:18	0.27	673.471	50.051	0.005	4.93	
DH40	1986-11-20	NA	NA	688.000	14.529	0.000	4.93	
DH40	1986-12-30	12:00	00.25	728.500	55.029	0.005	5.18	
DH40	1987-02-03	13:00	00.13	763.542	35.042	0.004	5.31	
DH40	1987-03-06	10:55	0.09	794.455	30.913	0.003	5.40	
DH40	1987-03-30	11:05	0.10	818.462	24.007	0.004	5.50	
DH40	1987-06-18	12:00	0.19	898.500	80.038	0.002	5.69	
DH40	1987-09-01	10:25	0.16	973.434	74.934	0.002	5.85	
DH40	1988-02-08	11:30	0.55	1133.480	160.046	0.003	6.40	
DH40	1988-03-29	11:25	0.14	1183.480	50.000	0.003	6.54	
DH40	1988-05-12	11:40	0.20	1227.490	44.010	0.005	6.74	
DH40	1988-07-12	08:40	0.15	1288.360	60.870	0.002	6.89	
DH40	1988-09-27	10:25	0.21	1365.430	77.070	0.003	7.10	
DH40	1988-12-13	09:45	0.12	1442.410	76.980	0.002	7.22	
DH40	1989-03-15	10:35	Trace	1534.440	0.000	0.000	7.22	Trace of brine found.
DH40	1989-04-06	09:50	0.27	1556.410	114.004	0.002	7.49	
DH40	1989-04-20	09:20	0.09	1570.390	13.979	0.006	7.58	
DH40	1989-05-17	10:00	0.30	1597.420	27.028	0.011	7.88	
DH40	1989-06-06	09:55	0.12	1617.410	19.996	0.006	8.00	
DH40	1989-06-29	10:25	Trace	1640.430	0.000	0.000	8.00	Trace of brine found.
DH40	1989-07-25	10:18	0.07	1666.430	49.016	0.001	8.07	
DH40	1989-08-16	09:49	0.06	1688.410	21.980	0.003	8.13	
DH40	1989-09-12	09:10	Trace	1715.380	0.000	0.000	8.13	Trace of fluid in hole.
DH40	1989-12-13	10:25	0.20	1807.430	119.025	0.002	8.33	
DH40	1990-01-10	09:50	0.08	1835.410	27.976	0.003	8.41	
DH40	1990-03-05	09:10	0.50	1889.382	53.972	0.009	8.91	
DH40	1990-03-13	13:30	NA	1897.562			8.91	Installed sampler.
DH40	1990-03-19	11:25	0.09	1903.476	14.094	0.000	9.00	Brine probably left in hole.

BRINE ACCUMULATION DATA TABLE (Continued)
Data through December 31, 1990

Location	Date	Time	Liters removed	Days since 1/1/85	Days used for calc.	Liters per day	Cumulative liters collected	Remarks
DH40	1990-03-21	10:25	0.02	1905.434	1.958	0.007	9.02	Combined with 0.09 liters from 03/19/90. Used 0.11 liters for calculation.
DH40	1990-04-04	09:31	0.03	1919.397	13.963	0.002	9.05	
DH40	1990-05-02	10:41	0.09	1947.445	28.048	0.003	9.14	
DH40	1990-05-16	09:26	0.07	1961.393	13.948	0.005	9.21	
DH40	1990-06-14	11:19	0.13	1990.472	29.079	0.004	9.34	
DH40	1990-06-20	09:40	0.02	1996.403	5.931	0.003	9.36	
DH40	1990-06-28	09:00	0.03	2004.375	7.972	0.004	9.39	
DH40	1990-07-17	11:17	0.10	2023.470	19.095	0.005	9.49	

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DH41	1984-12-30	00:00	NA	0.000	0.000	0.000	0.00	Approximate date this part of Room G excavated.
DH41	1985-01-24	00:00	NA	0.000	0.000	0.000	0.00	Uphole drilled 1/23/85 to 1/24/85.
DH41	1985-02-05	11:15	NA	35.469	1.000	0.000	0.00	Moist, no stalactites.
DH41	1985-03-26	10:05	NA	84.420	49.951	0.000	0.00	Trace.
DH41	1985-05-07	09:21	00.01	126.390	91.921	0.000	0.01	
DH41	1985-05-29	10:00	00.01	148.417	22.027	0.000	0.02	Trace.
DH41	1985-07-24	10:13	00.01	204.426	56.009	0.000	0.03	
DH41	1985-08-20	12:00	00.01	231.500	27.074	0.000	0.04	Trace.
DH41	1985-08-28	09:35	00.02	239.399	7.899	0.003	0.06	
DH41	1985-09-17	09:20	00.01	259.389	19.990	0.001	0.07	
DH41	1986-02-19	11:20	00.05	414.472	155.083	0.000	0.12	Lots of salt crystals and lumps of clay in container.
DH41	1986-11-05	11:00	NA	673.458	258.986	0.000	0.12	Dry. Funnel has been removed, salt crust on collar.
DH41	1986-11-20	12:07	NA	688.505	274.033	0.000	0.12	Dry.
DH41	1986-12-30	12:50	NA	728.535	314.063	0.000	0.12	
DH41	1987-02-03	NA	NA	763.000	348.528	0.000	0.12	
DH41	1987-03-05	10:55	NA	793.455	378.983	0.000	0.12	Crusty.
DH41	1987-03-30	11:00	0.00	818.458	25.003	0.000	0.12	Dry.
DH41	1987-05-07	11:09	0.00	856.465	63.010	0.000	0.12	Dry.
DH41	1987-06-18	11:56	0.00	898.497	105.042	0.000	0.12	Dry.
DH41	1987-07-28	11:03	0.00	938.460	145.005	0.000	0.12	Dry.
DH41	1987-09-01	10:15	0.00	973.427	34.967	0.000	0.12	Dry.
DH41	1987-10-20	11:28	0.00	1022.480	49.053	0.000	0.12	Dry.
DH41	1987-11-19	10:55	0.00	1052.450	29.970	0.000	0.12	Dry.
DH41	1988-01-04	11:35	0.00	1098.480	46.030	0.000	0.12	Dry.
DH41	1988-02-08	11:20	0.00	1133.470	34.990	0.000	0.12	Dry.
DH41	1988-03-29	11:20	0.00	1183.470	50.000	0.000	0.12	Dry.
DH41	1988-07-12	08:40	0.00	1288.360	104.890	0.000	0.12	Dry.
DH41	1988-09-27	10:20	0.00	1365.430	77.070	0.000	0.12	Dry.
DH41	1988-12-13	09:45	0	1442.410	76.980	0.000	0.12	Dry.
DH41	1989-04-06	09:55	0	1556.410	114.007	0.000	0.12	Hole dry.
DH41	1989-04-20	09:10	0	1570.380	13.969	0.000	0.12	Hole dry.
DH41	1989-05-17	10:00	0	1597.420	27.035	0.000	0.12	Hole dry.
DH41	1989-06-06	09:55	0	1617.410	19.996	0.000	0.12	Hole dry.
DH41	1989-06-29	10:15	0	1640.430	23.014	0.000	0.12	Hole dry.
DH41	1989-07-25	09:55	0	1666.410	25.986	0.000	0.12	Hole dry.
DH41	1989-08-16	09:55	0	1688.410	22.000	0.000	0.12	Hole dry.
DH41	1989-08-28	10:15	0	1700.430	12.014	0.000	0.12	Collection device removed.
DH41	1989-12-13	10:03	0	1807.420	106.992	0.000	0.12	Hole dry.
DH41	1990-01-10	09:45	0.0	1835.406	27.987	0.000	0.12	Dry.
DH41	1990-01-24	10:00	0.0	1849.417	14.011	0.000	0.12	Dry.
DH41	1990-02-07	10:30	0.0	1863.438	14.021	0.000	0.12	Dry.
DH41	1990-02-21	09:45	0.0	1877.406	13.968	0.000	0.12	Dry.
DH41	1990-03-05	09:08	0.0	1889.381	11.975	0.000	0.12	Dry.
DH41	1990-03-19	11:12	0.0	1903.467	14.086	0.000	0.12	Dry.
DH41	1990-03-21	10:23	0.0	1905.433	1.966	0.000	0.12	Dry.
DH41	1990-04-04	09:14	0.0	1919.385	13.952	0.000	0.12	Dry.

BRINE ACCUMULATION DATA TABLE (Continued)
Data through December 31, 1990

Location	Date	Time	Liters removed	Days since 1/1/85	Days used for calc.	Liters per day	Cumulative liters collected	Remarks
DH41	1990-04-10	08:36	0.0	1925.358	5.973	0.000	0.12	Dry.
DH41	1990-04-17	10:29	0.0	1932.437	7.079	0.000	0.12	Dry.
DH41	1990-04-24	09:26	0.0	1939.393	6.956	0.000	0.12	Dry.
DH41	1990-05-02	10:30	0.0	1947.438	8.045	0.000	0.12	Dry.
DH41	1990-05-09	09:45	0.0	1954.406	6.968	0.000	0.12	Dry.
DH41	1990-05-16	09:11	0.0	1961.383	6.977	0.000	0.12	Dry.
DH41	1990-05-23	12:06	0.0	1968.504	7.121	0.000	0.12	Dry.
DH41	1990-05-31	09:01	0.0	1976.376	7.872	0.000	0.12	Dry.
DH41	1990-06-06	09:30	0.0	1982.396	6.020	0.000	0.12	Dry.
DH41	1990-06-14	08:48	0.0	1990.367	7.971	0.000	0.12	Dry.
DH41	1990-06-20	09:35	0.0	1996.399	6.032	0.000	0.12	Dry.
DH41	1990-06-28	08:38	0.0	2004.360	7.961	0.000	0.12	Dry.
DH41	1990-07-17	11:02	0.0	2023.460	19.100	0.000	0.12	Dry.
DH41	1990-07-25	09:43	0.0	2031.405	7.945	0.000	0.12	Dry.
DH41	1990-08-01	10:25	0.0	2038.434	7.029	0.000	0.12	Dry.
DH42	1984-12-30	00:00	NA	0.000	0.000	0.000	0.00	Approximate date this part of Room G excavated.
DH42	1985-01-23	00:00	NA	0.000	0.000	0.000	0.00	Downhole drilled.
DH42	1985-01-28	09:00	NA	27.375	1.000	0.000	0.00	Moist muck at the bottom.
DH42	1985-02-05	11:15	00.27	35.469	9.094	0.030	0.27	First time collected.
DH42	1985-02-11	11:00	00.30	41.458	5.989	0.050	0.57	
DH42	1985-02-19	13:10	00.33	49.549	8.091	0.041	0.90	
DH42	1985-02-26	10:45	00.26	56.448	6.899	0.038	1.16	
DH42	1985-03-05	10:00	00.28	63.417	6.969	0.040	1.44	
DH42	1985-03-12	10:20	00.25	70.431	7.014	0.036	1.69	
DH42	1985-03-20	10:54	00.25	78.454	8.023	0.031	1.94	Valve leaked, some brine drained back downhole.
DH42	1985-03-26	10:06	00.28	84.421	5.967	0.047	2.22	
DH42	1985-04-02	10:45	00.26	91.448	7.027	0.037	2.48	
DH42	1985-04-10	10:45	00.29	99.448	8.000	0.036	2.77	
DH42	1985-04-17	13:30	00.24	106.562	7.114	0.034	3.01	
DH42	1985-04-23	13:23	00.04	112.558	5.996	0.007	3.05	Significant volume of brine drained back down hole.
DH42	1985-04-30	10:31	00.38	119.438	6.880	0.055	3.43	
DH42	1985-05-07	09:25	00.33	126.392	6.954	0.047	3.76	
DH42	1985-05-14	10:30	00.25	133.438	7.046	0.035	4.01	
DH42	1985-05-21	10:17	00.26	140.428	6.990	0.037	4.27	
DH42	1985-05-29	10:10	00.30	148.424	7.996	0.038	4.57	
DH42	1985-06-04	10:45	00.22	154.448	6.024	0.037	4.79	
DH42	1985-06-11	10:10	00.25	161.424	6.976	0.036	5.04	
DH42	1985-06-18	09:53	00.25	168.412	6.988	0.036	5.29	
DH42	1985-06-25	11:15	00.25	175.469	7.057	0.035	5.54	
DH42	1985-07-02	11:00	00.24	182.458	6.989	0.034	5.78	
DH42	1985-07-09	10:30	00.25	189.438	6.980	0.036	6.03	
DH42	1985-07-16	11:08	00.25	196.464	7.026	0.036	6.28	Brine effervesces.
DH42	1985-07-24	10:19	00.28	204.430	7.966	0.035	6.56	
DH42	1985-07-30	09:57	00.22	210.415	5.985	0.037	6.78	
DH42	1985-08-06	10:13	00.26	217.426	7.011	0.037	7.04	
DH42	1985-08-14	10:59	00.27	225.458	8.032	0.034	7.31	
DH42	1985-08-20	10:45	00.21	231.448	5.990	0.035	7.52	
DH42	1985-08-28	09:45	00.29	239.406	7.958	0.036	7.81	
DH42	1985-09-04	10:12	00.25	246.425	7.019	0.036	8.06	
DH42	1985-09-10	09:56	00.21	252.414	5.989	0.035	8.27	
DH42	1985-09-17	09:26	00.28	259.393	6.979	0.040	8.55	
DH42	1985-09-24	09:37	00.24	266.401	7.008	0.034	8.79	
DH42	1985-10-01	09:44	00.24	273.406	7.005	0.034	9.03	
DH42	1985-10-08	10:25	00.23	280.434	7.028	0.033	9.26	
DH42	1985-10-15	10:00	00.23	287.417	6.983	0.033	9.49	

BRINE ACCUMULATION DATA TABLE (Continued)
Data through December 31, 1990

Location	Date	Time	Liters removed	Days since 1/1/85	Days used for calc.	Liters per day	Cumulative liters collected	Remarks
DH42	1985-10-23	10:07	00.26	295.422	8.005	0.032	9.75	
DH42	1985-10-29	09:16	00.24	301.386	5.964	0.040	9.99	
DH42	1985-11-05	09:05	00.22	308.378	6.992	0.031	10.21	
DH42	1985-11-13	09:46	00.26	316.407	8.029	0.032	10.47	
DH42	1985-11-21	10:53	00.26	324.453	8.046	0.032	10.73	
DH42	1985-11-26	10:59	00.16	329.458	5.005	0.032	10.89	
DH42	1985-12-03	13:10	00.20	336.549	7.091	0.028	11.09	
DH42	1985-12-10	12:50	00.22	343.535	6.986	0.031	11.31	
DH42	1986-01-23	11:30	01.32	387.479	43.944	0.030	12.63	Entry restricted since 12/10/85 due to mining activities.
DH42	1986-01-31	12:05	00.30	395.503	8.024	0.037	12.93	
DH42	1986-02-12	10:35	00.38	407.441	11.938	0.032	13.31	
DH42	1986-02-19	11:10	00.22	414.465	7.024	0.031	13.53	
DH42	1986-02-28	13:00	00.31	423.542	9.077	0.034	13.84	
DH42	1986-03-06	10:30	00.17	429.438	5.896	0.029	14.01	
DH42	1986-03-13	09:53	00.21	436.412	6.974	0.030	14.22	
DH42	1986-03-26	10:00	00.39	449.417	13.005	0.030	14.61	
DH42	1986-04-02	09:25	00.20	456.392	6.975	0.029	14.81	
DH42	1986-04-08	09:30	00.20	462.396	6.004	0.033	15.01	
DH42	1986-04-16	11:55	00.24	470.497	8.101	0.030	15.25	
DH42	1986-04-24	09:55	00.21	478.413	7.916	0.027	15.46	
DH42	1986-04-30	10:41	00.17	484.445	6.032	0.028	15.63	
DH42	1986-05-06	10:10	00.19	490.424	5.979	0.032	15.82	
DH42	1986-05-13	10:00	00.20	497.417	6.993	0.029	16.02	
DH42	1986-05-20	11:00	00.20	504.458	7.041	0.028	16.22	
DH42	1986-05-27	15:35	00.20	511.649	7.191	0.028	16.42	
DH42	1986-06-03	09:50	00.20	518.410	6.761	0.030	16.62	
DH42	1986-06-10	11:13	00.17	525.467	7.057	0.024	16.79	
DH42	1986-06-17	10:40	00.20	532.444	6.977	0.029	16.99	
DH42	1986-06-24	10:40	00.18	539.444	7.000	0.026	17.17	
DH42	1986-07-01	13:45	00.20	546.573	7.129	0.028	17.37	
DH42	1986-07-08	10:22	00.20	553.432	6.859	0.029	17.57	
DH42	1986-07-16	10:15	00.30	561.427	7.995	0.038	17.87	
DH42	1986-07-22	09:50	00.16	567.410	5.983	0.027	18.03	
DH42	1986-07-29	10:25	00.20	574.434	7.024	0.028	18.23	
DH42	1986-08-05	11:00	00.22	581.458	7.024	0.031	18.45	
DH42	1986-08-12	10:20	00.20	588.431	6.973	0.029	18.65	
DH42	1986-08-19	11:20	00.18	595.472	7.041	0.026	18.83	
DH42	1986-08-26	10:25	00.20	602.434	6.962	0.029	19.03	
DH42	1986-09-04	10:20	00.25	611.431	8.997	0.028	19.28	
DH42	1986-09-09	09:46	00.14	616.407	4.976	0.028	19.42	
DH42	1986-09-16	09:52	00.20	623.411	7.004	0.029	19.62	
DH42	1986-09-23	09:58	00.15	630.415	7.004	0.021	19.77	
DH42	1986-10-01	12:03	00.36	638.502	8.087	0.045	20.13	
DH42	1986-10-08	10:55	00.15	645.455	6.953	0.022	20.28	
DH42	1986-10-14	11:19	00.15	651.472	6.017	0.025	20.43	
DH42	1986-11-05	11:07	0.52	673.463	21.991	0.024	20.95	
DH42	1986-11-20	12:10	00.33	688.507	15.044	0.022	21.28	
DH42	1986-12-30	11:45	00.78	728.490	39.983	0.020	22.06	
DH42	1987-02-03	12:50	00.85	763.535	35.045	0.024	22.91	
DH42	1987-03-06	10:45	0.68	794.448	30.913	0.022	23.59	
DH42	1987-03-30	11:00	0.53	818.458	24.010	0.022	24.12	
DH42	1987-05-07	11:15	0.90	856.469	38.011	0.024	25.02	Brine effervesces.
DH42	1987-06-17	10:35	0.91	897.441	0.000	0.000	25.93	Wood fragments in hole. Some brine left in hole, no calculation.
DH42	1987-06-18	11:56	0.10	898.497	42.028	0.024	26.03	Calculated using 1.01 liters (0.91 l. 6/17/87 plus 0.10 l 6/18/87).
DH42	1987-07-28	11:10	0.94	938.465	39.968	0.024	26.97	
DH42	1987-09-01	10:15	0.79	973.427	34.962	0.023	27.76	
DH42	1987-10-20	11:31	1.29	1022.480	49.053	0.026	29.05	

BRINE ACCUMULATION DATA TABLE (Continued)
Data through December 31, 1990

Location	Date	Time	Liters removed	Days since 1/1/85	Days used for calc.	Liters per day	Cumulative liters collected	Remarks
DH42	1987-11-19	10:55	0.75	1052.450	29.970	0.025	29.80	
DH42	1988-01-04	11:30	1.13	1098.480	46.030	0.025	30.93	
DH42	1988-02-08	11:20	0.75	1133.470	34.990	0.021	31.68	
DH42	1988-03-29	11:20	1.10	1183.470	50.000	0.022	32.78	
DH42	1988-05-05	09:30	0.75	1220.400	36.930	0.020	33.53	
DH42	1988-05-12	09:45	0.13	1227.410	7.010	0.019	33.66	
DH42	1988-07-12	08:35	1.15	1288.360	60.950	0.019	34.81	
DH42	1988-07-28	10:10	0.34	1304.420	16.060	0.021	35.15	
DH42	1988-09-27	10:20	0.66	1365.430	61.010	0.011	35.81	
DH42	1988-12-13	09:38	1.71	1442.400	76.970	0.022	37.52	
DH42	1989-03-15	10:30	1.50	1534.440	92.037	0.016	39.02	
DH42	1989-04-06	10:10	0.54	1556.420	21.986	0.025	39.56	
DH42	1989-04-20	09:10	0.50	1570.380	13.958	0.036	40.06	
DH42	1989-05-17	09:45	0.66	1597.410	27.024	0.024	40.72	
DH42	1989-06-06	09:50	0.41	1617.410	20.004	0.020	41.13	
DH42	1989-06-29	10:20	0.35	1640.430	23.021	0.015	41.48	
DH42	1989-07-25	10:10	0.55	1666.420	25.993	0.021	42.03	
DH42	1989-08-16	09:40	0.36	1688.400	21.979	0.016	42.39	
DH42	1989-09-12	09:00	0.35	1715.380	26.972	0.013	42.74	
DH42	1989-12-13	10:03	1.50	1807.420	92.044	0.016	44.24	
DH42	1990-01-10	09:45	0.70	1835.406	27.987	0.025	44.94	
DH42	1990-01-24	09:57	0.27	1849.415	14.009	0.019	45.21	
DH42	1990-02-07	10:23	0.34	1863.433	14.018	0.024	45.55	
DH42	1990-02-21	10:19	0.32	1877.430	13.997	0.023	45.87	
DH42	1990-03-05	09:00	0.36	1889.375	11.945	0.030	46.23	
DH42	1990-03-13	12:00	NA	1897.500			46.23	Installed sampler.
DH42	1990-03-19	11:12	0.06	1903.467	14.092	0.000	46.29	Brine probably left in hole.
DH42	1990-03-21	10:23	0.08	1905.433	1.966	0.008	46.37	Combined with 0.06 liters from 03/19/90. Used 0.14 liters for calculation.
DH42	1990-04-04	09:24	0.24	1919.392	13.959	0.017	46.61	
DH42	1990-04-10	08:43	0.14	1925.363	5.971	0.023	46.75	
DH42	1990-04-17	10:29	0.14	1932.437	7.074	0.020	46.89	
DH42	1990-04-24	09:26	0.13	1939.393	6.956	0.019	47.02	
DH42	1990-05-02	10:39	0.15	1947.444	8.051	0.019	47.17	
DH42	1990-05-09	09:01	0.13	1954.376	6.932	0.019	47.30	
DH42	1990-05-16	09:11	0.13	1961.383	7.007	0.019	47.43	
DH42	1990-05-23	12:08	0.14	1968.506	7.123	0.020	47.57	
DH42	1990-05-31	08:59	0.13	1976.374	7.868	0.017	47.70	
DH42	1990-06-06	09:37	0.13	1982.401	6.027	0.022	47.83	
DH42	1990-06-14	08:46	0.16	1990.365	7.964	0.020	47.99	
DH42	1990-06-20	09:35	0.12	1996.399	6.034	0.020	48.11	
DH42	1990-06-28	08:55	0.15	2004.372	7.973	0.019	48.26	
DH42	1990-07-17	11:08	0.31	2023.464	19.092	0.016	48.57	
DH42	1990-07-25	09:40	0.20	2031.403	7.939	0.025	48.77	
DH42	1990-08-01	10:20	0.15	2038.431	7.028	0.021	48.92	
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DH42A	1984-12-30	00:00	NA	0.000	0.000	0.000	0.00	Approximate date this part of Room G excavated.
DH42A	1985-01-25	00:00	NA	0.000	0.000	0.000	0.00	Downhole drilled (redrill of DH42) to recover core from 20 to 40 ft.
DH42A	1985-01-28	09:00	NA	27.375	1.000	0.000	0.00	Brine in hole.
DH42A	1985-02-05	11:15	00.85	35.469	9.094	0.093	0.85	First time collected.
DH42A	1985-02-11	11:00	00.99	41.458	5.989	0.165	1.84	
DH42A	1985-02-19	12:10	01.45	49.507	8.049	0.180	3.29	
DH42A	1985-02-26	10:45	01.18	56.448	6.941	0.170	4.47	
DH42A	1985-03-05	10:00	01.24	63.417	6.969	0.178	5.71	
DH42A	1985-03-12	10:20	01.29	70.431	7.014	0.184	7.00	
DH42A	1985-03-20	11:00	01.45	78.458	8.027	0.181	8.45	

BRINE ACCUMULATION DATA TABLE (Continued)
Data through December 31, 1990

Location	Date	Time	Liters removed	Days since 1/1/85	Days used for calc.	Liters per day	Cumulative liters collected	Remarks
DH42A	1985-03-26	10:10	01.07	84.424	5.966	0.179	9.52	
DH42A	1985-04-02	10:45	01.15	91.448	7.024	0.164	10.67	
DH42A	1985-04-10	10:45	01.45	99.448	8.000	0.181	12.12	
DH42A	1985-04-17	13:30	01.32	106.562	7.114	0.186	13.44	
DH42A	1985-04-23	13:23	01.07	112.558	5.996	0.178	14.51	
DH42A	1985-04-30	10:23	01.35	119.433	6.875	0.196	15.86	
DH42A	1985-05-07	09:23	01.39	126.391	6.958	0.200	17.25	
DH42A	1985-05-14	10:25	01.34	133.434	7.043	0.190	18.59	
DH42A	1985-05-21	10:14	01.29	140.426	6.992	0.184	19.88	
DH42A	1985-05-29	10:30	01.28	148.438	8.012	0.160	21.16	
DH42A	1985-06-04	10:50	01.03	154.451	6.013	0.171	22.19	
DH42A	1985-06-11	10:15	01.19	161.427	6.976	0.171	23.38	
DH42A	1985-06-18	09:51	01.18	168.410	6.983	0.169	24.56	
DH42A	1985-06-25	11:05	01.16	175.462	7.052	0.164	25.72	
DH42A	1985-07-02	11:00	01.12	182.458	6.996	0.160	26.84	
DH42A	1985-07-09	10:25	01.12	189.434	6.976	0.161	27.96	Gas effervescing from sample.
DH42A	1985-07-16	11:10	01.11	196.465	7.031	0.158	29.07	Brine effervesces.
DH42A	1985-07-24	10:25	01.23	204.434	7.969	0.154	30.30	
DH42A	1985-07-30	09:54	00.94	210.412	5.978	0.157	31.24	
DH42A	1985-08-06	10:10	01.05	217.424	7.012	0.150	32.29	
DH42A	1985-08-14	10:33	01.11	225.440	8.016	0.138	33.40	
DH42A	1985-08-20	10:14	00.92	231.426	5.986	0.154	34.32	
DH42A	1985-08-28	09:40	01.17	239.403	7.977	0.147	35.49	
DH42A	1985-09-04	10:10	00.99	246.424	7.021	0.141	36.48	
DH42A	1985-09-10	09:55	00.83	252.413	5.989	0.139	37.31	
DH42A	1985-09-17	09:25	00.92	259.392	6.979	0.132	38.23	
DH42A	1985-09-24	09:25	00.94	266.392	7.000	0.134	39.17	
DH42A	1985-10-01	09:40	00.93	273.403	7.011	0.133	40.10	
DH42A	1985-10-08	10:24	00.96	280.433	7.030	0.137	41.06	
DH42A	1985-10-15	10:15	00.81	287.427	6.994	0.116	41.87	
DH42A	1985-10-23	10:10	01.02	295.424	7.997	0.128	42.89	
DH42A	1985-10-29	09:20	00.75	301.389	5.965	0.126	43.64	
DH42A	1985-11-05	09:00	00.86	308.375	6.986	0.123	44.50	
DH42A	1985-11-13	09:44	01.03	316.406	8.031	0.128	45.53	
DH42A	1985-11-21	10:50	00.94	324.451	8.045	0.117	46.47	
DH42A	1985-11-26	10:55	00.61	329.455	5.004	0.122	47.08	
DH42A	1985-12-03	13:05	00.78	336.545	7.090	0.110	47.86	
DH42A	1985-12-10	12:50	00.86	343.535	6.990	0.123	48.72	
DH42A	1986-01-23	11:40	05.13	387.486	43.951	0.117	53.85	Entry restricted since 12/10/85 due to mining activities.
DH42A	1986-01-31	12:00	00.92	395.500	8.014	0.115	54.77	
DH42A	1986-02-12	10:40	01.36	407.444	11.944	0.114	56.13	
DH42A	1986-02-19	11:15	00.80	414.469	7.025	0.114	56.93	
DH42A	1986-02-28	12:55	00.90	423.538	9.069	0.099	57.83	
DH42A	1986-03-06	10:25	00.70	429.434	5.896	0.119	58.53	
DH42A	1986-03-13	09:48	00.73	436.408	6.974	0.105	59.26	
DH42A	1986-03-26	09:40	01.39	449.403	12.995	0.107	60.65	
DH42A	1986-04-02	09:20	00.80	456.389	6.986	0.115	61.45	
DH42A	1986-04-08	09:28	00.63	462.394	6.005	0.105	62.08	
DH42A	1986-04-16	11:50	00.89	470.493	8.099	0.110	62.97	
DH42A	1986-04-24	09:50	00.67	478.410	7.917	0.085	63.64	
DH42A	1986-04-30	10:36	00.76	484.442	6.032	0.126	64.40	
DH42A	1986-05-06	10:00	00.55	490.417	5.975	0.092	64.95	
DH42A	1986-05-13	10:00	00.73	497.417	7.000	0.104	65.68	
DH42A	1986-05-20	11:00	00.70	504.458	7.041	0.099	66.38	
DH42A	1986-05-27	15:35	00.65	511.649	7.191	0.090	67.03	
DH42A	1986-06-03	09:50	00.66	518.410	6.761	0.098	67.69	
DH42A	1986-06-10	11:15	00.54	525.469	7.059	0.076	68.23	
DH42A	1986-06-17	10:31	00.65	532.438	6.969	0.093	68.88	
DH42A	1986-06-24	10:45	00.63	539.448	7.010	0.090	69.51	

BRINE ACCUMULATION DATA TABLE (Continued)
Data through December 31, 1990

Location	Date	Time	Liters removed	Days since 1/1/85	Days used for calc.	Liters per day	Cumulative liters collected	Remarks
DH42A	1986-07-01	13:50	00.71	546.576	7.128	0.100	70.22	
DH42A	1986-07-08	10:25	00.63	553.434	6.858	0.092	70.85	
DH42A	1986-07-16	10:00	00.66	561.417	7.983	0.083	71.51	
DH42A	1986-07-22	09:48	00.61	567.408	5.991	0.102	72.12	
DH42A	1986-07-29	10:25	00.71	574.434	7.026	0.101	72.83	
DH42A	1986-08-05	10:55	00.66	581.455	7.021	0.094	73.49	
DH42A	1986-08-12	10:23	00.63	588.433	6.978	0.090	74.12	
DH42A	1986-08-19	11:22	00.68	595.474	7.041	0.097	74.80	
DH42A	1986-08-26	10:28	00.68	602.436	6.962	0.098	75.48	Static level not measured.
DH42A	1986-09-04	10:25	00.71	611.434	8.998	0.079	76.19	Valve broke off and left in hole after collecting most of brine. Some brine left in hole.
DH42A	1986-09-09	09:40	00.07	616.403	4.969	0.014	76.26	Bottom obstructed by object in hole.
DH42A	1986-09-16	09:59	00.95	623.416	7.013	0.135	77.21	
DH42A	1986-09-23	10:02	00.60	630.418	7.002	0.086	77.81	
DH42A	1986-10-01	11:57	00.43	638.498	8.080	0.053	78.24	
DH42A	1986-10-08	10:55	00.81	645.455	6.957	0.116	79.05	
DH42A	1986-10-14	11:24	00.56	651.475	6.020	0.093	79.61	
DH42A	1986-11-05	11:04	1.94	673.461	21.986	0.088	81.55	
DH42A	1986-11-20	12:08	01.40	688.506	15.045	0.093	82.95	
DH42A	1986-12-31	11:30	02.91	729.479	40.973	0.071	85.86	
DH42A	1987-02-03	12:35	03.15	763.524	34.045	0.093	89.01	
DH42A	1987-03-06	10:45	2.61	794.448	30.924	0.084	91.62	
DH42A	1987-03-30	10:56	2.52	818.456	24.008	0.101	94.14	
DH42A	1987-05-07	11:10	3.17	856.465	38.009	0.083	97.31	
DH42A	1987-06-17	10:30	2.94	897.438	0.000	0.000	100.25	Approx.0.01 liter spilled. Some brine left in hole; no calc.
DH42A	1987-06-18	11:54	0.11	898.496	42.031	0.073	100.36	Calculated using 3.05 liters (2.94 l 6/17/87 plus 0.11 l 6/18/87).
DH42A	1987-07-28	11:03	3.07	938.460	39.964	0.077	103.43	
DH42A	1987-09-01	10:08	2.69	973.422	34.962	0.077	106.12	Samples effervesce.
DH42A	1987-10-20	11:28	3.73	1022.480	49.058	0.076	109.85	
DH42A	1987-11-19	10:55	2.17	1052.450	29.970	0.072	112.02	
DH42A	1988-01-04	11:25	3.28	1098.480	46.030	0.071	115.30	
DH42A	1988-02-08	11:10	2.47	1133.470	34.990	0.071	117.77	
DH42A	1988-03-29	11:15	3.57	1183.470	50.000	0.071	121.34	
DH42A	1988-05-05	09:00	2.38	1220.380	36.910	0.064	123.72	
DH42A	1988-05-12	09:40	0.50	1227.400	7.020	0.071	124.22	
DH42A	1988-07-12	08:30	4.06	1288.350	60.950	0.067	128.28	
DH42A	1988-07-28	10:15	1.25	1304.430	16.080	0.078	129.53	
DH42A	1988-09-14	08:45	3.00	1352.360	47.930	0.063	132.53	
DH42A	1988-09-27	10:10	1.07	1365.420	13.060	0.082	133.60	
DH42A	1988-12-13	09:35	7.95	1442.400	76.980	0.103	141.55	
DH42A	1989-03-15	10:00	5.82	1534.420	92.018	0.063	147.37	
DH42A	1989-04-06	10:15	1.44	1556.430	22.010	0.065	148.81	
DH42A	1989-04-20	09:00	0.75	1570.380	13.948	0.054	149.56	
DH42A	1989-05-17	09:45	1.91	1597.410	27.031	0.071	151.47	
DH42A	1989-06-06	09:45	1.30	1617.410	20.000	0.065	152.77	
DH42A	1989-06-29	10:15	1.35	1640.430	23.021	0.059	154.12	
DH42A	1989-07-25	10:05	1.51	1666.420	25.993	0.058	155.63	
DH42A	1989-08-16	09:31	1.48	1688.400	21.977	0.067	157.11	
DH42A	1989-09-12	08:50	1.63	1715.370	26.971	0.060	158.74	
DH42A	1989-12-13	09:20	5.28	1807.390	92.021	0.057	164.02	
DH42A	1990-01-10	09:36	1.95	1835.400	28.011	0.070	165.97	
DH42A	1990-01-24	09:52	0.75	1849.411	14.011	0.054	166.72	
DH42A	1990-02-07	10:20	0.95	1863.431	14.020	0.068	167.67	
DH42A	1990-02-21	09:56	0.81	1877.414	13.983	0.058	168.48	
DH42A	1990-03-05	08:47	0.68	1889.366	11.952	0.057	169.16	
DH42A	1990-03-13	11:36	NA	1897.483			169.16	Installed sampler.
DH42A	1990-03-19	11:07	0.51	1903.463	14.097	0.000	169.67	Partial evacuation.

BRINE ACCUMULATION DATA TABLE (Continued)
Data through December 31, 1990

Location	Date	Time	Liters removed	Days since 1/1/85	Days used for calc.	Liters per day	Cumulative liters collected	Remarks
DH42A	1990-03-21	10:21	0.28	1905.431	1.968	0.049	169.95	Combined with 0.51 liters from 03/19/90. Used 0.79 liters for calculation.
DH42A	1990-04-04	09:14	0.60	1919.385	13.954	0.043	170.55	
DH42A	1990-04-10	08:40	0.58	1925.361	5.976	0.097	171.13	
DH42A	1990-04-17	10:19	0.38	1932.430	7.069	0.054	171.51	
DH42A	1990-04-24	09:18	0.42	1939.388	6.958	0.060	171.93	
DH42A	1990-05-02	10:32	0.51	1947.439	8.051	0.063	172.44	
DH42A	1990-05-09	08:48	0.39	1954.367	6.928	0.056	172.83	
DH42A	1990-05-16	09:07	0.43	1961.380	7.013	0.061	173.26	
DH42A	1990-05-23	12:08	0.40	1968.506	7.126	0.056	173.66	
DH42A	1990-05-31	08:47	0.46	1976.366	7.860	0.059	174.12	
DH42A	1990-06-06	09:30	0.34	1982.396	6.030	0.056	174.46	
DH42A	1990-06-14	08:38	0.39	1990.360	7.964	0.049	174.85	
DH42A	1990-06-20	09:33	0.45	1996.398	6.038	0.075	175.30	
DH42A	1990-06-28	08:50	0.45	2004.368	7.970	0.056	175.75	
DH42A	1990-07-17	11:04	0.56	2023.461	19.093	0.000	176.31	Partial evacuation.
DH42A	1990-07-18	10:30	0.48	2024.438	0.977	0.052	176.79	Combined with 0.56 liters from 07/17/90. Used 1.04 liters for calculation.
DH42A	1990-07-25	09:37	0.43	2031.401	6.963	0.062	177.22	
DH42A	1990-08-01	10:18	0.50	2038.429	7.028	0.071	177.72	
DH215	1989-04-06	11:00	0	1556.458	114.010	0.000	17.45	Hole dry.
DH215	1989-04-20	13:10	0.11	1570.549	14.091	0.008	17.56	
DH215	1989-05-17	09:00	0	1597.375	26.826	0.000	17.56	Hole dry.
DH215	1989-06-29	08:50	0	1640.368	42.993	0.000	17.56	Hole dry.
DH215	1989-07-25	11:00	0.25	1666.458	26.090	0.010	17.81	
DH215	1989-08-16	09:10	0	1688.382	21.924	0.000	17.81	Hole dry.
DH215	1989-09-12	12:00	0	1715.500	27.118	0.000	17.81	Hole dry.
DH215	1989-12-12	12:25	0	1806.517	91.017	0.000	17.81	Hole dry.
DH215	1990-02-07	11:00	0.0	1863.458	56.941	0.000	17.81	Dry.
DH215	1990-02-21	09:00	0.0	1877.375	13.917	0.000	17.81	Dry.
DH215	1990-03-05	12:04	0.0	1889.503	12.128	0.000	17.81	Dry.
DH215	1990-03-21	09:00	0.0	1905.375	15.872	0.000	17.81	Dry.
DH215	1990-04-11	10:21	0.0	1926.431	21.056	0.000	17.81	Dry.
DH215	1990-05-02	09:35	0.0	1947.399	20.968	0.000	17.81	Dry.
DH215	1990-05-08	10:07	0.0	1953.422	6.023	0.000	17.81	Dry.
DH215	1990-05-17	09:11	0.0	1962.383	8.961	0.000	17.81	Dry. Prepared collector.
DH215	1990-05-23	13:35	0.0	1968.566	6.183	0.000	17.81	Dry.
DH215	1990-05-31	10:00	0.01	1976.417	7.851	0.001	17.82	Did not save.
DH215	1990-06-06	08:45	0.0	1982.365	5.948	0.000	17.82	Dry.
DH215	1990-06-14	10:57	0.07	1990.456	8.091	0.009	17.89	
DH215	1990-06-20	10:20	NA	1996.431			17.89	Trace. Did not remove.
DH215	1990-06-28	11:00	NA	2004.458			17.89	Trace. Did not remove.
DH215	1990-07-17	09:33	NA	2023.398			17.89	Trace. Did not remove.
DH215	1990-07-25	11:00	0.0	2031.458	41.002	0.000	17.89	Dry.
DH215	1990-08-07	09:10	0.04	2044.382	12.924	0.003	17.93	
DH215	1990-08-22	11:15	0.03	2059.469	15.087	0.002	17.96	
DH215	1990-08-29	11:30	NA	2066.479			17.96	Trace. Did not sample.
DH215	1990-09-05	10:30	NA	2073.438			17.96	Trace. Did not collect.
DH215	1990-09-12	08:37	0.02	2080.359	20.890	0.001	17.98	
DH215	1990-11-08	10:01	0.05	2137.417	57.058	0.001	18.03	
DH215	1990-11-14	10:15	0.0	2143.427	6.010	0.000	18.03	Dry.
DHP401	1986-10-29	00:00	NA	0.000	0.000	0.000	0.00	Drift excavated at S1950/E1320.
DHP401	1987-01-06	00:00	NA	0.000	0.000	0.000	0.00	Uphole drilling initiated 12/08/86, stopped on 12/09/86 at 27.9 ft. Drilling resumed 1/02/87 and completed 1/06/87.

BRINE ACCUMULATION DATA TABLE (Continued)
Data through December 31, 1990

Location	Date	Time	Liters removed	Days since 1/1/85	Days used for calc.	Liters per day	Cumulative liters collected	Remarks
DHP401	1987-03-06	09:15	0.12	794.385	1.000	0.000	0.12	First time collected.
DHP401	1987-03-30	09:15	0.06	818.385	24.000	0.003	0.18	
DHP401	1987-04-22	11:10	0.17	841.465	23.080	0.007	0.35	Stalactite growth beside funnel.
DHP401	1987-06-11	10:00	0.38	891.417	49.952	0.008	0.73	
DHP401	1987-07-28	10:15	0.27	938.427	47.010	0.006	1.00	Clay accumulation in container.
DHP401	1987-09-01	08:55	0.32	973.372	34.945	0.009	1.32	
DHP401	1987-09-16	09:15		988.385	0.000	0.000	1.32	0.01 liter in jar, not removed. No calculation.
DHP401	1987-11-16	08:50	0.59	1049.370	75.998	0.008	1.91	
DHP401	1988-02-09	09:00	0.43	1134.380	85.010	0.005	2.34	
DHP401	1988-03-07	10:00	0.02	1161.420	27.040	0.001	2.36	Removed collection device.
DHP401	1988-03-29	09:00		1183.380	0.000	0.000	2.36	No collection device.
DHP401	1988-07-12	13:50		1288.580	0.000	0.000	2.36	No funnel.
DHP401	1988-09-27	13:00	0.00	1365.540	0.000	0.000	2.36	None collected.
DHP401	1988-10-13	10:00		1381.420	0.000	0.000	2.36	Installed funnel and collection bottle.
DHP401	1988-12-13	10:50	0	1442.450	281.030	0.000	2.36	Dry.
DHP401	1989-04-20	13:05	0	1570.550	128.094	0.000	2.36	Hole dry.
DHP401	1989-05-17	09:00	0	1597.380	26.830	0.000	2.36	Hole dry.
DHP401	1989-06-29	09:10	0	1640.380	43.007	0.000	2.36	Hole dry.
DHP401	1989-08-16	09:00	0	1688.380	47.993	0.000	2.36	Hole dry.
DHP401	1989-11-15	10:25	0	1779.430	91.059	0.000	2.36	Hole dry.
DHP401	1989-12-12	12:25	0	1806.520	27.083	0.000	2.36	Hole dry.
DHP401	1990-03-05	12:10	0.0	1889.507	82.990	0.000	2.36	Dry.
DHP401	1990-03-21	09:10	0.0	1905.382	15.875	0.000	2.36	Dry.
DHP401	1990-04-11	10:23	0.0	1926.433	21.051	0.000	2.36	Dry.
DHP401	1990-05-02	09:35	0.0	1947.399	20.966	0.000	2.36	Dry.
DHP401	1990-05-08	10:10	0.0	1953.424	6.025	0.000	2.36	Dry.
DHP401	1990-05-17	09:14	0.0	1962.385	8.961	0.000	2.36	Dry.
DHP401	1990-05-23	13:40	0.0	1968.569	6.184	0.000	2.36	Dry.
DHP401	1990-06-06	08:53	0.0	1982.370	13.801	0.000	2.36	Dry.
DHP401	1990-06-14	11:00	0.0	1990.458	8.088	0.000	2.36	Dry.
DHP401	1990-06-20	10:31	0.0	1996.438	5.980	0.000	2.36	Dry.
DHP401	1990-07-17	09:37	0.0	2023.401	26.963	0.000	2.36	Dry.
DHP401	1990-07-25	11:26	0.0	2031.476	8.075	0.000	2.36	Dry.
DHP401	1990-08-07	09:20	0.0	2044.389	12.913	0.000	2.36	Dry.
DHP401	1990-08-16	08:54	0.0	2053.371	8.982	0.000	2.36	Dry.
DHP401	1990-08-22	11:20	0.0	2059.472	6.101	0.000	2.36	Dry.
DHP401	1990-08-29	11:32	0.0	2066.481	7.009	0.000	2.36	Dry.
DHP401	1990-09-05	10:28	0.0	2073.436	6.955	0.000	2.36	Dry.
DHP401	1990-09-12	08:40	0.0	2080.361	6.925	0.000	2.36	Dry.
DHP401	1990-10-20	10:20	0			0.000		Dry.
DHP401	1990-12-20	10:05	0.			0.000		Dry.

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Location	Date	Time	Liters removed	Days since 1/1/85	Days used for calc.	Liters per day	Cumulative liters collected	Remarks
DHP402A	1986-10-29	00:00	NA	0.000	0.000	0.000	0.00	Drift excavated at S1950/E1320.
DHP402A	1986-12-05	00:00	NA	0.000	0.000	0.000	0.00	Downhole completed.
DHP402A	1987-03-06	09:40	0.14	794.403	1.000	0.000	0.14	First time sampled.
DHP402A	1987-03-30	09:15	0.00	818.385	23.982	0.000	0.14	
DHP402A	1987-04-22	11:24	0.03	841.475	47.072	0.001	0.17	Bailer stuck in hole. Hole appears offset or blocked at the 45 ft level. There may be a rock bolt or piece of rod in hole.
DHP402A	1987-07-08	00:00	NA	0.000	0.000	0.000	0.17	Horizontal pilot hole for Room 7 of the first Waste Storage Panel started just north of this location, drilled with brine.
DHP402A	1987-07-16	09:20	0.00	926.389	0.000	0.000	0.17	Hole entirely filled with brine from drilling the pilot/gas release hole for the last room of the first panel.
DHP402A	1987-07-28	10:20	17.50	938.431	0.000	0.000	17.67	Removed 17.5 liters of brine from hole, mostly drilling fluid. No calculation.

