

IMPORTANT NOTICE: The current, official version of this document is available on the Sandia National Laboratories NWMP Online Documents web site. A printed copy of this document may not be the version currently in effect.

Sandia National Laboratories
Waste Isolation Pilot Plant (WIPP)

**Compliance Monitoring Program:
Recompletion and Testing of Wells for Evaluation of
Monitoring Data from the Magenta Member of the
Rustler Formation at the WIPP Site
Test Plan TP 00-03, Rev. 1**

BOE 1.3.5.3.1

Effective Date: 02/18/03

David A. Chace
Repository Performance and Certification Depart. 6822
Sandia National Laboratories
Carlsbad, NM 88220

WIPP:1.3.5.3.1.1:DC:QA-L:DPR1:FF:TP 00-03, Rev 1

APPROVALS

Author:	<u>Original signed by David Chace</u> D. A. Chace Well Testing Lead Repository Performance and Certification Dept. 6822 Sandia National Laboratories Carlsbad, NM 88220	<u>2-4-03</u> Date
Technical Reviewer:	<u>Original signed by R. Roberts</u> R. M. Roberts Compliance Monitoring Program Repository Performance and Certification Dept. 6822 Sandia National Laboratories Carlsbad, NM 88220	<u>2-4-03</u> Date
SNL QA:	<u>Original signed by M.J. Mitchell</u> M. Mitchell Quality Assurance Carlsbad Programs Group 6820 Sandia National Laboratories Carlsbad, NM 88220	<u>5 Feb 03</u> Date
SNL Management:	<u>Original signed by M.K. Knowles</u> M. K. Knowles Manager Performance Assessment and Decision Analysis Dept. 6821 Sandia National Laboratories Carlsbad, NM 88220	<u>14 Feb 03</u> Date

ACKNOWLEDGEMENTS

The author thanks Bryan Howard, Randy Roberts, Dave Guerin, Tanya McMullen, and many reviewers for their assistance in preparing this Test Plan.

CONTENTS

1 ABBREVIATIONS, ACRONYMS, AND INITIALISMS	8
2 REVISION HISTORY.....	9
3 PURPOSE AND SCOPE	10
3.1 Purpose of the SNL Compliance Monitoring Program.....	10
3.2 Purpose and Scope of Recompletion of Wells to the Magenta and Subsequent Data Collection	10
4 EXPERIMENTAL PROCESS DESCRIPTION.....	15
5 MEASURING AND TEST EQUIPMENT.....	30
5.1 Surface Equipment.....	30
5.1.1 Water-Level Sounders.....	30
5.1.2 Water-Quality Measurement Instruments	30
5.1.3 Mechanical Flow Meter	31
5.1.4 Diesel-Powered Generators.....	31
5.1.5 Storage Tanks.....	31
5.1.6 Data-Acquisition System.....	31
5.1.7 Electronic Flow-Control System.....	32
5.1.8 Barometer	32
5.2 Downhole Equipment	32
5.2.1 Bailing and Swabbing Equipment.....	33
5.2.2 Inflatable Packers	33
5.2.3 Sliding-Sleeve Shut-In Tool.....	33
5.2.4 TROLL Memory Gauges	33
5.2.5 Submersible Pump.....	34
5.2.6 Pressure Transmitters	34

CONTENTS (cont.)

6 TEST REQUIREMENTS/PROCEDURES	35
6.1 Test Requirements	35
6.2 Test Procedures	35
6.2.1 Slug and Drillstem Tests	35
6.2.2 Pumping Tests	37
6.2.3 Modifications to Test Procedures	37
7 DATA-ACQUISITION PLAN	38
7.1 Scientific Notebooks	38
7.2 Electronic Data Acquisition	39
7.3 Manual Data Acquisition	39
7.4 On-Site Data Validation	40
8 SAMPLING AND SAMPLE CONTROL	41
9 TRAINING	43
10 QUALITY ASSURANCE	44
10.1 Hierarchy of Documents	44
10.2 Quality-Affecting Activities	44
10.3 Quality Assurance Program Description	45
10.4 NPs, SPs and TOPs	45
10.5 Data Integrity	46
10.6 Records	46
10.6.1 Required QA Records	46
10.6.2 Miscellaneous Non-QA Records	47
10.6.3 Submittal of Records	47

CONTENTS (cont.)

11 HEALTH AND SAFETY48

12 ROLES AND RESPONSIBILITIES50

 12.1 SNL Responsibility50

 12.2 WRES Responsibilities50

 12.3 Responsibility for Permitting and Licensing51

13 REFERENCES52

FIGURES

Figure 1-1. Stratigraphic units at the WIPP site.	12
Figure 1-2. Locations of Magenta and other wells at the WIPP site.	14
Figure 2-1. Current configuration of Well DOE-1.	17
Figure 2-2. Current configuration of Well DOE-2.	18
Figure 2-3. Current configuration of Well ERDA-9.	19
Figure 2-4. Current configuration of Well H-11b2.	20
Figure 2-5. Current configuration of Well H-14.	21
Figure 2-6. Current configuration of Well H-15.	22
Figure 2-7. Current configuration of Well H-17.	23
Figure 2-8. Current configuration of Well H-18.	24
Figure 2-9. Current configuration of Well P-15.	25
Figure 2-10. Current configuration of Well WIPP-13.	26
Figure 2-11. Current configuration of Well WIPP-18.	27
Figure 2-12. Current configuration of Well H-9c.	28
Figure 2-13. Flow chart of the Magenta recompletion and data collection activities.	29

1 ABBREVIATIONS, ACRONYMS, AND INITIALISMS

A	ampere
APV	access port valve
ASME	American Society of Mechanical Engineers
CAO	(U.S. DOE) Carlsbad Area Office
CBFO	(U.S. DOE) Carlsbad Field Office
CCA	Compliance Certification Application
CMR	Central Monitoring Room
DAS	data-acquisition system
DC	direct current
DOE	(U.S.) Department of Energy
DST	drillstem test
EPA	(U.S.) Environmental Protection Agency
ES&H	environmental safety and health
GET	General Employee Training
gpm	gallons per minute
GWMP	Groundwater Monitoring Program
HA	hazard analysis
I.D.	inside diameter
JHA	job hazard analysis
MA	milliamperere
MOC	Management and Operating Contractor
MSDS	Material Safety Data Sheet
NEPA	National Environmental Policy Act
NP	(SNL NWMP) Nuclear Waste Management (QA) Procedure
NWMP	Nuclear Waste Management Program
PHS	primary hazard screening
PI	Principal Investigator
PIP	production-injection packer
psia	pounds per square inch, absolute
psig	pounds per square inch, gauge
QA	quality assurance
QAPD	Quality Assurance Program Document
SNL	Sandia National Laboratories
SP	(SNL NWMP) Activity/Project-Specific Procedure
TOP	(SNL NWMP) Technical Operating Procedure
TP	(SNL) test plan
V	volts
WRES	Washington Regulatory and Environmental Services
WIPP	(U.S. DOE) Waste Isolation Pilot Plant

2 REVISION HISTORY

Revision 1 of this test plan (TP) consists of the inclusion of well H-9c in the list of WIPP-Site wells scheduled for recompletion and testing for evaluation of monitoring data from the Magenta Member of the Rustler Formation. Well H-9c was recompleted as a Magenta well in February 2002 in order to extend the information base of the Magenta to the southern boundary of the current model domain. This was done well after the release of Rev. 0 for this TP; therefore, a revision was necessary. Changes to this TP, other than those defined as editorial changes per Sandia National Laboratories' (SNL's) Nuclear Waste Management Program (NWMP) Quality Assurance (QA) Procedure NP 20-1 (Subsection 10.4), shall be reviewed and approved by the same organization that performed the original review and approval. All TP revisions will have at least the same distribution as the original document.

3 PURPOSE AND SCOPE

The activities described in this TP constitute one component of a Sandia National Laboratories (SNL) program to evaluate monitoring data collected at the Waste Isolation Pilot Plant (WIPP) Site to demonstrate U.S. EPA (1993, 1996). The overall SNL Compliance Monitoring Program is discussed below, followed by a summary of the specific activities described in this TP and their objectives.

3.1 Purpose of the SNL Compliance Monitoring Program

The WIPP is a U.S. Department of Energy (DOE) facility for the safe disposal of transuranic wastes resulting from the U.S. defense programs. In the WIPP Compliance Certification Application (CCA) (U.S. DOE, 1996), the DOE made commitments to conduct a number of monitoring activities to comply with U.S. EPA (1996) and to ensure that important deviations from the expected long-term performance of the repository are identified at the earliest possible time. Collection and reporting of the data from the WIPP monitoring programs are the responsibility of the WIPP Management and Operating Contractor (MOC), Washington Regulatory and Environmental Services (WRES). SNL, as the Scientific Advisor to the DOE for the WIPP Project, evaluates the monitoring data against performance expectations for the disposal system.

The SNL Compliance Monitoring Program evaluates data collected by WRES under five monitoring programs: the Geotechnical Monitoring Program, the Groundwater Monitoring Program (GWMP), the Delaware Basin Drilling Monitoring Program, the Subsidence Monitoring Program, and the WIPP Waste Information System. This TP supports the SNL Compliance Monitoring Program by providing for evaluation of data collected under the GWMP.

3.2 Purpose and Scope of Recompletion of Wells to the Magenta and Subsequent Data Collection

The WIPP repository is excavated in bedded halite of the Salado Formation, approximately 2150 ft below land surface. At the center of the WIPP Site, the Salado is approximately 2000 ft thick and is overlain by the approximately 310-ft-thick Rustler, the 500-ft-thick Dewey Lake Formation, and approximately 50 ft of surficial deposits ranging from weathered sedimentary rock to Quaternary eolian deposits (Figure 1-1). Groundwater is found principally in three horizons above the Salado: the Culebra Member of the Rustler, the Magenta, and the Dewey Lake Redbeds (over the southern portion of the WIPP Site only).

Appendix GWMP of the CCA (U.S. DOE, 1996) commits the DOE to monitor groundwater levels in the Culebra, the Magenta, and the Dewey Lake. That monitoring is performed by the MOC, and the monitoring data are then evaluated by SNL to determine if any changes from historic and expected conditions have occurred. If changes have occurred, SNL evaluates the potential for those changes to affect the performance of the WIPP disposal system. SNL developed a

groundwater flow model for the Culebra for the CCA; initial calculations were adequate to show that the consequences of a release of radionuclides to the Magenta were less severe than those of a release to the Culebra. In order to facilitate evaluation of Magenta monitoring data, SNL now intends to develop a Magenta groundwater-flow model.

Modeling flow through the Magenta requires a variety of spatially distributed data, including:

- depth and thickness,
- transmissivity,
- storativity,
- hydraulic head, and
- fluid density.

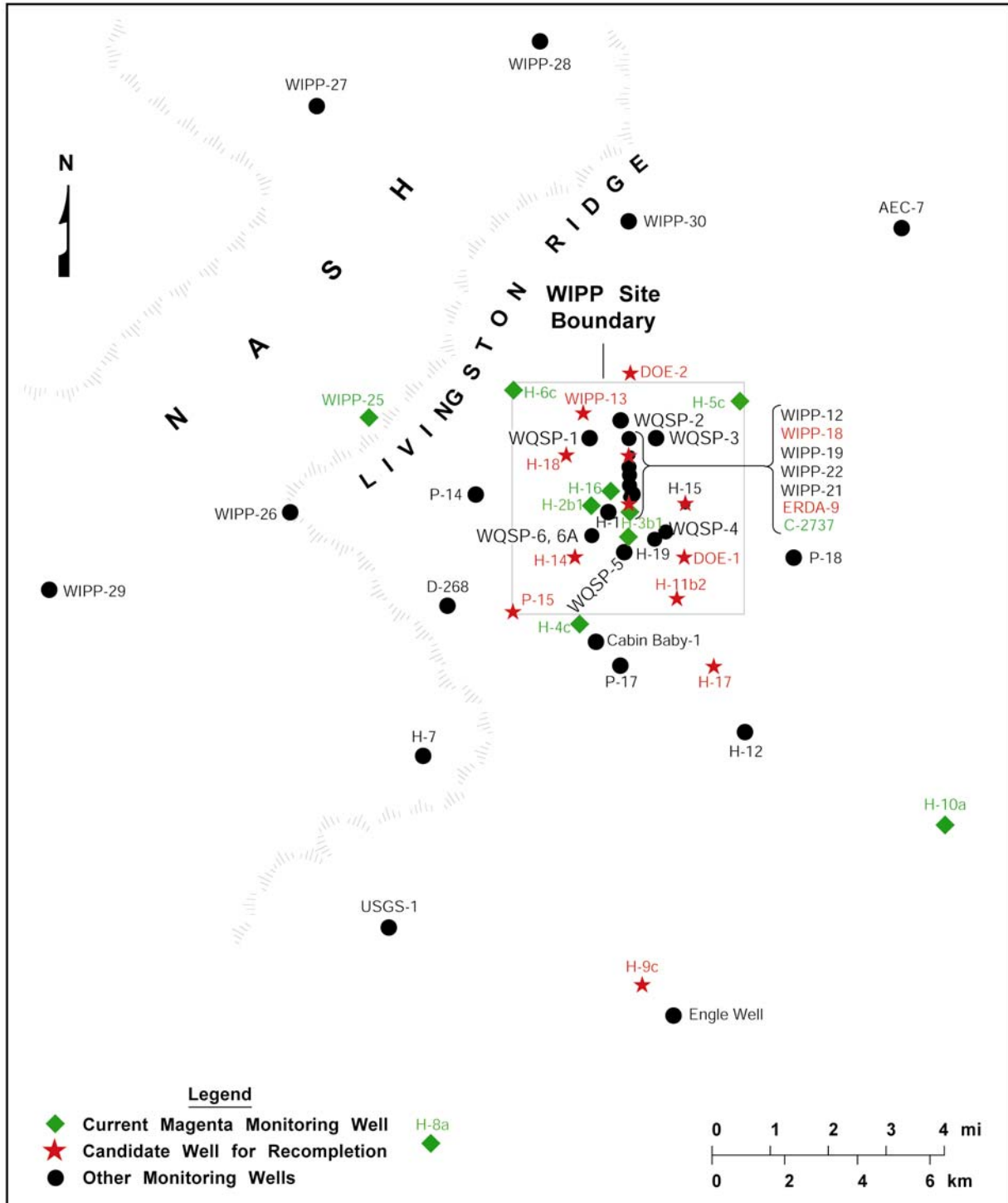
System	Series	Group	Formation	Member	Approximate Thickness* (m ft)
Quaternary	Recent		Surficial Deposits		3 10
	Pleistocene		Mescalero Caliche		10 30
			Gatuña		
Triassic		Dockum	Santa Rosa		3 10
Permian	Ochoan		Dewey Lake Redbeds		150 500
			Rustler	Forty-niner	18 60
				Magenta	7 24
				Tamarisk	26 85
				Culebra Dolomite	7 24
				Los Medanos	37 120
	Salado		600 2000		
	Castile		400 1300		
	Guadalupian	Delaware Mountain	Bell Canyon		310 1000
			Cherry Canyon		335 1100
			Brushy Canyon		550 1800

* At center of WPP site.

Figure 1-1. Stratigraphic units at the WIPP Site.

The depth and thickness of the Magenta over the WIPP site are well established through the drilling of approximately 100 wells and exploratory boreholes. The other parameters needed for modeling, however, are not as well established. Transmissivity values are available from only 16 locations in the vicinity of WIPP (ten on the WIPP site); no storativity data are available; hydraulic-head data are available from only 13 wells (six on the WIPP site); fluid-density data are available from only six wells (four on the WIPP site). Thus, the currently available data are inadequate to construct a reliable flow model for the Magenta. The purpose of the activities described in this TP is to recompleat existing wells to the Magenta and then collect the data needed for development of a defensible groundwater flow model of the Magenta in the vicinity of the WIPP site.

Figure 1-2 shows the wells currently existing around the WIPP Site. Wells currently configured to allow monitoring of the Magenta are shown, as well as those that might be recompleated to the Magenta. In all cases, recompleation will involve setting a bridge plug in the well casing between the Culebra and Magenta, and perforating the casing across the Magenta interval. Drillstem and/or slug tests will be performed to obtain transmissivity estimates. The wells will also be pumped to collect samples of the Magenta water for density measurements and major-ion analyses, and possibly to provide additional data for estimation of transmissivity and storativity. Finally, water levels in the wells will be monitored to provide hydraulic-head information. This TP describes plans, procedures, and specifications for the recompleation and data-collection activities to be conducted.



TRI-6115-192-0

Figure 1-2. Locations of Magenta and other wells at the WIPP Site.

4 EXPERIMENTAL PROCESS DESCRIPTION

Twelve wells currently completed to the Culebra are under consideration for potential recompletion to the Magenta (Figure 1-2). These wells were selected because they are in locations where Magenta data are currently lacking. For some of the wells, data on hydraulic head are particularly important (e.g., DOE-2, H-11b2, H-15, and P-15). For others, transmissivity data are of primary importance (e.g., H-18, WIPP-18). However, hydraulic-head, transmissivity, and fluid-density data should be collected from all locations.

The recompletions and subsequent data collection are planned to occur in two phases. In the first phase, the six wells considered most important (DOE-2, H-11b2, H-15, H-18, P-15, and WIPP-18) will be recompleted and data collected. We will then evaluate whether the expanded database is adequate for construction of a reliable Magenta model, or if data are needed from some or all of the remaining five wells (DOE-1, ERDA-9, H-9c, H-14, and H-17, and WIPP-13). If additional data are required, the appropriate wells will be recompleted in phase two.

For each well, the sequence of activities will typically be as follows:

1. The well casing will be scraped, if necessary, to remove scale and rust.
2. An inflatable bridge plug will be set in the well casing approximately 20 ft below the Magenta (as determined from available logs) to isolate the open Culebra interval from the well casing above.
3. The water in the casing above the bridge plug will be bailed or swabbed from the well until the water level is approximately 50 ft above the Magenta. This will ensure that the hydraulic gradient will be from the Magenta into the well immediately after perforation, which will prevent Culebra water from entering the Magenta, while leaving enough water in the well to cushion the perforating gun.
4. A natural gamma log will be run in the well to identify the precise depth interval of the Magenta.
5. The well casing will be jet-perforated from 1 ft above to 1 ft below the Magenta, using four shots per foot.
6. A production-injection packer (PIP) will be set in the well casing above the perforations on 2.375-in tubing, with a sliding-sleeve shut-in tool below the PIP controlling communication between the tubing and the Magenta interval. Two slug tests or two drillstem tests (DSTs) will be performed by opening and closing the shut-in valve, as appropriate, and bailing or swabbing the tubing as necessary (see procedures in Subection 6.2.1).

7. A submersible pump will be set just below the perforations and operated at a rate of approximately 1 gpm until water-quality parameters (specific conductance and specific gravity) are stable within $\pm 5\%$ while two wellbore volumes are pumped. Water-level measurements will be performed at least every 30 min while the pump is on. If the water level in the well gets down to 5 ft above the perforations before the water-quality parameters have stabilized for the desired period, the pump will be shut off overnight while the well recovers. Pumping will resume the next morning and continue, stopping as necessary, until the desired stabilization is achieved. When that occurs, water samples will be collected for laboratory analysis of major ions and the pump will be turned off and removed from the well.

8. The Principal Investigator (PI) will evaluate the data from the pumping exercise to determine if the well can sustain a pumping rate of approximately 1 gpm for a 50-h pumping test. If his determination is that the well cannot support a pumping test, we will proceed to Step 10. If the well can support a pumping test, we will proceed to Step 9.

9. After the well has recovered from the pumping for water-quality samples, a pumping test will be performed in accordance with the procedures given in Subsection 6.2.2.

10. All test equipment will be removed from the well, and the well will be configured for long-term monitoring. This will involve no further work in H-11b2 and WIPP-18. In DOE-2, H-15, H-18, and P-15, a 2.375-in tubing string will be run down and attached to the bridge plug between the Magenta and Culebra, and the bottom plug will be sheared or blown out of the bridge plug, converting it to a PIP. The tubing will then be bailed or swabbed to remove non-Culebra water. In P-15, 0.75-in flush-jointed polyvinyl chloride pipe may be installed alongside the 2.375 in tubing to a depth approximately 50 ft below the Magenta water level to allow easy access of a water-level probe.

This will complete SNL activities in the well. The MOC will begin monthly water-level measurements of the Culebra through the tubing (where present) and the Magenta in the well casing as part of the GWMP. Figures 2-1 through 2-11 show the current configurations of the wells that activities.

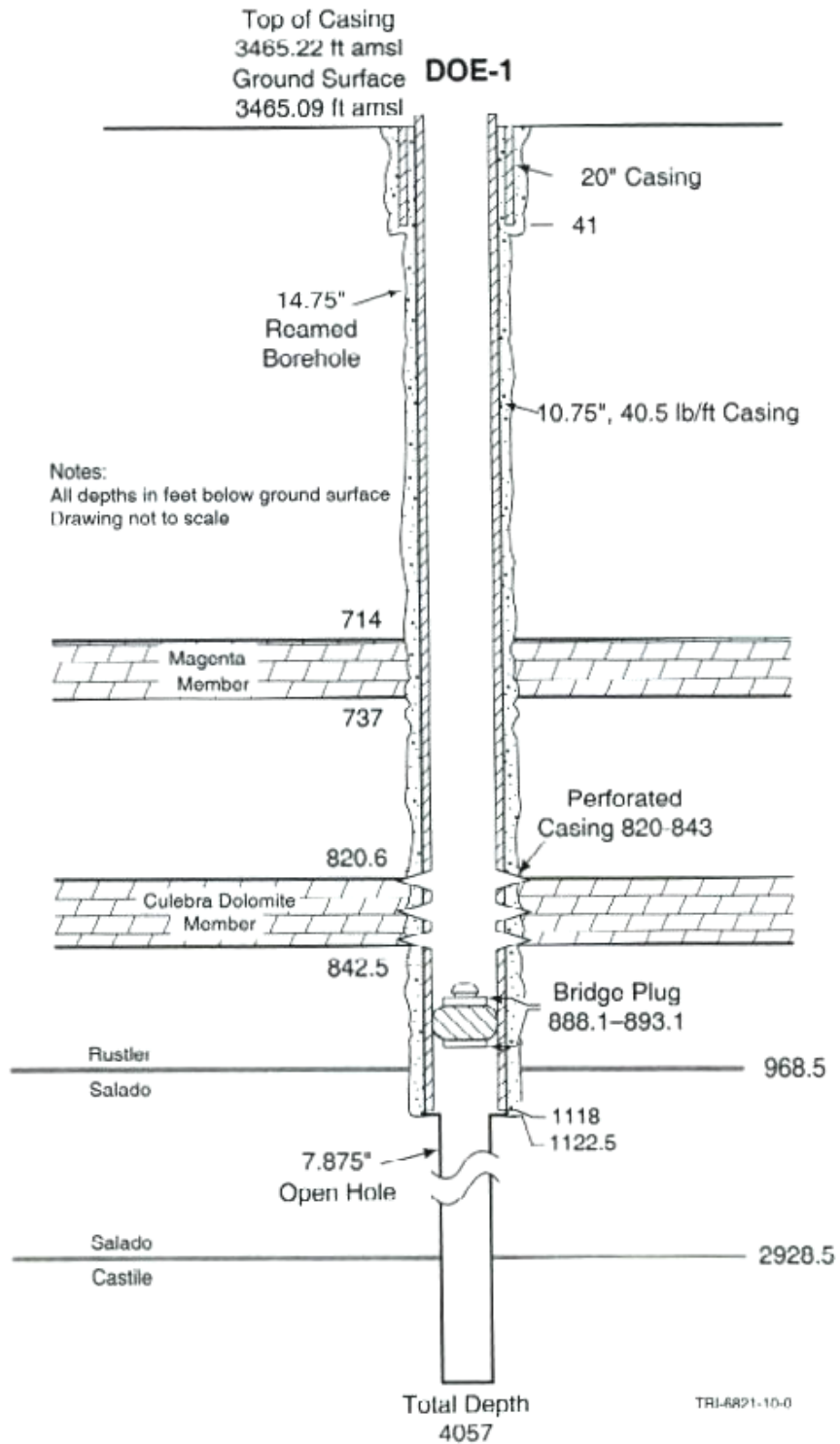


Figure 2-1. Current configuration of Well DOE-1.

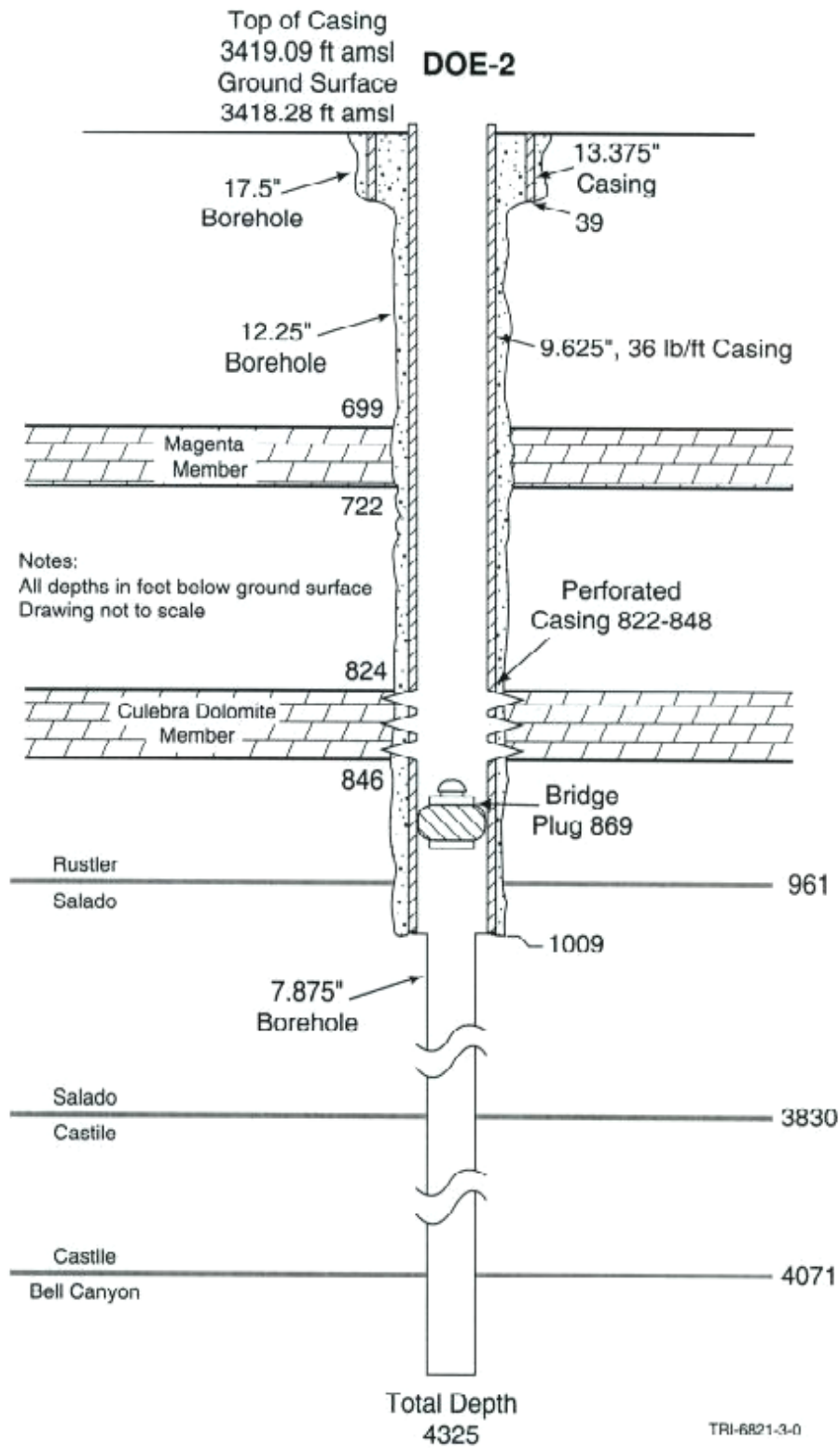


Figure 2-2. Current configuration of Well DOE-2.