BRINE ACCUMULATION DATA TABLE (Continued)
Data through December 31, 1990

Location	Date	Time	Liters removed	Days since 1/1/85	Days used for calc.	Liters per day	Cumulative liters collected	Remarks
DHP402A	1987-07-29	09:10	15.00	939.382	0.000	0.000	32.67	Drilling brine removed from hole. Partial excavation, brine left in hole, no calculation.
DHP402A	1987-08-16		NA	0.000	0.000	0.000	32.67	Brine from the AIS sump spread in Panel 1 to assist in the reconstitution of loose muck on floor.
DHP402A	1987-08-20		NA	0.000	0.000	0.000	32.67	Brine from the AIS sump spread in Panel 1 to assist in the reconstitution of loose muck on floor.
DHP402A	1987-10-01	00:00	NA	0.000	0.000	0.000	32.67	Approximate date the salt muck stockpile was placed at the east end of S1950, covering the collar of this hole.
DHP402A	1988-07-12	13:50		1288.580	0.000	0.000	32.67	Muck piled over hole, could not collect.
DHP402A	1988-08-19	10:00	57.25	1326.420	387.989	0.186	89.92	Used 72.25 liters for calculation (15.0 on 7/29 + 57.25 on 8/29).
DHP402A	1988-08-30	11:00	42.75	1337.460	11.040	3.872	132.67	Depth of water 28.8 feet below floor. Bottom of hole at 44.3 feet. 5.7 feet of salt on bottom of hole.
DHP402A	1988-09-15	10:00	0.24	1353.420	0.000	0.000	132.91	Not fully evacuated. Don't use for calculation. Sampled for bacteriology.
DHP402A	1988-09-22	09:00	63.75	1360.380	22.920	2.781	196.66	Hole evacuated to 44.2' level.
DHP402A	1988-09-27	13:00		1365.540	0.000	0.000	196.66	
DHP402A	1988-10-18	13:45	45	1386.570	26.190	1.718	241.66	Some moisture could have entered hole due to water spread for dust control.
DHP402A	1988-11-15	10:30	40.65	1414.440	27.870	1.459	282.31	Evacuated to 43.75 foot level. Lip or obstruction near bottom of hole prevents additional evacuation.
DHP402A	1988-12-13	10:50	6.0	1442.450	0.000	0.000	288.31	Not fully evacuated, some brine left in hole. Don't use for calculation.
DHP402A	1988-12-29	12:00	43.60	1458.500	44.060	1.126	331.91	Used 49.6 liters for calculation (6.0 on 12/13 + 43.6 on 12/29).
DHP402A	1989-01-04	13:30	13.5	1464.560	6.062	2.227	345.41	Complete evacuation to 43.3 ft. level. Strong odor of diesel from hole and bailer.
DHP402A	1989-01-20	10:30	19	1480.440	15.876	1.197	364.41	Volume removed includes 2.5 gallons of brine introduced to hole by Intera.
DHP402A	1989-02-28	11:50	12.1	1519.490	39.055	0.310	376.51	Hole open to 44.2 feet.
DHP402A	1989-04-06	13:30	1.19	1556.560	37.069	0.032	377.70	Sample removed from above packer.
DHP402A	1989-04-20	13:05	NA	1570.550	0.000	0.000	377.70	Level measured at 33.1 feet.
DHP402A	1989-04-26	10:30	NA	1576.440	0.000	0.000	377.70	Level of brine at 27.2 feet.
DHP402A	1989-04-27	10:00	49.00	1577.420	20.855	2.350	426.70	Hole bottom measured at 44.3 feet.
DHP402A	1989-05-17	09:00	33	1597.380	19.958	1.653	459.70	Fluid level at 44.6 feet.
DHP402A	1989-06-20	10:00	NA	1631.420	0.000	0.000	459.70	Fluid measured at 39.8 feet. Hole not evacuated.
DHP402A	1989-06-29	09:00	NA	1640.380	0.000	0.000	459.70	Measured hole fluid level at 37.6 feet.
DHP402A	1989-07-24	09:50	24	1665.410	68.035	0.353	483.70	Hole pumped to fluid level of 41.1 feet.
DHP402A	1989-08-16	09:00	NA	1688.380	0.000	0.000	483.70	Sample not obtained. Fluid level at 36.5 feet.
DHP402A	1989-08-23	11:45	NA	1695.490	0.000	0.000	483.70	Observed fluid level at 35.4 feet. Not sampled.
DHP402A	1989-09-12	12:30	6.30	1715.520	50.111	0.126	490.00	
DHP402A	1989-10-02	11:00	25.5	1735.460	19.937	1.279	515.50	
DHP402A	1989-11-15	10:30	16	1779.440	43.980	0.364	531.50	
DHP402A	1989-12-13	12:12	15.62	1807.510	28.070	0.556	547.12	
DHP402A	1990-03-22	08:53	4.0	1906.370			547.12	Hole not completely evacuated.
DHP402A	1990-03-26	09:25	7.0	1910.392			547.12	Hole not completely evacuated.
DHP402A	1990-05-31	10:03	0.0	1976.419	168.911	0.000	547.12	Hole not sampled, water level at 36.0 feet.
DHP402A	1990-06-20	10:31	15.0	1996.440	20.019	0.749	562.12	2 liters for BSEP, 0.25 liters for SNL/NM (did not include in calculation). Partial evacuation.
DHP402A	1990-10-05	09:30	2.250	2103.396	106.958	0.000	564.37	Partial evacuation.
DHP402A	1990-11-14	10:20	0.0	2143.430	35.989	0.000	564.37	Hole not sampled, water level at 34.2 feet.

BRINE ACCUMULATION DATA TABLE (Continued)
Data through December 31, 1990

Location	Date	Time	Liters removed	Days since 1/1/85	Days used for calc.	Liters per day	Cumulative liters collected	Remarks
DHP402A	1990-12-20	10:05	40.7	2179.420	35.989	0.299	605.07	Combined with 2.0 liters from 10/05/90. Used 42.7 liters for calculation.
GSEEP	1984-11-21			0.000	0.000	0.000	0.00	Approximate date this part of Room G excavated.
GSEEP	1985-08-28			0.000	0.000	0.000	0.00	Noticed damp area on floor at this location.
GSEEP	1985-11-12			0.000	0.000	0.000	0.00	Damp area on floor near S. rib approx. E1140 (45 ft E. of DH35) and at E1149. Crusted moist area is about 4 ft by 4 ft, has increased noticeably in size over last two months. Damp area covers 16 ft E-W, 13 ft N-S across width of Room G. Many weeps on lower 3 ft of S rib. Brine is seeping out of air pipe support hole.
GSEEP	1985-11-26	12:00	03.00	329.500	1.000	0.000	3.00	First time collection. Dug out salt.
GSEEP	1985-12-03	12:00	01.50	336.500	7.000	0.214	4.50	Partial removal.
GSEEP	1985-12-04	12:00	01.13	337.500	1.000	1.130	5.63	
GSEEP	1985-12-10	12:00	01.80	343.500	6.000	0.300	7.43	
GSEEP	1986-01-23	12:00	00.50	387.500	44.000	0.011	7.93	Lots of salt in pool.
GSEEP	1986-01-31	12:00	00.94	395.500	8.000	0.117	8.87	
GSEEP	1986-02-12	12:00	02.23	407.500	12.000	0.186	11.10	Pumped twice.
GSEEP	1986-02-19	12:00	02.14	414.500	7.000	0.306	13.24	
GSEEP	1986-02-28	12:00	01.95	423.500	9.000	0.217	15.19	Partial removal. No pump, scooped with beaker.
GSEEP	1986-03-04	11:20	02.62	427.472	3.972	0.660	17.81	
GSEEP	1986-03-06	10:50	02.07	429.451	1.979	1.046	19.88	
GSEEP	1986-03-13	11:46	03.23	436.490	7.039	0.459	23.11	Collected three times.
GSEEP	1986-03-26	10:20	03.00	449.431	12.941	0.232	26.11	
GSEEP	1986-04-02	10:00	02.68	456.417	6.986	0.384	28.79	
GSEEP	1986-04-08	10:00	02.50	462.417	6.000	0.417	31.29	
GSEEP	1986-04-16	12:00	02.24	470.500	8.083	0.277	33.53	
GSEEP	1986-04-24	10:30	02.35	478.438	7.938	0.296	35.88	
GSEEP	1986-04-30	11:00	02.40	484.458	6.020	0.399	38.28	
GSEEP	1986-05-06	10:30	02.49	490.438	5.980	0.416	40.77	
GSEEP	1986-05-13	11:20	02.66	497.472	7.034	0.378	43.43	
GSEEP	1986-05-20	11:20	02.44	504.472	7.000	0.349	45.87	
GSEEP	1986-05-27	15:30	03.11	511.646	7.174	0.434	48.98	
GSEEP	1986-06-03	10:40	03.31	518.444	6.798	0.487	52.29	
GSEEP	1986-06-10	11:38	03.21	525.485	7.041	0.456	55.50	
GSEEP	1986-06-17	11:15	03.11	532.469	6.984	0.445	58.61	
GSEEP	1986-06-24	11:00	04.60	539.458	6.989	0.658	63.21	Very humid air in workings.
GSEEP	1986-07-01	14:00	05.43	546.583	7.125	0.762	68.64	Very humid last week; rain on surface.
GSEEP	1986-07-08	10:50	04.14	553.451	6.868	0.603	72.78	
GSEEP	1986-07-16	10:50	03.32	561.451	8.000	0.415	76.10	
GSEEP	1986-07-22	10:15	02.29	567.427	5.976	0.383	78.39	
GSEEP	1986-07-29	10:45	02.68	574.448	7.021	0.382	81.07	
GSEEP	1986-08-05	11:20	02.60	581.472	7.024	0.370	83.67	
GSEEP	1986-08-12	10:45	03.67	588.448	6.976	0.526	87.34	
GSEEP	1986-08-19	11:40	03.90	595.486	7.038	0.554	91.24	
GSEEP	1986-08-26	11:00	03.73	602.458	6.972	0.535	94.97	
GSEEP	1986-09-04	10:55	05.15	611.455	8.997	0.572	100.12	Last week has been humid and rainy.
GSEEP	1986-09-09	10:00	03.70	616.417	4.962	0.746	103.82	
GSEEP	1986-09-16	10:25	03.82	623.434	7.017	0.544	107.64	
GSEEP	1986-09-23	10:20	04.29	630.431	6.997	0.613	111.93	
GSEEP	1986-10-01	12:24	03.70	638.517	8.086	0.458	115.63	
GSEEP	1986-10-08	10:45	03.80	645.448	6.931	0.548	119.43	
GSEEP	1986-10-08	14:57	01.87	645.623	0.175	10.690	121.30	Second collection for this day. Use (3.80 + 1.87)/(6.931 + 0.175) = 0.798 liter/day.
GSEEP	1986-10-10	09:16	01.24	647.386	1.763	0.703	122.54	

BRINE ACCUMULATION DATA TABLE (Continued)
Data through December 31, 1990

Location	Date	Time	Liters removed	Days since 1/1/85	Days used for calc.	Liters per day	Cumulative liters collected	Remarks
GSEEP	1986-10-14	11:10	02.19	651.465	4.079	0.537	124.73	
GSEEP	1986-11-05	10:45	4.44	673.448	21.983	0.202	129.17	First time 3.74 liters; second time 0.70 liters.
GSEEP	1986-11-20	12:02	03.84	688.501	15.053	0.255	133.01	
GSEEP	1986-12-30	12:50	04.44	728.535	40.034	0.111	137.45	
GSEEP	1987-02-03	13:45	03.45	763.573	35.038	0.098	140.90	
GSEEP	1987-03-06	11:30	3.0	794.479	30.906	0.097	143.90	
GSEEP	1987-03-30	11:34	2.51	818.482	24.003	0.105	146.41	
GSEEP	1987-05-07	11:48	3.31	856.492	38.010	0.087	149.72	
GSEEP	1987-06-30	10:00	12.24	910.417	53.925	0.227	161.96	
GSEEP	1987-07-16	10:30	11.66	926.438	16.021	0.728	173.62	
GSEEP	1987-07-23	09:20	3.87	933.389	6.951	0.557	177.49	
GSEEP	1987-07-28	11:35	2.36	938.483	5.094	0.463	179.85	
GSEEP	1987-08-07	09:15	5.33	948.385	9.902	0.538	185.18	
GSEEP	1987-08-12	10:12	2.80	953.425	5.040	0.556	187.98	
GSEEP	1987-08-24	08:46	6.53	965.365	11.940	0.547	194.51	
GSEEP	1987-09-01	11:00	5.26	973.458	8.093	0.650	199.77	
GSEEP	1987-09-11	09:00	5.03	983.375	9.917	0.507	204.80	
GSEEP	1987-09-16	09:33	2.42	988.398	5.023	0.482	207.22	
GSEEP	1987-09-25	08:55	4.12	997.372	8.974	0.459	211.34	Sump drilled to facilitate accumulation of brine.
GSEEP	1987-10-01	12:15	2.81	1003.510	6.138	0.458	214.15	
GSEEP	1987-10-08	10:25	2.97	1010.430	6.920	0.429	217.12	
GSEEP	1987-10-16	10:41	3.37	1018.450	8.020	0.420	220.49	
GSEEP	1987-10-20	11:59	2.06	1022.500	4.050	0.509	222.55	
GSEEP	1987-11-12	10:41	10.21	1045.450	22.950	0.445	232.76	
GSEEP	1987-11-19	11:35	2.90	1052.480	7.030	0.413	235.66	
GSEEP	1987-12-07	12:50	7.02	1070.530	18.050	0.389	242.68	
GSEEP	1988-01-04	12:10	16.11	1098.510	27.980	0.576	258.79	
GSEEP	1988-01-20	11:25	8.68	1114.480	15.970	0.544	267.47	
GSEEP	1988-02-08	12:15	9.58	1133.510	19.030	0.503	277.05	
GSEEP	1988-02-25	10:40	11.87	1150.440	16.930	0.701	288.92	
GSEEP	1988-03-09	10:18	7.35	1163.430	12.990	0.566	296.27	
GSEEP	1988-03-17	11:20	4.45	1171.470	8.040	0.553	300.72	
GSEEP	1988-03-29	11:45	5.42	1183.490	12.020	0.451	306.14	
GSEEP	1988-04-15	11:01	7.43	1200.460	16.970	0.438	313.57	
GSEEP	1988-05-05	10:10	9.34	1220.420	19.960	0.468	322.91	
GSEEP	1988-05-12	09:30	3.55	1227.400	6.980	0.509	326.46	
GSEEP	1988-06-09	08:45	12.00	1255.360	27.960	0.429	338.46	
GSEEP	1988-06-16	09:43	4.13	1262.400	7.040	0.587	342.59	
GSEEP	1988-06-30	08:30	6.00	1276.350	13.950	0.430	348.59	
GSEEP	1988-07-12	09:00	6.40	1288.380	12.030	0.532	354.99	
GSEEP	1988-07-28	10:30	11.35	1304.440	16.060	0.707	366.34	
GSEEP	1988-08-11	10:00	12.02	1318.420	13.980	0.860	378.36	
GSEEP	1988-08-25	09:07	6.72	1332.380	13.960	0.481	385.08	Hole covered with tight fitting brattice cloth.
GSEEP	1988-09-08	14:48	7.31	1346.620	14.240	0.513	392.39	
GSEEP	1988-09-14	08:30	3.00	1352.350	5.730	0.524	395.39	
GSEEP	1988-09-27	10:50	6.45	1365.450	13.100	0.492	401.84	
GSEEP	1988-10-18	10:22	10.20	1386.430	20.980	0.486	412.04	
GSEEP	1988-11-10	09:08	12.62	1409.380	22.950	0.550	424.66	Smell of urine in sample and coming from hole.
GSEEP	1988-12-13	10:20	17.81	1442.430	33.050	0.539	442.47	Sample effervesces and brine feels warmer than usual.
GSEEP	1989-01-10	13:30	17.38	1470.560	28.131	0.618	459.85	
GSEEP	1989-02-09	10:22	19.5	1500.430	29.870	0.653	479.35	
GSEEP	1989-03-01	10:00	3.90	1520.420	0.000	0.000	483.25	
GSEEP	1989-03-14	12:45	19.57	1533.530	33.099	0.709	502.82	Add 3.9 l collected 3/01/90 to 19.57 l. Use 23.47 liter for calculation.
GSEEP	1989-04-06	08:56	16.35	1556.370	22.841	0.716	519.17	
GSEEP	1989-04-20	08:45	10.43	1570.370	13.993	0.745	529.60	
GSEEP	1989-05-17	09:40	19.72	1597.400	27.038	0.729	549.32	

BRINE ACCUMULATION DATA TABLE (Continued)
Data through December 31, 1990

Location	Date	Time	Liters removed	Days since 1/1/85	Days used for calc.	Liters per day	Cumulative liters collected	Remarks
GSEEP	1989-06-06	09:40	14.52	1617.400	20.000	0.726	563.84	
GSEEP	1989-06-29	10:01	15.95	1640.420	23.014	0.693	579.79	
GSEEP	1989-07-06	09:00	4.67	1647.380	6.958	0.671	584.46	
GSEEP	1989-07-25	09:30	12.60	1666.400	19.021	0.662	597.06	
GSEEP	1989-08-16	09:15	14.73	1688.380	21.989	0.670	611.79	
GSEEP	1989-09-12	08:30	18.68	1715.350	26.969	0.693	630.47	
GSEEP	1989-10-11	09:47	17.70	1744.410	29.054	0.609	648.17	
GSEEP	1989-11-15	09:30	21.44	1779.400	34.988	0.613	669.61	
GSEEP	1989-12-13	09:13	16.30	1807.380	27.988	0.582	685.91	
GSEEP	1990-01-10	09:21	16.40	1835.390	28.006	0.586	702.31	
GSEEP	1990-01-24	09:19	9.0	1849.388	13.998	0.643	711.31	
GSEEP	1990-02-07	10:07	9.0	1863.422	14.034	0.641	720.31	
GSEEP	1990-02-21	09:40	8.32	1877.403	13.981	0.595	728.63	
GSEEP	1990-03-21	09:49	16.55	1905.409	28.006	0.591	745.18	
GSEEP	1990-04-24	11:16	20.33	1939.469	34.060	0.597	765.51	
GSEEP	1990-05-23	11:51	16.66	1968.494	29.025	0.574	782.17	
GSEEP	1990-06-06	12:30	10.50	1982.521	14.000	0.750	792.67	
GSEEP	1990-06-20	08:56	15.72	1996.372	27.878	0.564	808.39	
GSEEP	1990-07-25	08:50	15.0	2031.368	34.996	0.429	823.39	
GSEEP	1990-12-11	10:30	2.0	2170.438	139.070	0.000	825.39	Partial removal. First time sampled since 07/25/90.
GSEEP	1990-12-13	08:56	49.89	2172.372	1.930	0.368	875.28	Combined with 2.0 liters from 12/11/90. Used 51.89 liters for calculation.
GSEEP	1990-12-20	08:23	0.0	2179.349	147.981	0.000	875.28	Could not sample.

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Location	Date	Time	Liters removed	Days since 1/1/85	Days used for calc.	Liters per day	Cumulative liters collected	Remarks
L1S25	1984-04-21			0.000	0.000	0.000	0.00	Room L1 excavated 4/19/84 to 4/21/84.
L1S25	1985-06-28			0.000	0.000	0.000	0.00	Downhole drilled.
L1S25	1985-08-20			0.000	0.000	0.000	0.00	Wet.
L1S25	1985-09-17			0.000	0.000	0.000	0.00	Wet.
L1S25	1985-12-10	09:00	02.84	343.375	1.000	0.000	2.84	First time collected.
L1S25	1985-12-17	09:00	00.18	350.375	7.000	0.026	3.02	
L1S25	1986-01-03	09:00	00.25	367.375	17.000	0.015	3.27	
L1S25	1986-01-08	09:00	00.10	372.375	5.000	0.020	3.37	
L1S25	1986-01-16	09:00	00.13	380.375	8.000	0.016	3.50	
L1S25	1986-01-23	09:00	00.11	387.375	7.000	0.016	3.61	
L1S25	1986-01-31	09:00	00.13	395.375	8.000	0.016	3.74	
L1S25	1986-02-12	09:00	00.19	407.375	12.000	0.016	3.93	
L1S25	1986-02-19	09:00	00.12	414.375	7.000	0.017	4.05	
L1S25	1986-02-28	09:00	00.15	423.375	9.000	0.017	4.20	
L1S25	1986-03-06	09:15	00.10	429.385	6.010	0.017	4.30	
L1S25	1986-03-13	08:35	00.10	436.358	6.973	0.014	4.40	
L1S25	1986-03-26	08:40	00.20	449.361	13.003	0.015	4.60	
L1S25	1986-04-02	08:20	00.11	456.347	6.986	0.016	4.71	
L1S25	1986-04-08	08:30	00.09	462.354	6.007	0.015	4.80	
L1S25	1986-04-16	10:25	00.10	470.434	8.080	0.012	4.90	
L1S25	1986-04-24	08:55	00.13	478.372	7.938	0.016	5.03	
L1S25	1986-04-30	09:25	00.10	484.392	6.020	0.017	5.13	Collection device installed.
L1S25	1986-05-06	09:05	00.09	490.378	5.986	0.015	5.22	
L1S25	1986-05-13	09:00	00.10	497.375	6.997	0.014	5.32	
L1S25	1986-05-20	09:20	00.10	504.389	7.014	0.014	5.42	
L1S25	1986-05-27	14:20	00.10	511.597	7.208	0.014	5.52	
L1S25	1986-06-03	08:55	00.10	518.372	6.775	0.015	5.62	
L1S25	1986-06-10	09:33	00.10	525.398	7.026	0.014	5.72	
L1S25	1986-06-17	09:24	00.10	532.392	6.994	0.014	5.82	
L1S25	1986-06-24	09:33	00.10	539.398	7.006	0.014	5.92	
L1S25	1986-07-01	12:08	00.10	546.506	7.108	0.014	6.02	
L1S25	1986-07-08	09:15	00.10	553.385	6.879	0.015	6.12	
L1S25	1986-07-16	09:24	00.12	561.392	8.007	0.015	6.24	
L1S25	1986-07-22	08:59	00.09	567.374	5.982	0.015	6.33	

BRINE ACCUMULATION DATA TABLE (Continued)
Data through December 31, 1990

Location	Date	Time	Liters removed	Days since 1/1/85	Days used for calc.	Liters per day	Cumulative liters collected	Remarks
L1S25	1986-07-29	09:27	00.10	574.394	7.020	0.014	6.43	
L1S25	1986-08-05	09:51	00.09	581.410	7.016	0.013	6.52	
L1S25	1986-08-12	09:20	00.10	588.389	6.979	0.014	6.62	
L1S25	1986-08-19	10:03	00.10	595.419	7.030	0.014	6.72	
L1S25	1986-08-26	09:36	00.10	602.400	6.981	0.014	6.82	
L1S25	1986-09-04	09:15	00.12	611.385	8.985	0.013	6.94	
L1S25	1986-09-09	11:38	00.08	616.485	5.100	0.016	7.02	
L1S25	1986-09-16	09:02	00.09	623.376	6.891	0.013	7.11	
L1S25	1986-09-23	09:08	00.10	630.381	7.005	0.014	7.21	
L1S25	1986-10-01	09:58	00.10	638.415	8.034	0.012	7.31	
L1S25	1986-10-08	09:24	00.10	645.392	6.977	0.014	7.41	
L1S25	1986-10-14	10:09	00.07	651.423	6.031	0.012	7.48	
L1S25	1986-11-05	09:32	0.27	673.397	21.974	0.012	7.75	
L1S25	1986-11-20	10:13	00.18	688.426	15.029	0.012	7.93	
L1S25	1986-12-31	10:42	00.41	729.446	41.020	0.010	8.34	Collection device removed.
L1S25	1987-03-06	12:20	0.61	794.514	65.068	0.009	8.95	
L1S25	1987-03-31	10:25	0.00	819.434	24.920	0.000	8.95	Dry.
L1S25	1987-05-07	08:35	0.33	856.358	61.844	0.005	9.28	
L1S25	1987-06-18	12:25	0.42	898.517	42.159	0.010	9.70	
L1S25	1987-07-28	13:09	0.44	938.548	40.031	0.011	10.14	
L1S25	1987-09-01	12:52	0.34	973.536	34.988	0.010	10.48	
L1S25	1987-10-20	12:20	0.38	1022.510	48.974	0.008	10.86	
L1S25	1987-11-19	12:20	0.19	1052.510	30.000	0.006	11.05	
L1S25	1988-01-04	12:33	0.14	1098.520	46.010	0.003	11.19	
L1S25	1988-02-08	13:46	0.13	1133.570	35.050	0.004	11.32	
L1S25	1988-03-30	12:20	0.28	1184.510	50.940	0.005	11.60	
L1S25	1988-07-12	11:50	0.31	1288.490	103.980	0.003	11.91	
L1S25	1988-09-27	08:50	0.40	1365.370	76.880	0.005	12.31	
L1S25	1988-12-13	11:30	0.55	1442.480	77.110	0.007	12.86	
L1S25	1989-03-15	11:02	0.21	1534.460	91.981	0.002	13.07	
L1S25	1989-04-06	10:30	0.10	1556.440	21.978	0.005	13.17	
L1S25	1989-04-20	12:05	0.08	1570.500	14.065	0.006	13.25	
L1S25	1989-05-17	NA	NA	1597.000	0.000	0.000	13.25	Not sampled, equipment in the way.
L1S25	1989-06-06	10:35	0.15	1617.440	46.938	0.003	13.40	Last time sampled for BSEP.
L1S26	1984-04-21			0.000	0.000	0.000	0.00	Room L1 excavated 4/19/84 to 4/21/84.
L1S26	1985-06-28			0.000	0.000	0.000	0.00	Downhole drilled.
L1S26	1985-08-20			0.000	0.000	0.000	0.00	Dry.
L1S26	1985-09-17			0.000	0.000	0.000	0.00	Dry.
L1S26	1985-12-10			0.000	0.000	0.000	0.00	Dry.
L1S26	1985-12-17			0.000	0.000	0.000	0.00	Dry.
L1S26	1986-04-02	08:20	00.09	456.347	1.000	0.000	0.09	First time collected.
L1S26	1986-04-24	08:55	00.05	478.372	22.025	0.002	0.14	
L1S26	1986-05-20	09:20	00.05	504.389	26.017	0.002	0.19	
L1S26	1986-06-10	09:24	00.05	525.392	21.003	0.002	0.24	
L1S26	1986-06-24	09:20	00.05	539.389	13.997	0.004	0.29	
L1S26	1986-07-08	09:17	00.04	553.387	13.998	0.003	0.33	
L1S26	1986-07-16	09:05	00.02	561.378	7.991	0.003	0.35	
L1S26	1986-07-29	09:15	00.04	574.385	13.007	0.003	0.39	
L1S26	1986-08-12	09:06	00.04	588.379	13.994	0.003	0.43	
L1S26	1986-08-26	09:25	00.04	602.392	14.013	0.003	0.47	
L1S26	1986-09-09	11:27	00.05	616.477	14.085	0.004	0.52	
L1S26	1986-09-23	08:55	00.03	630.372	13.895	0.002	0.55	
L1S26	1986-10-01	09:48	00.03	638.408	8.036	0.004	0.58	
L1S26	1986-11-05	09:04	0.03	673.378	34.970	0.001	0.61	
L1S26	1986-11-20	09:59	00.03	688.416	15.038	0.002	0.64	
L1S26	1986-12-31	10:42	NA	729.446	41.030	0.000	0.64	Dry.
L1S26	1987-03-06	12:25	0.05	794.517	106.101	0.000	0.69	

BRINE ACCUMULATION DATA TABLE (Continued)
Data through December 31, 1990

Location	Date	Time	Liters removed	Days since 1/1/85	Days used for calc.	Liters per day	Cumulative liters collected	Remarks
L1S26	1987-03-31	10:28	0.00	819.436	24.919	0.000	0.69	Dry.
L1S26	1987-05-07	08:37	0.02	856.359	61.842	0.000	0.71	
L1S26	1987-06-18	12:27	0.07	898.519	42.160	0.002	0.78	
L1S26	1987-07-28	13:13	0.10	938.551	40.032	0.002	0.88	
L1S26	1987-09-01	12:55	0.07	973.538	34.987	0.002	0.95	
L1S26	1987-10-20	12:24	0.03	1022.520	48.982	0.001	0.98	
L1S26	1987-11-19	12:21	0.07	1052.510	29.990	0.002	1.05	
L1S26	1988-01-04	12:38	0.03	1098.530	46.020	0.001	1.08	
L1S26	1988-02-08	13:47	0.04	1133.570	35.040	0.001	1.12	
L1S26	1988-03-30	12:20	Trace	1184.510	50.940	0.000	1.12	
L1S26	1988-07-12	11:50	0.11	1288.490	103.980	0.001	1.23	
L1S26	1988-09-27	08:52	0.15	1365.370	76.880	0.002	1.38	
L1S26	1988-12-13	11:30	0.13	1442.480	77.110	0.002	1.51	
L1S26	1989-03-15	11:04	0	1534.460	91.982	0.000	1.51	Hole dry.
L1S26	1989-04-06	10:32	0	1556.440	21.978	0.000	1.51	Hole dry.
L1S26	1989-04-20	12:10	0	1570.510	14.068	0.000	1.51	Hole dry.
L1S26	1989-05-17	NA	NA	1597.000	0.000	0.000	1.51	Not sampled, equipment in the way.
L1S26	1989-06-06	10:40	0	1617.440	46.937	0.000	1.51	Hole dry. Last time sampled for BSEP.
L1S27	1984-04-21			0.000	0.000	0.000	0.00	Room L1 excavated 4/19/84 to 4/21/84.
L1S27	1985-07-01			0.000	0.000	0.000	0.00	Downhole drilled.
L1S27	1985-08-20			0.000	0.000	0.000	0.00	Wet.
L1S27	1985-09-17			0.000	0.000	0.000	0.00	Wet.
L1S27	1985-12-10	09:00	00.83	343.375	1.000	0.000	0.83	First time collected.
L1S27	1985-12-17			0.000	0.000	0.000	0.83	Wet, partial pool in bottom, none collected.
L1S27	1986-01-03	09:00	00.10	367.375	24.000	0.004	0.93	
L1S27	1986-01-16	09:00	00.05	380.375	13.000	0.004	0.98	
L1S27	1986-02-12	09:00	00.08	407.375	27.000	0.003	1.06	
L1S27	1986-02-19	09:00	00.04	414.375	7.000	0.006	1.10	
L1S27	1986-02-28	09:00	00.06	423.375	9.000	0.007	1.16	
L1S27	1986-03-13	08:35	00.08	436.358	12.983	0.006	1.24	Two weeks collection.
L1S27	1986-03-26	08:45	00.06	449.365	13.007	0.005	1.30	
L1S27	1986-04-08	08:30	00.07	462.354	12.989	0.005	1.37	
L1S27	1986-04-24	09:05	00.08	478.378	16.024	0.005	1.45	
L1S27	1986-05-06	08:55	00.05	490.372	11.994	0.004	1.50	
L1S27	1986-05-13	08:50	00.04	497.368	6.996	0.006	1.54	
L1S27	1986-05-27	14:20	00.07	511.597	14.229	0.005	1.61	
L1S27	1986-06-10	09:25	00.06	525.392	13.795	0.004	1.67	
L1S27	1986-06-17	09:15	00.04	532.385	6.993	0.006	1.71	
L1S27	1986-06-24	09:22	00.04	539.390	7.005	0.006	1.75	
L1S27	1986-07-01	11:56	00.04	546.497	7.107	0.006	1.79	
L1S27	1986-07-08	09:18	00.04	553.388	6.891	0.006	1.83	
L1S27	1986-07-16	09:09	00.04	561.381	7.993	0.005	1.87	
L1S27	1986-07-29	09:17	00.07	574.387	13.006	0.005	1.94	
L1S27	1986-08-12	09:08	00.06	588.381	13.994	0.004	2.00	
L1S27	1986-08-19	09:52	00.05	595.411	7.030	0.007	2.05	
L1S27	1986-08-26	09:26	00.04	602.393	6.982	0.006	2.09	
L1S27	1986-09-04	08:57	00.05	611.373	8.980	0.006	2.14	
L1S27	1986-09-09	11:28	00.04	616.478	5.105	0.008	2.18	
L1S27	1986-09-16	08:53	00.04	623.370	6.892	0.006	2.22	
L1S27	1986-09-23	08:56	00.03	630.372	7.002	0.004	2.25	
L1S27	1986-10-01	09:49	00.03	638.409	8.037	0.004	2.28	
L1S27	1986-11-05	09:06	0.06	673.379	34.970	0.002	2.34	
L1S27	1986-11-20	10:02	00.04	688.418	15.039	0.003	2.38	
L1S27	1986-12-31	10:42	00.00	729.446	41.028	0.000	2.38	Wet, but not enough to remove.
L1S27	1987-03-06	12:30	0.13	794.521	65.075	0.002	2.51	
L1S27	1987-03-31	10:28	0.00	819.436	24.915	0.000	2.51	Dry.
L1S27	1987-05-07	08:39	0.07	856.360	61.839	0.001	2.58	
L1S27	1987-06-18	12:30	0.11	898.521	42.161	0.003	2.69	

BRINE ACCUMULATION DATA TABLE (Continued)
Data through December 31, 1990

Location	Date	Time	Liters removed	Days since 1/1/85	Days used for calc.	Liters per day	Cumulative liters collected	Remarks
L1S27	1987-07-28	13:14	0.18	938.551	40.030	0.004	2.87	
L1S27	1987-09-01	12:55	0.14	973.538	34.987	0.004	3.01	
L1S27	1987-10-20	12:25	0.09	1022.520	48.982	0.002	3.10	
L1S27	1987-11-19	12:25	0.11	1052.520	30.000	0.004	3.21	
L1S27	1988-01-04	12:40	0.00	1098.530	46.010	0.000	3.21	Dry.
L1S27	1988-02-08	13:48	0.00	1133.580	35.050	0.000	3.21	Dry.
L1S27	1988-03-30	12:20	0.07	1184.510	50.930	0.001	3.28	
L1S27	1988-07-12	11:50	0.24	1288.490	103.980	0.002	3.52	
L1S27	1988-09-27	08:54	0.53	1365.370	76.880	0.007	4.05	
L1S27	1988-12-13	11:30	0.18	1442.480	77.110	0.002	4.23	
L1S27	1989-03-15	11:06	0.04	1534.460	91.983	0.000	4.27	
L1S27	1989-04-06	10:32	0	1556.440	21.977	0.000	4.27	Hole dry.
L1S27	1989-04-20	12:10	0	1570.510	14.068	0.000	4.27	Hole dry.
L1S27	1989-05-17	NA	NA	1597.000	0.000	0.000	4.27	Not sampled, equipment in the way.
L1S27	1989-06-06	10:45	0	1617.450	46.941	0.000	4.27	Hole dry. Last time sampled for BSEP.
L1S28	1984-04-21			0.000	0.000	0.000	0.00	Room L1 excavated 4/19/84 to 4/21/84.
L1S28	1985-07-12			0.000	0.000	0.000	0.00	Downhole drilled.
L1S28	1985-08-20			0.000	0.000	0.000	0.00	Dry.
L1S28	1985-09-17			0.000	0.000	0.000	0.00	Dry.
L1S28	1985-12-10			0.000	0.000	0.000	0.00	Dry.
L1S28	1985-12-17			0.000	0.000	0.000	0.00	Dry.
L1S28	1986-11-05	09:08	0.11	673.381	1.000	0.000	0.11	First time collected.
L1S28	1986-11-20	NA	NA	688.000	14.619	0.000	0.11	Dry.
L1S28	1986-12-31	10:42	NA	729.446	41.011	0.000	0.11	Dry.
L1S28	1987-03-06	12:30	NA	794.521	121.140	0.000	0.11	Dry.
L1S28	1987-03-31	10:31	0.00	819.438	24.917	0.000	0.11	Dry.
L1S28	1987-05-07	08:39	0.00	856.360	61.839	0.000	0.11	Dry.
L1S28	1987-06-18	12:35	0.00	898.524	104.003	0.000	0.11	Dry.
L1S28	1987-07-28	13:24	0.09	938.558	144.037	0.001	0.20	
L1S28	1987-09-01	12:55	0.01	973.538	34.980	0.000	0.21	
L1S28	1987-10-20	12:26	0.02	1022.520	48.982	0.000	0.23	
L1S28	1987-11-19	12:30	0.00	1052.520	30.000	0.000	0.23	Dry.
L1S28	1988-01-04	12:42	0.01	1098.530	46.010	0.000	0.24	
L1S28	1988-02-08	13:49	Trace	1133.580	35.050	0.000	0.24	
L1S28	1988-03-30	12:20	0.00	1184.510	50.930	0.000	0.24	Dry.
L1S28	1988-07-12	11:55	0.50	1288.500	103.990	0.005	0.74	
L1S28	1988-09-27	08:56	0.40	1365.370	76.870	0.005	1.14	
L1S28	1988-12-13	11:30	0.37	1442.480	77.110	0.005	1.51	
L1S28	1989-03-15	11:08	0.48	1534.460	91.985	0.005	1.99	
L1S28	1989-04-06	10:40	0.06	1556.440	21.980	0.003	2.05	
L1S28	1989-04-20	12:10	0.17	1570.510	14.063	0.012	2.22	
L1S28	1989-05-17	NA	NA	1597.000	0.000	0.000	2.22	Not sampled; equipment in the way.
L1S28	1989-06-06	10:50	0.28	1617.450	46.944	0.006	2.50	Last time sampled for BSEP.
L1S29	1984-04-21			0.000	0.000	0.000	0.00	Room L1 excavated 4/19/84 to 4/21/84.
L1S29	1985-07-15			0.000	0.000	0.000	0.00	Downhole drilled.
L1S29	1985-08-20			0.000	0.000	0.000	0.00	Wet.
L1S29	1985-09-17			0.000	0.000	0.000	0.00	Wet.
L1S29	1985-12-10	09:00	02.20	343.375	1.000	0.000	2.20	First time collected.
L1S29	1985-12-17	09:00	00.30	350.375	7.000	0.043	2.50	
L1S29	1986-01-03	09:00	00.71	367.375	17.000	0.042	3.21	
L1S29	1986-01-08	09:00	00.24	372.375	5.000	0.048	3.45	
L1S29	1986-01-16	09:00	00.40	380.375	8.000	0.050	3.85	
L1S29	1986-01-23	09:00	00.32	387.375	7.000	0.046	4.17	
L1S29	1986-01-31	09:00	00.34	395.375	8.000	0.043	4.51	
L1S29	1986-02-12	09:00	00.41	407.375	12.000	0.034	4.92	
L1S29	1986-02-19	09:00	00.25	414.375	7.000	0.036	5.17	

BRINE ACCUMULATION DATA TABLE (Continued)
Data through December 31, 1990

Location	Date	Time	Liters removed	Days since 1/1/85	Days used for calc.	Liters per day	Cumulative liters collected	Remarks
L1S29	1986-02-28	09:00	00.23	423.375	9.000	0.026	5.40	
L1S29	1986-03-06	09:20	00.13	429.389	6.014	0.022	5.53	
L1S29	1986-03-13	08:35	00.16	436.358	6.969	0.023	5.69	
L1S29	1986-03-26	08:50	00.27	449.368	13.010	0.021	5.96	
L1S29	1986-04-02	08:30	00.15	456.354	6.986	0.021	6.11	
L1S29	1986-04-08	08:40	00.11	462.361	6.007	0.018	6.22	
L1S29	1986-04-16	10:35	00.13	470.441	8.080	0.016	6.35	
L1S29	1986-04-24	09:10	00.12	478.382	7.941	0.015	6.47	
L1S29	1986-04-30	09:35	00.12	484.399	6.017	0.020	6.59	
L1S29	1986-05-06	09:00	00.12	490.375	5.976	0.020	6.71	Collection device installed.
L1S29	1986-05-13	08:55	00.12	497.372	6.997	0.017	6.83	
L1S29	1986-05-20	09:20	00.11	504.389	7.017	0.016	6.94	
L1S29	1986-05-27	14:20	00.13	511.597	7.208	0.018	7.07	
L1S29	1986-06-03	08:53	00.13	518.370	6.773	0.019	7.20	
L1S29	1986-06-10	09:37	00.14	525.401	7.031	0.020	7.34	
L1S29	1986-06-17	09:21	00.13	532.390	6.989	0.019	7.47	
L1S29	1986-06-24	09:30	00.14	539.396	7.006	0.020	7.61	
L1S29	1986-07-01	12:06	00.15	546.504	7.108	0.021	7.76	
L1S29	1986-07-08	09:25	00.13	553.392	6.888	0.019	7.89	
L1S29	1986-07-16	09:21	00.16	561.390	7.998	0.020	8.05	
L1S29	1986-07-22	09:00	00.11	567.375	5.985	0.018	8.16	
L1S29	1986-07-29	09:25	00.12	574.392	7.017	0.017	8.28	
L1S29	1986-08-05	09:48	00.13	581.408	7.016	0.019	8.41	
L1S29	1986-08-12	09:18	00.14	588.388	6.980	0.020	8.55	
L1S29	1986-08-19	10:01	00.18	595.417	7.029	0.026	8.73	
L1S29	1986-08-26	09:34	00.26	602.399	6.982	0.037	8.99	
L1S29	1986-09-04	09:10	00.60	611.382	8.983	0.067	9.59	
L1S29	1986-09-09	11:37	00.48	616.484	5.102	0.094	10.07	
L1S29	1986-09-16	09:16	00.76	623.386	6.902	0.110	10.83	
L1S29	1986-09-23	09:06	00.77	630.379	6.993	0.110	11.60	
L1S29	1986-10-01	10:00	00.74	638.417	8.038	0.092	12.34	
L1S29	1986-10-08	09:28	00.69	645.394	6.977	0.099	13.03	
L1S29	1986-10-14	10:12	00.67	651.425	6.031	0.111	13.70	
L1S29	1986-11-05	09:35	0.80	673.399	21.974	0.036	14.50	
L1S29	1986-11-20	10:27	05.60	688.435	15.036	0.372	20.10	0.70 liters in probe. Opened hole and found suction tube floating on brine. Bailed hole dry.
L1S29	1986-12-31	10:32	06.48	729.439	41.004	0.158	26.58	Collection device removed.
L1S29	1987-03-06	12:40	10.32	794.528	65.089	0.159	36.90	
L1S29	1987-03-31	10:30	4.19	819.438	24.910	0.162	41.09	
L1S29	1987-05-07	08:45	18.82	856.365	36.927	0.510	59.91	
L1S29	1987-05-08	08:45	13.35	857.365	0.000	0.000	73.26	Not pumped dry, brine left in hole, no calculation.
L1S29	1987-06-17	14:10	16.31	897.590	0.000	0.000	89.57	Partial removal, no calculation.
L1S29	1987-06-18	12:36	3.66	898.525	42.160	0.790	93.23	Used 33.32 liters in 42.16 days for calculation (5/08/87, 6/17/87, and 6/18/87).
L1S29	1987-07-28	13:25	11.32	938.559	40.034	0.283	104.55	
L1S29	1987-09-01	12:55	2.43	973.538	34.979	0.069	106.98	
L1S29	1987-10-20	12:28	2.61	1022.520	48.982	0.053	109.59	
L1S29	1987-11-19	12:35	1.43	1052.520	30.000	0.048	111.02	
L1S29	1988-01-04	12:45	2.85	1098.530	46.010	0.062	113.87	
L1S29	1988-02-08	13:49	2.43	1133.580	35.050	0.069	116.30	
L1S29	1988-03-30	12:20	3.00	1184.510	50.930	0.059	119.30	
L1S29	1988-07-12	11:58	7.14	1288.500	103.990	0.069	126.44	
L1S29	1988-09-27	08:58	14.23	1365.370	76.870	0.185	140.67	
L1S29	1988-12-13	11:45	9.97	1442.490	77.120	0.129	150.64	
L1S29	1989-03-15	11:10	3.16	1534.460	91.975	0.034	153.80	
L1S29	1989-04-06	10:42	0.60	1556.450	21.981	0.027	154.40	
L1S29	1989-04-20	12:15	0.26	1570.510	14.064	0.018	154.66	
L1S29	1989-05-17	NA	NA	1597.000	0.000	0.000	154.66	Not sampled, equipment in the way.

BRINE ACCUMULATION DATA TABLE (Continued)
Data through December 31, 1990

Location	Date	Time	Liters removed	Days since 1/1/85	Days used for calc.	Liters per day	Cumulative liters collected	Remarks
L1S29	1989-06-06	10:55	0.63	1617.450	46.945	0.013	155.29	Last time sampled for BSEP.
L1S30	1984-04-21			0.000	0.000	0.000	0.00	Room L1 excavated 4/19/84 to 4/21/84.
L1S30	1985-07-15			0.000	0.000	0.000	0.00	Downhole drilled.
L1S30	1985-08-20			0.000	0.000	0.000	0.00	Dry.
L1S30	1985-09-17			0.000	0.000	0.000	0.00	Dry.
L1S30	1985-12-10			0.000	0.000	0.000	0.00	Dry.
L1S30	1985-12-17			0.000	0.000	0.000	0.00	Dry.
L1S30	1986-01-23	09:00	00.07	387.375	1.000	0.000	0.07	First time collected.
L1S30	1986-02-12	09:00	00.09	407.375	20.000	0.004	0.16	
L1S30	1986-03-26	08:45	00.32	449.365	41.990	0.008	0.48	
L1S30	1986-04-08	08:35	00.13	462.358	12.993	0.010	0.61	
L1S30	1986-04-24	09:10	00.10	478.382	16.024	0.006	0.71	
L1S30	1986-05-06	09:00	00.05	490.375	11.993	0.004	0.76	
L1S30	1986-05-13	08:50	00.05	497.368	6.993	0.007	0.81	
L1S30	1986-05-27	14:20	00.08	511.597	14.229	0.006	0.89	
L1S30	1986-06-17	09:17	00.07	532.387	20.790	0.003	0.96	
L1S30	1986-07-01	11:58	00.05	546.499	14.112	0.004	1.01	
L1S30	1986-07-16	09:10	00.03	561.382	14.883	0.002	1.04	
L1S30	1986-07-29	09:19	00.04	574.388	13.006	0.003	1.08	
L1S30	1986-08-19	09:53	00.04	595.412	21.024	0.002	1.12	
L1S30	1986-09-04	09:00	00.04	611.375	15.963	0.003	1.16	
L1S30	1986-09-09	11:29	00.02	616.478	5.103	0.004	1.18	
L1S30	1986-09-23	08:58	00.02	630.374	13.896	0.001	1.20	
L1S30	1986-10-01	09:51	00.02	638.410	8.036	0.002	1.22	
L1S30	1986-10-14	10:01	00.00	651.417	13.007	0.000	1.22	Dry.
L1S30	1986-11-05	09:35	NA	673.399	34.989	0.000	1.22	Dry.
L1S30	1986-11-20	NA	NA	688.000	49.590	0.000	1.22	
L1S30	1986-12-31	10:08	00.05	729.422	91.012	0.001	1.27	
L1S30	1987-03-06	12:45	O.21	794.531	65.109	0.000	1.27	
L1S30	1987-03-31	10:33	0.15	819.440	24.909	0.006	1.42	
L1S30	1987-05-07	09:37	22.87	856.401	36.961	0.619	24.29	
L1S30	1987-05-08	08:35	16.28	857.358	0.000	0.000	40.57	Brine left in hole; no calculation.
L1S30	1987-06-17	14:35	17.42	897.608	0.000	0.000	57.99	Brine left in hole; no calculation.
L1S30	1987-06-18	12:40	0.58	898.528	42.127	0.814	58.57	Used 34.28 liters in 42.127 days for calculation (5/08/87, 6/17/87, and 6/18/87).
L1S30	1987-07-28	13:29	3.82	938.562	40.034	0.095	62.39	
L1S30	1987-09-01	13:00	2.09	973.542	34.980	0.060	64.48	One ear plug found in hole.
L1S30	1987-10-20	12:36	1.59	1022.520	48.978	0.032	66.07	
L1S30	1987-11-19	12:40	0.43	1052.530	30.010	0.014	66.50	
L1S30	1988-01-04	12:47	0.28	1098.530	46.000	0.006	66.78	
L1S30	1988-02-08	13:50	0.03	1133.580	35.050	0.001	66.81	
L1S30	1988-03-30	12:30	5.07	1184.520	50.940	0.100	71.88	
L1S30	1988-07-12	12:05	1.64	1288.500	103.980	0.016	73.52	
L1S30	1988-09-27	09:15	7.55	1365.390	76.890	0.098	81.07	
L1S30	1988-12-13	11:45	1.50	1442.490	77.100	0.019	82.57	
L1S30	1989-03-15	11:12	6.4	1534.470	91.977	0.070	88.97	
L1S30	1989-04-06	10:45	0.03	1556.450	21.981	0.001	89.00	
L1S30	1989-04-20	12:20	0.04	1570.510	14.066	0.003	89.04	
L1S30	1989-05-17	NA	NA	1597.000	0.000	0.000	89.04	Not sampled, equipment in the way.
L1S30	1989-06-06	11:00	0	1617.460	46.944	0.000	89.04	Hole dry. Last time sampled for BSEP.
L1S31	1984-04-21			0.000	0.000	0.000	0.00	Room L1 excavated 4/19/84 to 4/21/84. Hole drilled before 12/85.
L1S31	1985-07-24			0.000	0.000	0.000	0.00	Downhole drilled.
L1S31	1985-08-20			0.000	0.000	0.000	0.00	Dry.
L1S31	1985-09-17			0.000	0.000	0.000	0.00	Dry.
L1S31	1985-12-10			0.000	0.000	0.000	0.00	Dry.

BRINE ACCUMULATION DATA TABLE (Continued)
Data through December 31, 1990

Location	Date	Time	Liters removed	Days since 1/1/85	Days used for calc.	Liters per day	Cumulative liters collected	Remarks
L1S31	1985-12-17			0.000	0.000	0.000	0.00	Dry.
L1S31	1986-11-05	09:35	NA	673.399	1.000	0.000	0.00	Dry.
L1S31	1986-11-20	NA	NA	688.000	15.601	0.000	0.00	Installed collection device.
L1S31	1986-12-31	10:08	NA	729.422	57.023	0.000	0.00	Dry.
L1S31	1987-03-06	12:50	NA	794.535	122.136	0.000	0.00	Dry.
L1S31	1987-03-31	10:33	0.00	819.440	24.905	0.000	0.00	Dry.
L1S31	1987-05-07	09:41	0.73	856.403	61.868	0.012	0.73	
L1S31	1987-06-18	12:42	3.39	898.529	42.126	0.080	4.12	
L1S31	1987-07-28	13:32	0.37	938.564	40.035	0.009	4.49	
L1S31	1987-09-01	13:05	0.21	973.545	34.981	0.006	4.70	
L1S31	1987-10-20	12:39	0.27	1022.530	48.985	0.006	4.97	
L1S31	1987-11-19	12:45	0.21	1052.530	30.000	0.007	5.18	
L1S31	1988-01-04	12:48	0.20	1098.530	46.000	0.004	5.38	
L1S31	1988-02-08	13:55	0.26	1133.580	35.050	0.007	5.64	
L1S31	1988-03-30	12:35	0.30	1184.520	50.940	0.006	5.94	
L1S31	1988-07-12	12:08	2.83	1288.510	103.990	0.027	8.77	
L1S31	1988-09-27	09:20	8.08	1365.390	76.880	0.105	16.85	
L1S31	1988-12-13	11:50	11.48	1442.490	77.100	0.149	28.33	
L1S31	1989-03-15	11:14	7.23	1534.470	91.975	0.079	35.56	
L1S31	1989-04-06	10:45	NA	1556.450	0.000	0.000	35.56	Hole blocked, could not sample.
L1S31	1989-04-20	12:25	0.50	1570.520	36.049	0.014	36.06	
L1S31	1989-05-17	NA	NA	1597.000	0.000	0.000	36.06	Not sampled, equipment in the way.
L1S31	1989-06-06	11:05	0.14	1617.460	46.945	0.003	36.20	Last time sampled for BSEP.
L1S32	1984-04-21			0.000	0.000	0.000	0.00	Room L1 excavated 4/19/84 to 4/21/84.
L1S32	1985-07-24			0.000	0.000	0.000	0.00	Downhole drilled.
L1S32	1985-08-20			0.000	0.000	0.000	0.00	Dry.
L1S32	1985-09-17			0.000	0.000	0.000	0.00	Moist.
L1S32	1985-12-10			0.000	0.000	0.000	0.00	Dry.
L1S32	1985-12-17			0.000	0.000	0.000	0.00	Dry.
L1S32	1986-04-16	10:30	00.07	470.438	1.000	0.000	0.07	First collection.
L1S32	1986-05-20	09:20	00.02	504.389	33.951	0.001	0.09	
L1S32	1986-06-03	08:45	00.05	518.365	13.976	0.004	0.14	
L1S32	1986-06-24	09:25	00.05	539.392	21.027	0.002	0.19	
L1S32	1986-07-16	09:12	00.07	561.383	21.991	0.003	0.26	
L1S32	1986-07-29	09:20	00.05	574.389	13.006	0.004	0.31	
L1S32	1986-08-12	09:10	00.11	588.382	13.993	0.008	0.42	
L1S32	1986-08-19	09:55	00.10	595.413	7.031	0.014	0.52	
L1S32	1986-08-26	09:28	00.12	602.394	6.981	0.017	0.64	
L1S32	1986-09-04	09:03	00.19	611.377	8.983	0.021	0.83	
L1S32	1986-09-09	11:30	00.11	616.479	5.102	0.022	0.94	
L1S32	1986-09-16	08:54	00.19	623.371	6.892	0.028	1.13	
L1S32	1986-09-23	09:01	00.20	630.376	7.005	0.029	1.33	
L1S32	1986-10-01	09:52	00.22	638.411	8.035	0.027	1.55	
L1S32	1986-10-08	09:29	00.20	645.395	6.984	0.029	1.75	
L1S32	1986-10-14	10:04	00.16	651.419	6.024	0.027	1.91	
L1S32	1986-11-05	09:10	0.57	673.382	21.963	0.026	2.48	
L1S32	1986-11-20	10:05	00.56	688.420	15.038	0.037	3.04	
L1S32	1986-12-31	10:15	01.62	729.427	41.007	0.040	4.66	
L1S32	1987-03-06	12:50	3.31	794.535	65.108	0.051	7.97	
L1S32	1987-03-31	10:37	1.57	819.442	24.907	0.063	9.54	
L1S32	1987-04-22	10:40	1.27	841.444	22.002	0.058	10.81	
L1S32	1987-05-07	09:44	1.25	856.406	14.962	0.084	12.06	
L1S32	1987-06-18	12:45	7.44	898.531	42.125	0.177	19.50	
L1S32	1987-07-28	13:38	5.89	938.568	40.037	0.147	25.39	
L1S32	1987-09-01	13:12	5.39	973.550	34.982	0.154	30.78	
L1S32	1987-10-20	12:50	7.14	1022.530	48.980	0.146	37.92	
L1S32	1987-11-19	12:50	4.32	1052.530	30.000	0.144	42.24	
L1S32	1988-01-04	12:56	6.98	1098.540	46.010	0.152	49.22	

BRINE ACCUMULATION DATA TABLE (Continued)
Data through December 31, 1990

Location	Date	Time	Liters removed	Days since 1/1/85	Days used for calc.	Liters per day	Cumulative liters collected	Remarks
L1S32	1988-02-08	14:00	6.11	1133.580	35.040	0.174	55.33	
L1S32	1988-03-30	12:40	7.84	1184.530	50.950	0.154	63.17	
L1S32	1988-07-12	12:20	12.64	1288.510	103.980	0.122	75.81	
L1S32	1988-09-27	09:25	13.03	1365.390	76.880	0.169	88.84	
L1S32	1988-12-13	11:50	12.40	1442.490	77.100	0.161	101.24	
L1S32	1989-03-15	11:16	10.03	1534.470	91.976	0.109	111.27	
L1S32	1989-04-06	10:50	0.18	1556.450	21.982	0.008	111.45	
L1S32	1989-04-20	12:30	0.12	1570.520	14.070	0.009	111.57	
L1S32	1989-05-17	NA	NA	1597.000	0.000	0.000	111.57	Not sampled, equipment in the way.
L1S32	1989-06-06	11:10	0.21	1617.460	46.944	0.004	111.78	Last time sampled for BSEP.
L1S33	1984-04-21			0.000	0.000	0.000	0.00	Room L1 excavated 4/19/84 to 4/21/84.
L1S33	1985-07-23			0.000	0.000	0.000	0.00	Downhole drilled.
L1S33	1985-08-20			0.000	0.000	0.000	0.00	Wet.
L1S33	1985-09-17			0.000	0.000	0.000	0.00	Wet.
L1S33	1985-12-10	09:00	01.01	343.375	1.000	0.000	1.01	First time collected.
L1S33	1985-12-17	09:00	00.11	350.375	7.000	0.016	1.12	
L1S33	1986-01-03	09:00	00.21	367.375	17.000	0.012	1.33	
L1S33	1986-01-08	09:00	00.06	372.375	5.000	0.012	1.39	
L1S33	1986-01-16	09:00	00.09	380.375	8.000	0.011	1.48	
L1S33	1986-01-23	09:00	00.08	387.375	7.000	0.011	1.56	
L1S33	1986-01-31	09:00	00.09	395.375	8.000	0.011	1.65	
L1S33	1986-02-12	09:00	00.15	407.375	12.000	0.012	1.80	
L1S33	1986-02-19	09:00	00.12	414.375	7.000	0.017	1.92	
L1S33	1986-02-28	09:00	00.11	423.375	9.000	0.012	2.03	Estimated, lost some during collection.
L1S33	1986-03-06	09:20	00.09	429.389	6.014	0.015	2.12	
L1S33	1986-03-13	08:40	00.10	436.361	6.972	0.014	2.22	
L1S33	1986-03-26	08:50	00.20	449.368	13.007	0.015	2.42	
L1S33	1986-04-02	08:30	00.10	456.354	6.986	0.014	2.52	
L1S33	1986-04-08	08:38	00.08	462.360	6.006	0.013	2.60	
L1S33	1986-04-16	10:30	00.11	470.438	8.078	0.014	2.71	
L1S33	1986-04-24	09:10	00.12	478.382	7.944	0.015	2.83	
L1S33	1986-04-30	09:30	00.10	484.396	6.014	0.017	2.93	
L1S33	1986-05-06	09:00	00.09	490.375	5.979	0.015	3.02	
L1S33	1986-05-13	08:55	00.11	497.372	6.997	0.016	3.13	
L1S33	1986-05-20	09:20	00.12	504.389	7.017	0.017	3.25	
L1S33	1986-05-27	14:20	00.12	511.597	7.208	0.017	3.37	
L1S33	1986-06-03	08:50	00.12	518.368	6.771	0.018	3.49	
L1S33	1986-06-10	09:28	00.12	525.394	7.026	0.017	3.61	
L1S33	1986-06-17	09:19	00.12	532.388	6.994	0.017	3.73	
L1S33	1986-06-24	09:25	00.13	539.392	7.004	0.019	3.86	
L1S33	1986-07-01	12:00	00.11	546.500	7.108	0.015	3.97	
L1S33	1986-07-08	09:20	00.10	553.389	6.889	0.015	4.07	
L1S33	1986-07-16	09:14	00.13	561.385	7.996	0.016	4.20	
L1S33	1986-07-22	08:52	00.10	567.369	5.984	0.017	4.30	
L1S33	1986-07-29	09:22	00.15	574.390	7.021	0.021	4.45	
L1S33	1986-08-05	09:43	00.13	581.405	7.015	0.019	4.58	
L1S33	1986-08-12	09:13	00.16	588.384	6.979	0.023	4.74	
L1S33	1986-08-19	09:56	00.16	595.414	7.030	0.023	4.90	
L1S33	1986-08-26	09:29	00.18	602.395	6.981	0.026	5.08	
L1S33	1986-09-04	09:04	00.22	611.378	8.983	0.024	5.30	
L1S33	1986-09-09	11:31	00.14	616.480	5.102	0.027	5.44	
L1S33	1986-09-16	08:55	00.16	623.372	6.892	0.023	5.60	
L1S33	1986-09-23	09:02	00.17	630.376	7.004	0.024	5.77	
L1S33	1986-10-01	09:54	00.20	638.413	8.037	0.025	5.97	
L1S33	1986-10-08	09:29	00.18	645.395	6.982	0.026	6.15	
L1S33	1986-10-14	10:06	00.17	651.421	6.026	0.028	6.32	
L1S33	1986-11-05	09:15	0.45	673.385	21.964	0.020	6.77	
L1S33	1986-11-20	10:07	00.35	688.422	15.037	0.023	7.12	

BRINE ACCUMULATION DATA TABLE (Continued)
Data through December 31, 1990

Location	Date	Time	Liters removed	Days since 1/1/85	Days used for calc.	Liters per day	Cumulative liters collected	Remarks
L1S33	1986-12-31	10:17	00.69	729.428	41.006	0.017	7.81	
L1S33	1987-03-06	12:55	0.68	794.538	65.110	0.010	8.49	
L1S33	1987-03-31	10:40	0.81	819.444	24.906	0.033	9.30	
L1S33	1987-05-07	09:46	1.50	856.407	36.963	0.041	10.80	
L1S33	1987-06-18	12:50	4.39	898.535	42.128	0.104	15.19	
L1S33	1987-07-28	13:45	2.10	938.573	40.038	0.052	17.29	
L1S33	1987-09-01	13:13	0.27	973.551	34.978	0.008	17.56	
L1S33	1987-10-20	12:52	2.20	1022.540	48.989	0.045	19.76	
L1S33	1987-11-19	12:55	1.43	1052.540	30.000	0.048	21.19	
L1S33	1988-01-04	12:58	2.82	1098.540	46.000	0.061	24.01	
L1S33	1988-02-08	14:10	1.65	1133.590	35.050	0.047	25.66	
L1S33	1988-03-30	12:45	1.96	1184.530	50.940	0.038	27.62	
L1S33	1988-07-12	12:25	6.11	1288.520	103.990	0.059	33.73	
L1S33	1988-09-27	09:40	7.77	1365.400	76.880	0.101	41.50	
L1S33	1988-12-13	12:00	8.42	1442.500	77.100	0.109	49.92	
L1S33	1989-03-15	11:18	5.58	1534.470	91.971	0.061	55.50	
L1S33	1989-04-06	10:55	0.31	1556.450	21.984	0.014	55.81	
L1S33	1989-04-20	12:35	0.28	1570.520	14.069	0.020	56.09	
L1S33	1989-05-17	NA	NA	1597.000	0.000	0.000	56.09	Not sampled, equipment in the way.
L1S33	1989-06-06	11:15	0.40	1617.470	46.945	0.009	56.49	Last time sampled for BSEP.
L1S34	1984-04-21			0.000	0.000	0.000	0.00	Room L1 excavated 4/19/84 to 4/21/84.
L1S34	1985-07-18			0.000	0.000	0.000	0.00	Downhole drilled.
L1S34	1985-08-20			0.000	0.000	0.000	0.00	Dry.
L1S34	1985-09-17			0.000	0.000	0.000	0.00	Dry.
L1S34	1985-12-10			0.000	0.000	0.000	0.00	Dry.
L1S34	1985-12-17			0.000	0.000	0.000	0.00	Dry.
L1S34	1986-11-05	09:15	NA	673.385	1.000	0.000	0.00	Dry.
L1S34	1986-11-20	NA	NA	688.000	15.615	0.000	0.00	
L1S34	1986-12-31	10:17	NA	729.428	57.043	0.000	0.00	Dry.
L1S34	1987-03-06	13:00	NA	794.542	122.157	0.000	0.00	Dry.
L1S34	1987-03-31	10:40	0.00	819.444	24.902	0.000	0.00	Dry.
L1S34	1987-05-07	09:46	0.00	856.407	61.865	0.000	0.00	Dry.
L1S34	1987-06-18	12:51	0.00	898.535	103.993	0.000	0.00	Dry.
L1S34	1987-07-28	13:38	0.00	938.568	144.026	0.000	0.00	Dry.
L1S34	1987-09-01	13:13	0.00	973.551	34.983	0.000	0.00	Dry.
L1S34	1987-10-20	12:53	0.00	1022.540	48.989	0.000	0.00	Dry.
L1S34	1987-11-19	13:00	0.00	1052.540	30.000	0.000	0.00	Dry.
L1S34	1988-01-04	12:58	0.00	1098.540	46.000	0.000	0.00	Dry.
L1S34	1988-02-08	14:15		1133.590	0.000	0.000	0.00	Did not sample.
L1S34	1988-03-30	12:45	0.00	1184.530	85.990	0.000	0.00	Dry.
L1S34	1988-07-12	12:25	0.00	1288.520	103.990	0.000	0.00	Dry.
L1S34	1988-09-27	09:40	0.00	1365.400	76.880	0.000	0.00	Dry.
L1S34	1988-12-13	12:00	0	1442.500	77.100	0.000	0.00	Dry.
L1S34	1989-03-15	11:20	0	1534.470	91.972	0.000	0.00	Hole dry.
L1S34	1989-04-06	10:57	0	1556.460	21.984	0.000	0.00	Hole dry.
L1S34	1989-04-20	12:40	0	1570.530	14.072	0.000	0.00	Hole dry.
L1S34	1989-05-17NA		NA	1597.000	0.000	0.000	0.00	Not sampled, equipment in the way.
L1S34	1989-06-06	11:20	0	1617.470	46.944	0.000	0.00	Hole dry. Last time sampled for BSEP.
L1S35	1984-04-21			0.000	0.000	0.000	0.00	Room L1 excavated 4/19/84 to 4/21/84.
L1S35	1985-07-17			0.000	0.000	0.000	0.00	Downhole drilled.
L1S35	1985-08-20			0.000	0.000	0.000	0.00	Dry.
L1S35	1985-09-17			0.000	0.000	0.000	0.00	Dry.
L1S35	1985-12-10		0.000	0.000	0.000	0.00	Dry.	
L1S35	1985-12-17			0.000	0.000	0.000	0.00	Dry.
L1S35	1986-11-05	09:20	0.09	673.389	1.000	0.000	0.09	
L1S35	1986-11-20	NA	NA	688.000	14.611	0.000	0.09	

BRINE ACCUMULATION DATA TABLE (Continued)
Data through December 31, 1990

Location	Date	Time	Liters removed	Days since 1/1/85	Days used for calc.	Liters per day	Cumulative liters collected	Remarks
L1S35	1986-12-31	10:17	NA	729.428	56.039	0.000	0.09	Dry.
L1S35	1987-03-06	13:00	NA	794.542	121.153	0.000	0.09	Dry.
L1S35	1987-03-31	10:40	0.00	819.444	24.902	0.000	0.09	Dry.
L1S35	1987-05-07	09:46	0.00	856.407	61.865	0.000	0.09	Dry.
L1S35	1987-06-18	12:52	0.00	898.536	103.994	0.000	0.09	Dry.
L1S35	1987-07-28	13:38	0.00	938.568	144.026	0.000	0.09	Dry.
L1S35	1987-09-01	13:13	0.00	973.551	34.983	0.000	0.09	Dry.
L1S35	1987-10-20	12:53	0.00	1022.540	48.989	0.000	0.09	Dry.
L1S35	1987-11-19	13:05	0.00	1052.550	30.010	0.000	0.09	Dry.
L1S35	1988-01-04	12:58	0.00	1098.540	45.990	0.000	0.09	Dry.
L1S35	1988-02-08	14:25		1133.600	0.000	0.000	0.09	Did not sample.
L1S35	1988-03-30	12:45	0.00	1184.530	85.990	0.000	0.09	Dry.
L1S35	1988-07-12	12:25	0.00	1288.520	103.990	0.000	0.09	Dry.
L1S35	1988-09-27	09:40	0.00	1365.400	76.880	0.000	0.09	Dry.
L1S35	1988-12-13	12:30	0	1442.520	77.120	0.000	0.09	Dry.
L1S35	1989-03-15	11:22	0	1534.470	91.953	0.000	0.09	Hole dry.
L1S35	1989-04-06	10:57	0	1556.460	21.982	0.000	0.09	Hole dry.
L1S35	1989-04-20	12:40	0	1570.530	14.072	0.000	0.09	Hole dry.
L1S35	1989-05-17	NA	NA	1597.000	0.000	0.000	0.09	Not sampled, equipment in the way.
L1S35	1989-06-06	11:25	0	1617.480	46.948	0.000	0.09	Hole dry. Last time sampled for BSEP.
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L1S36	1984-04-21			0.000	0.000	0.000	0.00	Room L1 excavated 4/19/84 to 4/21/84.
L1S36	1985-07-22			0.000	0.000	0.000	0.00	Downhole drilled.
L1S36	1985-08-2			0.000	0.000	0.000	0.00	Wet.
L1S36	1985-09-17			0.000	0.000	0.000	0.00	Wet.
L1S36	1985-12-10	09:00	01.28	343.375	1.000	0.000	1.28	First time collected.
L1S36	1985-12-17	09:00	00.09	350.375	7.000	0.013	1.37	
L1S36	1986-01-03	09:00	00.12	367.375	17.000	0.007	1.49	
L1S36	1986-01-08	09:00	00.05	372.375	5.000	0.010	1.54	
L1S36	1986-01-16	09:00	00.04	380.375	8.000	0.005	1.58	
L1S36	1986-02-12	09:00	00.15	407.375	27.000	0.006	1.73	
L1S36	1986-02-28	09:00	00.11	423.375	16.000	0.007	1.84	
L1S36	1986-03-13	08:40	00.06	436.361	12.986	0.005	1.90	
L1S36	1986-04-02	08:35	00.11	456.358	19.997	0.006	2.01	Yellow color.
L1S36	1986-04-16	10:30	00.08	470.438	14.080	0.006	2.09	
L1S36	1986-04-30	09:30	00.09	484.396	13.958	0.006	2.18	
L1S36	1986-05-13	08:58	00.08	497.374	12.978	0.006	2.26	
L1S36	1986-05-27	14:20	00.09	511.597	14.223	0.006	2.35	
L1S36	1986-06-10	09:30	00.10	525.396	13.799	0.007	2.45	
L1S36	1986-06-24	09:28	00.10	539.394	13.998	0.007	2.55	
L1S36	1986-07-01	12:03	00.05	546.502	7.108	0.007	2.60	
L1S36	1986-07-08	09:22	00.05	553.390	6.888	0.007	2.65	
L1S36	1986-07-16	09:16	00.06	561.386	7.996	0.008	2.71	
L1S36	1986-07-22	08:56	00.05	567.372	5.986	0.008	2.76	
L1S36	1986-07-29	09:23	00.05	574.391	7.019	0.007	2.81	
L1S36	1986-08-05	09:46	00.05	581.407	7.016	0.007	2.86	
L1S36	1986-08-12	09:15	00.05	588.385	6.978	0.007	2.91	
L1S36	1986-08-19	09:59	00.06	595.416	7.031	0.009	2.97	
L1S36	1986-08-26	09:30	00.06	602.396	6.980	0.009	3.03	
L1S36	1986-09-04	09:05	00.07	611.378	8.982	0.008	3.10	
L1S36	1986-09-09	11:32	00.04	616.481	5.103	0.008	3.14	
L1S36	1986-09-16	08:56	00.05	623.372	6.891	0.007	3.19	
L1S36	1986-09-23	09:03	00.05	630.377	7.005	0.007	3.24	
L1S36	1986-10-01	09:55	0.05	638.413	8.036	0.006	3.29	
L1S36	1986-10-08	09:30	00.03	645.396	6.983	0.004	3.32	
L1S36	1986-11-05	09:25	0.10	673.392	27.996	0.004	3.42	
L1S36	1986-11-20	10:10	00.05	688.424	15.032	0.003	3.47	
L1S36	1986-12-31	10:22	00.05	729.432	41.008	0.001	3.52	
L1S36	1987-03-06	13:00	0.14	794.542	65.110	0.002	3.66	

BRINE ACCUMULATION DATA TABLE (Continued)
Data through December 31, 1990

Location	Date	Time	Liters removed	Days since 1/1/85	Days used for calc.	Liters per day	Cumulative liters collected	Remarks
L1S36	1987-03-31	10:45	0.03	819.448	24.906	0.001	3.69	
L1S36	1987-05-07	09:47	0.03	856.408	36.960	0.001	3.72	
L1S36	1987-06-18	12:53	0.19	898.537	42.129	0.005	3.91	
L1S36	1987-07-28	13:47	0.19	938.574	40.037	0.005	4.10	
L1S36	1987-09-01	13:15	0.14	973.552	34.978	0.004	4.24	
L1S36	1987-10-20	12:57	0.15	1022.540	48.988	0.003	4.39	
L1S36	1987-11-19	13:10	0.08	1052.550	30.010	0.003	4.47	
L1S36	1988-01-04	12:59	0.08	1098.540	45.990	0.002	4.55	
L1S36	1988-02-08	14:30	Wet	1133.600	35.060	0.000	4.55	
L1S36	1988-03-30	12:45	0.00	1184.530	50.930	0.000	4.55	Dry.
L1S36	1988-07-12	12:25	0.00	1288.520	103.990	0.000	4.55	Dry.
L1S36	1988-09-27	09:40	0.00	1365.400	76.880	0.000	4.55	Dry.
L1S36	1988-12-13	12:30	0.04	1442.520	77.120	0.001	4.59	
L1S36	1989-03-15	11:24	0.75	1534.470	91.954	0.008	5.34	
L1S36	1989-04-06	10:59	0.06	1556.460	21.983	0.003	5.40	
L1S36	1989-04-20	12:40	0.07	1570.530	14.070	0.005	5.47	
L1S36	1989-05-17	NA	NA	1597.000	0.000	0.000	5.47	Not sampled, equipment in the way.
L1S36	1989-06-06	11:30	0	1617.480	46.951	0.000	5.47	Hole dry. Last time sampled for BSEP.

Location	Date	Time	Liters removed	Days since 1/1/85	Days used for calc.	Liters per day	Cumulative liters collected	Remarks
L1X00	1984-04-21			0.000	0.000	0.000	0.00	Room L1 excavated 4/19/84 to 4/21/84.
L1X00	1984-05-13			0.000	0.000	0.000	0.00	Downhole drilled 5/10/84 to 5/13/84. Brine entered hole over weekend during drilling.
L1X00	1984-11-27	NA	11	-34.417	0.000	0.000	11.00	First time collected. Brine and salt muck.
L1X00	1985-05-14	11:24	11.46	133.475	1.000	0.000	22.46	Hole looked dry due to floating salt dust on surface of brine. Salt muck removed with brine. Volume high due to near-hole storage.
L1X00	1985-05-21	12:33	00.31	140.523	7.048	0.044	22.77	
L1X00	1985-05-29	10:00	00.23	148.417	7.894	0.029	23.00	Removed 1 lb. of salt muck with brine.
L1X00	1985-06-04	09:25	00.17	154.392	5.975	0.028	23.17	
L1X00	1985-06-11	09:00	00.23	161.375	6.983	0.033	23.40	2 lbs. salt removed with brine during bailing.
L1X00	1985-06-18	09:05	00.23	168.378	7.003	0.033	23.63	
L1X00	1985-06-25	08:55	00.21	175.372	6.994	0.030	23.84	
L1X00	1985-07-02	11:00	00.23	182.458	7.086	0.032	24.07	
L1X00	1985-07-09	09:10	00.21	189.382	6.924	0.030	24.28	
L1X00	1985-07-16	09:12	00.21	196.383	7.001	0.030	24.49	
L1X00	1985-07-24	09:29	00.22	204.395	8.012	0.027	24.71	
L1X00	1985-07-30	08:42	00.18	210.363	5.968	0.030	24.89	
L1X00	1985-08-06	09:07	00.18	217.380	7.017	0.026	25.07	
L1X00	1985-08-14	08:53	00.23	225.370	7.990	0.029	25.30	
L1X00	1985-08-20	08:58	00.16	231.374	6.004	0.027	25.46	
L1X00	1985-08-28	08:25	00.23	239.351	7.977	0.029	25.69	
L1X00	1985-09-04	09:09	00.19	246.381	7.030	0.027	25.88	
L1X00	1985-09-10	08:53	00.16	252.370	5.989	0.027	26.04	
L1X00	1985-09-17	08:25	00.21	259.351	6.981	0.030	26.25	
L1X00	1985-09-24	08:40	00.21	266.361	7.010	0.030	26.46	
L1X00	1985-10-01	08:52	00.17	273.369	7.008	0.024	26.63	
L1X00	1985-10-08	09:55	00.19	280.413	7.044	0.027	26.82	
L1X00	1985-10-15	08:45	00.16	287.365	6.952	0.023	26.98	
L1X00	1985-10-23	09:09	00.20	295.381	8.016	0.025	27.18	
L1X00	1985-10-29	11:30	00.18	301.479	6.098	0.030	27.36	
L1X00	1985-11-05	08:17	00.16	308.345	6.866	0.023	27.52	
L1X00	1985-11-13	08:47	00.18	316.366	8.021	0.022	27.70	
L1X00	1985-11-21	10:00	00.17	324.417	8.051	0.021	27.87	
L1X00	1985-11-26	09:25	00.12	329.392	4.975	0.024	27.99	
L1X00	1985-12-03	14:35	00.14	336.608	7.216	0.019	28.13	
L1X00	1985-12-10	12:55	00.14	343.538	6.930	0.020	28.27	
L1X00	1985-12-17	13:02	00.15	350.543	7.005	0.021	28.42	

BRINE ACCUMULATION DATA TABLE (Continued)
Data through December 31, 1990

Location	Date	Time	Liters removed	Days since 1/1/85	Days used for calc.	Liters per day	Cumulative liters collected	Remarks
L1X00	1986-01-03	09:05	00.38	367.378	16.835	0.023	28.80	
L1X00	1986-01-08	09:25	00.11	372.392	5.014	0.022	28.91	
L1X00	1986-01-16	09:00	00.18	380.375	7.983	0.023	29.09	
L1X00	1986-01-23	09:15	00.14	387.385	7.010	0.020	29.23	
L1X00	1986-01-31	09:45	00.18	395.406	8.021	0.022	29.41	
L1X00	1986-02-12	08:50	00.30	407.368	11.962	0.025	29.71	
L1X00	1986-02-19	09:40	00.16	414.403	7.035	0.023	29.87	
L1X00	1986-02-28	11:20	00.24	423.472	9.069	0.026	30.11	
L1X00	1986-03-06	09:10	00.12	429.382	5.910	0.020	30.23	
L1X00	1986-03-13	08:30	00.16	436.354	6.972	0.023	30.39	
L1X00	1986-03-26	08:35	00.29	449.358	13.004	0.022	30.68	
L1X00	1986-04-02	08:15	00.17	456.344	6.986	0.024	30.85	
L1X00	1986-04-08	08:26	00.15	462.351	6.007	0.025	31.00	
L1X00	1986-04-16	10:20	00.19	470.431	8.080	0.024	31.19	
L1X00	1986-04-24	08:50	00.16	478.368	7.937	0.020	31.35	
L1X00	1986-04-30	09:20	00.16	484.389	6.021	0.027	31.51	
L1X00	1986-05-06	08:50	00.15	490.368	5.979	0.025	31.66	
L1X00	1986-05-13	08:48	00.18	497.367	6.999	0.026	31.84	
L1X00	1986-05-20	09:20	00.18	504.389	7.022	0.026	32.02	
L1X00	1986-05-27	14:20	00.17	511.597	7.208	0.024	32.19	
L1X00	1986-06-03	08:43	00.15	518.363	6.766	0.022	32.34	
L1X00	1986-06-10	09:20	00.21	525.389	7.026	0.030	32.55	
L1X00	1986-06-17	09:12	00.14	532.383	6.994	0.020	32.69	
L1X00	1986-06-24	09:15	00.22	539.385	7.002	0.031	32.91	
L1X00	1986-07-01	11:53	00.22	546.495	7.110	0.031	33.13	
L1X00	1986-07-08	09:10	00.22	553.382	6.887	0.032	33.35	
L1X00	1986-07-16	09:00	00.21	561.375	7.993	0.026	33.56	
L1X00	1986-07-22	08:45	00.17	567.365	5.990	0.028	33.73	
L1X00	1986-07-29	09:08	00.18	574.381	7.016	0.026	33.91	
L1X00	1986-08-05	09:33	00.20	581.398	7.017	0.029	34.11	
L1X00	1986-08-12	09:05	00.20	588.378	6.980	0.029	34.31	
L1X00	1986-08-19	09:49	00.20	595.409	7.031	0.028	34.51	
L1X00	1986-08-26	09:20	00.19	602.389	6.980	0.027	34.70	
L1X00	1986-09-04	08:55	00.25	611.372	8.983	0.028	34.95	
L1X00	1986-09-09	11:25	00.16	616.476	5.104	0.031	35.11	
L1X00	1986-09-16	08:50	00.19	623.368	6.892	0.028	35.30	
L1X00	1986-09-23	08:53	00.20	630.370	7.002	0.029	35.50	
L1X00	1986-10-01	09:46	00.22	638.407	8.037	0.027	35.72	
L1X00	1986-10-08	09:17	00.18	645.387	6.980	0.026	35.90	
L1X00	1986-10-14	10:00	00.14	651.417	6.030	0.023	36.04	
L1X00	1986-11-05	09:02	0.52	673.376	21.959	0.024	36.56	
L1X00	1986-11-20	09:47	00.36	688.408	15.032	0.024	36.92	
L1X00	1986-12-31	10:00	00.88	729.417	41.009	0.021	37.80	
L1X00	1987-02-03	10:45	00.61	763.448	34.031	0.018	38.41	
L1X00	1987-03-06	09:45	0.58	794.406	30.958	0.019	38.99	Hole looked dry due to floating salt dust on surface of brine.
L1X00	1987-04-10	09:30	0.68	829.396	34.990	0.019	39.67	
L1X00	1987-06-17	14:00	0.83	897.583	0.000	0.000	40.50	Brine left in hole; no calculation.
L1X00	1987-07-28	13:07	1.09	938.547	109.151	0.018	41.50	Calculated using 1.92 liters in 109.151 days (6/17/87 and 7/28/87).
L1X00	1987-09-01	12:45	0.95	973.531	34.984	0.027	42.45	
L1X00	1987-09-10	10:34	0.25	982.440	8.909	0.028	42.70	Installed collection device.
L1X00	1987-10-20	12:18	0.09	1022.510	40.070	0.002	42.79	
L1X00	1987-11-19	12:15	1.35	1052.510	30.000	0.045	44.14	
L1X00	1988-01-04	12:30	0.43	1098.520	46.010	0.009	44.57	
L1X00	1988-02-08	13:45	0.93	1133.570	35.050	0.027	45.50	
L1X00	1988-03-30	12:20	1.00	1184.510	50.940	0.020	46.50	
L1X00	1988-07-12	12:25	2.33	1288.520	104.010	0.022	48.83	
L1X00	1988-09-27	08:45	2.07	1365.360	76.840	0.027	50.90	
L1X00	1988-12-13	11:30	1.85	1442.480	77.120	0.024	52.75	

BRINE ACCUMULATION DATA TABLE (Continued)
Data through December 31, 1990

Location	Date	Time	Liters removed	Days since 1/1/85	Days used for calc.	Liters per day	Cumulative liters collected	Remarks
L1X00	1989-03-15	11:00	1.58	1534.460	91.979	0.017	54.33	Std. will not fit in hole, collection device removed.
L1X00	1989-04-06	10:30	NA	1556.440	0.000	0.000	54.33	
L1X00	1989-04-20	12:00	1.25	1570.500	36.042	0.035	55.58	Last time sampled for BSEP.

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Location	Date	Time	Liters removed	Days since 1/1/85	Days used for calc.	Liters per day	Cumulative liters collected	Remarks
NG252	1983-03-16			0.000	0.000	0.000	0.00	West side of SPDV Test Room 2 excavated. (Room excavated 3/09/83 to 3/20/83).
NG252	1983-03-20			0.000	0.000	0.000	0.00	Approximate date downhole drilled.
NG252	1984-03-04			0.000	0.000	0.000	0.00	Overcored nonfunctional stress meter with 6" hole (to 1.5 feet).
NG252	1984-11-21			0.000	0.000	0.000	0.00	Brine 7" below west edge of collar. Cleaned hole.
NG252	1984-11-30			0.000	0.000	0.000	0.00	Installed PVC casing for BSEP observations.
NG252	1984-12-19	12:00	04.60	-12.500	1.000	0.000	4.60	Partial removal. First time collected.
NG252	1984-12-20	09:00	04.35	-11.625	0.875	0.000	8.95	Pumped dry. Inflow rate about 2 cc/hr.
NG252	1985-01-08	09:43	08.19	7.405	19.030	0.430	17.14	Pumped dry.
NG252	1985-02-05	09:30	08.48	35.396	27.991	0.303	25.62	Gas bubbles observed rising through brine in hole.
NG252	1985-02-14	10:33	04.14	44.440	9.044	0.458	29.76	
NG252	1985-02-19	10:18	03.92	49.429	4.989	0.786	33.68	
NG252	1985-03-07	10:57	03.83	65.456	16.027	0.239	37.51	
NG252	1985-03-12	09:10	03.41	70.382	4.926	0.692	40.92	
NG252	1985-03-20	10:00	03.71	78.417	8.035	0.462	44.63	
NG252	1985-03-26	09:30	03.24	84.396	5.979	0.542	47.87	
NG252	1985-04-02	10:00	03.38	91.417	7.021	0.481	51.25	
NG252	1985-04-10	10:02	03.29	99.418	8.001	0.411	54.54	
NG252	1985-04-17	13:50	03.57	106.576	7.158	0.499	58.11	
NG252	1985-04-23	12:00	02.58	112.500	5.924	0.436	60.69	
NG252	1985-04-30	11:39	03.28	119.485	6.985	0.470	63.97	
NG252	1985-05-07	10:25	02.96	126.434	6.949	0.426	66.93	
NG252	1985-05-14	11:05	02.83	133.462	7.028	0.403	69.76	
NG252	1985-05-21	11:12	03.01	140.467	7.005	0.430	72.77	Brine degassing in collection container.
NG252	1985-05-29	10:00	03.45	148.417	7.950	0.434	76.22	
NG252	1985-06-04	11:50	02.90	154.493	6.076	0.477	79.12	
NG252	1985-06-11	11:35	03.06	161.483	6.990	0.438	82.18	
NG252	1985-06-18	10:47	02.82	168.449	6.966	0.405	85.00	
NG252	1985-06-25	10:00	03.34	175.417	6.968	0.479	88.34	
NG252	1985-07-02	11:00	03.50	182.458	7.041	0.497	91.84	
NG252	1985-07-09	11:30	03.46	189.479	7.021	0.493	95.30	Brine effervesces.
NG252	1985-07-16	12:09	03.43	196.506	7.027	0.488	98.73	Brine effervesces.
NG252	1985-07-24	11:10	03.83	204.465	7.959	0.481	102.56	
NG252	1985-07-30	10:45	02.79	210.448	5.983	0.466	105.35	
NG252	1985-08-06	10:58	03.05	217.457	7.009	0.435	108.40	
NG252	1985-08-14	12:10	03.48	225.507	8.050	0.432	111.88	
NG252	1985-08-20	11:31	03.15	231.480	5.973	0.527	115.03	
NG252	1985-08-28	10:00	03.11	239.417	7.937	0.392	118.14	
NG252	1985-09-04	10:58	03.17	246.457	7.040	0.450	121.31	
NG252	1985-09-10	11:23	03.04	252.474	6.017	0.505	124.35	
NG252	1985-09-17	10:16	02.68	259.428	6.954	0.385	127.03	
NG252	1985-09-24	10:20	02.98	266.431	7.003	0.426	130.01	
NG252	1985-10-01	10:25	03.19	273.434	7.003	0.456	133.20	
NG252	1985-10-08	11:05	03.36	280.462	7.028	0.478	136.56	
NG252	1985-10-15	10:46	02.64	287.449	6.987	0.378	139.20	
NG252	1985-10-23	10:58	02.93	295.457	8.008	0.366	142.13	
NG252	1985-10-29	10:45	02.64	301.448	5.991	0.441	144.77	
NG252	1985-11-05	09:40	02.16	308.403	6.955	0.311	146.93	10 days after brine was removed from 36" hole in SPDV Test Room 3.
NG252	1985-11-13	10:45	02.72	316.448	8.045	0.338	149.65	
NG252	1985-11-21	11:50	02.88	324.493	8.045	0.358	152.53	

BRINE ACCUMULATION DATA TABLE (Continued)
Data through December 31, 1990

Location	Date	Time	Liters removed	Days since 1/1/85	Days used for calc.	Liters per day	Cumulative liters collected	Remarks
NG252	1985-11-26	10:40	02.28	329.444	4.951	0.461	154.81	
NG252	1985-12-03	14:15	02.45	336.594	7.150	0.343	157.26	
NG252	1985-12-10	13:41	02.34	343.570	6.976	0.335	159.60	
NG252	1985-12-17	14:15	02.73	350.594	7.024	0.389	162.33	
NG252	1986-01-03	10:30	04.03	367.438	16.844	0.239	166.36	Partial removal only.
NG252	1986-01-08	10:40	03.00	372.444	5.006	0.599	169.36	High volume of brine due to only partial removal on 1/03/86.
NG252	1986-01-16	10:10	03.90	380.424	7.980	0.489	173.26	
NG252	1986-01-23	10:20	02.84	387.431	7.007	0.405	176.10	
NG252	1986-01-31	12:45	02.94	395.531	8.100	0.363	179.04	
NG252	1986-02-12	11:30	02.87	407.479	11.948	0.240	181.91	
NG252	1986-02-19	12:13	02.85	414.509	7.030	0.405	184.76	
NG252	1986-03-06	11:00	04.10	429.458	14.949	0.274	188.86	
NG252	1986-03-13	10:30	02.78	436.438	6.980	0.398	191.64	
NG252	1986-03-26	10:25	03.50	449.434	12.996	0.269	195.14	
NG252	1986-04-02	10:10	02.67	456.424	6.990	0.382	197.81	
NG252	1986-04-08	10:15	02.00	462.427	6.003	0.333	199.81	
NG252	1986-04-16	12:30	02.52	470.521	8.094	0.311	202.33	
NG252	1986-04-24	10:40	01.93	478.444	7.923	0.244	204.26	
NG252	1986-04-30	11:20	02.10	484.472	6.028	0.348	206.36	
NG252	1986-05-06	10:45	01.80	490.448	5.976	0.301	208.16	
NG252	1986-05-13	11:35	01.33	497.483	7.035	0.189	209.49	
NG252	1986-05-20	11:25	01.22	504.476	6.993	0.174	210.71	
NG252	1986-05-27	16:10	01.60	511.674	7.198	0.222	212.31	
NG252	1986-06-03	10:45	01.49	518.448	6.774	0.220	213.80	
NG252	1986-06-10	11:45	02.18	525.490	7.042	0.310	215.98	
NG252	1986-06-17	11:21	02.65	532.473	6.983	0.379	218.63	
NG252	1986-06-24	11:15	01.77	539.469	6.996	0.253	220.40	
NG252	1986-07-01	14:20	01.80	546.597	7.128	0.253	222.20	
NG252	1986-07-08	10:55	01.50	553.455	6.858	0.219	223.70	
NG252	1986-07-16	11:00	01.88	561.458	8.003	0.235	225.58	
NG252	1986-07-22	10:22	01.94	567.432	5.974	0.325	227.52	
NG252	1986-07-29	10:55	02.16	574.455	7.023	0.308	229.68	
NG252	1986-08-05	11:33	01.92	581.481	7.026	0.273	231.60	
NG252	1986-08-12	10:50	01.90	588.451	6.970	0.273	233.50	
NG252	1986-08-19	11:45	01.82	595.490	7.039	0.259	235.32	
NG252	1986-08-26	11:05	01.85	602.462	6.972	0.265	237.17	
NG252	1986-09-04	11:00	02.15	611.458	8.996	0.239	239.32	
NG252	1986-09-09	09:12	01.85	616.383	4.925	0.376	241.17	
NG252	1986-09-16	10:27	01.81	623.435	7.052	0.257	242.98	
NG252	1986-09-23	10:30	01.65	630.438	7.003	0.236	244.63	
NG252	1986-10-01	12:30	02.67	638.521	8.083	0.330	247.30	
NG252	1986-10-08	11:30	01.61	645.479	6.958	0.231	248.91	
NG252	1986-10-14	12:10	01.72	651.507	6.028	0.285	250.63	
NG252	1986-11-05	11:57	3.45	673.498	21.991	0.157	254.08	
NG252	1986-11-20	12:40	03.93	688.528	15.030	0.261	258.01	
NG252	1986-12-30	13:13	03.54	728.551	40.023	0.090	261.55	
NG252	1987-01-06	13:00	02.38	735.542	6.991	0.318	263.93	
NG252	1987-01-12	12:15	06.81	741.510	5.968	1.141	270.74	
NG252	1987-02-03	09:15	03.93	763.385	21.875	0.180	274.67	
NG252	1987-03-06	13:35	4.2	794.566	31.181	0.135	278.87	
NG252	1987-04-22	09:17	4.83	841.387	46.821	0.103	283.70	
NG252	1987-05-07	11:59	4.24	856.499	15.112	0.281	287.94	Low liters/day values for some periods between 11/05/86 and 6/16/87 may be the result in part of the long time between collections.
NG252	1987-06-17	14:10	4.63	897.590	0.000	0.000	292.57	Some brine left in hole; no calc.
NG252	1987-06-30	10:20	4.10	910.431	53.932	0.162	296.67	Calculation used 8.73 liters in 53.932 days (6/17/87 and 6/30/87).
NG252	1987-07-16	10:50	3.77	926.451	16.020	0.235	300.44	

BRINE ACCUMULATION DATA TABLE (Continued)
Data through December 31, 1990

Location	Date	Time	Liters removed	Days since 1/1/85	Days used for calc.	Liters per day	Cumulative liters collected	Remarks
NG252	1987-07-23	09:35	2.32	933.399	6.948	0.334	302.76	
NG252	1987-07-29	09:54	2.07	939.413	6.014	0.344	304.83	
NG252	1987-08-07	09:00	1.89	948.375	8.962	0.211	306.72	
NG252	1987-08-12	10:00	1.28	953.417	5.042	0.254	308.00	
NG252	1987-08-24	08:57	1.89	965.373	11.956	0.158	309.89	
NG252	1987-09-01	13:41	1.75	973.570	8.197	0.213	311.64	
NG252	1987-09-11	08:35	2.04	983.358	9.788	0.208	313.68	
NG252	1987-09-16	09:45	1.45	988.406	5.048	0.287	315.13	
NG252	1987-09-25	09:05	1.64	997.378	8.972	0.183	316.77	
NG252	1987-10-01	12:25	1.22	1003.520	6.142	0.199	317.99	
NG252	1987-10-08	10:36	1.12	1010.440	6.920	0.162	319.11	
NG252	1987-10-16	10:49	1.38	1018.450	8.010	0.172	320.49	
NG252	1987-10-20	12:06	0.87	1022.500	4.050	0.215	321.36	
NG252	1987-11-12	10:54	2.47	1045.450	22.950	0.108	323.83	
NG252	1987-11-19	11:50	1.84	1052.490	7.040	0.261	325.67	
NG252	1987-12-07	13:15	3.00	1070.550	18.060	0.166	328.67	
NG252	1988-01-04	12:23	2.80	1098.520	27.970	0.100	331.47	
NG252	1988-01-20	11:33	2.96	1114.480	15.960	0.185	334.43	
NG252	1988-02-08	13:30	2.87	1133.560	19.080	0.150	337.30	
NG252	1988-02-25	10:53	3.09	1150.450	16.890	0.183	340.39	
NG252	1988-03-09	10:30	2.92	1163.440	12.990	0.225	343.31	
NG252	1988-03-17	11:30	2.28	1171.480	8.040	0.284	345.59	
NG252	1988-03-29	12:30	1.91	1183.520	12.040	0.159	347.50	
NG252	1988-04-15	11:10	2.37	1200.470	16.950	0.140	349.87	
NG252	1988-05-05	10:30	1.95	1220.440	19.970	0.098	351.82	
NG252	1988-05-12	11:00	1.38	1227.460	7.020	0.197	353.20	
NG252	1988-06-09	09:00	2.88	1255.380	27.920	0.103	356.08	
NG252	1988-06-16	10:00	1.95	1262.420	7.040	0.277	358.03	
NG252	1988-07-12	09:10	2.32	1288.380	25.960	0.089	360.35	
NG252	1988-08-11	11:00	2.53	1318.460	30.080	0.084	362.88	
NG252	1988-08-25	10:00	2.37	1332.420	13.960	0.170	365.25	
NG252	1988-09-08	14:55	2.64	1346.620	14.200	0.186	367.89	
NG252	1988-09-27	11:00	2.40	1365.460	18.840	0.127	370.29	
NG252	1988-10-18	10:51	1.33	1386.450	20.990	0.063	371.62	
NG252	1988-11-10	09:23	1.98	1409.390	22.940	0.086	373.60	Smell of paint thinner. Sample effervesces.
NG252	1988-12-13	10:30	3.34	1442.440	33.050	0.101	376.94	
NG252	1989-01-10	13:50	2.08	1470.580	28.138	0.074	379.02	
NG252	1989-02-09	10:40	2.3	1500.440	29.868	0.077	381.32	
NG252	1989-03-15	10:45	1.98	1534.450	34.004	0.058	383.30	
NG252	1989-04-06	10:20	0.38	1556.430	21.983	0.017	383.68	
NG252	1989-04-20	09:55	0.12	1570.410	13.982	0.009	383.80	Last time sampled for BSEP.
NG252	1989-06-29	10:45	NA	1640.450	0.000	0.000	383.80	Room closed.