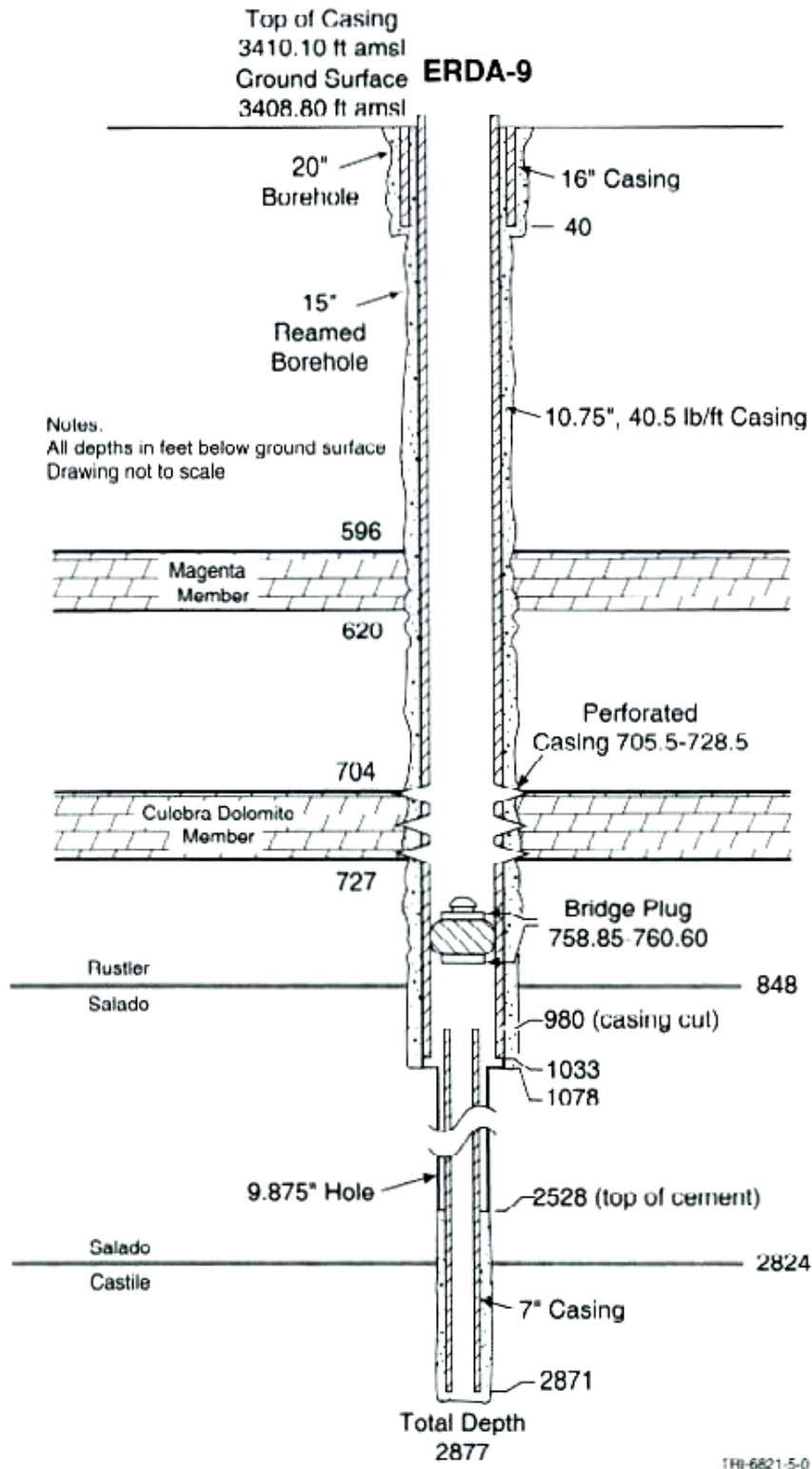


Figure 2-3. Current configuration of Well ERDA-9.

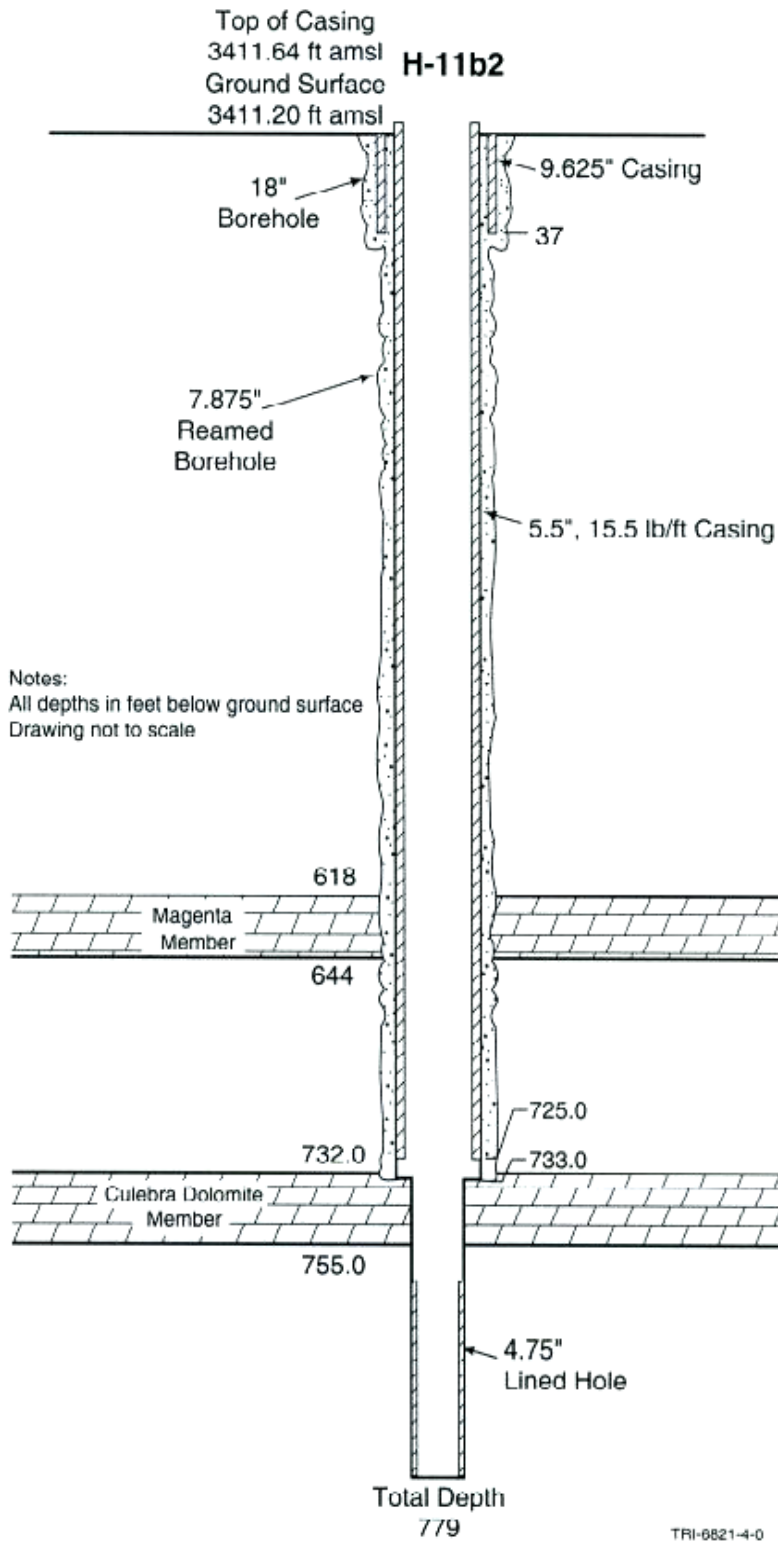


Figure 2-4. Current configuration of Well H-11b2.

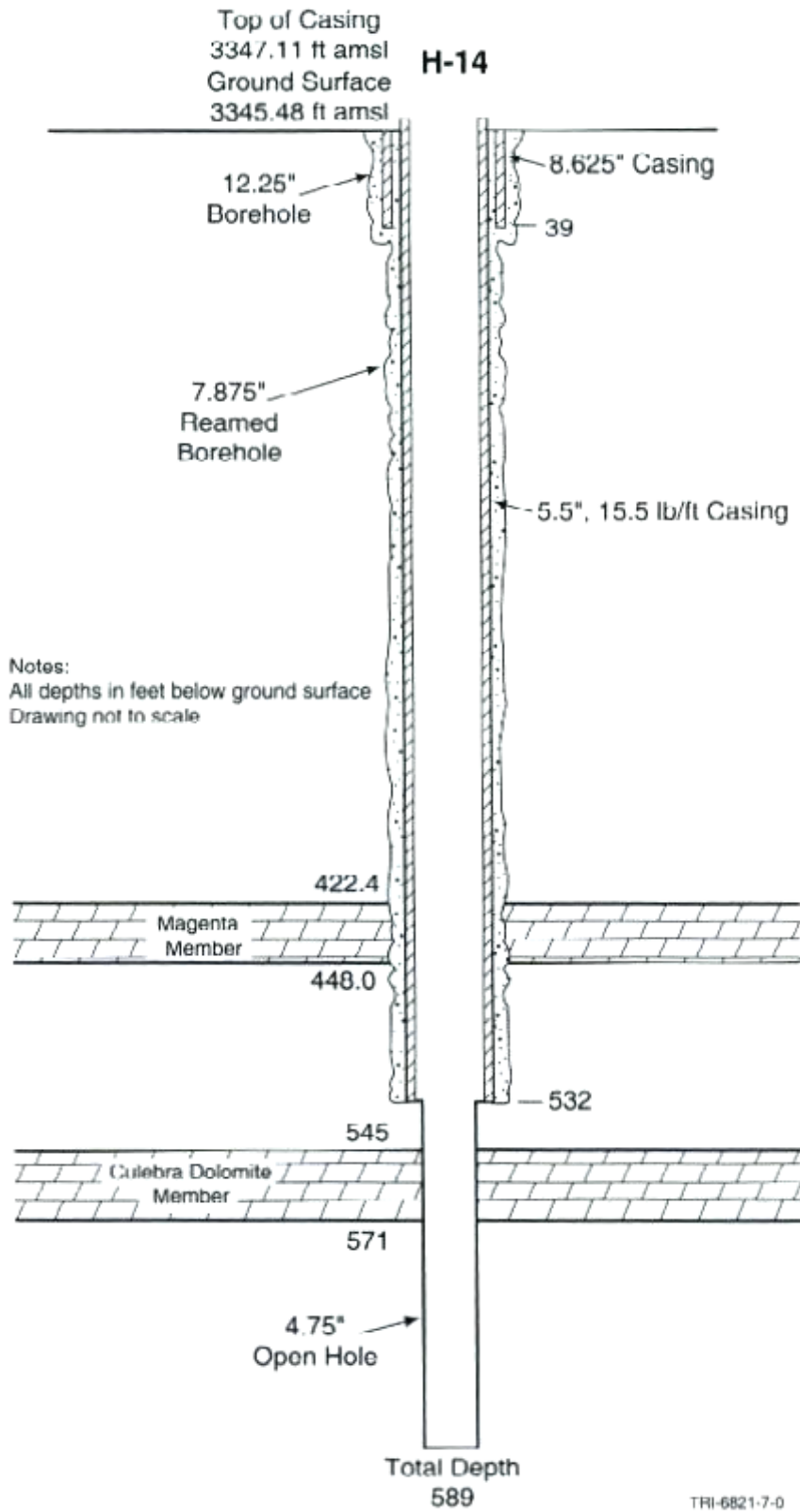


Figure 2-5. Current configuration of Well H-14.