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Location	Date	Time	Liters removed	Days since 1/1/85	Days used for calc.	Liters per day	Cumulative liters collected	Remarks
OH20	1985-09-03	14:00	NA	0.000	0.000	0.000	0.00	Approximated date this part of drift excavated.
OH20	1989-03-29	14:00	NA	0.000	0.000	0.000	0.00	Horizontal hole drilled 3/28/89 to 3/29/89. Hole drilled with brine. Fluorescien added to drilling fluid.
OH20	1989-03-30	11:00	NA	1549.458	0.000	0.000	0.00	New hole. Installed collection device. Hole dry.
OH20	1989-04-18	09:45	0	1568.406	18.948	0.000	0.00	Device left with 50 centibars suction.
OH20	1989-04-26	09:50	0	1576.410	8.004	0.000	0.00	Device left with 50 centibars suction.
OH20	1989-06-05	09:00	0.31	1616.375	39.965	0.008	0.31	First time sample recovered from this hole. Sample colored with Fluorescien dye. Replaced collection device.
OH20	1989-06-20	08:30	0.03	1631.354	14.979	0.002	0.34	
OH20	1989-07-06	11:00	0.02	1647.458	16.104	0.001	0.36	Collection device retained vacuum.
OH20	1989-08-09	10:00	0.29	1681.417	33.959	0.009	0.65	Pumped collection device, repaired hose end.
OH20	1989-08-23	11:22	0.16	1695.474	14.057	0.011	0.81	Still yellowish green in color.

BRINE ACCUMULATION DATA TABLE (Continued)
Data through December 31, 1990

Location	Date	Time	Liters removed	Days since 1/1/85	Days used for calc.	Liters per day	Cumulative liters collected	Remarks
OH20	1989-09-14	11:05	0.21	1717.462	21.988	0.010	1.02	
OH20	1989-10-02	11:20	0.27	1735.472	18.010	0.015	1.29	
OH20	1989-10-20	11:25	0.26	1753.476	18.004	0.014	1.55	
OH20	1989-11-10	10:18	0.29	1774.429	20.953	0.014	1.84	
OH20	1989-11-29	13:00	0.37	1793.542	19.113	0.019	2.21	
OH20	1989-12-12	10:06	0.20	1806.421	12.879	0.016	2.41	
OH20	1990-01-04	11:52	0.27	1829.494	23.073	0.012	2.68	
OH20	1990-01-17	09:59	0.21	1842.416	12.922	0.016	2.89	
OH20	1990-01-31	10:38	0.21	1856.443	14.027	0.015	3.10	
OH20	1990-02-13	10:40	0.18	1869.444	13.001	0.014	3.28	
OH20	1990-02-27	12:28	0.24	1883.519	14.075	0.017	3.52	
OH20	1990-03-05	11:12	0.20	1889.467	5.948	0.034	3.72	
OH20	1990-03-21	09:30	0.08	1905.396	15.929	0.005	3.80	
OH20	1990-04-04	12:04	0.18	1919.503	14.107	0.013	3.98	
OH20	1990-04-10	10:06	0.11	1925.421	5.918	0.019	4.09	
OH20	1990-05-02	10:03	0.10	1947.419	21.998	0.005	4.19	
OH20	1990-05-09	09:24	0.09	1954.392	6.973	0.013	4.28	
OH20	1990-05-16	11:55	0.07	1961.497	7.105	0.010	4.35	
OH20	1990-05-23	13:09	0.18	1968.548	7.051	0.026	4.53	
OH20	1990-05-31	09:43	0.09	1976.405	7.857	0.011	4.62	
OH20	1990-06-06	11:45	0.08	1982.490	6.085	0.013	4.70	
OH20	1990-06-14	10:27	0.09	1990.435	7.945	0.011	4.79	
OH20	1990-06-28	10:42	0.18	2004.446	14.011	0.013	4.97	
OH20	1990-07-17	09:14	0.24	2023.385	18.939	0.000	5.21	
OH20	1990-07-18	11:10	0.01	2024.465	1.080	0.012	5.22	Combined with 0.24 liters from 07/17/90. Used 0.25 liters for calculation.
OH20	1990-07-25	10:20	0.09	2031.431	6.966	0.013	5.31	
OH20	1990-08-01	11:20	0.09	2038.472	7.041	0.013	5.40	
OH20	1990-08-07	10:13	0.08	2044.426	5.954	0.013	5.48	
OH20	1990-08-16	10:13	0.11	2053.426	9.000	0.012	5.59	
OH20	1990-08-22	10:56	0.08	2059.456	6.030	0.013	5.67	
OH20	1990-08-29	10:33	0.09	2066.440	6.984	0.013	5.76	
OH20	1990-09-05	10:44	0.09	2073.447	7.007	0.013	5.85	
OH20	1990-09-12	09:10	0.08	2080.382	6.935	0.012	5.93	
OH20	1990-09-25	11:52	0.14	2093.494	13.112	0.000	6.07	Partial evacuation.
OH20	1990-09-26	10:10	0.09	2094.424	0.930	0.016	6.16	Combined with 0.14 liters from 09/25/90. Used 0.23 liters for calculation.
OH20	1990-10-03	09:10	0.06	2101.382	6.958	0.009	6.22	
OH20	1990-10-10	10:31	0.08	2108.438	7.056	0.011	6.30	
OH20	1990-10-18	09:37	0.09	2116.401	7.963	0.011	6.39	
OH20	1990-10-24	11:45	0.07	2122.490	6.089	0.011	6.46	
OH20	1990-10-31	11:00	0.09	2129.458	6.968	0.013	6.55	
OH20	1990-11-07	11:37	0.08	2136.484	7.026	0.011	6.63	
OH20	1990-11-14	10:50	0.09	2143.451	6.967	0.013	6.72	
OH20	1990-11-28	11:37	0.16	2157.484	14.033	0.011	6.88	
OH20	1990-12-05	09:40	0.09	2164.403	6.919	0.013	6.97	
OH20	1990-12-13	10:00	0.10	2172.417	8.014	0.012	7.07	
OH20	1990-12-20	10:47	0.09	2179.449	7.032	0.013	7.16	
OH21	1985-09-03	14:00	NA	0.000	0.000	0.000	0.00	Approximate date this part of drift excavated.
OH21	1988-12-12	14:00	NA	0.000	0.000	0.000	0.00	Horizontal hole drilled 12/12/88 to 12/19/88. Hole drilled with brine. Fluorescien added to drilling fluid.
OH21	1989-02-06	10:00	NA	1497.417	0.000	0.000	0.00	New hole. Installed collection device @ 53' in hole. Hole dry.
OH21	1989-02-14	09:25	0	1505.392	7.975	0.000	0.00	Hole plugged with foam. Hole holding vacuum at approx. 50 centibars.
OH21	1989-02-21	10:30	0	1512.438	7.046	0.000	0.00	Holding vacuum.

BRINE ACCUMULATION DATA TABLE (Continued)
Data through December 31, 1990

Location	Date	Time	Liters removed	Days since 1/1/85	Days used for calc.	Liters per day	Cumulative liters collected	Remarks
OH21	1989-02-28	10:50	0	1519.451	7.013	0.000	0.00	Holding vacuum.
OH21	1989-03-01	11:45	NA	1520.490	0.000	0.000	0.00	Device left with approximately 70 centibars suction.
OH21	1989-03-08	09:45	0	1527.406	7.955	0.000	0.00	Device left with approximately 50 centibars suction.
OH21	1989-03-15	11:35	0	1534.483	7.077	0.000	0.00	Hole dry.
OH21	1989-03-30	10:20	0	1549.431	14.948	0.000	0.00	Hole dry.
OH21	1989-04-18	09:50	0	1568.410	18.979	0.000	0.00	Device left with approximately 50 centibars suction.
OH21	1989-04-26	09:55	0	1576.413	8.003	0.000	0.00	Device left with approximately 50 centibars suction.
OH21	1989-06-05	09:10	0	1616.382	39.969	0.000	0.00	Hole dry, no vacuum in collection device. Removed and replaced collection device.
OH21	1989-06-20	08:40	0	1631.361	14.979	0.000	0.00	Hole dry.
OH21	1989-07-06	11:10	0	1647.465	16.104	0.000	0.00	Hole dry. Collection device retained vacuum.
OH21	1989-08-09	10:05	0	1681.420	33.955	0.000	0.00	Hole dry. Pumped collection device, repaired hose ends.
OH21	1989-08-23	11:20	0	1695.472	14.052	0.000	0.00	Hole dry.
OH21	1989-10-02	11:25	0	1735.476	40.004	0.000	0.00	Hole dry.
OH21	1989-10-20	11:25	0	1753.476	18.000	0.000	0.00	Hole dry.
OH21	1989-11-10	10:20	0	1774.431	20.955	0.000	0.00	Hole dry.
OH21	1989-11-29	12:52	0	1793.536	19.105	0.000	0.00	Hole dry.
OH21	1989-12-12	10:10	0	1806.424	12.888	0.000	0.00	Hole dry. Reseat collection device (leaking).
OH22	1985-09-03	14:00	NA	0.000	0.000	0.000	0.00	Approximate date this part of drift excavated.
OH22	1988-12-19	14:00	NA	0.000	0.000	0.000	0.00	Horizontal hole drilled 12/12/88 to 12/19/88. Hole drilled with brine. Fluorescien added to drilling fluid.
OH22	1989-02-06	11:00	NA	1497.458	0.000	0.000	0.00	New hole, Installed collection device @ 52.4' in hole. Hole dry.
OH22	1989-02-14	09:20	0	1505.389	7.931	0.000	0.00	Hole plugged with foam. Hole holding vacuum at approx. 50 centibars.
OH22	1989-02-21	10:40	0	1512.444	7.055	0.000	0.00	Holding vacuum.
OH22	1989-02-28	10:50	0	1519.451	7.007	0.000	0.00	Not holding vacuum.
OH22	1989-03-01	11:00	NA	1520.458	0.000	0.000	0.00	Device left with approximately 70 centibars suction.
OH22	1989-03-08	09:45	0	1527.406	7.955	0.000	0.00	Device left with approximately 50 centibars suction.
OH22	1989-03-15	11:35	0	1534.483	7.077	0.000	0.00	Hole dry.
OH22	1989-03-30	10:22	0	1549.432	14.949	0.000	0.00	Hole dry.
OH22	1989-04-18	09:55	0	1568.413	18.981	0.000	0.00	Device left with approximately 50 centibars suction.
OH22	1989-04-26	10:00	0	1576.417	8.004	0.000	0.00	Device left with approximately 50 centibars suction.
OH22	1989-06-05	09:20	0	1616.389	39.972	0.000	0.00	Hole dry. No vacuum on collection device. Removed and replaced collection device.
OH22	1989-06-20	08:45	Trace	1631.365	0.000	0.000	0.00	Trace of brine found in hole.
OH22	1989-07-06	11:20	0	1647.472	31.083	0.000	0.00	Hole dry. Collection device retained vacuum.
OH22	1989-08-09	10:10	0	1681.424	33.952	0.000	0.00	Hole dry. Pumped collection device, repaired hose ends.
OH22	1989-08-23	11:20	0	1695.472	14.048	0.000	0.00	Hole dry.
OH22	1989-10-02	11:23	0	1735.474	40.002	0.000	0.00	Hole dry.
OH22	1989-10-20	11:25	0	1753.476	18.002	0.000	0.00	Hole dry.
OH22	1989-11-10	10:22	0	1774.432	20.956	0.000	0.00	Hole dry.
OH22	1989-11-29	12:55	0	1793.538	19.106	0.000	0.00	Hole dry.
OH22	1989-12-12	10:12	0	1806.425	12.887	0.000	0.00	Hole dry. Reseat collection device (leaking).

BRINE ACCUMULATION DATA TABLE (Continued)
Data through December 31, 1990

Location	Date	Time	Liters removed	Days since 1/1/85	Days used for calc.	Liters per day	Cumulative liters collected	Remarks
OH23	1985-12-08	14:00	NA	0.000	0.000	0.000	0.00	Approximate date this part of drift excavated.
OH23	1989-02-06	14:00	NA	0.000	0.000	0.000	0.00	Horizontal hole drilled 2/6/89. Hole drilled with brine. Fluorescien added to drilling fluid.
OH23	1989-02-07	14:00	NA	1498.583	0.000	0.000	0.00	New hole. Installed collection device @ 153' in hole. Hole dry.
OH23	1989-02-14	09:08	0	1505.381	6.798	0.000	0.00	Hole plugged with foam. Hole holding vacuum at approx. 50 centibars.
OH23	1989-02-21	10:00	0.00	1512.417	7.036	0.000	0.00	Holding vacuum.
OH23	1989-02-28	10:00	0.43	1519.417	7.000	0.061	0.43	Sample clear, warm and effervescent.
OH23	1989-03-08	09:30	0.30	1527.396	7.979	0.038	0.73	Device left with approximately 50 centibars suction.
OH23	1989-03-15	11:45	0.21	1534.490	7.094	0.030	0.94	
OH23	1989-03-30	10:15	0.52	1549.427	14.937	0.035	1.46	
OH23	1989-04-04	09:30	0.10	1554.396	4.969	0.020	1.56	Device left with approximately 50 centibars suction. Outer 75 feet (approx.) of hole dry.
OH23	1989-04-18	09:55	0.10	1568.413	14.017	0.007	1.66	Device left with approximately 50 centibars suction.
OH23	1989-04-26	09:35	0.15	1576.399	7.986	0.019	1.81	Device left with approximately 50 centibars suction.
OH23	1989-06-05	09:30	0.35	1616.396	39.997	0.009	2.16	
OH23	1989-06-20	08:50	0.62	1631.368	14.972	0.041	2.78	
OH23	1989-07-06	11:30	0.37	1647.479	16.111	0.023	3.15	Collection device retained vacuum.
OH23	1989-08-09	10:15	0.76	1681.427	33.948	0.022	3.91	Pumped collection device.
OH23	1989-08-23	11:13	0.35	1695.467	14.040	0.025	4.26	
OH23	1989-09-14	11:14	0.51	1717.468	22.001	0.023	4.77	
OH23	1989-10-02	11:30	0.36	1735.479	18.011	0.020	5.13	
OH23	1989-10-20	11:35	0.46	1753.483	18.004	0.026	5.59	
OH23	1989-11-10	10:24	NA	1774.433	0.000	0.000	5.59	Collection device exploded in hole due to overpressuring during sampling.
OH23	1989-11-15	09:00	NA	1779.375	0.000	0.000	5.59	Reinstalled collection device.
OH23	1989-11-29	12:51	0.26	1793.535	40.052	0.006	5.85	
OH23	1989-12-12	09:52	0.13	1806.411	12.876	0.010	5.98	Reseat collection device (leaking).
OH23	1990-01-04	11:57	0.11	1829.498	23.087	0.005	6.09	
OH23	1990-01-17	09:20	0.23	1842.389	12.891	0.018	6.32	
OH23	1990-03-26	09:15	0.60	1910.385	67.996	0.000	6.92	Brine probably left in hole.
OH23	1990-04-04	11:53	0.58	1919.495	9.110	0.000	7.50	Brine probably left in hole.
OH23	1990-04-10	09:39	0.33	1925.402	5.907	0.018	7.83	Combined with 0.60 liters from 03/26/90 and 0.58 liters from 04/04/90. Used 1.51 liters for calculation.
OH23	1990-04-24	08:46	0.29	1939.365	13.963	0.021	8.12	
OH23	1990-05-02	09:52	0.17	1947.411	8.046	0.021	8.29	
OH23	1990-05-09	09:32	0.15	1954.397	6.986	0.021	8.44	
OH23	1990-05-16	11:45	0.17	1961.490	7.093	0.024	8.61	
OH23	1990-05-23	13:07	0.13	1968.547	7.057	0.018	8.74	
OH23	1990-05-31	09:35	0.16	1976.399	7.852	0.020	8.90	
OH23	1990-06-06	11:40	0.12	1982.486	6.087	0.020	9.02	
OH23	1990-06-14	10:35	0.17	1990.441	7.955	0.021	9.19	
OH23	1990-06-28	10:36	0.38	2004.442	14.001	0.027	9.57	
OH23	1990-07-17	09:04	0.33	2023.378	18.936	0.000	9.90	
OH23	1990-07-18	11:05	0.10	2024.462	1.084	0.021	10.00	Combined with 0.33 liters from 07/17/90. Used 0.43 liters for calculation.
OH23	1990-07-25	10:15	0.10	2031.427	6.965	0.014	10.10	
OH23	1990-08-01	11:15	0.14	2038.469	7.042	0.020	10.24	
OH23	1990-08-07	09:58	0.14	2044.415	5.946	0.024	10.38	
OH23	1990-08-16	09:42	0.15	2053.404	8.989	0.017	10.53	
OH23	1990-08-22	10:51	0.10	2059.452	6.048	0.017	10.63	
OH23	1990-08-29	10:30	0.15	2066.438	6.986	0.021	10.78	
OH23	1990-09-05	10:40	0.17	2073.444	7.006	0.024	10.95	
OH23	1990-09-12	09:00	0.10	2080.375	6.931	0.014	11.05	
OH23	1990-09-25	11:42	0.21	2093.488	13.113	0.000	11.26	

BRINE ACCUMULATION DATA TABLE (Continued)
Data through December 31, 1990

Location	Date	Time	Liters removed	Days since 1/1/85	Days used for calc.	Liters per day	Cumulative liters collected	Remarks
OH23	1990-09-26	09:53	0.06	2094.412	0.924	0.019	11.32	Combined with 0.21 liters from 09/25/90. Used 0.27 liters for calculation.
OH23	1990-10-03	09:05	0.11	2101.378	6.966	0.016	11.43	
OH23	1990-10-10	10:22	0.13	2108.432	7.054	0.018	11.56	
OH23	1990-10-18	09:30	0.15	2116.396	7.964	0.019	11.71	
OH23	1990-10-24	11:30	0.10	2122.479	6.083	0.016	11.81	
OH23	1990-10-31	10:53	0.11	2129.453	6.974	0.016	11.92	
OH23	1990-11-07	11:40	0.10	2136.486	7.033	0.014	12.02	
OH23	1990-11-14	10:45	0.13	2143.448	6.962	0.019	12.15	
OH23	1990-11-28	11:32	0.22	2157.481	14.033	0.016	12.37	
OH23	1990-12-05	09:35	0.10	2164.399	6.918	0.014	12.47	
OH23	1990-12-13	10:15	0.14	2172.427	8.028	0.017	12.61	
OH23	1990-12-20	10:30	0.10	2179.438	7.011	0.014	12.71	
OH24	1985-12-08	14:00	NA	0.000	0.000	0.000	0.00	Approximate date this part of drift excavated.
OH24	1989-03-06	14:00	NA	0.000	0.000	0.000	0.00	Horizontal hole drilled 3/2/89 to 3/6/89.
OH24	1989-03-08	09:50	NA	1527.410	0.000	0.000	0.00	New hole. Installed collection device. Hole dry.
OH24	1989-03-15	11:45	0	1534.490	7.080	0.000	0.00	Hole dry.
OH24	1989-03-30	10:25	0	1549.434	14.944	0.000	0.00	Hole dry.
OH24	1989-04-18	10:00	0	1568.417	18.983	0.000	0.00	Device left with approximately 50 centibars suction.
OH24	1989-04-26	09:40	0	1576.403	7.986	0.000	0.00	Device left with approximately 50 centibars suction.
OH24	1989-06-05	09:40	0.05	1616.403	40.000	0.001	0.05	First time sample recovered. No vacuum in collection device. Collection device removed and replaced.
OH24	1989-06-20	09:00	0.03	1631.375	14.972	0.002	0.08	
OH24	1989-07-06	11:40	0.01	1647.486	16.111	0.001	0.09	Collection device retained vacuum.
OH24	1989-08-09	10:20	0	1681.431	33.945	0.000	0.09	Hole dry. Pumped collection device.
OH24	1989-08-23	11:18	0	1695.471	14.040	0.000	0.09	Hole dry.
OH24	1989-10-02	11:35	0	1735.483	40.012	0.000	0.09	Hole dry.
OH24	1989-10-20	11:35	0	1753.483	18.000	0.000	0.09	Hole dry.
OH24	1989-11-10	10:26	0	1774.435	20.952	0.000	0.09	Hole dry.
OH24	1989-11-29	12:58	0	1793.540	19.105	0.000	0.09	Hole dry.
OH24	1989-12-12	09:54	0	1806.412	12.872	0.000	0.09	Hole dry. Reseat collection device (leaking).
OH24	1990-04-10	09:46	0.09	1925.407	118.995	0.001	0.18	
OH24	1990-04-24	08:46	0.03	1939.365	13.958	0.002	0.21	
OH24	1990-05-02	09:55	NA	1947.413			0.21	Trace.
OH24	1990-08-10	09:40	NA	2047.403			0.21	Cleaned, checked, and reinstalled vacuum up to 50 centibars. Checked in one hour. Sampler holding vacuum.
OH25	1985-12-08	14:00	NA	0.000	0.000	0.000	0.00	Approximate date this part of drift excavated.
OH25	1989-03-27	14:00	NA	0.000	0.000	0.000	0.00	Horizontal hole drilled on 3/27/89.
OH25	1989-03-30	10:27	0	1549.435	1549.430	0.000	0.00	Hole dry.
OH25	1989-04-18	10:05	0	1568.420	18.985	0.000	0.00	Device left with approximately 50 centibars suction.
OH25	1989-04-26	09:45	0	1576.406	7.986	0.000	0.00	Device left with approximately 50 centibars suction.
OH25	1989-06-05	09:50	0	1616.410	40.004	0.000	0.00	Hole dry. No vacuum on collection device. Collection device removed and replaced.
OH25	1989-06-20	09:10	0	1631.382	14.972	0.000	0.00	Hole dry.
OH25	1989-07-06	11:40	0.01	1647.486	16.104	0.001	0.01	Collection device retained vacuum.
OH25	1989-08-09	10:25	0	1681.434	33.948	0.000	0.01	Hole dry.
OH25	1989-08-23	11:18	0	1695.471	14.037	0.000	0.01	Hole dry.
OH25	1989-10-02	11:35	0	1735.483	40.012	0.000	0.01	Hole dry.
OH25	1989-10-20	11:35	0	1753.483	18.000	0.000	0.01	Hole dry.

BRINE ACCUMULATION DATA TABLE (Continued)
Data through December 31, 1990

Location	Date	Time	Liters removed	Days since 1/1/85	Days used for calc.	Liters per day	Cumulative liters collected	Remarks
OH25	1989-11-10	10:30	0	1774.438	20.955	0.000	0.01	Hole dry.
OH25	1989-11-29	13:02	0	1793.543	19.105	0.000	0.01	Hole dry.
OH25	1989-12-12	09:58	0	1806.415	12.872	0.000	0.01	Hole dry. Reseat collection device (leaking).
OH25	1990-08-10	09:50	NA	2047.410			0.01	Cleaned, checked, and reinstalled vacuum up to 50 centibars. Checked in one hour. Sampler holding vacuum.

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Location	Date	Time	Liters removed	Days since 1/1/85	Days used for calc.	Liters per day	Cumulative liters collected	Remarks
OH26	1986-08-05	14:00	NA	0.000	0.000	0.000	0.00	Approximate date this part of drift excavated.
OH26	1989-03-27	14:00	NA	0.000	0.000	0.000	0.00	Horizontal hole drilled on 3/27/89. Hole drilled with brine. Fluorescien added to drilling fluid.
OH26	1989-03-30	10:00	NA	1549.417	0.000	0.000	0.00	New hole. Installed collection device. Hole dry.
OH26	1989-04-18	10:10	0	1568.424	19.007	0.000	0.00	Device left with approximately 50 centibars suction.
OH26	1989-04-26	09:15	0	1576.385	7.961	0.000	0.00	Device left with approximately 50 centibars suction.
OH26	1989-06-05	10:00	0.20	1616.417	40.032	0.005	0.20	First time sample recovered. Collection device removed and replaced.
OH26	1989-06-20	09:15	0.05	1631.385	14.968	0.003	0.25	
OH26	1989-07-06	11:50	0.49	1647.493	16.108	0.030	0.74	Collection device retained vacuum.
OH26	1989-08-09	10:30	0.67	1681.438	33.945	0.020	1.41	
OH26	1989-08-23	10:30	0.55	1695.438	14.000	0.039	1.96	
OH26	1989-09-14	11:21	0.51	1717.473	22.035	0.023	2.47	
OH26	1989-10-02	11:40	0.56	1735.486	18.013	0.031	3.03	
OH26	1989-10-20	11:45	0.45	1753.490	18.004	0.025	3.48	
OH26	1989-11-10	11:04	0.48	1774.461	20.971	0.023	3.96	
OH26	1989-11-29	12:40	0.32	1793.528	19.067	0.017	4.28	
OH26	1989-12-12	09:38	0.32	1806.401	12.873	0.025	4.60	
OH26	1990-01-04	12:05	0.23	1829.503	23.102	0.010	4.83	
OH26	1990-01-17	08:58	0.36	1842.374	12.871	0.028	5.19	
OH26	1990-01-31	10:54	0.26	1856.454	14.080	0.018	5.45	
OH26	1990-02-13	11:30	0.26	1869.479	13.025	0.020	5.71	
OH26	1990-02-27	12:46	0.21	1883.532	14.053	0.015	5.92	Brine probably left in hole.
OH26	1990-03-05	11:27	0.26	1889.477	5.945	0.044	6.18	
OH26	1990-03-21	09:26	0.18	1905.393	15.916	0.011	6.36	
OH26	1990-04-04	11:49	0.28	1919.492	14.099	0.020	6.64	Brine probably left in hole.
OH26	1990-04-10	09:17	0.22	1925.387	5.895	0.037	6.86	
OH26	1990-04-24	08:33	0.19	1939.356	13.969	0.014	7.05	
OH26	1990-05-02	09:45	0.24	1947.406	8.050	0.030	7.29	
OH26	1990-05-09	09:46	0.21	1954.407	7.001	0.030	7.50	
OH26	1990-05-16	11:30	0.15	1961.479	7.072	0.021	7.65	
OH26	1990-05-23	13:03	0.12	1968.544	7.065	0.017	7.77	
OH26	1990-05-31	09:29	0.14	1976.395	7.851	0.018	7.91	
OH26	1990-06-06	11:35	0.14	1982.483	6.088	0.023	8.05	
OH26	1990-06-14	10:42	0.14	1990.446	7.963	0.018	8.19	
OH26	1990-06-28	10:27	0.16	2004.435	13.989	0.011	8.35	
OH26	1990-07-17	08:56	0.18	2023.372	18.937	0.000	8.53	
OH26	1990-07-18	11:00	0.28	2024.458	1.086	0.023	8.81	Combined with 0.18 liters 07/17/90. Used 0.46 liters for calculation.
OH26	1990-07-25	10:07	0.05	2031.422	6.964	0.007	8.86	Brine probably left in hole.
OH26	1990-08-01	11:05	0.25	2038.462	7.040	0.036	9.11	
OH26	1990-08-07	09:40	0.11	2044.403	5.941	0.019	9.22	
OH26	1990-08-16	09:18	0.12	2053.387	8.984	0.013	9.34	
OH26	1990-08-22	10:44	0.10	2059.447	6.060	0.017	9.44	
OH26	1990-08-29	10:23	0.11	2066.433	6.986	0.016	9.55	
OH26	1990-09-05	10:34	0.11	2073.440	7.007	0.016	9.66	
OH26	1990-09-12	08:45	0.10	2080.365	6.925	0.014	9.76	
OH26	1990-09-25	11:26	0.19	2093.476	13.111	0.000	9.95	

BRINE ACCUMULATION DATA TABLE (Continued)
Data through December 31, 1990

Location	Date	Time	Liters removed	Days since 1/1/85	Days used for calc.	Liters per day	Cumulative liters collected	Remarks
OH26	1990-09-26	09:48	0.10	2094.408	0.932	0.020	10.05	Combined with 0.19 liters from 09/25/90. Used 0.29 liters for calculation.
OH26	1990-10-03	08:55	0.10	2101.372	6.964	0.014	10.15	
OH26	1990-10-10	10:14	0.11	2108.426	7.054	0.016	10.26	
OH26	1990-10-18	09:25	0.13	2116.392	7.966	0.016	10.39	
OH26	1990-10-24	11:16	0.11	2122.469	6.077	0.018	10.50	
OH26	1990-10-31	10:43	0.12	2129.447	6.978	0.017	10.62	
OH26	1990-11-07	11:43	0.13	2136.488	7.041	0.018	10.75	
OH26	1990-11-14	10:40	0.10	2143.444	6.956	0.014	10.85	
OH26	1990-11-28	11:20	0.21	2157.472	14.028	0.015	11.06	
OH26	1990-12-05	09:30	0.14	2164.396	6.924	0.020	11.20	
OH26	1990-12-13	10:20	0.13	2172.431	8.035	0.016	11.33	
OH26	1990-12-20	10:20	0.11	2179.431	7.000	0.016	11.44	
OH27	1986-08-05	14:00	NA	0.000	0.000	0.000	0.00	Approximate date this part of drift excavated.
OH27	1989-04-17	14:00	NA	0.000	0.000	0.000	0.00	Horizontal hole drilled 4/13/89 to 4/17/89.
OH27	1989-04-18	10:15	0	1568.427	1568.430	0.000	0.00	Device left with approximately 50 centibars suction.
OH27	1989-04-26	09:25	0	1576.392	7.965	0.000	0.00	Device left with approximately 50 centibars suction.
OH27	1989-06-05	10:10	0	1616.424	40.032	0.000	0.00	Hole dry. Collection device removed and replaced.
OH27	1989-06-20	09:20	0	1631.389	14.965	0.000	0.00	Hole dry.
OH27	1989-07-06	11:55	0.02	1647.497	16.108	0.001	0.02	Collection device retained vacuum.
OH27	1989-08-09	10:35	Trace	1681.441	0.000	0.000	0.02	Trace of brine found.
OH27	1989-08-23	10:57	Trace	1695.456	0.000	0.000	0.02	Trace of fluid in hole.
OH27	1989-10-02	11:45	0	1735.490	87.993	0.000	0.02	Hole dry.
OH27	1989-10-20	11:45	0	1753.490	18.000	0.000	0.02	Hole dry.
OH27	1989-11-10	11:14	0	1774.468	20.978	0.000	0.02	Hole dry.
OH27	1989-11-29	12:45	0	1793.531	19.063	0.000	0.02	Hole dry.
OH27	1989-12-12	09:40	0	1806.403	12.872	0.000	0.02	Hole dry.
OH27	1990-04-24	08:52	0.17	1939.369	132.966	0.001	0.19	
OH27	1990-08-10	09:30	NA	2047.396			0.19	Cleaned, checked, and reinstalled vacuum up to 50 centibars. Checked in one hour. Sampler holding vacuum.
OH27A	1986-08-05	14:00	NA	0.000	0.000	0.000	0.00	Approximate date this part of drift excavated.
OH27A	1989-04-04	14:00	NA	0.000	0.000	0.000	0.00	Horizontal hole drilled on 4/4/89.
OH27A	1989-04-18	10:20	0	1568.431	1568.430	0.000	0.00	Device left with approximately 50 centibars suction.
OH27A	1989-04-26	09:20	0.21	1576.389	7.958	0.026	0.21	Device left with approximately 50 centibars suction.
OH27A	1989-05-17	09:10	0.08	1597.382	20.993	0.004	0.29	
OH27A	1989-06-05	10:20	0	1616.431	19.049	0.000	0.29	Hole dry. Collection device removed and replaced.
OH27A	1989-06-20	09:25	0	1631.392	14.961	0.000	0.29	Hole dry.
OH27A	1989-07-06	11:55	0	1647.497	16.105	0.000	0.29	Hole dry. Collection device retained vacuum.
OH27A	1989-08-09	10:40	0	1681.444	33.947	0.000	0.29	Hole dry.
OH27A	1989-08-23	10:50	0	1695.451	14.007	0.000	0.29	Hole dry.
OH27A	1989-10-02	11:45	0	1735.490	40.039	0.000	0.29	Hole dry.
OH27A	1989-10-20	11:45	0	1753.490	18.000	0.000	0.29	Hole dry.
OH27A	1989-11-10	11:14	0	1774.468	20.978	0.000	0.29	Hole dry.
OH27A	1989-11-29	12:48	0	1793.533	19.065	0.000	0.29	Hole dry.
OH27A	1989-12-12	09:40	0	1806.403	12.870	0.000	0.29	Hole dry.
OH28	1986-08-05	14:00	NA	0.000	0.000	0.000	0.00	Approximate date this part of drift excavated.
OH28	1989-04-12	14:00	NA	0.000	0.000	0.000	0.00	Horizontal hole drilled 4/11/89 to 4/12/89.

BRINE ACCUMULATION DATA TABLE (Continued)
Data through December 31, 1990

Location	Date	Time	Liters removed	Days since 1/1/85	Days used for calc.	Liters per day	Cumulative liters collected	Remarks
OH28	1989-04-18	10:25	0	1568.434	1568.430	0.000	0.00	Device left with approximately 50 centibars suction.
OH28	1989-04-26	09:30	0	1576.396	7.962	0.000	0.00	Device left with approximately 50 centibars suction.
OH28	1989-06-05	10:30	0.08	1616.438	40.042	0.002	0.08	First time sample recovered. Collection device removed and replaced.
OH28	1989-06-20	09:30	0.03	1631.396	14.958	0.002	0.11	
OH28	1989-07-06	12:00	0	1647.500	16.104	0.000	0.11	Hole dry. Collection device retained vacuum.
OH28	1989-08-09	10:45	0	1681.448	33.948	0.000	0.11	Hole dry.
OH28	1989-08-23	10:46	0	1695.449	14.001	0.000	0.11	Hole dry.
OH28	1989-10-02	11:50	0.05	1735.493	40.044	0.001	0.16	
OH28	1989-10-20	11:45	0	1753.490	17.997	0.000	0.16	Hole dry.
OH28	1989-11-10	11:10	0.07	1774.465	20.975	0.003	0.23	
OH28	1989-11-29	12:48	0	1793.533	19.068	0.000	0.23	Hole dry.
OH28	1989-12-12	09:48	0.10	1806.408	12.875	0.008	0.33	
OH28	1990-04-10	09:36	0.14	1925.400	118.992	0.001	0.47	
OH28	1990-04-24	08:36	0.18	1939.358	13.958	0.013	0.65	
OH28	1990-05-02	09:35	0.01	1947.399	8.041	0.001	0.66	
OH28	1990-05-09	09:40	NA	1954.403			0.66	Trace.
OH28	1990-05-16	11:38	0.02	1961.485	14.086	0.001	0.68	
OH28	1990-05-31	09:33	0.01	1976.398	14.913	0.001	0.69	
OH28	1990-08-07	09:42	0.10	2044.404	68.006	0.001	0.79	
OH28	1990-08-10	09:10	NA	2047.382			0.79	Cleaned, checked, and reinstalled vacuum up to 50 centibars. Checked in one hour. Sampler holding vacuum.
OH28	1990-09-12	08:40	0.04	2080.361	35.957	0.001	0.83	
OH28	1990-09-26	09:50	0.05	2094.410	14.049	0.004	0.88	
OH28	1990-11-28	11:28	0.08	2157.478	63.068	0.001	0.96	
OH28	1990-12-20	10:27	0.07	2179.435	21.957	0.003	1.03	
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OH45	1989-05-08	14:00	NA	0.000	0.000	0.000	0.00	Approximate date this part of underground core storage room excavated.
OH45	1989-06-15	14:00	NA	0.000	0.000	0.000	0.00	Horizontal hole drilled 6/9/89 to 6/15/89.
OH45	1989-06-23	11:00	NA	1634.458	0.000	0.000	0.00	New hole. Installed collection device.
OH45	1989-08-09	14:00	0	1681.583	47.125	0.000	0.00	No vacuum, reinstalled collection device. Hole dry.
OH45	1989-08-23	11:30	0.45	1695.479	13.896	0.032	0.45	First time hole sampled.
OH45	1989-09-12	12:35	0.15	1715.524	20.045	0.007	0.60	
OH45	1989-10-02	12:15	0.13	1735.510	19.986	0.007	0.73	
OH45	1989-10-20	11:10	0.11	1753.465	17.955	0.006	0.84	
OH45	1989-11-10	10:20	0.13	1774.431	20.966	0.006	0.97	
OH45	1989-11-29	13:11	0.11	1793.549	19.118	0.006	1.08	
OH45	1989-12-12	10:19	0.08	1806.430	12.881	0.006	1.16	Sample bubbling.
OH45	1990-01-04	11:41	0.14	1829.487	23.057	0.006	1.30	
OH45	1990-01-17	11:54	0.08	1842.496	13.009	0.006	1.38	
OH45	1990-01-31	11:08	0.01	1856.464	13.968	0.001	1.39	
OH45	1990-02-13	10:54	0.01	1869.454	12.990	0.001	1.40	
OH45	1990-02-27	12:56	0.11	1883.539	14.085	0.008	1.51	Removed and replaced sampler.
OH45	1990-03-05	11:45	0.08	1889.490	5.951	0.013	1.59	
OH45	1990-03-21	11:34	NA	1905.482			0.43	Trace.
OH45	1990-04-10	10:28	NA	1925.436			0.43	Trace.
OH45	1990-05-02	09:12	0.06	1947.383	57.893	0.001	1.65	
OH45	1990-05-09	10:03	NA	1954.419			0.49	Trace.
OH45	1990-05-17	09:20	0.05	1962.389	15.006	0.003	1.70	
OH45	1990-05-23	13:10	0.01	1968.549	6.160	0.002	1.71	
OH45	1990-06-14	10:15	0.01	1990.427	21.878	0.000	1.72	Brine probably left in hole.
OH45	1990-07-17	11:58	0.46	2023.499	33.072	0.014	2.18	

BRINE ACCUMULATION DATA TABLE (Continued)
Data through December 31, 1990

Location	Date	Time	Liters removed	Days since 1/1/85	Days used for calc.	Liters per day	Cumulative liters collected	Remarks
OH45	1990-08-07	08:50	NA	2044.368			1.02	Trace. Could not sample. Brine probably left in hole.
OH45	1990-08-29	12:01	0.27	2066.501	43.002	0.006	2.45	
OH45	1990-09-13	10:40	0.02	2081.444	14.943	0.001	2.47	
OH45	1990-10-18	10:14	0.05	2116.426	34.982	0.001	2.52	
OH46	1989-05-08	14:00	NA	0.000	0.000	0.000	0.00	Approximate date this part of underground core storage room excavated.
OH46	1989-06-20	14:00	NA	0.000	0.000	0.000	0.00	Downhole drilled 6/16/89 to 6/20/89.
OH46	1989-07-06	11:30	NA	1647.479	0.000	0.000	0.00	First day of observation for hole; blown dry.
OH46	1989-07-25	10:48	0.28	1666.450	18.971	0.015	0.28	First time hole sampled. Sample yellow- with wood chips and other debris. Hydrocarbon odor (diesel lubricant?).
OH46	1989-08-16	10:05	0.68	1688.420	21.970	0.031	0.96	
OH46	1989-09-12	12:35	0.47	1715.524	27.104	0.017	1.43	
OH46	1989-10-02	12:30	0.05	1735.521	19.997	0.000	1.48	Brine probably left in hole.
OH46	1989-10-20	11:10	0.57	1753.465	17.944	0.032	2.05	Combined with 0.05 liters from 10/02/89. Used 0.62 liters for calculation.
OH46	1989-11-10	10:30	0.68	1774.438	20.973	0.032	2.73	
OH46	1989-11-29	13:15	0.53	1793.552	19.114	0.028	3.26	
OH46	1989-12-12	10:20	0.46	1806.431	12.879	0.036	3.72	
OH46	1990-01-04	11:44	0.45	1829.489	23.058	0.020	4.17	
OH46	1990-01-17	11:58	0.25	1842.499	13.010	0.019	4.42	
OH46	1990-01-31	11:12	0.25	1856.467	13.968	0.018	4.67	
OH46	1990-02-13	11:16	0.22	1869.469	13.002	0.017	4.89	
OH46	1990-02-27	13:10	0.27	1883.549	14.080	0.019	5.16	Brine probably left in hole.
OH46	1990-03-05	11:54	0.27	1889.496	5.947	0.045	5.43	
OH46	1990-03-21	11:34	0.13	1905.482	15.986	0.008	5.56	Brine probably left in hole.
OH46	1990-04-11	10:33	0.32	1926.440	20.958	0.015	5.88	
OH46	1990-05-02	09:10	0.25	1947.382	20.942	0.012	6.13	Brine probably left in hole.
OH46	1990-05-08	10:05	0.15	1953.420	6.038	0.025	6.28	
OH46	1990-05-17	09:30	0.14	1962.396	8.976	0.016	6.42	
OH46	1990-05-23	13:30	0.10	1968.562	6.166	0.016	6.52	
OH46	1990-06-14	10:01	0.32	1990.417	21.855	0.015	6.84	
OH46	1990-06-28	11:06	0.20	2004.462	14.045	0.014	7.04	
OH46	1990-07-17	11:50	0.30	2023.493	19.031	0.016	7.34	
OH46	1990-07-25	10:50	0.15	2031.451	7.958	0.019	7.49	
OH46	1990-08-07	08:50	0.19	2044.368	12.917	0.015	7.68	
OH46	1990-08-16	10:30	0.17	2053.438	9.070	0.019	7.85	
OH46	1990-08-22	11:05	0.11	2059.462	6.024	0.018	7.96	
OH46	1990-08-29	11:45	0.11	2066.490	7.028	0.016	8.07	
OH46	1990-09-05	11:04	0.12	2073.461	6.971	0.017	8.19	
OH46	1990-09-13	10:42	0.12	2081.446	7.985	0.015	8.31	
OH46	1990-09-28	10:10	0.22	2096.424	14.978	0.015	8.53	
OH46	1990-10-18	09:52	0.26	2116.411	19.987	0.013	8.79	
OH47	1989-05-08	14:00	NA	0.000	0.000	0.000	0.00	Approximate date this part of underground core storage room excavated.
OH47	1989-07-06	14:4:00	NA	0.000	0.000	0.000	0.00	Uphole drilled 6/28/89 to 7/6/89.
OH47	1989-08-09	14:30	NA	1681.604	0.000	0.000	0.00	Installed funnel and collection bottle. Start collection date from 08/09/89.
OH47	1989-08-16	10:05	?	1688.420	6.816	0.000	0.00	First time hole sampled.
OH47	1989-08-30	10:30	0.35	1702.438	14.018	0.025	0.35	
OH47	1989-09-14	10:55	0.48	1717.455	15.017	0.032	0.83	
OH47	1989-10-20	11:10	0.60	1753.465	36.010	0.017	1.43	
OH47	1989-11-10	10:25	0.28	1774.434	20.969	0.013	1.71	
OH47	1989-11-29	13:06	0.18	1793.546	19.112	0.009	1.89	
OH47	1989-12-12	10:25	0.12	1806.434	12.888	0.009	2.01	

BRINE ACCUMULATION DATA TABLE (Continued)
Data through December 31, 1990

Location	Date	Time	Liters removed	Days since 1/1/85	Days used for calc.	Liters per day	Cumulative liters collected	Remarks
OH47	1990-01-04	11:40	0.24	1829.486	23.052	0.010	2.25	
OH47	1990-01-17	11:59	0.13	1842.499	13.013	0.010	2.38	
OH47	1990-01-31	11:15	0.11	1856.469	13.970	0.008	2.49	
OH47	1990-02-13	11:20	0.09	1869.472	13.003	0.007	2.58	
OH47	1990-02-27	13:30	0.12	1883.562	14.090	0.009	2.70	
OH47	1990-03-05	11:57	0.09	1889.498	5.936	0.015	2.79	
OH47	1990-03-21	11:41	0.11	1905.487	15.989	0.007	2.90	
OH47	1990-04-11	10:30	0.05	1926.438	20.951	0.002	2.95	
OH47	1990-05-02	08:55	0.08	1947.372	20.934	0.004	3.03	
OH47	1990-05-08	10:07	0.09	1953.422	6.050	0.015	3.12	
OH47	1990-05-17	09:25	0.02	1962.392	8.970	0.002	3.14	
OH47	1990-05-23	13:30	0.01	1968.562	6.170	0.002	3.15	
OH47	1990-06-14	10:08	0.13	1990.422	21.860	0.006	3.28	
OH47	1990-07-17	11:42	0.08	2023.487	33.065	0.002	3.36	
OH47	1990-08-07	08:56	0.05	2044.372	20.885	0.002	3.41	
OH47	1990-08-22	11:07	0.04	2059.463	15.091	0.003	3.45	
OH47	1990-08-29	11:47	0.02	2066.491	7.028	0.003	3.47	Red-brown mud in collection bottle, cleaned out.
OH47	1990-09-05	10:45	NA	2073.448			3.47	Trace.
OH47	1990-09-13	10:45	0.15	2081.448	14.957	0.010	3.62	
OH47	1990-10-18	09:54	0.13	2116.412	34.964	0.004	3.75	

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APPENDIX B
GRAPHS OF BRINE ACCUMULATION DATA

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APPENDIX B
GRAPHS OF BRINE ACCUMULATION DATA

This appendix contains graphs of data presented in Appendix A for selected locations. As described in Deal and Case (1987), much of the variability in the quantity of brine collected resulted from limitations of the collection techniques, rather than variations in the actual inflow of brine from bedrock at the collecting locations. As a result, plotting of the inflow data from the data tables (Appendix A) results in an irregular plot that implies variations in inflow which, in fact, do not exist. The graphed data included in this report were processed and plotted by a standard software program (STSC Statgraphics)[1] on an IBM XT microcomputer, using an 11-point moving average to smooth the curve, unless otherwise stated. The smoothed data reflect trends in the body of the curve that are representative of the brine seepage rates, while still showing variations that are probably the result of collection techniques.

At the beginning and end of each curve, the smoothing program projects the calculated trend. As a result, initial and ending real values, usually zero, and maximum inflow values within the first few data points, tend to be distorted by the smoothing program. In order to correct the distortion caused by the smoothing program, the smoothed data are replaced by the actual data for the first and last few data points prior to plotting. Additional discussion of the collection and data handling is provided in Deal and Case (1987).

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[1]Statgraphics, 1989, Version 4.0, Statistical Graphics Corporation, Rockville, Maryland.

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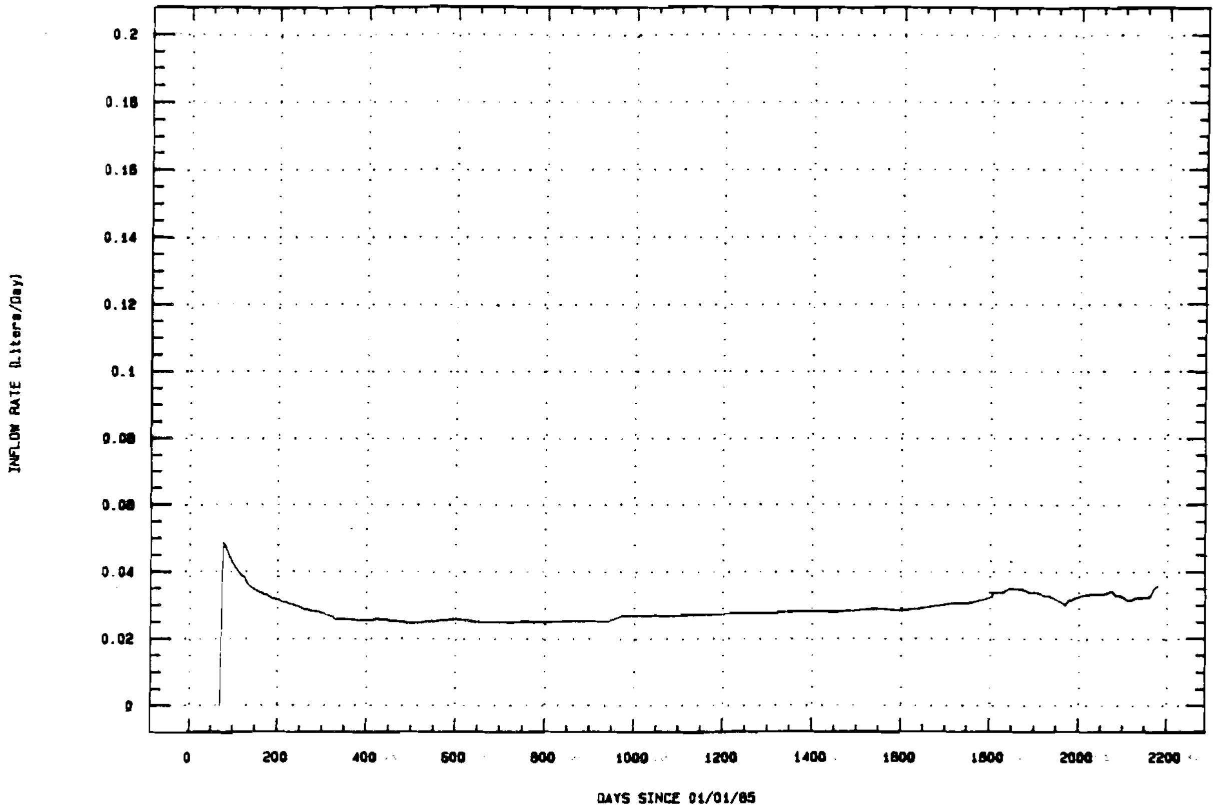
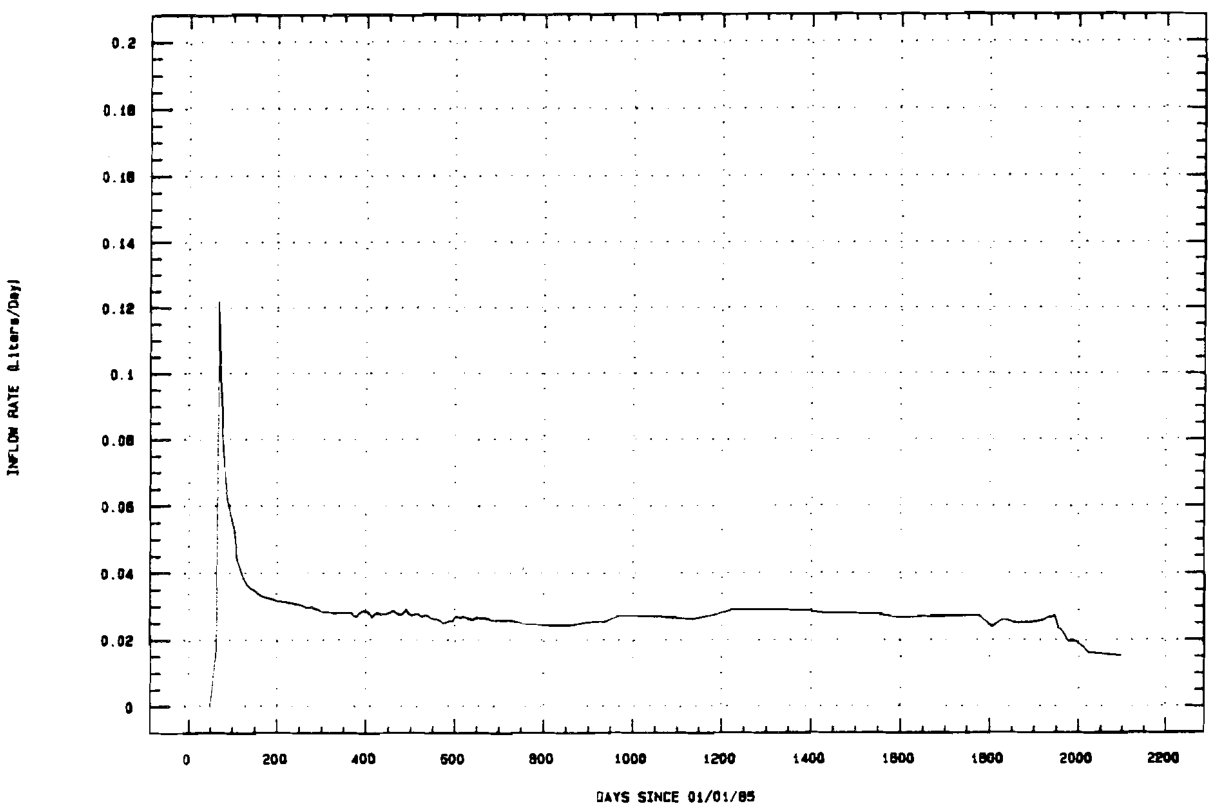
SIMPLE ELEVEN POINT MOVING AVERAGE

A1X01

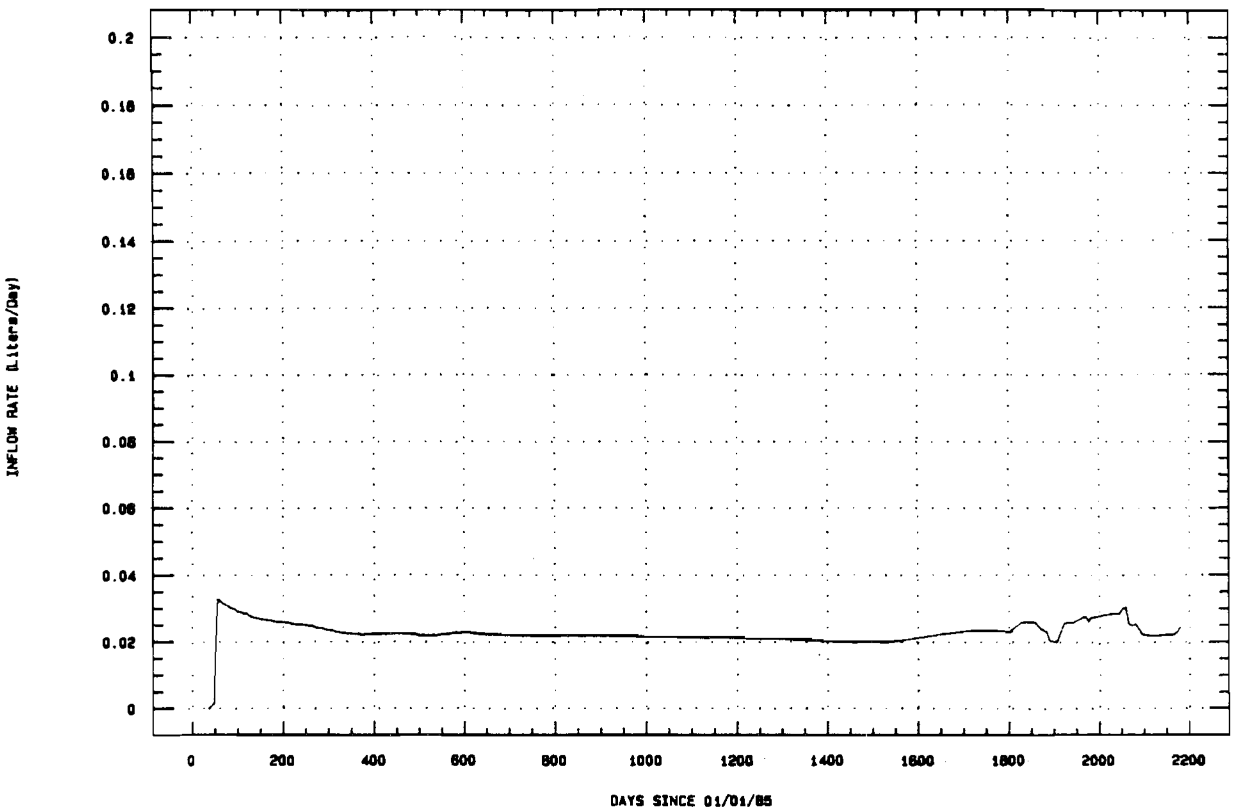


A2X01

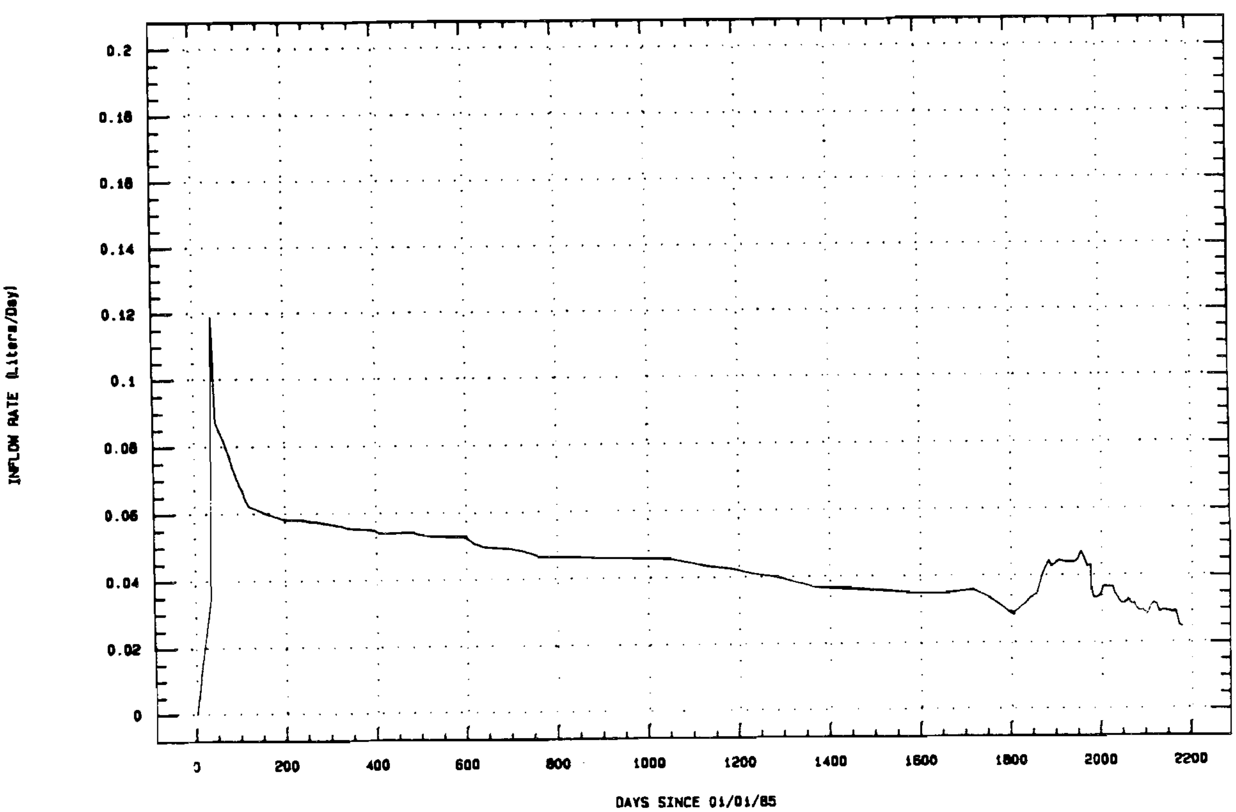


SIMPLE ELEVEN POINT MOVING AVERAGE

A3X01

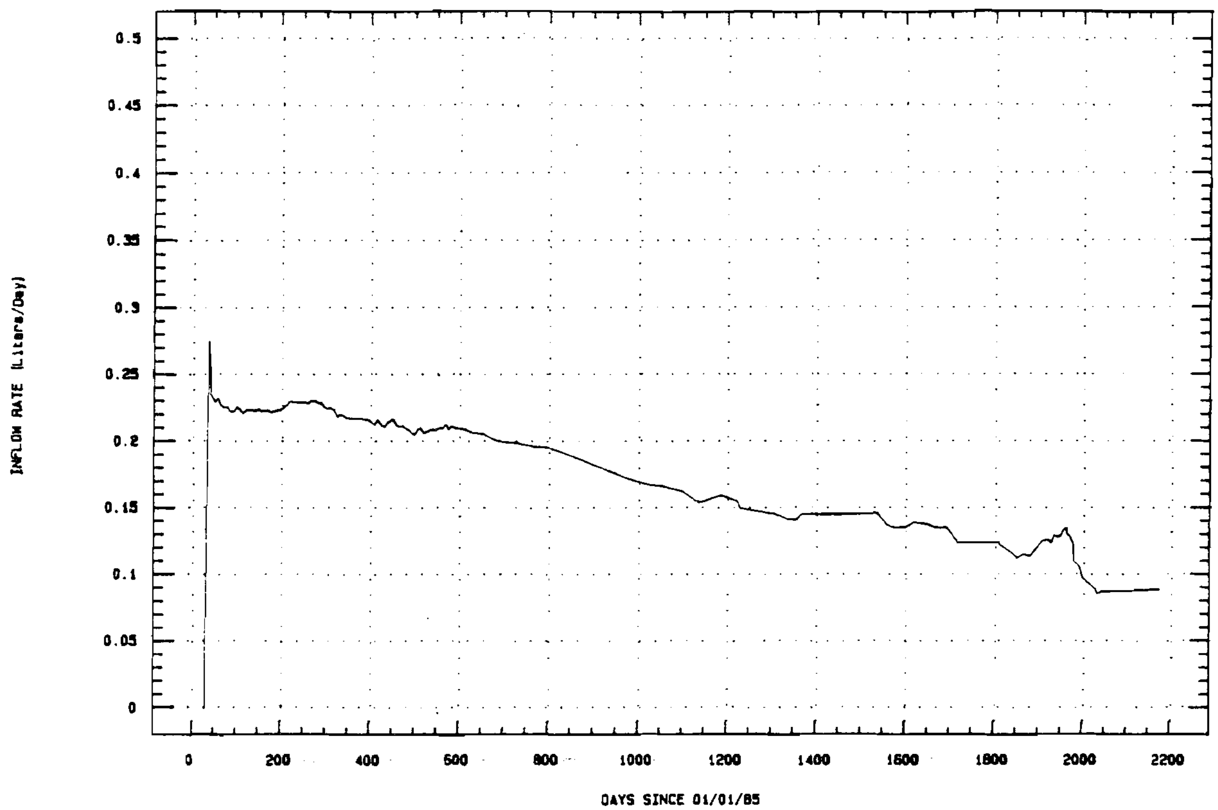


BX01

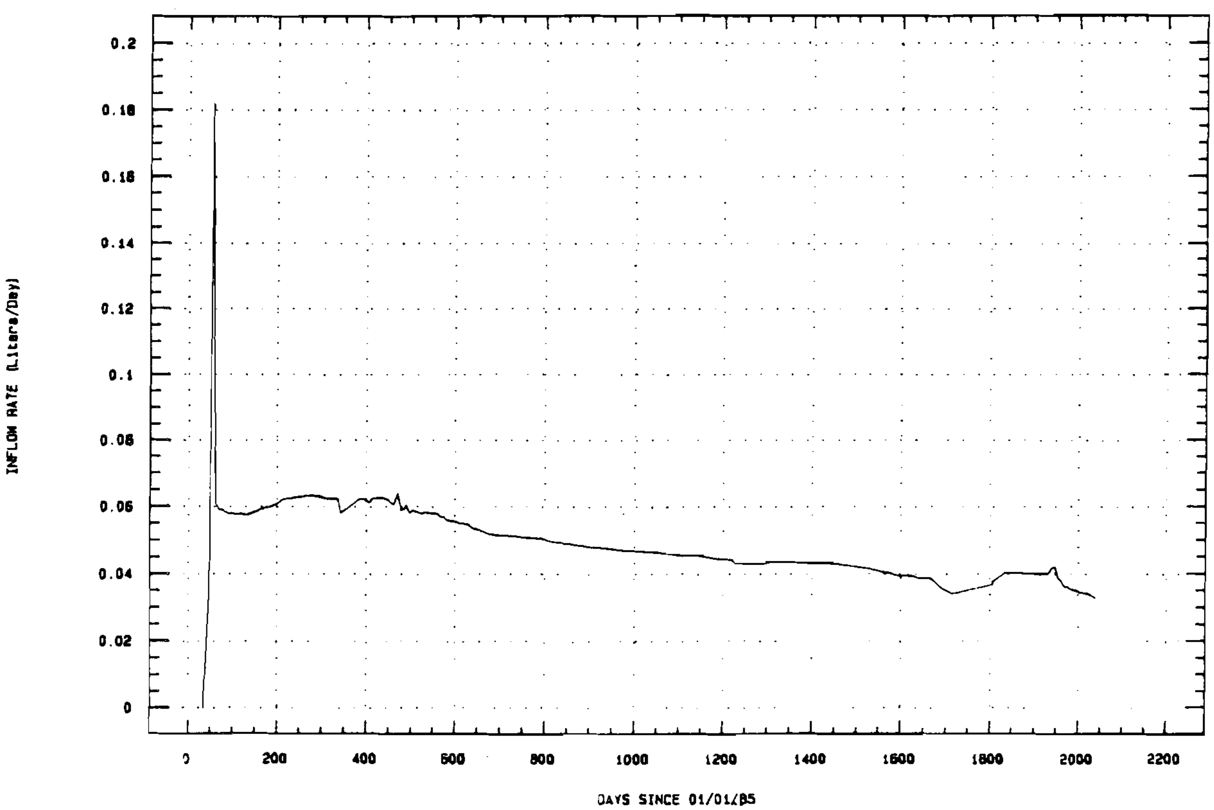


SIMPLE ELEVEN POINT MOVING AVERAGE

DH36

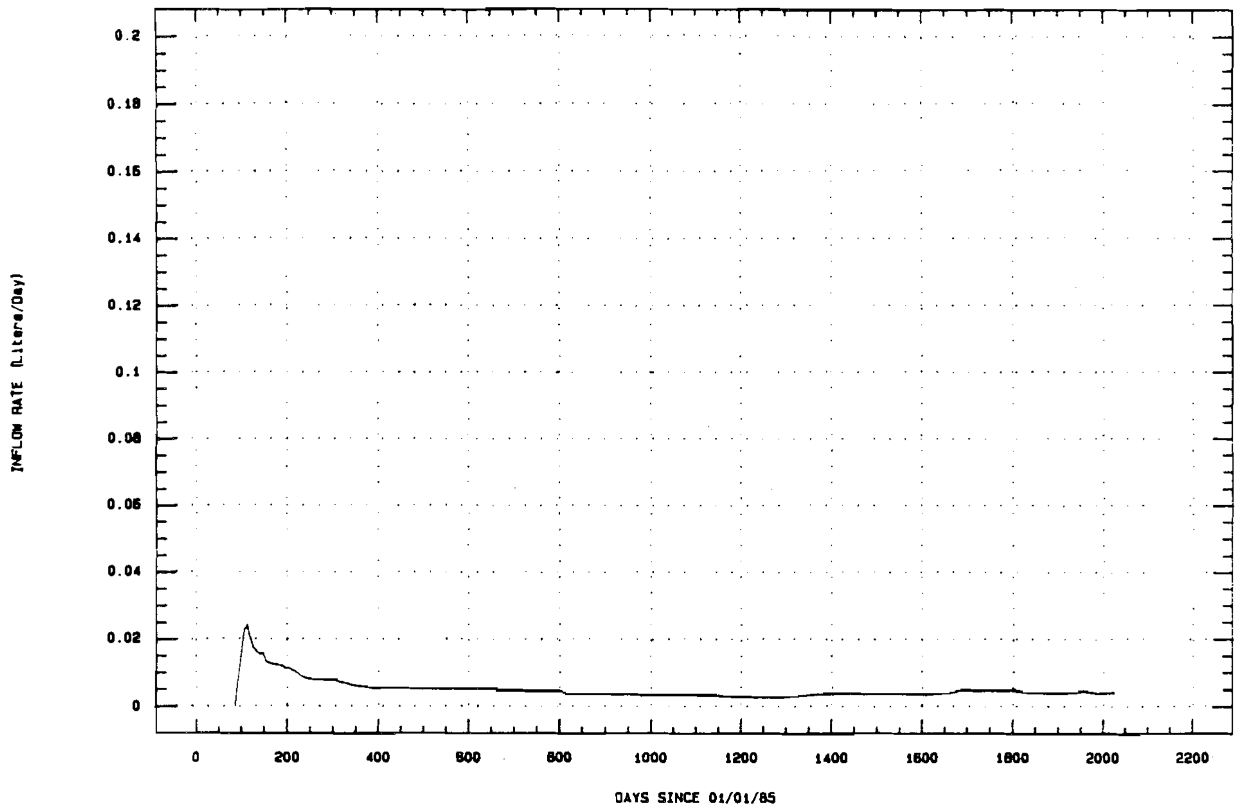


DH38

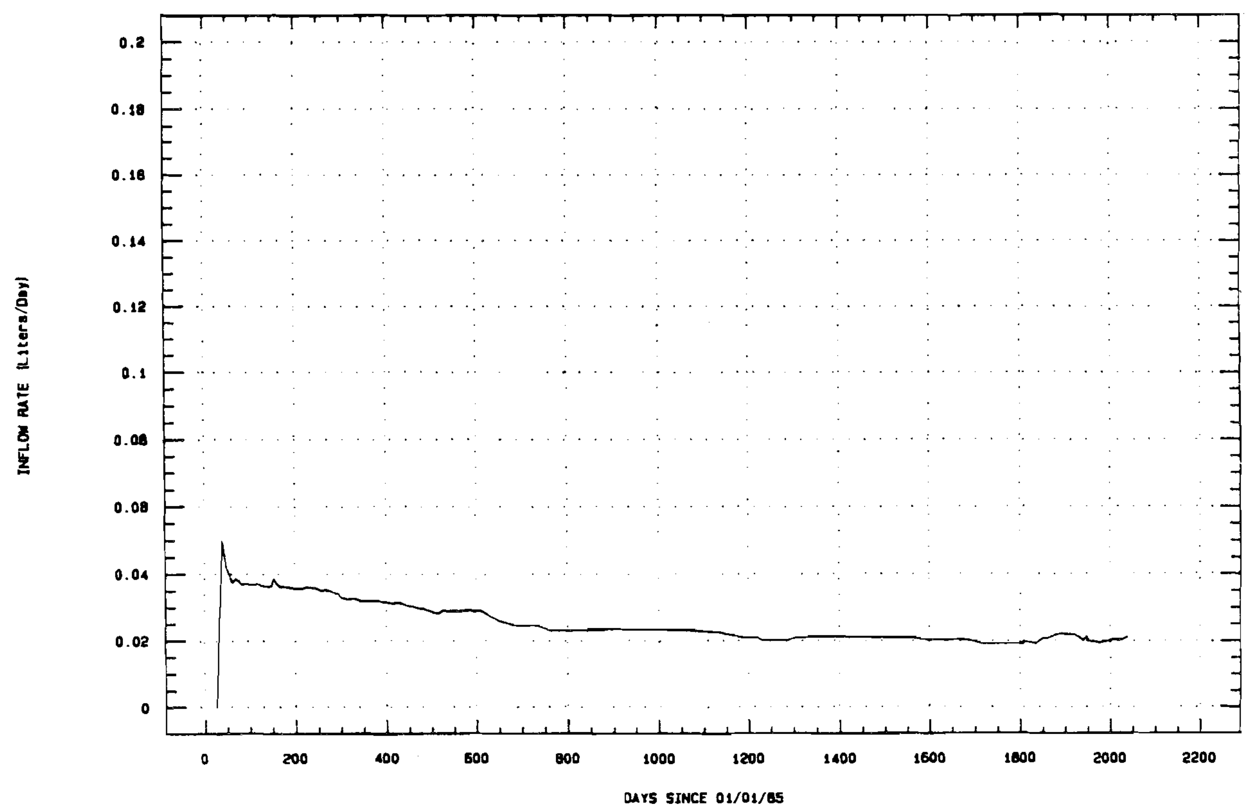


SIMPLE ELEVEN POINT MOVING AVERAGE

DH40

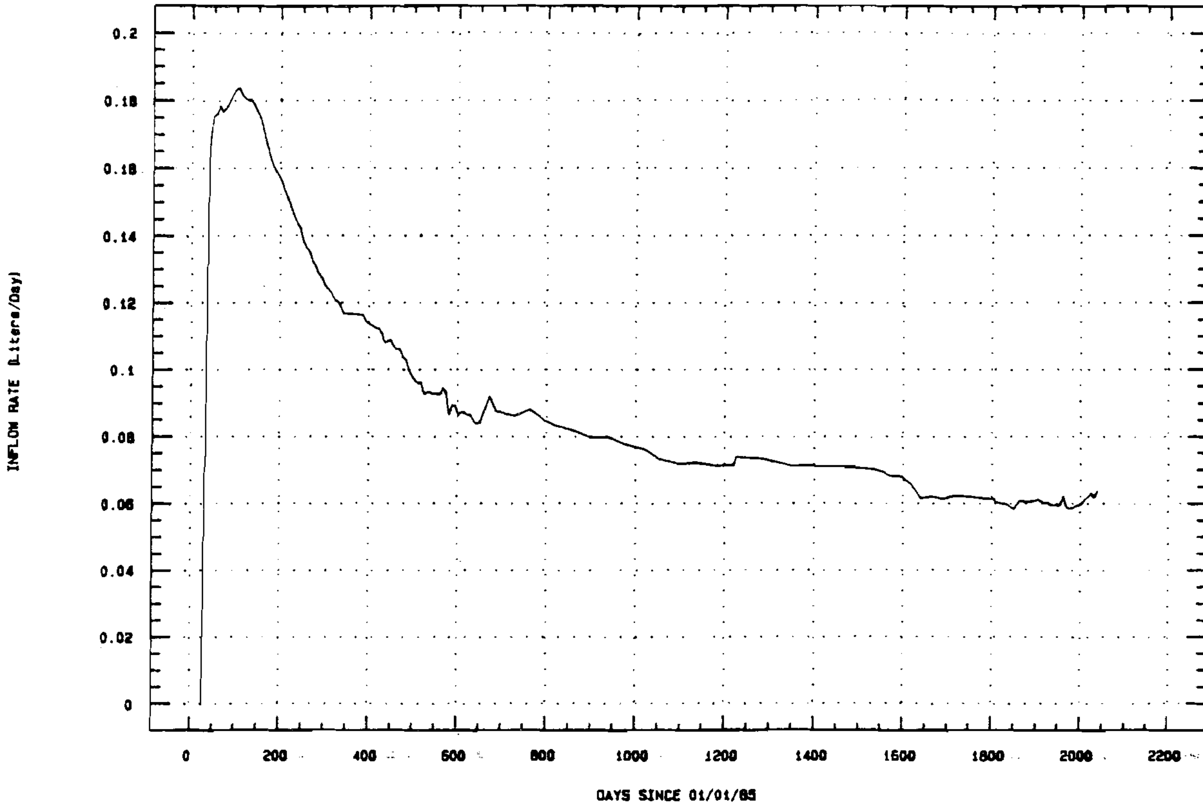


DH42

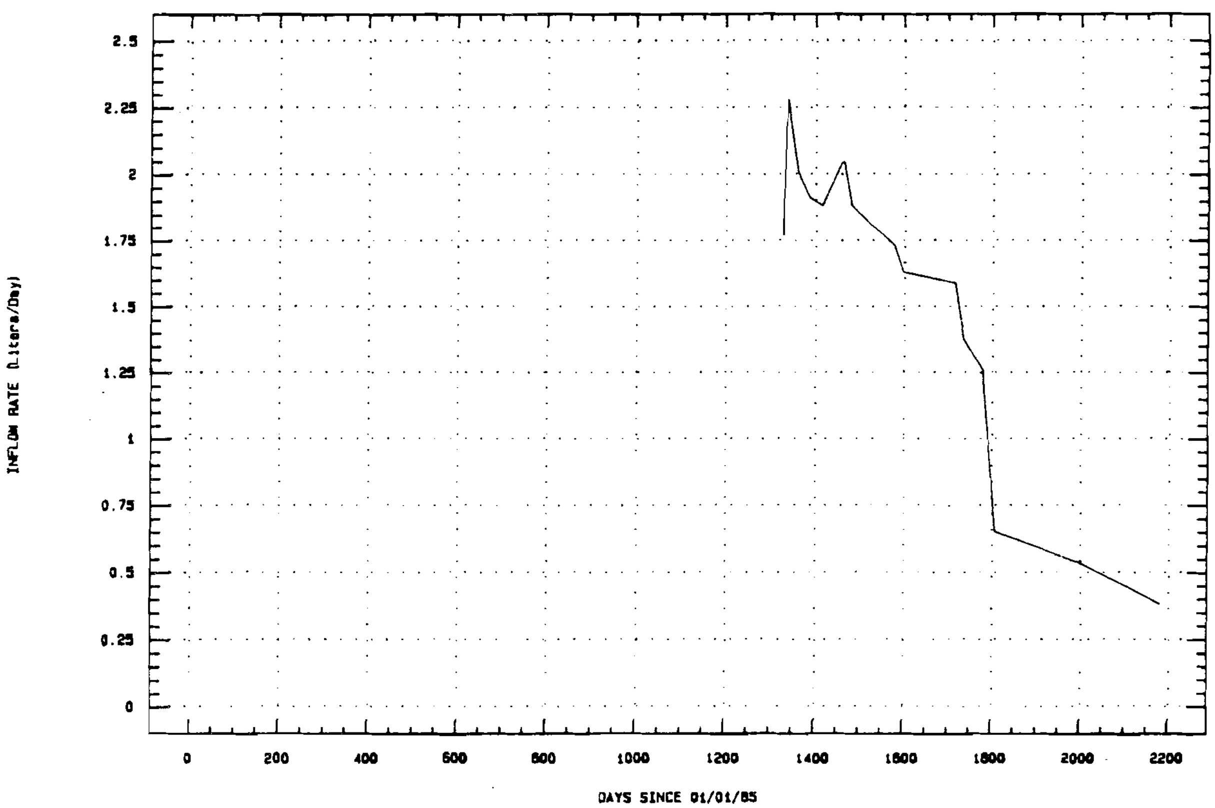


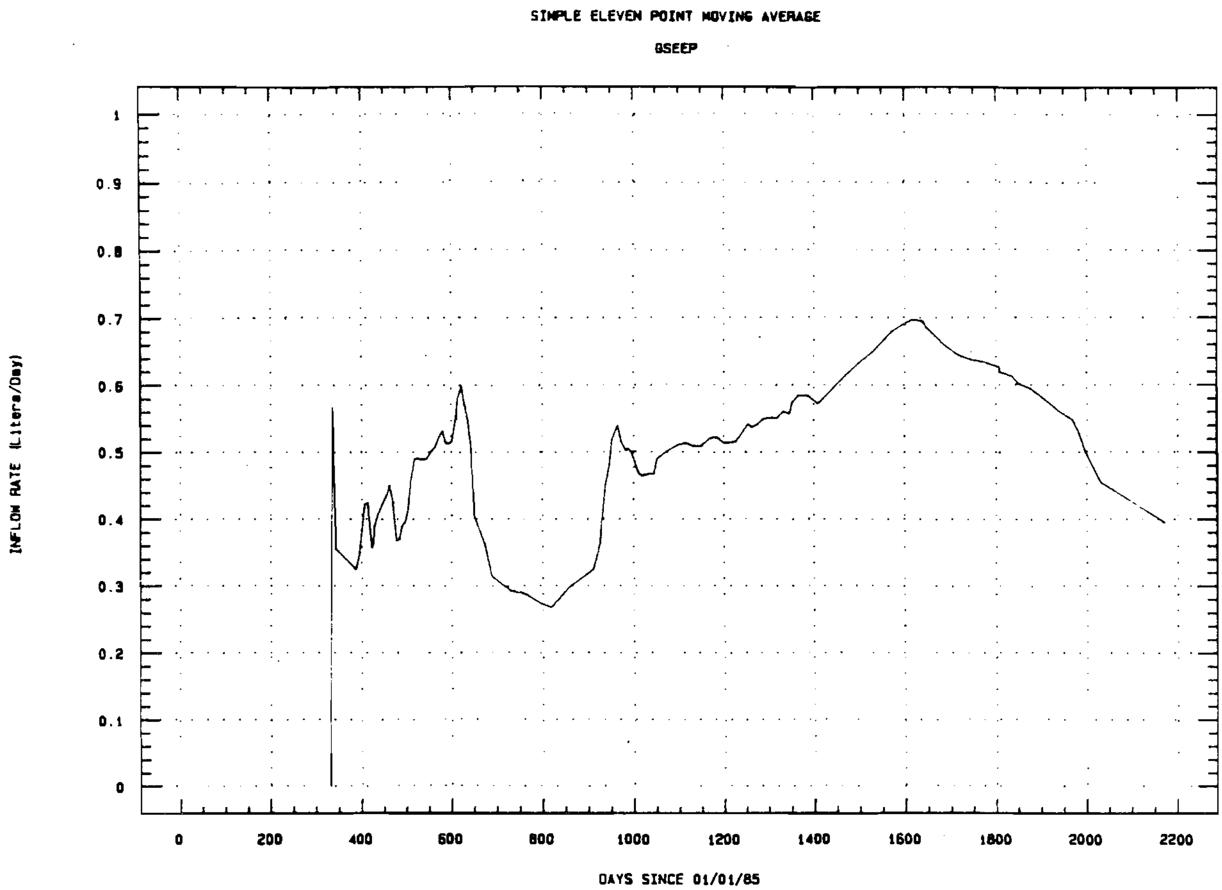
SIMPLE ELEVEN POINT MOVING AVERAGE

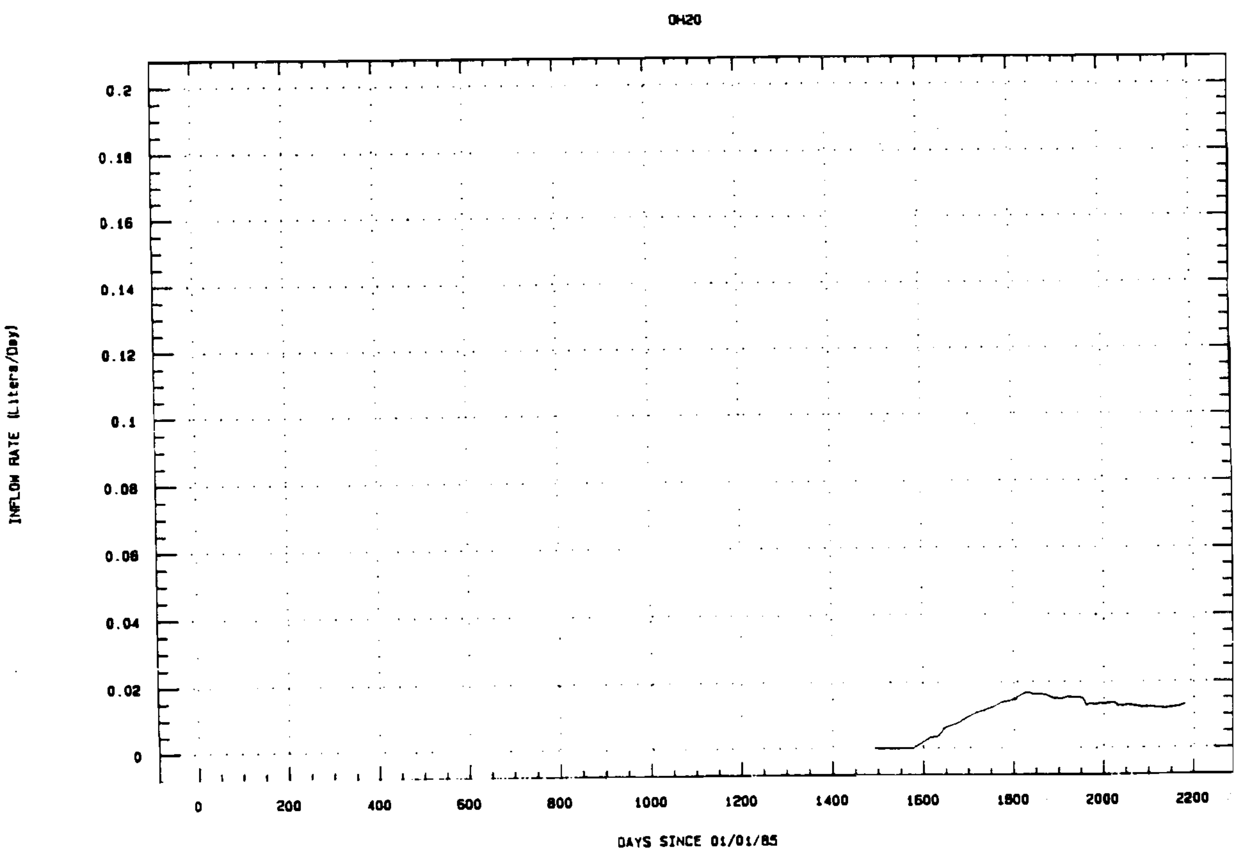
DH42A



DHP402A

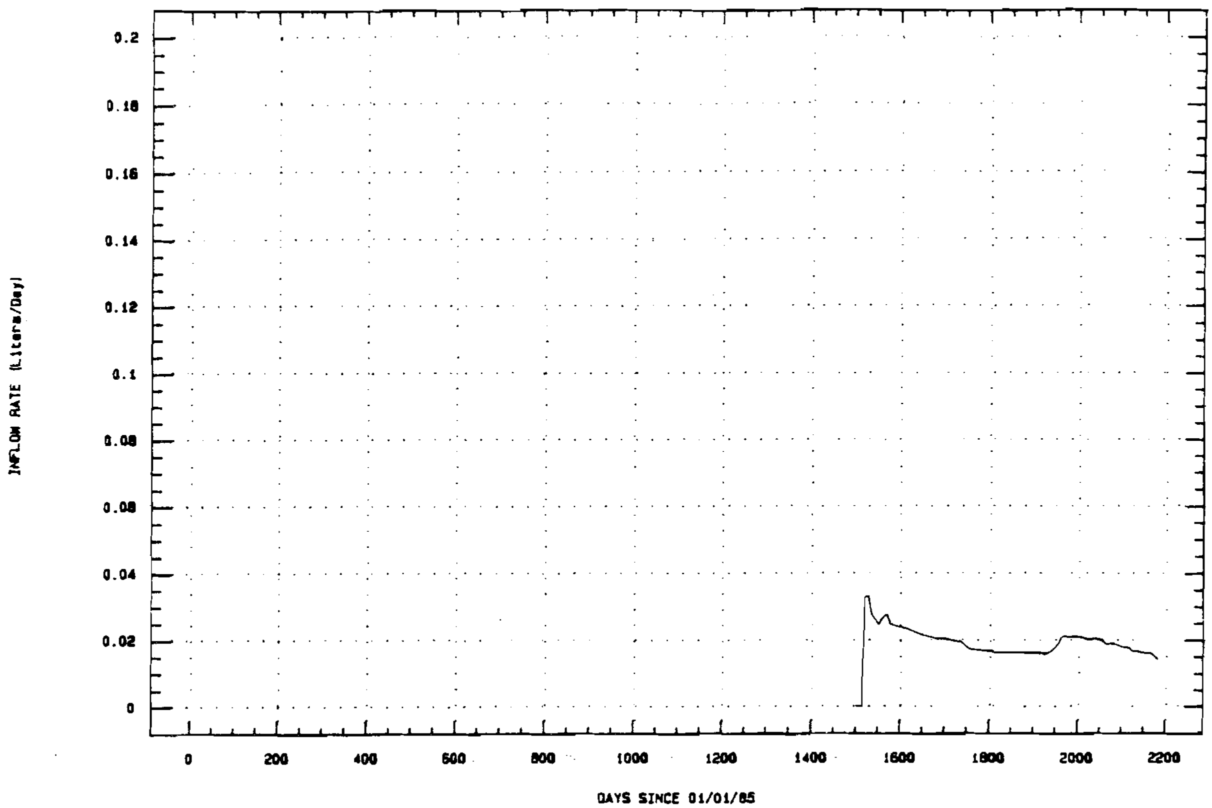



SIMPLE ELEVEN POINT MOVING AVERAGE
BSEEP
INFLOW RATE (Liters/Day)
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
0
200
400
600
800
1000
1200
1400
1600
1800
2000
2200
DAYS SINCE 01/01/85

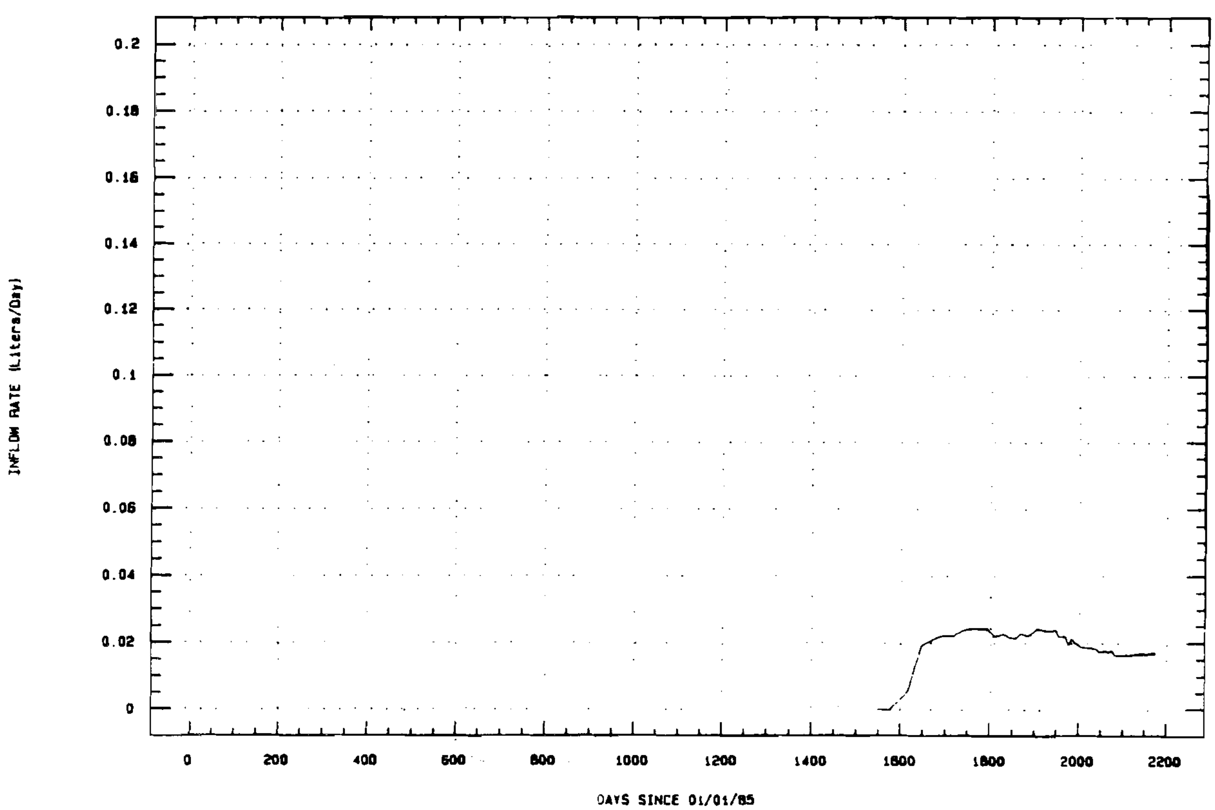

DH20
INFLOW RATE (Liters/Day)
0.2
0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
0
200
400
600
800
1000
1200
1400
1600
1800
2000
2200
DAYS SINCE 01/01/85