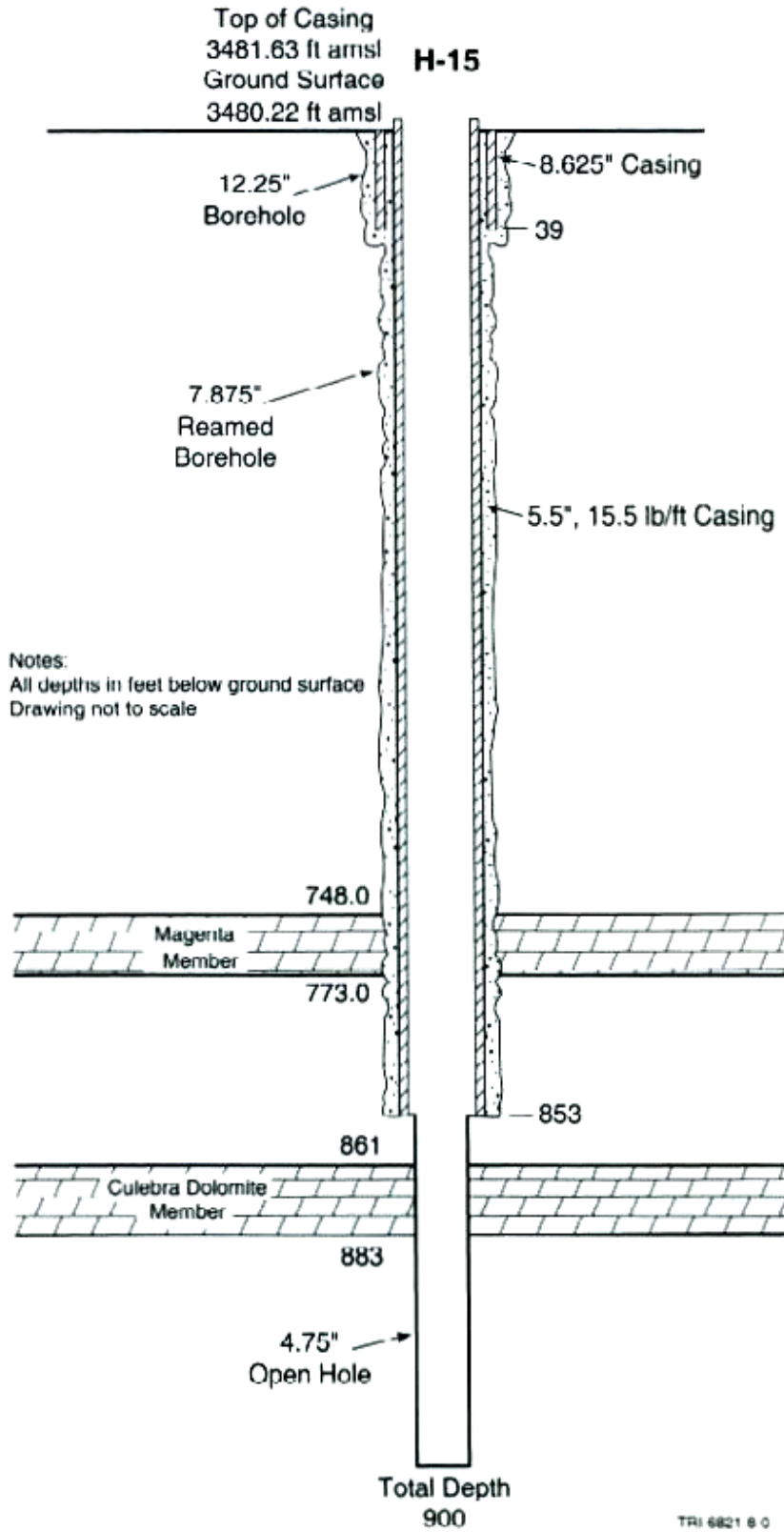


Figure 2-6. Current configuration of Well H-15.

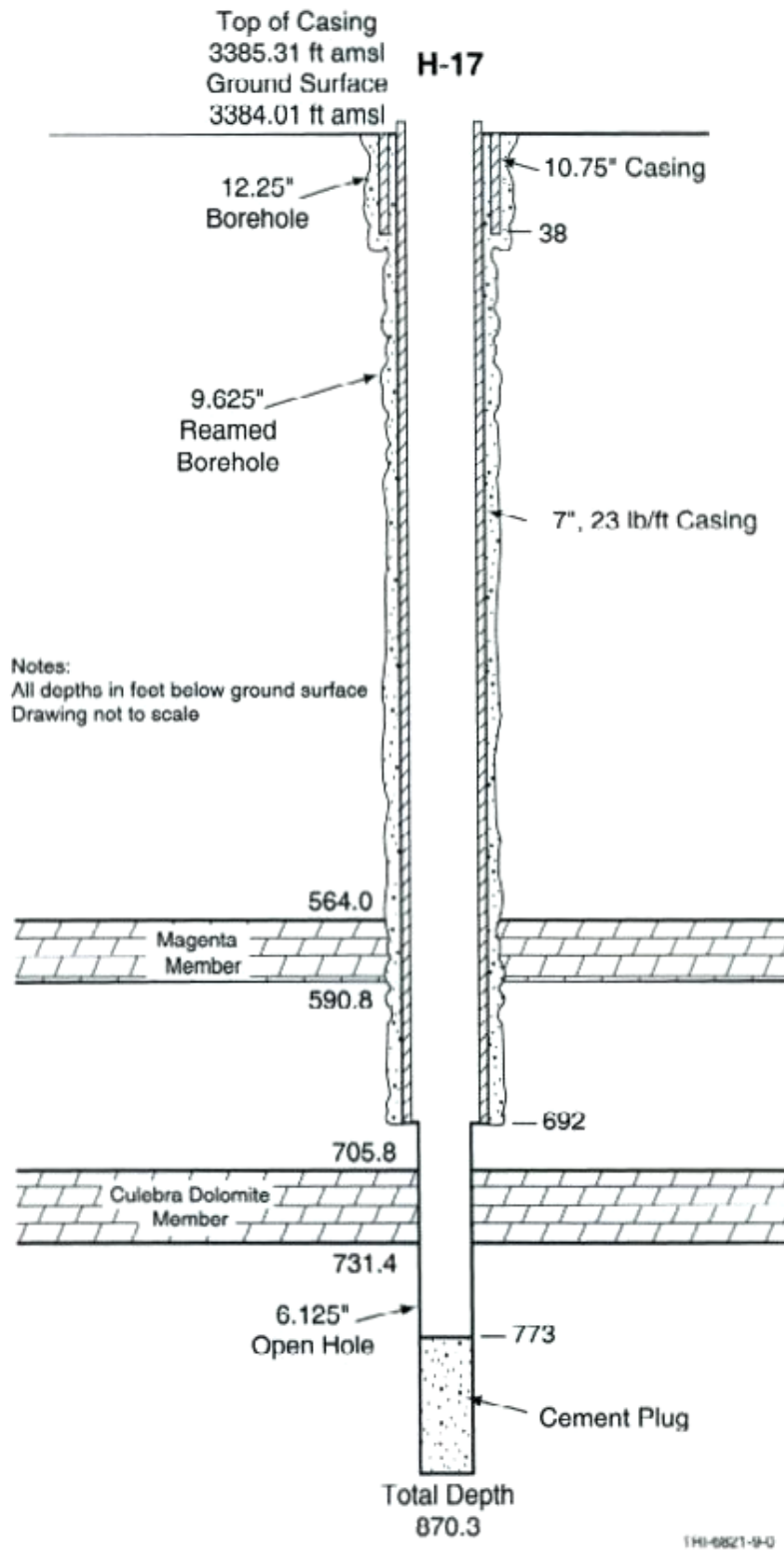


Figure 2-7. Current configuration of Well H-17.

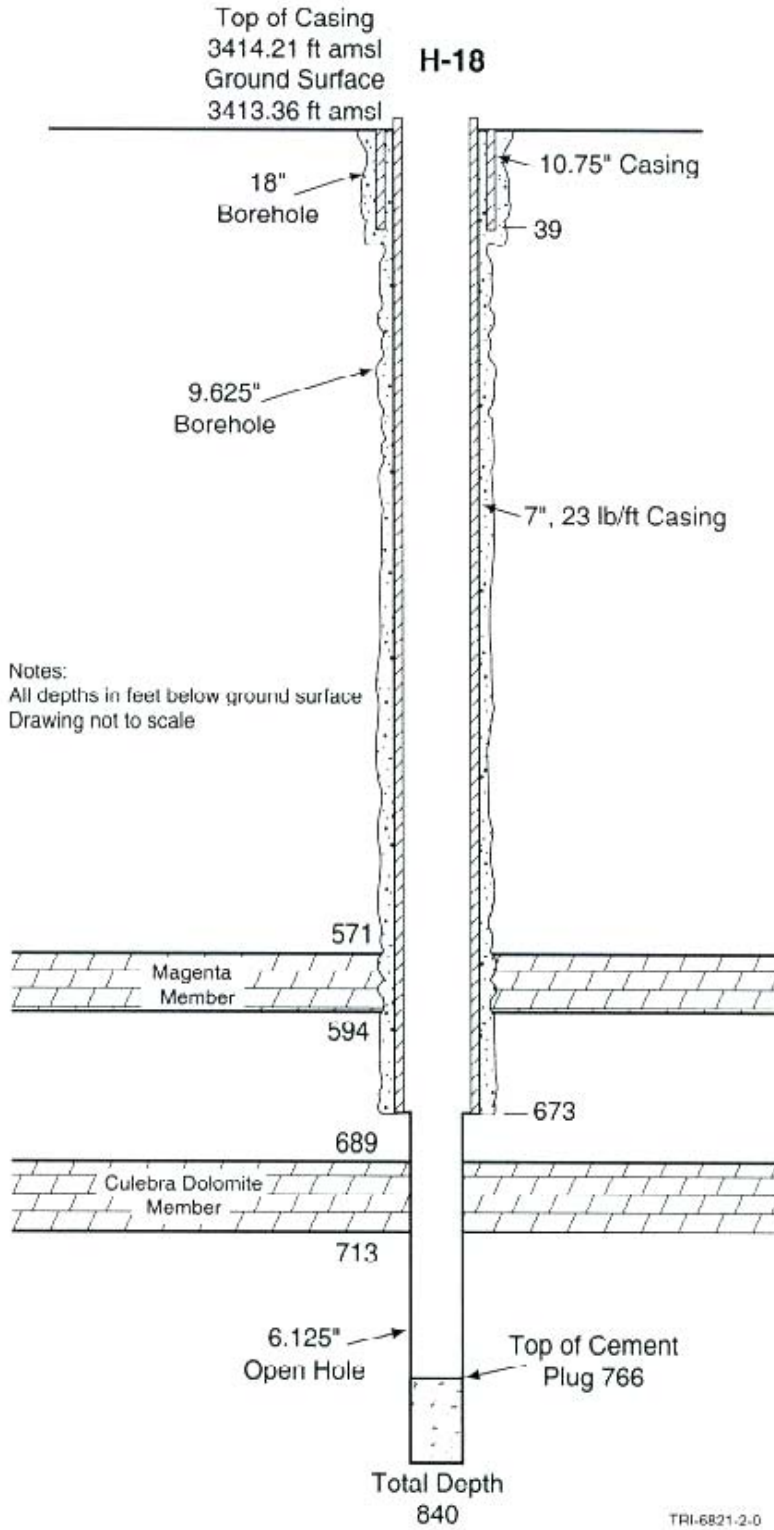


Figure 2-8. Current configuration of Well H-18.