SIMPLE ELEVEN POINT MOVING AVERAGE

OH23

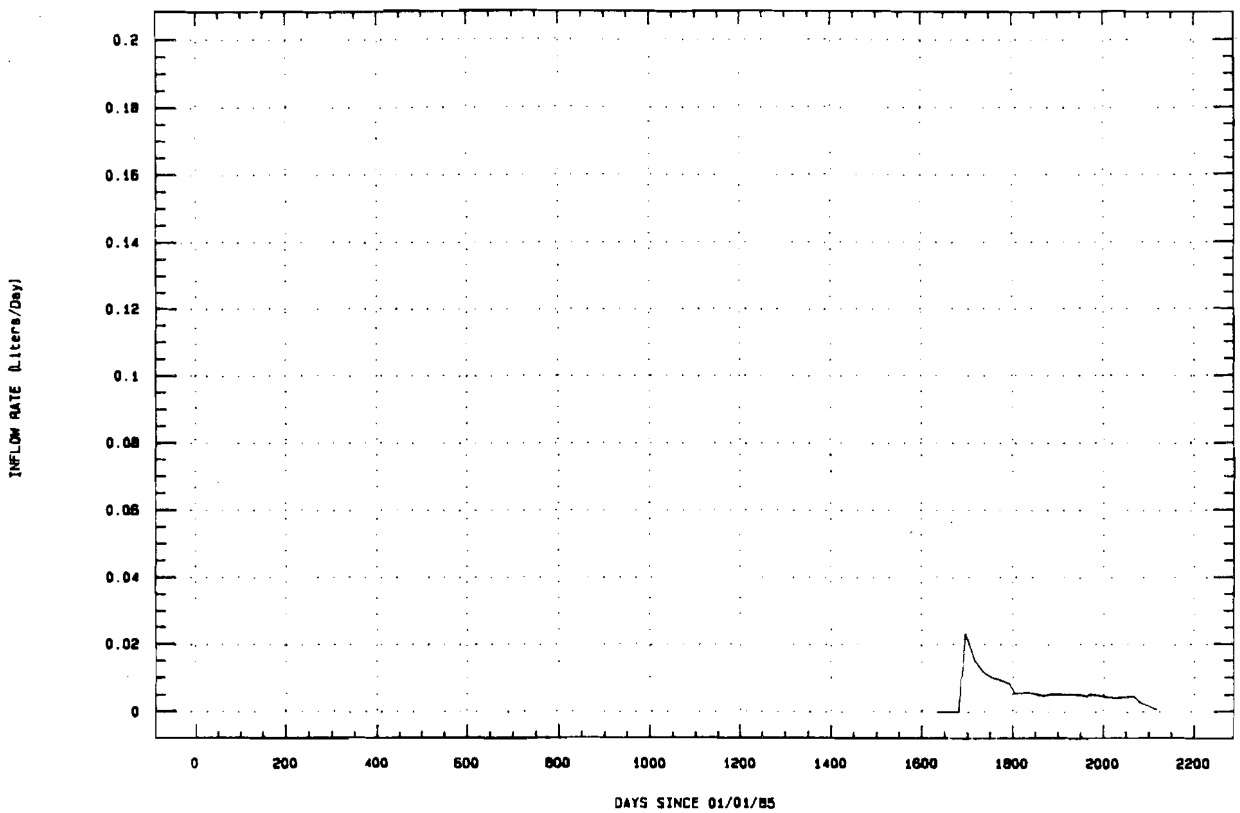


OH26

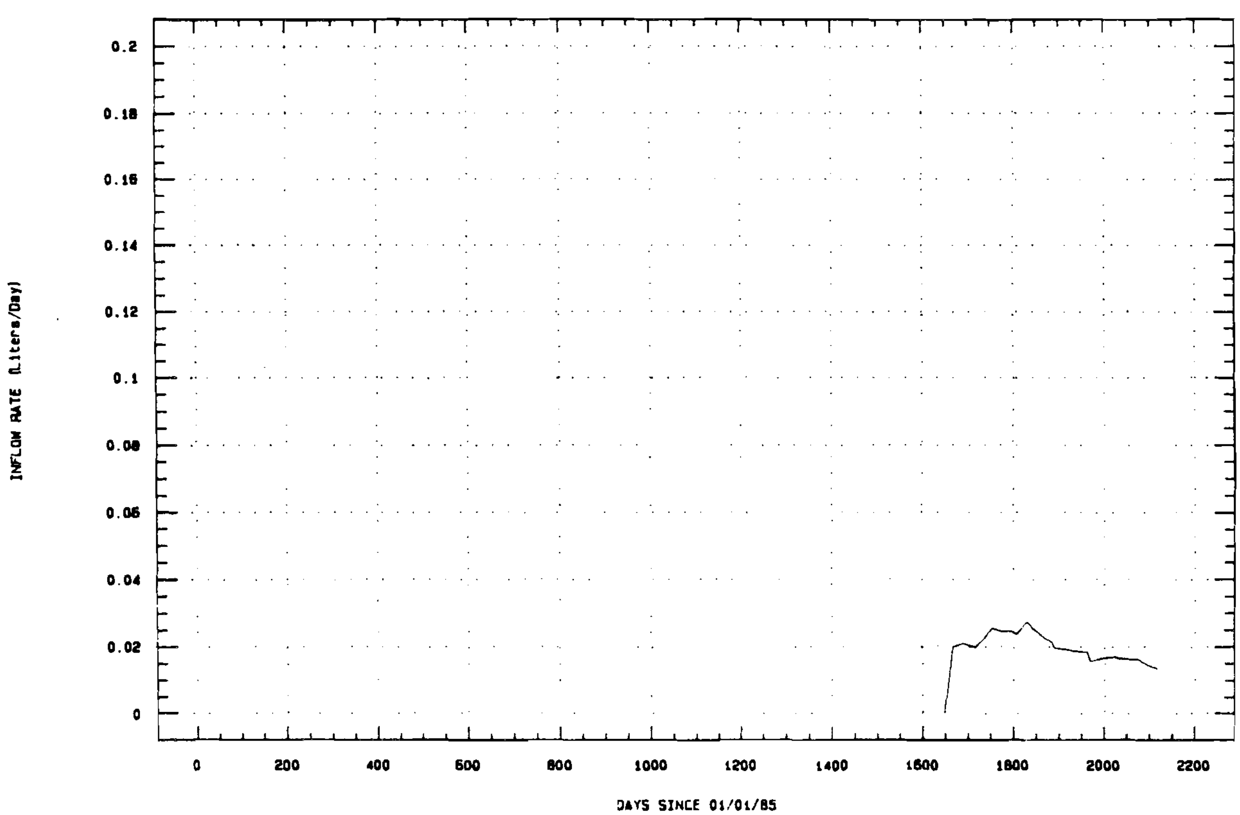


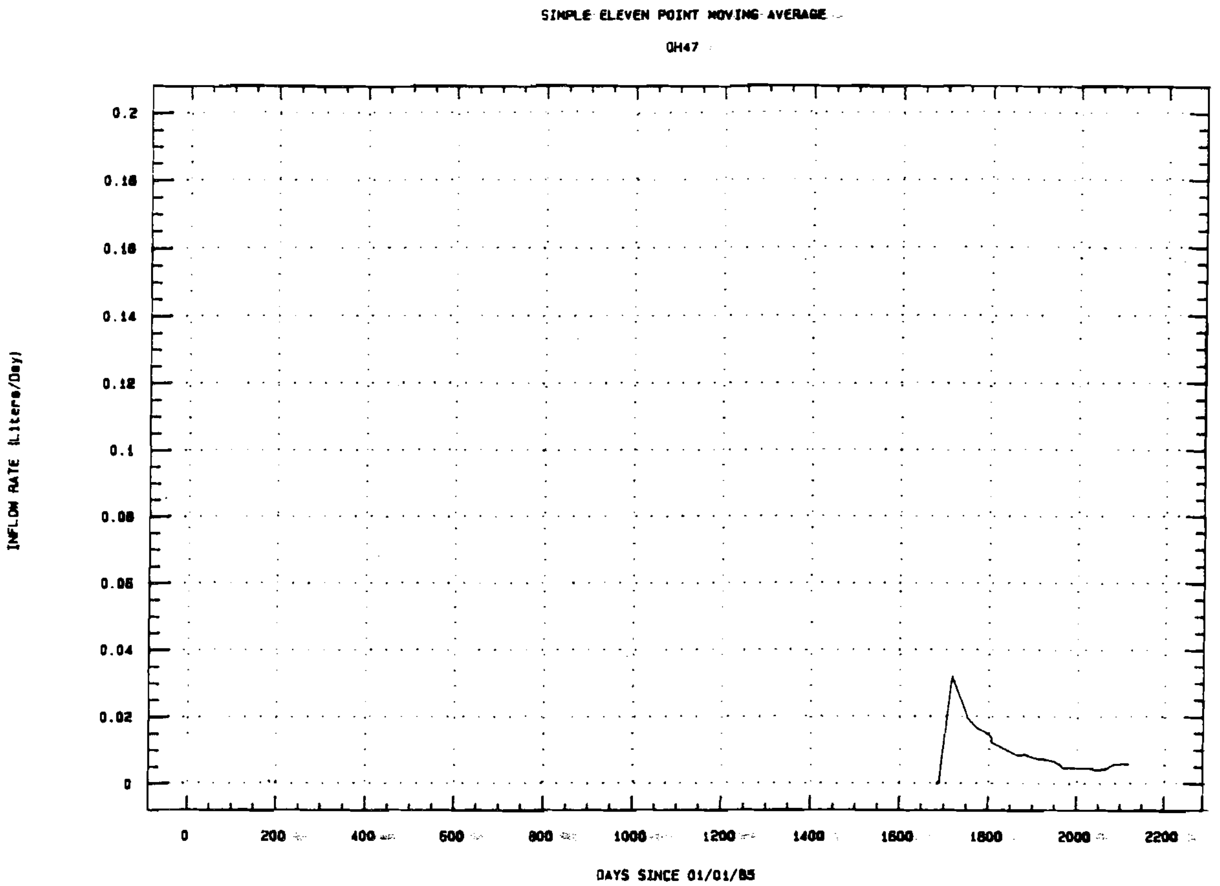
SIMPLE ELEVEN POINT MOVING AVERAGE

OH45



OH46




SIMPLE ELEVEN POINT MOVING AVERAGE
DH47
INFLOW RATE (Liters/Day)
0.2
0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
0
200
400
600
800
1000
1200
1400
1600
1800
2000
2200
DAYS SINCE 01/01/85

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APPENDIX C
1990 ANALYTICAL RESULTS

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TABLE C-1
ANALYTICAL RESULTS

SAMPLE NUMBER	HOLE NUMBER & DIRECTION	LAB	DATE	pH	SG (mg/L)	TDS (mg/L)	EXT ALK[1] (mg/L)	ALK (mg/L)	TIC[2] (mg/L)	TOC[2] (mg/L)	Br (mg/L)	Cl (mg/L)	F (mg/L)	I (mg/L)	NO_3 (mg/L)	NH_4 (mg/L)	P_4 (mg/L)	SO_4
3150	A1X01 DN	UNC	1990-09-20	6.1	1.22	372000	960	--	3.6	5	1480	190000	7	18.5	1.3	135	< 0.1	16600
3151	A1X01 DN	IT	1990-09-20	6.2	1.23	348000	950	--	< 5	--	1500	240000	9	14	0.18	130	--	17300
2086	A1X01 DN	IT	1990-06-22	6.1	1.22	401000	1050	--	< 5	--	1500	200000	7	13	0.18	140	--	16500
2087	A1X01 DN	UNC	1990-06-22	6.1	1.22	382000	1043	--	4.1	25	1530	191000	6	14.7	0.8	179	< 0.1	16900
1170	A1X01 DN	IT	1990-03-21	6.1	1.23	389000	1020	--	< 5	--	2200	186000	9	23	0.35	190	--	18400
1167	A1X01 DN	UNC	1990-03-21	5.7	1.23	412000	844	--	< 2.5	< 5	2160	195000	7	13.7	0.9	154	< 0.1	23300
1166	A1X01 DN	IT	1990-03-21	5.7	1.23	403000	930	--	< 5	--	2900	188000	9	19	0.35	130	--	27700
1173	A1X01 DN	UNC	1990-03-21	6.1	1.23	387000	1022	--	4.1	30	1560	190000	5	14.4	0.7	141	< 0.1	17700
3149	A1X01 DN	UNC	1990-09-20	6.1	1.22	363000	963	--	4.6	15	1480	190000	7	14.0	1.4	136	< 0.1	16700
3293	A1X01 DN	UNC	1990-12-20	6.2	1.22	373000	946	--	4.1	10	1550	198000	7	18.8	1.0	137	< 0.1	17300
3292	A1X01 DN	IT	1990-12-20	6.0	1.23	366000	950	--	< 5	--	1600	201000	8	14	< 0.09	140	--	17100
3291	A1X01 DN	UNC	1990-12-20	6.1	1.22	373000	994	--	3.6	10	1550	198000	7	17.0	0.4	140	< 0.1	17300
3294	A1X02 UP	UNC	1990-12-20	5.7	1.22	380000	811	--	< 2.5	< 5	2090	202000	7	15.5	0.6	146	< 0.1	21400
1168	A1X02 UP	IT	1990-03-21	5.8	1.24	400000	900	--	< 5	--	2900	190000	9	25	0.31	140	--	26000
2085	A1X02 UP	UNC	1990-06-22	5.7	1.23	403000	867	--	2.5	15	2080	189000	6	14.6	0.8	159	< 0.1	21900
3296	A1X02 UP	UNC	1990-12-20	5.7	1.22	388000	817	--	< 2.5	5	2090	202000	7	14.3	0.9	144	< 0.1	21400
3295	A1X02 UP	IT	1990-12-20	5.7	1.24	343000	790	--	< 5	--	2100	200000	3	12	0.09	140	--	18800
3153	A1X02 UP	IT	1990-09-20	5.3	1.25	383000	1180	--	< 5	--	3100	266000	10	15	0.27	170	--	28200
3152	A1X02 UP	UNC	1990-09-20	5.0	1.24	439000	1213	--	< 2.5	15	3180	211000	10	22.2	1.5	171	< 0.1	26200
3300	A2X01 DN	UNC	1990-12-20	6.2	1.21	356000	964	--	9.7	160	1520	194000	7	14.2	0.4	143	< 0.1	16700
2083	A2X01 DN	IT	1990-06-22	6.1	1.22	386000	1010	--	< 5	--	1500	194000	6	13	0.27	140	--	15800
1172	A2X01 DN	IT	1990-03-21	6.1	1.22	393000	1000	--	< 5	--	1700	187000	8	20	0.35	140	--	20400
1171	A2X01 DN	UNC	1990-03-21	6.1	1.22	388000	1137	--	3.6	41	1580	193000	7	14.0	0.8	141	< 0.1	17400
2084	A2X01 DN	UNC	1990-06-22	6.1	1.23	379000	1007	--	5.1	97	1530	187000	6	14.6	0.9	147	< 0.1	16400
3156	A3X01 DN	IT	1990-09-20	6.1	1.21	331000	1000	--	5	--	1500	229000	8	14	0.40	120	--	15800
3289	A3X01 DN	UNC	1990-12-20	6.1	1.22	372000	1019	--	4.6	20	1550	196000	8	15.1	0.9	139	< 0.1	17000
1175	A3X01 DN	IT	1990-03-21	6.1	1.22	386000	1010	--	< 5	--	2500	186000	9	28	0.62	150	--	21200
3290	A3X01 DN	IT	1990-12-20	5.9	1.23	352000	990	--	< 5	--	1600	192000	10	14	0.13	140	--	17200
1174	A3X01 DN	UNC	1990-03-21	6.1	1.22	391000	1008	--	4.6	25	1530	194000	7	14.5	0.9	139	< 0.1	17200
3154	A3X01 DN	UNC	1990-09-20	6.2	1.21	351000	986	--	6.6	25	1430	182000	8	31.2	1.8	127	< 0.1	15600
2082	A3X01 DN	UNC	1990-06-22	6.2	1.22	378000	1065	--	5.6	132	1500	189000	6	14.9	1.0	180	< 0.1	16400
1062	AIS CLBRA	UNC	1990-03-03	8.1	1.04	48000	113	--	72.6	10	28	20600	0.7	0.2	0.1	0.34	< 0.1	8230
3147	BX01 DN	UNC	1990-09-20	6.1	1.22	375000	885	--	3.6	25	1450	192000	7	15.8	1.3	134	< 0.1	16300
2081	BX01 DN	UNC	1990-06-22	6.1	1.23	386000	909	--	3.6	51	1460	189000	5	14.8	0.7	142	< 0.1	16100

[1] Extended alkalinity measured to an endpoint pH of 2.5 and reported as equivalent bicarbonate (HCO_3^-).
[2] TIC and TOC reported as equivalent bicarbonate.

TABLE C-1
ANALYTICAL RESULTS
(Continued)

SAMPLE NUMBER	HOLE NUMBER & DIRECTION	LAB	DATE	Al (mg/L)	As (mg/L)	B (mg/L)	Ba (mg/L)	Ca (mg/L)	Cs (mg/L)	Fe (mg/L)	K (mg/L)	Mg (mg/L)	Mn (mg/L)	Na (mg/L)	Rb (mg/L)	Si (mg/L)	Sr (mg/L)	Charge Balance
3150	A1X01 DN	UNC	1990-09-20	0.074	0.002	1470	0.032	234	0.345	< 0.5	15000	21900	1.49	73800	16.5	0.91	1.64	-2.98
3151	A1X01 DN	IT	1990-09-20	--	--	1500	--	270	--	< 3	16800	25000	2.4	73700	--	0.51	2.0	-11.3
2086	A1X01 DN	IT	1990-06-22	--	--	1400	--	270	--	< 3	16800	23100	2.2	87200	--	0.6	1.8	0.95
2087	A1X01 DN	UNC	1990-06-22	0.052	< 0.001	1420	0.065	233	0.381	< 0.5	15100	23100	1.5	77600	16.4	1.01	1.52	-0.89
1170	A1X01 DN	IT	1990-03-21	--	--	1400	--	270	--	< 3	16500	22900	2.2	80500	--	0.6	2.1	1.28
1167	A1X01 DN	UNC	1990-03-21	0.059	0.001	1540	0.018	256	0.376	< 0.5	15400	24500	1.51	83000	16.8	1.26	1.7	0.05
1166	A1X01 DN	IT	1990-03-21	--	--	1400	--	270	--	< 3	16800	24800	2.7	79100	--	0.5	3.6	-0.06
1173	A1X01 DN	UNC	1990-03-21	0.057	< 0.001	1720	0.018	267	0.393	< 0.5	16000	24500	1.6	83000	17.2	1.55	1.72	2.40
3149	A1X01 DN	UNC	1990-09-20	0.069	0.002	1480	0.036	234	0.323	< 0.5	14600	21700	1.49	76700	16.4	0.87	1.63	-2.09
3293	A1X01 DN	UNC	1990-12-20	< 0.05	0.001	1620	0.036	225	0.375	< 0.5	16200	23200	1.67	77800	14.6	1.02	1.78	-2.24
3292	A1X01 DN	IT	1990-12-20	--	--	1400	--	250	--	< 3	16400	22200	2.4	75800	--	0.5	2.9	-4.36
3291	A1X01 DN	UNC	1990-12-20	0.065	0.001	1600	0.067	224	0.376	< 0.5	16300	23400	1.68	78100	14.8	1.09	1.79	-1.97
3294	A1X02 UP	UNC	1990-12-20	0.065	0.013	1600	0.044	228	0.362	< 0.5	15200	32600	4.58	64400	17.1	0.91	5.99	-2.49
1168	A1X02 UP	IT	1990-03-21	--	--	1700	--	250	--	< 3	17600	38900	5.6	55500	--	0.4	7.1	1.04
2085	A1X02 UP	UNC	1990-06-22	0.104	0.008	1490	0.039	236	0.403	< 0.5	14400	33600	4.59	62400	20.7	0.99	5.79	0.26
3296	A1X02 UP	UNC	1990-12-20	0.063	0.012	1620	0.079	230	0.372	< 0.5	15600	32300	4.63	64000	17.3	1.00	6.06	-2.76
3295	A1X02 UP	IT	1990-12-20	--	--	1700	--	210	--	< 3	15000	24400	7.2	58000	--	0.5	9.1	-10.4
3153	A1X02 UP	IT	1990-09-20	--	--	2400	--	250	--	< 3	18800	56200	8.0	40900	--	0.56	4.5	-8.33
3152	A1X02 UP	UNC	1990-09-20	0.188	0.012	2530	0.04	198	0.406	< 0.5	15800	48300	4.84	41100	22.8	1.08	4.21	-3.00
3300	A2X01 DN	UNC	1990-12-20	< 0.05	< 0.001	1430	0.152	223	0.348	< 0.5	15700	22000	1.76	73900	14.5	0.72	0.93	-3.70
2083	A2X01 DN	IT	1990-06-22	--	--	1400	--	270	--	< 3	16700	23300	2.4	83200	--	0.3	0.7	1.18
1172	A2X01 DN	IT	1990-03-21	--	--	1400	--	270	--	< 3	16500	23100	2.3	78000	--	< 0.2	1.9	-0.08
1171	A2X01 DN	UNC	1990-03-21	0.139	< 0.001	1620	0.031	263	0.399	3.03	16000	25500	1.85	80000	17.4	1.17	0.95	1.31
2084	A2X01 DN	UNC	1990-06-22	< 0.5	< 0.001	1370	0.101	233	0.384	3.17	14900	23200	1.68	75400	16.3	0.69	0.59	-0.63
3156	A3X01 DN	IT	1990-09-20	--	--	1300	--	250	--	< 3	14600	22300	1.9	62800	--	0.75	1.5	-15.9
3289	A3X01 DN	UNC	1990-12-20	< 0.05	0.001	1550	0.062	235	0.374	< 0.5	15900	23300	1.41	75900	15	1.65	2.08	-2.44
1175	A3X01 DN	IT	1990-03-21	--	--	1400	--	280	--	< 3	15800	22500	2.0	80700	--	0.6	2.3	0.37
3290	A3X01 DN	IT	1990-12-20	--	--	1400	--	260	--	< 3	15600	22200	2.2	73300	--	0.8	3.4	-3.42
1174	A3X01 DN	UNC	1990-03-21	0.07	0.001	1650	0.020	271	0.392	< 0.5	15200	24400	1.36	82000	17	1.35	2.2	0.93
3154	A3X01 DN	UNC	1990-09-20	< 0.05	0.001	1710	0.069	237	0.318	< 0.5	14100	21300	1.27	69600	15.8	1.28	1.31	-3.20
2082	A3X01 DN	UNC	1990-06-22	0.096	< 0.001	1410	0.047	249	0.381	< 0.5	15000	22900	1.38	76600	15.7	1.79	1.68	-0.86
1062	AIS CLBRA	UNC	1990-03-03	< 0.05	< 0.001	35	0.027	822	--	0.51	376	568	< 0.5	15800	--	3.84	10.72	1.95
3147	BX01 DN	UNC	1990-09-20	0.089	0.001	1370	0.075	248	0.303	< 0.5	14900	21300	1.15	77100	16	0.84	1.79	-2.56
2081	BX01 DN	UNC	1990-06-22	< 0.05	0.001	1460	0.071	257	0.362	< 0.5	14500	22200	1.24	78800	15.9	0.89	2.01	-0.55

TABLE C-1
ANALYTICAL RESULTS
(Continued)

SAMPLE NUMBER	HOLE NUMBER & DIRECTION	LAB	DATE	pH	SG	TDS (mg/L)	EXT ALK[1] (mg/L)	ALK (mg/L)	TIC[2] (mg/L)	TOC[2] (mg/L)	Br (mg/L)	Cl (mg/L)	F (mg/L)	I (mg/L)	NO_3 (mg/L)	NH_4 (mg/L)	P_4 (mg/L)	SO_4 (mg/L)
2080	BX01 DN	IT	1990-06-22	6.1	1.22	394000	900	--	< 5	--	1400	199000	8	14	0.18	140	--	15800
3297	BX01 DN	UNC	1990-12-20	6.1	1.21	361000	909	--	4.6	15	1510	198000	7	15.0	0.7	136	< 0.1	17000
3148	BX01 DN	IT	1990-09-20	6.2	1.22	342000	880	--	< 5	--	1400	240000	9	13	0.18	110	--	17100
3298	BX01 DN	IT	1990-12-20	6.0	1.23	376000	860	--	< 5	--	1500	191000	8	14	0.13	130	--	16100
1165	BX01 DN	IT	1990-03-21	6.3	1.20	330000	740	--	< 5	--	2100	160000	7	21	0.27	121	--	16800
3299	BX01 DN	UNC	1990-12-20	6.1	1.22	364000	897	--	3.6	20	1480	194000	7	14.9	0.9	142	< 0.1	16700
3146	BX01 DN	UNC	1990-09-20	6.1	1.22	368000	875	--	3.6	25	1450	192000	7	16.6	1.2	130	< 0.1	16300
1124	DH28 DN	UNC	1990-03-21	6.1	1.23	386000	921	--	7.6	310	1590	190000	4	15.7	3.9	148	1.1	16500
1125	DH30 DN	UNC	1990-03-21	6.1	1.23	387000	882	--	3.0	15	1570	190000	4	21.0	1.8	150	< 0.1	16500
1127	DH32 DN	UNC	1990-03-21	6.1	1.22	374000	831	--	5.1	10	1530	188000	4	16.3	12	150	< 0.1	16100
1128	DH32 DN	UNC	1990-03-21	6.1	1.22	374000	808	--	4.1	10	1520	189000	4	17.2	0.6	155	< 0.1	16100
3004	DH36 DN	IT	1990-06-22	6.1	1.23	393000	870	--	< 5	--	1400	196000	4	15	0.27	150	--	15200
3005	DH36 DN	UNC	1990-06-22	6.1	1.22	386000	866	--	3.0	25	1470	189000	6	16.9	0.8	185	< 0.1	15600
1178	DH36 DN	UNC	1990-03-21	6.1	1.22	381000	852	--	4.1	10	1490	191000	3	16.9	1.0	155	< 0.1	16600
1123	DH36 DN	UNC	1990-03-21	6.1	1.22	378000	874	--	8.1	20	1570	188000	4	17.0	3.5	151	< 0.1	16600
3140	DH36 DN	IT	1990-09-20	6.2	1.22	361000	830	--	< 5	--	1500	249000	6	15	0.18	120	--	15300
3139	DH36 DN	UNC	1990-09-20	6.0	1.23	377000	852	--	4.1	15	1480	197000	5	16.6	1.3	161	< 0.1	16000
3138	DH36a DN	IT	1990-09-20	6.0	1.23	356000	850	--	< 5	--	1400	250000	7	15	0.18	120	--	15500
3137	DH36a DN	UNC	1990-09-20	6.1	1.23	385000	852	--	3.6	25	1470	198000	5	16.3	1.5	153	< 0.1	16200
1154	DH38 DN	UNC	1990-03-21	6.2	1.23	383000	1011	--	6.1	20	1470	191000	4	19.9	0.9	153	0.2	16100
3144	DH38 DN	UNC	1990-09-20	6.3	1.22	372000	1088	--	7.1	25	1430	195000	5	18.3	1.1	158	< 0.1	15600
1156	DH38 DN	IT	1990-03-21	6.2	1.23	397000	990	--	5	--	2200	189000	5	19	0.44	170	--	16300
3281	DH38 DN	UNC	1990-12-20	6.1	1.21	375000	850	--	5.6	20	1490	198000	5	17.6	0.7	156	< 0.1	16300
3145	DH38 DN	IT	1990-09-20	6.2	1.23	354000	1110	--	8	--	1300	244000	4	16	0.18	130	--	15800
2097	DH38 DN	UNC	1990-06-22	6.2	1.22	383000	1017	--	5.6	56	1440	188000	6	16.8	0.7	168	< 0.1	15300
2096	DH38 DN	IT	1990-06-22	6.2	1.22	392000	990	--	< 5	--	1400	197000	6	17	0.27	150	--	16500
1157	DH38 DN	UNC	1990-03-21	6.2	1.22	380000	1000	--	5.6	15	1450	193000	4	19.7	0.8	153	0.1	16100
3287	DH38a DN	UNC	1990-12-20	6.2	1.22	368000	872	--	3.6	20	1480	198000	5	17.4	0.7	156	0.1	16100
3288	DH38a DN	IT	1990-12-20	6.1	1.23	384000	840	--	< 5	--	1500	208000	< 2	15	0.09	150	--	16300
3301	DH40 DN	UNC	1990-12-20	6.4	1.21	363000	1315	--	10	190	1550	194000	5	16.1	2.3	163	0.6	16100
1153	DH40 DN	UNC	1990-03-21	6.3	1.23	382000	1275	--	7.1	51	1570	191000	4	18.0	1.3	160	0.4	16300
3165	DH42 DN	UNC	1990-09-20	6.2	1.22	371000	924	--	4.6	30	1430	193000	5	17.4	1.4	136	< 0.1	15400
2098	DH42 DN	IT	1990-06-22	6.2	1.23	393000	960	--	< 5	--	1400	196000	7	16	0.53	170	--	14400
1151	DH42 DN	IT	1990-03-21	6.3	1.23	391000	960	--	< 5	--	1900	186000	6	20	0.75	180	--	15800

[1] Extended alkalinity measured to an endpoint pH of 2.5 and reported as equivalent bicarbonate (HCO_3^-).
[2] TIC and TOC reported as equivalent bicarbonate.

TABLE C-1
ANALYTICAL RESULTS
(Continued)

SAMPLE NUMBER	HOLE NUMBER & DIRECTION		LAB	DATE	Al (mg/L)	As (mg/L)	B (mg/L)	Ba (mg/L)	Ca (mg/L)	Cs (mg/L)	Fe (mg/L)	K (mg/L)	Mg (mg/L)	Mn (mg/L)	Na (mg/L)	Rb (mg/L)	Si (mg/L)	Sr (mg/L)	Charge Balance
2080	BX01	DN	IT	1990-06-22	--	--	1400	--	290	--	< 3	16900	22100	1.9	89800	--	0.5	2.5	1.61
3297	BX01	DN	UNC	1990-12-20	< 0.05	0.001	1650	0.061	240	0.346	< 0.5	16900	22200	1.21	78500	14.4	0.96	1.88	-2.47
3148	BX01	DN	IT	1990-09-20	--	--	1500	--	290	--	< 3	16300	22800	2.0	74000	--	0.47	0.9	-12.9
3298	BX01	DN	IT	1990-12-20	--	--	1600	--	220	--	< 3	16100	17000	2.3	71600	--	0.5	3.2	-7.67
1165	BX01	DN	IT	1990-03-21	--	--	1400	--	290	--	< 3	17000	22500	1.9	81200	--	0.5	3.1	8.67
3299	BX01	DN	UNC	1990-12-20	< 0.05	0.001	1460	0.047	237	0.346	< 0.5	16100	21600	1.26	77800	14.4	1.03	1.88	-2.35
3146	BX01	DN	UNC	1990-09-20	< 0.05	0.001	1430	0.073	251	0.306	< 0.5	14000	21300	1.17	78400	16.2	0.72	1.82	-2.25
1124	DH28	DN	UNC	1990-03-21	1.9	0.003	1520	0.061	340	0.289	1.39	16700	20800	2.05	85000	--	2.87	1.85	0.99
1125	DH30	DN	UNC	1990-03-21	0.644	0.004	1590	0.027	294	0.291	0.55	17600	20600	1.21	86000	--	1.73	2.21	1.40
1127	DH32	DN	UNC	1990-03-21	0.11	0.002	1590	0.026	302	0.283	< 0.5	18100	20600	0.91	88200	--	1.64	2.4	2.89
1128	DH32	DN	UNC	1990-03-21	0.116	0.002	1590	0.025	302	0.286	< 0.5	17500	20500	0.93	91000	--	1.57	2.41	3.46
3004	DH36	DN	IT	1990-06-22	--	--	1400	--	330	--	< 3	18500	18100	1.5	93300	--	0.9	1.8	1.34
3005	DH36	DN	UNC	1990-06-22	0.57	0.008	1430	0.029	307	0.284	< 0.5	16200	18400	0.97	82700	14.7	1.87	1.39	-1.32
1178	DH36	DN	UNC	1990-03-21	< 0.05	0.009	1670	0.026	319	0.281	< 0.5	17500	19300	0.98	89000	15.3	2.03	1.34	1.34
1123	DH36	DN	UNC	1990-03-21	1.1	0.004	1580	0.029	294	0.302	0.85	18000	20600	1.2	86000	--	2.37	2.2	1.97
3140	DH36	DN	IT	1990-09-20			1400	--	320	--	< 3	17600	18700	1.4	75700	--	0.89	1.5	-16.4
3139	DH36	DN	UNC	1990-09-20	0.061	0.01	1490	0.082	306	0.241	< 0.5	16800	18000	0.91	85300	14.9	1.6	1.31	-2.48
3138	DH36a	DN	IT	1990-09-20	--	--	1500	--	320	--	< 3	19300	20100	1.4	86300	--	0.89	1.4	-11.2
3137	DH36a	DN	UNC	1990-09-20	0.075	0.011	1500	0.033	307	0.241	< 0.5	17000	18500	0.91	91300	15	1.63	1.33	-0.10
1154	DH38	DN	UNC	1990-03-21	0.056	0.002	1590	0.021	315	0.273	< 0.5	17300	18700	1.02	89000	15.4	2	0.8	0.95
3144	DH38	DN	UNC	1990-09-20	0.107	0.005	1470	0.095	291	0.216	< 0.5	17200	17100	0.93	85600	14.2	1.43	0.82	-2.42
1156	DH38	DN	IT	1990-03-21	--	--	1400	--	330	--	< 3	18400	18000	1.5	86000	--	0.8	1.2	-0.05
3281	DH38	DN	UNC	1990-12-20	< 0.05	0.013	1570	0.06	290	0.275	< 0.5	18300	18200	0.99	82200	13.4	< 1.82	1.34	-3.49
3145	DH38	DN	IT	1990-09-20	--	--	1400	--	300	--	< 3	17400	18000	1.3	75500	--	0.75	0.8	-16.2
2097	DH38	DN	UNC	1990-06-22	< 0.05	< 0.001	1440	0.022	303	0.282	< 0.5	16900	18100	0.89	83600	14.5	1.85	0.76	-0.75
2096	DH38	DN	IT	1990-06-22	--	--	1400	--	330	--	< 3	18600	17800	1.4	100000	--	0.9	1.0	3.04
1157	DH38	DN	UNC	1990-03-21	0.437	0.003	1570	0.022	322	0.268	< 0.5	17600	18800	0.99	89000	14.9	2.35	0.83	0.60
3287	DH38a	DN	UNC	1990-12-20	< 0.05	0.014	1580	0.056	286	0.275	< 0.5	18000	18500	0.95	83900	13.3	2.05	1.36	-2.65
3288	DH38a	DN	IT	1990-12-20	--	--	1500	--	290	--	< 3	18300	16000	1.5	80400	--	1.0	2.4	-8.18
3301	DH40	DN	UNC	1990-12-20	0.067	< 0.001	1500	0.171	291	0.256	< 0.5	18100	18000	1.12	79700	12.7	3.40	0.54	-3.76
1153	DH40	DN	UNC	1990-03-21	0.116	0.002	1660	0.049	341	0.256	< 0.5	17500	19200	1.18	87000	15.3	3.16	0.71	0.52
2099	DH42	DN	UNC	1990-06-22	< 0.05	0.003	1440	0.023	294	0.264	< 0.5	17200	17600	1.03	85300	14.1	1.98	0.74	0.12
3165	DH42	DN	UNC	1990-09-20	< 0.05	< 0.001	1420	0.032	296	0.234	< 0.5	15600	17600	0.79	85800	14.6	1.26	0.76	-1.79
2098	DH42	DN	IT	1990-06-22	--	--	1400	--	330	--	< 3	18900	17300	1.6	93500	--	1.0	1.0	1.08
1151	DH42	DN	IT	1990-03-21	--	--	1400	--	350	--	< 3	18100	17000	1.6	84400	--	0.7	1.5	-0.58

TABLE C-1
ANALYTICAL RESULTS
(Continued)

SAMPLE NUMBER	HOLE NUMBER & DIRECTION	LAB	DATE	pH	SG	TDS (mg/L)	EXT ALK[1] (mg/L)	ALK (mg/L)	TIC[2] (mg/L)	TOC[2] (mg/L)	Br (mg/L)	Cl (mg/L)	F (mg/L)	I (mg/L)	NO_3 (mg/L)	NH_4 (mg/L)	P_4 (mg/L)	SO_4 (mg/L)
1150	DH42 DN	UNC	1990-03-21	6.3	1.22	372000	947	--	6.1	15	1440	189000	4	16.4	0.9	163	< 0.1	15600
3143	DH42A DN	IT	1990-09-20	6.2	1.22	345000	940	--	5	--	1400	252000	5	16	0.13	140	--	16700
3142	DH42A DN	UNC	1990-09-20	6.2	1.22	382000	958	--	6.6	5	1440	197000	5	17.7	1.2	157	< 0.1	15600
1142	DH42A DN	UNC	1990-03-21	6.2	1.22	378000	902	--	5.6	10	1460	189000	4	16.5	0.8	168	0.2	15700
3141	DH42A DN	UNC	1990-09-20	6.2	1.23	376000	954	--	6.6	< 5	1440	197000	5	17.3	1.4	160	< 0.1	15600
3000	DH42A DN	IT	1990-06-22	6.2	1.22	390000	930	--	< 5	--	1400	202000	6	17	0.22	180	--	15000
1140	DH42A DN	UNC	1990-03-21	6.1	1.22	381000	900	--	2.5	10	1470	188000	4	19.2	1.2	163	< 0.1	15900
1143	DH42A DN	IT	1990-03-21	6.3	1.22	384000	890	--	< 5	--	2200	190000	5	16	0.31	190	--	15700
1147	DH42A DN	IT	1990-03-21	6.3	1.23	392000	900	--	< 5	--	2300	188000	5	19	0.71	180	--	15800
3003	DH42A DN	UNC	1990-06-22	6.2	1.22	385000	932	--	4.6	25	1430	188000	6	15.9	0.6	183	< 0.1	15200
3002	DH42A DN	UNC	1990-06-22	6.2	1.22	383000	927	--	4.6	20	1420	188000	6	6.7	0.7	163	< 0.1	15200
3001	DH42A DN	IT	1990-06-22	6.2	1.22	386000	930	--	5	--	1400	199000	5	18	0.22	150	--	14600
1146	DHP402A DN	UNC	1990-03-21	6.0	1.22	386000	736	--	5.6	10	1580	190000	6	12.8	0.8	126	< 0.1	17900
3008	DHP402A DN	UNC	1990-06-22	6.0	1.22	392000	775	--	5.1	15	1550	191000	5	13.3	0.5	164	< 0.1	17200
3280	DHP402A DN	IT	1990-12-20	6.0	1.23	354000	730	--	5	--	1600	210000	8	13	0.13	140	--	16100
1138	DHP402A DN	UNC	1990-03-21	6.0	1.22	387000	775	--	5.6	5	1600	192000	6	13.0	1.2	130	< 0.1	18000
1132	DHP402A DN	UNC	1990-03-21	6.0	1.22	389000	756	--	6.1	15	1610	188000	6	13.2	0.6	135	< 0.1	18100
3009	DHP402A DN	UNC	1990-06-22	6.0	1.22	391000	772	--	5.1	15	1550	188000	5	13.2	0.8	130	< 0.1	17200
3006	DHP402A DN	IT	1990-06-22	6.0	1.22	382000	770	--	< 5	--	1500	199000	7	13	0.13	140	--	16900
3007	DHP402A DN	IT	1990-06-22	6.0	1.22	384000	760	--	< 5	--	1500	199000	6	11	0.13	150	--	16700
3282	DHP402A DN	IT	1990-12-20	6.0	1.23	364000	820	--	10	--	1500	203000	4	16	< 0.09	180	--	16500
3279	DHP402A DN	UNC	1990-12-20	6.0	1.21	374000	775	--	4.6	10	1560	199000	7	13.4	0.4	129	< 0.1	17500
3010	DHP402Aa DN	IT	1990-06-22	6.0	1.22	382000	740	--	< 5	--	1500	199000	6	12	0.13	220	--	17100
3011	DHP402Aa DN	IT	1990-06-22	6.0	1.22	388000	740	--	< 5	--	1500	198000	6	12	0.13	140	--	15900
3013	DHP402Aa DN	UNC	1990-06-22	6.0	1.22	374000	744	--	4.6	15	1530	190000	4	13.3	0.6	177	< 0.1	17100
3285	DHP402Aa DN	UNC	1990-12-20	6.0	1.22	374000	726	--	5.1	15	1560	199000	6	13.4	0.5	121	< 0.1	17800
3286	DHP402Aa DN	IT	1990-12-20	6.0	1.23	344000	710	--	< 5	--	1700	205000	8	13	< 0.09	150	--	15100
3012	DHP402Aa DN	UNC	1990-06-22	6.0	1.22	388000	744	--	4.1	15	1520	188000	3	12.9	2.1	123	< 0.1	17000
3133	DHP402Aa DN	UNC	1990-09-20	5.9	1.22	383000	745	--	3.0	10	1520	198000	7	12.8	1.2	131	< 0.1	17700
3134	DHP402Aa DN	IT	1990-09-20	5.9	1.23	332000	740	--	< 5	--	1600	251000	7	12	0.18	110	--	18500
2075	G090 DN	UNC	1990-06-22	6.2	1.23	383000	702	--	12.2	25	1320	178000	7	18.4	1.1	189	< 0.1	29100
2074	G090 DN	UNC	1990-06-22	6.2	1.23	380000	683	--	12.7	25	1310	180000	7	17.3	0.7	194	< 0.1	29000
2072	G090 DN	IT	1990-06-22	6.1	1.23	402000	680	--	10	--	1300	178000	5	16	0.18	150	--	28500
2073	G090 DN	IT	1990-06-22	6.1	1.23	400000	680	--	10	--	1300	198000	4	17	0.22	170	--	29200

[1] Extended alkalinity measured to an endpoint pH of 2.5 and reported as equivalent bicarbonate (HCO_3^-).
[2] TIC and TOC reported as equivalent bicarbonate.

TABLE C-1
ANALYTICAL RESULTS
(Continued)

SAMPLE NUMBER	HOLE NUMBER & DIRECTION		LAB	DATE	Al (mg/L)	As (mg/L)	B (mg/L)	Ba (mg/L)	Ca (mg/L)	Cs (mg/L)	Fe (mg/L)	K (mg/L)	Mg (mg/L)	Mn (mg/L)	Na (mg/L)	Rb (mg/L)	Si (mg/L)	Sr (mg/L)	Charge Balance
150	DH42	DN	UNC	1990-03-21	0.211	0.005	1490	0.071	328	0.248	< 0.5	17800	18000	1.09	88000	14.1	2.75	0.98	0.79
143	DH42A	DN	IT	1990-09-20	--	--	1400	--	300	--	< 3	17800	17500	1.3	76900	--	0.89	1.6	-17.5
142	DH42A	DN	UNC	1990-09-20	< 0.05	< 0.001	1490	0.041	312	0.219	< 0.5	17000	17200	0.83	87400	14.5	1.58	0.81	-2.15
142	DH42A	DN	UNC	1990-03-21	0.223	0.003	1560	0.012	311	0.248	< 0.5	17700	18200	0.96	90000	14.2	2.29	0.86	1.63
141	DH42A	DN	UNC	1990-09-20	< 0.05	< 0.001	1480	0.039	301	0.223	< 0.5	17200	17100	0.85	88400	14.3	1.57	0.78	-1.79
000	DH42A	DN	IT	1990-06-22	--	--	1400	--	340	--	< 3	19100	17400	1.4	93900	--	1.0	1.1	-0.18
140	DH42A	DN	UNC	1990-03-21	0.24	0.003	1590	0.014	307	0.254	< 0.5	18000	18300	0.95	91000	14.5	2.01	0.83	2.34
143	DH42A	DN	IT	1990-03-21	--	--	1400	--	330	--	< 3	18800	17400	1.4	87900	--	0.8	1.1	0.21
147	DH42A	DN	IT	1990-03-21	--	--	1400	--	330	--	< 3	18500	17300	1.4	86800	--	1.1	1.2	0.11
003	DH42A	DN	UNC	1990-06-22	< 0.05	< 0.001	1440	0.052	296	0.265	< 0.5	16900	17400	0.92	85700	14.1	1.93	0.8	-0.41
002	DH42A	DN	UNC	1990-06-22	< 0.05	< 0.001	1500	0.064	298	0.268	< 0.5	17400	17500	0.92	84600	14.2	1.95	0.79	-0.65
001	DH42A	DN	IT	1990-06-22	--	--	1400	--	330	--	< 3	18800	17100	1.4	99100	--	1.0	1.0	2.17
146	DHP402A	DN	UNC	1990-03-21	0.091	< 0.001	1280	0.032	313	0.364	84.4	14100	25100	2.73	80000	16.4	< 0.5	4.1	1.34
008	DHP402A	DN	UNC	1990-06-22	0.119	< 0.001	1230	0.105	300	0.401	23.1	13100	23600	2.11	75500	15.9	< 0.5	4.03	-1.78
280	DHP402A	DN	IT	1990-12-20	--	--	1900	--	300	--	< 3	13700	22100	2.5	70900	--	0.2	5.4	-8.86
138	DHP402A	DN	UNC	1990-03-21	0.083	< 0.001	1360	0.03	315	0.358	82.4	14000	25300	2.71	81000	16	< 0.5	4.15	1.31
132	DHP402A	DN	UNC	1990-03-21	0.105	< 0.001	1380	0.032	312	0.343	95.8	14300	24800	2.69	80000	16.4	< 0.5	4.18	1.62
009	DHP402A	DN	UNC	1990-06-22	0.121	< 0.001	1180	0.076	296	0.371	21.9	13100	23500	2.08	75100	15.9	< 0.5	3.95	-1.28
006	DHP402A	DN	IT	1990-06-22	--	--	1200	--	340	--	20	14900	23900	2.9	84000	--	< 0.2	4.3	0.18
007	DHP402A	DN	IT	1990-06-22	--	--	1200	--	350	--	20	15100	24300	3.0	85600	--	< 0.2	4.0	1.10
282	DHP402A	DN	IT	1990-12-20	--	--	1500	--	330	--	< 3	19200	19200	1.6	86100	--	0.8	2.2	-2.26
279	DHP402A	DN	UNC	1990-12-20	< 0.05	< 0.001	1330	0.043	278	0.361	1.27	14900	24100	1.79	76000	14.5	< 0.5	3.68	-2.79
010	DHP402Aa	DN	IT	1990-06-22	--	--	1200	--	340	--	< 3	15000	24000	3.5	87300	--	< 0.2	3.9	1.41
011	DHP402Aa	DN	IT	1990-06-22	--	--	1200	--	340	--	< 3	14900	23800	3.4	95300	--	< 0.2	4.1	4.45
013	DHP402Aa	DN	UNC	1990-06-22	0.063	< 0.001	1200	0.064	296	0.372	< 0.5	13200	23900	2.56	75500	15.5	< 0.5	4.04	-1.27
285	DHP402Aa	DN	UNC	1990-12-20	< 0.05	< 0.001	1300	0.044	295	0.367	1.54	15000	24500	2.72	76100	14.8	< 0.5	4.18	-2.48
286	DHP402Aa	DN	IT	1990-12-20	--	--	1200	--	350	--	< 3	15300	25100	3.6	78300	--	< 0.2	2.3	-2.09
012	DHP402Aa	DN	UNC	1990-06-22	0.092	< 0.001	1180	0.132	295	0.374	< 0.5	13200	23500	2.55	75100	15.7	< 0.5	4.03	-1.21
133	DHP402Aa	DN	UNC	1990-09-20	< 0.5	< 0.001	1310	0.085	304	0.335	< 0.5	13700	23800	2.52	75500	16.7	< 0.5	3.92	-3.26
134	DHP402Aa	DN	IT	1990-09-20	--	--	1300	--	340	--	< 3	14200	24300	3.5	71200	--	< 0.2	4.7	-15.6
075	G090	DN	UNC	1990-06-22	0.063	< 0.001	1470	0.022	225	0.197	24.8	12100	13200	2	96800	11.7	< 0.5	2.04	-0.34
074	G090	DN	UNC	1990-06-22	0.06	< 0.001	1460	0.042	223	0.202	19.7	12200	13500	1.99	96900	11.7	< 0.5	2.02	-0.53
072	G090	DN	IT	1990-06-22	--	--	1400	--	250	--	18	13100	13300	2.6	107000	--	< 0.2	2.7	3.87
073	G090	DN	IT	1990-06-22	--	--	1400	--	250	--	24	13100	13300	2.6	107000	--	< 0.2	2.6	-1.01

TABLE C-1
ANALYTICAL RESULTS
(Continued)

SAMPLE NUMBER	HOLE NUMBER & DIRECTION		LAB	DATE	pH	SG	TDS (mg/L)	EXT ALK[1] (mg/L)	ALK (mg/L)	TIC[2] (mg/L)	TOC[2] (mg/L)	Br (mg/L)	Cl (mg/L)	F (mg/L)	I (mg/L)	NO_3 (mg/L)	NH_4 (mg/L)	P_4 (mg/L)	SO_4 (mg/L)
3283	GSEEP	DN	IT	1990-12-20	6.0	1.23	353000	850	--	< 5	--	1500	192000	3	17	0.13	210	--	22600
3284	GSEEP	DN	UNC	1990-12-20	6.3	1.22	371000	872	--	4.6	10	1380	189000	4	18.7	1.0	169	< 0.1	27900
2071	GSEEP	DN	UNC	1990-06-22	6.3	1.23	384000	895	--	3.0	25	1350	181000	6	20.2	0.7	194	< 0.1	27700
2070	GSEEP	DN	IT	1990-06-22	6.2	1.23	400000	900	--	< 5	--	1300	226000	4	17	0.22	180	--	27700
1133	GSEEP	DN	UNC	1990-03-21	6.2	1.22	378000	885	--	3.6	< 5	1420	182000	4	17.0	0.8	176	< 0.1	28100
1131	GSEEP	DN	IT	1990-03-21	6.4	1.23	400000	920	--	< 5	--	1900	180000	6	21	0.35	170	--	26300
2077	H090	DN	IT	1990-06-22	6.2	1.23	397000	730	--	10	--	1200	182000	6	16	0.13	180	--	27900
2076	H090	DN	IT	1990-06-22	6.2	1.23	397000	740	--	10	--	1200	193000	5	15	0.13	190	--	28800
2079	H090	DN	UNC	1990-06-22	6.2	1.23	378000	744	--	9.7	142	1270	178000	6	16.1	0.8	189	0.4	28200
2078	H090	DN	UNC	1990-06-22	6.2	1.23	380000	738	--	9.7	142	1260	179000	6	16.0	0.8	200	0.4	28000
3014	NBP		UNC	1990-06-22	7.6	1.23	395000	312	--	184	137	89	188000	6	0.4	78.5	1.70	0.2	31800
2095	OH20	DN	UNC	1990-06-22	6.1	1.23	378000	710	--	4.6	71	1470	187000	6	19.1	2.0	146	0.2	17300
3274	OH20	HZ	IT	1990-12-20	6.0	1.23	353000	660	--	< 5	--	1600	204000	4	15	0.53	140	--	14300
3273	OH20	HZ	UNC	1990-12-20	6.0	1.21	380000	672	--	3.6	41	1500	199000	4	15.9	1.1	127	0.1	17500
3164	OH20	HZ	UNC	1990-09-20	5.9	1.22	384000	697	--	4.6	10	1430	195000	5	15.9	1.9	143	0.2	17300
3163	OH20	HZ	IT	1990-09-20	6.0	1.23	348000	650	--	< 5	--	1400	242000	5	13	0.22	120	--	17200
1181	OH20	HZ	UNC	1990-03-21	6.1	1.22	380000	676	--	6.1	66	1310	188000	3	9.3	1.9	120	0.1	18500
1179	OH20	HZ	IT	1990-03-21	6.1	1.19	325000	600	--	< 5	--	2200	154000	5	17	1.20	100	--	18000
3276	OH23	HZ	IT	1990-12-20	6.0	1.22	328000	630	--	< 5	--	1500	208000	2	14	0.13	150	--	15200
2094	OH23	HZ	UNC	1990-06-22	6.0	1.22	393000	732	--	4.6	66	1540	188000	6	15.0	0.6	171	< 0.1	16200
1183	OH23	HZ	UNC	1990-03-21	6.0	1.22	390000	793	--	6.6	110	1470	195000	4	14.8	1.4	141	< 0.1	18300
3275	OH23	HZ	UNC	1990-12-20	6.0	1.21	361000	653	--	4.5	36	1500	193000	4	14.9	0.4	135	< 0.1	16200
2093	OH23	HZ	IT	1990-06-22	6.0	1.22	388000	710	--	< 5	--	1500	199000	5	13	0.22	140	--	15700
3162	OH23	HZ	UNC	1990-09-20	5.9	1.22	374000	677	--	3.6	30	1480	192000	5	13.9	1.5	142	< 0.1	15800
3161	OH26	HZ	IT	1990-09-20	6.1	1.22	343000	730	--	< 5	--	1500	241000	6	16	0.44	120	--	15800
3277	OH26	HZ	UNC	1990-12-20	6.0	1.22	363000	1507	--	4.1	81	1520	193000	4	17.7	1.1	131	0.2	16300
3160	OH26	HZ	UNC	1990-09-20	6.0	1.22	372000	750	--	5.1	76	1480	192000	5	16.7	1.5	134	0.1	15700
3278	OH26	HZ	IT	1990-12-20	6.1	1.22	348000	730	--	< 5	--	1700	194000	3	16	0.49	140	--	16800
1136	OH26	HZ	IT	1990-03-21	6.0	1.24	390000	740	--	< 5	--	1200	192000	6	19	0.35	170		16900
2092	OH26	HZ	UNC	1990-06-22	6.0	1.21	379000	732	--	3.6	51	1500	184000	5	16.1	0.6	159	0.1	15800
2091	OH26	HZ	IT	1990-06-22	6.0	1.21	385000	710	--	< 5	--	1500	198000	5	15	0.13	140	--	16100
1180	OH26	HZ	UNC	1990-03-21	6.0	1.22	391000	741	--	4.1	36	1430	191000	3	16.3	0.8	140	< 0.1	17700
2090	OH28	DN	UNC	1990-06-22	6.0	1.22	385000	683	--	3.6	102	1520	191000	6	15.3	1.5	137	1.0	16400
1010	OH35	DN	IT	1990-01-04	6.9	1.23	318000	620	--	10	--	1100	181000	6	14	4.0	121	--	18000

[1] Extended alkalinity measured to an endpoint pH of 2.5 and reported as equivalent bicarbonate (HCO_3^-).
[2] TIC and TOC reported as equivalent bicarbonate.

TABLE C-1
ANALYTICAL RESULTS
(Continued)

SAMPLE NUMBER	HOLE NUMBER & DIRECTION		LAB	DATE	Al (mg/L)	As (mg/L)	B (mg/L)	Ba (mg/L)	Ca (mg/L)	Cs (mg/L)	Fe (mg/L)	K (mg/L)	Mg (mg/L)	Mn (mg/L)	Na (mg/L)	Rb (mg/L)	Si (mg/L)	Sr (mg/L)	Charge Balance
3283	GSEEP	DN	IT	1990-12-20	--	--	1400	--	260	--	< 3	13300	13700	1.0	93100	--	0.5	4.2	-3.40
3284	GSEEP	DN	UNC	1990-12-20	< 0.05	0.006	1620	0.025	242	0.204	< 0.5	13400	14000	0.55	94900	11	1.03	1.99	-2.67
2071	GSEEP	DN	UNC	1990-06-22	0.058	0.005	1510	0.015	244	0.211	< 0.5	12600	14400	0.54	95800	12	0.77	1.85	-0.24
2070	GSEEP	DN	IT	1990-06-22	--	--	1500	--	280	--	< 3	14000	14200	1.0	107000	--	0.5	2.6	-5.98
1133	GSEEP	DN	UNC	1990-03-21	< 0.05	0.005	1700	0.012	256	0.194	< 0.5	13700	14600	0.58	101000	12.5	1.08	1.92	1.76
1131	GSEEP	DN	IT	1990-03-21	--	--	1500	--	280	--	< 3	13600	14100	0.9	101000	--	0.4	2.5	2.17
2077	H090	DN	IT	1990-06-22	--	--	1400	--	290	--	< 3	13000	13900	1.1	106000	--	0.5	3.6	3.03
2076	H090	DN	IT	1990-06-22	--	--	1400	--	290	--	< 3	12900	13800	1.2	104000	--	0.5	3.5	-0.56
2079	H090	DN	UNC	1990-06-22	< 0.05	< 0.001	1470	0.054	262	0.213	< 0.5	12000	14700	0.71	95700	11.4	0.98	2.79	0.49
2078	H090	DN	UNC	1990-06-22	0.085	0.001	1410	0.028	262	0.219	1.01	11700	13900	0.71	94800	11.6	1.01	2.79	-0.72
3014	NBP		UNC	1990-06-22	< 0.05	0.034	15	0.088	251	0.017	< 0.5	38600	9040	0.54	97300	8.23	4.57	5.65	0.04
2095	OH20	DN	UNC	1990-06-22	0.087	0.002	1290	0.022	338	0.3	< 0.5	14900	21100	2.12	81300	15	1.47	1.86	0.04
3274	OH20	HZ	IT	1990-12-20	--	--	1300	--	380	--	< 3	16600	21900	2.7	83000	--	0.7	2.6	-1.91
3273	OH20	HZ	UNC	1990-12-20	< 0.05	0.002	1320	0.1	328	0.274	< 0.5	15700	21000	2.04	80400	13.6	1.25	1.69	-3.13
3164	OH20	HZ	UNC	1990-09-20	0.084	0.003	1360	0.044	336	0.258	< 0.5	15400	20800	1.97	80200	15.6	1.25	1.52	-2.43
3163	OH20	HZ	IT	1990-09-20	--	--	1300	--	290	--	< 3	15100	21600	2.4	67300	--	0.70	0.9	-17.1
1181	OH20	HZ	UNC	1990-03-21	0.072	0.002	1290	0.018	343	0.264	< 0.5	15600	20600	2.16	85000	14	1.42	2.25	0.80
1179	OH20	HZ	IT	1990-03-21	--	--	1200	--	350	--	< 3	15200	19400	2.8	81200	--	0.6	4.5	7.56
3276	OH23	HZ	IT	1990-12-20	--	--	2200	--	270	--	< 3	15100	19600	4.3	72700	--	0.7	1.6	-9.12
2094	OH23	HZ	UNC	1990-06-22	0.104	0.001	1340	0.073	284	0.31	< 0.5	15300	22100	1.85	76800	16.1	1.87	1.05	-0.96
1183	OH23	HZ	UNC	1990-03-21	0.111	0.001	1470	0.095	306	0.322	< 0.5	15900	23000	1.96	81000	16.5	3.45	1.58	-0.64
3275	OH23	HZ	UNC	1990-12-20	0.101	0.001	1370	0.074	262	0.285	< 0.5	16000	21800	1.70	78800	13.9	1.35	0.95	-1.46
2093	OH23	HZ	IT	1990-06-22	--	--	1300	--	320	--	< 3	16300	21700	2.5	87000	--	0.9	1.4	0.26
3162	OH23	HZ	UNC	1990-09-20	0.08	0.002	1420	0.046	280	0.253	< 0.5	14800	20900	1.66	76100	15.9	1.25	0.91	-3.15
3161	OH26	HZ	IT	1990-09-20	--	--	1200	--	300	--	< 3	14900	21700	2.2	67200	--	0.61	1.2	-16.8
3277	OH26	HZ	UNC	1990-12-20	0.146	< 0.001	1370	0.051	279	0.292	< 0.5	15200	22000	1.67	77100	14.2	1.15	0.94	-2.29
3160	OH26	HZ	UNC	1990-09-20	0.149	0.002	1600	0.04	288	0.255	< 0.5	15100	20800	1.53	75600	15.7	1.04	0.96	-3.34
3278	OH26	HZ	IT	1990-12-20	--	--	1300	--	320	--	< 3	15900	22000	2.5	78600	--	0.6	1.6	-1.77
1136	OH26	HZ	IT	1990-03-21	--	--	1300	--	320	--	< 3	16200	22000	2.3	82700	--	0.5	1.3	0.36
2092	OH26	HZ	UNC	1990-06-22	0.173	< 0.001	1270	0.082	284	0.313	< 0.5	14400	21400	1.54	78100	15.6	0.98	1.02	-0.09
2091	OH26	HZ	IT	1990-06-22	--	--	1300	--	320	--	< 3	16100	21600	2.2	101000	--	0.5	1.3	5.16
1180	OH26	HZ	UNC	1990-03-21	0.235	0.001	1470	0.028	305	0.305	< 0.5	15800	23000	1.57	85000	16.4	0.97	1.05	1.89
2090	OH28	DN	UNC	1990-06-22	0.055	0.002	1250	0.083	292	0.315	< 0.5	13300	21800	2.26	78400	15.6	2.32	1.28	-1.78
1010	OH35	DN	IT	1990-01-04	--	--	930	--	380	--	< 3	14300	14000	1.4	90000	--	0.2	19	-0.49

TABLE C-1
ANALYTICAL RESULTS
(Continued)

SAMPLE NUMBER	HOLE NUMBER & DIRECTION		LAB	DATE	pH	SG	TDS (mg/L)	EXT ALK[1] (mg/L)	ALK (mg/L)	TIC[2] (mg/L)	TOC[2] (mg/L)	Br (mg/L)	Cl (mg/L)	F (mg/L)	I (mg/L)	NO_3 (mg/L)	NH_4 (mg/L)	P_4 (mg/L)	SO_4 (mg/L)
1009	OH35	DN	UNC	1990-01-04	6.4	1.22	377000	610	--	8.1	41	1000	185000	4	9.2	5.1	114	< 0.1	19500
1007	OH36	DN	UNC	1990-01-04	7.0	1.22	355000	204	--	56.4	117	273	180000	1	1.4	0.7	24.0	< 0.1	28300
1008	OH36	DN	IT	1990-01-04	6.9	1.22	328000	210	--	46	--	340	180000	4	5	0.22	32	--	27000
1012	OH37	DN	IT	1990-01-04	6.3	1.22	318000	183	--	51	--	330	178000	3	5	0.2	50	--	27000
1011	OH37	DN	UNC	1990-01-04	7.0	1.22	358000	195	--	49.3	102	262	178000	1	1.4	0.6	22.9	< 0.1	28600
1013	OH38	DN	UNC	1990-01-04	6.8	1.22	360000	366	--	62.5	173	554	185000	3	4.4	0.8	59.4	0.1	22300
1014	OH38	DN	IT	1990-01-04	6.7	1.22	327000	380	--	41	--	690	184000	4	17	0.22	150	--	21000
1004	OH41	DN	IT	1990-01-04	7.1	1.23	337000	230	--	43	--	330	180000	4	14	0.26	49	--	26000
1003	OH41	DN	UNC	1990-01-04	7.0	1.22	358000	214	--	68.1	91	267	181000	2	1.3	0.7	22.4	< 0.1	28300
1005	OH42	DN	UNC	1990-01-04	7.0	1.22	359000	227	--	53.8	71	273	181000	2	1.8	0.6	27.3	< 0.1	27600
1006	OH42	DN	IT	1990-01-04	6.9	1.22	341000	230	--	36	--	330	177000	3	10	0.26	63	--	27000
1002	OH43	DN	IT	1990-01-04	7.4	1.22	340000	770	--	100	--	490	182000	4	4	4.8	50	--	20000
1001	OH43	DN	UNC	1990-01-04	7.4	1.22	357000	775	--	110	813	402	184000	< 1	1.8	6.4	45.8	< 0.1	21500
1000	OH44	DN	IT	1990-01-04	7.7	1.23	648000	590	--	94	--	330	186000	4	4	0.70	50	--	23000
0999	OH44	DN	UNC	1990-01-04	7.8	1.22	357000	671	--	97.5	559	285	183000	< 1	2.0	1.3	33.8	< 0.1	23300
3157	OH45	HZ	UNC	1990-09-20	6.0	1.21	381000	856	--	7.1	76	1530	197000	5	21.9	1.5	142	0.2	16100
2089	OH45	HZ	UNC	1990-06-22	6.1	1.22	378000	822	--	3.6	122	1520	186000	6	17.3	0.8	180	0.2	15900
3303	OH46	DN	UNC	1990-12-20	6.2	1.22	366000	866	--	5.1	25	1550	196000	5	16.0	0.3	139	< 0.1	15800
1176	OH46	DN	UNC	1990-03-21	6.1	1.22	383000	921	--	4.6	36	1640	193000	3	15.6	0.8	141	< 0.1	16800
1177	OH46	DN	IT	1990-03-21	6.0	1.22	388000	900	--	< 5	--	2500	188000	7	28	0.35	140	--	19500
2088	OH46	DN	UNC	1990-06-22	6.1	1.23	379000	943	--	4.6	46	1590	188000	6	15.9	0.7	172	< 0.1	15800
3159	OH46	DN	IT	1990-09-20	6.2	1.23	350000	870	--	< 5	--	1500	243000	6	14	0.22	120	--	16000
3158	OH46	DN	UNC	1990-09-20	6.1	1.21	358000	870	--	5.6	25	1510	191000	5	15.0	1.3	134	< 0.1	15200
3302	OH47	UP	UNC	1990-12-20	5.4	1.24	420000	1338	--	3.6	46	2910	206000	8	17.8	1.1	225	0.1	27600
1160	OH47	UP	UNC	1990-03-21	5.6	1.24	422000	1071	--	3.0	41	2390	197000	6	17.3	0.8	184	0.1	23900
1059	OH49	DN	UNC	1990-03-03	7.1	1.23	356000	295	--	76.2	132	326	176000	2	1.8	1	24.5	< 0.1	27200
1079	OH62	DN	IT	1990-03-03	6.1	1.23	393000	840	--	5	--	1200	190000	3	17	0.13	101	--	16800
1080	OH62	DN	UNC	1990-03-03	6.1	1.22	368000	817	--	4.1	5	1550	187000	5	15.6	2	149	< 0.1	16400
1078	OH62	DN	UNC	1990-03-03	6.0	1.23	373000	833	--	5.1	274	1550	186000	5	15.2	2	151	< 0.1	16400
1082	OH63	DN	IT	1990-03-03	6.1	1.23	390000	830	--	< 5	--	360	192000	5	17	0.18	104	--	16700
1081	OH63	DN	UNC	1990-03-03	6.0	1.23	370000	809	--	5.6	5	1540	187000	5	15.7	3	151	0.1	16400
1083	OH63	DN	UNC	1990-03-03	6.0	1.23	373000	822	--	5.6	10	1540	187000	3	15.8	2	145	< 0.1	16400
1077	OH66	DN	UNC	1990-03-03	6.2	1.23	367000	553	--	8.6	279	1180	186000	13	11.1	1	110	0.2	21700
1076	OH66	DN	IT	1990-03-03	6.3	1.23	393000	550	--	10	--	1100	183000	5	10	0.31	129	--	22700

[1] Extended alkalinity measured to an endpoint pH of 2.5 and reported as equivalent bicarbonate (HCO_3^-).

[2] TIC and TOC reported as equivalent bicarbonate.

TABLE C-1
ANALYTICAL RESULTS
(Continued)

SAMPLE NUMBER	HOLE NUMBER & DIRECTION		LAB	DATE	Al (mg/L)	As (mg/L)	B (mg/L)	Ba (mg/L)	Ca (mg/L)	Cs (mg/L)	Fe (mg/L)	K (mg/L)	Mg (mg/L)	Mn (mg/L)	Na (mg/L)	Rb (mg/L)	Si (mg/L)	Sr (mg/L)	Charge Balance
1009	OH35	DN	UNC	1990-01-04	0.1	< 0.001	1050	0.022	348	--	1.02	14300	15300	0.99	98500	--	0.68	16.3	2.41
1007	OH36	DN	UNC	1990-01-04	0.56	0.005	323	0.014	268	--	1.38	9410	6200	0.6	117000	--	2.17	22.5	1.56
1008	OH36	DN	IT	1990-01-04	--	--	180	--	290	--	< 3	9000	5800	0.9	101000	--	< 0.2	25	-4.95
1012	OH37	DN	IT	1990-01-04	--	--	180	--	290	--	< 3	9300	5700	0.9	106000	--	< 0.2	26	-2.36
1011	OH37	DN	UNC	1990-01-04	0.305	0.004	327	0.006	259	--	1.99	9370	5980	0.59	119000	--	1.3	23.3	2.58
1013	OH38	DN	UNC	1990-01-04	16.3	0.001	584	0.019	312	--	2.06	11100	9560	0.85	111000	--	6.32	20.6	1.88
1014	OH38	DN	IT	1990-01-04	--	--	460	--	360	--	< 3	11000	9200	1.3	69000	--	0.3	24	-16.3
1004	OH41	DN	IT	1990-01-04	--	--	160	--	290	--	< 3	9100	5900	0.9	111000	--	0.2	24	-0.59
1003	OH41	DN	UNC	1990-01-04	< 0.05	0.005	318	0.006	261	--	0.52	9320	6250	0.6	120000	--	0.61	20.8	2.43
1005	OH42	DN	UNC	1990-01-04	0.115	0.006	372	< 0.005	269	--	0.6	9450	6140	0.58	119000	--	0.86	18.7	2.14
1006	OH42	DN	IT	1990-01-04	--	--	220	--	290	--	< 3	8800	5500	0.8	111000	--	0.3	22	-0.38
1002	OH43	DN	IT	1990-01-04	--	--	310	--	370	--	< 3	9100	6500	0.7	109000	--	< 0.2	32	-0.38
1001	OH43	DN	UNC	1990-01-04	< 0.05	< 0.001	464	< 0.005	331	--	< 0.5	9330	6970	0.41	114000	--	< 0.5	29.8	1.15
1000	OH44	DN	IT	1990-01-04	--	--	170	--	350	--	< 3	8800	5100	0.6	111000	--		18	-2.22
0999	OH44	DN	UNC	1990-01-04	0.077	< 0.001	356	0.006	304	--	< 0.5	9280	5940	0.4	117000	--	< 0.5	15.4	1.47
3157	OH45	HZ	UNC	1990-09-20	0.058	0.002	1720	0.056	293	0.246	< 0.5	15900	20200	1.53	77500	15.7	1.06	2.66	-4.14
2089	OH45	HZ	UNC	1990-06-22	0.063	0.001	1270	0.125	297	0.272	< 0.5	14400	20400	1.57	78500	15.2	1.39	2.89	-1.21
3303	OH46	DN	UNC	1990-12-20	< 0.05	< 0.001	1410	0.207	282	0.296	< 0.5	19000	21000	1.43	82000	14	0.99	2.12	-0.83
1176	OH46	DN	UNC	1990-03-21	0.055	< 0.001	1600	0.025	302	0.305	< 0.5	16700	22400	1.7	84000	16.1	0.99	1.55	0.93
1177	OH46	DN	IT	1990-03-21	--	--	1400	--	330	--	< 3	17700	21700	2.5	89700	--	0.4	1.8	3.36
2088	OH46	DN	UNC	1990-06-22	0.096	< 0.001	1440	0.026	286	0.317	< 0.5	15500	21100	1.48	79500	15.8	0.84	1.59	-0.56
3159	OH46	DN	IT	1990-09-20	--	--	1300	--	310	--	< 3	16400	21000	1.9	70400	--	0.42	2.1	-16.0
3158	OH46	DN	UNC	1990-09-20	0.088	0.001	1740	0.06	289	0.249	< 0.5	16100	20000	1.31	76700	15.6	0.72	1.8	-2.96
3302	OH47	UP	UNC	1990-12-20	0.353	< 0.001	2050	0.255	193	0.473	2.69	19700	41300	5.22	45400	24.4	2.05	2.16	-4.53
1160	OH47	UP	UNC	1990-03-21	0.81	< 0.001	1760	0.025	282	0.392	0.79	17300	33000	3.57	67000	20.6	2.38	3.79	-0.14
1059	OH49	DN	UNC	1990-03-03	< 0.05	0.014	218	0.018	289	--	< 0.5	9200	6600	0.58	113000	--	0.54	30.11	1.50
1079	OH62	DN	IT	1990-03-03	--	--	1300	--	360	--	< 3	16600	20900	1.5	83200	--	0.7	3.2	0.37
1080	OH62	DN	UNC	1990-03-03	0.161	0.043	1480	0.029	331	--	< 0.5	15500	21700	0.96	81000	--	1.8	2.92	0.64
1078	OH62	DN	UNC	1990-03-03	0.129	0.038	1500	0.032	330	--	< 0.5	16900	21800	0.97	82000	--	2.07	2.86	1.64
1082	OH63	DN	IT	1990-03-03	--	--	1300	--	360	--	< 3	16700	21100	1.5	82500	--	0.7	4.1	-0.11
1081	OH63	DN	UNC	1990-03-03	< 0.05	0.025	1480	0.048	332	--	< 0.5	16400	21600	0.95	81000	--	1.42	2.89	0.77
1083	OH63	DN	UNC	1990-03-03	< 0.05	0.024	1500	0.047	337	--	< 0.5	16600	21600	0.94	80000	--	1.6	2.91	0.43
1077	OH66	DN	UNC	1990-03-03	0.154	0.034	1020	0.035	321	--	< 0.5	14900	17400	0.96	89000	--	1.52	4.51	-0.20
1076	OH66	DN	IT	1990-03-03	--	--	900	--	340	--	< 3	14900	16300	1.4	94100	--	0.6	7.8	1.52

TABLE C-1
ANALYTICAL RESULTS
(Continued)

SAMPLE NUMBER	HOLE NUMBER & DIRECTION	LAB	DATE	pH	SG	TDS (mg/L)	EXT ALK[1] (mg/L)	ALK (mg/L)	TIC[2] (mg/L)	TOC[2] (mg/L)	Br (mg/L)	Cl (mg/L)	F (mg/L)	I (mg/L)	NO_3 (mg/L)	NH_4 (mg/L)	P_4 (mg/L)	SO_4 (mg/L)
1075	OH66 DN	UNC	1990-03-03	6.3	1.23	371000	542	--	10.7	259	1180	186000	12	11.0	1	111	< 0.1	21300
1072	OH67 DN	UNC	1990-03-03	6.2	1.23	362000	621	--	9.7	137	1270	185000	8	11.9	1	120	< 0.1	19900
1073	OH67 DN	IT	1990-03-03	6.2	1.23	392000	620	--	10	--	1100	184000	3	11	0.18	129	--	20400
1074	OH67 DN	UNC	1990-03-03	6.2	1.23	368000	628	--	9.7	137	1270	185000	8	11.8	1	121	< 0.1	19900
3015	SBP	UNC	1990-06-22	7.2	1.21	361000	244	--	184	122	241	186000	6	0.2	17.3	90.8	0.2	15000
3016	TW+SP	UNC	1990-06-22	7.5	1.15	240000	165	--	154	30	9	136000	3	0.1	11.0	0.07	0.3	489

[1] Extended alkalinity measured to an endpoint pH of 2.5 and reported as equivalent bicarbonate (HCO_3^-).
[2] TIC and TOC reported as equivalent bicarbonate.

TABLE C-1
ANALYTICAL RESULTS
(Continued)

SAMPLE NUMBER	HOLE NUMBER & DIRECTION		LAB	DATE	Al (mg/L)	As (mg/L)	B (mg/L)	Ba (mg/L)	Ca (mg/L)	Cs (mg/L)	Fe (mg/L)	K (mg/L)	Mg (mg/L)	Mn (mg/L)	Na (mg/L)	Rb (mg/L)	Si (mg/L)	Sr (mg/L)	Charge Balance
1075	OH66	DN	UNC	1990-03-03	0.104	0.033	1020	0.032	323	--	< 0.5	14900	17300	0.98	90000	--	1.51	4.49	0.18
1072	OH67	DN	UNC	1990-03-03	0.083	0.014	1160	0.029	330	--	< 0.5	15700	18600	0.86	88000	--	2.04	5.56	1.02
1073	OH67	DN	IT	1990-03-03	--	--	1000	--	350	--	< 3	15600	17800	1.3	91600	--	0.8	8.7	1.97
1074	OH67	DN	UNC	1990-03-03	0.111	0.013	1150	0.028	328	--	< 0.5	15100	18300	0.87	88000	--	2	5.55	0.67
3015	SBP		UNC	1990-06-22	0.056	0.018	18	0.56	473	0.046	< 0.5	26000	7430	1.16	97300	5.87	7.24	55.5	-0.31
3016	TW+SP		UNC	1990-06-22	1.12	0.005	--	0.193	182	< 0.01	0.82	59	56	< 0.2	88900	0.06	15.6	2.85	0.43

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APPENDIX D
SIMPLE STATISTICS

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Table D-1
IT Simple Statistics for 1989 and 1990 Analyses

	A1X01-d			A1X02-u			A2X01-d		
	N	X	S	N	X	S	N	X	S
SG	8	1.22	0.01	9	1.22	0.03	5	1.22	0.02
TDS	8	369000	27000	9	368000	25000	5	360000	28000
pH	8	6.0	0.2	9	5.6	0.2	5	6.1	0.0
ALK	8	1009	60	9	843	172	5	1012	88
TIC[a]	8	4.4	4.4	9	2.5	0.0	5	3.5	1.4
Br^-	8	1780	510	9	2400	600	5	1500	200
Cl^-	8	200000	18000	9	203000	25000	5	192000	7000
F^-	8	8	1	9	7	2	5	7	1
I^-	7[b]	16	4	8[b]	19	8	4[b]	15	4
NH_4^+	8	154	21	9	148	23	5	143	6
NO_3^-	6	0.35	0.28	8	0.15	0.11	4	0.28	0.10
SO_4^{-2}	8	18100	4100	9	21200	4800	5	16700	2500
B	8	1400	<100	9	1600	400	5	1400	0
Ca	8	280	20	9	300	90	5	290	20
Fe	1	3		1	3		2	28	18
K	8	17200	900	9	17200	2800	5	17100	900
Mg	8	23700	1000	9	36300	9700	5	23500	500
Mn	8	2.4	0.2	9	6.6	1.3	5	2.5	0.2
Na	8	79500	4000	9	61000	11200	5	79400	2700
Si	8	0.6	0.2	9	0.5	0.1	3	0.4	0.1
Sr	8	2.2	0.8	9	6.5	1.7	5	1.2	0.5

[a]Mean and standard deviation calculated using one-half the value of the reported detection limit.
[b]Outlier values omitted in statistical calculations.
N = number of samples.
X = mean.
S = standard deviation.

Table D-1 *(Continued)*
IT Simple Statistics for 1989 and 1990 Analyses

	A3X01-d			BX01-d			DH30-d		
	N	X	S	N	X	S	N	X	S
SG	6	1.22	0.01	8	1.21	0.02	2	1.22	0.00
TDS	6	353000	23000	8	359000	27000	2	368000	28000
pH	6	6.1	0.1	8	6.1	0.1	2	6.1	0.0
ALK	6	1002	58	8	855	69	2	870	0
TIC[a]	6	3.8	1.4	8	3.4	1.3	2	3.8	1.8
Br^-	6	1600	500	8	1500	400	2	1900	400
Cl^-	6	198000	17000	8	191000	23000	2	181000	1000
F^-	6	8	1	8	7	1	2	3	1
I^-	5[b]	17	6	7[b]	16	4	2	15	2
NH_4^+	6	144	17	8	130	13	2	140	0
NO_3^-	5	0.35	0.22	7	0.16	0.08	2	0.2	<0.1
SO_4^{-2}	6	16600	2600	8	15800	1400	2	17000	1000
B	6	1400	100	8	1500	100	2	1500	100
Ca	6	290	30	8	290	30	2	360	10
Fe	1	3		1	4		0	<3	
K	6	16600	1500	8	17300	1000	2	18600	100
Mg	6	23400	1400	8	22100	2100	2	20400	0
Mn	6	2.2	0.2	8	2.1	0.2	2	1.9	0.1
Na	6	76800	7800	8	81000	6200	2	86300	3300
Si	6	0.6	0.1	8	0.5	0.1	2	0.4	0.0
Sr	6	2.4	0.6	8	2.3	0.8	2	3.0	0.1

[a]Mean and standard deviation calculated using one-half the value of the reported detection limit.
[b]Outlier values omitted in statistical calculations.
N = number of samples.
X = mean.
S = standard deviation.

Table D-1 *(Continued)*
IT Simple Statistics for 1989 and 1990 Analyses

	DH32-d			DH34-d			DH36-d		
	N	X	S	N	X	S	N	X	S
SG	3	1.22	0.01	3	1.22	0.00	8	1.22	0.01
TDS	3	355000	38000	3	341000	11000	8	347000	25000
pH	3	6.1	0.0	3	6.1	0.0	8	6.1	0.0
ALK	3	855	52	3	838	45	8	855	42
TIC[a]	3	3.3	1.4	3	7.5	4.3	8	4.1	2.0
Br^-	3	1700	600	2[b]	1800	300	8	1500	300
Cl^-	3	185000	6000	3	187000	5000	8	198000	21000
F^-	3	4	1	2	4	1	8	5	1
I^-	2[b]	15	1	2[b]	14	0	7[b]	16	1
NH_4^+	3	143	5	3	147	11	8	154	18
NO_3^-	3	0.16	0.03	3	0.19	0.02	5	0.18	0.06
SO_4^{-2}	3	15600	600	3	16100	900	8	15000	2000
B	3	1500	100	3	1500	100	8	1400	100
Ca	3	350	10	3	450	10	8	340	20
Fe	0	<3		0	<3		1	2	
K	3	19300	700	3	18600	300	8	19300	1400
Mg	3	20500	500	3	18800	400	8	18600	500
Mn	3	1.6	0.1	3	1.6	0.1	8	1.5	0.1
Na	3	88100	500	2[b]	86600	2300	8	86400	5400
Si	3	0.9	0.1	3	0.7	0.0	8	0.9	0.1
Sr	3	2.5	0.2	3	3.6	1.6	8	1.7	0.1

[a]Mean and standard deviation calculated using one-half the value of the reported detection limit.
[b]Outlier values omitted in statistical calculations.
N = number of samples.
X = mean.
S = standard deviation.

Table D-1 *(Continued)*

IT Simple Statistics for 1989 and 1990 Analyses

	DH38-d			DH42-d			DH42A-d		
	N	X	S	N	X	S	N	X	S
SG	6	1.22	0.01	3	1.23	0.01	10	1.22	0.01
TDS	6	366000	23000	3	378000	25000	10	361000	27000
pH	6	6.2	0.0	3	6.3	0.1	10	6.2	0.1
ALK	6	980	76	3	960	10	10	901	38
TIC[a]	6	5.1	1.7	3	3.3	1.4	10	3.3	1.2
Br^-	6	1700	300	3	1700	300	9[b]	1600	400
Cl^-	6	198000	24000	3	187000	8000	10	200000	19000
F^-	6	6	1	3	7	1	10	5	1
I^-	6	17	2	3	18	2	9[b]	17	1
NH_4^+	6	160	20	3	170	10	10	170	17
NO_3^-	5	0.27	0.10	3	0.52	0.24	8	0.27	0.19
SO_4^{-2}	6	16900	1600	3	15100	700	10	14700	1400
B	6	1400	<100	3	1400	0	10	1400	100
Ca	6	330	20	3	340	10	10	340	20
Fe	0	<3		0	<3		0	<3	
K	6	18700	1300	3	18400	500	10	19500	1200
Mg	6	18000	100	3	17100	200	10	17600	500
Mn	6	1.5	0.1	3	1.6	0.1	10	1.4	0.1
Na	6	86800	7900	3	88700	4600	9[b]	86200	7400
Si	6	0.8	<0.1	3	0.8	0.2	10	0.9	0.1
Sr	6	1.0	0.1	3	1.3	0.3	10	1.1	0.3

[a]Mean and standard deviation calculated using one-half the value of the reported detection limit.
[b]Outlier values omitted in statistical calculations.
N = number of samples.
X = mean.
S = standard deviation.

Table D-1 *(Continued)*
IT Simple Statistics for 1989 and 1990 Analyses

	DHP402A-d			DHP402Aa-d[c]			G090-d		
	N	X	S	N	X	S	N	X	S
SG	8	1.22	0.01	4	1.23	0.01	2	1.23	0.00
TDS	8	344000	32000	4	362000	28000	2	401000	1000
pH	8	6.0	0.0	4	6.0	<0.1	2	6.1	0.0
ALK	8	774	34	4	730	20	2	680	0
TIC[a]	8	4.4	2.6	4	2.5	0.0	2	10	0
Br^-	8	1700	300	4	1600	100	2	1300	0
Cl^-	8	195000	11000	3[b]	201000	4000	2	188000	14000
F^-	8	7	1	4	7	1	2	5	1
I^-	7[b]	17	6	4	12	1	2	17	1
NH_4^+	8	141	21	4	160	50	2	160	10
NO_3^-	5	0.13	0.00	3	0.15	0.03	2	0.20	0.03
SO_4^{-2}	8	17600	1500	4	16700	1500	2	28900	500
B	8	1400	200	4	1200	100	2	1400	0
Ca	8	340	20	4	340	10	2	250	0
Fe	4	53	39	0	<3		2	21	4
K	8	15500	1600	4	14900	500	2	13100	0
Mg	8	23600	2100	4	24300	600	2	13300	0
Mn	8	2.8	0.6	4	3.5	0.1	2	2.6	0.0
Na	8	80400	5000	4	83000	10500	2	107000	0
Si	4	0.5	0.3	0	<0.2		0	<0.2	
Sr	8	4.1	1.1	4	3.8	1.0	2	2.7	0.1

[a]Mean and standard deviation calculated using one-half the value of the reported detection limit.
[b]Outlier values omitted in statistical calculations.
[c]Archived DHP402A brine that was analyzed approximately 6 months after collection.
N = number of samples.
X = mean.
S = standard deviation.

Table D-1 *(Continued)*
IT Simple Statistics for 1989 and 1990 Analyses

	GSEEP-d			H090-d			OH20-h		
	N	X	S	N	X	S	N	X	S
SG	11	1.23	0.01	2	1.23	0.00	4	1.22	0.02
TDS	11	356000	28000	2	397000	0	4	347000	16000
pH	11	6.2	0.1	2	6.2	0.0	4	6.1	0.1
ALK	11	914	53	2	740	10	4	640	30
TIC[a]	11	3.2	1.8	2	10	0	4	4.4	3.8
Br^-	9[b]	1500	200	2	1200	0	3[b]	1700	400
Cl^-	11	187000	14000	2	188000	8000	4	195000	37000
F^-	11	3	1	2	6	1	4	5	1
I^-	9[b]	18	2	2	16	1	4	17	5
NH_4^+	11	178	14	2	190	10	4	120	20
NO_3^-	9	0.2	0.1	2	0.13	0.00	4	0.89	0.62
SO_4^{-2}	11	26100	2100	2	28400	600	4	17400	2400
B	11	1500	100	2	1400	0	4	1200	100
Ca	11	290	20	2	290	0	4	350	40
Fe	0	<3		0	<3		1	20	
K	11	14500	900	2	13000	100	4	15700	700
Mg	11	14500	400	2	13900	100	4	20600	1300
Mn	9	1.0	0.1	2	1.2	0.1	4	2.9	0.6
Na	11	99300	3700	2	105000	1000	4	78700	7700
Si	11	0.5	0.1	2	0.5	0.0	4	0.7	0.1
Sr	11	2.5	0.8	2	3.6	0.1	4	3.0	1.6

[a]Mean and standard deviation calculated using one-half the value of the reported detection limit.
[b]Outlier values omitted in statistical calculations.
N = number of samples.
X = mean.
S = standard deviation.

Table D-1 *(Continued)*

IT Simple Statistics for 1989 and 1990 Analyses

	OH23-h			OH26-h			OH46-d		
	N	X	S	N	X	S	N	X	S
SG	3	1.22	0.01	6	1.22	0.01	3	1.22	0.01
TDS	3	357000	30000	6	357000	26000	3	356000	30000
pH	3	6.0	0.1	6	6.0	0.1	3	6.1	0.1
ALK	3	695	59	6	730	10	3	880	20
TIC[a]	3	2.5	0.0	6	2.9	1.0	3	3.3	1.4
Br^-	2[b]	1500	0	6	1400	200	3	1900	600
Cl^-	3	197000	12000	6	199000	21000	3	202000	36000
F^-	3	4	2	6	5	1	3	6	2
I^-	3	17	6	5[b]	17	2	3	21	7
NH_4^+	3	138	13	6	144	17	3	130	10
NO_3^-	3	0.32	0.26	6	0.33	0.13	3	0.6	0.5
SO_4^{-2}	3	15700	600	6	16400	600	3	17200	2000
B	3	1700	500	6	1300	100	3	1400	100
Ca	3	300	30	6	320	20	3	340	30
Fe	0	<3		0	<3		0	<3	
K	3	16400	1300	6	16200	800	3	17600	1200
Mg	3	22000	2500	6	22300	800	3	21800	900
Mn	3	3.4	0.9	6	2.3	0.1	3	2.6	0.7
Na	3	80100	7200	6	81200	11300	3	81300	9900
Si	3	0.8	0.1	6	0.7	0.3	2[b]	0.4	<0.1
Sr	3	1.4	0.2	6	1.4	0.2	3	2.3	0.6

[a]Mean and standard deviation calculated using one-half the value of the reported detection limit.
[b]Outlier values omitted in statistical calculations.
N = number of samples.
X = mean.
S = standard deviation.

Table D-2
UNC Simple Statistics for 1989 and 1990 Analyses

	A1X01-d			A1X02-u			A2X01-d		
	N	X	S	N	X	S	N	X	S
SG	13	1.22	0.01	12	1.24	0.01	8	1.23	0.01
TDS	13	379000	13000	12	397000	15000	8	376000	10000
pH	13	6.1	0.1	12	5.6	0.3	8	6.1	0.1
ALK	13	984	53	12	888	171	8	1000	68
TIC	12	4.4	0.8	2	2.5	0.0	8	6.1	1.9
TOC	11	26	20	10	11	5	8	58	52
Br^-	13	1570	180	12	2230	410	8	1540	30
Cl^-	13	193000	3000	12	198000	7000	8	192000	3000
F^-	13	6	1	12	7	2	8	6	1
I^-	13	16.3	2.9	12	14.1	3.2	8	13.5	0.8
NH_4^+	13	150	15	12	166	21	8	149	10
NO_3^-	9	1.1	0.4	9	0.8	0.3	4	0.7	0.2
P	1	0.1		3	0.3	0.2	2	0.3	0.1
SO_4^{-2}	13	17700	1700	12	22700	2800	8	17300	800
Al	11	0.20	0.21	12	0.12	0.06	5	0.20	0.08
As	11	0.002	0.001	12	0.009	0.003	3	0.001	0.00
B	13	1510	90	12	1670	350	8	1450	80
Ba	13	0.04	0.02	12	0.04	0.02	8	0.06	0.04
Ca	13	251	21	12	254	30	8	270	34
Cs	13	0.37	0.03	12	0.40	0.06	8	0.37	0.04
Fe	4	1.6	1.3	0	<0.5		7	21.6	18.8
K	13	16000	700	12	16000	1900	8	16100	600
Mg	13	23700	1000	12	36900	6200	8	23600	1300
Mn	13	1.7	0.2	12	4.8	0.2	8	1.9	0.2
Na	13	78800	2600	12	61100	8900	8	78200	2700
Rb	7	16.1	1.0	4	19.5	2.8	3	16.1	1.5
Si	13	1.4	0.4	12	1.3	0.4	7	1.1	0.4
Sr	13	1.7	0.1	12	5.7	0.7	8	0.9	0.2

N = number of samples.
X = mean.
S = standard deviation.

Table D-2 *(Continued)*

UNC Simple Statistics for 1989 and 1990 Analyses

	A3X01-d			BX01-d			DH28-d		
	N	X	S	N	X	S	N	X	S
SG	8	1.22	0.01	12	1.23	0.01	5	1.23	0.01
TDS	8	374000	12000	12	373000	8000	5	375000	9000
pH	8	6.1	0.1	12	6.1	0.1	5	6.1	0.1
ALK	8	1004	36	12	874	34	5	861	37
TIC	8	5.2	0.9	12	5.8	2.2	5	9.8	1.8
TOC	8	40	41	11	38	18	5	120	107
Br^-	8	1500	40	12	1470	20	5	1470	70
Cl^-	8	191000	4000	12	193000	2000	5	191000	1000
F^-	8	7	1	12	7	1	5	3	1
I^-	8	17.0	6.7	12	14.0	1.7	5	16.6	4.0
NH_4^+	8	148	18	12	145	12	5	147	10
NO_3^-	5	1.3	0.5	7	0.9	0.3	5	1.5	1.4
P	1	0.1		0	<0.1		2	0.7	0.6
SO_4^{-2}	8	16800	500	12	16900	400	5	16600	200
Al	5	0.22	0.14	8	0.53	0.62	5	1.3	0.7
As	7	0.001	0.001	11	0.002	0.001	5	0.004	0.001
B	8	1510	120	12	1460	80	5	1460	40
Ba	8	0.04	0.02	12	0.04	0.02	5	0.04	0.02
Ca	8	267	29	12	265	22	5	360	22
Cs	8	0.36	0.04	12	0.35	0.04	5	0.27	0.03
Fe	3	1.2	0.2	7	2.1	1.4	5	1.9	0.6
K	8	15700	900	12	16100	1000	5	17000	200
Mg	8	23600	1100	12	22500	800	5	20400	300
Mn	8	1.4	0.1	12	1.4	0.2	5	1.4	0.4
Na	8	77700	3800	12	80000	1800	5	85300	1000
Rb	4	15.9	0.8	5	15.4	0.9	0		
Si	8	1.6	0.2	12	1.6	0.7	5	2.7	0.6
Sr	8	1.8	0.3	12	2.0	0.1	5	1.7	0.3

N = number of samples.
X = mean.
S = standard deviation.

Table D-2 *(Continued)*
UNC Simple Statistics for 1989 and 1990 Analyses

	DH30-d			DH32-d			DH-34-d		
	N	X	S	N	X	S	N	X	S
SG	7	1.22	0.01	9	1.22	0.00	6	1.22	0.00
TDS	7	372000	12000	9	366000	12000	6	368000	8000
pH	7	6.1	0.0	9	6.1	0.0	6	6.1	<0.1
ALK	7	819	41	9	820	13	6	771	14
TIC	7	6.1	1.7	9	5.9	2.1	6	8.6	1.6
TOC	7	22	15	9	11	3	5	18	9
Br^-	7	1450	60	9	1430	60	6	1350	50
Cl^-	7	190000	2000	9	191000	2000	6	191000	3000
F^-	7	4	1	9	4	1	6	4	1
I^-	7	16.3	2.2	9	15.4	0.9	6	15.9	1.9
NH_4^+	7	151	16	9	153	12	6	152	20
NO_3^-	6	0.9	0.5	7	2	4	3	0.8	0.4
P	1	0.2		0	<0.1		0	<0.1	
SO_4^{-2}	7	16400	200	9	16100	100	6	16800	100
Al	7	0.80	0.74	8	0.30	0.21	6	0.43	0.07
As	7	0.005	0.002	9	0.003	0.001	6	0.004	0.001
B	7	1510	60	9	1510	100	6	1460	90
Ba	7	0.04	0.01	9	0.03	0.01	6	0.04	0.01
Ca	7	326	40	9	329	32	6	427	44
Cs	7	0.28	0.03	9	0.26	0.02	6	0.25	0.03
Fe	7	0.7	0.3	3	2.6	0.7	3	2.8	0.4
K	7	17500	400	9	17500	500	6	17400	300
Mg	7	20200	300	9	19900	600	6	18800	700
Mn	7	1.2	<0.1	9	1.0	0.1	6	1.1	0.1
Na	7	85300	900	9	87000	2100	6	87000	700
Rb	0			0			0		
Si	7	3.1	2.6	9	2.7	1.0	6	2.7	0.4
Sr	7	2.5	0.3	9	2.4	0.1	6	4.1	0.2

N = number of samples.
X = mean.
S = standard deviation.