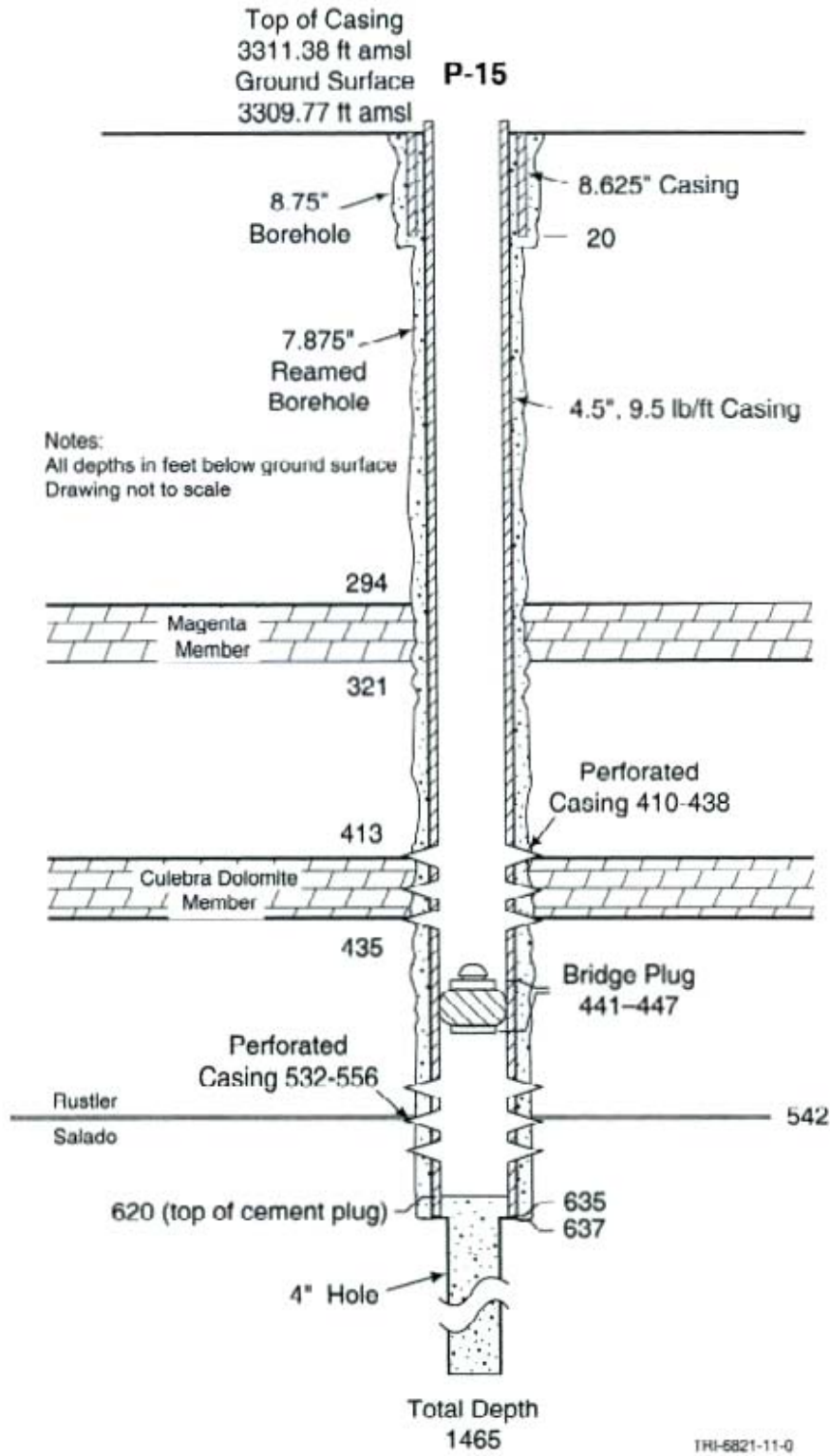


Figure 2-9. Current configuration of Well P-15.

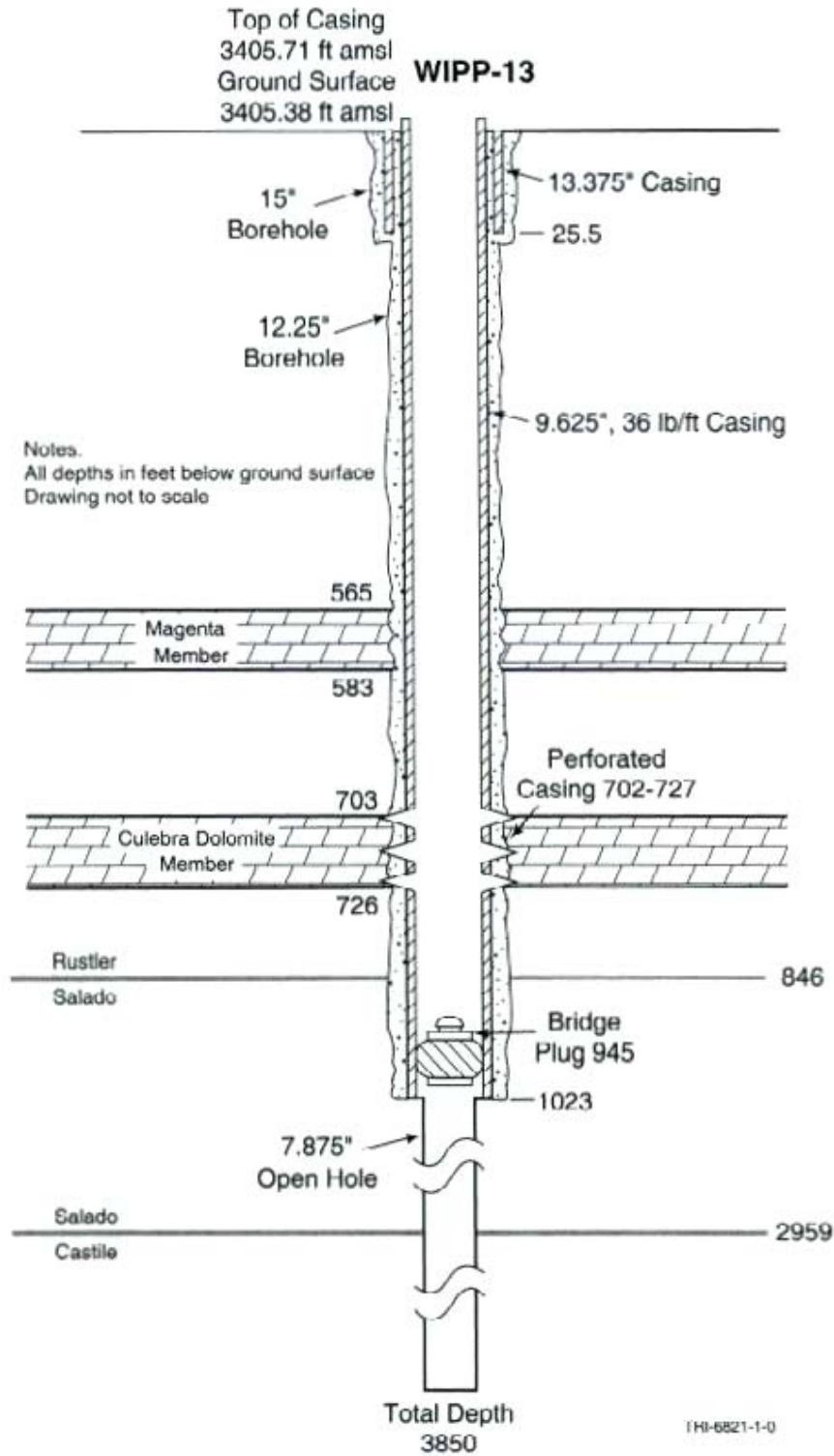


Figure 2-10. Current configuration of Well WIPP-13.

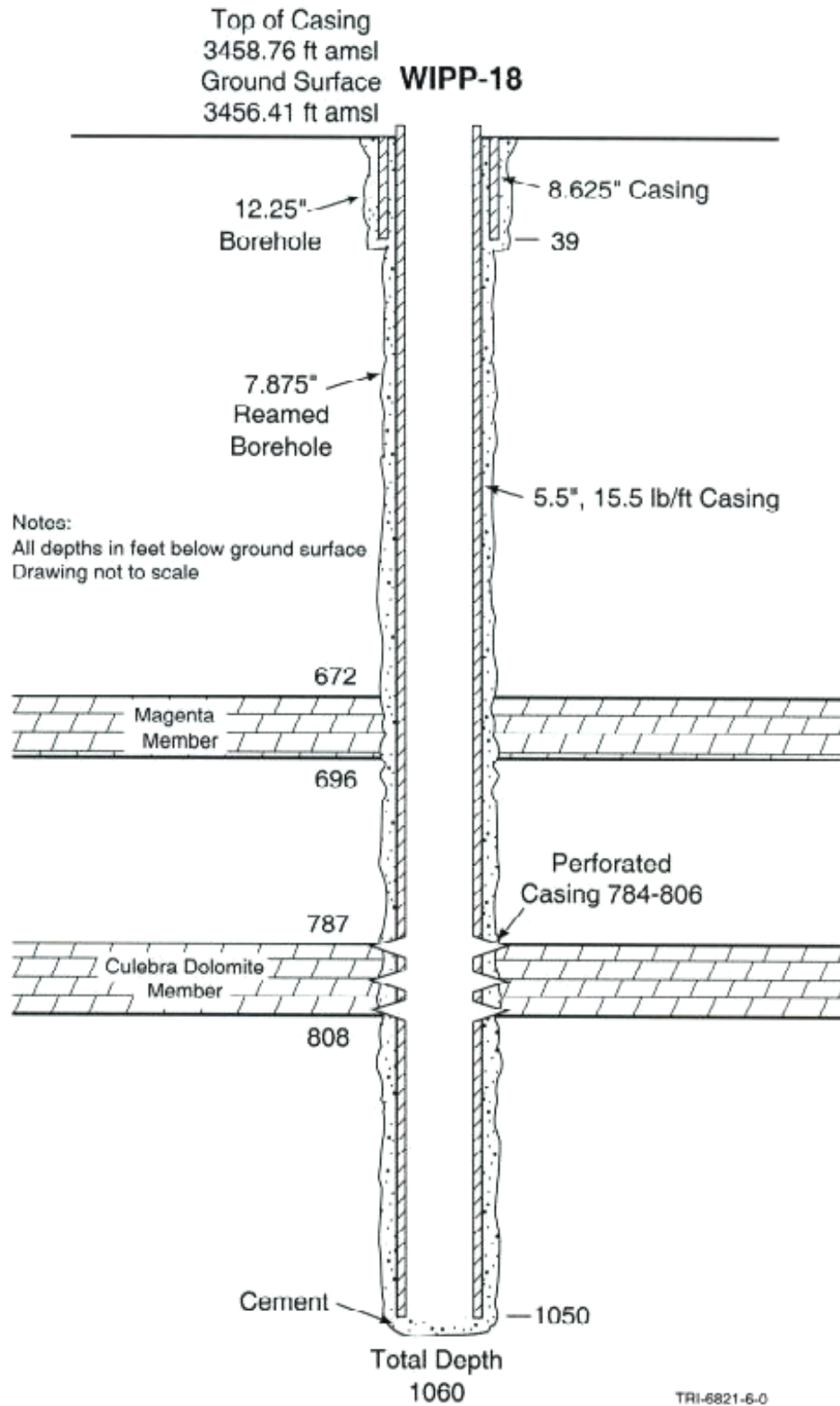


Figure 2-11. Current configuration of Well WIPP-18.

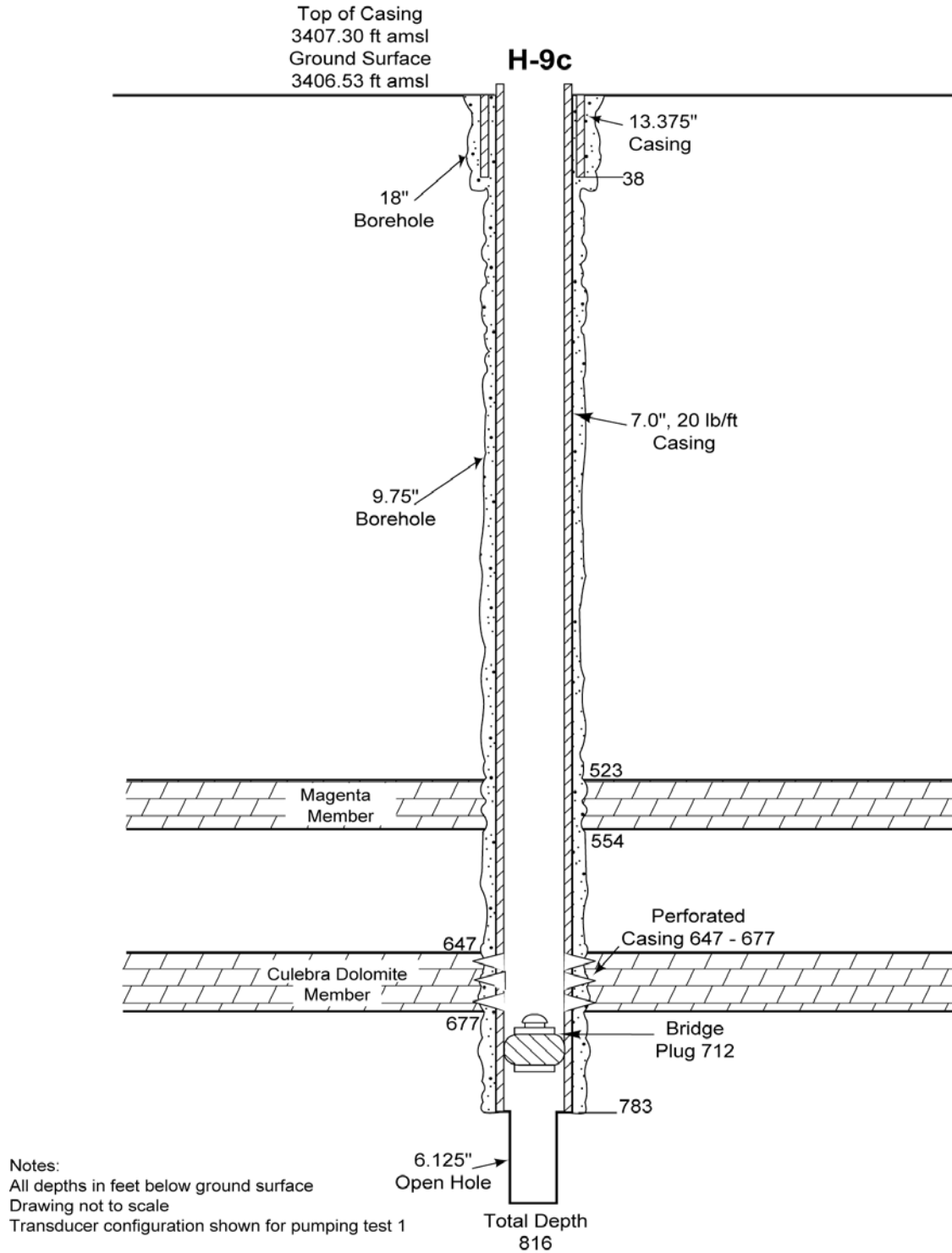
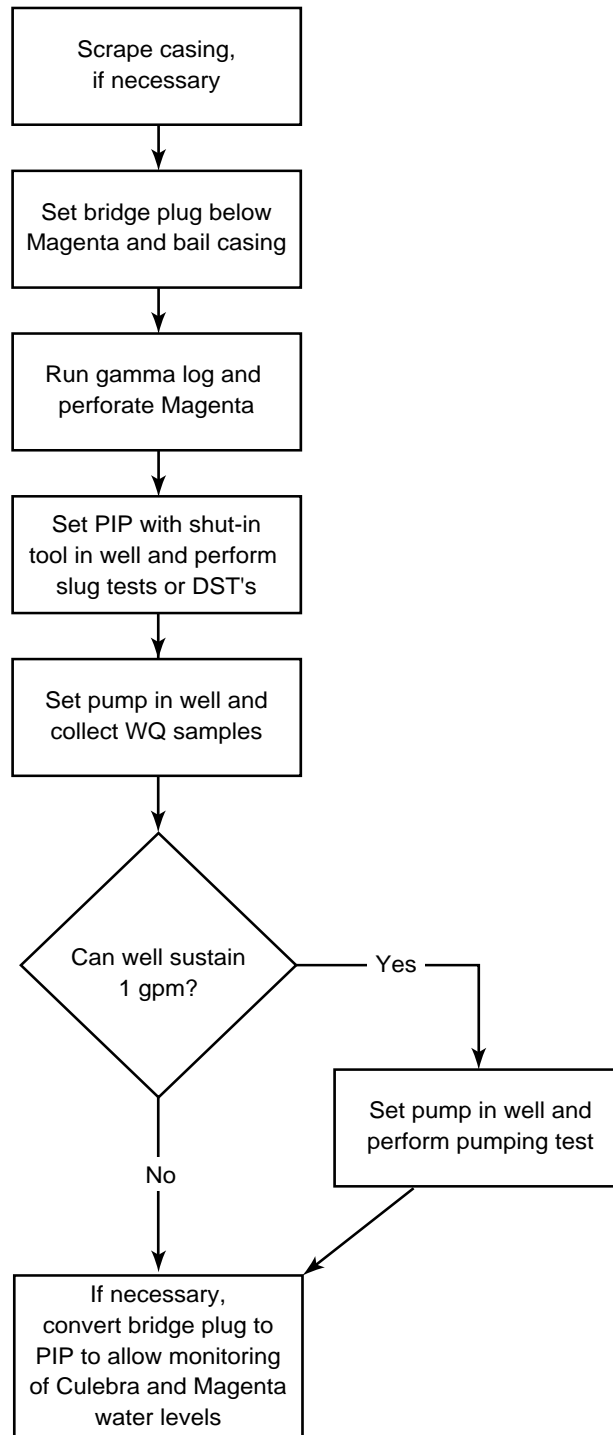


Figure 2-12. Current configuration of Well H-9c.



TRI-6821-13-0

Figure 2-13. Flow chart of the Magenta recompletion and data collection activities.

might potentially be recompleted to the Magenta. Figure 2-12 shows a flow chart of the field activities.

5 MEASURING AND TEST EQUIPMENT

Equipment needed for the Magenta recompletion and data-collection activities will consist of equipment at the land surface and downhole equipment to be installed in the wells. Equipment will consist of either “off-the-shelf” items ordered directly from qualified suppliers or standard equipment provided by qualified service companies as required to complete their contracted tasks. No specially designed equipment is anticipated. All equipment used will follow the supplier’s operation and calibration recommendations and will be documented as part of the QA records and controlled following NP 12-1 (Subsections 6.1 and 10.4).

5.1 Surface Equipment

The Magenta recompletion and data-collection activities will be conducted utilizing some equipment at the land surface and some equipment installed in the wells (i.e., downhole equipment). Equipment will be operated observing relevant SNL and WRES environmental safety and health (ES&H) procedures and protocols. The surface equipment will include water-level sounders, water-quality-measurement instruments, a mechanical flow meter, diesel-powered generators, and storage tanks. A data-acquisition system (DAS) to monitor pressure and flow rate, an electronic flow-control system, and a barometer will be used for any pumping test performed.

5.1.1 Water-Level Sounders

Water levels in the wells will be measured before installing any equipment. Water levels may also be measured in other Magenta monitoring wells within 1 mile of a well undergoing recompletion, pumping, or testing. The water levels will be measured using Solinst electric water-level sounders according to SNL NWNP Technical Operating Procedure (TOP) 512 (Subsection 10.4). All measurements will be documented as part of the QA records. The Solinst meter consists of a graduated plastic tape with two wire leads, a water-level probe at the downhole end of the tape, batteries, and a signal light and buzzer mounted on a surface reel. When the water-level probe enters the water, the electrical conductivity of the water closes the electric circuit on the tape, activating the surface light and buzzer. The water level is read directly, in feet or meters, on the graduated plastic tape, at the observation-well measuring point, which will be clearly marked on the surface casing.

5.1.2 Water-Quality Measurement Instruments

Throughout the pumping phases of this program, the specific conductance, temperature, pH, and specific gravity of the produced water will be measured hourly, or as directed by the PI, following SNL NWMP Activity/Project-Specific Procedure (SP) 13-3 (Subsection 10.4). The same measurements will also be performed on water bailed or swabbed from the wells prior to slug tests or DSTs. With the exception of specific gravity, these data will be considered qualitative in nature

and will not be used for interpretation, but only to indicate relative changes in the quality of the fluid produced. The specific conductance and temperature will be measured with a Yellow Springs Instruments S-C-T meter or equivalent; pH with an Orion pH meter or equivalent; and the specific gravity with a laboratory-grade hydrometer. Measurements will be documented as part of the QA records.

5.1.3 Mechanical Flow Meter

A totalizing mechanical flow meter will be used to measure the cumulative discharge during all pumping periods. The total discharge will be measured with a Carlon (or equivalent) in-line totalizing flow meter. The Carlon flow meter has a 0.675-in orifice, and is a brass-housed synthetic (non-corrosive) turbine flow meter designed for discharge rates of 1 to 20 gpm, with scale divisions of 0.10 gal. The Carlon flow meter is a totalizing flow meter and monitors only the total volume of fluid pumped. If necessary, the data from the totalizing flow meter can be used to calculate the average pumping rate by observing the meter at the beginning and end of a time period. The time and volume data can be used to calculate the average discharge rate for the time period in question. Totalizing-flow-meter data will be documented as part of the QA records. The flow meter will be checked during each pumping activity to verify that it is performing within design specifications by timing the filling of a container of known volume.

5.1.4 Diesel-Powered Generators

Diesel-powered generators are needed to generate electricity for the pump and DAS. Diesel-powered generators will be operated in accordance with the instructions provided by the manufacturer. Operation of diesel generators is not a quality-affecting activity and, therefore, documentation of activities associated with the generators is not mandatory. No diesel fuel will be stored in separate containers at the well sites.

5.1.5 Storage Tanks

All groundwater produced from the wells during these activities will be stored in polyethylene tanks at the well pad until such time as it can be discharged into the H-19 evaporation pond.

5.1.6 Data-Acquisition System

All pumping tests conducted will be controlled and monitored using a computer-controlled DAS. The DAS will send and receive signals to/from the downhole and barometric pressure transmitters and record their responses on the computer's hard disk and on floppy diskettes. The DAS to be used will be PERM or Geomation. The basic PERM system consists of a power-excitation input to access the downhole pressure transmitters and other gauges such as the barometer and flow meter, a digital voltmeter to observe each gauge's output signal, a data-control unit to access each gauge's signal, a programmable voltage standard to verify the signal output from gauge

and excitation devices, and a computer to store and process the data. The PERM DAS will collect and process each gauge's input signal and store the data on hard disk and on floppy disks using SNL's PERM5 version 1.01 data-acquisition software, which has been qualified as software in accordance with SNL NP 19-1 (Subsection 10.4). The PERM5 software requires a computer with a 100-MHz 486 processor (or higher) running DOS 6.20. The Geomation System 2300 field monitoring and control system consists of modules that interface with various instruments by reading and recording voltage, amperage, resistance, and SDI-12 (environmental instrument interface). In addition, the Geomation DAS can provide outputs to flow control valves and other control devices. A computer will be used to provide a user interface and programming capabilities for the Geomation DAS via the Geonet™ Suite of software. The Geomation DAS will collect and process each gauge's input signal and store the data in memory until it can be archived to the computers hard drive. The Geonet™ Suite of software qualifies as "off the shelf software" with no access to the source code. This type of off-the-shelf software does not fall under the QA requirements as per NP 19-1, however the DAS activity must comply with NP 9-1.

5.1.7 Electronic Flow-Control System

Pumping rates during any pumping test will be controlled using an electronic flow-control system consisting of an in-line inductive flow meter, a programmable electronic flow controller, and an electropneumatic valve. The flow-control system will be operated with the DAS and flow rates will be recorded by the DAS. The components of the system are combined in a simple feedback loop. Thus, the flow-rate output from the flow meter will be used as input to the electropneumatic valve allowing stable flow-rate changes to be introduced from the DAS keyboard in less than 30 s. The setpoint can be set manually at the controller or remotely via the DAS. The design control range for flow rate is 0.2 to 2 gpm. Additional checks on the discharge rate may be provided using a calibrated bucket and stopwatch, and a mechanical flow meter.

5.1.8 Barometer

Atmospheric pressure will be monitored during all pumping tests using a Druck PTX 260 series 0-to-17-psia pressure transmitter mounted at the well site. Druck PTX transmitters have a 9 to 30 V (DC) input voltage with a 4-to-20-mA output signal which is converted to a voltage output and monitored by the DAS. The barometric output monitored by the DAS and converted pressure data will be recorded at the same frequency as the downhole pressure data.

5.2 Downhole Equipment

Downhole equipment will be operated from the surface and will consist of bailing and swabbing equipment to remove fluid from the borehole(s), inflatable packers, a sliding-sleeve shut-in tool, memory gauges, a submersible pump, and possibly pressure transmitters. The depths of all equipment installed in a well will be measured and documented relative to a known permanent datum, such as a survey marker established on the hydropad. A secondary datum, such as the top of well casing, may be used as a reference point for depths provided that the elevation of that secondary datum relative to that of the primary datum is known and documented.

5.2.1 Bailing and Swabbing Equipment

Bailing and swabbing equipment will be used to remove fluid from the tubing above the shut-in tool as needed to conduct slug and/or DSTs. The bailing and swabbing equipment will consist of artificial and/or natural rubber tubing wipers (swab cups) or downhole bailers supplied and operated by the pump-truck contractor. If bailing or swabbing is not possible or not effective, the fluid level in the tubing string may be lowered by means of air lifting, whereby a hose or flexible tubing would be used to inject compressed air below the water level in the tubing string at pressures and volumes sufficient to lift the fluid to land surface.

5.2.2 Inflatable Packers

Slug and DSTs will be conducted with a PIP set above the Magenta perforations on 2.375-in tubing. Compressed air or compressed nitrogen will be used to inflate the packers. The packers to be used will have uninflated diameters of 3.5-7 in, depending on the diameter of the casing in each well.

5.2.3 Sliding-Sleeve Shut-In Tool

A Baski Access Port Valve (APV™) will be used to control access to the packer-isolated Magenta zones. An APV is a sliding-sleeve shut-in tool consisting of concentric sections of pipe with circular ports passing through the wall of the pipe. In the open position, the ports on the two sections line up, allowing fluid to pass from the tool string to the well. When one of the sections slides vertically relative to the other, the ports no longer line up (closed position), and the fluid cannot pass from the tool to the well. The Baski APVs are controlled from the surface. Gas or hydraulic pressure is applied to a piston through a 0.25-in control line run alongside the tool string to open or close the sleeve. Separate pistons and control lines are used to open and close the sleeve. No tubing movement or weight change to the tubing above the shut-in tool is required to operate this shut-in tool, thus minimizing tool-induced pressure disturbances in the test zone. APVs will be installed between two 2.375-in pup joints beneath PIPs.

5.2.4 TROLL Memory Gauges

TROLL 4000 and miniTROLL downhole memory gauges will be used as the primary data-acquisition instrument during slug tests and DSTs. Any time a Magenta well is pumped and another Magenta monitoring well is within 1 mile of the pumped well, TROLLs will also be used to monitor the pressure response in the nearby well(s). TROLLs are manufactured by In-Situ, Inc., and consist of a downhole pressure transducer and programmable data logger. They are installed at a known depth below the water surface in a well. The data logger is accessed from land surface by RS-422 or RS-232 cables, allowing the data-acquisition rate to be programmed and accumulate data to be downloaded to any laptop computer using a Windows 95, 98, 2000, or NT operating system and Win-Situ™, version 2.1, software. These battery-operated devices can operate for over 1 year without battery replacement. The use of the TROLL 4000 memory gauges will allow efficient use of manpower and provide useful data at any desired data density over extended time periods.