Table D-2 *(Continued)*

UNC Simple Statistics for 1989 and 1990 Analyses

	DH36-d			DH38-d			DH40-d		
	N	X	S	N	X	S	N	X	S
SG	10	1.23	0.01	11	1.22	0.01	2	1.22	0.01
TDS	10	373000	10000	11	372000	10000	2	373000	13000
pH	10	6.1	0.1	11	6.2	0.1	2	6.4	0.1
ALK	10	853	15	11	958	68	2	1295	28
TIC	10	5.6	2.0	11	7.7	3.1	2	9	2
TOC	10	16	7	11	22	12	2	121	98
Br^-	10	1460	60	11	1430	40	2	1560	10
Cl^-	10	192000	3000	11	192000	4000	2	193000	2000
F^-	10	4	1	11	4	1	2	5	1
I^-	10	16.0	1.0	11	18.8	4.1	2	17.1	1.3
NH_4^+	10	162	11	11	159	7	2	162	2
NO_3^-	6	1.3	1.1	8	0.9	0.2	2	1.8	0.7
P	1	0.2		5	0.2	0.1	2	0.5	0.1
SO_4^{-2}	10	16200	300	11	16000	300	2	16200	100
Al	9	0.40	0.30	9	0.33	0.19	2	0.09	0.04
As	10	0.011	0.005	10	0.007	0.004	1	0.002	
B	10	1520	70	11	1530	50	2	1580	110
Ba	10	0.03	0.02	11	0.03	0.02	2	0.11	0.09
Ca	10	318	20	11	318	25	2	316	35
Cs	10	0.28	0.03	11	0.27	0.03	2	0.26	0.00
Fe	1	0.9		1	0.5		0	<0.5	
K	10	17800	800	11	18000	800	2	17800	400
Mg	10	19100	800	11	18500	600	2	18600	800
Mn	10	1.0	0.1	11	1.0	0.1	2	1.2	<0.1
Na	10	86500	1800	11	86600	2200	2	83400	5200
Rb	3	15.0	0.3	5	14.2	0.8	2	14.0	1.4
Si	10	2.4	0.6	10	2.4	0.7	2	3.3	0.2
Sr	10	1.4	0.3	11	0.9	0.2	2	0.6	0.1

N = number of samples.
X = mean.
S = standard deviation.

Table D-2 *(Continued)*
UNC Simple Statistics for 1989 and 1990 Analyses

	DH42-d			DH42A-d			DHP402A-d		
	N	X	S	N	X	S	N	X	S
SG	5	1.22	0.01	11	1.22	0.01	10	1.22	<0.01
TDS	5	369000	4000	11	375000	9000	10	378000	17000
pH	5	6.2	0.1	11	6.1	0.1	10	6.0	<0.1
ALK	5	935	19	11	903	36	10	757	17
TIC	5	6.5	2.7	11	5.1	1.2	9	5.0	1.0
TOC	5	37	15	8	20	11	9	14	7
Br^-	5	1420	30	11	1420	30	10	1530	60
Cl^-	5	190000	3000	11	192000	4000	10	191000	3000
F^-	5	4	1	11	5	1	10	6	1
I^-	5	18.5	4.5	11	16.2	4.5	10	12.4	1.0
NH_4^+	5	161	15	11	166	10	10	133	13
NO_3^-	5	3	4	8	1.0	0.4	10	0.7	0.2
P	1	0.1		2	0.3	0.1	0	<0.1	
SO_4^{-2}	5	15800	700	11	15700	300	10	17800	300
Al	3	0.71	0.44	7	0.25	0.18	8	0.19	0.17
As	4	0.005	0.002	7	0.004	0.001	2	0.007	0.001
B	5	1470	40	11	1510	50	10	1300	60
Ba	5	0.04	0.02	11	0.03	0.02	10	0.05	0.02
Ca	5	317	25	11	321	27	10	312	22
Cs	5	0.27	0.03	10	0.25	0.04	10	0.37	0.04
Fe	2	0.8	<0.1	2	2.2	0.7	10	44.5	38.3
K	5	17600	1300	11	18000	800	10	14100	600
Mg	5	17800	200	11	17900	500	10	24700	700
Mn	5	1.0	0.1	11	1.0	0.1	10	2.3	0.4
Na	5	86800	1400	11	87900	1900	10	78500	2200
Rb	3	14.3	0.6	6	14.3	0.2	6	15.9	0.7
Si	5	2.2	0.8	11	2.3	0.6	2	1.4	0.1
Sr	5	0.9	0.1	11	0.8	0.1	10	4.2	0.4

N = number of samples.
X = mean.
S = standard deviation.

Table D-2 *(Continued)*

UNC Simple Statistics for 1989 and 1990 Analyses

	DHP402Aa-d[a]			G090-d			GSEEP-d		
	N	X	S	N	X	S	N	X	S
SG	4	1.22	0.00	2	1.23	0.00	11	1.23	0.01
TDS	4	380000	7000	2	382000	2000	11	373000	6000
pH	4	6.0	<0.1	2	6.2	0.0	11	6.3	0.1
ALK	4	740	9	2	693	13	11	891	16
TIC	4	4.2	0.9	2	12.5	0.4	9	4.0	0.8
TOC	4	14	3	2	25	0	9	19	7
Br^-	4	1530	20	2	1320	10	11	1360	30
Cl^-	4	194000	6000	2	179000	1000	11	184000	3000
F^-	4	5	2	2	7	0	11	4	1
I^-	4	13.1	0.3	2	17.9	0.8	11	17.0	1.3
NH_4^+	4	138	26	2	192	4	11	176	11
NO_3^-	4	1.1	0.7	2	0.9	0.3	7	0.7	0.2
P	0	<0.1		0	<0.1		3	0.2	0.1
SO_4^{-2}	4	17400	400	2	29100	100	11	28200	300
Al	2	0.08	0.02	2	0.06	0.00	5	0.06	0.01
As	0	<0.001		0	<0.001		11	0.006	0.001
B	4	1250	70	2	1470	10	11	1580	60
Ba	4	0.08	0.04	2	0.03	0.01	11	0.02	0.01
Ca	4	298	4	2	224	1	11	267	19
Cs	4	0.36	0.02	2	0.20	0.04	11	0.21	0.02
Fe	1	1.5		2	22.3	3.6	0	<0.5	
K	4	13800	900	2	12200	100	11	13500	300
Mg	4	23900	400	2	13400	200	11	14600	400
Mn	4	2.6	0.1	2	2.0	0.0	11	0.6	<0.1
Na	4	75600	400	2	96900	100	11	98000	2200
Rb	4	15.7	0.8	2	11.7	0.0	3	11.8	0.8
Si	0	<0.5		0	<0.5		11	1.2	0.3
Sr	4	4.0	0.1	2	2.0	0.0	11	2.0	0.3

[a]Archived DHP402A brine that was analyzed approximately 6 months after collection.

N = number of samples.

X = mean.

S = standard deviation.

Table D-2 *(Continued)*

UNC Simple Statistics for 1989 and 1990 Analyses

	H090-d			OH20-h			OH23-h		
	N	X	S	N	X	S	N	X	S
SG	2	1.23	0.00	6	1.22	0.01	10	1.22	0.01
TDS	2	379000	1000	6	382000	4000	10	376000	12000
pH	2	6.2	0.0	6	6.1	0.1	10	6.0	<0.1
ALK	2	741	4	6	682	24	10	759	73
TIC	2	9.7	0.0	6	5.5	1.5	10	4.5	1.1
TOC	2	142	0	6	75	51	10	129	79
Br^-	2	1270	10	6	1360	120	10	1530	60
Cl^-	2	179000	1000	6	191000	5000	10	193000	3000
F^-	2	6	0	6	4	1	10	4	1
I^-	2	16.1	0.1	6	19.9	10.6	10	20.3	8.6
NH_4^+	2	195	8	6	130	12	10	150	12
NO_3^-	2	0.8	0.0	6	1.9	0.5	8	1.2	0.4
P	2	0.4	0.0	6	0.2	0.2	6	0.3	0.2
SO_4^{-2}	2	28100	100	6	18200	1700	10	17200	900
Al	1	0.09		5	0.09	0.02	10	0.16	0.08
As	1	0.001		6	0.003	0.001	10	0.007	0.015
B	2	1440	40	6	1250	120	10	1450	70
Ba	2	0.04	0.02	6	0.05	0.03	10	0.07	0.02
Ca	2	262	0	6	334	6	10	316	38
Cs	2	0.22	<0.01	6	0.27	0.03	10	0.31	0.04
Fe	1	1.0		1	1.3		10	<0.5	
K	2	11900	200	6	15500	300	10	16300	800
Mg	2	14300	600	6	20400	800	10	23300	1500
Mn	2	0.7	0.0	6	2.3	0.4	10	2.1	0.4
Na	2	95300	600	6	84100	4100	10	79600	2200
Rb	2	11.5	0.1	4	14.6	0.9	4	15.6	1.2
Si	2	1.0	0.0	6	1.7	0.7	10	2.0	0.7
Sr	2	2.8	0.0	6	2.9	1.8	10	1.3	0.3

N = number of samples.
X = mean.
S = standard deviation.

Table D-2 *(Continued)*
UNC Simple Statistics for 1989 and 1990 Analyses

	OH26-h			OH45-h			OH46-d		
	N	X	S	N	X	S	N	X	S
SG	8	1.22	0.01	3	1.22	0.01	7	1.22	0.01
TDS	8	377000	12000	3	368000	19000	7	375000	10000
pH	8	6.0	0.0	3	6.1	0.1	7	6.1	<0.1
ALK	8	851	266	3	828	26	7	882	35
TIC	8	4.0	0.6	3	5.3	1.8	7	5.4	2.0
TOC	8	80	28	3	112	32	7	60	37
Br^-	8	1490	30	3	1510	20	7	1570	40
Cl^-	8	191000	3000	3	192000	6000	7	192000	3000
F^-	8	4	1	3	5	2	7	5	1
I^-	8	18.7	3.7	3	19.4	2.3	7	18.4	4.2
NH_4^+	8	146	13	3	154	22	7	154	17
NO_3^-	8	0.9	0.3	3	1.1	0.4	7	1.1	0.7
P	7	0.2	0.1	3	0.3	0.2	0	<0.1	
SO_4^{-2}	8	16800	800	3	16500	900	7	16300	700
Al	8	0.17	0.05	2	0.06	0.004	4	0.45	0.75
As	6	0.002	0.001	3	0.002	0.002	2	0.002	0.001
B	8	1420	100	3	1480	230	7	1530	110
Ba	8	0.05	0.02	3	0.09	0.04	7	0.07	0.06
Ca	8	308	33	3	326	53	7	300	20
Cs	8	0.30	0.03	3	0.26	0.02	7	0.29	0.02
Fe	0	<0.5		0	<0.5		1	10.1	
K	8	15600	700	3	15900	1500	7	17200	1300
Mg	8	22700	1200	3	21100	1400	7	22000	1300
Mn	8	1.6	0.1	3	1.5	0.1	7	2.6	2.3
Na	8	80600	3500	3	78800	1500	7	80800	3000
Rb	4	15.5	0.9	2	15.5	0.4	4	15.4	0.9
Si	8	1.6	1.0	3	1.8	1.0	7	1.6	1.3
Sr	8	1.2	0.3	3	3.0	0.4	7	2.0	0.4

N = number of samples.
X = mean.
S = standard deviation.

Table D-2 *(Continued)*
UNC Simple Statistics for 1989 and 1990 Analyses

	OH47-u			OH62-d			OH63-d		
	N	X	S	N	X	S	N	X	S
SG	4	1.24	0.01	2	1.23	0.01	2	1.23	0.00
TDS	4	406000	25000	2	371000	4000	2	372000	2000
pH	4	5.6	0.1	2	6.1	0.1	2	6.0	0.0
ALK	4	1170	123	2	825	11	2	816	9
TIC	2	3.3	0.4	2	4.6	0.7	2	5.6	0.0
TOC	4	44	3	2	140	190	2	8	4
Br^-	4	2460	310	2	1550	0	2	1540	0
Cl^-	4	197000	6000	2	187000	1000	2	187000	0
F^-	4	6	2	2	5	0	2	4	1
I^-	4	16.6	1.3	2	15.4	0.3	2	15.8	0.1
NH_4^+	4	217	29	2	150	1	2	148	4
NO_3^-	4	1.0	0.2	2	2	0	2	3	1
P	4	0.3	0.3	0	<0.1		1	0.1	
SO_4^{-2}	4	25200	1600	2	16400	0	2	16400	0
Al	4	0.33	0.34	2	0.15	0.02	0	<0.05	
As	1	0.002		2	0.040	0.004	2	0.025	0.001
B	4	1810	160	2	1490	10	2	1490	10
Ba	4	0.09	0.11	2	0.03	0.01	2	0.05	0.00
Ca	4	270	60	2	331	1	2	335	4
Cs	4	0.40	0.05	0			0		
Fe	4	1.6	0.8	0	<0.5		0	<0.05	
K	4	18100	1200	2	16200	1000	2	16500	100
Mg	4	36100	3800	2	21800	100	2	21600	0
Mn	4	4.3	0.7	2	1.0	0.0	2	1.0	<0.1
Na	4	60000	9800	2	82000	1000	2	81000	1000
Rb	2	22.5	2.7	0			0		
Si	4	2.0	0.4	2	1.9	0.2	2	1.5	0.1
Sr	4	3.9	1.3	2	2.9	0.0	2	2.9	0.0

N = number of samples.
X = mean.
S = standard deviation.

Table D-2 *(Continued)*
UNC Simple Statistics for 1989 and 1990 Analyses

	OH66-d			OH67-d		
	N	X	S	N	X	S
SG	2	1.23	0.00	2	1.23	0.00
TDS	2	369000	3000	2	365000	4000
pH	2	6.3	0.1	2	6.2	0.0
ALK	2	548	8	2	625	5
TIC	2	9.6	1.5	2	9.7	0.0
TOC	2	269	14	2	137	0
Br^-	2	1180	0	2	1270	0
Cl^-	2	186000	0	2	185000	0
F^-	2	13	1	2	8	0
I^-	2	11.1	0.1	2	11.9	0.1
NH_4^+	2	111	1	2	121	1
NO_3^-	2	1	0	2	1	0
P	1	0.2		0	<0.1	
SO_4^{-2}	2	21500	300	2	19900	0
Al	2	0.13	0.04	2	0.10	0.02
As	2	0.034	0.001	2	0.014	0.001
B	2	1020	0	2	1160	10
Ba	2	0.03	<0.01	2	0.03	0.00
Ca	2	322	1	2	329	1
Cs	0			0		
Fe	0	<0.5		0	<0.5	
K	2	14900	0	2	15400	400
Mg	2	17400	100	2	18500	200
Mn	2	1.0	0.0	2	0.9	0.0
Na	2	90000	1000	2	88000	0
Rb	0			0		
Si	2	1.5	0.0	2	2.0	0.0
Sr	2	4.5	0.0	2	5.6	0.0

N = number of samples.
X = mean.
S = standard deviation.

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APPENDIX E
ACTIVITY PLAN

BRINE SAMPLING AND EVALUATION PROGRAM
PHASE II, III, AND IV SUBHORIZONTAL OBSERVATION HOLES

Rev. 1
September 1991

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1.0 Introduction

Since excavations at the Waste Isolation Pilot Plant (WIPP) were initiated in 1982, much has been learned about the nature of brine found in the Salado Formation, in which the WIPP is being constructed. This activity plan details a proposed drilling program designed to provide new brine sampling holes that will yield additional brine inflow data to support modeling for performance assessment.

Possible brine inflow systems have been discussed by Deal and Roggenthen (1991). There are basically two systems: one in which far-field flow occurs through undisturbed rock outside of the zone of rock deformation known as the Disturbed Rock Zone (DRZ) and a local near-field system where brine is redistributed within the DRZ. Additional effects, such as gas exsolution, development of enhanced porosity and permeability within the DRZ, and preferential flow along bedding planes may modify brine inflow, but it is fundamentally important to distinguish between far-field sources and local, relatively limited redistribution of brine in the immediate vicinity of the WIPP excavations.

The relative importance of these two systems needs to be determined to assess long-term facility performance. For example, if there is enough far-field flow into the repository, then sufficient brine may come into the excavations to completely corrode the metal in the waste and the waste drums; therefore, the potential for hydrogen generation due to corrosion will be limited by the total metal inventory. If the brine seepage is purely a local phenomena due to redistribution of brine in the immediate vicinity of the excavations, there may be insufficient brine available to cause much corrosion after closure. In the latter case, hydrogen generation will be limited by the brine available and may not be a potential problem. Even if both of the proposed systems yield similar volumes of brine during the pressurization phase, the predicted consequences of human intrusion events, the fate of waste-generated gases, and the migration of hazardous constituents during undisturbed performance are all sensitive to brine inflow assumptions.

Human Intrusion. If the far-field model is valid, a human-intrusion event (drilling into the sealed repository at a future date) will lower fluid pressure in the rooms, create pressure gradients toward the rooms, and reinstate far-field flow. This will lead to a greater release of radionuclides from the repository as the inflowing brine infiltrates through the waste and flows up the borehole. Alternatively, if the near-field model is valid, the only brine available for transport of radionuclides is the volume of brine that is trapped in the room at the time of sealing.

Waste-Generated Gases. Predicting the fate of waste-generated gases is also dependent upon the hydrologic system assumed to be operational. If brine can flow through the far-field, excess gas pressure can probably be dissipated through the host rock; but if far-field flow is not a viable mechanism, gas generation from microbial or radiolytic decomposition of organic materials may yield very high local pressures. Analyses by the WIPP Engineered Alternatives Task Force (EATF) have shown that predicted peak pressures are highly dependent upon the assumed mechanisms by which fluids can flow through the undisturbed host rock.

Migration of Hazardous Constituents. Another long-term performance concern is the migration of RCRA-listed hazardous constituents from the repository. If far-field flow is valid, then the generation of excess gas pressure within the repository may force gas (possibly contaminated with VOCs) across the RCRA unit boundary. However, if far-field flow does not occur, there will be less of a potential for VOC migration.

The main objectives of this plan are to evaluate the effects of stratigraphy on brine inflow and to determine which of these two hydrologic systems is dominant. Brine sampling from the new boreholes will become a routine part of the WIPP Brine Sampling and Evaluation Program (BSEP).

2.0 Objectives

The proposed drilling program has three specific objectives: to determine whether the brine inflow underground is stratigraphically controlled; if so, to quantify inflow to boreholes from the different stratigraphic units exposed at the repository level; and to determine whether there is a significant far-field component of brine flow in the Salado Formation surrounding the WIPP.

3.0 Theory

Recently completed work shows that the moisture content of the rocks exposed in the repository excavations varies directly with clay content (Deal and others, 1989). The lack of weeps on the back of the workings and the permeability testing of Beauheim (Beauheim and Howarth, 1991) support the contention that brine seepage occurs horizontally, preferentially along stratigraphic partings of interbeds, rather than vertically or through clear halite (Deal and Roggenthen, 1991). This leads to the suggestion that most brine seeping out of repository walls may be associated with the clays above and below the orange band, argillaceous halite salt, and clay F near the back (Deal and others, 1991).

4.0 Previous Investigations

During 1989 (Phase I), eleven subhorizontal brine sampling holes were drilled to investigate the variability in seepage rates from different stratigraphic horizons. The holes are oriented slightly downward to accumulate brine at the end of the hole where it can be collected and measured without loss to fractures near the excavations. Ten of the eleven holes were drilled in the future entries to Panels 7 and 8 at S1600, S1950, and S2150 (Figure E-1). Three of the holes (OH20, OH23, and OH26) are 150-foot (ft), 3-inch-diameter boreholes, started in the clayey halite (map unit 4) above the orange band and angled downward so that they end in the clear halite (map unit 0) below the orange band (Figure E-2). The 150-ft holes reached the orange band about 50 ft into the holes. Hole OH27A was started at the initial location for OH27 but was terminated at a depth of 4.1 ft due to drilling problems. The six remaining 50-ft holes were drilled either above or below the orange band about 50 ft into the holes. One 50-ft hole (OH45) was drilled in a new excavation at S400, which cuts the same stratigraphic interval as the three 150-ft holes.

The holes are monitored for brine inflow. When tubing was removed from the 150-ft holes for maintenance of the moisture collection devices, dry tubing was observed for about the first 50 ft. The device was pulled twice in OH23. Both times, approximately 40 to 50 ft of tubing was dry. It is not known conclusively what rock unit is encountered at that depth in the holes (these holes were not cored) nor whether there is brine inflow from deeper than 50 ft.

Several of the holes have produced measurable quantities of brine (Deal and others, 1991). However, the 150-ft holes have all produced orders of magnitude more brine than the 50-ft holes, and the longer holes are still producing while the shorter holes are dry, with one exception—OH45, a 50-ft hole that cuts the same stratigraphic interval as the 150-ft-long holes—which was drilled in a more recently mined area. It is noted that OH45 is located over 1,000 ft north of OH20, OH23, and OH26. Lateral variation may play a minor role in the difference in brine seepage. This is considered to be unlikely, as Deal and others (1989) found no significant lateral variation in moisture content for any of the stratigraphic units exposed in the excavations.

Two explanations can be offered for the brine inflow results: the longer holes are tapping an area that is not dewatered because they extend past the DRZ developed around the W170 drift. Therefore, they may only tap about 100 ft of undisturbed salt (in this case, the one 50-ft hole would still produce brine because it was drilled from a young excavation where a

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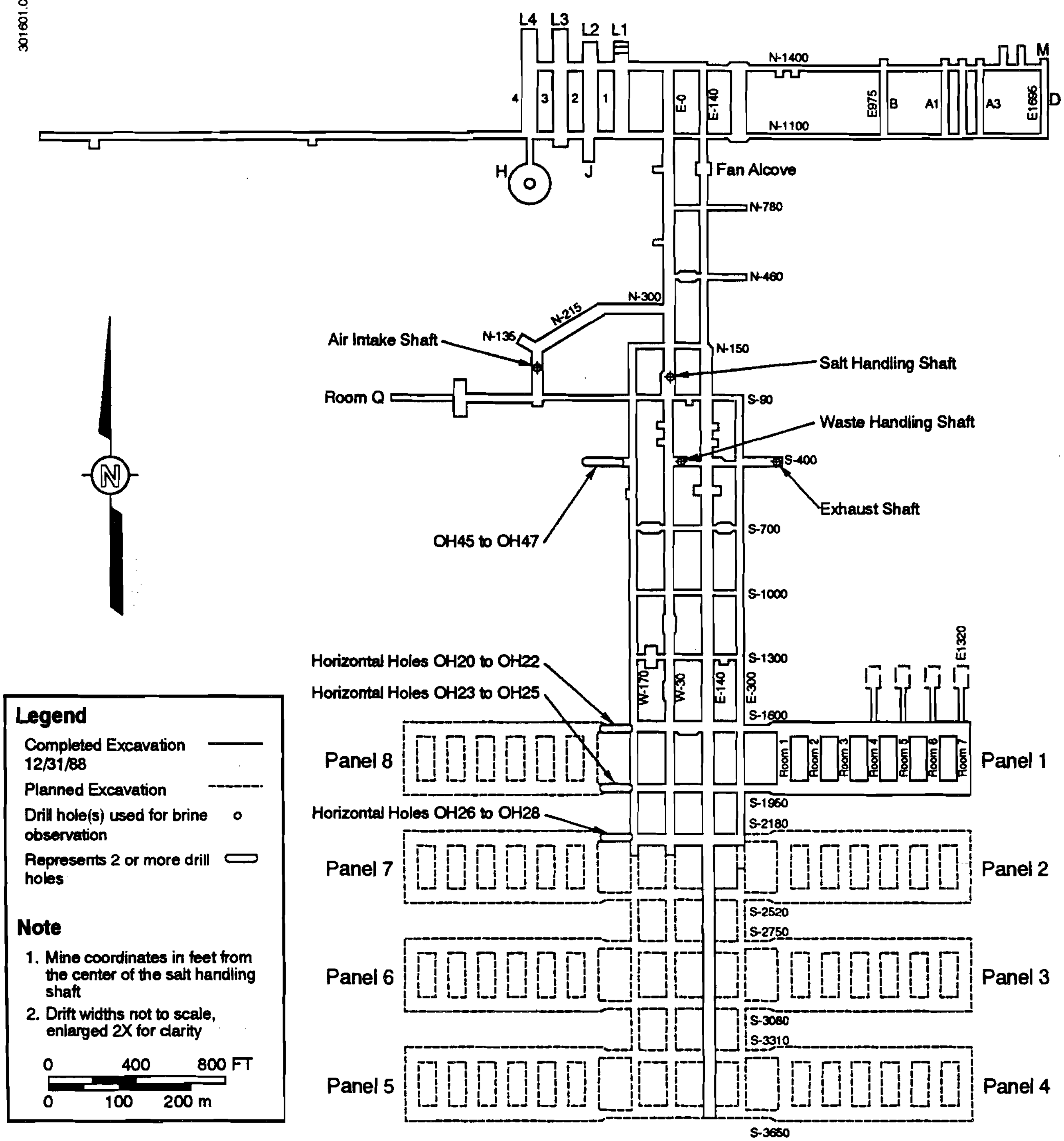
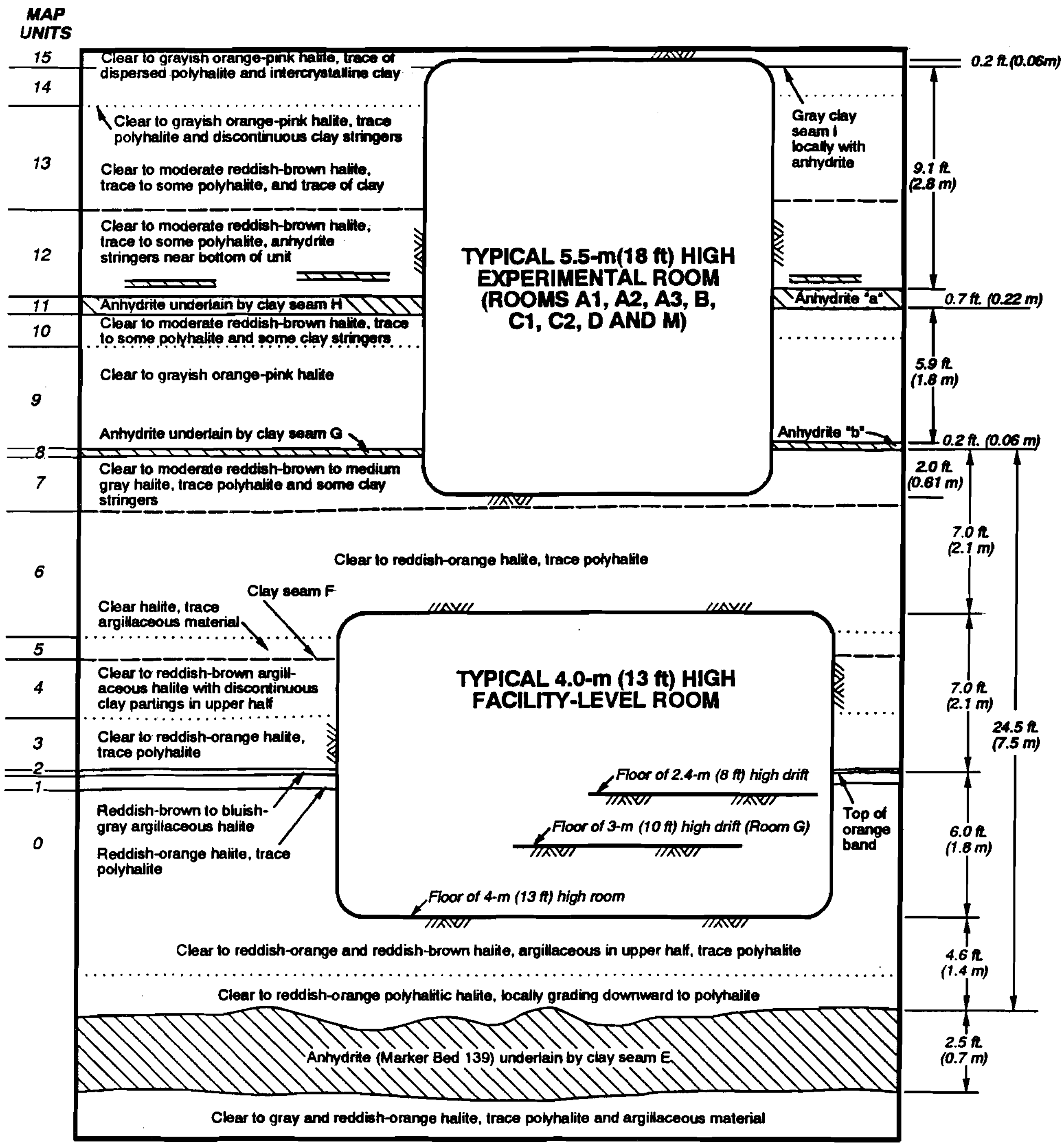


Figure E-1

Locations of the OH Series Subhorizontal Holes



NOTES:

1. Dimensions and lithologic descriptions are derived primarily from corehole and geologic mapping data from the four test rooms and experimental area.
2. Unit thicknesses are approximate and vary slightly.
3. Room dimensions have changed with time due to salt-creep closure.

(After Deal and Case, 1987)

Figure E-2

Geologic Cross Section of the Facility with Unit Number Designations (Modified from Bechtel, 1985)

significant DRZ had not yet developed); or brine flows preferentially along stratigraphic boundaries, such as the clay units at the top and bottom of the orange band. Therefore, only the four holes (OH20, OH23, OH26, and OH45) that cut the orange band accumulate brine and only from that part of the drill hole that intersects the clay units.

To improve the understanding of the mechanisms that affect brine seeping from the Salado Formation at the WIPP site, this drilling program is designed to consider various relevant effects separately. Drilling programs that discriminate between three different possible brine seepage mechanisms are outlined in the following sections.

5.0 Logistics

The boreholes will be drilled by WIPP Experimental Operations. Drilling operations will be observed by a geologist from Geotechnical Engineering, who will log the cores. When the holes are completed, pressure-suction moisture collection devices (identical to those presently in use by the BSEP) will be installed to monitor brine seepage. The boreholes will then become the responsibility of BSEP (Geotechnical Engineering), who will measure brine seepage volumes and obtain the brine chemistry analyses.

6.0 Phase II Drilling Program

This plan was initially proposed in July 1991, when the N460 and N780 drifts east of E140 were relatively new drifts. If implementation of this plan is delayed, relocating the drilling of Phase II holes to a recently mined drift is required; however, the theory behind this plan is not affected.

The hypothesis to be tested in Phase II is whether horizontal brine flow around horizontal discontinuities in the Salado Formation is significantly different for various stratigraphic units at the facility level. Drilling is proposed in an area that does not have a well-developed DRZ (i.e., a newly mined drift). New drifts have been excavated along E140 at N460 and N780 (Figure E-3). Drilling should commence in these areas as soon as is practicable. Two arrays of holes will be drilled: one in the south face of N460 east of E140 and one in the south face of N780 east of E140. According to the structure contour map of the orange band (Figure E-4), the map units in that area of the underground are dipping 1 to 2 degrees to the south. Holes will be drilled parallel to the dip so that they slope downward away from the collar to effectively collect any brine inflow at their far end and still remain within a single stratum.

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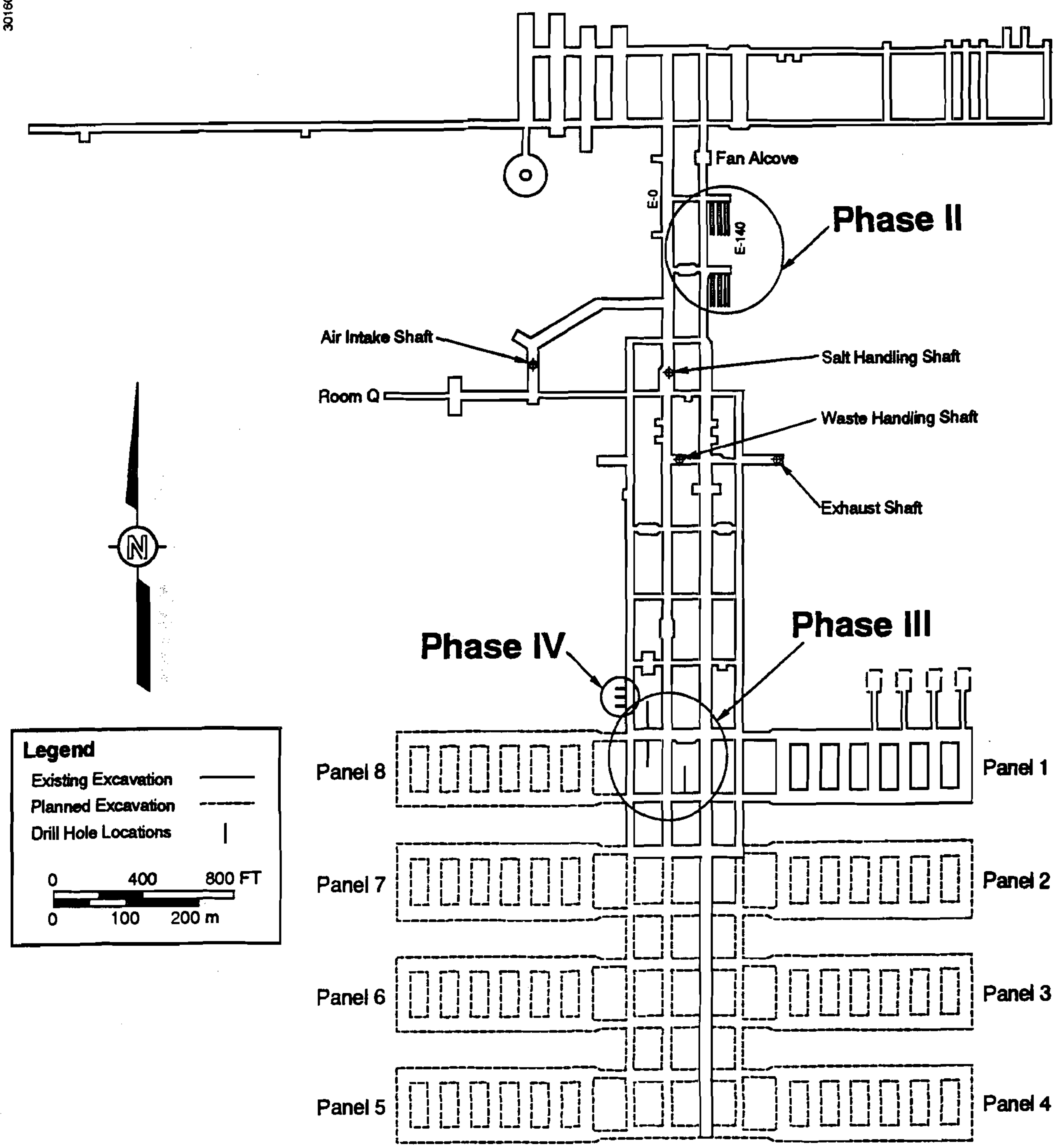

Figure E-3
Proposed Location of Phase II, III, and IV Drill Holes

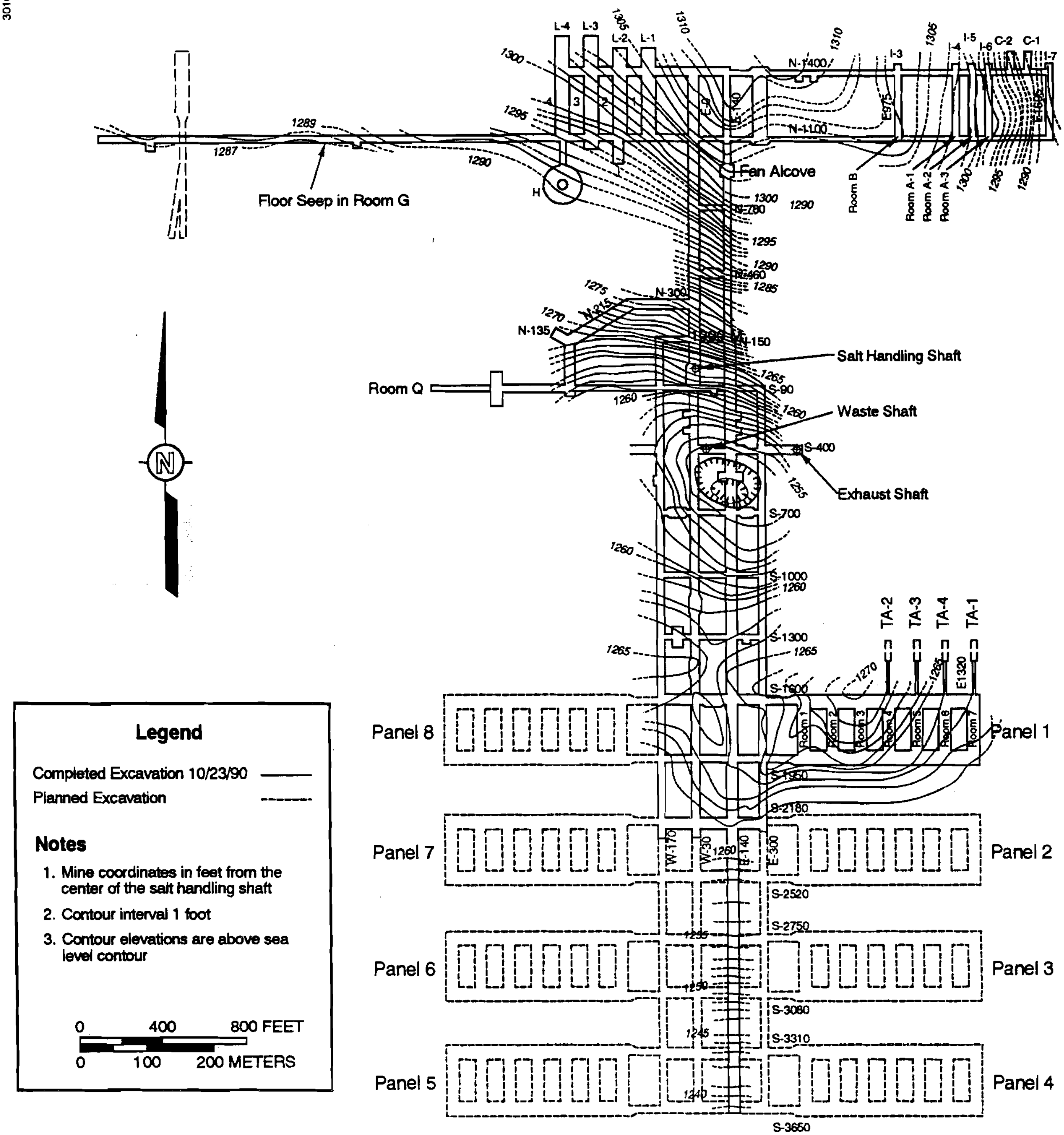

Figure E-4
Structure Contour Map on the Top of the Orange Band. Contour Interval is 1 Foot, and Elevations are in Feet (Francke and Others, 1990).

Figure E-5 illustrates the arrangement of drill holes for this phase. Each array will consist of three sets of five holes up to 150-ft long, drilled one above the other in each of five stratigraphic units, plus six additional 150-ft-long drill holes in units 1 and 2. These units are, from top to bottom: clay F and the base of map unit 4, argillaceous halite; map unit 3, clear halite; map units 1 and 2, halite and argillaceous halite (map unit 1 is the orange band); map unit 0, the argillaceous halite interval; and map unit 0, the clear halite interval. The holes in each array will be drilled with a target depth of 150 ft. If coring indicates that the hole has deviated from the desired stratigraphic unit, the drilling will be stopped, leaving the holes shorter than planned but remaining in the intended stratum.

7.0 Phase III Drilling Program

A third phase of the drilling program will examine the possibility of far-field brine flow. Assuming brine flow is primarily horizontal and controlled by strata, there would be no means by which brine could replenish dewatered interior pillars.

This phase will consist of three 150-ft holes cutting the same stratigraphy as OH20, OH23, and OH26, which are the 150-ft holes that are still producing brine. Like the 150-ft OH holes, they will begin about 1 ft above the orange band and bottom in map unit 0 below the orange band. Two will be drilled in S1600 between W30 and W170, one to the north and one to the south. A third hole will be drilled north in S1950 between W30 and E140 (Figure E-3). If a significant far-field component of flow is dominant along stratigraphic partings, the new holes should be dry or soon become dry. However, the existing long holes (OH20, OH23, and OH26) located outside the pillars should continue to produce brine and approach steady state. If the new holes in the interior pillars have brine inflow patterns similar to the exterior holes and all of the drill holes become dry, that would support the idea that the seepage is from a very local, near-field source. If a far-field flow is without horizontal constraints, brine inflow into all drill holes that extend beyond the DRZ around drifts should become steady state.

The locations for these holes were selected because they are in interior pillars in a part of the working where traffic is relatively light. The area is in close proximity to existing boreholes, and the strata are equivalent, so the results from these holes may reasonably be compared with data from the OH20, OH23, and OH26.

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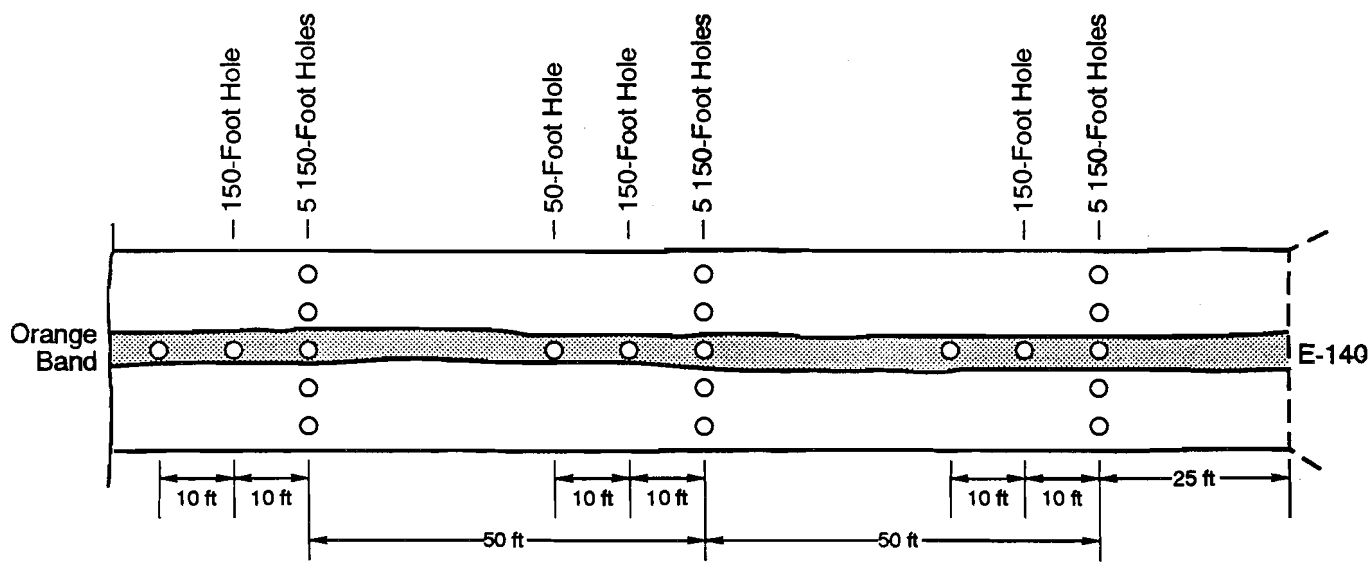

Note: All drill holes slope down away from the collar, parallel to dip, and remain in the same stratum for their entire length.

2 Sets of Holes:
1. N-460, Looking South
2. N-780, Looking South

Figure E-5
Phase II Drill Hole Arrangement

8.0 Phase IV Drilling Program

This fourth phase of drilling is intended to further define whether the DRZ around the W170 drift has already been dewatered. This phase will determine whether the first 50 ft of holes OH20, OH23, and OH26 are dry because no brine seeps into the holes from map unit 3 or because the DRZ around W170 at S1600, S1950, and S2150 was dewatered before the holes were drilled. As described in Chapter 4, the 50-ft boreholes in the series are dry, while the 150-ft holes produce brine. The 50-ft holes in this phase will cross the same stratigraphy as the 150-ft holes drilled during Phase I in 1989. If brine flows into the 50-ft holes that cross the orange band, it may be concluded that the brine is related to the orange band or the units flanking it rather than being strictly a function of depth into the ribs and the DRZ around the W170 drift.

The drilling will consist of three subhorizontal 50-ft holes drilled on 50-ft spacings north of S1600 west into W170, starting approximately 50-ft north of OH21 (Figures E-5 and E-6). These holes will be drilled to cross the orange band, just as the 150-ft OH20, OH23, and OH26 holes do. This data will supplement existing data for an overall interpretation.

9.0 References

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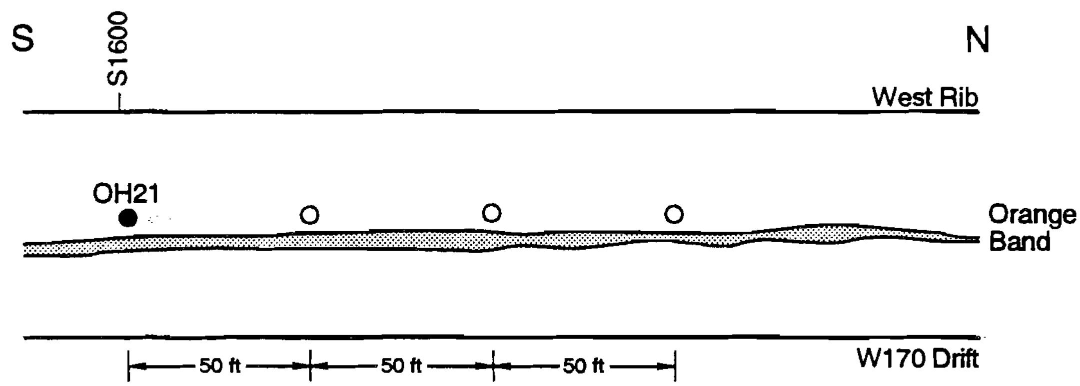

Note: Drill holes are 50 feet long and slope downward away from the collar so that the far end is close to the level of the floor of the W170 drift.

Figure E-6
Phase IV Drill Hole Arrangement