5.2.5 Submersible Pump

An electric submersible pump with a production capacity of up to 5 gpm will be used for groundwater sampling and possibly pumping tests under open-hole conditions. For pumping tests, the pump will be installed with an in-line check valve so that the pump tubing column can be filled with water at the start of pumping to ensure immediate flow control and regulation, and to ensure that water will not drain back through the pump when the pump is turned off. All wiring of submersible pumps will be performed by a licensed pump installer.

5.2.6 Pressure Transmitters

Druck PTX 161 pressure transmitters will be used to monitor the changes in Magenta pressure during any pumping tests. Two transmitters will be used at all times to ensure continued data collection in the event that one transmitter fails. The transmitters will be strapped to the discharge tubing above the pump. The Druck PTX 161 pressure transmitters have a 0-to-300-psig range of operation. These pressure transmitters will be monitored with the PERM DAS, which will record both the 4- to 20-mA output from the gages and the converted data in the desired pressure units.

6 TEST REQUIREMENTS/PROCEDURES

The activities discussed in this TP have been designed so that the data and information collected are of the highest possible value, and are more than adequate to meet specific program objectives.

6.1 Test Requirements

The testing elements of the Magenta data-collection activities require specific initial and operational conditions for maximum success. The Magenta pressure must be stabilized (changing less than 0.5 psi/day) before any hydraulic test is initialized. The fluid density in the well must be uniform before testing begins. The pumping rate during a pumping test should ideally be constant within $\pm 5\%$, but in any event must be well documented.

The test equipment used for the Magenta data-collection activities has to:

- provide quality data to support test objectives;
- perform according to design specifications; and
- be calibrated, as appropriate, according to standards acceptable under SNL NP 12-1 Subection 10.4).

6.2 Test Procedures

Three different types of tests may be performed in the Magenta wells depending on the conditions actually encountered. The following sections list the different tests that may be performed, provide general criteria for their selection, and define the procedures that will govern their performance.

6.2.1 Slug and Drillstem Tests

Slug tests or DSTs will be performed in all recompleted wells. A DST is simply a slug test that is shut in before complete water-level recovery has occurred. The slug portion of a DST is referred to as a flow period and the shut-in portion is referred to as a buildup period. The advantages of a DST relative to a slug test are that it takes less time to complete and provides two data sets that can be analyzed instead of one. The disadvantage of a DST relative to a slug test is that the flow-period data set is less definitive than a full slug data set.

All slug tests and DSTs will be conducted in accordance with the following TP procedures. A PIP will be set on 2.375-in tubing in the well casing above the perforations with a sliding-sleeve

shut-in valve immediately below the PIP. The PIP size will be selected so that the casing inside diameter (I.D.) is not more than twice the uninflated diameter of the PIP. The exact placement of the PIP is not critical, as long as it is within 20 ft of the uppermost perforation and its position is carefully measured. The shut-in valve will be in the open position when the test equipment is installed in the well. Once at the desired depth, the PIP will be inflated (set), after which the shut-in valve will be closed.

A TROLL (Subsection 5.2.4) will be strapped to the tubing at a depth below the stabilized Magenta water surface calculated to provide a pressure of 90-95% of the maximum pressure for that instrument. The pressure sensor of the TROLL will be connected to the Magenta interval using a feed-through line passing through the PIP. The depths of all equipment in the well will be carefully measured and documented in the scientific notebook.

With the shut-in valve closed, the tubing will be bailed or swabbed to remove some of the water above the Magenta and the specific gravity of this water will be measured. The amount of water to be removed will be determined on-site by the PI, based on the following guideline: the water level will be lowered to where it will provide a pressure no less than 5% of the maximum pressure for the TROLL when the shut-in valve is opened. After bailing or swabbing, the water level in the tubing will be measured using a Solinst meter in accordance with TOP 512.

The pressure in the Magenta interval below the PIP will be allowed to stabilize until the rate of change is <0.5 psi/day. At the direction of the PI, the shut-in tool will be opened to initiate a slug test. The PI will evaluate the test data in real time to determine if the test should be continued as a slug test or converted to a DST. Subject to the discretion of the PI, the following guidelines will be used to determine if and when a slug test will be converted to a DST:

- If 50% of the initial slug has dissipated after 3 h, the test will remain a slug test.
- If 50% of the initial slug dissipates between 3 and 24 h, the shut-in valve will be closed and the test will be converted to a DST when 80% of the slug has dissipated.
- If 50% of the initial slug has not dissipated after 24 h, the shut-in valve will be closed and the test will be converted to a DST whenever 50% dissipation occurs.

Slug tests and DST buildup periods will continue until at least 98% pressure recovery has occurred.

For a slug test, the shut-in valve will then be closed and the tubing bailed or swabbed to create a pressure differential approximately half of that created for the first slug test. For a slug test converted to a DST at 80% slug dissipation, the tubing will also be bailed or swabbed to create a pressure differential approximately half of that created for the first test. No bailing or swabbing will be required for a test converted to a DST at 50% slug dissipation. After the pressure disturbance caused by bailing/swabbing has dissipated, the shut-in valve will be opened to begin a second slug test or DST. The second test will be an exact duplicate of the first test, but with half of the initial pressure differential. Testing may be terminated at any time after 98% pressure recovery has occurred.

Data-acquisition rates will be set as fast as possible at the start of each test event (slug/flow or buildup) and will then be systematically decreased throughout the test to provide a reasonably uniform distribution of data with respect to the logarithm of elapsed time.

6.2.2 Pumping Tests

Constant-rate pumping tests will be performed in any Magenta well capable of sustaining a pumping rate of about 1 gpm or more. All pumping tests will be conducted in accordance with the following TP procedures. A submersible pump (Subsection 5.2.5) will be set in the well approximately 5 ft below the Magenta perforations on 2.375-in tubing. A check valve will be installed above the pump to prevent water in the tubing column from draining back down through the pump when the pump is turned off. Two pressure transmitters (Subsection 5.2.6) will be strapped to the tubing approximately 10 ft above the pump. The depths of all equipment in the well will be carefully measured and documented in the scientific notebook.

The pump will be turned on and operated at a constant rate (determined during water-quality sampling) to produce water from the Magenta. A TROLL will be set in any Magenta monitoring well within 1 mile of the pumping well. Real-time analysis of the pressure data from the pumping and monitoring (if any) wells will be used by the PI to establish the time when the pump may be turned off and the time at which recovery monitoring will be terminated. The objective of any pumping test will be to determine the local Magenta transmissivity and, if other monitoring wells are affected, the local storativity. Pumping time may vary from two to as much as ten days depending on the local Magenta transmissivity.

The DAS (Subsection 5.1.6) will be used for any pumping test to record downhole pressure, barometric pressure, and flow rate. Data-acquisition rates will be set as fast as possible at the start of pumping and recovery and will then be systematically decreased to hourly, providing at least 20 readings for each log cycle of elapsed time. Manual totalizing-flow-meter readings and water-quality (temperature, specific conductance, pH, and specific gravity) measurements will be made no less frequently than hourly during pumping. During the recovery period, the water level in the tubing will be measured several times a day to verify that the check valve is not leaking.

6.2.3 Modifications to Test Procedures

Modifications to test procedures may be required during testing activities. These modifications will be conducted at the direction of the PI and will be documented in the scientific notebook as part of the QA records. Such modifications are not deviations and will not be reported as nonconformances that require corrective action.

7 DATA-ACQUISITION PLAN

Both manually and electronically collected data will be acquired during the Magenta activities. The following types of data will be recorded:

- electronically collected downhole pressure data;
- electronically and/or manually collected pumping rate and volume data from wells being pumped;
- electronically collected barometric-pressure data;
- manually collected water-level data;
- manually collected water-quality data concerning the temperature, pH, specific gravity, and specific conductance of fluid produced during pumping, bailing, and/or swabbing; and
- manually collected data on equipment and instrument configurations in the wells and at the surface.

7.1 Scientific Notebooks

Scientific notebooks will be used in accordance with SNL NP 20-2 (Subsection 10.4) to document all activities and decisions made during the Magenta field activities. Specific information to be included in the scientific notebooks includes:

- a statement of the objectives and description of work to be performed at each well, as well as a reference to this TP;
- a written account of all activities associated with each well;
- documentation of safety briefings;
- a list of all equipment used at each well, including make, model, and operating system (if applicable);
- a description of standards used for on-site instrument calibration and calibration results;
- traceable references to calibration information for instruments and/or gauges calibrated elsewhere;
- a sketch, showing all dimensions, of each downhole equipment configuration;

- tubing tallies and other equipment measurements;
- manually collected water-level measurements;
- manually collected water-quality data concerning the temperature, pH, specific gravity, and specific conductance of fluid produced during pumping, bailing, and/or swabbing;
- entries providing the names, start times, and stop times of all data files created with the DAS software or WinSitu, as well as tables showing the configuration information (pressure transmitter serial number, calibration coefficients, etc.) entered into PERM5 to initiate each data file; and
- discussion of the information and/or observations leading to decisions to initiate, terminate, or modify activities.

All entries in the scientific notebooks will be signed or initialed and dated by the person making the entry. The scientific notebook(s) for each well will be reviewed by an independent, technically qualified individual within 2 weeks of the end of each major field activity (recompletion, pumping, and hydraulic testing) at that well to verify that sufficient detail has been recorded to retrace the activities and confirm the results.

Manually collected water-quality data and water-level measurements may also be recorded on specially prepared forms rather than in the scientific notebooks when that would provide a more efficient means of data collection and tracking. Use of such forms will be noted in the scientific notebooks and these forms will be submitted as QA records.

7.2 Electronic Data Acquisition

TROLL memory gauges (Subsection 5.2.4) will be used for monitoring and testing activities. The PERM or Geomation DAS described in Subsection 5.1.6 will be used if any Magenta pumping tests are performed. If used, the DAS will record downhole pressures, barometric pressure, and pumping rates. Electronic data file-management systems will be documented in the scientific notebooks for these activities. These electronic data files will be submitted as QA records according to NP 17-1 (Subsection 10.4).

7.3 Manual Data Acquisition

Manual data collection will be carried out either using the scientific notebooks or forms designed specifically for each activity or data type. To minimize transcription errors and multiple documentation of the same information, the use of forms specified in the WIPP procedures is not mandatory. The PI will determine the means of documenting manually acquired data and will ensure that all quality-affecting information is documented.

7.4 On-Site Data Validation

During the field activities, the PI will evaluate the data as they are acquired. The data will be diagnosed for any tool failure and/or procedure-induced effect that may affect the data quality. The PI will take immediate action (if so required) to make any necessary changes to the equipment configuration or the procedures to assure the data quality is consistent with the objectives of these activities.

The PI will use real-time evaluation of the acquired data during any given activity to assure that the data are usable in a detailed interpretation, the conditions can be maintained over the planned duration of the activity, and that an activity will not be terminated before the minimum objectives can be achieved under the given time constraints. The PI may utilize some or all of the following procedures and analytical tools:

- To assure that the acquired data satisfy program plans, the PI may use the same interpretation techniques during the data-validation process as will be used in later interpretation of these data.
- The PI may use specialized plots to interpret the formation response and to identify the time domain of that response such as the wellbore storage, transition, stabilization, or other response phase.
- The PI may use real-time analysis of the acquired data to determine the time when continuing the activity will provide no further improvement in the interpreted results within the program's time and budget constraints.
- The PI may use real-time analysis to determine whether or not an activity can be terminated earlier than planned, and to develop a revised schedule as appropriate.

If at any time the PI determines that an activity or objective cannot be accomplished due to time constraints, problems concerning the performance of the equipment, or unsuitability of initial conditions, the PI may terminate the activity. The PI will document all real-time evaluation of data in the scientific notebook.

8 SAMPLING AND SAMPLE CONTROL

After recompletion to the Magenta, each well will be pumped to allow water samples representative of the Magenta to be collected. As discussed in Section 6, the wells will be pumped until water-quality parameters (electrical conductivity and specific gravity) are stable within $\pm 5\%$ while two wellbore volumes are pumped. When that occurs, water samples will be collected for laboratory analysis of major ions (calcium, sodium, magnesium, potassium, chloride, sulfate, and alkalinity). Samples will be collected and controlled in accordance with NP 13-1 (Subsection 10.4). The chain of custody for the samples when they are transferred to the WRES mobile analytical laboratory will be established in accordance with SP 13-1.

Water samples will be collected in 1-L acid-washed polyethylene bottles. Each bottle will be rinsed three times with water from the pump discharge line before a sample is collected. Two bottles will be filled in immediate succession. The first bottle will be filled completely. The second bottle will be filled approximately halfway. Approximately 2 mL of nitric acid (HNO₃ Ultrex II, 70.6 wt %) or equivalent] will be added to this bottle, and then the bottle will be filled to the shoulder. (Note: chemical goggles and protective gloves must be worn while handling nitric acid.) The lid will be screwed on the bottle and the bottle agitated. The pH of the sample will then be checked and, if it is above 2.0 standard units, 1 mL of nitric acid will be added, the sample agitated, and the pH checked again. This procedure will continue until the pH is less than 2.0.

After filling, the lids of all sample bottles will be secured with electrical tape. A label will be affixed to each bottle bearing the information listed below, and the label will be completely covered with clear packing tape. The label will contain the following information, written using an indelible marker:

- project name (WIPP),
- sample number,
- sample location (Magenta),
- well designation,
- collector's name,
- date and time,
- type of sample (groundwater),
- acid wash (yes or no),
- parameter or destination,

- type of preservative (HNO₃ or none),
- bottle number, and
- method of collection (filtered or unfiltered).

After collection, water samples will be stored in a cooler until they can be delivered to the WRES mobile analytical laboratory, which should occur as soon as practicable.

9 TRAINING

All SNL and WIPP-Site contractor personnel must receive WIPP General Employee Training (GET) followed by annual refreshers as part of employment requirements at WIPP. All personnel who will perform quality-affecting activities under this TP must have training in the SNL QA program (Form NP 2-1-1 and have viewed the current QA Refresher video), and must read SNL NPs 12-1, 13-1, and 20-2 and SP 13-1. They must also read the procedures outlined in this TP, the job hazard analysis (JHA), and applicable SPs and TOPs listed in Subsection 10.4, but no additional training in those procedures is required. No other special training requirements are anticipated in addition to the GET and the safety briefings described in Section 11.

10 QUALITY ASSURANCE

10.1 Hierarchy of Documents

Several types of documents are used to control work performed under this TP. If inconsistencies or conflicts exist among the requirements specified in these documents, the following hierarchy shall apply:

- memoranda or other written instructions used to modify or clarify the requirements of the TP (most recent instructions having precedence over previous instructions);
- this TP,
- NPs (Subsection 10.4),
- SPs,
- TOPs.

SNL QA concurrence will be obtained and/or corrective action reports will be written for modifications to QA procedures implemented for work conducted under this TP.

10.2 Quality-Affecting Activities

Activities performed under this TP are quality-affecting with the following exceptions:

- water-quality measurements (except specific gravity; see Subection 5.1.2);
- operation of diesel-powered generators (see Subection 5.1.4);
- assistance provided by the manufacturer/contractor in the installation of tools and equipment;
- support services for tasks that do not involve data collection, such as pump trucks, machining, welding, fishing services, fuel, etc.; and
- water storage and disposal.

Activities that are not quality-affecting are not subject to the requirements of the SNL QA program.

10.3 Quality Assurance Program Description

SNL activities are conducted in accordance with the requirements specified in the Carlsbad Field Office (CBFO) Quality Assurance Program Document (QAPD) (U.S. DOE, 2002). The requirements and guidance specified in the QAPD are based on criteria contained in American Society of Mechanical Engineers (ASME) (1989a), ASME (1989), ASME (1989c) and U.S. EPA (1993). The requirements of U.S. DOE (2002) are passed down and implemented through the SNL NWMP QA procedures.

10.4 NPs, SPs and TOPs

The following NPs, SPs, and TOPs are applicable to the work described in this TP. Note that the versions listed below may not be the current versions. Always check the SNL NWMP web site (www.nwmp.sandia.gov/onlinedocuments/) to find the current version of these or other NPs, SPs, or TOPs.

- NP 9-1, “Analyses;”
- NP 12-1, “Control of Measuring and Test Equipment;”
- NP 9-1, “Analyses;”
- NP 13-1, “Sample Control;”
- NP 17-1, “Records;”
- NP 19-1, “Software Requirements;”
- NP 20-2, “Scientific Notebooks;”
- SP 13-1, “Chain of Custody;”
- SP 13-3, “Field Water-Quality Measurements;” and
- TOP 512, “Depth-to-Water Measurement Using Solinst Brand Electric Sounder.”

Modification to these procedures may be required during field activities. Such modifications are not deviations and will not be reported as nonconformances that require corrective action. However, modifications will be documented by the PI in the scientific notebook as they occur as part of the QA records.

10.5 Data Integrity

Care will be taken throughout the performance of the operations for this TP to ensure the integrity of all data collected including documentation on hard copy and data collected on magnetic media. Duplicate copies of all data will be produced no less frequently than monthly and the duplicate copies will be maintained at a location separate from the well site to ensure that data are not lost. Data collected shall not be released unless and until the data are reviewed and approved by the SNL PI.

10.6 Records

Records shall be maintained as described in this TP and applicable QA implementing procedures. These records may consist of bound scientific notebooks, loose-leaf pages, forms, printouts, or information stored on electronic media. The PI will ensure that the required records are maintained and are submitted to the SNL NWMP Records Center according to NP 17-1 (Subsection 10.4.

10.6.1 Required QA Records

As a minimum, QA records will include:

- scientific notebooks;
- SPs , NPs, and TOPs used;
- calibration records for all controlled equipment;
- equipment-specification sheets or information;
- photographs taken of the equipment and activities, with a log listing the photographs and describing what is seen;
- data files collected by TROLLs and/or the DAS, with a log listing the files and defining their contents;
- all forms containing manually collected data;
- a log of all samples collected;
- copies of all permits obtained; and
- reports (e.g., gamma and perforation logs) provided by contractors.

10.6.2 Miscellaneous Non-QA Records

Additional records that are useful in documenting the history of the activities but are considered non-QA records may be maintained and submitted to the SNL NWMP Records Center. These records include:

- safety briefings,
- as-built diagrams of equipment supplied by contractors,
- pump-truck and other equipment certifications,
- equipment manuals and specifications,
- information related to operation of diesel generators,
- equipment manifests, and
- cost and billing information regarding contracted services.

These records do not support performance assessment or regulatory compliance and, therefore, are not quality-affecting information.

10.6.3 Submittal of Records

Records resulting from work conducted under this TP, including forms and data stored on electronic media, will not be submitted to the SNL QA staff for review and approval in individual pieces. Instead, the records will be assembled into a records package(s), which will be reviewed by the SNL PI before being submitted for QA review.

11 HEALTH AND SAFETY

SNL field operations will be conducted on land controlled by WRES, the WIPP Management and Operating Contractor (MOC), and the field operations team assembled for this TP will follow all WRES safety practices and policies. Operational safety for individual field operations will be addressed through an ES&H PHS (SNL2A00137-001) and a Hazard Analysis (HA) developed by SNL. Project-specific WIPP-Site safety procedures and a Job Hazard Analysis (JHA) will be approved through the SNL WTL and WRES safety personnel. All activities will be performed in accordance with the requirements of WP12 FP.01, WP12 IS.01, and WP12 IH.02.

All equipment will be operated in accordance with the appropriate allowable operating pressures and in accordance with the SNL ES&H pressure-safety manual. Pressure ratings for individual parts such as valves and pressure tubing will be either marked by the manufacturer with the maximum allowable operating pressure or such information will be made available in written documentation according to guidelines of the SNL Center 6800 ES&H Coordinator. Additional safety requirements to be observed by field personnel are:

- appropriate use of safety shoes, safety glasses, chemical goggles, hard hats, and protective gloves;
- ensuring adequate fuel is available for all field vehicles, especially those traveling to remote locations;
- proper installation and safety procedures when handling electrical submersible pumps and other electrical equipment;
- proper procedures for operation of diesel-powered generators for on-site electric power;
- proper procedures for inflation of downhole packers;
- familiarity with on- and off-site road conditions and driving regulations;
- familiarity with the locations of First Aid supplies, medical support facilities, and fire extinguishers and other safety equipment;
- familiarity with the location of lists of emergency telephone numbers and persons and offices to notify in the event of emergencies; and
- familiarity with the location of all MSDS information.

All field personnel assigned to the field operations described in this TP will receive a safety briefing before the beginning of field operations at each well site. In addition, the PI or field-site supervisor will conduct daily safety meetings at the beginning of daily operations or at the beginning

of each shift. All personnel receiving safety briefings are required to sign and date the safety-briefing form as part of safety-documentation procedures. All work locations will maintain a mobile communication system. In case of accident, injury, or sudden illness, the WIPP Central Monitoring Room (CMR) will be notified immediately. The CMR will coordinate emergency response activities.

12 ROLES AND RESPONSIBILITIES

The work in question will require the drilling of several new wells in the vicinity of the WIPP site. It will also involve reconditioning several existing wells. Throughout this multi-year field program, wells will be tested, water levels monitored, and well water chemistry will be observed. SNL intends to partner with Washington Regulatory and Environmental Services (WRES), the WIPP MOC, and/or its corporate affiliates to ensure integration of program efforts, to see that this work is done in accordance with all applicable technical and regulatory standards, and that data generated are fully qualified under SNL's WIPP quality assurance program for use in assessing the long-term performance of the repository.

12.1 SNL Responsibility

SNL responsibilities are:

- Identify which monitoring wells will need to be reconditioned and work with WRES to identify by what means those wells will be made ready for scientific endeavor.
- Identify which wells will need to be hydraulically tested and identify the type(s) of test(s) to be performed.
- Provide water-level and water-chemistry monitoring equipment, when appropriate, for placement in new and/or reconditioned wells.
- Provide all equipment, both downhole and surface-located, necessary to perform hydraulic tests in new/replacement and reconditioned wells.
- Monitor water levels and water chemistry in wells of interest to SNL, or cause levels and chemistry to be monitored.
- In collaboration with WRES (as outlined below), perform all hydraulic tests in wells.
- Analyze and interpret well tests and hydrological monitoring data acquired.

12.2 WRES Responsibilities

WRES will assume the following responsibilities in support of the activities discussed in this TP:

- Recondition (or have reconditioned) any existing wells to be tested.

- For wells to be hydraulically tested, provide (or have provided) the requisite capabilities, including (but not limited to) pump-setting trucks or pulling rigs and crews to install hydraulic testing equipment, “kill” trucks to inflate packers (when required), and appropriately licensed, authorized, and experienced electrician(s) to wire and hook up pumps (as needed).
- Provide necessary oversight personnel at well sites to allow SNL to conduct well testing operations on a 24-hour-per-day/7-day-per-week basis, as needed. In turn, SNL will provide to WRES as much advance notice as possible of the need for specific operations outside normal day-time work hours.
- Dispose of any waste water or other waste materials generated during well testing and well reconditioning operations in accordance with all applicable environmental and regulatory standards (including chemical analysis of produced waste water, as appropriate).
- Facilitate compliance with the applicable WIPP Site environment, health, safety, and security requirements as they relate to program activities.
- Participate in water-level and water-chemistry monitoring and data gathering to the degree that SNL and WRES jointly determine is needed.

12.3 Responsibility for Permitting and Licensing

WRES is responsible for ensuring that WIPP-site activities are conducted in accordance with applicable federal, state, and local regulatory requirements. WRES is responsible for all permitting and licensing requirements associated with drilling, coring, logging, reconditioning, testing, and waste disposal necessary to complete the activities outlined within this TP. SNL will abide by all of the permitting and licensing rules and regulatory requirements as indicated by WRES. SNL is responsible for ensuring that all contracted experimental work performed by SNL contractors at the WIPP site meets all applicable federal, state, and local regulatory requirements.

13 REFERENCES

- ASME. 1989a. *Quality Assurance Program Requirements for Nuclear Facilities*. ASME NQA-1-1989 Edition. New York, NY: American Society of Mechanical Engineers.
- ASME. 1989b. *Quality Assurance Requirements for Nuclear Facility Applications*. ASME NQA-2-1989 Edition. New York, NY: American Society of Mechanical Engineers.
- ASME. 1989c. *Quality Assurance Program Requirements for the Collection of Scientific and Technical Information for Site Characterization of High Level Nuclear Waste Repositories*. ASME NQA-3-1989 Edition. New York, NY: American Society of Mechanical Engineers.
- U.S. DOE. 1996. *Title 40 CFR Part 191 Compliance Certification Application for the Waste Isolation Pilot Plant*. DOE/CAO-1996-2184. Carlsbad, NM: U.S. Department of Energy Carlsbad Area Office.
- U.S. DOE. 2002. *Quality Assurance Program Document, Rev. 4*. DOE-CBFO-94-1012. Carlsbad, NM: U.S. Department of Energy Carlsbad Field Office.
- U.S. EPA. 1993. "40 CFR Part 191: Environmental Radiation Protection Standards for the Management and Disposal of Spent Nuclear Fuel, High-Level and Transuranic Radioactive Wastes; Final Rule," *Federal Register*. Vol. 58, no. 242, 66398-66416.
- U.S. EPA. 1996. "40 CFR Part 194: Criteria for the Certification and Re-Certification of the Waste Isolation Pilot Plant's Compliance With the 40 CFR Part 191 Disposal Regulations: Final Rule," *Federal Register*. Vol. 61, no. 28, 5224-5245.

NOTICE: This document was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency thereof, nor any of their employees, nor any of their contractors, subcontractors, or their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness or any information, apparatus, product or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process or service by trade name, trademark, manufacturer, or otherwise, does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government, any agency thereof or any of their contractors or subcontractors. The views and opinions expressed herein do not necessarily state or reflect those of the United States Government, any agency thereof or any of their contractors.

This document was authored by Sandia Corporation under Contract No. DE-AC04-94AL85000 with the United States Department of Energy. Parties are allowed to download copies at no cost for internal use within your organization only provided that any copies made are true and accurate. Copies must include a statement acknowledging Sandia Corporation's authorship of the subject matter.